

# **TRAFFIC SAFETY EVALUATION**

## **Using the Highway Safety Manual and the Interactive Highway Safety Design Model**

### **US 93 North of Lages Jct. MP WP111 to MP EL70 Shoulder Widening**

Prepared for:



Nevada Department of Transportation  
Safety Engineering

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# US 93 WP111 to MP EL70 Shoulder Widening - Safety Evaluation

## SAFETY EVALUATION

### 1.1 Analysis Overview

A safety analysis has been performed on United States (US) 93 from MP WP111 to MP EL70 south of Wells, Nevada. This segment of roadway is a rural two lane highway in White Pine (WP) and Elko (EL) counties. This segment of roadway has experienced a high number of crashes over the previous five years based on average annual daily traffic. The existing condition is twelve foot lanes and paved shoulder widths that vary from one foot to six feet. This project includes widening the shoulder to six feet for the entire length including adding shoulder rumble strips. The project also includes milling and overlapping the existing roadway. For the purposes of this evaluation the shoulder widening project will be analyzed for future crashes and compared to existing conditions expected future crashes and a Benefit Cost (B/C) Analysis.

Using the American Association of State & Highway Transportation Officials Highway Safety Manual (HSM) Predictive Method, expected crash totals were estimated using the Interactive Highway Safety Design Model (IHSDM) to evaluate safety improvement for the roadway segment. The effect on traffic safety was analyzed to determine the safety benefit of widening the shoulder to a constant six feet. **Figure 1** and **Figure 2** are vicinity maps and an aerial of the study area.

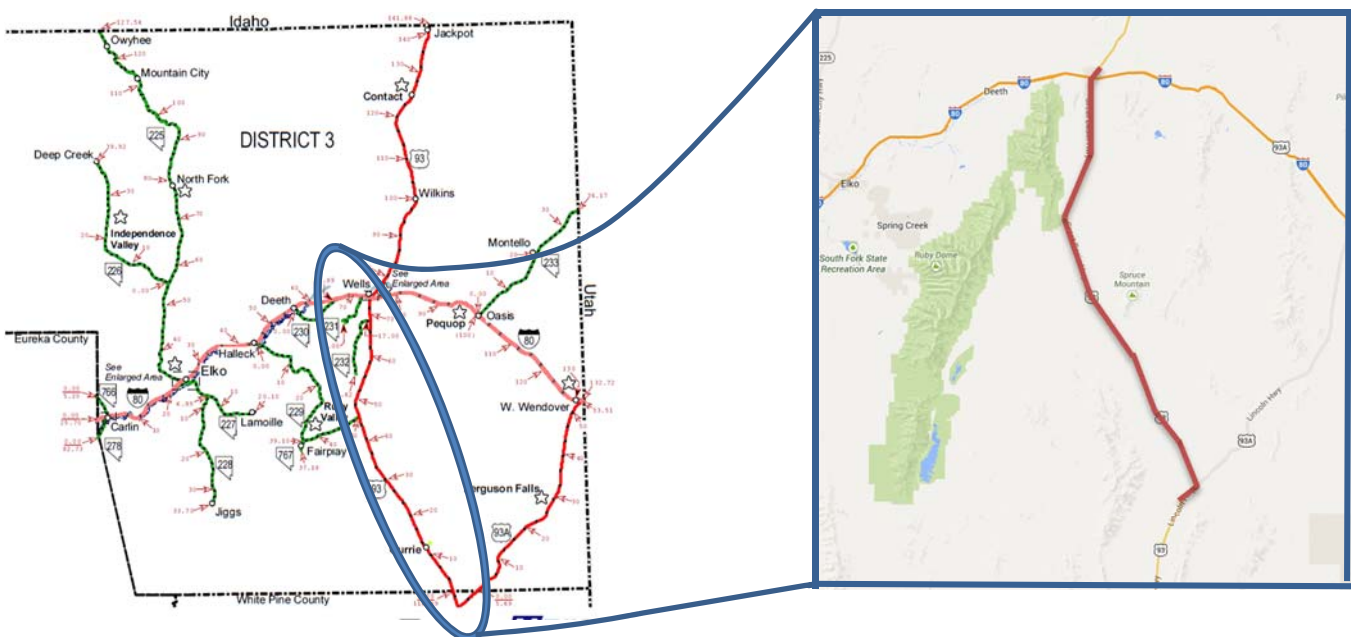
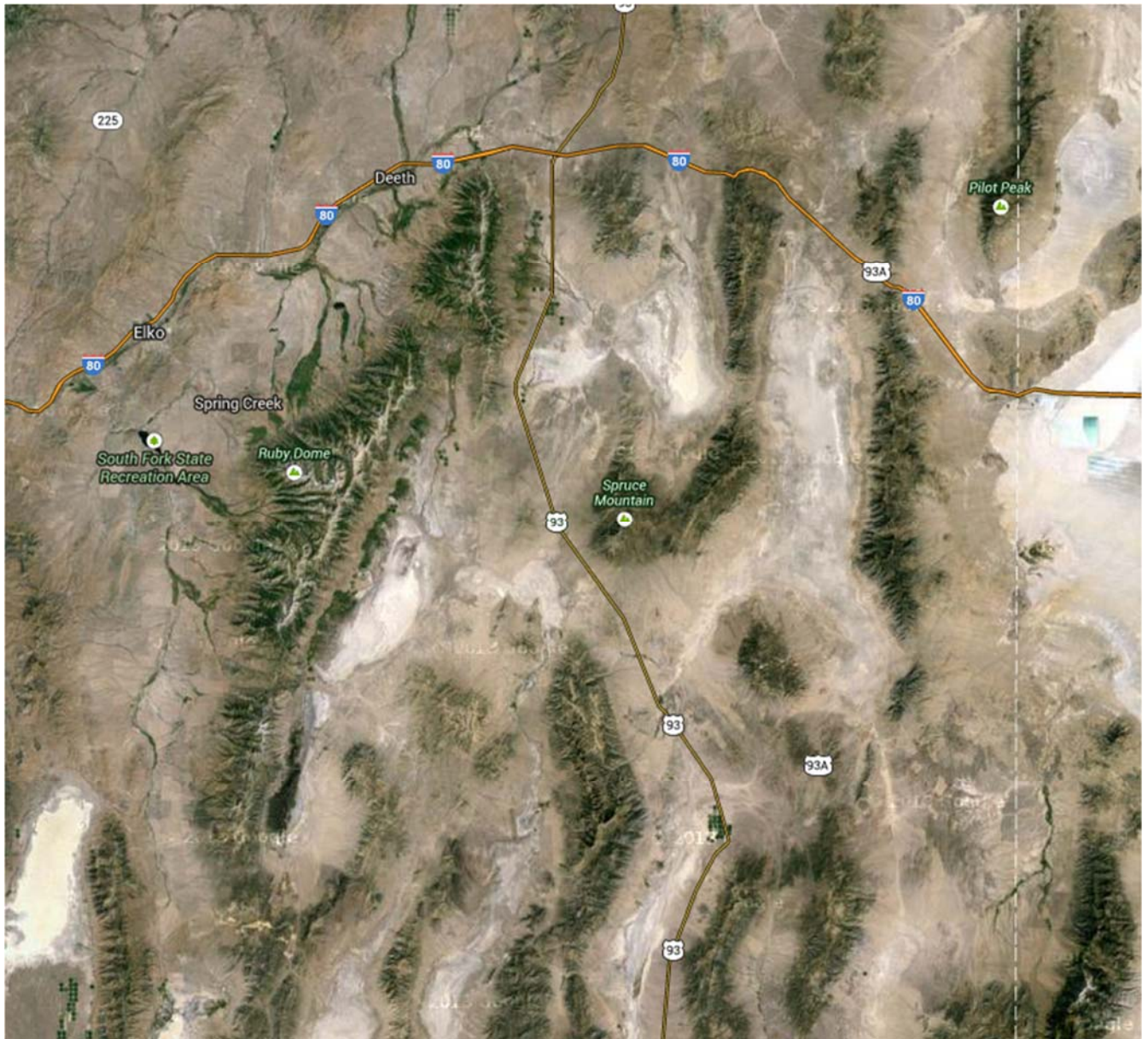


Figure 1. Vicinity Map and Blow Up of US 93



**Figure 2. Aerial view of US 93**

## 1.2 Expected Crash Analysis

Using the IHSDM to complete the HSM Predictive Method, the safety improvements of the project were quantified and compared to the existing condition of this segment of roadway for the 20-year evaluation period. The Safety Performance Function for a Rural Two Lane Road conditions requires the following data for predictive analysis:

- Complete horizontal alignment and grades for the vertical alignment.
- General; annual average daily traffic, area type and design speed.
- Cross-section; cross slope, through lane width, auxiliary lanes, shoulders and two way left turn lanes.
- Roadside; driveway density and roadside hazard rating.
- Other; Lighting, Automated speed enforcement and centerline rumble strip.
- Crash history data; segment-related crashes and intersection-related crashes.

The base conditions for analysis, as seen in **Table 1**, were entered into the model.

	Conditions for Analysis	
	Existing Conditions	Alt. 1
		Shoulder Widening
<i>Number of Lanes</i>	2	2
<i>Shoulder Width</i>	1-6 Feet	6 Feet
<i>Presence of Lighting</i>	No	No
<i>Cross Slope</i>	2.00%	2.00%
<i>Design Speed</i>	25-70 MPH	25-70 MPH
<i>Driveway Density</i>	0.5 Driveways/mi	0.5 Driveways/mi
<i>AADT 2012</i>	1,100-1,500	1,100-1,500
<i>AADT 2032</i>	1,600-2,200	1,600-2,200
<i>Centerline Rumble Strip</i>	Yes	Yes
<i>Roadside Hazard Rating</i>	1-4	1-4
<i>Edgeline Rumble Strip</i>	No	Yes

**Table 1. Base Conditions for Analysis**

Observed crashes were used in a site specific Empirical-Bayes analysis to further refine the predictive results. Crash data was obtained for property damage only crashes and fatal or serious injury crashes over a 6 year period from 2007 to 2012. The crash values for 2007 and 2012 were thrown out of the analysis due to their inconsistency with the other years with respect to pure number of crashes. There were a 115 total crashes between 2008 and 2011. All of the crashes were non intersection related with the majority (105) being single vehicle crashes. There were a total of 67 property damage only crashes and 48 fatal or serious injury crashes. The crashes associated the roadway segment are further summarized in **Appendix A**.

The expected crash totals and crash rates for the next 20 years for the existing condition and Alternative 1 are summarized in **Table 2**. The IHSDM Predictive Method results for Alternative 1 are further summarized in **Appendix B**.

Scenario	Expected No. Crashes for Evaluation Period	Expected No. Crashes/Year (crashes/million veh-mi)	Expected Crash Rate (crashes/mi/yr)
<i>Existing Conditions</i>	759	0.88	0.47
<i>Alternative 1</i>	593	0.69	0.36

**Table 2. Expected Crash Totals**

The widening of the shoulder to a consistent 6 feet and the addition of shoulder rumble strip with a CMF of 0.84 would reduce the annual crashes by 21.9%. Along with the IHSDM analysis a Nevada Calibration factor (1.21) was applied. The crash reduction is shown in Table 3.

	2013-2033 Expected Total Number of Crashes	
	Existing Conditions	Alt. 1 Shoulder Widening
<i>Total</i>	759	593
<i>Reduction in Total Crashes over Existing Conditions</i>	N/A	166.3
<i>Crash Reduction Factor (CRF)</i>	N/A	21.9%

**Table 3. Summary of Crash Reduction**

### 1.3 Benefit-Cost Ratio Economic Analysis

The following B/C Ratio found in **Table 4** was calculated using the HSM severity distribution for crashes, as shown in Table 10-3 of the HSM. The primary analysis only takes into account cost of shoulder widening without the pavement rehabilitation portion of the project. The total project cost is estimated at \$21M. Construction costs were estimated by NDOT. The estimated shoulder improvement cost is separated from the total project cost at \$11M. The complete cost break down can be found in **Appendix C**. Complete results from the B/C analysis can be found in **Appendix D**.

	Benefit-Cost Ratio	
	Existing Conditions	Alt. 1
		Shoulder Widening
<i>Total Alternative Cost</i>	N/A	\$11,000,000
<i>Total Annual Benefit including 2% Growth per year</i>	N/A	\$943,673
<i>Total Annualized Cost</i>	N/A	\$766,568
<i>Benefit-Cost Ratio</i>	N/A	1.23
<i>Average Annual Net Return</i>	N/A	\$177,105

**Table 4. Annual Benefits, Annual Costs, and B/C Ratio**

### 1.4 Results

Widening the shoulder to a consistent six feet the entire length of the project and adding shoulder rumble strips has the potential to reduce crashes according to the HSM Predictive Method. The total number of crashes over the 20 year period from 2013-2033 has the potential to decrease by 21.9%. Reduction is generated by shoulder widening and shoulder rumble strips. The B/C Ratio is 1.23 which means this is a cost effective safety improvement and is above the general minimum B/C Ratio of 1.0. The Federal Highway Administration requires a ratio of 1.0 or higher in order for a project to be eligible for Highway Safety Improvement Project funding. See **Appendix C** for a break out of shoulder construction cost versus the total project cost of \$21 million.

## **1.5 Considerations**

Other considerations not contained in the HSM Predictive Method or B/C Ratio analysis should be taken into account by decision makers in order to proceed with design and construction of this alternative such as operational improvements, environmental constraints, and funding.

## **1.6 Conclusions**

The predictive method and the B/C Ratio is an effective tools to evaluate the future effects of safety improvements for this section of US 93. Shoulder widening with the addition of a shoulder rumble strip would be a practical safety improvement. NDOT should use results contained within this report, other monetary/non-monetary considerations, and project funding/budget to determine how to proceed and improve the segment.



## **APPENDIX A**

### **Crash Data**

<b>Year</b>	<b>Severity</b>	<b>Type</b>	<b>Location</b>	<b>Direction</b>	<b>Relation to Intersection</b>
2007	Fatal or serious injury	Single Vehicle	25+701.360	Increasing	Non-intersection-related
2007	Fatal or nonfatal injury	Single Vehicle	37+581.360	Increasing	Non-intersection-related
2007	Property damage only	Single Vehicle	58+701.360	Increasing	Non-intersection-related
2007	Property damage only	Single Vehicle	63+981.360	Increasing	Non-intersection-related
2007	Property damage only	Single Vehicle	85+101.360	Increasing	Non-intersection-related
2007	Fatal or serious injury	Single Vehicle	108+544.560	Decreasing	Non-intersection-related
2007	Property damage only	Multi Vehicle	119+949.360	Decreasing	Non-intersection-related
2007	Property damage only	Single Vehicle	185+421.360	Increasing	Non-intersection-related
2007	Property damage only	Single Vehicle	195+981.360	Decreasing	Non-intersection-related
2007	Fatal or serious injury	Single Vehicle	201+261.360	Decreasing	Non-intersection-related
2007	Fatal or serious injury	Single Vehicle	232+941.360	Increasing	Non-intersection-related
2007	Property damage only	Single Vehicle	238+221.360	Increasing	Non-intersection-related
2007	Fatal or serious injury	Single Vehicle	265+413.360	Increasing	Non-intersection-related
2008	Property damage only	Single Vehicle	32+301.360	Decreasing	Non-intersection-related
2008	Property damage only	Single Vehicle	37+581.360	Decreasing	Non-intersection-related
2008	Fatal or serious injury	Single Vehicle	40+221.360	Decreasing	Non-intersection-related
2008	Fatal or serious injury	Single Vehicle	42+755.760	Decreasing	Non-intersection-related
2008	Fatal or serious injury	Single Vehicle	44+867.760	Decreasing	Non-intersection-related
2008	Fatal or serious injury	Single Vehicle	53+421.360	Increasing	Non-intersection-related
2008	Property damage only	Multi Vehicle	54+213.360	Increasing	Non-intersection-related
2008	Property damage only	Single Vehicle	74+541.360	Decreasing	Non-intersection-related
2008	Fatal or serious injury	Single Vehicle	83+094.960	Increasing	Non-intersection-related
2008	Fatal or serious injury	Multi Vehicle	89+853.360	Decreasing	Non-intersection-related
2008	Property damage only	Single Vehicle	153+741.360	Decreasing	Non-intersection-related
2008	Fatal or serious injury	Single Vehicle	188+061.360	Increasing	Non-intersection-related
2008	Property damage only	Single Vehicle	190+701.360	Increasing	Non-intersection-related
2008	Fatal or serious injury	Single Vehicle	195+453.360	Increasing	Non-intersection-related
2008	Fatal or nonfatal injury	Single Vehicle	201+261.360	Decreasing	Non-intersection-related
2008	Property damage only	Multi Vehicle	201+261.360	Decreasing	Non-intersection-related
2008	Property damage only	Single Vehicle	203+637.360	Decreasing	Non-intersection-related
2008	Property damage only	Single Vehicle	206+541.360	Increasing	Non-intersection-related
2008	Fatal or serious injury	Single Vehicle	210+395.760	Decreasing	Non-intersection-related
2008	Property damage only	Single Vehicle	217+101.360	Decreasing	Non-intersection-related
2008	Fatal or serious injury	Single Vehicle	248+781.360	Increasing	Non-intersection-related
2008	Property damage only	Single Vehicle	259+341.360	Increasing	Non-intersection-related
2008	Property damage only	Single Vehicle	264+357.360	Increasing	Non-intersection-related
2008	Property damage only	Single Vehicle	264+621.360	Decreasing	Non-intersection-related
2008	Fatal or serious injury	Single Vehicle	280+461.360	Increasing	Non-intersection-related
2008	Property damage only	Single Vehicle	285+741.360	Increasing	Non-intersection-related
2008	Fatal or serious injury	Single Vehicle	302+742.960	Increasing	Non-intersection-related
2009	Property damage only	Single Vehicle	24+921.360	Increasing	Non-intersection-related
2009	Fatal or nonfatal injury	Multi Vehicle	48+141.360	Decreasing	Non-intersection-related
2009	Property damage only	Multi Vehicle	48+141.360	Decreasing	Non-intersection-related
2009	Property damage only	Single Vehicle	63+875.760	Increasing	Non-intersection-related
2009	Property damage only	Single Vehicle	63+981.360	Decreasing	Non-intersection-related

2009	Fatal or serious injury	Single Vehicle	74+541.360	Increasing	Non-intersection-related
2009	Property damage only	Single Vehicle	85+101.360	Decreasing	Non-intersection-related
2009	Property damage only	Single Vehicle	180+146.360	Increasing	Non-intersection-related
2009	Property damage only	Single Vehicle	195+981.360	Increasing	Non-intersection-related
2009	Property damage only	Single Vehicle	204+323.760	Decreasing	Non-intersection-related
2009	Fatal or serious injury	Single Vehicle	206+541.360	Increasing	Non-intersection-related
2009	Fatal or nonfatal injury	Single Vehicle	206+541.360	Increasing	Non-intersection-related
2009	Fatal or nonfatal injury	Single Vehicle	211+821.360	Increasing	Non-intersection-related
2009	Property damage only	Single Vehicle	213+141.360	Increasing	Non-intersection-related
2009	Property damage only	Single Vehicle	231+621.360	Decreasing	Non-intersection-related
2009	Fatal or serious injury	Single Vehicle	238+221.360	Increasing	Non-intersection-related
2009	Fatal or serious injury	Single Vehicle	244+610.160	Decreasing	Non-intersection-related
2009	Fatal or nonfatal injury	Single Vehicle	248+200.560	Increasing	Non-intersection-related
2009	Property damage only	Single Vehicle	248+780.760	Increasing	Non-intersection-related
2009	Property damage only	Single Vehicle	264+621.360	Decreasing	Non-intersection-related
2009	Fatal or serious injury	Single Vehicle	266+205.360	Increasing	Non-intersection-related
2009	Property damage only	Single Vehicle	277+821.360	Increasing	Non-intersection-related
2009	Property damage only	Single Vehicle	277+821.360	Increasing	Non-intersection-related
2009	Property damage only	Multi Vehicle	280+461.360	Decreasing	Non-intersection-related
2009	Property damage only	Single Vehicle	301+581.360	Increasing	Non-intersection-related
2009	Property damage only	Single Vehicle	312+141.360	Increasing	Non-intersection-related
2010	Fatal or serious injury	Single Vehicle	22+269.360	Decreasing	Non-intersection-related
2010	Fatal or serious injury	Single Vehicle	27+021.360	Decreasing	Non-intersection-related
2010	Property damage only	Single Vehicle	48+141.360	Increasing	Non-intersection-related
2010	Property damage only	Single Vehicle	81+035.760	Increasing	Non-intersection-related
2010	Property damage only	Single Vehicle	85+101.360	Decreasing	Non-intersection-related
2010	Fatal or serious injury	Single Vehicle	85+101.860	Decreasing	Non-intersection-related
2010	Property damage only	Single Vehicle	105+429.360	Decreasing	Non-intersection-related
2010	Property damage only	Multi Vehicle	106+221.360	Decreasing	Non-intersection-related
2010	Fatal or nonfatal injury	Single Vehicle	153+741.360	Decreasing	Non-intersection-related
2010	Property damage only	Single Vehicle	162+822.960	Decreasing	Non-intersection-related
2010	Property damage only	Single Vehicle	180+616.560	Decreasing	Non-intersection-related
2010	Fatal or serious injury	Single Vehicle	181+355.760	Increasing	Non-intersection-related
2010	Property damage only	Single Vehicle	190+700.860	Decreasing	Non-intersection-related
2010	Property damage only	Single Vehicle	195+242.160	Decreasing	Non-intersection-related
2010	Property damage only	Single Vehicle	195+981.360	Increasing	Non-intersection-related
2010	Fatal or serious injury	Single Vehicle	205+696.560	Increasing	Non-intersection-related
2010	Property damage only	Single Vehicle	211+820.860	Increasing	Non-intersection-related
2010	Property damage only	Single Vehicle	232+941.360	Increasing	Non-intersection-related
2010	Fatal or nonfatal injury	Single Vehicle	238+221.360	Decreasing	Non-intersection-related
2010	Fatal or serious injury	Single Vehicle	248+622.960	Increasing	Non-intersection-related
2010	Fatal or serious injury	Single Vehicle	249+467.760	Decreasing	Non-intersection-related
2010	Property damage only	Single Vehicle	254+061.360	Increasing	Non-intersection-related
2010	Property damage only	Single Vehicle	254+061.360	Decreasing	Non-intersection-related
2010	Property damage only	Single Vehicle	254+061.360	Increasing	Non-intersection-related
2010	Fatal or nonfatal injury	Single Vehicle	264+621.360	Increasing	Non-intersection-related
2010	Property damage only	Multi Vehicle	264+621.360	Decreasing	Non-intersection-related

2010	Property damage only	Single Vehicle	264+779.760	Increasing	Non-intersection-related
2010	Fatal or serious injury	Multi Vehicle	269+924.360	Increasing	Non-intersection-related
2010	Property damage only	Single Vehicle	280+461.360	Increasing	Non-intersection-related
2010	Fatal or serious injury	Multi Vehicle	287+219.760	Decreasing	Non-intersection-related
2011	Property damage only	Single Vehicle	27+496.560	Decreasing	Non-intersection-related
2011	Property damage only	Single Vehicle	27+549.360	Decreasing	Non-intersection-related
2011	Fatal or serious injury	Single Vehicle	37+581.360	Increasing	Non-intersection-related
2011	Property damage only	Single Vehicle	49+144.560	Decreasing	Non-intersection-related
2011	Property damage only	Single Vehicle	49+197.360	Decreasing	Non-intersection-related
2011	Fatal or nonfatal injury	Single Vehicle	54+160.560	Increasing	Non-intersection-related
2011	Property damage only	Single Vehicle	57+645.360	Increasing	Non-intersection-related
2011	Fatal or serious injury	Single Vehicle	58+701.360	Increasing	Non-intersection-related
2011	Property damage only	Single Vehicle	59+018.160	Increasing	Non-intersection-related
2011	Property damage only	Single Vehicle	63+981.360	Increasing	Non-intersection-related
2011	Fatal or nonfatal injury	Single Vehicle	79+821.360	Increasing	Non-intersection-related
2011	Property damage only	Single Vehicle	90+381.360	Increasing	Non-intersection-related
2011	Fatal or nonfatal injury	Single Vehicle	116+781.360	Decreasing	Non-intersection-related
2011	Property damage only	Single Vehicle	137+901.360	Increasing	Non-intersection-related
2011	Fatal or serious injury	Single Vehicle	158+229.360	Increasing	Non-intersection-related
2011	Property damage only	Single Vehicle	159+021.360	Increasing	Non-intersection-related
2011	Fatal or serious injury	Single Vehicle	169+580.860	Increasing	Non-intersection-related
2011	Fatal or serious injury	Single Vehicle	185+421.360	Decreasing	Non-intersection-related
2011	Property damage only	Single Vehicle	201+260.860	Increasing	Non-intersection-related
2011	Fatal or nonfatal injury	Single Vehicle	208+653.360	Increasing	Non-intersection-related
2011	Property damage only	Single Vehicle	211+821.360	Increasing	Non-intersection-related
2011	Property damage only	Single Vehicle	217+101.360	Decreasing	Non-intersection-related
2011	Fatal or serious injury	Single Vehicle	222+380.660	Decreasing	Non-intersection-related
2011	Fatal or nonfatal injury	Single Vehicle	226+605.360	Decreasing	Non-intersection-related
2011	Property damage only	Single Vehicle	230+406.960	Increasing	Non-intersection-related
2011	Fatal or serious injury	Single Vehicle	232+941.360	Increasing	Non-intersection-related
2011	Fatal or serious injury	Single Vehicle	234+050.160	Increasing	Non-intersection-related
2011	Property damage only	Single Vehicle	238+221.360	Decreasing	Non-intersection-related
2011	Property damage only	Single Vehicle	243+026.160	Increasing	Non-intersection-related
2011	Fatal or serious injury	Single Vehicle	249+626.160	Increasing	Non-intersection-related
2011	Property damage only	Single Vehicle	276+501.360	Decreasing	Non-intersection-related
2011	Property damage only	Single Vehicle	291+020.860	Increasing	Non-intersection-related
2012	Property damage only	Single Vehicle	48+669.360	Decreasing	Non-intersection-related
2012	Fatal or serious injury	Single Vehicle	74+541.360	Increasing	Non-intersection-related
2012	Fatal or serious injury	Single Vehicle	116+781.360	Decreasing	Non-intersection-related
2012	Fatal or nonfatal injury	Single Vehicle	154+533.360	Increasing	Non-intersection-related
2012	Property damage only	Single Vehicle	180+141.360	Increasing	Non-intersection-related
2012	Property damage only	Single Vehicle	267+366.960	Increasing	Non-intersection-related
2012	Fatal or serious injury	Single Vehicle	269+900.860	Increasing	Non-intersection-related
2012	Property damage only	Single Vehicle	269+900.860	Increasing	Non-intersection-related
2012	Property damage only	Single Vehicle	269+901.360	Decreasing	Non-intersection-related
2012	Property damage only	Single Vehicle	269+901.360	Increasing	Non-intersection-related

**APPENDIX B**  
**IHSDM Predictive Method Results**

*Interactive Highway Safety Design Model*

**Crash Prediction Evaluation Report**

February 3, 2014

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## Report Overview

**Report Generated:** Feb 3, 2014 5:49 PM

**Report Template:** System: Multi-Page [System] (mlcpm2, Oct 15, 2013 11:19 AM)

**Evaluation Date:** Tue Oct 15 14:23:59 PDT 2013

**IHSDM Version:** v8.1.0 (Feb 13, 2013)

**Crash Prediction Module:** v3.1.0 (Feb 13, 2013)

**User Name:** michael.mosley

**Organization Name:**

**Phone:**

**E-Mail:**

**Project Title:** US93-LG-JCT

**Project Comment:** Created Wed Jul 10 08:39:38 PDT 2013

**Project Unit System:** U.S. Customary

**Highway Title:** Highway 93 - Existing

**Highway Comment:** Created Thu Jul 18 08:48:30 PDT 2013

**Highway Version:** 3

**Evaluation Title:** CPM wNevada Calibration

**Evaluation Comment:** Created Tue Oct 15 14:22:54 PDT 2013

**Minimum Station:** 10+00.000

**Maximum Station:** 4112+58.620

**Policy for Superelevation:** AASHTO 2011 U.S. Customary

**Calibration:** Nevada Configuration

**Crash Distribution:** HSM Configuration

**Model/CMF:** HSM Configuration

**Empirical-Bayes Analysis:** Site-Specific

**Highway with Crash History:** Highway 93 - Existing

**Highway with Crash History Comment:** Created Thu Jul 18 08:48:30 PDT 2013

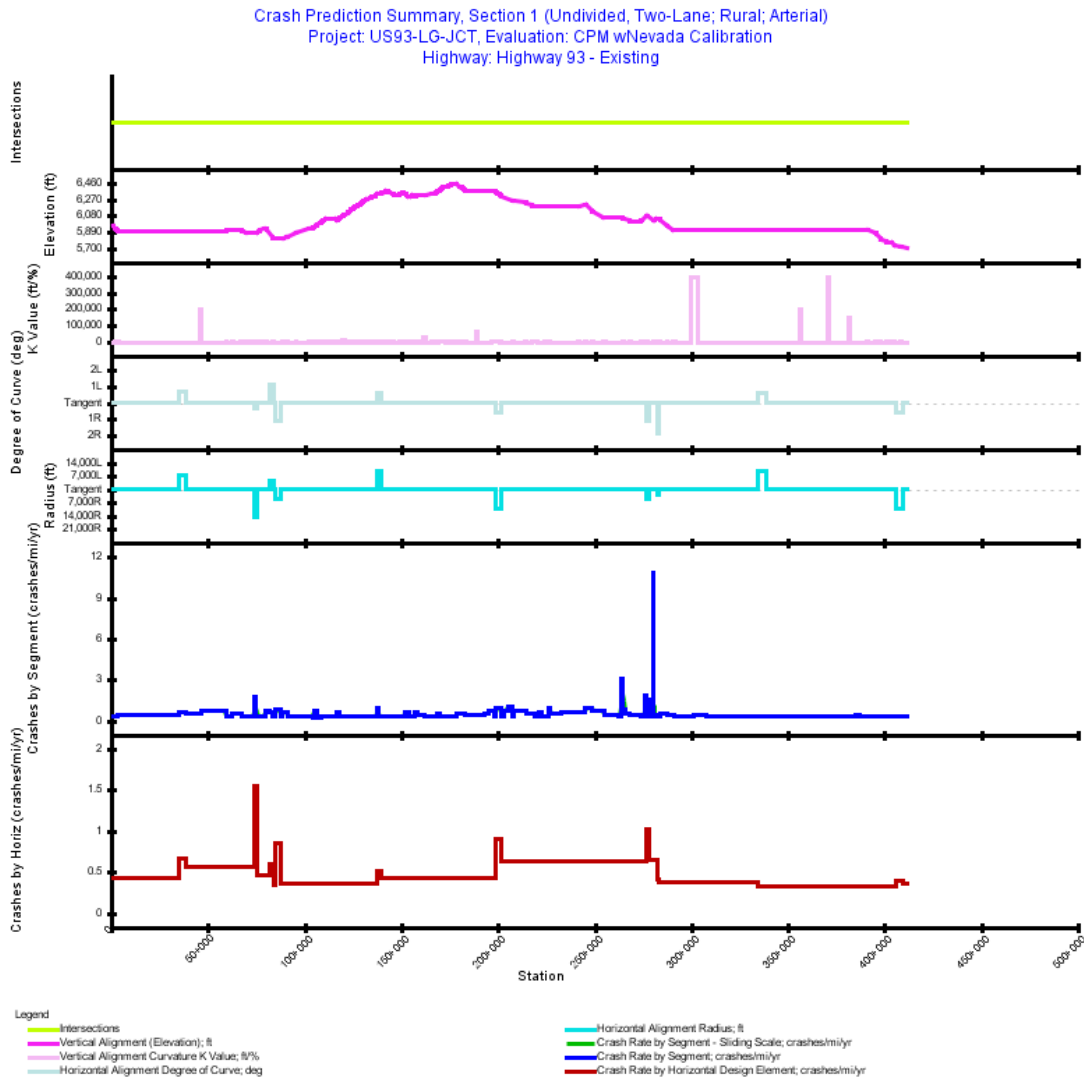
**Highway with Crash History Version:** 3

**First Year of Analysis:** 2013

**Last Year of Analysis:** 2033

# Section 1 Evaluation

**Section:** Section 1  
**Evaluation Start Location:** 10+00.000  
**Evaluation End Location:** 4112+58.620  
**Area Type:** Rural  
**Functional Class:** Arterial  
**Type of Alignment:** Undivided, Two Lane  
**Model Category:** Rural, Two Lane  
**Calibration Factor:** 2U=1.21;



**Figure 1. Crash Prediction Summary (Section 1)**

**Table 1. Observed Crash Summary (Section 1)**

<b>Year</b>	<b>Total Crashes</b>	<b>FI Crashes</b>	<b>FI no/C Crashes</b>	<b>PDO Crashes</b>
2008	27	13	12	14
2009	26	9	5	17
2010	30	12	9	18
2011	32	14	9	18
All Years	115	48	35	67



Table 2. Evaluation Highway - Homogeneous Segments (Section 1)

Seg. No.	Type	Start Location	End Location	Length (ft)	Length (mi)	AADT	Left Lane Width (ft)	Right Lane Width (ft)	Left Shoulder Width (ft)	Right Shoulder Width (ft)	Grade (%)	Driveway Density (driveway/s/mi)	Hazard Rating	Centerline Rumble Strip	Passing Lanes	TWL T Lane	Lighting	Automated Speed Enforcement	Radius (ft)	Superelevation (%)	Adverse	Design Speed (mph)		
1	2U	10+00.000	23+57.450	1,357.45	0.2571	2013: 1,125; 2014: 1,150; 2015: 1,175; 2016: 1,200; 2017: 1,225; 2018: 1,250; 2019: 1,275; 2020: 1,300; 2021: 1,325; 2022: 1,350; 2023: 1,375; 2024: 1,400; 2025: 1,425; 2026: 1,450; 2027: 1,475; 2028: 1,500; 2029: 1,525; 2030: 1,550; 2031: 1,575; 2032-2033: 1,600	12.00	12.00	1.00	1.00	2.88	0.5	3	true	0	false	false	false						
2	2U	23+57.450	35+07.450	1,150.00	0.2178	2013: 1,125; 2014: 1,150; 2015: 1,175; 2016: 1,200; 2017: 1,225; 2018: 1,250; 2019: 1,275; 2020: 1,300; 2021: 1,325; 2022: 1,350; 2023: 1,375; 2024: 1,400; 2025: 1,425; 2026: 1,450; 2027: 1,475; 2028: 1,500; 2029: 1,525; 2030: 1,550; 2031: 1,575; 2032-2033: 1,600	12.00	12.00	1.00	1.00	1.71	0.5	3	true	0	false	false	false						
3	2U	35+07.450	352+16.190	31,708.74	6.0054	2013: 1,125; 2014: 1,150; 2015: 1,175; 2016: 1,200; 2017: 1,225; 2018: 1,250; 2019: 1,275; 2020: 1,300; 2021: 1,325; 2022: 1,350; 2023: 1,375; 2024: 1,400; 2025: 1,425; 2026: 1,450; 2027: 1,475; 2028: 1,500; 2029: 1,525; 2030: 1,550; 2031: 1,575; 2032-2033: 1,600	12.00	12.00	1.00	1.00	0.00	0.5	3	true	0	false	false	false						
4	2U	352+16.190	387+96.580	3,580.39	0.6781	2013: 1,125; 2014: 1,150; 2015: 1,175; 2016: 1,200; 2017: 1,225; 2018: 1,250; 2019: 1,275; 2020: 1,300; 2021: 1,325; 2022: 1,350; 2023: 1,375; 2024: 1,400; 2025: 1,425; 2026: 1,450; 2027: 1,475; 2028: 1,500; 2029: 1,525; 2030: 1,550; 2031: 1,575; 2032-2033: 1,600	12.00	12.00	1.00	1.00	0.00	0.5	3	true	0	false	false	false	8,006.00	2.0	true	70		
5	2U	387+96.580	462+57.450	7,460.87	1.4130	2013: 1,125; 2014: 1,150; 2015: 1,175; 2016: 1,200; 2017: 1,225; 2018: 1,250; 2019: 1,275; 2020: 1,300; 2021: 1,325; 2022: 1,350; 2023: 1,375; 2024: 1,400; 2025: 1,425; 2026: 1,450; 2027: 1,475; 2028: 1,500; 2029: 1,525; 2030: 1,550; 2031: 1,575; 2032-2033: 1,600	12.00	12.00	1.00	1.00	0.00	0.5	3	true	0	false	false	false						
6	2U	462+57.450	592+29.360	12,971.91	2.4568	2013: 1,125; 2014: 1,150; 2015: 1,175; 2016: 1,200; 2017: 1,225; 2018: 1,250; 2019: 1,275; 2020: 1,300; 2021: 1,325; 2022: 1,350; 2023: 1,375; 2024: 1,400; 2025: 1,425; 2026: 1,450; 2027: 1,475; 2028: 1,500; 2029: 1,525; 2030: 1,550; 2031: 1,575; 2032-2033: 1,600	12.00	12.00	1.00	1.00	0.00	0.5	3	true	0	false	false	false						
7	2U	592+29.360	595+57.450	328.09	0.0621	2013: 1,125; 2014: 1,150; 2015: 1,175; 2016: 1,200; 2017: 1,225; 2018: 1,250; 2019: 1,275; 2020: 1,300; 2021: 1,325; 2022: 1,350; 2023: 1,375; 2024: 1,400; 2025: 1,425; 2026: 1,450; 2027: 1,475; 2028: 1,500; 2029: 1,525; 2030: 1,550; 2031: 1,575; 2032-2033: 1,600	12.00	12.00	1.00	1.00	0.00	0.5	2	true	0	false	false	false						
8	2U	595+57.450	624+57.450	2,900.00	0.5492	2013: 1,125; 2014: 1,150; 2015: 1,175; 2016: 1,200; 2017: 1,225; 2018: 1,250; 2019: 1,275; 2020: 1,300; 2021: 1,325; 2022: 1,350; 2023: 1,375; 2024: 1,400; 2025: 1,425; 2026: 1,450; 2027: 1,475; 2028: 1,500; 2029: 1,525; 2030: 1,550; 2031: 1,575; 2032-2033: 1,600	12.00	12.00	1.00	1.00	0.42	0.5	2	true	0	false	false	false						
9	2U	624+57.450	676+57.450	5,200.00	0.9848	2013: 1,125; 2014: 1,150; 2015: 1,175; 2016: 1,200; 2017: 1,225; 2018: 1,250; 2019: 1,275; 2020: 1,300; 2021: 1,325; 2022: 1,350; 2023: 1,375; 2024: 1,400; 2025: 1,425; 2026: 1,450; 2027: 1,475; 2028: 1,500; 2029: 1,525; 2030: 1,550; 2031: 1,575; 2032-2033: 1,600	12.00	12.00	1.00	1.00	0.14	0.5	2	true	0	false	false	false						
10	2U	676+57.450	697+57.450	2,100.00	0.3977	2013: 1,125; 2014: 1,150; 2015: 1,175; 2016: 1,200; 2017: 1,225; 2018: 1,250; 2019: 1,275; 2020: 1,300; 2021: 1,325; 2022: 1,350; 2023: 1,375; 2024: 1,400; 2025: 1,425; 2026: 1,450; 2027: 1,475; 2028: 1,500; 2029: 1,525; 2030: 1,550; 2031: 1,575; 2032-2033: 1,600	12.00	12.00	1.00	1.00	1.56	0.5	2	true	0	false	false	false						
11	2U	697+57.450	728+57.450	3,100.00	0.5871	2013: 1,125; 2014: 1,150; 2015: 1,175; 2016: 1,200; 2017: 1,225; 2018: 1,250; 2019: 1,275; 2020: 1,300; 2021: 1,325; 2022: 1,350; 2023: 1,375; 2024: 1,400; 2025: 1,425; 2026: 1,450; 2027: 1,475; 2028: 1,500; 2029: 1,525; 2030: 1,550; 2031: 1,575; 2032-2033: 1,600	12.00	12.00	1.00	1.00	0.01	0.5	2	true	0	false	false	false						
12	2U	728+57.450	742+92.190	1,434.74	0.2717	2013: 1,125; 2014: 1,150; 2015: 1,175; 2016: 1,200; 2017: 1,225; 2018: 1,250; 2019: 1,275; 2020: 1,300; 2021: 1,325; 2022: 1,350; 2023: 1,375; 2024: 1,400; 2025: 1,425; 2026: 1,450; 2027: 1,475; 2028: 1,500; 2029: 1,525; 2030: 1,550; 2031: 1,575; 2032-2033: 1,600	12.00	12.00	1.00	1.00	0.10	0.5	2	true	0	false	false	false						
13	2U	742+92.190	749+57.450	665.26	0.1260	2013: 1,125; 2014: 1,150; 2015: 1,175; 2016: 1,200; 2017: 1,225; 2018: 1,250; 2019: 1,275; 2020: 1,300; 2021: 1,325; 2022: 1,350; 2023: 1,375; 2024: 1,400; 2025: 1,425; 2026: 1,450; 2027: 1,475; 2028: 1,500; 2029: 1,525; 2030: 1,550; 2031: 1,575; 2032-2033: 1,600	12.00	12.00	1.00	1.00	0.10	0.5	2	true	0	false	false	false	15,000.00	2.0	true	55		
14	2U	749+57.450	750+90.750	133.30	0.0252	2013: 1,125; 2014: 1,150; 2015: 1,175; 2016: 1,200; 2017: 1,225; 2018: 1,250; 2019: 1,275; 2020: 1,300; 2021: 1,325; 2022: 1,350; 2023: 1,375; 2024: 1,400; 2025: 1,425; 2026: 1,450; 2027: 1,475; 2028: 1,500; 2029: 1,525; 2030: 1,550; 2031: 1,575; 2032-2033: 1,600	12.00	12.00	1.00	1.00	2.00	0.5	2	true	0	false	false	false	15,000.00	2.0	true	55		
15	2U	750+90.750	765+57.450	1,466.70	0.2778	2013: 1,125; 2014: 1,150; 2015: 1,175; 2016: 1,200; 2017: 1,225; 2018: 1,250; 2019: 1,275; 2020: 1,300; 2021: 1,325; 2022: 1,350; 2023: 1,375; 2024: 1,400; 2025: 1,425; 2026: 1,450; 2027: 1,475; 2028: 1,500; 2029: 1,525; 2030: 1,550; 2031: 1,575; 2032-2033: 1,600	12.00	12.00	1.00	1.00	2.00	0.5	2	true	0	false	false	false						
16	2U	765+57.450	795+57.450	3,000.00	0.5682	2013: 1,125; 2014: 1,150; 2015: 1,175; 2016: 1,200; 2017: 1,225; 2018: 1,250; 2019: 1,275; 2020: 1,300; 2021: 1,325; 2022: 1,350; 2023: 1,375; 2024: 1,400; 2025: 1,425; 2026: 1,450; 2027: 1,475; 2028: 1,500; 2029: 1,525; 2030: 1,550; 2031: 1,575; 2032-2033: 1,600	12.00	12.00	1.00	1.00	1.20	0.5	2	true	0	false	false	false						
17	2U	795+57.450	817+41.440	2,183.99	0.4136	2013: 1,125; 2014: 1,150; 2015: 1,175; 2016: 1,200; 2017: 1,225; 2018: 1,250; 2019: 1,275; 2020: 1,300; 2021: 1,325; 2022: 1,350; 2023: 1,375; 2024: 1,400; 2025: 1,425; 2026: 1,450; 2027: 1,475; 2028: 1,500; 2029: 1,525; 2030: 1,550; 2031: 1,575; 2032-2033: 1,600	12.00	12.00	1.00	1.00	2.96	0.5	2	true	0	false	false	false						
18	2U	817+41.440	836+57.450	1,916.01	0.3629	2013: 1,125; 2014: 1,150; 2015: 1,175; 2016: 1,200; 2017: 1,225; 2018: 1,250; 2019: 1,275; 2020: 1,300; 2021: 1,325; 2022: 1,350; 2023: 1,375; 2024: 1,400; 2025: 1,425; 2026: 1,450; 2027: 1,475; 2028: 1,500; 2029: 1,525; 2030: 1,550; 2031: 1,575; 2032-2033: 1,600	12.00	12.00	1.00	1.00	2.96	0.5	2	true	0	false	false	false	5,000.00	2.0	true	55		
19	2U	836+57.450	838+35.860	178.41	0.0338	2013: 1,125; 2014: 1,150; 2015: 1,175; 2016: 1,200; 2017: 1,225; 2018: 1,250; 2019: 1,275; 2020: 1,300; 2021: 1,325; 2022: 1,350; 2023: 1,375; 2024: 1,400; 2025: 1,425; 2026: 1,450; 2027: 1,475; 2028: 1,500; 2029: 1,525; 2030: 1,550; 2031: 1,575; 2032-2033: 1,600	12.00	12.00	1.00	1.00	0.00	0.5	2	true	0	false	false	false	5,000.00	2.0	true	55		
20	2U	838+35.860	846+56.380	820.52	0.1554	2013: 1,125; 2014: 1,150; 2015: 1,175; 2016: 1,200; 2017: 1,225; 2018: 1,250; 2019: 1,275; 2020: 1,300; 2021: 1,325; 2022: 1,350; 2023: 1,375; 2024: 1,400; 2025: 1,425; 2026: 1,450; 2027: 1,475; 2028: 1,500; 2029: 1,525; 2030: 1,550; 2031: 1,575; 2032-2033: 1,600	12.00	12.00	1.00	1.00	0.00	0.5	2	true	0	false	false	false						
21	2U	846+56.380	876+19.690	2,963.31	0.5612	2013: 1,125; 2014: 1,150; 2015: 1,175; 2016: 1,200; 2017: 1,225; 2018: 1,250; 2019: 1,275; 2020: 1,300; 2021: 1,325; 2022: 1,350; 2023: 1,375; 2024: 1,400; 2025: 1,425; 2026: 1,450; 2027: 1,475; 2028: 1,500; 2029: 1,525; 2030: 1,550; 2031: 1,575; 2032-2033: 1,600	12.00	12.00	1.00	1.00	0.00	0.5	2	true	0	false	false	false	5,000.00	2.0	true	55		
22	2U	876+19.690	885+57.450	937.76	0.1776	2013: 1,125; 2014: 1,150; 2015: 1,175; 2016: 1,200; 2017: 1,225; 2018: 1,250; 2019: 1,275; 2020: 1,300; 2021: 1,325; 2022: 1,350; 2023: 1,375; 2024: 1,400; 2025: 1,425; 2026: 1,450; 2027: 1,475; 2028: 1,500; 2029: 1,525; 2030: 1,550; 2031: 1,575; 2032-2033: 1,600	12.00	12.00	1.00	1.00	0.00	0.5	2	true	0	false	false	false						
23	2U	885+57.450	910+57.450	2,500.00	0.4735	2013: 1,125; 2014: 1,150; 2015: 1,175; 2016: 1,200; 2017: 1,225; 2018: 1,250; 2019: 1,275; 2020: 1,300; 2021: 1,325; 2022: 1,350; 2023: 1,375; 2024: 1,400; 2025: 1,425; 2026: 1,450; 2027: 1,475; 2028: 1,500; 2029: 1,525; 2030: 1,550; 2031: 1,575; 2032-2033: 1,600	12.00	12.00	1.00	1.00	0.43	0.5	2	true	0	false	false	false						











Seg. No.	Type	Start Location	End Location	Length (ft)	Length (mi)	AADT	Left Lane Width (ft)	Right Lane Width (ft)	Left Shoulder Width (ft)	Right Shoulder Width (ft)	Grade (%)	Driveway Density (driveways/mi)	Hazard Rating	Centerline Rumble Strip	Passing Lanes	TWT Lane	Lighting	Automated Speed Enforcement	Radius (ft)	Superelevation (%)	Adverse	Design Speed (mph)
124	2U	3015+36.2	3073+89.3	5,853.1	1.1086	2013: 1,227; 2014: 1,255; 2015: 1,282; 2016: 1,310; 2017: 1,337; 2018: 1,365; 2019: 1,392; 2020: 1,420; 2021: 1,447; 2022: 1,475; 2023: 1,502; 2024: 1,530; 2025: 1,557; 2026: 1,585; 2027: 1,612; 2028: 1,640; 2029: 1,667; 2030: 1,695; 2031: 1,722; 2032-2033: 1,750	12.00	12.00	1.00	1.00	0.00	0.5	1	true	0	false	false	false				
125	2U	3073+89.3	3346+46.1	27,256.8	5.1623	2013: 1,227; 2014: 1,255; 2015: 1,282; 2016: 1,310; 2017: 1,337; 2018: 1,365; 2019: 1,392; 2020: 1,420; 2021: 1,447; 2022: 1,475; 2023: 1,502; 2024: 1,530; 2025: 1,557; 2026: 1,585; 2027: 1,612; 2028: 1,640; 2029: 1,667; 2030: 1,695; 2031: 1,722; 2032-2033: 1,750	12.00	12.00	6.00	6.00	0.00	0.5	1	true	0	false	false	false				
126	2U	3346+46.1	3385+65.1	3,918.9	0.7422	2013: 1,227; 2014: 1,255; 2015: 1,282; 2016: 1,310; 2017: 1,337; 2018: 1,365; 2019: 1,392; 2020: 1,420; 2021: 1,447; 2022: 1,475; 2023: 1,502; 2024: 1,530; 2025: 1,557; 2026: 1,585; 2027: 1,612; 2028: 1,640; 2029: 1,667; 2030: 1,695; 2031: 1,722; 2032-2033: 1,750	12.00	12.00	6.00	6.00	0.00	0.5	1	true	0	false	false	false	10,000.00	2.0	true	55
127	2U	3385+65.1	3565+38.3	17,973.1	3.4040	2013: 1,227; 2014: 1,255; 2015: 1,282; 2016: 1,310; 2017: 1,337; 2018: 1,365; 2019: 1,392; 2020: 1,420; 2021: 1,447; 2022: 1,475; 2023: 1,502; 2024: 1,530; 2025: 1,557; 2026: 1,585; 2027: 1,612; 2028: 1,640; 2029: 1,667; 2030: 1,695; 2031: 1,722; 2032-2033: 1,750	12.00	12.00	6.00	6.00	0.00	0.5	1	true	0	false	false	false				
128	2U	3565+38.3	3708+38.3	14,300.0	2.7083	2013: 1,227; 2014: 1,255; 2015: 1,282; 2016: 1,310; 2017: 1,337; 2018: 1,365; 2019: 1,392; 2020: 1,420; 2021: 1,447; 2022: 1,475; 2023: 1,502; 2024: 1,530; 2025: 1,557; 2026: 1,585; 2027: 1,612; 2028: 1,640; 2029: 1,667; 2030: 1,695; 2031: 1,722; 2032-2033: 1,750	12.00	12.00	6.00	6.00	0.01	0.5	1	true	0	false	false	false				
129	2U	3708+38.3	3814+38.3	10,600.0	2.0076	2013: 1,227; 2014: 1,255; 2015: 1,282; 2016: 1,310; 2017: 1,337; 2018: 1,365; 2019: 1,392; 2020: 1,420; 2021: 1,447; 2022: 1,475; 2023: 1,502; 2024: 1,530; 2025: 1,557; 2026: 1,585; 2027: 1,612; 2028: 1,640; 2029: 1,667; 2030: 1,695; 2031: 1,722; 2032-2033: 1,750	12.00	12.00	6.00	6.00	0.00	0.5	1	true	0	false	false	false				
130	2U	3814+38.3	3842+24.6	2,786.3	0.5277	2013: 1,227; 2014: 1,255; 2015: 1,282; 2016: 1,310; 2017: 1,337; 2018: 1,365; 2019: 1,392; 2020: 1,420; 2021: 1,447; 2022: 1,475; 2023: 1,502; 2024: 1,530; 2025: 1,557; 2026: 1,585; 2027: 1,612; 2028: 1,640; 2029: 1,667; 2030: 1,695; 2031: 1,722; 2032-2033: 1,750	12.00	12.00	6.00	6.00	0.00	0.5	1	true	0	false	false	false				
131	2U	3842+24.6	3850+05.3	780.74	0.1479	2013: 1,535; 2014: 1,570; 2015: 1,605; 2016: 1,640; 2017: 1,675; 2018: 1,710; 2019: 1,745; 2020: 1,780; 2021: 1,815; 2022: 1,850; 2023: 1,885; 2024: 1,920; 2025: 1,955; 2026: 1,990; 2027: 2,025; 2028: 2,060; 2029: 2,095; 2030: 2,130; 2031: 2,165; 2032-2033: 2,200	12.00	12.00	6.00	6.00	0.00	0.5	1	true	0	false	false	false				
132	2U	3850+05.3	3871+17.3	2,112.0	0.4000	2013: 1,535; 2014: 1,570; 2015: 1,605; 2016: 1,640; 2017: 1,675; 2018: 1,710; 2019: 1,745; 2020: 1,780; 2021: 1,815; 2022: 1,850; 2023: 1,885; 2024: 1,920; 2025: 1,955; 2026: 1,990; 2027: 2,025; 2028: 2,060; 2029: 2,095; 2030: 2,130; 2031: 2,165; 2032-2033: 2,200	12.00	12.00	6.00	6.00	0.00	0.5	4	true	0	false	false	false				
133	2U	3871+17.3	3887+01.3	1,584.0	0.3000	2013: 1,535; 2014: 1,570; 2015: 1,605; 2016: 1,640; 2017: 1,675; 2018: 1,710; 2019: 1,745; 2020: 1,780; 2021: 1,815; 2022: 1,850; 2023: 1,885; 2024: 1,920; 2025: 1,955; 2026: 1,990; 2027: 2,025; 2028: 2,060; 2029: 2,095; 2030: 2,130; 2031: 2,165; 2032-2033: 2,200	12.00	12.00	6.00	6.00	0.00	0.5	1	true	0	false	false	false				
134	2U	3887+01.3	3902+85.3	1,584.0	0.3000	2013: 1,535; 2014: 1,570; 2015: 1,605; 2016: 1,640; 2017: 1,675; 2018: 1,710; 2019: 1,745; 2020: 1,780; 2021: 1,815; 2022: 1,850; 2023: 1,885; 2024: 1,920; 2025: 1,955; 2026: 1,990; 2027: 2,025; 2028: 2,060; 2029: 2,095; 2030: 2,130; 2031: 2,165; 2032-2033: 2,200	12.00	12.00	6.00	6.00	0.00	0.5	3	true	0	false	false	false				
135	2U	3902+85.3	3910+38.3	752.95	0.1426	2013: 1,535; 2014: 1,570; 2015: 1,605; 2016: 1,640; 2017: 1,675; 2018: 1,710; 2019: 1,745; 2020: 1,780; 2021: 1,815; 2022: 1,850; 2023: 1,885; 2024: 1,920; 2025: 1,955; 2026: 1,990; 2027: 2,025; 2028: 2,060; 2029: 2,095; 2030: 2,130; 2031: 2,165; 2032-2033: 2,200	12.00	12.00	6.00	6.00	0.00	0.5	1	true	0	false	false	false				
136	2U	3910+38.3	3956+38.3	4,600.0	0.8712	2013: 1,535; 2014: 1,570; 2015: 1,605; 2016: 1,640; 2017: 1,675; 2018: 1,710; 2019: 1,745; 2020: 1,780; 2021: 1,815; 2022: 1,850; 2023: 1,885; 2024: 1,920; 2025: 1,955; 2026: 1,990; 2027: 2,025; 2028: 2,060; 2029: 2,095; 2030: 2,130; 2031: 2,165; 2032-2033: 2,200	12.00	12.00	6.00	6.00	0.87	0.5	1	true	0	false	false	false				
137	2U	3956+38.3	3977+88.3	2,150.0	0.4072	2013: 1,535; 2014: 1,570; 2015: 1,605; 2016: 1,640; 2017: 1,675; 2018: 1,710; 2019: 1,745; 2020: 1,780; 2021: 1,815; 2022: 1,850; 2023: 1,885; 2024: 1,920; 2025: 1,955; 2026: 1,990; 2027: 2,025; 2028: 2,060; 2029: 2,095; 2030: 2,130; 2031: 2,165; 2032-2033: 2,200	12.00	12.00	6.00	6.00	3.11	0.5	1	true	0	false	false	false				
138	2U	3977+88.3	4007+88.3	3,000.0	0.5682	2013: 1,535; 2014: 1,570; 2015: 1,605; 2016: 1,640; 2017: 1,675; 2018: 1,710; 2019: 1,745; 2020: 1,780; 2021: 1,815; 2022: 1,850; 2023: 1,885; 2024: 1,920; 2025: 1,955; 2026: 1,990; 2027: 2,025; 2028: 2,060; 2029: 2,095; 2030: 2,130; 2031: 2,165; 2032-2033: 2,200	12.00	12.00	6.00	6.00	0.99	0.5	1	true	0	false	false	false				
139	2U	4007+88.3	4032+38.3	2,450.0	0.4640	2013: 1,535; 2014: 1,570; 2015: 1,605; 2016: 1,640; 2017: 1,675; 2018: 1,710; 2019: 1,745; 2020: 1,780; 2021: 1,815; 2022: 1,850; 2023: 1,885; 2024: 1,920; 2025: 1,955; 2026: 1,990; 2027: 2,025; 2028: 2,060; 2029: 2,095; 2030: 2,130; 2031: 2,165; 2032-2033: 2,200	12.00	12.00	6.00	6.00	0.34	0.5	1	true	0	false	false	false				
140	2U	4032+38.3	4052+38.3	2,000.0	0.3788	2013: 1,535; 2014: 1,570; 2015: 1,605; 2016: 1,640; 2017: 1,675; 2018: 1,710; 2019: 1,745; 2020: 1,780; 2021: 1,815; 2022: 1,850; 2023: 1,885; 2024: 1,920; 2025: 1,955; 2026: 1,990; 2027: 2,025; 2028: 2,060; 2029: 2,095; 2030: 2,130; 2031: 2,165; 2032-2033: 2,200	12.00	12.00	6.00	6.00	1.36	0.5	1	true	0	false	false	false				
141	2U	4052+38.3	4056+18.5	380.28	0.0720	2013: 1,535; 2014: 1,570; 2015: 1,605; 2016: 1,640; 2017: 1,675; 2018: 1,710; 2019: 1,745; 2020: 1,780; 2021: 1,815; 2022: 1,850; 2023: 1,885; 2024: 1,920; 2025: 1,955; 2026: 1,990; 2027: 2,025; 2028: 2,060; 2029: 2,095; 2030: 2,130; 2031: 2,165; 2032-2033: 2,200	12.00	12.00	6.00	6.00	0.79	0.5	1	true	0	false	false	false				
142	2U	4056+18.5	4083+38.3	2,719.7	0.5151	2013: 1,535; 2014: 1,570; 2015: 1,605; 2016: 1,640; 2017: 1,675; 2018: 1,710; 2019: 1,745; 2020: 1,780; 2021: 1,815; 2022: 1,850; 2023: 1,885; 2024: 1,920; 2025: 1,955; 2026: 1,990; 2027: 2,025; 2028: 2,060; 2029: 2,095; 2030: 2,130; 2031: 2,165; 2032-2033: 2,200	12.00	12.00	6.00	6.00	0.79	0.5	1	true	0	false	false	false	10,000.00	2.0	true	70
143	2U	4083+38.3	4095+46.6	1,207.7	0.2287	2013: 1,535; 2014: 1,570; 2015: 1,605; 2016: 1,640; 2017: 1,675; 2018: 1,710; 2019: 1,745; 2020: 1,780; 2021: 1,815; 2022: 1,850; 2023: 1,885; 2024: 1,920; 2025: 1,955; 2026: 1,990; 2027: 2,025; 2028: 2,060; 2029: 2,095; 2030: 2,130; 2031: 2,165; 2032-2033: 2,200	12.00	12.00	6.00	6.00	0.52	0.5	1	true	0	false	false	false	10,000.00	2.0	true	70
144	2U	4095+46.6	4112+58.6	1,712.5	0.3243	2013: 1,535; 2014: 1,570; 2015: 1,605; 2016: 1,640; 2017: 1,675; 2018: 1,710; 2019: 1,745; 2020: 1,780; 2021: 1,815; 2022: 1,850; 2023: 1,885; 2024: 1,920; 2025: 1,955; 2026: 1,990; 2027: 2,025; 2028: 2,060; 2029: 2,095; 2030: 2,130; 2031: 2,165; 2032-2033: 2,200	12.00	12.00	6.00	6.00	0.52	0.5	1	true	0	false	false	false				







Seg. No.	Type	Start Location	End Location	Length (ft)	Length(mi)	AADT	Left Lane Width (ft)	Right Lane Width (ft)	Left Shoulder Width (ft)	Right Shoulder Width (ft)	Grade (%)	Driveway Density (driveways/mi)	Hazard Rating	Centerline Rumble Strip	Passing Lanes	TWLT Lane	Lighting	Automated Speed Enforcement	Radius (ft)	Superelevation (%)	Adverse	Design Speed (mph)
118	2U	2819+86.210	2823+49.190	362.98	0.0688	2008-2011: 1,200	12.00	12.00	1.00	1.00	0.23	0.5	1	true	0	false	false	false				
119	2U	2823+49.190	2835+18.210	1,169.02	0.2214	2008-2011: 1,200	12.00	12.00	1.00	1.00	0.23	0.5	1	true	0	false	false	false	3,000.00	2.0	true	55
120	2U	2835+18.210	2837+61.210	243.00	0.0460	2008-2011: 1,200	12.00	12.00	1.00	1.00	0.23	0.5	1	true	0	false	false	false				
121	2U	2837+61.210	2875+36.210	3,775.00	0.7150	2008-2011: 1,200	12.00	12.00	1.00	1.00	2.04	0.5	1	true	0	false	false	false				
122	2U	2875+36.210	2910+86.210	3,550.00	0.6724	2008-2011: 1,200	12.00	12.00	1.00	1.00	1.43	0.5	1	true	0	false	false	false				
123	2U	2910+86.210	3015+36.210	10,450.00	1.9792	2008-2011: 1,200	12.00	12.00	1.00	1.00	0.01	0.5	1	true	0	false	false	false				
124	2U	3015+36.210	3073+89.360	5,853.15	1.1086	2008-2011: 1,200	12.00	12.00	1.00	1.00	0.00	0.5	1	true	0	false	false	false				
125	2U	3073+89.360	3346+46.170	27,256.81	5.1623	2008-2011: 1,200	12.00	12.00	6.00	6.00	0.00	0.5	1	true	0	false	false	false				
126	2U	3346+46.170	3385+65.120	3,918.95	0.7422	2008-2011: 1,200	12.00	12.00	6.00	6.00	0.00	0.5	1	true	0	false	false	false	10,000.00	2.0	true	55
127	2U	3385+65.120	3565+38.310	17,973.19	3.4040	2008-2011: 1,200	12.00	12.00	6.00	6.00	0.00	0.5	1	true	0	false	false	false				
128	2U	3565+38.310	3708+38.310	14,300.00	2.7083	2008-2011: 1,200	12.00	12.00	6.00	6.00	0.01	0.5	1	true	0	false	false	false				
129	2U	3708+38.310	3814+38.310	10,600.00	2.0076	2008-2011: 1,200	12.00	12.00	6.00	6.00	0.00	0.5	1	true	0	false	false	false				
130	2U	3814+38.310	3842+24.620	2,786.31	0.5277	2008-2011: 1,200	12.00	12.00	6.00	6.00	0.00	0.5	1	true	0	false	false	false				
131	2U	3842+24.620	3850+05.360	780.74	0.1479	2008-2011: 1,500	12.00	12.00	6.00	6.00	0.00	0.5	1	true	0	false	false	false				
132	2U	3850+05.360	3871+17.360	2,112.00	0.4000	2008-2011: 1,500	12.00	12.00	6.00	6.00	0.00	0.5	4	true	0	false	false	false				
133	2U	3871+17.360	3887+01.360	1,584.00	0.3000	2008-2011: 1,500	12.00	12.00	6.00	6.00	0.00	0.5	1	true	0	false	false	false				
134	2U	3887+01.360	3902+85.360	1,584.00	0.3000	2008-2011: 1,500	12.00	12.00	6.00	6.00	0.00	0.5	3	true	0	false	false	false				
135	2U	3902+85.360	3910+38.310	752.95	0.1426	2008-2011: 1,500	12.00	12.00	6.00	6.00	0.00	0.5	1	true	0	false	false	false				
136	2U	3910+38.310	3956+38.310	4,600.00	0.8712	2008-2011: 1,500	12.00	12.00	6.00	6.00	0.87	0.5	1	true	0	false	false	false				
137	2U	3956+38.310	3977+88.310	2,150.00	0.4072	2008-2011: 1,500	12.00	12.00	6.00	6.00	3.11	0.5	1	true	0	false	false	false				
138	2U	3977+88.310	4007+88.310	3,000.00	0.5682	2008-2011: 1,500	12.00	12.00	6.00	6.00	0.99	0.5	1	true	0	false	false	false				
139	2U	4007+88.310	4032+38.310	2,450.00	0.4640	2008-2011: 1,500	12.00	12.00	6.00	6.00	0.34	0.5	1	true	0	false	false	false				
140	2U	4032+38.310	4052+38.310	2,000.00	0.3788	2008-2011: 1,500	12.00	12.00	6.00	6.00	1.36	0.5	1	true	0	false	false	false				
141	2U	4052+38.310	4056+18.590	380.28	0.0720	2008-2011: 1,500	12.00	12.00	6.00	6.00	0.79	0.5	1	true	0	false	false	false				
142	2U	4056+18.590	4083+38.310	2,719.72	0.5151	2008-2011: 1,500	12.00	12.00	6.00	6.00	0.79	0.5	1	true	0	false	false	false	10,000.00	2.0	true	70
143	2U	4083+38.310	4095+46.080	1,207.77	0.2287	2008-2011: 1,500	12.00	12.00	6.00	6.00	0.52	0.5	1	true	0	false	false	false	10,000.00	2.0	true	70
144	2U	4095+46.080	4112+58.620	1,712.54	0.3243	2008-2011: 1,500	12.00	12.00	6.00	6.00	0.52	0.5	1	true	0	false	false	false				

**Table 4. Expected Highway Crash Rates and Frequencies (Section 1)**

First Year of Analysis	2013
Last Year of Analysis	2033
Evaluated Length (mi)	77.7005
Average Future Road AADT (vpd)	1,445
<b>Expected Crashes</b>	
Total Crashes	758.90
Fatal and Injury Crashes	253.28
Fatal and Serious Injury Crashes	131.09
Property-Damage-Only Crashes	505.62
<b>Percent of Total Expected Crashes</b>	
Percent Fatal and Injury Crashes (%)	33
Percent Fatal and Serious Injury Crashes (%)	17
Percent Property-Damage-Only Crashes (%)	67
<b>Expected Crash Rate</b>	
Crash Rate (crashes/mi/yr)	0.4651
Fatal and Injury Crash Rate (crashes/mi/yr)	0.1552
Fatal and Serious Injury Crash Rate (crashes/mi/yr)	0.0803
Property-Damage-Only Crash Rate (crashes/mi/yr)	0.3099
<b>Expected Travel Crash Rate</b>	
Total Travel (million veh-mi)	860.42
Travel Crash Rate (crashes/million veh-mi)	0.88
Travel Fatal and Injury Crash Rate (crashes/million veh-mi)	0.29
Travel Fatal and Serious Injury Crash Rate (crashes/million veh-mi)	0.15
Travel Property-Damage-Only Crash Rate (crashes/million veh-mi)	0.59





**Table 5. Expected Crash Frequencies and Rates by Highway Segment (Section 1)**

Start Location	End Location	Length (mi)	Expected No. Crashes for Evaluation Period	Crash Rate (crashes/mi/yr)	Travel Crash Rate (crashes/million veh-mi)
10+00.000	23+57.450	0.2571	1.929	0.3573	0.71
23+57.450	35+07.450	0.2178	1.634	0.3573	0.71
35+07.450	352+16.190	6.0054	55.687	0.4416	0.88
352+16.190	387+96.580	0.6781	9.542	0.6701	1.34
387+96.580	462+57.450	1.4130	15.915	0.5363	1.07
462+57.450	592+29.360	2.4568	37.914	0.7349	1.47
592+29.360	595+57.450	0.0621	0.444	0.3400	0.68
595+57.450	624+57.450	0.5492	3.922	0.3400	0.68
624+57.450	676+57.450	0.9848	12.087	0.5844	1.16
676+57.450	697+57.450	0.3977	2.840	0.3400	0.68
697+57.450	728+57.450	0.5871	4.192	0.3400	0.68
728+57.450	742+92.190	0.2717	1.940	0.3400	0.68
742+92.190	749+57.450	0.1260	4.738	1.7906	3.57
749+57.450	750+90.750	0.0252	0.200	0.3773	0.75
750+90.750	765+57.450	0.2778	1.983	0.3400	0.68
765+57.450	795+57.450	0.5682	4.057	0.3400	0.68
795+57.450	817+41.440	0.4136	6.323	0.7280	1.45
817+41.440	836+57.450	0.3629	4.810	0.6312	1.26
836+57.450	838+35.860	0.0338	0.271	0.3825	0.76
838+35.860	846+56.380	0.1554	1.110	0.3400	0.68
846+56.380	876+19.690	0.5612	10.140	0.8604	1.72
876+19.690	885+57.450	0.1776	1.268	0.3400	0.68
885+57.450	910+57.450	0.4735	6.751	0.6789	1.35
910+57.450	957+57.450	0.8902	6.356	0.3400	0.68
957+57.450	1027+91.050	1.3321	9.511	0.3400	0.68
1027+91.050	1041+09.360	0.2497	1.783	0.3400	0.68
1041+09.360	1046+57.450	0.1038	0.654	0.2999	0.60
1046+57.450	1062+57.450	0.3030	4.881	0.7670	1.53
1062+57.450	1083+33.360	0.3932	2.476	0.2999	0.60
1083+33.360	1084+57.450	0.0235	0.172	0.3491	0.70
1084+57.450	1088+61.360	0.0765	0.561	0.3491	0.70
1088+61.360	1094+57.450	0.1129	0.728	0.3072	0.61
1094+57.450	1112+38.560	0.3373	2.176	0.3072	0.61
1112+38.560	1140+38.560	0.5303	3.421	0.3072	0.61
1140+38.560	1146+69.360	0.1195	0.771	0.3072	0.61
1146+69.360	1151+97.360	0.1000	0.750	0.3572	0.71
1151+97.360	1152+38.560	0.0078	0.050	0.3072	0.61
1152+38.560	1167+38.560	0.2841	1.832	0.3072	0.61
1167+38.560	1179+38.560	0.2273	2.988	0.6261	1.25
1179+38.560	1202+38.560	0.4356	2.810	0.3072	0.61
1202+38.560	1226+38.560	0.4545	2.932	0.3072	0.61
1226+38.560	1242+38.560	0.3030	1.955	0.3072	0.61
1242+38.560	1257+38.560	0.2841	1.832	0.3072	0.61
1257+38.560	1271+38.560	0.2652	1.710	0.3072	0.61
1271+38.560	1290+38.560	0.3598	2.321	0.3072	0.61
1290+38.560	1302+38.560	0.2273	1.466	0.3072	0.61
1302+38.560	1317+38.560	0.2841	1.832	0.3072	0.61
1317+38.560	1343+38.560	0.4924	3.176	0.3072	0.61

Start Location	End Location	Length (mi)	Expected No. Crashes for Evaluation Period	Crash Rate (crashes/mi/yr)	Travel Crash Rate (crashes/million veh-mi)
1343+38.560	1363+38.560	0.3788	2.443	0.3072	0.61
1363+38.560	1368+45.360	0.0960	0.619	0.3072	0.61
1368+45.360	1374+22.860	0.1094	0.706	0.3072	0.61
1374+22.860	1381+38.560	0.1355	2.646	0.9294	1.85
1381+38.560	1398+08.000	0.3162	2.251	0.3391	0.68
1398+08.000	1400+13.360	0.0389	0.251	0.3072	0.61
1400+13.360	1401+38.560	0.0237	0.156	0.3144	0.63
1401+38.560	1420+38.560	0.3598	2.376	0.3144	0.63
1420+38.560	1433+88.560	0.2557	1.688	0.3144	0.63
1433+88.560	1457+38.560	0.4451	2.938	0.3144	0.63
1457+38.560	1492+38.560	0.6629	4.376	0.3144	0.63
1492+38.560	1505+38.560	0.2462	1.625	0.3144	0.63
1505+38.560	1519+38.560	0.2652	1.750	0.3144	0.63
1519+38.560	1539+38.560	0.3788	5.617	0.7061	1.41
1539+38.560	1559+38.560	0.3788	2.501	0.3144	0.63
1559+38.560	1571+88.560	0.2367	1.563	0.3144	0.63
1571+88.560	1583+38.560	0.2178	2.996	0.6550	1.31
1583+38.560	1619+38.560	0.6818	6.059	0.4232	0.84
1619+38.560	1663+38.560	0.8333	7.059	0.4034	0.80
1663+38.560	1675+38.560	0.2273	1.500	0.3144	0.63
1675+38.560	1685+38.560	0.1894	1.250	0.3144	0.63
1685+38.560	1699+38.560	0.2652	3.308	0.5942	1.18
1699+38.560	1709+38.560	0.1894	1.250	0.3144	0.63
1709+38.560	1722+38.560	0.2462	1.625	0.3144	0.63
1722+38.560	1743+38.560	0.3977	2.626	0.3144	0.63
1743+38.560	1757+38.560	0.2652	1.750	0.3144	0.63
1757+38.560	1782+38.560	0.4735	3.126	0.3144	0.63
1782+38.560	1810+38.560	0.5303	6.617	0.5942	1.18
1810+38.560	1830+38.560	0.3788	4.059	0.5102	1.02
1830+38.560	1888+42.160	1.0992	10.372	0.4494	0.90
1888+42.160	1933+41.360	0.8521	8.741	0.4885	0.97
1933+41.360	1954+53.360	0.4000	5.011	0.5966	1.19
1954+53.360	1980+93.360	0.5000	8.200	0.7809	1.56
1980+93.360	1984+34.640	0.0646	0.523	0.3850	0.77
1984+34.640	1985+92.160	0.0298	0.264	0.4211	0.84
1985+92.160	2014+92.160	0.5492	11.119	0.9640	1.92
2014+92.160	2016+46.900	0.0293	0.259	0.4211	0.84
2016+46.900	2028+45.360	0.2270	1.835	0.3850	0.77
2028+45.360	2049+57.360	0.4000	6.393	0.7610	1.52
2049+57.360	2075+92.160	0.4990	11.666	1.1132	2.22
2075+92.160	2081+25.360	0.1010	0.816	0.3850	0.77
2081+25.360	2142+92.160	1.1680	18.943	0.7723	1.54
2142+92.160	2189+92.160	0.8902	9.986	0.5342	1.06
2189+92.160	2207+97.360	0.3419	2.506	0.3491	0.70
2207+97.360	2223+81.360	0.3000	4.128	0.6553	1.31
2223+81.360	2242+92.160	0.3619	2.523	0.3320	0.66
2242+92.160	2264+92.160	0.4167	2.905	0.3320	0.66
2264+92.160	2271+33.360	0.1214	2.492	0.9772	1.95
2271+33.360	2308+29.360	0.7000	7.567	0.5148	1.03
2308+29.360	2324+13.360	0.3000	3.737	0.5932	1.18
2324+13.360	2416+92.160	1.7573	25.655	0.6952	1.39
2416+92.160	2452+92.160	0.6818	9.328	0.6515	1.30

Start Location	End Location	Length (mi)	Expected No. Crashes for Evaluation Period	Crash Rate (crashes/mi/yr)	Travel Crash Rate (crashes/million veh-mi)
2452+92.160	2488+92.160	0.6818	13.144	0.9180	1.83
2488+92.160	2548+42.160	1.1269	18.650	0.7881	1.57
2548+42.160	2625+09.360	1.4521	13.648	0.4475	0.89
2625+09.360	2638+40.620	0.2521	1.800	0.3400	0.68
2638+40.620	2646+86.310	0.1602	10.280	3.0564	5.58
2646+86.310	2656+77.360	0.1877	3.250	0.8246	1.50
2656+77.360	2682+86.310	0.4941	5.332	0.5138	0.94
2682+86.310	2739+86.310	1.0795	9.607	0.4238	0.77
2739+86.310	2741+25.360	0.0263	0.192	0.3478	0.64
2741+25.360	2762+37.360	0.4000	2.847	0.3389	0.62
2762+37.360	2765+52.880	0.0598	2.323	1.8509	3.38
2765+52.880	2770+66.210	0.0972	0.861	0.4217	0.77
2770+66.210	2772+93.360	0.0430	0.381	0.4217	0.77
2772+93.360	2780+73.030	0.1477	4.995	1.6109	2.94
2780+73.030	2804+61.360	0.4523	3.219	0.3389	0.62
2804+61.360	2805+86.210	0.0236	5.364	10.8029	19.72
2805+86.210	2819+86.210	0.2652	1.944	0.3491	0.64
2819+86.210	2823+49.190	0.0687	0.504	0.3491	0.64
2823+49.190	2835+18.210	0.2214	1.931	0.4152	0.76
2835+18.210	2837+61.210	0.0460	0.337	0.3491	0.64
2837+61.210	2875+36.210	0.7150	8.703	0.5796	1.06
2875+36.210	2910+86.210	0.6723	6.660	0.4717	0.86
2910+86.210	3015+36.210	1.9792	14.511	0.3491	0.64
3015+36.210	3073+89.360	1.1086	11.588	0.4978	0.91
3073+89.360	3346+46.170	5.1623	34.768	0.3207	0.58
3346+46.170	3385+65.120	0.7422	5.257	0.3373	0.62
3385+65.120	3565+38.310	3.4040	21.924	0.3067	0.56
3565+38.310	3708+38.310	2.7083	17.444	0.3067	0.56
3708+38.310	3814+38.310	2.0076	12.930	0.3067	0.56
3814+38.310	3842+24.620	0.5277	3.399	0.3067	0.56
3842+24.620	3850+05.360	0.1479	1.130	0.3638	0.53
3850+05.360	3871+17.360	0.4000	3.520	0.4191	0.61
3871+17.360	3887+01.360	0.3000	2.292	0.3638	0.53
3887+01.360	3902+85.360	0.3000	2.521	0.4001	0.58
3902+85.360	3910+38.310	0.1426	1.089	0.3638	0.53
3910+38.310	3956+38.310	0.8712	6.656	0.3638	0.53
3956+38.310	3977+88.310	0.4072	3.331	0.3895	0.57
3977+88.310	4007+88.310	0.5682	4.341	0.3638	0.53
4007+88.310	4032+38.310	0.4640	3.545	0.3638	0.53
4032+38.310	4052+38.310	0.3788	2.894	0.3638	0.53
4052+38.310	4056+18.590	0.0720	0.550	0.3638	0.53
4056+18.590	4083+38.310	0.5151	4.304	0.3979	0.58
4083+38.310	4095+46.080	0.2287	1.911	0.3979	0.58
4095+46.080	4112+58.620	0.3243	2.478	0.3638	0.53

**Table 6. Expected Crash Frequencies and Rates by Horizontal Design Element (Section 1)**

Title	Start Location	End Location	Length (mi)	Expected No. Crashes for Evaluation Period	Crash Rate (crashes/mi/yr)	Travel Crash Rate (crashes/million veh-mi)
Tangent	10+00.000	352+16.190	6.4803	59.251	0.4354	0.87
Curve 1	352+16.190	387+96.580	0.6781	9.542	0.6701	1.34
Tangent	387+96.580	742+92.190	6.7227	79.253	0.5614	1.12
Curve 2	742+92.190	750+90.750	0.1512	4.938	1.5547	3.10
Tangent	750+90.750	817+41.440	1.2596	12.363	0.4674	0.93
Curve 3	817+41.440	838+35.860	0.3967	5.082	0.6101	1.22
Tangent	838+35.860	846+56.380	0.1554	1.110	0.3400	0.68
Curve 4	846+56.380	876+19.690	0.5612	10.140	0.8604	1.72
Tangent	876+19.690	1374+22.860	9.4324	70.932	0.3581	0.71
Curve 5	1374+22.860	1398+08.000	0.4517	4.897	0.5162	1.03
Tangent	1398+08.000	1984+34.640	11.1035	100.914	0.4328	0.86
Curve 6	1984+34.640	2016+46.900	0.6084	11.642	0.9112	1.82
Tangent	2016+46.900	2765+52.880	14.1867	191.553	0.6430	1.26
Curve 7	2765+52.880	2780+73.030	0.2879	6.237	1.0316	1.88
Tangent	2780+73.030	2823+49.190	0.8099	11.032	0.6486	1.18
Curve 8	2823+49.190	2835+18.210	0.2214	1.931	0.4152	0.76
Tangent	2835+18.210	3346+46.170	9.6833	76.568	0.3765	0.69
Curve 9	3346+46.170	3385+65.120	0.7422	5.257	0.3373	0.62
Tangent	3385+65.120	4056+18.590	12.6995	87.564	0.3283	0.56
Curve 10	4056+18.590	4095+46.080	0.7438	6.216	0.3979	0.58
Tangent	4095+46.080	4112+58.620	0.3243	2.478	0.3638	0.53

**Table 7. Expected Crash Type Distribution (Section 1)**

Element Type	Crash Type	Fatal and Injury		Property Damage Only		Total	
		Crashes	Crashes (%)	Crashes	Crashes (%)	Crashes	Crashes (%)
Highway Segment	Collision with Animal	9.62	1.3	93.03	12.3	91.83	12.1
Highway Segment	Collision with Bicycle	1.01	0.1	0.51	0.1	1.52	0.2
Highway Segment	Other Single-vehicle Collision	1.77	0.2	14.66	1.9	15.94	2.1
Highway Segment	Overturned	9.37	1.2	7.58	1.0	18.97	2.5
Highway Segment	Collision with Pedestrian	1.77	0.2	0.51	0.1	2.28	0.3
Highway Segment	Run Off Road	138.04	18.2	255.34	33.6	395.38	52.1
Highway Segment	Single Vehicle Crashes	161.59	21.3	371.63	49.0	525.92	69.3
Highway Segment	Angle Collision	25.58	3.4	36.40	4.8	64.51	8.5
Highway Segment	Head-on Collision	8.61	1.1	1.52	0.2	12.14	1.6
Highway Segment	Other Multiple-vehicle Collision	6.58	0.9	15.17	2.0	20.49	2.7
Highway Segment	Rear-end Collision	41.79	5.5	61.69	8.1	107.76	14.2
Highway Segment	Sideswipe	9.62	1.3	19.21	2.5	28.08	3.7
Highway Segment	Multiple Vehicle Crashes	92.19	12.1	133.99	17.7	232.98	30.7
Highway Segment	Total Highway Segment Crashes	253.78	33.4	505.62	66.6	758.90	100.0
	Total Crashes	253.78	33.4	505.62	66.6	758.90	100.0

**Note:** *Fatal and Injury Crashes* and *Property Damage Only Crashes* do not necessarily sum up to *Total Crashes* because the distribution of these three crashes had been derived independently.

*Interactive Highway Safety Design Model*

**Crash Prediction Evaluation Report**

February 3, 2014

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## Report Overview

**Report Generated:** Feb 3, 2014 5:51 PM

**Report Template:** System: Multi-Page [System] (mlcpm2, Oct 15, 2013 11:19 AM)

**Evaluation Date:** Tue Oct 15 14:26:37 PDT 2013

**IHSDM Version:** v8.1.0 (Feb 13, 2013)

**Crash Prediction Module:** v3.1.0 (Feb 13, 2013)

**User Name:** michael.mosley

**Organization Name:**

**Phone:**

**E-Mail:**

**Project Title:** US93-LG-JCT

**Project Comment:** Created Wed Jul 10 08:39:38 PDT 2013

**Project Unit System:** U.S. Customary

**Highway Title:** Highway 93 - Proposed

**Highway Comment:** Copied from Highway 93 - Existing (v3)

**Highway Version:** 2

**Evaluation Title:** CPM w Nevada Calibr & Rumbles

**Evaluation Comment:** Created Tue Oct 15 14:24:59 PDT 2013

**Minimum Station:** 10+00.000

**Maximum Station:** 4112+58.620

**Policy for Superelevation:** AASHTO 2011 U.S. Customary

**Calibration:** Nevada w/ Edge Rumble Configuration

**Crash Distribution:** HSM Configuration

**Model/CMF:** HSM Configuration

**Empirical-Bayes Analysis:** Site-Specific

**Highway with Crash History:** Highway 93 - Existing

**Highway with Crash History Comment:** Created Thu Jul 18 08:48:30 PDT 2013

**Highway with Crash History Version:** 3

**First Year of Analysis:** 2013

**Last Year of Analysis:** 2033

# Section 1 Evaluation

**Section:** Section 1

**Evaluation Start Location:** 10+00.000

**Evaluation End Location:** 4112+58.620

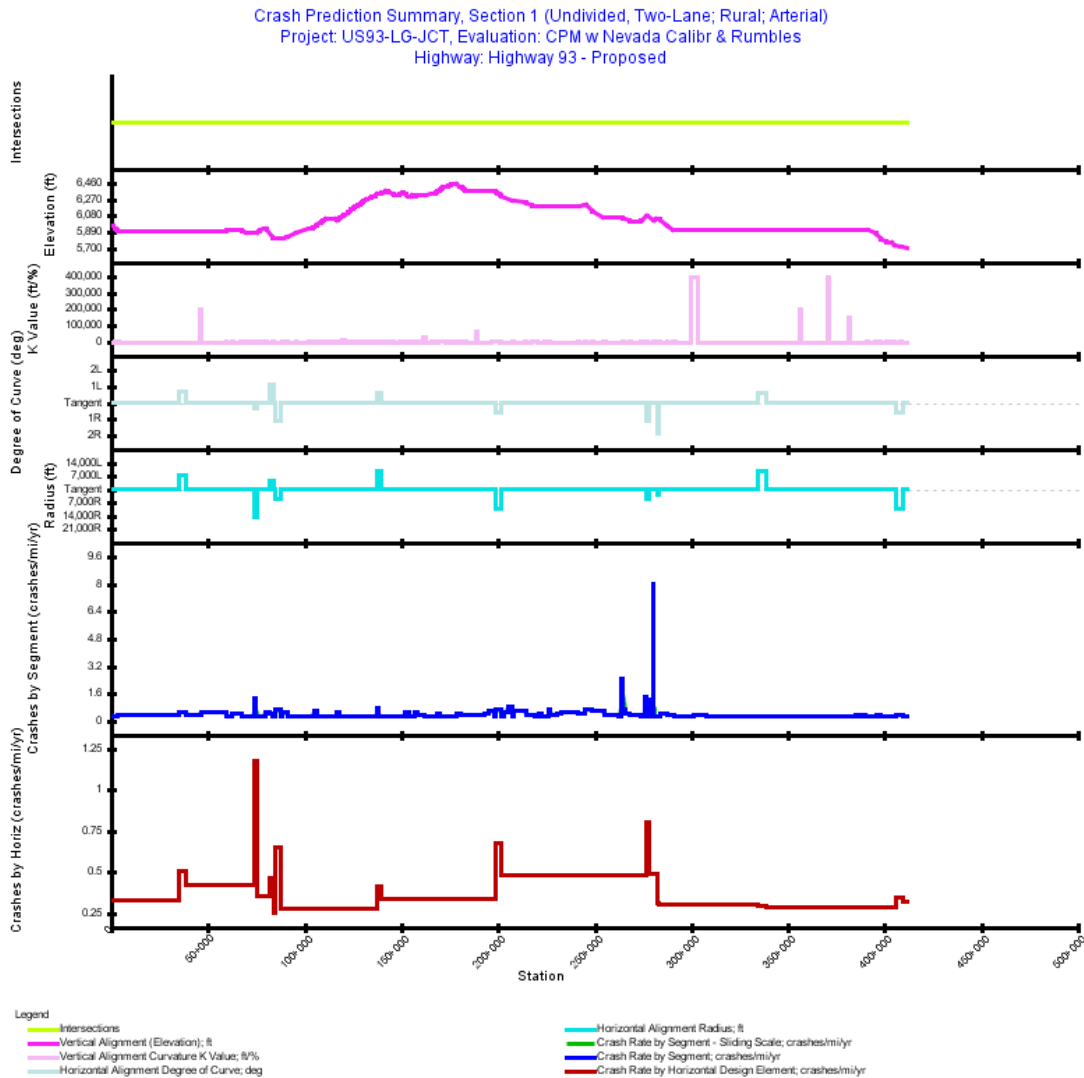
**Area Type:** Rural

**Functional Class:** Arterial

**Type of Alignment:** Undivided, Two Lane

**Model Category:** Rural, Two Lane

**Calibration Factor:** 2U=1.0164;



**Figure 1. Crash Prediction Summary (Section 1)**

**Table 1. Observed Crash Summary (Section 1)**

<b>Year</b>	<b>Total Crashes</b>	<b>FI Crashes</b>	<b>FI no/C Crashes</b>	<b>PDO Crashes</b>
2008	27	13	12	14
2009	26	9	5	17
2010	30	12	9	18
2011	32	14	9	18
All Years	115	48	35	67















Seg. No.	Type	Start Location	End Location	Length (ft)	Length (mi)	AADT	Left Lane Width (ft)	Right Lane Width (ft)	Left Shoulder Width (ft)	Right Shoulder Width (ft)	Grade (%)	Driveway Density (driveways/mi)	Hazard Rating	Centerline Rumble Strip	Passing Lanes	TWT Lane	Lighting	Automated Speed Enforcement	Radius (ft)	Superelevation (%)	Adverse	Design Speed (mph)
124	2U	3015+36.2	3073+89.3	5,853.1	1.1086	2013: 1,227; 2014: 1,255; 2015: 1,282; 2016: 1,310; 2017: 1,337; 2018: 1,365; 2019: 1,392; 2020: 1,420; 2021: 1,447; 2022: 1,475; 2023: 1,502; 2024: 1,530; 2025: 1,557; 2026: 1,585; 2027: 1,612; 2028: 1,640; 2029: 1,667; 2030: 1,695; 2031: 1,722; 2032-2033: 1,750	12.00	12.00	6.00	6.00	0.00	0.5	1	true	0	false	false	false				
125	2U	3073+89.3	3346+46.1	27,256.8	5.1623	2013: 1,227; 2014: 1,255; 2015: 1,282; 2016: 1,310; 2017: 1,337; 2018: 1,365; 2019: 1,392; 2020: 1,420; 2021: 1,447; 2022: 1,475; 2023: 1,502; 2024: 1,530; 2025: 1,557; 2026: 1,585; 2027: 1,612; 2028: 1,640; 2029: 1,667; 2030: 1,695; 2031: 1,722; 2032-2033: 1,750	12.00	12.00	6.00	6.00	0.00	0.5	1	true	0	false	false	false				
126	2U	3346+46.1	3385+65.1	3,918.9	0.7422	2013: 1,227; 2014: 1,255; 2015: 1,282; 2016: 1,310; 2017: 1,337; 2018: 1,365; 2019: 1,392; 2020: 1,420; 2021: 1,447; 2022: 1,475; 2023: 1,502; 2024: 1,530; 2025: 1,557; 2026: 1,585; 2027: 1,612; 2028: 1,640; 2029: 1,667; 2030: 1,695; 2031: 1,722; 2032-2033: 1,750	12.00	12.00	6.00	6.00	0.00	0.5	1	true	0	false	false	false	10,000.00	2.0	true	55
127	2U	3385+65.1	3565+38.3	17,973.1	3.4040	2013: 1,227; 2014: 1,255; 2015: 1,282; 2016: 1,310; 2017: 1,337; 2018: 1,365; 2019: 1,392; 2020: 1,420; 2021: 1,447; 2022: 1,475; 2023: 1,502; 2024: 1,530; 2025: 1,557; 2026: 1,585; 2027: 1,612; 2028: 1,640; 2029: 1,667; 2030: 1,695; 2031: 1,722; 2032-2033: 1,750	12.00	12.00	6.00	6.00	0.00	0.5	1	true	0	false	false	false				
128	2U	3565+38.3	3708+38.3	14,300.0	2.7083	2013: 1,227; 2014: 1,255; 2015: 1,282; 2016: 1,310; 2017: 1,337; 2018: 1,365; 2019: 1,392; 2020: 1,420; 2021: 1,447; 2022: 1,475; 2023: 1,502; 2024: 1,530; 2025: 1,557; 2026: 1,585; 2027: 1,612; 2028: 1,640; 2029: 1,667; 2030: 1,695; 2031: 1,722; 2032-2033: 1,750	12.00	12.00	6.00	6.00	0.01	0.5	1	true	0	false	false	false				
129	2U	3708+38.3	3814+38.3	10,600.0	2.0076	2013: 1,227; 2014: 1,255; 2015: 1,282; 2016: 1,310; 2017: 1,337; 2018: 1,365; 2019: 1,392; 2020: 1,420; 2021: 1,447; 2022: 1,475; 2023: 1,502; 2024: 1,530; 2025: 1,557; 2026: 1,585; 2027: 1,612; 2028: 1,640; 2029: 1,667; 2030: 1,695; 2031: 1,722; 2032-2033: 1,750	12.00	12.00	6.00	6.00	0.00	0.5	1	true	0	false	false	false				
130	2U	3814+38.3	3842+24.6	2,786.3	0.5277	2013: 1,227; 2014: 1,255; 2015: 1,282; 2016: 1,310; 2017: 1,337; 2018: 1,365; 2019: 1,392; 2020: 1,420; 2021: 1,447; 2022: 1,475; 2023: 1,502; 2024: 1,530; 2025: 1,557; 2026: 1,585; 2027: 1,612; 2028: 1,640; 2029: 1,667; 2030: 1,695; 2031: 1,722; 2032-2033: 1,750	12.00	12.00	6.00	6.00	0.00	0.5	1	true	0	false	false	false				
131	2U	3842+24.6	3850+05.3	780.74	0.1479	2013: 1,535; 2014: 1,570; 2015: 1,605; 2016: 1,640; 2017: 1,675; 2018: 1,710; 2019: 1,745; 2020: 1,780; 2021: 1,815; 2022: 1,850; 2023: 1,885; 2024: 1,920; 2025: 1,955; 2026: 1,990; 2027: 2,025; 2028: 2,060; 2029: 2,095; 2030: 2,130; 2031: 2,165; 2032-2033: 2,200	12.00	12.00	6.00	6.00	0.00	0.5	1	true	0	false	false	false				
132	2U	3850+05.3	3871+17.3	2,112.0	0.4000	2013: 1,535; 2014: 1,570; 2015: 1,605; 2016: 1,640; 2017: 1,675; 2018: 1,710; 2019: 1,745; 2020: 1,780; 2021: 1,815; 2022: 1,850; 2023: 1,885; 2024: 1,920; 2025: 1,955; 2026: 1,990; 2027: 2,025; 2028: 2,060; 2029: 2,095; 2030: 2,130; 2031: 2,165; 2032-2033: 2,200	12.00	12.00	6.00	6.00	0.00	0.5	4	true	0	false	false	false				
133	2U	3871+17.3	3887+01.3	1,584.0	0.3000	2013: 1,535; 2014: 1,570; 2015: 1,605; 2016: 1,640; 2017: 1,675; 2018: 1,710; 2019: 1,745; 2020: 1,780; 2021: 1,815; 2022: 1,850; 2023: 1,885; 2024: 1,920; 2025: 1,955; 2026: 1,990; 2027: 2,025; 2028: 2,060; 2029: 2,095; 2030: 2,130; 2031: 2,165; 2032-2033: 2,200	12.00	12.00	6.00	6.00	0.00	0.5	1	true	0	false	false	false				
134	2U	3887+01.3	3902+85.3	1,584.0	0.3000	2013: 1,535; 2014: 1,570; 2015: 1,605; 2016: 1,640; 2017: 1,675; 2018: 1,710; 2019: 1,745; 2020: 1,780; 2021: 1,815; 2022: 1,850; 2023: 1,885; 2024: 1,920; 2025: 1,955; 2026: 1,990; 2027: 2,025; 2028: 2,060; 2029: 2,095; 2030: 2,130; 2031: 2,165; 2032-2033: 2,200	12.00	12.00	6.00	6.00	0.00	0.5	3	true	0	false	false	false				
135	2U	3902+85.3	3910+38.3	752.95	0.1426	2013: 1,535; 2014: 1,570; 2015: 1,605; 2016: 1,640; 2017: 1,675; 2018: 1,710; 2019: 1,745; 2020: 1,780; 2021: 1,815; 2022: 1,850; 2023: 1,885; 2024: 1,920; 2025: 1,955; 2026: 1,990; 2027: 2,025; 2028: 2,060; 2029: 2,095; 2030: 2,130; 2031: 2,165; 2032-2033: 2,200	12.00	12.00	6.00	6.00	0.00	0.5	1	true	0	false	false	false				
136	2U	3910+38.3	3956+38.3	4,600.0	0.8712	2013: 1,535; 2014: 1,570; 2015: 1,605; 2016: 1,640; 2017: 1,675; 2018: 1,710; 2019: 1,745; 2020: 1,780; 2021: 1,815; 2022: 1,850; 2023: 1,885; 2024: 1,920; 2025: 1,955; 2026: 1,990; 2027: 2,025; 2028: 2,060; 2029: 2,095; 2030: 2,130; 2031: 2,165; 2032-2033: 2,200	12.00	12.00	6.00	6.00	0.87	0.5	1	true	0	false	false	false				
137	2U	3956+38.3	3977+88.3	2,150.0	0.4072	2013: 1,535; 2014: 1,570; 2015: 1,605; 2016: 1,640; 2017: 1,675; 2018: 1,710; 2019: 1,745; 2020: 1,780; 2021: 1,815; 2022: 1,850; 2023: 1,885; 2024: 1,920; 2025: 1,955; 2026: 1,990; 2027: 2,025; 2028: 2,060; 2029: 2,095; 2030: 2,130; 2031: 2,165; 2032-2033: 2,200	12.00	12.00	6.00	6.00	3.11	0.5	1	true	0	false	false	false				
138	2U	3977+88.3	4007+88.3	3,000.0	0.5682	2013: 1,535; 2014: 1,570; 2015: 1,605; 2016: 1,640; 2017: 1,675; 2018: 1,710; 2019: 1,745; 2020: 1,780; 2021: 1,815; 2022: 1,850; 2023: 1,885; 2024: 1,920; 2025: 1,955; 2026: 1,990; 2027: 2,025; 2028: 2,060; 2029: 2,095; 2030: 2,130; 2031: 2,165; 2032-2033: 2,200	12.00	12.00	6.00	6.00	0.99	0.5	1	true	0	false	false	false				
139	2U	4007+88.3	4032+38.3	2,450.0	0.4640	2013: 1,535; 2014: 1,570; 2015: 1,605; 2016: 1,640; 2017: 1,675; 2018: 1,710; 2019: 1,745; 2020: 1,780; 2021: 1,815; 2022: 1,850; 2023: 1,885; 2024: 1,920; 2025: 1,955; 2026: 1,990; 2027: 2,025; 2028: 2,060; 2029: 2,095; 2030: 2,130; 2031: 2,165; 2032-2033: 2,200	12.00	12.00	6.00	6.00	0.34	0.5	1	true	0	false	false	false				
140	2U	4032+38.3	4052+38.3	2,000.0	0.3788	2013: 1,535; 2014: 1,570; 2015: 1,605; 2016: 1,640; 2017: 1,675; 2018: 1,710; 2019: 1,745; 2020: 1,780; 2021: 1,815; 2022: 1,850; 2023: 1,885; 2024: 1,920; 2025: 1,955; 2026: 1,990; 2027: 2,025; 2028: 2,060; 2029: 2,095; 2030: 2,130; 2031: 2,165; 2032-2033: 2,200	12.00	12.00	6.00	6.00	1.36	0.5	1	true	0	false	false	false				
141	2U	4052+38.3	4056+18.5	380.28	0.0720	2013: 1,535; 2014: 1,570; 2015: 1,605; 2016: 1,640; 2017: 1,675; 2018: 1,710; 2019: 1,745; 2020: 1,780; 2021: 1,815; 2022: 1,850; 2023: 1,885; 2024: 1,920; 2025: 1,955; 2026: 1,990; 2027: 2,025; 2028: 2,060; 2029: 2,095; 2030: 2,130; 2031: 2,165; 2032-2033: 2,200	12.00	12.00	6.00	6.00	0.79	0.5	1	true	0	false	false	false				
142	2U	4056+18.5	4083+38.3	2,719.7	0.5151	2013: 1,535; 2014: 1,570; 2015: 1,605; 2016: 1,640; 2017: 1,675; 2018: 1,710; 2019: 1,745; 2020: 1,780; 2021: 1,815; 2022: 1,850; 2023: 1,885; 2024: 1,920; 2025: 1,955; 2026: 1,990; 2027: 2,025; 2028: 2,060; 2029: 2,095; 2030: 2,130; 2031: 2,165; 2032-2033: 2,200	12.00	12.00	6.00	6.00	0.79	0.5	1	true	0	false	false	false	10,000.00	2.0	true	70
143	2U	4083+38.3	4095+46.6	1,207.7	0.2287	2013: 1,535; 2014: 1,570; 2015: 1,605; 2016: 1,640; 2017: 1,675; 2018: 1,710; 2019: 1,745; 2020: 1,780; 2021: 1,815; 2022: 1,850; 2023: 1,885; 2024: 1,920; 2025: 1,955; 2026: 1,990; 2027: 2,025; 2028: 2,060; 2029: 2,095; 2030: 2,130; 2031: 2,165; 2032-2033: 2,200	12.00	12.00	6.00	6.00	0.52	0.5	1	true	0	false	false	false	10,000.00	2.0	true	70
144	2U	4095+46.6	4112+58.6	1,712.5	0.3243	2013: 1,535; 2014: 1,570; 2015: 1,605; 2016: 1,640; 2017: 1,675; 2018: 1,710; 2019: 1,745; 2020: 1,780; 2021: 1,815; 2022: 1,850; 2023: 1,885; 2024: 1,920; 2025: 1,955; 2026: 1,990; 2027: 2,025; 2028: 2,060; 2029: 2,095; 2030: 2,130; 2031: 2,165; 2032-2033: 2,200	12.00	12.00	6.00	6.00	0.52	0.5	1	true	0	false	false	false				







Seg. No.	Type	Start Location	End Location	Length (ft)	Length(mi)	AADT	Left Lane Width (ft)	Right Lane Width (ft)	Left Shoulder Width (ft)	Right Shoulder Width (ft)	Grade (%)	Driveway Density (driveways/mi)	Hazard Rating	Centerline Rumble Strip	Passing Lanes	TWLT Lane	Lighting	Automated Speed Enforcement	Radius (ft)	Superelevation (%)	Adverse	Design Speed (mph)
118	2U	2819+86.210	2823+49.190	362.98	0.0688	2008-2011: 1,200	12.00	12.00	1.00	1.00	0.23	0.5	1	true	0	false	false	false				
119	2U	2823+49.190	2835+18.210	1,169.02	0.2214	2008-2011: 1,200	12.00	12.00	1.00	1.00	0.23	0.5	1	true	0	false	false	false	3,000.00	2.0	true	55
120	2U	2835+18.210	2837+61.210	243.00	0.0460	2008-2011: 1,200	12.00	12.00	1.00	1.00	0.23	0.5	1	true	0	false	false	false				
121	2U	2837+61.210	2875+36.210	3,775.00	0.7150	2008-2011: 1,200	12.00	12.00	1.00	1.00	2.04	0.5	1	true	0	false	false	false				
122	2U	2875+36.210	2910+86.210	3,550.00	0.6724	2008-2011: 1,200	12.00	12.00	1.00	1.00	1.43	0.5	1	true	0	false	false	false				
123	2U	2910+86.210	3015+36.210	10,450.00	1.9792	2008-2011: 1,200	12.00	12.00	1.00	1.00	0.01	0.5	1	true	0	false	false	false				
124	2U	3015+36.210	3073+89.360	5,853.15	1.1086	2008-2011: 1,200	12.00	12.00	1.00	1.00	0.00	0.5	1	true	0	false	false	false				
125	2U	3073+89.360	3346+46.170	27,256.81	5.1623	2008-2011: 1,200	12.00	12.00	6.00	6.00	0.00	0.5	1	true	0	false	false	false				
126	2U	3346+46.170	3385+65.120	3,918.95	0.7422	2008-2011: 1,200	12.00	12.00	6.00	6.00	0.00	0.5	1	true	0	false	false	false	10,000.00	2.0	true	55
127	2U	3385+65.120	3565+38.310	17,973.19	3.4040	2008-2011: 1,200	12.00	12.00	6.00	6.00	0.00	0.5	1	true	0	false	false	false				
128	2U	3565+38.310	3708+38.310	14,300.00	2.7083	2008-2011: 1,200	12.00	12.00	6.00	6.00	0.01	0.5	1	true	0	false	false	false				
129	2U	3708+38.310	3814+38.310	10,600.00	2.0076	2008-2011: 1,200	12.00	12.00	6.00	6.00	0.00	0.5	1	true	0	false	false	false				
130	2U	3814+38.310	3842+24.620	2,786.31	0.5277	2008-2011: 1,200	12.00	12.00	6.00	6.00	0.00	0.5	1	true	0	false	false	false				
131	2U	3842+24.620	3850+05.360	780.74	0.1479	2008-2011: 1,500	12.00	12.00	6.00	6.00	0.00	0.5	1	true	0	false	false	false				
132	2U	3850+05.360	3871+17.360	2,112.00	0.4000	2008-2011: 1,500	12.00	12.00	6.00	6.00	0.00	0.5	4	true	0	false	false	false				
133	2U	3871+17.360	3887+01.360	1,584.00	0.3000	2008-2011: 1,500	12.00	12.00	6.00	6.00	0.00	0.5	1	true	0	false	false	false				
134	2U	3887+01.360	3902+85.360	1,584.00	0.3000	2008-2011: 1,500	12.00	12.00	6.00	6.00	0.00	0.5	3	true	0	false	false	false				
135	2U	3902+85.360	3910+38.310	752.95	0.1426	2008-2011: 1,500	12.00	12.00	6.00	6.00	0.00	0.5	1	true	0	false	false	false				
136	2U	3910+38.310	3956+38.310	4,600.00	0.8712	2008-2011: 1,500	12.00	12.00	6.00	6.00	0.87	0.5	1	true	0	false	false	false				
137	2U	3956+38.310	3977+88.310	2,150.00	0.4072	2008-2011: 1,500	12.00	12.00	6.00	6.00	3.11	0.5	1	true	0	false	false	false				
138	2U	3977+88.310	4007+88.310	3,000.00	0.5682	2008-2011: 1,500	12.00	12.00	6.00	6.00	0.99	0.5	1	true	0	false	false	false				
139	2U	4007+88.310	4032+38.310	2,450.00	0.4640	2008-2011: 1,500	12.00	12.00	6.00	6.00	0.34	0.5	1	true	0	false	false	false				
140	2U	4032+38.310	4052+38.310	2,000.00	0.3788	2008-2011: 1,500	12.00	12.00	6.00	6.00	1.36	0.5	1	true	0	false	false	false				
141	2U	4052+38.310	4056+18.590	380.28	0.0720	2008-2011: 1,500	12.00	12.00	6.00	6.00	0.79	0.5	1	true	0	false	false	false				
142	2U	4056+18.590	4083+38.310	2,719.72	0.5151	2008-2011: 1,500	12.00	12.00	6.00	6.00	0.79	0.5	1	true	0	false	false	false	10,000.00	2.0	true	70
143	2U	4083+38.310	4095+46.080	1,207.77	0.2287	2008-2011: 1,500	12.00	12.00	6.00	6.00	0.52	0.5	1	true	0	false	false	false	10,000.00	2.0	true	70
144	2U	4095+46.080	4112+58.620	1,712.54	0.3243	2008-2011: 1,500	12.00	12.00	6.00	6.00	0.52	0.5	1	true	0	false	false	false				



**Table 4. Expected Highway Crash Rates and Frequencies (Section 1)**

<b>First Year of Analysis</b>	2013
<b>Last Year of Analysis</b>	2033
<b>Evaluated Length (mi)</b>	77.7005
<b>Average Future Road AADT (vpd)</b>	1,445
<b>Expected Crashes</b>	
<b>Total Crashes</b>	592.65
<b>Fatal and Injury Crashes</b>	195.88
<b>Fatal and Serious Injury Crashes</b>	99.21
<b>Property-Damage-Only Crashes</b>	396.77
<b>Percent of Total Expected Crashes</b>	
<b>Percent Fatal and Injury Crashes (%)</b>	33
<b>Percent Fatal and Serious Injury Crashes (%)</b>	17
<b>Percent Property-Damage-Only Crashes (%)</b>	67
<b>Expected Crash Rate</b>	
<b>Crash Rate (crashes/mi/yr)</b>	0.3632
<b>Fatal and Injury Crash Rate (crashes/mi/yr)</b>	0.1200
<b>Fatal and Serious Injury Crash Rate (crashes/mi/yr)</b>	0.0608
<b>Property-Damage-Only Crash Rate (crashes/mi/yr)</b>	0.2432
<b>Expected Travel Crash Rate</b>	
<b>Total Travel (million veh-mi)</b>	860.42
<b>Travel Crash Rate (crashes/million veh-mi)</b>	0.69
<b>Travel Fatal and Injury Crash Rate (crashes/million veh-mi)</b>	0.23
<b>Travel Fatal and Serious Injury Crash Rate (crashes/million veh-mi)</b>	0.11
<b>Travel Property-Damage-Only Crash Rate (crashes/million veh-mi)</b>	0.46



**Table 5. Expected Crash Frequencies and Rates by Highway Segment (Section 1)**

Start Location	End Location	Length (mi)	Expected No. Crashes for Evaluation Period	Crash Rate (crashes/mi/yr)	Travel Crash Rate (crashes/million veh-mi)
10+00.000	23+57.450	0.2571	1.458	0.2700	0.54
23+57.450	35+07.450	0.2178	1.235	0.2700	0.54
35+07.450	352+16.190	6.0054	42.076	0.3336	0.66
352+16.190	387+96.580	0.6781	7.243	0.5086	1.01
387+96.580	462+57.450	1.4130	12.025	0.4052	0.81
462+57.450	592+29.360	2.4568	28.647	0.5553	1.11
592+29.360	595+57.450	0.0621	0.334	0.2563	0.51
595+57.450	624+57.450	0.5492	2.957	0.2563	0.51
624+57.450	676+57.450	0.9848	9.113	0.4406	0.88
676+57.450	697+57.450	0.3977	2.141	0.2563	0.51
697+57.450	728+57.450	0.5871	3.161	0.2563	0.51
728+57.450	742+92.190	0.2717	1.463	0.2563	0.51
742+92.190	749+57.450	0.1260	3.588	1.3562	2.70
749+57.450	750+90.750	0.0252	0.152	0.2858	0.57
750+90.750	765+57.450	0.2778	1.495	0.2563	0.51
765+57.450	795+57.450	0.5682	3.059	0.2563	0.51
795+57.450	817+41.440	0.4136	4.768	0.5489	1.10
817+41.440	836+57.450	0.3629	3.646	0.4784	0.95
836+57.450	838+35.860	0.0338	0.206	0.2899	0.58
838+35.860	846+56.380	0.1554	0.837	0.2563	0.51
846+56.380	876+19.690	0.5612	7.683	0.6519	1.30
876+19.690	885+57.450	0.1776	0.956	0.2563	0.51
885+57.450	910+57.450	0.4735	5.090	0.5119	1.02
910+57.450	957+57.450	0.8902	4.792	0.2563	0.51
957+57.450	1027+91.050	1.3321	7.171	0.2563	0.51
1027+91.050	1041+09.360	0.2497	1.344	0.2563	0.51
1041+09.360	1046+57.450	0.1038	0.538	0.2470	0.49
1046+57.450	1062+57.450	0.3030	4.020	0.6318	1.26
1062+57.450	1083+33.360	0.3932	2.039	0.2470	0.49
1083+33.360	1084+57.450	0.0235	0.143	0.2893	0.58
1084+57.450	1088+61.360	0.0765	0.465	0.2893	0.58
1088+61.360	1094+57.450	0.1129	0.583	0.2458	0.49
1094+57.450	1112+38.560	0.3373	1.741	0.2458	0.49
1112+38.560	1140+38.560	0.5303	2.737	0.2458	0.49
1140+38.560	1146+69.360	0.1195	0.617	0.2458	0.49
1146+69.360	1151+97.360	0.1000	0.604	0.2876	0.57
1151+97.360	1152+38.560	0.0078	0.040	0.2458	0.49
1152+38.560	1167+38.560	0.2841	1.466	0.2458	0.49
1167+38.560	1179+38.560	0.2273	2.391	0.5010	1.00
1179+38.560	1202+38.560	0.4356	2.248	0.2458	0.49
1202+38.560	1226+38.560	0.4545	2.346	0.2458	0.49
1226+38.560	1242+38.560	0.3030	1.564	0.2458	0.49
1242+38.560	1257+38.560	0.2841	1.466	0.2458	0.49
1257+38.560	1271+38.560	0.2652	1.369	0.2458	0.49
1271+38.560	1290+38.560	0.3598	1.857	0.2458	0.49
1290+38.560	1302+38.560	0.2273	1.173	0.2458	0.49
1302+38.560	1317+38.560	0.2841	1.466	0.2458	0.49
1317+38.560	1343+38.560	0.4924	2.542	0.2458	0.49

Start Location	End Location	Length (mi)	Expected No. Crashes for Evaluation Period	Crash Rate (crashes/mi/yr)	Travel Crash Rate (crashes/million veh-mi)
1343+38.560	1363+38.560	0.3788	1.955	0.2458	0.49
1363+38.560	1368+45.360	0.0960	0.495	0.2458	0.49
1368+45.360	1374+22.860	0.1094	0.564	0.2458	0.49
1374+22.860	1381+38.560	0.1355	2.125	0.7467	1.49
1381+38.560	1398+08.000	0.3162	1.809	0.2724	0.54
1398+08.000	1400+13.360	0.0389	0.201	0.2458	0.49
1400+13.360	1401+38.560	0.0237	0.122	0.2446	0.49
1401+38.560	1420+38.560	0.3598	1.848	0.2446	0.49
1420+38.560	1433+88.560	0.2557	1.313	0.2446	0.49
1433+88.560	1457+38.560	0.4451	2.286	0.2446	0.49
1457+38.560	1492+38.560	0.6629	3.404	0.2446	0.49
1492+38.560	1505+38.560	0.2462	1.264	0.2446	0.49
1505+38.560	1519+38.560	0.2652	1.362	0.2446	0.49
1519+38.560	1539+38.560	0.3788	4.370	0.5493	1.10
1539+38.560	1559+38.560	0.3788	1.945	0.2446	0.49
1559+38.560	1571+88.560	0.2367	1.216	0.2446	0.49
1571+88.560	1583+38.560	0.2178	2.331	0.5096	1.02
1583+38.560	1619+38.560	0.6818	4.714	0.3292	0.66
1619+38.560	1663+38.560	0.8333	5.492	0.3138	0.63
1663+38.560	1675+38.560	0.2273	1.167	0.2446	0.49
1675+38.560	1685+38.560	0.1894	0.973	0.2446	0.49
1685+38.560	1699+38.560	0.2652	2.574	0.4622	0.92
1699+38.560	1709+38.560	0.1894	0.973	0.2446	0.49
1709+38.560	1722+38.560	0.2462	1.264	0.2446	0.49
1722+38.560	1743+38.560	0.3977	2.043	0.2446	0.49
1743+38.560	1757+38.560	0.2652	1.362	0.2446	0.49
1757+38.560	1782+38.560	0.4735	2.432	0.2446	0.49
1782+38.560	1810+38.560	0.5303	5.148	0.4622	0.92
1810+38.560	1830+38.560	0.3788	3.158	0.3969	0.79
1830+38.560	1888+42.160	1.0992	8.069	0.3496	0.70
1888+42.160	1933+41.360	0.8521	6.801	0.3800	0.76
1933+41.360	1954+53.360	0.4000	3.795	0.4517	0.90
1954+53.360	1980+93.360	0.5000	6.170	0.5876	1.17
1980+93.360	1984+34.640	0.0646	0.388	0.2855	0.57
1984+34.640	1985+92.160	0.0298	0.197	0.3137	0.63
1985+92.160	2014+92.160	0.5492	8.283	0.7181	1.43
2014+92.160	2016+46.900	0.0293	0.193	0.3137	0.63
2016+46.900	2028+45.360	0.2270	1.361	0.2855	0.57
2028+45.360	2049+57.360	0.4000	4.720	0.5620	1.12
2049+57.360	2075+92.160	0.4990	8.652	0.8257	1.65
2075+92.160	2081+25.360	0.1010	0.606	0.2855	0.57
2081+25.360	2142+92.160	1.1680	13.988	0.5703	1.14
2142+92.160	2189+92.160	0.8902	7.374	0.3945	0.79
2189+92.160	2207+97.360	0.3419	1.851	0.2578	0.51
2207+97.360	2223+81.360	0.3000	3.055	0.4849	0.97
2223+81.360	2242+92.160	0.3619	1.859	0.2447	0.49
2242+92.160	2264+92.160	0.4167	2.141	0.2447	0.49
2264+92.160	2271+33.360	0.1214	1.836	0.7201	1.44
2271+33.360	2308+29.360	0.7000	5.612	0.3818	0.76
2308+29.360	2324+13.360	0.3000	2.754	0.4371	0.87
2324+13.360	2416+92.160	1.7573	19.028	0.5156	1.03
2416+92.160	2452+92.160	0.6818	6.918	0.4832	0.96

Start Location	End Location	Length (mi)	Expected No. Crashes for Evaluation Period	Crash Rate (crashes/mi/yr)	Travel Crash Rate (crashes/million veh-mi)
2452+92.160	2488+92.160	0.6818	9.748	0.6808	1.36
2488+92.160	2548+42.160	1.1269	13.832	0.5845	1.17
2548+42.160	2625+09.360	1.4521	10.122	0.3319	0.66
2625+09.360	2638+40.620	0.2521	1.446	0.2731	0.54
2638+40.620	2646+86.310	0.1602	8.222	2.4443	4.46
2646+86.310	2656+77.360	0.1877	2.599	0.6594	1.20
2656+77.360	2682+86.310	0.4941	4.255	0.4101	0.75
2682+86.310	2739+86.310	1.0795	7.667	0.3382	0.62
2739+86.310	2741+25.360	0.0263	0.154	0.2775	0.51
2741+25.360	2762+37.360	0.4000	2.200	0.2619	0.48
2762+37.360	2765+52.880	0.0598	1.803	1.4368	2.62
2765+52.880	2770+66.210	0.0972	0.672	0.3293	0.60
2770+66.210	2772+93.360	0.0430	0.298	0.3293	0.60
2772+93.360	2780+73.030	0.1477	3.882	1.2520	2.28
2780+73.030	2804+61.360	0.4523	2.488	0.2619	0.48
2804+61.360	2805+86.210	0.0236	3.998	8.0520	14.70
2805+86.210	2819+86.210	0.2652	1.449	0.2602	0.48
2819+86.210	2823+49.190	0.0687	0.376	0.2602	0.48
2823+49.190	2835+18.210	0.2214	1.451	0.3120	0.57
2835+18.210	2837+61.210	0.0460	0.252	0.2602	0.48
2837+61.210	2875+36.210	0.7150	6.486	0.4320	0.79
2875+36.210	2910+86.210	0.6723	4.964	0.3516	0.64
2910+86.210	3015+36.210	1.9792	10.816	0.2602	0.48
3015+36.210	3073+89.360	1.1086	8.637	0.3710	0.68
3073+89.360	3346+46.170	5.1623	30.329	0.2798	0.51
3346+46.170	3385+65.120	0.7422	4.604	0.2954	0.54
3385+65.120	3565+38.310	3.4040	19.124	0.2675	0.49
3565+38.310	3708+38.310	2.7083	15.216	0.2675	0.49
3708+38.310	3814+38.310	2.0076	11.279	0.2675	0.49
3814+38.310	3842+24.620	0.5277	2.965	0.2675	0.49
3842+24.620	3850+05.360	0.1479	0.992	0.3196	0.46
3850+05.360	3871+17.360	0.4000	3.114	0.3707	0.54
3871+17.360	3887+01.360	0.3000	2.013	0.3196	0.46
3887+01.360	3902+85.360	0.3000	2.225	0.3531	0.51
3902+85.360	3910+38.310	0.1426	0.957	0.3196	0.46
3910+38.310	3956+38.310	0.8712	5.846	0.3196	0.46
3956+38.310	3977+88.310	0.4072	2.935	0.3433	0.50
3977+88.310	4007+88.310	0.5682	3.813	0.3196	0.46
4007+88.310	4032+38.310	0.4640	3.114	0.3196	0.46
4032+38.310	4052+38.310	0.3788	2.542	0.3196	0.46
4052+38.310	4056+18.590	0.0720	0.483	0.3196	0.46
4056+18.590	4083+38.310	0.5151	3.797	0.3510	0.51
4083+38.310	4095+46.080	0.2287	1.686	0.3510	0.51
4095+46.080	4112+58.620	0.3243	2.177	0.3196	0.46

**Table 6. Expected Crash Frequencies and Rates by Horizontal Design Element (Section 1)**

Title	Start Location	End Location	Length (mi)	Expected No. Crashes for Evaluation Period	Crash Rate (crashes/mi/yr)	Travel Crash Rate (crashes/million veh-mi)
Tangent	10+00.000	352+16.190	6.4803	44.769	0.3290	0.66
Curve 1	352+16.190	387+96.580	0.6781	7.243	0.5086	1.01
Tangent	387+96.580	742+92.190	6.7227	59.841	0.4239	0.84
Curve 2	742+92.190	750+90.750	0.1512	3.740	1.1775	2.35
Tangent	750+90.750	817+41.440	1.2596	9.322	0.3524	0.70
Curve 3	817+41.440	838+35.860	0.3967	3.852	0.4624	0.92
Tangent	838+35.860	846+56.380	0.1554	0.837	0.2563	0.51
Curve 4	846+56.380	876+19.690	0.5612	7.683	0.6519	1.30
Tangent	876+19.690	1374+22.860	9.4324	55.785	0.2816	0.56
Curve 5	1374+22.860	1398+08.000	0.4517	3.934	0.4147	0.83
Tangent	1398+08.000	1984+34.640	11.1035	78.183	0.3353	0.67
Curve 6	1984+34.640	2016+46.900	0.6084	8.673	0.6788	1.35
Tangent	2016+46.900	2765+52.880	14.1867	143.804	0.4827	0.95
Curve 7	2765+52.880	2780+73.030	0.2879	4.852	0.8025	1.46
Tangent	2780+73.030	2823+49.190	0.8099	8.311	0.4887	0.89
Curve 8	2823+49.190	2835+18.210	0.2214	1.451	0.3120	0.57
Tangent	2835+18.210	3346+46.170	9.6833	61.484	0.3024	0.55
Curve 9	3346+46.170	3385+65.120	0.7422	4.604	0.2954	0.54
Tangent	3385+65.120	4056+18.590	12.6995	76.619	0.2873	0.48
Curve 10	4056+18.590	4095+46.080	0.7438	5.484	0.3510	0.51
Tangent	4095+46.080	4112+58.620	0.3243	2.177	0.3196	0.46

**Table 7. Expected Crash Type Distribution (Section 1)**

Element Type	Crash Type	Fatal and Injury		Property Damage Only		Total	
		Crashes	Crashes (%)	Crashes	Crashes (%)	Crashes	Crashes (%)
Highway Segment	Collision with Animal	7.44	1.3	73.00	12.3	71.71	12.1
Highway Segment	Collision with Bicycle	0.78	0.1	0.40	0.1	1.18	0.2
Highway Segment	Other Single-vehicle Collision	1.37	0.2	11.51	1.9	12.45	2.1
Highway Segment	Overtaken	7.25	1.2	5.95	1.0	14.82	2.5
Highway Segment	Collision with Pedestrian	1.37	0.2	0.40	0.1	1.78	0.3
Highway Segment	Run Off Road	106.75	18.0	200.37	33.8	308.77	52.1
Highway Segment	Single Vehicle Crashes	124.97	21.1	291.62	49.2	410.70	69.3
Highway Segment	Angle Collision	19.78	3.3	28.57	4.8	50.38	8.5
Highway Segment	Head-on Collision	6.66	1.1	1.19	0.2	9.48	1.6
Highway Segment	Other Multiple-vehicle Collision	5.09	0.9	11.90	2.0	16.00	2.7
Highway Segment	Rear-end Collision	32.32	5.5	48.41	8.2	84.16	14.2
Highway Segment	Sideswipe	7.44	1.3	15.08	2.5	21.93	3.7
Highway Segment	Multiple Vehicle Crashes	71.30	12.0	105.14	17.7	181.94	30.7
Highway Segment	Total Highway Segment Crashes	196.27	33.1	396.77	66.9	592.65	100.0
	Total Crashes	196.27	33.1	396.77	66.9	592.65	100.0

**Note:** *Fatal and Injury Crashes* and *Property Damage Only Crashes* do not necessarily sum up to *Total Crashes* because the distribution of these three crashes had been derived independently.

**APPENDIX C**  
**Shoulder Cost Estimation**



US 93 Total Construction Cost is \$21 Million per e-mail from Peter Aiyuk received 10-9-2013

Sta	Sta	Length Feet	Length Miles	Side	Before Width	After Width	Net Shoulder Feet added	\$200K per mile Shoulder widening
10+00.000	1041+09.360	103109	19.5	Both	1	6	5	\$3,905,658
1041+09.360	1088+61.360	4752	0.9	Both	4	6	2	\$72,000
1088+61.360	1400+13.360	31152	5.9	Both	3	6	3	\$708,000
1400+13.360	1933+41.360	53328	10.1	Both	2	6	4	\$1,616,000
1933+41.360	1980+93.360	4752	0.9	Both	1	6	5	\$180,000
1980+93.360	2625+09.360	64416	12.2	Both	0	6	6	\$2,928,000
2625+09.360	2741+25.360	11616	2.2	Both	3	6	3	\$264,000
2741+25.360	2804+61.360	6336	1.2	Both	2	6	4	\$192,000
2804+61.360	3073+89.360	26928	5.1	Both	1	6	5	\$1,020,000
3073+89.360	4112+58.620	103869	19.7	Both	6	6	0	\$0

Approximate Total Shoulder Widening Cost= **\$11,000,000**

**APPENDIX D**  
**Benefit Cost Analysis**



# COST EFFECTIVENESS ANALYSIS ACCIDENT REDUCTION BENEFITS

(2012 DOLLAR FIGURES)

12/11/13

ENGINEERING AUTHORIZATION NO.	<u>Not Known</u>
PROJECT NO.	<u>Not Known</u>
PROJECT LOCATION	<u>US 93 North of Lages Station</u>
ALTERNATIVE NO.	<u>Alt 1</u>
COUNTERMEASURE	<u>Widen Shoulders to 6'</u>
AADT - Segment or Main St & Cross St	_____
ROADWAY CHARACTERISTICS	<u>2 LANE UNDIVIDED</u>
DEMOGRAPHIC DESIGNATION	<u>RURAL</u>
FUNCTIONAL CLASSIFICATION	<u>3 OTHER PRINCIPLE ARTERIAL</u>
IMPLEMENTATION COSTS	<u>\$11,000,000.00</u>
ANNUAL MAINTENANCE COSTS	<u>\$10,000.00</u>
CURRENT PRIME INTEREST RATE	<u>3.25%</u>
PERCENTAGE OF GROWTH	<u>2.00%</u>
ESTIMATED SERVICE LIFE & NUMBER OF YEARS PREDICTED	<u>20</u> YEAR(S)
NUMBER OF YEARS OF CRASH HISTORY DATA	<u>4</u> YEAR(S)



### CALCULATION OF REDUCTIONS USING IHSDM

IHSDM (Interactive Highway Safety Design Model)

<http://www.ihsdm.org/>

	2012 CRASH COSTS	HSM DISTR. OF CRASHES (A)	EXISTING CONDITION EXPECTED CRASHES (B)	ALTERNATIVE EXPECTED CRASHES (C)	EXPECTED CRF (%) (D)	CRASHES SAVED ANNUALLY (E)
FATAL	\$5,339,711.00	1.3	<u>9.9</u>	<u>7.7</u>	<u>22%</u>	<u>0.11</u>
INJURY A	\$285,349.00	5.4	<u>41.0</u>	<u>32.0</u>	<u>22%</u>	<u>0.45</u>
INJURY B	\$104,302.00	10.9	<u>82.7</u>	<u>64.6</u>	<u>22%</u>	<u>0.91</u>
INJURY C	\$59,037.00	14.5	<u>110.0</u>	<u>85.9</u>	<u>22%</u>	<u>1.21</u>
PDO	\$9,638.00	67.9	<u>515.3</u>	<u>402.4</u>	<u>22%</u>	<u>5.64</u>

### CALCULATION OF BENEFITS

	CRASHES SAVED ANNUALLY (E)	SOCIETAL COST (F)	SOCIETAL BENEFIT (G)
FATAL	<u>0.11</u>	<u>\$5,339,711</u>	<u>\$577,023</u>
INJURY A	<u>0.45</u>	<u>\$285,349</u>	<u>\$128,086</u>
INJURY B	<u>0.91</u>	<u>\$104,302</u>	<u>\$94,504</u>
INJURY C	<u>1.21</u>	<u>\$59,037</u>	<u>\$71,158</u>
PDO	<u>5.64</u>	<u>\$9,638</u>	<u>\$54,399</u>
TOTAL ANNUAL BENEFITS (Summation of Column E)		<u>\$925,169</u>	
TOTAL ANNUAL BENEFITS (Including Growth )		<u>\$943,673</u>	
CAPITAL RECOVERY FACTOR		<u>0.0688</u>	
ANNUALIZED IMPLEMENTATION COSTS		<u>\$756,568</u>	
TOTAL ANNUALIZED COSTS		<u>\$766,568</u>	
AVERAGE ANNUAL NET RETURN		<u>\$177,105</u>	
<b>BENEFIT/COST</b>		<b><u>1.23</u></b>	