

Spot Safety Project Evaluation

Project Log # 41000009245

Spot Safety Project # 02-04-210

**Spot Safety Project Evaluation of the Construction of Raised Median Islands on
Both Legs of SR 1708 (Firetower Rd) at its Intersection with NC 43 (Charles Blvd)
Pitt County**

Documents Prepared By:

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

Principal Investigator


Brad Robinson, PE

12/10/2010
Date

Traffic Safety Project Engineer

Spot Safety Project Evaluation Documentation

Subject Location

Evaluation of Spot Safety Project Number 02-04-210 – The Intersection of SR 1708 (Firetower Rd) and NC 43 (Charles Blvd) in Pitt County.



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-foot wide concrete island approximately 300 feet in length on the western leg of SR 1708, dividing the eastbound and westbound lanes in front of the driveways to Eckerd's and McDonald's. In addition, the existing concrete median on the eastern leg was extended to approximately 300 feet in front of the driveway to Walgreen's. The medians islands were installed in order to restrict left turns into and out of the driveways on SR 1708, thereby reducing angle and left turn crashes.

SR 1708 is a five-lane roadway with a 45 mph speed limit. The driveways on either side of NC 43 are approximately 200 feet from the intersection. NC 43 is also a five-lane roadway with a 45 mph speed limit. The intersection is signalized.

The original statement of problem was that motorists entering and exiting SR 1708 from the driveways were causing crashes to occur in close proximity to the signalized intersection, creating both congestion and confusion at a location with high peak traffic volumes.

The initial crash analysis was completed from June 1, 2000 to May 31, 2003 with 60 reported crashes, 23 of which were considered correctable by the chosen countermeasure. The final completion date for the improvement at the subject intersection was on April 3, 2006 with a total cost of \$10,500.00.

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 February 1, 2006 to April 30, 2006. The before period consisted of reported crashes from November 1, 2002 through January 31, 2006 (3 years and 3 months) and the after period consisted of reported crashes from May 1, 2006 through July 31, 2009 (3 years and 3 months). The ending date for this analysis was limited due to a flashing yellow arrow signal head which was installed in September 2009.

The treatment data consisted of all reported crashes within 300 feet of the subject intersection on SR 1708 and within 150 feet of the subject intersection on NC 43. The following data table depicts the Naive Before and After Analysis for the treatment location. Please note that crashes involving vehicles attempting to enter or exit the driveways on SR 1708 were the Target Crashes for the applied countermeasures. The target crashes are clearly identified in the before and after period collision diagrams.

Treatment Information			
	Before	After	Percent Reduction (-) Percent Increase (+)
Total Crashes	78	55	-29.5
Total Severity Index	4.42	3.69	-16.5
Target Crashes			
Target Crashes	8	0	-100.0
Target Crash Severity Index	3.77	0	-100.0
Volume			
Volume	42,500	44,500	4.7
Crash Severity Summary			
Fatal Crashes	0	0	N/A
Class A Crashes	0	0	N/A
Class B Crashes	0	0	N/A
Class C Crashes	3	0	-100.0
PDO Crashes	5	0	-100.0

The naive before and after analysis at the treatment location resulted in a 30 percent decrease in Total Crashes, a 100 percent decrease in Target Crashes, and a 5 percent increase in Average Daily Traffic (ADT). The before period ADT year was 2004 and the after period ADT year was 2008.

Results and Discussion

In the before period there were a total of eight Target Crashes, seven occurring on the western leg and one occurring on the eastern leg of SR 1708. In the after period there were no Target Crashes, although there was one crash involving a vehicle attempting to make a u-turn just past the median island (after crash #51) and another crash involving a vehicle making a wide right turn from the McDonalds pva (after crash #38) in preparation for making a u-turn after the median island.

Non-target crash patterns in the intersection remained present from the before to the after period, although a couple experienced a decrease. The largest crash patterns were three left turn-same roadway patterns. Those involving northbound NC 43 vehicles turning left remained constant at nine crashes in both the before and the after period, those involving southbound NC 43 vehicles turning left decreased from nine to five, and those involving eastbound SR 1708 vehicles turning left decreased from seven to four.

As stated in the *Project Background* section, in September 2009 flashing yellow arrow signals were installed at the intersection for all directions of travel. For your information an analysis was conducted to include the one year of data since the installation. The following table compares the crash data for the 3.25 year original after period to the one year period after the new signals were installed. The data was analyzed on a per-year basis. Left Turn-Same Roadway Crashes are also identified due to the new signal affecting this movement. A collision diagram is also included for this one-year period.

	After Period (3.25 Years) 5/1/06-7/31/09		After Flashing Yellow Arrow (1Year) 10/1/09-9/30/10		Percent Reduction (-) Percent Increase (+) (Per Year)
	Crashes	Crashes Per Year	Crashes	Crashes Per Year	
Total Crashes	55	16.9	19	19	12.4%
Left Turn-Same Roadway	19	5.8	6	6	3.4%

The analysis at the treatment location resulted in a 12 percent increase in Total Crashes and a 3 percent increase in Left Turn-Same Roadway Crashes. In the period after the flashing yellow arrow signals were installed, there was one crash involving a vehicle exiting a driveway onto SR 1708 and attempting to make a u-turn immediately after the end of the median barrier.

The calculated benefit to cost ratio for this project is 57.62 considering total crashes. The benefit to cost ratio considering only target crashes is 13.41. 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.

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.

BENEFIT-COST ANALYSIS WORKSHEET

LOCATION: SR 1708 at NC 43
 COUNTY: Pitt
 FILE NO.: SS 02-04-210

BY: bdr
 DATE: 11/17/2010

DETAILED COST: TYPE IMPROVEMENT - Median Island Channelization

ITEMS	TOTAL	SERVICE	CRF	ANNUAL COST
Construction	\$0	0	0.000	\$0
	\$10,500	20	0.102	\$1,069
Right-of-Way	\$0	0	0.000	\$0

TOTALS	\$10,500	20	0.102	\$1,069
---------------	-----------------	-----------	--------------	----------------

ESTIMATED INCREASE IN ANNUAL MAINT. COST =	\$800
ESTIMATED INCREASE IN ANNUAL UTILITY COST =	\$0
TOTAL ANNUAL COST=	\$1,869
TOTAL COST OF PROJECT=	\$10,500

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	3.25	0	0.00	36	11.08	42	12.92	\$277,108
AFTER	3.25	0	0.00	20	6.15	35	10.77	\$169,385

Annual Benefits from Crash Cost Savings \$107,723

NET AVG. ANNUAL BENEFITS = AVG. ANNUAL BENEFITS - TOTAL ANNUAL COST = \$105,854

BENEFIT-COST RATIO = AVG ANNUAL BENEFITS/TOTAL ANNUAL COST = 57.62

TOTAL COST OF PROJECT	-	\$10,500	COMPREHENSIVE B/C RATIO	-	57.62
------------------------------	----------	-----------------	--------------------------------	----------	--------------

BENEFIT-COST ANALYSIS WORKSHEET

LOCATION: SR 1708 at NC 43
 COUNTY: Pitt
 FILE NO.: SS 02-04-210 Target Crashes Only

BY: bdr
 DATE: 11/17/2010

DETAILED COST: TYPE IMPROVEMENT - Median Island Channelization

ITEMS	TOTAL	SERVICE	CRF	ANNUAL COST
Construction	\$0	0	0.000	\$0
Right-of-Way	\$10,500	20	0.102	\$1,069
	\$0	0	0.000	\$0
TOTALS	\$10,500	20	0.102	\$1,069

ESTIMATED INCREASE IN ANNUAL MAINT. COST =	\$800
ESTIMATED INCREASE IN ANNUAL UTILITY COST =	\$0
TOTAL ANNUAL COST=	\$1,869
TOTAL COST OF PROJECT=	\$10,500

COMPREHENSIVE COST REDUCTION:

TIME PERIOD	YEARS	ESTIMATED NUMBER OF ANNUAL ACCIDENT DECREASES						ANNUAL COSTS
		K & A CRASHES	K & A CRASHES PER YR	B & C CRASHES	B & C CRASHES PER YR	PDO CRASHES	PDO CRASHES PER YR	
BEFORE	3.25	0	0.00	3	0.92	5	1.54	\$25,077
AFTER	3.25	0	0.00	0	0.00	0	0.00	\$0

Annual Benefits from Crash Cost Savings \$25,077

NET AVG. ANNUAL BENEFITS = AVG. ANNUAL BENEFITS - TOTAL ANNUAL COST = \$23,207

BENEFIT-COST RATIO = AVG ANNUAL BENEFITS/TOTAL ANNUAL COST = 13.41

TOTAL COST OF PROJECT - \$10,500 COMPREHENSIVE B/C RATIO - 13.41

Treatment Site Photos from Google Street-View



Looking east on SR 1708 (Firetower)



Looking east on SR 1708 (Firetower)



Looking west on SR 1708 (Firetower)



Looking west on SR 1708 (Firetower)



Looking south on NC 43 (Charles)



Looking north on NC 43 (Charles)

SS# 02-04-210
 Order# 41000009245
 Pitt County
 BEFORE Period
 11/1/02-1/31/06

LEGEND

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

SR 1708
 (Fire Tower Rd)
 45 mph

McDonalds

NC 43
 (Charles Blvd)
 45 mph

Walgreens

SR 1708
 (Fire Tower Rd)
 45 mph

Rite Aid

BP Gas

NC 43
 (Charles Blvd)
 45 mph

Target Crashes

Map showing crash locations at the intersection of SR 1708 and NC 43. Markers are numbered 1 through 82. Symbols include 'R' for rollover, 'Y' for injury, and 'G' for fatality. A 12-foot scale bar is provided.

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

TRAFFIC SAFETY UNIT

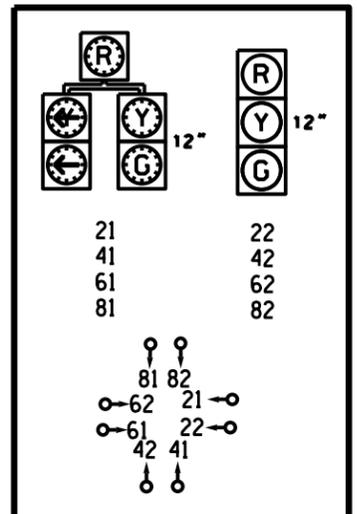
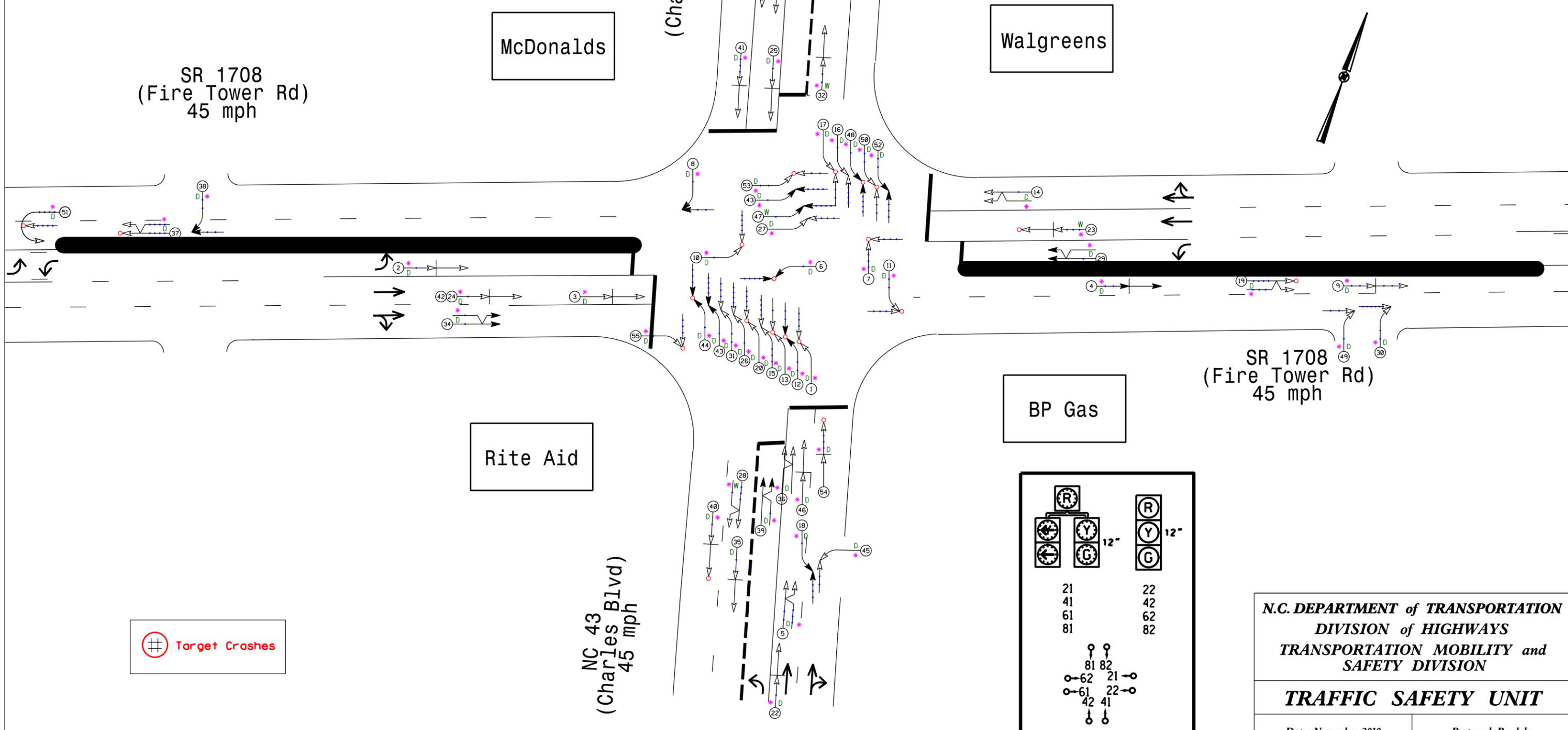
Date: November 2010

Prepared By: bdr

SS# 02-04-210
 Order# 41000009245
 Pitt County
 AFTER Period
 5/1/06-7/31/09

LEGEND

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



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

TRAFFIC SAFETY UNIT

Date: November 2010 Prepared By: bdr

SS# 02-04-210
 Order# 41000009245
 Pitt County
 Left Turn Yellow Flasher Period
 10/1/09-9/30/10
 (1 Year)

LEGEND

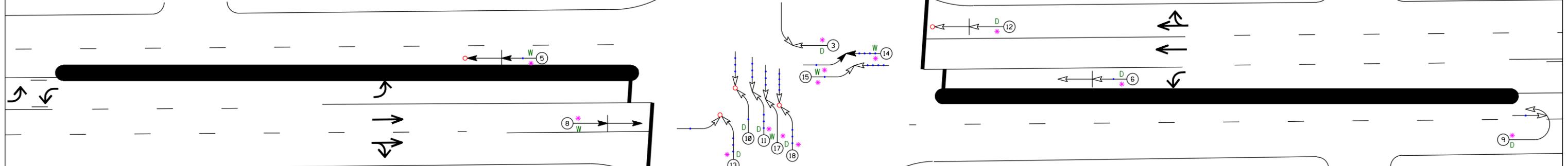
	MOVING VEHICLE		ANGLE		9 MPH OR LESS		PEDESTRIAN
	PEDESTRIAN		TURNING		10 MPH TO 19		TRAIN
	PAKED VEHICLE		BACKING		20 MPH TO 29		* DRIVER AT FAULT
	PARKING VEHICLE		SIDESWIPE		30 MPH TO 39		D DRY
	FIXED OBJECT		OUT OF CONTROL		40 MPH TO 49		W WET
	HEAD ON		INJURY		50 MPH TO 59		70 AND UP
	REAR END	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

SR 1708
 (Fire Tower Rd)
 45 mph

McDonalds

NC 43
 (Charles Blvd)
 45 mph

Walgreens



SR 1708
 (Fire Tower Rd)
 45 mph

Rite Aid

NC 43
 (Charles Blvd)
 45 mph

BP Gas

		12"			12"
11	21, 22		61	31	81, 82
31	41, 42		11	51	
51	61, 62		42	41	71
71	81, 82				

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

TRAFFIC SAFETY UNIT

Date: November 2010

Prepared By: bdr