Spot Safety Project Evaluation

Order # 41000010098

Spot Safety Project # 12-05-202

Spot Safety Project Evaluation of the Traffic Signal Installation
NC 16 at SR 1453 (Saint Peters Church Road)
Catawba County

Documents Prepared By:

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

Principal Investigator

_____ 12-20-2010

Jason B. Schronce Date

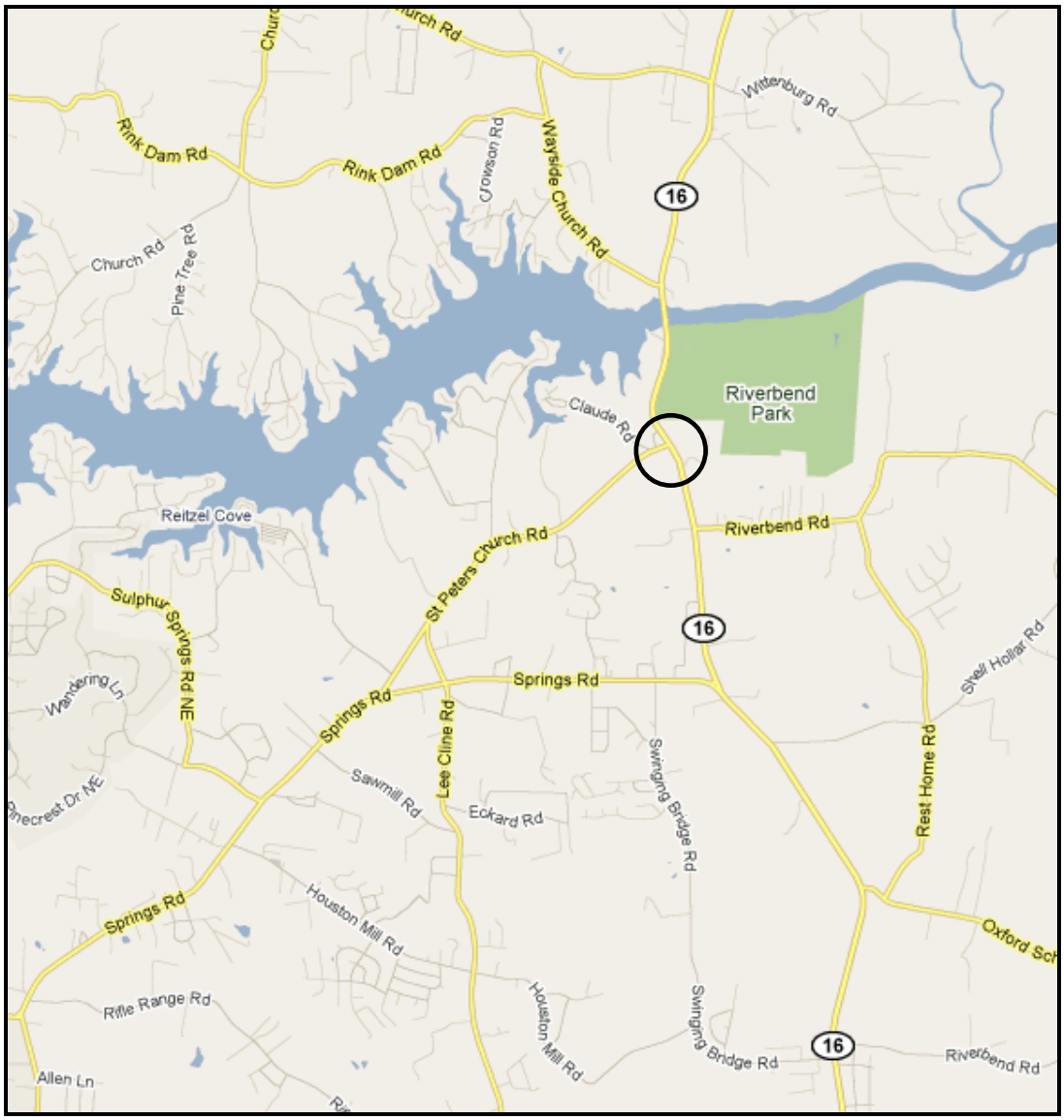
Traffic Safety Project Engineer

Spot Safety Project Evaluation Documentation

Subject Location

Evaluation of Spot Safety Project Number 12-05-202 located at the Intersection of NC 16 and SR 1453 (Saint Peters Church Road) in Catawba County, north of the City of Conover.

The Sig ID is 12-1730 for this newly installed traffic signal.



2009 Aerial Photo from Catawba County GIS

Project Information and Background from the Project File Folder

The spot safety project improvement countermeasure chosen for the subject location was the installation of an intersection 2-phase traffic signal. NC 16 and SR 1453 are both two-lane facilities at the subject intersection with speed limits of 55 mph on all approaches. NC 16 did provide a northbound left turn lane during the before period and was repainted to also include a southbound left turn lane into the PVAs with the signal installation. The subject location is a three-leg state maintained intersection (fourth leg consisting of businesses), which was controlled by a stop sign on SR 1453 (Saint Peters Church Rd) prior to the signal.

The original statement of problem was the significant existence of side street delay and the development of an "angle" crash pattern at the intersection. The intended purpose of the improvement was to alleviate crashes and assign vehicle right-of-way.

The initial crash analysis was completed from December 1, 1999 to November 30, 2004 with thirteen (13) reported angle crashes. The final completion date, as indicated from the police crash reports for the improvement at the subject intersection, was during the first quarter of 2006 with a total cost of $43,500.

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 January through March 2006. The before period consisted of reported crashes from June 1, 2001 through December 31, 2005 (4 years and 7 months); and the after period consisted of reported crashes from April 1, 2006 through October 31, 2010 (4 years and 7 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.

Treatment Information	**Before**	**After**	**Percent Reduction (-) Percent Increase (+)**
Total Crashes	21	20	- 4.8 %
Total Severity Index	4.17	7.38	77.0 %
Target Crashes	12	6	- 50.0 %
Target Crash Severity Index	4.08	7.17	75.7 %
Volume (2003, 2008)	14,400	14,100	- 2.1 %

Injury Crash Summary	**Before**	**After**	**Percent Reduction (-) Percent Increase (+)**
Fatal injury Crashes	0	0	N/A
Class A injury Crashes	0	1	100.0 %
Class B injury Crashes	4	2	- 50.0 %
Class C Injury Crashes	5	5	0.0 %
Total Injury Crashes	9	8	- 11.1 %

The naive before and after analysis at the treatment location resulted in a 5 percent decrease in Total Crashes, a 50 percent decrease in Target Crashes, but a 77 percent increase in the Total Severity Index. The before period ADT year was 2003 and the after period ADT year was 2008.

Results and Discussion

Referencing the *Collision Diagrams,* the before period presented a strong pattern of eleven (11) left turn different roadway collisions and one (1) head-on crash, due to a NC 16 southbound motorist avoidance, resulting from vehicles on SR 1453 choosing insufficient gaps to safely make the left

turn onto northbound NC 16. All vehicles in the before period did come to a complete stop prior to attempting the left turn movement.

After the signal installation, frontal impact collisions reduced by half with three (3) permissive left turn collisions and three (3) red light run angle crashes. The intersection however experienced nearly the same number of total crashes including an increase in rear-end collisions from four (4) in the before period to eight (8) in the after period. The total severity index also nearly doubled resulting from an A-injury pedestrian crash involving a northbound NC 16 motorist.

The calculated benefit to cost ratio for this project is **(-13.73) considering total crashes**. The benefit to cost ratio **considering only target crashes is 0.60**. 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 three 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 South on NC 16

Looking North on NC 16

Traveling East on SR 1453 (St. Peters Church Road)

BENEFIT-COST ANALYSIS WORKSHEET - Total Crashes

LOCATION: NC 16 at SR 1453 BY: JBS
COUNTY: Catawba DATE: 12/14/2010
FILE NO.: SS 12-05-202

DETAILED COST: TYPE IMPROVEMENT - New Signal

ITEMS	TOTAL	SERVICE	CRF	ANNUAL COST
Construction	$43,500	10	0.149	$6,483
	$0	0	0.000	$0
Right-of-Way	$0	0	0.000	$0
TOTALS	$43,500	10	0.149	$6,483

ESTIMATED INCREASE IN ANNUAL MAINT. COST = $2,000
ESTIMATED INCREASE IN ANNUAL UTILITY COST = $900

TOTAL ANNUAL COST= $9,383
TOTAL COST OF PROJECT= $43,500

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	4.58	0	0.00	9	1.97	12	2.62	$50,568
AFTER	4.58	1	0.22	7	1.53	12	2.62	$179,389

Annual Benefits from Crash Cost Savings ($128,821)

NET AVG. ANNUAL BENEFITS = AVG. ANNUAL BENEFITS - TOTAL ANNUAL COST = ($138,204)

BENEFIT-COST RATIO = AVG ANNUAL BENEFITS/TOTAL ANNUAL COST = -13.73

TOTAL COST OF PROJECT - $43,500 COMPREHENSIVE B/C RATIO - -13.73

BENEFIT-COST ANALYSIS WORKSHEET - Target Crashes

LOCATION: NC 16 at SR 1453 BY: JBS
COUNTY: Catawba DATE: 12/14/2010
FILE NO.: SS 12-05-202

DETAILED COST: TYPE IMPROVEMENT - New Signal

ITEMS	TOTAL	SERVICE	CRF	ANNUAL COST
Construction	$43,500	10	0.149	$6,483
	$0	0	0.000	$0
Right-of-Way	$0	0	0.000	$0
TOTALS	$43,500	10	0.149	$6,483

ESTIMATED INCREASE IN ANNUAL MAINT. COST = $2,000
ESTIMATED INCREASE IN ANNUAL UTILITY COST = $900

TOTAL ANNUAL COST= $9,383
TOTAL COST OF PROJECT= $43,500

COMPREHENSIVE COST REDUCTION:

ESTIMATED NUMBER OF ANNUAL ACCIDENT DECREASES

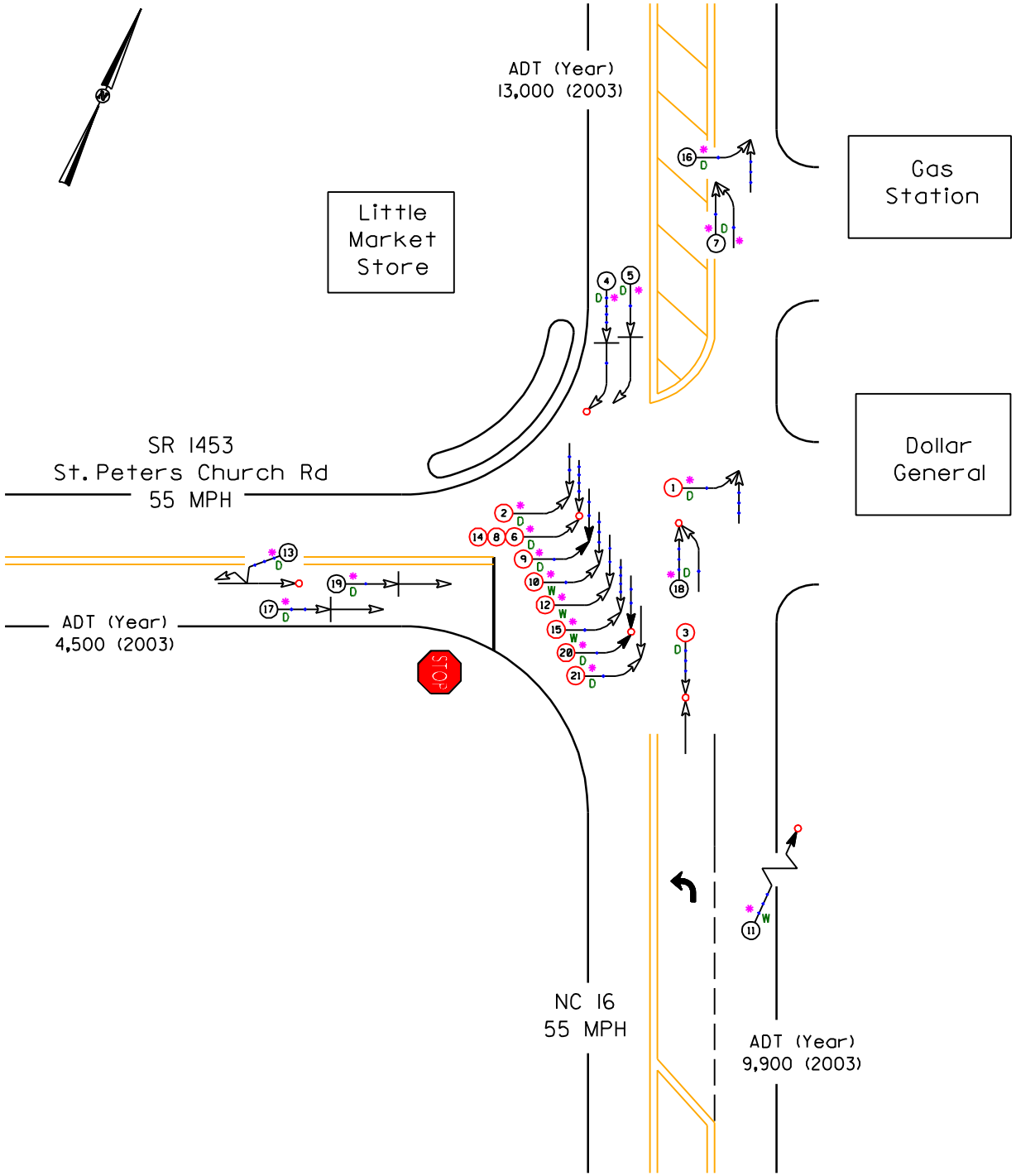
TIME PERIOD	YEARS	K & A CRASHES	K & A CRASHES PER YR	B & C CRASHES	B & C CRASHES PER YR	PDO CRASHES	PDO CRASHES PER YR	ANNUAL COSTS
BEFORE	4.58	0	0.00	5	1.09	7	1.53	$28,406
AFTER	4.58	0	0.00	5	1.09	1	0.22	$22,773

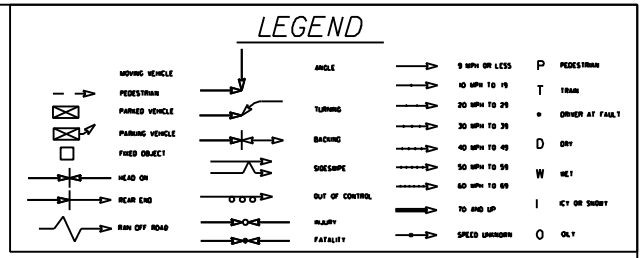
Annual Benefits from Crash Cost Savings $5,633

NET AVG. ANNUAL BENEFITS = AVG. ANNUAL BENEFITS - TOTAL ANNUAL COST = ($3,750)

BENEFIT-COST RATIO = AVG ANNUAL BENEFITS/TOTAL ANNUAL COST = 0.60

TOTAL COST OF PROJECT - $43,500 COMPREHENSIVE B/C RATIO - 0.60





SS# 12-05-202
Order# 41000010098
Catawba County
BEFORE Period
6/1/01 - 12/31/05

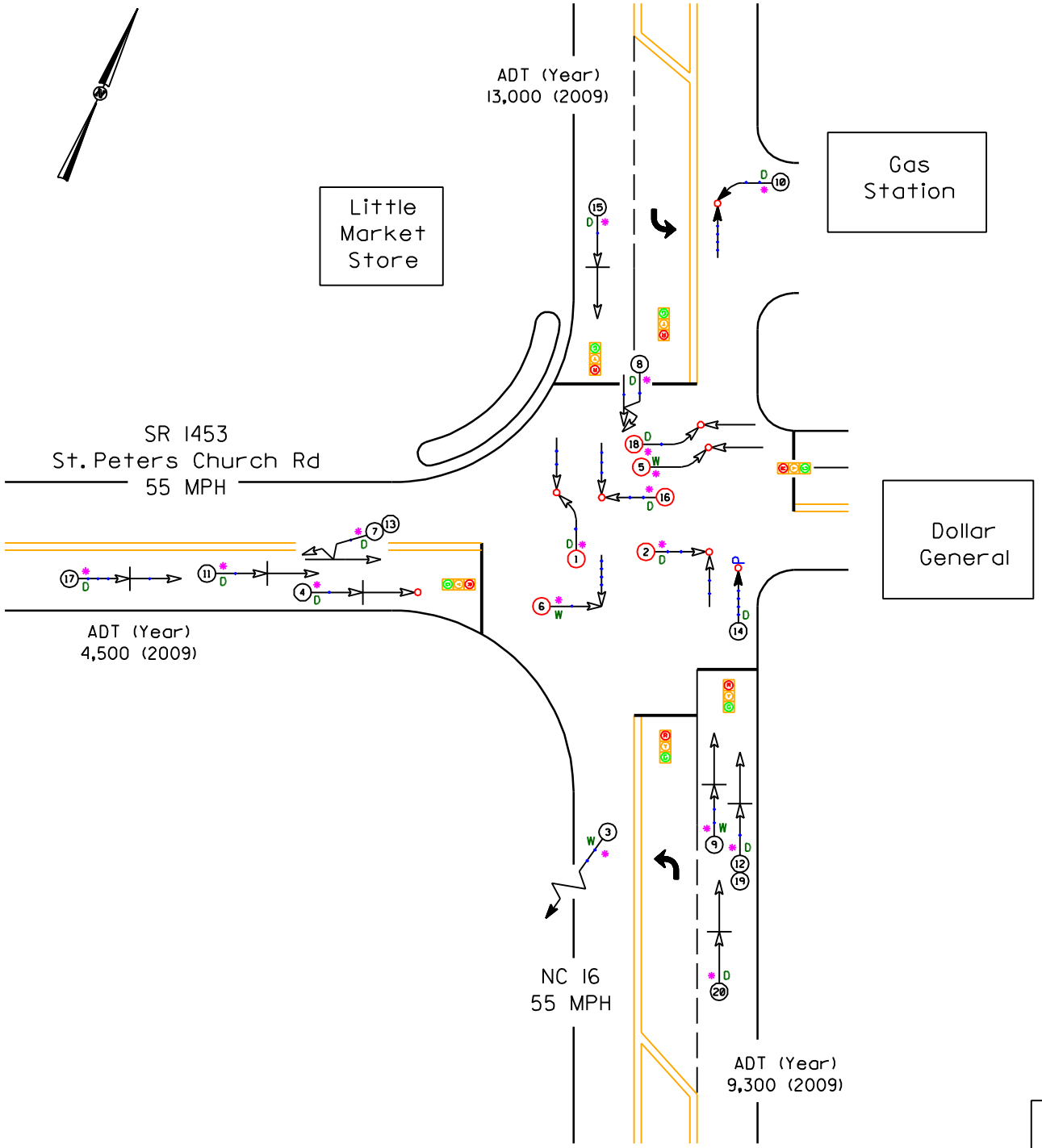
Frontal Impact Target Crashes

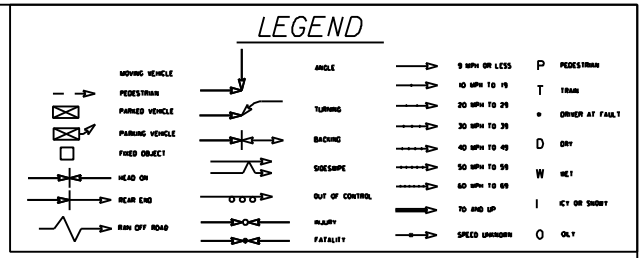
N.C. DEPARTMENT of TRANSPORTATION
DIVISION of HIGHWAYS
TRANSPORTATION MOBILITY and SAFETY DIVISION

TRAFFIC SAFETY UNIT

Date: 12-13-2010

Prepared By: J. Schronce





SS# 12-05-202
Order# 41000010098
Catawba County
AFTER Period
4/1/06 - 10/31/10

R
Y
G
New
Traffic Signal
Installation
Sig ID: 12-1730

Frontal Impact Target Crashes

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

TRAFFIC SAFETY UNIT

Date: 12-13-2010

Prepared By: J. Schronce