

Spot Safety Project Evaluation

Spot Safety Project # 10-04-212

Spot Safety Project Evaluation of the Signal Installation I-85 Northbound Ramp at SR 2180 (Lane Street) Cabarrus County

Documents Prepared By:
Stantec Consulting Ltd.
for
Safety Evaluation Group
Traffic Safety Systems Management Section
Transportation Mobility and Safety Division
North Carolina Department of Transportation

Principal Investigator



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Transportation Designer

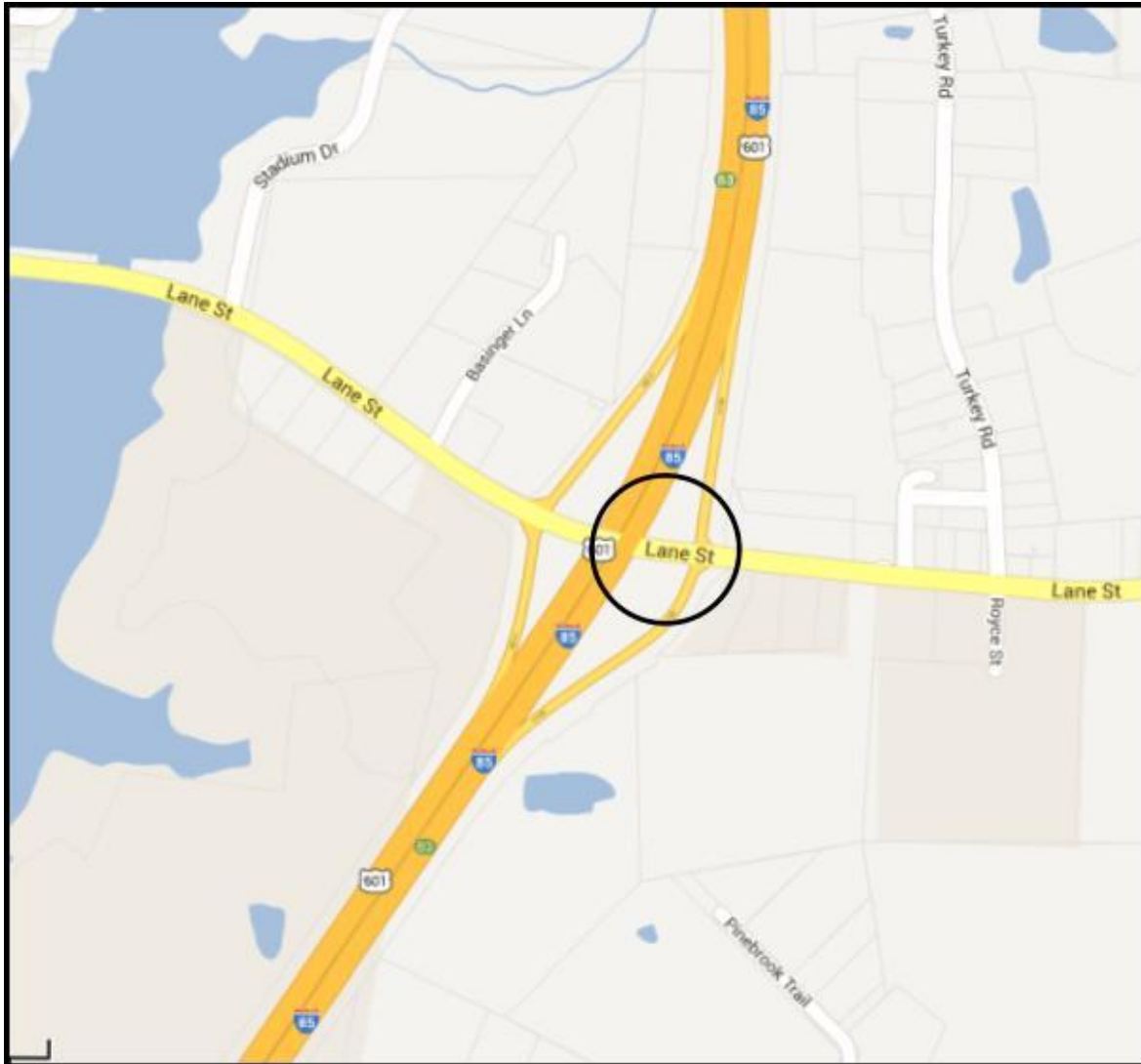
7-26-2013
Date

Spot Safety Project Evaluation Documentation

Subject Location

Evaluation of Spot Safety Project Number 10-04-212 located at the Intersection of I-85 at SR 2180 (Lane St) in Cabarrus County.

The Sig ID is 10-1992 for this 2-Phase Fully Actuated Traffic Signal.





Aerial Provided from Google Maps

Project Information and Background from the Project File Folder

The spot safety project improvement countermeasure chosen for the subject location was the installation of a signal.

I-85 is a 4-lane divided interstate. The northbound off-ramp has a channelized right turn lane and a shared through and left lane at the intersection. SR 2180 (Lane Street) is a two-lane road that widens for a left and right turn lanes at the intersection. The speed limit on SR 2180 is 35-mph. The speed limit on the I-85 off-ramp is not posted. The subject location is stop-controlled on the I-85 off-ramp.

The original statement of problem was the existence collisions due to high volumes of traffic with insufficient gaps. The initial crash analysis was completed from October 1, 1999 to September 30,

2004 with twenty-seven (27) reported crashes. The final completion date for the improvement at the subject intersection was on December 9, 2008 with a total cost of \$53,000.00.

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 August through January 2009. The before period consisted of reported crashes from April 1, 2004 through July 31, 2008 (4 years, 4 months); and the after period consisted of reported crashes from February 1, 2009 through May 31, 2013 (4 years, 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 for the I-85 NB ramps and SR 2180 approaches. *Please see attached location map and aerial map 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. Frontal Impact crashes include: Left turn, same roadway; Left turn, different roadways; Right turn, same roadway; Right turn, different roadways; Head on; and Angle.

<u>Treatment Information</u>	Before	After	Percent Reduction (-) Percent Increase (+)
Total Crashes	24	28	+ 16.7 %
Total Severity Index	4.08	6.35	+ 55.6 %
Target Crashes	7	11	+ 57.1 %
Target Crash Severity Index	6.29	11.25	+ 98.1 %
Volume (2006, 2011)	19,800	11,200	- 43.4 %

<u>Injury Crash Summary</u>	Before	After	Percent Reduction (-) Percent Increase (+)
Fatal injury Crashes	0	1	+ 100.0 %
Class A injury Crashes	0	0	N/A
Class B injury Crashes	1	4	+ 300.0 %
Class C Injury Crashes	9	6	- 33.3 %
Property Damage Only	14	17	+ 21.4 %

The naive before and after analysis at the treatment location resulted in a 16.7 percent increase in Total Crashes, a 57.1 percent increase in Target Frontal Impact Crashes, and a 55.6 percent increase in the Total Severity Index. The before period ADT year was 2006 and the after period ADT year was 2011.

To further analyze the intersection crash patterns, the following chart shows different traffic movements and the change in crash totals through the study:

<u>Additional Information</u>	Before	After	Percent Reduction (-) Percent Increase (+)
Left Turn, Different Roadway (Target)	3	3	N/A
Left Turn, Same Roadway (Target)	3	5	+ 66.7 %
Angle	1	3	+ 200.0 %
Northbound Rear End crashes	17	10	- 41.2 %
Westbound Rear End Crashes	0	5	+ 500.0 %

Results and Discussion

Referencing the *Collision Diagrams*, the target crashes experienced a 57.1 percent increase in frontal impact collisions. The target crash severity index saw an increase of 98.1 percent. Additionally, as shown in the graphs above, a fatality occurred in the after period. B injury crashes increased from one (1) to four (4) in the after period

From the additional information chart above, the number of left turn, different roadway crashes remained unchanged from the before period to the after period with three (3) crashes occurring in both periods. Of the three left turn, different roadway crashes in the after period, all three had placed fault on the through eastbound SR 2180 vehicle. The left turn, same roadway crashes increased from three (3) to five (5) through the evaluation time frame.

Along the I-85 northbound off-ramp, the rear end crashes decreased from seventeen (17) to ten (10) throughout the evaluation period. In the before period, fourteen (14) of the northbound rear ends occurred on the channelized right turns. In the same location in the after period, eight (8) rear-end crashes occurred. The rear-end crashes on SR 2180 increased from zero (0) to five (5). The five (5) rear ends in the after period on SR 2180 were located on the westbound leg.

For reference, the south bound ramps of I-85 at SR 2180 (Lane St) were studied during the same time periods. These ramps are stop-controlled.

<u>Reference (Southbound Ramps) Information</u>	Before	After	Percent Reduction (-) Percent Increase (+)
Total Crashes	42	34	- 19.0 %
Total Severity Index	3.64	3.61	- 0.8 %
Fatal injury Crashes	0	0	N/A
Class A injury Crashes	0	0	N/A
Class B injury Crashes	3	1	- 66.7 %
Class C Injury Crashes	12	11	- 8.33 %
Property Damage Only	27	22	- 18.5 %

Using the same before and after time periods set for the northbound ramps, the southbound ramps saw a decrease in total crashes. Additionally, injury crashes also decreased. However, both time periods have higher totals of crashes than the northbound ramps.

<u>Additional (Southbound Ramps) Information</u>	Before	After	Percent Reduction (-) Percent Increase (+)
Left Turn, Different Roadway	4	5	+ 25.0 %
Left Turn, Same Roadway	9	8	- 11.1 %
Angle	3	0	- 300.0 %
Southbound Rear End crashes	21	15	- 28.6 %

In comparison, the south bound ramps show high totals of left turn, different roadway and left turn, same roadway crashes. Rear end crashes on the off-ramp were also higher at the southbound ramps than the northbound ramps. However, angle, and left turn, same roadway crashes saw decreases from the set before to the after period.

Please see the attached *Treatment Site Photos*. Photos are provided from Google Street View 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 from Google Street View



Google Maps (July 2012) – Looking South from I-85 On-Ramp Approach



Google Maps (July 2012) – Looking North from I-85 Off-Ramp Approach



Google Maps (July 2012) – Looking West from SR 2180 Approach



Google Maps (July 2012) – Looking East from SR 2180 Approach

SS# 10-04-212
 Cabarrus County
 Before Period
 4/1/04 - 7/31/08

LEGEND			
	MOVING VEHICLE		ANGLE
	PARKED VEHICLE		TURNING
	PARKING VEHICLE		BACKING
	MOVABLE OBJECT		SIDESWIPE
	HEAD ON		INJURY
	REAR END		FATALITY
	RAN OFF ROAD		9 MPH OR LESS
	DAYLIGHT CRASH		10 MPH TO 19
	NIGHT CRASH		20 MPH TO 29
			30 MPH TO 39
			40 MPH TO 49
			50 MPH TO 59
			60 MPH TO 69
			70 AND UP
			SPEED UNKNOWN
			A ANIMAL
			P PEDESTRIAN
			B BICYCLE
			T TRAIN
			* DRIVER AT FAULT
			D DRY
			W WET
			I ICY OR SNOWY
			O Other

SR 2180 (Lane Street)
 ADT (Year)
 10,000 (2006)

ADT (Year)
 3,910 (2006)

ADT (Year)
 17,000 (2006)

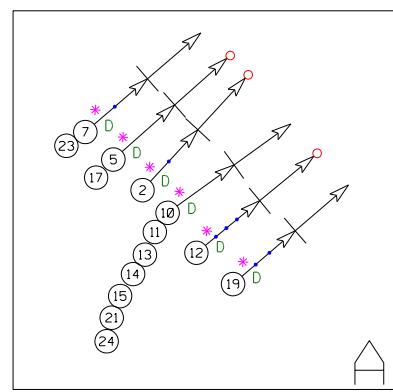
35 MPH

35 MPH

SR 2180 (Lane Street)

I-85 (Exit 63)
 NB Off Ramp
 ADT (Year)
 8,670 (2006)

Speed Unposted
 (Design Speed 25 MPH)



Target Crashes



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

Date: 7/22/2013

Prepared By: ESS



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SS# 10-04-212
 Cabarrus County
 After Period
 2/1/09 - 5/31/13

LEGEND							
	MOVING VEHICLE		ANGLE		9 MPH OR LESS	A	ANIMAL
	PARKED VEHICLE		TURNING		10 MPH TO 19	P	PEDESTRIAN
	PARKING VEHICLE		BACKING		20 MPH TO 29	B	BICYCLE
	MOVABLE OBJECT		SIDESWIPE		30 MPH TO 39	T	TRAIN
	HEAD ON		INJURY		40 MPH TO 49	*	DRIVER AT FAULT
	REAR END		FATALITY		50 MPH TO 59	D	DRY
	RAN OFF ROAD				60 MPH TO 69	W	WET
	DAYLIGHT CRASH				70 AND UP	I	ICY OR SNOWY
	NIGHT CRASH				SPEED UNKNOWN	O	Other

SR 2180 (Lane Street)

I-85 (Exit 63)
 NB On Ramp

ADT (Year)
 2,300 (2010)

35 MPH

ADT (Year)
 6,500 (2010)

ADT (Year)
 8,500 (2010)

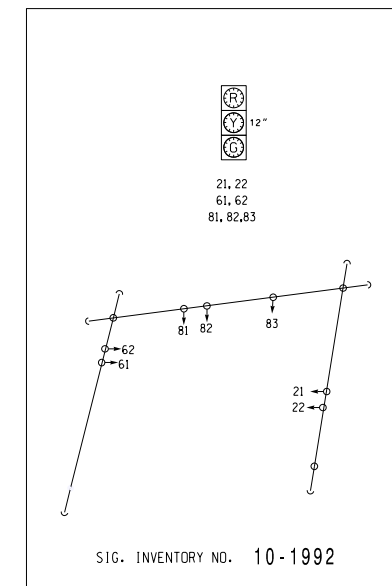
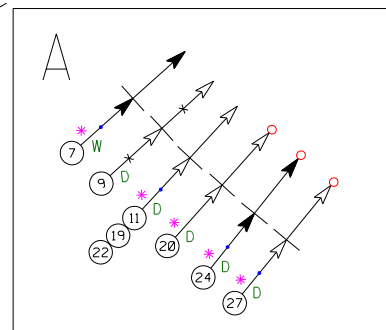
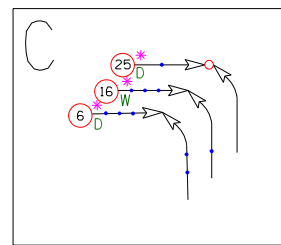
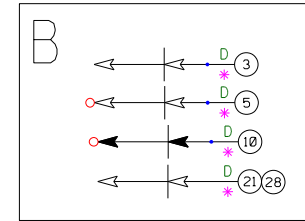
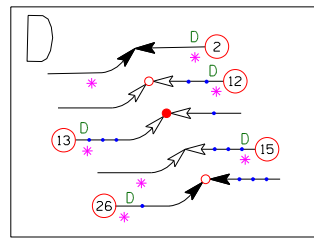
35 MPH

SR 2180 (Lane Street)

I-85 (Exit 63)
 NB Off Ramp

ADT (Year)
 5,100 (2010)

Speed Unposted
 Design Speed 25 MPH



Target Crashes

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

Date: 7/22/2013

Prepared By: KRG



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SS# 10-04-212
 Cabarrus County
 Before Period (SB Ramps)
 4/1/04 - 7/31/08

ADT (Year)
 10,000 (2006)

35 MPH

Speed Unposted
 (Design Speed 25 MPH)

I-85 (Exit 63)
 SB Off Ramp
 ADT (Year)
 2,530 (2006)

SR 2180 (Lane Street)

ADT (Year)
 17,000 (2006)

SR 2180 (Lane Street)

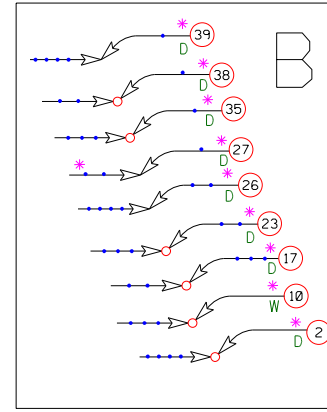
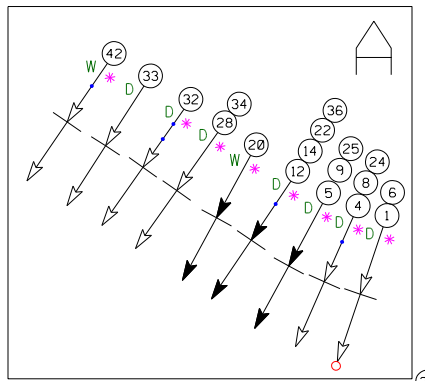
35 MPH

ADT (Year)
 5,980 (2006)

I-85 (Exit 63)
 SB On Ramp

LEGEND

	MOVING VEHICLE		ANGLE		9 MPH OR LESS		A ANIMAL
	PARKED VEHICLE		10 MPH TO 19		P PEDESTRIAN		B BICYCLE
	PARKING VEHICLE		20 MPH TO 29		T TRAIN		* DRIVER AT FAULT
	MOVABLE OBJECT		30 MPH TO 39		D DRY		W WET
	HEAD ON		40 MPH TO 49		I ICY OR SNOWY		O Other
	REAR END		50 MPH TO 59		INJURY		FATALITY
	RAN OFF ROAD		60 MPH TO 69		SPEED UNKNOWN		
	DAYLIGHT CRASH		70 AND UP				
	NIGHT CRASH						



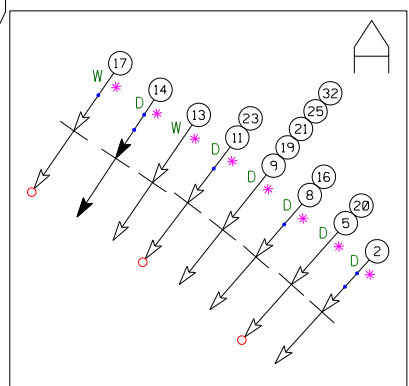
Target Crashes

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

Date: 8/09/2013
 Prepared By: KRG

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SS# 10-04-212
 Cabarrus County
 After Period (SB Ramps)
 2/1/09 - 5/31/13

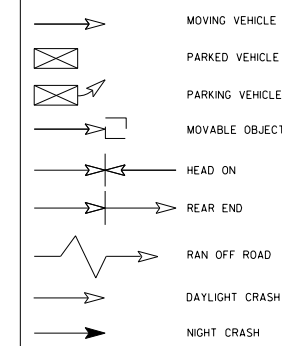


ADT (Year)
 8,500 (2011)

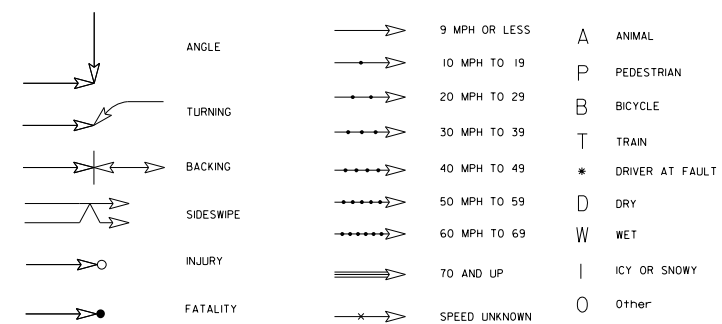
35 MPH

Speed Unposted
 (Design Speed 25 MPH)

ADT (Year) I-85 (Exit 63)
 2,200 (2011) SB Off Ramp



LEGEND



SR 2180 (Lane Street)

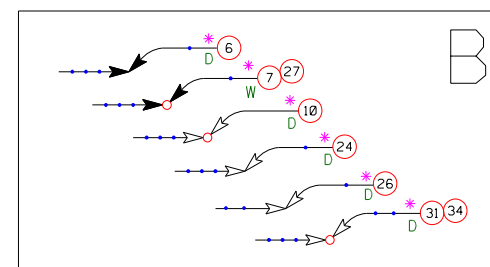
ADT (Year)
 6,500 (2011)

SR 2180 (Lane Street)

35 MPH

ADT (Year)
 5,200 (2011)

I-85 (Exit 63)
 SB On Ramp



ROLLOVER

⊕ Target Crashes

N.C. DEPARTMENT of TRANSPORTATION
 DIVISION of HIGHWAYS
 TRANSPORTATION MOBILITY and
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Date: 8/09/2013

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