Michigan Lane Departure Action Plan

Governor's Traffic Safety Advisory Commission

Member agencies:
Michigan Department of Transportation
Office of Highway Safety Planning
Michigan Department of State
Michigan State Police
Office of Services to the Aging
Michigan Department of Education
Michigan Department of Community Health

September 2005

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Introduction

In 1998, the American Association of State Highway and Transportation Officials (AASHTO) approved its Strategic Highway Safety Plan, which was developed by the AASHTO Standing Committee for Highway Traffic Safety with the assistance of the Federal Highway Administration, the National Highway Traffic Safety Administration, and the Transportation Research Board Committee on Transportation Safety Management. The plan includes strategies in 22 key emphasis areas that affect highway safety. The plan's goal is to reduce the annual number of highway deaths by 5,000 to 7,000. Each of the 22 emphasis areas includes strategies and an outline of what is needed to implement each strategy.

NCHRP Project 17-18(3) is developing a series of guides to assist state and local agencies in reducing injuries and fatalities in targeted areas. The guides correspond to the emphasis areas outlined in the AASHTO Strategic Highway Safety Plan. Each guide includes a brief introduction, a general description of the problem, the strategies/countermeasures to address the problem, and a model implementation process.
http://safety.transportation.org/guides.aspx

The Michigan Lane Departure Action Plan (MLDAP) was created by using the above documents and resources as a base foundation.

Action Plan Development

A Strategic Highway Safety Plan should define a system, organization, and process for managing the attributes of the road, the driver, and the vehicle to achieve the highest level of highway safety by integrating the work of disciplines and agencies involved. These disciplines include the planning, design, construction, operation, and maintenance of the roadway infrastructure (engineering); injury prevention and control (emergency response services), health education; and those disciplines involved in modifying road user behaviors (education and enforcement).

The development of the strategic highway safety plan was commissioned by Michigan's Governors Traffic Safety Advisory Commission (GTSAC) in October 2004. The GTSAC consists of the Governor (or a designee), the Directors (or their designees) of the Departments of Community Health, Education, State, State Police, and Transportation, the Office of Highway Safety Planning, the Office of Services to the Aging, and three local representatives from the county, city, and township level.

Lane Departure issues were identified as an emphasis area in the both AASHTO and GTSAC Strategic Highway Safety Plans. The Traffic Safety Engineering Advisory Committee (TSEAC) A GTSAC sub-committee consisting of a multi-disciplinary group of agencies and disciplines was identified to work on this topic and conducted a kick off meeting on May 13, 2005 in Lansing, Michigan. Issues and strategies from the national and state agenda were carried forward into the Michigan plan, as well as other issues and strategies not mentioned in the national plan.

The Issue: Leaving the Roadway and Lane Departures

For the purpose of this action plan Leaving the Roadway and Lane Departure issues are categorized into the following areas:

- Run-Off-Road (ROR)
- Collisions with Trees (CWT)
- Collisions with Utility Poles (CWP)
- Head-On Collisions (HOC)
- Horizontal Curves (HC)

national data and statistics

Run-Off-Road (ROR) crashes involve vehicles that leave the travel lane and encroach onto the shoulder and beyond and hit one or more objects. Nearly 4 of every 10 fatal motor vehicle crashes—well over 14,000 a year—involve a single vehicle leaving the roadway. There are more than twice as many ROR fatal crashes on rural roads than on urban roads. Some 42% of ROR fatal crashes occur on curves (50% in rural areas). The life-threatening events most likely to occur are rollovers (42%) and collisions with trees (25%).

One of the most common causes of fatal and severe injury crashes, on rural roads in particular, is a vehicle leaving the road and striking a fixed object. In fatal crashes involving a fixed object, **Trees** are the objects most often struck. 8% of fatal crashes—more than 3,000 a year—involve crashes into trees. More than half of these crashes occur under dark conditions, half occur on curved roads, and half involve alcohol.

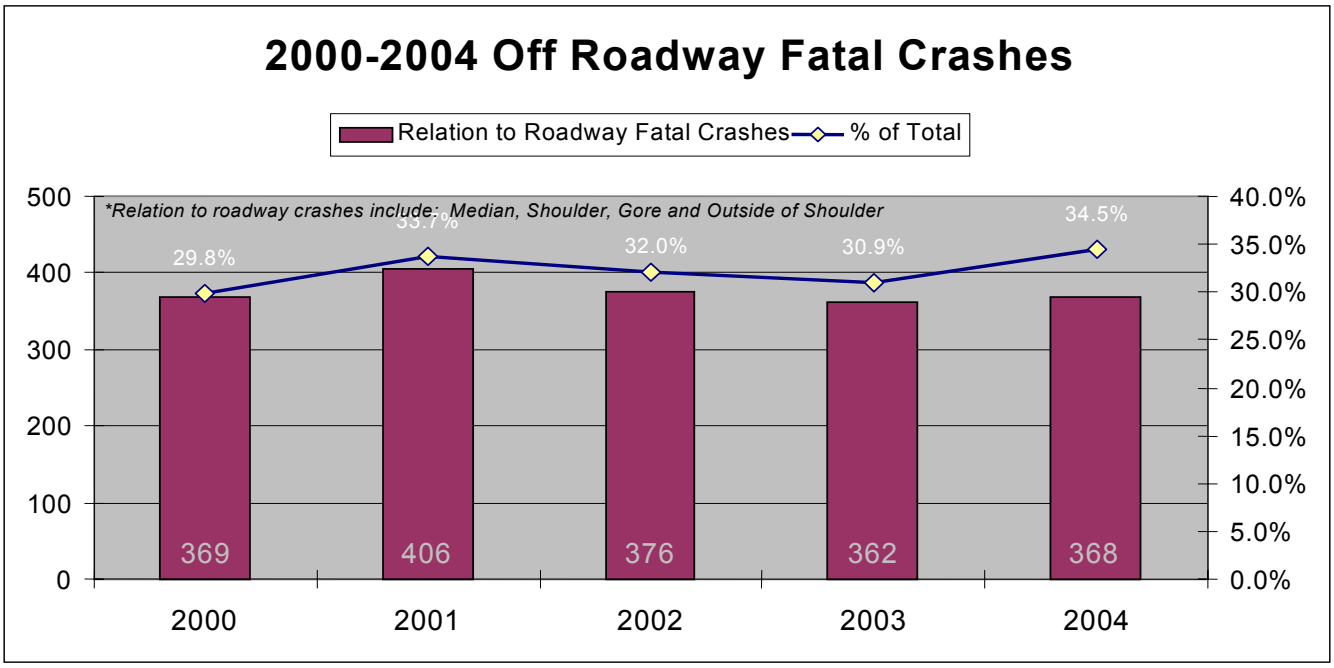
Each year more than 1,000 fatal crashes are associated with utility poles, a figure based on collision with a **Utility Pole** being the "most harmful event" in a fatal crash. Many more crashes in which one or more vehicles strike a utility pole are not classified as run-off-the-road or fixed-object crashes. Nearly 40% of utility pole crashes involve some type of non-fatal injury. 25% of pole crashes occur in adverse weather conditions, while another 25% occur under lighted conditions at night. Half occur in full daylight. Because of the structural strength and small impact area of utility poles, these crashes tend to be severe. The only object type more frequently struck in fatal fixed-object crashes is trees.

Head-On Crashes (HOC) kill 5,200 citizens each year. About one in five non-intersection fatal crashes involves two vehicles crashing head-on. Of these, 75% occur on rural roads and 75% on undivided two-lane roads. For all roads, one-third of head-on crashes involve vehicles "negotiating a curve" and two-thirds are related to vehicles "going straight." Most head-on crashes are likely to result from a motorist making an "unintentional" maneuver—the driver falls asleep, is distracted, or travels too fast in a curve. Contributing factors may also include speed and alcohol use.

Nearly 25% of the people who die each year on the nation's roadways are killed in motor vehicle crashes occurring at **Curves**. About 75% of all fatal crashes occur in rural areas, and more than 70% on two-lane secondary highways, many of which are local roads. The average crash rate for horizontal curves is about three times that for highway tangents. Statistical analyses show that 76% of curve-related fatal crashes involve single vehicles leaving the roadway (ROR) and striking fixed objects or overturning. Another 11% are head-on crashes.

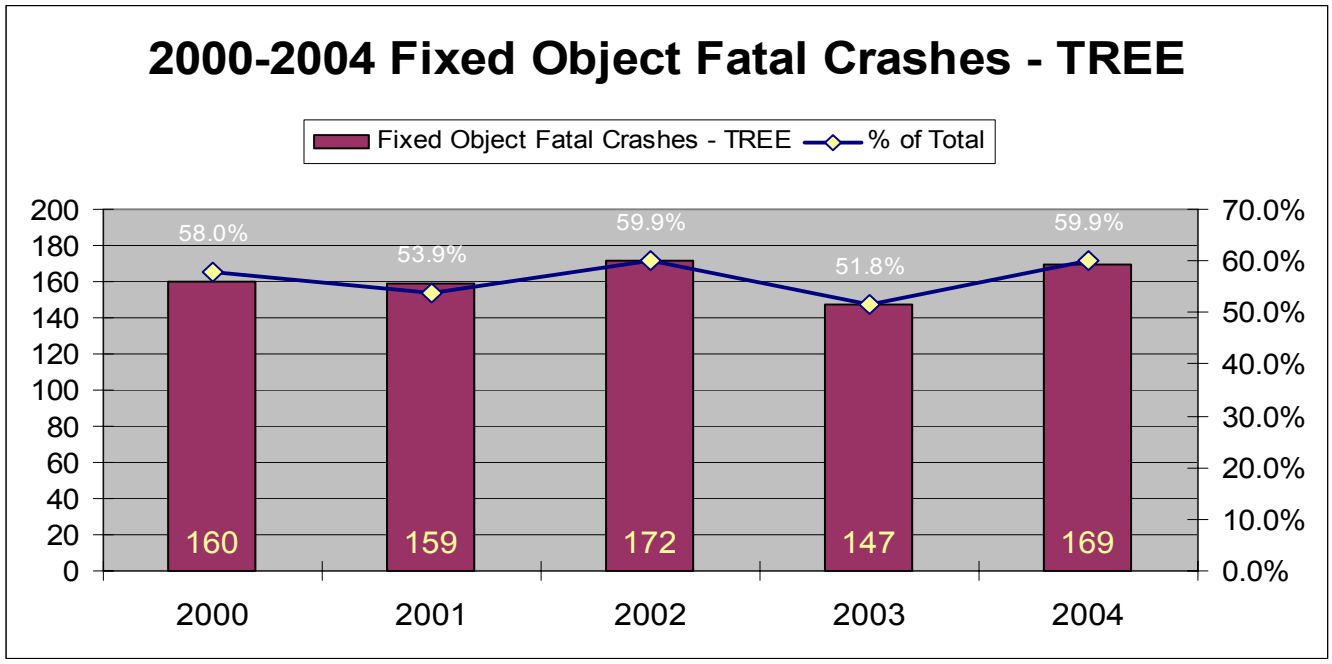
Michigan Leaving the Roadway and Lane Departure Data

Run-Off-Road (ROR)



In Michigan, in 2004 34.5% of all fatal crashes were the result of a ROR issue.

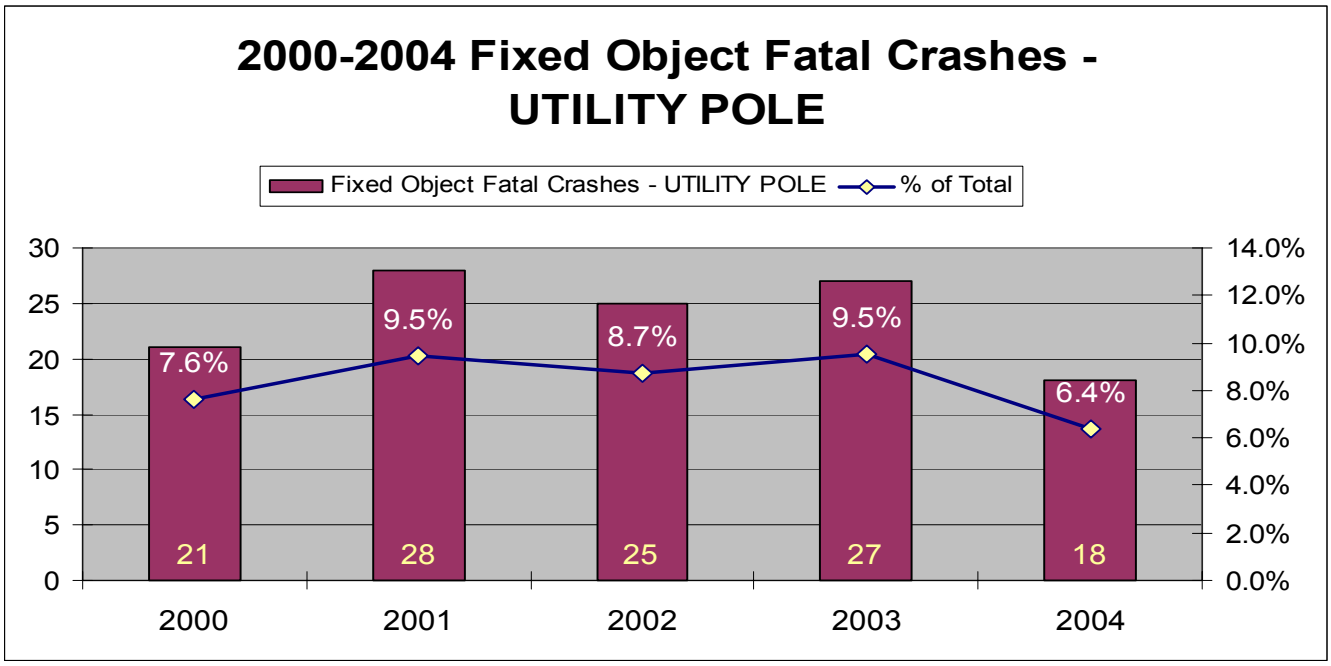
Collisions with Trees (CWT)



In Michigan in 2004, in fatal crashes in which a fixed object was struck, 59.9% were trees.

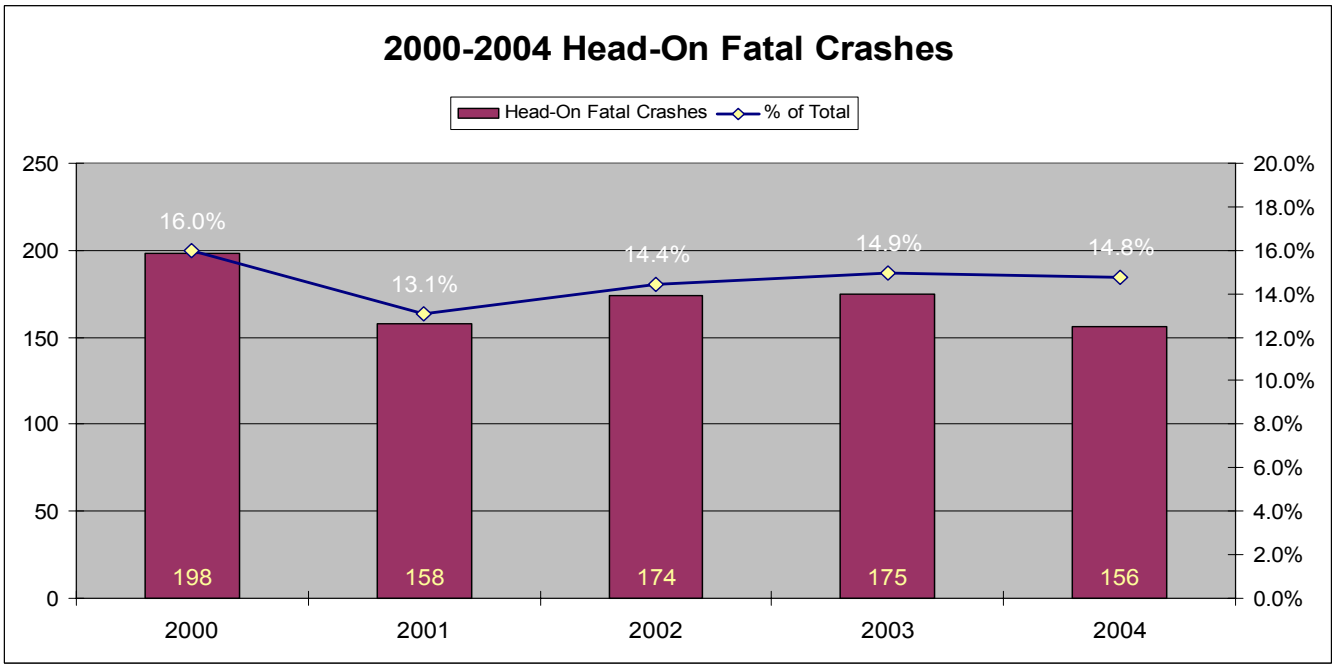
Collisions with Utility Poles (CWP)

6.4% of all fatal crashes involving a fixed object were utility poles, the lowest level since 2000. Utility poles were the next highest fixed object struck in fatal crashes after trees.



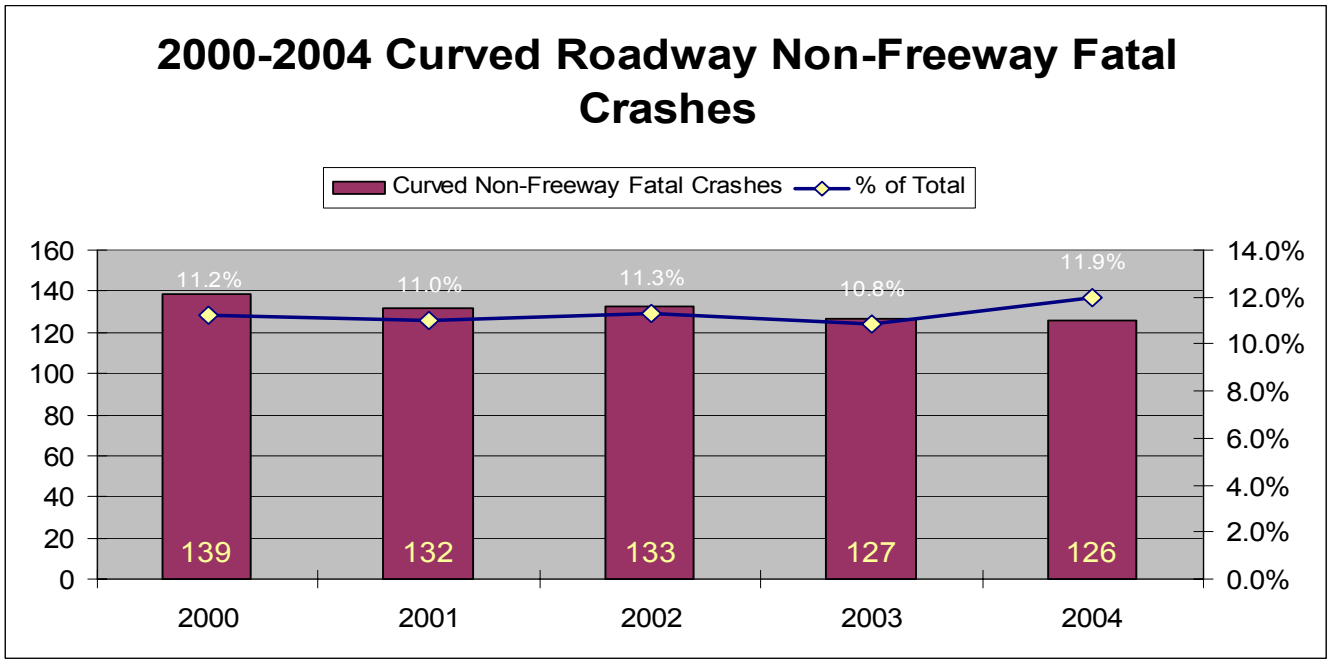
Head-On Collisions (HOC)

In Michigan, in 2004 14.8% of all fatal crashes were the result of a HOC, second most crash type next to angle crashes at 23.1%.



Horizontal Curves (HC)

HC crashes accounted for almost 12% of all fatal crashes in Michigan in 2004. The number and percentage of the total of these instances has remained flat since 2000.



Michigan Driver Behavior Safety Goals

The goal of this action plan is to outline a course of action that, when followed, targets a reduction in the number and severity of roadway and lane departure related crashes in Michigan by 2009, as follows:

- Run off Road fatal crashes <320 (assumes a 3% reduction each year)
- Collision with Trees fatal crashes <145 (assumes a 3% reduction each year)
- Collision with Poles fatal crashes < 15 (assumes a 3% reduction each year)
- Head-On Collisions fatal crashes <135 (assumes a 3% reduction each year)
- Horizontal Curves fatal crashes <110 (assumes a 3% reduction each year)

ISSUE	2000	2001	2002	2003	2004	2005	2006	2007	2008	2009
Run-Off-Road	369	406	376	362	368	357	346	336	326	316
Collisions with Trees	160	159	172	147	169	164	159	154	150	145
Collisions w/Utility Poles	21	28	25	27	18	17	17	16	16	15
Head-On Collision	198	158	174	175	156	151	147	142	138	134
Horizontal Curves	139	127	133	132	126	122	119	115	112	108

Note: For analysis purposes only, an assumption was made that a constant reduction is achieved

Benefit Analysis

Achieving a reduction in the number and percentage of roadway and lane departure fatal crashes as depicted above, in five years would result in saving approximately 140 lives in ROR crashes, 65 lives in CWT crashes, 10 lives in CWP crashes, 70 lives in HOC crashes and 40 lives in HC crashes for a total of 325 lives in the next 5 years.

The National Safety Council estimates that the calculable cost of each highway crash fatality is $1,090,000.

Eliminating 325 deaths in Michigan over five years would save more than $354 million. The associated reduction in injuries, property damage, health care costs and lost worker productivity would be well over $1 billion.

Michigan Leaving the Roadway and Lane Departure Strategies

This action plan suggests several strategies for addressing the problems. These strategies combine the elements of enforcement, education, and engineering. The strategies are suggested recognizing that, with few exceptions, programs that depend upon only one of these elements are not likely to be successful.

PLANNING

Strategies:

- Maintain a multi-disciplinary/multi-agency safety task group within the state to address lane departure safety issues.
  - Identify current activities by various groups or individuals
  - Establish communication systems to share information and data.

Near-term Action Plan:

- The GTSAC will continue to convene the Lane Departure Task Force:
  - Explore a web site that houses a clearinghouse of information on lane departure crashes.

- MDOT and OHSP will develop and promote a lane departure safety element as a core part of ongoing safety initiatives aimed at MPO's:
  - Promote and support annual safety forums for each MPO area (with lane departure element)
  - Encourage MPO's and rural planning organizations to monitor lane departure crashes in their region and identify for their constituent agencies the high-crash locations that might be pursued for development of safety projects
  - Provide MPO's and counties with yearly lane departure crash data.

RESEARCH & ANALYSIS

Strategies:

- Determine issues and trends in Michigan lane departure crash data
- Conduct an inventory and analysis of existing lane departure safety analysis tools
- Institutionalize / promote the use of tools in the safety planning process
- Provide traffic engineering safety support to local governments

Near-term Action Plan:

- GTSAC will analyze current crash data to determine the top lane departure locations and/or issues.

- GTSAC will develop an ongoing research program to conduct before-and-after studies of traffic safety engineering improvements around the state – including lane departure safety efforts. Cities, county road commissions and MDOT would be able to apply to have a before-and-after study conducted on a specific traffic safety-engineering project. All completed studies would be made available on a web site. This initiative will help publicize the results of successful applications of safety improvements.

- GTSAC will review the ability of local agencies and MDOT to identify and analyze lane departure high crash locations:
  - SEMCOG Crash Analysis Tool
  - RoadSoft tools for use by local agencies
  - Current MDOT tools and practices
  - Michigan Traffic Crash Facts
  - Traffic Crash Records System

- MDOT will include lane departure safety analysis as a component of their ongoing local agency safety initiative

- GTSAC will look for national lane departure safety training courses to bring to Michigan

ENGINEERING

Strategies:

- Target and increase lane departure safety funding at the state and local level
  - Increase safety program funds available for use by local governments.

- Review and implement countermeasures as appropriate from the following guides:
  - *NCHRP Report 500, Volume 3: A Guide for Addressing Collisions with Trees in Hazardous Locations*
  - *NCHRP Report 500, Volume 4: A Guide for Addressing Head-On Collisions*
  - *NCHRP Report 500, Volume 6: A Guide for Addressing Run-Off-Road Collisions*
  - *NCHRP Report 500, Volume 7: A Guide for Reducing Collisions on Horizontal Curves*
  - *NCHRP Report 500, Volume 8: A Guide for Reducing Collisions Involving Utility Poles*

  NOTE: Further detail about these guides can be found in Appendix A-E

- Establish programs, with funding mechanisms, to institutionalize a strategic, statewide engineering approach to lane departure safety including but not limited to:
  - System-wide feature upgrades for identified desirable lane departure-related engineering or operational highway safety features (such as, installing rumble strips and guardrail, improving ditch profile…etc)
  - Targeted safety efforts directed at individual rural corridors
  - Targeted safety efforts directed at "hot spot" locations in an urban or rural area

Near-term Action Plan:

- The GTSAC will promote an institutional approach to the design and construction of roadway features that provide enhanced lane departure safety
  - GTSAC will develop model safety-related roadway design and operational practices for consideration by MDOT and local communities
  - MDOT will review and change, as appropriate, design and funding policies that address lane departure safety-related features.

- MDOT will implement lane departure safety counter measures for trunkline roads such as: rumble strips, ditch profile, guardrail and attenuator design and use, roadside delineation and pavement markings

- MDOT and OHSP will promote lane departure safety projects at the local level:
  - More MDOT categorical safety funding to be reserved for local lane departure safety projects.
    - Targeted funding provided to high-crash jurisdictions for countermeasures.
    - Feature-related funding provided to localities throughout the state for systematic upgrade of safety-related highway features.
  - OHSP will provide funding to support consultant analysis of local lane departure crash data.
  - Continue efforts to interest MPO staff and constituent agencies in monitoring and analysis of local crash data in general.

ENFORCEMENT

Strategies:

- Analyze current enforcement methods in relation to lane departure safety to determine possible improvements.
- Include enforcement in the discussions when analyzing engineering and educational countermeasures.

Near-term Action Plan:

- Through GTSAC Action Teams, lane departure presentations will be provided at existing law enforcement forums/meetings

- Each individual enforcement agency should consider selective enforcement at targeted locations within their jurisdiction as a means of reminding motorists which locations are experiencing the most crashes and as a way to remind motorists to drive with proper driving behavior. Elements of this type program would include:
  - Engineering assistance to identify lane departure high-crash locations and analyze driving behavior related to the crashes at that location (for example, speeding, failure to yield, distracted driving)
  - Publicity of the program to expand the driving public's awareness of the locations and the institutional effort to improve driving behavior.

EDUCATION

Strategies:

- Provide recognition to jurisdictions and/or officials who have brought about a significant decrease in lane departure crashes
- Increase the amount and types of Lane Departure education available
- Increase the exposure of Lane Departure issues to the public and all traffic safety partners

Near-term Action Plan:

- The GTSAC will recognize and promote actions to reduce the frequency or severity of lane departure crashes, and add them to the existing structure for awards presented at the annual Michigan Traffic Safety Summit

- The GTSAC will include a lane departure safety breakout session at the annual Michigan Traffic Safety Summit

- MDOT will encourage MPO assistance to provide data for regional and sub-regional Analysis

- GTSAC will develop a communication plan to disseminate information to officials in state and local agencies and the public:
  - Communicate lane departure crash facts (e.g., demonstrate and illustrate how driver behavior that leads to various common lane departure crash types in Michigan)
  - Use the GTSAC Listserv to communicate with all safety partners

- GTSAC will promote attendance at conferences or workshops, in which engineers, law enforcement, and safety professionals share information on the state of the practice on lane departure safety efforts:
  - Promote strong Michigan attendance at regional or national conferences or other collective efforts to discuss lane departure safety issues
  - Develop and hold a Michigan Lane Departure Conference

- Develop a training plan or provide for resources on lane departure safety:
  - The GTSAC will develop a presentation on highway features that affect lane departure safety

- Develop a statewide media campaign regarding lane departure safety that can be used by local agencies, and pilot in one or two specific local agencies:
  - Includes a media strategy
  - Increases public awareness through editorials, radio, public service announcements, etc
  - Uses media to explain how to use new highway improvements or operational treatments
  - Uses media to provide safety arguments for enforcement activity
  - Uses information on best practices/approaches from states and locals to enhance media campaign materials

NCHRP Report 500

In 1998, AASHTO approved its Strategic Highway Safety Plan, which was developed by the AASHTO Standing Committee for Highway Traffic Safety with the assistance of the Federal Highway Administration, the National Highway Traffic Safety Administration, and the Transportation Research Board Committee on Transportation Safety Management. The plan includes strategies in 22 key emphasis areas that affect highway safety. Each of the emphasis areas includes strategies and an outline of what is needed to implement each strategy.

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These are 13 volumes of NCHRP Report 500: Guidance for Implementation of the AASHTO Strategic Highway Safety Plan, a series in which relevant information is assembled into single concise volumes, each pertaining to specific types of highway crashes (e.g., run-off-road, head-on) or contributing factors (e.g., aggressive driving).

Appendices A-F describe the reports related to Lane Departure issues

Appendix A – Run-Off-Road

Objectives:

- Keep vehicles from encroaching on the roadside
- Minimize the likelihood of crashing into an object or overturning if the vehicle travels beyond the shoulder of the road
- Reduce the severity of crashes

Strategies:

- Install shoulder rumble strips
- Install edge line rumble strips or modified shoulder rumble strips on section with narrow or no paved shoulders
- Install mid-lane rumble strips
- Provide enhanced shoulder or in-lane delineation and marking for sharp curves
- Provide improved highway geometry for horizontal curves
- Provide enhanced pavement markings
- Provide skid-resistant pavement surfaces
- Eliminate shoulder drop-offs
- Widen and/or pave shoulders

- Design safer slopes and ditches to prevent rollovers
- Remove/relocate objects in hazardous locations
- Delineate trees or utility poles with reflective tape

- Improve design of roadside hardware (e.g., light poles, signs, bridge rails)
- Improve design and application of barrier and attenuation systems

Resources:

A guide for addressing Run-off-road collisions:
http://safety.transportation.org/guides.aspx?cid=27

Appendix B – Collisions with Trees

Objectives:

- Prevent trees from growing in hazardous locations
- Eliminate the hazard and/or reduce the severity of the crash

Strategies:

- Develop, Revise, and Implement Planting Guidelines Prevent Placing Trees in Hazardous Locations
- Mowing and Vegetation Control Guidelines

- Remove Trees in Hazardous Locations
- Shield Motorists from Striking Trees
- Modify Roadside Clear Zone in the Vicinity of Trees
- Delineate Trees in Hazardous Locations

Resources:

A guide for addressing collisions with tress in hazardous locations:
http://safety.transportation.org/guides.aspx?cid=24

Appendix C – Collisions with Utility Poles

Objectives:

- Treat specific utility poles in high-crash and high-risk spot locations
- Prevent placing utility poles in high-risk locations
- Treat several utility poles along a corridor to minimize the likelihood of crashing into a utility pole if a vehicle runs off the road

Strategies:

- Remove poles in high-crash locations
- Relocate poles in high-crash locations farther from the roadway and/or to less vulnerable locations
- Use breakaway devices
- Shield drivers from poles in high-crash locations
- Improve the drivers' ability to see poles in high-crash locations
- Apply traffic calming measures to reduce speeds on high-risk sections

- Develop, revise, and implement policies to prevent placing or replacing poles within the recovery area

- Place utilities underground
- Relocate poles along the corridor farther from the roadway and/or to less vulnerable locations
- Decrease the number of poles along the corridor

Resources:

A guide for reducing collisions involving utility poles:
http://safety.transportation.org/guides.aspx?cid=31

Appendix D – Head on Collisions

Objectives:

- Keep vehicles from encroaching into opposite lane.
- Minimize the likelihood of crashing into an oncoming vehicle.

Strategies:

- Install centerline rumble strips for two-lane roads
- Install profiled thermoplastic strips for centerlines
- Provide wider cross sections on two-lane roads
- Provide center two-way left-turn lanes for four and two-lane roads
- Reallocate total two-lane roadway width (land and shoulder) to include 'buffer median"

- Use alternating passing lanes or four-lane sections at key locations
- Install median barriers for narrow width medians on multilane roads

Resources:

A guide for addressing head-on collisions:
http://safety.transportation.org/guides.aspx?cid=25

Appendix E – Horizontal Curves

Objectives:

- Reducing the likelihood of a vehicle leaving the roadway at a horizontal curve
- Minimizing the adverse consequences of leaving the roadway at a horizontal curve.

Strategies:

- Provide advance warning of unexpected changes in horizontal alignment
- Enhance delineation along the curve
- Provide adequate sight distance
- Install shoulder rumble strips
- Install centerline rumble strips
- Prevent edge drop-offs
- Provide skid-resistant pavement surfaces
- Provide grooved pavement
- Provide lighting of the curve
- Provide dynamic curve warning system
- Widen the roadway
- Improve or restore super elevation
- Modify horizontal alignment
- Install automated anti-icing systems
- Prohibit/restrict trucks with very long semi-trailers on roads with horizontal curves that cannot accommodate truck off tracking

- Design safer slopes and ditches to prevent rollovers
- Remove/relocate objects in hazardous locations
- Delineate roadside objects
- Add or improve roadside hardware
- Improve design and application of barrier and attenuation systems

Resources:

A guide for reducing collisions on horizontal curves:
http://safety.transportation.org/guides.aspx?cid=32

ACRONYMS

AAA	American Automobile Association
AASHTO	American Association of State Highway and Transportation Officials
CWP	Collisions with Utility Poles
CWT	Collisions with Trees
FHWA	Federal Highway Administration
GTSAC	Governor's Traffic Safety Advisory Commission
HC	Horizontal Curves
HOC	Head-On Collisions
MACP	Michigan Association of Chiefs of Police
MDE	Michigan Department of Education
MDOS	Michigan Department of State
MDOT	Michigan Department of Transportation
MPO	Metropolitan Planning Organization
MSA	Michigan Sheriff's Association
MSP	Michigan Department of State Police
NCHRP	National Cooperative Highway Research Program
NHI	National Highway Institute
OHSP	Office of Highway Safety Planning
PI&E	Public Information and Education
PSA	Public Service Announcement
ROR	Run-Off-Road
SCP	Safety Conscious Planning

Acknowledgements

This document could not have been made possible without the guidance, planning, dedication and knowledge of the following individuals and their organizational support:

Dick Beaubien	*Hubbell Roth and Clark*
Tom Bruff	*SEMCOG*
Wes Butch	*DLZ, Michigan*
Jim Culp	*Michigan Department of Transportation*
Jeff Bagdade	*AAA Michigan*
Keith Dersham	*City of Adrian*
Tom Krycinski	*Michigan State University*
Deb McAvoy	*Wayne State University*
Dave Morena	*Federal Highway Administration*
Jill Morena	*Michigan Department of Transportation*
Thad Peterson	*Michigan Department of State Police*
Steve Schreier	*Michigan Department of State Police*
Dave Sonnenberg	*Ingham County Road Commission*
Carlos Torres	*Michigan Department of Transportation*
Steve Waterbury	*Kentwood Police Department*