Spot Safety Project Evaluation

Order # 41000015267

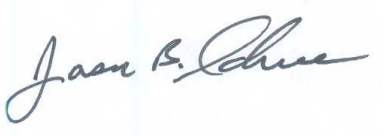
Spot Safety Project # 12-03-212

Spot Safety Project Evaluation of the Traffic Signal Installation
US-70 at 22nd Street SW
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



Jason B. Schronce

Traffic Safety Project Engineer

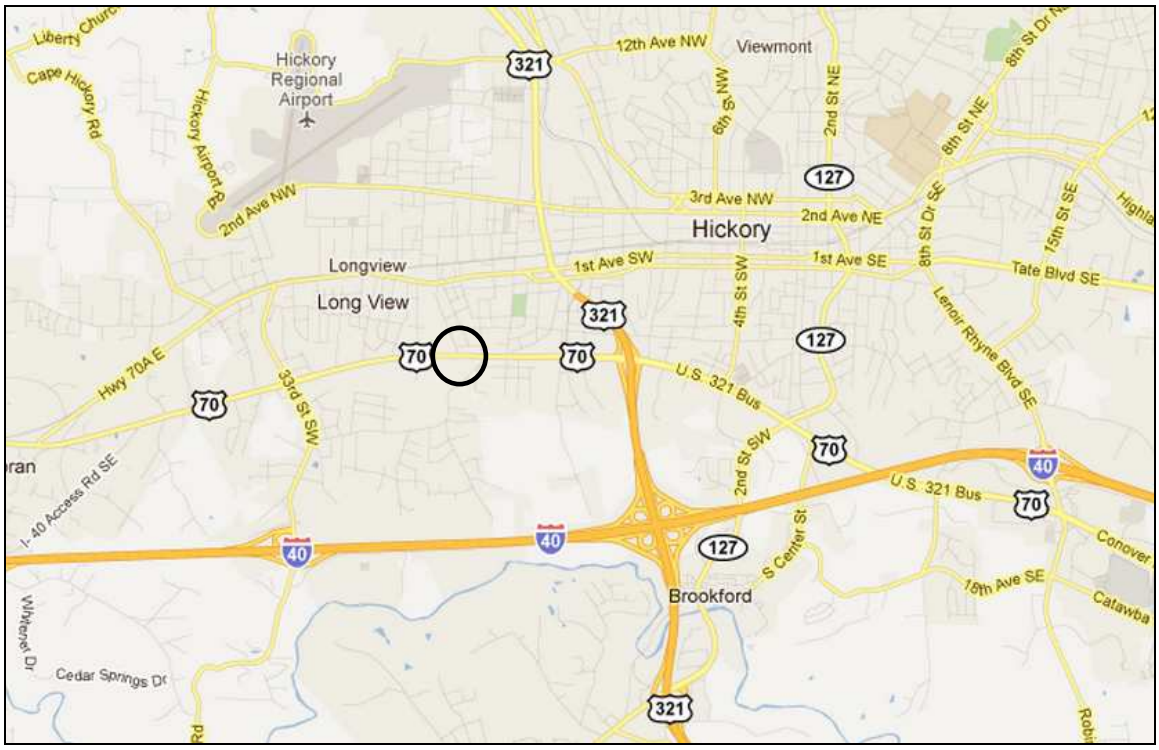
11-16-2011
Date

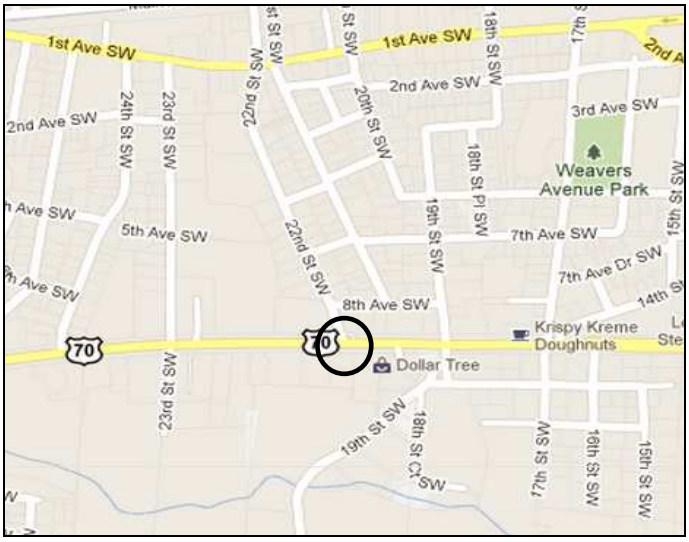
Spot Safety Project Evaluation Documentation

Subject Location

Evaluation of Spot Safety Project Number 12-03-212 located at the Intersection of US-70 and 22nd Street SW in Catawba County, in the City of Hickory.

The Sig ID is 12-1711 for this newly installed Traffic Signal.





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 traffic signal. US-70 is a five-lane facility with a dedicated center turn lane and a posted 50-mph speed limit. 22nd Street SW is a small two-lane facility serving multiple businesses and residences. 22nd Street SW connects US-70 to US-70A and has a 35-mph city speed limit. The subject location is a three-leg intersection, which was controlled by a stop sign on 22nd Street SW in the before period. There are also multiple businesses surrounding this location including a gas station, restaurant, and bar / strip club.

The original statement of problem was the existence of delay for vehicles on the side street. Also, the intersection was experiencing left turn crashes from motorists entering a high volume, high speed roadway. The intersection met Signal Warrants 2 and 3B.

The initial crash analysis was completed from December 1, 1999 to November 30, 2002 with eleven (11) reported crashes, four (4) of which were deemed correctable. The installation date for the traffic signal by Police crash reports was during the first quarter of 2005 with a total cost of $110,000.

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 January through April 2005. The before period consisted of reported crashes from September 1, 1998 through December 31, 2004 (6 years and 4 months); and the after period consisted of reported crashes from May 1, 2005 through August 31, 2011 (6 years and 4 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	19	- 9.5 %
Total Severity Index	8.84	7.33	- 17.1 %
Target Crashes	5	10	100.0 %
Target Crash Severity Index	5.44	12.28	125.7 %
Volume (2001, 2008)	18,800	15,500	- 17.6 %

Injury Crash Summary	**Before**	**After**	**Percent Reduction (-) Percent Increase (+)**
Fatal injury Crashes	0	0	N/A
Class A injury Crashes	1	1	0.0 %
Class B injury Crashes	2	1	- 50.0 %
Class C Injury Crashes	10	5	- 50.0 %
Total Injury Crashes	13	7	- 46.2 %

The naive before and after analysis at the treatment location resulted in a 9.5 percent decrease in Total Crashes, a 100 percent increase in Target Crashes, but a 17 percent decrease in the Total Severity Index. The before period ADT year was 2001 and the after period ADT year was 2008.

Results and Discussion

Referencing the *Collision Diagrams*, the before period presented a pattern of five (5) left turn different roadway collisions from vehicles who attempted to turn left from 22nd Street SW and were struck by westbound US-70 vehicles. The before period also indicated seven (7) left turn crashes from motorists pulling out of PVAs located within the 150 foot y-line.

After the signal installation, the intersection left turn crash pattern increased to seven (7) collisions which all resulted from westbound US-70 motorists running the red light. Additionally, there were three (3) right turn crashes caused by one (1) westbound US-70 vehicle running the red light and two (2) improper turn right on red movements. However, PVA left turn crashes were reduced to five (5) in the after period.

The before period consisted of one (1) A-injury crash which occurred as a PVA left turn crash from the Strip Club in the northeast quadrant. However, the after period had one (1) A-injury target crash from a left turn intersection collision where a westbound US-70 vehicle ran the red light. The target crash frequency increase and A-injury collision generates a negative target benefit-cost ratio.

The calculated benefit to cost ratio for this project is **0.84 considering total crashes**. The benefit to cost ratio **considering only target crashes is (-5.55)**. 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 our field visit on October 31st, 2011 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 (Field Visit 10-31-2011)

Travelling East on US-70

Travelling West on US-70

Travelling South on 22nd Street SW

BENEFIT-COST ANALYSIS WORKSHEET - Total Crashes

LOCATION: US-70 at 22nd St. SW
COUNTY: Catawba
FILE NO.: SS 12-03-212
BY: JBS
DATE: 11/3/2011

DETAILED COST: TYPE IMPROVEMENT - New Traffic Signal

ITEMS	TOTAL	SERVICE	CRF	ANNUAL COST
Construction	$110,000	10	0.149	$16,393
	$0	0	0.000	$0
Right-of-Way	$0	0	0.000	$0
TOTALS	$110,000	10	0.149	$16,393

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

TOTAL ANNUAL COST= $19,293
TOTAL COST OF PROJECT= $110,000

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	6.34	1	0.16	12	1.89	8	1.26	$142,650
AFTER	6.34	1	0.16	6	0.95	12	1.89	$126,435

Annual Benefits from Crash Cost Savings $16,215

NET AVG. ANNUAL BENEFITS = AVG. ANNUAL BENEFITS - TOTAL ANNUAL COST = ($3,079)

BENEFIT-COST RATIO = AVG ANNUAL BENEFITS/TOTAL ANNUAL COST = 0.84

TOTAL COST OF PROJECT - $110,000 COMPREHENSIVE B/C RATIO - 0.84

BENEFIT-COST ANALYSIS WORKSHEET - Target Crashes

LOCATION: US-70 at 22nd St. SW
COUNTY: Catawba
FILE NO.: SS 12-03-212
BY: JBS
DATE: 11/3/2011
Target - Intersection Frontal Impact

DETAILED COST: TYPE IMPROVEMENT - New Traffic Signal

ITEMS	TOTAL	SERVICE	CRF	ANNUAL COST
Construction	$110,000	10	0.149	$16,393
	$0	0	0.000	$0
Right-of-Way	$0	0	0.000	$0
TOTALS	$110,000	10	0.149	$16,393

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

TOTAL ANNUAL COST= $19,293
TOTAL COST OF PROJECT= $110,000

COMPREHENSIVE COST REDUCTION:

ESTIMATED NUMBER OF ANNUAL ACCIDENT DECREASES

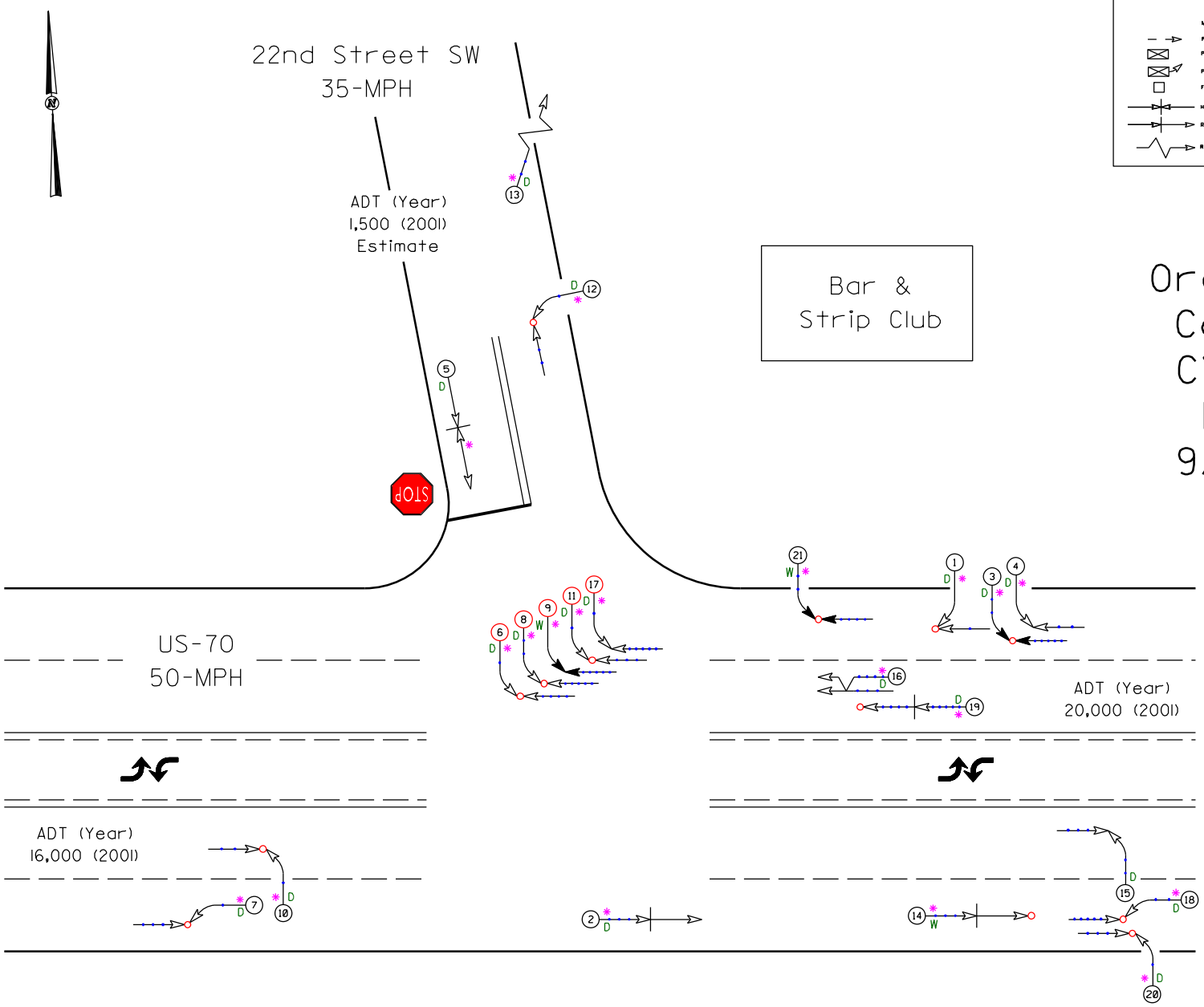
TIME PERIOD	YEARS	K & A CRASHES	K & A CRASHES PER YR	B & C CRASHES	B & C CRASHES PER YR	PDO CRASHES	PDO CRASHES PER YR	ANNUAL COSTS
BEFORE	6.34	0	0.00	3	0.47	2	0.32	$10,820
AFTER	6.34	1	0.16	5	0.79	4	0.63	$117,855

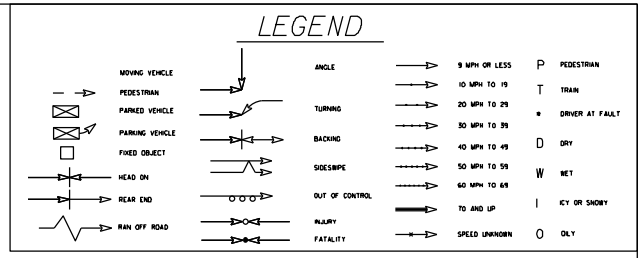
Annual Benefits from Crash Cost Savings ($107,035)

NET AVG. ANNUAL BENEFITS = AVG. ANNUAL BENEFITS - TOTAL ANNUAL COST = ($126,328)

BENEFIT-COST RATIO = AVG ANNUAL BENEFITS/TOTAL ANNUAL COST = -5.55

TOTAL COST OF PROJECT - $110,000 COMPREHENSIVE B/C RATIO - -5.55





SS# 12-03-212
Order# 41000015267
Catawba County
City of Hickory
BEFORE Period
9/1/98 - 12/31/04

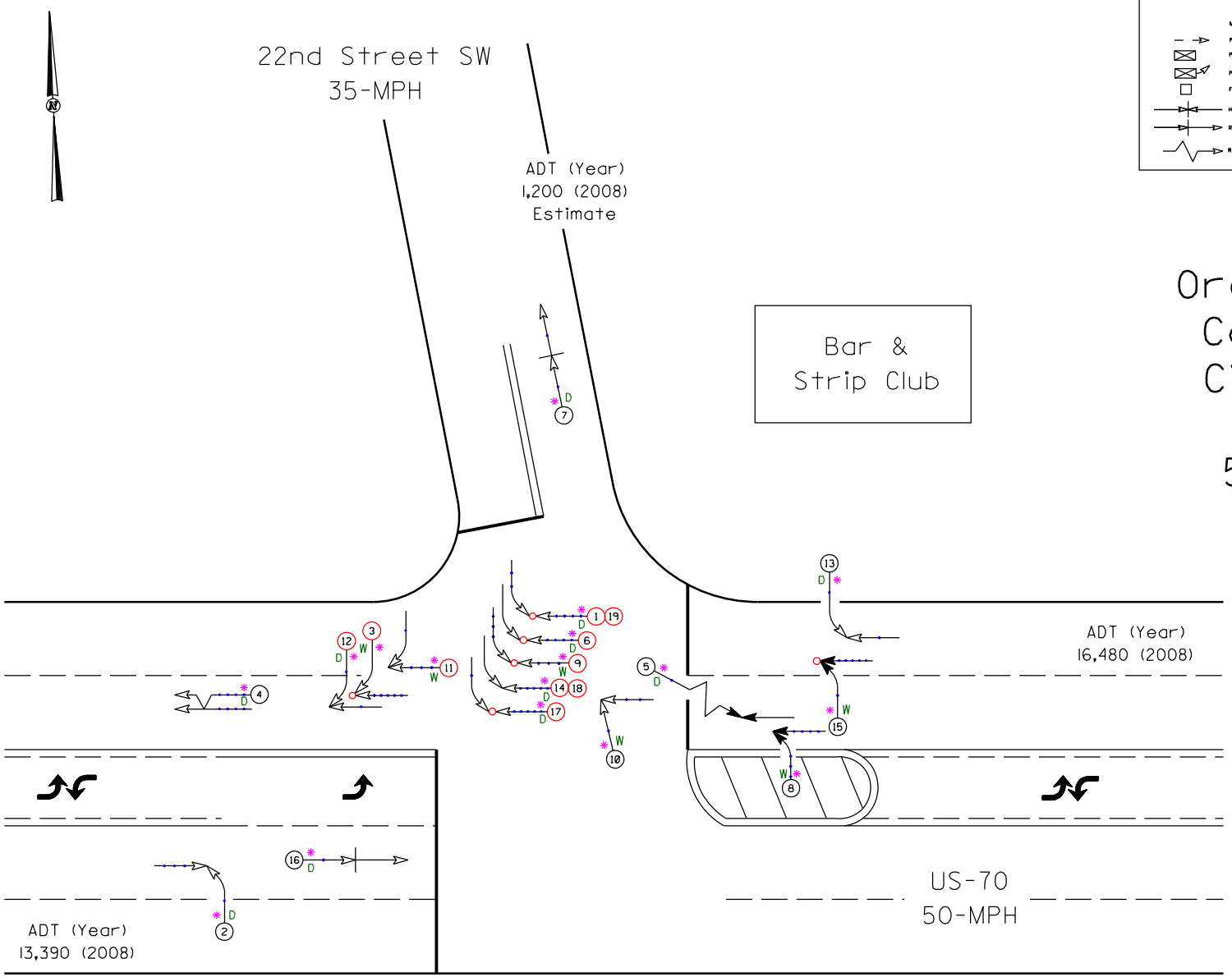
(#) Frontal Impact Target Crashes

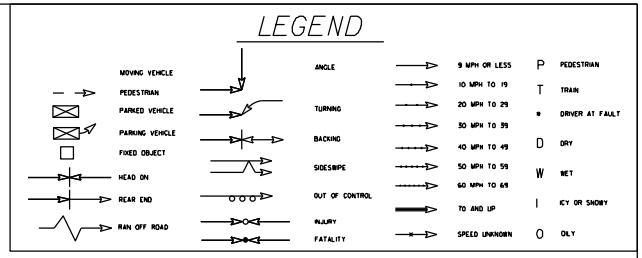
N.C. DEPARTMENT of TRANSPORTATION
DIVISION of HIGHWAYS
TRANSPORTATION MOBILITY and SAFETY DIVISION

TRAFFIC SAFETY UNIT

Date: 11-2-2011

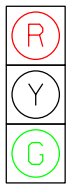
Prepared By: J. Schronce





SS# 12-03-212
Order# 41000015267
Catawba County
City of Hickory
AFTER Period
5/1/05 - 8/31/11

New Signalized
Intersection
Sig ID 12-1711



All Permissive
Phasing

(#) Frontal Impact Target Crashes

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

TRAFFIC SAFETY UNIT

Date: 11-2-2011

Prepared By: J. Schronce