

Spot Safety Project Evaluation

Order # 41000011849

Spot Safety Project # 02-05-204

Spot Safety Project Evaluation of the Crossover Installations & Median Opening Removals US-70 (East Main Street) from Nunn St. to McCotter Blvd Craven County, City of Havelock

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

3-7-2012

Date

Traffic Safety Project Engineer



Aerial Map provided from Craven County GIS – Aerial 2010

Project Information and Background from the Project File Folder

The spot safety project improvement countermeasures chosen for the subject location were the installation of directional median crossovers at Webb Boulevard and Shepard Street. Also, the median openings at Speight Street and the Sonic / BB&T Driveway were closed to not allow left turn movements. US-70 (East Main Street) is a four-lane grass median divided facility with a 40 mph posted city speed limit. The segment has multiple right and left turn lanes, many commercial driveways, and is the main thoroughfare through the City of Havelock.

The original statement of problem was that frontal impact crashes were occurring on US-70 at Speight Street, Webb Boulevard, and Shepard Street from these locations having full access median openings. Due the high volumes along US-70, insufficient gaps exist to allow motorists safe movement across or into the flow of US-70 from the side streets.

The initial crash analysis was completed from November 1, 1999 to October 31, 2004 with thirty-three (33) reported angle crashes and eleven (11) left turn different road collisions. The final completion date for the improvement at the subject roadway segment was on November 13, 2007 with a total cost of \$400,000; of which \$250,000 was provided from Spot Safety Funds and the remaining \$150,000 from Small Construction Funds.

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 August through November 2007. The before period consisted of reported crashes from October 1, 2003 through July 31, 2007 (3 years and 10 months); and the after period consisted of reported crashes from December 1, 2007 through September 30, 2011 (3 years and 10 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 along the US-70 roadway segment from 150 feet north of Nunn Street (MP 36.172) to 150 feet south of McCotter (MP 36.791). The study also included a 150 foot y-line for all included intersections. *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 Crossover Crashes were the target crashes for the applied countermeasure. The Crossover Crash types considered are deemed collisions where the movement was eliminated in the after period. The individual crash types are as follows: Angle (Speight, Webb, Sonic, and Shepard); Left Turn Same Roadway (Speight and Sonic); and Median Sideswipes.

<u>Treatment Information</u>	Before	After	Percent Reduction (-) Percent Increase (+)
Total Crashes	122	73	- 40.2 %
Total Severity Index	5.09	2.72	- 46.6 %
Target Crashes	33	0	- 100.0 %
Target Crash Severity Index	4.14	0.00	- 100.0 %
Volume (2005, 2009)	35,000	33,000	- 5.7 %

<u>Injury Crash Summary</u>	Before	After	Percent Reduction (-) Percent Increase (+)
Fatal injury Crashes	1	0	- 100.0 %
Class A injury Crashes	1	0	- 100.0 %
Class B injury Crashes	11	1	- 90.9 %
Class C Injury Crashes	36	16	- 55.6 %
Total Injury Crashes	49	17	- 65.3 %

The naive before and after analysis at the treatment location resulted in a 40 percent decrease in Total Crashes, a 100 percent elimination of Target Crashes, and a 47 percent decrease in the Total Severity Index. The before period ADT year was 2005 and the after period ADT year was 2009.

Results and Discussion

Referencing the *Collision Diagrams*, the before period presented six (6) angle crashes at Speight, eight (8) angle crashes at Webb, and ten (10) angle collisions at Shepard from vehicles attempting to enter/cross US-70 from the side streets. The crossover installations and the median closures of Speight Street and the Sonic driveway totally eliminated thirty-three (33) collisions from the before period since the traffic movement was no longer available to motorists. Also, the after period did not show an increase in u-turn collisions at the two traffic signals at either end of the study segment.

In addition, the collision diagrams show a reduction of left turn same roadway crashes at Webb Blvd from five (5) to one (1) through the evaluation. Shepard Street also experienced a reduction of left turn same roadway crashes from nine (9) to one (1) even though this traffic movement is still permitted at both side streets with the crossover design.

The calculated benefit to cost ratio for this project is **8.44 considering total crashes**. The benefit to cost ratio **considering only target crashes is 1.58**. 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 June 15th, 2011 for multiple points along the segment. 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 countermeasure.

Treatment Site Photos (Field Visit 6/15/2011)



Travelling East on US-70 at Speight Street (Median Closure)



Travelling East on US-70 at Webb Blvd



Travelling East on US-70 at Shepard Street



Travelling West on US-70 at the Sonic / BB&T Driveway (Median Closure)



Travelling East on US-70 at McCotter Blvd – U-turn Location



Travelling West on US-70 at Nunn Street – U-turn Location

BENEFIT-COST ANALYSIS WORKSHEET - Total Crashes

LOCATION: US-70 in Havelock		BY: JBS						
COUNTY: Craven		DATE: 3/6/2012						
FILE NO.: SS 02-05-204								
DETAILED COST:	TYPE IMPROVEMENT - Crossovers and Median Closure							
	ITEMS	TOTAL	SERVICE	CRF	ANNUAL COST			
	Construction	\$400,000	10	0.149	\$59,612			
		\$0	0	0.000	\$0			
	Right-of-Way	\$0	0	0.000	\$0			
	TOTALS	\$400,000	10	0.149	\$59,612			
	ESTIMATED INCREASE IN ANNUAL MAINT. COST =				\$200			
	ESTIMATED INCREASE IN ANNUAL UTILITY COST =				\$0			
	TOTAL ANNUAL COST=				\$59,812			
	TOTAL COST OF PROJECT=				\$400,000			
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	3.83	2	0.52	47	12.27	73	19.06	\$656,371
AFTER	3.83	0	0.00	17	4.44	56	14.62	\$151,645
						Annual Benefits from Crash Cost Savings		\$504,726
NET AVG. ANNUAL BENEFITS = AVG. ANNUAL BENEFITS - TOTAL ANNUAL COST					=	\$444,914		
BENEFIT-COST RATIO = AVG ANNUAL BENEFITS/TOTAL ANNUAL COST					=	8.44		
TOTAL COST OF PROJECT		-	\$400,000	COMPREHENSIVE B/C RATIO		-	8.44	

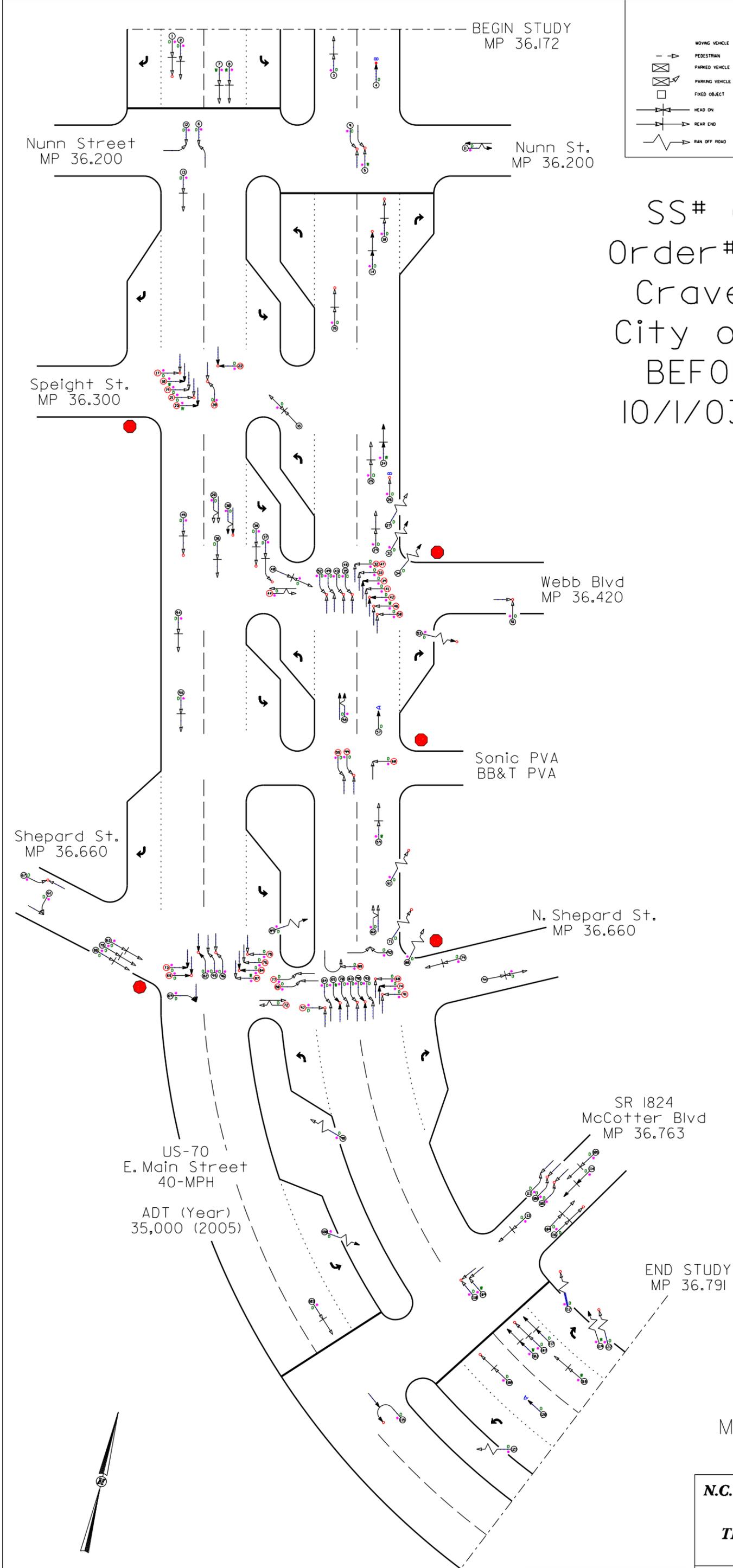
BENEFIT-COST ANALYSIS WORKSHEET - Target Crashes

LOCATION: US-70 in Havelock		BY: JBS						
COUNTY: Craven		DATE: 3/6/2012						
FILE NO.: SS 02-05-204		Target Crossover Crashes - Angles						
DETAILED COST:	TYPE IMPROVEMENT - Crossovers and Median Closure							
	ITEMS	TOTAL	SERVICE	CRF	ANNUAL COST			
	Construction	\$400,000	10	0.149	\$59,612			
		\$0	0	0.000	\$0			
	Right-of-Way	\$0	0	0.000	\$0			
	TOTALS	\$400,000	10	0.149	\$59,612			
	ESTIMATED INCREASE IN ANNUAL MAINT. COST =				\$200			
	ESTIMATED INCREASE IN ANNUAL UTILITY COST =				\$0			
	TOTAL ANNUAL COST=				\$59,812			
	TOTAL COST OF PROJECT=				\$400,000			
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	3.83	0	0.00	14	3.66	19	4.96	\$94,439
AFTER	3.83	0	0.00	0	0.00	0	0.00	\$0
						Annual Benefits from Crash Cost Savings		\$94,439
NET AVG. ANNUAL BENEFITS = AVG. ANNUAL BENEFITS - TOTAL ANNUAL COST					=	\$34,627		
BENEFIT-COST RATIO = AVG ANNUAL BENEFITS/TOTAL ANNUAL COST					=	1.58		
TOTAL COST OF PROJECT		-	\$400,000	COMPREHENSIVE B/C RATIO		-	1.58	

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		DRY
	FIXED OBJECT		OUT OF CONTROL		40 MPH TO 49		WET
	HEAD ON		INJURY		50 MPH TO 59		ICY OR SNOWY
	REAR END		FATALITY		70 AND UP		ONLY
	RAN OFF ROAD				SPEED UNKNOWN		

SS# 02-05-204
 Order# 410000011849
 Craven County
 City of Havelock
 BEFORE Period
 10/1/03 - 7/31/07



Traffic Signals
 Nunn: Sig 02-0392
 McCotter: Sig 02-0649

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

TRAFFIC SAFETY UNIT

Date: 3-2-2012

Prepared By: J. Schrone

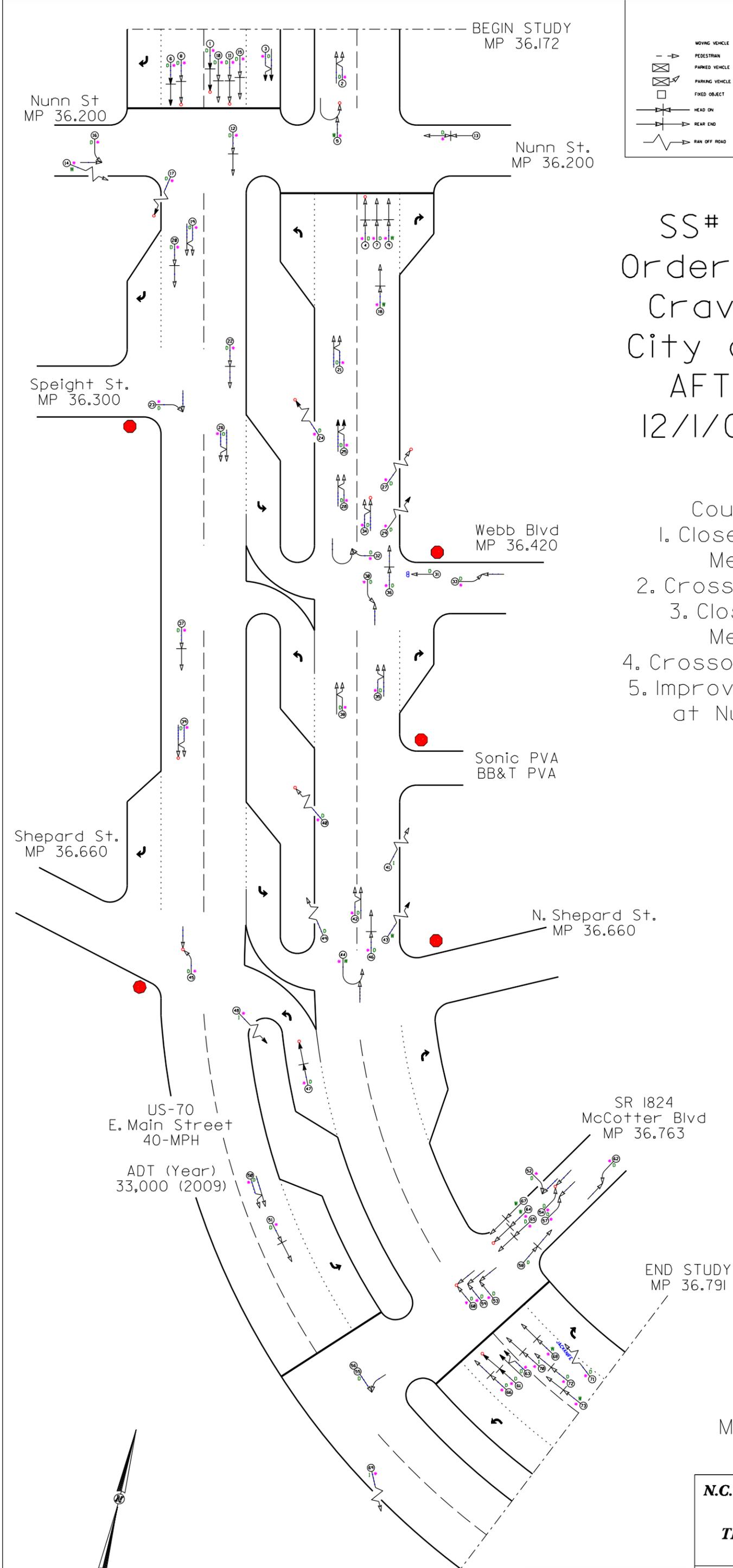
Crossover (Angle)
 Target Crashes

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		DRY
	FIXED OBJECT		OUT OF CONTROL		40 MPH TO 49		WET
	HEAD ON		INJURY		50 MPH TO 59		ICY OR SNOWY
	REAR END		FATALITY		70 AND UP		ONLY
	RAN OFF ROAD				SPEED UNKNOWN		

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 Craven County
 City of Havelock
 AFTER Period
 12/1/07 - 9/30/11

- Countermeasures:
1. Close Speight Street Median Opening
 2. Crossover at Webb Blvd
 3. Close Sonic / BB&T Median Opening
 4. Crossover at Shepard St.
 5. Improvements for U-Turns at Nunn & McCotter



US-70
 E. Main Street
 40-MPH
 ADT (Year)
 33,000 (2009)

END STUDY
 MP 36.791

Traffic Signals
 Nunn: Sig 02-0392
 McCotter: Sig 02-0649

Crossover (Angle)
 Target Crashes

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

TRAFFIC SAFETY UNIT

Date: 3-6-2012 Prepared By: J. Schronce