Spot Safety Project Evaluation

Project Log # 200812034

Spot Safety Project # 12-01-230

Spot Safety Project Evaluation of the Signal Revision and Upgrades at the Intersection of US 70 and SR 1462 (10th Ave Dr SE) / SR 1171 (6th St SE) in Hickory Catawba 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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Brad Robinson, PE

5/12/2009
Date

Traffic Safety Project Engineer

Spot Safety Project Evaluation Documentation

Subject Location

Evaluation of Spot Safety Project Number 12-01-230 – The Intersection of US 70 and SR 1462 (10^{th} Ave Dr SE) / SR 1171 (6^{th} St SE) in Hickory, Catawba County.

Project Information and Background from the Project File Folder

The spot safety project improvement countermeasure chosen for the subject location was to revise the signal to provide a protected left turn phase for the eastbound approach of US 70. In addition, all the signal heads were upgraded to LED's.

The subject location is a four-leg intersection which allowed only permissive left turns for all approaches in the before period. US 70 is a five-lane roadway at the subject intersection. SR 1462 and SR 1171 both have single lane approaches. The speed limits are 50 mph for US 70 and 30 mph for SR 1462/SR 1171.

The original statement of problem was that eastbound left turning vehicles were experiencing delay and a crash problem.

The initial crash analysis was conducted from June 1, 1998 to May 31, 2001 with a total of 21 crashes, six of which were Left Turn-Same Roadway Crashes and considered correctable by the chosen countermeasure. The final completion date for the improvements at the subject intersection was on January 28, 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 was from December 1, 2002 to March 31, 2003. The before period consisted of reported crashes from June 1, 1997 through November 30, 2002 (5 years and 6 months) and the after period consisted of reported crashes from April 1, 2003 through September 30, 2008 (5 years and 6 months). The ending date for this analysis was limited by the available crash data at the time the analysis was conducted.

The treatment data consisted of all reported crashes within 150 feet of the subject intersection. The following data table depicts the Naive Before and After Analysis for the treatment location. Please note that Left Turn Same Roadway Crashes involving eastbound vehicles on US 70 making left turns were the Target Crashes for the chosen countermeasure. The Target Crashes are clearly identified in the before and after period collision diagrams.

Treatment Information			
	Before	**After**	**Percent Reduction (-) Percent Increase (+)**
Total Crashes	53	47	-11.3
Total Severity Index	3.65	4.82	32.1
Target Crashes	14	7	-50.0
Target Crash Severity Index	4.7	16.06	241.7
Volume	23,500	22,200	-5.5
Crash Severity Summary			
Fatal Crashes	0	1	N/A
Class A Crashes	0	0	N/A
Class B Crashes	3	4	33.3
Class C Crashes	16	10	-37.5
PDO Crashes	34	32	-5.9

The naive before and after analysis at the treatment location resulted in an 11 percent decrease in Total Crashes, a 50 percent decrease in Target Crashes, and a six percent decrease in Average Daily Traffic (ADT). The before period ADT year was 2000 and the after period ADT year was 2005.

Results and Discussion

The naive before and after analysis involving the comparison of treatment actual before data versus treatment actual after data resulted in an 11 percent decrease in Total Crashes and a 50 percent decrease in Target Crashes. The Total Severity Index increased by 32 percent and the Target Crash Severity Index increased by 242 percent. 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 although the severity indexes experienced increased significant increases.

The calculated benefit to cost ratio for this project is -30.29 considering total crashes. The benefit to cost ratio considering only target crashes is -31.88. 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.

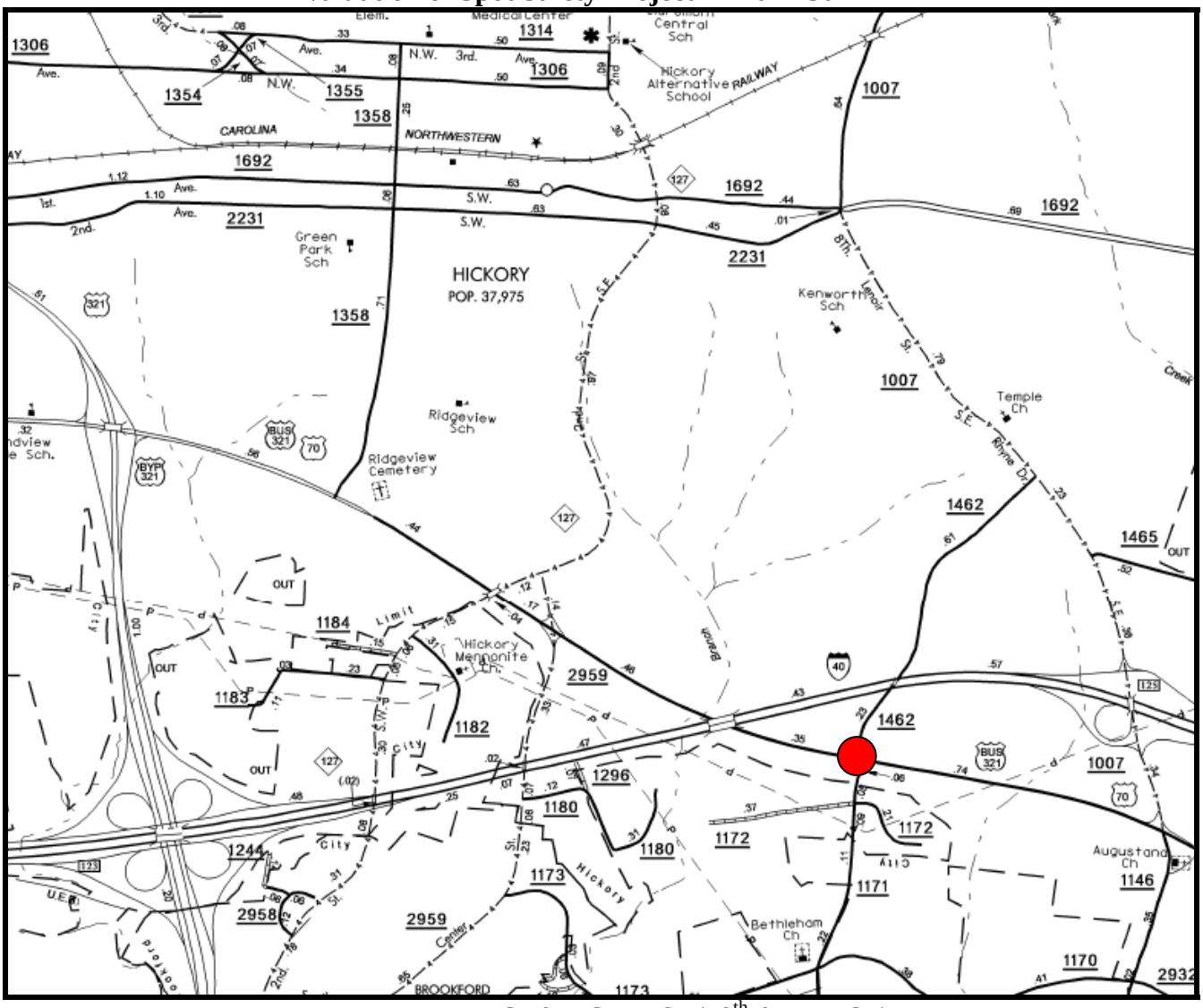
There was a fatal Target Crash in the after period that contributed to the large increase in the Severity Indexes and the negative cost ratios. The crash occurred during the permissive left turn phase of the signal and involved an eastbound vehicle failing to properly yield to a thru vehicle. The driver of the left-turning vehicle was under the influence of drugs and alcohol.

It appears that the chosen countermeasure was effective in reducing Target Crashes at the subject intersection. The number of Left Turn-Same Roadway Crashes involving eastbound left turning vehicles was halved from the before to the after period (from 14 to 7). According to the crash reports, all of the Target Crashes in the after period occurred during the permissive left turn phase.

There was a noticeable increase in Left Turn-Same Roadway Crashes involving westbound left-turning traffic from the before to the after period. This pattern increased from two in the before period to five in the after, an increase of 150 percent.

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
Catawba County
Evaluation of Spot Safety Project #12-01-230



Treatment Location: US 70 at SR 1462 (10th Ave Dr SE)

Looking East on US 70

Looking West on US 70

Looking North on SR 1171 (6th St SE)

Looking South on SR 1462 (10th Ave Dr SE)

BENEFIT-COST ANALYSIS WORKSHEET

LOCATION: US 70 at SR 1462 BY: BDR
COUNTY: Catawba DATE: 4/6/2009
FILE NO.: SS 12-01-230

DETAILED COST: TYPE IMPROVEMENT - Signal Revision

ITEMS	TOTAL	SERVICE	CRF	ANNUAL COST
Construction	$0	0	0.000	$0
	$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 = $0
ESTIMATED INCREASE IN ANNUAL UTILITY COST = $150

TOTAL ANNUAL COST= $3,131
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	5.50	0	0.00	19	3.45	34	6.18	$95,055
AFTER	5.50	1	0.18	14	2.55	32	5.82	$189,891

Annual Benefits from Crash Cost Savings ($94,836)

NET AVG. ANNUAL BENEFITS = AVG. ANNUAL BENEFITS - TOTAL ANNUAL COST = ($97,967)

BENEFIT-COST RATIO = AVG ANNUAL BENEFITS/TOTAL ANNUAL COST = -30.29

TOTAL COST OF PROJECT - $20,000 COMPREHENSIVE B/C RATIO - -30.29

BENEFIT-COST ANALYSIS WORKSHEET

LOCATION: US 70 at SR 1462 BY: BDR
COUNTY: Catawba DATE: 4/6/2009
FILE NO.: SS 12-01-230 Target Crashes

DETAILED COST: TYPE IMPROVEMENT - Signal Revision

ITEMS	TOTAL	SERVICE	CRF	ANNUAL COST
Construction	$0	0	0.000	$0
	$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 = $0
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TOTAL ANNUAL COST= $3,131
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	5.50	0	0.00	7	1.27	7	1.27	$30,800
AFTER	5.50	1	0.18	4	0.73	2	0.36	$130,618

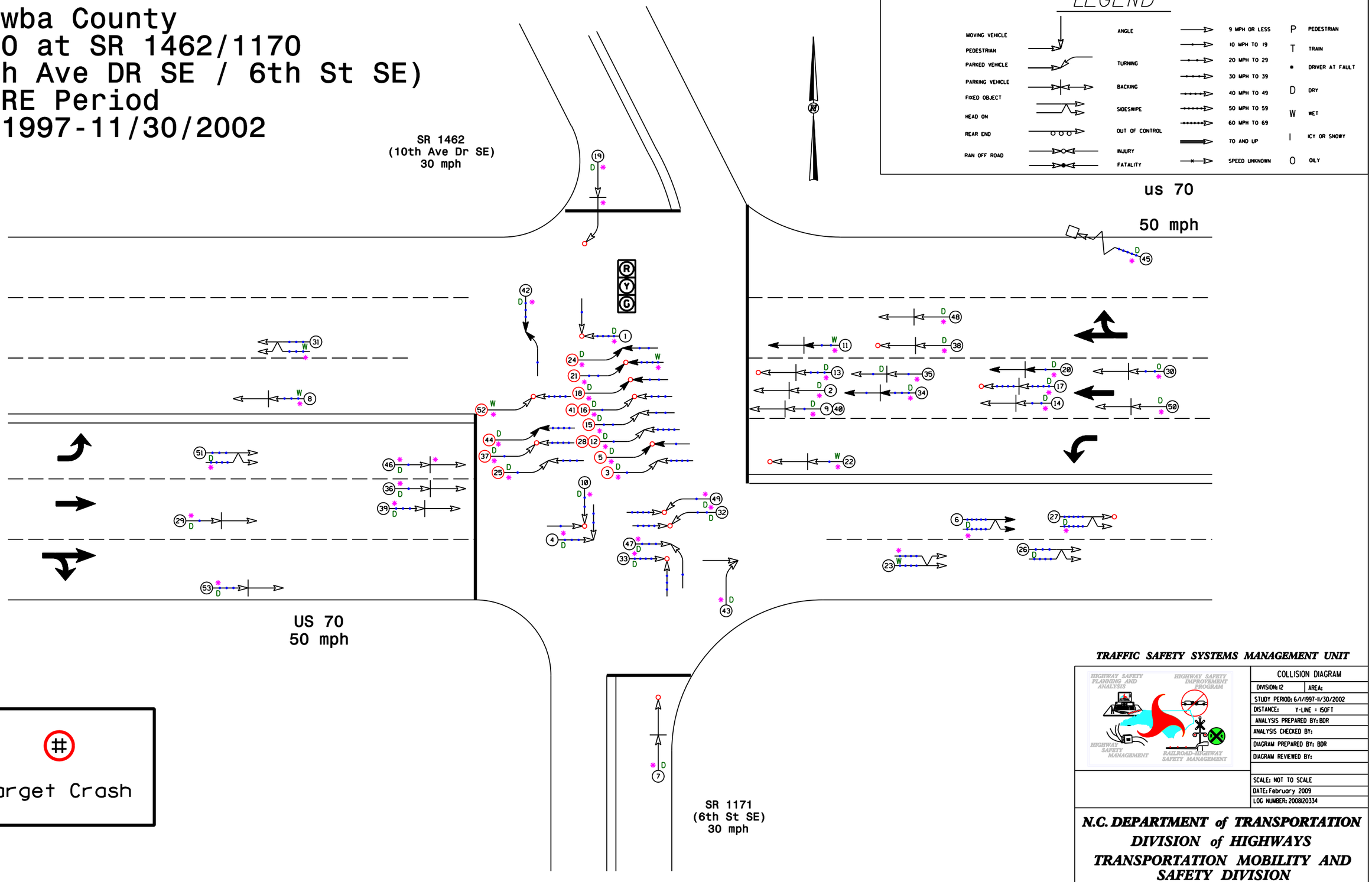
Annual Benefits from Crash Cost Savings ($99,818)

NET AVG. ANNUAL BENEFITS = AVG. ANNUAL BENEFITS - TOTAL ANNUAL COST = ($102,949)

BENEFIT-COST RATIO = AVG ANNUAL BENEFITS/TOTAL ANNUAL COST = -31.88

TOTAL COST OF PROJECT - $20,000 COMPREHENSIVE B/C RATIO - -31.88

Catawba County
US 70 at SR 1462/1170
(10th Ave DR SE / 6th St SE)
BEFORE Period
6/1/1997-11/30/2002



Target Crash

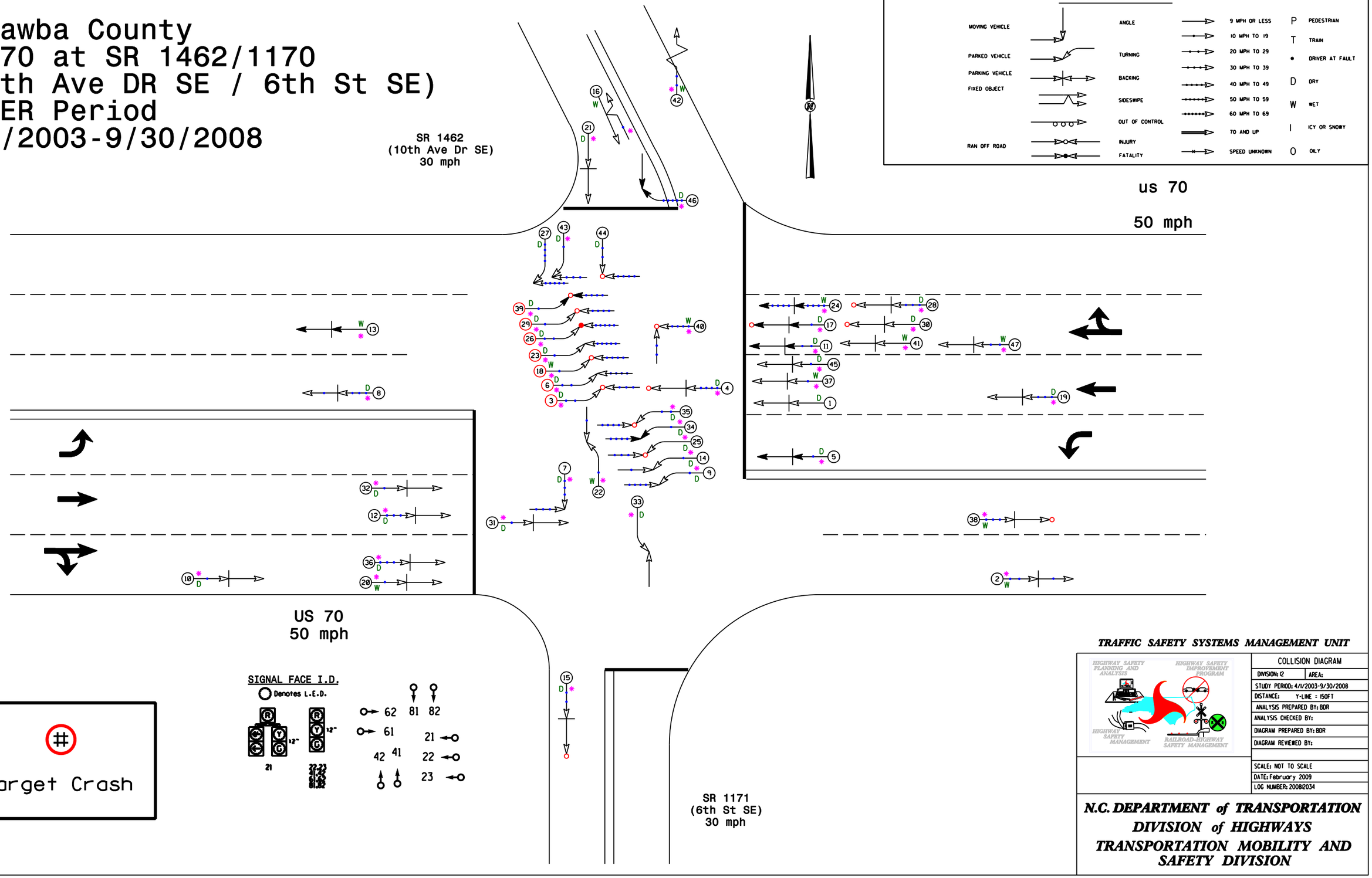
TRAFFIC SAFETY SYSTEMS MANAGEMENT UNIT

COLLISION DIAGRAM	
DIVISION: 12	AREA:
STUDY PERIOD: 6/1/1997-11/30/2002	
DISTANCE: Y-LINE = 150FT	
ANALYSIS PREPARED BY: BDR	
ANALYSIS CHECKED BY:	
DIAGRAM PREPARED BY: BDR	
DIAGRAM REVIEWED BY:	
SCALE: NOT TO SCALE	
DATE: February 2009	
LOG NUMBER: 200820334	

HIGHWAY SAFETY PLANNING AND ANALYSIS · HIGHWAY SAFETY IMPROVEMENT PROGRAM · HIGHWAY SAFETY MANAGEMENT · RAILROAD-HIGHWAY SAFETY MANAGEMENT

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

Catawba County
US 70 at SR 1462/1170
(10th Ave DR SE / 6th St SE)
AFTER Period
4/1/2003-9/30/2008



TRAFFIC SAFETY SYSTEMS MANAGEMENT UNIT

COLLISION DIAGRAM	
DIVISION: 12	AREA:
STUDY PERIOD: 4/1/2003-9/30/2008	
DISTANCE:	Y-LINE = 150FT
ANALYSIS PREPARED BY: BDR	
ANALYSIS CHECKED BY:	
DIAGRAM PREPARED BY: BDR	
DIAGRAM REVIEWED BY:	
SCALE: NOT TO SCALE	
DATE: February 2009	
LOG NUMBER: 20082034	

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