

# Spot Safety Project Evaluation

Order # 41000009942

Spot Safety Project # 10-04-209

**Spot Safety Project Evaluation of the  
Modular Lane Separation Installation / Median Barrier Delineators  
US 601 (Warren C. Coleman Blvd) at SR 1482 (Zion Church Road)  
Cabarrus County, City of Concord**

Documents Prepared By:

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

**Principal Investigator**



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Jason B. Schronce

12-14-2010

Date

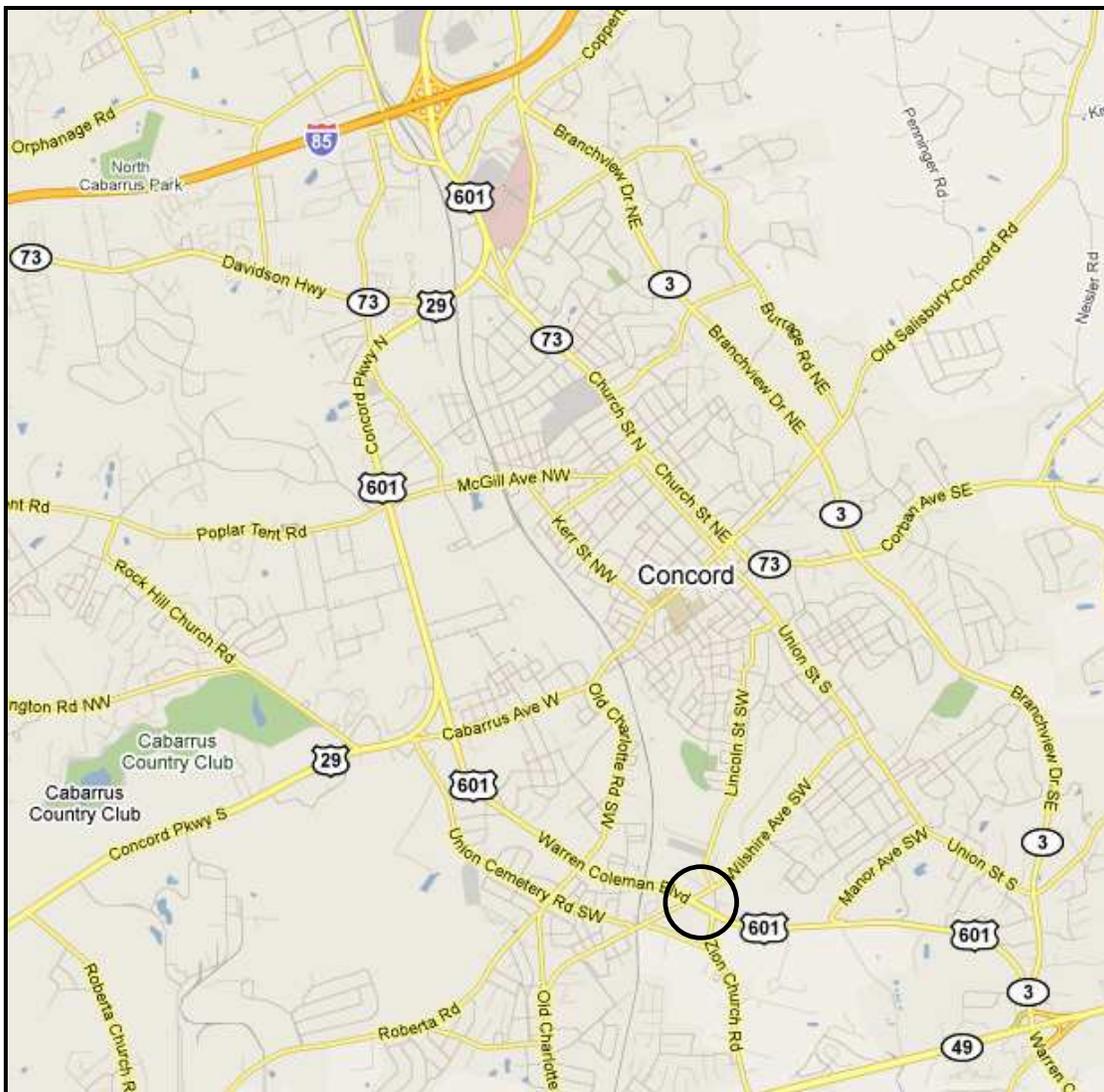
Traffic Safety Project Engineer

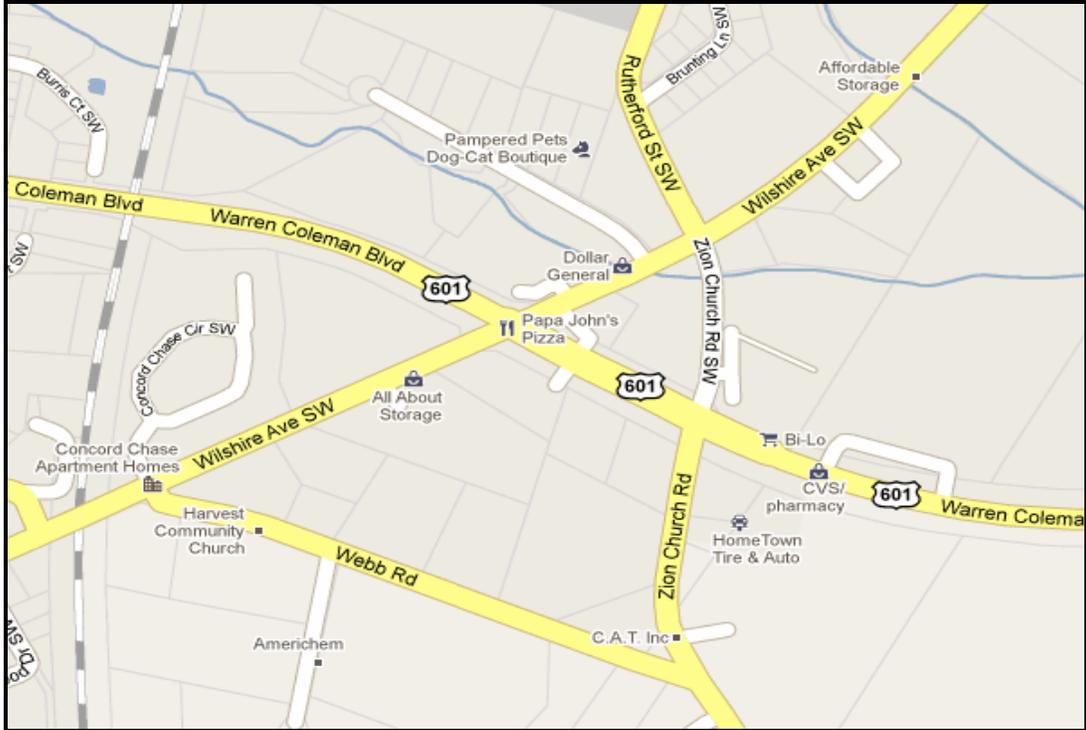
# Spot Safety Project Evaluation Documentation

## Subject Location

Evaluation of Spot Safety Project Number 10-04-209 located along US 601 from 300 feet north/west of SR 1157 (Wilshire Ave) to the Bi-Lo Shopping Center Entrance located 330 feet south/east of SR 1482 (Zion Church Road) in Cabarrus County, City of Concord.

The study limits are from Milepost 15.528 (Bi-Lo Entrance) to Milepost 15.817 (north of SR 1157) and include the existing signalized intersection of US 601 (Warren C. Coleman Blvd) at SR 1157 (Wilshire Avenue) with Sig ID 10-0672.





## **Project Information and Background from the Project File Folder**

The spot safety project improvement countermeasure chosen for the subject location was the installation of breakaway pole delineators along US 601 which created a median barrier to restrict PVA left turns and SR 1482 (Zion Church Rd) crossing maneuver. US 601 is a two-lane bypass route around the City of Concord which widens along this segment to provide multiple left turn lanes with a speed limit of 45 mph.

SR 1157 (Wilshire Ave) intersects US 601 at a skewed signalized intersection with turn lanes on all approaches. SR 1482 (Zion Church Rd) intersects US 601 approximately 1,000 feet east of SR 1157 and is under stop sign control. This segment also serves multiple businesses including a Bi-Lo Shopping Center, gas station, video store, and a small strip mall with a Dollar General.

The original statement of problem was the existing high crash patterns from vehicles improperly accessing or crossing US 601 at the gas station exit and the SR 1482 intersection. The intended purpose of the 1,200 feet of modular lane separation was to restrict left turn motorists and alleviate collisions.

The initial crash analysis was completed from June 1, 2000 to May 31, 2003 with fifty-seven (57) reported crashes, nineteen (19) of which were deemed correctable including one A-injury crash. The final completion date for the improvement at the subject intersection was on November 1, 2006 with a total cost of \$75,000.

## **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 October through November 2006. The before period consisted of reported crashes from November 1, 2002 through September 30, 2006 (3 years and 11 months); and the after period consisted of reported crashes from December 1, 2006 through October 31, 2010 (3 years and 11 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 a 150 feet y-line of the subject US 601 roadway from MP 15.528 (Bi-Lo Entrance) to MP 15.817 (150 feet west of Dollar General Driveway).  
*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 segment. Please note that Accessing US 601 Crashes (that were restricted in the after period) were the target crashes for the applied countermeasure. The crash types considered are as follows: Left turn, same roadways; Left turn, different roadways; Rear-end, Turn; and Angle.

These crash types only apply at the intersections of Zion Church Road (MP 15.59), the Gas Station / Video Store PVA (MP 15.717), and the Dollar General PVA (MP 15.788).

<u>Treatment Information</u>	Before	After	Percent Reduction (-) Percent Increase (+)
Total Crashes	98	44	- 55.1 %
Total Severity Index	5.34	3.86	- 27.7 %
Target Crashes	37	0	- 100.0 %
Target Crash Severity Index	6.05	0.00	- 100.0 %
Volume (2004, 2008)	19,500	18,700	- 4.1 %

<u>Injury Crash Summary</u>	Before	After	Percent Reduction (-) Percent Increase (+)
Fatal injury Crashes	0	0	N/A
Class A injury Crashes	2	0	- 100.0 %
Class B injury Crashes	7	1	- 85.7 %
Class C Injury Crashes	30	16	- 46.7 %
Total Injury Crashes	39	17	- 56.4 %

The naive before and after analysis at the treatment location resulted in a 55 percent decrease in Total Crashes, a complete 100 percent decrease in Target Crashes, and a 28 percent decrease in the Total Severity Index. The before period ADT year was 2004 and the after period ADT year was 2008.

## Results and Discussion

Referencing the *Collision Diagrams*, the before period shows a significant pattern of thirty-seven (37) collisions from movements that are restricted in the after period. Of these crashes, sixteen (16) occurred as a motorist was attempting to leave the gas station (MP 15.717) turning left and was struck in the northbound left turn lane of US 601 after being “waved” through by a vehicle in queue. There were also three (3) crashes as vehicles attempted to enter the gas station. SR 1482 (Zion Church Rd) also had a pattern of eleven (11) angle crashes, three (3) left turn different roadways, two (2) left turn same road, and two (2) rear-end turns. All of these movements were prohibited in the after period.

With the installation of breakaway pole delineators as a median barrier, all the target crashes were alleviated. There were possibly two (2) collisions – crash # 21 (left turn on SR 1157 from gas station) and crash # 27 (u-turn at SR 1157) – that might have been created from restricting the before period movements. This was a very successful project in alleviating existing crash patterns.

The calculated benefit to cost ratio for this project is **10.90 considering total crashes**. The benefit to cost ratio **considering only target crashes is 6.19**. 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 US 601 approaches to the treatment (restricted access) sites. 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 West / Northwest on US 601 from Bi-Lo Entrance  
Showing restricted left turn onto SR 1482 (Zion Church Road) – MP 15.59



Traveling West / Northwest on US 601 (Warren C. Coleman Blvd)  
Showing restricted left turn from Gas Station / Video Store - MP 15.717



Traveling West / Northwest on US 601 (Warren C. Coleman Blvd)  
Showing Intersection with SR 1157 (Wilshire Ave) – MP 15.76



Traveling East / Southeast on US 601 from “end of study”  
Showing restricted left turn from Dollar General - MP 15.788

**BENEFIT-COST ANALYSIS WORKSHEET - Total Crashes**

LOCATION: US 601 near SR 1482		BY: JBS						
COUNTY: Cabarrus		DATE: 12/7/2010						
FILE NO.: SS 10-04-209								
DETAILED COST:	TYPE IMPROVEMENT - <b>Modular Median Barrier - Pole Mounted Delineators</b>							
	ITEMS	TOTAL	SERVICE	CRF	ANNUAL COST			
	Construction	\$75,000	2	0.561	\$42,058			
	Right-of-Way	\$0	0	0.000	\$0			
	TOTALS	\$75,000	2	0.561	\$42,058			
	ESTIMATED INCREASE IN ANNUAL MAINT. COST =				\$0			
	ESTIMATED INCREASE IN ANNUAL UTILITY COST =				\$0			
	TOTAL ANNUAL COST=				\$42,058			
	TOTAL COST OF PROJECT=				\$75,000			
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	3.92	2	0.51	37	9.44	59	15.05	\$574,923
AFTER	3.92	0	0.00	17	4.34	27	6.89	\$116,352
						Annual Benefits from Crash Cost Savings		\$458,571
NET AVG. ANNUAL BENEFITS = AVG. ANNUAL BENEFITS - TOTAL ANNUAL COST					=	\$416,514		
BENEFIT-COST RATIO = AVG ANNUAL BENEFITS/TOTAL ANNUAL COST					=	10.90		
TOTAL COST OF PROJECT		-	\$75,000	COMPREHENSIVE B/C RATIO		-	10.90	

**BENEFIT-COST ANALYSIS WORKSHEET - Target Crashes**

LOCATION: US 601 near SR 1482		BY: JBS						
COUNTY: Cabarrus		DATE: 12/7/2010						
FILE NO.: SS 10-04-209								
DETAILED COST:	TYPE IMPROVEMENT - <b>Modular Median Barrier - Pole Mounted Delineators</b>							
	ITEMS	TOTAL	SERVICE	CRF	ANNUAL COST			
	Construction	\$75,000	2	0.561	\$42,058			
	Right-of-Way	\$0	0	0.000	\$0			
	TOTALS	\$75,000	2	0.561	\$42,058			
	ESTIMATED INCREASE IN ANNUAL MAINT. COST =				\$0			
	ESTIMATED INCREASE IN ANNUAL UTILITY COST =				\$0			
	TOTAL ANNUAL COST=				\$42,058			
	TOTAL COST OF PROJECT=				\$75,000			
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	3.92	1	0.26	15	3.83	21	5.36	\$260,281
AFTER	3.92	0	0.00	0	0.00	0	0.00	\$0
						Annual Benefits from Crash Cost Savings		\$260,281
NET AVG. ANNUAL BENEFITS = AVG. ANNUAL BENEFITS - TOTAL ANNUAL COST					=	\$218,223		
BENEFIT-COST RATIO = AVG ANNUAL BENEFITS/TOTAL ANNUAL COST					=	6.19		
TOTAL COST OF PROJECT		-	\$75,000	COMPREHENSIVE B/C RATIO		-	6.19	

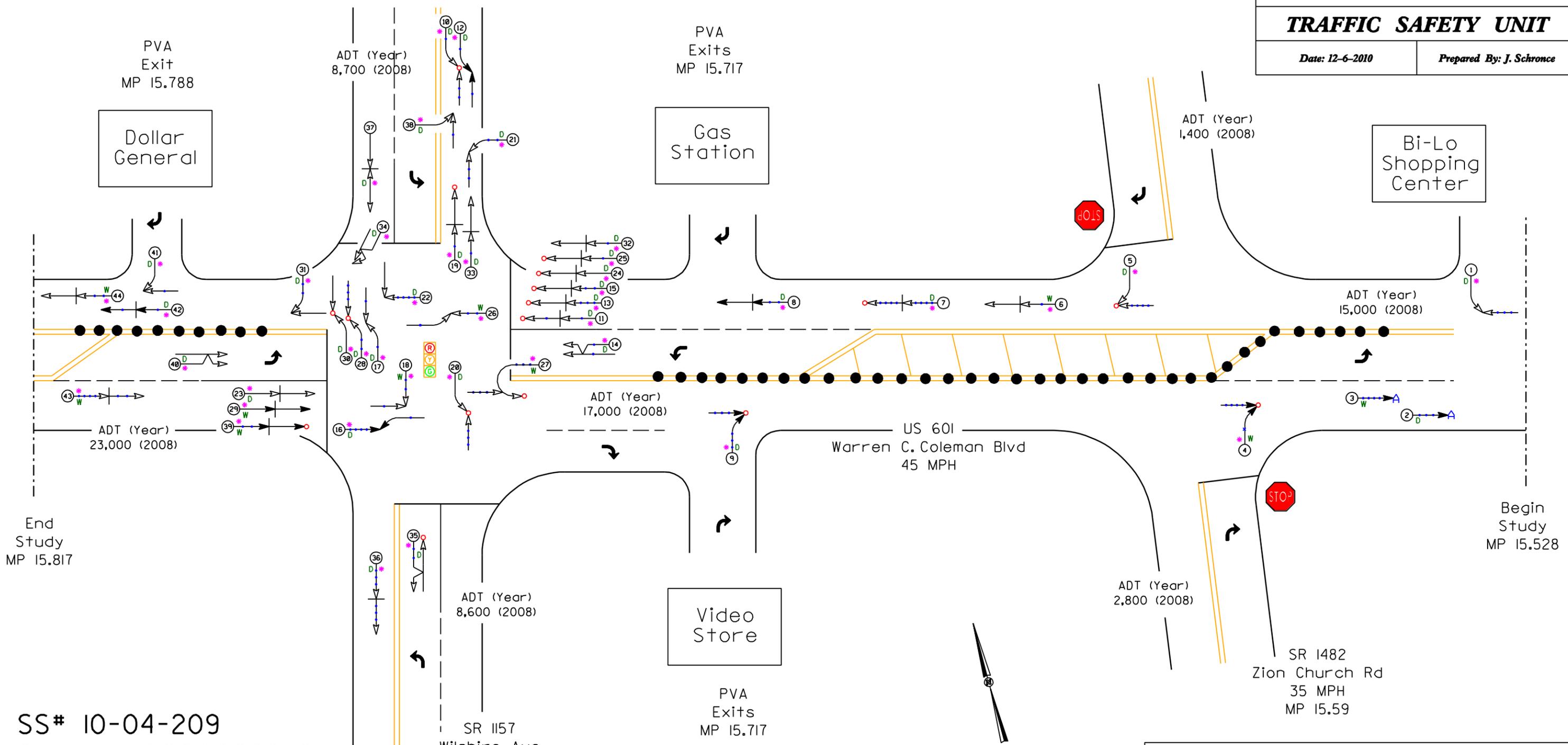


**TRAFFIC SAFETY UNIT**

Date: 12-6-2010

Prepared By: J. Schronce

⊕ Crossing US-601  
 Target Crashes



SS# 10-04-209  
 Order# 41000009942  
 Cabarrus County  
 AFTER Period  
 12/1/06 - 10/31/10

**LEGEND**

	MOVING VEHICLE		ANGLE		9 MPH OR LESS		P PEDESTRIAN
	PEDESTRIAN		TURNING		10 MPH TO 19		T 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		RAN OFF ROAD		50 MPH TO 59		I ICY OR SNOWY
	REAR END		REAR END		60 MPH TO 69		U SPEED UNKNOWN
	RAN OFF ROAD		REAR END		70 AND UP		O ONLY
			REAR END		FATALITY		