

# **Wrong Way Crashes**

## ***Statewide Study of Wrong Way Crashes on Freeways in North Carolina***

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**July 2006**



## **Executive Summary**

From October 2005 to March 2006, there were a total of five reported wrong way crashes in the Charlotte, North Carolina area that resulted in seven deaths. This seemingly abnormally high occurrence of wrong way crashes quickly raised the concerns of both state and local officials as well as others such as the media and the general public.

In an effort to determine the exact magnitude of the wrong way crashes in North Carolina and whether additional initiatives (enforcement, engineering, etc.) are needed/warranted to prevent future crashes of this type, the Traffic Engineering and Safety Systems Branch of the North Carolina Department of Transportation initiated a detailed analysis of wrong way crashes.

## **DATA/INVESTIGATION**

Crash analyses of data contained in the North Carolina crash database was performed for the years 2000 – 2005 for all freeway related wrong way crashes. As part of this statewide effort, a thorough data analyses and field investigations of all key issues were reviewed. Issues analyzed included but were not limited to crash data, interchange design, lighting, whether the interchanges were signalized, pavement markings and signage. The results of the analyses showed that although wrong way crashes are a rare event, that when they do occur, the results are normally more severe than most crashes occurring on our freeway system. Alcohol and/or drugs along with older drivers were found to be over represented in wrong way crashes. It was also speculated that lighting conditions could be a contributing factor to individuals entering the freeway in the wrong direction. However, data analyses showed that only about 1/3 of these crashes occurred during dark conditions (at night with no street lighting).

- From 2000 – 2005 there were 101,232 crashes on North Carolina freeways.
- 161 (0.16%) of these crashes were wrong way crashes.
- 34 of the 161 wrong way crashes were fatal crashes that resulted in 44 fatalities.
- In all freeway crashes, 2.5% result in a serious injury (class A) or fatality, while 60% of wrong way crashes on freeways involve a serious injury or fatality.
- Alcohol and/or drugs is over represented by 5 times in wrong way crashes. 43% of wrong way crashes involve alcohol as compared to only 8% of all freeway crashes.
- Alcohol and/or drugs were involved in 53% of fatal wrong way crashes as compared to 26% of all freeway crashes.
- Older drivers (age 65 and older) are over represented by 3 times in wrong way crashes. 17% of wrong way crashes on freeways involved an older driver as compared to just 5% of all freeway crashes.
- 63% of wrong way crashes occurred on lighted roads or during the day.

## **COUNTERMEASURES**

There are a host of potential countermeasures available to help deter or prevent wrong way type crashes. These countermeasures include devices such as embedded sensors, video and flashing lights along with spikes and other physical barriers. While other states have experimented with some of these countermeasures with varying degrees of effectiveness, the biggest deterrent to implementing most of the applicable countermeasures is the feasibility based upon the cost of the countermeasure in conjunction with the very small number of target crashes at a given location.

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Countermeasures to reduce or prevent these types of collisions are costly to install and maintain and have had mixed results. This coupled with the fact that these crashes (27 per year) are spread out over thousands of miles of freeways with no significant concentrations, makes selecting locations for potential countermeasures difficult at best.

There are several initiatives underway within the State that should help address some of the areas of concern identified by this analysis. For example, the Governor's task force on DWI recently completed their report and submitted a detailed list of recommendations to the Governor targeting ways to help combat the issue of drinking and driving. This bill, House Bill 1048, has just passed the legislature and will make significant changes to the identification, citation and adjudication of DWI cases. The North Carolina Executive for Highway Safety's Older Driver Working Group is in the final stages of completing a strategy for advanced signage at interchanges. This additional advanced signing should provide all motorist and especially older drivers with more time to successfully navigate into the proper lane as well as additional guidance as to which ramps to enter the freeway, depending on the desired direction of travel.

## **CONCLUSION**

The recent rash of wrong way crashes in the Charlotte area brought wrong way crashes to the forefront due mainly to the occurrence of these five crashes happening within the same proximity and within a relatively short time frame. Analysis of the past six years of crash data shows that while rare, these types of collisions have been reported through out the past six years of analyzed data and on average account for only two out of approximately 19,000 reported crashes each month. The rare occurrence of these crashes coupled with the often severe results usually means that a wrong way crash is brought to the public's attention via the media outlets, thereby making these crashes seem more prevalent than they really are.

Based upon the data analyses and the field investigations completed, we did not identify any cost effective engineering countermeasures to reduce these types of collisions. Due to the limited number of wrong way crashes that occur on an annual basis, there are no concentrations that would indicate a particular location as a potential candidate for countermeasures specifically targeting wrong way crashes. Furthermore, these countermeasures historically have had mixed results and are expensive, both in initial costs and long term operation/maintenance and therefore not feasible. Final review of all data by key safety partners including engineering and law enforcement, showed no deficiencies (from an engineering or law enforcement perspective) that could potentially be a contributing factor in these crashes. The data collected during this study suggest that a continued strong emphasis on reducing all alcohol related impaired driving could have significant and positive impacts on reducing the number of wrong way crashes on our freeways. Hopefully the programs that have been mentioned, once implemented will have an effect on reducing identified contributing factors and therefore the number of future wrong way crashes.

## **I. Background Information**

### **1.1 A Persistent Issue**

Nationally, driving the wrong way on freeways has been a persistent traffic safety concern since the interstate highway system was founded in the late 1950s. Despite many decades of highway striping and sign improvements at freeway interchanges, wrong way crashes continue to occur. While studies show that the vast majority of wrong-way drivers correct their mistakes before causing a crash by simply turning around and heading in the right direction, for unknown reasons some drivers, even when sober, head straight into oncoming traffic with devastating consequences. On average, according to data from the National Highway Traffic Safety Administration's Fatal Accident Reporting System (FARS), nationally about 350 people are killed annually in wrong way crashes.

### **1.2 Study Initiation**

From October 2005 to March 2006, there were five reported wrong way crashes in the Charlotte, North Carolina area that resulted in seven deaths. This abnormally high occurrence of wrong way crashes quickly raised the concerns of both state and local officials as well as others such as the media and the general public.

Due to the spike in the number of fatal and severe injury wrong way crashes in the Charlotte area, North Carolina Department of Transportation (NCDOT) Division Engineer, Barry Moose requested that the Traffic Engineering and Safety Systems Branch initiate a statewide study of wrong way crashes.

The purpose of the study is to:

1. Identify the magnitude of this crash type in North Carolina,
2. Identify common characteristics (if any) of these crashes,
3. Determine if there are clusters of these crashes and if so, conduct further investigations to determine if there are geometric or operational characteristics of the interchanges that may make a driver more susceptible to a driver entering the highway in the wrong direction and
4. Examine potential countermeasures for wrong way crashes.

This study only examines crashes on freeways (roads with full access control) within North Carolina during the last six full years of available data (2000 – 2005).

### **1.3 Summary: Charlotte Area Wrong Way Crashes**

According to various media accounts and law enforcement records, the following is a summary of the Charlotte area wrong way crashes:

- ◆ **October 22, 2005:** A male driver from Virginia was intoxicated and driving a Cadillac the wrong way on Interstate 40 near Statesville when he struck another vehicle head-on, killing 5-year-old girl.
- ◆ **November 18, 2005:** Authorities say a 35 year old male driver was intoxicated and going about 100 mph the wrong way on I-485 when he hit a car, killing an 18-year-old UNC Charlotte student.
- ◆ **December 1, 2005:** A 34 year old male driver from Chesterfield, S.C., was intoxicated and driving his pickup truck north in the southbound lane of I-85 when it smashed into a Dodge Neon driven by a 22 year old female from Greenville, S.C. Both drivers died at the scene.
- ◆ **February 18, 2006:** Two males, ages 22 and 23, were killed when their vehicle was hit by an 18-year old driver who police say was intoxicated and going the wrong way on I-485. The 18 year old male driver was seriously injured. He was charged with two counts of second-degree murder. His bail was set at \$500,000.
- ◆ **March 8, 2006:** A 31 year old male from Harrisburg died while traveling in the wrong direction on I-277 and hitting a tractor-trailer. He had a history of speeding and a DWI conviction. Later reports show that the driver was intoxicated at the time of the collision.

#### **1.4 Investigation: Charlotte Area Wrong Way Crashes**

After the third wrong way related crash occurred in the Charlotte area, officials from the NCDOT along with members of the North Carolina State Highway Patrol, NCSHP, met and investigated each of the three locations and surrounding interchanges where the fatal crashes had occurred. Rick Mason, Regional Traffic Engineer, and Tim Kirk, Assistant Division Traffic Engineer, with the NCDOT met with Captain Jones, Lieutenant Lassane, First Sergeant Malone and Master Trooper Huffstickler of the NCSHP and performed these investigations on January 11, 2006. As part of the investigation, the team examined all aspects from both an engineering and enforcement perspective to determine if there were any circumstances present that may have contributed to these collisions or the driver entering the interstate in the wrong direction. Similar investigations were performed for each of the last two collisions that occurred in February and March, along with night time investigations to look for deficiencies.

In addition to the initial investigations above, David Naylor, Division Traffic Engineer and his staff checked all of the interchange ramps on the interstate facilities in the Charlotte area looking for signs that were damaged, missing or in poor condition. Overall Mr. Naylor reported that all of the signs were in good condition.

The results of all of these investigations found all signage, pavement markings, lighting to be in place and operational according to NCDOT standards. The one common factor found in each of these collisions was “gross” intoxication of the driver at fault, with blood alcohol levels at two to three times the legal limit of 0.08.

On March 20, 2006 a meeting was held in Charlotte that included engineering representatives, local law enforcement, state law enforcement, Charlotte City Council members, North Carolina legislators, private citizens and others to discuss the recent rash of wrong way crashes in the Charlotte area and what if anything could/needed to be done. The results of the discussions were best summarized by state Senator Malcom Graham, D-Mecklenburg. "The engineering was right. The lighting was correct and appropriate. The signage was correct and appropriate. "The only thing that wasn't appropriate was the status of the driver."

## **II. Data Analysis**

In an effort to determine the magnitude of wrong way crashes in North Carolina, analyses of crash data contained in the North Carolina Crash Data base was performed for the last six years (2000 – 2005) of available data for freeway related crashes. The data was broken out into several categories and is discussed below.

### **2.1 Injury Data**

	<b>Freeway All Crashes (2000-2005)</b>					<b>Freeway Wrong Way Crashes (2000-2005)</b>				
	<b>Crashes</b>	<b>Fatals</b>	<b>A Inj.</b>	<b>B inj.</b>	<b>C Inj.</b>	<b>Crashes</b>	<b>Fatals</b>	<b>A Inj.</b>	<b>B Inj.</b>	<b>C Inj.</b>
<b>2000</b>	15,227	146	372	1,863	6,420	34	10	12	12	21
<b>2001</b>	14,118	113	282	1,587	5,930	18	4	2	8	9
<b>2002</b>	16,722	134	311	1,783	6,444	28	10	19	8	15
<b>2003</b>	18,741	119	266	1,829	6,772	32	2	1	10	14
<b>2004</b>	18,955	139	257	1,862	6,733	31	10	12	15	26
<b>2005</b>	17,469	138	240	1,839	6,116	19	8	5	5	8
	<b>101,232</b>	<b>789</b>	<b>1,728</b>	<b>10,763</b>	<b>38,415</b>	<b>162</b>	<b>44</b>	<b>51</b>	<b>58</b>	<b>93</b>

On average, wrong way crashes account for less than 0.2% of all freeway crashes, but account for over 5.6% of all fatalities on our freeways within North Carolina. In the past six years, there have been a total of 162 wrong way crashes, or roughly two per month in the state on our freeways. Thirty four (34) of these resulted in a fatal crash, killing a total of forty four (44) people. While these types of collisions are not very common, when they do occur, due to the nature of the collision, they typically result in more severe injuries than most freeway crashes. Nearly sixty percent (60%) of wrong way crashes on freeways involved a fatality or serious injury (A class injury) as compared to about two and a half percent (2.5%) for all freeway collisions.

From 2000 – 2005, all freeway crashes increased by over 14% while fatalities and injuries decreased by approximately 5% each. During this same time period, freeway wrong way crashes decreased by 44% while the number of fatalities decreased by 20% and injuries decreased by 60%. This decline can likely be contributed primarily to the sudden decrease in wrong way crashes during 2005.

Of the 162 wrong way crashes 65% occurred at night. The occurrence of wrong way crashes begin to rise at 9:00 p.m. and continue until about 6:00 a.m. with a peak (11%) during the during the 2:00 a.m. – 3:00 a.m. period. Weekends (Saturday and Sunday) accounted for 42% of wrong way crashes and mid-week (Tuesday-Thursday) accounted for another 40% of these crashes. The months of July (11.7%) and December (13%), possibly holiday travel, were the months with the highest number of wrong way crashes.

Of the total 162 wrong way crashes, there were 21 crashes (13%) that the officer was not able to identify the driver due to the wrong way driver reportedly causing the crash, but not being involved and leaving the scene.

## 2.2 Alcohol Data

As mentioned previously, alcohol was a factor in all of the recent wrong way crashes in Charlotte. Additional analysis was completed to determine how often alcohol is involved in these types of collisions on a state wide basis. This analysis shows that alcohol and/or drugs is over represented by 5 times in wrong way crashes. Alcohol involved crashes comprise approximately 8% of all crashes and 26% of fatal crashes statewide.

- ◆ 70 (43%) of the 162 wrong way crashes involved alcohol and/or drugs
- ◆ 18 (53%) of the 34 fatal crashes involved alcohol and/or drugs
- ◆ 25 (57%) of the 44 fatalities involved alcohol and/or drugs
- ◆ 70% of alcohol related crashes occurred on Saturday and Sunday
- ◆ 87% of alcohol related crashes occurred at night with 54% occurring between midnight and 4:00 am

## 2.3 Age Data

In an effort to determine if age is a factor in the wrong way crashes, driver information of the at fault vehicle was analyzed. More specifically, there was concern if older drivers (age 65 or older) may be over represented in freeway related wrong way crashes due to potential issues (signing, lighting, etc.) associated with entering the freeway in the proper direction. Older drivers in wrong way crashes are over represented by 3 times as compared to their involvement in all freeway crashes. The table below shows the break out of the age of drivers at fault in the freeway wrong way crashes.

Age	Freeway All Crashes		Freeway Wrong Way Crashes	
	Total	% Total	Total	% Total
< 21	10,594	7.9%	7	4.3%
21-64	95,472	71.1%	102	62.0%
> 64	6,714	5.0%	28	17.3%
Unknown	21,500	16.0%	25	15.4
	<b>134,280</b>	<b>100.0%</b>	<b>162</b>	<b>100.0%</b>



- ◆ 17% of wrong way crashes involve an older driver
- ◆ 5% of all freeway crashes involve an older driver

Of the 28 wrong way crashes involving an older driver:

- ◆ 21% resulted in a fatal crash,
- ◆ 75% of these were low injury or PDO only crashes,
- ◆ 75% of these occurred during daylight conditions,
- ◆ 25% occur on Tuesday and

## 2.4 Race Data

Due to the recent involvement of Hispanic drivers in the Charlotte area wrong way crashes, we were asked to review this data on a state wide basis. Therefore, the data for the wrong way crashes was further analyzed in regards to race of the driver at fault.

Race	Freeway All Crashes				Freeway Wrong Way Crashes			
	Total	% Total	Alcohol	% Alcohol	Total	% Total	Alcohol	% Alcohol
Asian	4,943	2.5%	45	0.9%	0	0.0%	0	0.0%
Black	52,473	26.9%	912	1.7%	25	17.7%	9	36.0%
Hispanic	16,715	8.6%	674	4.0%	21	14.9%	17	81.0%
White	116,128	59.5%	2,569	2.2%	93	66.0%	44	45.2%
Other	5,054	2.6%	74	1.5%	2	1.4%	0	0.0%
Unknown	---		---	---	21		---	---
	<b>195,313</b>		<b>4,274</b>	<b>2.2%</b>	<b>162</b>		<b>70</b>	<b>43.2%</b>

Both Hispanics and Whites appear to be over represented in wrong way crashes as compared to all freeway crashes, and alcohol was a factor for all three race groups represented in the wrong way crashes. The sample size for this data analysis is insufficient to make statistically sound inferences in regards to the involvement of Hispanic drivers. However, it does appear that they are over represented which is consistent with the findings of other groups such as El Pueblo.

## 2.5 Driver Familiarity

The questions was raised as to whether the drivers involved in the wrong way crashes were unfamiliar with the locations in which the crash occurred and if their lack of familiarity may have been a contributing circumstance to entering the freeway in the wrong direction. In an effort to make this determination, the city of the crash was compared to the address given for the driver at fault for crashes that occurred within the top nine counties (based upon total frequency of wrong way crashes).

The top nine counties accounted for 101 of the 162 total crashes. Of the 101 crashes, 38 of the drivers lived within the city that the crash occurred in, 43 were from a different city with an

average distance between the crash location and their reported address of 40 miles. Only six drivers were from out of state.

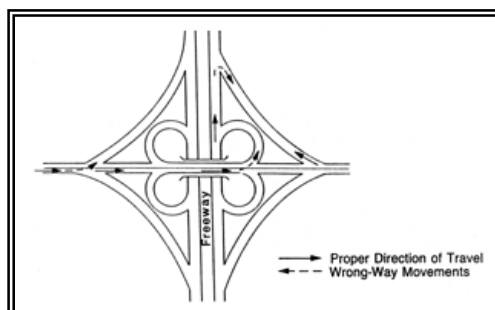
It is difficult at best to draw any conclusions from this data in regards to familiarity with the roads. Simply because a driver lives within the same city, does not mean that they are familiar with the particular road in which the crash occurred. Likewise, just because a driver lives elsewhere than the city where the crash occurred, does not mean that the driver was unfamiliar with the road. For example, the driver could travel frequently in and around the location where the crash occurred, but live somewhere else.

## 2.6 Interchange Design

In a 1989 Caltrans study, “*Prevention of Wrong-Way Accidents on Freeways*”, (Report No. FHWA/CA-TE-89-2) Joyce E. Copelan found that, similar to North Carolina’s data, driving under the influence of alcohol or drugs is by far the primary cause of wrong-way crashes. But she also examined the relationship between wrong-way movements and interchange designs and offered suggestions for interchange improvements. Below are the findings from the Caltrans report.

### Full Cloverleaf Interchange

This type of interchange is seldom a problem and is considered the most desirable as far as preventing wrong-way movements, especially if reflective markers and a double yellow stripe or other barrier is used on the over crossing bridge to keep motorists on the proper side.

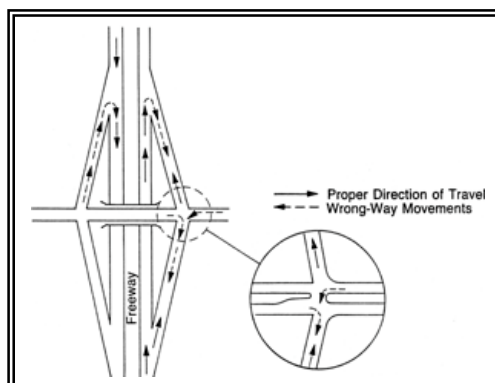


### The Two-Quadrant Cloverleaf

The two-quadrant cloverleaf, which developers prefer because it creates properties on the two opposite corners, is less desirable in terms of wrong-way movements. However, separating the on- and off-ramps can prevent movements, as can designing the orientation of the on-ramp for easy access; constructing a larger, better-lit opening for the on-ramp than the off-ramp; and constructing a curb nose between adjacent ramps.

### Full Diamond Interchange

This interchange, though considered a good design, presents some potential problems. Motorists occasionally mistake an off-ramp for a frontage road located parallel to the ramp, and drivers can mistakenly turn left from the over-crossing street on to the off-ramp. An island constructed to partially overlap the off-ramp can prevent this from happening. Proper guide signing and direction pavement arrows are important to direct motorists to the correct lane for left turns on the freeway. Pavement markers also can be installed to direct drivers to the on-ramp entrance



and, if space permits, a left turn lane may be provided.

### **Half-Diamond Interchanges**

Good signing is extremely important in this type of interchange. Wrong-way movements can occur if the guide signing does not clearly indicate a safe route for the driver to enter and exit the freeway.

### **North Carolina Results**

Copelan's findings differ from the results of North Carolina's data in regards to interchange design and operation. Over 200 separate interchanges were reviewed on various freeway routes within the top nine counties. The design type of these interchanges consisted of an equal mixture of full and partial diamond and full and partial cloverleaf designs. By contrast, two major Interstate facilities (I-40 and I-95) were further reviewed for interchange design type in the remaining counties not included in the top nine. Over 95% of the interchange design in these other counties were diamond interchanges. Since these counties, although similar in traffic volumes, experienced few if any wrong way collisions, one may conclude that the design of the full or partial cloverleaf interchange (and the challenges associated with successfully navigating it) may be a contributing cause to some of the wrong way crashes. These findings are consistent with a Washington State study<sup>1</sup> that determined that the most probable locations for wrong way entrances to freeways consisted of full or partial clover leaf interchange designs.

### **Missing Data**

During the statewide analysis, one potential key piece of data that was not available was information as to where the errant vehicle actually entered the freeway. On the present collision report form, there is no field for this and often the information is not known unless there are witnesses who actually see the vehicle enter the freeway or the errant driver is not fatally injured. Law enforcement dispatch systems possible capture some of this information, but it is not readily accessible for use in further analysis. There was discussions as to whether freeway entry information needs to be added to the present collision report form or captured in some other manner, but it was determined that due to the limited number of these types of crashes that occur each year, that these were not a feasible options.

## **2.7 Interchange Lighting**

With the onset of the recent rash of wrong way crashes in the Charlotte area, concerns were raised that lighting issues could be contributing to the problem of motorist entering the freeway in the wrong direction. A review of the 162 wrong way crashes on freeways in the state over the past six years, shows that these crashes occur at all times of the day, and are dispersed fairly evenly throughout a 24 hour period with a primary peak in the 12:00 a.m. – 4:00 a.m. period.

Sixty three percent (63%) of the wrong way crashes occurred during daylight conditions (35%) or on roads with streetlights (28%). Based upon these numbers, it is difficult at best to say that the lack of lighting is a contributing factor to motorist entering the freeways in the wrong direction.

### **III. Available Countermeasures**

There are a host of potential countermeasures available to help deter or prevent wrong way type crashes. While other states have experimented with some of these countermeasures with varying degrees of effectiveness, the biggest deterrent to implementing most of the applicable countermeasures is the feasibility based upon the cost of the countermeasure in conjunction with the very limited number of target crashes at a given location. Described below are some of the countermeasures that other states have experimented with or/utlized.

#### **3.1 Embedded Sensors, Video and Flashing Lights**

One potential countermeasure involves embedded sensors in the pavement that are connected to a video system and warning message signs<sup>1</sup>. When electromagnetic sensors embedded in the ramp pavement detect a wrong-way vehicle, the system performs three primary functions. First, two signs mounted on both sides of the exit ramp begin flashing an alternating red-yellow



*Electromagnetic sensors embedded in the pavement (the three dark squares) detect vehicles moving in the wrong direction.*



*When the sensors determine a vehicle is traveling the wrong way, the message sign illuminates a red "Wrong Way" message*

"Wrong Way" message for several minutes. At the same time, a closed-

circuit video camera and time-lapse VCR record the incident to help traffic engineers determine the cause of the wrong-way incident and develop measures to prevent future wrong-way crashes.

#### **3.2 Video Detection System and Flashing Lights**

The Traficon Video Detection system consists of a camera installed on a signal pole. When the video detector is activated, a signal is transmitted to the message sign, which flashes a wrong-way message to the driver while an attached VCR records the incident<sup>1</sup>.

Monitoring wrong way incidents with cameras and VCRs enables engineers to evaluate the effectiveness of the implemented countermeasures and compare results from various applications at different locations. This data can also potentially help determine whether the incidents are caused by driver error or interchange deficiencies, or a combination of both.

#### **3.3 Spikes and Other Barriers**

In past implementation in other states, spikes and other types of devices that physically prevent wrong-way entries onto freeways have been impractical and, in some cases, caused more

problems than they solved. Parking-lot spike barriers have been tested in California to determine if they could be used at off-ramps to stop wrong-way vehicles. As it turned out, spikes, even when modified with a fishhook shape, did not cause tires to deflate fast enough to prevent a vehicle from entering the freeway. Furthermore, the spikes broke in heavy traffic, leaving stubs that damaged the tires of right-way vehicles and some right-way drivers, upon seeing the spikes, jammed on their brakes, thus creating additional hazards.

In her 1989 Caltrans study, Copelan sent a questionnaire to chief traffic engineers in all 50 State DOTs to find out what each State is doing to reduce wrong-way crashes. She received replies from 40, and none supported using parking-lot spikes, barriers, raised curbs, or similar devices.

### **3.4 Sensor Video Information for Making Modifications**

Washington State DOT (WSDOT) is managing three projects to study wrong-way driver behavior and test various wrong-way countermeasures using Intelligent Transportation System technology<sup>1</sup>. At the I-82/Hwy. 22 interchange near Toppenish in south-central Washington, WSDOT has outfitted two exit ramps with sensors and digital video cameras. The system uses two 1.8-meter (6-foot) induction loops connected to a Reno S-Series loop detector to provide directional detection. From the detector a contact closure is connected to a Lanex RVC 2000 digital recorder, which serves as an incident log and recording center. The Lanex is a system designed for bank surveillance and continuously records video to a 30 gigabyte hard drive. Upon receiving a contact closure, the Lanex device enters a time stamp into its system log with the label "wrong way" and saves that portion of the hard drive from being rewritten. At the same time, the recording device increases recording speed from one frame every 2 seconds to two frames every second. This increased speed helps improve image quality for the next recorded minute. By having the device record before the incident, researchers can see the direction the vehicle is coming from and observe the driver's behavior. With this information traffic engineers hope to learn more about how and why drivers wind up heading into oncoming traffic.

## **IV. Conclusions & Recommendations**

The findings outlined above paint a fairly clear picture. In the overall scheme of traffic crashes and fatalities, wrong way type crashes comprise a very small percent of the overall crashes and fatalities within North Carolina on an annual basis. On average there are over 220,000 reported traffic crashes each year (27 wrong way) and more than 1,500 fatalities (7 wrong way). However, when these types of crashes do occur, the results are often devastating and the consequences result in a high proportion of deaths and serious injuries.

Countermeasures to reduce or prevent these types of collisions have had mixed results and are costly to install and maintain. This coupled with the fact that these crashes (27 per year) are spread out over thousands of miles of freeways with no significant concentrations, makes selecting locations for potential countermeasures difficult at best.

The recent rash of these type of collisions in the Charlotte area spurred detailed and in-depth reviews by all safety partners within the state including DOT officials and those from both local and state law enforcement agencies. The results of these investigations revealed that all issues from an engineering, enforcement, roadway, signing, etc. perspective were in place and up to

current policies and standards. The primary factor in these incidents (and over 40% of all statewide wrong way crashes) was alcohol. In fact, in the words of one state law enforcement official, the Charlotte area collisions involved “*Gross Inebriation*”.

#### **4.1 Alcohol Use**

Alcohol was involved in 43% of all wrong way crashes and in 53% of the fatal crashes, as well as in 100% of the crashes in the Charlotte area. The time has come for North Carolina to take a tougher stance on driving while impaired. In 2005, the Governor assembled a task force to look into the issue of drinking and driving. The Task force ultimately provided the Governor with a detailed list of recommendations that will hopefully have a significant impact on this problem in North Carolina once they are implemented. Some of the recommendations of the task force included:

##### **1) Reduce alcohol sales to people who are underage or intoxicated:**

- ◆ Require a permit from a local ABC board to purchase a beer keg, identifying the adult permit-holder who would be responsible for underage drinking.
- ◆ Increase routine compliance checks at stores and bars, with stepped-up focus on repeat violators.
- ◆ Improve training for the state's 350,000 clerks and bartenders who sell or serve alcohol, and expand the state driver's license ID verification program to reduce illegal sales.
- ◆ Give law enforcement officers greater access to private clubs that sell alcohol.

##### **2) Arrest more impaired drivers:**

- ◆ Increase sobriety checkpoints and saturation patrols.

##### **3) Increase pretrial driving restrictions for people charged with DWI:**

- ◆ Revoke the license until case is resolved in court, instead of the current maximum 30 days.
- ◆ Install an ignition interlock device immediately after arrest for DWI defendants who are younger than 21 or repeat offenders who refuse to take a blood-alcohol test or who register over 0.16. The device prevents a car from starting if it detects alcohol on the driver's breath.

##### **4) Close loopholes, provide more consistent court handling of DWI cases, and rewrite laws for some offenses:**

- ◆ Clarify the law allowing judges to convict any driver with an Intoxilyzer reading of .08 or greater.
- ◆ Automatically revoke for one year the license of any drunken driver who causes a crash.
- ◆ Create separate offenses for drunken drivers who injure someone and those who kill someone, and increase the punishment. Currently, a driver who kills someone while impaired can be charged with death by motor vehicle, which carries a likely sentence of 10 to 13 months.
- ◆ Create a new crime for driving after a license has been revoked for impaired driving.

- ◆ Require community service, assessment and treatment or education for any young person charged with underage drinking and driving. Eliminate the "prayer for judgment continued" option.
- ◆ Create an online data system that unites databases on how impaired drivers are charged, judged, punished and treated.
- ◆ Start an electronic citation system to decrease the time spent by arresting officers and court officials processing records for each DWI case.
- ◆ Add resources to let the State Bureau of Investigation labs process alcohol and drug tests more quickly.

On July 27, 2006, the North Carolina Legislature passed House Bill 1048, Governor's DWI Task Force Recommendations" which includes many of the listed items above along with others. This bill should make significant changes to the identification, citation and adjudication of DWI cases.

## **4.2 Hispanic Drivers**

Growing diversity within the North Carolina population is presenting new challenges to traffic safety professionals and other agencies that serve the public. One of the fastest growing demographic groups is the Hispanic population. Due to cultural and other differences, there are many challenges faced within the highway safety community to ensure that the Hispanic population is as safe as possible when traveling among our highways. According to safety leaders and the crash data, the major areas of concern include 1) Drinking and driving, 2) Speeding, 3) Seat belt use and 4) Child safety seat use. In reviewing the wrong way crash data, Hispanics were over represented in wrong way crashes; especially those involving alcohol.

There are currently several initiatives underway that hopefully will have a direct impact on educating the Hispanic community and assisting them in safely traveling on the highways within our state.

One of these initiatives is a program being conducted out of the Governor's Highway Safety Program (GHSP) office - *Nuestra Seguridad: The Hispanic Highway Safety Education Campaign*. The GHSP has partnered with the Latino non-profit El Pueblo to create *Nuestra Seguridad*, an initiative to reduce the disproportionate amount of highway safety and injuries among Hispanic drivers in North Carolina. The focus of the program is to increase awareness of driving laws and safety issues among Hispanics and it offers campaign staff for seminars regarding public safety issues to government, non-profit agencies and the community. The staff also distributes English and Spanish language materials at events and holds child safety seat installation clinics.

There are also many law enforcement agencies at both the local and state level who have created special units or divisions to address the safety concerns within the growing Hispanic community.

### **4.3 Interchange Design/Older Drivers**

From reviewing the statewide data, it is evident that the wrong way crashes are more prevalent on facilities that have partial or full cloverleaf interchanges. It would appear that for the general public, these interchanges can be more difficult to navigate due to a variety of reasons.

For the past three years, North Carolina has had in place an Executive Committee for Highway Safety (ECHS). The ECHS is comprised of representatives from top management of selected disciplines involved in highway safety who control the current and potentially available resources for utilization in safety efforts. The ECHS strives to identify, prioritize, promote and support all emphasis areas in the AASHTO Strategic Highway Safety Plan (SHSP) as well as emphasis areas not included in the AASHTO Plan for the coordinated North Carolina highway safety effort to save lives and reduce injuries.

One of the Working Groups of the ECHS that is focusing on older driver safety issues, is in the process of developing a strategy for advanced signing at interchanges. The advanced signing will provide drivers with additional warning as to the proper lane they need to be in to travel a given direction on the freeway. This additional advanced signing should provide all motorists and especially older drivers with more time to successfully navigate into the proper lane as well as additional guidance on which ramps to enter the freeway, depending on the desired direction of travel. These advanced signs will only be utilized at cloverleaf interchanges.

### **4.4 Final Thoughts**

The recent rash of wrong way crashes in the Charlotte area brought wrong way crashes to the forefront due mainly to the occurrence of these five crashes happening within the same proximity and within a relatively short time frame. Analysis of the past six years of crash data shows that while rare, these types of collisions have been reported through out the past six years of analyzed data and on average account for only two out of approximately 19,000 reported crashes each month. The rare occurrence of these crashes coupled with the often severe results usually means that a wrong way crash is brought to the public's attention via the media outlets, thereby making these crashes seem more prevalent than they really are.

Based upon the completed data analyses and the field investigations completed, there are no reliable or cost effective engineering countermeasures to reduce these types of collisions. Due to the limited number of wrong way crashes that occur on an annual basis, there are no concentrations that would indicate a particular location as a potential candidate for countermeasures specifically targeting wrong way crashes. Furthermore, these countermeasures historically have had mixed results and are expensive, both in initial costs and long term operation/maintenance and therefore not feasible. Final review of all data by key safety partners including engineering and law enforcement, showed no deficiencies (from an engineering or law enforcement perspective) that could potentially be a contributing factor in these crashes. The data collected during this study suggest that a continued strong emphasis on reducing all alcohol related impaired driving could have significant and positive impacts on reducing the number of wrong way crashes on our freeways. Hopefully the programs that have been mentioned, once



implemented will have an effect on reducing identified contributing factors and therefore the number of future wrong way crashes.

**REFERENCES:**

<sup>1</sup>“Stop. You're Going the Wrong Way”, Steve Moler, *Public Roads*, U.S. Department of Transportation Federal Highway Administration, September/October 2002