

Spot Safety Project Evaluation

Order # 41000007975

Spot Safety Project # 14-03-201

Spot Safety Project Evaluation of the Traffic Signal and Left Turn Lane Installation SR 1929 (Hospital Drive) at US 19/23/74 Eastbound Ramps Haywood 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

8-23-2010

Date

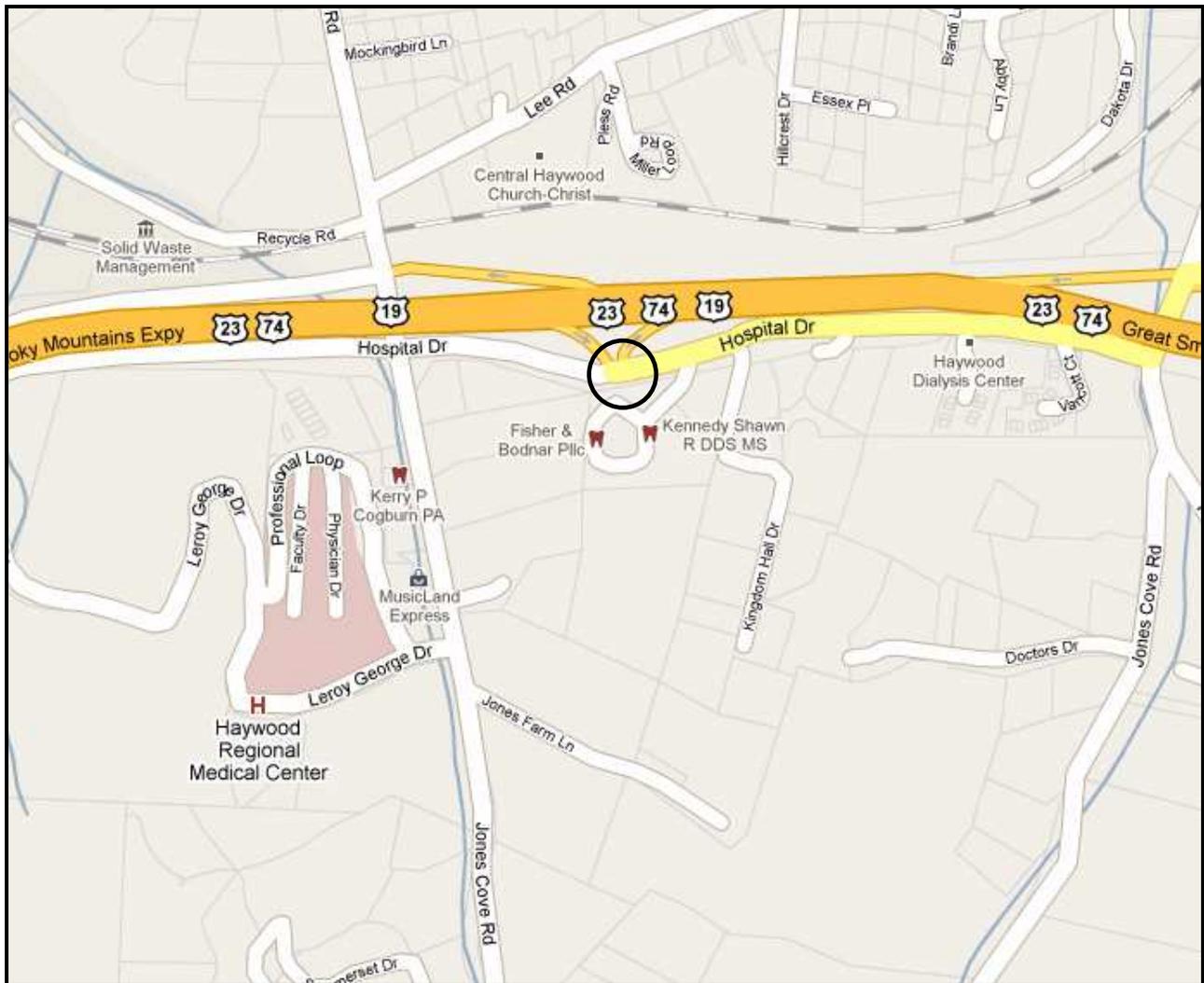
Traffic Safety Project Engineer

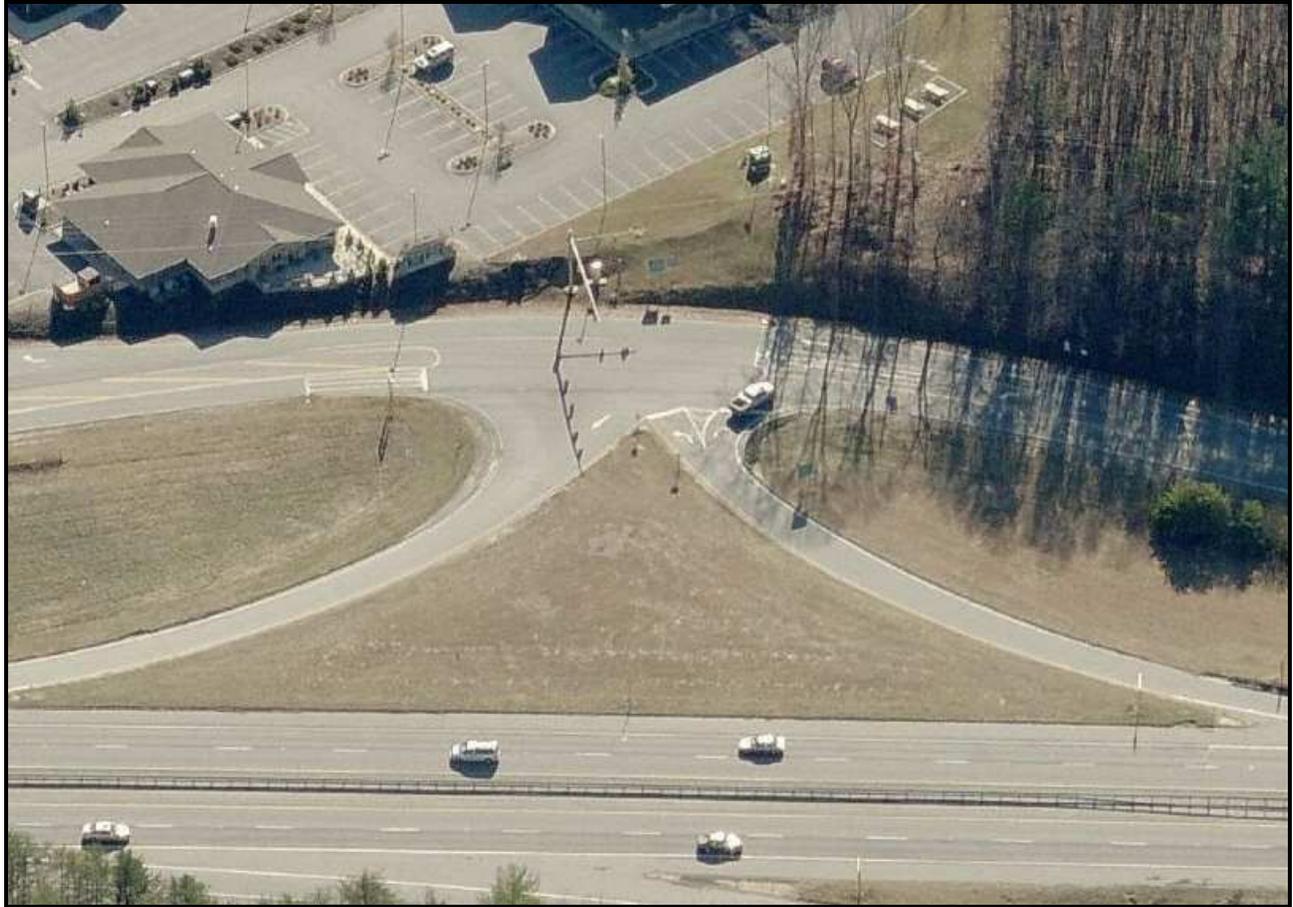
Spot Safety Project Evaluation Documentation

Subject Location

Evaluation of Spot Safety Project Number 14-03-201 located at the Intersection of SR 1929 (Hospital Drive) and the US 19/23/74 Eastbound Ramp Terminal (Exit 105) in Haywood County, between the Cities of Waynesville and Clyde. This is the Eastbound Exit for Haywood Regional Medical Center.

The Sig ID is 14-1097 for this newly installed traffic signal.





Aerial Photo - South Direction facing Up to show Roadway Geometrics

Project Information and Background from the Project File Folder

The spot safety project improvement countermeasures chosen for the subject location were the installation of an intersection traffic signal and a SR 1929 eastbound left turn lane. SR 1929 (Hospital Drive) is a two-lane facility with a speed limit of 45 mph. The eastbound off-ramp from US 19/23/74 is a single lane approach that widens for right and left turn slip lanes at the intersection. The subject location is a three-leg intersection as the off-ramp and on-ramp come to a single point and the location was controlled by a stop sign on US 19/23/74 off-ramp in the before period.

The original statement of problem indicated that this location was experiencing increased ramp delay and a prevalent pattern of left turn crashes accessing the on-ramp. The intended purpose of the new signal and new left turn lane was to alleviate the existing intersection crash pattern.

The initial crash analysis was completed from September 1, 1999 to August 31, 2002 with ten (10) reported crashes, all ten (10) of which were deemed correctable including one A-injury crash. The final completion date for the improvement at the subject intersection was on January 24, 2005 with a total cost of \$125,000.

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 December 2004 through January 2005. The before period consisted of reported crashes from July 1, 1999 through November 30, 2004 (5 years and 5 months); and the after period consisted of reported crashes from February 1, 2005 through June 30, 2010 (5 years and 5 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 Frontal Impact Crashes were the target crashes for the applied countermeasure. 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	23	5	- 78.3 %
Total Severity Index	10.81	2.48	- 77.1 %
Target Crashes	21	2	- 90.5 %
Target Crash Severity Index	11.74	1.00	- 91.5 %
Volume (2002, 2007)	4,000	5,400	35.0 %

<u>Injury Crash Summary</u>	Before	After	Percent Reduction (-) Percent Increase (+)
Fatal injury Crashes	1	0	- 100.0 %
Class A injury Crashes	1	0	- 100.0 %
Class B injury Crashes	3	1	- 66.7 %
Class C Injury Crashes	7	0	- 100.0 %
Total Injury Crashes	12	1	- 91.7 %

The naive before and after analysis at the treatment location resulted in a 78 percent decrease in Total Crashes, a 91 percent decrease in Target Crashes, and a 77 percent decrease in the Total Severity Index. The before period ADT year was 2002 and the after period ADT year was 2007.

Results and Discussion

Referencing the *Collision Diagrams*, the before period showed a significant pattern of sixteen (16) left turn-same roadway crashes for eastbound SR 1929 motorists attempting to turn left onto the US 19/23/74 on-ramp. There were also three (3) left turn crashes from the off-ramp, one (1) right turn-same road crash, and one (1) head-on collision as an eastbound SR 1929 vehicle traveled across the double yellow line. The before period intersection experienced a total of twenty-one (21) frontal impact crashes including the head-on fatality crash. After the signal and left turn lane installations, this location only experienced two (2) left turn-same roadway collisions. These two target crashes resulted from an eastbound SR 1929 vehicle making an improper permissive green left turn movement onto the ramp. The countermeasures chosen for this intersection upgrade made a considerable positive impact on crash performance.

The calculated benefit to cost ratio for this project is **12.26 considering total crashes**. The benefit to cost ratio **considering only target crashes is 12.42**. 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 from Google Street View 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 East on SR 1929 (Hospital Drive)



Traveling West on SR 1929 approaching intersection



Traveling North on US 19/23/74 Off-Ramp (Exit 105)

BENEFIT-COST ANALYSIS WORKSHEET - Total Crashes

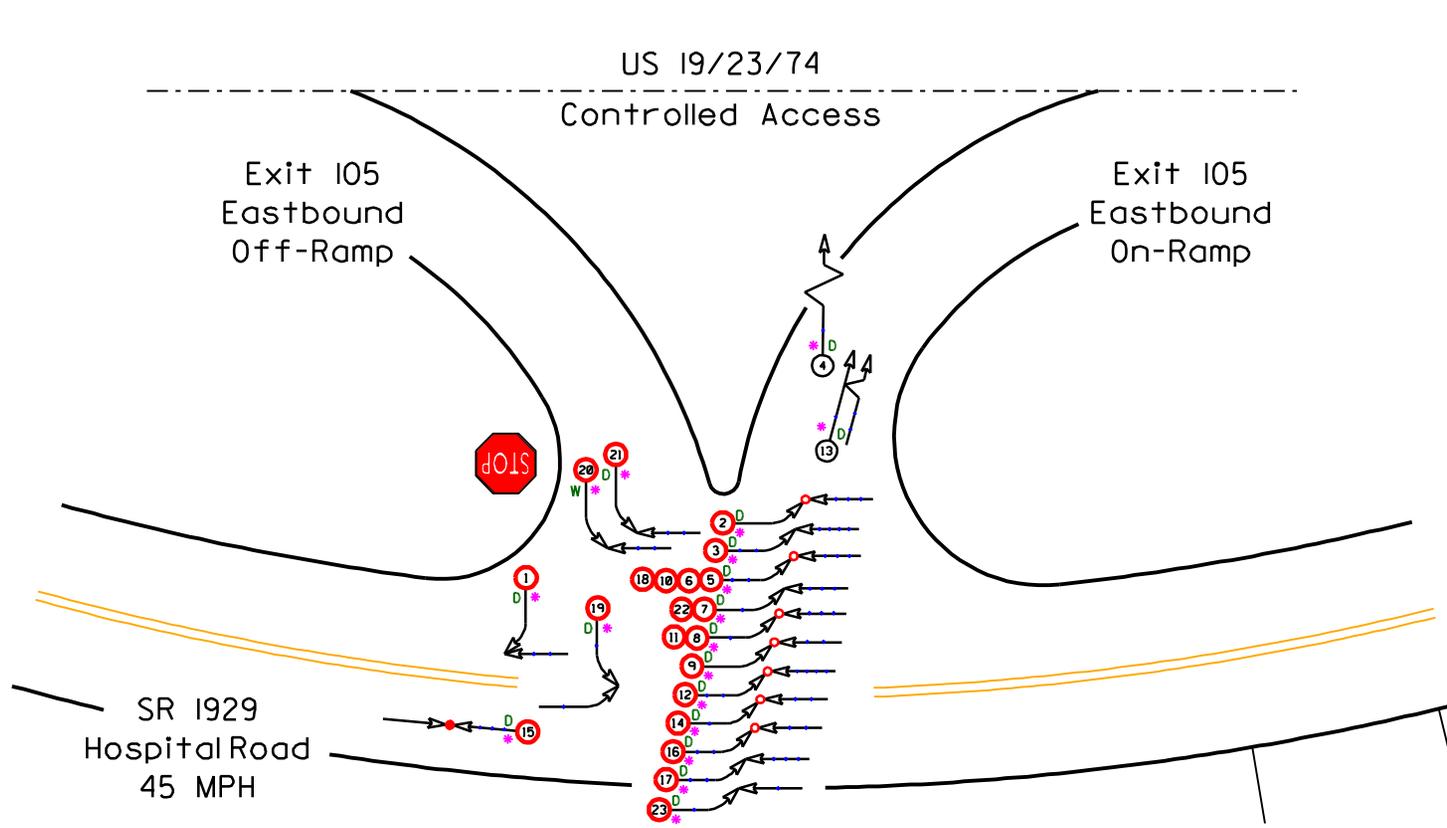
LOCATION: SR 1929 at US 19/23/74 EB Ramps		BY: JBS						
COUNTY: Haywood		DATE: 8/20/2010						
FILE NO.: SS 14-03-201								
DETAILED COST:	TYPE IMPROVEMENT - SR 1929 Left Turn Lane and Traffic Signal							
	ITEMS	TOTAL	SERVICE	CRF	ANNUAL COST			
	Construction	\$125,000	10	0.149	\$18,629			
	Right-of-Way	\$0	0	0.000	\$0			
		\$0	0	0.000	\$0			
	TOTALS	\$125,000	10	0.149	\$18,629			
	ESTIMATED INCREASE IN ANNUAL MAINT. COST =				\$2,600			
	ESTIMATED INCREASE IN ANNUAL UTILITY COST =				\$900			
	TOTAL ANNUAL COST=				\$22,129			
	TOTAL COST OF PROJECT=				\$125,000			
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	5.42	2	0.37	10	1.85	11	2.03	\$278,100
AFTER	5.42	0	0.00	1	0.18	4	0.74	\$6,863
Annual Benefits from Crash Cost Savings								\$271,236
NET AVG. ANNUAL BENEFITS = AVG. ANNUAL BENEFITS - TOTAL ANNUAL COST					=	\$249,107		
BENEFIT-COST RATIO = AVG ANNUAL BENEFITS/TOTAL ANNUAL COST					=	12.26		
TOTAL COST OF PROJECT		-	\$125,000	COMPREHENSIVE B/C RATIO		-	12.26	

BENEFIT-COST ANALYSIS WORKSHEET - Target Crashes

LOCATION: SR 1929 at US 19/23/74 EB Ramps		BY: JBS						
COUNTY: Haywood		DATE: 8/20/2010						
FILE NO.: SS 14-03-201								
DETAILED COST:	TYPE IMPROVEMENT - SR 1929 Left Turn Lane and Traffic Signal							
	ITEMS	TOTAL	SERVICE	CRF	ANNUAL COST			
	Construction	\$125,000	10	0.149	\$18,629			
	Right-of-Way	\$0	0	0.000	\$0			
		\$0	0	0.000	\$0			
	TOTALS	\$125,000	10	0.149	\$18,629			
	ESTIMATED INCREASE IN ANNUAL MAINT. COST =				\$2,600			
	ESTIMATED INCREASE IN ANNUAL UTILITY COST =				\$900			
	TOTAL ANNUAL COST=				\$22,129			
	TOTAL COST OF PROJECT=				\$125,000			
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	5.42	2	0.37	10	1.85	9	1.66	\$276,513
AFTER	5.42	0	0.00	0	0.00	2	0.37	\$1,587
Annual Benefits from Crash Cost Savings								\$274,926
NET AVG. ANNUAL BENEFITS = AVG. ANNUAL BENEFITS - TOTAL ANNUAL COST					=	\$252,798		
BENEFIT-COST RATIO = AVG ANNUAL BENEFITS/TOTAL ANNUAL COST					=	12.42		
TOTAL COST OF PROJECT		-	\$125,000	COMPREHENSIVE B/C RATIO		-	12.42	

SS# 14-03-201
 Order# 41000007975
 Haywood County
 BEFORE Period
 7/1/99 - 11/30/04

LEGEND							
	MOVING VEHICLE		ANGLE		9 MPH OR LESS		PEDESTRIAN
	PEDESTRIAN		TURNING		10 MPH TO 19		TRAIN
	PAKED 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		HURT		50 MPH TO 59		ICY OR SNOW
	REAR END		FATALITY		TO AND UP		SPEED UNKNOWN
	RAN OFF ROAD				0		



Frontal Impact
Target Crashes

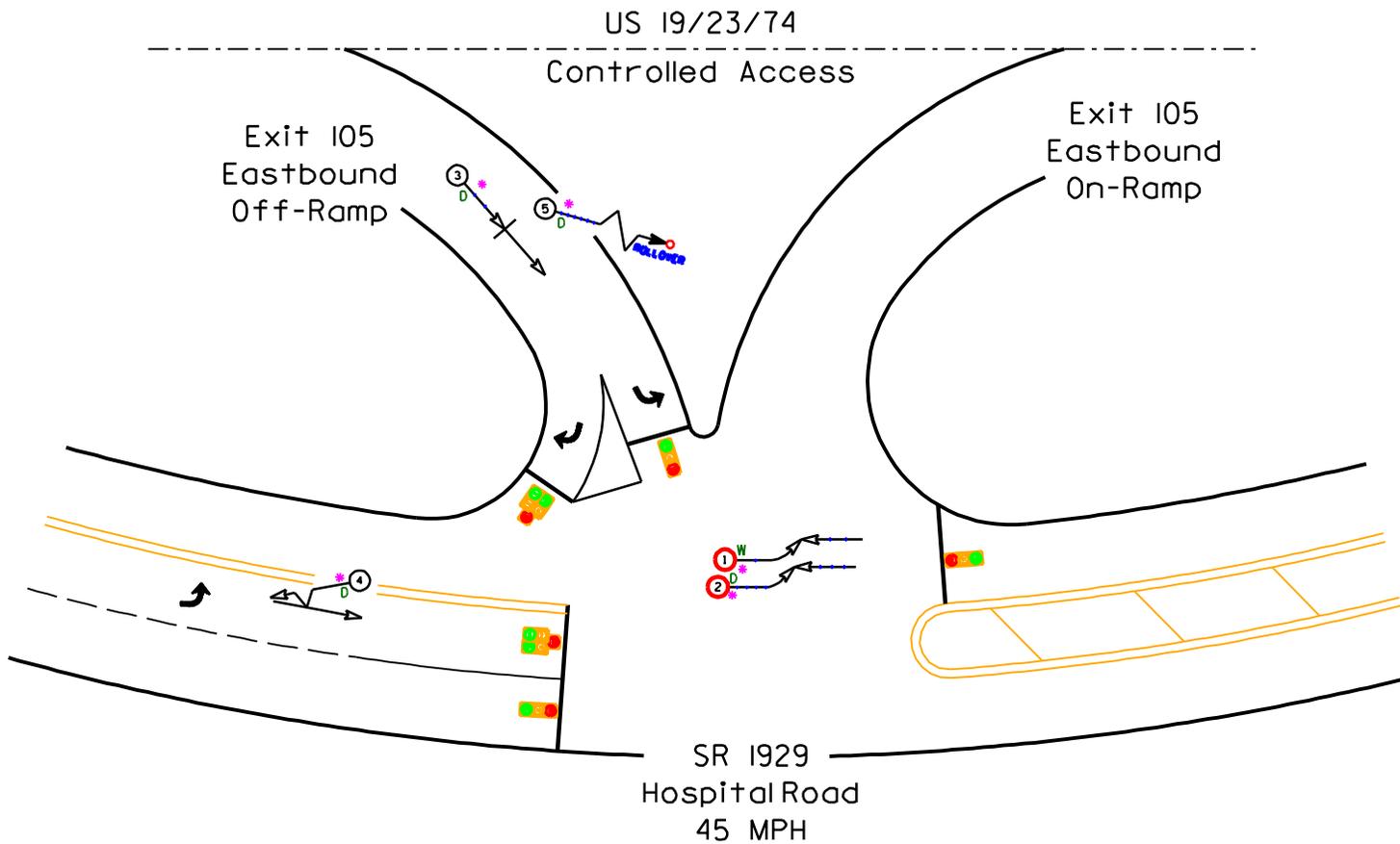
N.C. DEPARTMENT of TRANSPORTATION
DIVISION of HIGHWAYS
TRANSPORTATION MOBILITY and
SAFETY DIVISION

TRAFFIC SAFETY UNIT

Date: 8-20-2010 Prepared By: J. Schronce

SS# 14-03-201
 Order# 41000007975
 Haywood County
 AFTER Period
 2/1/05 - 6/30/10

LEGEND							
	MOVING VEHICLE		ANGLE		9 MPH OR LESS		PEDESTRIAN
	PEDESTRIAN		TURNING		10 MPH TO 19		TRAM
	PAKED VEHICLE		BACKING		20 MPH TO 29		DRIVER AT FAULT
	PAKED VEHICLE		SIDESWIPE		30 MPH TO 39		DRY
	FIXED OBJECT		OUT OF CONTROL		40 MPH TO 49		WET
	HEAD ON		TO AND UP		50 MPH TO 59		ICY OR SNOW
	REAR END		INJURY		60 MPH TO 69		SPEED UNKNOWN
	RAN OFF ROAD		FATALITY		70 MPH TO 79		ONLY



New Signalized Intersection
 Sig ID 14-1097



Frontal Impact
Target Crashes

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DIVISION of HIGHWAYS
TRANSPORTATION MOBILITY and SAFETY DIVISION

TRAFFIC SAFETY UNIT

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