

Spot Safety Project Evaluation

Spot Safety Project # 05-03-216

**Spot Safety Project Evaluation for Installation of Traffic Signal and
Protected-Permitted Left-Turn Phase**

**SR 1009 (Tryon Road) and SR 1321 (Avent Ferry Road)
Wake County**

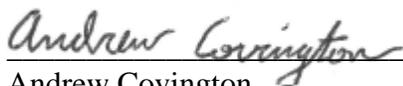
Documents Prepared By:

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For:

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Traffic Safety Systems Management Section
Transportation Mobility and Safety Division
North Carolina Department of Transportation

Principal Investigator



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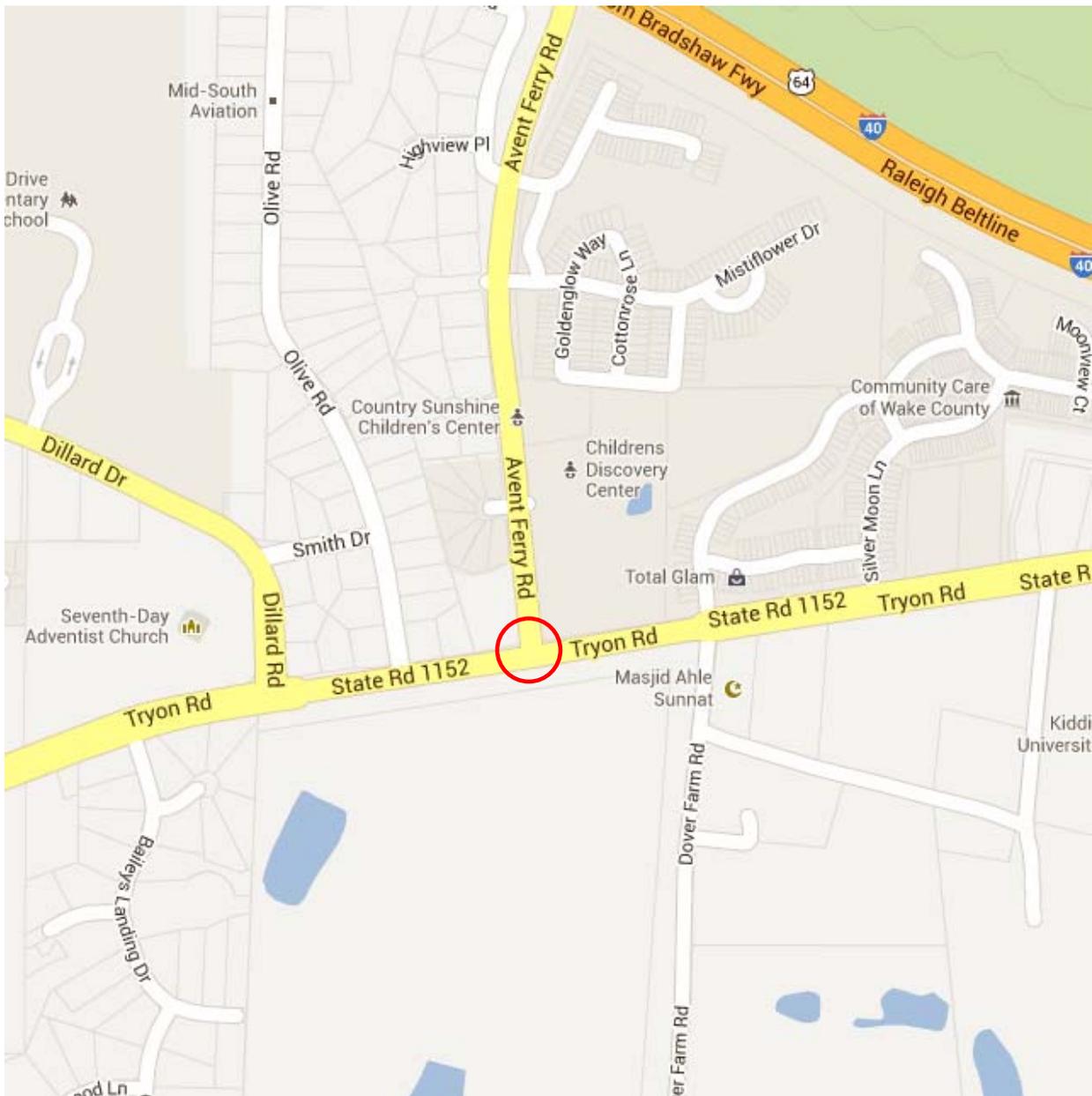
6-26-2013
Date

Spot Safety Project Evaluation Documentation

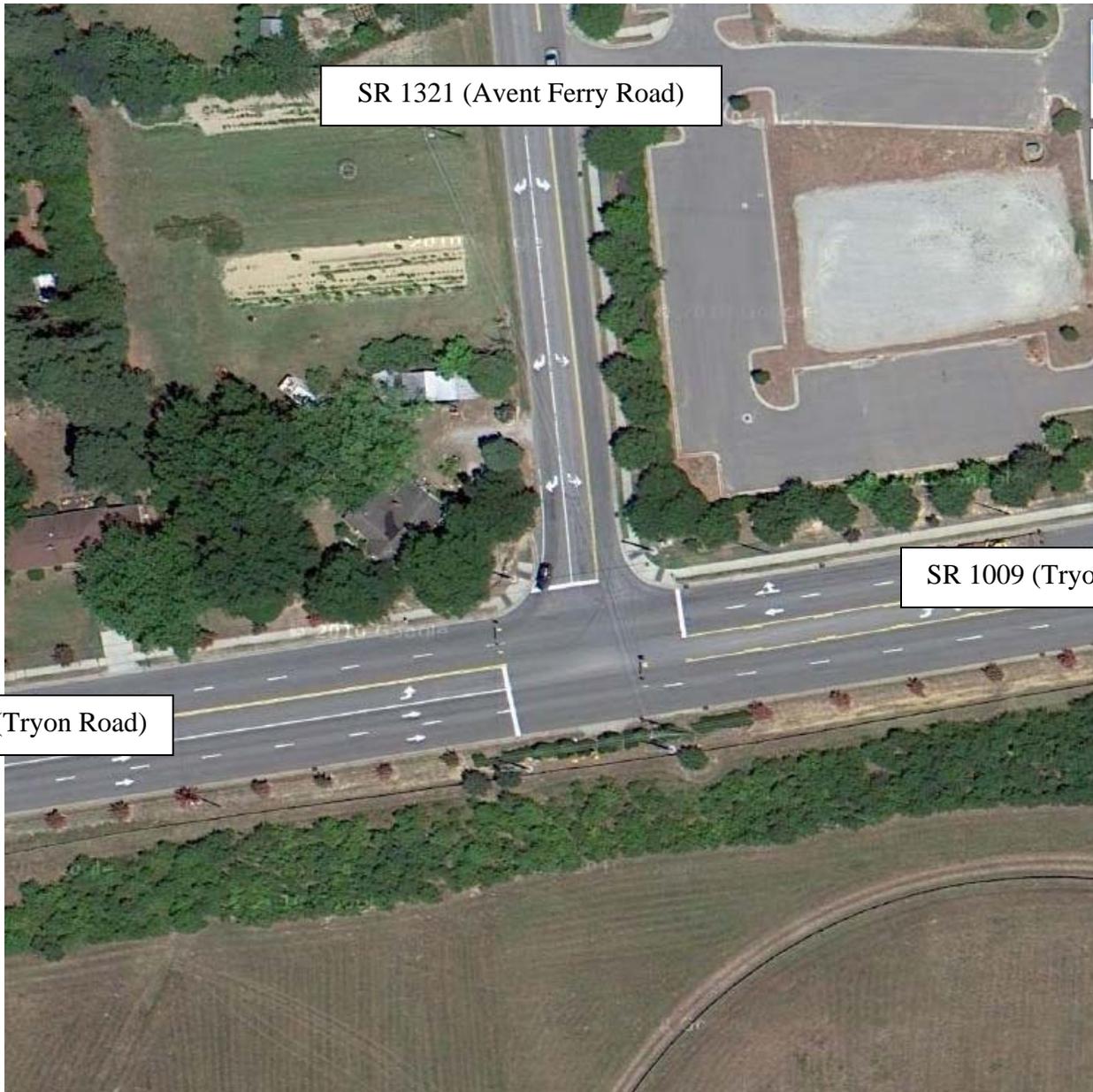
Subject Location

Evaluation of Spot Safety Project Number 05-03-216 located at the intersection of SR 1009 (Tryon Road) and SR 1321 (Avent Ferry Road) in Raleigh in Wake County.

The Sig ID is 05-0520 for this 3-Phase Fully Actuated Traffic Signal.



Location Map Provided from Google Maps



Aerial Map Provided from Google Maps

Project Information and Background from the Project File Folder

The spot safety project improvement countermeasure chosen for the subject location was installation of a traffic signal with a left-turn protected permitted phase on eastbound SR 1009 (Tryon Road).

SR 1009 (Tryon Road) is a five-lane facility with a two-way left-turn lane on both approaches and a speed limit of 45 mph. SR 1321 (Avent Ferry Road) is a two-lane roadway with a right and left-turn lane on the southbound approach and a speed limit of 45 mph. It should be noted that SR 1009 (Tryon Road) was a two-lane roadway, which was widened during the before period. According to

the crash diagrams it appears the widening was completed in November 2004. The before period was adjusted to begin at the completion of the widening construction.

The original statement of problem was that vehicles on SR 1321 (Avent Ferry Road) cannot enter the intersection safely due to insufficient gaps in traffic. Also, eastbound vehicles on SR 1009 (Tryon Road) are having difficulty safely negotiating a left-turn onto SR 1321 (Avent Ferry Road) due to insufficient gaps in westbound traffic. The initial crash analysis was completed from September 1, 1999 to August 31, 2004 with twenty-two (22) total reported crashes, of which there were six (6) angle, four (4) left-turn different roadway, and two (2) left-turn same roadway. The final completion date for the improvement at the subject intersection was on April 3, 2008 with a total cost of \$81,400.00.

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 were the months of March through May 2008. The before period consisted of reported crashes from November 1, 2004 through February 29, 2008 (3 years 4 months); and the after period consisted of reported crashes from June 1, 2008 through April 30, 2013 (4 years 11 months). The starting date for the begin period coincides with the completion of road widening on SR 1009 (Tryon Road). 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 for the SR 1009 (Tryon Road) and SR 1321 (Avent Ferry Road) approaches. *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 target crashes for the applied countermeasure. 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 (3 years 4 months)	After (4 years 11 months)	Percent Reduction (-) Percent Increase (+)
Total Crashes	38	42	n/a
Crashes Per Year	11.40	8.54	- 25.1 %
Total Severity Index	3.34	2.76	- 17.4 %
Target Crashes	25	18	n/a
Target Crashes Per Year	7.50	3.66	- 51.2 %
Target Crash Severity Index	3.66	3.88	+6.0 %
Volume (2006, 2010)	24,000	26,400	10.0 %

Injury Crash Summary	Before (total)	Before (per year)	After (total)	After (per year)	Percent Reduction (-) Percent Increase (+) (per year)
Fatal injury Crashes	0	0.00	0	0.00	N/A
Class A injury Crashes	0	0.00	0	0.00	N/A
Class B injury Crashes	3	0.90	4	0.81	- 10%
Class C Injury Crashes	9	2.70	6	1.22	- 54.8 %
Property Damage Only	26	7.8	32	6.51	- 16.5 %

The naive before and after analysis at the treatment location resulted in a 25 percent reduction in total crashes per year, a 51 percent reduction in frontal impact crashes per year, and a 17 percent reduction in the Total Severity Index. The before period ADT year was 2006 and the after period ADT year was 2010.

To further analyze the intersection crash patterns, the following chart shows different traffic movements and the change in crash totals through the study:

Additional Information	Before (total)	Before (per year)	After (total)	After (per year)	Percent Reduction (-) Percent Increase(+) (per year)
Left Turn, Same Roadway	11	3.3	11	2.24	- 32.1%
Left Turn, Different Roadway	6	1.8	3	0.61	- 66.1%
Rear End Slow or Stop	9	2.7	19	3.86	+ 43.0%
Sideswipe	0	0.00	4	0.81	+ 100.0%

Results and Discussion

Referencing the *Collision Diagrams*, target crashes per year (Frontal Impact Crashes) experienced a reduction from 7.5 crashes per year in the before period to 3.66 crashes per year in the after period. The installation of the signal was beneficial in reducing the target crashes per year at this location during the after period.

Left turn, same roadway crashes decreased from 3.3 crashes per year in the before period to 2.24 crashes per year in the after period. Left-turn, different roadway crashes decreased from 1.8 crashes per year in the before period to 0.61 crashes per year in the after period.

Although the target crashes were reduced, the number of rear end crashes and sideswipe crashes per year at the intersection increased. Rear end crashes increased from 2.7 crashes per year in the before period to 3.86 crashes per year in the after period. Sideswipe crashes also increased from 0 crashes per year in the before period to 0.81 crashes per year in the after period.

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 from Google Street View



Google Maps (Image Date: 9/11) - Looking East on SR 1009 (Tryon Road Rd) Approach



Google Maps (Image Date: 9/11) - Looking West on SR 1009 (Tryon Road Rd) Approach



Google Maps (Image Date: 9/11) - Looking South on SR 1321 (Avent Ferry Rd) Approach

SS# 05-03-216
 Wake County
 BEFORE Period
 11/1/04 - 2/29/08

Note: The before and after time periods are not equal

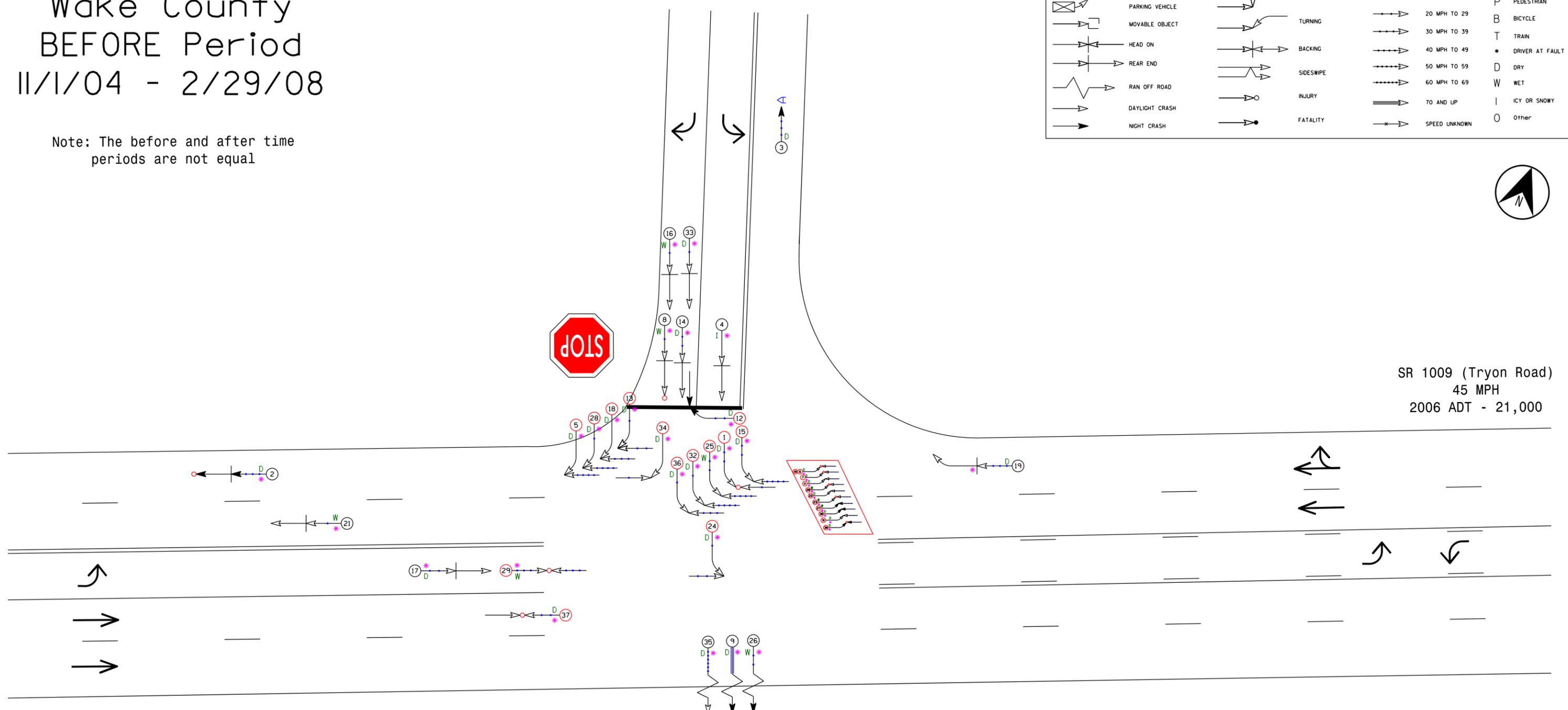
SR 1321 (Avent Ferry Road)
 45 MPH
 2006 ADT - 6,550

LEGEND			
	MOVING VEHICLE		ANGLE
	PARKED VEHICLE		TURNING
	PARKING VEHICLE		BACKING
	MOVABLE OBJECT		SIDESWIPE
	HEAD ON		INJURY
	REAR END		FATALITY
	RAN OFF ROAD		9 MPH OR LESS
	DAYLIGHT CRASH		10 MPH TO 19
	NIGHT CRASH		20 MPH TO 29
			30 MPH TO 39
			40 MPH TO 49
			50 MPH TO 59
			60 MPH TO 69
			70 AND UP
			SPEED UNKNOWN
			A ANIMAL
			P PEDESTRIAN
			B BICYCLE
			T TRAIN
			* DRIVER AT FAULT
			D DRY
			W WET
			I ICY OR SNOWY
			O Other



SR 1009 (Tryon Road)
 45 MPH
 2006 ADT - 21,000

SR 1009 (Tryon Road)
 45 MPH
 2006 ADT - 20,500



Frontal Impact Crashes

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

TRAFFIC SAFETY UNIT

Date: 6-26-13 Prepared By: Andrew Covington

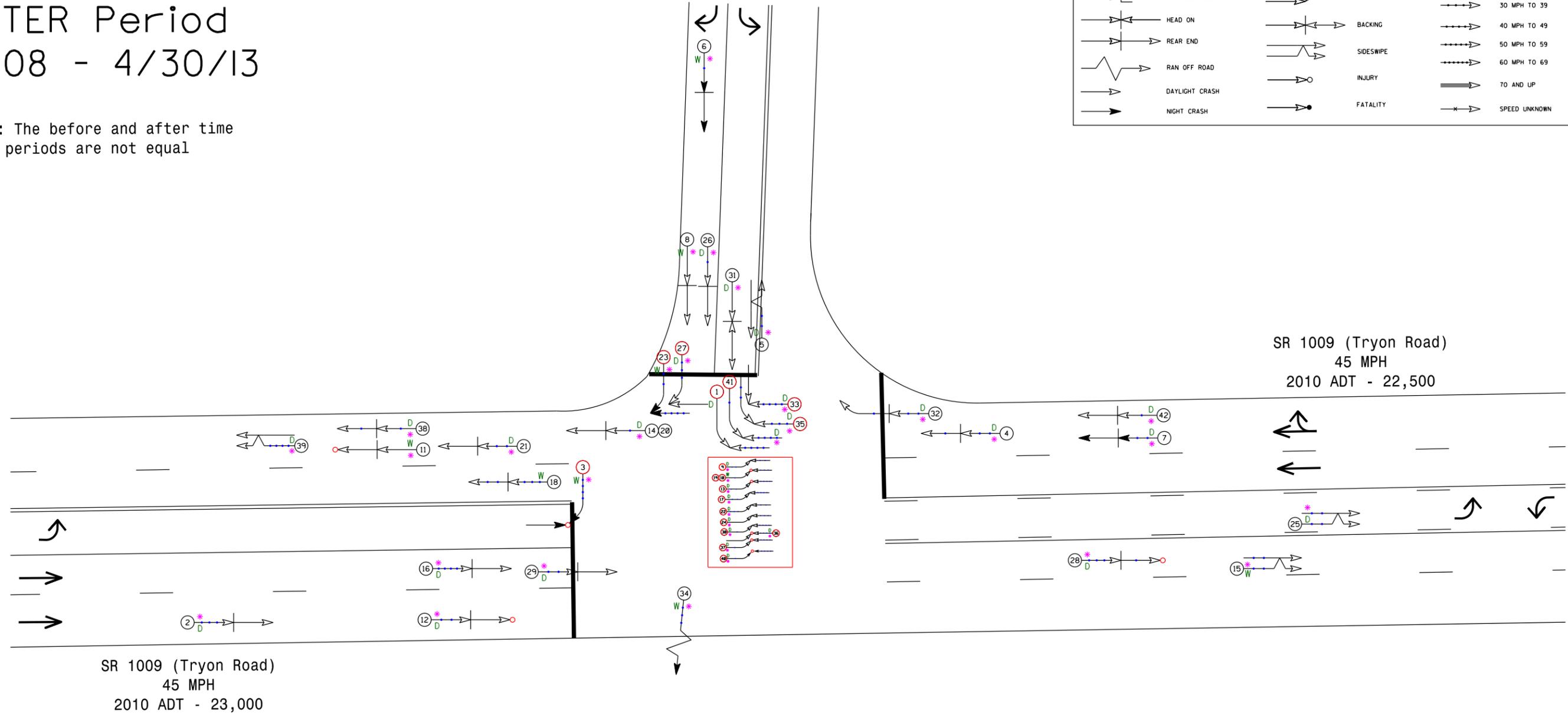
SS# 05-03-216
 Wake County
 AFTER Period
 6/1/08 - 4/30/13

SR 1321 (Avent Ferry Road)
 45 MPH
 2010 ADT - 7,200

LEGEND

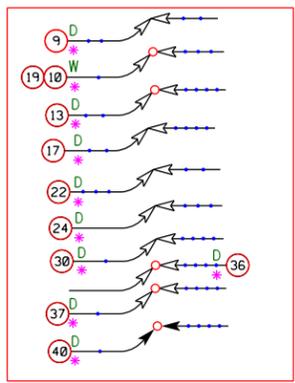
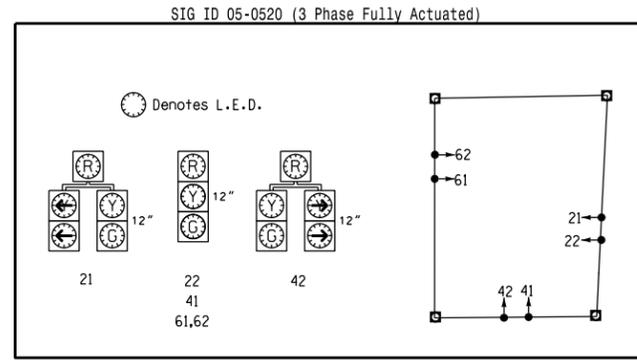
	MOVING VEHICLE		ANGLE		9 MPH OR LESS		A ANIMAL
	PARKED VEHICLE		TURNING		10 MPH TO 19		P PEDESTRIAN
	PARKING VEHICLE		BACKING		20 MPH TO 29		B BICYCLE
	MOVABLE OBJECT		SIDESWIPE		30 MPH TO 39		T TRAIN
	HEAD ON		INJURY		40 MPH TO 49		* DRIVER AT FAULT
	REAR END		FATALITY		50 MPH TO 59		D DRY
	RAN OFF ROAD		70 AND UP		60 MPH TO 69		W WET
	DAYLIGHT CRASH		SPEED UNKNOWN		I ICY OR SNOWY		O Other
	NIGHT CRASH						

Note: The before and after time periods are not equal



SR 1009 (Tryon Road)
 45 MPH
 2010 ADT - 23,000

SR 1009 (Tryon Road)
 45 MPH
 2010 ADT - 22,500



Frontal Impact Crashes

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DIVISION of HIGHWAYS
TRANSPORTATION MOBILITY and SAFETY DIVISION

TRAFFIC SAFETY UNIT

Date: 6-26-13 Prepared By: Andrew Covington