

Hazard Elimination Project Evaluation

Order # 41000011039

Hazard Elimination Project W-4422

Evaluation of the Six (6) Median Crossover Removals, Left Turn Lane Installations at Two (2) Existing Crossovers, and One (1) New Crossover US 1 (Capital Blvd) in Franklin 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

11-7-2013
Date

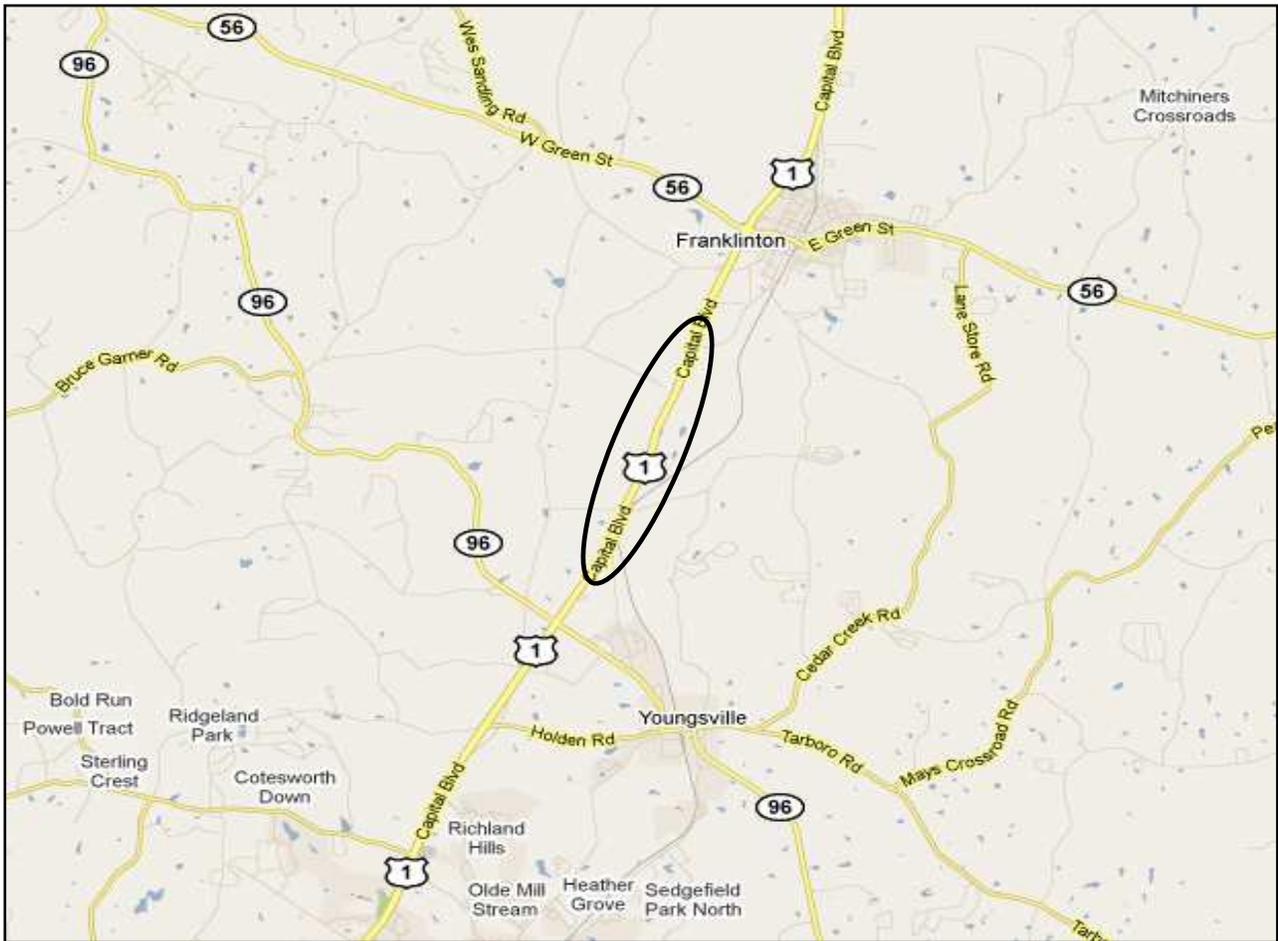
Traffic Safety Project Engineer

Hazard Elimination Project Evaluation Documentation

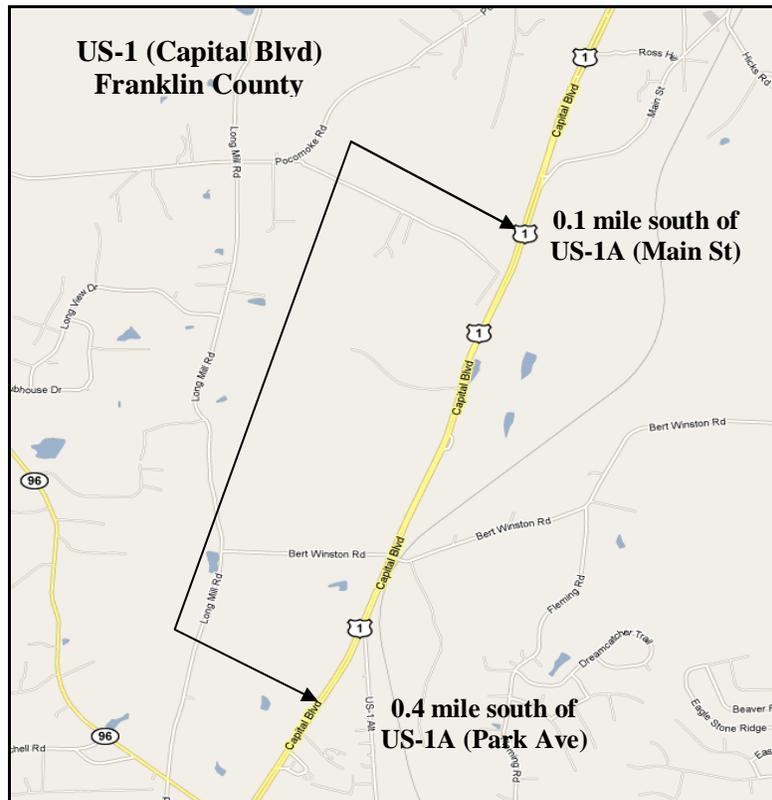
Subject Location

The treatment location includes the US-1 (Capital Blvd) segment as shown below. The study begins 0.4 mile south of US-1 Alternate (Park Avenue) near NC-96 in Youngsville and continues north on US-1 (Capital Boulevard) to 0.1 mile south of US-1 Alternate (Main Street) near NC-56 in Franklinton.

The Milepost range on US-1 is MP 2.988 to 5.376 for a total distance of 2.388 miles.



W-4422 Location Map (Google Maps)



Google Maps – Evaluation Limits

The study segment was separated into the following parts:

- A: Begin Study – MP 2.988 – 0.4 mile south of US-1A (Park Ave)
- B: MP 3.24 – Dirt Crossover – Removed in After Period (Range 3.212-3.268)
- C: MP 3.388 – US-1 at US-1A (Park Avenue) Intersection – Crossovers consolidated, left turn lanes installed (Range 3.360-3.416)
- D: MP 3.736 – US-1 at SR 1133 (Bert Winston Road) – Crossover in the before period, offset left turn lanes installed; Signal 05-2398 installed in June 2010 (Range 3.708-3.764)
- E: MP 4.14 – Paved Crossover (Marita Business) – Removed in After Period (Range 4.112-4.168)
- F: MP 4.39 – Dirt Crossover – Removed in After Period (Range 4.362-4.418)
- G: MP 4.54 – New After Crossover with Left Turn Lanes – Materials Drive (Range 4.512-4.568)
- H: MP 4.64 – Dirt Crossover – Removed in After Period (Range 4.612-4.668)
- I: MP 4.99 – Dirt Crossover – Removed in After Period (Range 4.962-5.018)
- J: MP 5.09 – Dirt Crossover – Removed in After Period (Range 5.062-5.118)
- K: End of Study – MP 5.376 – 0.1 mile south of US-1A (Main Street)



**Typical Section of Treatment Area - View near the SR 1133 Intersection looking south
Google Maps Street View – June 2011 Photo**

Project Information and Background from the Project File Folder

The original hazard elimination project called for installing left turn lanes at six (6) crossovers, consolidating the two (2) crossovers at the US-1A intersection, and removing one (1) dirt crossover. The final improvement countermeasures chosen for this subject US-1 segment was the closure of six (6) median crossovers, improvement with turn lanes at two (2) crossovers, and the installation of a new crossover at Materials Drive.

US-1 (Capital Boulevard) along this section of roadway is a rural four-lane divided facility with a posted speed limit of 55 mph and variable width grass median. This section had several dirt and paved median crossovers in the before period with limited roadway guidance.

The original statement of problem was the concern for collisions due to the lack of left turn lanes at median crossovers on this section of a four-lane divided highway. The speed differential and slowing of motorists to make the left turn can lead to rear-end and sideswipe crashes. The intended purpose of the roadway improvements were for safety and traffic flow mobility benefit.

The initial crash analysis was completed from January 1, 1995 to December 31, 1997 with sixty (60) reported crashes, sixteen (16) of which were rear-end in nature. The final completion for the improvement along the segment was during the middle of 2006 with a total cost of \$625,000.

Naive Before and After Analysis

After reviewing the hazard elimination project file folder along with all the crashes along the subject segment, the crash data omitted from this analysis to consider for an adequate construction period was the year of 2006. The before period consisted of reported crashes from July 1, 1999 through December 31, 2005 (6 years and 6 months); and the after period consisted of reported crashes from January 1, 2007 through June 30, 2013 (6 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 150 feet of the subject highway section. *Please see attached location map and photo for further details.* When examining the crashes per location, a y-line of 150 feet to the north and south on US-1 (Capital Blvd) was used.

The following data table depicts the Naive Before and After Analysis for the treatment segment. Please note that a particular crash type was not selected for a Target Crash since the improvements covered multiple locations. The data tables below separate the crash data by countermeasure, location, and contributing factors.

US-1: Franklin County, 2.388 Miles

US-1 Both Directions	Before	After	Percent Reduction (-)/ Percent Increase (+)
Total Crashes – Both Directions	146	114	- 21.9 %
Total Severity Index	6.40	4.93	- 23.0 %
Locations of Crossovers Removed (B,E,F,H,I,J)	30	16	- 46.7 %
X-Overs Removed Severity Index	16.10	4.24	- 73.7 %
Locations with After Period Crossovers (C,D,G)	33	38	15.2 %
After Period X-Over Severity Index	4.14	6.50	57.0 %
Segments in Between X-over Locations	83	60	- 27.7 %
Segments Severity Index	3.79	4.11	8.4 %
Volume (2002, 2010)	15,800	17,800	12.7 %
Total Crash Rate (100 Million Vehicle Miles)	162.86	113.02	- 30.6 %
Critical Crash Rate (100 Million Vehicle Miles)	170.19	175.68	N/A

The naive before and after analysis for US 1 Franklin County resulted in an overall 22 percent reduction in Total Crashes and an 23 percent reduction in the Total Severity Index. The locations where crossovers were removed reduced by 47 percent in crashes but there were a 15 percent increase at locations with after period crossovers.

<u>US-1 Both Directions</u>	Before	After	Percent Reduction (-)/ Percent Increase (+)
Injuries			
Fatal Injury Crashes	4	0	- 100.0 %
Class-A Injury Crashes	2	2	0.0 %
Class-B Injury Crashes	9	17	88.9 %
Class-C Injury Crashes	36	23	- 36.1 %
Property Damage Only Crashes	95	72	- 24.2 %
Contributing Factors			
Night Crashes	58	39	- 32.8 %
Animal Crashes	27	20	- 25.9 %
Wet Road Crashes	21	15	- 28.6 %
Alcohol / Drug Related	10	11	10.0 %

The following table shows the crashes per crossover location:

<u>US-1 Countermeasure Locations</u>	Before	After	Percent Reduction (-)/ Percent Increase (+)
B: MP 3.24 – Dirt X-Over Removed	1	0	- 100.0 %
C: MP 3.388 – US-1 @ US-1A Intersection	14	15	7.1 %
D: MP 3.736 – US-1 @ SR 1133 Intersection	17	16	- 5.9 %
E: MP 4.14 – Paved X-Over Removed	6	4	- 33.3 %
F: MP 4.39 – Dirt X-Over Removed	1	0	- 100.0 %
G: MP 4.54 – New X-Over (Materials Dr)	2	7	250.0 %
H: MP 4.64 – Dirt X-Over Removed	4	2	- 50.0 %
I: MP 4.99 – Dirt X-Over Removed	9	9	0.0 %
J: MP 5.09 – Dirt X-Over Removed	9	1	- 88.9 %

Results and Discussion

From the tables above, the overall segment has benefited from the after period changes with a reduction in crashes and the severity index. The crashes in the vicinity of former crossovers have reduced by 47 percent with a severity index reduction of 74 percent. Additionally, the area between crossover locations experienced a crash reduction of 28 percent. It can be concluded that the overall flow and mobility of this roadway section has been benefited by the crossover removals and improvements.

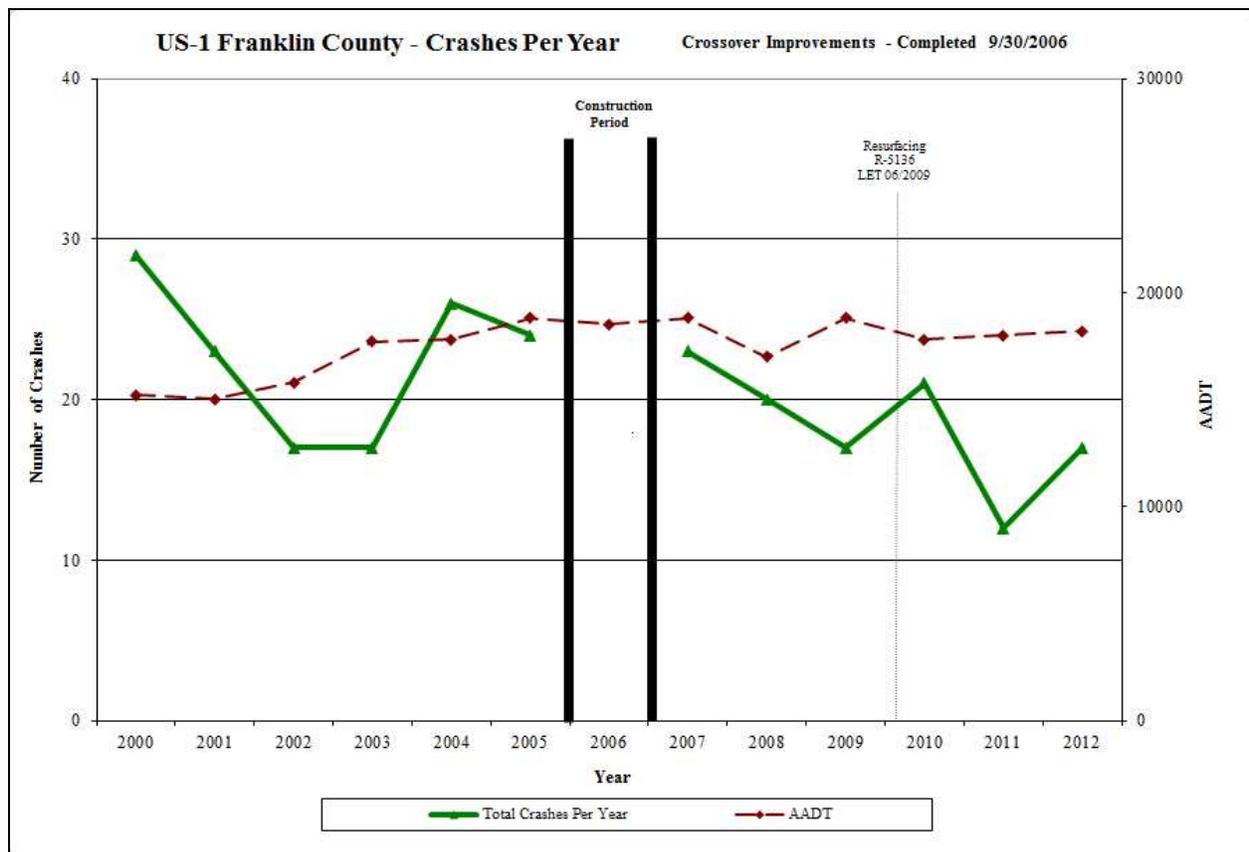
Severe injury crashes were reduced throughout the study from four (4) Fatal and two (2) A-injury collisions in the before period to two (2) A-Injury crashes in the after period. These two after period crashes are explained further below:

1. Crash 101929836 (1/24/2007), A-Injury – Angle Crash with Motorcycle – US-1 at SR 1133

2. Crash 102612437 (6/12/2009), A-Injury – Ran-Off Road and struck tree, traveling at 85-mph in a reckless manner

The Safety Evaluation Group also has provided Before-After Collision Diagrams for Section-G and Section-I. Section-G (new crossover at Materials Drive) experienced a crash increase from two (2) in the before period to seven (7) in the after period. From the diagram, the main crash type is ran-off road in the vicinity of the median opening with only one (1) frontal impact crash. Section-I was the removal of a dirt crossover at MP-4.99 in the before period. The total crashes remained the same at nine (9) in the before and after periods.

The following chart depict the number of Total Crashes per year plotted in the before and after period, along with the AADT to show the change over time. The chart also highlights an additional resurfacing project that took place on this segment in 2009.



As the Safety Evaluation Group completes additional hazard elimination 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 treatment.

W-4422
 Order# 41000011039
 Wake County
 Section-G

END MP-4.568

END MP-4.568

ADT (Year)
 16,000 (2002)

BEFORE Period
 7/1/99 - 12/31/05
 6.5 Years

AFTER Period
 1/1/07 - 6/31/13
 6.5 Years

US-1
 Capital Blvd
 55-MPH

Materials Drive
 New Crossover
 MP-4.54

US-1
 Capital Blvd
 55-MPH

ADT (Year)
 18,000 (2010)

BEGIN MP-4.512

BEGIN MP-4.512

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

TRAFFIC SAFETY UNIT

Date: 9-23-2013

Prepared By: J. Schronce

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		SHOULDER		30 MPH TO 39		DRY
	HEAD ON		FATALITY		40 MPH TO 49		WET
	REAR END		INJURY		50 MPH TO 59		ICY OR SNOWY
	RAN OFF ROAD		SPEED UNKNOWN		60 MPH TO 69		OIL

