Oklahoma Long Range
TRANSPORTATION PLAN

Moving Oklahoma
FORWARD

Safety and Security

Prepared for:

Oklahoma Department of Transportation

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The Technical Memos were written to document early research for the 2015 2040 Oklahoma Long Range Transportation Plan (LRTP). Most of these memos were written in 2014; all precede the writing of the 2015-2040 Oklahoma LRTP *Document* and 2015-2040 Oklahoma LRTP *Executive Summary*.

The 2015-2040 Oklahoma LRTP *Document* and 2015-2040 Oklahoma LRTP *Executive Summary* were composed in Spring 2015.

If there is an inconsistency between the Tech Memos and the 2015-2040 Oklahoma LRTP *Document* or 2015-2040 Oklahoma LRTP *Executive Summary*, the reader should assume that the *Document* and *Executive Summary* contain the most current and accurate information.

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1. INTRODUCTION

The Oklahoma Department of Transportation (ODOT) 2015-2040 Long Range Transportation Plan (LRTP) establishes a framework for the future using a policy approach to guide ODOT as it maintains and enhances an intermodal transportation system for the State of Oklahoma.

Improved safety on the transportation system is a goal of all states including Oklahoma. The transportation industry as a whole values life, and strives to minimize traffic fatalities and serious injury crashes. In fact, there are very few things in the transportation industry that are universally agreed upon, but improved safety is one of them

The Safety and Security Technical Memorandum is organized by giving an initial overview of traffic safety trends in the United States. Following that section is a more detailed description of Oklahoma trends and statistics, including a look at the state's performance relative to the 2007 Oklahoma Strategic Highway Safety Plan (SHSP)[1] and a preview of the Draft 2014 SHSP[2], and issues that merit further consideration. The final portion of the report comments on security issues in relation to transportation planning and operations.

2. SAFETY OVERVIEW

According to the National Transportation Safety Board (NHTSA), annual road deaths in the U.S. rose 3.7 percent in 2012 to 33,561. This rise breaks a trend dating back to 2005 when roadway fatalities had steadily decreased from 39,252 to 32,367 people per year. More Americans were traveling in 2012 as compared to previous years so the rise in fatalities was not unexpected. Moreover, road fatalities per million vehicle miles of ravel rose from 1.10 in 2011, to 1.16 in 2012.

These statistics suggest that road safety professionals have significant work to accomplish with regard to reducing fatalities and serious road crashes. Some states have adopted the national goal: toward zero deaths. In working toward that goal, states throughout the U.S. continue to employ the 3E or 4E strategy of engineering, education, enforcement, and emergency medical services. The following sections discuss some of the recent trends used by safety professionals in carrying out the 4E process.

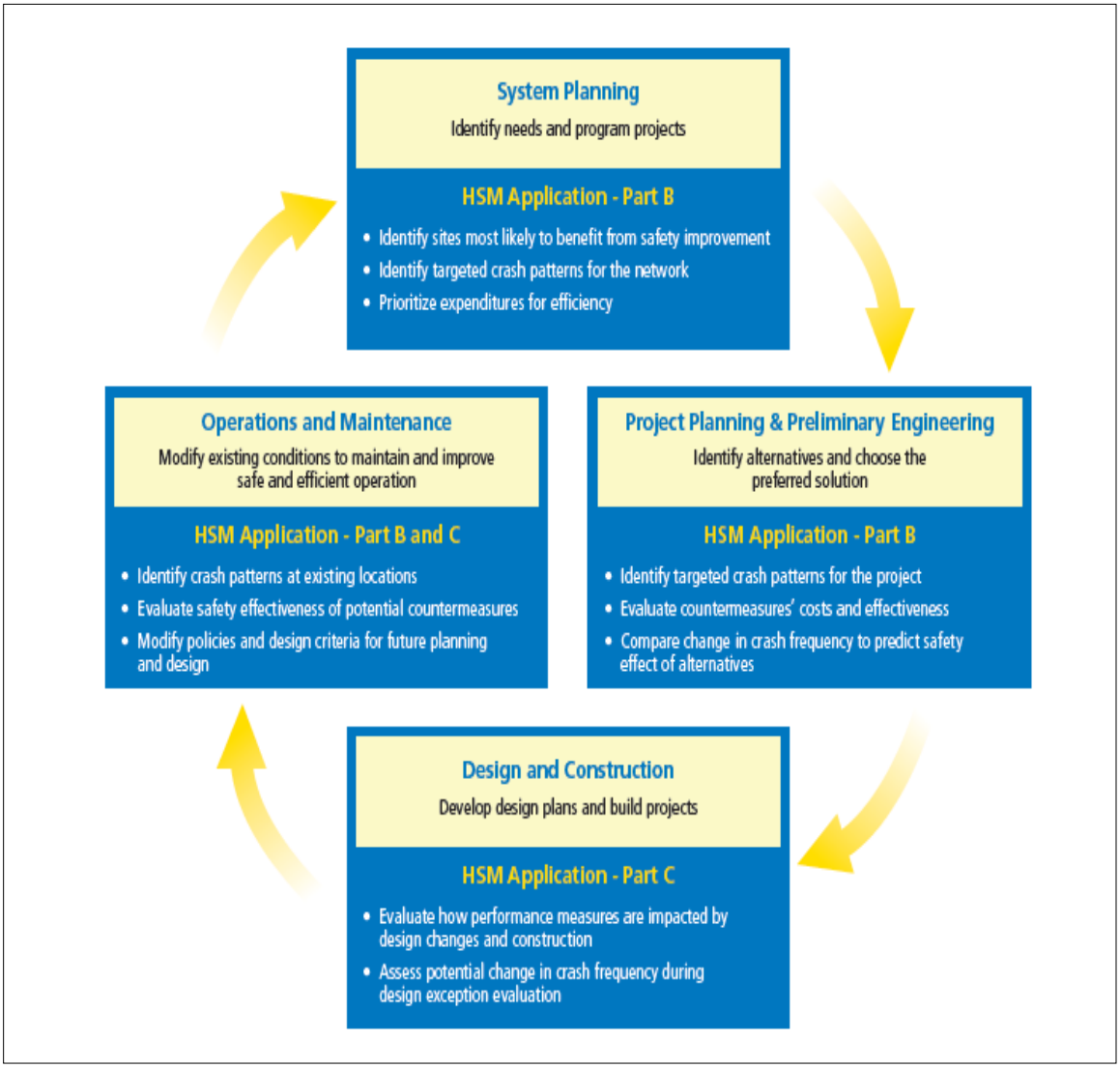
2.1 HIGHWAY SAFETY MANUAL

The Highway Safety Manual (HSM) concept was initiated at a 1999 Transportation Research Board (TRB) conference to be a single authoritative document that could quantify the impact of implementing crash-preventative measures.

HSM is, in many ways, the traffic safety equivalent of the Highway Capacity Manual (HCM). Ultimately, the goals of the HSM are to provide transportation professionals techniques and methodology, through a data driven approach, to help them make good decisions when they plan, design, and maintain roads.

Many states, including Oklahoma, are already using the HSM. It is a very comprehensive document and to fully utilize it, states must collect data and factors to localize the formulas. **Figure 2-1** depicts how the HSM can be used in planning, designing, operating, and maintaining roadways.

Figure 2-1: Application Guide for the Highway Safety Manual



Source: FHWA HSM Web Site

2.2 SYSTEM BASED SOLUTIONS

A growing trend among states is to take a *systemic* or system-based approach to road safety. This technique utilizes analysis of high-risk roadway features and correlates them with particular crash types; then follows up with addressing and mitigating high risk features. Oklahoma has utilized systemic solutions as well; particularly those that are low cost and result in a high benefit-cost ratio. These solutions will be discussed in the following section. The systemic approach recognizes that fatal crash locations are random, and consequently cannot be predicted. Conversely, fatal crash types are not random and can be predicted. For example, lane departure crashes are the most common type of crash on rural roads.

2.3 ACCESS MANAGEMENT

In urban areas, states continue to struggle with the implementation of good access management features. It is particularly difficult to retrofit existing roadways that have too many driveways and no median. In 2013, Alabama adopted its Access Management Manual that covered the principals of access management, traffic impact requirements, access design features, and retrofitting access management to existing roads. This is a significant document for ALDOT and has served them well.

2.4 DISTRACTED DRIVERS

Americans are bombarded with warnings to not text and drive. Public service announcements warn citizens to put the cell phone out of reach or to put it in the silent mode while driving. Americans are also told to avoid other distracting tasks while driving like eating, reading documents, or putting on make-up.

Despite the warnings and public service announcements, many Americans continue to undertake these unsafe behaviors; and as a result, too many people lose their life or sustain a permanent injury due to distracted driving. In 2011, 3,331 people were killed in the U.S. and about 387,000 people were injured in automobile crashes involving a distracted driver according to a Center for Disease Control and Prevention article published in January 2014.

No state in the U.S. fully bans cell phone use but 47 states, including Oklahoma, have some laws that restrict the use of those devices. Moreover, “no texting” laws have increased from 28 states in 2010 to 41 states in 2013. Despite the laws, distracted driving crashes continue to rise in the U.S., so more action is needed to prevent this dangerous activity.

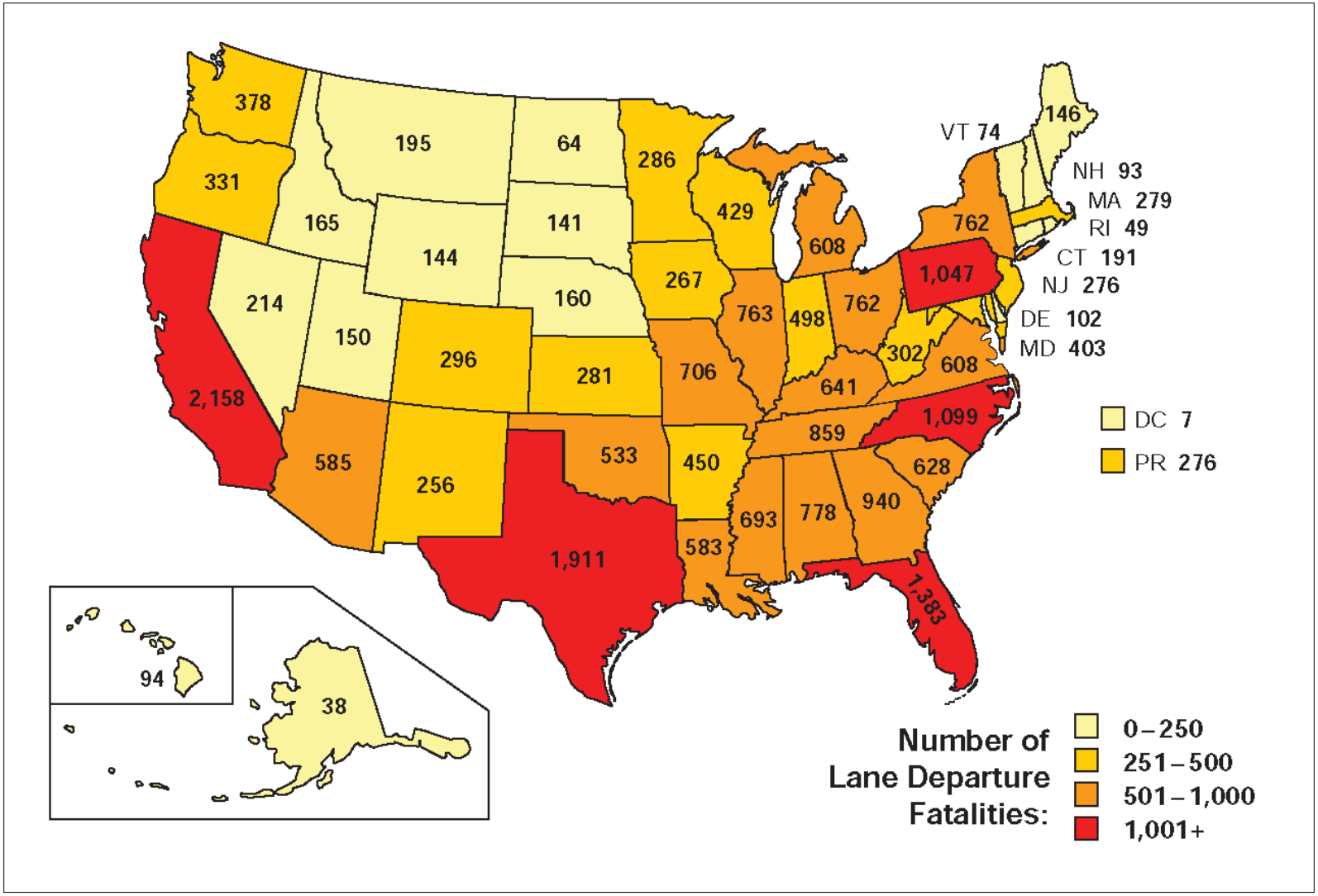
2.5 LANE DEPARTURE CRASHES

A significant amount of state and federal resources have been directed toward lane departure crashes recently because of the frequency and severity. **Figure 2-2** illustrates year 2006 fatal lane departure crashes by state. In 2012, approximately 34,080 fatalities occurred on U.S. roads and almost 60 percent were lane departure crashes. Lane departure crashes can be from vehicles crossing the centerline and colliding with an oncoming vehicle or departing the roadway and striking a fixed object.

The preponderance of lane departure crashes take place on rural roads with horizontal curves being a major contributing factor.

Lane departure mitigation strategies include centerline and shoulder rumble strips, and cable median barriers. Proactive solutions (preventing the crashes) include upgrading shoulders for better recovery, clearing areas of obstacles, and adding guardrails as necessary.

Figure 2-2: Lane Departure Fatalities- 2006



Source: Driving Down Lane-departure Crashes April 2008 by AASHTO

2.6 SAFETY INTEGRATION

More and more state DOTs are taking a broad multimodal, integrated approach to safety that touches all Department levels and functions. Guidance for this type of integration is provided in the reference manual: *Statewide Opportunities for Integrating Operations, Safety, and Multimodal Planning*, published by the U.S. Department of Transportation, Federal Highway Administration (FHWA). This manual documents safety and operation strategies at the following five levels:

- Overall DOT environment
- Statewide opportunities
- Regional opportunities
- Corridor and sub-level opportunities
- Project opportunities

Integration of safety and operations, as envisioned by FHWA, spans across all travel modes and includes all of the state DOTs primary organizational units - planning, design, and operation. The research concluded that full integration should also include other DOT ancillary central office departments like Information Technology, Human Resources, and Legal.

2.7 CRASH DATA

Information is a powerful tool. Good crash data in terms of type, location, and conditions is a necessity when developing systemic or site specific road safety recommendations. Many states have good data relative to statewide trends but feel that improvements to the location, type, and characteristics of the crash data should be improved. A growing trend in some states is to geo-code crash data so that it can be mapped in a GIS format.

3. SAFETY TRENDS AND ANALYSIS

This section provides an overall summary of how Oklahoma performed since the development of the 2007 SHSP in terms of total crashes and crash rate. It also provides a review of Oklahoma's performance in the five 2007 SHSP emphasis areas as well as several other recent emphasis areas like bicycles and pedestrians, freight railroad highway, crossings, and hazardous materials. Where available, safety data are presented for 2007 through 2012. Finally, the section concludes with a summary of the 2014 SHSP that is under development and suggested safety focus areas that Oklahoma should consider.

3.1 SUMMARY OF 2007 SHSP- HOW DID OKLAHOMA PERFORM?

Oklahoma's first Strategic Highway Safety Plan (SHSP) was published in 2007. It included a *primary goal with measureable subgoals* related to fatalities and injuries; and outlined *five focus areas*.

The primary goal was to "reverse the increasing trend of traffic related fatalities and injuries…" and the subgoals were:

(1) "Achieve a 20 percent **reduction in the 2004 Oklahoma fatality rate** (1.71 lives lost per 100 million vehicle miles of travel/HMVMT) **by 2015**, and

(2) Achieve a 20 percent **reduction in the 2004 Oklahoma serious injury rate** (40.46 serious injuries per 100 million vehicle miles of travel) **by 2015**".

Achievement of these subgoals would result in the following:

(1) A 2015 fatality rate per HMVMT of 1.37, and
(2) A 2015 serious injury rate of 32.37.

The five focus areas were:

(1) Unsafe driving behavior
- impaired drivers,
- aggressive drivers,
- speeding drivers,
- fatigued drivers,
- distracted drivers, and
- drivers not using seatbelts.

(2) Intersection crashes,
(3) Crashes involving young drivers,

(4) Lane departure crashes, and
(5) Crosscutting issues and strategies
- Reduction in overall fatalities and injuries
- Improvement of crash data and its availability, and
- Development of a safer overall vehicle fleet.

As mentioned earlier, the SHSP relates to highway safety; and the focus areas are vehicle/traveler neutral.

3.2 PERFORMANCE IN RELATION TO SHSP PLAN GOALS

3.2.1 Motor Vehicle Crashes

Motor vehicle crashes declined between 2007 and 2012 in Oklahoma. **Table 3-1** presents crash data for the last six years, from the date of the first Oklahoma SHSP in 2007 through the last complete year for which data are available: 2012. Despite some year-to-year increases in collisions, the table shows that total crashes in each year following 2007 were lower than the initial year. The year 2012 concluded with a 5.9 percent decrease in crashes as compared to 2007.

Table 3-1: Number of Crashes in Oklahoma, 2007-2012

Year	Total Crashes	
	Number	Annual Percent Change
2007	75,059	---
2008	72,667	3.2
2009	71,218	-2.0
2010	69,807	-2.0
2011	68,967	-1.2
2012	70,669	2.5
% Reduction 2007-2012	**5.9%**	

Note: This chart displays total crashes, not total vehicles involved in crashes or total individuals involved in crashes.

Source: CDM Smith analysis based on data from the Oklahoma Highway Safety Office.

3.2.2 Fatality Rate and Fatalities

Both *Oklahoma's fatality rate* (number of fatalities per hundred million vehicle-miles traveled /HMVMT) and the *number of traffic related fatalities* declined between 2007 and 2012. The fatality rate decreased 7.5 percent and the number of fatalities declined 7.6 percent.

Table 3-2 depicts Oklahoma's fatality rate, the national fatality rate, and the raw number of traffic related fatalities in Oklahoma crash data for the six years period from 2007 to 2012.

Table 3-2 : Fatality Rate per 100 MVMT, 2007-2012

Year	Historical (1997-2011) Oklahoma Fatality Rate Trend	Oklahoma Actual Annual Fatality Rate	National Fatality Rate	Oklahoma Fatality Number
2007	1.66	1.61	1.37	766
2008	1.65	1.55	1.26	750
2009	1.55	1.57	1.13	737
2010	1.47	1.40	1.11	668
2011	1.37	1.47	1.10	696
2012	1.41	1.49	1.14	708
% Reduction 2007-2012	**15.06%**	**7.45%**	**16.79%**	**7.57%**

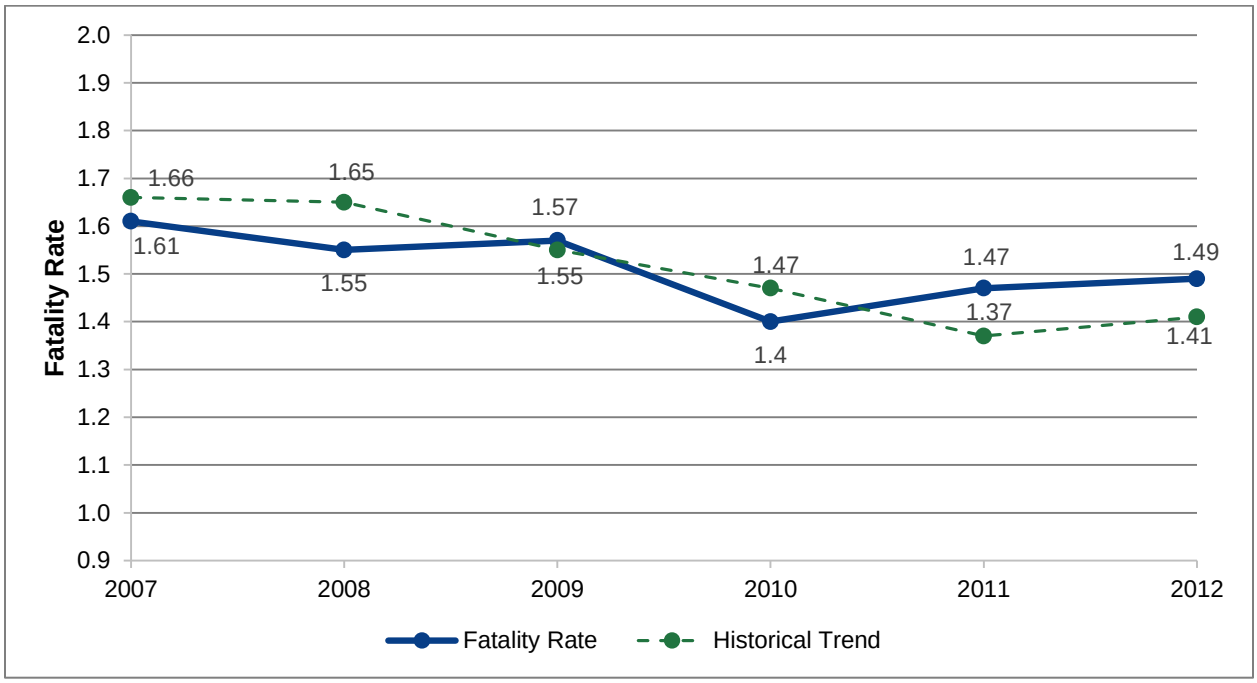
Source: National Highway traffic Safety Administration, December 2014. http://www-nrd.nhtsa.dot.gov.

ODOT Collision Analysis and Safety Branch, December 2014.
Historical trend based on statistical analysis of crash data from 1997 to 2011.[3]

Oklahoma's fatality rate decreases between 2007 and 2012, but at a slower rate than the national rate decline. Raw numbers of fatalities for the six year period also show an overall decrease, from 766 to 708; and each year is lower than 2007

The historical trend analysis[4] as shown in **Figure 3-1** suggests a continued decrease for ensuing years, and indicates the possibility of meeting the 2015 fatality rate per HMVMT of 1.37 as anticipated in the original Oklahoma SHSP.

Figure 3-1 : Fatality Rate (fatalities per HMVMT), 2007-2012



Source: CDM Smith analysis based on data from the Oklahoma Highway Safety Office.

3.2.3 Serious Injury Rate and Serious Injuries

The traffic related *serious injury rate in Oklahoma* (number of serious injuries per hundred million vehicle-miles traveled /HMVMT) and the *number of traffic related serious injuries* declined between 2007 and 2012. The serious injury rate decreased 9.8 percent, while the total number of serious injuries declined 7.6 percent.

Table 3-3 depicts Oklahoma's serious injury rate and the raw number of traffic related serious injuries in Oklahoma collisions for the six years period from 2007 to 2012. Because there is variation in the way each state calculates serious injuries, a national comparison is not included.

Table 3-3: Serious Injury Rate per HMVMT, 2007-2012

Year	Oklahoma Serious Annual Injury Rate	Oklahoma Serious Injury Number
2007	37.9	17,663
2008	35.0	16,398
2009	34.2	16,077
2010	34.7	16,557
2011	34.1	16,190
2012	34.2	16,314
% Reduction 2007-2012	**9.8%**	**7.6%**

Source: ODOT Collision Analysis and Safety Branch, December 2014.

Oklahoma's serious injury rate decreases between 2007 and 2012, as does the number of serious injuries. Thus, the general trend is toward reducing serious injuries, despite some interim year increases. Again, the historical trend analysis suggests a possibility (though not a likelihood) of achieving the 2015 serious injury rate per HMVMT of 32.37, a goal of the original Oklahoma SHSP.

3.3 PERFORMANCE IN RELATION TO 2007 SHSP EMPHASIS AREAS

3.3.1 Unsafe Driver Behavior

The 2007 SHSP proposed nine objectives to address unsafe driver behavior, which were broken down into the following subsets: impaired drivers, aggressive driving and speeding, fatigued and distracted driving, and occupant protection.

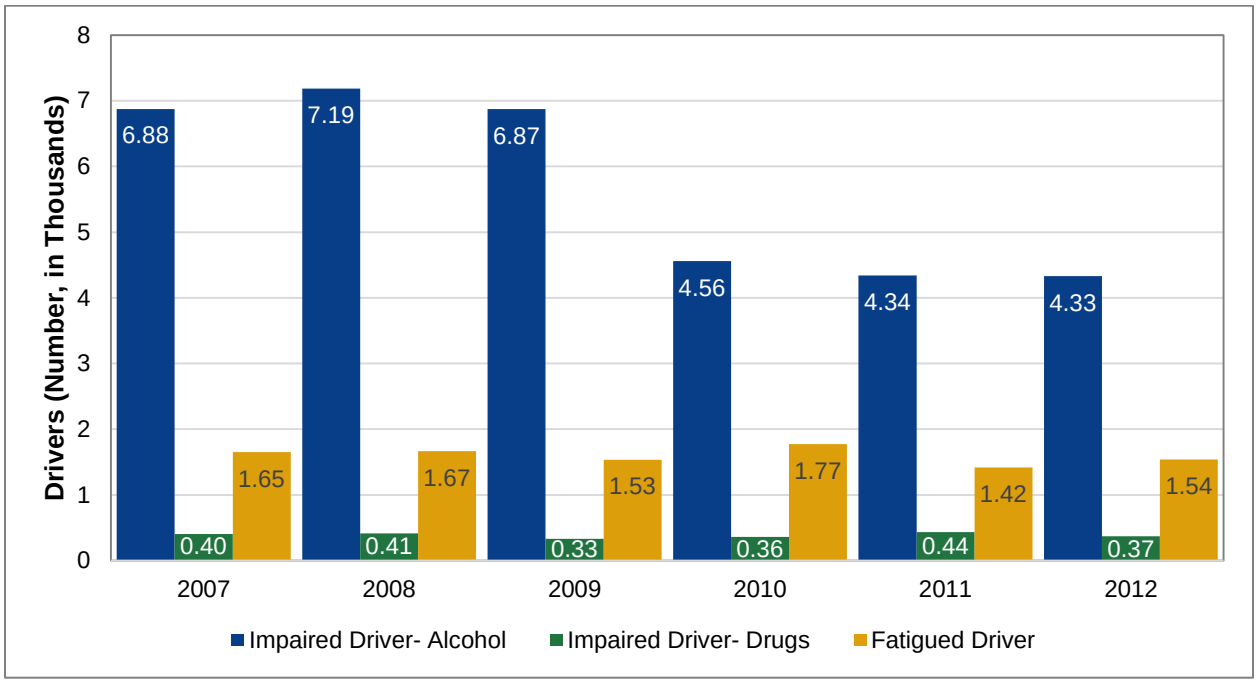
Table 3-4 and

Figure 3-2 show the driver conditions related to impaired (alcohol, drugs) and fatigued drivers during the six-year time period. Over the six-year time period, the number of drivers involved in crashes that were under the influence of alcohol decreased from 6,875 in 2007 to 4,330 in 2012 (37 percent reduction). During the same time period, the number of drivers under the influence of a drug involved in crashes decreased from 402 in 2007 to 372 in 2012, which is a 7.5 percent reduction. The number of fatigued drivers involved in a crash decreased from 1,652 in 2007 to 1,540 in 2012.

Table 3-4: Impaired or Fatigued Drivers Involved in a Crash, 2007-2012

Year	Impaired Driver-Alcohol		Impaired Driver-Drugs		Fatigued Driver		Total Number of Impaired or Fatigued Drivers
	Number	Percent of Total	Number	Percent of Total	Number	Percent of Total	Number
2007	6,875	77.00	402	4.50	1,652	18.50	8,929
2008	7,186	77.56	413	4.46	1,666	17.98	9,265
2009	6,871	78.66	332	3.80	1,532	17.54	8,735
2010	4,558	68.14	358	5.35	1,773	26.51	6,689
2011	4,341	70.12	435	7.03	1,415	22.86	6,191
2012	4,330	69.37	372	5.96	1,540	24.67	6,242
% Reduction 2007-2012	**37.0%**		**7.5%**		**6.8%**		**30.1%**

Figure 3-2: Impaired or Fatigued Drivers Involved in a Crash, 2007-2012



Source: CDM Smith analysis based on data from the Oklahoma Highway Safety Office.

Occupant Protection and Crashes Related to Unsafe Speeds

Seatbelt usage in Oklahoma has remained consistent at between 83 and 86 percent from 2007 to 2012 with the highest level of usage (85.9%) achieved in 2010 and 2011.

The record of crashes caused by unsafe speeds showed that Year 2007 crashes related to unsafe speeds were less than half of the number recorded in 2008. However, a revision of Oklahoma traffic collision reporting forms in 2007, allowed for reporting of contributing factors for each vehicle involved in a crash -- instead of a single cause of the crash to determine individual driver behaviors.

Therefore, the number of crashes recorded from 2008 to 2012 is a better period for comparison. The number of crashes mainly caused by unsafe speeds decreased from 10,921 in 2008 to 8,866 in 2012; this is a 19 percent decrease.

3.3.2 Intersection Crashes

The 2007 SHSP recognized intersection related crashes as a priority; and ODOT began a process to evaluate and fund critical intersections improvements statewide. The overall results, as shown in **Table 3-5** and

Figure 3-3 are positive. During the six-year time period, total intersection crashes have been reduced by nearly 1,000 or 3.2 percent; injury crashes have been

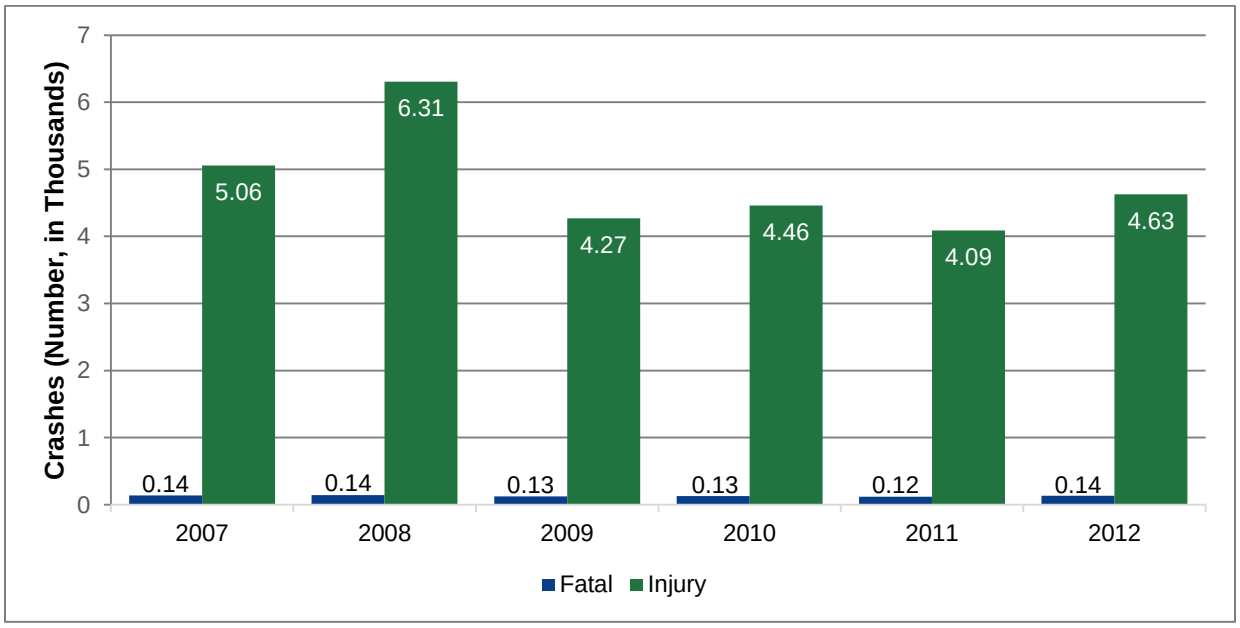
reduced by 428 or 8.5 percent; and fatal crashes have been reduced by three or 2.2 percent. The majority of intersection crashes are defined as “other”, indicating no damage or property damage only.

Table 3-5: Intersection Crashes, 2007-2012

Year	Fatal		Injury[1]		Other		Total Intersection Crashes
	Number	Percent of Total	Number	Percent of Total	Number	Percent of Total	Number
2007	138	0.44	5,055	16.09	26,217	83.47	31,410
2008	142	0.46	6,309	20.57	24,217	78.97	30,668
2009	126	0.42	4,270	14.38	25,302	85.20	29,698
2010	127	0.45	4,458	15.96	23,356	83.59	27,941
2011	120	0.44	4,088	15.07	22,927	84.49	27,135
2012	135	0.44	4,627	15.21	25,652	84.34	30,414
% Reduction 2007-2012	**2.2%**		**8.5%**		**2.2%**		**3.2%**

Note: 1. Includes all incapacitating and non-incapacitating injuries.
Source: CDM Smith analysis based on data from the Oklahoma Highway Safety Office.

Figure 3-3: Fatality and Injury Related Intersection Crashes, 2007-2012



Source: CDM Smith Analysis Based on ODOT Traffic Engineering Division

The lower crash numbers between 2008 and 2011 are most likely attributed to lower VMT attributed to the economic recession.

3.3.3 Crashes Involving Young Drivers

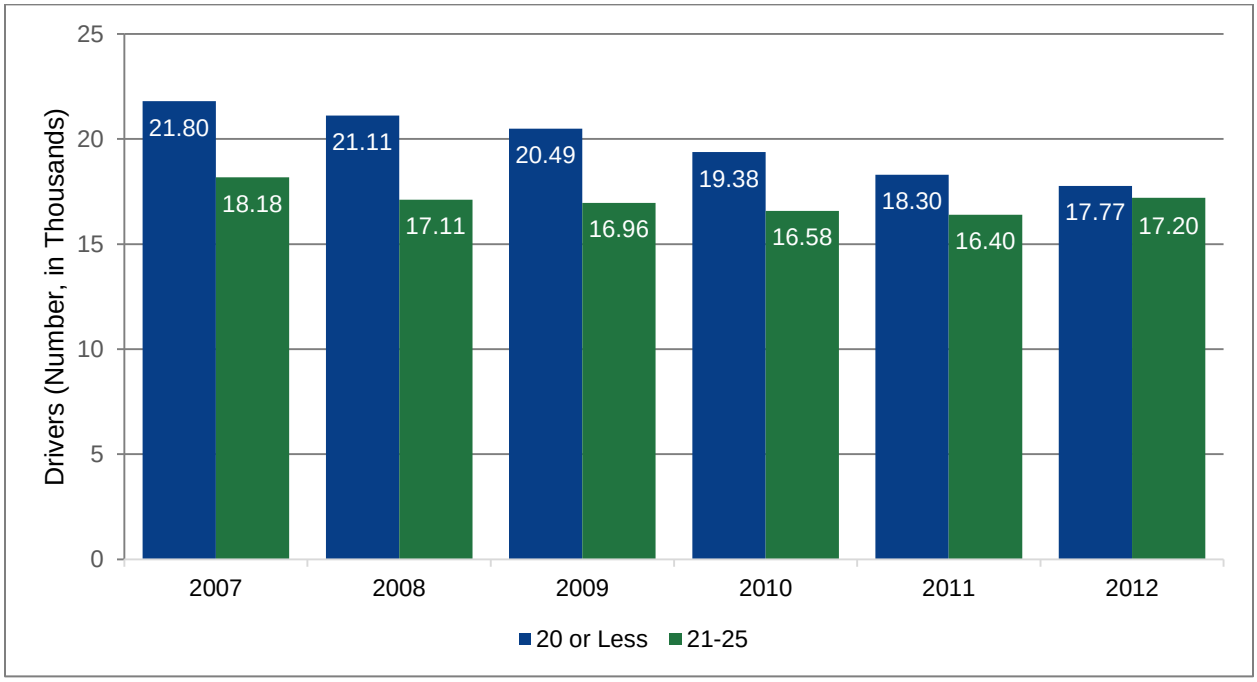
As shown in **Table 3-6** and

Figure 3-4, there were 129,238 drivers involved in crashes in 2012 and 17,771 or 13.8 percent were drivers less than 20 years old. A total of 17,204 drivers or 13.3 percent were 21-25 years old.

Table 3-6: Age of Drivers Involved in a Crash, 2007-2012

Year	20 or Less		21-25		26 or Over		Total Number of Drivers
	Number	Percent of Total	Number	Percent of Total	Number	Percent of Total	Number
2007	21,800	16.35	18,175	13.63	93,391	70.03	133,366
2008	21,111	16.31	17,107	13.21	91,254	70.48	129,472
2009	20,490	16.17	16,961	13.38	89,266	70.45	126,717
2010	19,375	15.30	16,582	13.09	90,705	71.61	126,662
2011	18,304	14.46	16,401	12.96	91,892	72.59	126,597
2012	17,771	13.75	17,204	13.31	94,263	72.94	129,238
% Reduction 2007-2012	**18.5%**		**5.3%**		**-0.9%**		**3.1%**

Figure 3-4: Drivers Age 25 or Less Involved in a Crash, 2007-2012



Source: CDM Smith analysis based on data from the Oklahoma Highway Safety Office.

Since 2007, Oklahoma has experienced a reduction in the percent of drivers 25 years or less involved in a crash. Despite the reduction in young drivers involved in a crash, additional improvements can be accomplished. During the six-year time period, drivers 20 years old or less accounted for approximately 8 percent of the driving population, yet were involved in 14 to 16 percent of the total crashes.

Objectives proposed in the 2007 SHSP to address young driver crashes included improving driver education, judicial/enforcement/legislative, and public awareness.

3.3.4 Lane Departure Crashes

Lane departure[5] crashes are considered one of the most serious causative factors that safety engineers must address. In the 2007 SHSP, objectives to reduce lane departure crashes were grouped into three categories: keep vehicles in the proper lane, minimize the chance of a crash once a lane departure has occurred, and reduce the severity of a crash once it occurs.

ODOT proposed the following:

- Develop and deploy guidance for enhanced pavement markings
- Implement centerline and shoulder rumble strips and rumble stripes
- Improve signing and delineation
- Widen and pave more rural two lane road shoulders
- Remove, protect, or delineate roadside obstacles
- Flatten roadside slopes
- Add median barriers
- Replace substandard roadside hardware equipment on two lane roads

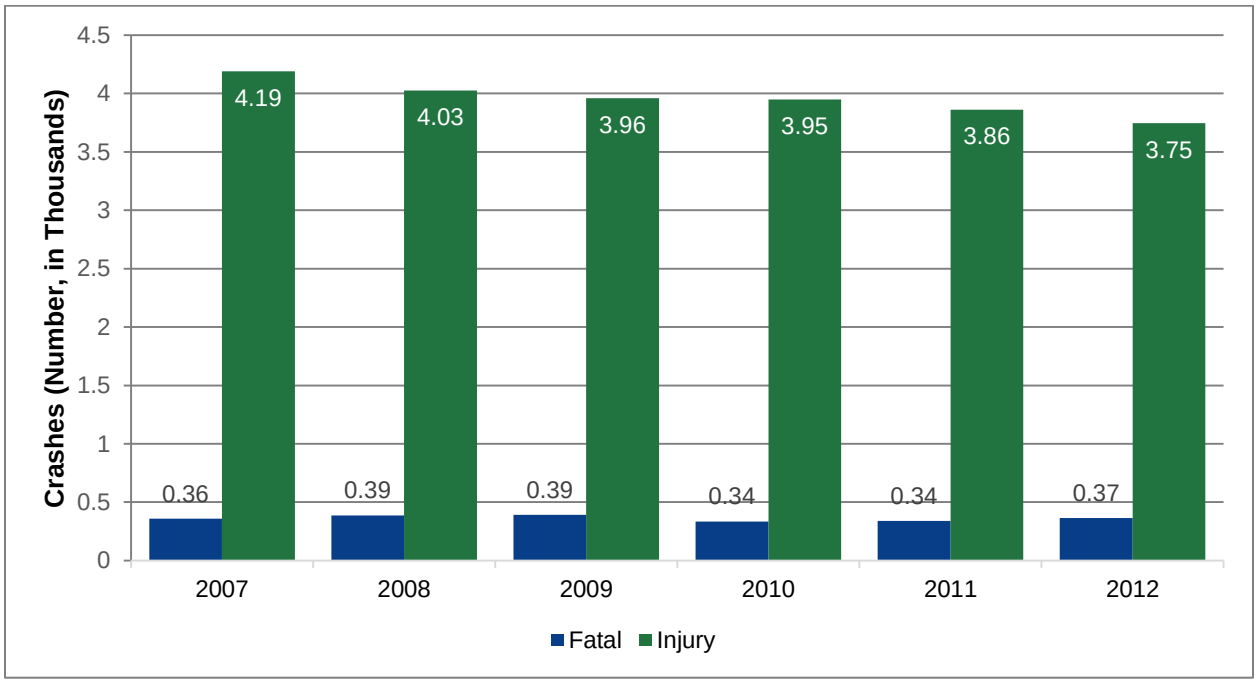
Table 3-7 and **Figure 3-5** show the annual lane departure fatal and injury crashes on all Oklahoma roads between 2007 and 2012. The total number of lane departure crashes was reduced by 1,274 or 8.1 percent; injury crashes were reduced by 118 or 9.9 percent, and fatal crashes increased by six or 1.7 percent.

Table 3-7: Lane Departure Crashes, 2007-2012

Year	Fatal		Injury$_1$		Other		Total Lane Departure Crashes
	Number	Percent of Total	Number	Percent of Total	Number	Percent of Total	
2007	359	2.29	4,189	26.77	11,102	70.94	15,650
2008	386	2.59	4,026	27.03	10,481	70.38	14,893
2009	391	2.55	3,960	25.84	10,972	71.60	15,323
2010	335	2.28	3,949	26.91	10,390	70.81	14,674
2011	340	2.30	3,862	26.12	10,583	71.58	14,785
2012	365	2.54	3,745	26.05	10,266	71.41	14,376
% Reduction 2007-2012	**-1.7%**		**9.9%**		**7.5%**		**8.1%**

Note: 1. Includes all incapacitating and non-incapacitating injuries.
Source: CDM Smith analysis based on data from the ODOT Traffic Engineering Division.

Figure 3-5: Fatality and Injury Related Lane Departure Crashes, 2007-2012



Source: CDM Smith Analysis Based on ODOT Traffic Engineering Division

Crossover Collisions Mitigated by Cable Barriers

An effective counter-measure ODOT has implemented to reduce lane departure crashes on divided highways is the use of cable barriers. Between 2007 and 2012, ODOT constructed or has placed under construction a total of 690 miles of median cable barrier. ODOT saw substantial avoidance of crossover collisions following these improvements. In 2012, fatalities resulting from crossover collisions on facilities with median cable barriers had been reduced by 84 percent from the 2007 level.

3.3.5 Crosscutting Traffic Safety issues

This section addresses safety issues that may be related to overall fatalities or injuries, or that may overlap with another category previously discussed. Traffic safety issues that focus on the following topics: pedestrians, bicyclists, highway freight, hazardous materials transported on highways, railway-highway crossing collision, and railroad hazardous material incidents are discussed below.

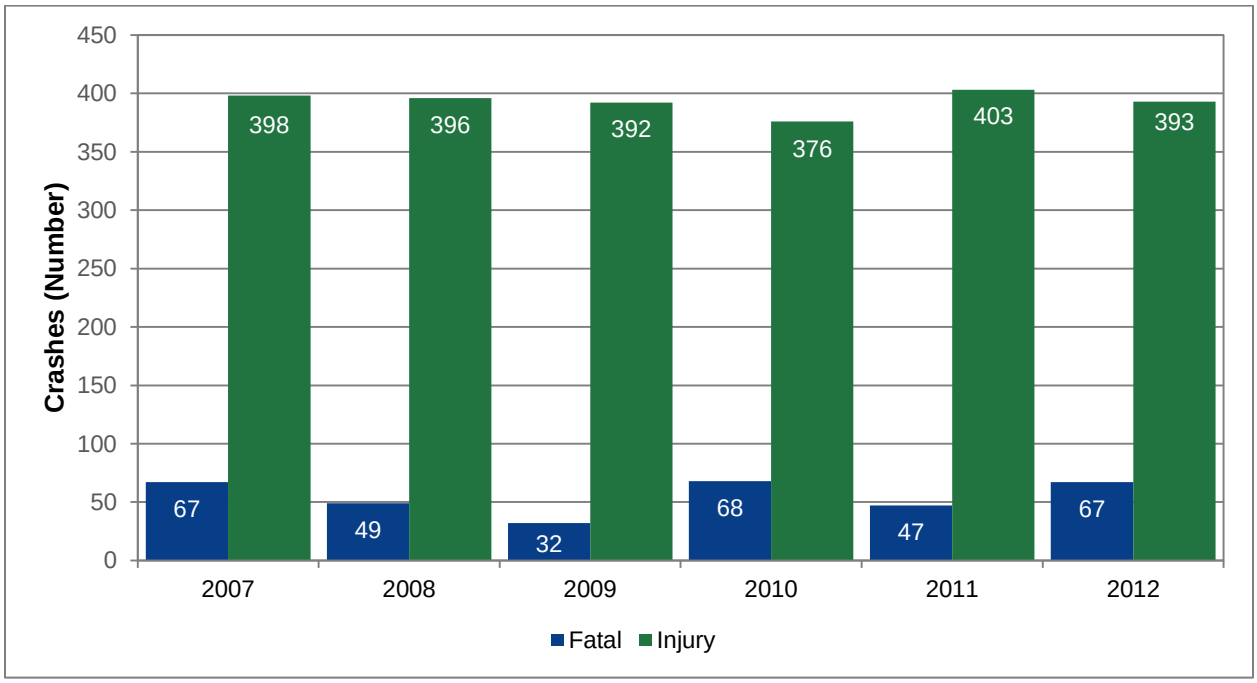
Pedestrian and Bicycle Safety

Pedestrian and bicyclists are vulnerable travelers on roads and highways, and those non-motorized forms of travel are becoming more popular each year. As shown in **Table 3-8** and **Figure 3-6,** pedestrian crashes on Oklahoma's road system have remained relatively constant between 2007 and 2012. Fatal pedestrian crashes declined in 2008 and 2009 (which correlates with a period of fewer vehicle miles of travel), but are at the same level in 2012 as 2007.

Table 3-8: Pedestrian Involved Crashes, 2007-2012

Year	Fatal		Injury$_1$		PDO$_2$		Unknown		Total Pedestrian Involved Crashes
	Number	Percent of Total	Number	Percent of Total	Number	Percent of Total	Number	Percent of Total	
2007	67	10.01	398	59.49	165	24.66	39	5.83	669
2008	49	7.62	396	61.59	184	28.62	14	2.18	643
2009	32	5.35	392	65.55	162	27.09	12	2.01	598
2010	68	10.15	376	56.12	212	31.64	14	2.09	670
2011	47	6.86	403	58.83	181	26.42	54	7.88	685
2012	67	9.50	393	55.74	194	27.52	51	7.23	705
Average Annual	**55**		**393**		**183**		**31**		**662**
% Reduction 2007-2012	**0.0%**		**1.3%**		**-17.6%**		**-30.8%**		**-5.4%**

Figure 3-6: Fatality and Injury Related Pedestrian Involved Crashes, 2007-2012



Source: CDM Smith analysis based on data from the Oklahoma Highway Safety Office.

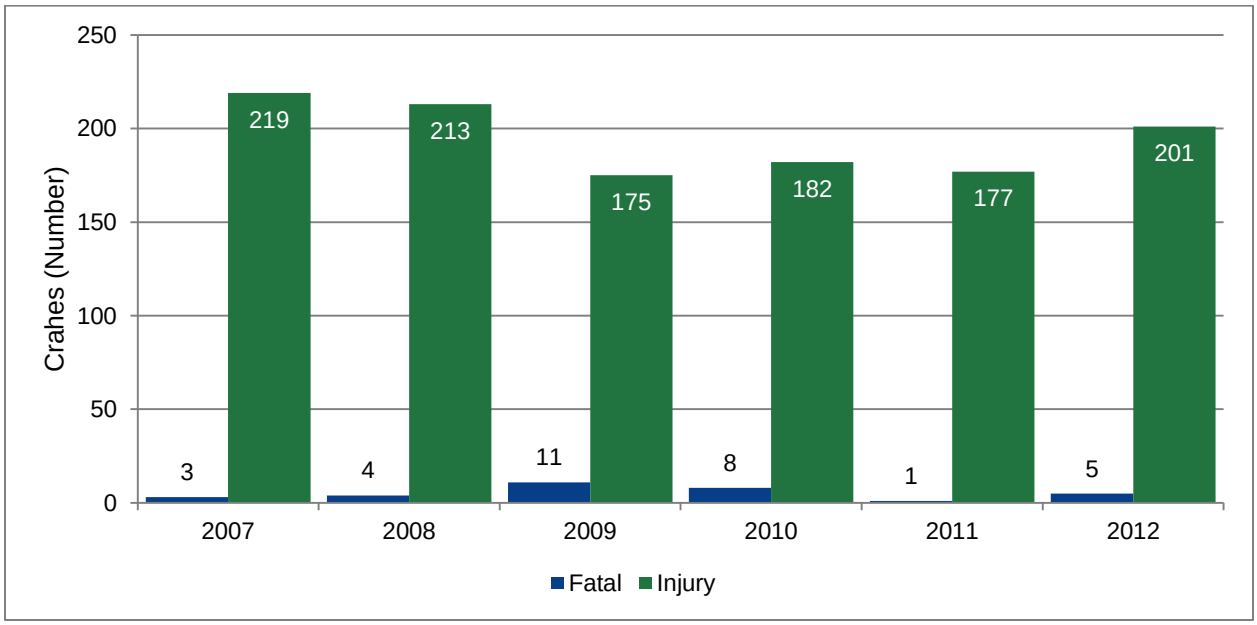
The report on bicycle crashes from the last six years presents a mixture of encouraging results and challenges. Total bicycle crashes are down 19.8 percent when comparing 2007 to 2012, as shown in **Table 3-9** and **Figure 3-7**. Injury and property damage only bicycle crashes have slightly reduced from 2007 to 2012. Eleven fatal crashes were reported in 2009, which is a six-year high; however, there were less fatal crashes in the next three years with a six year low of only one in 2011.

Table 3-9: Bicyclist Involved Crashes, 2007-2012

Year	Fatal		Injury[1]		PDO[2]		Unknown		Total Bicyclist Involved Crashes
	Number	Percent of Total	Number	Percent of Total	Number	Percent of Total	Number	Percent of Total	
2007	3	0.63	219	46.20	143	30.17	109	23.00	474
2008	4	1.12	213	59.66	127	35.57	13	3.64	357
2009	11	3.61	175	57.38	106	34.75	13	4.26	305
2010	8	2.45	182	55.83	127	38.96	9	2.76	326
2011	1	0.33	177	57.65	120	39.09	9	2.93	307
2012	5	1.32	201	52.89	133	35.00	41	10.79	380
Average Annual	**5**		**195**		**126**		**32**		**358**
% Reduction 2007-2012	**-66.7%**		**8.2%**		**7.0%**		**62.4%**		**19.8%**

Notes:
1. Includes all incapacitating and non-incapacitating injuries.
2. Possible crash injury included with Property Damage Only (PDO) data.
Source: CDM Smith analysis based on data from the Oklahoma Highway Safety Office.

Figure 3-7: Fatality and Injury Related Bicyclist Involved Crashes, 2007-2012



Source: CDM Smith analysis based on data from the Oklahoma Highway Safety Office.

Freight Highway Safety

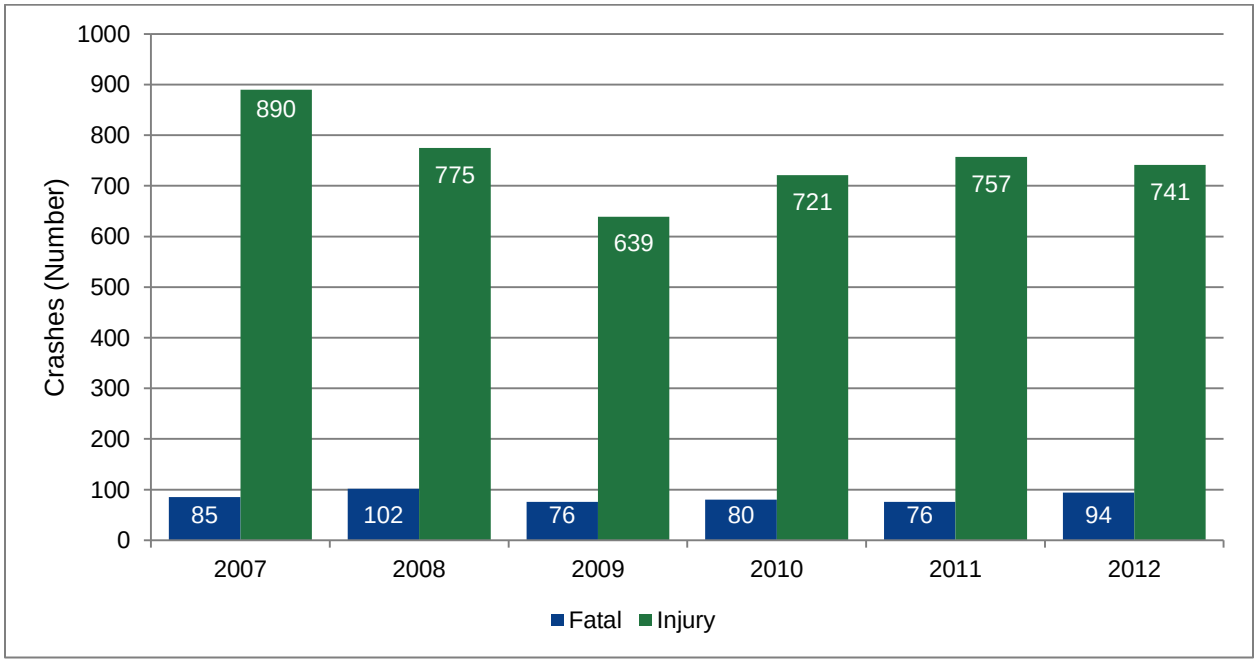
Data on freight highway safety are available through the Oklahoma Highway Safety Office in the form of large truck[6] crashes. Between 2007 and 2012, the total number of large trucks involved in crashes has declined by 14.6 percent as shown in **Table 3-10** and

Figure 3-8. The number of large truck injury crashes has also been on a relatively steady decline from 890 in 2007, to 741 in 2012. Fatal crashes involving large trucks, on the other hand, have remained fairly constant since 2007.

Table 3-10: Large Truck Involved Crashes, 2007-2012

Year	Fatal		Injury$_1$		PDO$_2$		Total Large Truck Crashes
	Number	Percent	Number	Percent	Number	Percent	
2007	85	1.49	890	15.59	4,735	82.92	5,710
2008	102	2.00	775	15.20	4,221	82.80	5,098
2009	76	1.76	639	14.83	3,594	83.41	4,309
2010	80	1.77	721	15.99	3,707	82.23	4,508
2011	76	1.61	757	16.00	3,898	82.39	4,731
2012	94	1.93	741	15.20	4,041	82.88	4,876
Average Annual	**86**		**754**		**4,033**		**4,872**
% Reduction 2007-2012	**-10.6%**		**16.7%**		**14.7%**		**14.6%**

Figure 3-8: Fatality and Injury Related Large Truck Involved Crashes, 2007-2012



Source: CDM Smith analysis based on data from the Oklahoma Highway Safety Office.

Hazardous Material Highway Crashes

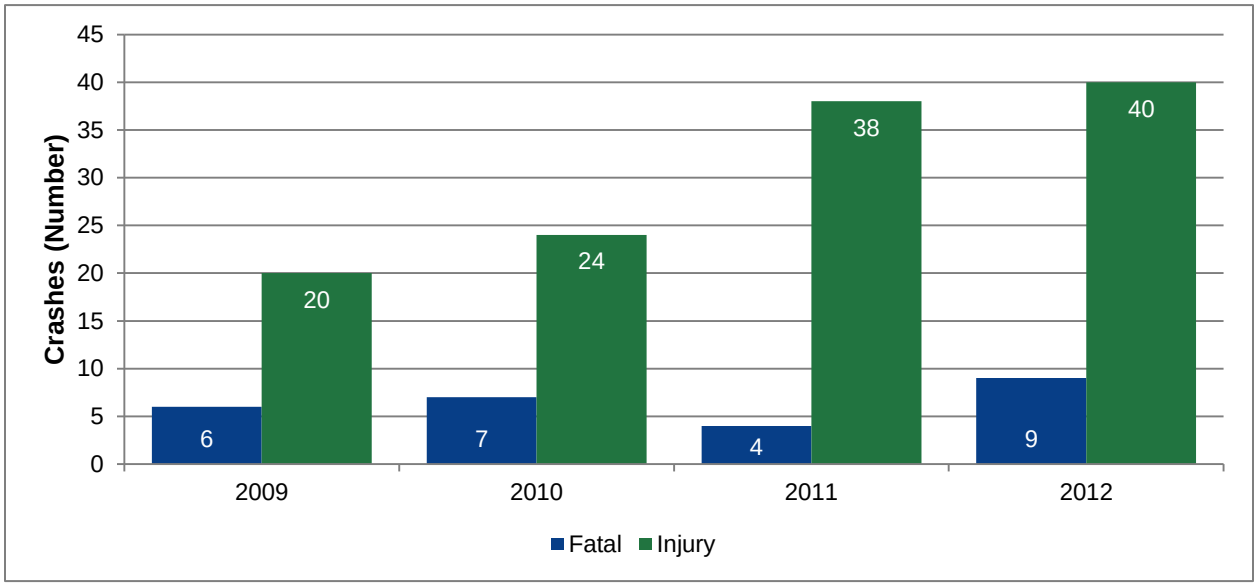
Hazardous material highway crashes have increased from 114 in 2009 to 178 in 2012. The vast majority of these crashes do not involve a serious injury or fatality, but the increase in crashes presents a challenge to traffic safety engineers in Oklahoma. **Table 3-11** and **Figure 3-9** summarize hazardous material crashes on Oklahoma roads between 2009 and 2012, as no data were available for years 2007-2008. No ODOT data are available on the length of time a road is closed due to a hazardous material crash. Fatal highway crashes involving hazardous material have fluctuated between 2009 and 2012 with the highest number, nine, recorded in 2012.

Table 3-11: Hazardous Material Highway Crashes, 2009-2012

Year	Fatal		Injury[1]		Other		Total Hazardous Material Involved Crashes
	Number	Percent of Total	Number	Percent of Total	Number	Percent of Total	
2009	6	5.26	20	17.54	88	77.19	114
2010	7	5.88	24	20.17	88	73.95	119
2011	4	2.67	38	25.33	108	72.00	150
2012	9	5.06	40	22.47	129	72.47	178
Average Annual	**7**		**31**		**103**		**140**
% Reduction 2009-2012	**-50.0%**		**-100.0%**		**-46.6%**		**-56.1%**

Note: 1. Includes all incapacitating and non-incapacitating injuries.
Source: CDM Smith analysis based on data from the Oklahoma Highway Safety Office.

Figure 3-9: Fatality and Injury Related Hazardous Material Highway Crashes, 2009-2012



Source: CDM Smith analysis based on data from the Oklahoma Highway Safety Office.

Freight Rail Safety – Grade Crossing Crashes

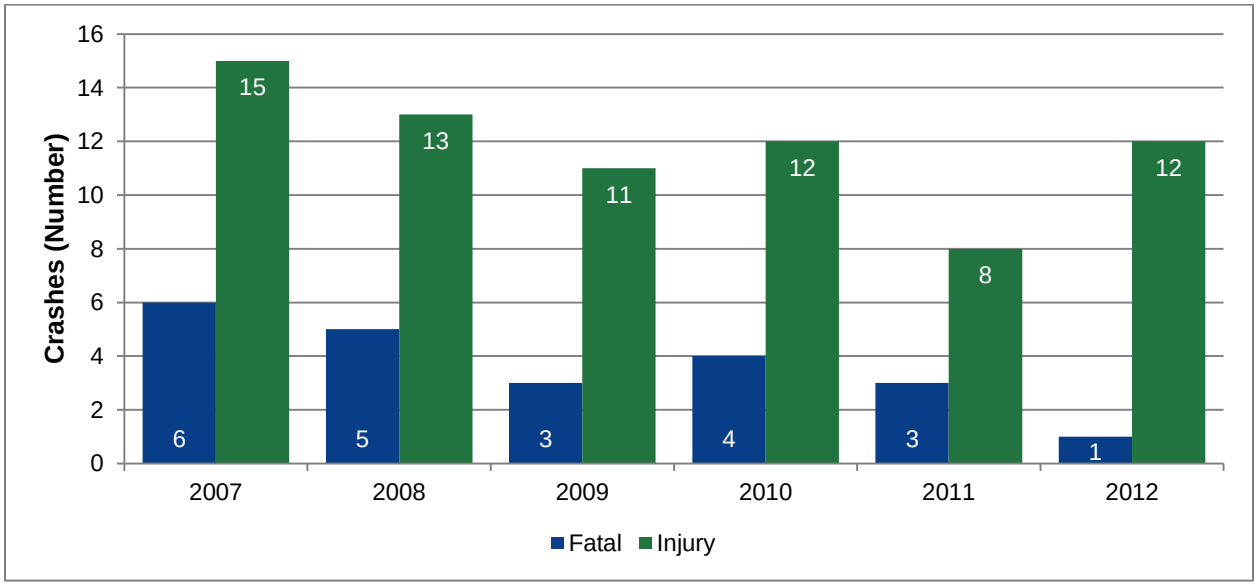
An at-grade railroad crossing is a location where a public highway, road, street, or private roadway, including associated sidewalks, and pathways, crosses railroad tracks at street level. Currently, there are approximately 3,700 at-grade railroad crossings in Oklahoma. Data on railway highway crossing crashes are presented in **Table 3-12** and **Figure 3-10**. In 2007, there were six highway railroad crossing related fatal crashes reported, and the number declined to one in 2012, which is an 83.3 percent reduction. On average, each fatal crash caused two deaths (not shown in table). During the same six-year time period, railroad crossing crashes resulting in injuries were reduced by 20 percent. Even though the trend of railway highway crashes shows a decline, between 2007 and 2012 total crashes averaged about 44 per year, nearly four per month.

Table 3-12: Railway Highway Crossing Crashes, 2007-2012

Year	Fatal	Injury[1]	Other	Total Crashes
2007	6	15	29	50
2008	5	13	38	56
2009	3	11	26	40
2010	4	12	22	38
2011	3	8	30	41
2012	1	12	28	37
Average Annual	**4**	**12**	**29**	**44**
% Reduction 2007-2012	**83.3%**	**20.0%**	**3.5%**	**26.0%**

Note: 1. Includes all incapacitating and non-incapacitating injuries.
Source: Railway Highway Crossing Crashes 2007-2012; ODOT Collision Analysis and Safety Branch- February 2015

Figure 3-10: Fatality and Injury Related Railway Highway Crossing Crashes, 2007-2012



Source: CDM Smith analysis based on data from the ODOT Collision Analysis & Safety Branch.

Hazardous Material Railroad Incidents

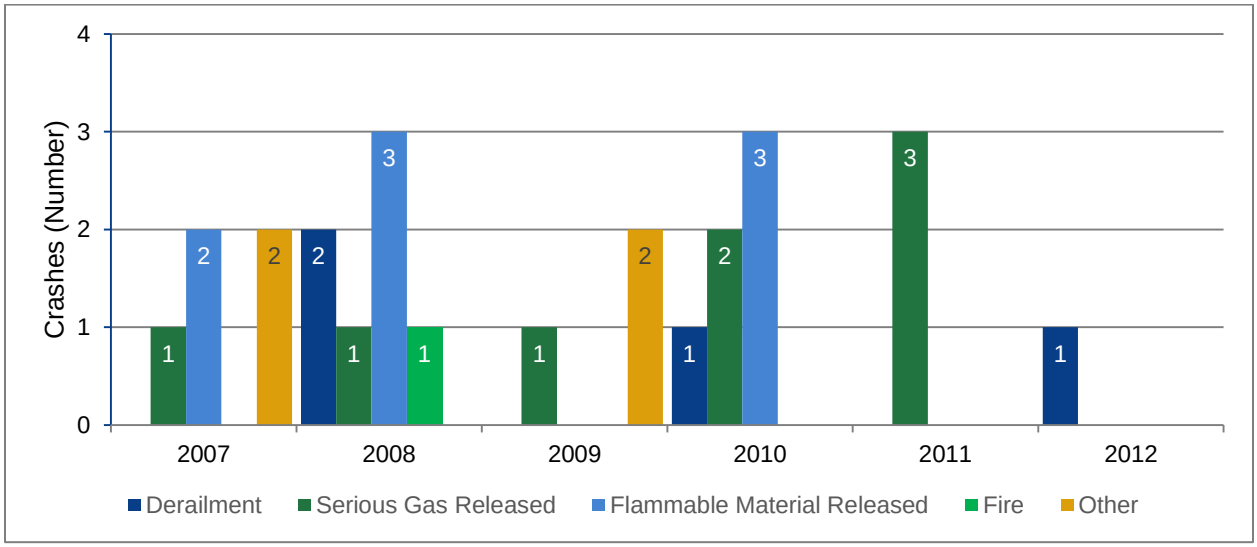
The number of hazardous material railroad incidents were relatively low in Oklahoma between 2007 and 2012, with 25 total incidents occurring during the six-year time period[7]. Of the 25 incidents, seven were considered serious[8] by the Pipeline and Hazardous Materials Safety Administration (PHMSA) and two required evacuations. However, none of the hazardous material railroad crashes resulted in a serious injury or fatality. **Table 3-13** and **Figure 3-11** summarizes the Oklahoma hazardous material railroad incidents by type during the six-year time period. The total number of hazardous material railroad incidents was lower in 2012 than in 2007, with the annual average being four.

Table 3-13: Hazardous Material Railroad Incidents, 2007-2012

Year	Derailment	Serious Gas Released	Flammable Material Released	Fire	Other	Total
2007	0	1	2	0	2	5
2008	2[1]	1	3	1	0	7
2009	0	1	0	0	2	3
2010	1	2[2]	3	0	0	6
2011	0	3	0	0	0	3
2012	1	0	0	0	0	1
Average Annual 2007-2012	**0.6**	**1.3**	**1.3**	**0.2**	**0.7**	**4.2**

Notes:
1. One incident had a derailment and fire occur. Recorded as derailment to avoid duplication.
2. One incident released a flammable gas. Recorded as serious gas released to avoid duplication.
Source: CDM Smith analysis based on data from the US DOT Pipeline and Hazardous Materials Safety Administration.

Figure 3-11: Hazardous Material Railroad Incidents, 2007-2012



Source: CDM Smith analysis based on data from the US DOT Pipeline and Hazardous Materials Safety Administration.

3.4 2014 SHSP

The ODOT is in the process of updating the 2007 SHSP with the intent of completing it in 2015. The Draft 2014 SHSP retained the 2007 SHSP vision statement: ***Provide and promote the safest roadway transportation system for all travelers- zero deaths, zero injuries.***

The Draft 2014 SHSP also retained the 2007 SHSP's Mission Statement***: Develop, implement, and evaluate a data driven multidisciplinary process to maximize road safety through widespread collaboration, integrating Engineering, Enforcement, Education, and Emergency Services (The 4E approach).***

Several chapters in the Draft 2014 SHSP will be the same as in the 2007 SHSP including an Executive Summary, the Need for a Strategic Highway Safety Plan, Safety Needs of the State, Overview of the Oklahoma SHSP Planning Process, Emphasis Areas and Strategies.

The development of the Draft 2014 SHSP is being guided by a Working Group that is comprised of ODOT, OHSO, FHWA, the Federal Motor Carrier Safety Administration (FMCSA), and the Oklahoma Department of Public Safety/Highway Patrol (ODPS/OHP).

The Working Group identified the following broad statewide safety goal areas.

To reduce:

- Fatalities;
- Fatality rate;
- Serious injury;
- Serious injury rate;
- Unrestrained occupant fatalities;
- Fatalities involving drivers or motorcycle operators with high (0.08 or greater) blood alcohol content; and
- Commercial motor vehicle collisions.

The first four statewide safety goals are consistent with MAP-21's Safety Performance Measures and the LRTP Safety Performance Measures, and relate to reduction in percent and number of traffic fatalities annually in Oklahoma, as well as reduction in percent and number of traffic-related serious injuries annually in Oklahoma.

The 2014 SHSP discusses three types of safety improvements strategies.

- **Hot Spots** – Analyze high crash locations. This is the traditional approach to analyze crash location, type, and frequency.

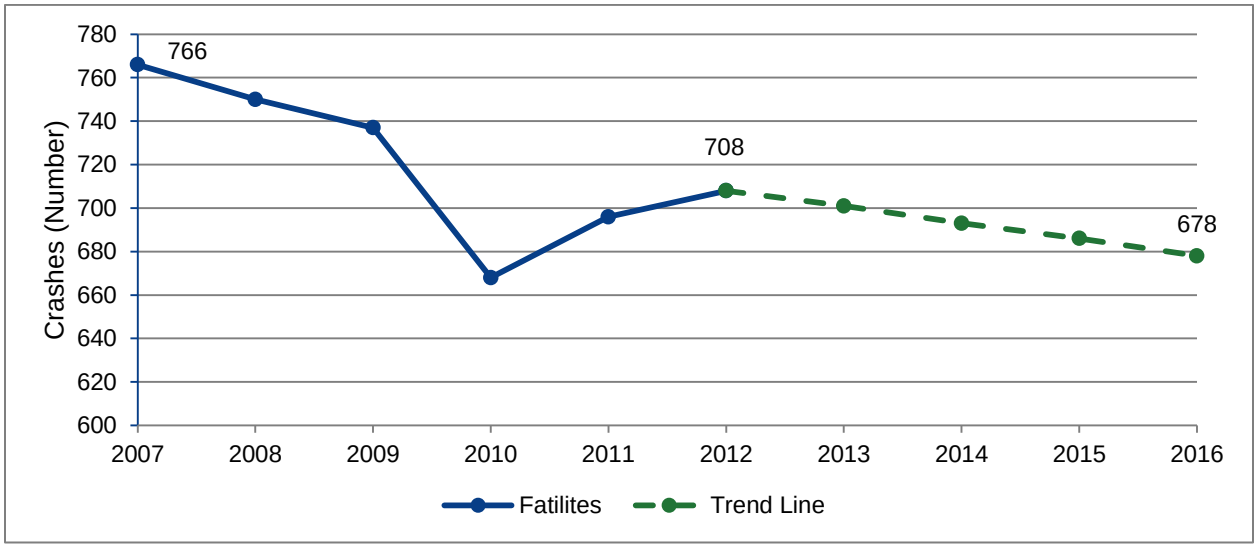
- **Systemic** – Use a particular solution to address roadway issues associated to a particular crash type, meeting certain criteria. For example, lane departure crashes could be reduced if rumble strips were installed system-wide, where roadway conditions correlate with the crash type.
- **Policy** – Utilize a policy guideline to guide implementation of improvements. In this case, there has typically been sufficient research and successful implementation of a given strategy that a policy can be utilized to address the issue. For example, ODOT has a statewide striping policy.

3.4.1 SHSP Goals Related to MAP-21 Performance Measures

MAP-21 established the following national goal categories: safety, infrastructure condition, congestion reduction, system reliability, freight movement and economic vitality, environmental sustainability, and reduced project delivery delays. Oklahoma's LRTP proposes performance measures for six of these seven categories.

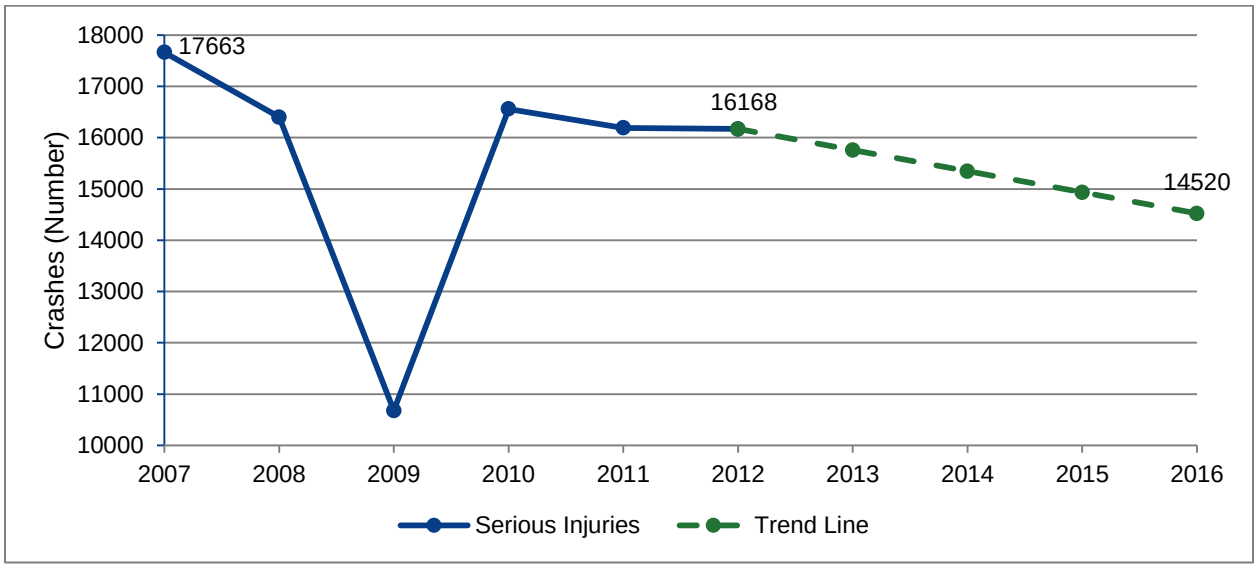
Two of the Draft 2014 SHSP goals address the MAP-21 safety performance measure: these are the goals to reduce the number of fatalities and to reduce the number of injuries on Oklahoma's roads and highways. The Oklahoma safety targets for 2016 are shown in **Figure 3-12** and **Figure 3-13**. In general, fatalities have been on the decline since 2007; and the draft 2014 SHSP sets a target of greater reduction - down from 708 in 2012 to 678 in 2016. Likewise, serious injuries have generally been declining since 2007; and the target is to reduce them from 16, 168 in 2012 to 14,520 by 2016.

Figure 3-12: SHSP Goals and Targets- Number of Fatalities



Source: CDM Smith analysis based on data from the Oklahoma Highway Safety Office.

Figure 3-13: SHSP Goals and Targets- Number of Serious Injuries



Source: CDM Smith analysis based on data from the Oklahoma Highway Safety Office.

3.4.2 Emphasis Areas and Strategies

The Draft 2014 SHSP includes the following four emphasis areas:

- Unsafe driver behavior (addressing impaired, aggressive, fatigued/distracted drivers, and occupant protection);
- Intersection crashes;
- Crashes involving young drivers; and
- Lane departure crashes.

3.4.3 Other 2014 SHSP Chapters under Development

A growing and welcome trend in many U.S. is to emphasize pedestrian and bicycle safety through planning and program initiatives. ODOT recognized the importance of pedestrian safety in the Draft 2014 SHSP where it discusses two programs: the Tulsa Pedestrian Action Plan and installation of Pedestrian Hybrid Beacons (PHBs). Tulsa's Pedestrian Action Plan is complete; and the city is now looking at strategies, potential projects, and funding sources. Three PHBs have been installed in Oklahoma, two on state highways and one on a local road, and two more are scheduled for installation by the end of 2014. ODOT should develop a formal process for PHBs to include a warrant analysis, design standards, and an inventory of installations.

3.5 SAFETY SUCCESSES AND OPPORTUNITIES

The following sections describe recent safety successes in Oklahoma as well as opportunities for improving safety on Oklahoma's transportation system.

3.5.1 Success- Safety Gains since 2007 SHSP

Oklahoma has made substantial progress towards reducing total and serious crashes on its roadways since the 2007 SHSP was published. Below is a sample of the significant improvements made between 2007 and 2012:

- Total crashes reduced by 5.9 percent
- Fatal crash rate reduced by 7.5. percent
- Fatalities reduced by 7.6 percent
- Serious injury crash rate reduced by 9.8 percent
- Alcohol and drug impaired crashes reduced by 37 percent and 7. percent, respectively
- Drivers less than 20 years old involved in crashes reduced by 18.5 percent
- Lane departure crashes reduced by 8.1 percent
- Bicyclist crashes reduced by 19.8 percent

These are significant gains, but more improvements are needed as ODOT develops and implements the 2014 SHSP. For example, the Oklahoma fatal crash rate is down by 7.45 percent, but nationally it is down 16.8 percent during the same six-year time period. Pedestrian fatalities remained constant in the six year reporting period and the total number of pedestrians involved in crashes increased by 5.4 percent.

3.5.2 Opportunity- Crosscutting Strategies

An early version draft 2014 SHSP did not yet include the same or new crosscutting strategies as were included in the 2007 SHSP. The four 2007 SHSP crosscutting strategies included:

- Improve emergency response time;
- Increase enforcement in high-crash corridors;
- Improve crash data and its availability; and
- Facilitate safer vehicles through a vehicle inspection program.

ODOT has made progress in all of these crosscutting strategies except a vehicle inspection program, which is perhaps the most challenging of the four because it can be divisive and challenging to implement. More importantly, ODOT would need to determine if the program should have state-run inspection facilities or private

facilities regulated by the state. Since some success has been realized in crosscutting strategies, ODOT may want to consider providing an update of these successes in the 2014 SHSP.

3.5.3 Opportunity- Pedestrian Hybrid Beacons (PHB)

ODOT recognized the importance of pedestrian safety in the Draft 2014 SHSP where it discusses two programs: the Tulsa Pedestrian Action Plan and installation of Pedestrian Hybrid Beacons (PHBs). ODOT should develop a formal process for PHBs to include a warrant analysis, new state laws, design standards, and an inventory of installations.

3.5.4 Opportunity- Reference Tools Available to Address Focus Areas

Throughout the U.S. there are a significant number of excellent reference manuals and documents that can assist ODOT and OHSO address the four 2014 SHSP focus areas. The following provides key safety documents being used:

- Pedsafe 2013- Pedestrian Safety Guide and Countermeasure Selection System- FHWA (Zegeer, et al., August 2013). This is an on-line or CD based document that provides practitioners a toolbox of countermeasures to improve pedestrian safety.
- Bicycle and Pedestrian Road Safety Audit Guidelines and Prompt Lists- FHWA (Nabors, et al., May 2012). This document has a discussion on the basic Road Safety Audit concepts from a pedestrian viewpoint and a field manual of potential pedestrian safety issues.
- Pedestrian and Bicyclist Crash Analysis Tools- FHWA (Harkey, et al., June 2006). This software is used to develop crash reports and countermeasures from the Pedsafe and Bikesafe toolbox.
- Safety in the Project Development Process: A Context Sensitive Approach- ITE Publication in Draft form (July 2014). This document is under development but will be a user guide for the Highway Safety Manual and will specifically address integration of safety into all modes of travel and all phases of project development and operation.
- Statewide Opportunities for Integrating Operations, Safety, and Multimodal Planning- A Reference Manual- FHWA (Grant, et al., May 2010). This document provides a how-to guideline on state safety integration at all levels from the central office to corridor management.

Although pedestrian and bicycle safety are not specifically listed as focus areas in the Draft 2014 SHSP, it is an area of increased interest to Oklahomans and merits more attention.

3.5.5 Opportunity- High Risk Rural Roads

Rural roads are a significant 84 percent of Oklahoma's roadway inventory, but the incidence of crashes and fatalities is higher on rural roads than other types of roads in the state. ODOT's Traffic Engineering Division should continue working closely with Traffic Engineers in the Field Divisions to identify vulnerable locations and the appropriate improvements. Approximately half of the 8,700 miles of two lane highways[9] in Oklahoma are rural roads with shoulders less than two feet wide. Adequate shoulders at least four feet wide provide many benefits including but not limited to space for roadside emergencies, space to maneuver and avoid potential crashes, space for bus stops, mail delivery and detours, improved sight distance, and drainage removal from the roadway[10] .

3.5.6 Successes and Opportunity- Data Collection

Success- SAFE-T Database

The Statewide (safety) Analysis for Engineering and Technology (SAFE-T) software system is used by ODOT and local government agencies to manage and analyze crash data. It produces and analyzes statewide crash data so safety engineers can examine trends and tendencies on Oklahoma highways. For example, it has the capability to produce data and analyze it with regard to crashes occurring in rainy conditions. It can also be used to examine high crash segments or intersections through collision analysis reports.

The University of Oklahoma's Intelligent Transportation System (ITS) Laboratory, under contract with ODOT, maintains the SAFE-T system. Crash data are gathered from the Oklahoma Department of Public Safety's Records Management Division who then forwards the crash data to the ODOT Traffic Division. The ODOT Traffic Division then prepares the crash data for the ITS lab. The OHSO in collaboration with the ODOT Traffic Engineering Division analyzes, summarizes, and presents a substantial amount of statewide crash data using SAFE-T.

In the past, crash data were coded into the system based on a statewide grid and log mile system, but recently a GIS mapping utility was developed that will allow crashes to be geo-coded. SAFE-T has undergone several improvements over its history.

Success- Better Crash Data and Availability

Over the last six years from 2007 to 2012 Oklahoma has made substantial strides in providing better crash data in terms of accuracy and availability. In addition to SAFE-T improvements, ODOT has implemented a new Traffic Collision Report form and developed an annual Collision Data Digest containing information on proven countermeasure's and showing five-year crash trends for the eight Field Divisions.

Opportunity- Data on Emerging Safety Challenges

The OHSO is a significant resource for crash data. It is able to provide statewide statistics, data on corridors that experience above average crash rates, quick facts

about crashes in Oklahoma, and numerous other important statistics about highway safety.

As Oklahoma becomes more multimodal, it will need to keep statistics on transit crashes and develop programs to minimize them. It is also recommended that ODOT record data on hazardous material crashes including determining how long roads are closed as a result of the incident.

The following two action items are recommended:

- Track and publish transit vehicle crashes; and
- Track the length of time roads are closed due to incidents.

3.5.7 Success and Opportunity- Policies toward Zero Fatalities and Zero Serious Injury Crashes

Working toward the goal of zero fatalities and zero injuries requires a comprehensive effort involving Oklahoma's 4Es of Engineering, Education, Enforcement, and Emergency Services. ODOT's 2014 SHSP focuses on fatalities and serious injuries including the raw values and the rate per 100 million vehicle miles traveled.

On the engineering side, ODOT has a significant number of programs in place that use a system level systemic approach to address a particular crash type. These programs must continue and should be funded at or above the current level. Furthermore, ODOT should continue its location-based safety program whereby it identifies crash hot spots and implements strategies to reduce crashes at that location. This traditional method needs to be funded at or above current levels. More emphasis should be placed on the safety of transit and non-motorized modes of travel.

OHSO does a thorough job collecting and analyzing safety data and promoting safety through education. This program should continue with annual enhancements that provide new policies or tactics to reduce highway fatalities and serious injuries.

3.5.8 Opportunity- Safety Integration

Many states have begun a purposeful integration of safety and traffic operations into all aspects of their organization. Thus, safety is being weaved into planning, design, operation, and maintenance throughout the entire DOT organization. Moreover, this integration is occurring within all modes of travel- bikes, pedestrians, and automobiles. As mentioned in a previous section of this report, guidance to improve safety integration is documented in FHWA's *Statewide Opportunities for Integrating Operations, Safety, and Multimodal Planning, a Reference Manual***.**

The 2014 SHSP will have a chapter on multi-party cooperation that will discuss the framework for better safety integration throughout the ODOT and with public safety partners.

3.5.9 Opportunity- Aging Population

Even as Oklahoma's population continues to grow, the composition is also changing. The *Demographics, Socioeconomic and Land Use Technical Memorandum* provides population projections to the year 2040. According to estimates from Woods & Poole, the state's senior population (those aged 65+) is expected to increase by 266,000 persons – or just over 52 percent – from 2010 to 2040 and this has significant safety implications

This demographic change will affect the state's transportation system, like any other socioeconomic system, as seniors rarely independently perform the basic home-to-work travel functions and often have mobility restrictions that make travel more complicated. Some of the more common factors seniors encounter include increased reaction time, loss of visual and hearing abilities, and decreased cognitive function as among the most frequent issues affecting seniors' mobility.

Across the U.S., other states are facing the challenge of how to safely accommodate an aging population that still desires a high level of mobility. Older drivers experience driving challenges not necessarily because of their age, but instead because of growing health issues.

A sample of what some other states are doing with regard to older drivers:

- Illinois requires a road test every four years to check driving skills at age 75 and the frequency increases to every two years at age 81.
- New Mexico requires a driver's license renewal every year after age 75.
- Iowa requires a driver's license renewal every two years after age 70.
- Missouri requires drivers 70 years or older to renew every three years instead of the normal six years.

Clearly, there is a wide variety of strategies used to address the increase in older driver population and the risk they bring to the road system. Oklahoma requires drivers that are 70 years age and older to renew their license in person and take a visual test. Additionally, in certain instances, the Department of Motor Vehicles (DMV) requires older drivers to take the written test to confirm that a minimum level of knowledge has been retained. This requirement can be initiated by a family member, physician, Emergency Medical Technician (EMT), or police officer.

This is a sensitive issue that goes beyond transportation because at its core is the freedom Americans all expect and the desire to treat everyone equal and with respect. It is recommended that ODOT, in conjunction with the OHSO, consider a study on aging drivers in the state. This study should include a peer state review, analysis of data, a review of the current policies, broad stakeholder involvement, and recommendations on how to move forward.

3.5.10 Opportunity- Distracted Driving

Oklahoma does not have specific laws prohibiting drivers from using their cell phones or other electronic devices to talk or text while driving. However, there is a state law against distracted driving that says: "the operator of every vehicle, while driving, shall devote their full time and attention to such driving." Hence, law enforcement officers cannot issue a ticket for talking or texting while driving unless the driver is involved in crash or is driving very erratically.

Distracted driving is an unsafe driver behavior that received significant attention in the 2007 and 2014 SHSP. Oklahoma has undertaken several distracted driving campaigns statewide and has participated in some national efforts to educate the public on the consequences of texting and driving.

To combat the growing problem of distracted driving and the specific concern of texting while driving, the ODOT and OHSO should continue, and possibly increase, public awareness campaigns to discourage this behavior.

Source: Oklahoma Highway Safety Office Web Site; http://www.trafficsafetymarketing.gov/

4. SECURITY

The State of Oklahoma has seen tragedy firsthand when the Murrah Federal Building was bombed by domestic terrorists in 1995, killing 168 people and injuring hundreds more. Many lessons were learned that have improved security on Oklahoma's transportation system. Unfortunately, due to these types of events, natural disasters, and the potential for other system failures, security is an issue that all states must proactively address. As with most challenges, providing appropriate security on Oklahoma's transportation system requires teamwork. To start, the security objectives as related to transportation in Oklahoma should:

- Provide for safer travel for all modes of travel;
- Improve the security of the entire transportation system; and
- Improve the ability of the transportation system to support emergency management response and recovery.

4.1 SECURING CRITICAL ASSETS

There are hundreds of critical assets in Oklahoma that require protection. Listed in the next three subsections are a sampling of assets and events that should be made secure, to the extent possible, and that should have an evaluation and transportation response plan. This is not an exhaustive list but is intended to be illustrative of the types of assets and events that need special security attention and to identify where the transportation system can support the security of the facility or event.

4.1.1 Military Bases

Listed below are the principal Air Force, Army, and Coast Guard critical assets in Oklahoma:

- Altus Air Force Base
- Tinker Air Force Base
- Vance Air Force Base
- Fort Still Army Base
- McAlester Army Ammunition Base
- U.S. Coast Guard Institute Base, Oklahoma City
- U. S. Coast Guard Container Inspection Training, Oklahoma City

4.1.2 Universities

There are numerous colleges, universities, and technical schools in Oklahoma that may need attention in terms of how transportation can support its security. Listed below are most of the major universities in Oklahoma that may need to develop or update a transportation security plan:

- The University of Oklahoma
- Oklahoma State University
- University of Tulsa
- University of Central Oklahoma
- University of Oklahoma Health Sciences Center
- Northeastern State University
- Southern Nazarene University
- Southwestern Oklahoma State University
- Oral Roberts University
- Cameron University
- Oklahoma City University
- Oklahoma Baptist University
- East Central University
- Oklahoma Christian University
- University of Science and Arts of Oklahoma
- Oklahoma Panhandle State University Northwestern Oklahoma State University
- Southeastern Oklahoma State University
- Langston University
- Oklahoma Wesleyan University
- St. Gregory's University
- Southwestern Christian University

4.1.3 Other Buildings, Sites, Events

A sampling of infrastructure, buildings, and events that should be included in transportation security measures in Oklahoma includes:

- Major Bridges and Dams
- Public Transportation
- Rail Lines
- Interstates
- Major Airports
- City Halls in all Major Cities
- Federal Buildings
- State Capital Buildings
- Hospitals
- Sport Arenas and Stadiums
- Festival of the Arts in Oklahoma City
- Norman Music Festival
- Tulsa International Mayfest
- Oklahoma State Fair
- Nuclear Power Plants

4.2 ODOT'S ROLE WITH EMERGENCY AND INCIDENT COMMAND SYSTEM STRUCTURE

The ODOT has a significant role with regard to the state's emergency management system. According to the Oklahoma Emergency Operations Plan, ODOT serves as the primary state coordinating agency in relation to transportation and public works procedures. Under the transportation function, ODOT is responsible for coordinating with the federal government for assistance in areas such as allocation of civil transportation capacity, processing transportation requests, air and marine traffic control, disaster airlift operation management, hazardous materials action and damage assessment. The public works function call for ODOT to coordinate with the federal government for assistance in the areas if debris removal, engineering and construction, and utilities restoration.[11] Additionally ODOT is currently updating its Intelligent Transportation System plan – a vital component of managing emergencies and major incidents.

The Oklahoma Department of Emergency Management (OEM) is the state agency designated to coordinate the response to a natural disaster that occurs in the State. This is achieved primarily through the development and maintenance of a comprehensive statewide emergency management plan.

OEM is responsible for coordinating the efforts of the federal government with other state departments and agencies, county and municipal governments and school boards, and with private agencies that have a role in emergency management. To perform this function, the OEM works closely with the state departments of Agriculture, Environmental Quality, Health, Public Safety, and Transportation, as well as the Oklahoma National Guard, the Oklahoma Office of Homeland Security, and the Governor's Office.

4.3 SECURITY NEEDS FOR EXTREME WEATHER EVENTS

Tornadoes and other extreme weather events require good response from ODOT to attend to those injured, clean up the area, and repair damage to critical infrastructure. The same basic services provided for a major incident would also apply to extreme weather events.

4.4 INTERACTION WITH ITS

ITS systems and equipment play a critical transportation role in supporting safety and security during man-made and natural disasters. During a crisis, accurate information is invaluable and can help protect the public and minimize inconvenience to travelers. When a security incident occurs, ODOT's ITS should be used to the maximum extent possible to inform the public of traveling options for all modes.

4.5 SECURITY RECOMMENDATIONS

The following list provides general recommendations that ODOT and partnering agencies should consider carrying out relative to transportation security and the supporting role it has when a disaster occurs:

- Provide a high level review of potential security needs;
- Record/update key transportation security risks;
- Update existing and create new evacuation plans;
- Review NCHRP Report 525- Surface Transportation Security: Volume 16;
- Develop/ update a Collaborative Transportation Security Planning Team to:
  - Identify hazards and threats
  - Identify goals and objectives
  - Develop courses of action and identify resources
  - Develop the plan
  - Approve and implement the plan
  - Test the plan and refine it as necessary
  - Review and update the plan on a regular basis

5. CONCLUSION

Providing appropriate security on Oklahoma's transportation system is critically important and requires collaboration between numerous federal, state and local agencies. The state transportation security objectives should be to provide safe travel, improve and maintain security at critical locations, and support emergency management in a time of crisis. First and foremost, critical assets, both in the transportation system and land uses, need to be identified and secured to the extent possible. ODOT has a significant role in the state's emergency management plan that is maintained by the Oklahoma Department of Emergency Management (OEM). The supporting role that ODOT provides to OEM should continue and be strengthened whenever possible. One such case is the improvements underway for ODOT's Intelligent Transportation System that provides a vital component for managing emergencies. The recommendations in Section 4.5 should be carried out by ODOT and partnering agencies.

6. ENDNOTES

[1] Oklahoma's first Strategic Highway Safety Plan (SHSP) was adopted in 2007. The second edition (Draft 2014 SHSP) is in draft version and is used as a source for information in this report.

[2] Participants in the planning process for the second edition of the Oklahoma SHSP, the Draft 2014 SHSP, included the Oklahoma Department of Transportation (ODOT), the Oklahoma Highway Safety Office (OHSO), Federal Highway Administration (FHWA), the Federal Motor Carrier Safety Administration (FMCSA), the Oklahoma Department of Public Safety / Highway Patrol (ODPS/OHP). Data analysis assistance and consultation was provided by the University of Central Oklahoma.

[3] The University of Central Oklahoma Math Department served as a data consultant for the group that developed the Draft 2014 SHSP. That group included: the Oklahoma Department of Transportation (ODOT), the Oklahoma Highway Safety Office (OHSO), the Federal Highway Administration (FHWA), the Federal Motor Carrier Safety Administration (FMCSA), and the Oklahoma Department of Public Safety / Highway Patrol (ODPS/OHP). The consultant conducted an analysis of traffic collision and safety data to assist with the development of the Draft 2014 SHSP and related recommendations. Using statistical techniques, the data consultant analyzed data from 1997 to 2012 to determine historical trends. The data used to calculate the trends and confidence bands go back to year 1997.

[4] The Draft 2014 SHSP Executive Summary includes an analysis of historical fatality and serious injury data in Oklahoma from 1997 through 2011. This analysis includes a trend line showing a 2015 fatality rate per HMVMT of 1.33.

[5] Lane departures are when a vehicle leaves its lane into oncoming traffic (centerline or median crossover), into another lane in the same direction, or off of the roadway onto a shoulder or beyond.

[6] The classification of large trucks does not include personal pickup trucks, buses, and single unit trucks. Commercial vehicle trucks are another way to define the large truck classification. The large trucks include vehicle configurations as follows: Single Trailer Trucks with 3-4 axles, Single Trailers with 5 axles, Single Trailers with 6 or more axles, Multi Trailers with 5 or fewer axles, Multi Trailers with 6 axles, Multi Trailers with 7 or more axles.

[7] By comparison, the State of Kansas experienced 47 incidents during the same time period.

[8] PHMSA defines "serious incidents" as incidents that involve: a fatality or major injury caused by the released of a hazardous material, the evacuation of 25 or more persons as a result of release of a hazardous material or exposure to fire, a release or exposure to fire which results in the closure of a major transportation artery, the alteration of an aircraft flight plan or operation, the release of radioactive materials from Type B packaging, the release of over 11.9 gallons or 88.2 pounds of a severe marine pollutant, or the release of a bulk quantity (over 119 gallons or 882 pounds) of a hazardous material. https://hazmatonline.phmsa.dot.gov/IncidentReportsSearch/Search.aspx

[9] Two lane highways make up 8701 centerline miles of the State Highway System. Within this subset, 4267 miles of two lane highways have shoulders less than two feet. ODOT, GIS Branch, Strategic Asset & Performance Management, ODOT, December 2014.

[10] AASHTO Policy on Geometric Design of Highways and Streets

[11] http://www.ok.gov/OEM/documents/2009%20EOP.pdf