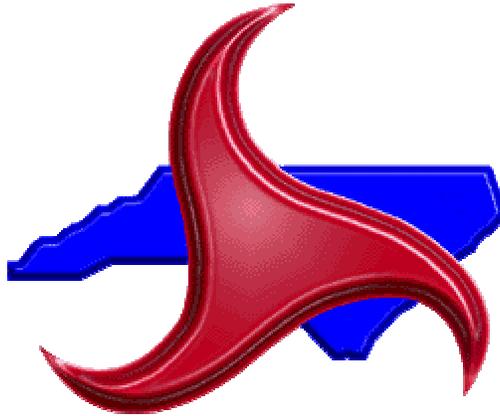


# **An Evaluation of Nine-Panel Specific Service Logo Signs and Overflow Combination Service Logo Signs**



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## Introduction

The purpose of this study is to investigate crashes at nine-panel and overflow combination logo signs on freeway facilities. Both signing options provide motorists with more than six and up to nine-panels per service per interchange, rather than the current MUTCD six-panel standard maximum. The following excerpts are taken from the MUTCD 2003 edition Chapter 2F:

- *No service type shall appear on more than one sign. (Section 2F.02)*
- *Each Specific Service sign or sign assembly shall be limited to no more than six logo panels.(Section 2F.04)*

Nine-panel logo signs include nine-panels on one sign. Overflow combination logo signs include a service type on more than one sign in advance of an interchange. Although motorists may benefit from the additional service selection, there is need to address the potential safety concerns when the number of logo panels is increased for a given service at an interchange.

Figure 1 shows a nine-panel logo sign. Figure 2 shows an overflow combination logo sign.

**Figure 1. Nine-Panel Logo Sign**



**Figure 2. Overflow Combination Logo Sign**



## Scope of Project

This report attempts to address the concern of crashes at nine-panel and overflow combination logo sign sites through a quantitative assessment of crash data at these locations. A total of ten interchanges with nine-panel logo signs and six interchanges with overflow combination logo signs were considered for this project. Each freeway approach to an interchange was analyzed separately. In several cases, nine-panel or overflow combination logo signs were only erected on one approach of an interchange. Therefore, 19 nine-panel and 11 overflow combination logo sign locations were analyzed. Additional nine-panel and overflow combination logo signs have been erected in North Carolina, but only locations completed prior to January 2006 field investigations have been included for analysis.

Crash data was also analyzed at a group of comparison interchanges with standard six-panel signs. Nine interchanges with six-panel logo signs were considered for this project. At these interchanges, eleven locations were analyzed. The comparison sites were chosen based off similar traffic volumes as well as being located on the same corridors as the treatment locations. Comparison sites were picked during the January 2006 field investigations of the treatment sites. See the Appendix for a statewide map of all the logo sign locations analyzed in this project.

Table 1 lists the nine-panel logo sign locations that were studied for this project.

Table 2 lists the overflow combination logo sign locations that were studied for this project.

Table 3 lists the comparison six-panel logo sign locations that were studied for this project.

**Table 1. Nine-panel Logo Signs Analyzed**

Obs	County	Route	Intersection	Exit Number	Direction	Sign	Date Erected	Before Period Analysis (3 Yrs)	After Period Analysis (Time Frame Varies)	After Period Time Frame (Yrs)	Length (miles)	Mid-Year Mainline Directional ADT	
												Before	After
1	Craven	US70	US17	414	EB	9 - Food	Feb-03	1/1/00-12/31/02	4/1/03-9/30/06	3.5	0.66	20500	22000
2	Craven	US70	US17	414	WB	9 - Food	Feb-03	1/1/00-12/31/02	4/1/03-9/30/06	3.5	0.66	20500	22000
3	Robeson	I95	US301 / SR1997 (Fayetteville Rd)	22	NB	9 - Food	Nov-03	10/1/00-9/30/03	1/1/04-9/30/06	2.75	1.67	21000	22500
4	Robeson	I95	US301 / SR1997 (Fayetteville Rd)	22	SB	9 - Food	Nov-03	10/1/00-9/30/03	1/1/04-9/30/06	2.75	1.03	20500	21000
5	Cumberland	I95	NC53 / NC210	49	NB	9 - Lodging / 9 - Food	Nov-03	10/1/00-9/30/03	1/1/04-9/30/06	2.75	1.26	20000	21500
6	Cumberland	I95	NC53 / NC210	49	SB	9 - Lodging / 9 - Food	Nov-03	10/1/00-9/30/03	1/1/04-9/30/06	2.75	1.70	18000	18500
7	Iredell	I40	US21	151	EB only	8 - Food	Aug-05	7/1/02-6/30/05	10/1/05-9/30/06	1	0.99	27000	29850
8	Iredell	I77	NC150	36	NB	9 - Food	Aug-04	7/1/01-6/30/04	10/1/04-9/30/06	2	0.95	26500	30500
9	Iredell	I77	NC150	36	SB	9 - Food	Aug-04	7/1/01-6/30/04	10/1/04-9/30/06	2	1.25	24000	25500
10	Burke	I40	NC 18 (S. Sterling St.)	105	EB	9 - Food	Mar-05	2/1/02-1/31/05	5/1/05-9/30/06	1.42	1.07	23000	23700
11	Burke	I40	NC 18 (S. Sterling St.)	105	WB	9 - Food	Mar-05	2/1/02-1/31/05	5/1/05-9/30/06	1.42	1.31	23000	23700
12	Henderson	I26	US64	49 (Old 18)	EB	9 - Food	Sep-05	8/1/02-7/31/05	11/1/05-9/30/06	0.91	2.01	24000	25750
13	Henderson	I26	US64	49 (Old 18)	WB	9 - Food	Sep-05	8/1/02-7/31/05	11/1/05-9/30/06	0.91	0.61	22500	25250
14	Haywood	US74	US 276 (Dellwood)	102	NB	9 - Food	Sep-05	8/1/02-7/31/05	11/1/05-9/30/06	0.91	0.84	16500	17500
15	Haywood	US74	US 276 (Dellwood)	102	SB	9 - Food	Sep-05	8/1/02-7/31/05	11/1/05-9/30/06	0.91	1.01	17500	18550
16	Cabarrus	I85	SR 2894 (Speedway Blvd)	49	NB	7 - Lodging / 9 - Food	Jun-05	5/1/02-4/30/05	8/1/05-9/30/06	1.16	1.14	44500	52500
17	Cabarrus	I85	SR 2894 (Speedway Blvd)	49	SB	7 - Lodging / 9 - Food	Jun-05	5/1/02-4/30/05	8/1/05-9/30/06	1.16	1.03	40000	47400
18	Johnston	I95	US 70	97	NB	7 - Lodging / 9 - Food	Apr-05	3/1/02-2/28/05	6/1/05-9/30/06	1.33	1.73	18000	20600
19	Johnston	I95	US 70	97	SB	7 - Lodging / 9 - Food	Apr-05	3/1/02-2/28/05	6/1/05-9/30/06	1.33	1.38	18000	21650

22.32	23200	25500
TOTAL	WEIGHTED AVERAGES	

**Table 2. Overflow Combination Logo Signs Analyzed**

Obs	County	Route	Intersection	Exit Number	Direction	Sign	Date Erected	Before Period Analysis (3 Yrs)	After Period Analysis (Time Frame Varies)	After Period Time Frame (Yrs)	Length (miles)	Mid-Year Mainline Directional ADT	
												Before	After
1	Cabarrus	185	SR 2126 (Eamhardt)	60	NB	2-Gas & 2-Food Combo	May-04	4/1/01-3/31/04	7/1/04-9/30/06	2.25	0.55	32000	37500
2	Cabarrus	185	SR 2126 (Eamhardt)	60	SB	2-Gas & 2-Food Combo	May-04	4/1/01-3/31/04	7/1/04-9/30/06	2.25	0.57	34000	39000
3	Mecklenburg	177	NC73 (Sam Furr)	25	NB	3-Gas & 3-Food Combo	Sep-04	8/1/01-7/31/04	11/1/04-9/30/06	1.91	0.66	38000	44500
4	Mecklenburg	177	NC73 (Sam Furr)	25	SB	3-Gas & 3-Food Combo	Sep-04	8/1/01-7/31/04	11/1/04-9/30/06	1.91	0.69	37000	42500
5	Johnston	195	US70 Bus	95	NB	2-Gas & 3-Food Combo	Apr-05	3/1/02-2/28/05	6/1/05-9/30/06	1.33	1.00	20000	22650
6	Johnston	195	US70 Bus	95	SB	2-Gas & 3-Food Combo	Apr-05	3/1/02-2/28/05	6/1/05-9/30/06	1.33	0.31	18000	20600
7	Alamance	I85/140	NC119	153	EB	2-Gas & 2-Food Combo	Aug-05	7/1/02-6/30/05	10/1/05-9/30/06	1	0.60	40000	44800
8	Alamance	I85/140	NC119	153	WB	2-Gas & 2-Food Combo	Aug-05	7/1/02-6/30/05	10/1/05-9/30/06	1	0.52	38000	42750
9	Buncombe	140	US19/23/74 (Smokey Park Hwy)	44	EB	2-Lodging & 0-Camping Combo	Oct-02	9/1/99-8/31/02	12/1/02-9/30/06	3.83	1.60	21000	23000
10	Buncombe	140	US19/23/74 (Smokey Park Hwy)	44	WB	2-Lodging & 0-Camping Combo	Oct-02	9/1/99-8/31/02	12/1/02-9/30/06	3.83	0.95	33000	34500
11	Buncombe	I240	SR 2208 (Chunns Cove)	6	EB Only	0-Food & 1-Lodging Combo	Oct-05	9/1/02-8/31/05	12/1/05-9/3/06	0.83	0.92	37000	41700

8.38	30600	34400
<i>TOTAL</i>	<i>WEIGHTED AVERAGES</i>	

**Table 3. Comparison Six-panel Logo Signs Analyzed**

Obs	County	Route	Intersection	Exit Number	Direction	Sign	Analysis Period (3 Yrs)	Length (miles)	Mid-Year Mainline Directional ADT
1	Buncombe	I 26	NC 146 (Long Shoals)	37	WB only	6-Food	10/1/03-9/30/06	0.39	31500
2	Buncombe	I 40	NC 9	64	EB only	6 - Food	10/1/03-9/30/06	0.97	17500
3	Catawba	I 40	SR 1005 (Startown)	126	WB only	6 - Food	10/1/03-9/30/06	1.46	31000
4	Alamance	I 40	NC 62 (Alamance)	143	EB only	6 - Food	10/1/03-9/30/06	0.61	51500
5	Davie	I 40	US 601	170	WB only	6 - Food	10/1/03-9/30/06	0.69	16000
6	Mecklenburg	I 77	US 21 (Catawba)	28	NB only	6- Lodging	10/1/03-9/30/06	1	42500
7	Vance	I 85	SR 1128 (Ruin Creek)	212	NB	6 - Food	10/1/03-9/30/06	0.75	17000
8	Vance	I 85	SR 1128 (Ruin Creek)	212	SB	6 - Food	10/1/03-9/30/06	0.9	16500
9	Harnett	I 95	US 421 / NC 55	73	SB only	6 - Food	10/1/03-9/30/06	0.91	24000
10	Johnston	I 95	NC 50 / NC 242	79	NB	6 - Food	10/1/03-9/30/06	0.72	24500
11	Johnston	I 95	NC 50 / NC 242	79	SB	6 - Food	10/1/03-9/30/06	0.55	26500

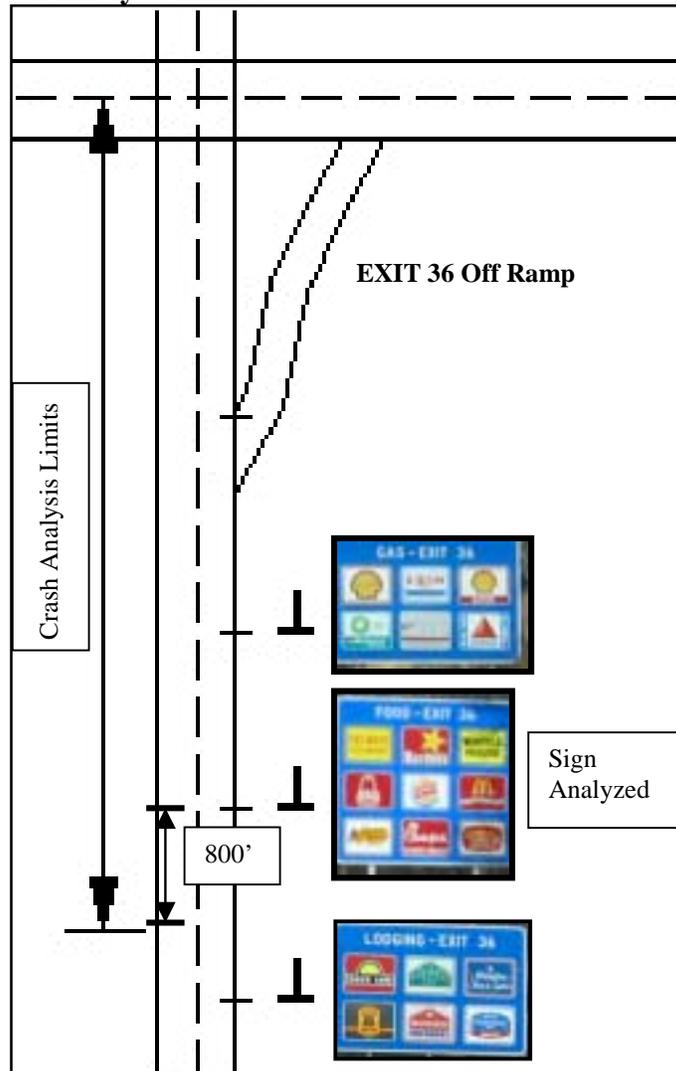
8.95	27,000
<i>TOTAL</i>	<i>WEIGHTED AVERAGE</i>

## Crash Analysis Method

The logo sign locations were analyzed using crash data from the North Carolina Traffic Records Database, which contains all reported crashes in the State since 1990. A crash analysis was conducted for each logo sign location. The nine-panel and overflow combination logo sign locations were analyzed using before and after period analyses. The before period analyses consisted of three years of crash data. The after period time frames varied and were limited by the available crash data at the time the crash analyses were completed. An average of 1.9 years of crash data was used for each of the nine-panel and overflow combination logo sign locations in the after period. The comparison six-panel logo sign locations were analyzed using the most recent three years of crash data available at the time the crash analyses were completed. See Tables 1-3 for the exact time periods for each study.

The crash analysis included all reported crashes from 800 feet in advance of the sign being evaluated up to the overpass of the nearest upstream interchange. If the exit-ramp for the interchange was located beyond the overpass, then the crash analysis was extended to the exit-ramp gore area. See Figure 3 for a visual representation of the crash analysis limits. The crash analyses only included mainline crashes in the direction of the sign being analyzed. Note that because only one direction of travel was analyzed, a directional ADT was used assuming a 50/50 directional split. There were several nine-panel logo sign locations with multiple nine-panel logo signs. In these cases, the crash analyses began in advance of the nine-panel logo sign located furthest from the interchange.

**Figure 3. Crash Analysis Limits**



## Findings

Tables 4-6 show a summary of the crash data at each of the logo sign locations. Table 4 provides before and after total crashes per year and crash rates for each nine-panel logo sign location. Table 5 provides before and after total crashes per year and crash rates for each overflow combination logo sign location. Table 6 provides total crashes per year and crash rates for each comparison six-panel logo sign location. The total length, weighted ADT averages, total crashes per year, and average crash rates per sign type are provided at the bottom of each table.

**Table 4. Crash Data at Nine-panel Logo Sign Locations**

Obs	County	Route	Intersection	Direction	Length (miles)	Mid-Year Mainline Directional ADT		Total Crashes/Yr		Crash Rate (Per 100MVM)		
						Before	After	Before	After	Before	After	
1	Craven	US70	US17	EB	0.66	20500	22000	1.3	1.1	27.00	21.56	
2	Craven	US70	US17	WB	0.66	20500	22000	0.7	2.0	13.47	37.65	
3	Robeson	I95	US301 / SR1997 (Fayetteville)	NB	1.67	21000	22500	7.3	7.3	57.29	53.03	
4	Robeson	I95	US301 / SR1997 (Fayetteville)	SB	1.03	20500	21000	5.7	5.1	73.42	64.39	
5	Cumberland	I95	NC53 / NC210	NB	1.26	20000	21500	8.0	2.5	86.98	25.74	
6	Cumberland	I95	NC53 / NC210	SB	1.70	18000	18500	5.7	5.5	50.69	47.47	
7	Iredell	I40	US21	EB only	0.99	27000	29850	6.7	7.0	68.23	64.80	
8	Iredell	I77	NC150	NB	0.95	26500	30500	6.3	6.5	68.81	61.36	
9	Iredell	I77	NC150	SB	1.25	24000	25500	12.7	14.0	115.54	120.19	
10	Burke	I40	NC 18 (S. Sterling St.)	EB	1.07	23000	23700	5.0	6.3	55.66	68.47	
11	Burke	I40	NC 18 (S. Sterling St.)	WB	1.31	23000	23700	6.3	11.3	57.59	99.43	
12	Henderson	I26	US64	EB	2.01	24000	25750	9.7	6.6	54.86	34.88	
13	Henderson	I26	US64	WB	0.61	22500	25250	3.3	1.1	66.37	19.50	
14	Haywood	US74	US 276 (Dellwood)	NB	0.84	16500	17500	1.7	0.0	32.95	0.00	
15	Haywood	US74	US 276 (Dellwood)	SB	1.01	17500	18550	1.3	1.1	20.67	16.07	
16	Cabarrus	I85	SR 2894 (Speedway Blvd)	NB	1.14	44500	52500	29.3	45.7	158.42	209.15	
17	Cabarrus	I85	SR 2894 (Speedway Blvd)	SB	1.03	40000	47400	32.3	10.3	214.70	57.97	
18	Johnston	I95	US 70	NB	1.73	18000	20600	10.3	7.5	90.83	57.75	
19	Johnston	I95	US 70	SB	1.38	18000	21650	9.7	12.0	106.62	110.32	
						22.32	23200	25500	163.3	153.0	74.74	61.56
						<i>TOTAL WEIGHTED AVERAGES</i>		<i>TOTALS</i>		<i>AVERAGES</i>		

**Table 5. Crash Data at Overflow Combination Logo Sign Locations**

Obs	County	Route	Intersection	Direction	Length (miles)	Mid-Year Mainline Directional ADT		Total Crashes/Yr		Crash Rate (Per 100MVM)		
						Before	After	Before	After	Before	After	
1	Cabarrus	I85	SR 2126 (Earnhardt Rd)	NB	0.55	32000	37500	4.3	12.0	67.46	159.40	
2	Cabarrus	I85	SR 2126 (Earnhardt Rd)	SB	0.57	34000	39000	9.0	9.3	126.89	114.72	
3	Mecklenburg	I77	NC 73 (Sam Furr Rd)	NB	0.66	38000	44500	7.3	13.1	79.93	121.82	
4	Mecklenburg	I77	NC 73 (Sam Furr Rd)	SB	0.69	37000	42500	9.3	5.2	99.94	48.81	
5	Johnston	I95	US70 Bus	NB	1.00	20000	22650	7.7	4.5	104.86	54.49	
6	Johnston	I95	US70 Bus	SB	0.31	18000	20600	2.3	3.0	114.01	128.40	
7	Alamance	I85/I40	NC 119	EB	0.60	40000	44800	1.7	1.0	19.03	10.19	
8	Alamance	I85/I40	NC 119	WB	0.52	38000	42750	4.3	1.0	59.91	12.29	
9	Buncombe	I40	US19/23/74 (Smokey Park)	EB	1.6	21000	23000	9.3	12.3	76.10	91.36	
10	Buncombe	I40	US19/23/74 (Smokey Park)	WB	0.95	33000	34500	10.0	14.1	87.39	117.86	
11	Buncombe	I240	SR 2208 (Chunns Cove)	EB only	0.92	37000	41700	2.7	2.4	21.46	17.21	
						8.38	30600	34400	48.7	51.6	77.91	79.69
						<i>TOTAL WEIGHTED AVERAGES</i>		<i>TOTALS</i>		<i>AVERAGES</i>		

**Table 6. Crash Data at Comparison Six-panel Logo Sign Locations**

Obs	County	Route	Intersection	Direction	Length (miles)	Mid-Year Mainline Directional ADT	Total Crashes/Yr	Crash Rate (Per 100MVM)
1	Buncombe	I 26	NC 146 (Long Shoals)	WB only	0.39	31500	3.0	66.90
2	Buncombe	I 40	NC 9	EB only	0.97	17500	2.3	37.66
3	Catawba	I 40	SR 1005 (Startown)	WB only	1.46	31000	3.7	22.20
4	Alamance	I 40	NC 62 (Alamance)	EB only	0.61	51500	6.0	52.33
5	Davie	I 40	US 601	WB only	0.69	16000	3.7	90.99
6	Mecklenburg	I 77	US 21 (Catawba)	NB only	1	42500	15.7	100.99
7	Vance	I 85	SR 1128 (Ruin Creek)	NB	0.75	17000	4.3	93.11
8	Vance	I 85	SR 1128 (Ruin Creek)	SB	0.9	16500	6.0	110.70
9	Harnett	I 95	US 421 / NC 55	SB only	0.91	24000	6.0	75.27
10	Johnston	I 95	NC 50 / NC 242	NB	0.72	24500	5.3	82.83
11	Johnston	I 95	NC 50 / NC 242	SB	0.55	26500	7.0	131.58

8.95	27,000	63.0	78.60
<i>TOTAL</i>	<i>WEIGHTED AVERAGE</i>	<i>TOTAL</i>	<i>AVERAGE</i>

Table 7a shows a comparison of the before and after crash data at the nine-panel logo sign locations and the overflow combination logo sign locations. Table 7b shows a comparison of the crash data at the nine-panel logo sign locations and the overflow combination logo sign locations versus the comparison six-panel locations.

**Table 7a. Before and After Crash Rate Analysis**

	Before Period Crash Rate	After Period Crash Rate	Percent Increase (+)/ Percent Decrease (-)
Nine-panel Logo Sign Locations	74.74	61.56	-17.6
Overflow Combination Logo Sign Locations	77.91	79.69	2.3

**Table 7b. Comparison Crash Rate Analysis**

	(Six Panel) Comparison Locations Crash Rate	After Period Crash Rate	Percent Above or Below Crash Rates At Comparison Sites
Nine-panel Logo Sign Locations	78.60	61.56	-21.7
Overflow Combination Logo Sign Locations	78.60	79.69	1.4

## **Concluding Remarks**

The summary results demonstrate that at locations installed with nine-panel logo signs the crash rates tended to be lower after the installation. Also, when comparing nine-panel logo sign locations to the comparison six-panel logo sign locations, the crash rates tended to be lower at the nine-panel logo sign locations after installation.

Locations installed with overflow combination logo signs tended to have slightly higher crash rates after the installation. Also, when comparing overflow combination logo sign locations to comparison six-panel logo sign locations, the crash rates tended to be slightly higher at the overflow combination logo sign locations after installation.

The comparison six-panel locations were selected and incorporated into the analysis to help give a better understanding of the safety assessment. The crash rate from the comparison six-panel locations established a baseline crash rate, based on the current MUTCD standards. Note that the crash rate at the comparison six-panel logo sign locations was higher than the before period crash rates at both the nine-panel and overflow combination logo sign locations, when these locations also contained only six-panel signs. The locations chosen for the comparison group experienced a higher average crash rate than the treatment locations prior to installation of the alternative signing options.

From a crash perspective, there is no overwhelming evidence in this analysis to discontinue the usage of either nine-panel or overflow combination logo signs in the state of North Carolina. However, it is very important to note that this evaluation was based on an average of only 1.9 years of after data at the treatment locations. It is difficult to draw concrete conclusions when such a small time frame is considered.

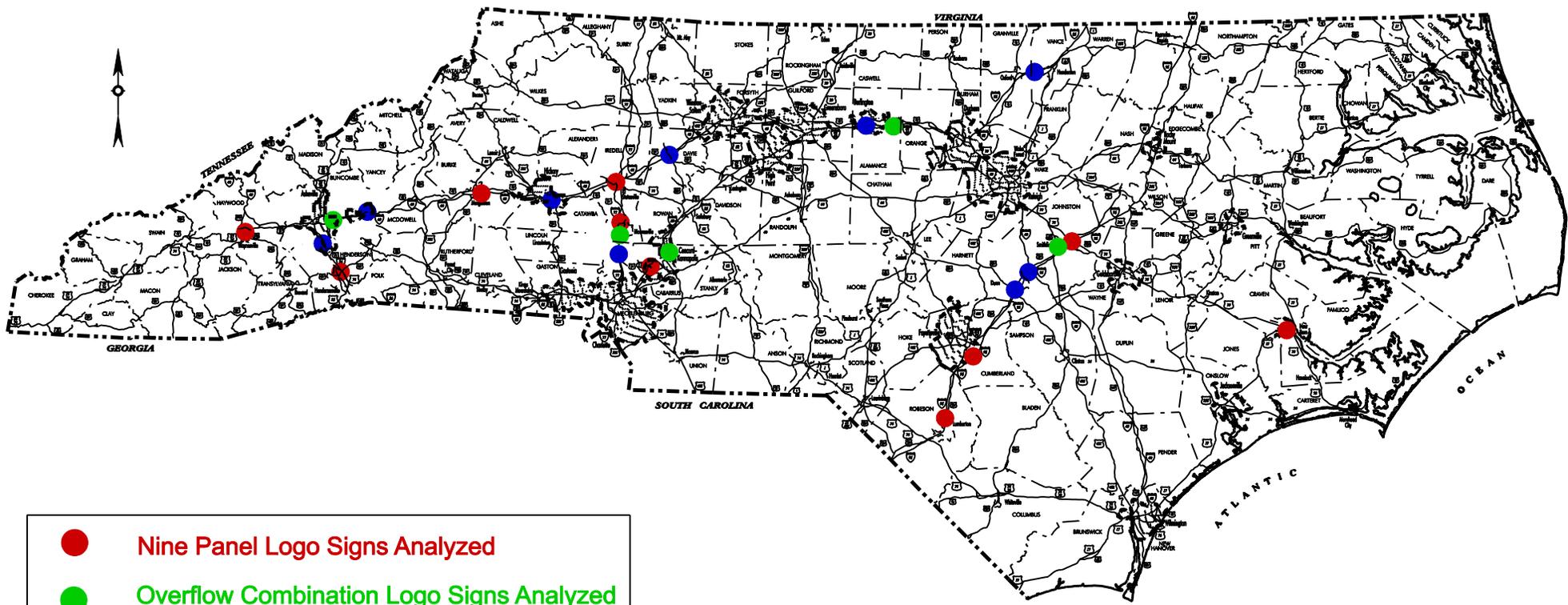
For further information, please review the reports completed by North Carolina State University (NCSU) and University of North Carolina Highway Safety Research Center (UNC HSRC), which were completed in conjunction with this safety evaluation. The report completed by NCSU, "The Human Factors Effects of Nine-Panel Logo Signs: Motorist Survey", used surveys and laboratory testing to examine how drivers use logo signs and whether their driving performance is impacted. The report concluded that nine-panel logo signs performed well when analyzing them from a human factors perspective. The report completed by UNC HSRC, "Evaluating Options to Increase Specific Service (Logo) Signs from Six Businesses to Nine Businesses per Service", used field observations to examine the effects of the various logo signs. Unusual behaviors and maneuvers in the vicinity of the logo signs were recorded and assessed. The report found that nine-panel and overflow combination logo signs did not increase motorist distraction.

## REFERENCES

1. Wang, Ian and Daniel Carter. "Evaluating Options to Increase Specific Service (Logo) Signs from Six Businesses to Nine Businesses per Service (Draft Final Report)", UNC Highway Safety Research Center, Chapel Hill, NC, December 2006.
2. Hummer, Joseph E., Lauren J. Gillespie, and Uday K. Maripalli. "The Human Factors Effects of Nine-Panel Logo Signs: Motorist Survey (Draft Final Report)", North Carolina State University, Raleigh, NC, August 2006.

## **APPENDIX**

### **STATEWIDE MAP OF LOGO SIGN LOCATIONS ANALYZED**



Nine Panel Logo Signs Analyzed



Overflow Combination Logo Signs Analyzed



Comparison Six Panel Logo Signs Analyzed