
To:	Steve Gramm, PE	From:	Tom Creasey, PE, PhD
	South Dakota DOT		Stantec
File:	193804017/Analysis/Crash Analysis	Date:	December 7, 2017

Reference: MEADE_IM 0901(195)32N_IM 0901(198)32N_I-90 Exit 32-40, Crash Analysis

CRASH HISTORY

Historical crash data were collected along the study area for the five-year period between 2012 and 2016 and constitute the "Analysis Period" for this report.

CRASH SEVERITY

Over the analysis period, there were 423 crashes in the study area. Of these, two resulted in fatalities, 21 resulted in incapacitating injuries, and 46 resulted in non-incapacitating injuries. **Figure 1** and **Figure 2** summarize the distribution of crashes by severity. It should be noted that 131 crashes were designated as 'wild animal hit' crashes. Although this is not typically a crash severity category, it was included to highlight crashes that most likely cannot be avoided with safety improvements to the roadway.

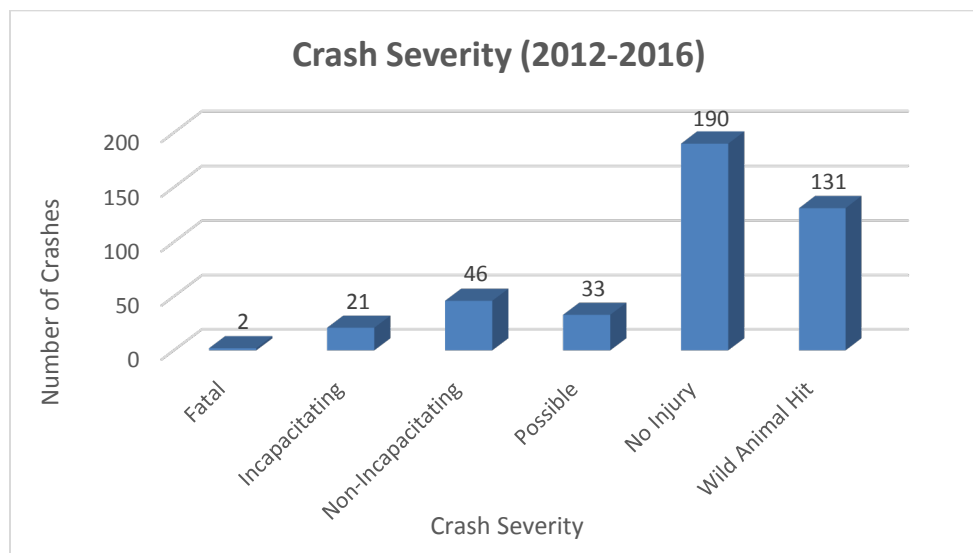


Figure 1: Distribution of Crashes by Severity

Reference: MEADE_IM 0901(195)32N_IM 0901(198)32N_I-90 Exit 32-40 Crash Analysis

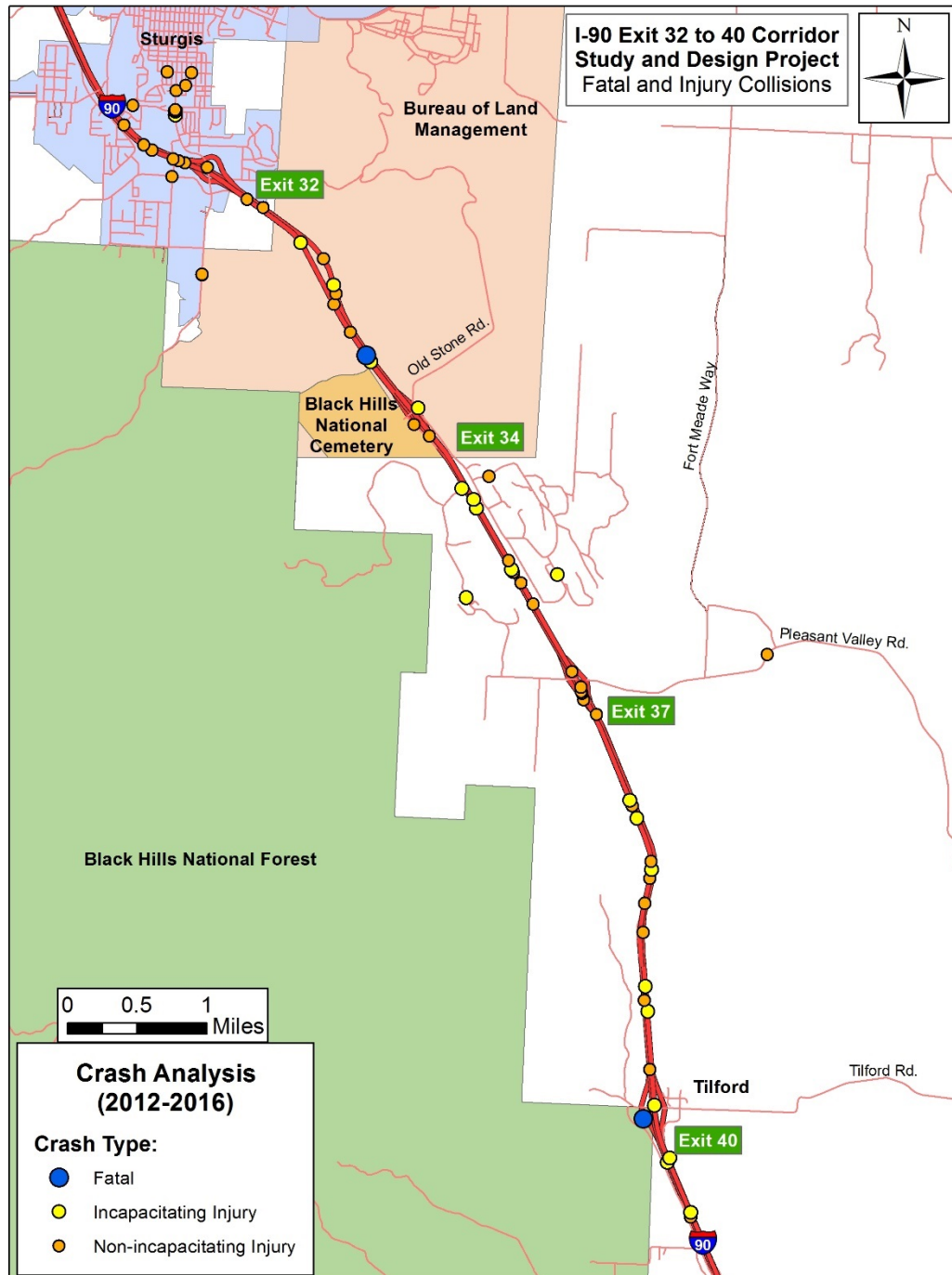


Figure 2: Distribution of Fatal and Injury Collisions

Reference: MEADE_IM 0901(195)32N_IM 0901(198)32N_I-90 Exit 32-40 Crash Analysis

CRASH TYPE

To better understand the crash history along this corridor, the crash types were examined based on the 'Manner of Collision' field in the crash reports. **Figure 3** shows the distribution of crashes by crash type. Single vehicle crashes were the most common crash type (281 crashes, 66%) and are predominately run-off the road incidents. Animal collisions were the second most commonly reported crash type, however many of these collisions were coded as single vehicle collisions.

To further refine the crash history by crash type, the field 'Events' in the crash reports was examined. This field allowed the respondent to choose one or more crash events such as 'ran off road right' and 'overturn/rollover.' Of the 423 crashes, 167 (39%) were coded as run-off the road collisions. **Figure 4** summarizes the run-off the road collisions by location. There is a cluster of collisions at the horizontal curve (MP 38.0-38.7) between Exit 37 and Exit 40. Of the 34 total collisions at this curve, 15 were run-off the road (ROR) incidents with 19 occurring during wet weather conditions (of the 15 ROR collisions, 12 occurred during wet weather conditions). Three of the collisions were coded as 'Ran off left' and 12 were coded as 'Ran off road right.'

The second most common crash event was animal collisions, with 155 (37%) over the five-year analysis period. **Figure 5** summarizes the animal collisions by location. There is a cluster of animal collisions around Exit 37, with 44 crashes between milepoints 36 and 38. Thirty-one of these collisions occurred during low light conditions in an area where the roadway is not lighted.

In general, crashes were evenly distributed along the study portion of I-90. However, there are several 0.3-mile "hot-spots" with a high concentration of crashes. **Table 1** presents a hot-spot crash analysis of the study portion of I-90. Of the 423 crashes in the study area over the five-year period, 333 occurred on the 9.5-mile stretch of I-90, equating to an average of 10.5 crashes per 0.3-mile stretch. The spot with the highest number of crashes was located between Exit 32 and Exit 34 (MP 33.0-33.3), with 43 crashes. The spot with the next highest number of crashes was located between Exit 34 and Exit 37 (MP 36.0-36.3) with 34 crashes.

SEGMENT ANALYSIS

A segment crash analysis was conducted on the study portion of I-90, as shown in **Table 2**. For each segment, the number of crashes, segment length, and five-year average ADT were evaluated to determine the crash rate. This crash rate was compared to the South Dakota statewide average based on similar roadways in the state. Segment 5, east of Exit 40, was the only segment with an actual crash rate higher than the statewide average. However, the segment length for the end sections was arbitrary and based on locations of reported crashes within the functional area of interchanges at Exits 32 and 40. The computed crash rates for Segments 1 and 5 shown in Table 2 are for informational purposes only and are not indicative of crash rates for those entire sections.

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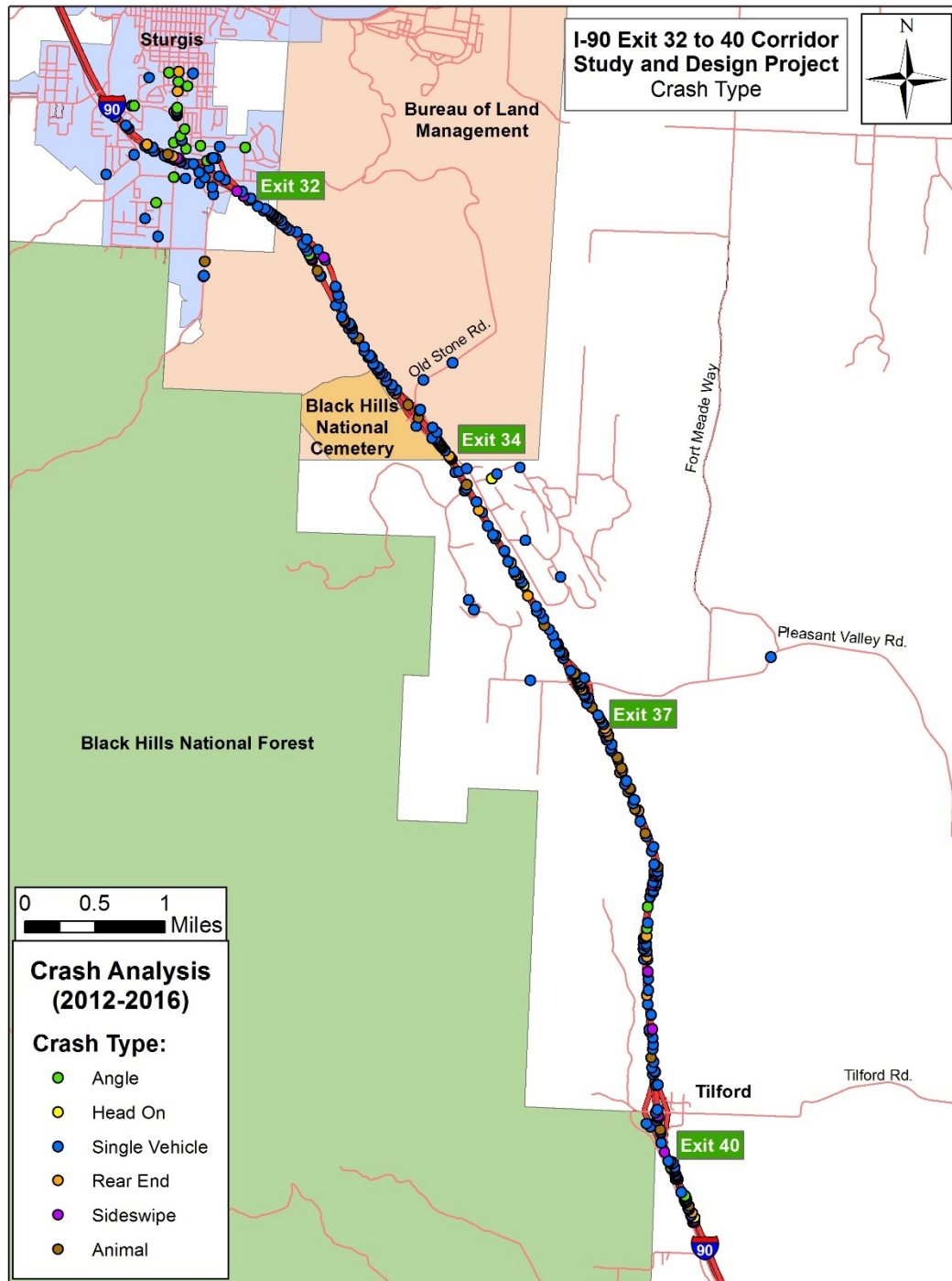


Figure 3: Distribution of Crash Type by Location

Reference: MEADE_IM 0901(195)32N_IM 0901(198)32N_I-90 Exit 32-40 Crash Analysis

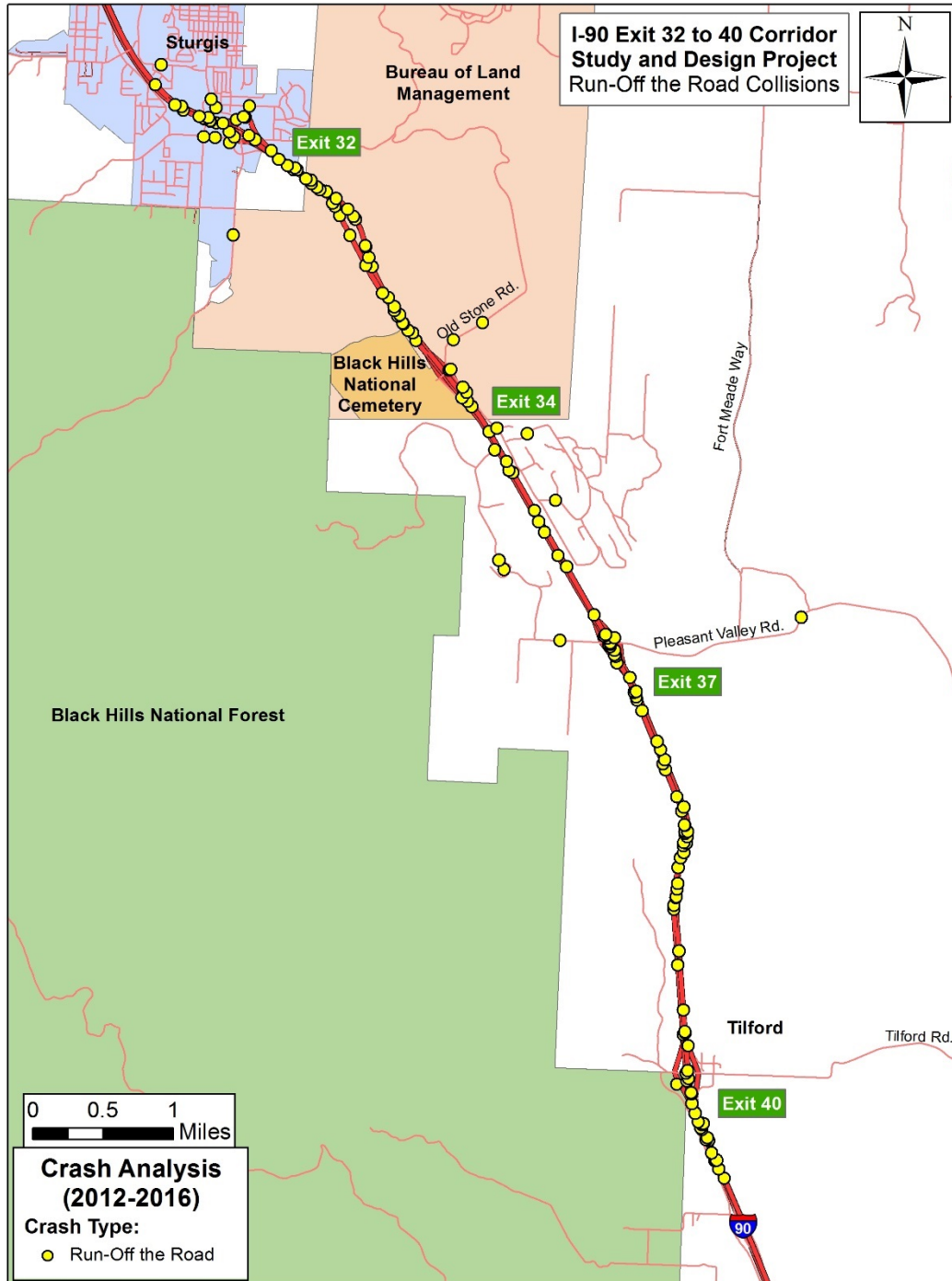


Figure 4: Run-Off the Road Crashes by Location

Reference: MEADE_IM 0901(195)32N_IM 0901(198)32N_I-90 Exit 32-40 Crash Analysis

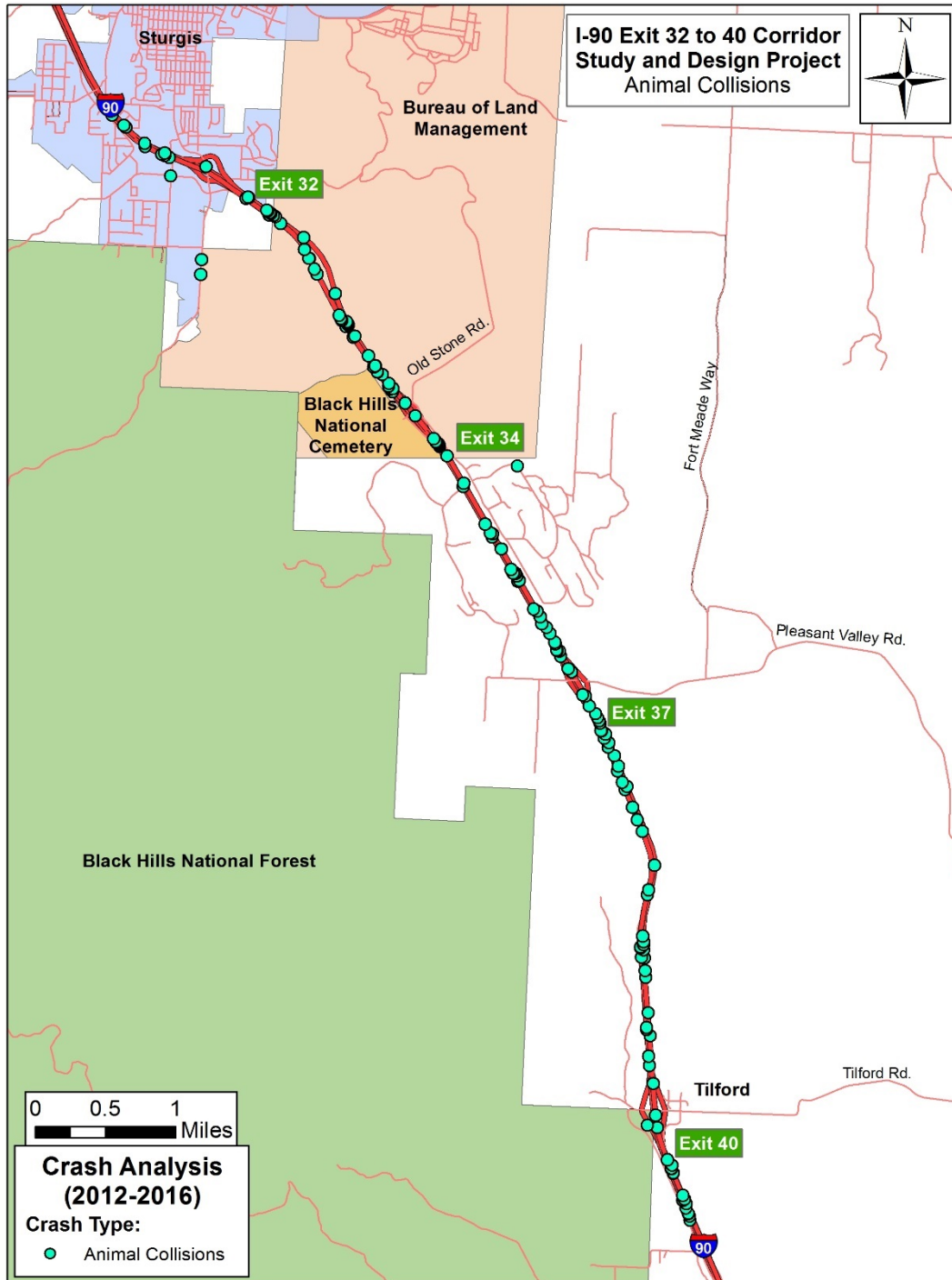


Figure 5: Animal Collisions by Location

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Table 1: Crash Analysis by Hot-Spot

Spot	Route	Begin MP	End MP	Number of Crashes	Number of Fatalities	Number Incapacitating Injuries	Number Non-Incapacitating Injuries
1	I-90	33.0	33.3	43	0	2	3
2	I-90	36.0	36.3	34	0	1	5
3	I-90	34.8	35.1	30	0	2	1
4	I-90	38.0	38.3	24	0	2	3
5	I-90	32.0	32.3	22	0	0	5
6	I-90	37.3	37.6	22	0	1	0
7	I-90	37.0	37.3	20	0	0	4
8	I-90	34.3	34.6	18	0	1	0
9	I-90	34.0	34.3	17	1	0	1
10	I-90	39.3	39.6	17	0	2	2
11	I-90	39.0	39.3	15	0	0	0
12	I-90	32.3	32.6	13	0	0	1
13	I-90	38.6	38.9	10	0	0	2
14	I-90	31.5	31.8	4	0	0	1

Table 2: Crash Analysis by Segment

Segment	Route	Description	Begin MP	End MP	Length (mi.)	Number of Crashes (2012-2016)	ADT ¹ (veh./day)	Actual Crash Rate	Statewide Average Crash Rate ²	Facility Type
								(Annual Crashes/100 million VMT ³)		
1	I-90	West of Exit 32	31.50	32.41	0.910 ⁴	39	14,132	166	302	Urban Interstate
2	I-90	Between Exits 32 & 34	32.41	34.81	2.400	79	18,546	97	302/129	Urban/Rural Interstate ⁵
3	I-90	Between Exits 34 & 37	34.81	37.01	2.200	83	18,090	114	129	Rural Interstate
4	I-90	Between Exits 37 & 40	37.01	40.20	3.190	95	17,570	93	129	Rural Interstate
5	I-90	East of Exit 40	40.20	41.00	0.800 ⁴	37	17,528	145	129	Rural Interstate

¹5-year annual average (2012-2016)

²Source: South Dakota Accident Records

³Vehicle Miles Traveled

⁴Segment length for end sections are arbitrary, based on locations of reported crashes within the functional area of interchanges at Exits 32 and 40. Computed crash rates are for informational purposes only and are not indicative of crash rates for those entire sections.

⁵Sturgis city limit lies at eastern terminus of Exit 32