

# **Hazard Elimination Project Evaluation**

Project Log # 200705280

Hazard Elimination Project W-3422

**Evaluation of Traffic Signal and Left Turn Lane Installation at the Intersection of SR 3549  
(Liberty) and SR 3314 (Wiley Lewis), Guilford County**

Documents Prepared By:

Safety Evaluation Group  
Traffic Safety Systems Management Section  
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North Carolina Department of Transportation

**Principal Investigator**

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Brian G. Murphy, PE

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Date

Traffic Safety Project Engineer

# ***Hazard Elimination Project Evaluation Documentation***

## **Subject Location**

Evaluation of Hazard Elimination Project W-3422 – Installation of Traffic Signal and Left Turn Lanes at the Intersection of SR 3549 (Liberty) and SR 3314 (Wiley Lewis), Guilford County

## **Project Information and Background from the Project File Folder**

The safety countermeasure chosen for the subject location was to install a traffic signal and left turn lanes at the intersection of SR 3549 (Liberty) and SR 3314 (Wiley Lewis). The project was let in July of 2000 and closed out in August of 2001 at an estimated cost of \$460,000.

The initial crash analysis for this location was completed from July 1, 1996 through June 30, 1999 with a total of ten reported crashes. According to the initial crash analysis, there were six Angle crashes, three Rear End crashes, and one Ran Off Road – Right crash that resulted in one fatal injury crash and four non-fatal injury crashes.

## **Naïve Before and After Analysis**

After reviewing the hazard elimination 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 July 1, 2000 through August 31, 2001. The before period consisted of reported crashes from November 1, 1994 through June 30, 2000 (5 Years, 8 Months) and the after period consisted of reported crashes from September 1, 2001 through April 30, 2007 (5 Years, 8 Months). The ending date for this analysis was determined by the available after period crash data.

The treatment data consisted of all crashes within 250 feet of the intersection of SR 3549 (Liberty) at SR 3314 (Wiley Lewis). The extended y-line was used because of the length of the turn lanes installed at this location. Please see the attached *Location Map* for further detail.

The following table depicts the Naïve Before and After Analysis for the Total Crashes and Target Crashes at the treatment location. Please note that Frontal Impact and Rear End 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; Sideswipe, opposite direction; and Angle.

**Treatment Information**

	Before	After	Percent Reduction (-) Percent Increase (+)
Total Crashes	25	14	-44.0%
Total Severity Index	7.29	4.17	-42.8%
Rear End Crashes	4	1	-75.0%
Rear End Severity Index	4.70	1.00	-78.7%
Frontal Impact Crashes	15	8	-46.7%
Frontal Impact Severity Index	9.51	5.62	-40.9%
Target Crashes	19	9	-52.6%
Target Severity Index	8.49	5.11	-39.8%
Volume	7,900	6,400	-19.0%

**Target Crash Information**

	Before	After	Percent Reduction (-) Percent Increase (+)
Fatal Injury Crashes	1	0	-100.0%
Non-Fatal Injury Crashes	9	5	-44.4%
Total Injury Crashes	10	5	-50.0%
Night Crashes	1	0	-100.0%
Wet Crashes	3	2	-33.3%

**Results and Discussion**

The naïve before and after analysis at the treatment location resulted in a 44 percent decrease in Total Crashes, a 53 percent decrease in Target Crashes, and a 19 percent decrease in Average Daily Traffic (ADT). Further investigation shows there was a 43 percent decrease in Severity Index for Total Crashes and a 40 percent decrease in Severity Index for Target Crashes. The summary results above demonstrate that the Treatment Location appears to have had a substantial decrease in both the Total and Target Crashes and the Severity Index from the before to after periods using naïve methodologies.

A more detailed look at the Target Crashes show that Rear End Crashes have decreased by 75 percent and the Severity Index of Rear End Crashes has decreased by 79 percent using naïve methodologies. Further analysis of Target Crashes show that Frontal Impact Crashes have decreased by 47 percent and the Severity Index of Frontal Impact Crashes has decreased by 41 percent. It appears the installation of the turn lanes and traffic signal at this location have been effective at reducing Rear End and Frontal Impact type Crashes.

The calculated benefit to cost ratio for this project is 1.59 considering Total Crashes. The benefit to cost ratio considering only Target Crashes is 1.54. 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 costs.

As the Safety Evaluation Group completes additional reviews for this type of countermeasure, we will be able to provide more objective and definite information regarding actual crash reduction factors.

**BENEFIT-COST ANALYSIS WORKSHEET**

LOCATION: SR 3549 (Liberty) at SR 3314 (Wiley Lewi) BY: BGM  
 COUNTY: Guilford DATE: 5/29/2008  
 FILE NO.: W-3422 TOTAL CRASHES

DETAILED COST: TYPE IMPROVEMENT - Left Turn Lanes and Signal Installation

ITEMS	TOTAL	SERVICE	CRF	ANNUAL COST
Construction	\$460,000	10	0.149	\$68,554
	\$0	0	0.000	\$0
Right-of-Way	\$0	0	0.000	\$0
<b>TOTALS</b>	<b>\$460,000</b>	<b>10</b>	<b>0.149</b>	<b>\$68,554</b>

ESTIMATED INCREASE IN ANNUAL MAINT. COST = \$2,200  
 ESTIMATED INCREASE IN ANNUAL UTILITY COST = \$900  
 TOTAL ANNUAL COST= \$71,654  
 TOTAL COST OF PROJECT= \$460,000

COMPREHENSIVE COST REDUCTION:

ESTIMATED NUMBER OF ANNUAL ACCIDENT DECREASES

TIME PERIOD	YEARS	ESTIMATED NUMBER OF ANNUAL ACCIDENT DECREASES				PDO		ANNUAL COSTS
		K & A CRASHES	K & A CRASHES PER YR	B & C CRASHES	B & C CRASHES PER YR	CRASHES	CRASHES PER YR	
BEFORE	5.66	1	0.18	11	1.94	13	2.30	\$139,982
AFTER	5.66	0	0.00	6	1.06	8	1.41	\$25,936

Annual Benefits from Crash Cost Savings \$114,046

NET AVG. ANNUAL BENEFITS = AVG. ANNUAL BENEFITS - TOTAL ANNUAL COST = \$42,392  
 BENEFIT-COST RATIO = AVG ANNUAL BENEFITS/TOTAL ANNUAL COST = 1.59

TOTAL COST OF PROJECT - \$460,000 COMPREHENSIVE B/C RATIO - 1.59

**BENEFIT-COST ANALYSIS WORKSHEET**

LOCATION: SR 3549 (Liberty) at SR 3314 (Wiley Lewi) BY: BGM  
 COUNTY: Guilford DATE: 5/29/2008  
 FILE NO.: W-3422 TARGET CRASHES

DETAILED COST: TYPE IMPROVEMENT - Left Turn Lanes and Signal Installation

ITEMS	TOTAL	SERVICE	CRF	ANNUAL COST
Construction	\$460,000	10	0.149	\$68,554
	\$0	0	0.000	\$0
Right-of-Way	\$0	0	0.000	\$0
<b>TOTALS</b>	<b>\$460,000</b>	<b>10</b>	<b>0.149</b>	<b>\$68,554</b>

ESTIMATED INCREASE IN ANNUAL MAINT. COST = \$2,200  
 ESTIMATED INCREASE IN ANNUAL UTILITY COST = \$900  
 TOTAL ANNUAL COST= \$71,654  
 TOTAL COST OF PROJECT= \$460,000

COMPREHENSIVE COST REDUCTION:

ESTIMATED NUMBER OF ANNUAL ACCIDENT DECREASES

TIME PERIOD	YEARS	ESTIMATED NUMBER OF ANNUAL ACCIDENT DECREASES				PDO		ANNUAL COSTS
		K & A CRASHES	K & A CRASHES PER YR	B & C CRASHES	B & C CRASHES PER YR	CRASHES	CRASHES PER YR	
BEFORE	5.66	1	0.18	9	1.59	9	1.59	\$130,371
AFTER	5.66	0	0.00	5	0.88	4	0.71	\$19,682

Annual Benefits from Crash Cost Savings \$110,689

NET AVG. ANNUAL BENEFITS = AVG. ANNUAL BENEFITS - TOTAL ANNUAL COST = \$39,035

BENEFIT-COST RATIO = AVG ANNUAL BENEFITS/TOTAL ANNUAL COST = 1.54

TOTAL COST OF PROJECT - \$460,000 COMPREHENSIVE B/C RATIO - 1.54

*Aerial Photo, Guilford County  
Evaluation of W-3422*



***Treatment Location: SR 3549 (Liberty) At SR 3314 (Wiley Lewis)***

*Treatment Site Photos (Taken on May 6, 2008)*



Looking West on SR 3314 (Wiley Lewis)



Looking East on SR 3314 (Wiley Lewis)

*Treatment Site Photos (Taken on May 6, 2008)*



Looking North on SR 3549 (Liberty)

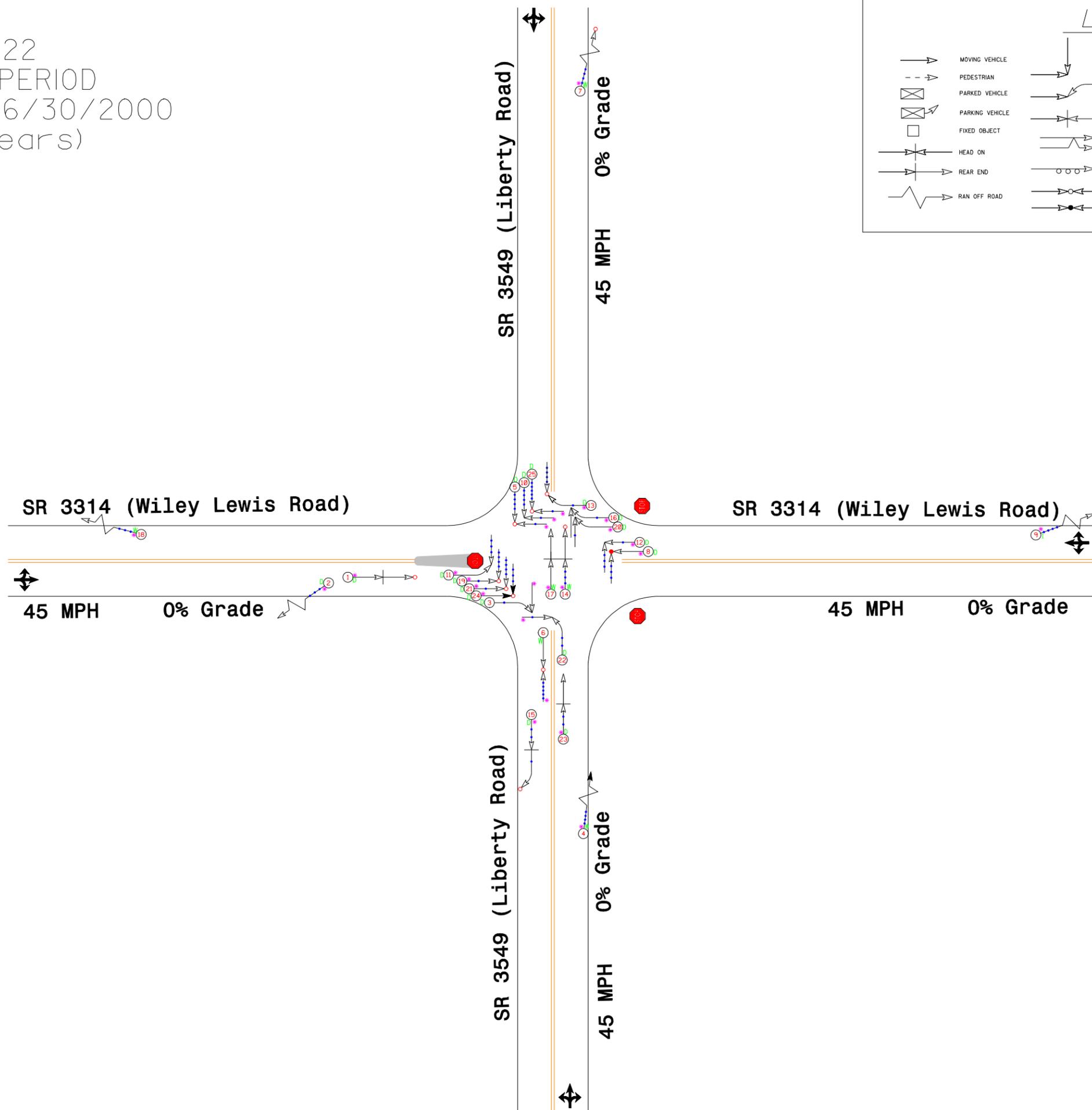


Looking South on SR 3549 (Liberty)



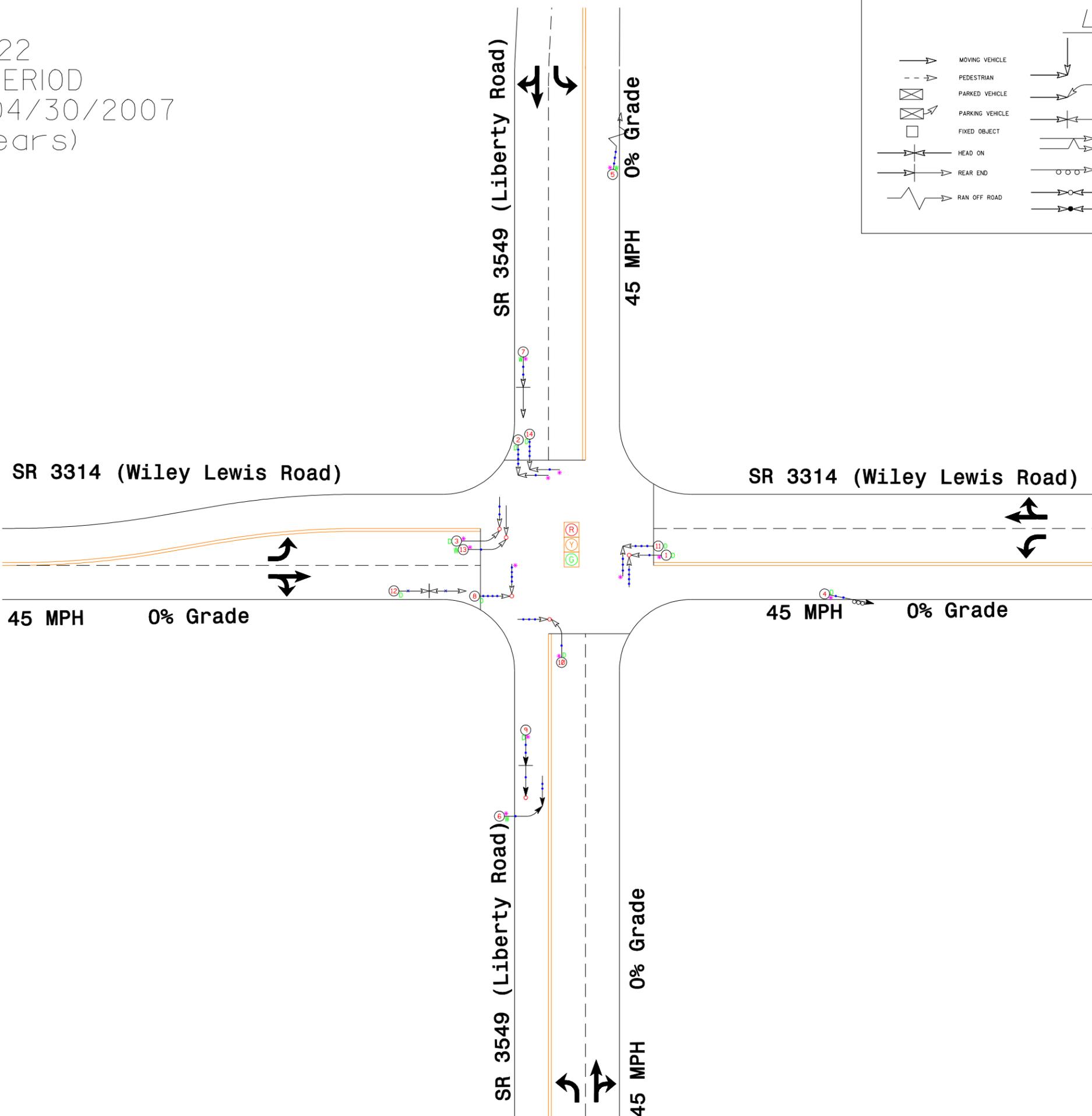
W-3422  
BEFORE PERIOD  
11/01/1994 - 06/30/2000  
(5.66 Years)

LEGEND							
	MOVING VEHICLE		ANGLE		9 MPH OR LESS		PEDESTRIAN
	PEDESTRIAN		TURNING		10 MPH TO 19		BICYCLE
	PARKED VEHICLE		BACKING		20 MPH TO 29		TRAIN
	PARKING VEHICLE		SIDESWIPE		30 MPH TO 39		ANIMAL
	FIXED OBJECT		OUT OF CONTROL		40 MPH TO 49		DRIVER AT FAULT
	HEAD ON		INJURY		50 MPH TO 59		DRY
	REAR END		FATALITY		60 MPH TO 69		WET
	RAN OFF ROAD		DAYLIGHT CRASH		70 AND UP		ICY OR SNOWY
			DARK CRASH		SPEED UNKNOWN		
					DAYLIGHT CRASH		
					DARK CRASH		





W-3422  
AFTER PERIOD  
09/01/2001 - 04/30/2007  
(5.66 Years)



LEGEND

MOVING VEHICLE	ANGLE	9 MPH OR LESS	PEDESTRIAN
PEDESTRIAN	TURNING	10 MPH TO 19	BICYCLE
PARKED VEHICLE	BACKING	20 MPH TO 29	TRAIN
PARKING VEHICLE	SIDESWIPE	30 MPH TO 39	ANIMAL
FIXED OBJECT	OUT OF CONTROL	40 MPH TO 49	DRIVER AT FAULT
HEAD ON	INJURY	50 MPH TO 59	DRY
REAR END	FATALITY	60 MPH TO 69	WET
RAN OFF ROAD	DAYLIGHT CRASH	70 AND UP	ICY OR SNOWY
	DARK CRASH	SPEED UNKNOWN	
		DAYLIGHT CRASH	
		DARK CRASH	