Spot Safety Project Evaluation

Order # 41000006199

Spot Safety Project # 09-01-201

Spot Safety Project Evaluation of the
Raised Median Channelization Installation
US 158 (Clemmons Rd) at SR 1103
Forsyth County

Documents Prepared By:

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

Principal Investigator

Jason B. Schronce

Traffic Safety Project Engineer

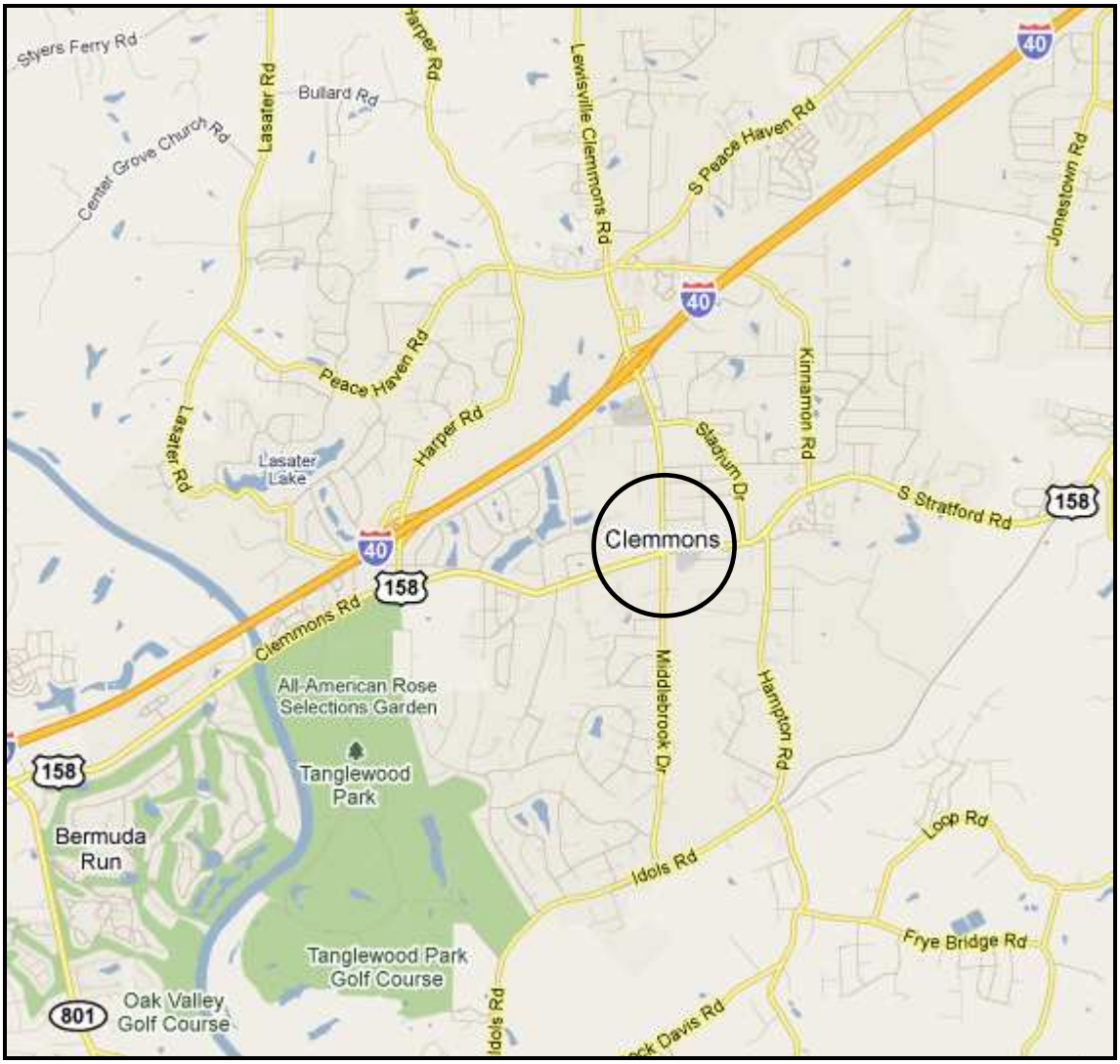
9-14-2010
Date

Spot Safety Project Evaluation Documentation

Subject Location

Evaluation of Spot Safety Project Number 09-01-201 located at the Intersection of US 158 (Clemmons Road) and SR 1103 (Lewisville-Clemmons Road / Middlebrook Drive) in Forsyth County, City of Clemmons.

The Sig ID is 09-0506 for this existing traffic signal.



Aerial Photo of Intersection (North→)

Project Information and Background from the Project File Folder

The spot safety project improvement countermeasure chosen for the subject location was the installation of raised median channelization islands on the remaining three (3) approaches to the subject location. The eastbound US 158 approach had an existing island in the before period. The eastbound approach of US 158 (Clemmons Rd) and northbound SR 1103 (Middlebrook Drive) are both two-lane facilities at the subject intersection with left turn lanes. The westbound US 158 approach is a 3-lane cross-section with an additional right turn lane and the southbound approach of SR 1103 (Lewisville-Clemmons Rd) is a five-lane cross-section roadway. The intersection has speed limits of 35 mph on all approaches and is already controlled by a traffic signal.

The original statement of problem explained that this high volume intersection was experiencing collisions related to multiple driveways and congestion. This countermeasure intended to alleviate crashes by limiting vehicular movement.

The initial crash analysis was completed from May 1, 1996 to May 1, 1999 with fifty-one (51) reported crashes, nine (9) of which were deemed correctable. The final completion date for the improvement at the subject intersection was on January 6, 2003 with a total cost of $97,000.00.

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 November through December 2005. The before period consisted of reported crashes from May 1, 2001 through October 31, 2005 (4 years and 6 months); and the after period consisted of reported crashes from January 1, 2006 through June 30, 2010 (4 years and 6 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 500 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 PVA Left Turn Crashes (on the three countermeasure approaches) were the target crashes for the applied countermeasure. The crash types considered are as follows: Left turn, same roadway and Left turn, different roadways.

Treatment Information	**Before**	**After**	**Percent Reduction (-) Percent Increase (+)**
Total crashes	68	60	- 11.8 %
Total Severity Index	2.96	2.85	- 3.7 %
Target Crashes	21	5	- 76.2 %
Target Crash Severity Index	3.11	2.48	- 20.3 %
Volume (2003, 2008)	35,100	34,100	- 2.8 %

Injury Crash Summary	**Before**	**After**	**Percent Reduction (-) Percent Increase (+)**
Fatal injury Crashes	0	0	N/A
Class A injury Crashes	0	0	N/A
Class B injury Crashes	4	2	- 50.0 %
Class C Injury Crashes	14	13	- 7.1 %
Total Injury Crashes	18	15	- 16.7 %

The naive before and after analysis at the treatment location resulted in a 12 percent decrease in Total Crashes, a 76 percent decrease in Target Crashes, and a 4 percent decrease 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 showed patterns of PVA left turn collisions entering and exiting the pharmacy in the northwest quadrant, exiting the service station (converted to another pharmacy in after period), and exiting the two banks on the northbound approach. There were twenty-one (21) non-intersection left turn crashes in the before period. These patterns were nearly eliminated, reduced to five (5) crashes, with the installation of the raised median barriers as the traffic movements were restricted.

The intersection overall still experienced similar crash totals through the analysis. Noteworthy crash pattern increases include: rear-end collisions approaching the signal increased from nineteen (19) to twenty-seven (27) and sideswipe-same direction collisions increased from two (2) to seven (7) from the before period to the after period.

The calculated benefit to cost ratio for this project is **0.70 considering total crashes**. The benefit to cost ratio **considering only target crashes is 1.27**. 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 both approaches of US 158 and the southbound approach of SR 1103 (Lewisville-Clemmons Rd). 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

Traveling South on SR 1103 (Lewisville-Clemmons Rd) – new median

Traveling South on SR 1103 (Lewisville-Clemmons Rd)

Looking East on US 158 (Clemmons Road)
Existing Before Period Median

Looking West on US 158 (Clemmons Road)

BENEFIT-COST ANALYSIS WORKSHEET - Total Crashes

LOCATION: US 158 at SR 1103 BY: JBS
COUNTY: Forsyth DATE: 9/10/2010
FILE NO.: SS 09-01-201

DETAILED COST: TYPE IMPROVEMENT - Raised Channelization

ITEMS	TOTAL	SERVICE	CRF	ANNUAL COST
Construction	$157,000	10	0.149	$23,398
	$0	0	0.000	$0
Right-of-Way	$0	0	0.000	$0
TOTALS	$157,000	10	0.149	$23,398

ESTIMATED INCREASE IN ANNUAL MAINT. COST = $2,400
ESTIMATED INCREASE IN ANNUAL UTILITY COST = $0

TOTAL ANNUAL COST= $25,798
TOTAL COST OF PROJECT= $157,000

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	4.50	0	0.00	18	4.00	50	11.11	$127,778
AFTER	4.50	0	0.00	15	3.33	45	10.00	$109,667

Annual Benefits from Crash Cost Savings $18,111

NET AVG. ANNUAL BENEFITS = AVG. ANNUAL BENEFITS - TOTAL ANNUAL COST = ($7,687)

BENEFIT-COST RATIO = AVG ANNUAL BENEFITS/TOTAL ANNUAL COST = 0.70

TOTAL COST OF PROJECT - $157,000 COMPREHENSIVE B/C RATIO - 0.70

BENEFIT-COST ANALYSIS WORKSHEET - Target Crashes

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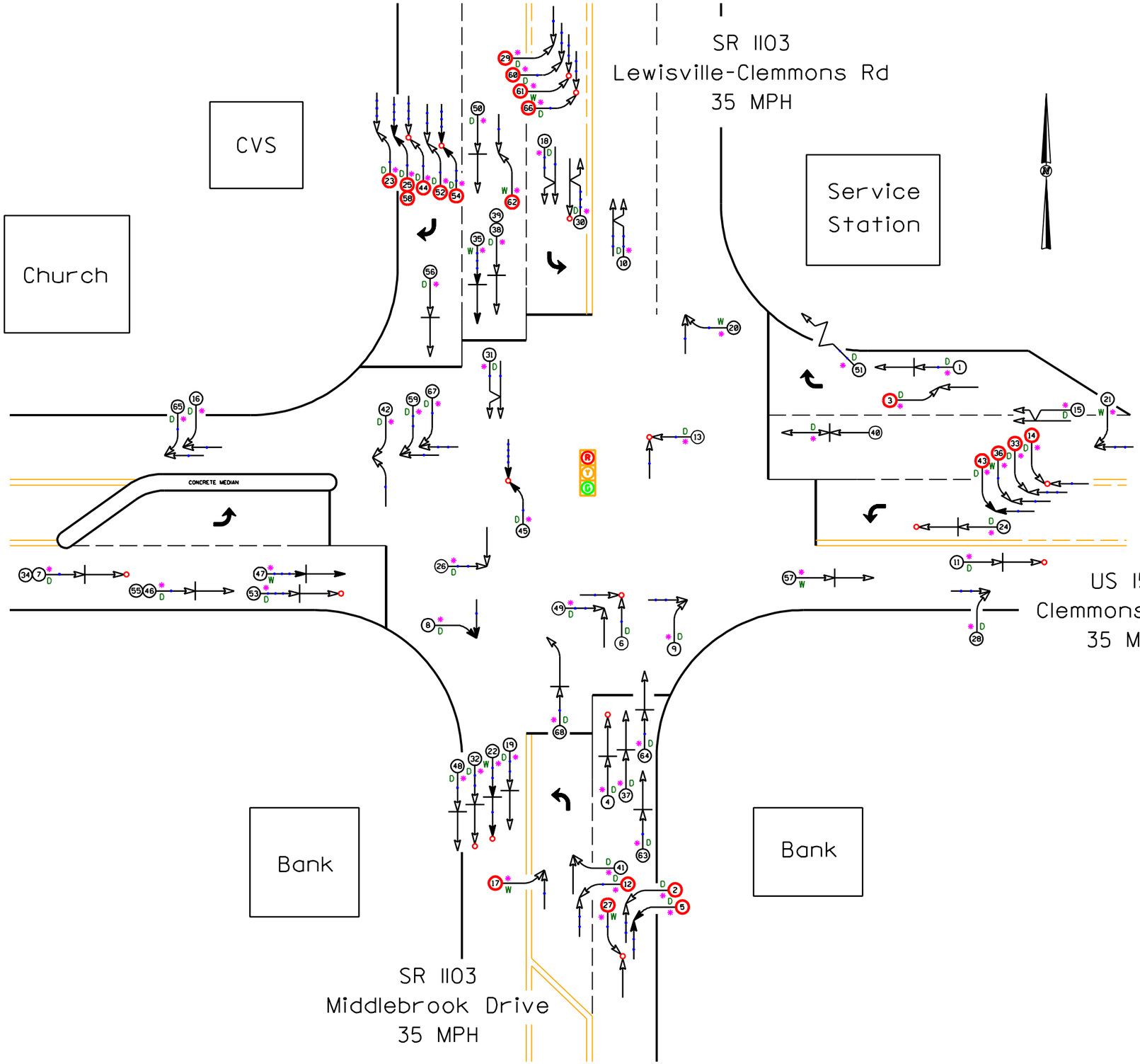
BEFORE	4.50	0	0.00	6	1.33	15	3.33	$41,000
AFTER	4.50	0	0.00	1	0.22	4	0.89	$8,267

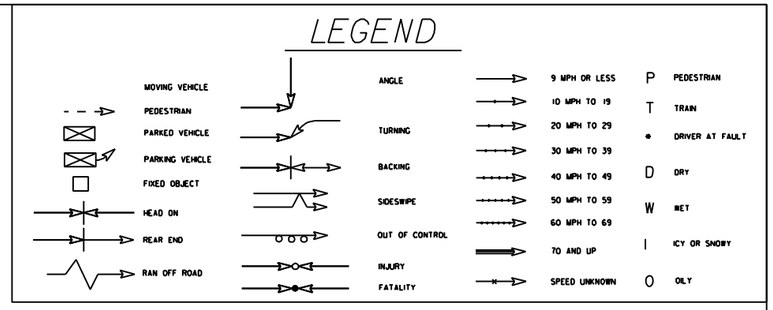
Annual Benefits from Crash Cost Savings $32,733

NET AVG. ANNUAL BENEFITS = AVG. ANNUAL BENEFITS - TOTAL ANNUAL COST = $6,936

BENEFIT-COST RATIO = AVG ANNUAL BENEFITS/TOTAL ANNUAL COST = 1.27

TOTAL COST OF PROJECT - $157,000 COMPREHENSIVE B/C RATIO - 1.27





SS# 09-01-201
Order# 4100006199
Forsyth County
City of Clemmons
BEFORE Period
5/1/01 - 10/31/05

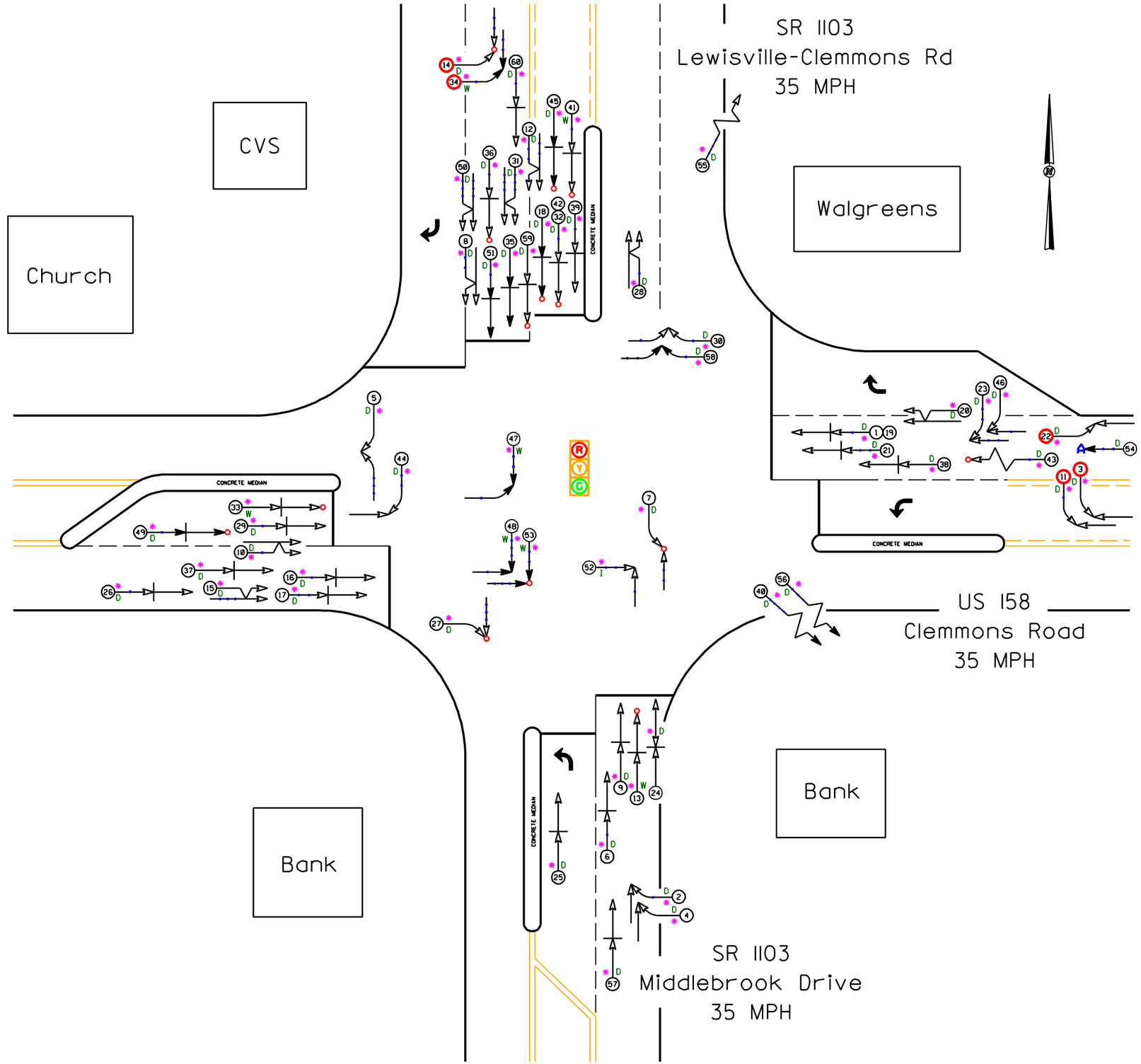
R Y G
Existing Signalized Intersection
Sig ID 09-0506

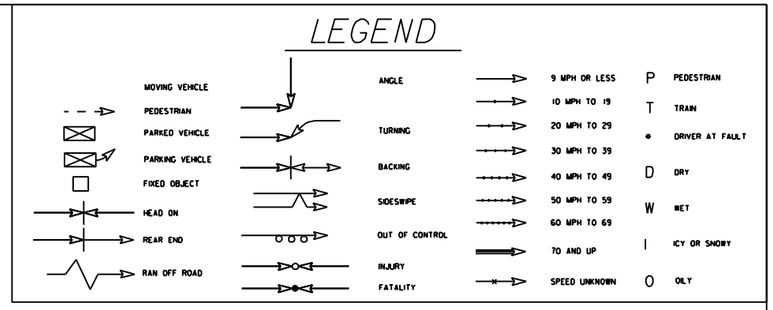
PVA Left Turn Target Crashes

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

TRAFFIC SAFETY UNIT

Date: 9-8-2010 | Prepared By: J. Schronce





SS# 09-01-201
Order# 4100006199
Forsyth County
City of Clemmons
AFTER Period
1/1/06 - 6/30/10

Existing
Signalized
Intersection
Sig ID 09-0506

PVA Left Turn
Target Crashes

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

TRAFFIC SAFETY UNIT

Date: 9-10-2010 | ***Prepared By: J. Schronce***