

Guardrail and Bridge Rail Recommendations for Very Low-Volume Local Roads in Kansas: Addendum to Include Bridges Up to 100 Feet Long and Traffic Volume Up to 100 Vehicles Per Day

Ronald J. Seitz, P.E.
Division of Engineering & Design

Tod Salfrank
Bureau of Local Projects

Kansas Department of Transportation



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In 2014, the Kansas Department of Transportation undertook a study, entitled "Guardrail and Bridge Rail Recommendations for Very Low-Volume Local Roads in Kansas" (Report No. KS-14-16, Seitz & Salfrank, 2014), to establish practical risk-based guidelines and policies for bridge rails and guardrails on low-volume local roads in the state. The purpose of the effort outlined in this report is to expand on the work performed in the 2014 study and to supplement the recommendations to include bridges up to 100 feet in length and roads with ADT up to 100 vehicles per day. The primary tasks to be completed will include: • Analysis of bridge rail/guardrail crashes on bridges with length between 50 feet and 100 feet and located on a local road with ADT between 50 and 100 vehicles per day. • Benefit-cost analyses based on these parameters and typical location features. Based on the results of this study, it is recommended that the recommendations of Report No. KS-14-16 be expanded to include bridge rails installed on new or rehabilitated bridges up to 100 feet long with traffic volume up to 100 vpd.			
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Final Report

Prepared by

Ronald J. Seitz, P.E.
Director, Division of Engineering & Design

Tod Salfrank
Assistant Chief, Bureau of Local Projects

Kansas Department of Transportation

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Abstract

In 2014, the Kansas Department of Transportation undertook a study, entitled “Guardrail and Bridge Rail Recommendations for Very Low-Volume Local Roads in Kansas” (Report No. KS-14-16, Seitz & Salfrank, 2014), to establish practical risk-based guidelines and policies for bridge rails and guardrails on low-volume local roads in the state.

The purpose of the effort outlined in this report is to expand on the work performed in the 2014 study and to supplement the recommendations to include bridges up to 100 feet in length and roads with ADT up to 100 vehicles per day. The primary tasks to be completed will include:

- Analysis of bridge rail/guardrail crashes on bridges with length between 50 feet and 100 feet and located on a local road with ADT between 50 and 100 vehicles per day.
- Benefit-cost analyses based on these parameters and typical location features.

Based on the results of this study, it is recommended that the recommendations of Report No. KS-14-16 be expanded to include bridge rails installed on new or rehabilitated bridges up to 100 feet long with traffic volume up to 100 vpd.

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Introduction

In 2014, the Kansas Department of Transportation undertook a study, entitled “Guardrail and Bridge Rail Recommendations for Very Low-Volume Local Roads in Kansas” (Report No. KS-14-16, Seitz & Salfrank, 2014), to establish practical risk-based guidelines and policies for bridge rails and guardrails on low-volume local roads in the state. The primary tasks completed in the study included:

- A review of the state of the practice, including current American Association of State Highway and Transportation Officials (AASHTO) policies and guidelines to determine the amount of flexibility/discretion allowed.
- A review of research studies with similar objectives that have been performed elsewhere.
- A review of the policies of other state highway agencies.
- Analysis of bridge rail/approach guardrail crashes on low-volume local roads in Kansas.
- Benefit-cost analyses based on typical traffic and location features.

The focus of the 2014 study was on bridges that are less than 50 feet long and located on roads with average daily traffic (ADT) lower than 50 vehicles per day. In Kansas, these bridges represent approximately one-third of all locally-owned bridges and one-half of all bridges classified as deficient in accordance with the National Bridge Inspection Program.

The results of the study suggest that a review of bridges with incrementally higher traffic volumes and/or greater length could yield similar results. The most obvious next thresholds for traffic volumes and bridge length would be 100 vehicles per day and 100 feet, respectively. Of the 19,305 locally-owned bridges in Kansas, 11,325 fall below at least one of these limits. These bridges represent more than one-half of all locally-owned bridges.

The purpose of the effort outlined in this report is to expand on the work performed in the 2014 study and to supplement the recommendations to include bridges up to 100 feet in length and roads with ADT up to 100 vehicles per day. The primary tasks to be completed will include:

- Analysis of bridge rail/guardrail crashes on bridges with length between 50 feet and 100 feet and located on a local road with ADT between 50 and 100 vehicles per day.
- Benefit-cost analyses based on these parameters and typical location features.

Kansas Bridge Crash Data Collection and Review

A review of crashes was performed for the 7-year period of 2008 through 2014. This review focused on roads that are functionally classified as “rural local roads,” have an ADT over 50 vpd and less than or equal to 100 vpd, and bridges that are over 50 feet and less than or equal to 100 feet long. In addition, the data for the bridges covered under the previous study were reviewed to determine if the additional 2 years of data would have any effect on the recommendations. The total number of reported crashes of all types in Kansas during the 7-year period was 424,494. Of these, 2,725 resulted in a fatality and 10,934 resulted in serious injury.

The queries of the Kansas crash database were the same as used in the original study. The query filters included the following:

- Functional class = Rural Minor Collector or Rural Local Road
- Surface type = Gravel or Dirt
- Crash type = Fixed Object
- Object type = Bridge Structure, Bridge Rail, Guard Rail, Culvert, Embankment, Curb, or Barricade

The resulting crash data set included, for the 7-year period, a total of 1,701 crashes, 36 of which were fatal and 75 of which were serious injury.

All of the fatal and serious injury crash reports were reviewed. In addition, all of the crash reports for non-fatal/non-serious injury crashes were reviewed for crashes coded as involving bridge structure (218 crashes), bridge rail (249 crashes), and guardrail (121 crashes). For the remaining categories of non-fatal/non-serious injury crashes, crashes that occurred in 2014 and 2015 were spot-reviewed. A spot-review of crashes in these categories had been done

under the previous study and yielded no crashes applicable to the study. This spot-review included culvert (422 crashes, 74 previously reviewed, 65 additional crashes reviewed), embankment (571 crashes, 48 previously reviewed, 40 additional crashes reviewed), and barricade (9 crashes, 9 reviewed). There were no additional non-fatal/non-serious injury crashes in the curb category.

The goal of the review was to determine the applicability of each crash to the specific parameters of this study. Google Maps were used to locate structures from the location information on the crash report and, if available to get a “street view” look at the site. This location was then found on KDOT’s Kan-Plan GIS system, which has a link to the Bridge Structure Inventory and Appraisal Sheet (SI&A) for every locally-owned bridge. The information on the SI&A sheet was used to determine if the structure is, in fact, a bridge and if its geometry is applicable to the study.

The review yielded a total of 2 fatal crashes and 4 serious injury crashes in the 7-year period that occurred on bridges meeting the parameters outlined previously. (It should be noted that in the previous study 3 fatal crashes were identified as being applicable; a further review as a part of this study determined that two of these crashes were erroneously included, therefore they have been eliminated from this study.) An additional 97 crashes were identified as applicable and were coded as something other than fatal or serious injury. A complete breakdown of the crashes, including the number of crashes in each severity category that are applicable to the focus of this effort, is shown in Table 1.

Table 1: Summary of Crash Review 2008–2014, Low-Volume Road Bridge Crashes

CRASH SEVERITY	ADT≤50		50<ADT≤100		TOTAL
	L≤50	50<L≤100	L≤50	50<L≤100	
FATAL CRASHES	1	0	1	0	2
SERIOUS INJURY CRASHES	0	1	3	0	4
NON-FATAL/NON-SER. INJ. CRASHES	56	29	8	4	97
TOTAL CRASHES IN STUDY (7 YEARS)	57	30	12	4	103

The overall numbers indicate that, even including longer bridges (up to 100 feet long) and higher traffic volumes (up to 100 vpd) than the original study, these crashes are very rare events. There were a total of 103 reported crashes of all severity levels over the 7-year period, in comparison to 424,494 crashes of all types across the state during the same period. These crashes account for only about 0.024% of the total. Fatal and serious injury crashes of this type accounted for 0.044% (6 out of 13,659) of all fatal and serious injury crashes and 0.0014% (6 out of 438,153) of all crashes.

Although these numbers are very comparable to those of the previous study, it would be premature to conclude that raising the traffic volume and bridge length thresholds to 100 vpd and 100 feet, respectively, has no significant effect on the risk of crashes. The baseline conditions that were previously studied included bridges up to and including 50 feet in length located on roads with traffic volumes equal to or less than 50 vpd. For comparison purposes, three categories were selected, using increments of 50 feet for bridge length and 50 vpd for traffic volumes. Table 2 summarizes the parameters for each of the additional categories.

Table 2: Traffic Volume and Bridge Length by Category

	CATEGORY			
	BASELINE	A	B	C
BRIDGE LENGTH (L)	$L \leq 50'$	$L \leq 50'$	$51' \leq L \leq 100'$	$51' \leq L \leq 100'$
TRAFFIC VOLUME (V)	$V \leq 50 \text{ vpd}$	$51 \text{ vpd} \leq V \leq 100 \text{ vpd}$	$V \leq 50 \text{ vpd}$	$51 \text{ vpd} \leq V \leq 100 \text{ vpd}$

In order to determine the relative risk of the various scenarios, one must consider the degree of exposure, which is related to the number of bridges in each volume/length category.

Using this approach, the theoretical annual risk of a crash in each category based on the 7 years of data can be defined by the following equation:

$$P_C = N_C/N_B \times 100/7$$

Where:

P_C = Annual Probability (percent chance) of a crash on a bridge in a volume/length category;

N_C = Number of crashes on bridges in the volume/length category; and

N_B = Number of bridges in the NBI inventory for the volume/length category.

Table 3 shows the calculated annual probability for a reported crash (all severity levels) for each category. Table 4 shows the calculated annual probability for a fatal or serious injury crash for each category.

Table 3: Annual Probability of Reported Crash

	CATEGORY			
	BASELINE	A	B	C
NUMBER OF CRASHES (N_C)	57	12	30	4
NUMBER OF BRIDGES (N_B)	6803	706	1843	204
PROBABILITY OF CRASH (P_B)	0.1197%	0.2428%	0.2325%	0.2801%

Table 4: Annual Probability of Fatal or Serious Injury Crash

	CATEGORY			
	BASELINE	A	B	C
NUMBER OF CRASHES (N_C)	1	4	1	0
NUMBER OF BRIDGES (N_B)	6803	706	1843	204
PROBABILITY OF CRASH (P_B)	0.0021%	0.0809%	0.0078%	0.0000%

Benefit Cost Analyses

The final task performed as part of this investigation involved performing benefit-to-cost (b/c) analyses to determine the efficacy of the various alternatives for some generalized typical bridge sites. The analyses were conducted using the Roadside Safety Analysis Program (RSAP), a probability-based encroachment tool that predicts crash costs associated with roadside features.

Because the investigation is focused on bridges ranging from 20 to 100 feet in length, and the previous study has already addressed 20-foot and 50-foot bridge lengths with traffic volumes of up to 50 vpd, the analysis for this investigation was performed on 20-foot, 50-foot, and 100-foot bridge lengths with 100 vpd. For each scenario, three safety treatment options were identified as being practical for a low-volume road application. These are:

1. Bridge structure with no bridge rail.
2. Bridge structure with a w-beam rail (non-tested) and blunt end terminals.
3. Bridge structure with a w-beam rail (non-tested) and crashworthy end terminals.

Obviously, there are other alternatives that could be considered, including the construction of crashworthy bridge railings along with approach guardrails with crashworthy end terminals and bridge-approach transitions. Several general assumptions were made in the development of the datasets and modeling of the site characteristics. These include:

1. The minimum width of a new bridge will be 24 feet, which is consistent with the recommendations for an agricultural access road in the AASHTO (2001) *Guidelines for Geometric Design of Very Low-Volume Local Roads*.
2. The roadway being investigated is a 24-foot-wide two-wheel-path road with traffic generally located in the center of the roadway. Assuming a width of traveled way equal to 10 feet, this would provide the equivalent of a 7-foot-wide “shoulder” on each side.
3. The construction costs used for all alternatives only included the cost of the w-beam and/or end terminals on both sides of the roadway. No

grading, R/W, or utility adjustments costs were included. This was done to provide the most conservative b/c ratio possible. If these alternates are not cost beneficial using the lower costs, then any additional cost would make them even less cost beneficial.

4. Height of the structure above the stream or ground underneath is 13 feet.

Initially, the analysis was done using RSAP Version 2.0.3, which is the version provided as part of the AASHTO (2006) *Roadside Design Guide* and still in widespread use by the industry. Due to some shortcomings in this version of the program and the inability to specifically consider a bridge with no side rail, Alternative 1 (Base Alternate) was modeled as a road with a vertical slope. This is the condition that most closely resembles the bridge drop-off condition.

The results of the analysis using RSAP Version 2.0.3 are shown in Tables 5, 6, and 7.

Table 5: RSAP 2.0.3 B/C Results for 20-Foot-Long Bridge

20 Ft. Bridge	RSAP 2.0.3	b/c	b/c	b/c
Alternates		1	2	3
1	20 Ft Bridge, no rail	1.00	0.58	0.26
2	20 ft. bridge with w-beam rail, no end terminals	0.00	0.00	0.20
3	20 ft. bridge with w-beam rail and end terminals	0.00	0.00	0.00

Table 6. RSAP 2.0.3 B/C Results for a 50-Foot-Long Bridge

50 Ft. Bridge	RSAP 2.0.3	b/c	b/c	b/c
Alternates		1	2	3
1	50 Ft Bridge, no rail	1.00	0.59	0.30
2	50 ft. bridge with w-beam rail, no end terminals	0.00	0.00	0.16
3	50 ft. bridge with w-beam rail and end terminals	0.00	0.00	0.00

Table 7. RSAP 2.0.3 B/C Results for a 100-Foot-Long Bridge

100 Ft. Bridge	RSAP 2.0.3	b/c	b/c	b/c
Alternates		1	2	3
1	100 Ft Bridge, no rail	1.00	0.57	0.41
2	100 ft. bridge with w-beam rail, no end terminals	0.00	0.00	0.25
3	100 ft. bridge with w-beam rail and end terminals	0.00	0.00	0.00

RSAP Version 3.0.1 has more recently become available. This version of the program was developed to address the shortcomings of Version 2.0.3 and to add a more user-friendly interface and more comprehensive model of roadway and roadside features. Although this version has not yet been adopted by KDOT, it was decided to repeat the analyses using this version because these improvements allow for a more accurate modeling of the features being considered. The following parameter changes were made.

1. The roadway was analyzed as a one-lane, one-way roadway with 100 VPD all in the same direction. It should be noted that using a one-way roadway with all traffic in the same direction will yield the same results as two-way traffic split 50/50 because the configuration would be identical regardless of direction.
2. Alternative 1 (Base Alternative) was modeled as a Bridge Edge, Medium Hazard. This hazard type more accurately reflects the condition being considered when compared to the hazard in the previous analysis.

The results of these analyses are shown in Tables 8, 9, and 10.

Table 8: RSAP 3.0.1 B/C Results for a 20-Foot-Long Bridge

20 Ft. Bridge	RSAP 3.0.1	b/c	b/c	b/c
Alternates		1	2	3
1	20 Ft Bridge, no rail	1.00	0.55	0.18
2	20 ft. bridge with w-beam rail, no end terminals	0.00	0.00	0.00
3	20 ft. bridge with w-beam rail and end terminals	0.00	0.00	0.00

Table 9: RSAP 3.0.1 B/C Results for a 50-Foot-Long Bridge

50 Ft. Bridge	RSAP 3.0.1	b/c	b/c	b/c
Alternates		1	2	3
1	50 Ft Bridge, no rail	1.00	0.55	0.18
2	50 ft. bridge with w-beam rail, no end terminals	0.00	0.00	0.00
3	50 ft. bridge with w-beam rail and end terminals	0.00	0.00	0.00

Table 10: RSAP 3.0.1 B/C Results for a 100-Foot-Long Bridge

100 Ft. Bridge	RSAP 3.0.1	b/c	b/c	b/c
Alternates		1	2	3
1	100 Ft Bridge, no rail	1.00	0.58	0.29
2	100 ft. bridge with w-beam rail, no end terminals	0.00	0.00	0.00
3	100 ft. bridge with w-beam rail and end terminals	0.00	0.00	0.00

As can be seen in the tables, the results from both versions are very similar. In all cases the B/C of adding a rail to the bridge is substantially lower than 1.0, which is generally considered the “break even” point for an investment. The generally accepted threshold for deciding to make a road or bridge improvement based on a B/C analysis is between 2.0 and 4.0. KDOT typically uses a B/C of 2.0 as the minimum to support that decision. Based on these thresholds, it is clear that the addition of a guardrail cannot be justified on a purely economic basis.

As stated in the previous study, regardless of the results of this analysis, engineering judgment would lead one to consider the installation of the w-beam guardrail. This railing will provide delineation of the edge of the bridge deck, helping to “funnel” the traffic across the bridge, and it provides some redirection capability for lower speed traffic that might drift toward the edge at a low angle. The determination that this is beneficial was demonstrated in the previous study and applies similarly to longer bridges with higher traffic volumes. Therefore, additional RSAP analysis was not needed.

Conclusions

The analyses performed in this study expanded on the baseline work done in Report No. KS-14-16 and includes analysis of longer bridges (50 feet to 100 feet long) and traffic volumes up to 100 vpd. Since two parameters, increased length and increased traffic volume, were changed from the original study, these analyses included 3 scenarios in order to evaluate the effect of increasing each parameter individually as well as the combined effect. Following are the three scenarios:

1. Bridge length between 20 feet and 50 feet with traffic volumes between 50 vpd and 100 vpd.
2. Bridge length between 50 feet and 100 feet with traffic volumes less than 50 vpd.
3. Bridge length between 50 feet and 100 feet with traffic volumes between 50 vpd and 100 vpd.

The analyses show that, although the crash risk is greater than the baseline risk found for bridges investigated in Report No. KS-14-16, the risk under any of these scenarios is very low. In addition, the costs of installing a crash-tested bridge rail and properly installed approach guardrail section on these bridges cannot be justified because the return on the investment, measured in reduced crash costs, is very low.

Recommendations

Based on the results of this study, it is recommended that the recommendations of Report No. KS-14-16 be expanded to include bridge rails installed on new or rehabilitated bridges up to 100 feet long with traffic volume up to 100 vpd. These recommendations allow installation of a non-tested bridge rail design with no approach guardrail if the structure meets all of the conditions outlined below.

1. The bridge is located on a road functionally classified as a Local Road.
2. Traffic volume is less than or equal to 100 vpd.
3. The approach roadway is a two-wheel path road.
4. Roadway surface on the approaches is gravel, sand, or dirt.
5. Maximum length of bridge is 100 feet.
6. The new structure shall be no less than 24 feet wide.
7. The bridge is not located on or adjacent to a curve or intersection.
8. A Type 3 object marker shall be installed at each end of the bridge rails.

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APPENDIX A FATAL CRASHES

Bridge Structure				
COUNTY_NAME	Year	ACCIDENT_KEY	MEET CRITERIA?	BRIDGE NUMBER
ELLIS	2011	20110090101	N	
OTTAWA	2008	20080095160	Y	BR# 000720779704420
WASHINGTON	2013	20130093069	N	

Bridge Rail				
COUNTY_NAME	Year	ACCIDENT_KEY	MEET CRITERIA?	BRIDGE NUMBER
GREENWOOD	2009	20090095053	N	
JACKSON	2009	20090090016	N	
MEADE	2011	20110095022	N	
NEOSHO	2014	20140095197	N	

Culvert				
COUNTY_NAME	Year	ACCIDENT_KEY	MEET CRITERIA?	BRIDGE NUMBER
BOURBON	2009	20090095025	N	
CLOUD	2008	20080095107	N	
NEOSHO	2009	20090095019	N	
OSAGE	2010	20100095051	N	
RICE	2010	20100095097	N	
RICE	2013	20130095010	N	
SEWARD	2009	20090097145	N	

Curb				
COUNTY_NAME	Year	ACCIDENT_KEY	MEET CRITERIA?	BRIDGE NUMBER
SEDGWICK	2011	20110095114	N	

Embankment				
COUNTY_NAME	Year	ACCIDENT_KEY	MEET CRITERIA?	BRIDGE NUMBER
BARBER	2010	20100095147	N	
BARTON	2010	20100095050	N	
BROWN	2011	20110090057	N	
CLAY	2010	20100095004	N	
CLAY	2010	20100095144	N	
DONIPHAN	2010	20100095077	N	
DONIPHAN	2014	20140095133	N	
DOUGLAS	2011	20110090087	N	
ELLSWORTH	2012	20120090076	N	
HARPER	2011	20110095046	N	
MARSHALL	2008	20080095065	N	
MIAMI	2013	20130090001	N	
OSAGE	2009	20090090130	N	
ROOKS	2012	20120095143	N	
SMITH	2013	20130095019	N	

KINGMAN	2009	20090095030	N	
NEOSHO	2014	20140095197	N	
WASHINGTON	2013	20130093069	N	

Guardrail

COUNTY_NAME	Year	ACCIDENT_KEY	MEET CRITERIA?	BRIDGE NUMBER
NESS	2014	20140095192	Y	BR # 000000000680360

APPENDIX B

SERIOUS INJURY CRASHES

Bridge Structure				
COUNTY_NAME	Year	ACCIDENT_KEY	MEET CRITERIA?	BRIDGE NUMBER
BARTON	2012	20120111224	N	
DICKINSON	2014	20140040195	N	
DOUGLAS	2011	20110033964	N	
FRANKLIN	2008	20080031063	N	
LINCOLN	2013	20130122329	N	
MIAMI	2008	20080004030	N	
MIAMI	2011	20110024720	Y	BR# 000611073005190
OSAGE	2012	20120110726	N	
SALINE	2010	20100113251	N	
SEDGWICK	2008	20080024155	N	
WABAUNSEE	2008	20080025051	N	
FINNEY	2009	20090100868	N	
Bridge Rail				
COUNTY_NAME	Year	ACCIDENT_KEY	MEET CRITERIA?	BRIDGE NUMBER
DECATUR	2013	20130114597	N	
LYON	2010	20100080767	N	
MCPHERSON	2013	20130101734	Y	BR# 000590801705340
MIAMI	2014	20140020786	N	
NEMAHA	2012	20120025879	N	
NEOSHO	2009	20090002091	N	
SEDGWICK	2011	20110009927	N	
WOODSON	2014	20140119943	N	
JOHNSON	2009	20090048846	Y	BR# 000461097804740
Culvert				
COUNTY_NAME	Year	ACCIDENT_KEY	MEET CRITERIA?	BRIDGE NUMBER
BUTLER	2008	20080003050	N	
CHEROKEE	2009	20090012004	N	
CRAWFORD	2008	20080105427	N	
ELLIS	2013	20130002232	N	
ELLSWORTH	2012	20120012176	N	
JACKSON	2013	20130031218	N	
MARION	2013	20130006555	N	
MARION	2014	20140030664	N	
NESS	2014	20140038219	N	
RUSSELL	2013	20130042206	N	
SALINE	2011	20110023643	N	
SEDGWICK	2010	20100101284	N	
WABAUNSEE	2008	20080048606	N	
WABAUNSEE	2009	20090152844	N	
WOODSON	2008	20080052738	N	

Barricade				
COUNTY_NAME	Year	ACCIDENT_KEY	MEET CRITERIA?	BRIDGE NUMBER
SEDGWICK	2013	20130103584	N	
Ditch				
COUNTY_NAME	Year	ACCIDENT_KEY	MEET CRITERIA?	BRIDGE NUMBER
CHEYENNE	2012	20120102639	N	
WABAUNSEE	2010	20100012423	N	
Embankment				
COUNTY_NAME	Year	ACCIDENT_KEY	MEET CRITERIA?	BRIDGE NUMBER
ANDERSON	2012	20120100755	N	
ATCHISON	2013	20130116303	N	
BROWN	2012	20120011636	N	
BUTLER	2011	20110019350	N	
CLAY	2011	20110105121	N	
CLOUD	2010	20100013171	N	
COFFEY	2012	20120118166	N	
COWLEY	2009	20090061919	N	
CRAWFORD	2010	20100024818	N	
DICKINSON	2011	20110021763	N	
DOUGLAS	2010	20100022073	N	
ELLIS	2011	20110106298	N	
ELLSWORTH	2014	20140026597	N	
FINNEY	2011	20110026710	N	
GRAHAM	2009	20090007071	N	
HODGEMAN	2012	20120120830	N	
JACKSON	2012	20120020024	N	
JEFFERSON	2011	20110009869	N	
LEAVENWORTH	2008	20080012089	N	
MARION	2010	20100018500	N	
MCPHERSON	2013	20130115323	N	
MIAMI	2011	20110019664	N	
MITCHELL	2012	20120007764	N	
MORRIS	2008	20080055540	N	
MORRIS	2012	20120118996	N	
NEMAHA	2011	20110024501	N	
NEMAHA	2011	20110032786	N	
OSAGE	2011	20110115362	N	
POTTAWATOMIE	2014	20140027346	N	
REPUBLIC	2009	20090156878	N	
RILEY	2014	20140026053	N	
SEDGWICK	2009	20090014127	N	
SUMNER	2012	20120026276	N	
WASHINGTON	2012	20120000084	N	
WYANDOTTE	2011	20110024365	N	

Guardrail

COUNTY_NAME	Year	ACCIDENT_KEY	MEET CRITERIA?	BRIDGE NUMBER
CLOUD	2014	20140025213	Y	BR #150789003665

APPENDIX C

NON-FATAL OR SERIOUS INJURY CRASHES

Bridge Structure				
COUNTY_NAME	Year	ACCIDENT_KEY	MEET CRITERIA?	BRIDGE NUMBER
ALLEN	2012	20120025119	N	
ALLEN	2013	20130080478	N	
ALLEN	2014	20140039546	Y	BR # 000011043106080
ANDERSON	2011	20110081068	N	
ANDERSON	2015	20150031069	N	
ATCHISON	2008	20080022530	N	
ATCHISON	2008	20080051003	Y	BR # 000031051903481
ATCHISON	2010	20100111065	Y	BR # 000031049603625
ATCHISON	2011	20110109146	N	
ATCHISON	2012	20120120279	N	
ATCHISON	2013	20130046138	N	
ATCHISON	2014	20140038656	N	
BARTON	2008	20080021511	N	
BARTON	2009	20090155350	N	
BOURBON	2008	20080042509	N	
BOURBON	2011	20110013754	N	
BOURBON	2012	20120030726	N	
BROWN	2014	20140035448	N	
BUTLER	2008	20080022544	N	
BUTLER	2009	20090010555	N	
BUTLER	2009	20090010556	N	
BUTLER	2009	20090028538	N	
BUTLER	2010	20100017141	N	
BUTLER	2010	20100017993	N	
BUTLER	2010	20100026290	N	
BUTLER	2010	20100081290	N	
BUTLER	2011	20110000010	N	
BUTLER	2011	20110004193	N	
BUTLER	2011	20110004874	N	
BUTLER	2011	20110116803	N	
BUTLER	2013	20130005575	N	
BUTLER	2013	20130030392	N	
BUTLER	2013	20130034378	Y	Br # 000080887905960
BUTLER	2014	20140021946	N	
BUTLER	2014	20140026177	N	
BUTLER	2014	20140037025	Y	BR # 000080887106040
CHAUTAUQUA	2011	20110029138	Y	BR # 000100943006948
CHEROKEE	2008	20080015510	N	
CHEROKEE	2008	20080026038	N	
CHEROKEE	2008	20080034015	Y	BR # 000111095006947
CHEROKEE	2008	20080054009	N	
CHEROKEE	2010	20100036814	N	

CHEROKEE	2013	20130007295	N	
CLARK	2008	20080026044	N	
CLAY	2009	20090152279	N	
CLAY	2010	20100115771	N	
CLAY	2011	20110112340	N	
CLOUD	2009	20090019474	N	
CLOUD	2010	20100080333	Y	Br # 000150785803740
COFFEY	2009	20090000534	N	
COFFEY	2010	20100107809	N	
COWLEY	2008	20080022578	N	
COWLEY	2009	20090063294	N	
COWLEY	2010	20100023567	N	
COWLEY	2010	20100025126	N	
COWLEY	2013	20130010650	N	
COWLEY	2014	20140000628	N	
COWLEY	2014	20140002432	Y	BR # 000180853606602
COWLEY	2015	20150085013	N	
CRAWFORD	2008	20080034539	N	
CRAWFORD	2011	20110008572	N	
CRAWFORD	2012	20120001444	N	
CRAWFORD	2012	20120021006	N	
CRAWFORD	2012	20120026815	N	
DICKINSON	2008	20080049071	N	
DICKINSON	2012	20120108559	N	
DICKINSON	2013	20130034894	N	
DONIPHAN	2010	20100014585	N	
DONIPHAN	2013	20130037438	Y	BR # 000221065003289
DOUGLAS	2008	20080021551	N	
DOUGLAS	2008	20080046072	N	
DOUGLAS	2008	20080051066	N	
ELK	2009	20090005005	N	
ELK	2014	20140026182	N	
ELLIS	2014	20140086360	Y	BR # 000260603204760
ELLIS	2014	20140121142	N	
ELLSWORTH	2013	20130030893	N	
FRANKLIN	2008	20080021570	N	
FRANKLIN	2010	20100005236	N	
FRANKLIN	2013	20130038566	N	
GEARY	2010	20100017701	N	
GEARY	2011	20110005170	N	
GEARY	2013	20130105581	N	
GOVE	2009	20090021338	N	
GRAHAM	2013	20130000563	N	
GREENWOOD	2008	20080016584	N	
GREENWOOD	2010	20100036932	N	
GREENWOOD	2011	20110008303	N	
GREENWOOD	2014	20140024062	N	

HAMILTON	2014	20140044966	N	
HARPER	2009	20090009052	N	
HARPER	2012	20120103824	N	
HARPER	2014	20140115746	N	
HARVEY	2008	20080023056	N	
HARVEY	2014	20140030170	Y	BR # 000400813905780
HARVEY	2014	20140039997	N	
HARVEY	2014	20140085356	N	
JACKSON	2013	20130034361	N	
JACKSON	2013	20130044735	N	
JEFFERSON	2013	20130111855	N	
JOHNSON	2011	20110080035	N	
KINGMAN	2010	20100112917	N	
KINGMAN	2012	20120103606	Y	BR # 000480765006565
KINGMAN	2012	20120108747	N	
KINGMAN	2014	20140120975	N	
KIOWA	2008	20080007513	N	
LABETTE	2008	20080053524	N	
LABETTE	2008	20080053530	N	
LABETTE	2009	20090023832	Y	BR # 000501029007085
LABETTE	2009	20090029390	N	
LABETTE	2010	20100018426	N	
LABETTE	2011	20110002264	N	
LABETTE	2012	20120002385	N	
LABETTE	2013	20130002305	N	
LABETTE	2013	20130044811	N	
LABETTE	2014	20140027909	N	
LABETTE	2014	20140037402	N	
LABETTE	2014	20140116447	N	
LABETTE	2014	20140126992	N	
LABETTE	2014	20140128776	Y	BR # 000501025506840
LABETTE	2015	20150105855	N	
LABETTE	2015	20150109531	N	
LEAVENWORTH	2008	20080012064	N	
LINCOLN	2011	20110033422	N	
LINCOLN	2013	20130109647	N	
LINN	2009	20090029475	N	
LINN	2013	20130104524	N	
LINN	2014	20140120908	N	
LYON	2010	20100116401	N	
MARION	2009	20090154773	N	
MARSHALL	2014	20140037309	N	
MCPHERSON	2008	20080001055	Y	BR # 000590801705340
MCPHERSON	2008	20080010574	Y	BR # 000590777505460
MCPHERSON	2010	20100023493	Y	BR # 000590815305500
MCPHERSON	2013	20130116367	N	
MEADE	2008	20080036548	N	

MIAMI	2008	20080011531	N	
MIAMI	2009	20090014615	N	
MIAMI	2009	20090029547	N	
MIAMI	2010	20100039360	N	
MIAMI	2010	20100039484	N	
MIAMI	2010	20100039678	Y	BR # 000611077105040
MIAMI	2012	20120027151	N	
MIAMI	2013	20130031156	N	
MIAMI	2013	20130085748	N	
MIAMI	2014	20140026754	Y	BR # 000611081004929
MIAMI	2015	20150032210	N	
MITCHELL	2011	20110005569	N	
MONTGOMERY	2008	20080036564	N	
MONTGOMERY	2009	20090029874	Y	BR # 000590777505460
MONTGOMERY	2014	20140108610	N	
MORRIS	2009	20090024310	N	
MORRIS	2011	20110122407	N	
NEMAHA	2013	20130004041	Y	BRIDGE REMOVED
NEOSHO	2008	20080002017	N	
NEOSHO	2009	20090020018	N	
NEOSHO	2009	20090102439	N	
NEOSHO	2011	20110007074	Y	BR # 000671045606340
NEOSHO	2014	20140037316	N	
NESS	2011	20110081201	N	
OSAGE	2009	20090004020	N	
OSAGE	2009	20090026966	N	
OSAGE	2012	20120106361	N	
OSAGE	2013	20130116542	N	
OSAGE	2014	20140114612	N	
OSBORNE	2009	20090017175	N	
OTTAWA	2011	20110021555	N	
OTTAWA	2014	20140020205	N	
PAWNEE	2011	20110001905	N	
PAWNEE	2011	20110026421	N	
PAWNEE	2013	20130007474	N	
PAWNEE	2013	20130030145	Y	BR # 000730589005481
POTTAWATOMIE	2008	20080002023	N	
POTTAWATOMIE	2009	20090047493	N	
POTTAWATOMIE	2013	20130005622	N	
POTTAWATOMIE	2014	20140022714	N	
POTTAWATOMIE	2014	20140036912	N	
POTTAWATOMIE	2014	20140040932	N	
RENO	2008	20080109915	N	
RENO	2009	20090156633	N	
RENO	2014	20140025492	N	
RENO	2014	20140034129	N	
RICE	2008	20080033081	N	

RICE	2009	20090022371	N	
RICE	2011	20110111544	Y	BR # 000800749805320
RICE	2012	20120122938	N	
RICE	2014	20140110951	N	
RUSSELL	2009	20090058968	N	
SALINE	2010	20100012106	N	
SEDGWICK	2008	20080024116	N	
SEDGWICK	2009	20090063126	N	
SEDGWICK	2010	20100014925	N	
SEDGWICK	2011	20110109595	N	
SEDGWICK	2013	20130127305	N	
SUMNER	2011	20110013137	N	
SUMNER	2014	20140114718	N	
WILSON	2008	20080042091	N	
WILSON	2012	20120021183	N	
WILSON	2012	20120080008	N	
WOODSON	2009	20090019915	N	
WOODSON	2010	20100080407	N	
WOODSON	2012	20120105447	N	
WOODSON	2013	20130113920	N	
CRAWFORD	2010	20100020211	N	
DOUGLAS	2010	20100029132	N	
KINGMAN	2010	20100100001	N	
LINN	2012	20120036054	N	
LYON	2014	20140040014	N	
POTTAWATOMIE	2015	20150034316	N	
SHAWNEE	2010	20100002271	N	

BridgeRail

COUNTY_NAME	Year	ACCIDENT_KEY	MEET CRITERIA?	BRIDGE NUMBER
ALLEN	2009	20090018507	N	
ALLEN	2013	20130007759	Y	BR # 000011031005780
ANDERSON	2008	20080013503	N	
ANDERSON	2009	20090010505	N	
ANDERSON	2013	20130000842	N	
ANDERSON	2015	20150032994	N	
ATCHISON	2011	20110107617	N	
ATCHISON	2013	20130046144	Y	BR # 000031043203625
BARBER	2011	20110022267	N	
BARTON	2013	20130112443	N	
BOURBON	2010	20100011610	N	
BOURBON	2012	20120104575	N	
BOURBON	2013	20130003017	N	
BOURBON	2014	20140035517	N	
BROWN	2011	20110024777	Y	BR # 000071007103380
BROWN	2012	20120029710	N	
BUTLER	2008	20080002512	N	

BUTLER	2009	20090015536	Y	BR # 000080879006128
BUTLER	2010	20100004082	N	
BUTLER	2010	20100015000	N	
BUTLER	2011	20110026869	N	
BUTLER	2011	20110026871	Y	BR # 000080857006189
BUTLER	2011	20110080419	Y	BR # 000080895006404
BUTLER	2012	20120021228	N	
BUTLER	2013	20130005583	Y	BR # 000080845306000
BUTLER	2013	20130008440	N	
BUTLER	2013	20130030746	Y	BR # 000080845306000
BUTLER	2013	20130034281	N	
BUTLER	2013	20130044253	N	
BUTLER	2013	20130085131	N	
BUTLER	2013	20130121737	N	
BUTLER	2014	20140023744	N	
BUTLER	2014	20140024344	N	
BUTLER	2015	20150080074	N	
CHASE	2012	20120036179	N	
CHAUTAUQUA	2008	20080034529	N	
CHEROKEE	2009	20090000090	N	
CHEROKEE	2014	20140020187	Y	BR # 000111089807100 OR BR # 000111089707100
CHEYENNE	2011	20110116008	N	
CLAY	2009	20090064577	N	
CLAY	2013	20130113284	N	
CLAY	2013	20130124333	N	
CLAY	2014	20140106743	N	
CLOUD	2009	20090154530	Y	BR # 000150805703600
CLOUD	2011	20110012273	N	
CLOUD	2011	20110025162	N	
CLOUD	2014	20140033710	Y	BR # 000150777503680
COFFEY	2011	20110104780	Y	BR # 000161007905660
COMANCHE	2011	20110028464	N	
COWLEY	2011	20110121286	N	
COWLEY	2012	20120028437	N	
COWLEY	2013	20130002247	N	
CRAWFORD	2009	20090063333	N	
CRAWFORD	2012	20120019546	Y	BR # 000191073906580
CRAWFORD	2014	20140020405	Y	BR # 000191093706360
CRAWFORD	2014	20140026550	N	
DICKINSON	2008	20080042554	N	
DICKINSON	2010	20100011922	N	
DICKINSON	2013	20130042829	N	
DICKINSON	2014	20140020728	Y	BR # 000210845004322
DICKINSON	2014	20140045015	N	
DONIPHAN	2009	20090013082	N	
DOUGLAS	2008	20080034553	N	

DOUGLAS	2011	20110000128	N	
DOUGLAS	2011	20110014743	N	
DOUGLAS	2013	20130005141	N	
DOUGLAS	2013	20130101874	N	
EDWARDS	2011	20110017855	Y	BR # 000240577205860
ELLIS	2010	20100011175	N	
ELLSWORTH	2011	20110022780	N	
ELLSWORTH	2013	20130045025	N	
FORD	2012	20120029699	N	
FORD	2012	20120036157	N	
FRANKLIN	2008	20080002551	N	
FRANKLIN	2008	20080014547	N	
FRANKLIN	2008	20080044060	N	
FRANKLIN	2008	20080053517	N	
FRANKLIN	2009	20090019500	N	
FRANKLIN	2010	20100013706	N	
FRANKLIN	2010	20100023359	N	
FRANKLIN	2010	20100035358	N	
FRANKLIN	2011	20110014147	N	
FRANKLIN	2011	20110026568	N	
FRANKLIN	2014	20140037434	N	
GEARY	2012	20120027569	N	
GEARY	2015	20150036903	N	
GRAHAM	2008	20080033039	N	
GRAHAM	2009	20090021344	N	
GRAHAM	2011	20110012961	N	
GRAY	2011	20110081508	N	
GREELEY	2008	20080020073	N	
GREENWOOD	2008	20080031567	N	
GREENWOOD	2010	20100016023	N	
HARPER	2011	20110121490	Y	BR # 000390735006948
HARPER	2013	20130101389	N	
HARVEY	2009	20090029059	N	
HARVEY	2014	20140031884	N	
HARVEY	2014	20140041461	N	
HARVEY	2014	20140042146	N	
HARVEY	2015	20150031459	N	
JACKSON	2008	20080004504	N	
JACKSON	2010	20100000664	N	
JACKSON	2010	20100024799	Y	BR # 000430989003646
JACKSON	2012	20120021796	N	
JACKSON	2013	20130036110	N	
JACKSON	2013	20130042773	N	
JACKSON	2013	20130060193	N	
JEFFERSON	2011	20110023383	Y	BR # 000441035204061
JEFFERSON	2014	20140040378	N	
JOHNSON	2008	20080032191	N	

JOHNSON	2009	20090055159	N	
KEARNY	2008	20080045043	N	
KEARNY	2008	20080049544	N	
KEARNY	2011	20110108650	N	
KINGMAN	2008	20080046545	Y	BR # 000480753506200
KINGMAN	2010	20100109855	N	
KINGMAN	2012	20120117893	Y	BR # 000480737006309
LABETTE	2009	20090029410	N	
LABETTE	2013	20130004505	N	
LABETTE	2013	20130030735	N	
LINCOLN	2008	20080054570	N	
LINN	2014	20140125414	N	
LYON	2010	20100010263	N	
MARION	2012	20120018879	N	
MARSHALL	2008	20080032035	Y	BR # 000580895403223
MARSHALL	2012	20120002464	N	
MARSHALL	2013	20130042294	N	
MCPHERSON	2009	20090002009	Y	BR # 000590801005187
MCPHERSON	2009	20090012510	Y	BR # 000590773005120
MCPHERSON	2010	20100004606	N	
MCPHERSON	2010	20100023957	Y	BR # 000590791205460
MCPHERSON	2011	20110115029	N	
MCPHERSON	2012	20120102091	Y	BR # 000590785105020
MCPHERSON	2013	20130114033	Y	BR # 000590775005426
MEADE	2013	20130007537	N	
MIAMI	2008	20080010004	N	
MIAMI	2008	20080010577	N	
MIAMI	2008	20080013041	N	
MIAMI	2009	20090019654	N	
MIAMI	2010	20100039463	Y	BR # 000611077105040
MIAMI	2010	20100039594	N	
MIAMI	2011	20110004345	N	
MIAMI	2012	20120001536	N	
MIAMI	2013	20130035562	N	
MIAMI	2013	20130042281	Y	BR # 000611067004849
MIAMI	2014	20140037200	N	
MIAMI	2014	20140042407	N	
MITCHELL	2009	20090017096	N	
MONTGOMERY	2008	20080018512	N	
MONTGOMERY	2010	20100120316	Y	BR # 000631003006728
MONTGOMERY	2012	20120103472	N	
MONTGOMERY	2012	20120105254	N	
MONTGOMERY	2013	20130100508	N	
MONTGOMERY	2014	20140108567	N	
MORRIS	2008	20080017062	N	
MORRIS	2008	20080030575	N	
MORRIS	2008	20080055019	Y	BR # 000640877004944

MORRIS	2009	20090029879	N	
MORRIS	2011	20110111119	N	
MORRIS	2012	20120104319	N	
NEMAHA	2009	20090004014	N	
NEMAHA	2013	20130004254	N	
NEMAHA	2013	20130030022	N	
NEOSHO	2009	20090003095	N	
NEOSHO	2009	20090007590	N	
NEOSHO	2010	20100015821	N	
NEOSHO	2011	20110019734	N	
NEOSHO	2014	20140025799	N	
NESS	2013	20130085588	N	
NORTON	2009	20090101460	N	
OSAGE	2010	20100106635	N	
OSAGE	2010	20100115021	Y	BR # 000701015004562
OSAGE	2012	20120123156	N	
OSAGE	2013	20130125298	N	
OSAGE	2015	20150109344	N	
OTTAWA	2011	20110024124	N	
OTTAWA	2014	20140022693	N	
PAWNEE	2012	20120029182	Y	BR # 000730615405540
PHILLIPS	2011	20110115331	Y	BR # 000920639003300
PHILLIPS	2011	20110124253	Y	BR # 000740609003366
PHILLIPS	2012	20120121928	Y	BR # 000740615303180
POTTAWATOMIE	2008	20080001504	N	
POTTAWATOMIE	2013	20130006855	N	
POTTAWATOMIE	2013	20130031185	N	
PRATT	2010	20100022632	N	
RENO	2011	20110006345	N	
RENO	2013	20130045231	N	
REPUBLIC	2008	20080108382	Y	BR # 000790767003246
REPUBLIC	2009	20090150881	Y	BR # 000790783203320
REPUBLIC	2013	20130119649	Y	BR # 000790783103240
REPUBLIC	2014	20140121559	N	
RICE	2011	20110118069	N	
RICE	2013	20130109356	Y	BR # 000800753805260
RICE	2015	20150101478	N	
ROOKS	2010	20100040088	N	
ROOKS	2010	20100040128	N	
RUSSELL	2014	20140037703	Y	BR # 000840669304780
SALINE	2009	20090058982	Y	BR # 000850775104820
SALINE	2009	20090062335	N	
SALINE	2011	20110023759	N	
SALINE	2014	20140024687	N	
SEDGWICK	2008	20080038593	N	
SEDGWICK	2009	20090010003	N	
SEDGWICK	2009	20090018094	N	

SEDGWICK	2011	20110000754	N	
SEDGWICK	2011	20110003418	N	
SEDGWICK	2011	20110120654	N	
SEDGWICK	2012	20120107687	Y	BR # 000870801006421
SEDGWICK	2012	20120108602	N	
SEDGWICK	2012	20120110984	N	
SEDGWICK	2013	20130107436	N	
SEDGWICK	2013	20130112810	N	
SEDGWICK	2013	20130127366	N	
SEDGWICK	2014	20140118578	N	
SHAWNEE	2008	20080040061	N	
SHAWNEE	2008	20080040085	N	
SHAWNEE	2012	20120028911	Y	BR # 000890987004240
SHERIDAN	2008	20080040618	N	
SHERIDAN	2011	20110030170	N	
SMITH	2010	20100110364	Y	BR # 000920645503260
SMITH	2013	20130101306	Y	BR # 000920661803300
STAFFORD	2010	20100027482	Y	BR # 000930691005882
SUMNER	2008	20080042049	Y	BR # 000960819506980
SUMNER	2009	20090065823	N	
SUMNER	2010	20100019929	N	
SUMNER	2010	20100022551	Y	BR # 000000000960200
SUMNER	2014	20140125306	N	
THOMAS	2011	20110118168	Y	BR # 000970447004180
WABAUNSEE	2008	20080010055	N	
WABAUNSEE	2012	20120002110	N	
WASHINGTON	2008	20080019045	Y	BR # 001010847103220
WASHINGTON	2009	20090019885	N	
WASHINGTON	2010	20100017471	N	
WASHINGTON	2013	20130033147	N	
WASHINGTON	2014	20140023768	N	
WILSON	2010	20100026150	N	
WILSON	2011	20110022978	Y	BR # 001030975406362
WILSON	2013	20130005533	N	
WOODSON	2009	20090030380	N	
WOODSON	2011	20110119582	N	
EDWARDS	2014	20140022960	Y	BR # 000240587005765
FRANKLIN	2013	20130000016	N	
JACKSON	2013	20130006908	N	
MIAMI	2012	20120021524	Y	BR # 000611071204800

Culvert

COUNTY_NAME	Year	ACCIDENT_KEY	MEET CRITERIA?	BRIDGE NUMBER
ALLEN	2008	20080021505		
ALLEN	2008	20080031001		
ALLEN	2008	20080033004		
ALLEN	2008	20080037501		

ALLEN	2008	20080042503		
ALLEN	2012	20120014879		
ALLEN	2014	20140031911	N	
ANDERSON	2008	20080033006		
ANDERSON	2010	20100033598		
ANDERSON	2010	20100109967		
ANDERSON	2012	20120027837		
ANDERSON	2012	20120104153		
ANDERSON	2013	20130037097		
BARBER	2012	20120027903		
BARTON	2008	20080026014		
BARTON	2010	20100103688		
BARTON	2010	20100107505		
BARTON	2010	20100111289		
BARTON	2011	20110106040		
BARTON	2011	20110108178		
BARTON	2011	20110109909		
BARTON	2012	20120116523		
BARTON	2015	20150103816	N	
BOURBON	2009	20090004521		
BOURBON	2009	20090018516		
BOURBON	2012	20120004713		
BOURBON	2012	20120006738		
BOURBON	2013	20130008529		
BOURBON	2014	20140039022	N	
BROWN	2008	20080013541		
BROWN	2008	20080044015		
BROWN	2011	20110033242		
BROWN	2014	20140035446	N	
BUTLER	2008	20080034005		
BUTLER	2008	20080050031		
BUTLER	2009	20090000060		
BUTLER	2009	20090007026		
BUTLER	2009	20090014524		
BUTLER	2009	20090020804		
BUTLER	2009	20090027321		
BUTLER	2009	20090028491		
BUTLER	2009	20090028495		
BUTLER	2009	20090028514		
BUTLER	2010	20100014186		
BUTLER	2010	20100025710		
BUTLER	2010	20100035772		
BUTLER	2010	20100102894		
BUTLER	2011	20110007287		
BUTLER	2011	20110016473		
BUTLER	2011	20110022308		
BUTLER	2011	20110029624		

BUTLER	2011	20110030587		
BUTLER	2011	20110030588		
BUTLER	2012	20120000064		
BUTLER	2012	20120012959		
BUTLER	2013	20130001334		
BUTLER	2013	20130007275		
BUTLER	2013	20130008807		
BUTLER	2013	20130032346		
BUTLER	2013	20130034818		
BUTLER	2013	20130037565		
BUTLER	2013	20130042864		
BUTLER	2014	20140033035	N	
BUTLER	2014	20140033483	N	
BUTLER	2014	20140042582	N	
BUTLER	2014	20140044305	N	
BUTLER	2014	20140109007	N	
BUTLER	2015	20150031003	N	
BUTLER	2015	20150033452	N	
BUTLER	2015	20150034572	N	
BUTLER	2015	20150034573	N	
CHAUTAUQUA	2012	20120007046		
CHAUTAUQUA	2013	20130034411		
CHEROKEE	2008	20080044036		
CHEROKEE	2009	20090000503		
CHEROKEE	2009	20090004545		
CHEROKEE	2009	20090153957		
CHEROKEE	2010	20100027053		
CHEROKEE	2011	20110023457		
CHEROKEE	2012	20120002567		
CHEROKEE	2012	20120018302		
CHEROKEE	2013	20130104950		
CHEROKEE	2014	20140032068	N	
CHEROKEE	2014	20140032880		
CHEYENNE	2010	20100107826		
CLARK	2008	20080026042		
CLARK	2012	20120018242		
CLAY	2011	20110116708		
CLAY	2012	20120111401		
CLAY	2015	20150107262	N	
CLOUD	2011	20110024101		
CLOUD	2012	20120026794		
CLOUD	2013	20130002898		
COFFEY	2009	20090000533		
COFFEY	2011	20110112918		
COFFEY	2011	20110113352		
COFFEY	2012	20120101994		
COFFEY	2012	20120124833		

COFFEY	2014	20140107240	N	
COWLEY	2009	20090006927		
COWLEY	2009	20090057339		
COWLEY	2009	20090061921		
COWLEY	2010	20100021402		
COWLEY	2011	20110005316		
COWLEY	2011	20110009535		
COWLEY	2011	20110024158		
COWLEY	2011	20110025817		
COWLEY	2011	20110034337		
COWLEY	2011	20110107562		
COWLEY	2013	20130010769		
COWLEY	2014	20140002105	N	
COWLEY	2015	20150000820	N	
CRAWFORD	2008	20080021547		
CRAWFORD	2008	20080030521		
CRAWFORD	2009	20090028843		
CRAWFORD	2010	20100003559		
CRAWFORD	2011	20110014751		
CRAWFORD	2011	20110022399		
CRAWFORD	2012	20120012818		
DICKINSON	2011	20110013812		
DICKINSON	2011	20110016599		
DICKINSON	2011	20110123490		
DICKINSON	2014	20140044539	N	
DOUGLAS	2008	20080051071		
DOUGLAS	2009	20090011004		
DOUGLAS	2009	20090016549		
DOUGLAS	2009	20090048821		
DOUGLAS	2010	20100036752		
DOUGLAS	2011	20110000433		
DOUGLAS	2012	20120010306		
DOUGLAS	2013	20130000099		
DOUGLAS	2013	20130005150		
DOUGLAS	2013	20130112286		
DOUGLAS	2014	20140109272		
DOUGLAS	2014	20140112230	N	
DOUGLAS	2014	20140121846	N	
EDWARDS	2014	20140029789	N	
ELK	2011	20110031181		
ELLIS	2009	20090063542		
ELLIS	2010	20100121712		
ELLIS	2011	20110031196		
ELLSWORTH	2009	20090021317		
ELLSWORTH	2012	20120018379		
FINNEY	2008	20080015523		
FINNEY	2009	20090048824		

FINNEY	2011	20110029980		
FINNEY	2012	20120019806		
FINNEY	2013	20130109387		
FINNEY	2014	20140128606	N	
FINNEY	2014	20140128836		
FORD	2010	20100039622		
FRANKLIN	2008	20080030054		
FRANKLIN	2008	20080034571		
FRANKLIN	2011	20110002801		
FRANKLIN	2011	20110005871		
FRANKLIN	2012	20120030924		
FRANKLIN	2014	20140025323	N	
GRANT	2009	20090065418		
GRAY	2011	20110028156		
GREENWOOD	2010	20100038339		
GREENWOOD	2011	20110015420		
HARPER	2008	20080024563		
HARPER	2009	20090011040		
HARPER	2009	20090019525		
HARPER	2009	20090019528		
HARPER	2011	20110103113		
HARPER	2013	20130101390		
HARVEY	2008	20080024848		
HARVEY	2008	20080030544		
HARVEY	2008	20080051531		
HARVEY	2009	20090019540		
HARVEY	2009	20090021362		
HARVEY	2009	20090021365		
HARVEY	2009	20090150961		
HARVEY	2010	20100000655		
HARVEY	2010	20100023757		
HARVEY	2011	20110007757		
HARVEY	2011	20110022324		
HARVEY	2011	20110034457		
HARVEY	2011	20110122807		
HARVEY	2012	20120023926		
HARVEY	2014	20140032189	N	
HARVEY	2015	20150031008	N	
HARVEY	2015	20150036830	N	
HARVEY	2015	20150037050	N	
HODGEMAN	2010	20100010807		
JACKSON	2009	20090009064		
JACKSON	2012	20120026434		
JACKSON	2013	20130045155		
JACKSON	2014	20140037694	N	
JACKSON	2015	20150036529	N	
JEFFERSON	2008	20080003585		

JEFFERSON	2009	20090005061		
JEFFERSON	2010	20100113881		
JEFFERSON	2015	20150031006		
JEWELL	2014	20140027913		
JOHNSON	2010	20100020086		
JOHNSON	2010	20100022921		
JOHNSON	2011	20110014033		
JOHNSON	2011	20110027826		
KEARNY	2011	20110120033		
KINGMAN	2008	20080018058		
LABETTE	2008	20080046562		
LABETTE	2009	20090019579		
LABETTE	2009	20090029393		
LABETTE	2010	20100033480		
LABETTE	2012	20120013304		
LABETTE	2014	20140025682	N	
LABETTE	2014	20140122476	N	
LABETTE	2014	20140127456	N	
LABETTE	2015	20150102330	N	
LEAVENWORTH	2008	20080032011		
LEAVENWORTH	2008	20080043063		
LEAVENWORTH	2008	20080045056		
LEAVENWORTH	2009	20090005505		
LEAVENWORTH	2012	20120013721		
LEAVENWORTH	2013	20130044283		
LEAVENWORTH	2014	20140022514	N	
LEAVENWORTH	2014	20140027123		
LINCOLN	2009	20090019988		
LINN	2008	20080106063		
LINN	2009	20090152540		
LOGAN	2012	20120002425		
LOGAN	2012	20120005682		
LYON	2008	20080050561		
LYON	2012	20120020783		
LYON	2012	20120025769		
LYON	2012	20120027450		
LYON	2013	20130009271		
LYON	2014	20140043159		
MARION	2009	20090011104		
MARION	2012	20120002415		
MARSHALL	2011	20110023543		
MARSHALL	2012	20120016053		
MCPHERSON	2008	20080020520		
MCPHERSON	2009	20090002014		
MCPHERSON	2009	20090023874		
MCPHERSON	2010	20100015785		
MCPHERSON	2011	20110112010		

MCPHERSON	2011	20110119217		
MCPHERSON	2012	20120116581		
MCPHERSON	2014	20140105440	N	
MCPHERSON	2014	20140123738	N	
MCPHERSON	2015	20150100036	N	
MIAMI	2009	20090006044		
MIAMI	2011	20110011816		
MIAMI	2011	20110030418		
MIAMI	2014	20140026752	N	
MIAMI	2014	20140029989	N	
MIAMI	2014	20140032168	N	
MITCHELL	2012	20120013632		
MONTGOMERY	2008	20080010162		
MONTGOMERY	2009	20090002058		
MONTGOMERY	2009	20090011147		
MONTGOMERY	2011	20110103976		
MONTGOMERY	2012	20120107002		
MONTGOMERY	2013	20130100515		
MONTGOMERY	2014	20140114944	N	
MONTGOMERY	2015	20150100764		
MONTGOMERY	2015	20150102807	N	
MORRIS	2008	20080008546		
MORRIS	2009	20090011153		
MORRIS	2011	20110111464		
MORRIS	2014	20140111535		
NEMAHA	2010	20100015783		
NEOSHO	2009	20090011165		
NEOSHO	2010	20100018055		
NEOSHO	2010	20100019141		
NEOSHO	2010	20100021484		
NEOSHO	2010	20100026009		
NEOSHO	2011	20110024301		
NEOSHO	2011	20110024302		
NEOSHO	2013	20130006783		
NEOSHO	2013	20130009301		
NORTON	2013	20130032135		
OSAGE	2009	20090004022		
OSAGE	2010	20100109504		
OSAGE	2010	20100121272		
OSAGE	2011	20110105577		
OTTAWA	2013	20130031774		
PAWNEE	2010	20100110235		
PHILLIPS	2009	20090017196		
POTTAWATOMIE	2010	20100000778		
POTTAWATOMIE	2011	20110023989		
POTTAWATOMIE	2012	20120010010		
POTTAWATOMIE	2012	20120022401		

POTTAWATOMIE	2013	20130042186		
POTTAWATOMIE	2014	20140028222	N	
PRATT	2011	20110022638		
RENO	2008	20080102224		
RENO	2008	20080103891		
RENO	2009	20090156597		
RENO	2012	20120020394		
RENO	2013	20130008699		
RENO	2013	20130033563		
RENO	2013	20130040137		
RENO	2014	20140036251	N	
RENO	2014	20140043810	N	
REPUBLIC	2008	20080111493		
RICE	2008	20080048525		
RICE	2010	20100101330		
RICE	2010	20100119659		
RICE	2011	20110109303		
RICE	2012	20120116003		
RICE	2014	20140114493	N	
ROOKS	2012	20120025215		
ROOKS	2012	20120081441		
RUSH	2009	20090017286		
RUSH	2010	20100012431		
RUSH	2013	20130031702		
RUSH	2013	20130044300		
RUSSELL	2009	20090058976		
RUSSELL	2009	20090064116		
RUSSELL	2010	20100015948		
RUSSELL	2010	20100027621		
RUSSELL	2013	20130042324		
SALINE	2008	20080102347		
SALINE	2009	20090045326		
SALINE	2009	20090058998		
SALINE	2011	20110030043		
SALINE	2012	20120027735		
SALINE	2012	20120081087		
SALINE	2013	20130002688		
SALINE	2013	20130030276		
SALINE	2013	20130036021		
SALINE	2014	20140024968	N	
SALINE	2014	20140026059	N	
SALINE	2014	20140042036	N	
SALINE	2015	20150031327	N	
SEDGWICK	2008	20080015578		
SEDGWICK	2008	20080017595		
SEDGWICK	2008	20080018578		
SEDGWICK	2008	20080020530		

SEDGWICK	2008	20080030386		
SEDGWICK	2008	20080040022		
SEDGWICK	2009	20090019800		
SEDGWICK	2009	20090022392		
SEDGWICK	2009	20090056632		
SEDGWICK	2009	20090101227		
SEDGWICK	2010	20100014250		
SEDGWICK	2010	20100015096		
SEDGWICK	2010	20100019876		
SEDGWICK	2010	20100023230		
SEDGWICK	2011	20110003963		
SEDGWICK	2011	20110024586		
SEDGWICK	2011	20110120551		
SEDGWICK	2012	20120101854		
SEDGWICK	2012	20120110259		
SEDGWICK	2012	20120116879		
SEDGWICK	2012	20120121567		
SEDGWICK	2013	20130123664		
SEDGWICK	2014	20140118963	N	
SEDGWICK	2014	20140121596	N	
SEDGWICK	2014	20140122631	N	
SEDGWICK	2014	20140123924	N	
SEDGWICK	2014	20140127009	N	
SEDGWICK	2014	20140129716	N	
SEDGWICK	2015	20150103142	N	
SEDGWICK	2015	20150103146	N	
SEWARD	2009	20090150066		
SHAWNEE	2009	20090046249		
SHAWNEE	2010	20100026380		
SHAWNEE	2011	20110021501		
SHAWNEE	2011	20110033367		
SHAWNEE	2013	20130011725		
SHAWNEE	2013	20130035239		
SHAWNEE	2014	20140024218	N	
SHAWNEE	2014	20140040160	N	
SHERIDAN	2014	20140086092	N	
SMITH	2008	20080019574		
SUMNER	2008	20080008046		
SUMNER	2009	20090012259		
SUMNER	2010	20100012335		
SUMNER	2011	20110023737		
SUMNER	2011	20110023739		
THOMAS	2012	20120105460		
WABAUNSEE	2011	20110002792		
WABAUNSEE	2012	20120005499		
WABAUNSEE	2013	20130080363		
WABAUNSEE	2014	20140024482	N	

WASHINGTON	2009	20090019889		
WASHINGTON	2012	20120015931		
WILSON	2008	20080048619		
WILSON	2008	20080052725		
WILSON	2010	20100026151		
WILSON	2010	20100038362		
WILSON	2011	20110021683		
WOODSON	2008	20080052737		
WOODSON	2010	20100008421		
WOODSON	2011	20110002095		
WOODSON	2011	20110117061		
WOODSON	2011	20110122014		
WOODSON	2013	20130100125		
WOODSON	2013	20130127469		
ATCHISON	2012	20120122747		
BUTLER	2012	20120008110		
BUTLER	2014	20140021938	N	
COFFEY	2012	20120122963		
DONIPHAN	2010	20100036989		
DOUGLAS	2010	20100014684		
DOUGLAS	2012	20120021940		
FINNEY	2011	20110013185		
GEARY	2011	20110001995		
GEARY	2011	20110005171		
HARVEY	2012	20120012955		
JACKSON	2013	20130009005		
LANE	2010	20100027936		
MARION	2013	20130042150		
MCPHERSON	2012	20120111027		
MCPHERSON	2012	20120118784		
MITCHELL	2010	20100002887		
MONTGOMERY	2011	20110123958		
NEMAHA	2013	20130031924		
POTTAWATOMIE	2014	20140041643	N	
SALINE	2011	20110033215		
SEDGWICK	2011	20110116078		
SEDGWICK	2012	20120104119		
SEDGWICK	2012	20120105498		
SEDGWICK	2012	20120123596		
STAFFORD	2013	20130085444		
SUMNER	2013	20130111429		
WOODSON	2012	20120117563		

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COUNTY_NAME	Year	ACCIDENT_KEY	MEET CRITERIA?	BRIDGE NUMBER
ALLEN	2008	20080020598	N	
BUTLER	2008	20080011035	N	

COWLEY	2012	20120015723	N	
EDWARDS	2011	20110080968	N	
GRANT	2010	20100028276	N	
RICE	2012	20120100506	N	
SALINE	2011	20110007424	N	
SEDGWICK	2015	20150107073	N	
OSAGE	2014	20140104318	N	
Guardrail				
COUNTY_NAME	Year	ACCIDENT_KEY	MEET CRITERIA?	BRIDGE NUMBER
ALLEN	2014	20140045063	N	
ANDERSON	2013	20130101842	N	
BARBER	2009	20090010531	Y	BR # 000040703406740
BARBER	2009	20090011505	Y	BR # 000040699906800
BARBER	2011	20110116650	N	
BARBER	2014	20140031127	Y	BR # 000040683807060
BARTON	2010	20100108881	N	
BROWN	2008	20080013546	N	
BUTLER	2008	20080013554	N	
BUTLER	2009	20090015546	N	
BUTLER	2009	20090019929	N	
BUTLER	2009	20090028484	N	
BUTLER	2011	20110016845	N	
BUTLER	2012	20120002754	N	
BUTLER	2012	20120017558	N	
BUTLER	2014	20140023297	N	
BUTLER	2014	20140026637	N	
BUTLER	2014	20140109293	N	
CHASE	2012	20120017808	N	
CHEROKEE	2011	20110009192	N	
CHEYENNE	2011	20110106608	N	
CLOUD	2014	20140035224	N	
COFFEY	2011	20110112917	N	
CRAWFORD	2008	20080014523	N	
CRAWFORD	2009	20090009032	N	
CRAWFORD	2013	20130037561	N	
CRAWFORD	2014	20140030474	Y	BR # 000191093906400
DICKINSON	2012	20120060187	N	
DOUGLAS	2008	20080034036	N	
DOUGLAS	2010	20100015204	N	
DOUGLAS	2013	20130124565	N	
DOUGLAS	2014	20140118762	N	
ELLIS	2008	20080040515	N	
ELLIS	2013	20130003612	N	
ELLIS	2013	20130030740	Y	BR # 000830593004801
ELLSWORTH	2009	20090021326	N	
FRANKLIN	2008	20080021564	N	

FRANKLIN	2011	20110024241	N	
FRANKLIN	2012	20120013536	N	
FRANKLIN	2013	20130041177	N	
FRANKLIN	2014	20140027170	N	
GEARY	2009	20090059989	N	
GEARY	2013	20130070285	N	
GEARY	2014	20140027439	N	
GRAHAM	2014	20140031122	N	
GRAY	2015	20150037060	N	
GREENWOOD	2012	20120021321	N	
GREENWOOD	2014	20140044024	N	
HARVEY	2009	20090005047	Y	BR # 000400817005748
HARVEY	2010	20100022082	Y	BR # 000400827005742
HARVEY	2010	20100022085	N	
HARVEY	2011	20110106410	N	
HARVEY	2014	20140023133	Y	BR # 000400831005788
JACKSON	2010	20100005845	Y	BR # 000430995003886
JACKSON	2013	20130038598	N	
JEFFERSON	2008	20080023073	Y	BR # 000441035604245
JEFFERSON	2013	20130037088	N	
JOHNSON	2008	20080035503	N	
JOHNSON	2008	20080044074	Y	BR # 000461083104680
JOHNSON	2009	20090101225	N	
JOHNSON	2014	20140035989	N	
KEARNY	2012	20120117646	N	
LABETTE	2011	20110021769	N	
LEAVENWORTH	2014	20140036543	N	
LINN	2013	20130115790	N	
LYON	2009	20090009081	N	
MARION	2012	20120002112	N	
MARSHALL	2008	20080002578	N	
MARSHALL	2009	20090003586	N	
MARSHALL	2010	20100004954	Y	BR # 000580885003108
MARSHALL	2015	20150032135	N	
MCPHERSON	2010	20100028059	N	
MEADE	2013	20130000101	Y	BR # 000600473906560
MIAMI	2008	20080017043	N	
MIAMI	2008	20080023561	N	
MIAMI	2009	20090014027	N	
MIAMI	2009	20090019651	N	
MIAMI	2010	20100039413	N	
MIAMI	2011	20110081339	Y	BR # 000611073004841
MIAMI	2012	20120018594	N	
MONTGOMERY	2008	20080001074	N	
MONTGOMERY	2010	20100105498	Y	BR # 000630999506906
MONTGOMERY	2011	20110107549	N	
MONTGOMERY	2014	20140114980	Y	BR # 000630999106844

NEMAHA	2011	20110115419	Y	BR # 000660983003149
NEMAHA	2013	20130037393	N	
NORTON	2014	20140111289	N	
OSAGE	2009	20090003113	N	
OSAGE	2010	20100107891	N	
OSAGE	2013	20130115476	N	
OTTAWA	2012	20120000014	N	
POTTAWATOMIE	2011	20110103022	N	
POTTAWATOMIE	2013	20130010094	N	
POTTAWATOMIE	2013	20130126201	N	
PRATT	2008	20080036598	N	
REPUBLIC	2008	20080103703	N	
RICE	2014	20140104788	N	
RILEY	2009	20090046110	N	
ROOKS	2014	20140029711	N	
RUSSELL	2009	20090050136	N	
SALINE	2008	20080052634	N	
SALINE	2009	20090052028	N	
SALINE	2014	20140024964	N	
SEDGWICK	2010	20100000825	Y	BR # 000870771406240
SEDGWICK	2010	20100017173	N	
SEDGWICK	2011	20110033891	N	
SEWARD	2010	20100120971	N	
SHAWNEE	2008	20080029548	N	
SHAWNEE	2011	20110030304	N	
SHAWNEE	2011	20110080487	Y	BR # 000890975104480
SHAWNEE	2014	20140037746	N	
SUMNER	2012	20120005259	N	
SUMNER	2013	20130107342	N	
SUMNER	2014	20140129214	N	
SUMNER	2015	20150109058	N	
WABAUNSEE	2013	20130003558	N	
WASHINGTON	2013	20130002930	N	
WILSON	2011	20110021948	N	
MITCHELL	2014	20140043297	N	
NORTON	2011	20110022465	Y	BR # 000690553903208

Embankment

COUNTY_NAME	Year	ACCIDENT_KEY	MEET CRITERIA?	BRIDGE NUMBER
ALLEN	2014	20140021603	N	
ANDERSON	2010	20100014318		
ANDERSON	2012	20120014463		
ANDERSON	2013	20130000103		
ANDERSON	2013	20130045630		
ATCHISON	2008	20080022514		
ATCHISON	2008	20080022529		
ATCHISON	2009	20090000040		

ATCHISON	2009	20090010514		
ATCHISON	2009	20090019427		
ATCHISON	2009	20090019439		
ATCHISON	2010	20100104943		
ATCHISON	2010	20100111067		
ATCHISON	2011	20110100774		
ATCHISON	2013	20130046157		
ATCHISON	2013	20130046301		
ATCHISON	2013	20130123055		
BARBER	2009	20090018008		
BARBER	2009	20090150833		
BARTON	2008	20080031009		
BARTON	2008	20080046023		
BARTON	2008	20080103363		
BARTON	2008	20080106251		
BARTON	2008	20080110628		
BARTON	2008	20080111174		
BARTON	2009	20090003505		
BARTON	2009	20090004520		
BARTON	2009	20090010532		
BARTON	2009	20090015517		
BARTON	2009	20090020782		
BARTON	2009	20090028450		
BARTON	2010	20100103422		
BARTON	2010	20100110891		
BARTON	2010	20100111004		
BARTON	2010	20100115303		
BARTON	2010	20100116318		
BARTON	2010	20100119382		
BARTON	2011	20110100793		
BARTON	2011	20110103244		
BARTON	2011	20110106258		
BARTON	2011	20110106931		
BARTON	2011	20110107474		
BARTON	2011	20110108857		
BARTON	2011	20110115134		
BARTON	2011	20110117801		
BARTON	2012	20120101029		
BARTON	2012	20120113288		
BARTON	2012	20120123173		
BARTON	2013	20130107092		
BARTON	2013	20130107103		
BARTON	2013	20130127478		
BARTON	2014	20140102438	N	
BARTON	2014	20140105480	N	
BARTON	2014	20140108228	N	
BOURBON	2010	20100030765		

BROWN	2008	20080102052		
BROWN	2012	20120123775		
BROWN	2014	20140026469	N	
BROWN	2014	20140128784	N	
BUTLER	2008	20080015015		
BUTLER	2010	20100000518		
BUTLER	2010	20100002142		
BUTLER	2010	20100008317		
BUTLER	2010	20100009857		
BUTLER	2010	20100010658		
BUTLER	2010	20100012041		
BUTLER	2010	20100023837		
BUTLER	2010	20100037273		
BUTLER	2011	20110008071		
BUTLER	2011	20110012311		
BUTLER	2011	20110013948		
BUTLER	2012	20120005525		
BUTLER	2012	20120007390		
BUTLER	2012	20120007393		
BUTLER	2012	20120016768		
BUTLER	2013	20130002274		
BUTLER	2013	20130010507		
BUTLER	2013	20130030376		
BUTLER	2013	20130031832		
BUTLER	2013	20130037166		
BUTLER	2013	20130044170		
BUTLER	2014	20140022374	N	
BUTLER	2014	20140024605	N	
BUTLER	2014	20140025369	N	
BUTLER	2014	20140026926	N	
BUTLER	2014	20140033807		
BUTLER	2014	20140034819		
BUTLER	2014	-	N	
BUTLER	2014	20140038781		
BUTLER	2014	20140044306		
CHAUTAUQUA	2010	20100029369		
CHAUTAUQUA	2011	20110022929		
CHAUTAUQUA	2013	20130101196		
CHEROKEE	2008	20080110640		
CHEROKEE	2014	20140037061	N	
CHEYENNE	2010	20100101927		
CHEYENNE	2014	20140115202		
CLAY	2009	20090150497		
CLAY	2010	20100116093		
CLAY	2012	20120111237		
CLAY	2013	20130113808		
CLAY	2014	20140127755		

CLAY	2014	20140127757	N	
CLOUD	2008	20080109799		
CLOUD	2010	20100121085		
CLOUD	2011	20110022488		
CLOUD	2013	20130006054		
CLOUD	2013	20130032428		
CLOUD	2014	20140029808		
COMANCHE	2011	20110023465		
COWLEY	2008	20080054010		
COWLEY	2009	20090057476		
COWLEY	2009	20090059425		
COWLEY	2009	20090059908		
COWLEY	2009	20090064697		
COWLEY	2009	20090064709		
COWLEY	2012	20120005860		
COWLEY	2012	20120025624		
COWLEY	2012	20120027148		
COWLEY	2012	20120108339		
COWLEY	2013	20130008573		
COWLEY	2013	20130012521		
COWLEY	2014	20140001441		
COWLEY	2014	20140001497	N	
COWLEY	2014	20140001709		
COWLEY	2015	20150000604		
CRAWFORD	2009	20090064410		
CRAWFORD	2011	20110000639		
CRAWFORD	2011	20110011311		
CRAWFORD	2011	20110027735		
CRAWFORD	2015	20150035327	N	
DICKINSON	2008	20080018025		
DICKINSON	2009	20090045010		
DICKINSON	2009	20090047471		
DICKINSON	2009	20090048812		
DICKINSON	2010	20100025422		
DICKINSON	2010	20100036563		
DICKINSON	2011	20110006910		
DICKINSON	2012	20120114335		
DICKINSON	2013	20130033779		
DICKINSON	2014	20140032261		
DICKINSON	2014	20140042988		
DICKINSON	2015	20150106644	N	
DONIPHAN	2008	20080005049		
DONIPHAN	2008	20080110164		
DONIPHAN	2009	20090000567		
DONIPHAN	2011	20110025588		
DONIPHAN	2011	20110029155		
DONIPHAN	2012	20120120562		

DOUGLAS	2009	20090000270		
DOUGLAS	2009	20090004588		
DOUGLAS	2009	20090007054		
DOUGLAS	2009	20090013503		
DOUGLAS	2009	20090015577		
DOUGLAS	2009	20090023345		
DOUGLAS	2009	20090028871		
DOUGLAS	2010	20100009921		
DOUGLAS	2010	20100036745		
DOUGLAS	2010	20100037844		
DOUGLAS	2011	20110006427		
DOUGLAS	2011	20110006924		
DOUGLAS	2011	20110007817		
DOUGLAS	2011	20110027895		
DOUGLAS	2011	20110031206		
DOUGLAS	2011	20110110976		
DOUGLAS	2012	20120003913		
DOUGLAS	2012	20120004858		
DOUGLAS	2012	20120007617		
DOUGLAS	2012	20120015551		
DOUGLAS	2012	20120025599		
DOUGLAS	2012	20120026499		
DOUGLAS	2012	20120120986		
DOUGLAS	2013	20130000096		
DOUGLAS	2013	20130080274		
DOUGLAS	2013	20130106125		
DOUGLAS	2013	20130108179		
DOUGLAS	2013	20130113233		
DOUGLAS	2013	20130119539		
DOUGLAS	2013	20130124312		
DOUGLAS	2014	20140104219		
DOUGLAS	2014	20140109198		
DOUGLAS	2014	20140109658	N	
DOUGLAS	2014	20140129104		
EDWARDS	2012	20120081302		
ELLIS	2008	20080033026		
ELLIS	2009	20090021300		
ELLIS	2010	20100003574		
ELLIS	2010	20100011176		
ELLIS	2010	20100023503		
ELLIS	2010	20100031439		
ELLIS	2011	20110007316		
ELLIS	2011	20110007342		
ELLIS	2012	20120010004		
ELLIS	2012	20120017062		
ELLIS	2012	20120028021		
ELLIS	2013	20130044290		

ELLIS	2013	20130114612		
ELLIS	2014	20140020922		
ELLIS	2014	20140038082	N	
ELLIS	2015	20150032281		
ELLIS	2015	20150034561		
ELLIS	2015	20150035814	N	
ELLSWORTH	2014	20140024526		
FINNEY	2008	20080030530		
FINNEY	2010	20100009943		
FINNEY	2010	20100025471		
FINNEY	2012	20120018599		
FORD	2008	20080007807		
FORD	2011	20110013470		
FORD	2014	20140037629		
FORD	2015	20150033857	N	
FORD	2015	20150036488		
FRANKLIN	2008	20080039073		
FRANKLIN	2008	20080050085		
FRANKLIN	2009	20090028931		
FRANKLIN	2010	20100009144		
FRANKLIN	2010	20100015945		
FRANKLIN	2012	20120016703		
FRANKLIN	2013	20130006218		
FRANKLIN	2014	20140027301		
FRANKLIN	2015	20150034945	N	
GEARY	2008	20080101808		
GEARY	2011	20110007517		
GEARY	2011	20110032122		
GRAHAM	2009	20090016028		
GRAHAM	2010	20100011228		
GRAHAM	2011	20110007262		
GRAHAM	2011	20110029658		
GRAHAM	2012	20120008638		
GRAHAM	2013	20130127398		
GRAHAM	2015	20150030152		
GRAHAM	2015	20150030153		
GRANT	2010	20100035392		
GRAY	2008	20080027039		
GRAY	2012	20120008136		
GREENWOOD	2009	20090045042		
GREENWOOD	2011	20110118311		
GREENWOOD	2012	20120005109		
GREENWOOD	2012	20120027728		
GREENWOOD	2013	20130045852		
HARPER	2008	20080010131		
HARPER	2009	20090101936		
HARPER	2009	20090150440		

HARPER	2010	20100119567		
HARPER	2012	20120109667		
HARPER	2013	20130111476		
HARPER	2013	20130112800		
HARPER	2014	20140108116	N	
HARVEY	2008	20080105989		
HARVEY	2010	20100105351		
HARVEY	2012	20120022144		
HASKELL	2008	20080045025		
HASKELL	2008	20080051534		
HODGEMAN	2009	20090029085		
JACKSON	2008	20080011082		
JACKSON	2010	20100036557		
JACKSON	2011	20110035225		
JACKSON	2012	20120006541		
JACKSON	2013	20130037163		
JACKSON	2014	20140035435		
JEFFERSON	2008	20080022001		
JEFFERSON	2008	20080043016		
JEFFERSON	2008	20080054556		
JEFFERSON	2009	20090005062		
JEFFERSON	2009	20090019560		
JEFFERSON	2010	20100027762		
JEFFERSON	2010	20100032844		
JEFFERSON	2010	20100037529		
JEFFERSON	2011	20110023382		
JEFFERSON	2012	20120013317		
JEFFERSON	2012	20120101312		
JEFFERSON	2014	20140032343		
JEWELL	2012	20120002129		
JOHNSON	2008	20080000580		
JOHNSON	2008	20080011507		
JOHNSON	2008	20080017550		
JOHNSON	2008	20080050527		
JOHNSON	2008	20080050537		
JOHNSON	2009	20090001526		
JOHNSON	2009	20090047156		
JOHNSON	2009	20090059389		
JOHNSON	2009	20090060526		
JOHNSON	2010	20100001485		
JOHNSON	2012	20120028815		
JOHNSON	2013	20130036468		
JOHNSON	2014	20140002618	N	
JOHNSON	2014	20140024717		
JOHNSON	2015	20150037059		
KINGMAN	2008	20080017018		
KINGMAN	2010	20100110998		

KINGMAN	2010	20100111465		
KINGMAN	2011	20110106612		
KINGMAN	2011	20110107868		
KINGMAN	2012	20120108741		
KINGMAN	2013	20130113833		
KINGMAN	2014	20140109665	N	
KINGMAN	2014	20140121924		
KINGMAN	2014	20140123908		
KIOWA	2009	20090019965		
KIOWA	2013	20130037120		
KIOWA	2014	20140026851	N	
LABETTE	2008	20080018079		
LABETTE	2010	20100081417		
LABETTE	2012	20120006572		
LABETTE	2013	20130030712		
LANE	2011	20110007970		
LEAVENWORTH	2008	20080045064		
LEAVENWORTH	2008	20080046568		
LEAVENWORTH	2009	20090001562		
LEAVENWORTH	2009	20090005504		
LEAVENWORTH	2009	20090011081		
LEAVENWORTH	2009	20090012063		
LEAVENWORTH	2009	20090013571		
LEAVENWORTH	2009	20090016078		
LEAVENWORTH	2009	20090029431		
LEAVENWORTH	2010	20100010217		
LEAVENWORTH	2010	20100012054		
LEAVENWORTH	2010	20100015985		
LEAVENWORTH	2010	20100017062		
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LEAVENWORTH	2010	20100032375		
LEAVENWORTH	2010	20100034221		
LEAVENWORTH	2012	20120007209		
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LEAVENWORTH	2012	20120028999		
LEAVENWORTH	2012	20120120749		
LEAVENWORTH	2013	20130031781		
LEAVENWORTH	2013	20130036801		
LEAVENWORTH	2013	20130037809		
LEAVENWORTH	2013	20130042534		
LEAVENWORTH	2014	20140031935		
LEAVENWORTH	2014	20140102006		
LINCOLN	2008	20080054571		
LOGAN	2014	20140042460	N	
LYON	2008	20080009260		
LYON	2008	20080024580		
LYON	2009	20090001582		

LYON	2012	20120026454		
LYON	2015	20150036381		
MARION	2008	20080018091		
MARION	2009	20090058913		
MARION	2011	20110001322		
MARION	2013	20130031703		
MARION	2014	20140026800		
MARION	2014	20140030665	N	
MARSHALL	2008	20080006067		
MARSHALL	2008	20080030567		
MARSHALL	2010	20100027047		
MARSHALL	2011	20110004814		
MARSHALL	2011	20110021766		
MARSHALL	2011	20110023545		
MCPHERSON	2008	20080028549		
MCPHERSON	2009	20090007516		
MCPHERSON	2009	20090007518		
MCPHERSON	2010	20100008979		
MCPHERSON	2011	20110101218		
MCPHERSON	2011	20110106523		
MCPHERSON	2011	20110110548		
MCPHERSON	2011	20110110775		
MCPHERSON	2012	20120103713		
MCPHERSON	2014	20140101763		
MCPHERSON	2014	20140107535		
MCPHERSON	2015	20150105688	N	
MCPHERSON	2015	20150110036		
MIAMI	2008	20080001064		
MIAMI	2011	20110004327		
MIAMI	2014	20140024475		
MIAMI	2015	20150030535	N	
MIAMI	2015	20150034767		
MITCHELL	2008	20080047012		
MITCHELL	2010	20100038425		
MITCHELL	2011	20110028296		
MITCHELL	2011	20110028475		
MITCHELL	2012	20120013628		
MONTGOMERY	2008	20080045510		
MONTGOMERY	2009	20090011141		
MONTGOMERY	2009	20090026926		
MONTGOMERY	2010	20100001526		
MONTGOMERY	2014	20140129627		
MONTGOMERY	2015	20150104650	N	
MORRIS	2009	20090017130		
MORRIS	2011	20110112190		
MORTON	2012	20120005097		
NEMAHA	2008	20080002004		

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NEMAHA	2008	20080028577		
NEMAHA	2008	20080032069		
NEMAHA	2008	20080049591		
NEMAHA	2009	20090063896		
NEMAHA	2010	20100006473		
NEMAHA	2010	20100117993		
NEMAHA	2010	20100121613		
NEMAHA	2011	20110029991		
NEMAHA	2012	20120012530		
NEMAHA	2012	20120017987		
NEMAHA	2013	20130000849		
NEMAHA	2013	20130033950		
NEOSHO	2008	20080048090		
NORTON	2008	20080024013		
NORTON	2010	20100005880		
NORTON	2010	20100005902		
NORTON	2011	20110029179		
NORTON	2013	20130036725		
OSAGE	2012	20120102353		
OSAGE	2012	20120102910		
OSAGE	2013	20130121961		
OSAGE	2014	20140128617		
OSAGE	2015	20150107741		
OTTAWA	2009	20090017181		
PAWNEE	2009	20090003123		
PAWNEE	2012	20120103213		
PHILLIPS	2008	20080111293		
POTTAWATOMIE	2008	20080024039		
POTTAWATOMIE	2008	20080041544		
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POTTAWATOMIE	2009	20090003135		
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POTTAWATOMIE	2010	20100022820		
POTTAWATOMIE	2010	20100022826		
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PRATT	2008	20080011556		
PRATT	2008	20080015560		
PRATT	2009	20090007552		
PRATT	2014	20140028715		
RENO	2009	20090156640		
RENO	2010	20100032269		
RENO	2012	20120013894		
RENO	2013	20130038425		
RENO	2013	20130040213		
REPUBLIC	2009	20090150889		
RICE	2009	20090004035		
RICE	2011	20110118849		
RICE	2012	20120100413		
RICE	2012	20120119491		
RICE	2014	20140105611		
RICE	2014	20140116940	N	
RILEY	2011	20110000041		
RILEY	2011	20110015944		
RILEY	2012	20120002798		
RILEY	2012	20120018806		
RILEY	2012	20120025196		
RILEY	2015	20150035722		
ROOKS	2013	20130035621		
ROOKS	2014	20140029684		
RUSH	2014	20140022061	N	
RUSSELL	2009	20090064119		
SALINE	2009	20090058997		
SALINE	2009	20090151878		
SALINE	2011	20110023642		
SALINE	2013	20130034111		
SALINE	2013	20130034440		
SALINE	2013	20130043762		
SALINE	2014	20140021490		
SALINE	2014	20140024674		
SCOTT	2012	20120007878		
SEDGWICK	2008	20080004544		
SEDGWICK	2008	20080038559		
SEDGWICK	2009	20090018097		
SEDGWICK	2009	20090027802		
SEDGWICK	2010	20100000823		
SEDGWICK	2010	20100016112		
SEDGWICK	2011	20110012072		
SEDGWICK	2011	20110012075		
SEDGWICK	2012	20120101526		
SEDGWICK	2012	20120107730		

SEDGWICK	2013	20130117784		
SEDGWICK	2014	20140117766	N	
SEDGWICK	2014	20140118773		
SEWARD	2010	20100021496		
SHAWNEE	2008	20080032555		
SHAWNEE	2009	20090045361		
SHAWNEE	2009	20090045606		
SHAWNEE	2009	20090060387		
SHAWNEE	2011	20110015365		
SHAWNEE	2011	20110032897		
SHAWNEE	2011	20110034077		
SHAWNEE	2011	20110035045		
SHAWNEE	2013	20130008384		
SHAWNEE	2013	20130012046		
SHAWNEE	2013	20130040099		
SHAWNEE	2013	20130043848		
SHAWNEE	2014	20140105788		
SHAWNEE	2014	20140109393	N	
SHERIDAN	2012	20120024953		
SHERIDAN	2014	20140029127		
SMITH	2012	20120108069		
SMITH	2012	20120110832		
SMITH	2012	20120117912		
SMITH	2013	20130100475		
STEVENS	2012	20120029354		
SUMNER	2010	20100119505		
SUMNER	2011	20110004821		
SUMNER	2011	20110028970		
SUMNER	2014	20140129195		
TREGO	2009	20090003094		
TREGO	2013	20130009809		
WABAUNSEE	2009	20090012665		
WABAUNSEE	2012	20120018675		
WABAUNSEE	2012	20120019168		
WABAUNSEE	2013	20130006828		
WABAUNSEE	2015	20150036785	N	
WASHINGTON	2008	20080019050		
WASHINGTON	2008	20080019580		
WASHINGTON	2009	20090004095		
WASHINGTON	2009	20090029602		
WASHINGTON	2012	20120000810		
WASHINGTON	2012	20120000814		
WASHINGTON	2012	20120029907		
WASHINGTON	2014	20140028770		
WASHINGTON	2014	20140033361		
WILSON	2008	20080042086		
WILSON	2012	20120022105		

WILSON	2012	20120025076		
WILSON	2012	20120036208		
WOODSON	2009	20090030379		
WOODSON	2012	20120118782		
WYANDOTTE	2012	20120031299		
ATCHISON	2011	20110111203		
BARTON	2014	20140116744	N	
BROWN	2012	20120000989		
BUTLER	2011	20110013750		
BUTLER	2013	20130006904		
BUTLER	2015	20150030660		
CHEROKEE	2010	20100011604		
CLAY	2012	20120114494		
COWLEY	2015	20150000873		
DOUGLAS	2012	20120013018		
DOUGLAS	2013	20130124879		
ELLIS	2013	20130000371		
FORD	2013	20130030675		
FRANKLIN	2012	20120003310		
GREENWOOD	2011	20110026314		
JACKSON	2010	20100031283		
JEFFERSON	2012	20120009106		
KINGMAN	2015	20150100379	N	
LABETTE	2012	20120029170		
LANE	2012	20120020562		
LEAVENWORTH	2013	20130005252		
MONTGOMERY	2011	20110103970		
MONTGOMERY	2013	20130108078		
NORTON	2013	20130031761		
OSAGE	2010	20100101998		
OTTAWA	2010	20100119717		
REPUBLIC	2011	20110101637		
RILEY	2011	20110023527		
RILEY	2014	20140037835		
ROOKS	2011	20110034046		
SALINE	2012	20120005915		
SALINE	2013	20130038860		
SALINE	2014	20140035508		
SALINE	2015	20150030624		
SEDGWICK	2010	20100008796		
SEDGWICK	2014	20140104107	N	
SHAWNEE	2014	20140026349		
SHERIDAN	2013	20130030689		
WABAUNSEE	2013	20130009559		
WABAUNSEE	2013	20130041071		
WILSON	2012	20120018444		

APPENDIX D

CRASH REPORTS

FATAL CRASHES AT SHORT BRIDGES ON LOW-VOLUME LOCAL ROADS

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APPENDIX E

CRASH REPORTS

SERIOUS INJURY CRASHES AT SHORT BRIDGES ON LOW-VOLUME LOCAL ROADS

MAIN NARRATIVE

On Tuesday October 18, 2011 at 1350 hours, I was dispatched to the area of Bethel Church Road south of W. 391st Street in reference to a one vehicle injury crash. Upon arrival, I located the crash just north of W. 399th Street on Bethel Church Road. I observed a silver 4 door Chevy Cruze bearing Kansas [REDACTED] laying on it's roof in the middle of the roadway. It appeared that the vehicle had struck the bridge on the west side of the road and then rolled on to it's roof. An off duty Osawatomie Police Officer Harold Whitley, was on scene and said that the driver and only occupant was trapped in the vehicle. I spoke to the subject who was identified as [REDACTED] I asked [REDACTED] what happened and he said he was southbound on Bethel Church Road when he fell asleep and struck the bridge. Osawatomie Fire was able to get [REDACTED] from the vehicle and he was transported to the Overland Park Regional Hospital with unknown injuries. I spoke with [REDACTED] mother at the scene who said that her son had been working two jobs. The vehicle was towed by [REDACTED]

USE RESTRICTED
23 USC 409

Kansas Motor Vehicle Accident Report KDOT Form 850A Rev 1-2009 KDOT: 20090048846				Investigating Department		Reviewed By		Local Case No.		Page of		☐ Amended Report ☐ DUI ☐ Hit & Run	
				Johnson County Sheriff's Office		30359		09002135		41 / 6			
Investigating Officer Name				Badge Number		County		City Name					
C. HARGRAVE				31275		JO C		BUCYRUS					
Milepost	Block No	Dir Pfx	On Road Name	Road Type	Dir Sfx	Spd Lmt	Date of Accident (mm/dd/yyyy)	Time Occur	Day	☐ Fatal ☒ Injury ☐ PDO >= \$1000 ☐ PDO < \$1000 ☐ Private Property			
1038	F	W	215TH	ST		35	05/06/2009	11:26	WE				
From Dist	Ft/Mi	From Dir	Dir Pfx	Reference or At Road Name	Road Type	Dir Sfx	Spd Lmt	Date Notified (mm/dd/yyyy)	Time Notif	Day			
1038	F	W	O AT	S	PFLUMM	RD		05/06/2009	11:30	WE			
Narrative: Describe each traffic unit's pre-crash movement and direction of travel							Date Arrived (mm/dd/yyyy)	Time Arriv	Day				
V1 was traveling westbound on 215th Street, when it left the north side of the roadway and struck a concrete bridge railing. V1 then completed one quarter of a rotation and landed in the roadway on its left side.							Latitude (AOI)	00 ON WORK ZONE TYPE AT					
							Longitude (AOI)	00 None Apply					
							Photos By	C. HARGRAVE					
KDOT? ☐ Object 1 Damaged & Nature of Damage (show in diagram) CONCRETE BRIDGE GAURD RAIL				Owner Street Address				Personal Phone					
Owner Last Name First Name Middle Name City State Zip Work Phone ROAD AND BRIDGE													
KDOT? ☐ Object 2 Damaged & Nature of Damage (show in diagram) ROAD AND BRIDGE				Owner Street Address				Personal Phone					
Owner Last Name First Name Middle Name City State Zip Work Phone													
ONLY CHOOSE ONE CODE PER CATEGORY UNLESS SPECIFIED OTHERWISE													
01 LIGHT CONDITIONS 01 Daylight 04 Dark: street lights on 02 Dawn 05 Dark: no street lights 03 Dusk 99 Unknown			20 ACC. LOCATION (of 1st Harmful Event) ON ROADWAY: (within travel lanes) 11 Non-Intersection 12 Intersection + 13 Intersection-related + 14 Access to Parking lot/Drwy 15 Interchange Area + 16 On Crossover 17 Toll Plaza OFF ROADWAY: 20 Shoulder 21 Roadside (not shoulder) 22 Median 23 Parking lot or Rest area 88 Other: 99 Unknown			08 ACCIDENT CLASS (mark 1 box per side) 1st Harmful Event Most Harmful Event 00 Other non-collision 01 Overturned/Rollover COLLISION WITH: 02 Pedestrian 03 Motor vehicle in-transport* 04 Legally Parked Vehicle 05 Railway train 06 Pedal cyclist 07 Animal Type: 08 Fixed object** 09 Other object: 99 Unknown			02 **FIXED OBJECT TYPE (mark 1 box per side if applicable) 1st Harmful Event Most Harmful Event 01 Bridge structure 02 Bridge rail 03 Crash cushion/Impact attenuator 04 Divider, median barrier 05 Overhead sign support 06 Utility devices: pole, meter, etc 07 Other post or pole 08 Building 09 Guardrail 10 Sign post 11 Culvert 12 Curb 13 Fence/Gate 14 Hydrant 15 Barricade 16 Mailbox 17 Ditch 18 Embankment 19 Wall 20 Tree 21 RRXING fixtures 88 Other: 99 Unknown				
00 ADVERSE WEATHER CONDITIONS 00 No adverse conditions 01 Rain, mist, drizzle 02 Sleet, hail 03 Snow 04 Fog 05 Smoke 06 Strong wind 07 Blowing dust, sand, etc. 08 Freezing rain, mist, drizzle 14 Rain & fog 16 Rain & wind 24 Sleet & fog 36 Snow & wind 88 Other: 99 Unknown			+INTERSECTION TYPE 01 Four-way Intersection 02 Five-way or more 03 T - Intersection 04 Y - Intersection 05 L - Intersection 06 Roundabout (See Manual for Definitions) 07 Traffic Circle 08 Part of an Interchange 99 Unknown										
03 ON SURFACE TYPE AT 01 Concrete 02 Blacktop (Asphalt) 03 Gravel 04 Dirt 05 Brick 88 Other: 99 Unknown													
01 SURFACE CONDITIONS ON AT 01 Dry 02 Wet 03 Snow 04 Ice 05 Mud/dirt/sand 06 Debris (oil, etc.) 07 Standing / moving water 08 Slush 88 Other: 99 Unknown			ROAD SPECIAL FEATURES (up to 3) 00 None 01 2 3 01 Bridge 02 Bridge Overhead 03 Railroad Bridge 04 RRXING 05 Interchange 06 Ramp 99 Unknown										
TRAFFIC CONTROLS (On / At Road) O / A Type Present OK/NP ↓ ↓ ↓ 00 None 01 Officer, flagger 02 Traffic signal 03 Stop sign 04 Flasher 05 Yield sign 06 RR gates / signal 07 RR crossing signs 08 No passing zone 09 Center/Edge lines 10 Warning signs 11 School zone signs 12 Parking lines 88 Other: 99 Unknown													

KDOT

Public Works

1504 05-08-09

Occupants & Vehicles 850B Continued		VEHICLE# 1 (01, 03, N3, X3, etc)		SPECIAL DATA		VEHICLE# (02, 04, N2, X4, etc)		SPECIAL DATA		Local Case No. 14A0308A59		Page of 1																							
OWNER Last Name ("Same" if Driver)				OWNER First Name				Middle Name				OWNER Last Name ("Same" if Driver)				OWNER First Name				Middle Name															
OWNER ADDRESS (Number, Street)								New address?		Personal Phone		OWNER ADDRESS (Number, Street)								New address?		Personal Phone													
CITY				ST		ZIP		Work Phone				CITY				ST		ZIP		Work Phone															
COLOR RED		YEAR 2005		MAKE RKTA		MODEL CYL		BODY STYLE MC		ST		COLOR		YEAR		MAKE		MODEL		BODY STYLE		ST													
LICENSE PLATE #		County		Exp YR		Removed by Owner		MC CCs 200				LICENSE PLATE #		County		Exp YR		Removed by		MC CCs															
VEHICLE IDENTIFICATION NUMBER								Dir of Travel N		# Occupants 2		VEHICLE IDENTIFICATION NUMBER								Dir of Travel		# Occupants													
Insurance Company Unknown				Policy Number								Insurance Company				Policy Number																			
SPECIAL CONDITIONS FOR TRAFFIC UNITS				1		2		3		4		5		Odometer 9999999		Fire?		SPECIAL CONDITIONS FOR TRAFFIC UNITS				1		2		3		4		5		Odometer		Fire?	
1 Hit & Run		2 Non-Contact		3 Stolen		7 Towed away due to damage		4 Legally Parked		5 Pursued by LE		6 Driverless		1 Hit & Run		2 Non-Contact		3 Stolen		7 Towed away due to damage		4 Legally Parked		5 Pursued by LE		6 Driverless									
02 VEHICLE BODY TYPE		LARGE / HEAVY VEHICLE (GCVWR over 10,000lbs)										02 VEHICLE BODY TYPE		LARGE / HEAVY VEHICLE (GCVWR over 10,000lbs)																					
01 Automobile		10 Single heavy truck >10,000 lbs										01 Automobile		10 Single heavy truck >10,000 lbs																					
02 Motorcycle		11 Truck & trailer(s)										02 Motorcycle		11 Truck & trailer(s)																					
03 Motor scooter or Moped		12 Tractor-trailer(s)										03 Motor scooter or Moped		12 Tractor-trailer(s)																					
04 Van		13 Cross country bus										04 Van		13 Cross country bus																					
05 Pickup truck <10,001 lbs		14 School bus										05 Pickup truck <10,001 lbs		14 School bus																					
06 Sport utility veh - SUV		15 Transit (city) bus										06 Sport utility veh - SUV		15 Transit (city) bus																					
07 Camper or RV		16 Other bus										07 Camper or RV		16 Other bus																					
08 Farm machinery		25 Train										08 Farm machinery		25 Train																					
09 All-terrain vehicle - ATV		88 Other:										09 All-terrain vehicle - ATV		88 Other:																					
		99 Unknown												99 Unknown																					
01 VEHICLE USE		01 VEHICLE DAMAGE										01 VEHICLE USE		01 VEHICLE DAMAGE																					
01 No special use		06 Police										01 No special use		06 Police																					
02 Taxi / Limo		07 Ambulance										02 Taxi / Limo		07 Ambulance																					
03 School bus		08 Fire										03 School bus		08 Fire																					
04 Other bus		09 Mail/Parcel										04 Other bus		09 Mail/Parcel																					
05 Military		99 Unknown										05 Military		99 Unknown																					
01 Damage (minor)		88 Other:										01 Damage (minor)		88 Other:																					
02 Functional		99 Unknown										02 Functional		99 Unknown																					
03 Disabling		99 Unknown										03 Disabling		99 Unknown																					
DAMAGE LOCATION AREA		VEH. MANU. BEFORE UNSTAB. SIT.										DAMAGE LOCATION AREA		VEH. MANU. BEFORE UNSTAB. SIT.																					
First Impact 12 Major Impact 12		01 Straight/ following road										First Impact Major Impact		01 Straight/ following road																					
11 Stopped awaiting turn		12 Stopped in traf										11 Stopped awaiting turn		12 Stopped in traf																					
13 Illegally parked		14 Disabled in roadway										13 Illegally parked		14 Disabled in roadway																					
15 Slowing or stopping		16 Negotiating a curve										15 Slowing or stopping		16 Negotiating a curve																					
06 Changing lanes		88 Other:										06 Changing lanes		88 Other:																					
07 Avoidance man		99 Unknown										07 Avoidance man		99 Unknown																					
08 Merging		99 Unknown										08 Merging		99 Unknown																					
09 Parking		99 Unknown										09 Parking		99 Unknown																					
10 Backing		99 Unknown										10 Backing		99 Unknown																					
VEHICLE SEQUENCE OF EVENTS (List up to 4 per unit in the order of occurrence)		VEHICLE SEQUENCE OF EVENTS (List up to 4 per unit in the order of occurrence)																																	
1 02 2 27 3 4		1 2 3 4																																	
The exact sequence is unknown		The exact sequence is unknown																																	
NON-COLLISION		COLLISION WITH										NON-COLLISION		COLLISION WITH																					
01 Ran off road right		10 Downhill runaway										01 Ran off road right		10 Downhill runaway																					
02 Ran off road left		11 Trailer swing										02 Ran off road left		11 Trailer swing																					
03 Crossed centerline		12 Separation of units										03 Crossed centerline		12 Separation of units																					
04 Overturn/Rollover		13 Jackknife										04 Overturn/Rollover		13 Jackknife																					
05 Crossed median		14 Fire										05 Crossed median		14 Fire																					
06 Fell/Jumped from veh		15 Explosion										06 Fell/Jumped from veh		15 Explosion																					
07 Thrown or falling object		16 Immersion in water										07 Thrown or falling object		16 Immersion in water																					
08 Cargo loss or shift		88 Other event:										08 Cargo loss or shift		88 Other event:																					
09 Equipment failure (tire, brakes, etc.)		98 Unknown non-coll.										09 Equipment failure (tire, brakes, etc.)		98 Unknown non-coll.																					
21 Pedestrian		22 Motor veh in-transport										21 Pedestrian		22 Motor veh in-transport																					
23 Legally Parked Vehicle		24 Train										23 Legally Parked Vehicle		24 Train																					
25 Pedal cycle (bike, etc)		26 Animal										25 Pedal cycle (bike, etc)		26 Animal																					
27 Fixed Object		28 Other moveable object										27 Fixed Object		28 Other moveable object																					
99 Unknown object		99 Unknown object										99 Unknown object		99 Unknown object																					

APPENDIX F

Appendix F contains no additional information to the original study.

APPENDIX G
BENEFIT/COST ANALYSES USING
RSAP VERSION 2.03

Date: February 05, 2016**Time:** 09:23:31AM

Benefit/Cost Ratio Report

Page: 1**File Name:** 20 ft 100 vpd.rpd**Project Description:** 20 ft bridge

<u>Alternative</u>	<u>Description</u>
1	20 ft bridge no rail
2	20 ft bridge with rail no terms
3	20 ft bridge with rail with terms

	<u>Alternative</u>		
<u>Alternative</u>	<u>1</u>	<u>2</u>	<u>3</u>
1	0.00	0.58	0.26
2	0.00	0.00	0.20
3	0.00	0.00	0.00

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Alternative Cost Report

Page: 2**File Name:** 20 ft 100 vpd.rpd**Project Description:** 20 ft bridge

<u>Alternative</u>	<u>Description</u>
1	20 ft bridge no rail
2	20 ft bridge with rail no terms
3	20 ft bridge with rail with terms

<u>Alternative</u>	<u>Expected Crash Frequency (Acc/Yr)</u>	<u>Annual Crash Cost (\$)</u>	<u>Annual Installation Cost (\$)</u>	<u>Annual Maintenance Cost (\$)</u>	<u>Annual Repair Cost (\$)</u>
1	0.004444	638.48	0.00	0.00	0.00
2	0.003757	601.28	64.01	0.00	0.11
3	0.003113	538.35	384.07	0.00	0.48

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Feature Cost Report

Page: 3**File Name:** 20 ft 100 vpd.rpd**Project Description:** 20 ft bridge**Alternative:** 1
Description: 20 ft bridge no rail

Feature	Distance From Beginning Of First Segment	Expected Crash Freq (Acc/Year)	Average Severity	Annual Crash Cost (\$)	Category	Type
1.1	0.0	0.002426	5.64	267.00	Foreslopes	2:1, H = 2.0 m (7 ft)
2.1	155.7	0.000422	6.61	89.16	Foreslopes	Vertical, H = 4.0 m (13 ft)
3.1	175.7	0.001596	5.65	282.33	Foreslopes	2:1, H = 2.0 m (7 ft)

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Feature Cost Report

Page: 4**File Name:** 20 ft 100 vpd.rpd**Project Description:** 20 ft bridge**Alternative:** 2**Description:** 20 ft bridge with rail no terms

Feature	Distance From Beginning Of First Segment	Expected Crash Freq (Acc/Year)	Average Severity	Annual Crash Cost (\$)	Category	Type
1.1	0.0	0.001907	5.61	211.58	Foreslopes	2:1, H = 2.0 m (7 ft)
2.1	155.7	0.000071	6.16	78.27	Terminals and Crash Cushions	Blunt End
3.1	155.8	0.000207	2.52	24.35	Longitudinal Barriers	TL-2 Guardrail
4.1	175.8	0.001572	5.61	287.08	Foreslopes	2:1, H = 2.0 m (7 ft)

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Feature Cost Report

Page: 5**File Name:** 20 ft 100 vpd.rpd**Project Description:** 20 ft bridge**Alternative:** 3**Description:** 20 ft bridge with rail with terms

Feature	Distance From Beginning Of First Segment	Expected Crash Freq (Acc/Year)	Average Severity	Annual Crash Cost (\$)	Category	Type
1.1	0.0	0.001401	5.61	239.46	Foreslopes	2:1, H = 2.0 m (7 ft)
2.1	118.5	0.000003	3.76	0.00	Terminals and Crash Cushions	TL-3 Guardrail Terminal
3.1	155.7	0.000230	2.50	29.60	Longitudinal Barriers	TL-2 Guardrail
4.1	175.7	0.000234	3.77	8.75	Terminals and Crash Cushions	TL-3 Guardrail Terminal
5.1	213.2	0.001245	5.62	260.54	Foreslopes	2:1, H = 2.0 m (7 ft)

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Input Data Report

Page: 6

File Name: 20 ft 100 vpd.rpd
Project Description: 20 ft bridge

Alternavtive 1[Baseline(Existing)Condition]

Description 20 ft bridge no rail
Life(years) 25
Total Installation Cost (\$) 0.00
Annual Maintenance Cost (\$) 0.00
Discount Rate 4.00
Area Type Rural
Functional Class Local
Highway Type Two-Way, Undivided
Number of Lanes 2
Lane Width(ft) 10.0
Shoulder Width(ft) 7.0
Speed Limit(mph) 55.0
Nominal Percent Truck(%) 10.0
ADT 200
Traffic Growth Factor(%) 0.0
Encroachment Rate Adjustment Factor 1
Random Seed Number 1111 (User Specified)

<u>Segment</u>	<u>Length(ft)</u>	<u>Median Width(ft)</u>	<u>Percent Grade(%)</u>	<u>Curvature Direction</u>	<u>Curvature Radius(ft)</u>
1	331.4	0.0	0.0	None	

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Input Data Report

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File Name: 20 ft 100 vpd.rpd
Project Description: 20 ft bridge

Alternative **1 [Baseline(Existing) Conditions]**

<u>Feature</u>	<u>Category</u>	<u>Type</u>
1	Foreslopes	2:1, H = 2.0 m (7 ft)
2	Foreslopes	Vertical, H = 4.0 m (13 ft)
3	Foreslopes	2:1, H = 2.0 m (7 ft)

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Input Data Report

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File Name: 20 ft 100 vpd.rpd

Project Description: 20 ft bridge

Alternative **1 [Baseline(Existing) Conditions]**

<u>Feature</u>	<u>Length(ft)</u>	<u>Width(ft)</u>	<u>Flare Rate</u>	<u>Location</u>	<u>Offset(ft)</u>	<u>Distance(ft)</u>	<u>Repetitions</u>	<u>Spacing(ft)</u>
1	155.7	13.0	0.000	Right	7.0	0.0		
2	20.0	0.5	0.000	Right	7.0	155.7		
3	155.7	13.0	0.000	Right	7.0	175.7		

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Input Data Report

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File Name: 20 ft 100 vpd.rpd
Project Description: 20 ft bridge

Alternavtive 2

Description 20 ft bridge with rail no terms
Life(years) 25
Total Installation Cost (\$) 1000.00
Annual Maintenance Cost (\$) 0.00
Discount Rate 4.00
Area Type Rural
Functional Class Local
Highway Type Two-Way, Undivided
Number of Lanes 2
Lane Width(ft) 10.0
Shoulder Width(ft) 7.0
Speed Limit(mph) 55.0
Nominal Percent Truck(%) 10.0
ADT 200
Traffic Growth Factor(%) 0.0
Encroachment Rate Adjustment Factor 1
Random Seed Number 1111 (User Specified)

<u>Segment</u>	<u>Length(ft)</u>	<u>Median Width(ft)</u>	<u>Percent Grade(%)</u>	<u>Curvature Direction</u>	<u>Curvature Radius(ft)</u>
1	331.4	0.0	0.0	None	

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Input Data Report

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File Name: 20 ft 100 vpd.rpd
Project Description: 20 ft bridge

Alternative **2**

<u>Feature</u>	<u>Category</u>	<u>Type</u>
1	Foreslopes	2:1, H = 2.0 m (7 ft)
2	Terminals and Crash Cushions	Blunt End
3	Longitudinal Barriers	TL-2 Guardrail
4	Foreslopes	2:1, H = 2.0 m (7 ft)

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File Name: 20 ft 100 vpd.rpd
Project Description: 20 ft bridge

Alternative **2**

<u>Feature</u>	<u>Length(ft)</u>	<u>Width(ft)</u>	<u>Flare Rate</u>	<u>Location</u>	<u>Offset(ft)</u>	<u>Distance(ft)</u>	<u>Repetitions</u>	<u>Spacing(ft)</u>
1	155.7	13.0	0.000	Right	7.0	0.0		
2	0.1	0.5	0.000	Right	7.0	155.7		
3	20.0	1.0	0.000	Right	7.0	155.8		
4	155.6	13.0	0.000	Right	7.0	175.8		

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Input Data Report

Page: 12

File Name: 20 ft 100 vpd.rpd
Project Description: 20 ft bridge

Alternavtive 3**Description** 20 ft bridge with rail with terms**Life(years)** 25**Total Installation Cost (\$)** 6000.00**Annual Maintenance Cost (\$)** 0.00**Discount Rate** 4.00**Area Type** Rural**Functional Class** Local**Highway Type** Two-Way, Undivided**Number of Lanes** 2**Lane Width(ft)** 10.0**Shoulder Width(ft)** 7.0**Speed Limit(mph)** 55.0**Nominal Percent Truck(%)** 10.0**ADT** 200**Traffic Growth Factor(%)** 0.0**Encroachment Rate Adjustment Factor** 1**Random Seed Number** 1111 (User Specified)

<u>Segment</u>	<u>Length(ft)</u>	<u>Median Width(ft)</u>	<u>Percent Grade(%)</u>	<u>Curvature Direction</u>	<u>Curvature Radius(ft)</u>
1	331.4	0.0	0.0	None	

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Input Data Report

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File Name: 20 ft 100 vpd.rpd
Project Description: 20 ft bridge

Alternative **3**

<u>Feature</u>	<u>Category</u>	<u>Type</u>
1	Foreslopes	2:1, H = 2.0 m (7 ft)
2	Terminals and Crash Cushions	TL-3 Guardrail Terminal
3	Longitudinal Barriers	TL-2 Guardrail
4	Terminals and Crash Cushions	TL-3 Guardrail Terminal
5	Foreslopes	2:1, H = 2.0 m (7 ft)

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Input Data Report

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File Name: 20 ft 100 vpd.rpd
Project Description: 20 ft bridge

Alternative **3**

<u>Feature</u>	<u>Length(ft)</u>	<u>Width(ft)</u>	<u>Flare Rate</u>	<u>Location</u>	<u>Offset(ft)</u>	<u>Distance(ft)</u>	<u>Repetitions</u>	<u>Spacing(ft)</u>
1	118.2	13.0	0.000	Right	7.0	0.0		
2	0.1	0.5	0.100	Right	11.0	118.5		
3	20.0	1.0	0.000	Right	7.0	155.7		
4	37.5	0.5	0.100	Right	7.0	175.7		
5	118.2	13.0	0.000	Right	7.0	213.2		

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Benefit/Cost Ratio Report

Page: 1**File Name:** 50 ft 100 vpd.rpd**Project Description:** 50 ft bridge

<u>Alternative</u>	<u>Description</u>
1	50 ft bridge no rail
2	50 ft bridge with rail no terms
3	50 ft bridge with rail with terms

	<u>Alternative</u>		
<u>Alternative</u>	<u>1</u>	<u>2</u>	<u>3</u>
1	0.00	0.59	0.30
2	0.00	0.00	0.16
3	0.00	0.00	0.00

Date: February 05, 2016**Time:** 09:22:11AM

Alternative Cost Report

Page: 2**File Name:** 50 ft 100 vpd.rpd**Project Description:** 50 ft bridge

<u>Alternative</u>	<u>Description</u>
1	50 ft bridge no rail
2	50 ft bridge with rail no terms
3	50 ft bridge with rail with terms

<u>Alternative</u>	<u>Expected Crash Frequency (Acc/Yr)</u>	<u>Annual Crash Cost (\$)</u>	<u>Annual Installation Cost (\$)</u>	<u>Annual Maintenance Cost (\$)</u>	<u>Annual Repair Cost (\$)</u>
1	0.004822	759.67	0.00	0.00	0.00
2	0.003877	664.81	160.03	0.00	0.17
3	0.003403	614.60	480.09	0.00	0.59

Date: February 05, 2016**Time:** 09:22:11AM

Feature Cost Report

Page: 3**File Name:** 50 ft 100 vpd.rpd**Project Description:** 50 ft bridge**Alternative:** 1
Description: 50 ft bridge no rail

Feature	Distance From Beginning Of First Segment	Expected Crash Freq (Acc/Year)	Average Severity	Annual Crash Cost (\$)	Category	Type
1.1	0.0	0.002426	5.65	304.43	Foreslopes	2:1, H = 2.0 m (7 ft)
2.1	155.7	0.000779	6.61	145.80	Foreslopes	Vertical, H = 4.0 m (13 ft)
3.1	205.7	0.001617	5.64	309.44	Foreslopes	2:1, H = 2.0 m (7 ft)

Date: February 05, 2016**Time:** 09:22:11AM

Feature Cost Report

Page: 4**File Name:** 50 ft 100 vpd.rpd**Project Description:** 50 ft bridge**Alternative:** 2**Description:** 50 ft bridge with rail no terms

Feature	Distance From Beginning Of First Segment	Expected Crash Freq (Acc/Year)	Average Severity	Annual Crash Cost (\$)	Category	Type
1.1	0.0	0.001845	5.62	238.07	Foreslopes	2:1, H = 2.0 m (7 ft)
2.1	155.7	0.000069	6.20	87.17	Terminals and Crash Cushions	Blunt End
3.1	155.8	0.000510	2.65	52.25	Longitudinal Barriers	TL-2 Guardrail
4.1	205.8	0.001453	5.59	287.32	Foreslopes	2:1, H = 2.0 m (7 ft)

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Feature Cost Report

Page: 5**File Name:** 50 ft 100 vpd.rpd**Project Description:** 50 ft bridge**Alternative:** 3**Description:** 50 ft bridge with rail with terms

Feature	Distance From Beginning Of First Segment	Expected Crash Freq (Acc/Year)	Average Severity	Annual Crash Cost (\$)	Category	Type
1.1	0.0	0.001375	5.61	263.62	Foreslopes	2:1, H = 2.0 m (7 ft)
2.1	118.5	0.000003	3.82	0.00	Terminals and Crash Cushions	TL-3 Guardrail Terminal
3.1	155.7	0.000561	2.63	56.59	Longitudinal Barriers	TL-2 Guardrail
4.1	205.7	0.000249	3.78	12.67	Terminals and Crash Cushions	TL-3 Guardrail Terminal
5.1	243.2	0.001215	5.61	281.73	Foreslopes	2:1, H = 2.0 m (7 ft)

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Input Data Report

Page: 6

File Name: 50 ft 100 vpd.rpd
Project Description: 50 ft bridge

Alternavtive 1[Baseline(Existing)Condition]

Description 50 ft bridge no rail
Life(years) 25
Total Installation Cost (\$) 0.00
Annual Maintenance Cost (\$) 0.00
Discount Rate 4.00
Area Type Rural
Functional Class Local
Highway Type Two-Way, Undivided
Number of Lanes 2
Lane Width(ft) 10.0
Shoulder Width(ft) 7.0
Speed Limit(mph) 55.0
Nominal Percent Truck(%) 10.0
ADT 200
Traffic Growth Factor(%) 0.0
Encroachment Rate Adjustment Factor 1
Random Seed Number 1111 (User Specified)

<u>Segment</u>	<u>Length(ft)</u>	<u>Median Width(ft)</u>	<u>Percent Grade(%)</u>	<u>Curvature Direction</u>	<u>Curvature Radius(ft)</u>
1	361.4	0.0	0.0	None	

Date: February 05, 2016

Time: 09:22:11AM

Input Data Report

Page: 7

File Name: 50 ft 100 vpd.rpd
Project Description: 50 ft bridge

Alternative **1 [Baseline(Existing) Conditions]**

<u>Feature</u>	<u>Category</u>	<u>Type</u>
1	Foreslopes	2:1, H = 2.0 m (7 ft)
2	Foreslopes	Vertical, H = 4.0 m (13 ft)
3	Foreslopes	2:1, H = 2.0 m (7 ft)

Date: February 05, 2016**Time:** 09:22:11AM

Input Data Report

Page: 8**File Name:** 50 ft 100 vpd.rpd**Project Description:** 50 ft bridge**Alternative** **1 [Baseline(Existing) Conditions]**

<u>Feature</u>	<u>Length(ft)</u>	<u>Width(ft)</u>	<u>Flare Rate</u>	<u>Location</u>	<u>Offset(ft)</u>	<u>Distance(ft)</u>	<u>Repetitions</u>	<u>Spacing(ft)</u>
1	155.7	13.0	0.000	Right	7.0	0.0		
2	50.0	0.5	0.000	Right	7.0	155.7		
3	155.7	13.0	0.000	Right	7.0	205.7		

Date: February 05, 2016**Time:** 09:22:11AM

Input Data Report

Page: 9

File Name: 50 ft 100 vpd.rpd
Project Description: 50 ft bridge

Alternavtive 2

Description 50 ft bridge with rail no terms
Life(years) 25
Total Installation Cost (\$) 2500.00
Annual Maintenance Cost (\$) 0.00
Discount Rate 4.00
Area Type Rural
Functional Class Local
Highway Type Two-Way, Undivided
Number of Lanes 2
Lane Width(ft) 10.0
Shoulder Width(ft) 7.0
Speed Limit(mph) 55.0
Nominal Percent Truck(%) 10.0
ADT 200
Traffic Growth Factor(%) 0.0
Encroachment Rate Adjustment Factor 1
Random Seed Number 1111 (User Specified)

<u>Segment</u>	<u>Length(ft)</u>	<u>Median Width(ft)</u>	<u>Percent Grade(%)</u>	<u>Curvature Direction</u>	<u>Curvature Radius(ft)</u>
1	361.4	0.0	0.0	None	

Date: February 05, 2016

Time: 09:22:11AM

Input Data Report

Page: 10

File Name: 50 ft 100 vpd.rpd
Project Description: 50 ft bridge

Alternative **2**

<u>Feature</u>	<u>Category</u>	<u>Type</u>
1	Foreslopes	2:1, H = 2.0 m (7 ft)
2	Terminals and Crash Cushions	Blunt End
3	Longitudinal Barriers	TL-2 Guardrail
4	Foreslopes	2:1, H = 2.0 m (7 ft)

Date: February 05, 2016

Time: 09:22:11AM

Input Data Report

Page: 11

File Name: 50 ft 100 vpd.rpd
Project Description: 50 ft bridge

Alternative **2**

<u>Feature</u>	<u>Length(ft)</u>	<u>Width(ft)</u>	<u>Flare Rate</u>	<u>Location</u>	<u>Offset(ft)</u>	<u>Distance(ft)</u>	<u>Repetitions</u>	<u>Spacing(ft)</u>
1	155.7	13.0	0.000	Right	7.0	0.0		
2	0.1	0.5	0.000	Right	7.0	155.7		
3	50.0	1.0	0.000	Right	7.0	155.8		
4	155.6	13.0	0.000	Right	7.0	205.8		

Date: February 05, 2016**Time:** 09:22:11AM

Input Data Report

Page: 12

File Name: 50 ft 100 vpd.rpd
Project Description: 50 ft bridge

Alternavtive 3**Description** 50 ft bridge with rail with terms**Life(years)** 25**Total Installation Cost (\$)** 7500.00**Annual Maintenance Cost (\$)** 0.00**Discount Rate** 4.00**Area Type** Rural**Functional Class** Local**Highway Type** Two-Way, Undivided**Number of Lanes** 2**Lane Width(ft)** 10.0**Shoulder Width(ft)** 7.0**Speed Limit(mph)** 55.0**Nominal Percent Truck(%)** 10.0**ADT** 200**Traffic Growth Factor(%)** 0.0**Encroachment Rate Adjustment Factor** 1**Random Seed Number** 1111 (User Specified)

<u>Segment</u>	<u>Length(ft)</u>	<u>Median Width(ft)</u>	<u>Percent Grade(%)</u>	<u>Curvature Direction</u>	<u>Curvature Radius(ft)</u>
1	361.4	0.0	0.0	None	

Date: February 05, 2016

Time: 09:22:11AM

Input Data Report

Page: 13

File Name: 50 ft 100 vpd.rpd
Project Description: 50 ft bridge

Alternative **3**

<u>Feature</u>	<u>Category</u>	<u>Type</u>
1	Foreslopes	2:1, H = 2.0 m (7 ft)
2	Terminals and Crash Cushions	TL-3 Guardrail Terminal
3	Longitudinal Barriers	TL-2 Guardrail
4	Terminals and Crash Cushions	TL-3 Guardrail Terminal
5	Foreslopes	2:1, H = 2.0 m (7 ft)

Date: February 05, 2016**Time:** 09:22:11AM

Input Data Report

Page: 14**File Name:** 50 ft 100 vpd.rpd**Project Description:** 50 ft bridge**Alternative** **3**

<u>Feature</u>	<u>Length(ft)</u>	<u>Width(ft)</u>	<u>Flare Rate</u>	<u>Location</u>	<u>Offset(ft)</u>	<u>Distance(ft)</u>	<u>Repetitions</u>	<u>Spacing(ft)</u>
1	118.2	13.0	0.000	Right	7.0	0.0		
2	0.1	0.5	0.100	Right	11.0	118.5		
3	50.0	1.0	0.000	Right	7.0	155.7		
4	37.5	0.5	0.100	Right	7.0	205.7		
5	118.2	13.0	0.000	Right	7.0	243.2		

Date: February 05, 2016**Time:** 09:25:38AM

Benefit/Cost Ratio Report

Page: 1**File Name:** 100 ft 100 vpd.rpd**Project Description:** 100 ft bridge

<u>Alternative</u>	<u>Description</u>
1	100 ft bridge no rail
2	100 ft bridge with rail no terms
3	100 ft bridge with rail with terms

	<u>Alternative</u>		
<u>Alternative</u>	<u>1</u>	<u>2</u>	<u>3</u>
1	0.00	0.57	0.41
2	0.00	0.00	0.25
3	0.00	0.00	0.00

Date: February 05, 2016**Time:** 09:25:38AM

Alternative Cost Report

Page: 2**File Name:** 100 ft 100 vpd.rpd**Project Description:** 100 ft bridge

<u>Alternative</u>	<u>Description</u>
1	100 ft bridge no rail
2	100 ft bridge with rail no terms
3	100 ft bridge with rail with terms

<u>Alternative</u>	<u>Expected Crash Frequency (Acc/Yr)</u>	<u>Annual Crash Cost (\$)</u>	<u>Annual Installation Cost (\$)</u>	<u>Annual Maintenance Cost (\$)</u>	<u>Annual Repair Cost (\$)</u>
1	0.005346	1015.48	0.00	0.00	0.00
2	0.004435	832.00	320.06	0.00	0.28
3	0.003929	751.03	640.12	0.00	0.77

Date: February 05, 2016**Time:** 09:25:38AM

Feature Cost Report

Page: 3**File Name:** 100 ft 100 vpd.rpd**Project Description:** 100 ft bridge**Alternative:** 1**Description:** 100 ft bridge no rail

Feature	Distance From Beginning Of First Segment	Expected Crash Freq (Acc/Year)	Average Severity	Annual Crash Cost (\$)	Category	Type
1.1	0.0	0.002426	5.66	368.14	Foreslopes	2:1, H = 2.0 m (7 ft)
2.1	155.7	0.001377	6.60	271.82	Foreslopes	Vertical, H = 4.0 m (13 ft)
3.1	255.7	0.001543	5.63	375.53	Foreslopes	2:1, H = 2.0 m (7 ft)

Date: February 05, 2016**Time:** 09:25:38AM

Feature Cost Report

Page: 4**File Name:** 100 ft 100 vpd.rpd**Project Description:** 100 ft bridge**Alternative:** 2**Description:** 100 ft bridge with rail no terms

Feature	Distance From Beginning Of First Segment	Expected Crash Freq (Acc/Year)	Average Severity	Annual Crash Cost (\$)	Category	Type
1.1	0.0	0.001801	5.63	283.16	Foreslopes	2:1, H = 2.0 m (7 ft)
2.1	155.7	0.000065	6.18	99.84	Terminals and Crash Cushions	Blunt End
3.1	155.8	0.001067	2.74	102.98	Longitudinal Barriers	TL-2 Guardrail
4.1	255.8	0.001502	5.60	346.01	Foreslopes	2:1, H = 2.0 m (7 ft)

Date: February 05, 2016**Time:** 09:25:38AM

Feature Cost Report

Page: 5**File Name:** 100 ft 100 vpd.rpd**Project Description:** 100 ft bridge**Alternative:** 3
Description: 100 ft bridge with rail with terms

Feature	Distance From Beginning Of First Segment	Expected Crash Freq (Acc/Year)	Average Severity	Annual Crash Cost (\$)	Category	Type
1.1	0.0	0.001343	5.62	308.17	Foreslopes	2:1, H = 2.0 m (7 ft)
2.1	118.5	0.000003	3.86	0.00	Terminals and Crash Cushions	TL-3 Guardrail Terminal
3.1	155.7	0.001143	2.74	109.02	Longitudinal Barriers	TL-2 Guardrail
4.1	255.7	0.000260	3.76	16.46	Terminals and Crash Cushions	TL-3 Guardrail Terminal
5.1	293.2	0.001180	5.61	317.38	Foreslopes	2:1, H = 2.0 m (7 ft)

Date: February 05, 2016**Time:** 09:25:38AM

Input Data Report

Page: 6

File Name: 100 ft 100 vpd.rpd
Project Description: 100 ft bridge

Alternavtive 1[Baseline(Existing)Condition]

Description 100 ft bridge no rail
Life(years) 25
Total Installation Cost (\$) 0.00
Annual Maintenance Cost (\$) 0.00
Discount Rate 4.00
Area Type Rural
Functional Class Local
Highway Type Two-Way, Undivided
Number of Lanes 2
Lane Width(ft) 10.0
Shoulder Width(ft) 7.0
Speed Limit(mph) 55.0
Nominal Percent Truck(%) 10.0
ADT 200
Traffic Growth Factor(%) 0.0
Encroachment Rate Adjustment Factor 1
Random Seed Number 1111 (User Specified)

<u>Segment</u>	<u>Length(ft)</u>	<u>Median Width(ft)</u>	<u>Percent Grade(%)</u>	<u>Curvature Direction</u>	<u>Curvature Radius(ft)</u>
1	411.4	0.0	0.0	None	

Date: February 05, 2016

Time: 09:25:38AM

Input Data Report

Page: 7

File Name: 100 ft 100 vpd.rpd
Project Description: 100 ft bridge

Alternative **1 [Baseline(Existing) Conditions]**

<u>Feature</u>	<u>Category</u>	<u>Type</u>
1	Foreslopes	2:1, H = 2.0 m (7 ft)
2	Foreslopes	Vertical, H = 4.0 m (13 ft)
3	Foreslopes	2:1, H = 2.0 m (7 ft)

Date: February 05, 2016**Time:** 09:25:38AM

Input Data Report

Page: 8**File Name:** 100 ft 100 vpd.rpd**Project Description:** 100 ft bridge**Alternative** **1 [Baseline(Existing) Conditions]**

<u>Feature</u>	<u>Length(ft)</u>	<u>Width(ft)</u>	<u>Flare Rate</u>	<u>Location</u>	<u>Offset(ft)</u>	<u>Distance(ft)</u>	<u>Repetitions</u>	<u>Spacing(ft)</u>
1	155.7	13.0	0.000	Right	7.0	0.0		
2	100.0	0.5	0.000	Right	7.0	155.7		
3	155.7	13.0	0.000	Right	7.0	255.7		

Date: February 05, 2016**Time:** 09:25:38AM

Input Data Report

Page: 9

File Name: 100 ft 100 vpd.rpd
Project Description: 100 ft bridge

Alternavtive 2

Description 100 ft bridge with rail no terms
Life(years) 25
Total Installation Cost (\$) 5000.00
Annual Maintenance Cost (\$) 0.00
Discount Rate 4.00
Area Type Rural
Functional Class Local
Highway Type Two-Way, Undivided
Number of Lanes 2
Lane Width(ft) 10.0
Shoulder Width(ft) 7.0
Speed Limit(mph) 55.0
Nominal Percent Truck(%) 10.0
ADT 200
Traffic Growth Factor(%) 0.0
Encroachment Rate Adjustment Factor 1
Random Seed Number 1111 (User Specified)

<u>Segment</u>	<u>Length(ft)</u>	<u>Median Width(ft)</u>	<u>Percent Grade(%)</u>	<u>Curvature Direction</u>	<u>Curvature Radius(ft)</u>
1	411.4	0.0	0.0	None	

Date: February 05, 2016

Time: 09:25:38AM

Input Data Report

Page: 10

File Name: 100 ft 100 vpd.rpd
Project Description: 100 ft bridge

Alternative **2**

<u>Feature</u>	<u>Category</u>	<u>Type</u>
1	Foreslopes	2:1, H = 2.0 m (7 ft)
2	Terminals and Crash Cushions	Blunt End
3	Longitudinal Barriers	TL-2 Guardrail
4	Foreslopes	2:1, H = 2.0 m (7 ft)

Date: February 05, 2016

Time: 09:25:38AM

Input Data Report

Page: 11

File Name: 100 ft 100 vpd.rpd

Project Description: 100 ft bridge

Alternative **2**

<u>Feature</u>	<u>Length(ft)</u>	<u>Width(ft)</u>	<u>Flare Rate</u>	<u>Location</u>	<u>Offset(ft)</u>	<u>Distance(ft)</u>	<u>Repetitions</u>	<u>Spacing(ft)</u>
1	155.7	13.0	0.000	Right	7.0	0.0		
2	0.1	0.5	0.000	Right	7.0	155.7		
3	100.0	1.0	0.000	Right	7.0	155.8		
4	155.6	13.0	0.000	Right	7.0	255.8		

Date: February 05, 2016**Time:** 09:25:38AM

Input Data Report

Page: 12

File Name: 100 ft 100 vpd.rpd
Project Description: 100 ft bridge

Alternavtive 3

Description 100 ft bridge with rail with terms
Life(years) 25
Total Installation Cost (\$) 10000.00
Annual Maintenance Cost (\$) 0.00
Discount Rate 4.00
Area Type Rural
Functional Class Local
Highway Type Two-Way, Undivided
Number of Lanes 2
Lane Width(ft) 10.0
Shoulder Width(ft) 7.0
Speed Limit(mph) 55.0
Nominal Percent Truck(%) 10.0
ADT 200
Traffic Growth Factor(%) 0.0
Encroachment Rate Adjustment Factor 1
Random Seed Number 1111 (User Specified)

<u>Segment</u>	<u>Length(ft)</u>	<u>Median Width(ft)</u>	<u>Percent Grade(%)</u>	<u>Curvature Direction</u>	<u>Curvature Radius(ft)</u>
1	411.4	0.0	0.0	None	

Date: February 05, 2016

Time: 09:25:38AM

Input Data Report

Page: 13

File Name: 100 ft 100 vpd.rpd
Project Description: 100 ft bridge

Alternative **3**

<u>Feature</u>	<u>Category</u>	<u>Type</u>
1	Foreslopes	2:1, H = 2.0 m (7 ft)
2	Terminals and Crash Cushions	TL-3 Guardrail Terminal
3	Longitudinal Barriers	TL-2 Guardrail
4	Terminals and Crash Cushions	TL-3 Guardrail Terminal
5	Foreslopes	2:1, H = 2.0 m (7 ft)

Date: February 05, 2016**Time:** 09:25:38AM

Input Data Report

Page: 14**File Name:** 100 ft 100 vpd.rpd**Project Description:** 100 ft bridge**Alternative** **3**

<u>Feature</u>	<u>Length(ft)</u>	<u>Width(ft)</u>	<u>Flare Rate</u>	<u>Location</u>	<u>Offset(ft)</u>	<u>Distance(ft)</u>	<u>Repetitions</u>	<u>Spacing(ft)</u>
1	118.2	13.0	0.000	Right	7.0	0.0		
2	0.1	0.5	0.100	Right	11.0	118.5		
3	100.0	1.0	0.000	Right	7.0	155.7		
4	37.5	0.5	0.100	Right	7.0	255.7		
5	118.2	13.0	0.000	Right	7.0	293.2		

APPENDIX H
BENEFIT/COST ANALYSES USING
RSAP VERSION 3.01

RSAP PROJECT INFORMATION

BASIC INFORMATION

Today's date (i.e., run date)

2/5/2016

Title

20 ft bridge 100 vpd

Units

USCU

(only USCU units at this time)

Design Life

25

YRS

Construction Year

2014

Rate of Return

4

%

CRASH COSTS

Use GDP values during life?

N

Expand to current year by GDP?

Y

<http://www.gpoaccess.gov/usbudget/fy09/hist.html>

GDP Deflator to construction year

1.07

Crash Cost Timeline

Base year for crash cost data

2012

2014

2026.5

2039

Cost Used

Value of Statistical Life

\$ 9,100,000

\$ 9,295,782

\$ 9,295,782

\$ 9,295,782

\$9,295,782

Reference for VSL

Guidance on Treatment of the Economic Value of a Statistical Life, US Department of Transportation, Washington, D.C., October 4, 2013.

<http://www.dot.gov/office-policy/transportation-policy/guidance-treatment-econo>

RSAP Root Directory:

C:\Program Files\RSAPv3

Notes:

20 ft bridge 100 vpd

TRAFFIC INFORMATION

CONSTRUCTION YEAR ADT:	50	vehicles/day
TRAFFIC GROWTH	0.0	% growth/yr
WHICH ADT TO USE?	Construction	
MID-LIFE ADT:	50	vehicles/day
END OF LIFE ADT:	50	vehicles/day
ADT USED BY RSAP	50	vehicles/day
PERCENT TRUCKS	10	%

VEHICLE MIX

RSAP VEHICLES	FHWA CLASS	PERCENT	RSAP TYPE	TYPICAL CHARACTERISTICS					Crash Cost Adj.	Trajectory Information		
				WEIGHT	LENGTH	WIDTH	C.G. Long.	C.G. Hgt		Trajectory Grid Name	Redirection Grid Name	Encr Multiplier
				lbs	ft	ft	ft	ft				
Motorcycles	1	0	M	600	7.00	1.50	3.00	2.60	0.56	TrajectoryGrid1	RedirectionCars	1
Passenger Cars	2	60	C	3,300	15.00	5.40	6.00	2.00	1	TrajectoryGrid2	RedirectionCars	1
PickupTruck	3	20	PU	5,000	19.75	6.50	8.50	2.30	1	TrajectoryGrid2	RedirectionCars	1
Light Tractor Trailer	8-9	0	LTT	16,000	48.00	8.50	12.00	4.8	3.52	TrajectoryGrid3	RedirectionTrucks	0.3
Average Tractor Trailer	8-13	6	ATT	22,250	48.00	8.50	20.00	4.8	3.52	TrajectoryGrid3	RedirectionTrucks	0.3
Heavy Tractor Trailer	8-13	0	HTT	37,500	48.00	8.50	20.00	6	3.52	TrajectoryGrid3	RedirectionTrucks	0.3
Light Single Unit Truck	5	0	LSUT	6,800	35.00	7.77	12.50	3.4	3.52	TrajectoryGrid4	RedirectionTrucks	0.3
Average Single Unit Truck	6	4	ASUT	12,000	35.00	7.77	12.50	3.4	3.52	TrajectoryGrid4	RedirectionTrucks	0.3
Heavy Single Unit Truck	7	0	HSUT	22,000	35.00	7.77	12.50	4.2	3.52	TrajectoryGrid4	RedirectionTrucks	0.3
Total		90.00										

Click [here](#) for the on-line link to the FHWA classification system.

Mix Multiplier
0
-0.75
-0.25
0
0.6
0
0
0.4
0
0.00

WHOLE ROADWAY CHARACTERISTICS

USER ENROACHMENT ADJUSTMENT:

100	%
50	%
O	
F	
55	mi/hr
1	

PROJECT LIMITS	
Min Sta	0+00. ft
Max Sta	3+31.40 ft
Max Offset	200.00 ft

[illegible]

WHOLE ROADWAY CHARACTERISTICS

USER ENROACHMENT ADJUSTMENT:

100	%
50	%
O	
F	
55	mi/hr
1	

PROJECT LIMITS	
Min Sta	0+00. ft
Max Sta	3+31.40 ft
Max Offset	200.00 ft

[illegible]

WHOLE ROADWAY CHARACTERISTICS

USER ENROACHMENT ADJUSTMENT:

PROJECT LIMITS	
Min Sta	0+00. ft
Max Sta	3+31.40 ft
Max Offset	200.00 ft

111

ALTERNATIVE NAME
CONSTRUCTION COST
SPECIFIC HAZARD TYPE
TL3WbeamGR
TL3WbeamGR
Generic Fixed Obj
Generic Fixed Obj

ROADSIDE FEATURES FOR ALTERNATIVE NUMBER:
3

ALTERNATIVE NAME		20 ft Br guard rail with terms			DEFAULT X-SECTION			All 2:1	
CONSTRUCTION COST		\$8,200			ANNUAL MAINTENANCE COST			\$0	
GENERAL HAZARD TYPE	SPECIFIC HAZARD TYPE	START STATION	START SIDE	START OFFSET	END STATION	END SIDE	END OFFSET	PARAMETER	VALUE
		STATIONS		ft	STATIONS		ft		
TerminalEnds	GenericEnd	1+55.70	R	17	NA	NA	NA		24
Guardrails_SemiRigid	TL3WbeamGR	1+55.70	R	17	1+75.70	R	17	Width (in.)	12
TerminalEnds	GenericEnd	1+75.70	R	17	NA	NA	NA		24
TerminalEnds	GenericEnd	1+55.70	L	5	NA	NA	NA		24
Guardrails_SemiRigid	TL3WbeamGR	1+55.70	L	5	1+75.70	L	5	Width (in.)	12
TerminalEnds	GenericEnd	1+75.70	L	5	NA	NA	NA		24

20 ft bridge 100 vpd

Based on Analysis Run on 2/5/2016 11:39:24 AM

RSAP 3.0.1 (release 140130XL12) running in Excel Version 14.0 on Windows (32-bit) NT 6.01

Settings Summary and Trajectory Score Report

Encroachment Settings			Trajectory Selection Settings				
Primary Right Encroachment: TRUE Primary Left Encroachment: TRUE Opposing Right Encroachment: FALSE Opposing Left Encroachment: FALSE Minimum No. of Trajectories per encroachment location: 10 Maximum No. of Trajectories per encroachment location: 200 Distance between encr. Locations: 5			Default Settings were modified:		FALSE		
			Criterion		Score	Weight	
			Highway Cross-Section		0.70	3.00	
			Horizontal Curve		0.70	2.00	
			Highway Grade		0.70	1.00	
			Speed Limit		0.70	1.00	
Trajectory Score for each Encroachment Grouping							
Score>0.9			→	Considered a good score.			
0.9<Score<0.8			→	Considered an acceptable score.			
0.8<Score<0.7			→	Considered a poor score.			
0.7>Score			→	Considered an unacceptable score.			
Seg.	Alt.	Vehicle Type	Encr. Type	No. of Trajectories	Min. Traj. Score	Avg. Traj. Score	
1	1	C	PR	10	0.39	0.50	
1	1	PU	PR	10	0.39	0.50	
1	1	ATT	PR	10	0.28	0.38	
1	1	ASUT	PR	10	0.28	0.39	
1	2	C	PR	10	0.39	0.50	
1	2	PU	PR	10	0.39	0.50	
1	2	ATT	PR	10	0.28	0.38	
1	2	ASUT	PR	10	0.28	0.39	
1	3	C	PR	10	0.39	0.50	
1	3	PU	PR	10	0.39	0.50	
1	3	ATT	PR	10	0.28	0.38	
1	3	ASUT	PR	10	0.28	0.39	
1	1	C	PL	10	0.39	0.49	
1	1	PU	PL	10	0.39	0.49	
1	1	ATT	PL	10	0.28	0.38	
1	1	ASUT	PL	10	0.28	0.39	
1	2	C	PL	10	0.39	0.49	
1	2	PU	PL	10	0.39	0.49	

20 ft bridge 100 vpd

Based on Analysis Run on 2/5/2016 11:39:24 AM

RSAP 3.0.1 (release 140130XL12) running in Excel Version 14.0 on Windows (32-bit) NT 6.01

Settings Summary and Trajectory Score Report

Encroachment Settings		Trajectory Selection Settings					
Primary Right Encroachment: TRUE Primary Left Encroachment: TRUE Opposing Right Encroachment: FALSE Opposing Left Encroachment: FALSE Minimum No. of Trajectories per encroachment location: 10 Maximum No. of Trajectories per encroachment location: 200 Distance between encr. Locations: 5		Default Settings were modified:		FALSE			
		Criterion		Score	Weight		
		Highway Cross-Section		0.70	3.00		
		Horizontal Curve		0.70	2.00		
		Highway Grade		0.70	1.00		
		Speed Limit		0.70	1.00		
Trajectory Score for each Encroachment Grouping							
Score>0.9		→	Considered a good score.				
0.9<Score<0.8		→	Considered an acceptable score.				
0.8<Score<0.7		→	Considered a poor score.				
0.7>Score		→	Considered an unacceptable score.				
Seg.	Alt.	Vehicle Type	Encr. Type	No. of Trajectories	Min. Traj. Score	Avg. Traj. Score	
1	2	ATT	PL	10	0.28	0.38	
1	2	ASUT	PL	10	0.28	0.39	
1	3	C	PL	10	0.39	0.49	
1	3	PU	PL	10	0.39	0.49	
1	3	ATT	PL	10	0.28	0.38	
1	3	ASUT	PL	10	0.28	0.39	

DETAILED COLLISION AND COST SUMMARY
20 ft bridge 100 vpd

Segment	FEATURE		EXPECTED ANNUAL CRASHES				ANNUAL COST OF CRASHES	
	Feature Number	Feature Type	Encroachment and Vehicle Type	Total Feature Crashes	Penetrated or Vaulted	Rolled Over after Redirection	Annual Feature Crash Cost	Feature Maintenance Cost

SEGMENT AND ALTERNATIVE COST SUMMARY
20 ft bridge 100 vpd

						Rate of Return		4	%	
						Design Life		25	yrs	
ANNUAL SEGMENT SUMMARY						A/P		0.0640		
Segment	Crashes	Crash Costs	Maintenance Cost	Repair Costs	Crash Rate (crashes/MVMT)	Alternative	Annualized Construction Cost	Expected Annual Maintenance Cost	Expected Annual Repair Cost	Expected Annual Crash Cost
						1	\$ 0	\$ 0		
						2	\$ 205	\$ 0		
						3	\$ 525	\$ 0		

EQUIVALENT ANNUAL INCREMENTAL BENEFIT-COST

20 ft bridge 100 vpd

		Decision Point Benefit-Cost Ratio:			
		Alternative Choice			
		1	2	3	
		20 ft Br no rail	20 ft br guard rail only	20 ft Br guard rail with terms	
With Respect to Alternative	Alternative No.	ALTERNATIVE NAMES			
	1	20 ft Br no rail	1.00	0.55	0.18
	2	20 ft br guard rail only		0.00	0.00
	3	20 ft Br guard rail with terms		0.00	

Best Benefit-Cost Choice is:

RSAP PROJECT INFORMATION

BASIC INFORMATION

Today's date (i.e., run date)

2/5/2016

Title

50 ft bridge100 vpd

Units

USCU

(only USCU units at this time)

Design Life

25

YRS

Construction Year

2014

Rate of Return

4

%

CRASH COSTS

Use GDP values during life?

N

Expand to current year by GDP?

Y

<http://www.gpoaccess.gov/usbudget/fy09/hist.html>

GDP Deflator to construction year

1.07

Crash Cost Timeline

Base year for crash cost data

2012

2014

2026.5

2039

Cost Used

Value of Statistical Life

\$ 9,100,000

\$ 9,295,782

\$ 9,295,782

\$ 9,295,782

\$9,295,782

Reference for VSL

Guidance on Treatment of the Economic Value of a Statistical Life, US Department of Transportation, Washington, D.C., October 4, 2013.

<http://www.dot.gov/office-policy/transportation-policy/guidance-treatment-econo>

RSAP Root Directory:

C:\Program Files\RSAPv3

Notes:

50 ft bridge100 vpd

TRAFFIC INFORMATION

CONSTRUCTION YEAR ADT:

100 vehicles/day

TRAFFIC GROWTH

0.0 % growth/yr

WHICH ADT TO USE?

Construction

MID-LIFE ADT:

100 vehicles/day

END OF LIFE ADT:

100 vehicles/day

ADT USED BY RSAP

100 vehicles/day

PERCENT TRUCKS

10 %

VEHICLE MIX

RSAP VEHICLES	FHWA CLASS	PERCENT	RSAP TYPE	TYPICAL CHARACTERISTICS					Crash Cost Adj.	Trajectory Information		
				WEIGHT	LENGTH	WIDTH	C.G. Long.	C.G. Hgt		Trajectory Grid Name	Redirection Grid Name	Encr Multiplier
				lbs	ft	ft	ft	ft				
Motorcycles	1	0	M	600	7.00	1.50	3.00	2.60	0.56	TrajectoryGrid1	RedirectionCars	1
Passenger Cars	2	60	C	3,300	15.00	5.40	6.00	2.00	1	TrajectoryGrid2	RedirectionCars	1
PickupTruck	3	20	PU	5,000	19.75	6.50	8.50	2.30	1	TrajectoryGrid2	RedirectionCars	1
Light Tractor Trailer	8-9	0	LTT	16,000	48.00	8.50	12.00	4.8	3.52	TrajectoryGrid3	RedirectionTrucks	0.3
Average Tractor Trailer	8-13	6	ATT	22,250	48.00	8.50	20.00	4.8	3.52	TrajectoryGrid3	RedirectionTrucks	0.3
Heavy Tractor Trailer	8-13	0	HTT	37,500	48.00	8.50	20.00	6	3.52	TrajectoryGrid3	RedirectionTrucks	0.3
Light Single Unit Truck	5	0	LSUT	6,800	35.00	7.77	12.50	3.4	3.52	TrajectoryGrid4	RedirectionTrucks	0.3
Average Single Unit Truck	6	4	ASUT	12,000	35.00	7.77	12.50	3.4	3.52	TrajectoryGrid4	RedirectionTrucks	0.3
Heavy Single Unit Truck	7	0	HSUT	22,000	35.00	7.77	12.50	4.2	3.52	TrajectoryGrid4	RedirectionTrucks	0.3
Total		90.00										

Click [here](#) for the on-line link to the FHWA classification system.

Mix Multiplier
0
-0.75
-0.25
0
0.6
0
0
0.4
0
0.00

WHOLE ROADWAY CHARACTERISTICS

USER ENROACHMENT ADJUSTMENT:

PROJECT LIMITS	
Min Sta	0+00. ft
Max Sta	3+61.40 ft
Max Offset	200.00 ft

123

WHOLE ROADWAY CHARACTERISTICS

100%

50%

0

F

55 mi/hr

1

PROJECT LIMITS	
Min Sta	0+00. ft
Max Sta	3+61.40 ft
Max Offset	200.00 ft

[illegible]

WHOLE ROADWAY CHARACTERISTICS

100%

50 %

0

F

55 mi/hr

1

[illegible]

ROADSIDE FEATURES FOR ALTERNATIVE NUMBER:
3

ALTERNATIVE NAME		50 ft Br guard rail with terms					DEFAULT X-SECTION		All 2:1
CONSTRUCTION COST		\$15,000			ANNUAL MAINTENANCE COST			\$0	
GENERAL HAZARD TYPE	SPECIFIC HAZARD TYPE	START STATION	START SIDE	START OFFSET	END STATION	END SIDE	END OFFSET	PARAMETER	VALUE
		STATIONS		ft	STATIONS		ft		
TerminalEnds	GenericEnd	1+55.70	R	17	NA	NA	NA		24
Guardrails_SemiRigid	TL3WbeamGR	1+55.70	R	17	2+05.70	R	17	Width (in.)	12
TerminalEnds	GenericEnd	2+05.70	R	17	NA	NA	NA		24
TerminalEnds	GenericEnd	1+55.70	L	5	NA	NA	NA		24
Guardrails_SemiRigid	TL3WbeamGR	1+55.70	L	5	2+05.70	L	5	Width (in.)	12
TerminalEnds	GenericEnd	2+05.70	L	5	NA	NA	NA		24

50 ft bridge100 vpd

Based on Analysis Run on 2/5/2016 11:39:24 AM

RSAP 3.0.1 (release 140130XL12) running in Excel Version 14.0 on Windows (32-bit) NT 6.01

Settings Summary and Trajectory Score Report

Encroachment Settings			Trajectory Selection Settings				
Primary Right Encroachment: TRUE Primary Left Encroachment: TRUE Opposing Right Encroachment: FALSE Opposing Left Encroachment: FALSE Minimum No. of Trajectories per encroachment location: 10 Maximum No. of Trajectories per encroachment location: 200 Distance between encr. Locations: 5			Default Settings were modified:		FALSE		
			Criterion		Score	Weight	
			Highway Cross-Section		0.70	3.00	
			Horizontal Curve		0.70	2.00	
			Highway Grade		0.70	1.00	
			Speed Limit		0.70	1.00	
Trajectory Score for each Encroachment Grouping							
Score>0.9			→	Considered a good score.			
0.9<Score<0.8			→	Considered an acceptable score.			
0.8<Score<0.7			→	Considered a poor score.			
0.7>Score			→	Considered an unacceptable score.			
Seg.	Alt.	Vehicle Type	Encr. Type	No. of Trajectories	Min. Traj. Score	Avg. Traj. Score	
1	1	C	PR	10	0.39	0.50	
1	1	PU	PR	10	0.39	0.50	
1	1	ATT	PR	10	0.28	0.38	
1	1	ASUT	PR	10	0.28	0.39	
1	2	C	PR	10	0.39	0.50	
1	2	PU	PR	10	0.39	0.50	
1	2	ATT	PR	10	0.28	0.38	
1	2	ASUT	PR	10	0.28	0.39	
1	3	C	PR	10	0.39	0.50	
1	3	PU	PR	10	0.39	0.50	
1	3	ATT	PR	10	0.28	0.38	
1	3	ASUT	PR	10	0.28	0.39	
1	1	C	PL	10	0.39	0.49	
1	1	PU	PL	10	0.39	0.49	
1	1	ATT	PL	10	0.28	0.38	
1	1	ASUT	PL	10	0.28	0.39	
1	2	C	PL	10	0.39	0.49	
1	2	PU	PL	10	0.39	0.49	

50 ft bridge100 vpd

Based on Analysis Run on 2/5/2016 11:39:24 AM

RSAP 3.0.1 (release 140130XL12) running in Excel Version 14.0 on Windows (32-bit) NT 6.01

Settings Summary and Trajectory Score Report

Encroachment Settings			Trajectory Selection Settings				
Primary Right Encroachment: TRUE Primary Left Encroachment: TRUE Opposing Right Encroachment: FALSE Opposing Left Encroachment: FALSE Minimum No. of Trajectories per encroachment location: 10 Maximum No. of Trajectories per encroachment location: 200 Distance between encr. Locations: 5			Default Settings were modified: FALSE				
			Criterion		Score	Weight	
			Highway Cross-Section		0.70	3.00	
			Horizontal Curve		0.70	2.00	
			Highway Grade		0.70	1.00	
			Speed Limit		0.70	1.00	
Trajectory Score for each Encroachment Grouping							
Score>0.9			→	Considered a good score.			
0.9<Score<0.8			→	Considered an acceptable score.			
0.8<Score<0.7			→	Considered a poor score.			
0.7>Score			→	Considered an unacceptable score.			
Seg.	Alt.	Vehicle Type	Encr. Type	No. of Trajectories	Min. Traj. Score	Avg. Traj. Score	
1	2	ATT	PL	10	0.28	0.38	
1	2	ASUT	PL	10	0.28	0.39	
1	3	C	PL	10	0.39	0.49	
1	3	PU	PL	10	0.39	0.49	
1	3	ATT	PL	10	0.28	0.38	
1	3	ASUT	PL	10	0.28	0.39	

DETAILED COLLISION AND COST SUMMARY

50 ft bridge100 vpd

Based on Analysis Run on 2/5/2016 11:42:50 AM

RSAP 3.0.1 (release 140130XL12) running in Excel Version 14.0 on Windows (32-bit) NT 6.01

Analysis Time = 97.01563 sec.

FEATURE			EXPECTED ANNUAL CRASHES				ANNUAL COST OF CRAS	
Segment	Feature Number	Feature Type	Encroachment and Vehicle Type	Total Feature Crashes	Penetrated or Vaulted	Rolled Over after Redirection	Annual Feature Crash Cost	Feature Maintenance Cost

ALTERNATIVE 1

SEGMENT AND ALTERNATIVE COST SUMMARY

50 ft bridge100 vpd

Based on Analysis Run on 2/5/2016 11:42:50 AM

RSAP 3.0.1 (release 140130XL12) running in Excel Version 14.0 on Windows (32-bit) NT 6.01

							Rate of Return	4	%		
							Design Life	25	yrs		
ANNUAL SEGMENT SUMMARY							A/P	0.0640			
Segment	Crashes	Crash Costs	Maintenance Cost	Repair Costs	Crash Rate (crashes/MVMT)	Alternative	Annualized Construction Cost	Expected Annual Maintenance Cost	Expected Annual Repair Cost	Expected Annual Crash Cost	
Alternative # 1							1	\$ 0	\$ 0	\$ 0	\$ 221
1	0.00	\$ 221		\$ 0	0	2	\$ 320	\$ 0	\$	\$ 46	
Alternative # 2							3	\$ 960	\$ 0	\$	\$ 46
1	0.00	\$ 46		\$	0						
Alternative # 3											
1	0.00	\$ 46		\$	0						

EQUIVALENT ANNUAL INCREMENTAL BENEFIT-COST

50 ft bridge100 vpd

Based on Analysis Run on 2/5/2016 11:42:50 AM

RSAP 3.0.1 (release 140130XL12) running in Excel Version 14.0 on Windows (32-bit) NT 6.01

		Decision Point Benefit-Cost Ratio:			
		Alternative Choice			
		1	2	3	
With Respect to Alternative	Alternative No.	50 ft Br no rail	50 ft br guard rail only	50 ft Br guard rail with terms	
	ALTERNATIVE NAMES				
	1	50 ft Br no rail	1.00	0.55	0.18
	2	50 ft br guard rail only		0.00	0.00
	3	50 ft Br guard rail with terms		0.00	

Best Benefit-Cost Choice is:

50 ft Br no rail

RSAP PROJECT INFORMATION

BASIC INFORMATION

Today's date (i.e., run date)

2/5/2016

Title

100 ft bridge 100 vpd

Units

USCU

(only USCU units at this time)

Design Life

25

YRS

Construction Year

2014

Rate of Return

4

%

CRASH COSTS

Use GDP values during life?

N

Expand to current year by GDP?

Y

<http://www.gpoaccess.gov/usbudget/fy09/hist.html>

GDP Deflator to construction year

1.07

Crash Cost Timeline

Base year for crash cost data

2012

2014

2026.5

2039

Cost Used

Value of Statistical Life

\$ 9,100,000

\$ 9,295,782

\$ 9,295,782

\$ 9,295,782

\$9,295,782

Reference for VSL

Guidance on Treatment of the Economic Value of a Statistical Life, US Department of Transportation, Washington, D.C., October 4, 2013.

<http://www.dot.gov/office-policy/transportation-policy/guidance-treatment-econo>

RSAP Root Directory:

C:\Program Files\RSAPv3

Notes:

100 ft bridge 100 vpd

TRAFFIC INFORMATION

CONSTRUCTION YEAR ADT:

100 vehicles/day

TRAFFIC GROWTH

0.0 % growth/yr

WHICH ADT TO USE?

Construction

MID-LIFE ADT:

100 vehicles/day

END OF LIFE ADT:

100 vehicles/day

ADT USED BY RSAP

100 vehicles/day

PERCENT TRUCKS

10 %

VEHICLE MIX

RSAP VEHICLES	FHWA CLASS	PERCENT	RSAP TYPE	TYPICAL CHARACTERISTICS					Crash Cost Adj.	Trajectory Information		
				WEIGHT	LENGTH	WIDTH	C.G. Long.	C.G. Hgt		Trajectory Grid Name	Redirection Grid Name	Encr Multiplier
				lbs	ft	ft	ft	ft				
Motorcycles	1	0	M	600	7.00	1.50	3.00	2.60	0.56	TrajectoryGrid1	RedirectionCars	1
Passenger Cars	2	60	C	3,300	15.00	5.40	6.00	2.00	1	TrajectoryGrid2	RedirectionCars	1
PickupTruck	3	20	PU	5,000	19.75	6.50	8.50	2.30	1	TrajectoryGrid2	RedirectionCars	1
Light Tractor Trailer	8-9	0	LTT	16,000	48.00	8.50	12.00	4.8	3.52	TrajectoryGrid3	RedirectionTrucks	0.3
Average Tractor Trailer	8-13	6	ATT	22,250	48.00	8.50	20.00	4.8	3.52	TrajectoryGrid3	RedirectionTrucks	0.3
Heavy Tractor Trailer	8-13	0	HTT	37,500	48.00	8.50	20.00	6	3.52	TrajectoryGrid3	RedirectionTrucks	0.3
Light Single Unit Truck	5	0	LSUT	6,800	35.00	7.77	12.50	3.4	3.52	TrajectoryGrid4	RedirectionTrucks	0.3
Average Single Unit Truck	6	4	ASUT	12,000	35.00	7.77	12.50	3.4	3.52	TrajectoryGrid4	RedirectionTrucks	0.3
Heavy Single Unit Truck	7	0	HSUT	22,000	35.00	7.77	12.50	4.2	3.52	TrajectoryGrid4	RedirectionTrucks	0.3
Total		90.00										

Click [here](#) for the on-line link to the FHWA classification system.

Mix Multiplier
0
-0.75
-0.25
0
0.6
0
0
0.4
0
0.00

WHOLE ROADWAY CHARACTERISTICS

USER ENROACHMENT ADJUSTMENT:

PROJECT LIMITS	
Min Sta	0+00. ft
Max Sta	4+11.40 ft
Max Offset	200.00 ft

WHOLE ROADWAY CHARACTERISTICS

100%

50%

0

F

55 mi/hr

1

PROJECT LIMITS	
Min Sta	0+00. ft
Max Sta	4+11.40 ft
Max Offset	200.00 ft

ROAD CHARACTERISTICS TABLE

WHOLE ROADWAY CHARACTERISTICS

100%

50%

0

F

55 mi/hr

1

[illegible]

ROADSIDE FEATURES FOR ALTERNATIVE NUMBER:
3

ALTERNATIVE NAME		100 ft Br guard rail with terms					DEFAULT X-SECTION		All 2:1
CONSTRUCTION COST		\$20,000			ANNUAL MAINTENANCE COST			\$0	
GENERAL HAZARD TYPE	SPECIFIC HAZARD TYPE	START STATION	START SIDE	START OFFSET	END STATION	END SIDE	END OFFSET	PARAMETER	VALUE
		STATIONS		ft	STATIONS		ft		
TerminalEnds	GenericEnd	1+55.70	R	17	NA	NA	NA		24
Guardrails_SemiRigid	TL3WbeamGR	1+55.70	R	17	2+55.70	R	17	Width (in.)	12
TerminalEnds	GenericEnd	2+55.70	R	17	NA	NA	NA		24
TerminalEnds	GenericEnd	1+55.70	L	5	NA	NA	NA		24
Guardrails_SemiRigid	TL3WbeamGR	1+55.70	L	5	2+55.70	L	5	Width (in.)	12
TerminalEnds	GenericEnd	2+55.70	L	5	NA	NA	NA		24

100 ft bridge 100 vpd

Based on Analysis Run on 2/5/2016 12:06:03 PM

RSAP 3.0.1 (release 140130XL12) running in Excel Version 14.0 on Windows (32-bit) NT 6.01

Settings Summary and Trajectory Score Report

Encroachment Settings				Trajectory Selection Settings		
Primary Right Encroachment: TRUE Primary Left Encroachment: TRUE Opposing Right Encroachment: FALSE Opposing Left Encroachment: FALSE Minimum No. of Trajectories per encroachment location: 10 Maximum No. of Trajectories per encroachment location: 200 Distance between encr. Locations: 5				Default Settings were modified: FALSE		
				Criterion	Score	Weight
				Highway Cross-Section	0.70	3.00
				Horizontal Curve	0.70	2.00
				Highway Grade	0.70	1.00
				Speed Limit	0.70	1.00
Trajectory Score for each Encroachment Grouping						
Score>0.9 → Considered a good score. 0.9<Score<0.8 → Considered an acceptable score. 0.8<Score<0.7 → Considered a poor score. 0.7>Score → Considered an unacceptable score.						
Seg.	Alt.	Vehicle Type	Encr. Type	No. of Trajectories	Min. Traj. Score	Avg. Traj. Score
1	1	C	PR	10	0.39	0.50
1	1	PU	PR	10	0.39	0.50
1	1	ATT	PR	10	0.28	0.38
1	1	ASUT	PR	10	0.28	0.39
1	2	C	PR	10	0.39	0.50
1	2	PU	PR	10	0.39	0.50
1	2	ATT	PR	10	0.28	0.38
1	2	ASUT	PR	10	0.28	0.39
1	3	C	PR	10	0.39	0.50
1	3	PU	PR	10	0.39	0.50
1	3	ATT	PR	10	0.28	0.38
1	3	ASUT	PR	10	0.28	0.39
1	1	C	PL	10	0.39	0.49
1	1	PU	PL	10	0.39	0.49
1	1	ATT	PL	10	0.28	0.38
1	1	ASUT	PL	10	0.28	0.39
1	2	C	PL	10	0.39	0.49
1	2	PU	PL	10	0.39	0.49

100 ft bridge 100 vpd

Based on Analysis Run on 2/5/2016 12:06:03 PM

RSAP 3.0.1 (release 140130XL12) running in Excel Version 14.0 on Windows (32-bit) NT 6.01

Settings Summary and Trajectory Score Report

Encroachment Settings			Trajectory Selection Settings				
Primary Right Encroachment: TRUE Primary Left Encroachment: TRUE Opposing Right Encroachment: FALSE Opposing Left Encroachment: FALSE Minimum No. of Trajectories per encroachment location: 10 Maximum No. of Trajectories per encroachment location: 200 Distance between encr. Locations: 5			Default Settings were modified:		FALSE		
			Criterion		Score	Weight	
			Highway Cross-Section		0.70	3.00	
			Horizontal Curve		0.70	2.00	
			Highway Grade		0.70	1.00	
			Speed Limit		0.70	1.00	
Trajectory Score for each Encroachment Grouping							
Score>0.9		→	Considered a good score.				
0.9<Score<0.8		→	Considered an acceptable score.				
0.8<Score<0.7		→	Considered a poor score.				
0.7>Score		→	Considered an unacceptable score.				
Seg.	Alt.	Vehicle Type	Encr. Type	No. of Trajectories	Min. Traj. Score	Avg. Traj. Score	
1	2	ATT	PL	10	0.28	0.38	
1	2	ASUT	PL	10	0.28	0.39	
1	3	C	PL	10	0.39	0.49	
1	3	PU	PL	10	0.39	0.49	
1	3	ATT	PL	10	0.28	0.38	
1	3	ASUT	PL	10	0.28	0.39	

DETAILED COLLISION AND COST SUMMARY

100 ft bridge 100 vpd

Based on Analysis Run on 2/5/2016 12:07:19 PM

RSAP 3.0.1 (release 140130XL12) running in Excel Version 14.0 on Windows (32-bit) NT 6.01

Analysis Time = 174.8945 sec.

FEATURE			EXPECTED ANNUAL CRASHES				ANNUAL COST OF CRAS	
Segment	Feature Number	Feature Type	Encroachment and Vehicle Type	Total Feature Crashes	Penetrated or Vaulted	Rolled Over after Redirection	Annual Feature Crash Cost	Feature Maintenance Cost

ALTERNATIVE 1

SEGMENT AND ALTERNATIVE COST SUMMARY

100 ft bridge 100 vpd

Based on Analysis Run on 2/5/2016 12:07:19 PM

RSAP 3.0.1 (release 140130XL12) running in Excel Version 14.0 on Windows (32-bit) NT 6.01

							Rate of Return	4	%		
							Design Life	25	yrs		
ANNUAL SEGMENT SUMMARY							A/P	0.0640			
Segment	Crashes	Crash Costs	Maintenance Cost	Repair Costs	Crash Rate (crashes/MVMT)	Alternative	Annualized Construction Cost	Expected Annual Maintenance Cost	Expected Annual Repair Cost	Expected Annual Crash Cost	
Alternative # 1							1	\$ 0	\$ 0	\$ 0	\$ 427
1	0.00	\$ 427		\$ 0	0	2	\$ 640	\$ 0	\$ 1	\$ 54	
Alternative # 2							3	\$ 1,280	\$ 0	\$	\$ 54
1	0.00	\$ 54		\$ 1	0						
Alternative # 3											
1	0.00	\$ 54		\$	0						

EQUIVALENT ANNUAL INCREMENTAL BENEFIT-COST

100 ft bridge 100 vpd

Based on Analysis Run on 2/5/2016 12:07:19 PM

RSAP 3.0.1 (release 140130XL12) running in Excel Version 14.0 on Windows (32-bit) NT 6.01

		Decision Point Benefit-Cost Ratio:					1
		Alternative Choice					
		1	2	3			
With Respect to Alternative	Alternative No.	100 ft Br no rail	100 ft br guard rail only	100 ft Br guard rail with terms			
	ALTERNATIVE NAMES						
	1	100 ft Br no rail	1.00	0.58	0.29		
	2	100 ft br guard rail only		0.00	0.00		
	3	100 ft Br guard rail with terms			0.00		

Best Benefit-Cost Choice is:

100 ft Br no rail

