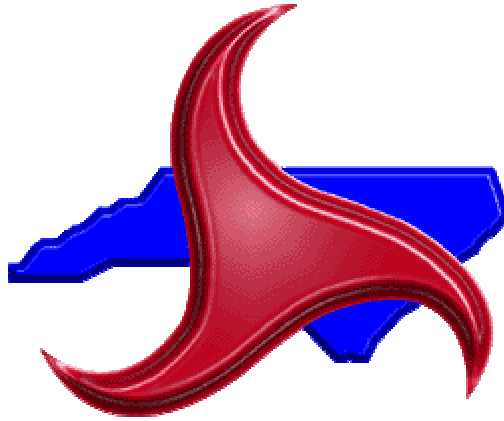


An Evaluation of Slower Traffic Keep Right Signs and Pavement Markings



Documents Prepared By:

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

Principal Investigator


Brian G. Murphy, PE

Traffic Safety Project Engineer

10/5/05
Date



INTRODUCTION

The desire to evaluate Slower Traffic Keep Right countermeasures came about due to increasing concerns regarding slower traffic using the left travel lanes and impeding faster moving traffic. North Carolina General Statute 20-146 makes it unlawful for any person to operate a motor vehicle in the inside lane of any dual-lane highway at a speed less than the posted speed limit when the vehicle impedes the steady flow of traffic and appropriate signs have been posted. “Appropriate signs” are defined as “Slower Traffic Keep Right” or designations of similar import. See Appendix A for complete text of General Statute 20-146.

The North Carolina Department of Transportation’s current policy is to place “Slower Traffic Keep Right” signing based on engineering judgement. The signs are to be installed only on multi-lane freeways where motorists tend to drive in the left lane(s) at less than the posted speed limit and impede the flow of traffic. Signs are typically placed at three to five mile intervals to reinforce the behavior. The Department’s complete policy can be found in Appendix B.

A work group consisting of senior level Traffic Engineering personnel has been charged with developing and evaluating measures to address this issue. Four countermeasures were identified by the group and evaluated under this project. The common goal of these countermeasures is to encourage slower drivers to stay out of the left lane by using various messages to influence their lane choice. The four countermeasures chosen for study were as follows:

- Keep Right Except to Pass Signs (See Figure 1)
- Keep Right Except to Pass Signs and Pass Lane Only Pavement Markings
- Slower Traffic Keep Right Signs (See Figure 2)
- Slower Traffic Keep Right Signs and Pass Lane Only Pavement Markings

Figure 1. Keep Right Except to Pass Sign

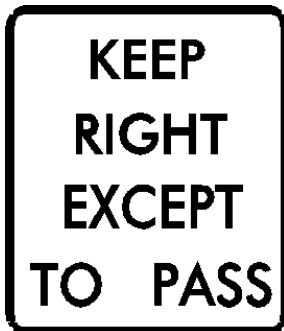


Figure 2. Slower Traffic Keep Right Sign



METHODOLOGY

Site Selection

Sites were chosen for countermeasure installation based on the following criteria:

- Sites must be a four-lane divided freeway facility with minimum speed limit of 65 mph
- Sites must be away from interchanges or other features that would influence the lane choice of a driver
- Sites must be far away from each other so that the effect of one countermeasure does not interfere with the effect of another
- Sites must be far away from any other Slower Traffic Keep Right countermeasure

Figure 3 shows the location of each countermeasure installation along with the date of implementation. A map showing the countermeasure locations can be found in Appendix C of this report. Each countermeasure consisted of one sign or one sign and one pavement marking depending on the site. The countermeasures at Site 4 were installed in two phases and data was collected after each phase. See Appendix D for a detailed pavement marking and signing plan for sites where pavement markings were utilized.

Figure 3. Location of Countermeasures

Site	Countermeasure	County	Route	Direction	Location	Countermeasure Installation Date
1	Keep Right Except to Pass Signs	Pender	I-40	WB	0.60 miles East of SR 1411 Overpass (MM 405.8)	4/29/2004
2	Slow Traffic Keep Right Signs and Pass Lane Only Pavement Markings	Johnston	I-40	WB	0.60 miles East of SR 1322 Overpass (MM 320.7)	9/14/2004
3	Slow Traffic Keep Right Signs	Wake	I-40	EB	0.60 miles West of SR 2700 Overpass	9/14/2004
4	Keep Right Except to Pass Signs and Pass Lane Only Pavement Markings	Wake	US 1	SB	0.60 miles North of SR 1149	3/2/2005
5	Do Nothing Site - No Countermeasure Installed	Wake	US 1	NB	At Railroad Bridge Near Chatham County Line	N/A

Site 5 was chosen as a “Do Nothing Site” where no countermeasures were installed. Data at this site was gathered to attempt to account for any other factors that may have impacted the data collection (ex. accuracy drift in radar gun, system-wide changes in driver behavior). The Do Nothing site can not account for every factor, but was mainly included to show that the data would be relatively constant in the before and after periods if no countermeasure was installed.

Data collection

All data collection was done in off peak hours, between the hours of 10:00 AM and 2:00 PM on typical weekdays, when it was likely that right lanes were accessible to slower drivers. Data collection was done in an inconspicuous manner so as not to influence the driver’s speed or lane choice. Data was collected at each site for two hours on at least two different visits before and after the countermeasures were installed. This provided for four hours of data in the before period and four hours in the after period at each site.

The following measures of effectiveness (MOEs) were collected at each site.

- **Speed distribution by lane** - All speed data was captured using a radar gun. Speed data was collected to determine what effect the countermeasures would have on system speeds in the area of the signs
- **Traffic volume by lane** - Traffic volume was recorded to determine the effect the signs would have on lane utilization.
- **Platooned vehicles in left lane** – Data on the number of platooned vehicles was gathered to get some idea of how many vehicles were being impeded by slower traffic in the left lane.
- **Lane changes just after a sign or pavement marking** – Data on the number of lane changes in the vicinity of the sign was gathered to determine if drivers seemed to be making erratic maneuvers in the vicinity of the countermeasures.

The after period data was collected once the countermeasure had been in place for at least three weeks. This was done so that any novelty effect caused by the countermeasures would not impact the data.

RESULTS

Speed Analysis

Figures 4 through 6 below show the results of the speed analysis. More detailed speed data can be found in Appendix E of this report.

Figure 4. Left Lane Speed Analysis

CM Site	County	Location	Before / After	Left Lane							
				Cars	Trucks	% Trucks	Volume	Speed Obs	Avg Speed	35th Speed	Variance
1	Pender	I-40	Before	469	27	5%	496	290	75.1	78.5	20.8
1	Pender	I-40	After	373	23	6%	396	170	75.8	78.8	19.2
2	Johnston	I-40	Before	1225	96	7%	1321	491	75.4	79.1	19.2
2	Johnston	I-40	After	1114	112	9%	1226	380	75.6	78.9	17.7
3	Wake	I-40	Before	2744	135	5%	2879	700	74.3	77.9	16.8
3	Wake	I-40	After	2473	103	4%	2576	443	74.9	78.1	12.8
4	Wake	US 1	Before	344	46	12%	390	249	72.4	75.8	18.1
4	Wake	US 1	After Sign	302	54	15%	356	177	72.6	76.0	18.7
4	Wake	US 1	After Sign & Pvrnt Mkng	305	44	13%	349	149	72.0	76.0	21.6
5	Wake	US 1	Before	386	38	9%	424	284	72.2	76.2	24.2
5	Wake	US 1	After	384	27	7%	411	227	72.2	75.7	17.9

Figure 5. Right Lane Speed Analysis

CM Site	County	Location	Before / After	Right Lane							
				Cars	Trucks	% Trucks	Volume	Speed Obs	Avg Speed	85th Speed	Variance
1	Pender	I-40	Before	1287	260	17%	1547	411	71.4	75.8	22.5
1	Pender	I-40	After	1195	219	15%	1414	454	72.0	75.6	20.6
2	Johnston	I-40	Before	1828	537	23%	2365	564	71.1	75.5	21.8
2	Johnston	I-40	After	1869	566	23%	2435	780	71.6	75.7	22.6
3	Wake	I-40	Before	2916	673	19%	3589	761	70.1	74.3	20.9
3	Wake	I-40	After	2837	608	18%	3445	774	70.6	74.8	21.8
4	Wake	US 1	Before	1042	405	28%	1447	395	68.7	72.5	17.2
4	Wake	US 1	After Sign	1097	354	24%	1451	504	68.2	72.3	20.7
4	Wake	US 1	After Sign & Pvmnt Mkng	1162	362	24%	1524	525	68.4	72.2	19.1
5	Wake	US 1	Before	1086	314	22%	1400	430	68.1	72.0	21.8
5	Wake	US 1	After	1116	245	18%	1361	481	68.3	72.2	20.9

Figure 6. Speed Analysis for Both Lanes Combined

CM Site	County	Location	Before / After	% Traffic Using Left Lane	Both Lanes							
					Volume	Cars	Trucks	% Trucks	Speed Obs	Avg Speed	85th Speed	Variance
1	Pender	I-40	Before	24%	2043	1756	287	14%	701	72.9	77.1	25.1
1	Pender	I-40	After	22%	1810	1568	242	13%	624	73.0	77.0	23.0
2	Johnston	I-40	Before	36%	3686	3053	633	17%	1055	73.1	77.7	25.3
2	Johnston	I-40	After	33%	3661	2983	678	19%	1160	72.9	77.3	24.5
3	Wake	I-40	Before	45%	6468	5660	808	12%	1461	72.1	76.6	23.4
3	Wake	I-40	After	43%	6021	5310	711	12%	1217	72.2	76.6	22.7
4	Wake	US 1	Before	21%	1837	1386	451	23%	644	70.1	74.3	20.7
4	Wake	US 1	After Sign	20%	1807	1399	408	23%	681	69.3	73.8	23.8
4	Wake	US 1	After Sign & Pvmnt Mkng	19%	1873	1467	406	22%	674	69.2	73.4	21.8
5	Wake	US 1	Before	23%	1824	1472	352	19%	714	69.7	73.8	26.7
5	Wake	US 1	After	23%	1772	1500	272	15%	708	69.6	73.6	23.1

As can be seen in the table of results above, there was little change in average and 85th percentile speeds between the two data collection periods. There was a statistically significant change in several of the speed categories when looking at each lane separately. However, the actual difference in speeds is very small and not practically significant. The numbers can be deemed statistically significant because of the large sample size of observations in each category. The large sample sizes allow for very small changes to be detected and declared significant in the statistical tests.

When looking at the speed data for both lanes together in Figure 6, there is a statistically significant change in the average speeds for Site 4 and a statistically significant change in the 85th percentile speeds at Sites 2 and 4. Again the actual numerical difference in speeds is quite small and not practically significant. Further investigation shows that the statistically significant changes are actually cases where the speeds have dropped from the before to the after period.

The data in Figures 4 through 6 show actual raw data. Ordinarily, the data is adjusted to incorporate the change seen at the Do Nothing Site in an attempt to account for any changes that may have occurred between the before and after periods not related to the applied countermeasure. In this case, there was so little change from the before to the after period at the

Do Nothing Site that it makes no practical difference in the outcome of this study. For completeness, the adjustment exercise was carried out and can be found in Appendix F.

Analysis of Traffic Using Left Lane

Figure 6 shows the before and after values for the percentage of vehicles using the left lane. At each site except for the Do Nothing Site, there was about a 2 – 3 percent reduction in the number of vehicles traveling in the left lane after the countermeasure was installed. Comparing the change in the percent of traffic in the left lane by itself can be very misleading. The largest factor that plays a role in the amount of traffic in the left lane is the volume of traffic using the facility. As the overall traffic volumes increase, the number of vehicles in the left lane will increase in order to handle the additional traffic. One can imagine as a facility approaches capacity, left lane usage will approach +/- 50 percent simply as a way to move the most amount of traffic. Taking overall volume fluctuations into consideration, it appears Sites 2 and 4 show the most evidence of a possible reduction of vehicles in the left lane. In each of these sites, the volume remained relatively the same in the before and after periods and the percent of traffic in the left lane went down slightly.

Analysis of Platooned Vehicles

Figure 7 below shows the results of the analysis of platooned vehicles in left lane.

Figure 7. Platooned Vehicle Data

CM Site	Before / After	Number of Platooned Vehicles	Number of Vehicles in Left Lane	Percent of Left Lane Vehicles In Platoon	Number of Observed Lane Changes
1	Before	77	496	16%	N/A
1	After	45	396	11%	40
2	Before	368	1321	28%	N/A
2	After	360	1226	29%	93
3	Before	960	2879	33%	N/A
3	After	1001	2576	39%	46
4	Before	51	390	13%	N/A
4	After Sign	47	356	13%	39
4	After Sign & Pvmt Mkng	52	349	15%	N/A
5	Before	53	424	13%	N/A
5	After	48	411	12%	36

The only sites that showed a decrease in the percentage of vehicles in the left lane that were in a platoon were Sites 1 and the Do Nothing Site. The other sites all showed a slight increase in the percentage of platooned vehicles. Because of the low sample sizes, none of these changes can be deemed statistically significant except for the change at Site 3 which was an increase.

Observations regarding the number of lane changes in the vicinity of the countermeasures were also recorded to ensure drivers were not making erratic movements after seeing the signs or pavement markings. There was some concern that drivers may immediately try to change lanes

after passing the countermeasure and attempt an unsafe merge. The project team did not note any drivers behaving abnormally after passing by the countermeasures.

FINAL COMMENTS

The before period data at each of the sites show that most drivers tend to travel in the right lane as a general rule even without a countermeasure in place. Drivers seem to have been trained into behaving this way either by experience, driver education classes (Department of Motor Vehicles Handbook discusses this issue), or by noting the various “Slower Traffic Keep Right” signs that are scattered about multi-lane roads in North Carolina. It seems the greatest factor that impacts left lane usage is the volume on the facility. As volume increases, traffic must adjust and utilize the left lane more in order to accommodate the additional vehicles.

None of the countermeasures analyzed seemed to have a significant impact on the measures of effectiveness chosen for this study. Sites where pavement markings and signs were placed together (Sites 2 and 4) seemed to be the most effective at reducing the amount of traffic in the left lane, but the changes are still quite small and the benefits seem negligible when considering the other performance measures. Based on the results of this study, it is unlikely to see significant benefits at a particular site by implementing the countermeasures considered for this project. However, placing signs at appropriate sites and intervals may help to reinforce the notion of slower traffic keep right on a system-wide basis. This practice is in concurrence with the current policy used by the Department.

The issue of getting slower traffic to stay in the right most lanes when available is deeply rooted in the realm of human factors research. The purpose of this project was not to understand why slower drivers sometimes travel in the left lane, but to determine if a set of predetermined, readily available countermeasures have any significant effect in urging slower drivers to move out of the left lane. Human factors research is playing an increasingly important role in transportation issues today and how best to encourage slower drivers to move to the right seems to be an excellent candidate for this type of research. Understanding why some slower drivers tend to drive in the left lane when the right lane is available may lead to better countermeasures that are more effective in urging drivers to move over.

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Please direct questions or comments on this evaluation to Brian Murphy, PE at (919) 733-3915 or via email at bgmurphy@dot.state.nc.us

APPENDIX A

§ 20-146. Drive on right side of highway; exceptions.

(a) Upon all highways of sufficient width a vehicle shall be driven upon the right half of the highway except as follows:

- (1) When overtaking and passing another vehicle proceeding in the same direction under the rules governing such movement;
- (2) When an obstruction exists making it necessary to drive to the left of the center of the highway; provided, any person so doing shall yield the right-of-way to all vehicles traveling in the proper direction upon the unobstructed portion of the highway within such distance as to constitute an immediate hazard;
- (3) Upon a highway divided into three marked lanes for traffic under the rules applicable thereon; or
- (4) Upon a highway designated and signposted for one-way traffic.

(b) Upon all highways any vehicle proceeding at less than the legal maximum speed limit shall be driven in the right-hand lane then available for thru traffic, or as close as practicable to the right-hand curb or edge of the highway, except when overtaking and passing another vehicle proceeding in the same direction or when preparing for a left turn.

(c) Upon any highway having four or more lanes for moving traffic and providing for two-way movement of traffic, no vehicle shall be driven to the left of the centerline of the highway, except when authorized by official traffic-control devices designating certain lanes to the left side of the center of the highway for use by traffic not otherwise permitted to use such lanes or except as permitted under subsection (a)(2) hereof.

(d) Whenever any street has been divided into two or more clearly marked lanes for traffic, the following rules in addition to all others consistent herewith shall apply.

- (1) A vehicle shall be driven as nearly as practicable entirely within a single lane and shall not be moved from such lane until the driver has first ascertained that such movement can be made with safety.
- (2) Upon a street which is divided into three or more lanes and provides for the two-way movement of traffic, a vehicle shall not be driven in the center lane except when overtaking and passing another vehicle traveling in the same direction when such center lane is clear of traffic within a safe distance, or in the preparation for making a left turn or where such center lane is at the time allocated exclusively to traffic moving in the same direction that the vehicle is proceeding and such allocation is designated by official traffic-control device.
- (3) Official traffic-control devices may be erected directing specified traffic to use a designated lane or designating those lanes to be used by traffic moving in a particular direction regardless of the center of the street and drivers of vehicles shall obey the direction of every such device.
- (4) Official traffic-control devices may be installed prohibiting the changing of lanes on sections of streets, and drivers of vehicles shall obey the directions of every such device.

(e) Notwithstanding any other provisions of this section, when appropriate signs have been posted, it shall be unlawful for any person to operate a motor vehicle over and upon the inside lane, next to the median of any dual-lane highway at a speed less than the posted speed limit when the operation of said motor vehicle over and upon said inside lane shall impede the steady flow of traffic except when preparing for a left turn. "Appropriate signs" as used herein shall be construed as including "Slower Traffic Keep Right" or designations of similar import. (1937, c. 407, s. 108; 1965, c. 678, s. 2; 1973, c. 1330, s. 3; 1975, c. 593; 1985, c. 764, s. 25; 1985 (Reg. Sess., 1986), c. 852, s. 17; 2001-487, s. 11.)

APPENDIX B



STATE OF NORTH CAROLINA
DEPARTMENT OF TRANSPORTATION

MICHAEL F. EASLEY
GOVERNOR

LYNDO TIPPETT
SECRETARY

October 21, 2003

MEMORANDUM

To: Division Engineers

From: W. S. Varnedoe, P.E.
Chief Engineer - Operations

Troy A. Peoples, P.E.
State Traffic Engineer

Subject: Slower Traffic Keep Right Signing

Attached are guidelines on the "Standard Practice for Slower Traffic Keep Right Signing". These guidelines are intended to ensure statewide consistency in the installation and maintenance of appropriate signs on the highway right-of-way identifying locations to the general public where Slower Traffic Keep Right is applicable.

These guidelines take effect immediately. If further information is needed, please contact either of us.

WSV:TAP:la

Attachment

cc: Len A. Sanderson, P.E., w/att.
Regional Traffic Engineers, w/att.
Division Traffic Engineers, w/att.
Sign Practices Technical Committee, w/att.
Sign Oversight Committee, w/att.
Sandy Nance, w/att.
Ken Ivey, P.E., w/att.

**North Carolina Department of Transportation
Division of Highways
Traffic Engineering and Safety Systems Branch**

**STANDARD PRACTICE
for
Slower Traffic Keep Right Signing**

It is the standard practice of NCDOT, based on G.S. 20-146(e), to install "Slower Traffic Keep Right" (R4-3) regulatory signs, based on engineering judgement. The signs shall be located and erected according to the standards of the Manual on Uniform Traffic Control Devices(MUTCD), the North Carolina Supplement to the MUTCD, and the North Carolina Roadway Standard Drawings.

CRITERIA

Signs are restricted to multi-lane facilities with full control of access at locations where motorists tend to drive in the left lane(s) at less than the posted speed limit and impede the flow of traffic.

- Signs are not to be used on an approach to an interchange, through an interchange area, or in high volume urban areas where there is a capacity deficiency.
- Signs are not to be used on roadway facilities if there are other lane restrictions in place, on roadways under construction, or on facilities with poor roadway pavement conditions that affects the ride-ability of the travel lanes.
- Signs are to be installed on the median side of the highway and behind existing guardrail, when possible.

Signs are to be placed at three (3) to five (5) mile intervals.

- Signs shall conform to the attached NCDOT approved Standards

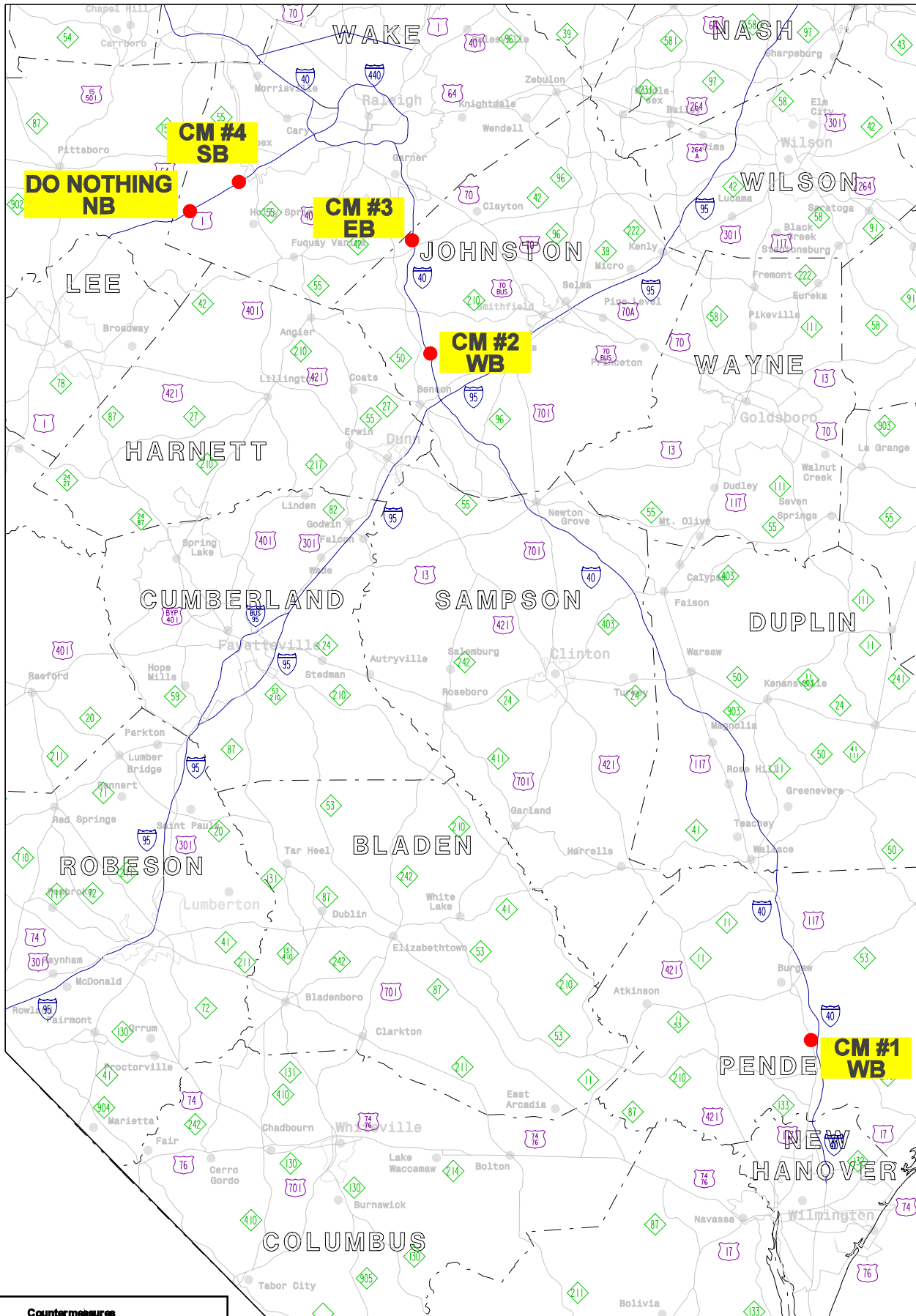
Note: For "Slower Traffic Keep Right" signing, pavement marking and other countermeasures see TEPL Topic K-1 (Keep Right Except to Pass)

G.S. 20-146. Drive on right side of highway; exceptions. (e)

Notwithstanding any other provisions of this section, when appropriate signs have been posted, it shall be unlawful for any person to operate a motor vehicle over and upon the inside lane, next to the median of any dual-lane highway at a speed less than the posted speed limit when the operation of said motor vehicle over and upon said inside lane shall impede the steady flow of traffic except when preparing for a left turn. "Appropriate signs" as used herein shall be construed as including "**Slower Traffic Keep Right**" or designations of similar import.

APPENDIX C

COUNTERMEASURE LOCATIONS

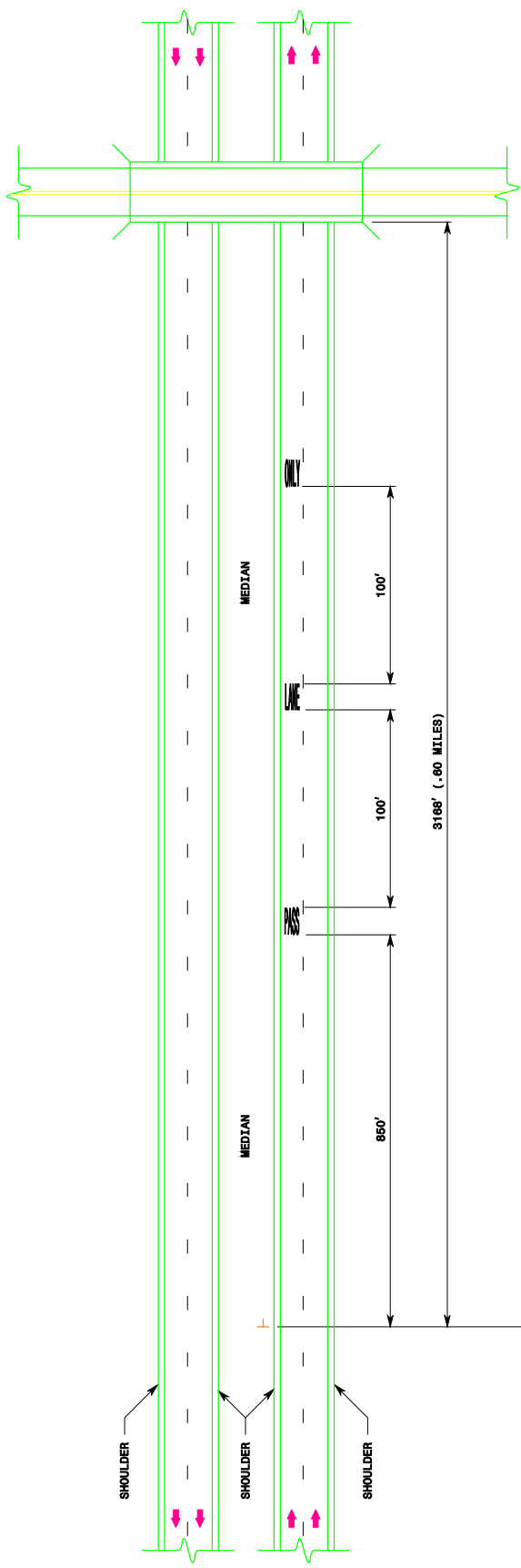


Countermeasures

1	Keep Right Except To Pass Signs
2	Slow Traffic Keep Right Signs and Pass Lane Only Pavement Markings
3	Slow Traffic Keep Right Signs
4	Keep Right Except To Pass Signs and Pass Lane Only Pavement Markings

APPENDIX D

PROJ. REFERENCE NO. SHEET NO.



SLOWER TRAFFIC KEEP RIGHT
 OR
 KEEP RIGHT EXCEPT TO PASS
 US 1 IN WAKE COUNTY
 I-40 IN JOHNSTON COUNTY

APPROVED: _____ DATE: _____

SEAL

REVISIONS	SCALE: NONE
	DATE: JAN. 2004
	DRAWN BY: DHB
	CHECKED BY: DHB
	APPROVED BY: CSB



APPENDIX E

Detailed Speed Data

CM Site	County	Location	Before / After	Date	Begin Time	End Time	Left Lane			Right Lane			Both Lanes		
							Obs	Avg Speed	85th Speed	Obs	Avg Speed	85th Speed	Obs	Avg Speed	85th Speed
1	Pender	I-40	Before	3/8/2004	11:10 AM	12:10 PM	84	75.0	78.5	115	71.5	76.6	199	73.0	77.6
1	Pender	I-40	Before	3/8/2004	12:10 PM	1:10 PM	75	75.5	79.4	103	71.3	75.7	178	73.0	77.6
1	Pender	I-40	Before	2/19/2004	9:50 AM	10:50 AM	83	75.1	79.2	110	71.2	75.1	193	72.9	76.6
1	Pender	I-40	Before	2/19/2004	11:50 AM	11:50 AM	48	74.6	77.6	83	71.7	75.9	131	72.8	76.7
1	Pender	I-40	After	2/1/2005	9:50 AM	10:50 AM	34	74.0	76.0	99	72.0	75.4	133	72.5	75.7
1	Pender	I-40	After	2/1/2005	10:50 AM	11:50 AM	21	74.5	76.7	85	71.8	75.6	279	72.8	77.2
1	Pender	I-40	After	3/7/2005	11:15 AM	12:15 PM	48	77.1	79.9	134	71.8	75.4	182	73.2	77.5
1	Pender	I-40	After	3/7/2005	12:15 PM	1:15 PM	67	76.1	80.0	136	72.3	76.2	203	73.6	77.9
2	Johnston	I-40	Before	2/23/2004	9:30 AM	10:30 AM	118	76.0	80.1	107	71.6	75.4	308	73.1	77.6
2	Johnston	I-40	Before	2/23/2004	10:30 AM	11:30 AM	82	75.7	78.8	128	72.0	76.5	312	72.4	77.1
2	Johnston	I-40	Before	3/10/2004	12:00 PM	1:00 PM	153	75.4	78.8	155	70.8	75.0	225	73.9	78.5
2	Johnston	I-40	Before	3/10/2004	1:00 PM	2:00 PM	138	74.9	78.7	174	70.3	74.6	210	73.5	77.8
2	Johnston	I-40	After	10/5/2004	10:12 AM	11:12 AM	107	75.4	79.2	226	71.3	75.5	333	72.6	77.2
2	Johnston	I-40	After	10/5/2004	11:12 AM	12:12 PM	81	76.2	79.3	182	71.2	75.2	263	72.8	77.2
2	Johnston	I-40	After	10/14/2004	12:01 PM	1:01 PM	92	76.3	79.6	193	72.1	76.0	285	73.5	77.7
2	Johnston	I-40	After	10/14/2004	1:01 PM	2:01 PM	100	74.8	77.9	179	71.8	76.4	279	72.8	77.2
3	Wake	I-40	Before	2/9/2004	10:25 AM	11:25 AM	111	75.0	77.9	158	69.8	74.5	269	72.0	76.8
3	Wake	I-40	Before	2/9/2004	12:25 PM	1:25 PM	106	74.9	78.6	137	70.8	75.3	243	72.6	76.7
3	Wake	I-40	Before	3/12/2004	11:45 AM	12:45 PM	206	74.0	77.7	199	70.2	74.3	405	72.1	76.6
3	Wake	I-40	Before	3/12/2004	12:45 PM	1:45 PM	277	74.1	77.8	267	69.9	74.1	544	72.0	76.4
3	Wake	I-40	After	2/8/2005	9:56 AM	10:56 AM	92	74.5	77.9	184	70.8	75.1	276	72.0	76.3
3	Wake	I-40	After	2/8/2005	10:56 AM	11:56 AM	89	75.0	77.9	195	70.2	75.3	284	71.7	76.3
3	Wake	I-40	After	2/18/2005	11:50 AM	12:50 PM	130	75.6	78.4	193	71.4	75.0	323	73.1	77.2
3	Wake	I-40	After	2/18/2005	12:50 PM	1:50 PM	132	74.4	78.1	202	70.2	73.9	334	71.8	76.2
4	Wake	US 1	Before	3/9/2004	11:30 AM	12:30 PM	63	72.1	74.9	97	68.5	72.9	144	69.7	73.6
4	Wake	US 1	Before	3/9/2004	12:30 PM	1:30 AM	74	72.2	75.6	107	68.9	72.8	159	70.6	75.1
4	Wake	US 1	Before	2/11/2004	9:35 AM	10:35 AM	48	72.7	76.5	96	68.1	71.8	160	69.9	74.0
4	Wake	US 1	Before	2/11/2004	10:35 AM	11:35 AM	64	72.5	76.4	95	69.3	72.3	181	70.3	74.4
4	Wake	US 1	After Sign	2/23/2005	9:35 AM	10:35 AM	49	73.2	76.3	116	68.4	72.4	165	69.9	74.2
4	Wake	US 1	After Sign	2/23/2005	10:35 AM	11:35 AM	35	72.9	78.8	126	68.3	72.2	161	69.3	73.4
4	Wake	US 1	After Sign	3/1/2005	11:45 AM	12:45 PM	43	72.3	75.5	131	68.6	72.7	174	69.5	73.6
4	Wake	US 1	After Sign	3/1/2005	12:45 PM	1:45 PM	50	72.0	75.6	131	67.5	71.7	181	68.8	73.7
4	Wake	US 1	After Sign & Pvmnt Mknng	5/18/2005	9:45 AM	10:45 AM	39	73.5	76.8	139	68.7	71.9	178	69.8	73.3
4	Wake	US 1	After Sign & Pvmnt Mknng	6/7/2005	11:45 AM	12:45 PM	35	72.1	75.8	133	68.1	71.8	168	69.0	73.2
4	Wake	US 1	After Sign & Pvmnt Mknng	6/7/2005	11:45 AM	12:45 PM	29	72.0	76.7	135	68.4	72.8	164	69.1	74.4
4	Wake	US 1	After Sign & Pvmnt Mknng	6/7/2005	12:45 PM	1:45 PM	46	70.7	74.0	118	68.4	72.3	164	69.1	73.0
5	Wake	US 1	Before	3/19/2004	9:45 AM	10:45 AM	80	72.5	75.4	108	68.1	72.1	188	70.0	73.8
5	Wake	US 1	Before	3/19/2004	10:45 AM	11:45 AM	77	71.6	77.3	111	67.8	71.9	188	69.4	73.7
5	Wake	US 1	Before	3/23/2004	12:00 PM	1:00 PM	61	71.7	75.3	107	68.0	72.4	168	69.3	73.5
5	Wake	US 1	Before	3/23/2004	1:00 PM	2:00 PM	66	71.9	77.4	104	68.6	71.5	170	70.3	74.6
5	Wake	US 1	After	2/4/2005	10:20 AM	11:20 AM	62	71.9	75.2	113	68.3	72.8	175	69.6	72.6
5	Wake	US 1	After	2/4/2005	11:20 AM	12:20 PM	68	71.5	74.9	138	71.6	71.8	206	69.1	73.2
5	Wake	US 1	After	2/22/2005	12:00 PM	1:00 PM	50	72.6	76.5	120	68.7	72.4	170	69.8	73.8
5	Wake	US 1	After	2/22/2005	1:00 PM	2:00 PM	47	73.1	77.0	110	68.5	73.4	157	69.9	74.7

APPENDIX F

Speed Data Adjusted By: Do Nothing Site Data

CM Site	County	Location	Before / After	Left Lane						Right Lane						Both Lanes										
				Cars	Trucks	% Trucks	Volume	Speed Obs	Avg Speed	85th Speed	Variance	Cars	Trucks	% Trucks	Volume	Speed Obs	Avg Speed	85th Speed	Variance	Cars	Trucks	% Trucks	Volume	Speed Obs	Avg Speed	85th Speed
1	Pender	I-40	Before	469	27	5%	496	290	75.1	78.5	20.8	1287	260	17%	1547	411	71.4	75.8	22.5	2043	1756	14%	701	72.9	77.1	25.1
1	Pender	I-40	After	373	23	6%	396	170	75.7	78.3	19.2	1195	219	15%	1414	454	72.2	75.9	20.6	1810	1568	13%	624	72.9	76.8	23.0
2	Johnston	I-40	Before	1225	96	7%	1321	491	75.4	79.1	19.2	1828	537	23%	2365	564	71.1	75.5	21.8	3686	3053	17%	1055	73.1	77.7	25.3
2	Johnston	I-40	After	1114	112	9%	1226	380	75.6	78.3	17.7	1869	566	23%	2435	780	71.8	76.0	22.6	3661	2983	17%	1160	72.7	77.1	24.5
3	Wake	I-40	Before	2744	135	5%	2879	700	74.3	77.9	16.8	2916	673	19%	3589	761	70.1	74.3	20.9	6468	5660	12%	1461	72.1	76.6	23.4
3	Wake	I-40	After	2473	103	4%	2576	443	74.9	77.6	12.8	2837	608	18%	3445	774	70.8	75.0	21.8	6021	5310	11%	1217	72.0	76.4	22.7
4	Wake	US 1	Before	344	46	12%	390	249	72.4	75.8	18.1	1042	405	28%	1447	395	68.7	72.5	17.2	1837	1386	45%	644	70.1	74.3	20.7
4	Wake	US 1	After Sign	302	54	15%	356	177	72.6	75.4	18.7	1097	354	24%	1451	504	68.4	72.6	20.7	1807	1399	40%	681	69.2	73.6	23.8
4	Wake	US 1	After Sign & Pmnt Mking	305	44	13%	349	149	72.0	75.4	21.6	1162	362	24%	1524	525	68.6	72.4	19.1	1873	1467	40%	674	69.1	73.2	21.8
5	Wake	US 1	Before	386	38	9%	424	284	72.2	76.2	24.2	1086	314	22%	1400	430	68.1	72.0	21.8	1824	1472	35%	714	69.7	73.8	26.7
5	Wake	US 1	After	384	27	7%	411	227	72.2	75.7	17.9	1116	245	18%	1361	481	68.3	72.2	20.9	1772	1500	27%	708	69.6	73.6	23.1

Adjustment Factors

- Left Lane Average Speed 1.00
- Left Lane 85th Percentile Speed 0.99
- Left Lane Average Speed 1.00
- Left Lane 85th Percentile Speed 1.00
- Both Lanes Average Speed 1.00
- Both Lanes 85th Percentile Speed 1.00