

Spot Safety Project Evaluation

Project Log # 200901034

Spot Safety Project # 09-02-205

**Spot Safety Project Evaluation of the Ramp Right Turn Lane Installation
I-85 Business / US 29-52-70 and SR 1147 (Old Salisbury Road)
Davidson County, City of Lexington**

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

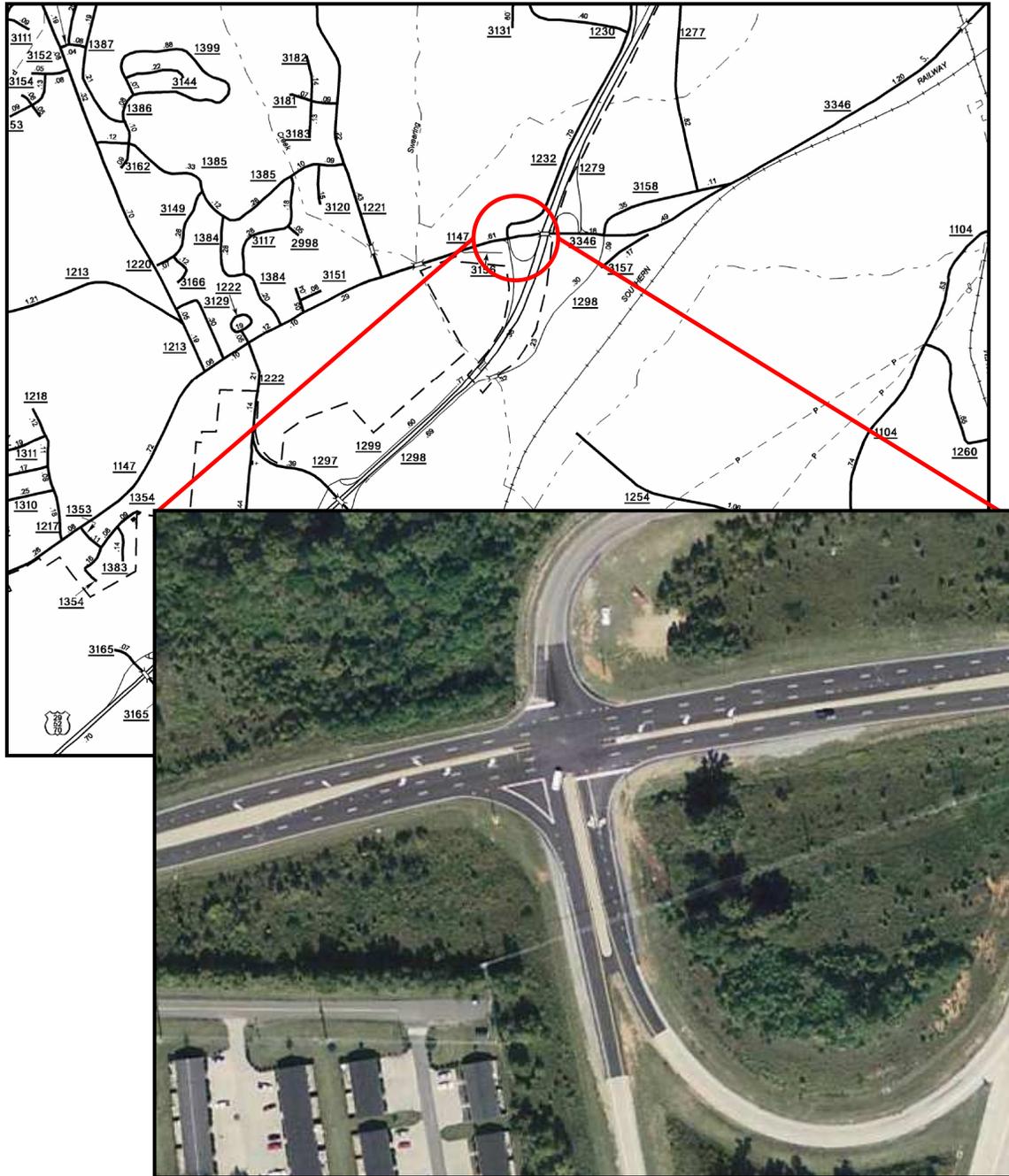
6-2-2009
Date

Traffic Safety Project Engineer

Spot Safety Project Evaluation Documentation

Subject Location

Evaluation of Spot Safety Project Number 09-02-205 located at the Intersection of I-85 Business / US 29-52-70 (Exit 86) Southbound Ramps and SR 1147 (Old Salisbury Road) / SR 1232 (Odell Owen Road) in Davidson County, City of Lexington.



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 I-85 Business / US 29-52-70 southbound off-ramp right turn lane. SR 1147 is a five-lane facility at the subject location with dedicated left turn lanes on both approaches. SR 1232 and the Southbound Ramp Terminal are both two-lane facilities with single lane approaches in the before period. The posted speed limit is 45 mph on all approaches. The subject location is a four-leg crossroads type intersection, which was controlled by stop signs through this evaluation on the SR 1232 (Odell Owen Road) and Southbound Ramp Terminal approaches. This intersection was also upgraded to full signal control (Sig ID 09-1315) in June 2007 under Spot Safety Project 09-05-208.

The original statement of problem was the concern for congestion and maintenance issues related to a significant volume of right turning motorists on the off-ramp who were using the dirt shoulder to drive around other vehicles waiting to go straight through or turn left at the intersection. The intended purpose of this project was to alleviate congestion.

The initial crash analysis was completed from May 1, 1999 to May 1, 2002 with five (5) reported crashes, none of which were deemed correctable. The final completion date for the improvement at the subject intersection was on December 30, 2003 with a total cost of \$70,000.00.

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 was the months of November through December 2003. The before period consisted of reported crashes from June 1, 2000 through October 31, 2003 (3 years and 5 months); and the after period consisted of reported crashes from January 1, 2004 through May 31, 2007 (3 years and 5 months). The ending date for this analysis was limited by the installation of the traffic signal at this location under Spot Safety Project 09-05-208.

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 US 29/52 Off-Ramp Rear-End Crashes were the target crashes for the applied countermeasure. The Target Crash types considered are as follows: Rear-End, Turn; and Rear-End, Slow or Stop.

<u>Treatment Information</u>	Before	After	Percent Reduction (-) Percent Increase (+)
Total crashes	20	19	- 5.0 %
Total Severity Index	3.59	10.05	150+ %
Target Crashes	4	4	0.0 %
Target Crash Severity Index	2.85	6.55	129.8 %
Volume	18,200	17,100	- 6.0 %

<u>Injury Crash Summary</u>	Before	After	Percent Reduction (-) Percent Increase (+)
Fatal injury Crashes	0	0	N/A
Class A injury Crashes	0	1	100.0 %
Class B injury Crashes	2	4	100.0 %
Class C Injury Crashes	5	9	80.0 %
Total Injury Crashes	7	14	100.0 %

The naive before and after analysis at the treatment location resulted in a 5 percent decrease in Total Crashes, no change in the number of Target Crashes, and over 150 percent increase in the Total Severity Index. The before period ADT year was 2002 and the after period ADT year was 2005.

Results and Discussion

The naive before and after analysis involving the comparison of treatment actual before data versus treatment actual after data resulted in a 5 percent decrease in Total Crashes and no change in Target Crashes. The summary results above demonstrate that neither the Total Crashes nor Target Crashes appear to have increased at the treatment location from the before to the after period.

The calculated benefit to cost ratio for this project is **(-15.57) considering total crashes**. The benefit to cost ratio **considering only target crashes is (-0.76)**. 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.

Referencing the *Collision Diagrams*, the southbound off-ramp rear-end crash pattern is nearly identical from the before to the after periods. As stated in the *Project Background* section, this project was implemented more to alleviate congestion and correct the roadway shoulder maintenance issues than for any particular safety benefits.

The intersection also did experience consistent angle and left turn type collisions during this analysis. However, these crashes should be reduced or corrected by the installation of the traffic signal; which the Safety Evaluation Group will conduct a full evaluation once three years of after period data is available. The negative benefit-cost ratio described above results from the presence of an A-injury angle collision in the after period.

Please see the attached *Treatment Site Photos*. Photos are provided for all four 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



Looking East on SR 1147 (Old Salisbury Road)



Looking North on I-85 Business / US 29-52-70 Southbound Off-Ramp
Project Countermeasure: Installation of Right Turn Lane



Looking West on SR 1147 (Old Salisbury Road)



Looking South on SR 1232 (Odell Owen Road)

BENEFIT-COST ANALYSIS WORKSHEET - Total Crashes

LOCATION: US-52 SB Off-Ramp at SR 1147		BY: JBS							
COUNTY: Davidson		DATE: 6/2/2009							
FILE NO.: SS 09-02-205		NOTES: Total Crashes							
DETAILED COST:	TYPE IMPROVEMENT - Right Turn Lane								
	ITEMS	TOTAL	SERVICE	CRF	ANNUAL COST				
	Construction	\$70,000	10	0.149	\$10,432				
	Right-of-Way	\$0	0	0.000	\$0				
	TOTALS	\$70,000	10	0.149	\$10,432				
ESTIMATED INCREASE IN ANNUAL MAINT. COST =					\$400				
ESTIMATED INCREASE IN ANNUAL UTILITY COST =					\$0				
TOTAL ANNUAL COST=					\$10,832				
TOTAL COST OF PROJECT=					\$70,000				
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	3.42	0	0.00	7	2.05	13	3.80	\$51,667	
AFTER	3.42	1	0.29	13	3.80	5	1.46	\$220,322	
Annual Benefits from Crash Cost Savings								(\$168,655)	
NET AVG. ANNUAL BENEFITS = AVG. ANNUAL BENEFITS - TOTAL ANNUAL COST					=	(\$179,487)			
BENEFIT-COST RATIO = AVG ANNUAL BENEFITS/TOTAL ANNUAL COST					=	-15.57			
TOTAL COST OF PROJECT		-	\$70,000	COMPREHENSIVE B/C RATIO		-	-15.57		

BENEFIT-COST ANALYSIS WORKSHEET - Target Crashes

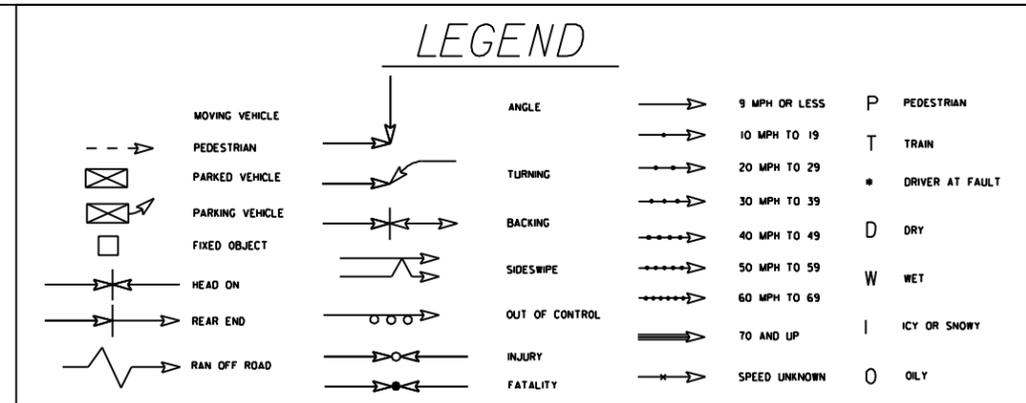
LOCATION: US-52 SB Off-Ramp at SR 1147		BY: JBS							
COUNTY: Davidson		DATE: 6/2/2009							
FILE NO.: SS 09-02-205		NOTES: Target Crashes - Ramp Rear-End							
DETAILED COST:	TYPE IMPROVEMENT - Off-Ramp Right Turn Lane								
	ITEMS	TOTAL	SERVICE	CRF	ANNUAL COST				
	Construction	\$70,000	10	0.149	\$10,432				
	Right-of-Way	\$0	0	0.000	\$0				
	TOTALS	\$70,000	10	0.149	\$10,432				
ESTIMATED INCREASE IN ANNUAL MAINT. COST =					\$400				
ESTIMATED INCREASE IN ANNUAL UTILITY COST =					\$0				
TOTAL ANNUAL COST=					\$10,832				
TOTAL COST OF PROJECT=					\$70,000				
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	3.42	0	0.00	1	0.29	3	0.88	\$8,684	
AFTER	3.42	0	0.00	3	0.88	1	0.29	\$16,930	
Annual Benefits from Crash Cost Savings								(\$8,246)	
NET AVG. ANNUAL BENEFITS = AVG. ANNUAL BENEFITS - TOTAL ANNUAL COST					=	(\$19,078)			
BENEFIT-COST RATIO = AVG ANNUAL BENEFITS/TOTAL ANNUAL COST					=	-0.76			
TOTAL COST OF PROJECT		-	\$70,000	COMPREHENSIVE B/C RATIO		-	-0.76		



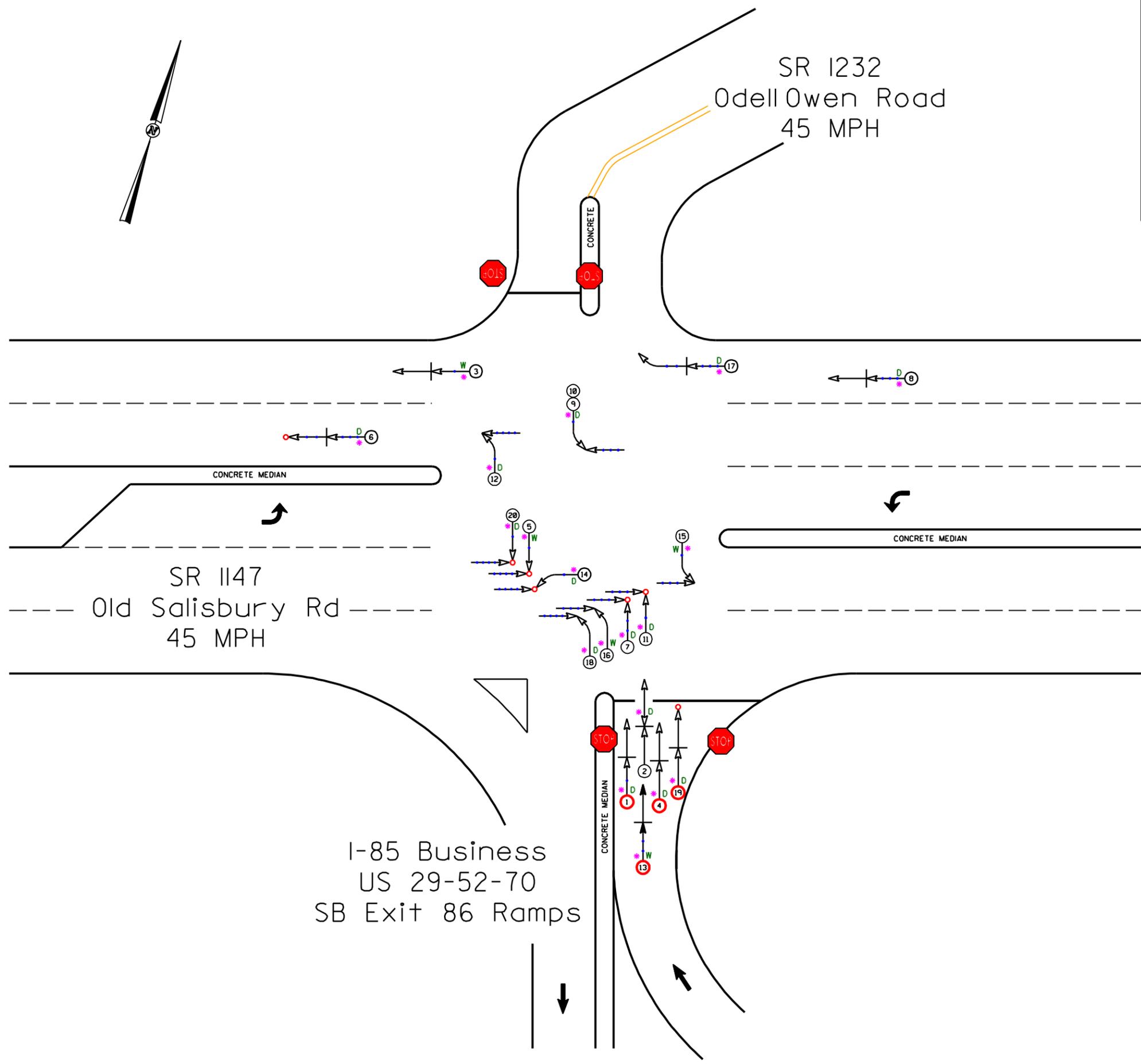
SR 1232
Odell Owen Road
45 MPH

SR 1147
Old Salisbury Rd
45 MPH

I-85 Business
US 29-52-70
SB Exit 86 Ramps



SS# 09-02-205
Davidson County
City of Lexington
BEFORE Period
6/1/00 - 10/31/03



Off-Ramp Rear-End
Target Crashes

TRAFFIC SAFETY SYSTEMS MANAGEMENT UNIT

	COLLISION DIAGRAM	
	DIVISION: 9	AREA:
STUDY PERIOD: 6/1/2000 TO 10/31/2003		
DISTANCE: Y-LINE = 150FT		
ANALYSIS PREPARED BY: JBS		
ANALYSIS CHECKED BY: BR		
DIAGRAM PREPARED BY: JBS		
DIAGRAM REVIEWED BY: ST		
SCALE: NOT TO SCALE		
DATE: 6-1-2009		
LOG NUMBER: SS* 09-02-205 BEFORE		

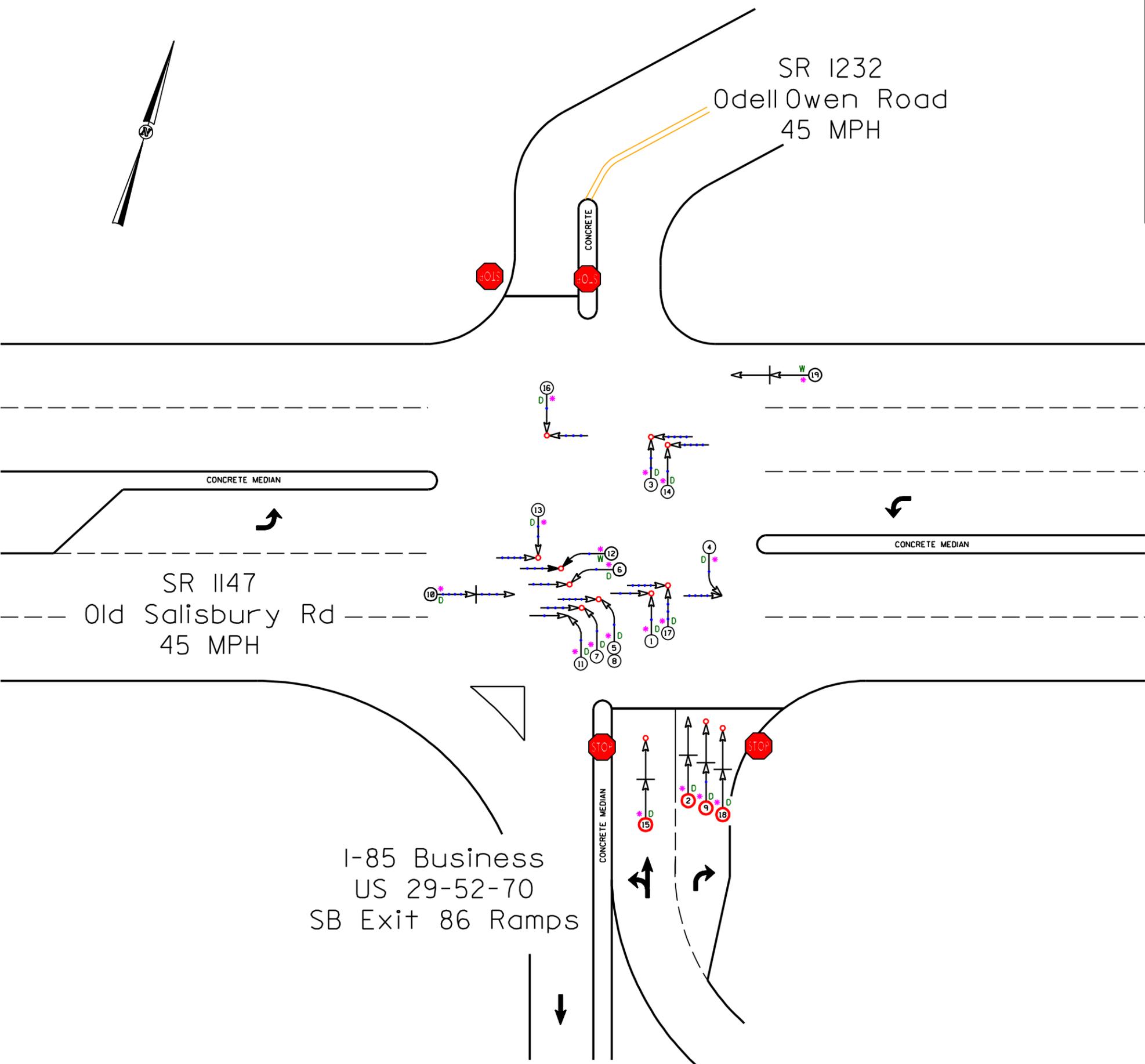
N.C. DEPARTMENT of TRANSPORTATION
 DIVISION of HIGHWAYS
 TRANSPORTATION MOBILITY and
 SAFETY DIVISION



SR 1232
Odell Owen Road
45 MPH

SR 1147
Old Salisbury Rd
45 MPH

I-85 Business
US 29-52-70
SB Exit 86 Ramps



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	60 MPH TO 69	OILY
RAN OFF ROAD		70 AND UP	
		SPEED UNKNOWN	

SS# 09-02-205
Davidson County
City of Lexington
AFTER Period
1/1/04 - 5/31/07

Off-Ramp Rear-End
Target Crashes

TRAFFIC SAFETY SYSTEMS MANAGEMENT UNIT

	COLLISION DIAGRAM	
	DIVISION: 9	AREA:
	STUDY PERIOD: 1/1/2004 - 5/31/2007	
	DISTANCE: Y-LINE : 150FT	
ANALYSIS PREPARED BY: JBS		
ANALYSIS CHECKED BY: BR		
DIAGRAM PREPARED BY: JBS		
DIAGRAM REVIEWED BY: ST		
SCALE: NOT TO SCALE		
DATE: 6-1-2009		
LOG NUMBER: SS* 09-02-205 AFTER		

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