Spot Safety Project Evaluation

Project Log # 200512149

Spot Safety Project # 05-99-203

Spot Safety Project Evaluation of the Traffic Signal Installation and Construction of Left Turn Lanes At the Intersection of NC 98 (Durham Rd) and SR 1831 (Old Creedmoor Rd) Wake County

Documents Prepared By:

Safety Evaluation Group
Traffic Safety Systems Management Section
Traffic Engineering and Safety Systems Branch
North Carolina Department of Transportation

Principal Investigator

_____ 2/5/2007

Brad Robinson, EI Date

Traffic Safety Project Engineer

Spot Safety Project Evaluation Documentation

Subject Location

Evaluation of Spot Safety Project Number 05-99-203 – The Intersection of NC 98 (Durham Rd) and SR 1831 (Old Creedmoor Rd) in Wake County.

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 traffic signal and the construction of left turn lanes on NC 98 (Durham Rd). After reviewing crash reports, it appears that left turn lanes were also constructed on SR 1831 (Old Creedmoor Rd) and a right turn lane was constructed on northbound SR 1831 at the same time.

In the before period, SR 1831 was a 2-lane roadway with median islands on both approaches and dual indicated stop signs. Both approaches of NC 98 had a through lane and a right turn lane. The speed limit for the southern leg of SR 1831 was 45 mph, while the other three approaches all had speed limits of 55 mph. In the after period the speed limit on the northern leg of SR 1831 was reduced to 45 mph. The subject intersection is a 4-leg intersection which was controlled by stop signs on SR 1831(Old Creedmoor Rd) in the before period.

The original statement of problem was that left turning vehicles on NC 98 were stopped in the through lanes and were being rear-ended. Also, the vehicles might have felt pressure to negotiate left turns without an appropriate gap in oncoming traffic. The signal was requested by the owner of a supply company located on the corner of the intersection.

The initial crash analysis was completed from September 1, 1995 to August 31, 1998 with 12 reported crashes, including 9 that were considered correctable by the chosen countermeasures. The final completion date for the improvement at the subject intersection was on July 6, 2000 with a total cost of $156,000.00. The owner of the supply company provided $25,000 toward the funding of the traffic signal.

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 from June 1, 2000 to August 31, 2000. The before period consisted of reported crashes from September 1, 1994 through May 31, 2000 (5 years and 9 months) and the after period consisted of reported crashes from September 1, 2000 through May 31, 2006 (5 years and 9 months). The ending date for this analysis was determined by the available crash data at the time the analysis was completed.

The treatment data consisted of all crashes extending 150 feet beyond the turn lane and taper on each approach to the subject intersection. This measures 300 feet for both legs of SR 1831, 800 feet on the west leg of NC 98, and 850 feet on the east leg of NC 98.

The following data table depicts the Naive Before and After Analysis for the treatment location. Please note that target crashes are divided into two types of crashes. Rear-End Crashes approaching the intersection are considered the first type of target crash. Frontal Impact Crashes that occurred in the intersection are the second 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	36	8	-77.8
Total Severity Index	8.29	3.77	-54.5
Target Crashes I (Rear-Ends)	18	5	-72.2
Target Crash I Severity Index	3.47	2.48	-28.5
Target Crash II (Frontal Impacts)	10	2*	-80.0
Target Crash II Severity Index	13.02	8.4	-35.5
Volume	14,600	13,200	-9.6
Crash Severity Summary			
Fatal Crashes	0	0	N/A
Class A Crashes	2	0	-100.0
Class B Crashes	2	1	-50.0
Class C Crashes	13	2	-84.6
PDO Crashes	19	5	-73.7

*A truck jackknifed at the intersection trying to avoid a frontal impact collision. This was included in Target Crashes.

The naive before and after analysis at the treatment location resulted in a 78 percent decrease in Total Crashes, a 72 percent decrease in Rear-End Crashes, and an 80 percent decrease in Frontal Impact Crashes. There was also a 55 percent decrease in the Total Severity Index and a 10 percent decrease in Average Daily Traffic (ADT). The before period ADT year was 1997 and the after period ADT year was 2003.

Results and Discussion

The naive before and after analysis involving the comparison of treatment actual before data versus treatment actual after data resulted in an 78 percent decrease in Total Crashes, a 72 percent decrease in Rear-End Crashes, and an 80 percent decrease in Frontal Impact Crashes. The Total Severity Index decreased by 55 percent, the Rear-End Crash Severity Index decreased by 29 percent, and the Frontal Impact Crash Severity Index decreased by 36 percent. The summary results above demonstrate that Total Crashes and both types of Target Crashes appear to have decreased at the treatment location from the before to the after period.

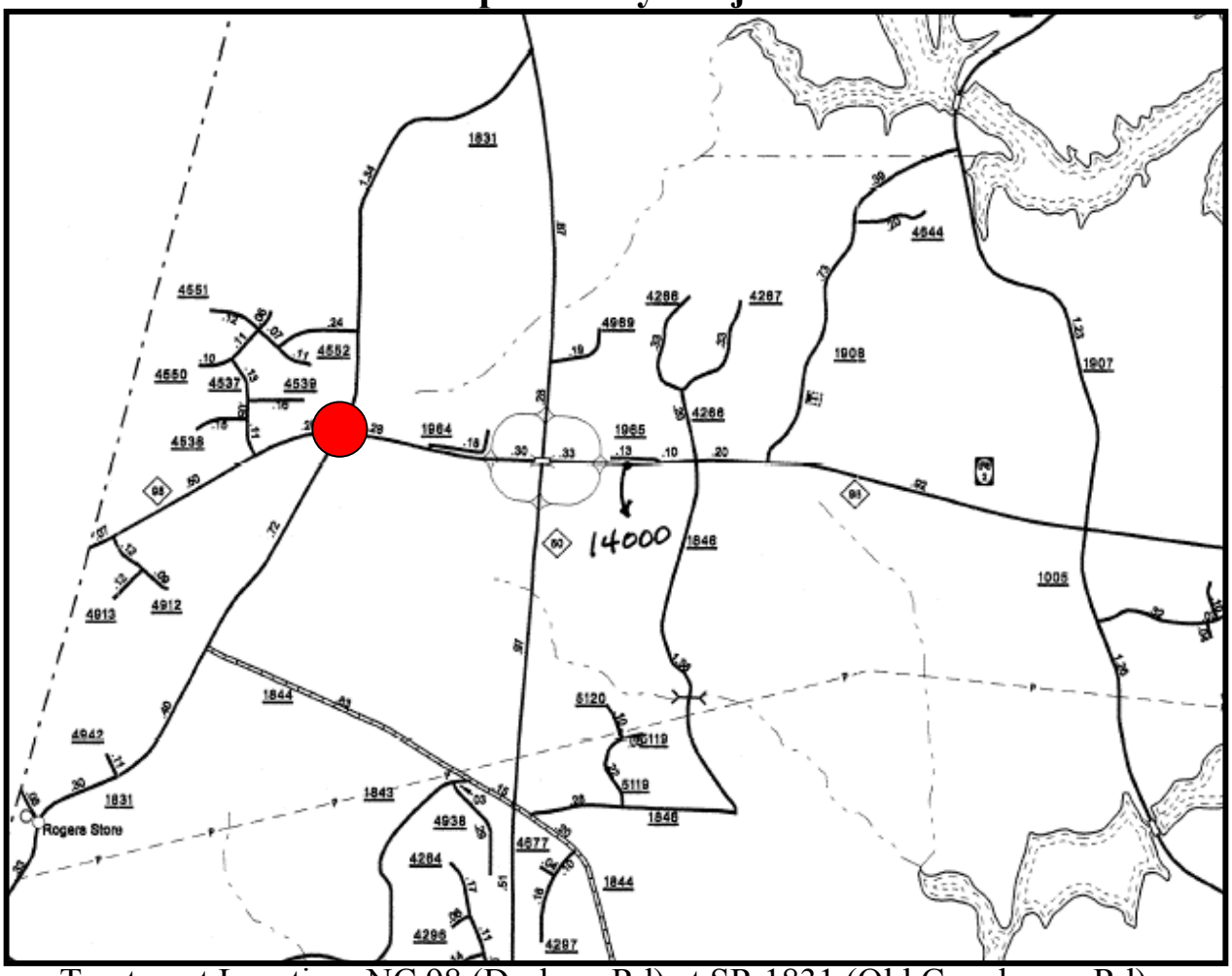
Referencing the *Collision Diagrams*, in the before period there was a large pattern of Rear-End Crashes for vehicles approaching the intersection from both westbound NC 98 and northbound SR 1831. Both of these patterns have disappeared in the after period, with no westbound Rear-Ends and only a single northbound Rear-End Crash in the study limits. The installation of turn lanes has provided vehicles with a refuge to wait in while vehicles traveling straight can continue uninterrupted.

Again referencing the *Collision Diagrams* and the previous table, the Frontal Impact Crashes have been almost eliminated in the after period. There was a single Left Turn, Same Roadway Crash on NC 98 in the after period and one crash involving a truck jackknifing in the intersection that was added to the Frontal Impact Crashes. The truck was traveling eastbound on NC 98 when the driver slammed on the breaks in an attempt to avoid a left turning driver from southbound SR 1831.

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

Location Map
Wake County
Evaluation of Spot Safety Project #05-99-203



Treatment Location: NC 98 (Durham Rd) at SR 1831 (Old Creedmoor Rd)

Site Photos Taken October 11, 2006

Looking EB on NC 98 (Durham Rd)

Looking EB on NC 98 (Durham Rd)

Looking WB on NC 98 (Durham Rd)

Looking WB on NC 98 (Durham Rd)

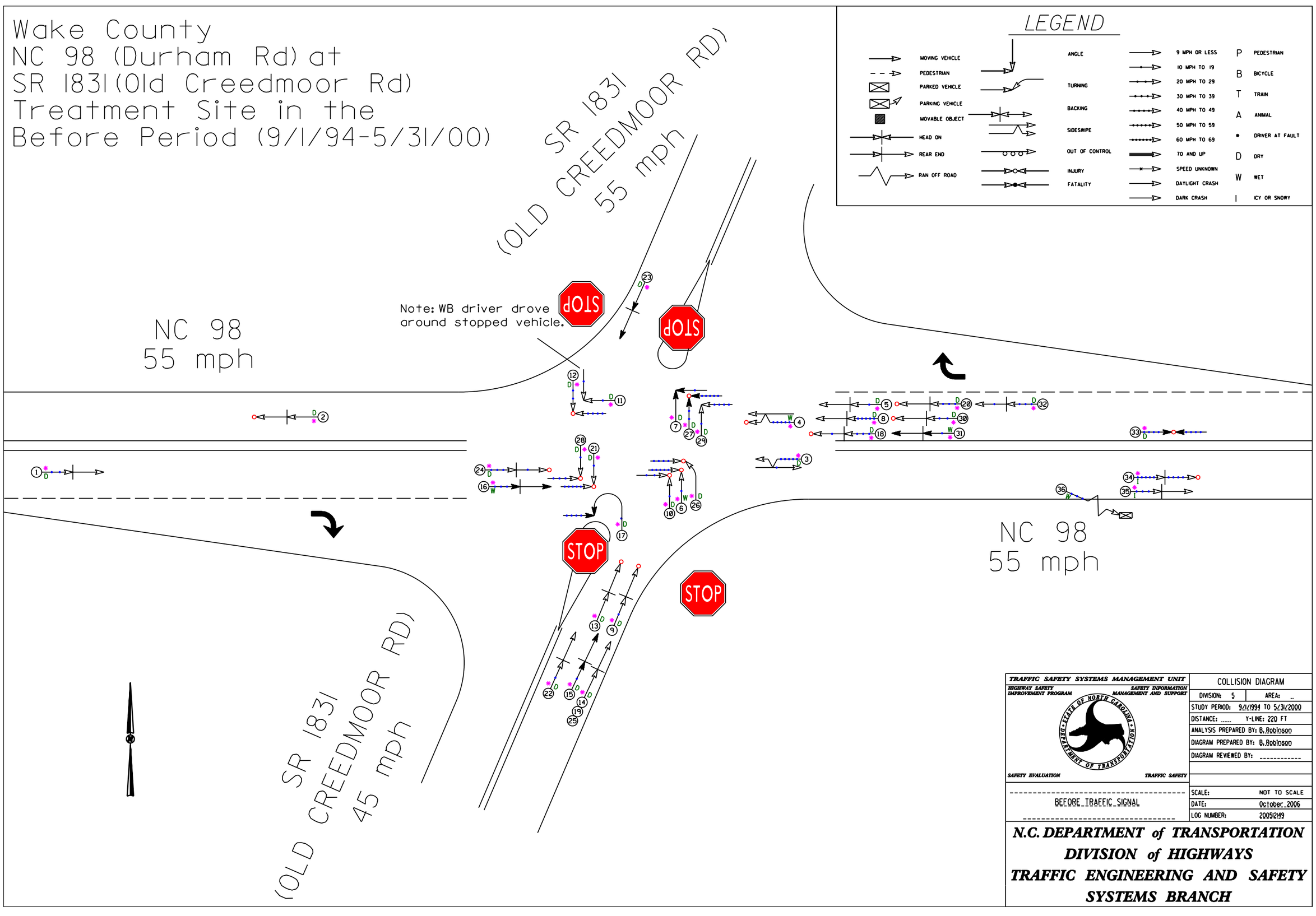
Looking NB on SR 1831 (Old Creedmoor Rd)

Looking NB on SR 1831 (Old Creedmoor Rd)

Looking SB on SR 1831 (Old Creedmoor Rd)

Looking SB on SR 1831 (Old Creedmoor Rd)

Wake County
NC 98 (Durham Rd) at
SR 1831 (Old Creedmoor Rd)
Treatment Site in the
Before Period (9/1/94-5/31/00)



TRAFFIC SAFETY SYSTEMS MANAGEMENT UNIT	COLLISION DIAGRAM
HIGHWAY SAFETY IMPROVEMENT PROGRAM / SAFETY INFORMATION MANAGEMENT AND SUPPORT	DIVISION: 5 AREA: ..
	STUDY PERIOD: 9/1/1994 TO 5/31/2000
	DISTANCE: ..... Y-LINE: 220 FT
	ANALYSIS PREPARED BY: B.Robbiosgo
	DIAGRAM PREPARED BY: B.Robbiosgo
	DIAGRAM REVIEWED BY: ----------
SAFETY EVALUATION / TRAFFIC SAFETY	
BEFORE TRAFFIC SIGNAL	SCALE: NOT TO SCALE
	DATE: October 2006
	LOG NUMBER: 20051249

N.C. DEPARTMENT of TRANSPORTATION
DIVISION of HIGHWAYS
TRAFFIC ENGINEERING AND SAFETY SYSTEMS BRANCH

Wake County
NC 98 (Durham Rd) at
SR 1831(Old Creedmoor Rd)
Treatment Site in the
After Period (9/1/00-5/31/06)

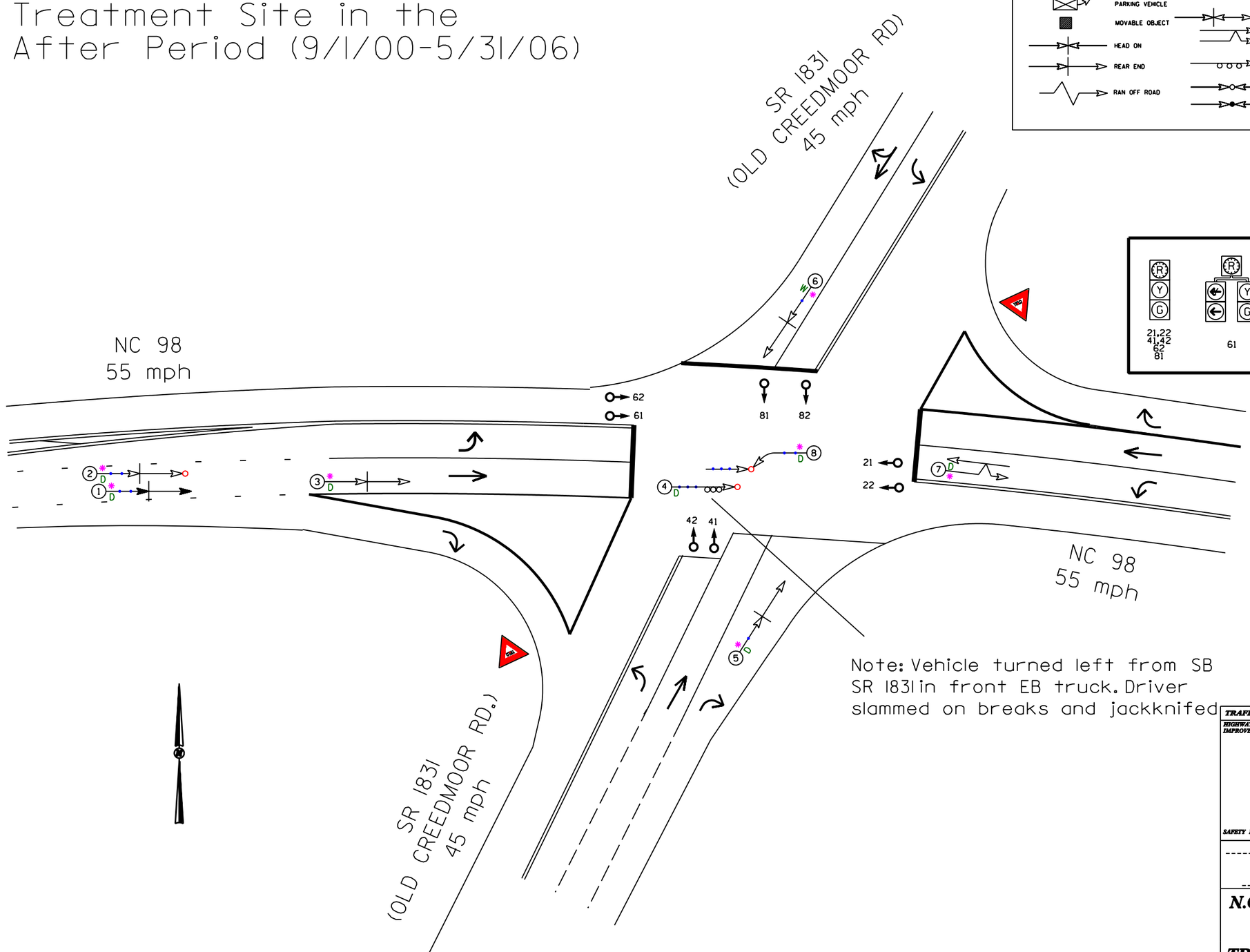
LEGEND

MOVING VEHICLE
PEDESTRIAN
PARKED VEHICLE
PARKING VEHICLE
MOVABLE OBJECT
HEAD ON
REAR END
RAN OFF ROAD

ANGLE
TURNING
BACKING
SIDESWIPE
OUT OF CONTROL
INJURY
FATALITY

9 MPH OR LESS
10 MPH TO 19
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
DAYLIGHT CRASH
DARK CRASH

P PEDESTRIAN
B BICYCLE
T TRAIN
A ANIMAL
* DRIVER AT FAULT
D DRY
W WET
I ICY OR SNOWY



Note: Vehicle turned left from SB SR 1831 in front EB truck. Driver slammed on breaks and jackknifed

TRAFFIC SAFETY SYSTEMS MANAGEMENT UNIT
HIGHWAY SAFETY IMPROVEMENT PROGRAM
SAFETY INFORMATION MANAGEMENT AND SUPPORT
SAFETY EVALUATION
TRAFFIC SAFETY

AFTER TRAFFIC SIGNAL

COLLISION DIAGRAM

DIVISION: 5	AREA: ..
STUDY PERIOD: 9/1/2000 TO 5/31/2006	
DISTANCE:	Y-LINE: 220 FT
ANALYSIS PREPARED BY: B.Robinson	
DIAGRAM PREPARED BY: B.Robinson	
DIAGRAM REVIEWED BY: ----------	
SCALE:	NOT TO SCALE
DATE:	October 2006
LOG NUMBER:	20051219

N.C. DEPARTMENT of TRANSPORTATION
DIVISION of HIGHWAYS
TRAFFIC ENGINEERING AND SAFETY SYSTEMS BRANCH