Nebraska Strategic Highway Safety Plan

Guidance for 2007-2011

Education • Enforcement • Engineering • EMS

March 2007

Nebraska Interagency Safety Committee

www.nhtsa.dot.gov nhtsa people saving people
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NDOR Nebraska Department of Roads
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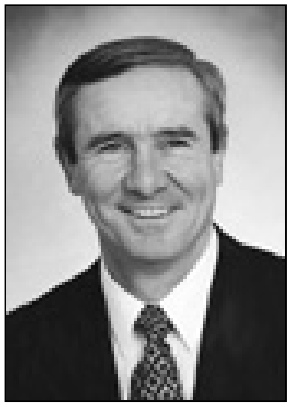

Dear Fellow Nebraskans:

In accordance with the provisions in the Safe, Accountable, Flexible, and Efficient Transportation Equity Act – A Legacy for Users (SAFETEA—LU), each state is required to develop and implement a strategic highway safety plan. On behalf of the Governor, I submit to you Nebraska's 2007-2011 Strategic Highway Safety Plan (SHSP).

This SHSP builds on the momentum of previous traffic safety collaborations in Nebraska. It cuts across the public and private sectors and all levels of government to reach for better results. The plan is data-driven, strategic and targeted, and it is designed to make significant progress towards Nebraska's goal of cutting fatal crashes by at least 80 per year by 2011.

I and the directors of the Department of Motor Vehicles, Department of Health and Human Services, the Superintendent of the Nebraska State Patrol, the Nebraska League of Municipalities and the Nebraska Association of County Officials invite you to join us in implementing the strategies outlined in the SHSP.

You may access the document at www.nebraskatransportation.org.

Remember, driving is dangerous. In fact, motor vehicle crashes are the leading cause of injury-related deaths in the state. Do not become complacent. Each of us is responsible for our own driving behavior.

Please drive safely.

John L. Craig
Director

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Executive Summary

Despite impressive improvements in highway traffic safety since the early 1970's (a 45% decrease in fatalities and a 50% decrease in fatality rate), traffic related deaths and injuries continue to impose a massive burden on the residents of Nebraska. Traffic crashes are one of the leading causes of death and the annual economic cost of the 35,000 crashes that occurred during 2005 is estimated at almost $1.7 billion dollars.

Traffic fatalities have fallen in Nebraska from a peak of 490 in 1970 to current levels of approximately 275 and over that same period of time road travel has increased by 80%. However, recent trends indicate that the rate of reduction in roadway related deaths and injuries has flattened and at the national level the number of fatalities has actually risen. This lack of progress in reducing the death toll on our Nation's highways led the American Association of State Highway and Traffic Officials (AASHTO) and the Federal Highway Administration (FHWA) to conclude that a new focus on and approach to traffic safety was necessary to address the documented increase in fatal and life changing injury crashes. Their vision for an improved safety planning and implementation process is contained in three key documents:

- AASHTO's Strategic Highway Safety Plan (SHSP)
- National Cooperative Highway Research Program Series 500 Reports (Guidance for Implementing AASHTO's Strategic Highway Safety Plan)
- FHWA's Strategic Highway Safety Plans: Guidance to Supplement SAFETEA-LU Requirements

These documents encourage states to develop their own Strategic Highway Safety plans based on six guiding principles:

1. Comprehensive—In order to be highly effective at reducing crashes, SHSPs need to be comprehensive in nature and include strategies that address education, enforcement, and emergency medical services, in addition to the more traditional engineering improvements (the Four Safety E's). The need to address safety in a comprehensive fashion is supported by a review of crash characteristics that found that the key contributing factor in over 60% of the serious crashes is driver behavior.

2. Systematic—A short list of safety strategies should be developed using a process that first identifies a universe of potential strategies and then screens the strategies so that the final prioritized list directly links the improvements to the key factors that are contributing to high numbers of serious crashes.

3. Integrated—Many state transportation departments have focused the implementation of engineering type improvements on the state highway system. The guiding principles suggest that to be more effective at reducing serious crashes, SHSPs need to be integrated across the state's entire system of roads and coordinated with all state and local agencies that address transportation safety issues. The need to address safety in an integrated fashion is supported by the crash characteristics that found 40 to 50% of serious crashes

occurred on local roads and that local roads in rural areas usually have the highest fatality rates.

4. Stakeholder Involved—Representatives of each element of the Four Safety E's should be involved in the process of developing and screening the safety strategies because they could be a key partner in implementing the strategies.

5. Data Driven—SHSPs need to be driven by crash data so that the recommended improvement strategies are directly linked to the factors contributing to high frequencies of fatal and disabling injury crashes. Being able to access reliable and accurate data will help increase the overall effectiveness of the SHSP by directing safety resources to those strategies that will prevent the most crashes at the locations with the greatest needs.

6. Proactive—Most recent safety plans have been primarily focused on reacting to locations identified as having unusually high crash frequencies. However, fatal and disabling crashes are often widely dispersed across the road system. Therefore, safety analyses that rely solely on crash frequency to select candidate locations for improvements have no guarantee of being able to predict which locations have a high probability of having a serious crash in the future. The most effective approach may include both a reactive component to deal with known locations with safety deficiencies and a proactive component to better address the random nature of serious crashes, especially those in rural areas.

In addition to these guiding principles, FHWA has asked the states to address three key objectives in their plans—first, set a safety goal; second, identify a short list of the highest priority safety strategies and finally, analyze your safety investment practices to determine the most effective way to achieve the adopted safety goal consistent with federal guidelines and state policies.

In response to the direction provided at the national level, the Nebraska Department of Roads along with their partners on the Nebraska Interagency Safety Committee have worked together to develop the Nebraska Strategic Highway Safety Plan in order to address the frequency, rate and factors contributing to fatal and disabling injury crashes in Nebraska. The Plan is intended to serve as a guide for accomplishing the identified goals – to provide a forum and process for engaging safety professionals in order to reduce the number of fatal and disabling injuries associated with traffic crashes in Nebraska. The Plan started with the guiding principles and then made adjustments based on Nebraska's crash characteristics and the input from a variety of safety partners at a workshop attended by approximately 90 safety professionals representing education, enforcement, engineering and emergency medical services.

The key results of the SHSP development process include:

- Nebraska has adopted a safety goal of reducing the statewide fatality rate by 38%, from a rate of 1.6 fatalities per 100 million vehicle miles of travel (VMT) in 2003 to a rate of 1.0 in 2011. Achieving this reduction in fatality rate would result in 80 lives saved per year compared to the number of traffic fatalities forecasted for 2011.
- Nebraska crash records were used to identify the areas that are emphasized in the Plan based on the number of related fatal crashes—the notion being that these emphasis areas represent the greatest opportunity for successfully reducing the number of severe crashes.

The Interagency Safety Committee then undertook a screening process that ultimately resulted in the selection of five areas of focus – the Critical Emphasis Areas (CEAs) – for the Plan:

1. Increasing Safety Belt Usage
2. Keeping Vehicles on the Roadway, Minimizing the Consequences of Leaving the Road, & Reducing Head-On and Across-Median Crashes
3. Reducing Impaired Driving
4. Improving the Design and Operation of Highway Intersections
5. Addressing the Over Involvement of Young Drivers

- The selection of the five CEAs focused the vision of the Plan from an initial universe of more than 500 alternative safety strategies to approximately 160 strategies that are directly related to the factors contributing to severe crashes in Nebraska. This reduced set of strategies was then further screened by the safety partners to a list of 20 Critical Strategies addressing the Four Safety E's. A summary of these Critical Strategies is illustrated in **Figure ES.1**.
- Most of the Critical Strategies dealing with engineering and emergency services can be implemented almost immediately, with cooperation of the responsible agency and the allocation of the necessary financial resources. However, several strategies dealing with enforcement and young drivers (a primary safety belt law, automated enforcement and a more comprehensive Graduated Drivers License program) would require new legislation before they could be implemented.
- The last step in the SHSP development process involved analyzing alternative safety investment options. The process for screening the safety strategies narrowed the focus of the Plan from hundreds of potential strategies to the twenty highest priority strategies. However, even after this prioritization there are still thousands of possible ways to invest safety dollars in different combinations of strategies. The analysis of alternative safety investment scenarios, using a specially developed spread sheet tool, identified six key characteristics that are associated with the most effective investment of safety dollars and therefore most likely to result in Nebraska achieving the adopted safety goal. Nebraska's six keys to safety investment include:

  1. Invest in all four Safety E's.
  2. Focus the safety investment in the few strategies that are associated with the largest pool of fatal and disabling injury crashes.
  3. Invest heavily in strategies that have proven to produce crash reductions, have relatively high safety effectiveness ratios, are relatively low cost and therefore can be widely deployed across Nebraska's entire system of highways.
  4. Find a balance between the traditional reactive approach to safety and a proactive approach that is expected to be more effective at addressing the few widely distributed serious crashes that are over represented in rural areas.
  5. Develop a method to direct safety resources to local road systems, which account for almost 40% of the fatal crashes in Nebraska.
  6. The enforcement and young driver strategies that require new legislation are linked to large pools of severe crashes that are susceptible to correction, have low to moderate

deployment costs and relatively high effectiveness ratios. As a result, the addition of these strategies to an overall safety plan would significantly increase Nebraska's ability to meet the adopted safety goal.

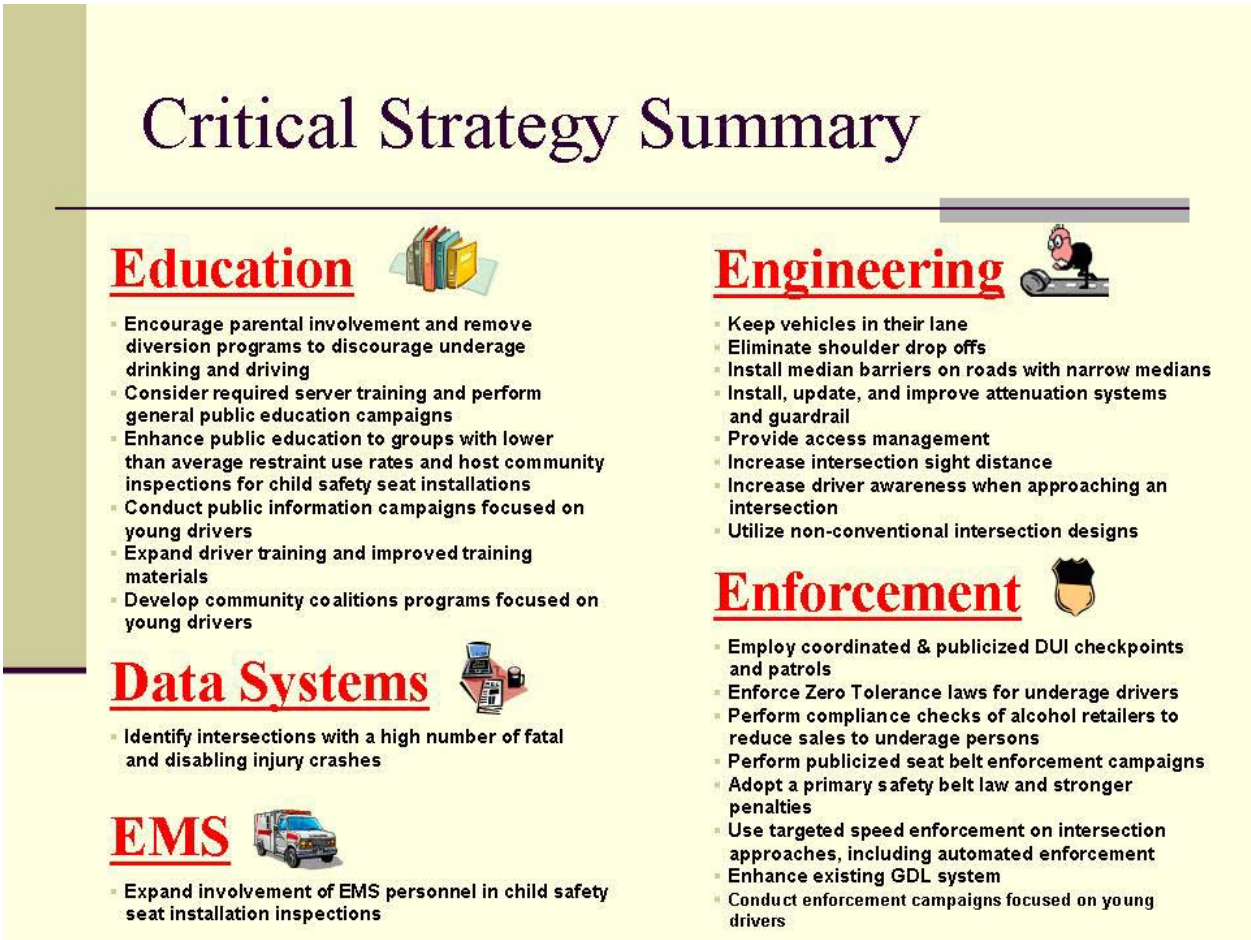


FIGURE ES.1
Summary of Nebraska's Critical Strategies
Note: Several Critical Strategies had multiple components and addressed more than one of the Four Safety E's. The strategies are based on material and guidance in the NCHRP Report 500 series, were prioritized by Safety Partners at a workshop on May 16, 2006 and with concurrence by the Nebraska Interagency Safety Committee.

It should be noted that additional investments to improve data systems was not identified as being highly effective at reducing severe crashes. It appears that this is likely a function of the lack of research results at the national level as opposed to providing a true picture of the actual value of good data. In fact, traffic safety professionals in Nebraska consider improving the crash data system to be a high priority. Without accurate data, both from the perspective of crash location and integrated across a variety of state agencies, the task of identifying crash prone locations and linking causative factors to mitigation strategies becomes far too speculative. As a result, Nebraska chooses to include improvements to data systems as a key part of the SHSP and will continue to make the necessary investment of safety dollars in order to support the development of a crash records system that is highly accurate and integrated across the State's safety agencies.

Finally, the greatest challenge facing traffic safety professionals in Nebraska is the need to acknowledge that the effort to reduce fatal and life changing injuries is tied to implementing a new, more effective safety program that is different than what has been done in the past. The previous program is associated with a trend line for highway traffic fatalities that is increasing. The analysis of safety investment options proves that Nebraska can achieve the adopted safety goal of reducing the fatal crash rate to the national goal of 1.0, a 38% reduction. However, doing so will require doing things differently than what has been the practice in recent years. This includes investing in additional enforcement, education and emergency services, being more proactive, engaging the legislature to improve laws dealing with safety belts, electronic enforcement and young drivers, and focusing safety investments to the small subset of low cost strategies that are linked to large pools of severe crashes and that can be widely deployed across Nebraska.

1. Introduction and Background

1.1 Highway Safety Trends at the National Level and in Nebraska

From a peak in the 1970s, there have been significant reductions in the number of traffic-related fatalities in the U.S. Nebraska has experienced a decrease in the number of traffic fatalities similar to the national trend as illustrated in **Figure 1.1** (*1,2*). After significant decreases up until the early 1980s, the number of traffic fatalities in Nebraska leveled off, with a slight upward trend in recent years. As indicated by the regression line in **Figure 1.1**, traffic fatalities in Nebraska are growing at an average rate of seven traffic fatalities every ten years.

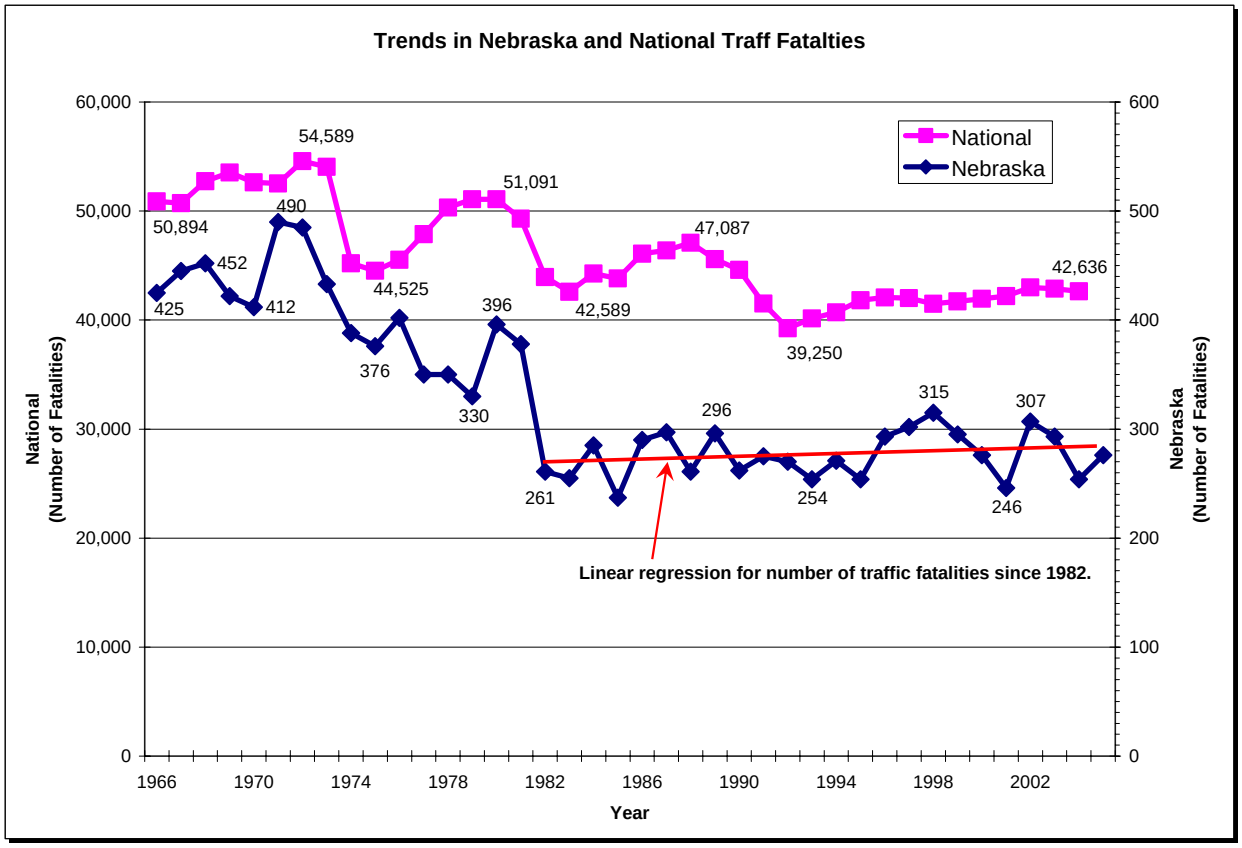


FIGURE 1.1
Historic Number of Traffic Fatalities

One reason the number of fatalities has been slightly increasing over the past 25 years is because the number of vehicles miles traveled (VMT) in Nebraska has increased steadily during the same time period; from 11.4 billion VMT in 1982, a 65% growth to 18.9 billion VMT in 2005. This trend is expected to continue and suggests the need to develop and implement more effective strategies if the goal of reducing the number of fatal and life-changing injury crashes is to be achieved.

When inspecting the trends in the fatality rates in **Figure 1.2** (*1,2*), the national trend indicates a sharp decrease up until the early 1990's, which has since been followed by a much slower decreasing trend. The trend in Nebraska has closely mirrored what has been occurring for the U.S. Given this trend, Nebraska's fatality rate would ultimately match the national safety goal of 1.0 fatalities per hundred million vehicle miles traveled at about 2015, because of the growth in VMT, not because of a decrease in the number of traffic fatalities.

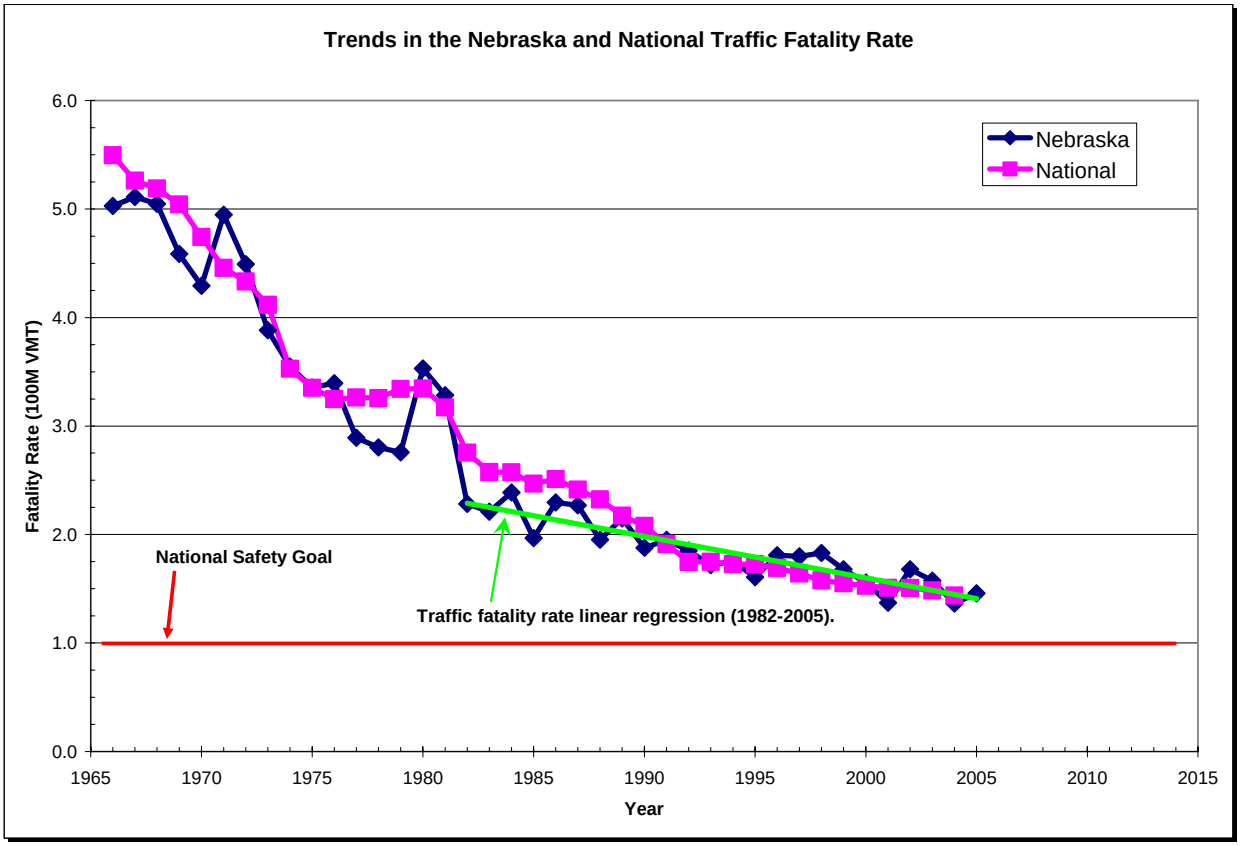


FIGURE 1.2
Historic Fatality Crash Rate

1.2 Recent National Guidance on Highway Safety

The more recent trends in fatal crash statistics, such as an overall increase in the number of fatal crashes and a relatively flat fatality rate, have led the American Association of State Highway and Transportation Officials (AASHTO) and the Federal Highway Administration (FHWA) to conclude that a new focus on and approach to traffic safety is necessary to address the increases in fatal and injury crashes. Their vision for a new process is documented in the AASHTO *Strategic Highway Safety Plan* (*3*) and the *National Cooperative Highway Research Program Report 501: Integrated Safety Management Process* (*4*). In addition, the recently passed Federal transportation reauthorization bill (SAFETEA-LU) requires State Transportation Agencies to update their safety plans and the FHWA's Guidance (*5*) basically adopts the recommended safety process outlined in the AASHTO and NCHRP reports. This process is integrated with

the efforts of other agencies and organizations working to improve traffic safety and focuses on addressing fatal crashes on all levels of roadways; not just the Interstate and state highway system. Agencies are also encouraged to use a data driven approach to focus efforts on target areas where the greatest number of fatalities occur and therefore maximizing the allocation of limited resources to prevent severe crashes. This concept is illustrated by FHWA's decision to target resources in the following safety focus areas: roadway departures, intersections, and pedestrians (*6*). Finally, a state Strategic Highway Safety Plan (SHSP) is intended to be a guide for investing in safety strategies in order to be more effective at reducing traffic fatalities and serious injuries.

In addition to requiring a State to prepare a SHSP, SAFETEA-LU also established the Safe Routes to School (SRTS) program. This is a $612 million program that creates a statewide program in each state, including a full-time coordinator. The SRTS program is intended to encourage children to walk or bike to school, and fosters this by ensuring that programs and projects are in place to make the trip as safe as possible. Improving safety for children will include traditional pedestrian engineering improvements, but public education and community outreach are expected to be an important component. A successful program will not only have the benefit of improving children's health by increasing their activity, but it will also help reduce traffic which will reduce fuel consumption, air pollution, and possibly even improve traffic safety.

In response to the direction provided at the national level, the Nebraska Department of Roads along with numerous other Safety Partners are working together to develop the Nebraska Strategic Highway Safety Plan in order to address the frequency, rate and primary factors contributing to fatal and disabling injury crashes in Nebraska.

1.3 Previous Highway Safety Efforts Completed by Nebraska

1.3.1 Formation of the Nebraska Interagency Safety Committee

To help move Nebraska towards reducing traffic fatalities and serious injuries, a multi-agency committee has been formed, called the Nebraska Interagency Safety Committee. The Interagency Safety Committee had its initial meeting on October, 2004. The committee involves state, local and federal agencies with an interest in Nebraska's road safety programs. There are two parts to the Nebraska Interagency Safety Committee. The first is the Leadership Committee which can meet on a quarterly basis and will sponsor and oversee the general direction of the Nebraska SHSP. The Leadership Committee is currently comprised of directors from:

- Nebraska Department of Roads
- Nebraska Department of Motor Vehicles / Office of Highway Safety
- Nebraska Department of Health and Human Services
- Nebraska State Patrol
- Nebraska Association of County Officials
- Nebraska League of Municipalities

The second component of the Nebraska Interagency Safety Committee is the Working Committee. The Working Committee meets monthly to give guidance to the development of the Plan and help with making decisions on technical issues. The members of the Working Committee are currently:

- Nebraska Department of Roads
- Nebraska Department of Motor Vehicles / Office of Highway Safety
- Nebraska Department of Health and Human Services, EMS / Trauma
- Nebraska State Patrol
- American Traffic Safety Services Association
- Federal Highway Administration (federal advisor)
- National Highway Traffic Safety Administration (federal advisor)
- Federal Motor Carrier Safety Administration (federal advisor)

The role of the Interagency Safety Committee in development of the Nebraska SHSP is to provide guidance, final approval of the document and help gain consensus at a high level among the many local, state and federal agencies with a stake in traffic safety. The Interagency Safety Committee will also play an important role to see that the recommendations in the Plan are implemented and that programs are evaluated and adjusted as needed.

1.3.2 Preliminary Identification of the Critical Emphasis Areas

The national plan to improve roadway safety is based on AASHTO's SHSP which identifies 22 key emphasis areas that broadly address the Four Safety E's – Education, Enforcement, Engineering and Emergency Medical Services (EMS). Each emphasis area targets a specific set of factors that contribute to a significant number of deaths on the nation's highways and also includes general strategies for reducing these fatalities. The 22 emphasis areas are grouped into the six parts (Drivers, Special Users, Vehicles, Highways, Emergency Medical Services, and Management) and are listed in **Table 1.1**.

To help a state focus its highway safety efforts in areas where they can be the most effective, a widely accepted approach is to identify the emphasis areas where there is a relatively high number of fatalities and / or disabling injuries. These select emphasis areas are referred to as Critical Emphasis Areas (CEAs).

In early meetings of the Working Committee, nine possible CEAs were identified. The nine emphasis areas being considered included:

1. Reducing Over Involvement of Young Drivers
2. Curbing Speeding
3. Reducing Impaired Driving
4. Increasing Safety Belt Usage
5. Making Truck Travel Safer
6. Keeping Vehicles on the Roadway
7. Improving the Design and Operation of Highway Intersections
8. Designing Safer Work Zones
9. Traffic Records

The Working Committee then prepared a summary of fatal, disabling injury and visible injury crashes (2002-2004) to gain a better understanding of the magnitude of the problem in each emphasis area (see **Table 1.2**).

TABLE 1.1
AASHTO's 22 Emphasis Areas

	Emphasis Areas
Part 1: Drivers	Instituting Graduated Licensing for Young Drivers
	Ensuring Drivers are Licensed and Fully Competent
	Sustaining Proficiency in Older Drivers
	Curbing Aggressive Driving
	Reducing Impaired Driving
	Keeping Drivers Alert
	Increasing Driver Safety Awareness
	Increasing Safety (Seat) Belt Usage and Improving Airbag Effectiveness
Part 2: Special Users	Making Walking and Street Crossing Safer
	Ensuring Safer Bicycle Travel
Part 3: Vehicles	Improving Motorcycle Safety and Increasing Motorcycle Awareness
	Making Truck Travel Safer
	Increasing Safety Enhancements in Vehicles
Part 4: Highways	Reducing Vehicle-Train Crashes
	Keeping Vehicles on the Roadway
	Minimizing the Consequences of Leaving the Road
	Improving the Design and Operation of Highway Intersections
	Reducing Head-On and Across-Median Crashes
	Designing Safer Work Zones
Part 5: EMS	Enhancing Emergency Medical Capabilities to Increase Survivability
Part 6: Management	Improving Information and Decision Support Systems
	Creating More Effective Processes and Safety Management Systems

Source: AASHTO Strategic Highway Safety Plan

Based on the results of the crash summary, the five CEAs below were identified for further consideration at the Critical Strategies Workshop on May 16, 2006. A later task during the development of the SHSP was to verify the selection of the CEAs. For more information about the final selection of the CEAs, refer to **Chapter 2**.

1. Reducing Impaired Driving
2. Reducing Over Involvement of Young Drivers
3. Increasing Safety Belt Usage
4. Improving the Design and Operation of Highway Intersections
5. Keeping Vehicles on the Roadway

1.4 Nebraska Crash Records System

The Department of Roads maintains a sophisticated crash data system, which collects, categorizes, and analyzes crashes on all roads in Nebraska. This system was revised in 2002 to correspond with many of the data elements described in the Model Minimum Uniform Crash Criteria. Data from this system is used to identify safety problems, including those defined in the state's Highway Safety Plan and Highway Safety Improvement Program. In addition, crash

data from this system is integrated into the Motor Carrier Management Information System and Nebraska's Crash Outcomes Data Evaluation System.

Nebraska has maintained a Traffic Records Coordinating Committee (TRCC) since 1995 which identifies and champions traffic records improvements. Many major improvements have been made during this time span and others are planned. The TRCC develops a Strategic Plan for Traffic Records which is updated annually. A Traffic Records Assessment was completed in August 2006. Future plans for improving the crash records system include allowing for the electronic submittal of accident reports and making crash data easily available through the web.

One of the recent improvements to the crash records system was a new Hazardous Location Analysis tool. This system allows for the identification of high accident intersections, sections, and clusters on the state highway system. Crash rate by type and volume of roadway, accident frequency, and crash severity are all used in the formula to identify significant locations. Although local roads are excluded from this process because of a lack of traffic volume data, these roads are not ignored. They are analyzed using a different, although more cumbersome procedure. Local road crash data were studied from all 93 Nebraska counties for the initial High Risk Rural Roads program analysis.

TABLE 1.2
AASHTO's 22 Emphasis Areas

Potential Critical Emphasis Area	Related Crashes*		
	2002	2003	2004
Reducing Over Involvement of Young Drivers	2,672	2,486	2,253
Curbing Speeding	656	622	605
Reducing Impaired Driving	820	781	748
Increasing Safety Belt Usage	2,497	2,172	1,894
Making Truck Travel Safer	387	392	381
Keeping Vehicles on the Roadway	2,210	2,193	2,067
Improving the Design and Operation of Highway Intersections	3,797	3,655	3,447
Designing Safer Work Zones	174	172	168
Traffic Records	-- Not Applicable --		

* All figures are fatal, disabling and visible injury crashes, with the exception of Increasing Safety Belt Usage, which is fatal, disabling and visible injuries to unbelted passengers.

Source: Nebraska Interagency Safety Committee – Working Committee

2. Selection of a Safety Goal and Confirmation of the Critical Emphasis Areas

2.1 Identification of a Statewide Safety Goal

One of the first steps in the development of a SHSP is to establish a statewide safety goal. The national highway safety goal is to reduce by 33% the national fatality rate from 1.5 fatalities per 100 million vehicle miles [MVM] in 2003 to 1.0 fatalities per 100 MVM by 2008 (see **Figure 2.1**). Achieving this goal is expected to reduce the annual traffic fatalities by 5,000 to 7,000 (*3*). A necessary part of this goal to reduce the national fatality rate is that each individual state does its part to help.

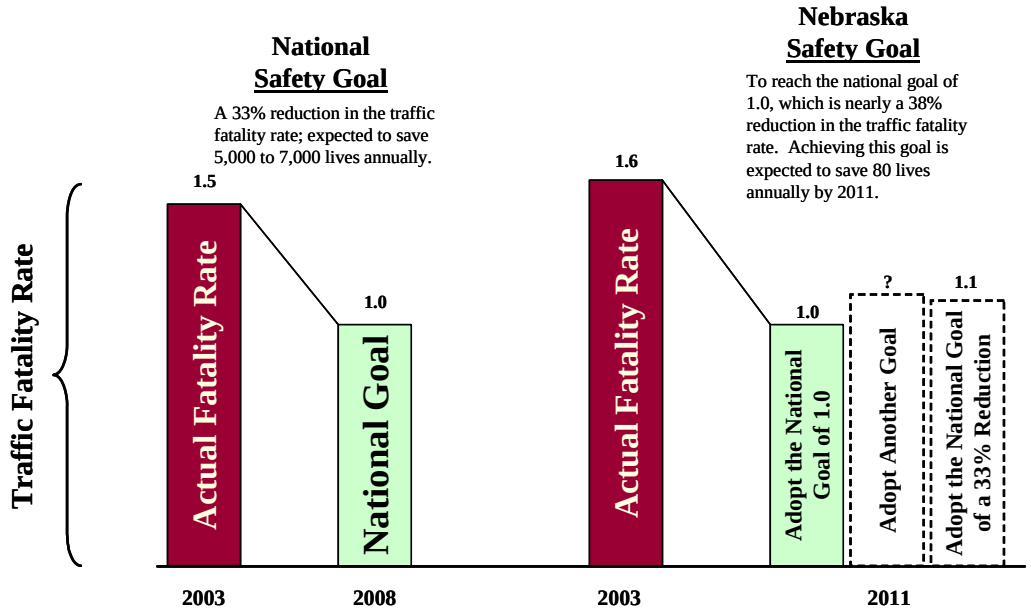


FIGURE 2.1
National and Nebraska Traffic Safety Goals

For Nebraska, a variety of alternative safety goals could have been adopted by the Interagency Safety Committee. Example safety goals may include (also illustrated in **Figure 2.1)**:

- Reduce Nebraska's fatality rate to 1.0 fatality per 100 MVM by 2011. With this goal, the State would expect annual traffic fatalities to decrease from 275 (2000-2004 average) to approximately 210 or fewer per year by 2011.
- Reduce Nebraska's fatality rate by 33%, consistent with the national goal. With this goal, the State would expect the fatality rate to decrease from 1.6 in 2003 to 1.07 by 2011, which would mean the annual traffic fatalities would decrease from approximately 275 to 225.

NOTE: An x% reduction in the traffic fatality rate between 2003 and 2011 does not translate into an equal percent reduction in the number of fatalities since the State's VMT has grown steadily at a rate of 340 MVM per year (Source for VMT Forecast: Traffic Analysis Unit, Planning & Project Development Division, NDOR. Based on VMT data from 1980-2005).

- Adopt an absolute reduction in the number of traffic fatalities (i.e., 200 or fewer traffic fatalities per year by 2011).

At a 2006 meeting of the Interagency Safety Committee, the alternatives were considered and the Leadership Committee adopted the national goal for Nebraska's statewide safety goal. Therefore, Nebraska's safety goal for the SHSP is to **reduce the State's traffic fatality rate from 1.6 fatalities per 100 MVM in 2003 to 1.0 fatalities per 100 MVM by 2011**. Based on the trend of increasing number of traffic fatalities in Nebraska, 290 traffic fatalities are expected in 2011. However, reversing the trend to achieve the goal would reduce traffic fatalities to approximately 210 and save approximately 80 lives each year in Nebraska.

2.2 Review of Statewide Fatal Crash Data by AASHTO's 22 Emphasis Areas

As referenced in **Chapter 1**, Nebraska used AASHTO's 22 emphasis areas as the building blocks for this Plan. This included an evaluation of fatal, disabling injury and visible injury crashes.

The second task in the SHSP development process involved reviewing the most current summary of Nebraska's fatal crashes (2000-2004) associated with the 22 emphasis areas (see **Table 2.1** and **Figure 2.2**) to reevaluate the initial selection of the CEAs. As seen in the fatal crash summary, the ten categories with the highest number of fatal crashes include:

1. Unrestrained vehicle occupants (59%)
2. Run-off the road crashes (41%)
3. Alcohol-related crashes (37%)
4. Intersection crashes (33%)
5. Involved a driver under 21 (26%)
6. Heavy vehicles (25%)
7. Involved a driver over 64 (19%)
8. Head-on and across median (12%)
9. Aggressive drivers (12%)
10. Pedestrian (5%)

2.3 Final Confirmation of the CEAs

Following the review of Nebraska's fatal crash records, the Interagency Safety Committee met to discuss the selection of the CEAs. The breakdown of the fatal crash information showed that the original CEAs (see **Section 1.3.2**) still identified the top five categories based on the number of traffic fatalities. Since the original recommendation for CEAs did cover the top emphasis areas, the Interagency Safety Committee elected to stay with the original selection for Nebraska's CEAs. The only modification to the CEAs is that "Keeping Vehicles on the Road" will be expanded from run-off-road crashes to include all facets of lane departure crashes (i.e., adding "Minimizing the Consequences of Leaving the Road" and "Reducing Head-on and Across-Median Crashes"). Therefore, the selected CEAs for the Nebraska SHSP are:

1. **Increasing Safety Belt Usage**
2. **Keeping Vehicles on the Roadway, Minimizing the Consequences of Leaving the Road, & Reducing Head-On and Across-Median Crashes**
3. **Reducing Impaired Driving**
4. **Improving the Design and Operation of Highway Intersections**
5. **Addressing the Over Involvement of Young Drivers**

TABLE 2.1
Summary of Nebraska's 2000-2004 Fatal Crashes by Emphasis Area

	Emphasis Area	Nebraska Fatal Crashes*	Percent
Part 1: Drivers	Instituting Graduated Licensing for Young Drivers	352 fatalities involved a driver under the age of 21	26%
	Ensuring Drivers are Licensed and Fully Competent	-- Not Available --	
	Sustaining Proficiency in Older Drivers	260 fatalities involved a driver over the age of 64	19%
	Curbing Aggressive Driving	164 fatalities listed speeding or reckless action as a contributing factor	12%
	Reducing Impaired Driving	501 fatalities were alcohol related	37%
	Keeping Drivers Alert	48 fatalities involved an inattentive driver	4%
	Increasing Driver Safety Awareness	-- Not Available --	
	Increasing Safety (Seat) Belt Usage and Improving Airbag Effectiveness	707 vehicle occupant fatalities (out of 1,204 vehicle occupant fatalities) were not using a restraint device	59%
Part 2: Special Users	Making Walking and Street Crossing Safer	65 pedestrian fatalities	5%
	Ensuring Safer Bicycle Travel	12 bicyclists fatalities	1%
Part 3: Vehicles	Improving Motorcycle Safety and Increasing Motorcycle Awareness	69 motorcyclists fatalities	5%
	Making Truck Travel Safer	345 fatalities involving heavy trucks	25%
	Increasing Safety Enhancements in Vehicles	-- Not Available --	
Part 4: Highways	Reducing Vehicle-Train Crashes	31 fatalities involving a collision with a train	2%
	Keeping Vehicles on the Roadway	558 single vehicle run-off the road fatalities	41%
	Minimizing the Consequences of Leaving the Road	Top 4 fatal run -off the road collisions: - Overturn - Collision with a ditch - Collision with a tree - Collision with an embankment	
	Improving the Design and Operation of Highway Intersections	455 fatalities at an intersection	33%
	Reducing Head-On and Across-Median Crashes	167 head-on and across-median fatalities	12%
	Designing Safer Work Zones	35 work zone fatalities	3%
Part 5: EMS	Enhancing Emergency Medical Capabilities to Increase Survivability	In 2004, the average response time (time of crash to arrival hospital) was 44.7 minutes for 182 rural fatal crashes. For 47 urban fatal crashes, the average response time was 26.9 minutes	
Part 6: Manage-ment	Improving Information and Decision Support Systems	-- Not Available --	
	Creating More Effective Processes and Safety Management Systems	-- Not Available --	

* Source: Nebraska Crash Database (2000 – 2004)

NOTE: Between 2000 and 2004, there were 1,212 fatal crashes and 1,371 traffic fatalities in Nebraska.

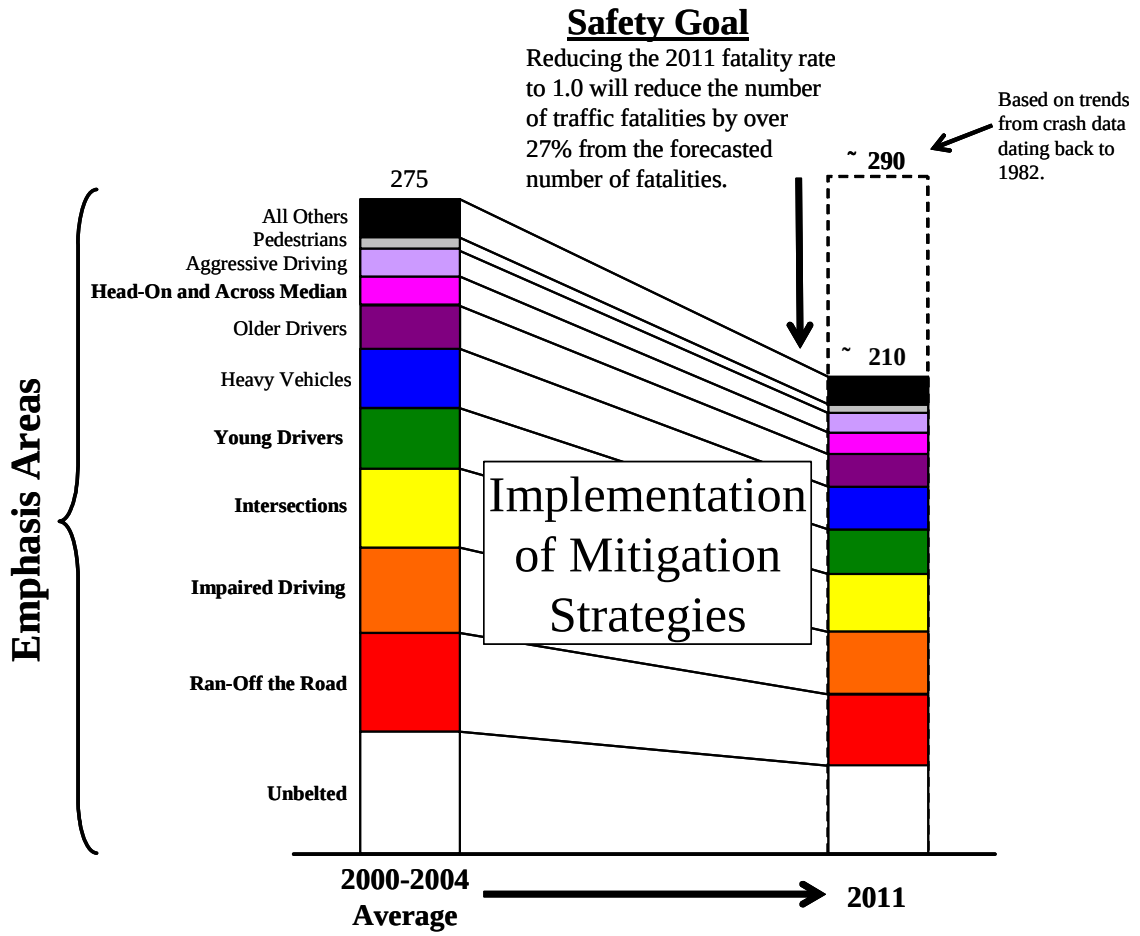


FIGURE 2.2
Illustration of How Nebraska's Fatalities Stack Up and the Needed Reduction to Meet the 2011 Safety Goal

2.4 Review of Fatal Crash Information for the CEAs

Prior to the May, 2006 safety summit, Nebraska's fatal crash records (2000-2004) were reviewed and summarized into fact sheets, which were then used by the participants to help identify major patterns or contributing factors when prioritizing the related strategies. A copy of these fact sheets has been provided at the end of this chapter for review. In addition, summaries of the key findings for each CEA identified during the crash review are provided below.

Increasing Safety Belt Usage

- 85% of unbelted vehicle occupant fatalities occurred on rural roads.
- 44% of unbelted fatalities were located on local roads followed by US Highways with 26%.
- The top six counties for unbelted fatalities were Douglas (8%), Lancaster (7%), Buffalo (4%), Sarpy (3%), Hall (3%), and Gage (3%).
- The most common crash type in which an unbelted fatality occurred was a single vehicle run-off-the-road crash (55%) followed by angle collision (23%).

- Males accounted for 67% of unbelted fatalities and 24% of the vehicle occupants killed were between the ages of 14 and 20.
- Over half of the unbelted fatalities occurred on Friday, Saturday and Sunday.
- Of vehicle occupant fatalities, unbelted vehicle occupants accounted for 59% of all deaths. However, the vehicle occupants not wearing safety belts and involved in the fatal crashes accounted for only 42% of the injured occupants and 17% of the uninjured vehicle occupants.

Keeping Vehicles on the Roadway, Minimizing the Consequences of Leaving the Road, & Reducing Head-On and Across-Median Crashes

- There was a total of 725 fatalities from lane departure crashes, which is comprised of 558 fatalities from single vehicle run-off the road crashes, 100 fatalities from head-on crashes, and 67 fatalities from fatal sideswipe (opposite direction) crashes.
- 85% of lane departure fatalities happened on rural roads.
- 41% of fatalities occurred on local roads with 26% of fatalities on US Highways.
- The top five counties for lane departure fatalities were Lancaster (9%), Douglas (8%), Sarpy (4%), Buffalo (4%), and Dawson (3%).
- Alcohol involvement was reported in 46% of lane departure fatalities and 67% of the vehicle occupant fatalities were individuals not wearing safety belts.
- Of the drivers involved in a fatal lane departure crash, 72% were male and 21% were at most 20 years old.
- 53% of the fatalities happened in “dark” driving conditions.
- Friday, Saturday, and Sunday accounted for 54% of lane departure fatalities.

Reducing Impaired Driving

- Alcohol-related fatalities were more likely in rural areas (76%).
- Most fatalities occurred on local roads (46%) with another 28% on US Highways.
- The top five counties for alcohol-related fatalities were Douglas (12%), Lancaster (12%), Sarpy (5%), Buffalo (3%), and Dawson (3%).
- Single vehicle run-off the road crashes accounted for 57% of all alcohol-related fatalities.
- Of drinking and drunk drivers; 18% were under the age of 21, 82% were male, and 57% were unbelted.
- Most alcohol-related fatalities occurred between 9:00 PM and 3:00 AM (53%) and 67% of alcohol-related fatalities occurred on Friday, Saturday, or Sunday.

Improving the Design and Operation of Highway Intersections

- There were a total of 455 intersection fatalities. Of these, 129 could be identified as having occurred at an unsignalized intersection and 40 at a signalized intersection.
- 65% of fatalities occurred at a rural intersection.
- Intersections on local roads accounted for 41% of the fatalities and US Highways was second with 32% of intersection fatalities.
- The top five counties for intersection fatalities were Douglas (19%), Lancaster (14%), Hall (4%), Gage (4%), and Sarpy (3%).
- 60% of intersection fatalities were right angle collisions.

- Alcohol involvement was reported in 30% of the fatalities and 49% of the vehicle occupant fatalities were not using safety belts.
- The leading contributing factor was “failure to yield right of way”.
- Only 29% of the intersection fatalities occurred during “dark” driving conditions.
- Of the drivers involved in a fatal intersection crash; 76% were male, 18% were in the 36-45 age group, and 17% were in the 46-55 age group.

Addressing the Over Involvement of Young Drivers

- 78% of fatalities involving young drivers occurred on rural roads.
- 53% of fatalities were on local roads followed by US Highways with 27%.
- The top six counties for fatalities involving a young driver were Douglas (13%), Lancaster (11%), Gage (3%), Dawson (3%), Hall (3%), and Seward (3%).
- The most common crash type involving a young driver was single vehicle run-off-the-road crash (38%) followed by right angle collision (30%).
- Males accounted for 67% of young drivers involved in a fatal crash; 34% of young drivers had been drinking; and 56% of the young drivers were unbelted.
- 56% of the fatalities involving a young driver occurred on Friday, Saturday and Sunday.
- 37% of fatalities involving a young driver occurred between 9:00 PM and 3:00 AM.

Fatal Crashes Involving Unbelted Vehicle Occupants

NEBRASKA STRATEGIC HIGHWAY SAFETY PLAN

How Significant is the Problem?

On Nebraska roadways, there were 707 unbelted vehicle occupant fatalities during 2000-2004, which is an average of 140 fatalities per year. This accounts for nearly 52% of all traffic fatalities during the five year period and approximately 59% of the all vehicle occupant fatalities (1,204) during the study period.

During 2000-2004, reported safety belt usage in Nebraska ranged from a low of 69.7% in 2002 to a high of 79.2% in 2004 (2005: no change from the 2004 usage rate).

What is the Nebraska Goal?

Nebraska's goal is to reduce the traffic fatality rate to 1.0 fatality per 100 million VMT by 2011 (which is expected to save 80 lives annually). In order to achieve the goal, the number of annual unbelted vehicle occupant fatalities needs to be reduced by approximately 40.

What are the Contributing Factors?

Road and Area Type

- Unbelted vehicle occupant fatalities were more likely to occur in rural areas (598 of 707, 85%).
- Local roads accounted for the greatest number of unbelted fatalities (316 of 707, 44%). The jurisdiction with the second highest number of fatalities was US Highways with 26% (181 of 707). Only 10% (73 of 707) of young driver involved fatalities were on Interstate routes.

Jurisdiction Classification	Rural	Urban
Interstates	8%	2%
US Highway	22%	4%
State Highways	17%	2%
Local Roads	37%	7%
Total by Area Type	85%	15%
Total	100%	

Location

- 29% (204 of 707) of unbelted vehicle occupant fatalities occurred at an intersection.
- The Top 6 counties represent only 28% (197 of 707) of unbelted vehicle occupant fatalities in Nebraska.

Top 6 Counties	Fatal Crashes	Fatalities
Douglas	51 (8%)	55 (8%)
Lancaster	50 (8%)	52 (7%)
Buffalo	25 (4%)	28 (4%)
Sarpy	19 (3%)	24 (3%)
Hall	18 (3%)	19 (3%)
Gage	16 (2%)	19 (3%)

Crash Type

- 55% (392 of 707) of unbelted fatalities occurred during a single vehicle run-off the road crash. Overall, single vehicle crashes accounted for 61% (433 of 707) and lane departure crashes (i.e., ROR plus head-on) were 65% (460 of 707). Angle crashes were the second most frequent crash type and accounted for 23% (164 of 707) of fatalities.

Crash Type	Unbelted Veh. Occ. Fatalities	Total Fatalities
Single Vehicle: Run-off Road	392 (55%)	558 (41%)
Single Vehicle: Other	41 (6%)	137 (10%)
Rear End and Sideswipe (Same)	33 (5%)	97 (7%)
Head-On & Sideswipe (Opposite)	68 (10%)	167 (12%)
Angle	164 (23%)	350 (26%)
Left Turn (Leaving)	3 (<1%)	37 (3%)
Other	6 (1%)	24 (2%)

- Of the single vehicle run-off the road fatalities: 59% were overturn, 14% were a collision with a ditch or embankment, 15% were a collision with a tree, utility pole, or sign support.

The Passenger

- Men were 67% (475 of 707) of unbelted fatalities.
- Few passengers under 13 were killed in a crash while unbelted. The 14-20 age range included the most unbelted fatalities (169 of 707, 24%). Between 21 and 65, the number of unbelted fatalities in each age group was fairly consistent, which then dropped for the 56-65 age group and increased again for adults over 65.

Age Group	Male	Female
≤ 13	6 (1%)	10 (1%)
14 – 20	108 (15%)	61 (9%)
21 – 25	76 (11%)	29 (4%)
26 – 35	75 (11%)	32 (5%)
36 – 45	70 (10%)	37 (5%)
46 – 55	63 (9%)	27 (4%)
56 – 65	24 (3%)	12 (2%)
66+	48 (7%)	23 (3%)
Unknown	2 (0%)	1 (0%)
Totals by Gender	475 (67%)	232 (33%)
Population Total	707 (100%)	

- Alcohol was listed as a contributing factor in 47% (331 of 707) of unbelted fatalities.
- 64 (9%) of the unbelted fatalities were partially ejected from their vehicle and 331 (47%) were reported as being totally ejected.

Role of Safety Belt in Injury Severity

In the fatal crashes that occurred between 2000 and 2004, unbelted vehicle occupants were found to account for 59% of all vehicle occupant fatalities. Looking at the rest of the passengers involved in the fatal crashes, 42% of the injured occupants were unbelted and only 17% of the uninjured occupants were not wearing a safety belt.

Time-of-Day & Day of Week

- Most unbelted vehicle occupant fatalities occurred between 9:00 PM – 3:00 AM (244 of 707, 34%). 48% (341 of 707) of unbelted fatalities occurred during dark driving conditions (compared to 43% of all fatalities).
- There were noticeable peaks at 6:00 PM (6%), 11:00 PM (8%), and midnight (8%).

Time of Day	Fatalities	Percentage
Midnight to 02:59	123	17%
3:00 to 05:59	62	9%
6:00 to 08:59	60	8%
9:00 to 11:59	55	8%
12:00 to 14:59	71	10%
15:00 to 17:59	102	14%
18:00 to 20:59	94	13%
21:00 to 23:59	121	17%
Unknown	19	3%

- 36% (152 of 707) of unbelted fatalities occurred on Saturday or Sunday. Another 17% (121 of 707) of the unbelted fatalities were on Friday.

Day of Week	Fatalities	Percentage
Sunday	126	18%
Monday	74	10%
Tuesday	80	11%
Wednesday	98	14%
Thursday	82	12%
Friday	121	17%
Saturday	126	18%

Some Existing Safety Activities

- Periodic Statewide Enforcement Operations
- Click-It or Ticket & Buckle Up In Your Truck
- Rollover Demonstration Units
- Secondary Belt Law
- Multi-Media Belt Use Campaign
- Child Passenger Protection Program

Fatal Lane Departure Crashes

NEBRASKA STRATEGIC HIGHWAY SAFETY PLAN

How Significant is the Problem?

On Nebraska roadways, there were 645 fatal crashes during 2000-2004in which the crash was classified as lane departure (516 single vehicle run-off the road, 76 head-on, and 53 sideswipe opposite direction). These crashes resulted in a total of 725 fatalities (558 ROR, 100 HO, and 67 SSW), which is an average of 145 fatalities per year. This accounts for nearly 53% of all traffic fatalities during the five year period.

What is the Nebraska Goal?

Nebraska's goal is to reduce the traffic fatality rate to 1.0 fatality per 100 million VMT by 2011 (which is expected to save 80 lives annually). In order to achieve the goal, the number of annual fatalities in lane departure crashes needs to be reduced by approximately 40.

What are the Contributing Factors?

Road and Area Type

- Lane departure fatalities were primarily in rural areas (619 of 725, 85%).
- Combining rural and urban roadways, local roads accounted for the greatest number of lane departure fatalities (299 of 725, 41%). The jurisdiction with the second highest number of fatalities was US Highways with 26% (189 of 725).

Jurisdiction Classification	Rural	Urban
Interstates	13%	2%
US Highway	23%	3%
State Highways	16%	2%
Local Roads	33%	8%
Total by Area Type	85%	15%
Total	100%	

Location

- Only 12% (84 of 725) of lane departure fatalities occurred at an intersection.
- The Top 5 counties represent only 28% (202 of 725) of lane departure fatalities in Nebraska.

Top 5 Counties	Fatal Crashes	Fatalities
Lancaster	57 (9%)	62 (9%)
Douglas	53 (8%)	61 (8%)
Sarpy	26 (4%)	31 (4%)
Buffalo	22 (3%)	26 (4%)
Dawson	21 (3%)	22 (3%)

Crash Type

- A majority of single vehicle run-off road fatalities were overturned vehicles.

Run-off Road Crashes	Fatalities	Percentage
Overturned	152	53%
Embankment	19	9%
Tree	17	8%
Ditch	17	5%
Highway Traffic Sign Post	13	4%
All Single Vehicle ROR	725	100%

Contributing Factors

- Alcohol was reported as a contributing factor is 46% (337 of 725) of lane departure fatalities.
- 67% of the vehicle occupant fatalities in lane departure crashes were individuals not using safety belts. By gender, 69% of males and 63% of females killed were not belted.

Weather

- A majority of lane departure fatalities were during good weather conditions.

Weather Conditions	Fatalities	Percentage
Clear or Cloudy	433	79%
Rain	26	5%
Snow	39	7%
Sleet, hail, or freezing rain	28	5%
Other	24	4%

Time-of-Day & Day of Week

- 38% (174 of 725) lane departure fatalities occurred between 9:00 PM and 3:00 AM. Overall, 53% (384 of 725) of lane departure fatalities occurred in "dark" driving conditions (compared 43% of all fatalities).

Time of Day	Fatalities	Percentage
Midnight to 02:59	153	21%
3:00 to 05:59	67	9%
6:00 to 08:59	48	7%
9:00 to 11:59	62	9%
12:00 to 14:59	84	12%
15:00 to 17:59	91	12%
18:00 to 20:59	75	10%
21:00 to 23:59	121	17%
Unknown	24	3%

- 39% (284 of 725) of lane departure fatalities occurred on Saturday or Sunday. An additional 15% (110 of 725) of the related fatalities were on Friday.

Day of Week	Fatalities	Percentage
Sunday	143	20%
Monday	77	11%
Tuesday	74	10%
Wednesday	87	12%
Thursday	93	13%
Friday	110	15%
Saturday	141	19%

Road Surface Conditions

- A majority of lane departure fatalities occurred when the road surface was dry.

Road Surface Conditions	Fatalities	Percentage
Dry	577	80%
Wet or Water	62	9%
Snow, Ice or Slush	73	10%
Other or Unknown	13	2%

The Driver

- There were 779 drivers involved in a fatal lane departure crash. Of these, approximately 72% were male.
- 21% of drivers involved in a fatal lane departure crash were under the age of 21.

Age Group	Male	Female	Total
≤ 20	18%	26%	21%
21 – 25	16%	10%	14%
26 – 35	19%	9%	16%
36 – 45	14%	21%	16%
46 – 55	16%	13%	15%
56 – 65	6%	6%	6%
66+	10%	15%	11%

- The top driver contributing factors for lane departure crashes were:

Top Contributing Factors	Number of Drivers
Failure to keep in lane or running off road	117
Driving too fast for conditions	46
Operating vehicle in erratic manner	36
Wrong side or wrong way	29
Over-correcting or over-steering	28
Exceeded authorized speed limit	27

Some Existing Safety Activities

- Hardware Inventory & Replacement
- Rural Road Design Training
- Centerline Rumble Strips
- Shoulder Rumble Strips
- Median Barriers

Fatal Crashes Involving Alcohol Impairment

NEBRASKA STRATEGIC HIGHWAY SAFETY PLAN

How Significant is the Problem?

On Nebraska roadways, there were 446 fatal crashes during 2000-2004in which the crash was classified as "alcohol related." These crashes resulted in a total of 501 fatalities, which is an average of 100 fatalities per year. This accounts for approximately 37% of all traffic fatalities during the five year period.

What is the Nebraska Goal?

Nebraska's goal is to reduce the traffic fatality rate to 1.0 fatality per 100 million VMT by 2011 (which is expected to save 80 lives annually). In order to achieve the goal, the number of annual alcohol-related fatalities needs to be reduced by 27.

What are the Contributing Factors?

Road and Area Type

- Alcohol-related fatalities were primarily in rural areas (379 of 501, 76%) and 82% were outside of Omaha and Lincoln.
- Combining rural and urban roadways, local roads accounted for almost half of all alcohol-related fatalities (234 of 501, 46%). The jurisdiction with the second highest number of fatalities was US Highways with 28% (138 of 501). Only 8% (39 of 501) of alcohol-related fatalities were on Interstate routes.

Jurisdiction Classification	Rural	Urban
Interstates	6%	2%
US Highway	22%	6%
State Highways	15%	3%
Local Roads	33%	13%
Total by Area Type	76%	24%
Total	100%	

Location

- 28% (138 of 501) of alcohol-related fatalities occurred at an intersection.
- The Top 5 counties represent 35% (175 of 501) of alcohol-related fatalities in Nebraska.

Top 5 Counties	Fatal Crashes	Fatalities
Douglas	55 (12%)	60 (12%)
Lancaster	51 (11%)	60 (12%)
Sarpy	21 (5%)	26 (5%)
Buffalo	14 (3%)	16 (3%)
Dawson	12 (3%)	13 (3%)

Crash Type

- Over half of alcohol related fatalities occurred during a single vehicle run-off the road crash (285 of 501, 57%). Overall, single vehicle crashes accounted for 65% (326 of 501) and lane departure crashes (i.e., ROR plus head-on) were 67% (337 of 501). Angle crashes accounted for 17% (86 of 501) of fatalities.

Crash Type	Alcohol-Related Fatalities	Total Fatalities
Single Vehicle: Run-off Road	285 (57%)	558 (41%)
Single Vehicle: Other	41 (8%)	137 (10%)
Rear End and Sideswipe (Same)	21 (4%)	97 (7%)
Head-On & Sideswipe (Opposite)	52 (10%)	167 (12%)
Angle	86 (17%)	350 (26%)
Left Turn (Leaving)	9 (2%)	37 (3%)
Other	7 (1%)	24 (2%)

- A majority of alcohol-related run-off road fatalities were overturned vehicles.

Run-off Road Crashes	Fatalities	Percentage
Overturned	152	53%
Embankment	19	7%
Tree	17	6%
Ditch	17	6%
Highway Traffic Sign Post	13	5%
Total	285	100%

The Driver

- There were 607 drinking or drunk drivers involved in a fatal crash. Of these, just over 82% were male.
- 18% of drinking or drunk drivers were under the age of 21.

Age Group	Male	Female	Total
≤ 20	18%	21%	18%
21 – 25	19%	14%	18%
26 – 35	19%	18%	19%
36 – 45	17%	24%	18%
46 – 55	17%	17%	17%
56 – 65	6%	3%	6%
66+	4%	3%	3%

- Other than alcohol use, the top contributing factors for drinking or drunk drivers involved in a fatal crash were:

Top Contributing Factors	Number of Drivers
Failure to keep in lane or running off road	81
Operating vehicle in erratic manner	43
Disregarded traffic sign, signals, or road markings	38
Exceeded authorized speed limit	25
Wrong side or wrong way	20
Failure to yield right of way	16
Driving too fast for conditions	15

- 57% (345 of 607) of drinking or drunk drivers were not wearing a safety belt when involved in a fatal crash. Men represented 82% of the drivers that were unbelted and drinking when involved in a fatal crash.

The Passenger

- There were 487 vehicle occupant fatalities from alcohol-related crashes. Of these, 331 or approximately 68% were unbelted (Statewide: 59% of occupant fatalities were unbelted).

Time-of-Day & Day of Week

- Most alcohol-related fatalities occurred between 6:00 PM – 6:00 AM (392 of 501, 78%). Overall, 74% (370 of 501) of alcohol-related fatalities occurred in "dark" driving conditions (compared to 43% of all fatalities).

Time of Day	Fatalities	Percentage
Midnight to 02:59	156	31%
3:00 to 05:59	63	13%
6:00 to 08:59	21	4%
9:00 to 11:59	24	5%
12:00 to 14:59	13	3%
15:00 to 17:59	29	6%
18:00 to 20:59	61	12%
21:00 to 23:59	112	22%
Unknown	22	4%

- 47% (236 of 501) of the alcohol-related fatalities occurred on Saturday or Sunday. An additional 20% (99 of 501) of the alcohol-related fatalities were on Friday.

Day of Week	Fatalities	Percentage
Sunday	111	22%
Monday	33	6.5%
Tuesday	33	6.5%
Wednesday	48	10%
Thursday	52	10%
Friday	99	20%
Saturday	125	25%

Some Existing Safety Activities

- Selective Overtime Enforcement Operations
- Conduct Sobriety Checkpoints (ave. 2 per month)
- Open Container & Repeat Offender laws
- Judicial & Prosecution Training
- Drug Recognition Expert Training
- Alcohol Server / Seller Training
- Administrative License Revocation Law
- 0.08 BAC and Zero Tolerance Laws.

Fatal Crashes at Intersections

NEBRASKA STRATEGIC HIGHWAY SAFETY PLAN

How Significant is the Problem?

At Nebraska's intersections, there were 403 fatal crashes during 2000-2004, resulting in a total of 455 traffic fatalities, which is an average of 91 fatalities per year. This accounts for approximately 33% of all traffic fatalities during the five year period.

Of these intersection fatalities, 129 fatalities could be identified as occurring at an unsignalized intersection. Forty intersection fatalities were identified at a signalized intersection. With the remaining 286 intersection fatalities, the traffic control was not reported sufficiently such that the type of intersection could be identified.

What is the Nebraska Goal?

Nebraska's goal is to reduce the traffic fatality rate to 1.0 fatality per 100 million VMT by 2011 (which is expected to save 80 lives annually). In order to achieve the goal, the number of annual intersection fatalities needs to be reduced by approximately 25.

What are the Contributing Factors?

Road and Area Type

- Intersection fatalities were primarily in rural areas (294 of 455, 65%).
- Combining rural and urban roadways, local roads accounted for 41% (187 of 455) of intersection fatalities. The jurisdiction with the second highest number of fatalities was US Highways with 32% (145 of 455).

Jurisdiction Classification	Rural	Urban
Interstates	2%	4%
US Highway	20%	12%
State Highways	15%	5%
Local Roads	27%	14%
Total by Area Type	65%	35%
Total	100%	

Location

- The Top 5 counties represent 44% (199 of 455) of intersection fatalities in Nebraska.

Top 5 Counties	Fatal Crashes	Fatalities
Douglas	79 (20%)	85 (19%)
Lancaster	57 (14%)	63 (14%)
Hall	18 (4%)	19 (4%)
Sarpy	14 (3%)	14 (3%)
Gage	13 (3%)	18 (4%)

Crash Type

- 60% (273 of 455) of intersection fatalities occurred during an angle collision. Single vehicle run-off the road crashes were the second most frequent crash type and accounted for 15% (68 of 455) of fatalities. For fatalities at signalized intersections 45% were from left-turn crashes and 38% were from angle crashes. Of the unsignalized fatalities, 90% were in angle crashes.

Crash Type	Int. Fatalities	Total Fatalities
Single Vehicle: Run-off Road	68 (15%)	558 (41%)
Single Vehicle: Other	24 (5%)	137 (10%)
Rear End and Sideswipe (Same)	29 (6%)	97 (7%)
Head-On & Sideswipe (Opposite)	16 (4%)	167 (12%)
Angle	273 (60%)	350 (26%)
Left Turn (Leaving)	37 (8%)	37 (3%)
Other	8 (2%)	24 (2%)

Weather

- A majority of intersection fatalities were during good weather conditions.

Weather Conditions	Fatalities	Percentage
Clear or Cloudy	288	64%
Rain	19	4%
Snow, sleet, hail, etc.	6	2%
Other or Unknown	142	31%

Road Surface Conditions

- A majority of intersection fatalities occurred when the road surface was dry.

Road Surface Conditions	Fatalities	Percentage
Dry	403	89%
Wet or Water	36	8%
Snow, Ice or Slush	9	2%
Other or Unknown	7	1%

The Driver

- There were 749 drivers involved in fatal intersection crashes. Of these, 76% were male.
- The most involved age group was 36 to 45 year olds. Drivers under the age of 21 were only the third highest driver age group.

Age Group	Male	Female	Total
≤ 20	15%	21%	16%
21 – 25	11%	9%	11%
26 – 35	16%	14%	15%
36 – 45	18%	17%	18%
46 – 55	18%	14%	17%
56 – 65	10%	6%	9%
66+	13%	19%	14%

- The top driver contributing factors for fatal intersection crashes were:

Top Contributing Factors	Number of Drivers
Failure to yield right of way	96
Disregarded traffic signs, signal, and road markings	67
Failure to keep in lane or running off road	18
Operating vehicle in erratic manner	14

Contributing Factors

- Alcohol was reported as a contributing factor in 30% (138 of 455) of intersection fatalities.
- 49% (209 of 428) of the vehicle occupant fatalities in intersection crashes were not using safety belts. By gender, 52% of males and 43% of females killed were not belted.

Time-of-Day & Day of Week

- Unlike the other four Critical Emphasis Areas, there was not an overrepresentation of intersection fatalities late at night or early morning. In fact, 63% (293 of 455) of intersection fatalities occurred between 9:00 AM and 9:00 PM. Overall, only 29% (130 of 455) of intersection fatalities occurred in "dark" driving conditions (compared to 43% of all fatalities).

Time of Day	Fatalities	Percentage
Midnight to 02:59	40	9%
3:00 to 05:59	17	4%
6:00 to 08:59	44	10%
9:00 to 11:59	66	14%
12:00 to 14:59	66	14%
15:00 to 17:59	93	20%
18:00 to 20:59	68	15%
21:00 to 23:59	58	13%
Unknown	3	1%

- Unlike the other four Critical Emphasis Areas, there was not a noticeable weekend peak in intersection fatalities.

Day of Week	Fatalities	Percentage
Sunday	60	13%
Monday	70	15%
Tuesday	60	13%
Wednesday	58	13%
Thursday	69	15%
Friday	73	16%
Saturday	65	14%

Some Existing Safety Activities

- Red Light Running Campaigns
- Roundabouts
- Advance Warning Detection
- Engineering Studies Upon Request by Law Enforcement
- Intersection Improvement Projects

Fatal Crashes Involving Young Drivers

NEBRASKA STRATEGIC HIGHWAY SAFETY PLAN

How Significant is the Problem?

On Nebraska roadways, there were 302 fatal crashes during 2000-2004in which a young driver (i.e., under the age of 21) was involved. These crashes resulted in a total of 352 fatalities, which is an average of 70 fatalities per year. This accounts for nearly 26% of all traffic fatalities during the five year period.

What is the Nebraska Goal?

Nebraska's goal is to reduce the traffic fatality rate to 1.0 fatality per 100 million VMT by 2011 (which is expected to save lives annually). In order to achieve the goal, the number of annual fatalities involving young drivers needs to be reduced by approximately 20.

What are the Contributing Factors?

Road and Area Type

- Fatalities where a young driver was involved occurred primarily in rural areas (274 of 352, 78%) and 84% were outside of Omaha and Lincoln.
- Combining rural and urban roadways, local roads accounted for just over half of all young driver involved fatalities (185 of 352, 53%). The jurisdiction with the second highest number of fatalities was US Highways with 27% (95 of 352). Only 6% (21 of 352) of young driver involved fatalities were on Interstate routes.

Jurisdiction Classification	Rural	Urban
Interstates	5%	1%
US Highway	22%	5%
State Highways	11%	3%
Local Roads	41%	12%
Total by Area Type	78%	22%
Total	100%	

Location

- 38% (133 of 352) of young driver involved fatalities occurred at an intersection.
- The Top 6 counties represent 35% (123 of 352) of young driver involved fatalities in Nebraska.

Top 6 Counties	Fatal Crashes	Fatalities
Douglas	38 (13%)	44 (13%)
Lancaster	30 (10%)	37 (11%)
Gage	10 (3%)	12 (3%)
Dawson	10 (3%)	11 (3%)
Hall	9 (3%)	9 (3%)
Seward	8 (3%)	10 (3%)

Crash Type

- 38% (133 of 352) of young driver involved fatalities occurred during a single vehicle run-off the road crash. Overall, single vehicle crashes accounted for 43% (153 of 352) and lane departure crashes (i.e., ROR plus head-on) were 53% (185 of 352). Angle crashes were the second most frequent crash type and accounted for 30% (107 of 352) of fatalities.

Crash Type	Young Driver Involved Fatalities	Total Fatalities
Single Vehicle: Run-off Road	133 (38%)	558 (41%)
Single Vehicle: Other	20 (6%)	137 (10%)
Rear End and Sideswipe (Same)	20 (6%)	97 (7%)
Head-On & Sideswipe (Opposite)	52 (15%)	167 (12%)
Angle	107 (30%)	350 (26%)
Left Turn (Leaving)	11 (3%)	37 (3%)
Other	9 (3%)	24 (2%)

- Of the single vehicle run-off the road fatalities: 56% were overturn, 19% were a collision with a ditch or embankment, 8% were a collision with a tree, and 5% were a collision with a light support.

The Driver

- There were 316 young drivers involved in a fatal crash. Of these, approximately two-thirds were male (213 of 316, 67%).
- There is a noticeable increase in the involvement on young drivers at the age of 16.

Age Group	Male	Female	Total
14	1%	2%	2%
15	4%	8%	5%
16	15%	21%	17%
17	15%	17%	15.5%
18	23%	17%	21%
19	16%	14%	15.5%
20	26%	22%	25%

- The top contributing factors for young drivers involved in a fatal crash were:

Top Contributing Factors	Number of Drivers
Failure to keep in lane or running off road	22
Failure to yield right of way	19
Exceeded authorized speed limit	16
Operating vehicle in erratic manner	15
Disregarded traffic sign, signals, or road markings	12
Driving too fast for conditions	11
Over-correcting or over-steering	10

- Of young drivers involved in a fatal crash, 34% (106 of 316) had been drinking or were drunk. Males made up 85% (90 of 116) of the young-drinking drivers.
- 56% (177 of 316) of young drivers involved in a fatal crash were not wearing safety belts. Of these, males represented 71% of the young-unbelted drivers. In comparison, 38% of drivers 21-years or older and involved in a fatal crash were not wearing safety belts. Further, safety belt non-use for all vehicle occupants had a range of 20% to 30% for the study period.

Time-of-Day & Day of Week

- Most young driver involved fatalities occurred between 9:00 PM – 3:00 AM (132 of 352, 37%). Overall, 44% of fatalities where a young driver was involved happened during dark driving conditions (compared to 43% of all fatalities).
- There were also noticeable peaks in the morning when many young drivers may be heading to school and also peaks in the early afternoon right after school is dismissed.

Time of Day	Fatalities	Percentage
Midnight to 02:59	56	16%
3:00 to 05:59	24	7%
6:00 to 08:59	41	12%
9:00 to 11:59	28	8%
12:00 to 14:59	34	10%
15:00 to 17:59	47	13%
18:00 to 20:59	44	13%
21:00 to 23:59	76	21%
Unknown	2	1%

- 40% (139 of 352) of young driver involved fatalities occurred on Saturday or Sunday. An additional 16% (56 of 352) of the young driver involved fatalities were on Friday.

Day of Week	Fatalities	Percentage
Sunday	66	19%
Monday	39	11%
Tuesday	35	10%
Wednesday	44	13%
Thursday	39	11%
Friday	56	16%
Saturday	73	21%

Some Existing Safety Activities

- Special Selective Traffic Enforcement
- Graduated Licensing Law
- Monitor & Oversight of Driver Training Schools
- Enforcing Underage Drinking Laws Program
- Community Coalition Support Program

3. Prioritization of Safety Strategies

3.1 Strategy Sources and Prioritization Methodology

Identification of Nebraska's Critical Strategies followed the final confirmation of the Critical Emphasis Areas (CEAs). The Critical Strategies are a sub-set of safety strategies that are expected to effectively address the primary contributing factors leading to fatal crashes in the CEAs. The Critical Strategies address the Four E's (education, enforcement, engineering, and EMS) as well as issues with crash data systems and data management.

A multi-disciplinary, iterative process was used in the selection of the critical strategies. This process began with the strategies listed in the *NCHRP Report 500* series. The specific guides that were used to identify the possible strategies are listed in **Table 3.1**. In addition to the NCHRP series, the initial list included some strategies that had been previously documented in safety plans through FHWA's Lead State Initiative.

TABLE 3.1
Primary Source for Initial Strategies Discussed at Safety Summit

***NCHRP Report 500* Series**	
Volume	**Title**
Increasing Safety Belt Usage	
11	A Guide for Increasing Seatbelt Use
Keeping Vehicles on the Roadway, Minimizing the Consequences of Leaving the Road, & Reducing Head-On and Across-Median Crashes	
3	A Guide for Addressing Collisions with Trees in Hazardous Locations
4	A Guide for Addressing Head-On Collisions
6	A Guide for Addressing Run-Off-Road Collisions
7	A Guide for Reducing Collisions on Horizontal Curves
8	A Guide for Reducing Collisions Involving Utility Poles
Reducing Impaired Driving	
16	A Guide for Reducing Alcohol-Related Collisions
Improving the Design and Operation of Highway Intersections	
5	A Guide for Addressing Unsignalized Intersection Collisions
12	A Guide for Reducing Collisions at Signalized Intersections
Addressing the Over Involvement of Young Drivers	
Draft copy of the Young Driver guide; to be published by 2007	

The strategies included in each of the *NCHRP Report 500* series were initially developed by teams of safety experts and then reviewed and refined by panels of practitioners from across the

US prior to publication. Based on the recommendations of the expert panels, the guides only included strategies that were considered practicable for most agencies to implement. The panels also provided basic information on expected effectiveness (i.e., proven, tried, or experimental), cost to implement and operate (i.e., low, moderate, or high), and timeframe for implementation (i.e., short [<1 year], medium [1-2 years], or long [>2 years]). For the strategies taken from the various state safety plans, the information regarding effectiveness, cost, and timeframe was generated by the project team and then reviewed by the Working Committee.

On May 16, 2006, a highway safety workshop was conducted with Nebraska's safety partners. The purpose of the safety summit was to review and prioritize the strategies associated with each of the CEAs. The safety summit was organized so that multi-disciplinary small groups were created to discuss, revise and prioritize the list of strategies for a specific CEA (see **Figure 3.1**). One of the strengths of the safety summit was the diversity of different agencies and organizations that participated in the summit, providing a truly comprehensive "4 E" look at the strategies. The participants included state and local highway and law enforcement agencies, FHWA, NHTSA, University researchers and students, driver training, representatives from the emergency medical field and health care providers, and consultants. See **Table 3.2** for a complete listing of the workshop participants.

TABLE 3.2
Safety Workshop Participants – May 16, 2006

	Name	Agency
Group 1: Increasing Safety Belt Usage	Bob Corner (facilitator)	Nebraska DMV
	Trooper Randy Bybee	Nebraska State Patrol
	Noelie Sherdon	Nebraska DMV
	Debbie Kuhn	Metro Region EMS
	Bill Christian	Metro Area Planning Agency (MAPA)
	Pat Polley	National Safety Council (Omaha Chapter)
	Sergeant Eric Sellers	Douglas County Sheriff's Office
	Dean Cole	Health & Human Services, EMS
	Mark Lutjeharms	Schemmer Associates
	Wesley Wahlgren	Nebraska DOR – District 4
	Sherri Cannon	NHTSA
	Manogna Kaluva	MATC
	Craig Schiller	MATC
	Justice Appiah	MATC
Group 2: Preventing Lane Departure Crashes	Rudy Umbs (facilitator)	FHWA
	Dennis Smith	Nebraska LTAP Center
	Mark Meisinger	Felsburg, Holt & Ullevig
	Tim Carlson	E & A Consulting Group
	Kylie Shannon	National Safety Council (Omaha Chapter)
	Captain Chris Kolb	Nebraska State Patrol
	Matt Gaffey	Nebraska DOR – Attorney General's Off.
	Glen Hansen	Omaha Public Works Department
	Cindy Scott	Winnebago Tribal Ambulance Service
	Monty Fredrickson	Nebraska DOR – Director's Office
	Jim Knott	Nebraska DOR – Roadway Design
	Mark Kovar	Nebraska DOR – District 8
	Bill Brownell	FHWA
	Kris Winter	Nebraska DOR – District 3
	Bhaven Naik	MATC
	Greg McKnight	MATC

TABLE 3.2
Safety Workshop Participants – May 16, 2006

	Name	Agency
Group 3: Reducing Impaired Driving	Simera Reynolds (facilitator)	MADD
	Sergeant Dan Schmidt	Lincoln Police Department
	Marcie Hagerty	Lancaster County Attorney's Office
	Murthy Koti	Kirkham Michael
	Scott Sandstrom	MAPA
	Virendra Singh	Lincoln Public Works Department
	Major A.K. Anderson	Nebraska State Patrol
	Holly Warth	Good Samaritan Health Systems
	Kurt Vosburg	Nebraska DOR – District 7
	Jim Schurr	Nebraska DOR – Planning
	Diane Riibe	Project Extra Mile
	Captain Andy Hall	Fresno Police Department
	Michele Lewon	Nebraska DOR – Attorney General's Off.
	Rich Ruby	Nebraska DOR – District 1
	Laura Lenzen	Nebraska DOR – Traffic Engineering
Group 4: Improving the Design and Operation of Highway Intersections	Karen Amen (facilitator)	Olsson Associates
	Lance Paulsen	E & A Consulting Group
	Tim Weander	Nebraska DOR – District 2
	Rich Uckert	FHWA
	Matt Selinger	HDR
	Doug Kluender	Attorney General
	Craig Lind	Nebraska DOR – District 5
	Lieutenant Tom Schwarten	Nebraska State Patrol
	Dan Cady	Nebraska LTAP Center
	Julia Walter	National Safety Council (Omaha Chapter)
	Jeff Schroeder	Nebraska DOR – Attorney General's Off.
	Rick Haden	Kirkham Michael
	Paul Mullen	MAPA
	Randy Hoskins	Lincoln Public Works Department
	Larry Wallace	Panhandle Regional EMS
Group 5: Addressing the Over Involvement of Young Drivers	Laurie Klosterboer- (facilitator)	Nebraska Safety Council
	Todd Gilkison	Lancaster County Medical Society/EMS
	Major Rhonda Lahm	Nebraska State Patrol
	Steve McBeth	Nebraska DOR – Planning
	Scott Opfer	Lincoln Public Works Department
	Bill Saxton	Road-Ready Driver Training
	Ming Qu	Health and Human Services
	Fred Zwonechek	Nebraska Office of Highway Safety
	Peg Prasa-Ogea	Health and Human Services
	Otto Villatoro	MATC
	Brian Gardner	MATC
	Tim Foss	MATC

TABLE 3.2
Safety Workshop Participants – May 16, 2006

	Name	Agency
Other Participants	John Craig	Nebraska DOR – Director's Office
	Randy Peters	Nebraska DOR – Traffic Engineering
	Bobbi Olson	Nebraska DOR – Traffic Engineering
	Bob Grant	Nebraska DOR – Highway Safety
	John Perry	FHWA
	Beverly Neth	Nebraska DMV
	John Nitzel	CH2M HILL
	Howard Preston	CH2M HILL
	Richard Storm	CH2M HILL
	Mike Piernicky	Olsson Associates
	Pat Phillips	Nebraska DMV
	Brian Ray	HWS Consulting Group
	Peggy Shalla	All Road Barricades
	Devin Townsend	MATC
	Ryan Haas	MATC

The workshop employed a data driven process since each participant was provided information on the expected effectiveness, implementation cost, and implementation timeframe for all strategies discussed by the task team. Further, participants were given a fact sheet that summarized the characteristics of fatalities associated with their CEA (see **Chapter 2**). Task teams were allowed to modify the list of strategies to add, delete, rewrite, or combine strategies if considered appropriate for Nebraska.

At the end of the breakout group, each task team ranked their strategies as high, medium, or low (the edited list of all strategies with rankings is provided in **Appendix I**). The ranking given to the strategies reflect the task teams' assessment of the relative importance and ability of each strategy to address the major factors contributing to traffic fatalities in Nebraska.

3.2 High Priority Strategies and Workshop Voting Results

Following the breakout sessions, all participants listened to brief presentations from each of the task team leaders regarding the basis for the selection of the high priority strategies. Next, followed a voting exercise where each participant cast votes for the strategies they believed to have the greatest potential to reduce the number of Nebraska's traffic fatalities and achieve the 2011 safety goal. During the voting exercise, the participants were instructed to vote for only the high priority strategies identified by the small groups.

This resulted in one of the key products from the safety summit; list of high priority strategies as well as stakeholder input (i.e., the voting results). This information reflects the professional opinions of the safety summit participants, indicating where they suggest the State should invest its safety resources in order to reduce the number of traffic fatalities. The 23 high priority strategies and voting results, organized by the CEAs, are summarized in **Appendix II**.

3.3 Selection of Critical Strategies

Immediately following the safety summit, the Working Committee concentrated on identifying the top strategies that Nebraska will focus on to achieve the 2011 safety goal. This select group of strategies is known as the Critical Strategies.

The process to identify the Critical Strategies was a multi-step process that first began with the safety summit prioritization and voting results, namely the 23 strategies ranked as a high priority by the workshop participants. This information acted as a guide for the Working Committee based on the safety partners' recommendations regarding how resources should be invested and allocated. Additionally, the Working Committee elected to add the countermeasure of using cable guardrail in narrow medians and improving roadside guardrail to address lane departure crashes. Also added by the Committee was a countermeasure to perform more compliance checks of alcohol retailers to reduce the sale of alcohol to minors. Finally, the strategy to use roundabouts when and where appropriate was expanded to include other non-conventional geometric designs that may have applications in certain circumstances. The Working Committee made these additions and revisions with the purpose of filling in any areas not sufficiently addressed by the outcomes of the workshop and finally selected a total of 20 Critical Strategies.

The selected Critical Strategies do not specifically include an EMS focused strategy. However, the Working Committee did identify that the EMS field can play important roles in the implementation of child and infant seat installation inspections. Specifically, EMS stations could be one location where parents could have a child seat installation inspected and emergency medical technicians could participate in events at community locations.

A summary of the 20 Critical Strategies organized by the Four Safety E's is provided in **Figure 3.1** while a full description of the strategies by the CEAs is in **Table 3.3**.

It is important to remember that the purpose of the Critical Strategies is not to replace existing safety programs and activities. Instead, the purpose of identifying the Critical Strategies is to help Nebraska supplement existing safety activities / programs and to provide a coordinated, multi-agency focus for Nebraska's safety funds, including NDOR's Highway Safety Improvement Program funds.

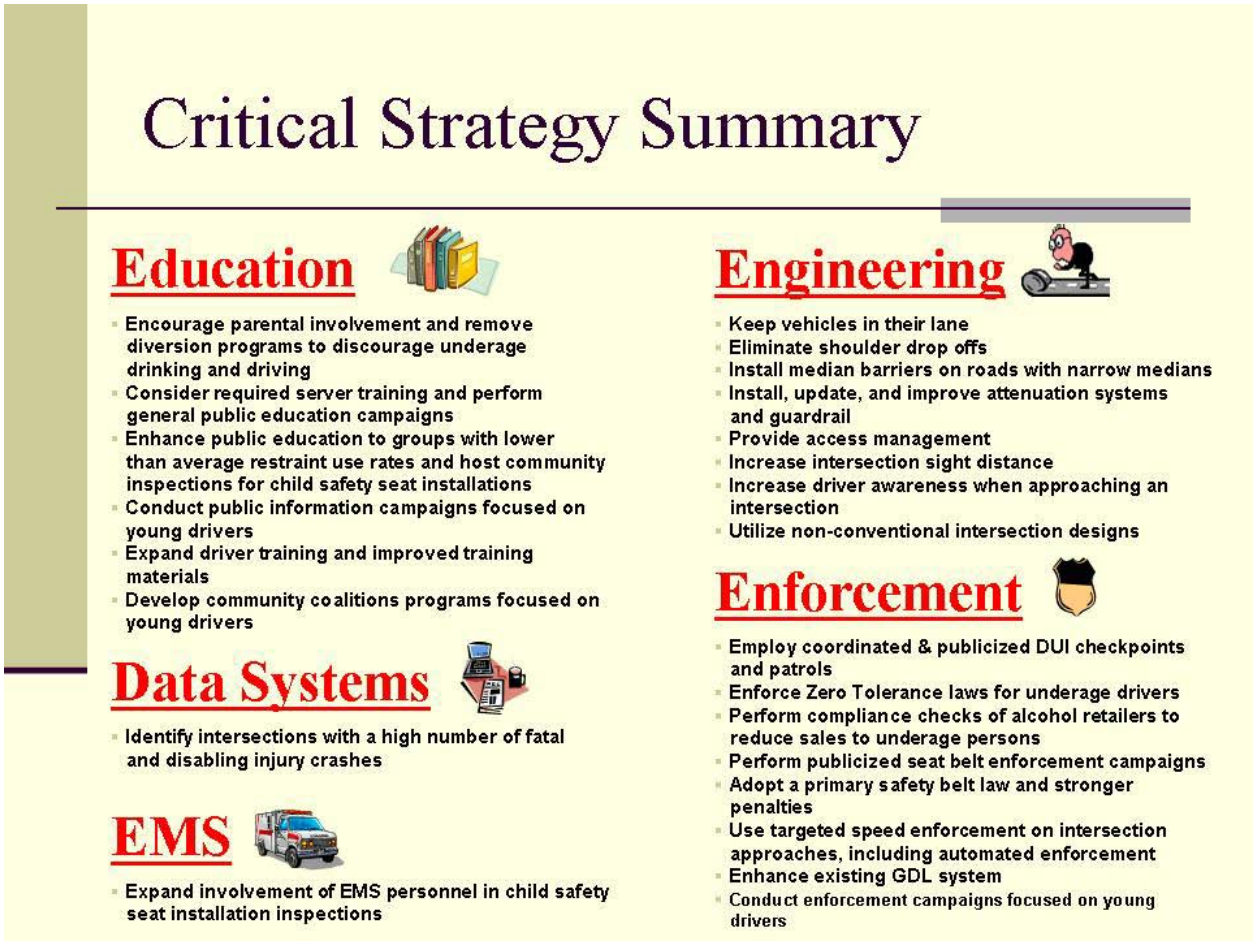


FIGURE 3.1
Summary of Nebraska's Critical Strategies
Note: Several Critical Strategies had multiple components and addressed more than one of the Four Safety E's
The strategies are based on material and guidance in the NCHRP Report 500 series, were prioritized by Safety Partners at a workshop on May 16, 2006 and with concurrence by the Nebraska Interagency Safety Committee.

TABLE 3.3
Nebraska SHSP Critical Strategies

Objective	Strategy[1]	Relative Cost to Implement	Effectiveness	Typical Timeframe for Implementation
Lane Departure Strategies				
Keep vehicles in their lane	Use cost effective treatments to keep vehicles in their lane. This may include: (1)centerline rumble strips for two-lane roads, (2) shoulder rumble strips on roads with paved shoulders, (3) edgeline "profile marking", edgeline rumble strips or modified shoulder rumble strips on section with narrow or no paved shoulders, (4) profiled thermoplastic strips, raised pavement markers, or other methods for centerlines in order to provide better day, night, and wet visibility, and (5) enhanced pavement markings, such as 6" or 8" markings instead of 4" markings or improved day/night/wet visibility.	Low (Note: some DOTs consider these moderate if extensively applied)	Tried/ Experimental	Short (<1 yr.) to Medium (1-2 yrs.)
Keep vehicles from encroaching on the roadside	Eliminate shoulder drop-offs by (1) paving shoulders, (2) widening substandard shoulders, and (3) maintaining gravel shoulders along pavement edges in order to keep vehicles from encroaching on the roadside. Assist drives with a safe recovery by (4) adding "safety wedges" to the edge of pavements.	Low	Experimental/ May be tried	Medium (1-2 yrs.)
Minimize the likelihood of crashing into an oncoming vehicle	On divided roadways with a narrow-width median, high volumes, high speeds, and/or a combination of these factors, minimize the likelihood of a vehicle crossing the median and crashing into an oncoming vehicle by installing cable median barriers.	Moderate	Tried	Medium (1-2 yrs.)
Reduce the severity of the crash	For run-off-road crashes, reduce the crash severity by (1) improving/updating barriers and attenuation systems and/or (2) shielding roadside objects (such as trees, utility poles, light poles) and steep slopes.	Moderate to High	Proven/Tried	Short (<1 yr.) to Medium (1-2 yrs.)
Impaired Driving Strategies				
Enforce DUI laws	Use enforcement to reduce the number of alcohol-related crashes by increasing the number of highly publicized and coordinated (1) DUI checkpoints or (2) saturation patrols. Also enhance DUI enforcement through the use of (3) traditional traffic enforcement. (4) Form state and local law enforcement partnerships to provide greater coverage during enforcement campaigns and also work with regional safety partners help identify target locations, times, etc. for enforcement efforts.	Low to High	Proven/Tried	Short (<1 yr.)

[1] The strategies are based on material and guidance in the NCHRP Report 500 series, were prioritized by Safety Partners at a workshop on May 16, 2006 and with concurrence by the Nebraska Interagency Safety Committee.

TABLE 3.3
Nebraska SHSP Critical Strategies

Objective	Strategy[1]	Relative Cost to Implement	Effectiveness	Typical Timeframe for Implementation
Impaired Driving Strategies continued				
Enforce DUI laws	(1) Publicize and enforce zero tolerance laws for drivers under age 21. (2) Encourage parental involvement and attendance in programs/classes and emphasize education and training through the graduated licensing programs. To further discourage drinking and driving, (3) work with courts to discourage diversion programs and plea bargains to non-alcohol offenses (i.e., improve DUI process and conviction rate).	Moderate	Proven/Tried	Short (<1 yr.) to Long (>2 yrs.)
Reduce excessive drinking and underage drinking	(1) Encourage the use of required responsible beverage service policies and training for alcohol servers and retailers, (2) continue to educate the general public, business owners, and alcohol servers on the dangers of impaired driving, (3) consider public policies that would make parents accountable for minors who consume alcohol at their place and then drive, and (4) use targeted education techniques (such as billboards) to reduce excessive drinking and underage drinking.	Moderate to High	Proven/Tried	Short (<1 yr.) to Long (>2 yrs.)
	To reduce underage drinking (and driving), increase the number of well-publicized compliance checks of alcohol retailers to reduce sales to underage persons.	Low	Tried	Short (<1 yr.)
Unbelted Vehicle Occupant Strategies				
Maximize use of occupant restraints by all vehicle occupants	To increase safety belt use rate: (1) provide enhanced public information and education to population groups with lower than average restraint use rates, (2) conduct highly publicized enforcement campaigns, and (3) ensure that child and infant restraints are properly used by providing community locations for instruction in proper child restraint use and conducting high profile “child restraint inspection” events at multiple community locations (involving EMS personnel at inspection locations).	Low to High	Proven/Tried	Short (<1 yr.) to Medium (1-2 yrs.)
	To increase safety belt use rate, (1) support adoption of a primary safety belt law and/or (2) strengthen penalties for safety belt violations.	Low	Proven/ Experimental	Medium (1-2 yrs.)

[1] The strategies are based on material and guidance in the NCHRP Report 500 series, were prioritized by Safety Partners at a workshop on May 16, 2006 and with concurrence by the Nebraska Interagency Safety Committee.

TABLE 3.3
Nebraska SHSP Critical Strategies

Objective	Strategy[1]	Relative Cost to Implement	Effectiveness	Typical Timeframe for Implementation
Intersection Strategies				
Improve management of access near unsignalized intersections	Near unsignalized intersections, use access management techniques to manage conflicts in the influence area of intersections.	Moderate	Tried	Medium (1-2 yrs.)
Improve sight distance at intersections	Improve sight distance at intersections by clearing sight triangles.	Low to Moderate	Tried	Short (<1 yr.)
Improve driver awareness of intersections on approaches	Increase a driver awareness's when approaching an intersection; whether a STOP controlled, signalized, or thru approach. Techniques for consideration include (1) enhanced warning and guide signing, (2) street lighting, (3) dynamic mainline warning flashers, and (4) advance warning flashers for traffic signals on high speed roadways.	Low to Moderate	Proven/Tried	Medium (1-2 yrs.)
Choose appropriate intersection traffic control to minimize crash frequency and severity	At appropriate locations, choose non-conventional intersection designs, such as roundabouts or indirect left-turn treatments.	Moderate to High	Proven/Tried	Medium (1-2 yrs.) to Long (>2 yrs.)
Reduce operating speeds on intersection approaches	Use targeted speed enforcement to reduce operating speeds on specific intersection approaches.	Moderate	Proven	Short (<1 yr.)
Improve safety through data analysis and coordination with local agencies	Through crash analysis, identify intersections with a disproportionately large number of fatal and serious injuries crashes. As necessary, improve data collection to enhance analysis of intersection crashes.	Low	Tried	Short (<1 yr.)

[1] The strategies are based on material and guidance in the NCHRP Report 500 series, were prioritized by Safety Partners at a workshop on May 16, 2006 and with concurrence by the Nebraska Interagency Safety Committee.

TABLE 3.3
Nebraska SHSP Critical Strategies

Objective	Strategy[1]	Relative Cost to Implement	Effectiveness	Typical Timeframe for Implementation
Young Driver Strategies				
Implement/improve GDL systems	Establish a more comprehensive graduated licensing system	Low	Proven/Tried	Medium (1-2 yrs.)
Publicize, enforce, and adjudicate laws pertaining to young drivers	Conduct more (1) public information and (2) enforcement campaigns pertaining to young drivers.	Moderate to High	Proven/ Experimental	Short (<1 yr.)
Improve young driver training	(1) Require driver training for new drivers and (2) improve driver training materials.	Moderate to High	Tried/ Experimental	Medium (1-2 yrs.) to Long (>2 yrs.)
Employ community or school-based strategies	Develop community coalition programs focused on young drivers.	Low to Moderate	Tried	Short (<1 yr.)

[1] The strategies are based on material and guidance in the NCHRP Report 500 series, were prioritized by Safety Partners at a workshop on May 16, 2006 and with concurrence by the Nebraska Interagency Safety Committee.

4. Critical Strategy Plan Summaries

The data and information driven prioritization process described in **Chapter 3** resulted in the identification of the 20 Critical Strategies that form the backbone of this Plan. These 20 strategies (summary list in **Table 4.1**) include elements that address all four of the safety Es and data management systems. Further, the Critical Strategies act as an investment guide to supplement existing safety activities in Nebraska and provide a framework for partnerships and coordination of multi-agency traffic safety efforts. The Critical Strategies are based on material and guidance contained in the NCHRP Report 500 series (Implementation of AASHTO's Strategic Highway Safety Plan). Input from Nebraska's Safety Partners was provided at the May 16, 2006 safety workshop with concurrence by the Nebraska Interagency Safety Committee.

In order to aid implementation of this Plan, additional information related to that Critical Strategies has been collected. This information in the following plan summaries provides guidance on expected effectiveness, implementation costs, targets, and possible goals. Other information including existing activities, organizational issues, keys to success, responsible agency, and legislative needs, to name a few, was also summarized. The plan summaries for the 20 Critical Strategies have been organized by the five Critical Emphasis Areas.

Further, throughout planning and implementation of the Critical Strategies, it is important to keep in mind that combination of strategies will often have the greatest effectiveness. For example, education and outreach can be used to supplement enforcement strategies or increasing enforcement levels to improve driver behavior are likely to have greater effectiveness than using engineering improvements alone.

Some of the Critical Strategies rely on enabling legislation or policies in order to be deployed. While still other Critical Strategies may not need enabling legislation, but changes in current laws may aid in implementation or improve the expected outcome. The information regarding needed enabling legislation or desirable legislation is contained in the plan summaries, but a review is also provided in **Table 4.1**.

TABLE 4.1
Summary of Nebraska Critical Strategies

Critical Strategy[1]	Page Number	Enabling or Desirable Legislation
Lane Departure Strategies		
1. Implement Cost Effective Improvements to Keep Vehicles in Their Lane	4-7	• None identified.
2. Keep Vehicles from Encroaching on the Roadside	4-10	• None identified.

[1] The strategies are based on material and guidance in the NCHRP Report 500 series, were prioritized by Safety Partners at a workshop on May 16, 2006 and with concurrence by the Nebraska Interagency Safety Committee.

TABLE 4.1
Summary of Nebraska Critical Strategies

Critical Strategy[1]		Page Number	Enabling or Desirable Legislation
Lane Departure Strategies continued			
3.	Minimize the Likelihood of Crashing into an Oncoming Vehicle	4-13	• None identified.
4.	Reduce the Severity of the Crash	4-15	• None identified.
Impaired Driving Strategies			
5.	Enforcement to Discourage Drinking & Driving	4-18	• None identified.
6.	Enforcement and Education to Discourage Underage Drinking and Driving	4-22	• Stronger penalties for violating Zero Tolerance Laws would be beneficial in discouraging underage drinking and driving.
7.	Broad Based Education Campaigns to Reduce Impaired Driving	4-26	• The authority to mandate alcohol server training rests with the Nebraska Legislature and/or the Nebraska Liquor Control Commission. • To enhance laws that address adults who allow minors to drink alcohol in their residence (and then drive afterwards), action by the Nebraska Legislature would be necessary.
8.	Compliance Checks of Alcohol Retailers	4-29	• Public policy initiatives may be necessary to enhance the penalties for selling to minors.
Unbelted Vehicle Occupant Strategies			
9.	Education and Enforcement to Increase Safety Belt Use Among Target Populations	4-31	• None identified.
10.	Enhanced Laws to Encourage Safety Belt Use	4-35	• Enacting a primary safety belt law or to strengthening penalties for not using a safety restraint device is within the authority of the Nebraska Legislature.
Intersection Strategies			
11.	Follow the Principles of Access Management	4-38	• A review of Nebraska state laws should be undertaken to identify if there are any gaps in roadway agencies' authority to require access change. If gaps are identified, action might be required by Nebraska's Legislature.
12.	Improve Sight Distance at Intersections	4-41	• Legal authority of highway agencies to control sight obstructions on private property may need to be strengthened.
13.	Improve Driver Awareness of Intersections on Approaches	4-43	• None identified.

[1] The strategies are based on material and guidance in the NCHRP Report 500 series, were prioritized by Safety Partners at a workshop on May 16, 2006 and with concurrence by the Nebraska Interagency Safety Committee.

TABLE 4.1
Summary of Nebraska Critical Strategies

Critical Strategy[1]		Page Number	Enabling or Desirable Legislation
Intersection Strategies continued			
14.	Use Non-Conventional Intersection Designs	4-45	• None identified.
15.	Targeted Speed Enforcement at Problem Intersections	4-48	• Enabling legislation by the Nebraska Legislature is necessary to allow use of automated enforcement.
16.	Work with Local Agencies to Identify Intersections with a Severe Crash Problem	4-52	• None identified.
Young Driver Strategies			
17.	Comprehensive Graduated Driver Licensing System	4-54	• A more comprehensive GDL program would have to be established by the Nebraska Legislature.
18.	Education and Enforcement of Laws Directed Towards Young Drivers	4-56	• Stronger provisions (curfew and passenger restrictions) and penalties for violating the GDL law would be beneficial in education and enforcement efforts directed towards young drivers.
19.	Required Driver Training and Improved Training Materials	4-59	• A program requiring driver training relies on enabling legislation from the Nebraska Legislature.
20.	Safe Community Coalitions	4-62	• None identified.

[1] The strategies are based on material and guidance in the NCHRP Report 500 series, were prioritized by Safety Partners at a workshop on May 16, 2006 and with concurrence by the Nebraska Interagency Safety Committee.

Finally, it should be noted that the Goals section of each Plan Summary was revised after completion of the analysis of the alternative safety investment scenarios described in Chapter 5 (summaries provided in **Table 4.2**). Each of the revised Goals for the Critical Strategies is consistent with the outcome of the investment analyses, describes realistic expectations relative to possible crash reductions, documents likely synergies associated with combining strategies and identifies feasible implementation goals consistent with deployment costs and funding limitations.

The combination of the details in the Plan summary for each Critical Strategy plus the results of the analyses of alternative safety investment scenarios (as documented in the next chapter) provides valuable insight about how Nebraska can best achieve the adopted safety goal—1.0 fatalities per 100 million vehicle miles of travel by 2011. This information suggests the need for a new approach to implement Nebraska's Safety Program—more comprehensive (including education, enforcement, and EMS in addition to engineering strategies), more systematic (a focus on strategies that are more directly linked to crash causation), integrated (all roads) and with a balance between reactive and proactive components of the Plan.

TABLE 4.2
Overview of Goals for Critical Strategies

	Critical Strategy[1]	Expected Crash Reduction	Possible Implementation Goal
Lane Departure Strategies			
1.	Implement Cost Effective Improvements to Keep Vehicles in Their Lane	5% to 35% reduction of lane departure crashes.	• None identified.
2.	Keep Vehicles from Encroaching on the Roadside	5% to 15% reduction of lane departure crashes.	• None identified.
3.	Minimize the Likelihood of Crashing into an Oncoming Vehicle	90% reduction in cross-median fatalities.	• None identified.
4.	Reduce the Severity of the Crash	Reduce likelihood of a fatality by up to 90% in the event of a collision.	• None identified.
Impaired Driving Strategies			
5.	Enforcement to Discourage Drinking & Driving	10% to 15% reduction of alcohol-related crashes.	• 15,000 additional hours of special overtime alcohol-related enforcement • Sobriety checkpoints at least three times annually in each of the 10 most populated counties
6.	Enforcement and Education to Discourage Underage Drinking and Driving	10% to 20% reduction of alcohol-related crashes involving an underage drinking driver.	• 2,000 additional hours of special overtime alcohol-related enforcement for underage drivers • Create a program that reaches at least 500 parents of newly licensed teens and educate the court systems in the most populated areas
7.	Broad Based Education Campaigns to Reduce Impaired Driving	5% to 23% reduction of alcohol-related crashes.	• Enhance policy regarding beverage server training by 2008 • Create a program that reaches at least 500 parents of newly licensed teens and educate the court systems in the largest populated areas
8.	Compliance Checks of Alcohol Retailers	See Plan Summary for discussion.	• Increase the number of compliance checks by 25%

[1] The strategies are based on material and guidance in the NCHRP Report 500 series, were prioritized by Safety Partners at a workshop on May 16, 2006 and with concurrence by the Nebraska Interagency Safety Committee.

TABLE 4.2
Overview of Goals for Critical Strategies

	Critical Strategy[1]	Expected Crash Reduction	Possible Implementation Goal
Unbelted Vehicle Occupant Strategies			
9.	Education and Enforcement to Increase Safety Belt Use Among Target Populations	See Plan Summary for discussion.	• 2,000 additional hours of special overtime enforcement for safety belts • Increase public education campaigns so that message reaches an additional 10% of the population
10.	Enhanced Laws to Encourage Safety Belt Use	Reduction of up to 20 unbelted vehicle occupant fatalities.	• Adopted a primary safety belt law and/or enhance penalties by 2008
Intersection Strategies			
11.	Follow the Principles of Access Management	Up to 30% reduction of access-related intersection crashes.	• None identified.
12.	Improve Sight Distance at Intersections	20% reduction of sight distance-related intersection crashes.	• None identified.
13.	Improve Driver Awareness of Intersections on Approaches	5% to 25% of intersection crashes.	• None identified.
14.	Geometric Improvements to Improve Intersection Safety	40% to 90% reduction of intersection crashes.	• Widespread as possible at locations that could benefit from these countermeasures
15.	Targeted Speed Enforcement at Problem Intersections	Nearly 30% reduction in speeding-related crashes.	• Widespread as possible at locations that could benefit from speed enforcement
16.	Work with Local Agencies to Identify Intersections with a Severe Crash Problem	See Plan Summary for discussion	• Assist local agencies identify the top 10% of high crash locations

[1] The strategies are based on material and guidance in the NCHRP Report 500 series, were prioritized by Safety Partners at a workshop on May 16, 2006 and with concurrence by the Nebraska Interagency Safety Committee.

TABLE 4.2
Overview of Goals for Critical Strategies

	Critical Strategy[1]	Expected Crash Reduction	Possible Implementation Goal
Young Driver Strategies			
17.	Comprehensive Graduated Driver Licensing System	Nearly 20% reduction in crashes involving young drivers.	• Enhance existing GDL program by 2008
18.	Education and Enforcement of Laws Directed Towards Young Drivers	See Plan Summary for discussion	• 2,000 additional hours of special overtime enforcement for underage drivers • Increase public education campaigns so that an additional 10% of young drivers hear message
19.	Required Driver Training and Improved Training Materials	5% reduction in crashes involving young drivers.	• 10% increase the number of teens that participate in a formal driver education course
20.	Safe Community Coalitions	24% reduction in crashes involving young drivers.	• Initiate ten new safe community coalitions

[1] The strategies are based on material and guidance in the NCHRP Report 500 series, were prioritized by Safety Partners at a workshop on May 16, 2006 and with concurrence by the Nebraska Interagency Safety Committee.

4.1 Lane Departure Critical Strategies

Strategy 1. Implement Cost Effective Improvements to Keep Vehicles in Their Lane	
Definition	Use cost effective treatments to keep vehicles in their lane. This may include: (1) centerline rumble strips for two-lane roads, (2) shoulder rumble strips on roads with paved shoulders, (3) edgeline "profile marking", edgeline rumble strips (sometimes known as rumble stripes) or modified shoulder rumble strips on sections with narrow or unpaved shoulders, (4) profiled thermoplastic strips, raised pavement markers (RPM's), or other methods for centerlines in order to provide better day, night, and wet visibility, and (5) enhanced pavement markings, such as 6" or 8" wide markings instead of 4" wide markings for improved day/night/wet visibility.
Technical	
Description	This strategy employs a variety of low-cost treatments that are intended to assist drivers with staying in their lane to prevent run-off-road and head-on crashes. Some devices and applications are intended specifically for two-lane, two-way roadways (i.e., centerline rumble strips and enhanced centerline markings) while the remaining can also be deployed on multi-lane, divided facilities. Further, many of the treatments are relatively low-cost which allow for preventative deployment (i.e., all corridors) in addition to reactive deployment (i.e., along high-crash corridors or at "problem" locations). These strategies are intended to assist the drivers that unintentionally have left their lane and either entered the roadside or an opposing lane. This suite of treatments does not address head-on crashes where a driver intentionally entered the opposing lane to complete a passing maneuver.
Target(s)	This strategy targets crashes involving a vehicle that ran-off the road or struck another vehicle head-on (including sideswipe crashes) when it entered the opposing lane. This strategy can be used to target crashes on either divided or undivided roadways and also on low or high speed facilities.
Goal	The statewide safety goal is approximately a 27% reduction in the number of traffic fatalities forecasted to occur in 2011. Since the listed countermeasures are expected to be 5% to 35% effective, most of the state's roadway system would need to be improved in order to reach the statewide goal. Therefore, this strategy should be part of a comprehensive program to prevent lane departure fatalities. (Note: For example, a comprehensive program may also utilize enforcement to reduce drinking and driving or encourage passengers to wear safety belts in order to prevent lane departure fatalities.)
Responsive and Preventative Plans	Because the actual location of fatal and disabling injury crashes is considered to be random, deploying these strategies along short segments in reaction to one serious crash is unlikely to prevent a significant number of crashes. As a result, this strategy consists of both a responsive and preventative component. First, these strategies could be deployed responsively along an entire corridor that has a documented safety problem related to lane departures. The preventative component would be to implement the strategies at locations that have an increased probability of a fatal or disabling injury crash (based on facility type, cross-section, and volume), and possibly across the entire road network given enough time and resources. A prioritized plan for a system wide implementation should be based on facility design, crash history, functional classification, volume, or a combination of these or similar factors.

Strategy 1. Implement Cost Effective Improvements to Keep Vehicles in Their Lane	
Expected Effectiveness	(Tried/Experimental) The effectiveness will depend upon the specific strategy chosen and on the specific locations selected for deployment. Also, combining strategies based on local conditions may prove to be more effective than selecting a single strategy, but it is important to remember the effectiveness ratios cannot simply be added together. Past studies have found varying results for most strategies, but some general guidance regarding expected effectiveness found in the *NCHRP Report 500* series is provided below. • Centerline rumble strips on two-lane roadways = 30 – 60% head-on crash reduction has been reported on roadways that were high crash sites. Note: treatment of only high crash sites does not account for regression to the mean, so the results may be slightly overstated. (Volume 4, Strategy 18.1 A1) • Shoulder rumble strips = FHWA reports a 20 – 50% reduction in the number of ROR crashes on freeways. The effectiveness on two-lane roadways has been reported as unstudied. (Volume 6, Strategy 15.1 A1) • Enhanced Pavement Markings = Results for wider pavement markings and use of RPM's is not definitive. Some studies have found no benefit from wider edge lines, while a New York study found 8" wide edgelines reduced total and injury crashes by an additional 5% and fixed object crashes by extra 15% when compared to installations with 4" wide edgelines. Studies in New Jersey, Ohio and New York have found RPM's generally effective when used at appropriate locations. New Jersey determined benefit-cost ratios of 15 ranging up to over 25 for several projects. In Ohio, RPM's reduced crashes by 9.2% and injuries by 4.9%. And in New York, RPM's reduced crashes by 19% at high-crash locations. (Volume 6, Strategy 15.1 A6). For detailed information regarding the effectiveness for these treatments, more information is available in the *NCHRP Report 500* series.
Keys to Success	Implementation along a corridor can be effective if a known, documented safety deficiency exists. However, implementation at a specific location or along a short segment in reaction to a fatal or high profile crash is unlikely to provide a significant safety benefit, especially in the short-term. After addressing crash locations that are significantly higher statistically than expected (responsive deployment), a prioritized systematic deployment should be more effective at preventing fatal and injury crashes (preventative deployment). Also, many of these strategies can be combined with routine roadway maintenance or added during roadway overlays in order to reduce the cost, allowing for a wider deployment across a system.
Potential Difficulties	A typical issue for many agencies is the maintenance associated with each strategy. Agencies need to consider the maintenance cost over time since pavement markings need to be replaced on a regular basis. Also, rumble strips may cause problems for bicyclists and motorcyclists, especially on roadways with narrow paved shoulders. For shoulder rumble strips, there is currently no proven design for roads with gravel shoulders or narrow paved shoulders (i.e, less than two feet). Another issue many agencies face is complaints by residents regarding the noise levels. Several states have encountered a few difficulties with RPM's placed in asphalt due to winter conditions. According to reports from these states, the asphalt deteriorates as it is apparently weakened by freeze-thaw cycles. If the pavement is not inspected and maintained, the devices may eventually come loose. No similar issues have been observed with RPM's placed in concrete pavement.

Strategy 1. Implement Cost Effective Improvements to Keep Vehicles in Their Lane	
Appropriate Measures and Data	A process measurement for the listed treatments is the number of miles of roadway that are improved. Safety benefits of implemented treatments can be determined by monitoring crash data for run-off-road and head-on (including sideswipe opposite direction) crashes. The crash severity may also change for the roadway as head-on and run-off-road crashes have a large potential to result in a fatality or disabling injury. Because of the random nature and the relative low density of these kinds of crashes across a system, consideration should also be given to the review of other non-crash related performance measures, such as maintenance records for markings and sampling the navigational success of vehicles through curves with portable video cameras.
Organizational and Institutional	
Champion	NDOR, county and city highway/roadway agencies.
Organizational, Institutional, and Policy Issues	These treatments are relatively easy to implement and will typically not require coordination among multiple agencies. With respect to institutional and policy issues, state, county, and city highway/roadway agencies may want to review installation guidelines and criteria for consistency of application. Guidelines should also be reviewed to ensure that they do not prohibit deployment. For example, a policy that allows shoulder rumble strips only on paved shoulders with a minimum width of six feet could prevent many locations from receiving the improvement. However, using rumble stripes on roads with narrower shoulders may still provide similar safety benefits while at the same time accommodating other needs (such as bicyclists). After guidelines are developed and/or revised, they should be periodically evaluated for consistency with the latest research findings.
Issues Affecting Implementation Time	Most of these strategies are relatively easy to implement and could be implemented in as little as one or two years. Some treatments, such as wider pavement markings, could be instituted immediately into annual re-striping programs. The part of the process which may have the greatest potential to delay implementation is developing a prioritized list of locations for deployment.
Costs Involved	The per mile costs of these treatments is classified as low. However, large deployments of these treatments may total up to a moderate cost project. The per mile costs of all listed treatments is expected to be several thousand dollars per mile, or even less. Examples include: centerline rumble strips at $1000 per mile, edgeline rumble strips at $2000 per mile, and wide pavement markings at $500/mile. (Note: The costs are intended to represent an average expected cost for Nebraska and assumes the pavement is in relatively good condition.) The construction costs could possibly be even lower if combined with existing maintenance activities, such as an asphalt overlay.
Training and Other Personnel Needs	Most highway/roadway agencies could implement these strategies with existing staff, whether as stand alone safety projects or part of existing maintenance activities. At some agencies, a little training may be needed in the areas of design and implementation of these strategies. Also, engineers may need some training to improve their ability to identify the appropriate strategy (or combination of strategies) to deploy given the specific corridor conditions and crash history.
Legislative Needs	None Identified.

Strategy 2. Keep Vehicles from Encroaching on the Roadside	
Definition	Eliminate shoulder drop-offs by (1) paving shoulders, (2) widening substandard shoulders, and (3) maintaining gravel shoulders to pavement edges in order to keep vehicles from encroaching on the roadside. Assist drivers with a safe recovery by (4) adding "safety wedges" to the edge of pavements.
Technical	
Description	This strategy employs a variety of pavement edge drop-off treatments to reduce lane departure crashes. The primary target is run-off-road crashes; however, excessive pavement drop-offs can also lead to head-on crashes on undivided facilities if drivers over correct when trying to get back onto the roadway. Many of these treatments would involve upgrading facilities that currently have deficient shoulders or may not meet minimum standards. Therefore, many of the listed treatments would likely not be considered a "low-cost" project. Also, adding "safety wedges" to pavement edges does not eliminate or move the drop-off further from the travel lane (like the other treatments); instead it helps reduce tire scrubbing and assists the driver to safely re-enter the travel lane.
Target(s)	The crash types targeted with this strategy include (1) crashes involving a vehicle that has run-off-the-road and struck a fixed object or overturned; and (2) head-on or sideswipe (opposing direction) crashes on undivided roadways.
Goal	The statewide safety goal is approximately a 27% reduction in the number of traffic fatalities forecasted to occur in 2011. Since the listed countermeasures are expected to be 5% to 15% effective, the entire roadway system would need to be improved in order to help reach the statewide goal. Therefore, this strategy should be part of a comprehensive program to prevent lane departure fatalities. (Note: For example, a comprehensive program may also utilize enforcement to reduce drinking and driving or encourage passengers to wear safety belts in order to prevent lane departure fatalities.) Since some of the countermeasures are experimental, they should be part of a test deployment to document expected crash reductions using data derived in Nebraska.
Responsive and Preventative Plans	The responsive plan would be to implement the strategies along corridors and at locations with a crash rate statistically significantly higher than the average (i.e., above the critical crash rate). The preventative plan would be to first implement the strategies at locations that have an increased probability of having a fatal or serious injury crash problem (based on variables such as traffic volume, crash history, existing shoulder type and condition, geometric alignment, and other factors that contribute to lane departure crashes). The second step of the preventative plan would be to implement and maintain the strategies over as much of the road network as possible—as a part of 3R improvements, safety projects, or as resources allow.
Expected Effectiveness	(Tried/Experimental) The effectiveness will depend upon the specific strategy chosen and on the specific locations selected for deployment. Also, combining strategies based on local conditions may prove to be more effective than selecting a single strategy, but it is important to remember the effectiveness ratios cannot simply be added together. Past studies have found varying results for most strategies, but some general guidance regarding expected effectiveness found in the *NCHRP Report 500* series is provided below. Pave shoulders. The expected effectiveness varies depending on initial shoulder width and surface type; the highest expected reduction in related crashes (i.e., run-off road, head-on, sideswipe opposite direction) is approximately 12%. (Volume 6, Strategy 15.1 A8, Exhibit V-18)

Strategy 2. Keep Vehicles from Encroaching on the Roadside	
	• Shoulder widening. The expected effectiveness varies depending on initial shoulder width, final shoulder width, shoulder surface type, and ADT; but at an ADT of over 2,000 vpd, a road with no shoulder that is widened to have an 8' shoulder would expect a 42% reduction in single vehicle run-off-road and multiple vehicle opposite-direction crashes (this is the greatest expected reduction). (Volume 6, Strategy 15.1 A8, Exhibit V-17) • Maintain gravel shoulders. The quantifiable expected effectiveness is currently unknown. • Safety wedge. The expected effectiveness is difficult to quantify because the percentage of lane departure or head-on crashes caused by overcorrection of vehicles that have first run off the road is unknown. Whatever the percentage, one study concluded that a 45-degree-angle asphalt fillet at the lane edge would virtually eliminate this type of crash, even in cases where the shoulder is unpaved and there is erosion adjacent to the pavement edge. (Volume 6, Strategy 15.1 A8) For additional information regarding the effectiveness for all strategies, refer to the *NCHRP Report 500* series.
Keys to Success	Due to the random nature of crashes, implementation on a more system-wide basis will lead to greater success. After addressing crash locations that are significantly higher statistically than expected (responsive deployment), a prioritized systematic deployment will be more effective at preventing fatal and serious injury crashes (preventative deployment). Also, some of these strategies can be combined with routine roadway maintenance or 3R projects in order to reduce the cost and gain wider deployment across the system.
Potential Difficulties	For roadways with narrow top widths, additional right-of-way and regrading may be necessary to accommodate wider shoulders. In these cases, other strategies such as edgeline rumble strips may be more cost-effective. Wider paved shoulders that are added to high speed roadways with poor alignment and hazardous roadsides could possibly lead to higher speeds and resultant increases in crash frequency and severity. Monitoring of these types of roadways is advised. Some modifications to paving equipment and construction practices will be needed for implementation of "safety wedges". Coordination with the construction industry is recommended.
Appropriate Measures and Data	A process measurement for the listed treatments is the number of miles of roadway that are improved. Safety benefits of implemented treatments can be determined by monitoring crash data for run-off-road and head-on (including sideswipe opposite direction) crashes. The crash severity may also change for the roadway as head-on and run-off-road crashes have a large potential to result in a fatality or disabling injury.
Organizational and Institutional	
Champion	NDOR, county and city highway/roadway agencies.
Organizational, Institutional, and Policy Issues	These strategies are relatively easy to implement and will typically not require coordination among multiple agencies. State, county, and city highway/roadway agencies may want to review their 3R and maintenance practices to determine if some of the strategies can be implemented and maintained as part of this work. Also guidelines may be helpful to designers for selecting the most appropriate treatment for a particular roadway.

Strategy 2. Keep Vehicles from Encroaching on the Roadside	
Issues Affecting Implementation Time	Implementation of shoulder paving and shoulder widening could be started in a short period of time. Full implementation would be dependent on prioritization and funding of projects. Some treatments, such as maintaining gravel shoulders, could be implemented immediately into annual maintenance programs. Coordination with the construction industry would be needed before implementation of the "safety wedge".
Costs Involved	The costs of this strategy range from low to medium, depending on the strategy chosen, the local conditions, and the size of the project. The following costs are intended to represent an average expected cost for Nebraska, but these costs could change substantially depending on issues such as the existing top width of the roadway, available right-of-way, etc. Maintaining gravel shoulders is estimated at several thousand dollars per mile. Once contractors have modified their equipment and construction practices, the cost of "safety wedges" when done in conjunction with 3R projects should be similarly low. Projects with costs in the medium range include paving shoulders at an estimated $100,000 per mile and widening shoulders at an estimated $200,000 per mile.
Training and Other Personnel Needs	Most highway/roadway agencies could implement these strategies with existing staff. Some training would be useful to construction staff on any inspection issues associated with the "safety wedge". Some training and guidelines would be helpful to designers for selecting appropriate treatments.
Legislative Needs	None Identified.

Strategy 3. Minimize the Likelihood of Crashing into an Oncoming Vehicle	
Definition	On divided roadways with a narrow-width median, high volumes, high speeds, and/or a combination of these factors, minimize the likelihood of a vehicle crossing the median and crashing into an oncoming vehicle by installing cable median barriers.
Technical	
Description	Where appropriate, install cable median barrier to prevent cross-median crashes on divided facilities. Recently, there have been improvements to these systems (i.e., four-strand, high-tension systems) which are rated to bring heavy vehicles safely to a stop. Unlike the first two strategies, this treatment does not prevent a crash from happening, but instead has a purpose of preventing a crash from resulting in a fatality or serious injury.
Target(s)	This strategy targets crashes where a vehicle crosses the median and collides with one or more vehicles traveling in the opposite direction. These types of crashes are normally very severe, involving head-on crashes at high speeds.
Goal	The statewide safety goal is approximately a 27% reduction in the number of traffic fatalities forecasted to occur in 2011. The countermeasure is expected to be up to 90% effective at preventing a cross-median fatality, but there are relatively few across-median fatalities when compared to total lane departure fatalities. Therefore, this strategy should be part of a comprehensive program to prevent lane departure fatalities. (Note: For example, a comprehensive program may also utilize enforcement to reduce drinking and driving or encourage passengers to wear safety belts in order to prevent lane departure fatalities.) Roadway segments with the greatest number of across-median fatalities (or segments with similar volumes, speeds, and design) should be a primary focus.
Responsive and Preventative Plans	The responsive component of the implementation plan would involve installation of cable barrier along highway segments where the crash history demonstrates an existing cross-median crash problem. Due to the rare nature of cross-median crashes, identifying where clusters of crashes have occurred is an effective approach for identification of problem locations rather than focusing on crash rates. The preventative component would involve installation of cable barrier at locations where site conditions indicate an increased probability of cross-median crashes. Variables to consider would include median width, traffic volume (including peak volumes), crash history, speeds, geometric alignment, and proximity to interchanges or areas with a high degree of weaving and lane changing. Some states have established warrants for median barrier that are more aggressive than the guidelines in the AASHTO Roadside Design Guide. Warrants specific to Nebraska could be another part of the preventative plan.
Expected Effectiveness	Less than 9% of crashes with weak-post barrier (cable barrier would be included in this category) resulted in an injury or fatality. (Volume 4, Strategy 18.1 B2) Not all vehicles that run off the road into the median will cross over into oncoming lanes. Not all vehicles that cross into oncoming lanes will collide with traffic. But, for cross-median crashes that would otherwise occur, impact with a cable median barrier will greatly reduce the probability that the outcome will be a fatality or serious injury.
Keys to Success	Installing cable median barrier at locations with an existing cross-median crash problem is a good first step, but due to the rare and random nature of these crashes, the preventative component of the plan is especially important. The roadway and traffic characteristics that contribute to an increased risk of cross-median crashes should be identified. This is then followed by a preventative program where cable median barrier is installed on a more system-wide basis on the highways that have these high-risk characteristics.

Strategy 3. Minimize the Likelihood of Crashing into an Oncoming Vehicle	
Potential Difficulties	Potential difficulties include: • Concerns about the maintenance needs of cable median barrier, as well as mowing and weed control. Several proprietary cable systems have come on the market in recent years that are easier to maintain. • Although crash severities will decrease, the introduction of barriers will increase crash frequency. • Steep median slopes may be a limitation at some locations. Limited crash testing has been conducted with cable barriers installed on steep slopes. Some states have installed the barrier along the edge of the median shoulder, on one side or the other, when faced with this site constraint.
Appropriate Measures and Data	The number of barrier impacts and the crash severity. Any penetrations of the barrier should be recorded. This type of data and some additional crash testing prompted North Carolina DOT to adjust the lateral placement of the cable barrier within the median.
Organizational and Institutional	
Champion	NDOR.
Organizational, Institutional, and Policy Issues	The AASHTO Roadside Design Guide provides some general guidance on when cable barrier should be considered, based on traffic volumes and median widths. Several states have developed state-specific warrants or guidelines for where median barrier should be installed.
Issues Affecting Implementation Time	Implementation time is short unless there are issues with median slopes, deflection space, or other site specific issues that make the use of cable median barrier more challenging. It is important that maintenance personnel are trained on how to maintain the system before it is installed.
Costs Involved	The cost of cable median barrier is approximately $80,000/mile (this does not include the costs of any median grading or paving). Annual maintenance costs such as mowing, post replacement, and general maintenance of the barrier should also be considered. Many states are using “socketed” systems to reduce repair time and cost. With these systems the posts are inserted into steel sleeves that are embedded in concrete. This allows posts damaged after an impact to be manually removed and replaced.
Training and Other Personnel Needs	Most highway/roadway agencies could implement this strategy with existing staff. Depending on how much additional barrier is added and how often it is impacted, there may be some additional needs for maintenance staff. Training may be needed for maintenance personnel if new barrier systems are being used. Some training and guidelines would also be useful for designers so that they understand barrier deflection requirements, placement location within the median and other design issues that influence both the barrier’s safety performance and how it can most efficiently be maintained.
Legislative Needs	None Identified.

Strategy 4. Reduce the Severity of the Crash	
Definition	For run-off-road crashes, reduce the crash severity by (1) improving/updating barriers and attenuation systems and/or (2) shielding roadside objects (such as trees, utility poles, light poles) and steep slopes.
Technical	
Description	These treatments will not prevent a crash from occurring, but instead can reduce the severity and the likelihood of a fatality or serious injury resulting from the crash. This strategy first addresses the issue of replacing guardrail and impact attenuators that no longer meet current standards. This may be due to designs that are no longer considered acceptable, or systems that have aged or been damaged and may not perform sufficiently. Also guardrail or impact attenuators can be added at locations where such systems are needed but currently not in place.
Target(s)	This strategy targets crashes involving a vehicle that runs off the road and strikes a fixed object or overturns.
Goal	The statewide safety goal is approximately a 27% reduction in the number of traffic fatalities forecasted to occur in 2011. The countermeasures have high expected effectiveness (i.e., shielding a hazardous roadside object would reduce the likelihood of a fatality by up to 90% in the event of a collision); but the cost per mile would likely prohibit immediate system wide deployment. Therefore, this strategy should be part of a comprehensive program to prevent lane departure fatalities. (Note: For example, a comprehensive program may also utilize enforcement to reduce drinking and driving or encourage passengers to wear safety belts in order to prevent lane departure fatalities.)
Responsive and Preventative Plans	Because the location of fatal and disabling injury crashes is random, deploying these strategies along short segments or at spot locations in reaction to one serious crash is unlikely to prevent a significant number of crashes. As a result, this strategy consists of both a responsive and preventative component. First, these strategies could be deployed responsively along an entire corridor that has a documented safety problem related to lane departures. The preventative plan would be to first implement the strategies at locations that have an increased probability of having a fatal or serious injury crash problem (based on variables such as traffic volume, crash history, steep roadside slopes or a large number of fixed objects along the roadside, poor alignment, poor shoulders, and other factors that contribute to run-off-road crashes). The second step of the preventative plan would be to implement and maintain the strategies over as much of the road network as possible—as a part of 3R improvements, safety projects, or as resources allow.
Expected Effectiveness	(Tried/Experimental) Currently, there are limited studies on the effectiveness of upgrading out-of-date guardrail and other safety hardware. Effectiveness is based primarily on how the various systems performed under current crash test criteria. There are a variety of newer terminals on the market which have passed these crash tests, several of which have energy absorbing and redirective capabilities when impacted. Many states have observed that impacts with even older terminals (like turned-down and blunt-end terminals) can result in very severe crashes. Crash frequencies may increase with the installation of additional barrier, relatively close to the roadway, but crash severities should decrease as impacts with safety hardware are much less likely to result in a fatal or serious injury as compared to an unimpeded run-off-road crash.
Keys to Success	Implementation at a specific location or along a short segment in reaction to a fatal or high profile crash is unlikely to make a significant impact on the number of fatal and serious injury crashes. After addressing crash locations that are significantly higher statistically than expected (responsive deployment), a prioritized systematic deployment should be more effective at preventing severe crashes (preventative deployment). It may be possible to accomplish some of the simpler, lower-cost upgrades with maintenance work. Periodic upgrades to safety hardware and reevaluating where guardrail should and should not be installed can also be a part of safety improvements on 3R projects.

Strategy 4. Reduce the Severity of the Crash	
Potential Difficulties	Concerns about the maintenance needs of additional barrier—maintenance of the barrier itself as well as mowing, weed control, and snow drifting. Some barrier may have been installed in the past where it is not needed and could be removed. Also, longer-term, more expensive projects such as slope flattening and removal/relocation of fixed objects may eliminate the need for barrier in some areas. Although crash severities will decrease, the introduction of barriers may increase crash frequency in some areas.
Appropriate Measures and Data	For some features, such as upgrading impact attenuators and guardrail terminals, the best measure is the number of locations improved. For other features, such as barrier that has been upgraded or added, the length of improvements is a better measure. Effectiveness of the strategies can be determined by monitoring crash data for lane departure crashes and paying particular attention to crash severities, which are expected to decrease.
Organizational and Institutional	
Champion	NDOR, county and city highway/roadway agencies.
Organizational, Institutional, and Policy Issues	These treatments are relatively easy to implement and will typically not require coordination among multiple agencies. Guidelines for maintenance and 3R projects should be reviewed to determine if some of these strategies could be implemented as a part of that work. This could decrease the timeframe needed for a more preventative, system-wide implementation, as well as establish a mechanism for ongoing monitoring and updating of systems.
Issues Affecting Implementation Time	Projects to update or add safety hardware can be designed quickly and could be implemented in a short timeframe. The part of the process which may have the greatest potential to delay implementation is developing a prioritized list of locations for deployment.
Costs Involved	The cost of this strategy is classified as moderate. The following costs are intended to represent an average expected cost for Nebraska, but these costs will vary depending on specific site conditions, size of the project, and the type of safety feature selected: Impact attenuator: $20,000. Guardrail terminal: $1500. Guardrail transition (connection to bridges or concrete barrier): $1000. w-beam or cable guardrail: $75,000/mile.
Training and Other Personnel Needs	Highway/roadway agencies may be able to implement these strategies with existing staff. Depending on how much additional barrier is added and how often it is impacted, there may be some additional needs for maintenance staff. Also, if new safety features are being used, training for maintenance personnel on repair and on-going maintenance should be provided. Training and guidelines are recommended for designers so they understand the various systems—how they function, where they are appropriate for use, and how they should be designed (issues such as length of barrier, deflection requirements, approach slopes, etc.).
Legislative Needs	None Identified.

4.2 Impaired Driving Critical Strategies

Strategy 5. Enforcement to Discourage Drinking & Driving	
Definition	Use enforcement to reduce the number of alcohol-related crashes by increasing the number of: (1) DUI checkpoints (2) Saturation patrols. Also enhance DUI enforcement through the use of – (3) Enhanced traditional traffic enforcement. (4) Form state and local law enforcement partnerships to provide greater coverage during enforcement campaigns and also work with regional safety partners to help identify target locations, times, etc. for enforcement efforts. All of the enforcement efforts will be highly publicized and coordinated to achieve greater impact and success.
Technical	
Description	DUI checkpoints are predetermined locations where law enforcement officers stop passing motorists and then assess the driver's condition to ensure they are not impaired. A saturation patrol floods with patrols dedicated to traffic enforcement, in an area during a defined time frame with a focus on identifying, stopping, and arresting impaired drivers. Traditional traffic enforcement can also effectively reduce drinking & driving and thereby affect behaviors that result in crashes. An Indianapolis study cited in *NCHRP Report 500, Volume 16* stated that most DUI arrests were persons stopped for speeding. So it is important that all officers are properly trained to be able to identify drivers that are under the influence of alcohol or drugs. This strategy advocates conducting DUI checkpoints and saturation patrols coordinated throughout Nebraska. The frequency, location and duration for statewide enforcement should be worked out cooperatively by state and local law enforcement agencies. However, these efforts should be carefully considered to achieve best results possible given available resources. This review can include a focus on areas with a high number of related crashes (engineers can assist with this) and/or past citations issued. Agencies should also consider using alternative enforcement methods to keep officers from becoming "burned out" and to keep the public from becoming accustomed to seeing one type of enforcement. Also, one of the keys to an effective enforcement program is increasing public awareness and visibility of the efforts. This includes highly publicizing the programs and the results (i.e., number of arrests and citations).
Target(s)	The real strength of DUI checkpoints and saturation patrols is deterring drinking and driving through increasing a driver's perception they will be caught. Achieving this outcome has been found to be effective at reducing drinking and driving.

Strategy 5. Enforcement to Discourage Drinking & Driving	
Goal	The statewide safety goal is approximately a 27% reduction in the number of traffic fatalities forecasted to occur in 2011. Each countermeasure is expected to reduce alcohol-related crashes by 10% to 15% if deployed statewide; therefore, using more than just one program may be sufficient to achieve an overall 25% reduction in alcohol-related fatalities. (Note: The 2006 Nebraska CHSP set a goal to reduce alcohol-related fatal, disabling injury, and visible injury crashes by 4% while increasing the number of alcohol-related arrests 5%.) The optimum frequency, duration, and density of enforcement efforts should be determined through experience. However, an example of an initial implementation goal would be conducting enforcement operations that result in 15,000 additional hours of special overtime alcohol-related enforcement. As part of this additional enforcement, sobriety checkpoints could be conducted at least three times annually in each of the 10 largest populated counties in the state.
Responsive and Preventative Plans	Highly publicized, statewide DUI checkpoints and saturation patrols should emphasize a preventative plan to reduce alcohol-related fatalities. This plan should be implemented by concentrating checkpoints and patrols along corridors or in areas that have a frequency or rate of alcohol-related crashes higher than expected. Using traditional traffic enforcement to enhance DUI detection, again, could be a preventative safety strategy.
Expected Effectiveness	(Proven/Tried) As reported in NCHRP Report 500, Volume 16 (Strategy 5.1 B1), DUI checkpoints coupled with a public information program have been found to reduce alcohol-related crashes by 10% - 30% in several studies. NHTSA has estimated that visible, routine use of DUI checkpoints will reduce alcohol-related fatalities by 15%. In the discussion of saturation patrols and traditional traffic enforcement (Strategy 5.1 B2), the authors reviewed a five year program from Massachusetts that was targeting drinking & driving, speeding, safety belt use, and other moving violations. At the end of the program, there was a 42% reduction in fatal alcohol-related crashes. Saturation patrols and DUI checkpoints are currently used in Nebraska. A summary of previous activities and effectiveness specific to Nebraska is provided below (from the Nebraska Office of Highway Safety). "In 2005, the Nebraska Office of Highway Safety (NOHS) awarded a total of 137 mini-grant contracts for overtime-selective alcohol enforcement to 56 different agencies. In addition to the Nebraska State Patrol and the Nebraska Game and Parks Commission, This includes 54 different county sheriffs' offices and local police departments. A total of 14,989 hours of additional enforcement in the form of sobriety checkpoints, underage drinking law enforcements, and saturation patrols, was initiated. The Omaha Police Department initiated "Project Night Life", with grant funding that targets 15 to 19 year old drivers between the hours of 12:00 a.m. and 6:00 a.m. During the project period, a total of 578 official citations were issued. This included 41 DWI's. To support the enforcement, the NOHS provided 233 preliminary breath testing instruments to a total of 58 different agencies. These aid in establishing breath alcohol presence at the time of arrest. The NOHS provided funding assistance to twenty local law enforcement agencies to purchase a total of 47 in-car camera systems to assist in documenting alcohol violation evidence. NOHS supported training related to alcohol enforcement activities. Training was provided to 192 officers in Standard Field Sobriety Training (SFST). A total of 139 officers were trained in the use of the in-car camera system to document DWI evidence and 15 other officers were provided with other alcohol enforcement related training. In 2005, Nebraska's alcohol crash rate per 100 million vehicle miles traveled declined from 10.3 in 2004 to 9.6 in 2005. Driving while intoxicated arrests increased from 14,148 in 2004 to 14,525 in 2005. DWI convictions increased from 11,016 in 2004 to 11,357 in 2005."

Strategy 5. Enforcement to Discourage Drinking & Driving	
	In addition to addressing drinking & driving and alcohol-related crashes, special enforcement programs have the potential to address other areas (i.e., spill over effect). This is demonstrated by the number of citations and arrests for other violations, such as speeding, drug use and possession, operating with a suspended license, and other moving violations (information on citations and arrests available in press releases on the Nebraska State Patrol webpage).
Keys to Success	As indicated, a regular cycle of performing checkpoints should be maintained, but the location and frequency should be varied so that drivers can't predict when and where the checkpoints will occur. Also, a campaign to make certain the public knows that the State is conducting regular, statewide checkpoints and how many stops, citations, and arrests are made during each campaign will help improve the effectiveness of the strategy. Often overlooked in a safe checkpoint program is a careful determination of the areas where vehicles will be stopped, including advance warning of drivers to slow and stop ahead. This may require the assistance of highway agencies to make sure the checkpoints follow the principles of safe traffic control. As indicated, for saturation patrol and traditional traffic enforcement, a continuous and visible presence by law enforcement is needed. As well as publicizing the results. All officers must be trained to spot signs of impairment and perform field sobriety tests in order to successfully remove drunk drivers from the roads.
Potential Difficulties	Locating the funding and personnel needed to staff the checkpoints and saturation patrols on a consistent basis statewide is likely to be the largest challenge. Several Strategies mentioned in the *NCHRP Report 500* series include using smaller teams (3 -5 people) at each checkpoint and teaming with other agencies. The people responsible for writing and releasing information to the press will need to find ways to keep the information fresh and interesting as the program matures. After the "newness" has worn off the program, media outlets may no longer be interested in the information. State agencies will also have to coordinate to determine the best locations, frequency, and duration to conduct special enforcement. Available crash data can be used to help identify locations and time, but professional judgment should be exercised to determine the frequency and timing.
Appropriate Measures and Data	At each location and on an aggregate basis for the program, agencies should track data, such as the total number of stopped vehicles, number of field sobriety tests given, number of drivers found driving drunk, number of citations written, arrests made for other violations, and the number of agencies/officers that participated in the program. However, the real effectiveness should be realized over time as there will hopefully be a reduction in the number of alcohol-related crashes both statewide and in the communities where programs were located.
Organizational and Institutional	
Champion	Nebraska Office of Highway Safety, Nebraska State Patrol and any local agency that provides law enforcement services.
Organizational, Institutional, and Policy Issues	Getting the support and backing of prosecutors, judges, political officials, and law enforcement chiefs will be needed if the program is to reach its full potential. Potentially, many agencies (state, county, and city) will have to be working together in order to develop a comprehensive statewide program.

Strategy 5. Enforcement to Discourage Drinking & Driving	
Issues Affecting Implementation Time	For a statewide program, the major issues affecting implementation include locating funding and coordinating law enforcement agencies (and possibly highway agencies if help is needed to create a safe traffic management plan or to potentially obtain crash data). For a statewide program, it was estimated that several months may be needed before the program can begin. After the DUI checkpoints are conducted, it is important that a press release is written and distributed quickly afterwards to make sure news agencies will be interested.
Costs Involved	The cost of a statewide DUI checkpoint and saturation patrol campaign will vary depending on the frequency, duration, number, and type of enforcement. These costs will include the time to staff each checkpoint or patrol, writing and publishing the results, and time to coordinate, plan and set-up each checkpoint. Often, officers working at a checkpoint are on overtime, which can increase the cost. The cost of the 2005 alcohol-related special enforcements conducted in Nebraska was approximately $765,000. Similarly, the reported cost for a DUI checkpoint program in Tennessee was at approximately $500,000 per year in which 576 checkpoints were conducted (http://www.nhtsa.dot.gov/people/injury/research/ChekTenn/ChkptTN.html). Further, NHTSA estimated that the savings (in crash costs) from each checkpoint is $62,000. The total cost of the Nebraska DUI checkpoints and saturation patrols were unpublished. But the efforts paid in part by grants from NOHS ranged from $1,200 up to $7,500.
Training and Other Personnel Needs	Continued support of enforcement related training that includes: low staffing sobriety checkpoint operation; standard field sobriety training; administrative license hearing preparation; and impaired motorcyclist detection. Equipment needs by a number of agencies include in-car computer systems with associated training and additional equipment (i.e., portable lighting and signs) to set up checkpoints.
Legislative Needs	None identified.

Strategy 6. Enforcement and Education to Discourage Underage Drinking and Driving	
Definition	(1) Publicize and enforce zero tolerance laws for drivers under age 21. (2) Encourage parental involvement and attendance in programs/classes and emphasize education and training through the graduated licensing programs. To further discourage drinking and driving, (3) work with courts to discourage diversion programs and plea bargains to non-alcohol offenses (i.e., improve DUI process and conviction rate).
Technical	
Description	Nebraska currently has a 0.02 BAC limit for drivers under the legal drinking age. Therefore, the first part of this strategy is to highly publicize this law so that minors and parents understand that it exists and what the penalties are if caught in violation of the law. To facilitate making this information available, consideration of a new GDL provision could require parents to attend a class where this law is reviewed, in addition to considering other age appropriate driver safety topics. Having law enforcement or other speakers discuss the consequences (legal -- if caught by law enforcement, physical -- if drinking and driving results in a crash) of drinking and driving could be one method to make sure every teen driver and their parent is educated. Advocacy groups and agencies can work with courts (judges and prosecutors) to educate them on the potential consequences of continually reducing charges for minors (or adults) that were stopped and cited for DUI; especially for individuals that have had multiple charges reduced.
Target(s)	Drivers under the legal drinking age is the primary target. Encouraging the elimination of diversion and plea bargains can discourage first time offenders if it is well known that the courts are strict, but it should be especially effective for repeat offenders.
Goal	The statewide safety goal is approximately a 27% reduction in the number of traffic fatalities forecasted to occur in 2011. Each countermeasure is expected to reduce alcohol-related crashes by 10% to 20% if a statewide program is created. Therefore, this strategy should be part of a comprehensive program to prevent fatalities involving underage drinking drivers. (Note: The 2006 Nebraska CHSP set a goal to reduce alcohol-related fatal, disabling injury, and visible injury crashes by 4% while increasing the number of alcohol-related arrests by 5%.) An example implementation goal would be to perform 2,000 additional hours of special overtime alcohol-related enforcement for underage drivers. Furthermore, an implementation goal could include creating a program that reaches at least 500 parents of newly licensed teens and educate the court systems in the most populated areas.
Responsive and Preventative Plans	The purpose of drinking and driving education, enforcement, and strict prosecution of citations is to raise awareness of the risks of drinking and driving so that people will not take the chance. Therefore, this strategy is a preventative approach to reduce underage drinking and driving (and indirectly could address adult repeat offenders).
Expected Effectiveness	(Proven/Tried) Detailed information on the effectiveness of each strategy can be found in the sixteenth volume of the *NCHRP Report 500* series, but summaries of effectiveness information are provided below. • Publicize and Enforce Zero Tolerance Laws: In Maryland, a zero tolerance law alone was attributed with reducing drinking and driving crashes by 21% for drivers under the age of 21. After the addition of an "extensive public information campaign", alcohol-related crashes decreased an additional 30%. In Maine, there was a "substantial" decrease in nighttime single-vehicle crashes (used as a proxy for alcohol-related crashes) two months before a new zero tolerance law went into effect; which coincides with when the new law was extensively publicized. (Volume 16, Strategy 5.1 B3)

Strategy 6. Enforcement and Education to Discourage Underage Drinking and Driving	
	• Eliminate Diversion Programs/Plea Bargains: Although diversion programs have been tried, there is no consensus on if they are effective and if so, by how much. The elimination of diversion programs has not yet been studied. The authors' literature review did identify that restrictions on plea bargains ("when combined with other policies") was responsible for approximately a 10% reduction in crashes and injuries. (Volume 16, Strategy 17.1 F3) The forthcoming Young Driver Guide provides some background information on getting parents actively involved with their teen driver, but no programs have been carefully studied. But there is information that simply providing parents with educational material has little influence. Thus it appears that requiring classroom time or in-vehicle time is likely necessary in order to have a genuine effect.
Keys to Success	In order to be effective, education materials relating to underage drinking laws need to be hard hitting and personal (i.e., profile a family who lost a family member in an alcohol-related crash) and be delivered through outlets likely to be viewed by teens and their parents (in school presentations, popular radio/TV shows, internet, etc.). It should also highlight the consequences of being caught drinking and driving when under the age of 21. The related enforcement effort should be continual and visible to be effective. Getting parents to participate in a class with their teen driver is only the first step. Afterwards, parents need to stay engaged in their child's driver training/education. This can include helping parents realize that it is acceptable to set limits on driving privileges, especially early on when teens have little or no behind-the-wheel experience. It will be necessary to not only get the support of the courts, but also public's acceptance of strictly enforcing DUI citations. The Nebraska Office of Highway Safety will establish a state Traffic Safety Resource Prosecutor within the Attorney General's Office. This individual will assist, train, and educate local prosecuting attorneys with traffic violation cases including, but not limited to DUI violations.
Potential Difficulties	After consuming even small amounts of alcohol, underage drivers frequently exhibit significant impairment. Some of these drivers may be able to successfully perform the standard field sobriety tests which will then require that officers be equipped with breath testing equipment to determine alcohol consumption. If parents are required to attend classes with their teen, they may view it as a major inconvenience. Some Nebraska courts have already implemented similar sentencing requirements with success. Those programs can be utilized as models for other courts. Discouraging the use of plea bargains and diversion programs may create additional workload for the courts system.
Appropriate Measures and Data	Records should be kept on the implementation of the different treatments (i.e., number, duration, and location of special enforcements; number and type of publicity, number of parents that participate in a class; etc.). After at least one year of a program, then changes in the rate and frequency of underage drinking and driving crashes can be reviewed.

Strategy 6. Enforcement and Education to Discourage Underage Drinking and Driving	
Organizational and Institutional	
Champion	Nebraska Office of Highway Safety and Project Extra Mile and other safety advocacy groups.
Organizational, Institutional, and Policy Issues	To encourage officers to enforce the underage drinking laws, the process for processing an offender so should be kept as simple as possible with minimal paperwork. Judges and prosecutors have the ability to utilize judicial and prosecutorial discretion. It is important to attempt to obtain consensus among judges and prosecutors for strict enforcement of penalties while simultaneously respecting their discretion. Continuing work on the automated court records system will help prevent repeat offenders from going unnoticed because the convictions occurred in separate court systems.
Issues Affecting Implementation Time	Increasing the education and enforcement of underage drinking laws could begin in as little as two months, possibly up to a year, depending on the time to develop the educational material (i.e., pamphlets, TV commercials, etc.). Special additional enforcement efforts could also be organized in as little as a few months. Expanding the program to require parent attendance may take some time to go statewide. However, expanding the implementation at local levels (i.e., by a county) could be accomplished in a much shorter timeframe. The time to change the culture of the courts will vary. However, development and production of materials to distribute and identification of persons to meet with the court employees should take no more than six months.
Costs Involved	The cost of publicizing and enforcing laws pertaining to underage drinking and driving will depend heavily on the type of media used (i.e., TV, radio, or print), intensity of enforcement, and frequency of media and enforcement campaigns. As an example, the cost in 2005 for the program to reduce DUI (including special enforcement; see Strategy 5) was $765,000. The cost of parent-teen programs and classes can be partially or fully offset by fees charged to the students. However, the costs could reach $500,000 per year. The cost of educating the courts regarding enhanced adjudication of the citations will include staff time and materials (including possible travel costs). An estimated cost for time and materials to support such a program is $50,000 per year.
Training and Other Personnel Needs	Existing staff should be able to further publicize and enforce the laws regarding underage drinking and driving. However, if agencies continue to staff special enforcements with officers on overtime, there may be a need to generally increase staff levels to keep officers from becoming “burned out” from all of the overtime. To conduct parent-teen classes, there will be a large need for qualified instructors if the program is statewide. Existing driver training instructors may be able to fill this need with some additional training. Also, effective selected and trained guest presenters (i.e., a parent who lost a child in an alcohol-related crash) may be an important element to encourage parents to be more involved in their child’s driver training. Existing staff familiar with traffic safety within Nebraska agencies and safety advocacy groups could meet with judges and prosecutors to explain the need to enforce DUI citations, especially for repeat offenders. The reduction or elimination of diversion programs (Nebraska law currently prohibits diversion of DUI offenders) and plea bargains could create a need for additional court staff if this results in a significant increase in workload.

Strategy 6. Enforcement and Education to Discourage Underage Drinking and Driving	
Legislative Needs	Action by the Nebraska Legislature would be necessary to require statewide parental involvement in programs and/or classes. However, there are already examples in Nebraska of parent-teen classes being required by some judges without action by the Legislature. Currently the penalty for violating the Zero Tolerance Law (drivers license impounded for 30 days and violation on record for 90 days before expunged) is less than the penalty for a minor in possession of alcohol (maximum fine of $500 and up to 30 days in jail). An enhanced penalty for violating the Zero Tolerance Law might include a six month loss of license and a requirement that the driver must maintain a clean record for up to twelve months. This change to the Zero Tolerance Law can only be accomplished by the Nebraska Legislature.

Strategy 7. Broad Based Education Campaigns to Reduce Impaired Driving	
Definition	(1) Encourage the use of required responsible beverage service policies and training for alcohol servers and retailers, (2) continue to educate the general public, business owners, and alcohol servers on the dangers of impaired driving, (3) consider public policies that would make parents accountable for minors who consume alcohol at their place and then drive, and (4) use targeted education techniques (such as billboards) to reduce excessive drinking and underage drinking.
Technical	
Description	This strategy is a combination of general and focused education campaigns and enhancing public policies to discourage drunken driving. Beverage server training is currently required in only some communities, while most of the state has only voluntary training for managers and servers. With the funding assistance from the Nebraska Office of Highway Safety, an online manager/server training program is now available to all licensees through the Liquor Control Commission at no cost. Consideration of a policy to require training as a condition of licensing would limit over-service and selling to underage patrons. An example program related to parental accountability, addresses parents that allow minors to consume alcohol in their home is Ohio's *Parents Who Host, Lose the Most*. Without a social host liability provision as exists in Ohio, the effectiveness of a similar program in Nebraska would be limited as well. The final aspect of the strategy is to provide public education on the dangers of drinking and driving. The education program could be oriented for the general public or focused on important groups (such as servers). Educational material could be distributed through a variety of mediums, including TV, radio, print, pamphlets, billboards, etc. Also, the education could be focused in regions of the State (i.e., counties, cities) or along corridors where alcohol crashes are overrepresented.
Target(s)	This strategy can be focused on target populations (i.e., servers, minors, etc.) if a serious problem exists, but the strategy is geared towards a broad based deployment to reduce drinking and driving crashes.
Goal	The statewide safety goal is approximately a 27% reduction in the number of traffic fatalities forecasted to occur in 2011. Each countermeasure is expected to reduce alcohol-related crashes by 5% to 23% if a statewide program is created. However, the countermeasure with the highest expected effectiveness ratio, alcohol server training, addresses a relatively small percentage of the alcohol-related fatalities. Therefore, this strategy should be part of a comprehensive program to prevent alcohol-related fatalities. (Note: The 2006 Nebraska CHSP set a goal to reduce alcohol-related fatal, disabling injury, and visible injury crashes by 4% while increasing the number of alcohol-related arrests by 5%.) An example implementation goal would be to have an enhanced policy regarding beverage server training by 2008. Furthermore, an implementation goal could include creating a program that reaches at least 500 parents of newly licensed teens and educate the court systems in the largest populated areas.
Responsive and Preventative Plans	This strategy is a preventative approach to reduce alcohol-related crashes through education and improved laws/public policies. However, the strategy could be focused on target populations or locations in order to deploy responsively. An example responsive deployment may include increasing the training of alcohol servers in areas where there is a high risk of drinking and driving for people leaving bars. Another responsive deployment may include more education material (i.e., billboards, commercials, etc.) in counties or along corridors where alcohol-related crashes are over represented.

Strategy 7. Broad Based Education Campaigns to Reduce Impaired Driving	
Expected Effectiveness	(Proven/Tried) • Responsible Beverage Service Policies: A responsible beverage service training program was found to reduce sales to underage persons by 11.5%, which was also accompanied by a 46% reduction in sales to the impaired (source: http://www.epi.umn.edu/alcohol/policy/rbst.shtm). Three years after a beverage training server law was implemented in Oregon, a 23% decrease in single vehicle nighttime injury crashes was observed. This crash type was used as a surrogate for alcohol-related crashes since many of these crashes involve a drinking driver. (Volume 16, Strategy 5.1 A2) • Broad Based Education Techniques: New York implemented a statewide program that relied on effective legislation that helped create a self-sustaining program at the local level. As part of this, paid media ads were used to promote fun and safe alternatives to drinking. Between 1981 and 2000 annual alcohol-related crashes fell 39%; fatalities were reduced by 70%; and alcohol-related injuries by 57%. (source: http://www.nhtsa.dot.gov/nhtsa/whatis/regions/Region02/Region2_ShareInfo/STOPDWI.html)
Keys to Success	If new legislation is enacted for beverage server training or to address adults allowing minors to drink and drive, getting this information out to the right audiences is important. Educational messages should be demographic and content appropriate to affect a change in behavior.
Potential Difficulties	Implementing beverage server training will likely face opposition by business owners. Arguments will likely focus on the cost of getting all servers trained and the difficulty in training all servers within an industry that has a potential for high turnover of staff. With Nebraska's existing on-line manager/server training option, this could be mitigated. Without existing Dram Shop legislation or case law, there is little threat to licensees regarding potential liability for over service or underage sale and those consequences related to drinking and driving crashes. (Note: Dram Shop laws impose civil liability on liquor licensed establishments or alcoholic beverage retailers who sell alcohol to underage persons or obviously intoxicated adults when they are subsequently involved in a crash resulting in death or injury to a third party.) For some of the above reasons, there could be opposition to new legislation that requires beverage server training. Similar opposition could occur for legislation that strengthens laws against adults that allow minors to drink and drive.
Appropriate Measures and Data	To measure the effectiveness of server training requirements, the measure would be the number of servers trained and the number of servers still waiting to attend a class or be trained and potentially the number of server related violations. Data to measure the effectiveness of the implementation of education messages could include the type of medium used to deliver the messages (i.e., TV, radio, billboard, or print), the frequency, time of day, etc. The results of the education messages could be determined in before and after surveys to determine, for example, how many people remember seeing the messages and if their behavior changed afterwards. Ultimately, an effective program as part of the overall approach to reduce drinking and driving should result in a reduction of alcohol-related crashes.

Strategy 7. Broad Based Education Campaigns to Reduce Impaired Driving	
Organizational and Institutional	
Champion	Nebraska Office of Highway Safety, likely in partnerships with safety advocacy groups such as Project Extra Mile, MADD, NU Directions, AAA and other safety advocacy groups..
Organizational, Institutional, and Policy Issues	None identified.
Issues Affecting Implementation Time	After funding is identified, education messages could likely be developed and broadcast within one year. Implementation of required server training efforts and those addressing parents that allow minors to drink can only begin after the Nebraska Legislature has taken action. If required server training is passed, there would likely be a window of time where businesses would have to train all of their servers. In Oregon, existing businesses had up to five years to complete training.
Costs Involved	Required server training could likely be self-sustaining from fees collected for people to attend a class. The Nebraska Office of Highway Safety has already invested over $50,000 to establish the on-line program, including providing materials and website development. A new investment of at least $20,000 will be made to enhance the current system and to add new teaching modules. Addressing parents that allow minors to drink and drive would be minimal, mostly related to court costs for prosecuting – once a program is underway these costs are often passed onto the defendant if found guilty. The cost of educating the court system and others on a new law is estimated at $10,000. The costs of education campaigns will vary greatly, depending on the media used and how broadly the message is distributed (i.e., target audiences such as minors, servers, or in target locations such as at sporting events). An estimated cost for a statewide education campaign is $100,000.
Training and Other Personnel Needs	Existing staff within agencies are already qualified and experienced at carrying out these types of strategies. With any new public policies, some education of agency staff is appropriate to make sure they are prepared to implement and enforce the initiatives.
Legislative Needs	While some individual communities in Nebraska have established required training, the Legislature and/or the Nebraska Liquor Control Commission are the only bodies with the authority to make training for alcohol servers required. The Legislature can enhance laws that address adults who allow minors to drink alcohol in their residence (and then drive afterwards).

Strategy 8. Compliance Checks of Alcohol Retailers	
Definition	To reduce underage drinking (and driving), increase the number of well-publicized compliance checks of alcohol retailers to reduce sales to underage persons.
Technical	
Description	Increase the number of retail compliance checks to further discourage business from selling alcohol to minors. Highly publicizing the results of these programs, to both the general public and to alcohol retailers, can help improve compliance. If retailers are made aware that enforcement agencies are cracking down on the sale of alcohol to minors, that knowledge could act as a strong deterrent to checkers tempted to sell alcohol to minors and can also discourage minors from trying to purchase alcohol.
Target(s)	Alcohol-related crashes involving drivers ages 20 and younger.
Goal	The statewide safety goal is approximately a 27% reduction in the number of traffic fatalities forecasted to occur in 2011. However, compliance checks of alcohol retailers only address a small fraction of the alcohol-related fatalities. Therefore, this strategy should be one component of a comprehensive program to prevent fatalities involving underage drinking drivers. (Note: The 2006 Nebraska CHSP set a goal to reduce fatal, disabling injury, and visible injury crashes by 4% while increasing the number of alcohol-related arrests by 5%.) A possible implementation goal would be increasing the number of compliance checks by 25% in 2007. In addition, a goal in Nebraska has been established to reach a community consensus that clearly states that underage alcohol use is illegal, unhealthy, and unacceptable.
Responsive and Preventative Plans	Alcohol retailer compliance checks (i.e., enforcement) coupled with publicizing the program (i.e., education), in general, is a preventative approach to reducing alcohol-related traffic fatalities, especially if the programs and campaigns are conducted across the entire state. However, if limitations on funding and other resources limits a statewide campaign, the program could be deployed responsively in communities (i.e., cities, counties) where there is a concentration of alcohol-related fatal crashes or a high potential for a fatal crash (possibly observed through the location of DUI stops).
Expected Effectiveness	(Tried) In the Douglas and Sarpy County area, conducting regular compliance checks has resulted in reducing retailer non-compliance from 47% to 9%. In New Orleans, a new retailer compliance law coupled with a media campaign on the law's existence increased age checks from 11% to 40% in five months. (*NCHRP Report 500, Volume 16*. Strategy 5.1 A3)
Keys to Success	Nebraska's established "We Want You Back" and "Think B4U Wink" education campaigns use hard-hitting, personal and emotionally evoking messages that grab attention and have been making a difference. Furthermore, education combined with enforcement (including publicizing the results such as number of arrests, citations, etc.) has been proven to be more effective at changing behavior than the education campaign alone. The penalties for breaking existing laws can be severe if appropriately applied. Education alone is unlikely to be a sufficient deterrent. It is essential that existing state policies related to the selling of alcohol to minors are assessed and that they are appropriately enforced with sufficiently appropriate penalties. Finally, participation by owners and managers of businesses that sell or serve alcohol are needed to achieve maximum effectiveness. Limited participation by this segment of the population makes success more challenging.

Strategy 8. Compliance Checks of Alcohol Retailers	
Potential Difficulties	The most difficult obstacle is getting the communities to recognize the seriousness of the problem and to get them engaged in supporting the education and enforcement activities necessary to change the community environment as it relates to underage drinking. An overall review of state and local alcohol policies and licensing practices, along with penalties needs to be conducted by members of that community. Those community members need to organize to support law enforcement initiatives to achieve the greatest success.
Appropriate Measures and Data	To measure implementation, law enforcement agencies submit activity reports regarding the enforcement operations. This includes the number of businesses checked in each operation and the media initiatives conducted. The number of alcohol-related traffic fatalities involving those drivers under age 21 is one of the most critical measurements. The non-compliance rate of retailers over time is another important performance measure.
Organizational and Institutional	
Champion	Nebraska State Patrol, Nebraska Liquor Control Commission, Nebraska Office of Highway Safety, Project Extra Mile, Nebraska Partners in Prevention, MADD and other safety advocacy groups.
Organizational, Institutional, and Policy Issues	The Nebraska Under-Age Drinking Advisory Task Force has already been formed to review existing laws and programs that speak to the problems addressed by this strategy. This Task Force along with other groups have been successful at improving some of the public policies and will continue to address those identified deficiencies.
Issues Affecting Implementation Time	The Nebraska State Patrol and more than 70 local law enforcement agencies already conduct routine compliance checks of alcohol retailers. The number of checks is constantly increasing. Educational materials already exist and results of the program are already routinely collected.
Costs Involved	Using an average cost of $30 per hour per officer, a team of six officers working a six hour operation would cost $2,160 ($1,080 for labor costs plus administrative costs and the cost of participation for one or two minors in the compliance checks). With nearly eight years of existing experience in conducting compliance checks in Nebraska, an established protocol with personnel and operational procedures is in place. The Nebraska Office of Highway Safety has an existing Compliance Check Grant Program that provides funding assistance to the Nebraska State Patrol and local agencies. In addition, the Office of Highway Safety is providing the Department of Health & Human Services with a template that they are using to establish requirement for the use of grant funding to conduct compliance checks. It is estimated that $300,000 will be expended in FY07 on compliance checks. The cost involved to further increase the number of compliance checks of alcohol retailers and servers could reach an additional $125,000 per year.
Training and Other Personnel Needs	Nebraska's existing agencies have staff trained to perform retail compliance checks. Plans are underway to expand training availability to more law enforcement agencies and personnel to meet the increasing demand for training.
Legislative Needs	Public policy initiatives may be necessary to enhance the penalties for selling to minors.

4.3 Unbelted Vehicle Occupant Critical Strategies

Strategy 9. Education and Enforcement to Increase Safety Belt Use Among Target Populations	
Definition	To increase safety belt use rate: (1) provide enhanced public information and education to population groups with lower than average restraint use rates, (2) conduct highly publicized enforcement campaigns, and (3) ensure that child and infant restraints are properly used by providing community locations for instruction in proper child restraint use and conducting high profile "child restraint inspection" events at multiple community locations (involving EMS personnel at inspection locations).
Technical	
Description	To increase safety belt use, a combination of enforcement and education is required. If the safety belt use rate stays static (or decreases) in the general population, enforcement will most likely need to be enhanced. The primary targeted group is 18-34 year old males. A subgroup is those that are driving pick-up trucks. Nebraska just implemented a targeted public information and education campaign combined with an enhanced enforcement effort. This was initiated in 2006 and will be continued into 2007. The media messages and the selected stations and programs are those frequently listened to by this group. An effort by the Nebraska "Click It, Don't Risk It" statewide Safety Belt Coalition targets teens with a competition among high schools that achieve a safety belt use rate of 80%, 90%, and 100%. The honor roll awards are presented by the Governor at the Capitol Building in Lincoln. Teen specific information and education materials have been created and are being distributed across the state. The use of parents who have lost teens as a result of no safety belt use are being utilized as guest presenters at schools and parental group meetings. The third countermeasure provides assistance to adults that have questions about the installation of child safety seats, and studies have found a high percentage of child safety seats are improperly installed. In doing so, one important element is to ensure that there are a sufficient number of certified child passenger safety technicians. Second, information regarding contacts to acquire assistance and dates/locations for special events needs to be made readily available. This could be done through advertising, web pages, or information distributed at hospitals.
Target(s)	This strategy is intended to motivate individuals that do not routinely use safety belts. This strategy will also encourage vehicle occupants that occasionally refrain from wearing their safety belt to use a belt each time they ride in a vehicle. Male drivers ages 18-34 are a targeted group along with all teens, especially when teens begin driving without an adult present. Another target is parents and care givers who need assistance to properly install child safety and booster seats in their vehicle.
Goal	The statewide safety goal is approximately a 27% reduction in the number of traffic fatalities forecasted to occur in 2011. Given the existing safety belt laws in Nebraska, a program that utilizes public information and education campaigns with enforcement would need to be aggressive if expected to increase safety belt usage enough so that unbelted fatalities are dropped by 25% before the end of 2011. (Note: The 2006 Nebraska CHSP set a goal to increase safety belt use to 82.8% by the end of 2006. Other goals included a 10% increase in safety belt usage by commercial motor vehicle drivers and a 5% increase in "No Child Restraint" and "No Occupant Protection" citations.)

Strategy 9. Education and Enforcement to Increase Safety Belt Use Among Target Populations	
	The optimum frequency, duration, and density of enforcement efforts should be determined through experience. However, an example of an initial implementation goal would be conducting enforcement operations that result in 2,000 additional hours of special overtime safety belt-related enforcement. Furthermore, an implementation goal may be to increase education campaigns so that the message reaches an additional 10% of the population.
Responsive and Preventative Plans	As defined in this strategy, the education of population groups with lower than average restraint use rates is primarily intended to be a preventative approach to increasing safety belt use. The use of targeted or special enforcements when the educational begins to prove ineffective is a responsive approach. Also focused on fatality prevention is the child seat installation instruction countermeasure. Normal crash reporting practices do not currently provide information on when restraints are improperly used, which makes a responsive component of this strategy difficult. Even if this were feasible, a preventative approach will be more effective as the goal is to achieve a broad, statewide understanding by parents and care givers of how to properly use child and infant restraints.
Expected Effectiveness	(Proven/Tried) Between 2000 and 2004, the reported safety belt usage rates ranged from 70% to 79% (with 2000 = 71%, 2001 = 70%, 2002 = 70%, 2003 = 76%, and 2004 = 79%) with a five-year average of 73%. During this time, there were 707 unbelted vehicle occupant fatalities. So, for every 1% of safety belt nonuse, there were approximately five unbelted traffic fatalities annually (707 unbelted fatalities ÷ 27% nonuse ÷ 5 years = 5.2 unbelted fatalities per 1% nonuse per year). In *NCHRP Report 500, Volume 11*, Section 3, a reported NHTSA study found safety belts reduce the risk of a fatality by 45% and a critical injury by 50% for front seat passengers over the age of five. As an estimate on safety belt strategies, it was assumed that a 1% increase in safety belt use would save between two and three lives annually (5.2 unbelted fatalities per 1% nonuse per year * 45% reduction in fatalities = 2.4 lives saved per 1% increase in safety belt use per year). [The 2005 and 2006 reported safety belt usage rates in Nebraska were 79.2% and 76.0% respectively. Since this information falls outside of the years that the crash data is from, it is provided only for informational purposes.] *NCHRP Report 500, Volume 11* reports that education and enforcement coupled together may result in a substantial increase in safety belt use. A South Carolina program that provided targeted education to population groups with low usage rates achieved some significant results (Strategy 8.1 A2). Overall, safety belt use in South Carolina increased by 8.4 percentage points. In target populations, there was an observed 8.7 percentage point increase in males and a 14.3 percentage point increase in nonwhites. Another example provided was the Safe Communities Coalition of Jefferson County, Wisconsin. Through their efforts, safety belt usage is above 87% in select populations, which is nearly 8 percentage points above Nebraska's statewide usage rate (79.2% in 2005). An effective and properly funded program could likely achieve a 4 percentage point increase in the safety belt usage rate (approximately half the gain seen in South Carolina and half of the difference between the Jefferson County and Nebraska usage rates). This would be expected to save almost 10 lives each year (10 lives saved per year = 2.4 lives saved per 1% increase in safety belt use per year * 4% increase in safety belt use). Locations for assistance with child seat installation has been tried by some local communities. Yet, the effectiveness of this strategy has not been documented. Additional education and inspection of child restraint use would be expected to decrease the percent of incorrectly used seats. Publicity about the conduct of events would also be expected to raise awareness among those who do not attend the events and inspire them to check for proper usage on their own. It will be difficult to quantitatively evaluate the safety impact of these programs. A special study would be required since normal crash reporting practices do not currently provide the necessary level of detail.

Strategy 9. Education and Enforcement to Increase Safety Belt Use Among Target Populations	
Keys to Success	The first key of a public education campaign is to make sure the population groups being targeted indeed do have a lower than average safety belt use rate. Next, any successful public education campaign needs to be hard hitting, graphic and personal in order to make a real change in driver behavior. Also, the message needs to be delivered through a media that is frequently seen by the target population. For enforcement, the first key is a continual and visible law enforcement presence. Also, the enforcement components should be publicized before and after implementation. The purpose of publicizing before implementation is to encourage as many people to buckle up as possible. Publicizing after implementation helps people realize that one could be caught the next time if they don't use their safety belt. The primary key to success for child safety seat inspections is to provide locations for education and inspection that are open on a regularly scheduled basis and at times and locations convenient to parents and care givers. Staffing is another important consideration, so agencies in the community (police, EMS, public health) must be willing to provide certified educators/inspectors or a sufficient number of qualified citizen volunteers must be recruited and trained. The City of Lodi, California currently has a program that is run by the police department working in conjunction with an organization of retired persons who volunteer time to assist with the program (http://www.lodi.gov/police/btb/btb%20carseats%202.htm). Key goals of the program include: • Providing multiple inspection sites. • Providing open locations such as fire stations for walk-in inspections. • Training police officers when making traffic stops or other motorist contact to recognize incorrect usage.
Potential Difficulties	A high profile, and extensive, public education and enforcement campaign can be costly. In addition to needing to find the financial resources, staffing special enforcement campaigns can be taxing on officers, especially if this occurs as part of a program that pays for overtime. But likely the largest difficulty to overcome is simply convincing individuals to change their behavior, especially if among a target population where use rates are below the statewide average. For whatever reasons, these groups have already demonstrated a reluctance to use their safety belts and resist efforts to change their behavior. With the many other obligations of police, EMS, and public health professionals, there may be some difficulty adequately staffing child safety seat installation inspection events at hours that are convenient to the public. Recruiting and training committed volunteers on an on-going basis may be a challenge in some communities, especially rural areas with a low population.
Appropriate Measures and Data	Implementation data for education programs should be measured, including the number, type, intensity, and frequency of messages. Related enforcement data should also be measured, including at a minimum where, when, how long, how many officers, and a record of citations and arrests, for the entire effort and separately among the targeted population. A measure of effectiveness will be changes in safety belt use rates, which increases in use rates should ultimately translate into a reduction of fatalities in the general and target population. Implementation measurements for the child safety seat inspection countermeasure include the number of people instructed, the number of seats inspected, the number of sites, and the number of instructors/inspectors (including the site-hours or instructor/inspector-hours of service).

Strategy 9. Education and Enforcement to Increase Safety Belt Use Among Target Populations	
	Effectiveness measurements may include the number and/or percent of incorrect usages that are identified and corrected. Note that without doing an inspection with the child in the safety seat, it is difficult to determine if the seat is being used correctly. Both how the seat is secured within the vehicle and how the child is placed and secured within the seat are important.
Organizational and Institutional	
Champion	Targeted Education and Enforcement of Safety Belt Laws: Nebraska Office of Highway Safety, Nebraska State Patrol Carrier Enforcement, Health & Human Services, EMS, and Nebraska "Click It, Don't' Risk It" Statewide Coalition and other safety advocacy groups. Community Locations for Inspection of Child Safety Seat Installation: NDOR, EMS personnel, public health professionals, state and local law enforcement, Nebraska Office of Highway Safety, and other safety advocacy groups.
Organizational, Institutional, and Policy Issues	An advocacy group within the community can be an important partner in promoting child safety restraint instruction and inspection programs, educating the public, recruiting and providing volunteers, and publicizing events.
Issues Affecting Implementation Time	Public information and education messages (print, TV, radio, etc.) have been developed. Enforcement is already underway and could be expanded. Likely the biggest hurdle to implementation is getting more interest and motivation of local law enforcement agencies. Issues affecting implementation of community child safety seat inspection locations are primarily organizational—finding good locations for the events, recruiting volunteers, training the instructors and inspectors, and effective publicizing and outreach.
Costs Involved	Costs of public education or enforcement campaigns will depend on the program implemented. For example, the cost of education messages delivered through school visits, print (i.e., pamphlets), radio ads, or TV ads may have a wide range of costs. Additionally, the amount of enforcement used will directly impact the cost. An example cost for a statewide program would be the cost of a program to address impaired drivers, or approximately $500,000 per year. For child seat inspections, there will be personnel costs if the instructors and inspectors are paid. If public facilities can be reserved for the programs, facility costs should be minimal. There may be some costs to develop and publish educational materials. There will be costs to advertise and publicize the events.
Training and Other Personnel Needs	Existing staff at State agencies and safety advocacy groups already have the training and expertise to develop and implement education and enforcement programs. Depending on the existing needs of law enforcement agencies, additional staff could be needed to meet the demands for patrol time. For child safety seat inspections, instructors and inspectors must be trained and certified. For information on child passenger safety training programs see http://www.nhtsa.dot.gov/CPS/Training/.
Legislative Needs	None identified.

Strategy 10. Enhanced Laws to Encourage Safety Belt Use	
Definition	To increase the safety belt use rate (as recommended by the May 16, 2006 Highway Safety Workshop participants): (1) Support adoption of a primary safety belt law (2) Strengthen penalties for safety belt violations.
Technical	
Description	Nebraska currently has a secondary safety belt law which allows an officer to give a citation only if the driver was first stopped for another traffic violation. A primary safety belt law would allow an officer to stop a vehicle and issue a citation simply because a vehicle occupant wasn't using their safety belt. Passing and publicizing a primary safety belt law would be expected to increase safety belt use rates among vehicle occupants. In addition to providing a primary law, a new law could also help eliminate any gaps in the current safety belt laws. For example, some national advocacy groups recommend that booster seat laws cover all children up to age eight, instead of age six currently covered by Nebraska law. An additional potential improvement to the current law is that all vehicle passengers in all seats must wear their safety belts (not just front seat passengers or when the driver has a provisional license). Examples of stronger penalties for violating the safety belt laws could include higher fines, citations to add points to a driver's record, and tickets given to adult passengers instead of the driver. Achieving a primary law is the first priority for this strategy; however, stronger penalties would be a great addition to a primary law, but could also be implemented separately if there is no Legislative support for a primary law.
Target(s)	This strategy is intended to motivate persons that do not regularly use safety belts. Ideally, this strategy will also encourage vehicle occupants that occasionally refrain from wearing their safety belt to use a belt every time they get in a vehicle. This strategy could also help protect children up to the age of eight by strengthening existing child restraint laws.
Goal	The statewide safety goal is approximately a 27% reduction in the number of traffic fatalities forecasted to occur in 2011. A primary law with stronger penalties coupled with education and enforcement would be an integral component to achieve this goal for unbelted fatalities by 2011. (Note: The 2006 Nebraska CHSP set a goal to increase safety belt use to 82.8% by the end of 2006. Other goals included a 10% increase in safety belt usage by commercial motor vehicle drivers and a 5% increase in "No Child Restraint" and "No Occupant Protection" citations.) The implementation goal for this strategy is to have adopted a primary safety belt law (and possibly also stronger child safety seat laws) and/or enhanced penalties for not using a safety belt by 2008.
Responsive and Preventative Plans	New or strengthened safety belt laws would be a preventative approach to increase safety belt use. Further publicizing the new laws would increase the strategies preventative nature.

Strategy 10. Enhanced Laws to Encourage Safety Belt Use	
Expected Effectiveness	(Proven/Experimental) Between 2000 and 2004, the reported safety belt usage rates ranged from 70% to 79% (2000 = 71%, 2001 = 70%, 2002 = 70%, 2003 = 76%, and 2004 = 79%) with a five-year average of 73%. During this time, there were 707 unbelted vehicle occupant fatalities. So, for every 1% of safety belt nonuse, there were approximately five unbelted traffic fatalities annually (707 unbelted fatalities ÷ 27% nonuse ÷ 5 years = 5.2 unbelted fatalities per 1% nonuse per year). In *NCHRP Report 500, Volume 11*, Section 3, a reported NHTSA study found safety belts reduce the risk of a fatality by 45% and a critical injury by 50% for front seat passengers over the age of five. As an estimate on safety belt strategies, it was assumed that a 1% increase in safety belt use would save between two and three lives annually (5.2 unbelted fatalities per 1% nonuse per year * 45% reduction in fatalities = 2.4 lives saved per 1% increase in safety belt use per year). [The 2005 and 2006 reported safety belt usage rates in Nebraska were 79.2% and 76.0% respectively. Since this information falls outside of the years that the crash data is from, it is provided only for informational purposes.] In 2005, the safety belt use rate in states with a primary safety belt law is on average 8.6 percentage points higher than states with a secondary law. If a primary law was passed in Nebraska and if it achieved an 8.6 percentage point increase in the safety belt usage rate, this could save 20 lives in the first year. During the study period, the information provided identifies nearly three fatalities per year where the occupant was 13 years old or younger. Realizing the number of individuals that are affected by booster seats is even less, stronger child safety seat laws may not save many lives each year. However, given the audience and importance of this group directly affected by child safety seat laws (i.e., children), the importance of strong and adequate traffic safety laws are immeasurable. Furthermore, proper use of child seat and booster seats may reduce injuries.
Keys to Success	For a new safety belt law(s), implementing an education effort and knowing that all law enforcement agencies are enforcing the law will be important to its success. Hard-hitting, graphic, personal education materials are often the most successful.
Potential Difficulties	There will likely be opposition from individuals or agencies that perceive these laws as intrusive into a person's life. However, one means to combat this argument is to make it clear that electing to not wear a safety belt does impact others. These impacts to others are often in the form of medical costs passed onto others in higher insurance premiums or increased taxes for emergency services to be able to respond. Also, not wearing a safety belt can impact other individuals in the vehicle since an unbelted occupant sometimes becomes a large projectile during a crash (there are documented examples of belted passengers being crushed and killed by someone who was unbelted).
Appropriate Measures and Data	Safety belt use information (entire state population and among high-risk groups) and the number of unbelted traffic fatalities are needed to evaluate the impact of this strategy. Changes in the use rate before and after any new laws go into effect will be especially important in understanding the safety benefits. It may also be necessary to monitor enforcement efforts (i.e., citations written) before and after any new laws in order to understand the impact enforcement had on the change in behavior.
Organizational and Institutional	
Champion	Statewide Click It Don't Risk It Coalition, Highway Safety Advocates and other safety advocacy groups.
Organizational, Institutional, and Policy Issues	Highway safety professionals need to work closely with law makers to educate them on the importance of safety belt laws.

Strategy 10. Enhanced Laws to Encourage Safety Belt Use	
Issues Affecting Implementation Time	Action by the Nebraska Legislature is the primary constraint on implementation of a primary safety belt law, new law(s) to eliminate gaps in child safety seats, or stronger fines for not using a safety belt.
Costs Involved	The estimated cost of staff time and materials to respond to Nebraska Legislature initiated requests for information on the need and benefit of a primary safety belt law or increasing the penalties for not using a safety belt is estimated at $10,000. Unidentified private or third parties may also incur costs associated with the marketing or promotion of a new law. If Nebraska were to pass a primary safety belt law, then Nebraska would receive a one-time grant (Section 406 of title 23, United States Code) of approximately $7.6 million for traffic safety.
Training and Other Personnel Needs	It is important that all law enforcement officers be properly trained/educated on the importance of enforcing safety belt and child safety seat laws, how to spot unbelted vehicle occupants, and inspection of child safety seats to ensure they are properly installed. The effectiveness of safety belt laws and enforcement campaigns will also require that the courts be educated on their importance so that citations are not dismissed by the courts. State agencies should already have trained staff that can produce press releases for enforcement campaigns and develop much of the material needed for education campaigns.
Legislative Needs	Only the State Legislature has the authority to enact a primary safety belt law or to change the fine for not using a safety restraint device.

4.4 Intersection Critical Strategies

Strategy 11. Follow the Principles of Access Management	
Definition	Near unsignalized intersections, use access management techniques to manage conflicts in the influence area of intersections.
Technical	
Description	The purpose of access management is to reduce the number of intersection-related crashes by reducing the number of conflict points or to at least separate intersections and/or driveways so that influence areas do not interact. Some techniques available include: controlling or managing access to adjacent land use (i.e., driveway frequency and location), spacing of intersections (i.e., closing and/or diverting traffic from unsignalized intersections to signalized intersections or interchanges), and prohibiting specific vehicle maneuvers that have demonstrated a higher risk (i.e., such as left turns or minor street crossings) by closing medians or using channelizing islands.
Target(s)	Depending on the specific situation, access management can help prevent rear end, sideswipe (i.e., car slowing to turn into a driveway is rear-ended or sideswiped by a vehicle going straight), angle (i.e., vehicle turning out of a driveway hit by a vehicle on the street) and left-turn (i.e., vehicle trying to turn left into a driveway is hit by an oncoming vehicle) crashes. Proper corridor access management, including the frequency of intersections, may not only improve safety, but could also help improve operations.
Goal	The statewide safety goal is approximately a % reduction in the number of traffic fatalities forecasted to occur in 2011. This strategy does have an expected effectiveness of 30% (or more), which should mean that a statewide system of roads that follow the principles of access management should help achieve the goal. However, there appear to be a relatively few fatalities that were directly linked to access management; therefore, this strategy should be part of a comprehensive program to prevent intersection fatalities. (Note: For example, a comprehensive program may also utilize roundabouts in appropriate locations or enforcement to reduce speeding and encourage passengers to wear safety belts in order to prevent intersection fatalities.) (Note: The 2006 Nebraska CHSP set a goal to reduce intersection crashes by 10% during 2006.)
Responsive and Preventative Plans	Access management can be practiced preventively in land use planning, working with local units of government to adopt development ordinances that include access management, and in new or reconstruction projects. This has the added benefit of minimizing construction costs if access needs to be changed after the initial construction. Another preventative plan for this strategy is to improve the access in locations that have experienced large growth in traffic volumes such that the existing access plan no longer functions well, even if a crash problem has not manifested yet. This strategy could be deployed responsively at locations or along corridors where there has been a history of access-related crashes.
Expected Effectiveness	(Tried) Access management is reported to be “considered effective and has been addressed in published literature, but there is no consensus on quantitative estimates of its effectiveness.” (Volume 5, Strategy 17.1 A1) The effectiveness of any access improvements will be dependent on the size of the problem at the location fixed and the ability of the specific strategy deployed to effectively manage vehicle movements. However, studies from Minnesota (Source: *Statistical Relationship Between Vehicular Crashes and Highway Access*, Minnesota DOT, August 1998) and Iowa (Source: *Access Management Research and Awareness Program: Phase IV*, Center for Transportation Research and Education, November 1999) have suggested that 30% to 40% reduction in crash rates can be expected.

Strategy 11. Follow the Principles of Access Management	
Keys to Success	Access management at a single intersection could have measurable safety benefits, but corridor improvement projects should be considered if large-scale impacts are desired. Involving the landowners and neighborhood early in the process is often an important step to helping them realize access changes will significantly improve safety while having little to no impact on ability to reach their property/business. Education of local officials is an important component in a successful statewide access management program. Example education materials and courses for access management already exist and could be used to quickly develop a program directed toward local agencies (elected officials as well as technical staff). A partnership with the Nebraska LTAP center could be used to help deliver the training to local agencies.
Potential Difficulties	Public opinion could be very much against the project. Especially with business owners, there is often a belief that changing access will reduce sales, possibly causing businesses to close. Studies in Texas, Kansas, Iowa, Minnesota, and Florida have found the opposite to be true, which is sales and property values in improved areas did as well as or better than comparable areas that were not improved. Access modifications could create changes in the traffic flow and patterns. Therefore, it is necessary for engineers to make sure that by correcting one location, that the change in traffic patterns won't create a problem at another location. It can also be challenging for the DOR (focus on mobility) and local planning agencies (focus on local access) to coordinate with each other.
Appropriate Measures and Data	Implementation information collected should include the number of intersections or corridors that had access improvements, the type of improvement(s) implemented, and the site/corridor's crash history (before and after, ideally looking at total crashes and access related crashes separately). Depending on the changes made and the concerns expressed by landowner(s) or business owner(s), an agency may also need to document impacts on travel time (i.e., increased time to access a parcel through a backage road versus direct access and how significant is this compared to the total trip length in the region) and business sales if an issue.
Organizational and Institutional	
Champion	NDOR, county and city highway agencies.
Organizational, Institutional, and Policy Issues	All highway agencies, whether urban, suburban, or rural, should include the principles of access management in the planning, design, and operation of their facilities because of the safety benefits. Therefore, it is best that access management be incorporated early into the process, including staff involved in planning and regulating land development. Equally important, personnel involved in final design or permitting also need to have an understanding of access management and be able to identify potential problems. It has been suggested that highway agencies need to establish formal guidelines for when and what type (i.e., full versus right-in/right-out) of access will be granted. Best practices and case examples may also be useful for staff when evaluating a situation. Agencies need to develop a culture of working with landowners to establish the best combination of access and safety, especially early in the development process before there has been large investments by the landowners. Agencies also need to work with neighborhoods to educate them when changes to access are needed, how they will benefit from a safer roadway, and demonstrate how most changes to access have a minimal effect (possibly even a positive effect) on travel time and business activity.

Strategy 11. Follow the Principles of Access Management	
Issues Affecting Implementation Time	The time to identify all intersections or corridors in need of access improvements will depend on the size of the jurisdiction. Ideally, the first sites or corridors selected for safety improvements would have a documented safety problem related to access or characteristics similar to locations where access safety problems have occurred. The time to implement the strategy may take only a few months to several years, depending on the selected solution, size of the project, extent of the agency's power to make changes to access, and cooperation by land owners.
Costs Involved	The cost of access modifications can vary from several thousand dollars for signs to several hundred thousand dollars if driveways have to be relocated, medians constructed, or frontage roads developed. Closing access may take $10,000 to $15,000 in construction costs, but relocating or creating restricted access can be quite expensive if major construction is involved (i.e., constructing a frontage or backage road, reconstructing intersections and neighboring driveways to install channelization). Generally, loss of direct left-turn turn access is something an agency would not be required to compensate a land owner for, especially if safety is a concern. When a corridor is reconstructed, especially in urban and suburban areas, the issue of access should be reviewed. It is possible that significant access improvements could be incorporated into the reconstruction at a relatively minimal cost to the project.
Training and Other Personnel Needs	Staff at highway agencies should be trained in the concept of access management to ensure the principles are properly followed and that changes made to access don't create a more hazardous situation. Since many decisions regarding access are made by elected officials (county or city) or agency managers, they should be provided with education of access management principles and the benefits when appropriate for a project.
Legislative Needs	Highway agencies need authority to require access changes. If a review of state laws finds gaps in this authority, action might be required by Nebraska's Legislature. Some states have also been able to enact access management polices and programs through a rule making process. For example, other states (such as Colorado and New Mexico) have enacted legislation or rules that have allowed the DOT to deny direct access to a State Highway if access to other roadways was available. Another State DOT is involved in the regulatory process for land development and can directly effect access decisions regarding State Highways as part of the land use planning process.

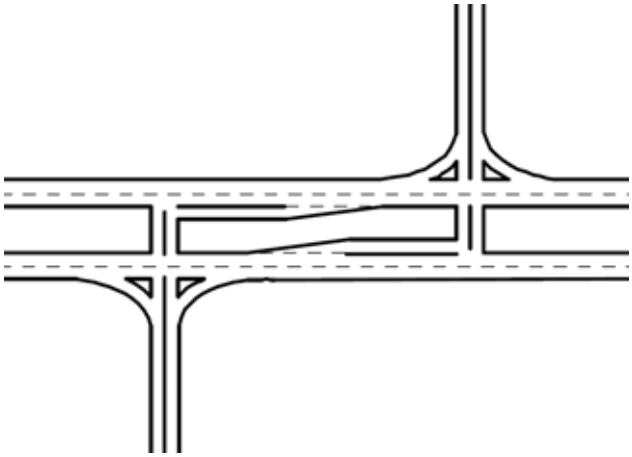
Strategy 12. Improve Sight Distance at Intersections	
Definition	Improve sight distance at intersections by clearing sight triangles.
Technical	
Description	Clearing of sight triangles should include the medians of divided highways in the vicinity of an intersection in addition to the intersection approaches. Clearing of sight triangles should not be limited to routine maintenance activities (i.e., mowing grass, removing trees and shrubs). Other fixed objects and even parked vehicles may block a driver's line of sight at an intersection. Therefore, at new construction, or at a review of an existing location, the placement of signs (especially guide signs and route markers on highway approaches), mailboxes, benches, landscaping, parked vehicles, and signal hardware are examples of items that need to be considered.
Target(s)	This strategy targets angle- and turning-related crashes at intersections.
Goal	The statewide safety goal is approximately a 27% reduction in the number of traffic fatalities forecasted to occur in 2011. This strategy only has an expected effectiveness of 20%, which is below the statewide goal. Therefore, this strategy should be part of a comprehensive program to prevent intersection fatalities. (Note: For example, a comprehensive program may also utilize roundabouts in appropriate locations or enforcement to reduce speeding and encourage passengers to wear safety belts in order to prevent intersection fatalities.) (Note: The 2006 Nebraska CHSP set a goal to reduce intersection crashes by 10% during 2006.)
Responsive and Preventative Plans	The responsive component of the strategy involves identification of intersections with a large number of angle- and turning-related crashes where restricted sight distance is causing or contributing to the crash problem. Due to the random nature of fatal and serious crashes, a preventative component of the strategy is very important. The preventative component would be to implement the strategy at intersections that have an increased probability of a fatal or serious injury crash (based on variables such as traffic volume, crash history, crash type, facility type, and speeds). A further step, as resources allow, would be to monitor and maintain good sight triangles at all intersections.
Expected Effectiveness	(Tried) Estimates of the safety effectiveness of providing full intersection sight distance where it does not currently exist suggest that up to a 20-percent reduction in related crashes can be expected.
Keys to Success	One key to success for the responsive component of the strategy is effective identification of whether a crash problem at an intersection is related to restricted sight distance. As sight conditions at intersections can change over time (due to growth of vegetation, placement of new obstructions, etc.), ongoing monitoring or periodic evaluations of sight triangles at intersections is important for maintaining good sight distance over time.
Potential Difficulties	One difficult aspect of this strategy is removal of sight restrictions on private property. The legal authority for highway agencies to remove sight obstructions from private property varies widely. If the legal authority does exist, it can still be difficult from a political perspective. There are also some obstructions that are very difficult or costly to remove, such as poles along major utility lines, obstructions owned by railroads, etc.
Appropriate Measures and Data	Process measures include the number of intersection quadrants at which sight distance was improved and the amount of increase in sight distance achieved. Effectiveness measures include crash frequency and severity, by type. Separate analysis of crashes targeted by the sight distance improvements is desirable. Traffic volume data are needed to understand the level of exposure.

Strategy 12. Improve Sight Distance at Intersections	
Organizational and Institutional	
Champion	NDOR, county and city highway/roadway agencies.
Organizational, Institutional, and Policy Issues	This strategy should be incorporated into highway design policies, signing policies, maintenance manuals, and educational materials for the public. Communication between highway safety professionals within an agency and maintenance personnel is important because of the key role maintenance plays in keeping sight triangles clear at intersections.
Issues Affecting Implementation Time	Projects to remove sight obstructions on the highway right-of-way can be accomplished in three months or less, assuming the objects are readily moveable. Removal of some obstructions may take more time. Examples include obstructions that are on private property, potentially controversial situations (such as removal of public parking), or those that involve working with other entities (such as utility or railroad companies).
Costs Involved	For many common obstructions such as vegetation, signs, etc., the cost of removal or relocation will be low. Some obstructions such as utility poles, or backslopes that require earth removal, etc. will be more costly.
Training and Other Personnel Needs	Training for maintenance personnel is important as sight conditions at intersections can change over time. Maintenance personnel who are out in the field often may be in the best position to identify and correct potential problems (such as overgrown vegetation). In addition to maintenance personnel, training on sight obstructions at intersections should be provided for individuals involved with geometric design, highway safety, and signing.
Legislative Needs	Legal authority of highway agencies to control sight obstructions on private property may need to be strengthened.

Strategy 13. Improve Driver Awareness of Intersections on Approaches	
Definition	Increase drivers' awareness when approaching an intersection; whether a STOP controlled, signalized, or thru approach. Techniques for consideration include (1) enhanced warning and guide signing, (2) street lighting, (3) dynamic mainline warning flashers, and (4) advance warning flashers for traffic signals on high speed roadways.
Technical	
Description	The listed treatments are common techniques used to help increase a driver's awareness when approaching an intersection. However, many of these treatments are not intended to prevent a driver on the stopped approach from running a STOP sign. Instead, the primary focus is on increasing the awareness of the driver approaching the intersection from the major street, which may help a driver take evasive actions if another driver suddenly crosses their path. The use of street lighting and enhanced warning/guide signs helps improve the conspicuity of an intersection. In contrast, the dynamic mainline warning flashers and advance traffic signal warning flashers improve intersection conspicuity, but also provide a real-time alert when a vehicle is waiting to enter the intersection ahead or the signal indication is changing to red. Note: Enhanced guide signing techniques may include diagrammatic signs or larger advanced junction guide signs similar to freeway style signs. An example of dynamic mainline warning flashers can be found in North Carolina and Missouri. These systems include loop detectors on the minor street approaches. When these loops detect a vehicle, this activates flashers on the mainline mounted on a sign warning of entering vehicles ahead.
Target(s)	Intersections with a pattern of rear-end, angle, or turning collisions related to a lack of driver awareness of the presence of the intersection or the presence of vehicles entering the intersection from the minor road.
Goal	The statewide safety goal is approximately a 27% reduction in the number of traffic fatalities forecasted to occur in 2011. These countermeasures have an expected effectiveness with a range of 5% to 25%. However, the most effective strategies address a relatively few number of traffic fatalities. Therefore, this strategy should be part of a comprehensive program to prevent intersection fatalities. (Note: For example, a comprehensive program may also utilize roundabouts in appropriate locations or enforcement to reduce speeding and encourage passengers to wear safety belts in order to prevent intersection fatalities.) (Note: The 2006 Nebraska CHSP set a goal to reduce intersection crashes by 10% during 2006.)
Responsive and Preventative Plans	The responsive component of the strategy involves identification of intersections with a large number of rear-end, angle, and turning collisions where a lack of awareness of the intersection by drivers on the mainline is contributing to the crash problem. Due to the random nature of fatal and serious crashes, a preventative component of the strategy is very important. The preventative component would be to implement the strategy at intersections that have an increased probability of a fatal or serious injury crash (based on variables such as traffic volume (on both the major and minor roads), crash history, crash type, facility type, intersection geometry, and speeds). Another preventative approach would be to improve driver awareness of intersections along an entire corridor. Improving just one intersection in a corridor may not prevent many crashes, but a noticeable benefit may occur when looking at a corridor of intersections.
Expected Effectiveness	(Tried) 1. Enhanced warning and guide signing: this strategy is expected to improve safety at the intersection because drivers on the mainline will be more alert to vehicles entering the intersection from the minor road. This heightened awareness should quicken drivers' reaction times when conflicts occur. However, the effectiveness of the strategy has not been quantified. (Proven) 2. Street lighting: studies indicate that installing streetlights at rural intersections result in a 25 to 50 percent reduction in the nighttime crash/total crash ratio.

Strategy 13. Improve Driver Awareness of Intersections on Approaches	
	(Tried) 3. Dynamic mainline warning flashers: The effectiveness of this strategy has not been quantified. It is expected to improve safety by providing a dynamic warning to drivers on the major road when vehicles are approaching the intersection on the minor road. (Tried) 4. Advance warning flashers for traffic signals on high speed roadways: The effectiveness of this strategy has not been quantified. Advance warning of traffic signals is expected to help prevent serious high-speed crashes, particularly rear-end crashes.
Keys to Success	A primary key to success is evaluating intersections to 1) determine whether or not one of these strategies is appropriate for a particular location and will have a real impact on preventing fatal and serious crashes; and 2) selection of the most appropriate strategy for a particular location. Evaluation of intersections may include looking at traffic volumes, geometry, crash types, speeds, and other factors and developing a good understanding of what factors are contributing to crashes and what measures will be most effective at preventing them.
Potential Difficulties	A potential difficulty related to dynamic warning flashers is that the message being conveyed needs to be clear to motorists. Additional signing can introduce sight obstructions at intersections if not properly placed. At some remote intersections, access to electricity may be a challenge for installing lighting and flashers.
Appropriate Measures and Data	A process measure would be the number of intersections improved. Effectiveness measures include crash frequency and severity, by type. Separate analysis of crashes targeted by the improvements is desirable. Traffic volume data are needed to understand the level of exposure.
Organizational and Institutional	
Champion	NDOR, county and city highway agencies.
Organizational, Institutional, and Policy Issues	Good crash data are important for effective implementation of these strategies. The type of crashes occurring at intersections will be important for determining if one or more of these strategies are appropriate for a particular location. Crash type is also important for evaluating the effectiveness of the strategies.
Issues Affecting Implementation Time	These strategies are relatively easy to implement and most could be accomplished within one or two years at targeted intersections. Access to electrical service could affect implementation time for lighting and flashers.
Costs Involved	There will be initial material and construction costs for signing, flashers, and lighting. These may include costs for larger signs, lighting and flasher hardware, installation of loop detectors in the pavement for dynamic warning flashers, and running electrical service for lighting and flashers. There will be ongoing maintenance costs for these features. There will be ongoing utility costs for lighting and flashers.
Training and Other Personnel Needs	Training and guidelines for designers so they can 1) evaluate intersections and determine the factors that are contributing to crashes; 2) choose the most effective strategy for a particular location; 3) design the improvements properly (for example proper placement of signs so they provide advance warning yet do not introduce sight obstructions for motorists on the minor road). Some training and guidelines for law enforcement personnel may be helpful to ensure that the types of intersection crashes are being properly recorded.
Legislative Needs	None Identified.

Strategy 14. Use Non-Conventional Intersection Designs	
Definition	At appropriate locations, choose non-conventional intersection designs, such as roundabouts, offset T-intersections, or one-quadrant interchanges.
Technical	
Description	This strategy is a suite of possible changes that can be made to a basic four-legged intersection to reduce conflicts and the potential for crashes. When used appropriately, roundabouts have been found to have both safety and operations improvements over a STOP or signal controlled intersection. Other design techniques such as offset T-intersections and one-quadrant interchanges can improve intersection safety. All of these techniques attempt to improve safety by reducing the number of conflict points associated with minor street crossing and left turn maneuvers. These particular maneuvers have been found to be over involved (represented) in intersection crashes, especially at thru-STOP intersections in rural corridors.



Example of Offset T-Intersections

Example of One-Quadrant Interchange (Intersection of US 59 and US 34 in Mills County, Iowa)

Source of Images: *Rural Expressway Intersection Synthesis of Practice and Crash Analysis*. Performed by Center for Transportation Research and Education at Iowa State University for the Iowa DOT. October 2004.

Strategy 14. Use Non-Conventional Intersection Designs	
Target(s)	This suite of strategies is primarily intended to address crossing path crashes, such as left-turn and right angle crashes. The roundabout is probably most often used in urban and suburban settings, but there are some rural situations where a roundabout could be appropriate. The remaining strategies are likely more appropriate in rural situations than in an urban or suburban setting. Occasionally an isolated traffic signal is installed at a rural intersection as a "safety" device. In these instances, replacing the traffic signal with a one-quadrant interchange or offset T-intersections could have a better safety record with less impact on traffic operations.
Goal	The statewide safety goal is approximately a 27% reduction in the number of traffic fatalities forecasted to occur in 2011. These countermeasures have an expected effectiveness with a range of 40% to 90%. However, implementation costs limit the ability to deploy statewide at appropriate locations. Therefore, this strategy should be part of a comprehensive program to prevent intersection fatalities. (Note: For example, a comprehensive program may also use traffic control improvements in needed locations or enforcement to reduce speeding and encourage passengers to wear safety belts in order to prevent intersection fatalities.) Because intersection fatalities are often spread over many intersections; there is no guarantee that intersection fatalities will consistently occur at a particular intersection. Because of this, implementation should be as widespread as possible at locations that could benefit from these countermeasures, instead of focusing only on intersections where a fatality had occurred. (Note: The 2006 Nebraska CHSP set a goal to reduce intersection crashes by 10% during 2006.)
Responsive and Preventative Plans	This strategy should consist of both responsive and preventative components. Intersections with a documented crash problem (especially crossing path crashes) spanning multiple years are good candidates for improvement. However, improvements in reaction to a fatal crash where there has been no track record of crashes may be essentially characterized as "chasing fatals" and ineffective at saving lives, especially in the short-term. This is where a preventative deployment (i.e., widespread implementation) could be highly effective at preventing crashes. The relatively high construction costs do prohibit a preventative implementation plan from addressing hundreds of intersections within a year or two. So prioritization of locations is key, even in a preventative plan. Some factors to consider when developing a prioritized list may include traffic volumes, functional classification, design features, crash history, or a combination of such factors. Also, these treatments could be deployed "proactively" by addressing multiple intersections along a corridor, especially if the corridor has high volumes (major and minor streets) and there is a pattern of crossing path crashes in the combined history of the intersections.
Expected Effectiveness	(Proven/Tried) Detailed information on the effectiveness of each strategy can be found in the fifth volume of the *NCHRP Report 500* series, but summaries of effectiveness information are provided below. Many of the strategies are listed as "tried" in the guides and there are no statistically robust estimates on their effectiveness; in these instances no information may be provided below. To estimate the expected effectiveness at a specific intersection, it is very important to have a thorough knowledge and understanding of local conditions. • Convert a Four-Legged Intersection to Two T-Intersections: The crash rate at offset T-intersections is approximately 43% of the crash rate at similar four-legged intersections. (Volume 5, Strategy 17.1 B14) • Roundabouts: At an unsignalized location, roundabouts can reduce all crashes by 38%, injury crashes by 76%, and fatal and life changing injury crashes by 90%. (Volume 5, Strategy 17.1 F3) Additional discussion related to these and other similar strategies is provided in Strategy 17.2 B4 and Strategy 17.2 B5 of *NCHRP Report 500, Volume 12*.

Strategy 14. Use Non-Conventional Intersection Designs	
Keys to Success	For this strategy to be measurably successful at reducing crashes and traffic fatalities and have a significant impact on the number of fatal intersections crashes in Nebraska, a large number of candidate intersections will need to be improved, ideally starting at locations with a poor safety record. The improvements should also be designed to have a minimal adverse impact on traffic and pedestrian operations. In order for an improvement to be effective (especially in a reactive deployment), engineers need to identify that there is a geometric feature or traffic pattern that is a cause or at least a contributing factor to the crashes. If alcohol, speeding, or other driver related issues are the primary cause, the effectiveness of engineering improvements may be limited and suggests the need to partner with law enforcement to develop a comprehensive safety strategy. It is possible that these strategies will require additional right of way. If so, the highway agency will need to work with the landowners and other stakeholders to explain the importance of the project to improve the safety at the intersection. Driver education/training or additional signing may be needed to help drivers navigate through an intersection design that is unlike others in the area (i.e., roundabouts).
Potential Difficulties	The improvements should be designed so they create a safer intersection; opposed to a poor design that may actually create more crashes. For example, roundabouts may create crossing difficulties for pedestrians; offset T-intersections should be separated enough that the intersection influence areas don't overlap, but not so far that the extra travel distance is too great; roundabouts need to be properly signed so drivers don't become confused, especially in areas where the treatment is new. Another possible difficulty is resistance or discomfort by agencies or the public to strategies that are new to Nebraska, but have been successful elsewhere.
Appropriate Measures and Data	To document this strategy, the first item needed is the number of locations that have been improved, including specific information on the improvements made to the intersection. Before and after crash information will also need to be tracked for each site. Impacts to crashes that are directly related to the improvements should be monitored in addition to all crashes at the intersections. If possible, crash totals at control sites (i.e., unimproved intersections) should also be included in the study. Because individual intersections may have only a few crashes in a year; it can be difficult to see significant crash reductions at a single intersection (especially in the first six or twelve months). Therefore, the combined crash history of all intersections improved with this strategy should provide a better understanding of effectiveness. If the effect on traffic operations is of a particular concern, then an evaluation of the impacts could also include before and after travel times and intersection delay.
Organizational and Institutional	
Champion	NDOR, county and city highway/roadway agencies.
Organizational, Institutional, and Policy Issues	All of these strategies can be implemented by the responsible roadway agency. However, it is important for the highway agency to update/create and then to continually maintain their design policies, guidelines, and best practices so that designs will be consistent with safety standards.

Strategy 14. Use Non-Conventional Intersection Designs	
Issues Affecting Implementation Time	Identification of intersections that would benefit from these specific improvements may take up to six months. Further, identification of the specific design changes recommended may take another several months or more, depending on the number of intersections identified within the jurisdiction. After identification, many strategies could be implemented in several years, as long as there are no complicating factors, such as purchase of right-of-way. The implementation time for any project requiring additional right-of way could easily stretch past two years. Another issue that may lengthen implementation time, is time needed to gain public input and acceptance for new treatments and concepts.
Costs Involved	The following costs are intended to represent an average expected cost for Nebraska, but these costs could change substantially depending if the area is rural or urban, available existing right-of-way, etc. The construction of a roundabout may be $300,000 for a single lane, increasing up to $1,000,000 for an urban two-lane roundabout. An expected cost per roundabout is $750,000. In many cases, compared to a new traffic signal if extensive right of way is not required, a roundabout is less in total cost. Depending on right-of-way and other constraints, the cost of constructing offset Ts or building a one-quadrant interchange could easily reach over $1 million.
Training and Other Personnel Needs	For proper design and implementation, it is important to make sure that design staff are sufficiently trained in geometric design and MUTCD guidelines.
Legislative Needs	None identified.

Strategy 15. Targeted Speed Enforcement at Problem Intersections	
Definition	Use targeted speed enforcement to reduce operating speeds on specific intersection approaches.
Technical	
Description	Whether an intersection is signalized or unsignalized, vehicle speeds can be an important element in a crash that occurs. At signalized intersections, drivers speeding may not be able to react in time to changes in the signal indication or other driver, pedestrian and bicycle maneuvers. Also other drivers may experience difficulties when trying to judge if it is safe to turn into or across the path of a speeding vehicle. Similarly, a driver stopped at an unsignalized intersection could underestimate the gap to make a maneuver, as they may be unable to accurately judge the approaching vehicles excessive speed. Methods to control speeds could range from traditional law enforcement to photo-radar (automated enforcement) if permitted by law. Especially for traditional law enforcement, a key is to recognize that effectiveness of increased enforcement at specific locations has a relatively short duration—measured in days or weeks, rather than months. Location of increased enforcement should be in areas where excessive speeding can be attributed to a crash problem.
Target(s)	Intersection crashes where speeding or excessive speed is a contributing factor.
Goal	The statewide safety goal is approximately a 27% reduction in the number of traffic fatalities forecasted to occur in 2011. Targeted speed enforcement may be effective at reducing fatalities, but available resources or legislative restraints for automated enforcement may prohibit widespread deployment. Therefore, this strategy should be part of a comprehensive program to prevent intersection fatalities. (Note: For example, a comprehensive program may also use traffic control improvements or construction of roundabouts in appropriate locations.) Because intersection fatalities are often spread over many intersections; it is not likely that intersection fatalities will consistently occur at a particular intersection. Because of this, implementation should be as widespread as possible at locations that could benefit from speed enforcement. (Note: The 2006 Nebraska CHSP set a goal to reduce intersection crashes by 10% during 2006.)
Responsive and Preventative Plans	Responsive deployment of enforcement should be at locations where there is a demonstrated crash problem that is correctable by enforcement. This may include specific signalized or unsignalized intersections where vehicle speeding was a significant contributing factor in crashes. Even though this plan would be responsive, a preventative component could be added to the program, which is to publicize the implementation of targeted enforcement, thereby increasing public knowledge and hopefully also increasing compliance with speed limits. Other preventative deployment methods may include performing targeted enforcement at locations where a crash related problem has not yet manifested, but the conditions are similar to other locations where an identified crash problem does exist. A third preventative method would be to provide additional enforcement along multiple intersections in a corridor. One of the benefits of this method would be that drivers would not be able to predict specific locations where the enforcement effort is occurring.
Expected Effectiveness	(Proven) Traditional speed enforcement is considered effective. However, the “halo effect” of traditional enforcement has been found to reduce speeds for about three days for a single enforcement episode and up to six days when multiple days of enforcement are used. Furthermore, vehicle speeds have been found to bounce back quickly downstream from the location of the enforcement.

Strategy 15. Targeted Speed Enforcement at Problem Intersections	
	Although not yet common in the United States, automated speed enforcement has been employed more widely in other countries, namely across Europe. In a study conducted in the United Kingdom, officials introduced a photo-radar system on a roadway that has variable speed limits. There were 28% fewer crashes involving occupant injuries during the first year of the program, and vehicle-damage-only crashes went down 25%. Preliminary data for the second year indicates the improvements are being sustained. Using mobile units with speed enforcement cameras, Paradise Valley, Arizona saw a 40% reduction in crashes while National City, California saw a 51% reduction. (Note: the Arizona and California studies may have study design issues in the methodology used to determine the results which may have resulted in an overestimation of crash reductions.) One technique similar to photo speed enforcement that has been used in the United States is dynamic speed warning signs. Speed warning signs use radar to measure a vehicle's speed and a dynamic message board to display the speed for the driver to see. Studies on speed warning signs have found the technology to be effective at reducing vehicles speeds while in place, especially for vehicles that are 10 mph or more above the posted speed limit. The study was conducted on a roadway with a 25 mph posted speed limit and was conducted in May 1998, as reported in *Road Injury Prevention & Litigation Journal*. Conclusions from the report are based on the study *A Comparative Study of the Speed Reduction Effects of Photo-Radar and Speed Display Boards*, by Steven A. Bloch. The use of a speed warning sign reduced the mean speed by 5.8 mph at the experimental site but had little effect 0.2 miles downstream (2.9 mph reduction in mean speeds). A speed warning sign used in conjunction with intermittent enforcement resulted in a 6.1 mph mean speed reduction at the experimental site and a 5.9 mph reduction in the mean speed downstream of the display. However, one source noted that changeable message signs are unlikely to be able to reduce speeds by 10 mph or more (Eric Meyer, *A Literature Review of Perceptual Countermeasures to Speeding*, University of Kansas, July 2000).
Keys to Success	In Nebraska, several agencies have recently returned to using motorcycles to enforce speeding problems in and around problem urban and suburban roadways and intersections. Many have indicated that the ability to maneuver and handle high-volume traffic situations has aided in effective speed enforcement. For targeted enforcement to be successful, the public and affected agencies (local elected officials, state/county/city highway agency, and law enforcement) must also be supportive of the program in order for it to succeed. To increase acceptance, consideration should be given to using public information campaigns that explain the problems and the potential benefits of the program and highlight that the program is not intended as a revenue generator (i.e., through collection of fines). This should not be an issue in Nebraska because under the State Constitution, all fine money goes to the local school district. Outreach to publicize the results will also help increase compliance with posted speed limits. Also important is that the speed limit is clearly posted, so that no drivers are confused or not properly informed. For an automated program to be successful in increasing driver compliance with traffic laws and consequently to potentially reduce the number of related crashes, it first must be deployed in locations where poor driving behavior is a documented problem. A potential method to identify these intersections is to first determine an estimate of the number of speed-related crashes at each intersection. Intersections could be screened by first eliminating locations with a low frequency of crashes. Next, using volumes, a rate based screen method could be used to identify locations where the rate is higher than expected (i.e., Bayesian analysis, crash rate, etc.). Further location screening could be done by observing the intersections to make sure geometry is not a contributing problem and to learn if there is high number of violations.

Strategy 15. Targeted Speed Enforcement at Problem Intersections	
	Another important factor of an automated enforcement programs is how the program is administered. Some agencies rely on private contractors to operate portions of the program. Although this is an appropriate mechanism, in such situations, it is important that the contractor's fees are not linked to the number of tickets issued or fines paid, as this is often perceived negatively by the public. Instead, it is recommended the appropriate law enforcement agency should be allowed to maintain control of the program in order to avoid any misperceptions.
Potential Difficulties	The general public may not be very supportive of targeted enforcement. It will be necessary to work with them to help them understand why enforcement is necessary at specific locations. As reported in *NCHRP Report 500, Volume 12*, the use of photo enforcement is often controversial, with most arguments centered on issues regarding personal privacy, effectiveness compared to traditional enforcement, costs exceeding the benefits, and its use by government as a revenue generator. ITE's report, *Automated Enforcement in Transportation,* offers counter points of view regarding these topics.
Appropriate Measures and Data	A key measure for evaluating the effectiveness of implementation is the number of locations where targeted traditional speed enforcement or automated enforcement were used. For traditional enforcement, additional implementation data such as time of day, and duration should be documented. A decrease in vehicle speeds and the number of speeding violations is the first means to determine the strategy's effectiveness. Also reviewing changes that occur in crash frequency and severity can be used to evaluate the effectiveness of targeted enforcement particularly those that are related to the enforcement actions. However, it is important to evaluate the effect enforcement has on all crashes and speeding or targeted crashes separately.
Organizational and Institutional	
Champion	Roadway (such as NDOR, counties and city roadway departments) and enforcement agencies (such as Nebraska State Patrol, county sheriffs, and city police departments) as well as the Nebraska Office of Highway Safety.
Organizational, Institutional, and Policy Issues	Coordination is needed between the legislature, city councils, roadway agencies, law enforcement and traffic courts to make a program successful. This cooperation and coordination is not only needed to run the program, but also in selecting the locations where targeted enforcement will be implemented.
Issues Affecting Implementation Time	Identification of locations that would benefit from targeted speed enforcement should take less than a year. The biggest issue facing implementation of automated enforcement is the time needed to adopt legislation to allow automated enforcement. Once automated enforcement is accepted by local and state governments, the time to gain local acceptance, approval, and participation for implementation can vary greatly depending on the local opinion and severity of the problem. (Nationwide surveys by IIHS and NHTSA both found support was already noted as strong by "two-thirds" of respondents.)
Costs Involved	The costs for traditional law enforcement are approximately $75 per hour for labor costs and related expenses (i.e., vehicle, fuel, etc.). Assuming that four hours of enforcement are conducted per day, one day per week; then the yearly cost per location would be approximately $15,500. For automated enforcement, the costs for the equipment will vary depending upon the actual camera and sensor equipment selected. However, a single installation could cost approximately $50,000. Additional costs include maintenance, monitoring tapes, processing citations, and moving the camera between locations.

Strategy 15. Targeted Speed Enforcement at Problem Intersections	
Training and Other Personnel Needs	Use of traditional speed enforcement targeted at specific locations will not require new staff, but in order to deploy extensively, law enforcement agencies may need to pay overtime or eventually add staff. It is not expected that automated enforcement will demand additional staff (especially if operated by private contractors), yet existing staff will surely need additional training. For example, highway engineers will need training on how to evaluate the technology and select locations ideal for the program. Additional training will also be needed for personnel responsible for maintenance of the equipment and users of the software for processing violations. Some of these training needs may be offset if part of the program is operated by private contractors.
Legislative Needs	As recommended by the May 16, 2006 Highway Safety Workshop participants, adoption of enabling legislation by the State Unicameral is necessary to allow use of automated enforcement on Nebraska's roadways since the use of automated enforcement is not permitted. *NCHRP Report 500, Volume 12,* provides sources for example legislation and information regarding existing state policies, including: • Insurance Institute for Highway Safety (http://www.iihs.org/safety_facts/state_laws/auto_enforce.htm) • National Conference of State Legislatures (http://www.nhtsa.dot.gov/ncsl/Index.cfm) • The National Campaign to Stop Red Light Running (www.stopredlightrunning.com)

Strategy 16. Work with Local Agencies to Identify Intersections with a Severe Crash Problem	
Definition	Through crash analysis, identify intersections with a disproportionately large number of fatal and serious injury crashes. As necessary, improve data collection to enhance analysis of intersection crashes.
Technical	
Description	The purpose of this strategy is to work with local agencies to help them identify intersections where there is an unusual number of fatal and disabling injury crashes. This may first necessitate improving data collection (i.e., crash data, intersection and road inventory information, traffic volumes) so that candidate locations can be identified. The information that comes from this program may also prove useful in identifying design or traffic characteristics that are often associated with an increased crash frequency, which could then be used to evolve the program from a strictly reactive deployment into a proactive approach.
Target(s)	Intersections with an unusually high frequency/rate of fatal and disabling injury crashes.
Goal	The statewide safety goal is approximately a 27% reduction in the number of traffic fatalities forecasted to occur in 2011. This strategy should be considered an important part in an overall comprehensive plan at reducing intersection fatalities by assisting local agencies identify those intersections with a significant safety problem. A possible implementation goal would be to assist local agencies identify the top 10% of high crash locations within their jurisdiction. (Note: The 2006 Nebraska CHSP set a goal to reduce intersection crashes by 10% during 2006.)
Responsive and Preventative Plans	This strategy is primarily responsive since it has a focus on identifying intersections with a crash severity issue. One method to use this strategy in a preventative approach is to identify characteristics often associated with intersections that commonly experience a high number of severe crashes (i.e., geometry, volumes, adjacent land use, etc.). This information could then be used to identify locations that have similar characteristics, such that a severe crash may be anticipated to occur at some point in the future.
Expected Effectiveness	No studies are available that quantify the effectiveness of similar or comparative activities, especially since the effectiveness will depend on the specific countermeasures implemented and the time it takes for implementation to occur. It was estimated that implementation of this strategy should lead to the prevention of at least one fatality and two disabling injuries over the course of five years.
Keys to Success	Data quality and accessibility will be one of the most important issues for this strategy to succeed. Not only are crash data important, but an intersection attribute database for all roads will be necessary (or expansion of the intersection database for the State maintained roads). This database should not only record the location of intersections, but would ideally contain information on traffic control, posted speed limit, number of lanes, turn lanes, median, street lighting, location of nearby access, etc. Further, dedicated staff that can be proactive in working with local agencies (i.e., seeks out local agencies looking for assistance rather than waiting for a local agency to initiate the request) are likely to make a more significant impact. Several states have identified average crash experience for both urban and rural intersections. While they have identified averages – many intersections have substantially higher crash frequencies and these are the appropriate targets for improvements. *NCHRP Report 500, Volume 5: A Guide for Addressing Unsignalized Intersection Collisions* and *Volume 12: A Guide for Reducing Collisions at Signalized Intersections* contains such data. Also contained in these guides is a range of specific countermeasures for intersections.

Strategy 16. Work with Local Agencies to Identify Intersections with a Severe Crash Problem	
Potential Difficulties	Creating a statewide intersection database would be a significant task, requiring many years and the assistance of local agencies. Current procedures used in Nebraska convert fatal and injury crashes into "equivalent" property damage only crashes when prioritizing locations for correction. Since the focus of this strategy is on severe crashes, the State would need to adopt a new approach at prioritizing locations.
Appropriate Measures and Data	Implementation data would include progress on an intersection attribute database for local agencies. Other implementation data that are important to collect include the number of problem locations identified (especially those under the jurisdiction of local agencies) and the countermeasures implemented as a result. Effectiveness data would include before and after crash data at improved intersections. The crash reductions at improved intersections would be one possible surrogate to estimate the effectiveness of this type of program.
Organizational and Institutional	
Champion	NDOR, LTAP center and county and city highway/roadway agencies.
Organizational, Institutional, and Policy Issues	NDOR will need to build relationships with each local agency to help them catalog local intersections and then identify locations that are candidates for countermeasures.
Issues Affecting Implementation Time	Acquiring or building a reliable crash and intersection attribute database is most likely issue to impede this strategy.
Costs Involved	The cost of this strategy is simply the time and materials needed to identify high crash locations. Assuming two staff work full time with local agencies, the cost of this strategy is likely $150,000 to $250,000. This would not necessarily include all of the costs related to building a database of intersection attributes, especially if maintenance or local agency staff is used to collect the data and clerks are used to perform the data entry.
Training and Other Personnel Needs	Additional staff will likely need to be trained in the use of the State's crash record system. Other skills that may be needed include database construction and management as well as identification of appropriate countermeasures based on crash data and field observations.
Legislative Needs	None identified.

4.5 Young Driver Critical Strategies

Strategy 17. Comprehensive Graduated Driver Licensing System	
Definition	Establish a more comprehensive graduated licensing system (as recommended by the May 16, 2006 Highway Safety Workshop participants).
Technical	
Description	A GDL system can have many elements to it, some of which have already been proven effective for reducing the number of young driver crashes. Some of the more common elements included in an improved GDL could include: at least six months of supervised driving for beginners starting at age 16, a night driving restriction that begins at 9:00 PM, and passenger restriction allowing only one or no young unrelated passengers. For an optimal GDL, the Advocates for Highway and Auto Safety recommend four key components: (1) six month holding period where an adult supervisor must be present at all times, (2) 30-50 hours of supervised driving, (3) a restriction on unsupervised driving between 10:00 PM and 5:00 AM, and (4) a limit of one non-family teenage passenger if no supervising adult is present. Currently, Nebraska has no probationary period or restrictions on the number of young passengers when an adult is not present. While Nebraska does have a 50 hour certification requirement, this can be waived if the teen completes an approved driver safety course. In Nebraska, there is a nighttime driving restriction, but it doesn't begin until midnight. Therefore, the Advocates for Highway and Auto Safety has given Nebraska a poor rating in teen driving for having no provisions in two areas and less than optimal laws in the other two.
Target(s)	All licensed drivers under the age of 18 during their first year of licensure.
Goal	The statewide safety goal is approximately a 27% reduction in the number of traffic fatalities forecasted to occur in 2011 and a comprehensive GDL would be expected to have an effectiveness of nearly 20%. Therefore, this strategy should be part of a comprehensive program to reduce fatalities involving young drivers. (Note: For example, a comprehensive program may also use enforcement to ensure young drivers and parents adhere to the provisions.) An example implementation goal would be to have an enhanced and comprehensive GDL program by 2008. (Note: The 2006 Nebraska CHSP set a goal to reduce fatal, disabling injury, and visible injury crashes involving young drivers by 4% while increasing the number of youth-related arrests for alcohol, safety belt and speeding by 5 %.)
Responsive and Preventative Plans	By their nature, a comprehensive GDL would be considered a preventative plan to reduce crashes involving young drivers. Public education and outreach along with aggressive enforcement are components that can help improve the effectiveness of a comprehensive GDL.
Expected Effectiveness	(Proven) In Wisconsin, implementation of a stronger GDL decreased the total number of crashes involving a young driver by 15%. Fatal crashes decreased 18% and injury crashes by 20%. (http://www.dot.state.wi.us/safety/motorist/teendriving/index.htm). Information provided in the upcoming young driver volume of the *NCHRP Report 500* series reports that a 25 – 35% reduction in 16 year-old crash rate, and a 15 – 20% reduction in 17 year-old crash rate can be achieved due to a new GDL. However, it is important to remember that the effectiveness of a specific new law depends on the provisions included, the amount and effectiveness of public education campaigns, and the degree to which the law is enforced (by parents and law enforcement agencies).

Strategy 17. Comprehensive Graduated Driver Licensing System	
Keys to Success	In order for a stronger GDL to be effective, parents and young drivers first have to be informed of the new law. Also, law enforcement needs to be informed/educated and given the resources to enforce the law. One of the most important elements is getting parents to realize that even though restrictions on teenage driving privileges may cause some inconveniences, these inconveniences are better than the alternative. Appropriately developed and targeted personal education materials may be the most successful methods to get parental endorsement and adherence.
Potential Difficulties	At times, policy makers and parents resist limiting the driving privileges of new drivers. There will likely be opposition from individuals or agencies that perceive these laws as intrusive into a person's (and parents) life or that teens are being unfairly targeted due to their age. Parents who no longer have to "taxi" their teenager to events and localities may view the restrictions as another year of inconvenience if the safety benefits are not clearly articulated and highlighted. However, one means to address these arguments is to make it clear that electing to not control the privileges of young drivers can have a more substantial impact, socially and personally. The social impacts are often in the form of medical costs passed onto others in higher insurance premiums or increased taxes for emergency services to be able to respond. Also, young driver crashes can have a personal impact if a friend or family member was in a vehicle involved in the crash.
Appropriate Measures and Data	The effectiveness can be measured by the change in the total number of crashes involving young drivers before and after a new GDL goes into effect. In addition, evaluating the number of fatalities and disabling injuries resulting from crashes involving a teen driver would be a measurement of the effectiveness of any new restrictions. It may also be necessary to monitor enforcement efforts (i.e., citations written) before and after any new laws in order to understand the impact enforcement had on the change in behavior. Teen drivers and parents should also be surveyed to make sure the general public comprehends the provisions and to see if they abide by them.
Organizational and Institutional	
Champion	Nebraska Office of Highway Safety, Safety Council, AAA, Highway Safety Advocates Organization and other safety advocacy groups.
Organizational, Institutional, and Policy Issues	The current provisional licensing statute would need to be amended by the state legislature. Highway safety professionals need to work closely with law makers to educate them on the importance of a comprehensive GDL.
Issues Affecting Implementation Time	A short implementation period should be built into the system so that DMV, driver educators, law enforcement, and the general public can be informed and given time to make any system changes. The real issue affecting implementation time is the actions that the State Legislature must take first.
Costs Involved	The estimated cost of staff time and materials to respond to Nebraska Legislature initiated requests for information on the need and benefit of a comprehensive GDL law is estimated at $10,000. This would not be an added cost to government agencies and organizations, but simply the value of resources allocated. Unidentified private or third parties may also incur costs associated with the marketing or promotion of a new law.
Training and Other Personnel Needs	Minimal training of law enforcement and driver educators would be needed to allow them to learn of the new restrictions for young drivers.
Legislative Needs	Only the Nebraska State Legislature has the authority to amend the current provisional license currently in statute.

Strategy 18. Education and Enforcement of Laws Directed Towards Young Drivers	
Definition	Conduct more (1) public information and (2) enforcement campaigns pertaining to young drivers.
Technical	
Description	Several of the young driver focused safety laws that could be targeted through education or enforcement campaigns may include GDL restrictions (especially if strengthened), the zero tolerance law for drivers under the legal drinking age, and safety belt requirements when a young person is behind the wheel. Education material should be target market tested material that uses appropriate graphic images and memorable facts in order to leave a lasting impression with young drivers. Also, targeting enforcement campaigns in areas where there are above average violations and crashes and then publicizing the results can help increase their effectiveness. An example program in Nebraska is "Project Nightlife" in the Omaha area. This program concentrates on the intermediate drivers and utilizes speakers to meet with students and parents. There is also increased enforcement to target speed, safety belts, and underage drinking and driving. The program is also using crash data to identify target locations with a known safety problem when trying to determine where to provide increased enforcement. Note, specific information pertaining to publicizing and enforcing Nebraska's Zero Tolerance Law is contained in Strategy 6.
Target(s)	Drivers under the age of 21, especially young drivers who knowingly or unknowingly violate driver safety laws.
Goal	The statewide safety goal is approximately a 27% reduction in the number of traffic fatalities forecasted to occur in 2011 and education and enforcement will be an important component to achieve a comparable decrease in fatalities involving young drivers. An example implementation goal would be to perform 2,000 additional hours of special overtime enforcement for underage drivers. Furthermore, an implementation goal may be to increase public education campaigns so that the message is heard by an additional 10% of young drivers. (Note: The 2006 Nebraska CHSP set a goal to reduce fatal, disabling injury, and visible injury crashes involving young drivers by 4% while increasing the number of youth-related arrests for alcohol, safety belt and speeding by 5 %.)
Responsive and Preventative Plans	A program to address all facets of young driver related crashes statewide would be a preventative implementation approach. The strategy could be deployed in a responsive plan by increasing messages and enforcement in areas with particular problems, often seen in a concentration of crashes. Additionally, a program could be responsive if it has an increased focus on a single area of driver safety, as opposed to addressing all areas.
Expected Effectiveness	(Proven/Experimental) Experience proves out that education and enforcement programs are most effective when coordinated with one another. Further, to improve effectiveness of enforcement, it is best to publicize before it begins and the results after completion (i.e., number of stops, citations and arrests). Getting the information out before a special enforcement program can deter drivers from violating the law in the first place, and sharing the results reinforces the idea. • Publicize and enforce Zero Tolerance Laws: In Maryland, a zero tolerance law alone was attributed with reducing drinking and driving crashes by 21% for drivers under the age of 21. After the addition of an "extensive public information campaign", alcohol-related crashes decreased an additional 30%. In Maine, there was a "substantial" decrease in nighttime single-vehicle crashes (used as a proxy for alcohol-related crashes) two months before a new zero tolerance law went into effect; which coincides with when the new law was extensively publicized. (Volume 16, Strategy 5.1 B3)

Strategy 18. Education and Enforcement of Laws Directed Towards Young Drivers	
	• Publicize and enforce safety belt laws for young drivers and their passengers: Results for programs targeted specifically at young drivers and their passengers were not available. However, a review of a South Carolina program that targeted education to population groups with low usage rates has been completed. Overall, safety belt use in South Carolina increased by 8.4 percentage points. In target populations, there was an observed 8.7 percentage point increase in males and a 14.3 percentage point increase in nonwhites. (Volume 11, Strategy 8.1 A2)
Keys to Success	Educational campaigns need to be demographically and content appropriate in order to grab the attention of the audience they are targeted towards. They should also keep the message simple by sharing the most important information, which will help people remember the message. Finally, an effective method(s) to deliver the message and/or materials should be chosen so that a large audience is reached. Enforcement needs to be visible in order to encourage good driving behavior; not only during special enforcement campaigns but also for traditional enforcement patrols.
Potential Difficulties	Finding the funding to prepare education materials can be difficult, especially if it is decided to use costly methods like media buys. If deployment has additional concentration in specific locations due to a higher number of crashes, then state and local agencies will have to coordinate to determine the best locations, frequency, and duration.
Appropriate Measures and Data	For educational approaches, measuring the implementation should at least include the method (i.e., media buys, direct mail, etc.) along with the number. A media buy plan should be developed that reaches the target market at appropriate times. If messages were targeted in problem locations, then this information should also be recorded. To gauge the effectiveness of the education campaigns, before and after surveys could be conducted to determine if a greater percentage of the young drivers and their parents know of the existence of the laws and understand the consequences when the laws are ignored. For the enforcement portion, agencies should track data, such as the total number of stopped vehicles with a young driver, number of citations written to young drivers or their passengers, number of arrests made, and the number of agencies/officers that participated in the program. However, the real effectiveness should be realized over time as there will hopefully be a reduction in the number of fatalities and injuries involving young drivers both statewide and in the communities where programs were concentrated.
Organizational and Institutional	
Champion	Nebraska Office of Highway Safety, Project Extra Mile, University of Nebraska-Kearney Safety Center, Nebraska Safety Council, National Safety Council—Omaha Chapter, Department of Motor Vehicles—Examining Division and other safety advocacy groups.
Organizational, Institutional, and Policy Issues	Getting the support and backing of prosecutors, judges, political officials, and law enforcement chiefs will be needed if the program is to reach its full potential. Potentially, many agencies (state, county, and city) will have to be working together in order to develop a comprehensive statewide program.
Issues Affecting Implementation Time	Public information campaigns for young driver laws could begin in as little as two months, taking possibly up to a year to implement. Traditional enforcement should already be on going since there is currently a 0.02 BAC law in Nebraska, a mandatory safety belt for all passengers if the vehicle is operated by a driver with a provisional license, and a curfew law. Special enforcement efforts could likely be organized in as little as a few months.
Costs Involved	The cost of publicizing and enforcing laws directed towards young drivers will depend heavily on the type of media used (i.e., TV, radio, or print), intensity of enforcement, and frequency of media and enforcement campaigns. As an example, the cost in 2005 for the program to reduce DUI (including special enforcement; see Strategy 5) was $765,000.

Strategy 18. Education and Enforcement of Laws Directed Towards Young Drivers	
Training and Other Personnel Needs	Existing staff should be able to further publicize and enforce the laws directed towards young drivers. However, if agencies continue to staff special enforcement efforts with officers on overtime, there may be a need to generally increase staff levels to keep officers from becoming "burned out" from all of the overtime.
Legislative Needs	Enhancing the current GDL law with further curfew, passenger, and violation restrictions to meet the national model law provisions (see Description) would reduce the number of teen fatal crashes based upon the evaluations of those provisions in other jurisdictions.

Strategy 19. Required Driver Training and Improved Training Materials	
Definition	(1) Required driver training for new drivers and (2) improve driver training materials (as recommended by the May 16, 2006 Highway Safety Workshop participants).
Technical	
Description	Currently, novice drivers are not required to successfully complete any form of driver training in order to obtain a permit or driver license. This strategy would establish a requirement that all young drivers would have to successfully complete a Department of Motor Vehicles (DMV) approved program by a DMV Certified Instructor to obtain an intermediate (provisional) operators permit. Continued efforts to improve and enhance the content and delivery of driver education/training material will be made. This would include DMV's continued effort to target and emphasize those identified crash causes in the material. The Nebraska Office of Highway Safety has developed and distributed a special "Getting Your Nebraska Drivers License—A Guide for Teens" that has been distributed to every 15 year old in the State for the past 4 years.
Target(s)	Crashes involving young drivers, especially those within the first few months of receiving their driving privileges. However, training taken early (i.e., age 15) could help prevent a crash years later if drivers remember/use safe driving habits learned at the outset.
Goal	The statewide safety goal is approximately a 27% reduction in the number of traffic fatalities forecasted to occur in 2011. This strategy has shown to lower the percentage of young drivers involved in a crash by five percentage points. Therefore, this strategy should be part of a comprehensive program to prevent fatalities involving young drivers. (Note: For example, a comprehensive program may also use enforcement to ensure young drivers use safety belts and don't drink and drive.) An example implementation goal would be to increase the number of teens that participate in a formal driver education/training course by 10%. (Note: The 2006 Nebraska CHSP set a goal to reduce fatal, disabling injury, and visible injury crashes involving young drivers by 4% while increasing the number of youth-related arrests for alcohol, safety belt and speeding by 5 %.)
Responsive and Preventative Plans	Use of this strategy would strictly be a preventative plan.
Expected Effectiveness	(Tried/Experimental) The Nebraska DMV has examined those teen drivers that have completed the existing DMV Driver Training Course compared to those teen drivers that have opted for the 50-hour driving log option. This comparison has revealed that the teens taking the DMV approved course have statistically significant fewer crashes, traffic violation convictions, and license suspensions than those opting for the 50-hour log provision. Specifically, an examination of the Nebraska data from 1999 to 2004 comparing the two groups found that only 23% of those that completed the driver training experienced one or more moving violations compared to 34% of those that opted for only logging the 50 hours behind the wheel. Of those that completed driver training, 19% were involved in one or more crashes compared to 22% of those with the 50-hour log. Of those completing the driver training, only 2% had their licenses suspended or revoked compared to 7% of those that utilized the 50-hour log.

Strategy 19. Required Driver Training and Improved Training Materials	
	Recent national research hasn't found driver training and education programs to be effective at reducing crashes. This is especially believed to be true if completion of these courses allows an individual to get their license at a younger age. (Source: J.H. Hedlund. *Countermeasures that Work: A Highway Safety Countermeasure Guide for State Highway Safety Offices*. DOT HS 809 980. 2005.) However, considering the results of the driver training program in Nebraska, it is still believed that driver training and education can be effective as part of a comprehensive graduated licensing (GDL) program. Driver education and training could be used to complement other GDL requirements such as nighttime driving restrictions, passenger restrictions, probationary period, strict enforcement of Zero Tolerance, and safety belt laws. (See Strategy 17 for more information on a GDL program.)
Keys to Success	The quality of the materials and instructors (both classroom and behind-the-wheel) are important to a successful program. Training materials related to the safety aspect of driver education must focus on the type of errors and driver behavior that most often result in a young driver being involved in a crash. Also, integrating this strategy with a comprehensive GDL is thought to be necessary in order to maximize the benefit.
Potential Difficulties	Parents may be reluctant to support driver training, especially if the cost is passed onto the students and/or their parents. In rural areas where there is a low density of students, it is difficult to provide easy access to approved courses. Web based training for the classroom portion, which could be especially useful in rural areas, is now being tested by the University of Nebraska.
Appropriate Measures and Data	Implementation data would include the number of young drivers that have completed a formal driver-training program, especially those that used training materials with an enhanced focus. To measure the effectiveness, students that complete the program should be compared to a control group (i.e., students that received their license without participating in a formal driving training). This should include monitoring crash data as well as the number of warnings and citations given. (Note: DMV has an evaluation process already in place.)
Organizational and Institutional	
Champion	Department of Motor Vehicles, Nebraska Office of Highway Safety, Nebraska Safety Council, University of Nebraska—Kearney Safety Center, State Community Colleges and other safety advocacy groups.
Organizational, Institutional, and Policy Issues	The DMV wii need to continue monitoring approved driver training programs to ensure guidelines and quality standards will be met.
Issues Affecting Implementation Time	Requiring driver training for young drivers couldn't be implemented without enabling legislation. Developing new training materials to have a focus on the primary contributing factors in young driver crashes could easily take two years or more.
Costs Involved	Nebraska already produces a Driver's Manual, and there are already established Rules and Regulations on what is required within the training materials. To enhance materials would require a public hearing for proposed Rules & Regulations changes and would involve minimal costs. The Nebraska Office of Highway Safety already provides an annual teen driver guide that is provided to every 15 year old in the state, so no additional funding would be needed for printing. The cost of developing new driver training materials or operating a statewide required driver training program could reach $200,000 annually.

Strategy 19. Required Driver Training and Improved Training Materials	
Training and Other Personnel Needs	With required driver training, there are insufficient numbers of trained and qualified instructors. There will be a need to train more instructors before fully implementing a driver-training requirement. State agencies should already have the staff with the necessary skills in order to develop new training manuals for novice drivers.
Legislative Needs	To require driver training prior to a young driver obtaining a driver permit would require enabling legislation.

Strategy 20. Safe Community Coalitions	
Definition	Develop community coalition programs focused on young drivers.
Technical	
Description	Community coalitions are often non-profit organizations (could rely on private-public partnerships to fund) focused on reducing the number of crashes in a specific area. Similar efforts in other states have taken a focus on issues related to young drivers and have demonstrated success at reducing crashes involving young drivers, specifically high school students. Such successful programs have used safety belt challenges, safety reminder signs posted at high school parking lot exits, parent-teen presentations, and a display of a vehicle driven by a young driver and involved in a fatal crash. Some coalitions are beginning to experiment with programs where at an officer's (or judges) discretion, a young driver stopped for a minor driving violation has an option to attend a safety course with a parent. After successfully completing the course, the young driver won't have to pay the fine and citation is removed from their record.
Target(s)	Crashes involving young drivers, especially those of the high school age.
Goal	The statewide safety goal is approximately a 27% reduction in the number of traffic fatalities forecasted to occur in 2011 and community coalitions are expected to have an effectiveness of 24%. Therefore, statewide coverage of active and effective safe community coalitions would be an important component to achieving the safety goal. An example implementation goal would be to initiate ten new safe community coalitions by 2011, in addition to the existing 23 coalitions already created. (Note: The 2006 Nebraska CHSP set a goal to reduce fatal, disabling injury, and visible injury crashes involving young drivers by 4% while increasing the number of youth-related arrests for alcohol, safety belt and speeding by 5 %.)
Responsive and Preventative Plans	The mission and actions of a Safe Communities Coalition could be both preventative and responsive. Most Safe Communities Coalitions work through public education campaigns to increase awareness of traffic safety and reduce crashes; this would be a preventative deployment. However, a Safe Community Coalition could use a responsive deployment by focusing messages along corridors or in areas where the greatest number of crashes occur. Further, targeting key segments on the population overrepresented in crashes (especially fatal and disabling crashes) can be another way efforts have a responsive nature.
Expected Effectiveness	(Tried) Between 1997 and 2005, the efforts of Safe Communities of Wright County (Minnesota) were instrumental in a 34% reduction in fatal and severe injury crashes for all age groups. Safety belt challenges conducted at high schools showed an initial 19% increase in safety belt use rate. Nebraska already has a significant number of Safe Community type programs that have been targeting young drivers with community efforts including the safety belt use challenges. Many of these have been operating for many years and have become institutionalized locally, many connected with the local health departments.
Keys to Success	A successful Safe Community Coalition will first have the support of many public and private entities that are have a desire to see highway safety improved in their area. Further, an effective leader will be necessary that will be proactive in getting the message out and has an ability to identify and develop quality programs.
Potential Difficulties	Safe Community Coalitions often receive funding from grants (Federal or State) or donations from agencies or private business. Groups may find it difficult to acquire funding every year.
Appropriate Measures and Data	A Safe Community Coalition should record the different types of programs it participates in. The effectiveness data may range from changes in driver behavior (i.e., increase in safety belt use, reduction in distracted driving, reduction in speeding, etc.) to the change in crashes.

Strategy 20. Safe Community Coalitions	
Organizational and Institutional	
Champion	Nebraska Office of Highway Safety
Organizational, Institutional, and Policy Issues	A Safe Community Coalition relies on building partnerships across many agencies and businesses. These partnerships are likely to be across groups that would typically not work with one another. Nebraska's statewide "Click It, Don't Risk It" Coalition has been providing support and the ability to link most of the existing community coalitions.
Issues Affecting Implementation Time	Generally, the time to establish a Safe Community Coalition can happen relatively quickly after the initial funding is identified. Realistically, the time to develop a mission, build partnerships, identify problem areas, and develop and implement countermeasures may take up to a year. Identifiable results may not be recognizable immediately until programs have time to mature.
Costs Involved	The cost of operating a Safe Community Coalition will depend on the number of staff needed and the activities performed. Some examples use only one part-time staff while others may have multiple full-time staff. The total operating cost of a Safe Communities Coalition in Nebraska can vary from only $3,000 to $15,000 based on their activities.
Training and Other Personnel Needs	Safe Community Coalition leaders need many different skills to run a successful program. Some examples of necessary skills include managing budgets; coordinating with multiple businesses, agencies, enforcement departments, and schools; performing analysis of crash data; assisting in the development of educational materials - to name just a few.
Legislative Needs	None identified.

5. Deployment Plan

5.1 Objective

The primary goal of this Plan is to reduce the traffic fatality rate in Nebraska by approximately 38%, from 1.6 fatalities per 100 million vehicle miles of travel in 2003 to 1.0 by 2011. Achieving this goal is expected to reduce the annual number of traffic fatalities by 80 from the number of traffic fatalities forecasted for 2011. Based on a phased approach to implementation of the Critical Strategies, approximately 15 to 20 fatalities need to be prevented each year beginning in 2007 or 2008, respectively.

The process for developing this Plan focused on using Nebraska's crash records and input from a wide variety of safety partners to screen the universe of potential safety strategies to a short list of strategies that are most directly linked to the factors contributing to fatal and life changing injury crashes. This screening process was completed and the resulting list of twenty Critical Strategies is documented in **Chapter 3**. However, even with this short list of strategies, there are still hundreds of possible safety investment scenarios, but experience suggests that only a few combinations of strategies will be the most effective at achieving the stated fatal crash reduction goal. As a result, the final component of the Nebraska SHSP and the objective of this Chapter is to provide guidance on how to invest safety funds and resources among the Critical Strategies in order to offer insight on how to achieve the safety goal and to provide proof that the goal is in fact attainable.

To assist with the decision making process, a spreadsheet tool (Effectiveness Spreadsheet) was developed that provides an estimate of both the safety benefits (i.e., lives saved and disabling injuries prevented) and the implementation costs associated with deployment of the Critical Strategies. Detailed information regarding the Effectiveness Spreadsheet is available in **Appendix III**.

5.2 Safety Investment Analysis

The Effectiveness Spreadsheet was used to complete an analysis of several investment scenarios, summarized in **Table 5.1** with detailed information presented in Appendix III. The three basic concepts tested with the spreadsheet tool are:

1. Engineering Only vs. Comprehensive: Determine if flexing 10% of the safety funds in the Highway Safety Improvement Program to increase education, enforcement, or EMS activities could increase the number of lives saved when compared to investing in only engineering strategies. The focus was on the nearly $6 million dollars in Federal funding that is in the Hazard Elimination Program controlled by NDOR and does not include funds in safety programs at enforcement, education or EMS agencies.
2. Broad Selection vs. Focused Selection. One side of the comparison is selecting a wide variety strategies, sometimes high-cost countermeasures, which results in deployment of a specific countermeasure at a relatively few number of locations. The comparison is to a focused selection of countermeasures that tend to be very effective and are low-cost (although a limited number of high-cost countermeasures were selected) which means each

countermeasure can be deployed at a "greater" number of locations, possibly as part of a preventative approach. For both types of investment, an attempt was made to select a realistic mix of strategies that would comprise a state's safety plan rather than simply directing all funds at the one project that has the highest benefit-cost ratio.

3. Enabling Legislation: Use of a combination of strategies which require no enabling legislation is compared to safety investments where the State Legislature would first need to pass enabling legislation before deployment could occur. This will highlight the importance that elected officials have in reducing the number of traffic fatalities.

TABLE 5.1
Example Investment Scenarios and Expected Outcomes

Investment Scenario		Selection of Strategies	Need for State Legislature to Pass New Laws	Investment Funding Notes*	Estimated Number of Lives Saved Annually
1	Engineering only	Broad selection	Not reliant on new legislation	$6 Million	2 – 3
2	Engineering only	Focused selection	Not reliant on new legislation	$6 Million	4 – 5
3	Engineering only	Focused selection	Not reliant on new legislation	Based on scenario #2, would expect the needed funding would be approximately $25 Million.	15-20
4	Comprehensive	Broad selection	Not reliant on new legislation	$6 Million with 10% flexed to education, enforcement, or EMS.	8 – 9
5	Comprehensive	Focused selection	Not reliant on new legislation	$6 Million with 10% flexed to education, enforcement, or EMS.	12 – 13
6	Comprehensive	Broad selection	Uses strategies which require enabling legislation	$6 Million with 10% flexed to education, enforcement, or EMS.	28 – 29
7	Comprehensive	Focused selection	Uses strategies which require enabling legislation	$6 Million with 10% flexed to education, enforcement, or EMS.	> 50

* Note: $6 million is a representative amount, approximately equal to the Federal funds available through the Hazard Elimination Program as part of HSIP. The High Risk Rural Roads funds and matching state funds were not included.

The results of this effort revealed several key conclusions:

1. Investment Scenario #1 reveals that use of Nebraska's HSIP funds in the traditional way – implementing a wide selection of engineering strategies broadly across the states system of roads - is not likely to achieve results (lives saved) consistent with the adopted safety goal, there simply are not enough serious crashes susceptible to correction based on improving the infrastructure. While a focused selection of countermeasures may increase the number of lives saved, this is still below the reductions needed in order to achieve Nebraska's safety goal (Investment Scenario #2).

2. Using NDOR's HSIP funds in a more comprehensive way (investing in all four Safety E's) can increase the number of lives saved, but probably not to the point of achieving the adopted safety goal (Investment Scenarios #4 and #5).

3. Two of the most effective strategies (recommended by the May 16, 2006 Highway Safety Workshop participants and based on the number of lives saved) in the overall list of Critical Strategies are consideration of adopting a primary safety belt law and enhancing the GDL program for young drivers. Enacting either or both of these laws would likely result in significant reductions in traffic related fatalities and disabling injuries such that the trend line necessary to meet the adopted safety goal would be exceeded (Investment Scenarios #6 and #7). However, only the State Legislature has the authority to pass enabling legislation.

   As illustrated in **Figure 5.1**, national research found that only 3% of crashes could be attributable to just the roadway (*7*). Roadway-related crashes increased to 34% of all crashes when the roadway was also considered in combination with the driver and vehicle influences. In contrast, the only contributing factor in 57% of crashes was the driver, and driver-related crashes increased to over 90% if interactions with roadway and vehicle were included. This illustrates why strategies like considering a primary safety belt law and enhancing the GDL program, which address person behaviors as opposed to infrastructure-based engineering countermeasures, are expected to be more successful at reducing fatalities and disabling injuries.

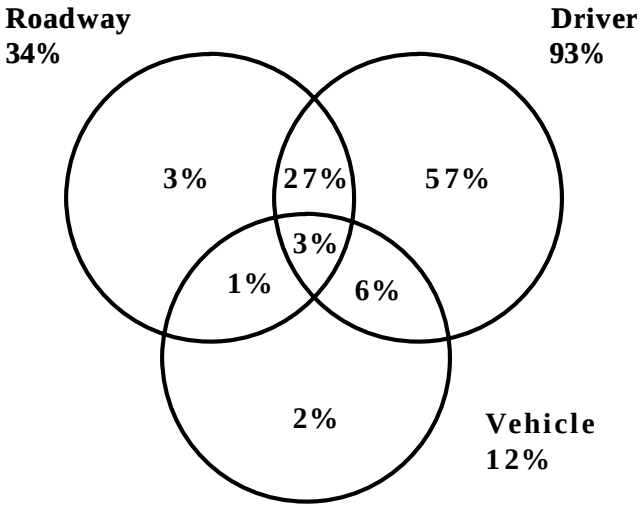


FIGURE 5.1
Contributing Factors in Crashes that Occurred in the United States (*7*)

4. Investments to improve data systems were not identified as capable of preventing a large number of traffic fatalities during the analysis of investment options. This outcome is most likely due to the lack of research results at the national level, as opposed to a lack of confidence in the value of investing in data systems. Accurate data, particularly as it relates to crash locations and key contributing factors (roadway, driver and vehicle characteristics) are critical to being able to respond to public comments about "dangerous" locations. In

addition, moving towards a more integrated system among state agencies can improve proactive efforts to implement mitigation strategies at crash prone locations based on identifying the correlation between crash frequency, severity and roadway / traffic control characteristics. Therefore, a basic assumption is that Nebraska would continue to invest in data systems enhancements and integration, which was not reflected in the investment scenarios.

Each of the investment analyses assumed an incremental approach to achieving the adopted safety goal, as illustrated in **Figure 5.2**. The number of lives saved and disabling injuries reduced reported in this Chapter is for the first year of Nebraska's safety program that includes investment in the new Critical Strategies. The results (lives saved and injuries prevented) in subsequent years depends on continued efforts to increase the focus of the State's safety program on the most highly effective of the identified Strategies.

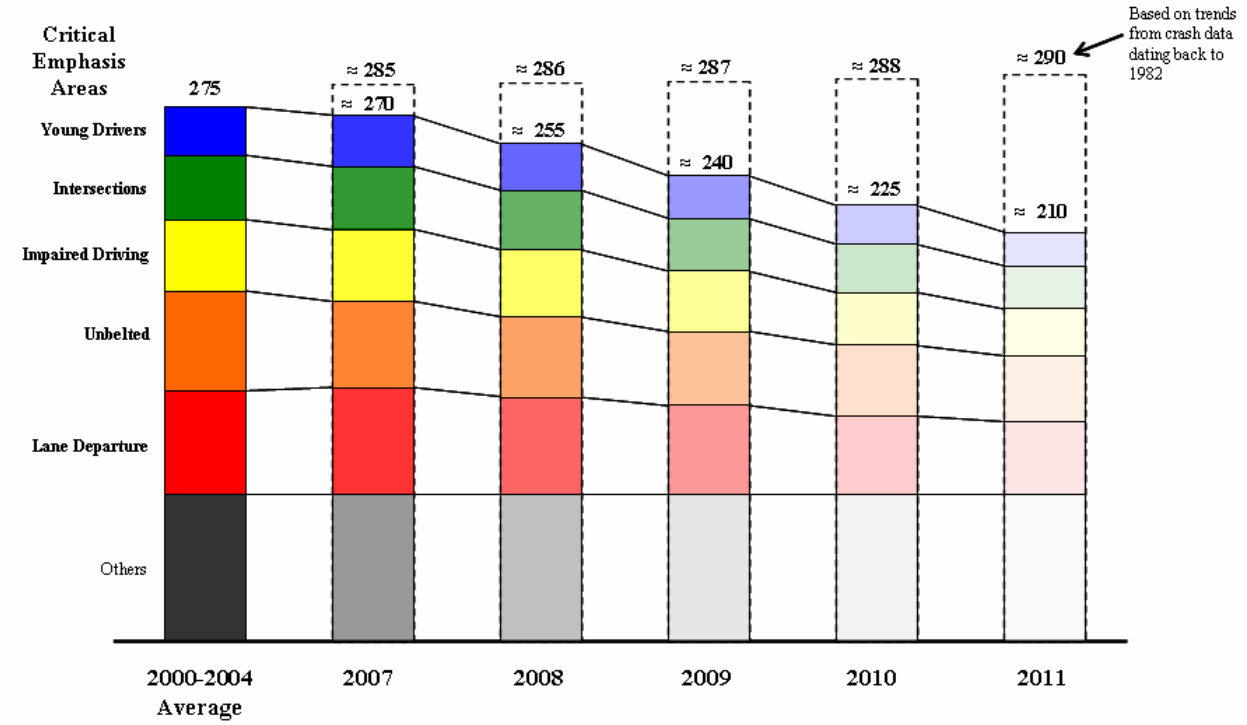


FIGURE 5.2
Incremental Approach to Achieve Safety Goal

Nebraska can achieve the adopted safety goal, but meeting the goal likely requires significant changes in the delivery of HSIP. The safety program will have to be more comprehensive, more systematic, more proactive and more narrowly focused on a small number of the most effective of the Critical Strategies. In addition, it appears that passage of a new primary safety belt law and / or a more comprehensive GDL program is also required.

5.3 Overview of Funding Available for Safety Programs

In Nebraska, there are several available sources for funding the implementation of the Critical Strategies. For example, HSIP contains approximately $10 million in Federal funding through FHWA, of which $6 million for the Hazard Elimination Program was analyzed in the investment scenarios. There is also $3.7 million for the Highway-Rail program, $1 million for the High Risk Rural Roads Program, and the necessary State matching funds. In addition to NDOR, other agencies make significant investments to improve traffic Safety. In the 2006 fiscal year, there was an additional $3.8 million spent by the Nebraska Office of Highway Safety and $2.4 million from the Nebraska State Patrol Carrier Enforcement. A one-year breakdown of how each agency invested these funds in the 2006 fiscal year is available in **Appendix III**.

5.4 Implementing, Evaluating, Revising, and Reporting on the Nebraska SHSP

The Nebraska SHSP will be implemented through the normal statewide transportation planning and programming process. Funding for identified safety projects will come from a number of different sources, including the FHWA HSIP funds administered by NDOR, the various NHTSA funds (Section 402, etc.) administered by the Department of Motor Vehicles, and the Motor Carrier Safety Assistance funds administered by the State Patrol. Each agency will be responsible for following the planning and programming process required by its federal counterpart. HSIP projects will be listed on the Safety Schedule of Improvements, an attachment to the Statewide Transportation Improvement Program (STIP).

The Safety Schedule of Improvements (SSI) is produced annually and updated as needed, allowing safety projects, which often have a quicker turnover than regular highway projects, to be programmed on a more flexible basis. The Safety Schedule of Improvements must be approved by FHWA.

After the completion of the SHSP, the Interagency Safety Committee will continue to meet regularly to set priorities for and to oversee implementation of the safety program. Individual projects will be selected to further the goals of the SHSP. A responsible agency will be assigned to each project. This agency will be responsible for implementation of the project, reporting on the progress of the project at future Interagency Safety Committee meetings, and, after the project is completed, performing an evaluation of the effectiveness of the project. NDOR will attempt to evaluate all HSIP projects which are chosen on the basis of actual crash data. A tracking system will be maintained to allow the Interagency Safety Committee to follow the progress of a project towards completion. Evaluation results should help guide the committee in making future project decisions.

The CEAs and Critical Strategies identified in the Nebraska SHSP may be relevant for the next five years, or the data may show that an update is needed after several years. However, the expectation is no drastic changes in the highway safety problems identified will change in the near term. Also, time will be needed to implement the new projects identified, and also determine their effectiveness. The Interagency Safety Committee will periodically review the crash data to look for new safety initiatives.

The NDOR will report annually to FHWA on the HSIP. This will include types of projects initiated, funds expended, and evaluation results.

6. Key Conclusions

Nebraska's Strategic Highway Safety Plan (SHSP) was prepared in accordance with the Federal Highway Administration's (FHWA) guidance—the analytical process was driven by crash data, the State's safety partners (representing enforcement, education and emergency services) participated in the entire process and the Plan addresses the following four key items:

Statewide Safety Goal

The Nebraska Interagency Safety Committee has adopted a new safety performance measure—fatal and life changing injury crashes—and a new goal of a reducing the statewide fatality rate by 38%, from a rate 1.6 fatalities per 100 million vehicle miles of travel in 2003 to a rate of 1.0 in 2011. Achieving this goal is expected to reduce the annual number of traffic fatalities in Nebraska by almost 80 per year (compared to the number of fatalities forecasted for 2011) at the end of the phased implementation period.

Critical Emphasis Areas

Nebraska's crash records were used to identify the areas that are emphasized in the Plan based on the number of related fatal crashes—the notion being that these Emphasis Areas represent the greatest opportunity for successfully reducing the number of severe crashes. The Interagency Safety Committee then undertook a screening process that ultimately resulted in the selection of five areas of focus—the Critical Emphasis Areas (CEAs) —for the Plan:

1. Increasing Safety Belt Usage
2. Keeping Vehicles on the Roadway, Minimizing the Consequences of Leaving the Road, & Reducing Head-On and Across-Median Crashes
3. Reducing Impaired Driving
4. Improving the Design and Operation of Highway Intersections
5. Addressing the Over Involvement of Young Drivers

Critical Safety Strategies

The selection of the five CEAs focused the vision of the Plan from an initial universe of more than 500 alternative safety strategies to approximately 160 strategies that are directly related to the factors contributing to severe crashes in Nebraska. This reduced set of strategies was then further screened by the safety partners to a list of 20 Critical Strategies addressing the Four Safety E's—about one-half of the strategies address engineering issues and the rest are evenly divided between enforcement and education. This distribution is consistent with the results of the analysis of factors contributing to severe crashes in Nebraska and with research at the national level (*7*) that indicates driver behavior is a primary factor in more than one-half of all crashes. A summary of the Critical Safety Strategies is illustrated in **Figure 6.1**.

It should be noted that most of the Critical Strategies (those dealing with engineering and emergency medical services) can be implemented almost immediately, with the cooperation of the responsible agency and the allocation of the necessary financial resources. However,

several strategies dealing with enforcement and young drivers (enhancing safety belt law, automated enforcement and an enhanced Graduated Drivers License program) would require new legislation before they could be implemented.

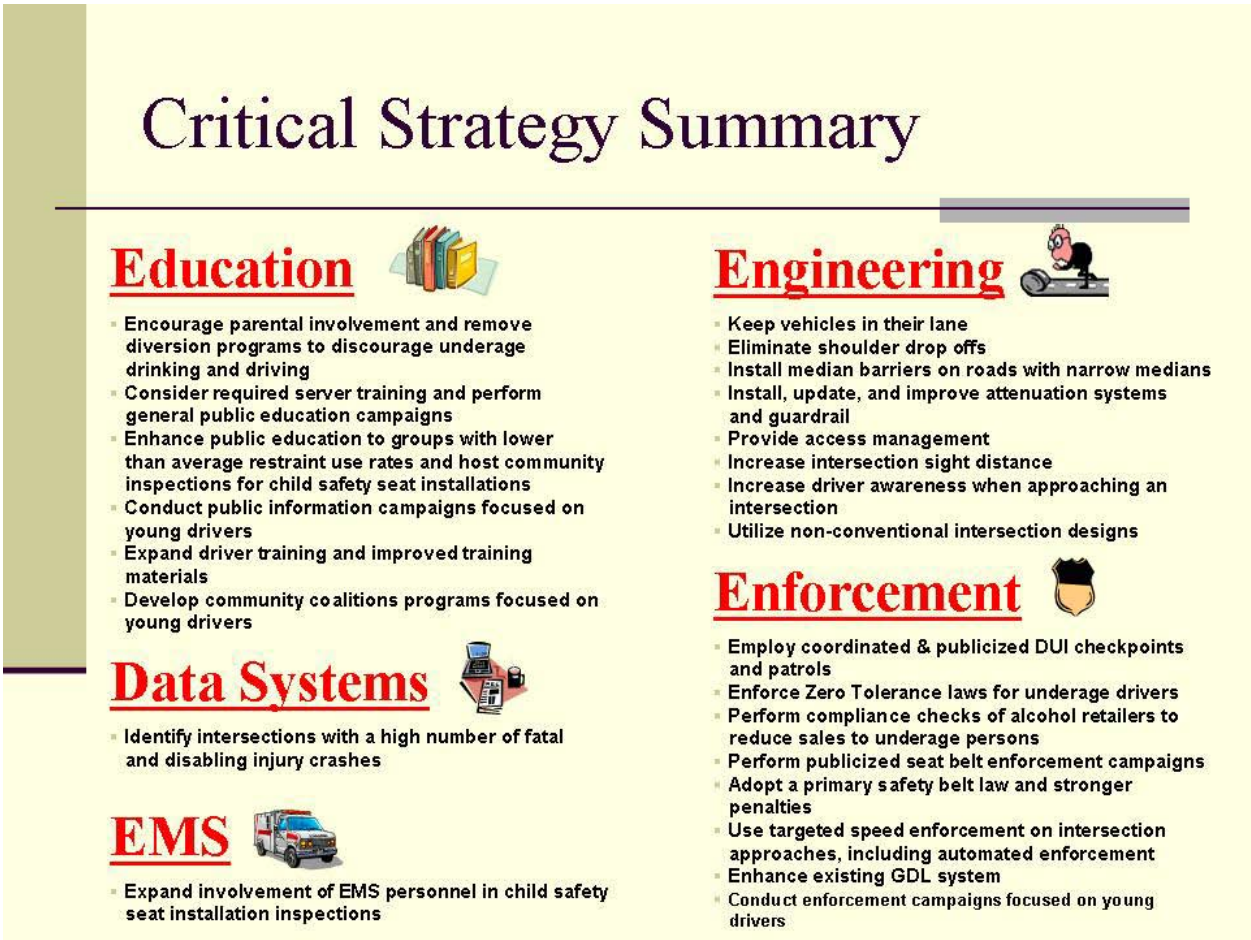


FIGURE 6.1
Summary of Nebraska's Critical Strategies
Note: Several Critical Strategies had multiple components and addressed more than one of the Four Safety E's
The strategies are based on material and guidance in the NCHRP Report 500 series, were prioritized by Safety Partners at a workshop on May 16, 2006 and with concurrence by the Nebraska Interagency Safety Committee.

Safety Investment Options

The process for screening safety strategies narrowed the focus of the Plan from hundreds of potential strategies to the twenty highest priority strategies. However, even after this prioritization there are still thousands of possible ways to invest safety dollars in different combinations of strategies. The analysis of alternative safety investment scenarios, using a specially developed spreadsheet tool, identified six key characteristics that are associated with the most effective investment of safety dollars and therefore most likely to result in Nebraska achieving the adopted safety goal. Nebraska's six keys to safety investment include:

1. Invest in all four Safety E's.
2. Focus the safety investment in the few strategies that are associated with the largest pool of fatal and disabling injury crashes.
3. Invest heavily in strategies that have proven to produce crash reductions, have relatively high safety effectiveness ratios, are relatively low cost and therefore can be widely deployed across Nebraska's entire system of highways.
4. Find a balance between the traditional reactive approach to safety and a proactive approach that is expected to be more effective at addressing the few widely distributed serious crashes that are over represented in rural areas.
5. Develop a method to direct safety resources to local road systems, which account for almost 40% of the fatal crashes in Nebraska.
6. The enforcement and young driver strategies that require new legislation are linked to large pools of severe crashes that are susceptible to correction, have low to moderate deployment costs and relatively high effectiveness ratios. As a result, the addition of these strategies to an overall safety plan would significantly increase Nebraska's ability to meet the adopted safety goal.

It should be noted that additional investments to improve data systems was not identified as being highly effective at reducing severe crashes. It appears that this is likely a function of the lack of research results at the national level as opposed to providing a true picture of the actual value of good data. In fact, traffic safety professionals in Nebraska consider improving the crash data system to be a high priority. Without accurate data, both from the perspective of crash location and integrated across a variety of state agencies, the task of identifying crash prone locations and linking causative factors to mitigation strategies becomes far too speculative. As a result, Nebraska chooses to include data systems as a key part of the SHSP and will continue to make the necessary investment of safety dollars in order to support the development of a crash system that is highly accurate and integrated across the State's safety agencies.

Finally, the greatest challenge facing traffic safety professionals in Nebraska is the need to acknowledge that the effort to reduce fatal and life changing injuries is tied to implementing a new, more effective safety program that is different than what has been done in the past. The previous program is associated with a trend line for highway traffic fatalities that is increasing. The analysis of safety investment options proves that Nebraska can achieve the adopted safety goal of reducing the fatal crash rate to the national goal of 1.0, a 38% reduction. However, doing so will require doing things differently than what has been the practice in recent years. This includes investing in additional enforcement, education and emergency services, being more proactive, engaging the legislature to improve dealing with safety belts, electronic enforcement and young drivers and focusing safety investments on the small subset of low cost strategies that are linked to large pools of severe crashes and that can be widely deployed across all road systems in Nebraska.

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Appendix I

Safety Countermeasures
for the Selected Critical Emphasis Area

TABLE A-1
Lane Departure Strategies

Objectives	Strategies	Relative Cost to Implement and Operate	Effectiveness	Typical Timeframe for Implementation	Priority Ranking
15.A—Keep vehicles from encroaching into the opposite lane	15.A1—Keep vehicles from encroaching into opposing lanes or running ff the road by installing: centerline rumble strips for two-lane roads; shoulder rumble strips; profiled thermoplastic strips, raised pavement markers, or other methods for centerlines in order to provide better day, night, and wet visibility; or edgeline "profile marking", edgeline rumble strips or modified shoulder rumble strips on section with narrow or no paved shoulders	Low	Tried / Experimental Centerline Rumble Strips: Delaware study showed a 31% fewer head-on crashes while a Colorado study showed 35% fewer head-on crashes. Shoulder Rumble Strips: 20%-30% reduction of single vehicle ROR crashes in rural areas; expected to be less effective in urban areas.	Short (< 1 yr.) to Medium (1-2 yrs.)	High
	15.A2—Provide wider cross sections on two-lane roads	Moderate to High	Experimental (MN: 50% fewer total crashes.)	Long (>2 yrs.)	Medium
	15.A3—Provide center two-way left turn lanes for four- and two-lane roads	Moderate	Tried (MN: 30% fewer total crashes.)	Short (< 1 yr.)	Medium
	15.A4—Reallocate total two-lane roadway width (lane and shoulder) to include a narrow "buffer median"	Low	Tried	Short (< 1 yr.)	Low
	15.A5—Prohibit / restrict trucks with very long semitrailers on roads with horizontal curves that cannot accommodate truck offtracking	Moderate	Tried	Medium (1-2 yrs.)	Low
15.B—Minimize the likelihood of crashing into an oncoming vehicle	15.B1—Use alternating passing lanes or four-lane sections at key locations	Moderate to High	Tried	Medium (1-2 yrs.)	Medium
	15.B2—Install median barriers for narrow-width medians on multilane roads	Moderate	Tried	Medium (1-2 yrs.)	Medium
	15.B3—Deploy "No Passing Zone" signs as appropriate	Low	Tried	Medium (1-2 yrs.)	Low
15.C—Keep vehicles from encroaching on the roadside	15.C1—Provide enhanced delineation and warning of sharp curves or unexpected changes in horizontal alignment, improve horizontal curve geometry, and provide adequate sight distance on approach to horizontal curves	Low to High	Proven / Tried / Experimental For average to well designed roads, post-mounted delineators may reduce ROR crashes by 15%. For total crashes on curves of rural 2-lane roads: 15-80% reduction for curve flattening [varies depending on initial and final degree of curvature]; 5-30% reduction for lane and shoulder widening.	Short (< 1 yr.) to Long (> 2 yrs.)	Medium
	15.C2—Provide enhanced pavement markings, such as 6" or 8" markings instead of 4" markings or improved day / night / wet visibility	Low	Tried	Short (< 1 yr.)	Medium
	15.C3—Provide skid-resistant pavements	Moderate	Tried	Medium (1-2 yrs.)	Low
	15.C4—Eliminate shoulder drop-off by paving shoulders, widening substandard shoulders, or maintenance of gravel shoulders and construct a beveled edge (a.k.a. safety edge) to assist drivers getting back onto the travel lane if on the shoulder	Low	Tried / Experimental MN: 15% reduction in crashes.	Short (<1 yr.) to Medium (1-2 yrs.)	High
	15.C13—Provide lighting of the sharp horizontal curves	Moderate	Tried	Medium (1-2 yrs.)	Low
	15.C14—Provide dynamic curve warning system	Moderate	Tried MN: Significant improvement of curve navigation, no speed reduction.	Medium (1-2 yrs.)	Medium
	15.C15—Improve or restore superelevation	Moderate to High	Proven If superelevation is deficient: 5% crash reduction for an improvement less than 0.02. A 10% crash reduction for an improvement of 0.02 or more.	Medium (1-2 yrs.)	Medium
	15.C16—Install automated anti-icing systems	Moderate to High	Tried	Medium (1-2 yrs.)	Medium
	15.C17—On roadways with narrow shoulders (i.e., 2 feet), pave shoulders and then stripe 11' lanes to control speeds	Low to Moderate	Tried	Short (< 1 yr.)	Low

TABLE A-1
Lane Departure Strategies

Objectives	Strategies	Relative Cost to Implement and Operate	Effectiveness	Typical Timeframe for Implementation	Priority Ranking
15.D—Minimize the likelihood of crashing into an object or over turning if the vehicle travels beyond the edge of the shoulder	15.D1—Provide shoulder treatments at key locations	Moderate	Tried	Medium (1-2 yrs.)	Medium
	15.D2—Design safer slopes and ditches to prevent rollovers	Moderate to High	Proven (On rural 2-lane roads: 6-27% reduction for single vehicle crashes and 3-15% reduction in total crashes for sideslope flattening [varies depending on initial and final sideslope]. Washington, 25-45% reduction in ROR crashes due to sideslope flattening.)	Medium (1-2 yrs.)	Medium
	15.D3—Remove / relocate objects, such as trees, utility poles, light poles, and etc., in hazardous locations (i.e., provide adequate clear zones), extend culverts to move outside of clearzone	Low to Moderate	Proven (On rural 2-lane roads with a 10-15 ft. clear zone: 13-44% reduction in ROR, head-on and sideswipe crashes for increased clear zones [varies depending on additional clearzone provided].)	Short (< 1 yr.)	Medium
	15.D4—Delineation of roadside objects, such as trees, utility poles, light poles, and etc., in hazardous locations	Low	Experimental	Short (< 1 yr.)	Low
	15.D5—Flatten transverse slopes (a.k.a. entrance slopes) and use culvert safety grates.	Moderate to High	Tried	Medium (1-2 yrs.)	Low
15.E—Reduce the severity of the crash	15.E1—Inventory, improve, update, and maintain roadside hardware including terminals	Moderate to High	Tried	Medium (1-2 yrs.)	Medium
	15.E2—Improve barriers and attenuation systems	Moderate to High	Tried	Medium (1-2 yrs.)	Medium
	15.E3—Shield motorists from striking roadside objects, such as trees, utility poles, light poles, driving off of steep slopes	Moderate	Proven (Reduction in ROR crash severity at an increase in number of guardrail crashes. Appendix A of Roadside Design Guide provides method to evaluate a location.)	Short (< 1 yr.)	Medium
	15.E4—Modify roadside clear zone in the vicinity of trees, utility poles, light poles, and etc.	Moderate to High	Tried	Medium (1-2 yrs.)	Low
	15.E5—Use breakaway devices	Moderate to High	Tried	Medium (1-2 yrs.)	Low
15.F—Evaluate system, infrastructure, and policy	15.F1—Inventory existing guardrail, develop criteria with which to evaluate the priority for replacing substandard guardrail, apply the criteria and determine a priority list to replace guardrail and systematically replace all substandard guardrail.	Moderate	Experimental	Medium (1-2 yrs.)	Low
	15.F2—Develop a comprehensive median barrier policy that clearly defines warrants and improves upon the guidelines of the Roadside Design Guide	Low	Experimental	Medium (1-2 yrs.)	Low
	15.F3—Identify corridors and locations with a disproportionately large number of actual and / or potential for run-off the road and head-on crashes and develop / implement a comprehensive and coordinated response	Moderate	Experimental	Medium (1-2 yrs.)	Medium
	15.F4—Participate in road safety audits	Low	Tried	Medium (1-2 yrs.)	Medium
15.G—Provide for driver education	15.G1—Train and educate roadway users to safely recover if on the shoulder and understand the dangers of speeding and risk taking behavior	High	Experimental	Medium (1-2 yrs.)	Low
	15.G2—Train and educate roadway users on passing zone markings and lanes	High	Experimental	Medium (1-2 yrs.)	Low
	15.G3—Legislature education on safety issues				Low
15.H—Provide targeted enforcement	15.H1— Identify segments with over representation of head-on and / or sideswipe crashes and then use targeted enforcement for vehicle passing regulations	Moderate to High	Tried	Short (<1 yr.)	Low
	15.H2—Identify segments with over representation of run-off road crashes and then use targeted enforcement on high incident corridors	Moderate to High	Tried	Short (<1 yr.)	Low

TABLE A-2
Alcohol-Related Strategies

Objectives	Strategies	Relative Cost to Implement and Operate	Effectiveness	Typical Timeframe for Implementation	Priority Ranking
5.A—Reduce Excessive Drinking and Underage Drinking	5.A1—Increase the excise tax on beer	Low	Tried	Long (>2 yrs.)	Low
	5.A2—Require responsible beverage service policies for alcohol servers and retailers and continue to educate the general public, business owners, and alcohol servers on the dangers of impaired driving	Moderate to High	Proven / Tried 23% decrease in Oregon's single-vehicle nighttime injury crashes after implementing server training law.	Short (<1 yr.) to Long (>2 yrs.)	High
	5.A3—Conduct well-publicized compliance checks of alcohol retailers to reduce sales to underage persons	Low	Tried	Short (<1 yr.)	High
	5.A4—Employ screening and brief interventions in health care settings	Low	Tried	Short (<1 yr.)	Low
5.B—Enforce DUI Laws	5.B1—Increase number of highly publicized DUI checkpoints and saturation patrols (coordinated throughout the state), enhance DUI detection through related traffic enforcement, and further encourage cooperation between regional safety partners to identify target locations, times, etc. for enforcement efforts *Note: For DUI checkpoints and saturation patrols, it is important to address areas with a high number fatal crashes and to "switch" back-and-forth between the two enforcement methods to keep officers from becoming "burned out".*	Low to High	Proven / Tried (NHTSA: routine highly publicized use would reduce alcohol-related fatalities by 15%. Range: 10% - 30%.)	Short (<1 yr.)	High
	5.B2—Publicize and enforce zero tolerance laws for drivers under age 21, require parent involvement and attendance (possibly a graduated licensing provision), and eliminate diversion programs and plea bargains to non-alcohol offenses (i.e., improve DUI process and conviction rate)	Moderate	Proven / Tried Maryland: law alone reduced drinking-driving crashes among drivers ≤21 by 21%. Coupled with extensive PI&E campaign, reduced crashes additional 30%.	Short (<1 yr.) to Long (>2 yrs.)	High
5.C—Control High BAC and Repeat Offenders	5.C1—Seize vehicles administratively upon arrest	Moderate	Proven Studies show a decrease of 25% [first time] to 38% [repeat offenders].	Medium (1-2 yrs.)	Low

TABLE A-3
Unbelted Vehicle Occupant Strategies

Objectives	Strategies	Relative Cost to Implement and Operate	Effectiveness	Typical Timeframe for Implementation	Priority Ranking
8.A—Maximize use of occupant restraints by all vehicle occupants	8.A1— Provide enhanced public education to population groups with lower than average restraint use rates and conduct highly publicized enforcement campaigns to maximize restraint use *NOTE: If safety belt use rate stays static (or decreases), then focus switches from education to enforcement*	Moderate to High	Proven Enforcement: North Carolina case example; since 1993, there has been a 19% increase in seat belt use and a 14% decrease in fatal and serious injuries. Education: South Carolina case example; overall usage rates increased from 65.5%to 73.9%; nonwhite use rates increased from 56.1% to 70.4%; seatbelt use among males increased from 59.2% to 67.9%; and there was a 29.5% decrease in fatalities. Jefferson County (Wisconsin) Safe Communities Coalition: has achieved more than 87% usage in selected populations.	Short (<1 yr.) to Medium (1-2 yrs.)	High
	8.A2—Support adoption of a primary safety belt law that eliminates gaps in safety belt, child seat, and booster seat laws; strengthen fines for safety belt violations *Note: Primary safety belt law is first and foremost; however, stronger penalties would be a great addition to a primary law, but could also be enacted separately.*	Low	Proven / Experimental In 2003, seat belt use in states with a primary law is on average 11 percentage points higher than a state with a secondary law.	Medium (1-2 yrs.)	High
	8.A3—Increase use of changeable message boards and signs encouraging restraint use	Low	Tried	Medium (1-2 yrs.)	Low
8.B—Insure that restraints, especially child and infant restraints, are properly used	8.B1—Provide community locations for instruction in proper child restraint use and conduct high profile “child restraint inspection” events at multiple community locations	Low	Proven / Tried	Short (<1 yr.)	High
	8.B2—Train law enforcement personnel to check for proper child restraint use in all motorist encounters	Moderate	Tried	Short (<1 yr.)	Low
8.C—Provide access to appropriate information, materials, and guidelines for those implementing programs to increase occupant restraint use	8.C1—Create state-level clearing houses for materials that offer guidance in implementing programs to increase restraint use	Moderate	Experimental	Medium (1-2 yrs.)	Medium

TABLE A-4
Intersection Strategies

Objectives	Strategies	Relative Cost to Implement and Operate	Effectiveness	Typical Timeframe for Implementation	Priority Ranking
17.A—Improve management of access near unsignalized intersections	17.A1— Manage conflicts in the influence area of intersections using driveway closures / relocations, driveway turn restrictions, and restricting cross median access near intersections	Low to Moderate	Tried Access management in Minnesota resulted in 15%-40% reduction in crash rates on rural roadways and as much as 75% reduction on urban roadways.	Short (<1 yr.) to Medium (1-2 yrs.)	High
17.B—Reduce the frequency and severity of intersection conflicts through geometric design improvements	17.B1—Provide left-turn lanes at intersections; provide sufficient length to accommodate deceleration and queuing, use offset turn lanes to provide better visibility if needed, provide left-turn acceleration lanes at divided highway intersections	Moderate to High	Proven (Depending on location [rural vs. urban], traffic control [signal vs. STOP], and number of approach legs [three vs. four], adding left turn lanes to a major approach may reduce crashes by 22%-44%.)	Medium (1-2 yrs.)	Medium
	17.B2—Provide bypass lanes on shoulders at T-intersections	Low	Tried	Short (<1 yr.)	Medium
	17.B3—Provide right-turn lanes at intersections; provide sufficient length to accommodate deceleration and queuing, use offset turn lanes to provide better visibility if needed, provide left-turn acceleration lanes at divided highway intersections	Moderate to High	Proven (Depending on location, traffic control [signal vs. STOP] and number of improved approaches [one vs. two], adding right turn lanes to a major approach may reduce crashes by 5%-25%.)	Medium (1-2 yrs.)	Low
	17.B4—Restrict or eliminate turning maneuvers by signing	Low	Tried	Short (<1 yr.)	Low
	17.B5—Restrict or eliminate turning maneuvers by providing channelization or closing median openings	Low	Tried (MN: 50%-90% crash reductions at limited number of sites.)	Short (<1 yr.)	Medium
	17.B6—Close or relocate “high-risk” intersections	High	Tried	Long (>2 yrs.)	Low
	17.B7—Convert four-legged intersection to two T-intersections	High	Tried	Medium (1-2 yrs.)	Low
	17.B8—Convert offset T-intersections to four-legged intersection	High	Tried	Medium (1-2 yrs.)	Low
	17.B9—Realign intersection approaches to reduce or eliminate intersection skew	High	Proven (Unsignalized Intersections: For removing a 30° skew, a 3-legged intersection would expect a 13% fewer crashes and a 4-legged intersection would expect 17.5% fewer crashes. For calculating the expected safety benefit for a specific skew angle, refer to the equations in NCHRP Report 500: Volume 5.)	Medium (1-2 yrs.)	Low
	17.B10—Use indirect left-turn treatments to minimize conflicts at divided highway intersections	Moderate	Tried	Medium (1-2 yrs.)	Medium
	17.B11—Improve pedestrian and bicycle facilities to reduce conflicts between motorists and nonmotorists	Moderate	Varies	Medium (1-2 yrs.)	Low
	17.B12—Revise geometry of complex intersections	High	Tried	Long (>2 yrs.)	Low
	17.B13—Construct special solutions, such as interchanges, median U-turn crossovers, etc.	High	Tried	Long (>2 yrs.)	Low
17.C—Improve sight distance at intersections	17.C1—Clear sight triangles on approaches to intersections and in the medians of divided highways near intersections; eliminate parking that restricts sight distance	Low to Moderate	Tried	Short (<1 yr.)	High
	17.C2—Change horizontal and / or vertical alignment of approaches to provide more sight distance	High	Tried	Long (>2 yrs.)	Low
17.D—Improve availability of gaps in traffic and assist drivers in judging gap sizes at unsignalized intersections	17.D1—Provide an automated real-time system to inform drivers of the suitability of available gaps for making turning and crossing maneuvers	Moderate	Experimental (FHWA & State Pooled Fund research underway. Low tech systems have also been deployed in Maine and Virginia.)	Medium (1-2 yrs.)	Low
	17.D2—Provide roadside markers or pavement markings (static devices) to assist drivers in judging the suitability of available gaps for making turning and crossing maneuvers	Low	Experimental	Medium (1-2 yrs.)	Low
	17.D3—Retime adjacent signals to create gaps at stop-controlled intersections	Low	Tried	Short (<1 yr.)	Low

TABLE A-4
Intersection Strategies

Objectives	Strategies	Relative Cost to Implement and Operate	Effectiveness	Typical Timeframe for Implementation	Priority Ranking
17.E—Improve driver awareness of intersections as viewed from the intersection approach	17.E1—Increase driver awareness when approaching intersections; including, STOP controlled, signalized, and thru approaches (i.e., enhanced regulatory, warning and guide signing, street lighting, dynamic mainline warning flashers)	Low to High	Proven / Tried / Experimental Intersection Lighting: In Minnesota, 27% reduction in the frequency of nighttime collisions; 35% reduction in nighttime crash rates; and 20% decrease in crash severity.	Short (<1 yr.) to Medium (1-2 yrs.)	High
	17.E3—Install splitter islands on the minor-road approach to an intersection	Moderate	Tried	Medium (1-2 yrs.)	Medium
	17.E4—Provide a stop bar (or provide a wider stop bar) on minor-road approaches	Low	Tried	Short (<1 yr.)	Medium
	17.E6—Call attention to the intersection by installing rumble strips on intersection approaches	Low	Tried	Short (<1 yr.)	Medium
	17.E7—Provide dashed marking (extended left edgelines) for major roadway continuity at divided highway intersections	Low	Tried	Short (<1 yr.)	Low
	17.E8—Provide supplementary stop signs mounted over the roadway	Low	Tried	Short (<1 yr.)	Low
	17.E9—Provide pavement markings with supplementary messages, such as STOP AHEAD	Low	Tried	Short (<1 yr.)	Medium
	17.E10—Provide improved maintenance of stop signs	Low	Tried	Short (<1 yr.)	Low
	17.E11—Install red flashing beacons on STOP signs at stop-controlled intersections	Low	Tried	Short (<1 yr.)	Medium
	17.E12—Improve visibility of signals and signs at intersections	Low	Tried	Short (<1 yr.)	Medium
17.F—Choose appropriate intersection traffic control to minimize crash frequency and severity	17.F1—Avoid Signalizing through roads	High	Tried	Long (>2 yrs.)	Low
	17.F2—Provide all-way stop control at appropriate intersections	Low	Proven Conversion from 2-way to all-way stop control could reduce total intersection crashes by 53%; based on limited data.	Short (<1 yr.)	Low
	17.F3—Provide roundabouts at appropriate locations	High	Proven Installing a modern roundabout at unsignalized location may result in a 38% reduction in total crashes, a 76% reduction in injury crashes, and a 90%reduction in fatal and serious injuries.	Long (>2 yrs.)	High
17.G—Improve driver compliance with traffic control devices and traffic laws at intersections	17.G1—Provide targeted enforcement of traffic laws	Moderate	Tried	Short (<1 yr.)	Low
	17.G2—Provide targeted public information and education on safety problems at specific intersections	Low	Tried	Short (<1 yr.)	High
	17.G3— Provide public information on the importance of compliance with traffic control devices	Moderate to High	Tried	Short (<1 yr.)	Low
	17.G5—Implement automated enforcement of red-light running (cameras)	Moderate	Proven (Fairfax, VA: 44% fewer violations during year 1. Oxnard, CA: 41% fewer red-light violations in first months. FHWA: 15% reduction in red-light-running incidents. Other: 35%-60% fewer violations; 35% fewer right-angle crashes, 25% fewer right-angle turning crashes, and 31% fewer rear-end crashes.)	Medium (1-2 yrs.)	Medium
17.H—Reduce operating speeds on specific intersection approaches	17.H1—Provide targeted speed enforcement (can expand to all traffic violations)	Moderate	Proven (Key is to recognize that effectiveness of increased enforcement at specific locations has a relatively short duration—measured in days or weeks, rather than months.)	Short (<1 yr.)	High
	17.H2—Provide traffic calming on intersection approaches through a combination of geometric and traffic control devices	Moderate	Proven (Impacts on mean speed at single sites varied from 3 mph increase to 17 mph decrease.)	Medium (1-2 yrs.)	Low
	17.H3—Post appropriate speed limit on intersection approaches	Low	Tried	Short (<1 yr.)	Low
	17.H4—Implement automated enforcement of approach speeds (cameras)	Moderate	Tried	Medium (1-2 yrs.)	Medium

TABLE A-4
Intersection Strategies

Objectives	Strategies	Relative Cost to Implement and Operate	Effectiveness	Typical Timeframe for Implementation	Priority Ranking
17.I—Guide motorist more effectively through complex intersections	17.I1—Provide turn path markings	Low	Tried	Short (<1 yr.)	Medium
	17.I2—Provide a double yellow centerline on the median opening of a divided highway at intersections	Low	Tried	Short (<1 yr.)	Low
	17.I3—Provide lane assignment signing or marking at complex intersections	Low	Tried	Short (<1 yr.)	Medium
17.J—Reduce frequency and severity of intersection conflicts through traffic signal control and operational improvements	17.J1—Employ multiphase signal operation	Low	Proven / Tried (California: 35% fewer total crashes when left-turn lanes added along with left-turn phasing. 15% fewer crashes for left-turn lanes only.)	Short (<1 yr.)	Medium
	17.J2—Optimize clearance intervals	Low	Proven (New York: 9% reduction in multi-vehicle and a 12% reduction in injury crashes at intersections where the change interval was lengthened to meet ITE guidelines. 37% reduction in crashes involving pedestrians or bicyclists.)	Short (<1 yr.)	Medium
	17.J3—Restrict or eliminate turning maneuvers (including right turns on red)	Low	Tried	Short (<1 yr.)	Low
	17.J4—Employ signal coordination	Moderate	Proven (25%-38% reduction in intersection crash.)	Medium (1-2 yrs.)	Medium
	17.J5—Employ emergency vehicle preemption	Moderate	Proven (14%-50% decreases in response times.)	Medium (1-2 yrs.)	Low
	17.J6—Improve operation of pedestrian and bicycle facilities at signalized intersections	Low	Proven / Tried (Addressed individually by Pedestrian Emphasis area.)	Short (<1 yr.)	Low
	17.J7—Remove unnecessary traffic signal	Low	Proven (Requires careful study of specific locations. When converted to all-way STOP, annual average crash frequency decreased by greater than one crash per year. When converted to two-way STOP, increase in right angle crashes was offset by reduction in rear end crashes.)	Short (<1 yr.)	Medium
	17.J8—Implement dilemma zone protection	Moderate	Tried	Medium (1-2 yrs.)	Low
	17.J9—On high speed roadways, install advance warning flashers to inform driver of need to stop	Moderate	Tried	Medium (1-2 yrs.)	High
17.K—Improve safety through other infrastructure treatments	17.K1—Improve drainage in intersection and on approaches	Moderate	Tried	Medium (1-2 yrs.)	Low
	17.K2—Provide skid resistance in intersection and on approaches	Moderate	Tried	Medium (1-2 yrs.)	Low
	17.K3—Coordinate closely spaced signals near at-grade railroad crossings	Moderate	Tried	Medium (1-2 yrs.)	Low
	17.K4—Relocate signal hardware out of clear zone	Moderate	Tried	Short (<1 yr.)	Low
17.L— Improve safety through data analysis and coordination with local agencies	17.L1—Through crash analysis, identify intersections with a disproportionately large number of fatal and serious injuries crashes	Low	Tried	Short (<1 yr.)	High
	17.L2—Through crash analysis, identify key factors contributing to crashes and link directly to mitigative strategies	Low	Experimental	Short (<1 yr.)	Medium
	17.L3—Participate in intersection safety audits	Low	Tried	Medium (1-2 yrs.)	Medium
	17.L4—Coordinate with local agencies at regular intervals to identify and discuss countermeasures to reduce traffic crashes	Low	Experimental	Medium (1-2 yrs.)	Medium
	17.L5—Streamline funding constraints so that local agencies can implement countermeasures to improve safety and operational features	Low	Experimental	Medium (1-2 yrs.)	Low

TABLE A-5
Young Driver Strategies

Objectives	Strategies	Relative Cost to Implement and Operate	Effectiveness	Typical Timeframe for Implementation	Priority Ranking
1.A—Implement or improve graduated driver licensing (GDL) systems	1.A1— Enact a comprehensive graduated licensing system, improvements may include requiring at least 6 months of supervised driving for beginners starting at age 16, implementing a night driving restriction that begins at 9:00 PM, and implement a passenger restriction allowing no or only one young passengers	Low	Proven / Tried Comp. GDL: Depending on the provisions, crash reductions on the order of 25% - 35% can be attained for 16 year-old drivers. A 15% - 20% reduction can also be attained for 17 year-old drivers. Supervised Training Period: Studies indicate substantially longer learner periods can have a 22% - 40% reduction in crash rates. Nighttime Driving Restriction: For first six months, studies indicate a possible 40% - 50% reduction in crashes after 9:00 PM for drivers under 18.	Medium (1-2 yrs.)	High
	1.A5—Prohibit cell phone use by drives with a GDL license	Low	Tried	Medium (1-2 yrs.)	Medium
	1.A6—Pass a primary seat belt law for vehicles operated by a driver with a GDL license	Low	Experimental	Medium (1-2 yrs.)	High
1.B—Publicize, enforce, and adjudicate laws pertaining to young drivers	1.B1— Conduct more public information campaigns and highly visible enforcement campaigns, including laws pertaining to GDL provisions, underage drinking and driving (i.e., zero tolerance laws), and seat belts; using check points when and where appropriate	Moderate to High	Proven / Experimental Zero Tolerance Law: Education and endforcement in Maryland reduced drinking-driving crashes among drivers ≤21 by 21%. Coupled with extensive PI&E campaign, reduced crashes additional 30%. Safety Belt Laws: North Carolina Case example for GENERAL safety belt use; since 1993, there has been a 19% increase in seat belt use and a 14% decrease in fatal and serious injuries	Short (<1 yr.)	High
1.C—Assist parents / adults in managing teen driving	1.C1—Facilitate parental supervision of learners	Moderate to High	Tried	Long (>2 yrs.)	Medium
	1.C2—Facilitate parental management of intermediate drivers	Moderate	Experimental	Long (>2 yrs.)	Medium
	1.C3—Encourage selection of safer vehicles for young drivers	Low	Tried	Medium (1-2 yrs.)	Low
1.D—Improve young driver training	1.D1—Improve content and delivery of driver education / training and review training manual to increase link between content & documented crash causation factors for young drivers	Moderate to High	Experimental	Long (>2 yrs.)	High
	1.D2—Require driver training for newly licensed young drivers	Moderate	Tried	Medium (1-2 yrs.)	High
1.E—Employ school-based strategies	1.E1—Eliminate early high school start times (e.g., before 8:30 AM)	Low	Tried	Medium (1-2 yrs.)	Low
	1.E2—Review transportation plans for new expanded high school sites	Low	Experimental	Short (<1 yr.)	Low
	1.E3 —Develop community coalition programs focused on young drivers and linked to schools	Low to Moderate	Tried Safe Communities of Wright County, MN has a demonstrated success at reducing number of fatal crashes involving high school students.	Short (<1 yr.)	High

Appendix II

High Priority Strategies

Objectives	Strategies	Relative Cost to Implement and Operate	Effectiveness	Typical Timeframe for Implementation	Voting Results
Lane Departure Strategies					
Keep vehicles in their lane	Use cost effective treatments to keep vehicles in their lane. This may include: (1)centerline rumble strips for two-lane roads, (2) shoulder rumble strips on roads with paved shoulders, (3) edgeline "profile marking", edgeline rumble strips or modified shoulder rumble strips on section with narrow or no paved shoulders, (4) profiled thermoplastic strips, raised pavement markers, or other methods for centerlines in order to provide better day, night, and wet visibility, and (5) enhanced pavement markings, such as 6" or 8" markings instead of 4" markings or improved day/night/wet visibility.	Low	Tried/ Experimental	Short (< 1 yr.) to Medium (1-2 yrs.)	23
Keep vehicles from encroaching on the roadside	Eliminate shoulder drop-offs by (1) paving shoulders, (2) widening substandard shoulders, and (3) maintaining gravel shoulders along pavement edges in order to keep vehicles from encroaching on the roadside. Assist drives with a safe recovery by (4) adding "safety wedges" to the edge of pavements.	Low	Experimental	Medium (1-2 yrs.)	12
Provide for education	Legislature education on safety issues.	Low	Experimental	Short (< 1yr.)	3
Alcohol-Related Strategies					
Reduce Excessive Drinking and Underage Drinking	(1) Encourage the use of required responsible beverage service policies and training for alcohol servers and retailers, (2) continue to educate the general public, business owners, and alcohol servers on the dangers of impaired driving, (3) consider public policies that would make parents accountable for minors who consume alcohol at their place and then drive, and (4) use targeted education techniques (such as billboards) to reduce excessive drinking and underage drinking.	Moderate to High	Proven/Tried	Short (<1 yr.) to Long (>2 yrs.)	8
	To reduce underage drinking (and driving), increase the number of well-publicized compliance checks of alcohol retailers to reduce sales to underage persons.	Low	Tried	Short (<1 yr.)	0

Objectives	Strategies	Relative Cost to Implement and Operate	Effectiveness	Typical Timeframe for Implementation	Voting Results
Enforce DUI Laws	Use enforcement to reduce the number of alcohol-related crashes by increasing the number of highly publicized and coordinated (1) DUI checkpoints or (2) saturation patrols. Also enhance DUI enforcement through the use of (3) traditional traffic enforcement. (4) Form state and local law enforcement partnerships to provide greater coverage during enforcement campaigns and also work with regional safety partners help identify target locations, times, etc. for enforcement efforts.	Low to High	Proven/Tried	Short (<1 yr.)	23
	(1) Publicize and enforce zero tolerance laws for drivers under age 21. (2) Encourage parental involvement and attendance in programs/classes and emphasize education and training through the graduated licensing programs. To further discourage drinking and driving, (3) work with courts to discourage diversion programs and plea bargains to non-alcohol offenses (i.e., improve DUI process and conviction rate).	Moderate	Proven/Tried	Short (<1 yr.) to Long (>2 yrs.)	19
Unbelted Vehicle Occupant Strategies					
Maximize use of occupant restraints by all vehicle occupants	To increase safety belt use rate: (1) provide enhanced public information and education to population groups with lower than average restraint use rates and (2) conduct highly publicized enforcement campaigns.	Low to High	Proven	Short (<1 yr.) to Medium (1-2 yrs.)	18
	Support adoption of a primary seat belt law; eliminate gaps in seat belt, child seat, and booster seat laws (i.e., cover all passenger and all seats)	Low	Proven/ Experimental	Medium (1-2 yrs.)	64
	Ensure that child and infant restraints are properly used by providing community locations for instruction in proper child restraint use and conducting high profile “child restraint inspection” events at multiple community locations (involving EMS personnel at inspection locations).	Low	Proven/Tried	Short (<1 yr.)	1
Intersection Strategies					
Improve management of access near unsignalized intersections	Near unsignalized intersections, use access management techniques to manage conflicts in the influence area of intersections.	Moderate	Tried	Medium (1-2 yrs.)	2

Objectives	Strategies	Relative Cost to Implement and Operate	Effectiveness	Typical Timeframe for Implementation	Voting Results
Improve sight distance at intersections	Improve sight distance at intersections by clearing sight triangles.	Low to Moderate	Tried	Short (<1 yr.)	0
Improve driver awareness of intersections on approaches	Increase a driver awareness's when approaching an intersection; whether a STOP controlled, signalized, or thru approach. Techniques for consideration include (1) enhanced warning and guide signing, (2) street lighting, (3) dynamic mainline warning flashers, and (4) advance warning flashers for traffic signals on high speed roadways.	Low to Moderate	Proven/Tried	Medium (1-2 yrs.)	14
Choose appropriate intersection traffic control to minimize crash frequency and severity	Provide roundabouts at appropriate locations.	High	Proven	Long (>2 yrs.)	21
Improve driver compliance with traffic control devices and traffic laws at intersections	Provide targeted public information and education on safety problems at specific intersections.	Low	Tried	Short (<1 yr.)	0
Reduce operating speeds on intersection approaches	Use targeted speed enforcement to reduce operating speeds on specific intersection approaches.	Moderate	Proven	Short (<1 yr.)	28
Reduce frequency and severity of intersection conflicts with traffic signal control and operational improvements	On high speed roadways, install advance warning flashers to inform driver of need to stop	Moderate	Tried	Medium (1-2 yrs.)	0

Objectives	Strategies	Relative Cost to Implement and Operate	Effectiveness	Typical Timeframe for Implementation	Voting Results
Improve safety through data analysis and coordination with local agencies	Through crash analysis, identify intersections with a disproportionately large number of fatal and serious injuries crashes. As necessary, improve data collection to enhance analysis of intersection crashes.	Low	Tried	Short (<1 yr.)	18
Young Driver Strategies					
Implement/ improve GDL systems	Establish a more comprehensive graduated licensing system.	Low	Proven/Tried	Medium (1-2 yrs.)	32
Publicize, enforce, and adjudicate laws pertaining to young drivers	Conduct more (1) public information and (2) enforcement campaigns pertaining to young drivers.	Moderate to High	Proven/ Experimental	Short (<1 yr.)	7
Improve young driver training	Improve driver training materials	Moderate to High	Experimental	Long (>2 yrs.)	0
	Mandatory driver training	Moderate	Tried	Medium (1-2 yrs.)	21
Employ community or school-based strategies	Develop community coalition programs focused on young drivers	Low to Moderate	Tried	Short (<1 yr.)	3

Appendix III

Supporting Information for Deployment Plan

The following sections provide an overview of the Effectiveness Spreadsheet (see **Figure A.1**), discuss two fundamentally different approaches to system wide safety investments (traditional engineering only strategies and a comprehensive approach consistent with current FHWA guidance) and a summary of key lessons learned from the analyses.

A.1.1 Effectiveness Spreadsheet

The Effectiveness Spreadsheet estimates the number of traffic fatalities and disabling injuries prevented (i.e., benefits) given a specified level of investment in a specific combination of Critical strategies. The spreadsheet also estimates the total implementation cost and then computes a B/C ratio. It must be understood that this tool was created to provide a planning level and statewide view of deployment of the Critical Strategies in Nebraska and is based on typical implementation costs and the average crash experiences spread over the entire State roadway system. This tool is not intended to produce results (i.e., safety benefit or implementation costs) for specific projects because actual crash characteristics and costs at individual locations could vary greatly from the averages assumed. Finally, only key and/or common project types for the Critical Strategies are listed. Some Critical Strategies may consist of multiple safety project types, but only select options have been included in the Effectiveness Spreadsheet.

The Spreadsheet has been organized into three basic components; given values, input values and output values. The given values (the number of crashes related to each strategy and effectiveness ratios) and input values (unit costs, service life and average system wide crash densities) were developed specifically for Nebraska using the State's data. **Table A.1** provides a detailed description of each field in the spreadsheet tool.

TABLE A.1
Effectiveness Spreadsheet Field Descriptions

	Field		Field Description
Given Values	1 & 2	Related Crashes: Fatalities and Disabling Injuries	The number of fatalities or disabling injuries (Nebraska, 2000-2004) that were potentially correctable by the action listed under the critical strategy.
	3 & 4	Effectiveness: Fatal & Disabling Injury	Reports the effectiveness of the listed strategy at reducing the number of fatal or disabling injury crashes. The effectiveness may be listed as a percentage (i.e., prevent 50% of related crashes for every mile treated) or as an absolute number (i.e., prevent 1 crash for every program developed). The source for the effectiveness is presented in the cell's comment.
Input Values	5	Deployment	The level of deployment for each strategy; for example, the number of DUI checkpoint campaigns, the miles of centerline rumble strips, the number of roundabouts constructed, etc.
	6	Unit Cost	Represents an estimate of the implementation cost (i.e., salary, construction cost, related maintenance, etc.) for the life of the project. The original values are general estimates that may be refined if more detailed information is made available.

TABLE A.1
Effectiveness Spreadsheet Field Descriptions

	Field		Field Description
Input Values cont'd	7	Service Life	The estimated life of the project related to the unit cost. This is the timeframe over which benefits are expected to accrue and also the number of years over which the cost is amortized.
	8	Crash Density: Fatal and Disabling Injury	For many of the engineering strategies, the effectiveness is expressed as a percent reduction in the number of the crashes at an intersection or that occurred along a corridor. Therefore, crash density (crash per mile, crash per intersection, etc.) was determined using the relevant portions of the state highway. Even though this constant is based on large parts of the roadway system, it is likely a conservative value because crashes were averaged across most of the system. Therefore, it is also likely to provide a reasonable estimate of conditions on roadways under local jurisdiction.
	9	Interest Rate	An interest rate of 4% is used to amortize the implementation costs into an annual value over the life of the project.
Output Values	10 & 11	Crash Prevention: Fatalities and Disabling Injuries	The estimated number of fatalities or disabling injuries prevented using the level of deployment specified and the effectiveness for fatal and disabling injury crashes. Most values are computed using only the number of crashes (1 & 2), effectiveness (3 & 4), and deployment (5). A crash density (8) was also needed for many of the engineering strategies.
	12	Initial Cost	The upfront or initial cost for implementation based upon the unit cost and the amount of deployment. As appropriate, this is inclusive of construction, annual maintenance over the life of the project, salary, advertising, and etc.
	13 & 14	Crash Cost: Fatality and Disabling Injury	The value or cost of a traffic fatality ($3,687,200) and disabling injury ($261,200). This information was provided by the Nebraska Department of Roads, which was taken from Federal Highway Administration report *The Cost of Highway Crashes* (report number FHWA-RD-91-055) and was adjusted to January 2006 costs.
	15	B/C Ratio	Annual benefit divided by the annualized cost. The annual benefit is the value of the fatalities and disabling injuries prevented.

The effectiveness values (crash reduction factors) for fatal and disabling injury crashes have also been color coded based on the level of confidence. Effectiveness values noted in green are considered "Proven" because the associated strategies have been rigorously tested and the results have been determined to be highly reliable. Effectiveness values noted in yellow are considered "Tried"—these strategies have been widely deployed, but statistical analysis has not yet been performed to thoroughly document the safety benefit. Effectiveness values noted in red are considered "Experimental"—there is little or no research available to document the safety effects of deployment. The effectiveness values for "Proven" and "Tried" strategies primarily come from the NCHRP 500 Series reports, supplemented by local experience whenever it is available. Effectiveness values for "Experimental" strategies were established using local safety professionals knowledge and expertise. For some strategies, a range of effectiveness values may be found in the safety literature. In these cases, a effectiveness value selected was determined to give the most reasonable results. Similarly, the implementation costs were colored coded based on the level of confidence. Unit costs noted in green have a

	Given Values					Input Values						Output Values				
						Interest Rate (9) = 4.0%								Fatality Cost (13) = $ 3,687,200.00		
														Disabling Injury Cost (14) = $ 261,200.00		
	Related Crashes (2000 - 2004)		Effectiveness						Crash Density		Annual Crash Prevention					
	Fatalities	Disabling Injuries	Fatal	Disabling Injury	Unit	Deployment	Unit Cost	Service Life	Fatal	Serious Injury	Fatalities	Disabling Injuries	Initial Cost	Annual Benefit	BC Ratio
Lane Departure Strategies	(1)	(2)	(3)	(4)		(5)	(6)	(7)	(8)		(10)	(11)	(12)		(15)
Critical Strategy #1: Implement Cost Effective Improvements to Keep Vehicles in Their Lane															
Centerline Rumble Strips for Two-Lane Roads	130	494	35%	35%	of head-on and sideswipe crashes on undivided highways	1000 mile(s)	$ 1,000	10	0.0020	0.0026	0.92	1.3	$ 1,000,000	$ 3,727,931	43.0
Shoulder Rumble Strips on Roads with Paved Shoulders	558	3,785	20%	20%	of run-off road crashes	1000 mile(s)	$ 2,000	10	0.0040	0.0204	0.86	4.9	$ 2,000,000	$ 4,472,591	25.8
Edgeline Rumble Strips or "Profile-Markings" on Roads with No or Narrow Shoulders	558	3,785	10%	10%	of run-off road crashes	1000 mile(s)	$ 2,000	10	0.0035	0.0169	0.38	2.0	$ 2,000,000	$ 1,916,638	11.1
Improved Centerline Markings (Thermoplastic, RPM, etc.)	130	494	5%	5%	of head-on and sideswipe crashes on undivided highways	1000 mile(s)	$ 500	2	0.0020	0.0026	0.13	0.2	$ 500,000	$ 532,562	2.1
Use of 6" or 8" Wide Markings as Opposed to 4" Wide Markings	725	4,279	5%	5%	of lane departure crashes	1000 mile(s)	$ 500	1	0.0070	0.0268	0.40	1.6	$ 500,000	$ 1,891,592	3.6
Critical Strategy #2: Keep Vehicles from Encroaching on the Roadside															
Provide Paved Shoulders	140	946	12%	12%	of lane departure crashes	1000 mile(s)	$ 100,000	20	0.00271	0.0116	0.35	1.7	$ 100,000,000	$ 1,740,559	0.5
Widen Substandard Shoulders	181	1,070	15%	15%	of lane departure crashes	1000 mile(s)	$ 200,000	20	0.00256	0.0116	0.43	2.1	$ 200,000,000	$ 2,149,239	0.3
Maintain Gravel Shoulders	140	946	5%	5%	of lane departure crashes	1000 mile(s)	$ 2,000	5	0.0027	0.0116	0.15	0.7	$ 2,000,000	$ 725,233	1.9
Add "Safety Wedge" to Pavement Edge	558	3,785	5%	5%	of lane departure crashes	1000 mile(s)	$ 2,000	10	0.0047	0.0237	0.26	1.4	$ 2,000,000	$ 1,318,031	7.6
Critical Strategy #3: Minimize the Likelihood of Crashing into an Oncoming Vehicle															
Install Cable Median Barriers	28	67	90%	90%	of across median crashes	1000 mile(s)	$ 100,000	10	0.0048	0.0107	5.54	15.1	$ 100,000,000	$ 24,345,294	2.8
Critical Strategy #4: Reduce the Severity of the Crash															
Improve/Update Barriers, Attenuation Systems, and Guardrail	8	67	10%	10%	of run-off road crashes involving a collision with guardrail	1000 mile(s)	$ 25,000	10	0.0047	0.0237	0.54	2.7	$ 25,000,000	$ 2,709,482	1.3
Shield Roadside Objects	518	3,430	90%	90%	of run-off road crashes involving a collision with a fixed object	1000 mile(s)	$ 50,000	10	0.0044	0.0214	4.25	23.3	$ 50,000,000	$ 21,771,855	5.0
							Total for Lane Departure Strategies =				14	57	$ 485,000,000	$ 67,301,006	2.5
Impaired Driving Strategies															
Critical Strategy #5: Enforcement to Discourage Drinking & Driving															
Highly Publicized and Coordinated DUI Checkpoint Campaign	501	1,317	15%	15%	of alcohol-related crashes	1 statewide program	$ 750,000	1			15.03	39.5	$ 750,000	$ 65,738,628	84.3
Highly Publicized and Coordinated Saturation Patrols	501	1,317	15%	15%	of alcohol-related crashes	1 statewide program	$ 750,000	1			15.03	39.5	$ 750,000	$ 65,738,628	84.3
Traditional Traffic Enforcement	501	1,317	10%	10%	of alcohol-related crashes	1 statewide program	$ 750,000	1			10.02	26.3	$ 750,000	$ 43,825,752	56.2
Utilize Partnerships to Identify Target Locations, Times, etc.	501	1,317	0.5%	0.5%	of alcohol-related crashes	1 statewide program	$ 25,000	1			0.50	1.3	$ 25,000	$ 2,191,288	84.3
Critical Strategy #6: Enforcement and Education to Discourage Underage Drinking and Driving															
Publicize and Enforce Zero Tolerance Laws	125	292	20%	20%	of alcohol-related crashes with a drinking/drunk young driver	1 statewide program	$ 500,000	1			5.00	11.7	$ 500,000	$ 21,482,637	41.3
Encourage Parent Involvement and Attendance in Programs/Classes	125	292	4%	4%	of alcohol-related crashes with a drinking/drunk young driver	1 statewide program	$ 500,000	1			1.00	2.3	$ 500,000	$ 4,296,527	8.3
Discourage Diversion Programs and Plea Bargains	125	292	10%	10%	of alcohol-related crashes with a drinking/drunk young driver	1 statewide program	$ 50,000	1			2.50	5.8	$ 50,000	$ 10,741,318	> 100
Critical Strategy #7: Broad Based Education Campaigns to Reduce Impaired Driving															
Require Mandatory Training for Servers and Retailers	50	132	23%	23%	of alcohol-related crashes	1 new law/program	$ 50,000	1			2.30	6.1	$ 50,000	$ 10,066,566	> 100
Continue to Educate the General Public, Business Owners, and Servers Using Broad Based Education Techniques (such as billboards)	501	1,317	5%	5%	of alcohol-related crashes	1 statewide program	$ 100,000	1			5.01	13.2	$ 100,000	$ 21,912,876	> 100
Make Adults Accountable when Minors Consume Alcohol at Their Residence and then Drive	12	29	8.5%	8.5%	of alcohol-related crashes	1 statewide program	$ 10,000	1			0.20	0.5	$ 10,000	$ 880,960	84.7
Critical Strategy #8: Compliance Checks of Alcohol Retailers															
Conduct Well-Publicized Compliance Checks of Alcohol Retailers	12	29	8.5%	8.5%	of alcohol-related crashes with a drinking/drunk young driver	1 statewide program	$ 125,000	1			0.20	0.5	$ 125,000	$ 880,960	6.8
							Total for Impaired Driver Strategies =				57	147	$ 3,610,000	$ 247,756,141	66.0
Unbelted Vehicle Occupant Strategies															
Critical Strategy #9: Education and Enforcement to Increase Safety Belt Use Among Target Populations															
Provide Enhance Education to Population Groups with Low Usage Rates	707	3,600	4%	4%	of unbelted fatalities	1 statewide program	$ 500,000	1			4.95	25.2	$ 500,000	$ 24,830,193	47.8
Conduct Highly Publicized Enforcement Campaigns	707	3,600	4%	4%	of unbelted fatalities	1 statewide program	$ 500,000	1			5.00	25.5	$ 500,000	$ 25,085,589	48.2
Provide Community Locations for Instruction in Proper Child Restraint Use	10	60	5%	5%	of unbelted fatalities (children)	1 statewide program	$ 100,000	20			0.10	0.6	$ 100,000	$ 525,440	> 100
Conduct High Profile "Child Restraint Inspection" Events at Multiple Community Locations	10	60	5%	5%	of unbelted fatalities (children)	1 statewide program	$ 50,000	20			0.10	0.6	$ 50,000	$ 525,440	> 100
Critical Strategy #10: Enhanced Laws to Encourage Safety Belt Use															
Enact a Primary Safety Belt Law	707	3,600	14%	14%	of unbelted fatalities	1 new law	$ 10,000	20			20.00	101.8	$ 10,000	$ 100,342,356	> 100
Strengthen Penalties for Safety Belt Violations	707	3,600	4%	4%	of unbelted fatalities	1 new law	$ 10,000	20			5.00	25.5	$ 10,000	$ 25,085,589	> 100
							Total for Unbelted Vehicle Occupant Strategies =				35	179	$ 1,170,000	$ 176,394,607	> 100

FIGURE A.1
Nebraska Effectiveness Spreadsheet

Interest Rate **(9)** = 4.0%

Fatality Cost **(13)** = $ 3,687,200.00
Disabling Injury Cost **(14)** = $ 261,200.00

	Given Values					Input Values						Output Values				
	Related Crashes (2000 - 2004)		Effectiveness					Service	Crash Density		Annual Crash Prevention					
	Fatalities	Disabling Injuries	Fatal	Disabling Injury	Unit	Deployment	Unit Cost	Life	Fatal	Serious Injury	Fatalities	Disabling Injuries	Initial Cost	Annual Benefit	BC Ratio
Intersection Strategies															
Critical Strategy #11: Follow the Principles of Access Management															
Restrict or Eliminate Turning Maneuvers Near Unsignalized Intersections	85	1,304	30%	30%	of intersection crashes	100 intersection(s)	$ 15,000	10	0.0688	0.5372	2.33	19.0	$ 1,500,000	$ 13,561,439	> 100
Critical Strategy #12 Improve Sight Distance at Intersections															
Clear Intersection Sight Triangles	31	366	20%	20%	of intersection crashes	100 intersection(s)	$ 10,000	10	0.0617	0.4572	1.47	12.0	$ 1,000,000	$ 8,560,700	98.8
Critical Strategy #13: Improve Driver Awareness of Intersections on Approaches															
Enhance Warning and Guide Signs, including Dynamic Mainline Warning Flashers	237	1620	5%	5%	of intersection crashes	100 intersection(s)	$ 10,000	10	0.0745	0.4167	0.43	2.7	$ 1,000,000	$ 2,285,537	26.4
Street Lighting	56	298	25%	25%	of nighttime intersection crashes	100 intersection(s)	$ 30,000	10	0.0822	0.3333	2.40	10.5	$ 3,000,000	$ 11,590,955	44.6
Advance Traffic Signal Warning Flashers	46	1,565	5%	5%	of intersection crashes	100 intersection(s)	$ 30,000	10	0.0303	0.5071	0.17	3.0	$ 3,000,000	$ 1,413,461	5.4
Critical Strategy #14: Use Non-Conventional Intersection Designs															
Roundabout	194	3068	90%	90%	of intersection crashes	100 intersection(s)	$ 750,000	10	0.0570	0.6796	5.71	69.7	$ 75,000,000	$ 39,243,225	6.0
Offset T-Intersections	237	1620	43%	43%	of intersection crashes	100 intersection(s)	$ 900,000	10	0.0873	0.3763	4.31	21.1	$ 90,000,000	$ 21,392,698	2.7
One-Quadrant Interchanges	237	1620	43%	43%	of intersection crashes	100 intersection(s)	$ 1,000,000	10	0.0873	0.3763	4.31	21.1	$ 100,000,000	$ 21,392,698	2.5
Critical Strategy #15 Targeted Speed Enforcement at Problem Intersections															
Targeted Speed Enforcement on Intersection Approaches	34	386	0.3%	0.3%	of intersection crashes involving speeding	100 intersection(s)	$ 50,000	1			1.99	22.9	$ 5,000,000	$ 13,319,193	2.6
Critical Strategy #16: Work with Local Agencies to Identify Intersections with a Severe Crash Problem															
Identify Intersection with High Number of Severe Crashes	455	5217	0.2%	0.2%	of intersection crashes	1 statewide program	$ 200,000	1			0.20	2.3	$ 200,000	$ 1,337,757	6.4
										Total for Intersection Strategies =	**23**	**184**	**$ 279,700,000**	**$ 134,097,663**	**4.6**
Young Driver Strategies															
Critical Strategy #17: Comprehensive Graduated Driver Licensing System															
Enhance Existing GDL	352	3,039	18%	20%	of young driver involved crashes	1 new law/program	$ 10,000	20			12.67	121.6	$ 10,000	$ 78,475,670	> 100
Critical Strategy #18: Education and Enforcement of Laws Directed Towards Young Drivers															
Public Information Campaign	352	3,039	1%	1%	of young driver involved crashes	1 statewide program	$ 750,000	1			1.00	8.6	$ 750,000	$ 5,940,375	7.6
Enforcement Campaign	352	3,039	7%	7%	of young driver involved crashes	1 statewide program	$ 750,000	1			5.00	43.2	$ 750,000	$ 29,701,873	38.1
Critical Strategy #19: Required Driver Training and Improved Training Materials															
Require Driver Training	352	3,039	1%	1%	of young driver involved crashes	1 statewide program	$ 200,000	1			1.00	8.6	$ 200,000	$ 5,940,375	28.6
Improved Driver Training Materials	352	3,039	0.3%	0.3%	of young driver involved crashes	1 statewide program	$ 200,000	1			0.20	1.7	$ 200,000	$ 1,188,075	5.7
Critical Strategy #20: Safe Community Coalitions															
Develop Safe Community Coalitions	352	3,039	25%	25%	of young driver involved crashes	1 safe community coalition	$ 100,000	1			0.22	1.9	$ 100,000	$ 1,307,301	12.6
										Total for Young Driver Strategies =	**20**	**186**	**$ 2,010,000**	**$ 122,553,668**	**58.9**
										Total =	**150**	**753**	**$ 771,490,000**	**$ 748,103,086**	**12**

Confidence Level for:	Effectiveness Value	Cost
	Statistically Proven	High, little variation expected
	Tried and Accepted	Medium, some variation likely to occur
	Experimental	Low, implementation costs may vary greatly

FIGURE A.1 continued
Nebraska Effectiveness Spreadsheet

high confidence level and little variation is expected while unit costs noted in red may be a best estimate or the cost could vary significantly depending on how the specific strategy is actually deployed. A yellow coded implementation cost indicates that variation in cost is expected, however, not to the degree of a project with a red cost coded.

To illustrate how the Effectiveness Spreadsheet works, a sample calculation is provided.

Centerline Rumble Strips for Two-Lane Roads

Step 1: Estimate annual number of crashes prevented.

Fatal = (1000 miles) * (0.0020 fatal head-on crashes per mile) * 35%
= 0.7 fatal head-on crashes prevented annually

Disabling Injury = (1000 miles) * (0.0026 disabling injury head-on crashes per mile) * 35%
= 0.9 disabling injury head-on crashes prevented annually

Step 2: Convert crashes prevented to fatalities and disabling injuries prevented using statewide ratio.

Fatalities = 0.7 fatal head-on crashes prevented * 130 fatalities / 99 fatal crashes
= 0.92 head-on fatalities prevented annually

Disabling Injuries = 0.91 dis. inj. head-on crashes prevented * 494 dis. inj. / 332 dis. inj. Crashes
= 1.3 disabling injuries from head-on crashes prevented annually

Note: Columns for fatal crashes and disabling injury crashes are included in the spreadsheet, but simply not visible in **Figure A.1**. These columns were hidden simply so that the spreadsheet would better fit the page size.

Step 3: Estimate annual benefit of fatalities and injuries prevented

Benefit = (0.92 fatalities) * ($3,687,200 per fatality) + (1.3 dis. inj.) * ($261,200 per dis. inj.)
= $3,727,931 per year

Step 4: Estimate initial implementation cost

Implementation Cost = (1000 miles) * ($1000 per mile)
= $1,000,000

Step 5: Amortize implementation cost over the life of project

Implementation Cost = Present Value * [I * (1 + i)] / [(1 + i)^n – 1]
= $1,000,000 * [4% * (1 + 4%)] / [(1 + 4%)^{10} -1]
= $86,622 per year

Step 6: Calculate benefit-cost ratio

B / C Ratio = $3,727,931 / $86,622
= 43.0

A.1.2 Deployment Scenarios

Two fundamentally different approaches to system wide safety investments were analyzed—a traditional deployment of engineering only strategies and a more comprehensive program including strategies across the four safety E's – engineering, enforcement, education and

emergency medical services. The analyses involved testing investments in different combinations of the Critical Strategies in order to provide insight on how Nebraska can achieve the adopted safety goal and prove that the goal is attainable.

Each deployment scenario used the effectiveness spreadsheet and began by assuming that the safety funding is limited to the $6 million per year in Highway Safety Improvement Program (HSIP) funds that Nebraska expects to receive through the current federal transportation legislation. It is important to note that other Nebraska agencies will continue to receive safety funding and to make investments in their own safety strategies plus Nebraska will need to provide matching funds for projects. Other state agencies could pursue partnerships with NDOR in order to help increase the deployment and outreach of these programs. A detailed description of the basic deployment scenarios; engineering only strategies and a comprehensive package of strategies are provided in the following sections.

A.1.2.1 Engineering Only Deployment Scenarios

Traditionally, highway safety funds the NDOR received from FHWA were spent on infrastructure improvements to the State's highway system. This first three investment scenarios look at the effectiveness of three different combinations of the Critical Strategies that continue to invest in only engineering countermeasures.

Scenario #1—Engineering only with a Broad Selection of Strategies: This scenario documents the safety effects of spending NDOR's safety funds on a wide variety of engineering (lane departure and intersection) strategies and does not rely on any new legislation. An investment in a wide variety of strategies combined with the $6 million funding limit means that each strategy could be deployed at a relative few locations. This scenario would be ideal for targeting a few high crash locations, but because the location of fatal and disabling injury crashes is often random and widely spread across Nebraska's system of roads, the difficulty would be in identifying locations where fatal crashes occur regularly. This scenario reduced the number of traffic fatalities by approximately three per year (**Figure A.2**), which is well below the trend line (approximately 15 to 20 fatalities prevented) needed to achieve the adopted safety goal in the first year of deployment.

Scenario #2—Engineering Only with a Focused Selection of Strategies: The second investment scenario also considered only engineering (lane departure and intersection) strategies, but with a focused approach that invested in fewer strategies which allowed a more widespread deployment. The strategies selected generally (1) would address a large pool of related fatal and disabling injury crashes, (2) were relatively inexpensive which would allow deployment across a larger number of locations, and (3) had a relatively high effectiveness for reducing fatal and disabling injury crashes. Focusing on a few low cost and highly effective strategies spread across a larger number of locations increased the number of lives saved to slightly more than four per year (see **Figure A.3**), a number that is still far below the trend line needed to achieve the adopted safety goal.

	Input Values			Output Values			
				Annual Crash Prevention			
	Deployment		Unit Cost	Fatalities	Disabling Injuries	Initial Cost	BC Ratio
Lane Departure Strategies							
Critical Strategy #1: Implement Cost Effective Improvements to Keep Vehicles in Their Lane							
Centerline Rumble Strips for Two-Lane Roads	700	mile(s)	$ 1,000	0.64	0.9	$ 700,000	43.0
Shoulder Rumble Strips on Roads with Paved Shoulders	700	mile(s)	$ 2,000	0.60	3.5	$ 1,400,000	25.8
Edgeline Rumble Strips or "Profile-Markings" on Roads with No or Narrow Shoulders	20	mile(s)	$ 2,000	0.01	0.0	$ 40,000	11.1
Improved Centerline Markings (Thermoplastic, RPM, etc.)	25	mile(s)	$ 500	0.00	0.0	$ 12,500	2.1
Use of 6" or 8" Wide Markings as Opposed to 4" Wide Markings	25	mile(s)	$ 500	0.01	0.0	$ 12,500	3.6
Critical Strategy #2: Keep Vehicles from Encroaching on the Roadside							
Provide Paved Shoulders	5	mile(s)	$ 100,000	0.00	0.0	$ 500,000	0.5
Maintain Gravel Shoulders	25	mile(s)	$ 2,000	0.00	0.0	$ 50,000	1.9
Add "Safety Wedge" to Pavement Edge	25	mile(s)	$ 2,000	0.01	0.0	$ 50,000	7.6
Critical Strategy #3: Minimize the Likelihood of Crashing into an Oncoming Vehicle							
Install Cable Median Barriers	10	mile(s)	$ 100,000	0.06	0.2	$ 1,000,000	2.8
Critical Strategy #4: Reduce the Severity of the Crash							
Improve/Update Barriers, Attenuation Systems, and Guardrail	10	mile(s)	$ 25,000	0.01	0.0	$ 250,000	1.3
Shield Roadside Objects	5	mile(s)	$ 50,000	0.02	0.1	$ 250,000	5.0
			Total for Lane Departure Strategies =	**1.4**	**5**	**$ 4,265,000**	**17.2**
Intersection Strategies							
Critical Strategy #11: Follow the Principles of Access Management							
Restrict or Eliminate Turning Maneuvers Near Unsignalized Intersections	15	intersection(s)	$ 15,000	0.35	2.9	$ 225,000	> 100
Critical Strategy #12 Improve Sight Distance at Intersections							
Clear Intersection Sight Triangles	15	intersection(s)	$ 10,000	0.22	1.8	$ 150,000	98.8
Critical Strategy #13: Improve Driver Awareness of Intersections on Approaches							
Enhance Warning and Guide Signs, including Dynamic Mainline Warning Flashers	15	intersection(s)	$ 10,000	0.06	0.4	$ 150,000	26.4
Street Lighting	11	intersection(s)	$ 30,000	0.26	1.2	$ 330,000	44.6
Advance Traffic Signal Warning Flashers	1	intersection(s)	$ 30,000	0.00	0.0	$ 30,000	5.4
Critical Strategy #14: Use Non-Conventional Intersection Designs							
Roundabout	1	intersection(s)	$ 750,000	0.06	0.7	$ 750,000	6.0
Critical Strategy #16: Work with Local Agencies to Identify Intersections with a Severe Crash Problem							
Identify Intersection with High Number of Severe Crashes	0.5	statewide program	$ 200,000	0.10	1.1	$ 100,000	6.4
			Total for Intersection Strategies =	**1.1**	**8**	**$ 1,735,000**	**24.5**
			Total =	**2.4**	**13**	**$ 6,000,000**	**20**

FIGURE A.2
Investment Scenario #1

	Input Values			Output Values			
				Annual Crash Prevention			
	Deployment		Unit Cost	Fatalities	Disabling Injuries	Initial Cost	BC Ratio
Lane Departure Strategies							
Critical Strategy #1: Implement Cost Effective Improvements to Keep Vehicles in Their Lane							
Centerline Rumble Strips for Two-Lane Roads	1000	mile(s)	$ 1,000	0.92	1.3	$ 1,000,000	43.0
Shoulder Rumble Strips on Roads with Paved Shoulders	1500	mile(s)	$ 2,000	1.29	7.4	$ 3,000,000	25.8
Edgeline Rumble Strips or "Profile-Markings" on Roads with No or Narrow Shoulders	20	mile(s)	$ 2,000	0.01	0.0	$ 40,000	11.1
Use of 6" or 8" Wide Markings as Opposed to 4" Wide Markings	150	mile(s)	$ 500	0.06	0.2	$ 75,000	3.6
Critical Strategy #2: Keep Vehicles from Encroaching on the Roadside							
Maintain Gravel Shoulders	40	mile(s)	$ 2,000	0.01	0.0	$ 80,000	1.9
Add "Safety Wedge" to Pavement Edge	40	mile(s)	$ 2,000	0.01	0.1	$ 80,000	7.6
			Total for Lane Departure Strategies =	**2.3**	**9**	**$ 4,275,000**	**24.1**
Intersection Strategies							
Critical Strategy #11: Follow the Principles of Access Management							
Restrict or Eliminate Turning Maneuvers Near Unsignalized Intersections	25	intersection(s)	$ 15,000	0.58	4.8	$ 375,000	> 100
Critical Strategy #12 Improve Sight Distance at Intersections							
Clear Intersection Sight Triangles	25	intersection(s)	$ 10,000	0.37	3.0	$ 250,000	98.8
Critical Strategy #13: Improve Driver Awareness of Intersections on Approaches							
Street Lighting	30	intersection(s)	$ 30,000	0.72	3.2	$ 900,000	44.6
Critical Strategy #16: Work with Local Agencies to Identify Intersections with a Severe Crash Problem							
Identify Intersection with High Number of Severe Crashes	1	statewide program	$ 200,000	0.20	2.3	$ 200,000	6.4
			Total for Intersection Strategies =	**1.9**	**13**	**$ 1,725,000**	**30.4**
			Total =	**4.2**	**22**	**$ 6,000,000**	**27**

FIGURE A.3
Investment Scenario #2

Scenario #3—Engineering Only with a Focused Selection of Strategies and Meets the Safety Goal: Given the results of the first two scenarios, a key question is what level of investment in engineering only strategies would it take to reach the adopted safety goal. Based on the results of the second investment scenario, safety spending would have to be increased to approximately $25 million annually (see **Figure A.4**). Even if this level of funding were made available, another difficulty would be finding enough miles of state highways and intersections that would benefit from the limited number of infrastructure based improvements.

This analysis clearly demonstrates that continuing to invest HSIP funds only in traditional engineering strategies is not an effective approach to achieving Nebraska's adopted safety goal.

	Input Values			Output Values			
				Annual Crash Prevention			
	Deployment	Unit Cost		Fatalities	Disabling Injuries	Initial Cost	BC Ratio
Lane Departure Strategies							
Critical Strategy #1: Implement Cost Effective Improvements to Keep Vehicles in Their Lane							
Centerline Rumble Strips for Two-Lane Roads	4200 mile(s)	$ 1,000		3.84	5.7	$ 4,200,000	43.0
Shoulder Rumble Strips on Roads with Paved Shoulders	6400 mile(s)	$ 2,000		5.52	31.6	$ 12,800,000	25.8
Edgeline Rumble Strips or "Profile-Markings" on Roads with No or Narrow Shoulders	85 mile(s)	$ 2,000		0.03	0.2	$ 170,000	11.1
Use of 6" or 8" Wide Markings as Opposed to 4" Wide Markings	640 mile(s)	$ 500		0.25	1.1	$ 320,000	3.6
Critical Strategy #2: Keep Vehicles from Encroaching on the Roadside							
Maintain Gravel Shoulders	170 mile(s)	$ 2,000		0.02	0.1	$ 340,000	1.9
Add "Safety Wedge" to Pavement Edge	170 mile(s)	$ 2,000		0.04	0.2	$ 340,000	7.6
	Total for Lane Departure Strategies =			**9.7**	**39**	**$ 18,170,000**	**24.0**
Intersection Strategies							
Critical Strategy #11: Follow the Principles of Access Management							
Restrict or Eliminate Turning Maneuvers Near Unsignalized Intersections	105 intersection(s)	$ 15,000		2.45	20.0	$ 1,575,000	> 100
Critical Strategy #12 Improve Sight Distance at Intersections							
Clear Intersection Sight Triangles	105 intersection(s)	$ 10,000		1.55	12.6	$ 1,050,000	98.8
Critical Strategy #13: Improve Driver Awareness of Intersections on Approaches							
Street Lighting	125 intersection(s)	$ 30,000		3.00	13.2	$ 3,750,000	44.6
Critical Strategy #16: Work with Local Agencies to Identify Intersections with a Severe Crash Problem							
Identify Intersection with High Number of Severe Crashes	1 statewide program	$ 200,000		0.20	2.3	$ 200,000	6.4
	Total for Intersection Strategies =			**7.2**	**48**	**$ 6,575,000**	**51.4**
			Total =	**16.9**	**87**	**$ 24,745,000**	**32**

FIGURE A.4
Investment Scenario #3

A.1.2.2 Comprehensive Deployment Scenarios

Under the new federal transportation legislation (SAFETEA-LU), states may flex up to 10% of their HSIP funds to invest in the other three safety E's—enforcement, education and EMS. In order to exercise this flexibility, states first have to have an approved SHSP and then they must certify that they have met all of their infrastructure needs. The following four scenarios illustrate the effectiveness of flexing 10% of Nebraska's HSIP funds for a particular year.

Scenario #4—Comprehensive Approach with a Broad Selection of Strategies: This scenario is based on investing NDOR's HSIP funds in a broad selection of strategies and each countermeasure could be deployed at a relatively few number of locations (similar to scenario #1). As with the previous scenarios, no safety funds were spent on any strategy that requires enabling legislation. The results of this analysis indicate that flexing the safety funds to invest in additional enforcement and education and utilizing a wide array of engineering strategies, the number of lives saved increased to just over 8 per year (see **Figure A.5**) which is still below what is needed in order to meet the goal.

	Input Values			Output Values			
				Annual Crash Prevention			
	Deployment	Unit Cost		Fatalities	Disabling Injuries	Initial Cost	BC Ratio
Lane Departure Strategies							
Critical Strategy #1: Implement Cost Effective Improvements to Keep Vehicles in Their Lane							
Centerline Rumble Strips for Two-Lane Roads	600 mile(s)	$ 1,000		0.55	0.8	$ 600,000	43.0
Shoulder Rumble Strips on Roads with Paved Shoulders	600 mile(s)	$ 2,000		0.52	3.0	$ 1,200,000	25.8
Edgeline Rumble Strips or "Profile-Markings" on Roads with No or Narrow Shoulders	15 mile(s)	$ 2,000		0.01	0.0	$ 30,000	11.1
Improved Centerline Markings (Thermoplastic, RPM, etc.)	20 mile(s)	$ 500		0.00	0.0	$ 10,000	2.1
Use of 6" or 8" Wide Markings as Opposed to 4" Wide Markings	20 mile(s)	$ 500		0.01	0.0	$ 10,000	3.6
Critical Strategy #2: Keep Vehicles from Encroaching on the Roadside							
Provide Paved Shoulders	5 mile(s)	$ 100,000		0.00	0.0	$ 500,000	0.5
Maintain Gravel Shoulders	20 mile(s)	$ 2,000		0.00	0.0	$ 40,000	1.9
Add "Safety Wedge" to Pavement Edge	20 mile(s)	$ 2,000		0.01	0.0	$ 40,000	7.6
Critical Strategy #3: Minimize the Likelihood of Crashing into an Oncoming Vehicle							
Install Cable Median Barriers	10 mile(s)	$ 100,000		0.06	0.2	$ 1,000,000	2.8
Critical Strategy #4: Reduce the Severity of the Crash							
Improve/Update Barriers, Attenuation Systems, and Guardrail	4 mile(s)	$ 25,000		0.00	0.0	$ 100,000	1.3
Shield Roadside Objects	5 mile(s)	$ 50,000		0.02	0.1	$ 250,000	5.0
	Total for Lane Departure Strategies =			**1**	**4**	**$ 3,780,000**	**16.9**
Impaired Driving Strategies							
Critical Strategy #5: Enforcement to Discourage Drinking & Driving							
Highly Publicized and Coordinated DUI Checkpoint Campaign	0.2 statewide program	$ 750,000		3.01	7.9	$ 150,000	84.3
Highly Publicized and Coordinated Saturation Patrols	0.1 statewide program	$ 750,000		1.50	4.0	$ 75,000	84.3
Utilize Partnerships to Identify Target Locations, Times, etc.	1 statewide program	$ 25,000		0.50	1.3	$ 25,000	84.3
	Total for Impaired Driver Strategies =			**5**	**13**	**$ 250,000**	**84.3**
Unbelted Vehicle Occupant Strategies							
Critical Strategy #9: Education and Enforcement to Increase Safety Belt Use Among Target Populations							
Conduct Highly Publicized Enforcement Campaigns	0.2 statewide program	$ 500,000		1.00	5.1	$ 100,000	48.2
Provide Community Locations for Instruction in Proper Child Restraint Use	1 statewide program	$ 100,000		0.10	0.6	$ 100,000	> 100
	Total for Unbelted Vehicle Occupant Strategies =			**1**	**6**	**$ 200,000**	**51.6**
Intersection Strategies							
Critical Strategy #11: Follow the Principles of Access Management							
Restrict or Eliminate Turning Maneuvers Near Unsignalized Intersections	16 intersection(s)	$ 15,000		0.37	3.0	$ 240,000	> 100
Critical Strategy #12 Improve Sight Distance at Intersections							
Clear Intersection Sight Triangles	15 intersection(s)	$ 10,000		0.22	1.8	$ 150,000	98.8
Critical Strategy #13: Improve Driver Awareness of Intersections on Approaches							
Enhance Warning and Guide Signs, including Dynamic Mainline Warning Flashers	20 intersection(s)	$ 10,000		0.09	0.5	$ 200,000	26.4
Street Lighting	5 intersection(s)	$ 30,000		0.12	0.5	$ 150,000	44.6
Advance Traffic Signal Warning Flashers	1 intersection(s)	$ 30,000		0.00	0.0	$ 30,000	5.4
Critical Strategy #14: Use Non-Conventional Intersection Designs							
Roundabout	1 intersection(s)	$ 750,000		0.06	0.7	$ 750,000	6.0
Critical Strategy #16: Work with Local Agencies to Identify Intersections with a Severe Crash Problem							
Identify Intersection with High Number of Severe Crashes	0.5 statewide program	$ 200,000		0.10	1.1	$ 100,000	6.4
	Total for Intersection Strategies =			**1**	**8**	**$ 1,620,000**	**23.6**
Young Driver Strategies							
Critical Strategy #18: Education and Enforcement of Laws Directed Towards Young Drivers							
Public Information Campaign	0.2 statewide program	$ 750,000		0.20	1.7	$ 150,000	7.6
Enforcement Campaign	0 statewide program	$ 750,000		0.00	0.0	$ -	0.0
	Total for Young Driver Strategies =			**0**	**2**	**$ 150,000**	**7.6**
		Total =		**8.44**	**33**	**$ 6,000,000**	**37**

FIGURE A.5
Investment Scenario #4

Scenario #5—Comprehensive Approach with a Focused Selection of Strategies: This scenario is based on investing NDOR's HSIP funds in a focused selection of a few strategies that are related to a large number of fatal and disabling injury crashes, are relatively inexpensive to allow a deployment at a larger number of locations and are highly effective (similar to scenario #2). As with the previous scenarios, no safety funds were spent on any strategy that requires enabling legislation. The results of this analysis indicate that between flexing the safety funds to invest in additional enforcement and education and being focused on only the most effective strategies, the number of lives saved increased to approximately 13 per year (see **Figure A.6**) which is still just below the desired trend line.

	Input Values			Output Values			
				Annual Crash Prevention			
	Deployment	Unit Cost		Fatalities	Disabling Injuries	Initial Cost	BC Ratio
Lane Departure Strategies							
Critical Strategy #1: Implement Cost Effective Improvements to Keep Vehicles in Their Lane							
Centerline Rumble Strips for Two-Lane Roads	850 mile(s)	$ 1,000		0.78	1.1	$ 850,000	43.0
Shoulder Rumble Strips on Roads with Paved Shoulders	1400 mile(s)	$ 2,000		1.21	6.9	$ 2,800,000	25.8
Use of 6" or 8" Wide Markings as Opposed to 4" Wide Markings	150 mile(s)	$ 500		0.06	0.2	$ 75,000	3.6
Critical Strategy #2: Keep Vehicles from Encroaching on the Roadside							
Maintain Gravel Shoulders	25 mile(s)	$ 2,000		0.00	0.0	$ 50,000	1.9
Add "Safety Wedge" to Pavement Edge	25 mile(s)	$ 2,000		0.01	0.0	$ 50,000	7.6
		Total for Lane Departure Strategies =		**2.1**	**8**	**$ 3,825,000**	**23.9**
Impaired Driving Strategies							
Critical Strategy #5: Enforcement to Discourage Drinking & Driving							
Highly Publicized and Coordinated DUI Checkpoint Campaign	0.25 statewide program	$ 750,000		3.76	9.9	$ 187,500	84.3
Highly Publicized and Coordinated Saturation Patrols	0.25 statewide program	$ 750,000		3.76	9.9	$ 187,500	84.3
		Total for Impaired Driver Strategies =		**7.5**	**20**	**$ 375,000**	**84.3**
Unbelted Vehicle Occupant Strategies							
Critical Strategy #9: Education and Enforcement to Increase Safety Belt Use Among Target Populations							
Conduct Highly Publicized Enforcement Campaigns	0.3 statewide program	$ 500,000		1.50	7.6	$ 150,000	48.2
		Total for Unbelted Vehicle Occupant Strategies =		**1.5**	**8**	**$ 150,000**	**48.2**
Intersection Strategies							
Critical Strategy #11: Follow the Principles of Access Management							
Restrict or Eliminate Turning Maneuvers Near Unsignalized Intersections	25 intersection(s)	$ 15,000		0.58	4.8	$ 375,000	> 100
Critical Strategy #12 Improve Sight Distance at Intersections							
Clear Intersection Sight Triangles	25 intersection(s)	$ 10,000		0.37	3.0	$ 250,000	98.8
Critical Strategy #13: Improve Driver Awareness of Intersections on Approaches							
Street Lighting	25 intersection(s)	$ 30,000		0.60	2.6	$ 750,000	44.6
Critical Strategy #16: Work with Local Agencies to Identify Intersections with a Severe Crash Problem							
Identify Intersection with High Number of Severe Crashes	1 statewide program	$ 200,000		0.20	2.3	$ 200,000	6.4
		Total for Intersection Strategies =		**1.7**	**13**	**$ 1,575,000**	**29.9**
Young Driver Strategies							
Critical Strategy #18: Education and Enforcement of Laws Directed Towards Young Drivers							
Public Information Campaign	0.1 statewide program	$ 750,000		0.10	0.9	$ 75,000	7.6
		Total for Young Driver Strategies =		**0.1**	**1**	**$ 75,000**	**7.6**
		Total =		**12.9**	**49**	**$ 6,000,000**	**45**

FIGURE A.6
Investment Scenario #5

Scenario #6—Comprehensive Approach with a Broad Selection of Strategies and Enabling Legislation: This scenario is nearly identical to scenario #4, with one key exception—the addition of a primary safety belt law. The results of the analysis of this scenario indicate that the adoption of a primary safety belt law is the single most effective strategy based on the number of lives saved, approximately 20 per year. The overall effect of investing in a combination of engineering, enforcement and education strategies (including the primary safety belt law), increased the number of lives saved per year to approximately 28 (see **Figure A.7**), which is above the trend line necessary to achieve the adopted safety goal.

	Input Values			Output Values			
				Annual Crash Prevention			
	Deployment	Unit Cost		Fatalities	Disabling Injuries	Initial Cost	BC Ratio
Lane Departure Strategies							
Critical Strategy #1: Implement Cost Effective Improvements to Keep Vehicles in Their Lane							
Centerline Rumble Strips for Two-Lane Roads	600 mile(s)	$ 1,000		0.55	0.8	$ 600,000	43.0
Shoulder Rumble Strips on Roads with Paved Shoulders	600 mile(s)	$ 2,000		0.52	3.0	$ 1,200,000	25.8
Edgeline Rumble Strips or "Profile-Markings" on Roads with No or Narrow Shoulders	15 mile(s)	$ 2,000		0.01	0.0	$ 30,000	11.1
Improved Centerline Markings (Thermoplastic, RPM, etc.)	20 mile(s)	$ 500		0.00	0.0	$ 10,000	2.1
Use of 6" or 8" Wide Markings as Opposed to 4" Wide Markings	20 mile(s)	$ 500		0.01	0.0	$ 10,000	3.6
Critical Strategy #2: Keep Vehicles from Encroaching on the Roadside							
Provide Paved Shoulders	5 mile(s)	$ 100,000		0.00	0.0	$ 500,000	0.5
Maintain Gravel Shoulders	20 mile(s)	$ 2,000		0.00	0.0	$ 40,000	1.9
Add "Safety Wedge" to Pavement Edge	20 mile(s)	$ 2,000		0.01	0.0	$ 40,000	7.6
Critical Strategy #3: Minimize the Likelihood of Crashing into an Oncoming Vehicle							
Install Cable Median Barriers	10 mile(s)	$ 100,000		0.06	0.2	$ 1,000,000	2.8
Critical Strategy #4: Reduce the Severity of the Crash							
Improve/Update Barriers, Attenuation Systems, and Guardrail	4 mile(s)	$ 25,000		0.00	0.0	$ 100,000	1.3
Shield Roadside Objects	5 mile(s)	$ 50,000		0.02	0.1	$ 250,000	5.0
	Total for Lane Departure Strategies =			**1.2**	**4**	**$ 3,780,000**	**16.9**
Impaired Driving Strategies							
Critical Strategy #5: Enforcement to Discourage Drinking & Driving							
Highly Publicized and Coordinated DUI Checkpoint Campaign	0.2 statewide program	$ 750,000		3.01	7.9	$ 150,000	84.3
Highly Publicized and Coordinated Saturation Patrols	0.1 statewide program	$ 750,000		1.50	4.0	$ 75,000	84.3
Utilize Partnerships to Identify Target Locations, Times, etc.	1 statewide program	$ 25,000		0.50	1.3	$ 25,000	84.3
	Total for Impaired Driver Strategies =			**5.0**	**13**	**$ 250,000**	**84.3**
Unbelted Vehicle Occupant Strategies							
Critical Strategy #9: Education and Enforcement to Increase Safety Belt Use Among Target Populations							
Conduct Highly Publicized Enforcement Campaigns	0.18 statewide program	$ 500,000		0.90	4.6	$ 90,000	48.2
Provide Community Locations for Instruction in Proper Child Restraint Use	1 statewide program	$ 100,000		0.10	0.6	$ 100,000	> 100
Critical Strategy #10: Enhanced Laws to Encourage Safety Belt Use							
Enact a Primary Safety Belt Law	1 new law	$ 10,000		20.00	101.8	$ 10,000	> 100
	Total for Unbelted Vehicle Occupant Strategies =			**21.0**	**107**	**$ 200,000**	**> 100**
Intersection Strategies							
Critical Strategy #11: Follow the Principles of Access Management							
Restrict or Eliminate Turning Maneuvers Near Unsignalized Intersections	16 intersection(s)	$ 15,000		0.37	3.0	$ 240,000	> 100
Critical Strategy #12 Improve Sight Distance at Intersections							
Clear Intersection Sight Triangles	15 intersection(s)	$ 10,000		0.22	1.8	$ 150,000	98.8
Critical Strategy #13: Improve Driver Awareness of Intersections on Approaches							
Enhance Warning and Guide Signs, including Dynamic Mainline Warning Flashers	20 intersection(s)	$ 10,000		0.09	0.5	$ 200,000	26.4
Street Lighting	5 intersection(s)	$ 30,000		0.12	0.5	$ 150,000	44.6
Advance Traffic Signal Warning Flashers	1 intersection(s)	$ 30,000		0.00	0.0	$ 30,000	5.4
Critical Strategy #14: Use Non-Conventional Intersection Designs							
Roundabout	1 intersection(s)	$ 750,000		0.06	0.7	$ 750,000	6.0
Critical Strategy #16: Work with Local Agencies to Identify Intersections with a Severe Crash Problem							
Identify Intersection with High Number of Severe Crashes	0.5 statewide program	$ 200,000		0.10	1.1	$ 100,000	6.4
	Total for Intersection Strategies =			**1.0**	**8**	**$ 1,620,000**	**23.6**
Young Driver Strategies							
Critical Strategy #18: Education and Enforcement of Laws Directed Towards Young Drivers							
Public Information Campaign	0.2 statewide program	$ 750,000		0.20	1.7	$ 150,000	7.6
	Total for Young Driver Strategies =			**0.2**	**2**	**$ 150,000**	**7.6**
		Total =		**28.3**	**134**	**$ 6,000,000**	**> 100**

FIGURE A.7
Investment Scenario #6

Scenario #7—Comprehensive Approach with a Focused Selection of Strategies and Enabling Legislation: This scenario is similar to scenario #5, with two key exceptions—the addition of a primary safety belt law, stronger penalties for not using a safety belt, and enhancing the Graduated Drivers License (GDL) program for young drivers. The results of the analysis of this scenario indicate that adoption of a primary safety belt law and enhancing the GDL program are two of the most effective strategies in the list of Critical Strategies, based on the number of lives saved. A primary safety belt law is expected to save 20 lives per year, an enhanced GDL program 12 lives per year and the overall effect of combination of strategies in this scenario would save approximately 52 lives per year (see **Figure A.8**), which exceeds the trend line necessary to achieve the adopted safety goal.

	Input Values			Output Values			
				Annual Crash Prevention			
	Deployment		Unit Cost	Fatalities	Disabling Injuries	Initial Cost	BC Ratio
Lane Departure Strategies							
Critical Strategy #1: Keep Vehicles in Their Lane							
Centerline Rumble Strips for Two-Lane Roads	850	mile(s)	$ 1,000	0.78	1.1	$ 850,000	43.0
Shoulder Rumble Strips on Roads with Paved Shoulders	1400	mile(s)	$ 2,000	1.21	6.9	$ 2,800,000	25.8
Use of 6" or 8" Wide Markings as Opposed to 4" Wide Markings	150	mile(s)	$ 500	0.06	0.2	$ 75,000	3.6
Critical Strategy #2: Keep Vehicles on the Road							
Maintain Gravel Shoulders	25	mile(s)	$ 2,000	0.00	0.0	$ 50,000	1.9
Add "Safety Wedge" to Pavement Edge	25	mile(s)	$ 2,000	0.01	0.0	$ 50,000	7.6
		Total for Lane Departure Strategies =		**2.1**	**8**	**$ 3,825,000**	**23.9**
Impaired Driving Strategies							
Critical Strategy #5: DUI Enforcement							
Highly Publicized and Coordinated DUI Checkpoint Campaign	0.3	statewide program	$ 750,000	4.51	11.9	$ 225,000	84.3
Highly Publicized and Coordinated Saturation Patrols	0.3	statewide program	$ 750,000	4.51	11.9	$ 225,000	84.3
		Total for Impaired Driver Strategies =		**9.0**	**24**	**$ 450,000**	**84.3**
Unbelted Vehicle Occupant Strategies							
Critical Strategy #9: Safety Belt Education and Enforcement							
Conduct Highly Publicized Enforcement Campaigns	0.2	statewide program	$ 500,000	1.00	5.1	$ 100,000	48.2
Critical Strategy #10: Enhance Safety Belt Laws							
Enact a Primary Safety Belt Law	1	new law	$ 10,000	20.00	101.8	$ 10,000	> 100
Strengthen Penalties for Safety Belt Violations	1	new law	$ 10,000	5.00	25.5	$ 10,000	> 100
		Total for Unbelted Vehicle Occupant Strategies =		**26.0**	**132**	**$ 120,000**	**> 100**
Intersection Strategies							
Critical Strategy #11: Access Management							
Restrict or Eliminate Turning Maneuvers Near Unsignalized Intersections	25	intersection(s)	$ 15,000	0.58	4.8	$ 375,000	> 100
Critical Strategy #12 Sight Distance							
Clear Intersection Sight Triangles	25	intersection(s)	$ 10,000	0.37	3.0	$ 250,000	98.8
Critical Strategy #13: Increase Driver Awareness							
Street Lighting	25	intersection(s)	$ 30,000	0.60	2.6	$ 750,000	44.6
Critical Strategy #16: Crash Analysis							
Identify Intersection with High Number of Severe Crashes	1	statewide program	$ 200,000	0.20	2.3	$ 200,000	6.4
		Total for Intersection Strategies =		**1.7**	**13**	**$ 1,575,000**	**29.9**
Young Driver Strategies							
Critical Strategy #17: Graduated Licensing Program							
Enhance Existing GDL	1	new law/program	$ 10,000	12.67	121.6	$ 10,000	> 100
Critical Strategy #19: Driver Training							
Require Driver Training	0.1	statewide program	$ 200,000	0.10	0.9	$ 20,000	28.6
		Total for Young Driver Strategies =		**12.8**	**122**	**$ 30,000**	**> 100**
		Total =		**51.6**	**300**	**$ 6,000,000**	**> 100**

FIGURE A.8
Investment Scenario #7

A.1.3 Overview of Funding Available for Safety Programs

The FY-2007 State Highway System Program for Nebraska totals $335.5 million. Additionally, $14.5 million is included for statewide planning and research. Of the $350 million total - $178 million is state funds and $172 million is federal funds. While most of the State's overall $350 million highway construction program is not specifically allocated to safety projects, there is an inherent safety benefit to such projects through better signing, gentler curves, improved sight distance, etc.

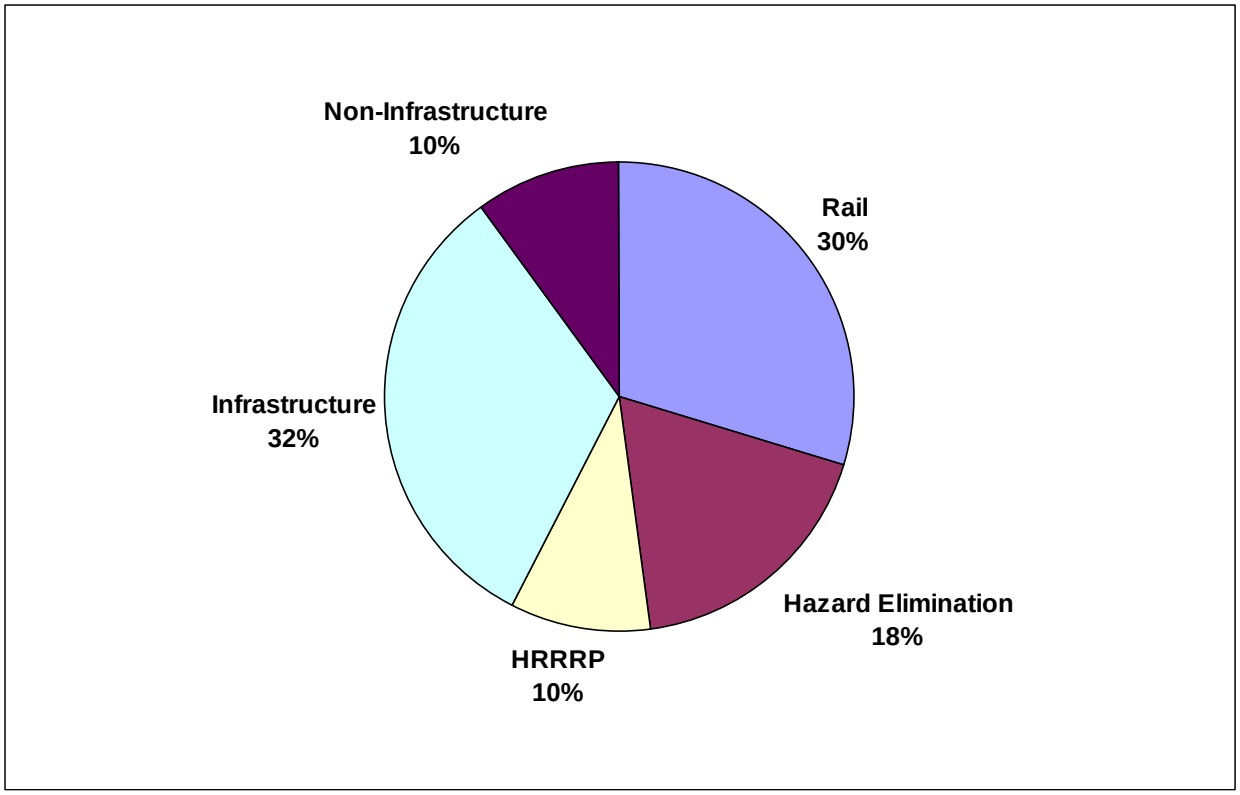
Nebraska Department of Roads

Financial Summary

Summary of Fiscal Year 2006
Countermeasure Programs

Highway Safety Improvement Program

Infrastructure	$3,286,000
Rail/Intersection	$3,000,000
Hazard Elimination	$1,800,000
Non-infrastructure	$1,000,000
High Risk Rural Roads	$ 981,000

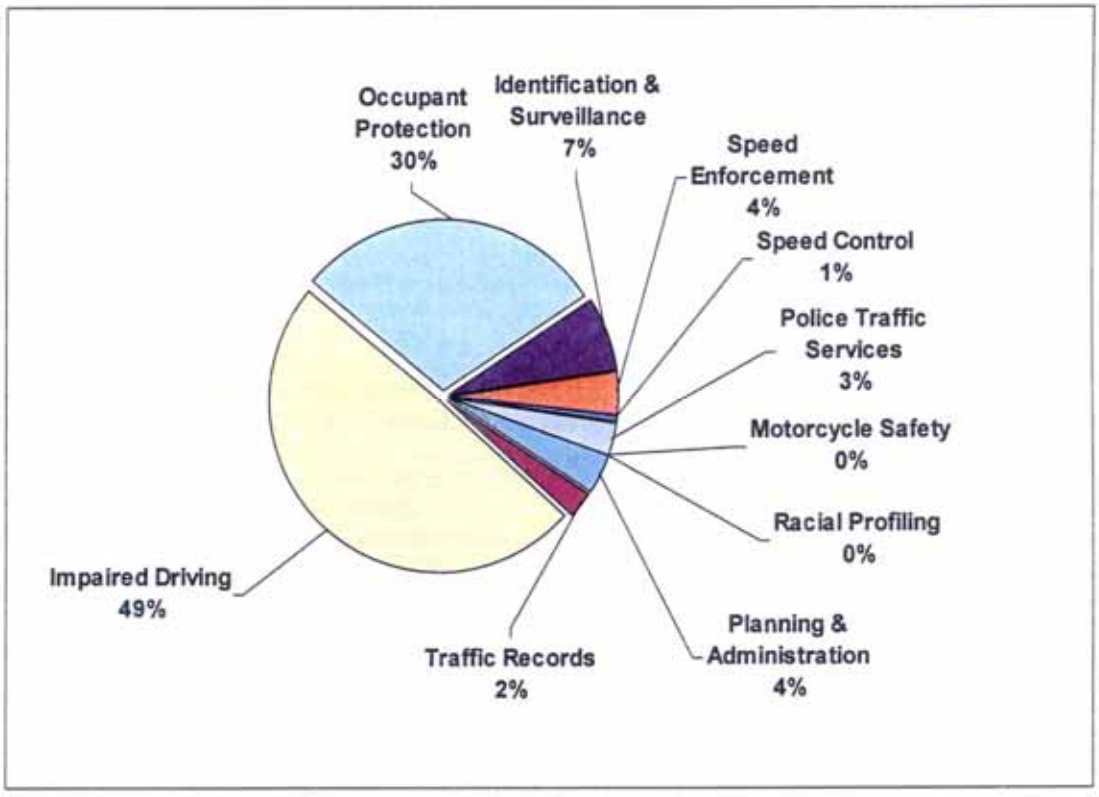


Nebraska Office of Highway Safety

Financial Summary

Summary of Fiscal Year 2006
Countermeasure Programs

Section 402 Funding	$1,917,192
Section 157 / Safety Belt Incentive	$ 71,865
Section 157 / Safety Belt innovative	$ 27,496
Section 163 / .08	$ 386,779
Section 405 / Occupant Protection	$ 803,225
Section 408 / State Traffic Safety Information System Improvement	$ 22,707
Section 410 / Alcohol Impaired Driving Countermeasures	$ 585,108
Section 1906 / Prohibit Racial Profiling	$ 0
Section 2010 / Motorcyclist Safety Grants	$ 0

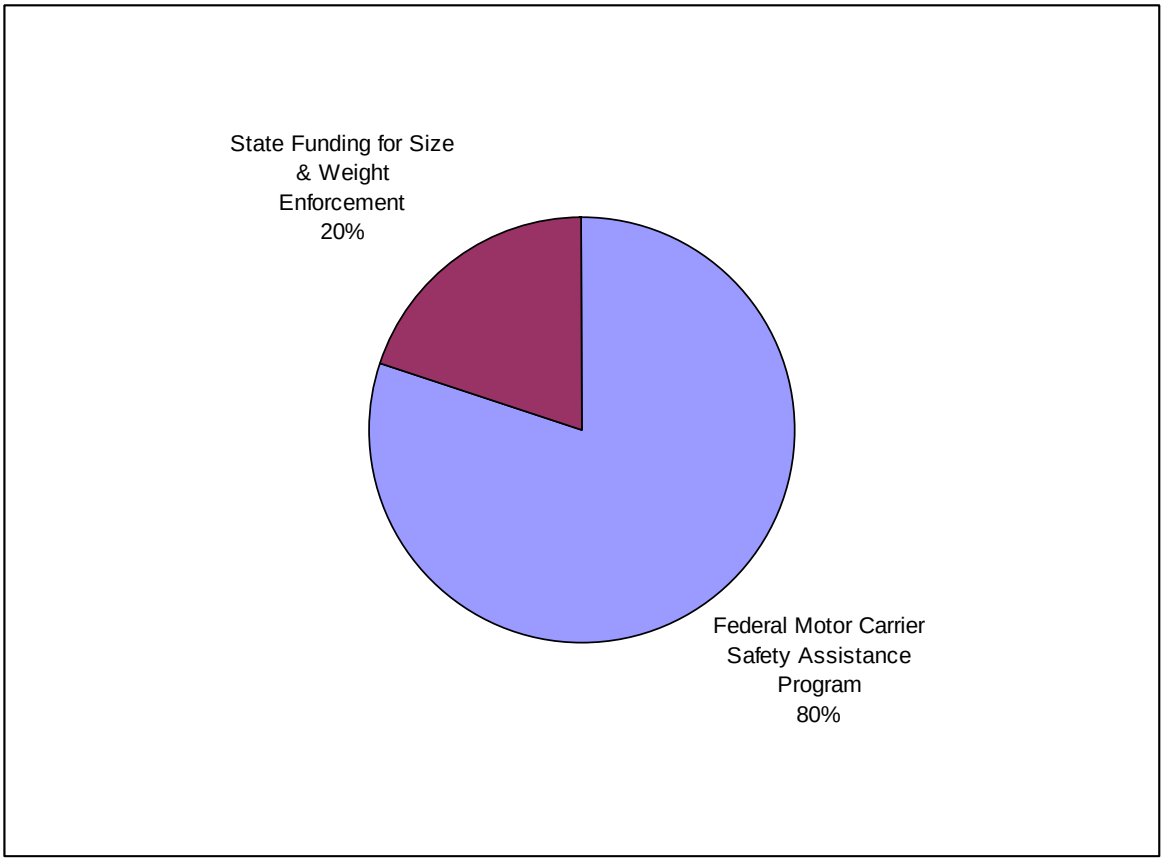


Nebraska State Patrol Carrier Enforcement

Financial Summary

Summary of Fiscal Year 2006
Countermeasure Programs

Federal Motor Carrier Safety Assistance Program	$1,936,715
Includes: Driver/Vehicle Inspection Traffic Enforcement Compliance Reviews Public Education & Awareness Data Collection	
State Size and Weight Enforcement	$ 484,179



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