Spot Safety Project Evaluation

Order # 41000025801

Spot Safety Project # 10-05-205

Spot Safety Project Evaluation of the Installation of a Two Way Directional Crossover
US 521 (Johnston Rd) at SR 3635 (Marvin Road)
Mecklenburg County

Documents Prepared By:

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

Principal Investigator

_____ 10-7-2013

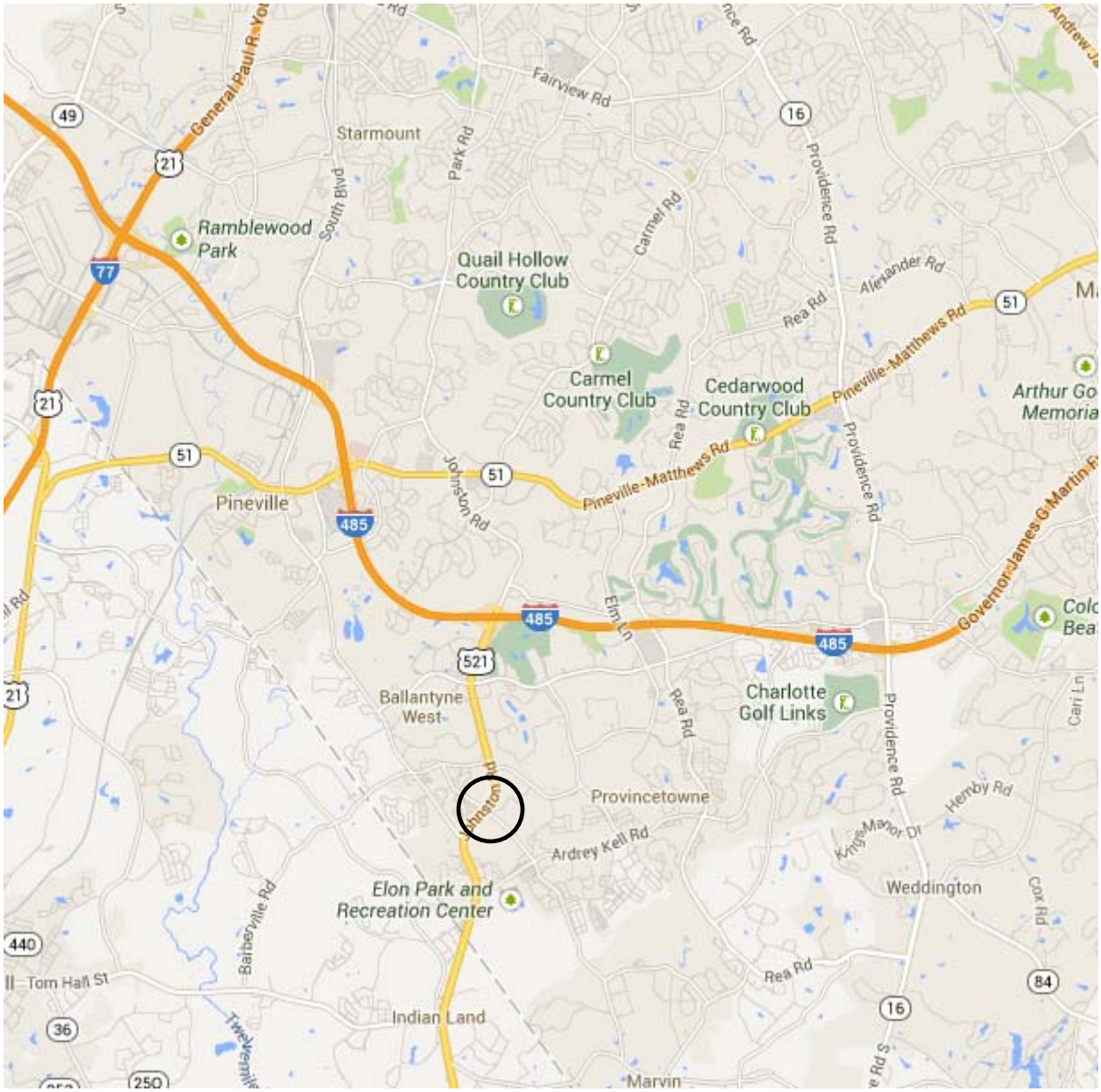
Justin Green Date

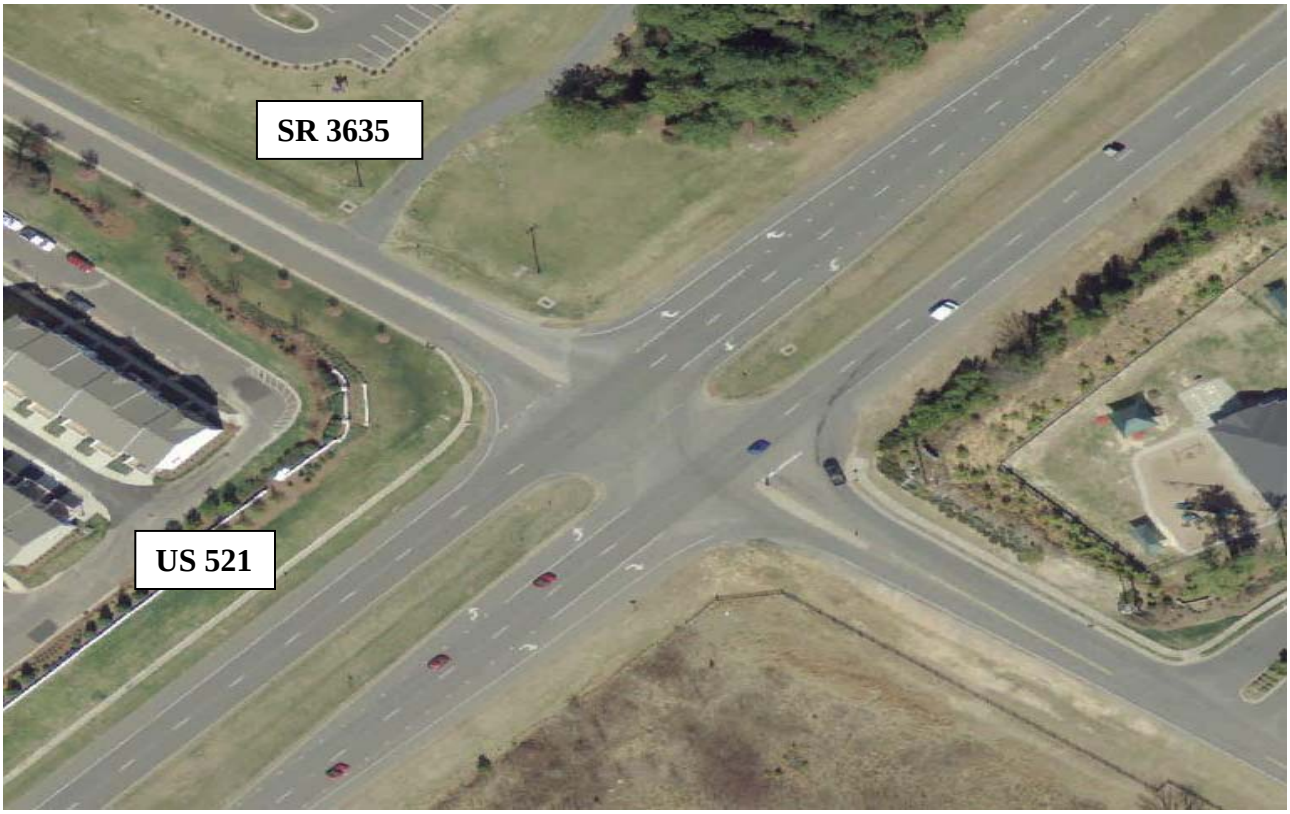
Traffic Safety Project Engineer

Spot Safety Project Evaluation Documentation

Subject Location

Evaluation of Spot Safety Project Number 10-05-205 located at the Intersection of US 251 (Johnston Road) at SR 3635 (Marvin Road) in Mecklenburg County.





Before Period
2007 Aerial Photo provided from Virtual Charlotte Web Map

After Period
2012 Aerial Photo 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 the installation of a two-way directional crossover. US 521 is a four-lane divided facility under partial control access with left and right turn lanes in both directions. SR 3635 is a two lane roadway under stop sign control which intersects US 521 at grade. The speed limit on US 521 is 55 mph in both directions. SR 3635 has a posted speed limit of 45 mph on the east leg and 35 mph on the west leg.

The original statement of problem stated that collisions (are occurring) due to high volume of traffic with insufficient gaps. The intended purpose of the crossover improvement was to help alleviate the occurrence and severity of collisions.

The initial crash analysis was completed from April 1, 2000 to March 31, 2005. There were thirty-two (32) total reported crashes in the five year analysis period. The final completion date for the improvement at the subject intersection was on May 13, 2008 with a total cost of $135,000.

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 February 2008 through May 2008. The before period consisted of reported crashes from January 1, 2003 through January 31, 2008 (5 years and 1 months); and the after period consisted of reported crashes from June 1, 2008 through June 30, 2013 (5 years and 1 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 Crossover Crashes were the target crashes for the applied countermeasure.
The Crossover Crash types considered are as follows: Left turn, different roadways and Angle.

Treatment Information	Before	After	Percent Reduction (-) Percent Increase (+)
Total Crashes	64	51	- 20.3 %
Total Severity Index	4.99	3.32	- 33.5 %
Target Crashes	13	1	- 92.3 %
Target Crash Severity Index	16.08	8.40	- 47.8 %
Intersection ADT Volume (2005,2010)	35,500	43,700	23.1 %

Crash Severity Summary	Before	After	Percent Reduction (-) Percent Increase (+)
Fatal injury Crashes	1	0	- 100.0 %
Class A Crashes	1	0	- 100.0 %
Class B Crashes	7	2	- 71.4 %
Class C Crashes	7	14	+ 100.0 %
Property Damage Only Crashes	48	35	- 27.1 %

Additional Information	Before	After	Percent Reduction (-) Percent Increase (+)
Rear End, Slow or Stop	32	34	+ 6.25 %
WB SR 3635 & SB US 521 Crashes	6	0	- 100.0 %
WB SR 3635 & NB US 521 Crashes	0	1	+ 100.0 %
EB SR 3635 & SB US 521 Crashes	4	0	- 100.0 %
EB SR 3635 & NB US 521 Crashes	3	0	- 100.0 %

The naive before and after analysis at the treatment location resulted in a 20 percent decrease in Total Crashes, a 92 percent removal of Target Crashes, and a 34 percent decrease in the Total Severity Index. The before period ADT year was 2005 and the after period ADT year was 2010.

Results and Discussion

Referencing the *Collision Diagrams*, the before period indicated thirteen (13) target roadway crashes at the studied intersection including a fatality crash in October 2004. All of these target crashes were angle type crashes. After the crossover installation all but one of these crashes were eliminated by the removal of the through movement option at the intersection for SR 3635 motorists. The main pattern shown was vehicles traveling westbound on SR 3635 are colliding with vehicles traveling southbound on US 521.

A noticeable rear-end crash pattern is shown in the before and after periods. Vehicles traveling westbound on SR 3635 are rear-ending other vehicles traveling in this direction. The before analysis period displays thirty-two (32) rear-end crashes in this pattern. The after analysis period displays thirty-four (34) rear-end crashes in this pattern.

Typically, crossover installations occur on median divided roadways and the Safety Evaluation Group evaluates the closest u-turn locations for crash migration. A general search analyzing for u-turn related crashes was completed. The closest u-turn location north of subject intersection is US 521 at Providence Rd. The closest u-turn location south of subject intersection is US 521 at Lancaster Rd. The following tables show the crash analysis results for both the before and after periods for the described u-turn locations.

U-Turn North (Providence Rd)	**Before**	**After**	**Percent Reduction (-) Percent Increase (+)**
Total Crashes	50	46	- 8.0 %
Total Severity Index	4.88	5.06	+ 3.7 %
U-Turn Target Crashes	0	0	N/A

U-Turn South (Lancaster Rd)	**Before**	**After**	**Percent Reduction (-) Percent Increase (+)**
Total Crashes	55	42	- 23.6 %
Total Severity Index	9.47	2.94	- 69.0 %
U-Turn Target Crashes	1	0	- 100.0 %
U-Turn Severity Index	8.40	0	- 100.0 %

From the tables above, the u-turn North location of Providence Road yielded a total crash reduction of 8 percent with no u-turn crashes found in the before or after periods. The u-turn South location of Lancaster Road experienced a 24 percent reduction in total crashes. There was one target u-turn crash in the before 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.

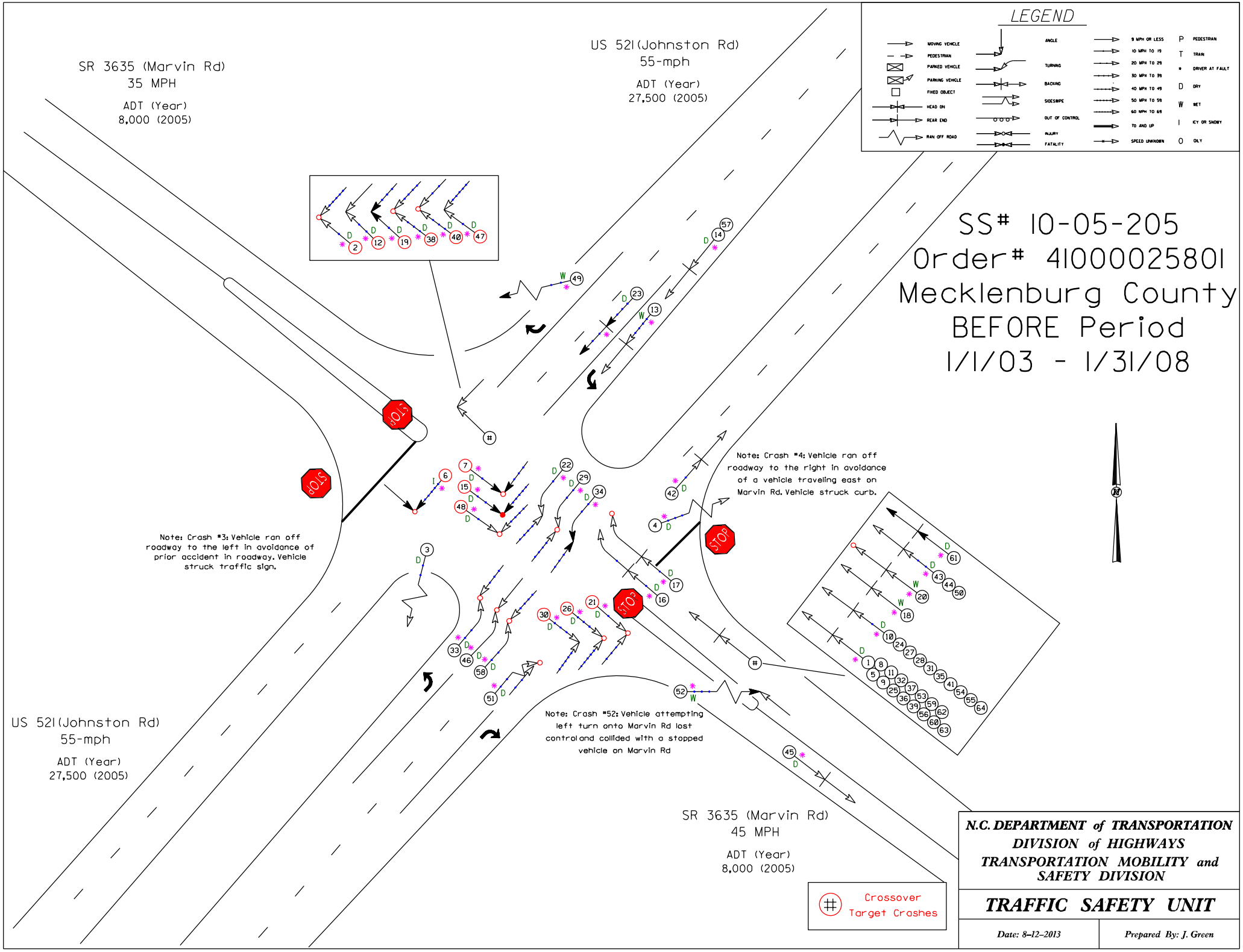
Treatment Site Photos (Google Street View)

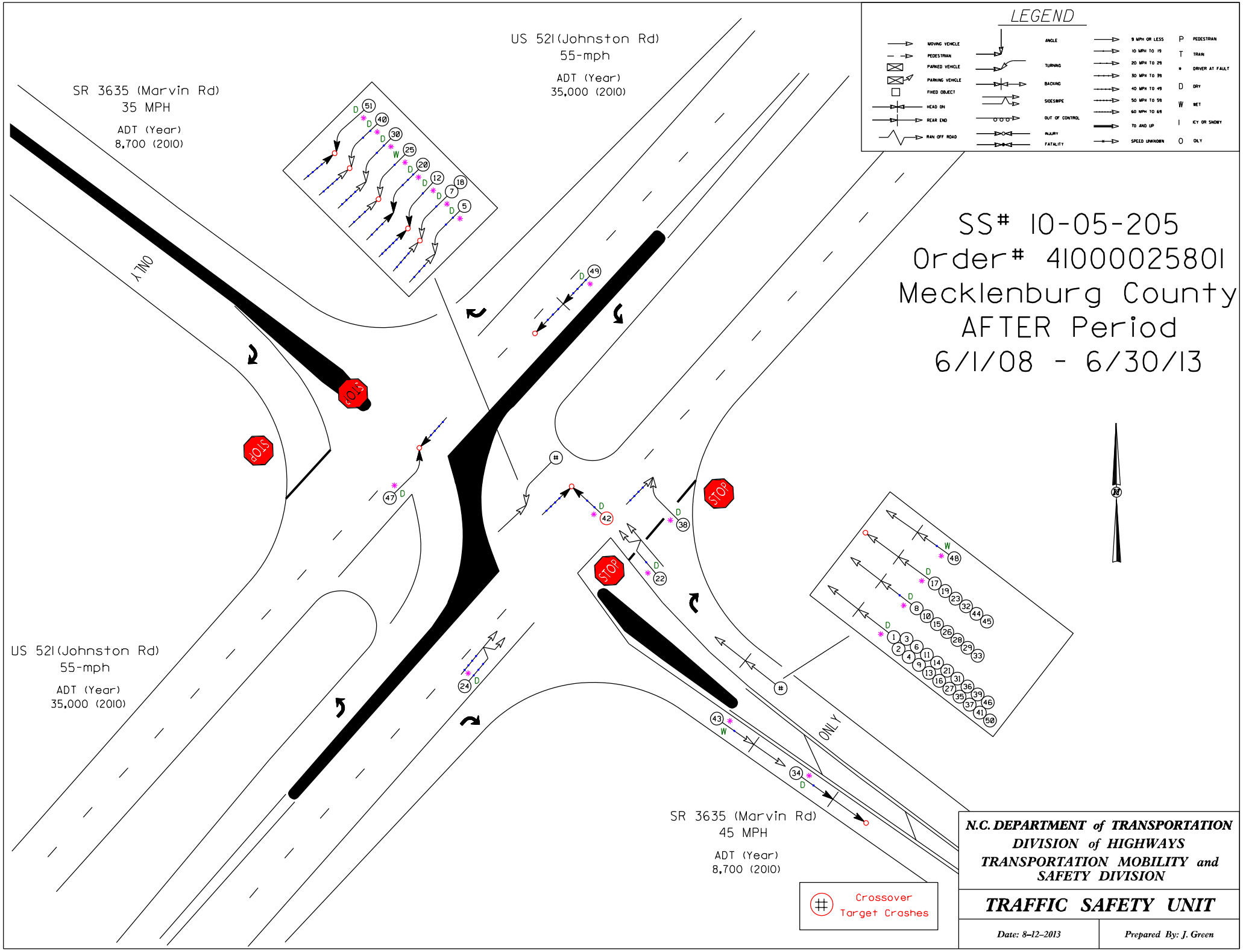
Looking North on US-521 (Image Date: May 2008)

Looking South on US-521 (Image Date: May 2008)

Looking East on SR 3635 (Marvin Road) (Image Date: May 2008)

Looking West on SR 3635 (Marvin Road) (Image Date: May 2008)


LEGEND
MOVING VEHICLE
PEDESTRIAN
PARKED VEHICLE
PARKING VEHICLE
FIXED OBJECT
HEAD ON
REAR END
RAN OFF ROAD
ANGLE
TURNING
BACKING
SIDESWIPE
OUT OF CONTROL
INJURY
FATALITY
9 MPH OR LESS
10 MPH TO 19
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
P PEDESTRIAN
T TRAIN
* DRIVER AT FAULT
D DRY
W WET
I ICY OR SNOWY
O OILY
SR 3635 (Marvin Rd)
35 MPH
ADT (Year)
8,000 (2005)
US 521 (Johnston Rd)
55-mph
ADT (Year)
27,500 (2005)
SS# 10-05-205
Order# 4100002580I
Mecklenburg County
BEFORE Period
1/1/03 - 1/31/08
Note: Crash #4: Vehicle ran off roadway to the right in avoidance of a vehicle traveling east on Marvin Rd. Vehicle struck curb.
Note: Crash #3: Vehicle ran off roadway to the left in avoidance of prior accident in roadway. Vehicle struck traffic sign.
Note: Crash #52: Vehicle attempting left turn onto Marvin Rd lost control and collided with a stopped vehicle on Marvin Rd
US 521 (Johnston Rd)
55-mph
ADT (Year)
27,500 (2005)
SR 3635 (Marvin Rd)
45 MPH
ADT (Year)
8,000 (2005)
Crossover Target Crashes
N.C. DEPARTMENT of TRANSPORTATION
DIVISION of HIGHWAYS
TRANSPORTATION MOBILITY and SAFETY DIVISION
TRAFFIC SAFETY UNIT
Date: 8-12-2013
Prepared By: J. Green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I ICY OR SNOWY
O OILY
SS# 10-05-205
Order# 4100002580I
Mecklenburg County
AFTER Period
6/1/08 - 6/30/13
US 521 (Johnston Rd)
55-mph
ADT (Year)
35,000 (2010)
SR 3635 (Marvin Rd)
35 MPH
ADT (Year)
8,700 (2010)
US 521 (Johnston Rd)
55-mph
ADT (Year)
35,000 (2010)
SR 3635 (Marvin Rd)
45 MPH
ADT (Year)
8,700 (2010)
ONLY
ONLY
STOP
STOP
STOP
STOP
Crossover Target Crashes
N.C. DEPARTMENT of TRANSPORTATION
DIVISION of HIGHWAYS
TRANSPORTATION MOBILITY and SAFETY DIVISION
TRAFFIC SAFETY UNIT
Date: 8-12-2013
Prepared By: J. Green