Appendix C

CORRIDOR PLANNING STUDY DOCUMENTATION

S-332 IMPROVEMENT OPTIONS - PLANNING LEVEL COST ESTIMATES*

**These cost estimates supercede those contained in the previously completed "Improvement Options" technical memorandum*

CONCEPT 1 - SPOT IMPROVEMENTS

1.A VERTICAL CURVES — **$ 1,605,000 TOT**

**Unit costs based on communication with MDT Glendive District (Jim Frank, 09/25/2012,*

ASPHALT SURFACE — **WIDTH (FT) 26**

TYPE	UNITS	UNIT PRICE	QUANTITY / STA	COST / MI
Cold Milling	SQYD	$ 1.42	288.9	$ 21,660
Crushed Aggregate Course - 8"*	CUYD	$ 40.00	87.1	$ 183,955
Cover - Type 1	SQYD	$ 0.56	289	$ 8,545
Plant Mix Bit Surf Gr S (3/4") - 4"*	TON	$ 35.00	67.3	$ 124,370
Asphalt Cement PG 64-28	TON	$ 708.22	3.63	$ 135,740
Emulsified Asphalt CRS-2P	TON	$ 623.57	0.52	$ 17,121
Aggregate Treatment	SQYD	$ 0.42	340	$ 7,540
Subtotal				$ 498,931

GRAVEL SURFACE — **WIDTH (FT) 28**

TYPE	UNITS	UNIT PRICE	QUANTITY / STA	COST / MI
Crushed Aggregate Course - 4"*	CUYD	$ 40.00	34.6	$ 73,075
Aggregate Treatment	SQYD	$ 0.42	311	$ 6,897
Subtotal				$ 73,075

VERTICAL CURVES (RP 3.06 - RP 3.97) — $ 690,000 TOT

VERTICAL CURVE (RP 3.06)	WIDTH (FT)	DEPTH (FT)	LENGTH (FT)	LENGTH (MI)		
CREST	26	0.16	660	0.13	$ 84,567	EA

TYPE	UNITS	UNIT PRICE	QUANTITY / STA	COST / MI
Asphalt Surfacing				$ 498,931
Excavation - Unclassified Borrow	CUYD	$ 5.43	7.70	$ 2,209
Special Borrow	CUYD	$ 15.20	0.00	$ -
Subtotal				$ 501,140
Construction Contingency		15%		$ 75,171
Preliminary Engineering (PE)		10%		$ 50,114
Incidental and Indirect Costs (IDIC)		10%		$ 50,114
Total				**$ 676,539**

VERTICAL CURVE (RP 3.20)	WIDTH (FT)	DEPTH (FT)	LENGTH (FT)	LENGTH (MI)		
SAG	26	1.8	1142	0.22	$ 165,992	EA

TYPE	UNITS	UNIT PRICE	QUANTITY / STA	COST / MI
Asphalt Surfacing				$ 498,931
Excavation - Unclassified Borrow	CUYD	$ 5.43	0.00	$ -
Special Borrow	CUYD	$ 15.20	86.67	$ 69,555
Subtotal				$ 568,487
Construction Contingency		15%		$ 85,273
Preliminary Engineering (PE)		10%		$ 56,849
Incidental and Indirect Costs (IDIC)		10%		$ 56,849
Total				**$ 767,457**

VERTICAL CURVE (RP 3.42)	WIDTH (FT)	DEPTH (FT)	LENGTH (FT)	LENGTH (MI)		
CREST	26	0.01	1401	0.27	$ 178,772	EA

TYPE	UNITS	UNIT PRICE	QUANTITY / STA	COST / MI
Asphalt Surfacing				$ 498,931
Excavation - Unclassified Borrow	CUYD	$ 5.43	0.48	$ 138
Special Borrow	CUYD	$ 15.20	0.00	$ -
Subtotal				$ 499,069
Construction Contingency		15%		$ 74,860
Preliminary Engineering (PE)		10%		$ 49,907
Incidental and Indirect Costs (IDIC)		10%		$ 49,907
Total				**$ 673,744**

VERTICAL CURVE (RP 3.66)	WIDTH (FT)	DEPTH (FT)	LENGTH (FT)	LENGTH (MI)	$	261,132	EA
SAG	26	4.02	1561	0.30			

TYPE	UNITS	UNIT PRICE	QUANTITY / STA	COST / MI
Asphalt Surfacing				$ 498,931
Excavation - Unclassified Borrow	CUYD	$ 5.43	0.00	$ -
Special Borrow	CUYD	$ 15.20	193.56	$ 155,340
Subtotal				$ 654,271
Construction Contingency		15%		$ 98,141
Preliminary Engineering (PE)		10%		$ 65,427
Incidental and Indirect Costs (IDIC)		10%		$ 65,427
Total				**$ 883,266**

VERTICAL CURVES (RP 17.82 - RP 18.84)					$	70,000	TOT

VERTICAL CURVE (RP 17.82)	WIDTH (FT)	DEPTH (FT)	LENGTH (FT)	LENGTH (MI)	$	37,644	EA
CREST	28	3.6	1163	0.22			

TYPE	UNITS	UNIT PRICE	QUANTITY / STA	COST / MI
Gravel Surfacing				$ 73,075
Excavation - Unclassified Borrow	CUYD	$ 5.43	186.67	$ 53,518
Special Borrow	CUYD	$ 15.20	0.00	$ -
Subtotal				$ 126,593
Construction Contingency		15%		$ 18,989
Preliminary Engineering (PE)		10%		$ 12,659
Incidental and Indirect Costs (IDIC)		10%		$ 12,659
Total				**$ 170,901**

VERTICAL CURVE (RP 17.97)	WIDTH (FT)	DEPTH (FT)	LENGTH (FT)	LENGTH (MI)	$	25,627	EA
SAG	28	1.32	783	0.15			

TYPE	UNITS	UNIT PRICE	QUANTITY / STA	COST / MI
Gravel Surfacing				$ 73,075
Excavation - Unclassified Borrow	CUYD	$ 5.43	0.00	$ -
Special Borrow	CUYD	$ 15.20	68.44	$ 54,931
Subtotal				$ 128,006
Construction Contingency		15%		$ 19,201
Preliminary Engineering (PE)		10%		$ 12,801
Incidental and Indirect Costs (IDIC)		10%		$ 12,801
Total				**$ 172,808**

VERTICAL CURVE (RP 18.84)	WIDTH (FT)	DEPTH (FT)	LENGTH (FT)	LENGTH (MI)	$	8,116	EA
CREST	28	0.05	430	0.08			

TYPE	UNITS	UNIT PRICE	QUANTITY / STA	COST / MI
Gravel Surfacing				$ 73,075
Excavation - Unclassified Borrow	CUYD	$ 5.43	2.59	$ 743
Special Borrow	CUYD	$ 15.20	0.00	$ -
Subtotal				$ 73,819
Construction Contingency		15%		$ 11,073
Preliminary Engineering (PE)		10%		$ 7,382
Incidental and Indirect Costs (IDIC)		10%		$ 7,382
Total				**$ 99,655**

VERTICAL CURVE (RP 20.28)					$	5,000	TOT

VERTICAL CURVE (RP 20.28)	WIDTH (FT)	DEPTH (FT)	LENGTH (FT)	LENGTH (MI)	$	5,362	TOT
SAG	28	0.09	273	0.05			

TYPE	UNITS	UNIT PRICE	QUANTITY / STA	COST / MI
Gravel Surfacing				$ 73,075
Excavation - Unclassified Borrow	CUYD	$ 5.43	0.00	$ -
Special Borrow	CUYD	$ 15.20	4.67	$ 3,745
Subtotal				$ 76,820
Construction Contingency		15%		$ 11,523
Preliminary Engineering (PE)		10%		$ 7,682
Incidental and Indirect Costs (IDIC)		10%		$ 7,682
Total				**$ 103,708**

VERTICAL CURVES (RP 23.86 - RP 24.87)					$	95,000	TOT

VERTICAL CURVE (RP 23.86)	WIDTH (FT)	DEPTH (FT)	LENGTH (FT)	LENGTH (MI)	$	10,470	EA
SAG	28	0.22	498	0.09			

TYPE	UNITS	UNIT PRICE	QUANTITY / STA	COST / MI
Gravel Surfacing				$ 73,075
Excavation - Unclassified Borrow	CUYD	$ 5.43	0.00	$ -
Special Borrow	CUYD	$ 15.20	11.41	$ 9,155
Subtotal				$ 82,230
Construction Contingency		15%		$ 12,335
Preliminary Engineering (PE)		10%		$ 8,223
Incidental and Indirect Costs (IDIC)		10%		$ 8,223
Total				**$ 111,011**

VERTICAL CURVE (RP 24.01)	WIDTH (FT)	DEPTH (FT)	LENGTH (FT)	LENGTH (MI)	$	15,967	EA
CREST	28	0.54	770	0.15			

TYPE	UNITS	UNIT PRICE	QUANTITY / STA	COST / MI
Gravel Surfacing				$ 73,075
Excavation - Unclassified Borrow	CUYD	$ 5.43	28.00	$ 8,028
Special Borrow	CUYD	$ 15.20	0.00	$ -
Subtotal				$ 81,103
Construction Contingency		15%		$ 12,165
Preliminary Engineering (PE)		10%		$ 8,110
Incidental and Indirect Costs (IDIC)		10%		$ 8,110
Total				**$ 109,489**

VERTICAL CURVE (RP 24.50)	WIDTH (FT)	DEPTH (FT)	LENGTH (FT)	LENGTH (MI)	$	22,888	EA
CREST	28	1.82	894	0.17			

TYPE	UNITS	UNIT PRICE	QUANTITY / STA	COST / MI
Gravel Surfacing				$ 73,075
Excavation - Unclassified Borrow	CUYD	$ 5.43	94.37	$ 27,056
Special Borrow	CUYD	$ 15.20	0.00	$ -
Subtotal				$ 100,132
Construction Contingency		15%		$ 15,020
Preliminary Engineering (PE)		10%		$ 10,013
Incidental and Indirect Costs (IDIC)		10%		$ 10,013
Total				**$ 135,178**

VERTICAL CURVE (RP 24.73)	WIDTH (FT)	DEPTH (FT)	LENGTH (FT)	LENGTH (MI)	$	27,614	EA
SAG	28	1.48	802	0.15			

TYPE	UNITS	UNIT PRICE	QUANTITY / STA	COST / MI
Gravel Surfacing				$ 73,075
Excavation - Unclassified Borrow	CUYD	$ 5.43	0.00	$ -
Special Borrow	CUYD	$ 15.20	76.74	$ 61,589
Subtotal				$ 134,664
Construction Contingency		15%		$ 20,200
Preliminary Engineering (PE)		10%		$ 13,466
Incidental and Indirect Costs (IDIC)		10%		$ 13,466
Total				**$ 181,797**

VERTICAL CURVE (RP 24.87)	WIDTH (FT)	DEPTH (FT)	LENGTH (FT)	LENGTH (MI)	$	18,142	EA
SAG	28	0.77	675	0.13			

TYPE	UNITS	UNIT PRICE	QUANTITY / STA	COST / MI
Gravel Surfacing				$ 73,075
Excavation - Unclassified Borrow	CUYD	$ 5.43	0.00	$ -
Special Borrow	CUYD	$ 15.20	39.93	$ 32,043
Subtotal				$ 105,118
Construction Contingency		15%		$ 15,768
Preliminary Engineering (PE)		10%		$ 10,512
Incidental and Indirect Costs (IDIC)		10%		$ 10,512
Total				**$ 141,910**

VERTICAL CURVES (RP 25.53 - RP 29.60)						$	385,000	TOT

VERTICAL CURVE (RP 25.53)	WIDTH (FT)	DEPTH (FT)	LENGTH (FT)	LENGTH (MI)		$	8,975	EA
CREST	28	0.13	468	0.09				

TYPE	UNITS	UNIT PRICE	QUANTITY / STA	COST / MI
Gravel Surfacing				$ 73,075
Excavation - Unclassified Borrow	CUYD	$ 5.43	6.74	$ 1,933
Special Borrow	CUYD	$ 15.20	0.00	$ -
Subtotal				$ 75,008
Construction Contingency		15%		$ 11,251
Preliminary Engineering (PE)		10%		$ 7,501
Incidental and Indirect Costs (IDIC)		10%		$ 7,501
Total				**$ 101,261**

VERTICAL CURVE (RP 25.89)	WIDTH (FT)	DEPTH (FT)	LENGTH (FT)	LENGTH (MI)		$	54,803	EA
CREST	28	5.31	1410	0.27				

TYPE	UNITS	UNIT PRICE	QUANTITY / STA	COST / MI
Gravel Surfacing				$ 73,075
Excavation - Unclassified Borrow	CUYD	$ 5.43	275.33	$ 78,939
Special Borrow	CUYD	$ 15.20	0.00	$ -
Subtotal				$ 152,014
Construction Contingency		15%		$ 22,802
Preliminary Engineering (PE)		10%		$ 15,201
Incidental and Indirect Costs (IDIC)		10%		$ 15,201
Total				**$ 205,219**

VERTICAL CURVE (RP 26.04)	WIDTH (FT)	DEPTH (FT)	LENGTH (FT)	LENGTH (MI)		$	17,342	EA
SAG	28	0.74	653	0.12				

TYPE	UNITS	UNIT PRICE	QUANTITY / STA	COST / MI
Gravel Surfacing				$ 73,075
Excavation - Unclassified Borrow	CUYD	$ 5.43	0.00	$ -
Special Borrow	CUYD	$ 15.20	38.37	$ 30,795
Subtotal				$ 103,870
Construction Contingency		15%		$ 15,580
Preliminary Engineering (PE)		10%		$ 10,387
Incidental and Indirect Costs (IDIC)		10%		$ 10,387
Total				**$ 140,224**

VERTICAL CURVE (RP 26.53)	WIDTH (FT)	DEPTH (FT)	LENGTH (FT)	LENGTH (MI)		$	35,194	EA
CREST	28	1.47	1450	0.27				

TYPE	UNITS	UNIT PRICE	QUANTITY / STA	COST / MI
Gravel Surfacing				$ 73,075
Excavation - Unclassified Borrow	CUYD	$ 5.43	76.22	$ 21,853
Special Borrow	CUYD	$ 15.20	0.00	$ -
Subtotal				$ 94,928
Construction Contingency		15%		$ 14,239
Preliminary Engineering (PE)		10%		$ 9,493
Incidental and Indirect Costs (IDIC)		10%		$ 9,493
Total				**$ 128,153**

VERTICAL CURVE (RP 26.72)	WIDTH (FT)	DEPTH (FT)	LENGTH (FT)	LENGTH (MI)		$	46,654	EA
SAG	28	2.62	1002	0.19				

TYPE	UNITS	UNIT PRICE	QUANTITY / STA	COST / MI
Gravel Surfacing				$ 73,075
Excavation - Unclassified Borrow	CUYD	$ 5.43	0.00	$ -
Special Borrow	CUYD	$ 15.20	135.85	$ 109,029
Subtotal				$ 182,104
Construction Contingency		15%		$ 27,316
Preliminary Engineering (PE)		10%		$ 18,210
Incidental and Indirect Costs (IDIC)		10%		$ 18,210
Total				**$ 245,841**

VERTICAL CURVE (RP 27.09)	WIDTH (FT)	DEPTH (FT)	LENGTH (FT)	LENGTH (MI)	$ 13,271 EA
CREST	28	0.6	633	0.12	

TYPE	UNITS	UNIT PRICE	QUANTITY / STA	COST / MI
Gravel Surfacing				$ 73,075
Excavation - Unclassified Borrow	CUYD	$ 5.43	31.11	$ 8,920
Special Borrow	CUYD	$ 15.20	0.00	$ -
Subtotal				$ 81,995
Construction Contingency		15%		$ 12,299
Preliminary Engineering (PE)		10%		$ 8,199
Incidental and Indirect Costs (IDIC)		10%		$ 8,199
Total				**$ 110,693**

VERTICAL CURVE (RP 27.27)	WIDTH (FT)	DEPTH (FT)	LENGTH (FT)	LENGTH (MI)	$ 12,952 EA
SAG	28	0.41	562	0.11	

TYPE	UNITS	UNIT PRICE	QUANTITY / STA	COST / MI
Gravel Surfacing				$ 73,075
Excavation - Unclassified Borrow	CUYD	$ 5.43	0.00	$ -
Special Borrow	CUYD	$ 15.20	21.26	$ 17,062
Subtotal				$ 90,137
Construction Contingency		15%		$ 13,521
Preliminary Engineering (PE)		10%		$ 9,014
Incidental and Indirect Costs (IDIC)		10%		$ 9,014
Total				**$ 121,685**

VERTICAL CURVE (RP 27.95)	WIDTH (FT)	DEPTH (FT)	LENGTH (FT)	LENGTH (MI)	$ 8,760 EA
SAG	28	0.09	446	0.08	

TYPE	UNITS	UNIT PRICE	QUANTITY / STA	COST / MI
Gravel Surfacing				$ 73,075
Excavation - Unclassified Borrow	CUYD	$ 5.43	0.00	$ -
Special Borrow	CUYD	$ 15.20	4.67	$ 3,745
Subtotal				$ 76,820
Construction Contingency		15%		$ 11,523
Preliminary Engineering (PE)		10%		$ 7,682
Incidental and Indirect Costs (IDIC)		10%		$ 7,682
Total				**$ 103,708**

VERTICAL CURVE (RP 28.05)	WIDTH (FT)	DEPTH (FT)	LENGTH (FT)	LENGTH (MI)	$ 39,604 EA
CREST	28	3.4	1253	0.24	

TYPE	UNITS	UNIT PRICE	QUANTITY / STA	COST / MI
Gravel Surfacing				$ 73,075
Excavation - Unclassified Borrow	CUYD	$ 5.43	176.30	$ 50,545
Special Borrow	CUYD	$ 15.20	0.00	$ -
Subtotal				$ 123,620
Construction Contingency		15%		$ 18,543
Preliminary Engineering (PE)		10%		$ 12,362
Incidental and Indirect Costs (IDIC)		10%		$ 12,362
Total				**$ 166,887**

VERTICAL CURVE (RP 28.16)	WIDTH (FT)	DEPTH (FT)	LENGTH (FT)	LENGTH (MI)	$ 44,029 EA
SAG	28	2.51	970	0.18	

TYPE	UNITS	UNIT PRICE	QUANTITY / STA	COST / MI
Gravel Surfacing				$ 73,075
Excavation - Unclassified Borrow	CUYD	$ 5.43	0.00	$ -
Special Borrow	CUYD	$ 15.20	130.15	$ 104,452
Subtotal				$ 177,527
Construction Contingency		15%		$ 26,629
Preliminary Engineering (PE)		10%		$ 17,753
Incidental and Indirect Costs (IDIC)		10%		$ 17,753
Total				**$ 239,661**

VERTICAL CURVE (RP 28.26)	WIDTH (FT)	DEPTH (FT)	LENGTH (FT)	LENGTH (MI)	$ 26,385 EA
CREST	28	2.04	998	0.19	

TYPE	UNITS	UNIT PRICE	QUANTITY / STA	COST / MI
Gravel Surfacing				$ 73,075
Excavation - Unclassified Borrow	CUYD	$ 5.43	105.78	$ 30,327
Special Borrow	CUYD	$ 15.20	0.00	$ -
Subtotal				$ 103,402
Construction Contingency		15%		$ 15,510
Preliminary Engineering (PE)		10%		$ 10,340
Incidental and Indirect Costs (IDIC)		10%		$ 10,340
Total				**$ 139,593**

VERTICAL CURVE (RP 28.58)	WIDTH (FT)	DEPTH (FT)	LENGTH (FT)	LENGTH (MI)	$ 19,251 EA
SAG	28	0.87	689	0.13	

TYPE	UNITS	UNIT PRICE	QUANTITY / STA	COST / MI
Gravel Surfacing				$ 73,075
Excavation - Unclassified Borrow	CUYD	$ 5.43	0.00	$ -
Special Borrow	CUYD	$ 15.20	45.11	$ 36,204
Subtotal				$ 109,280
Construction Contingency		15%		$ 16,392
Preliminary Engineering (PE)		10%		$ 10,928
Incidental and Indirect Costs (IDIC)		10%		$ 10,928
Total				**$ 147,527**

VERTICAL CURVE (RP 28.78)	WIDTH (FT)	DEPTH (FT)	LENGTH (FT)	LENGTH (MI)	$ 12,168 EA
SAG	28	0.35	543	0.10	

TYPE	UNITS	UNIT PRICE	QUANTITY / STA	COST / MI
Gravel Surfacing				$ 73,075
Excavation - Unclassified Borrow	CUYD	$ 5.43	0.00	$ -
Special Borrow	CUYD	$ 15.20	18.15	$ 14,565
Subtotal				$ 87,640
Construction Contingency		15%		$ 13,146
Preliminary Engineering (PE)		10%		$ 8,764
Incidental and Indirect Costs (IDIC)		10%		$ 8,764
Total				**$ 118,314**

VERTICAL CURVE (RP 29.03)	WIDTH (FT)	DEPTH (FT)	LENGTH (FT)	LENGTH (MI)	$ 28,208 EA
CREST	28	1.6	1139	0.22	

TYPE	UNITS	UNIT PRICE	QUANTITY / STA	COST / MI
Gravel Surfacing				$ 73,075
Excavation - Unclassified Borrow	CUYD	$ 5.43	82.96	$ 23,786
Special Borrow	CUYD	$ 15.20	0.00	$ -
Subtotal				$ 96,861
Construction Contingency		15%		$ 14,529
Preliminary Engineering (PE)		10%		$ 9,686
Incidental and Indirect Costs (IDIC)		10%		$ 9,686
Total				**$ 130,762**

VERTICAL CURVE (RP 29.24)	WIDTH (FT)	DEPTH (FT)	LENGTH (FT)	LENGTH (MI)	$ 12,190 EA
SAG	28	0.35	544	0.10	

TYPE	UNITS	UNIT PRICE	QUANTITY / STA	COST / MI
Gravel Surfacing				$ 73,075
Excavation - Unclassified Borrow	CUYD	$ 5.43	0.00	$ -
Special Borrow	CUYD	$ 15.20	18.15	$ 14,565
Subtotal				$ 87,640
Construction Contingency		15%		$ 13,146
Preliminary Engineering (PE)		10%		$ 8,764
Incidental and Indirect Costs (IDIC)		10%		$ 8,764
Total				**$ 118,314**

VERTICAL CURVE (RP 29.60)	WIDTH (FT)	DEPTH (FT)	LENGTH (FT)	LENGTH (MI)	$ 6,230 EA
SAG	28	0.04	326	0.06	

TYPE	UNITS	UNIT PRICE	QUANTITY / STA	COST / MI
Gravel Surfacing				$ 73,075
Excavation - Unclassified Borrow	CUYD	$ 5.43	0.00	$ -
Special Borrow	CUYD	$ 15.20	2.07	$ 1,665
Subtotal				$ 74,740
Construction Contingency		15%		$ 11,211
Preliminary Engineering (PE)		10%		$ 7,474
Incidental and Indirect Costs (IDIC)		10%		$ 7,474
Total				**$ 100,899**

VERTICAL CURVES (RP 31.54 - RP 32.41)	$ 65,000 TOT

VERTICAL CURVE (RP 31.54)	WIDTH (FT)	DEPTH (FT)	LENGTH (FT)	LENGTH (MI)	$ 34,409 EA
SAG	28	0.98	1182	0.22	

TYPE	UNITS	UNIT PRICE	QUANTITY / STA	COST / MI
Gravel Surfacing				$ 73,075
Excavation - Unclassified Borrow	CUYD	$ 5.43	0.00	$ -
Special Borrow	CUYD	$ 15.20	50.81	$ 40,782
Subtotal				$ 113,857
Construction Contingency		15%		$ 17,079
Preliminary Engineering (PE)		10%		$ 11,386
Incidental and Indirect Costs (IDIC)		10%		$ 11,386
Total				**$ 153,707**

VERTICAL CURVE (RP 32.41)	WIDTH (FT)	DEPTH (FT)	LENGTH (FT)	LENGTH (MI)	$ 32,019 EA
CREST	28	0.45	1570	0.30	

TYPE	UNITS	UNIT PRICE	QUANTITY / STA	COST / MI
Gravel Surfacing				$ 73,075
Excavation - Unclassified Borrow	CUYD	$ 5.43	23.33	$ 6,690
Special Borrow	CUYD	$ 15.20	0.00	$ -
Subtotal				$ 79,765
Construction Contingency		15%		$ 11,965
Preliminary Engineering (PE)		10%		$ 7,976
Incidental and Indirect Costs (IDIC)		10%		$ 7,976
Total				**$ 107,683**

VERTICAL CURVE (RP 33.76)	$ 20,000 TOT

VERTICAL CURVE (RP 33.76)	WIDTH (FT)	DEPTH (FT)	LENGTH (FT)	LENGTH (MI)	$ 20,550 TOT
SAG	28	0.84	744	0.14	

TYPE	UNITS	UNIT PRICE	QUANTITY / STA	COST / MI
Gravel Surfacing				$ 73,075
Excavation - Unclassified Borrow	CUYD	$ 5.43	0.00	$ -
Special Borrow	CUYD	$ 15.20	43.56	$ 34,956
Subtotal				$ 108,031
Construction Contingency		15%		$ 16,205
Preliminary Engineering (PE)		10%		$ 10,803
Incidental and Indirect Costs (IDIC)		10%		$ 10,803
Total				**$ 145,842**

VERTICAL CURVES (RP 38.77 - RP 39.35)	$ 15,000 TOT

VERTICAL CURVE (RP 38.77)	WIDTH (FT)	DEPTH (FT)	LENGTH (FT)	LENGTH (MI)	$ 15,204 TOT
SAG	28	0.3	695	0.13	

TYPE	UNITS	UNIT PRICE	QUANTITY / STA	COST / MI
Gravel Surfacing				$ 73,075
Excavation - Unclassified Borrow	CUYD	$ 5.43	0.00	$ -
Special Borrow	CUYD	$ 15.20	15.56	$ 12,484
Subtotal				$ 85,559
Construction Contingency		15%		$ 12,834
Preliminary Engineering (PE)		10%		$ 8,556
Incidental and Indirect Costs (IDIC)		10%		$ 8,556
Total				**$ 115,505**

VERTICAL CURVE (RP 39.35)	WIDTH (FT)	DEPTH (FT)	LENGTH (FT)	LENGTH (MI)	$ 7,591 TOT
SAG	28	0.01	404	0.08	

TYPE	UNITS	UNIT PRICE	QUANTITY / STA	COST / MI
Gravel Surfacing				$ 73,075
Excavation - Unclassified Borrow	CUYD	$ 5.43	0.00	$ -
Special Borrow	CUYD	$ 15.20	0.52	$ 416
Subtotal				$ 73,491
Construction Contingency		15%		$ 11,024
Preliminary Engineering (PE)		10%		$ 7,349
Incidental and Indirect Costs (IDIC)		10%		$ 7,349
Total				**$ 99,213**

VERTICAL CURVES (RP 41.44 - RP 43.36)			$ 155,000 TOT
Cost Per Curve - Gravel Surfacing	$ 22,254	EA	
Number of Curves	7		

VERTICAL CURVE (RP 46.46)			$ 20,000 TOT
Cost Per Curve - Gravel Surfacing	$ 22,254	EA	
Number of Curves	1		

VERTICAL CURVE (RP 48.48)			$ 20,000 TOT
Cost Per Curve - Gravel Surfacing	$ 22,254	EA	
Number of Curves	1		

VERTICAL CURVE (RP 49.69 - RP 50.27)			$ 65,000 TOT
Cost Per Curve - Gravel Surfacing	$ 22,254	EA	
Number of Curves	3		

1.B	SLIDE AREAS										$ 3,700,000 TOT

MDT SLIDE AREA PROJECTS (2011 - 2012)

NAME	LOCATION	LETTING DATE	LENGTH (FT)	LENGTH (MI)	COST	COST / MI
Clagget Hill Slide	Fergus	2/24/2011	1,000	0.19	$ 669,003	$ 3,532,338
Slide East of Noxon	Sanders	3/10/2011	689	0.13	$ 457,629	$ 4,017,125
US 191 Slides - S Mobridge	Fergus	5/26/2011	8,850	1.68	$ 3,133,525	$ 1,926,536
Cut Bank South Slide	Glacier	6/23/2011	1,166	0.22	$ 365,078	$ 2,013,385
E of Winnett - Slide Repair	Petroleum	11/17/2011	375	0.07	$ 525,738	$ 9,706,063
S of McLeod Slide Repair	Sweet Grass	11/17/2011	1,800	0.34	$ 835,658	$ 2,829,313
Slide Repair - NE of Glendive	Dawson	7/12/2012	600	0.11	$ 683,132	$ 6,810,883
Glasgow Slide Repair	Valley	7/12/2012	850	0.16	$ 482,262	$ 3,580,929
Slide Repair - 13 Miles East Glendive	Dawson	8/23/2012	650	0.12	$ 243,070	$ 1,636,703
Subtotal			15,979	3.03	$ 7,395,094	$ 2,443,544
Construction Contingency		15%			$ 1,109,264	$ 366,532
Preliminary Engineering (PE)		10%			$ 739,509	$ 244,354
Incidental and Indirect Costs (IDIC)		10%			$ 739,509	$ 244,354
Total					**$ 9,983,377**	**$ 3,298,784**

SLIDE AREA (RP 3.26)	LENGTH (MI)	0.08		$ 250,000	TOT
SLIDE AREAS (RP 3.74 - RP 4.65)				$ 1,600,000	TOT
RP 3.74	LENGTH (MI)	0.09		$ 296,891	EA
RP 4.20	LENGTH (MI)	0.2		$ 659,757	EA
RP 4.45	LENGTH (MI)	0.1		$ 329,878	EA
RP 4.65	LENGTH (MI)	0.1		$ 329,878	EA
SLIDE AREA (RP 26.22)	LENGTH (MI)	0.08		$ 250,000	TOT
SLIDE AREA (RP 27.90)	LENGTH (MI)	0.15		$ 500,000	TOT
SLIDE AREA (RP 36.30)	LENGTH (MI)	0.13		$ 450,000	TOT
SLIDE AREA (RP 43.50)	LENGTH (MI)	0.2		$ 650,000	TOT

1.C	GUARDRAIL					$	1,750,000	TOT

TYPE	UNITS	UNIT PRICE	COST PER LNFT
Guard Rail - Steel Box Beam	LNFT	$ 42.97	$ 42.97
Construction Contingency		15%	$ 6.45
Preliminary Engineering (PE)		10%	$ 4.30
Incidental and Indirect Costs (IDIC)		10%	$ 4.30
Total			**$ 58.01**

STEEP FILL SLOPE (RP 4.90)	LENGTH (FT)	1,260	$	73,092	EA
STEEP FILL SLOPE (RP 5.10)	LENGTH (FT)	1,600	$	92,815	EA
STEEP FILL SLOPE (RP 22.00)	LENGTH (FT)	3,700	$	214,635	EA
STEEP FILL SLOPE (RP 23.80)	LENGTH (FT)	1,380	$	80,053	EA
STEEP FILL SLOPE (RP 24.10)	LENGTH (FT)	1,900	$	110,218	EA
STEEP FILL SLOPE (RP 24.70)	LENGTH (FT)	1,600	$	92,815	EA
STEEP FILL SLOPE (RP 26.70)	LENGTH (FT)	4,220	$	244,800	EA
STEEP FILL SLOPE (RP 31.30)	LENGTH (FT)	3,160	$	183,310	EA
STEEP FILL SLOPE (RP 31.70)	LENGTH (FT)	4,760	$	276,125	EA
STEEP FILL SLOPE (RP 36.60)	LENGTH (FT)	2,120	$	122,980	EA
STEEP FILL SLOPE (RP 37.50)	LENGTH (FT)	2,120	$	122,980	EA
STEEP FILL SLOPE (RP 39.00)	LENGTH (FT)	840	$	48,728	EA
STEEP FILL SLOPE (RP 43.30)	LENGTH (FT)	840	$	48,728	EA
STEEP FILL SLOPE (RP 48.10)	LENGTH (FT)	520	$	30,165	EA

1.D	HORIZONTAL CURVES (RP 39.52 - RP 40.98)		WIDTH (FT)	LENGTH (MI)	$	950,000	TOT
	Approximate length to include approach work		32	1.00			
	**Costs from Winifred to Big Sandy Corridor Study (May 2011)*		Cost / mi*	$ 559,680			
			Width (ft)	26			
	Subtotal		Cost / sqft	$ 4.08			
	Construction Contingency	15%		$ 0.61			
	Preliminary Engineering (PE)	10%		$ 0.41			
	Incidental and Indirect Costs (IDIC)	10%		$ 0.41			
	Total		**Cost / sqft**	**$ 5.50**			

CONCEPT 2 - GRAVEL WITHOUT RECONSTRUCTION (RP 17.7 - RP 50.4)

2.A GRAVEL PLACEMENT **$ 3,200,000 TOT**

**Unit costs based on communication with MDT Glendive District (Jim Frank, 09/25/2012,*

GRAVEL SURFACING **WIDTH (FT) 24**

TYPE	UNITS	UNIT PRICE	QUANTITY / STA	COST / MI
Crushed Aggregate Course - 4"*	CUYD	$ 40.00	29.6	$ 62,515
Aggregate Treatment	SQYD	$ 0.42	267	$ 5,921
Subtotal				$ 68,436
Construction Contingency		15%		$ 10,265
Preliminary Engineering (PE)		10%		$ 6,844
Incidental and Indirect Costs (IDIC)		10%		$ 6,844
Total				**$ 92,389**

GRAVEL SURFACING **WIDTH (FT) 26**

TYPE	UNITS	UNIT PRICE	QUANTITY / STA	COST / MI
Crushed Aggregate Course - 4"*	CUYD	$ 40.00	32.1	$ 67,795
Aggregate Treatment	SQYD	$ 0.42	289	$ 6,409
Subtotal				$ 74,204
Construction Contingency		15%		$ 11,131
Preliminary Engineering (PE)		10%		$ 7,420
Incidental and Indirect Costs (IDIC)		10%		$ 7,420
Total				**$ 100,175**

GRAVEL SURFACING **WIDTH (FT) 28**

TYPE	UNITS	UNIT PRICE	QUANTITY / STA	COST / MI
Crushed Aggregate Course - 4"*	CUYD	$ 40.00	34.6	$ 73,075
Aggregate Treatment	SQYD	$ 0.42	311	$ 6,897
Subtotal				$ 79,972
Construction Contingency		15%		$ 11,996
Preliminary Engineering (PE)		10%		$ 7,997
Incidental and Indirect Costs (IDIC)		10%		$ 7,997
Total				**$ 107,962**

GRAVEL SURFACING **WIDTH (FT) 32**

TYPE	UNITS	UNIT PRICE	QUANTITY / STA	COST / MI
Crushed Aggregate Course - 4"*	CUYD	$ 40.00	39.5	$ 83,424
Aggregate Treatment	SQYD	$ 0.42	356	$ 7,895
Subtotal				$ 91,319
Construction Contingency		15%		$ 13,698
Preliminary Engineering (PE)		10%		$ 9,132
Incidental and Indirect Costs (IDIC)		10%		$ 9,132
Total				**$ 123,280**

	WIDTH (FT)	LENGTH (MI)		
GRAVEL SURFACE (RP 17.7 - RP 20.0)	28	2.3	$ 248,313	TOT
GRAVEL SURFACE (RP 20.0 - RP 39.6)	24	19.6	$ 1,810,822	TOT
GRAVEL SURFACE (RP 39.6 - RP 41.0)	32	1.4	$ 172,592	TOT
GRAVEL SURFACE (RP 41.0 - RP 44.7)	26	3.7	$ 370,649	TOT
GRAVEL SURFACE (RP 44.7 - RP 50.4)	28	5.7	$ 615,384	TOT

2.B	DOUBLE SHOT / BITUMEN TREATMENT			$ 2,550,000 TOT

**Unit costs from "Ashland - East" project (July 2012)*

DOUBLE SHOT / BITUMEN TREATMENT			WIDTH (FT)	24
TYPE	UNITS	UNIT PRICE	QUANTITY / STA	COST / MI
Emuls Asphalt CRS-2P*	TON	$ 726.15	0.95	$ 36,500
Cover - Type 1*	SQYD	$ 0.64	533	$ 18,022
Subtotal				$ 54,523
Construction Contingency		15%		$ 8,178
Preliminary Engineering (PE)		10%		$ 5,452
Incidental and Indirect Costs (IDIC)		10%		$ 5,452
Total				**$ 73,606**

DOUBLE SHOT / BITUMEN TREATMENT			WIDTH (FT)	26
TYPE	UNITS	UNIT PRICE	QUANTITY / STA	COST / MI
Emuls Asphalt CRS-2P*	TON	$ 726.15	1.03	$ 39,542
Cover - Type 1*	SQYD	$ 0.64	578	$ 19,524
Subtotal				$ 59,066
Construction Contingency		15%		$ 8,860
Preliminary Engineering (PE)		10%		$ 5,907
Incidental and Indirect Costs (IDIC)		10%		$ 5,907
Total				**$ 79,740**

DOUBLE SHOT / BITUMEN TREATMENT			WIDTH (FT)	28
TYPE	UNITS	UNIT PRICE	QUANTITY / STA	COST / MI
Emuls Asphalt CRS-2P*	TON	$ 726.15	1.11	$ 42,584
Cover - Type 1*	SQYD	$ 0.64	622	$ 21,026
Subtotal				$ 63,610
Construction Contingency		15%		$ 9,541
Preliminary Engineering (PE)		10%		$ 6,361
Incidental and Indirect Costs (IDIC)		10%		$ 6,361
Total				**$ 85,873**

DOUBLE SHOT / BITUMEN TREATMENT			WIDTH (FT)	32
TYPE	UNITS	UNIT PRICE	QUANTITY / STA	COST / MI
Emuls Asphalt CRS-2P*	TON	$ 726.15	1.27	$ 48,667
Cover - Type 1*	SQYD	$ 0.64	711	$ 24,030
Subtotal				$ 72,697
Construction Contingency		15%		$ 10,905
Preliminary Engineering (PE)		10%		$ 7,270
Incidental and Indirect Costs (IDIC)		10%		$ 7,270
Total				**$ 98,141**

GRAVEL SURFACE W/ DOUBLE SHOT (RP 17.7 - RP 20.0)	WIDTH (FT)	LENGTH (MI)	$ 197,509 TOT
	28	2.3	

GRAVEL SURFACE W/ DOUBLE SHOT (RP 20.0 - RP 39.6)	WIDTH (FT)	LENGTH (MI)	$ 1,442,672 TOT
	24	19.6	

GRAVEL SURFACE W/ DOUBLE SHOT (RP 39.6 - RP 41.0)	WIDTH (FT)	LENGTH (MI)	$ 137,397 TOT
	32	1.4	

GRAVEL SURFACE W/ DOUBLE SHOT (RP 41.0 - RP 44.7)	WIDTH (FT)	LENGTH (MI)	$ 295,036 TOT
	26	3.7	

GRAVEL SURFACE W/ DOUBLE SHOT (RP 44.7 - RP 50.4)	WIDTH (FT)	LENGTH (MI)	$ 489,478 TOT
	28	5.7	

CONCEPT 3 - RECONSTRUCT AND WIDEN GRAVEL SECTION (RP 17.7 - RP 50.4)

**Costs from Winifred to Big Sandy Corridor Study (May 2011)*	Cost / mi*		$	559,680
	Width (ft)			26
Subtotal	Cost / sqft		$	4.08
Construction Contingency		15%	$	0.61
Preliminary Engineering (PE)		10%	$	0.41
Incidental and Indirect Costs (IDIC)		10%	$	0.41
Total			**$**	**5.50**

RECONSTRUCT AND WIDEN GRAVEL SECTION (RP 17.7 - RP 50.4)	**WIDTH (FT)***	**LENGTH (MI)**	**$**	**34,200,000 TOT**
	36	32.7		

**36-foot base width was assumed for cost estimating purposes.*

BRIDGE COST ESTIMATES	**COST / SQFT**	**$**	**203**	**$ 2,550,000 TOT**
Subtotal*	COST / SQFT	$	150	
Construction Contingency	15%	$	22.50	
Preliminary Engineering (PE)	10%	$	15	
Incidental and Indirect Costs (IDIC)	10%	$	15	
Total		**$**	**203**	

**Planning level cost estimate from Toston Bridge Corridor Study, confirmed with MDT Glendive District Staff*

Foster Creek - RP 19.87	Length (ft)	Width (ft)	Cost	
	50	40	$	405,000
Tongue River - RP 39.61	Length (ft)	Width (ft)	Cost	
	227	40	$	1,838,700
Roe and Cooper Creek - RP 47.80	Length (ft)	Width (ft)	Cost	
	36	40	$	291,600

EXTENSION OF RECONSTRUCT AND WIDEN GRAVEL SECTION ON S-447	**WIDTH (FT)**	**LENGTH (MI)**	**$**	**2,800,000 TOT**
RP 43.72 - RP 46.42	36	2.7		

CONCEPT 4 - REHABILITATE WITH MILL / FILL / OVERLAY (RP 0.0 - RP 17.7) AND RECONSTRUCT AND WIDEN GRAVEL SECTION (RP 17.7 - RP 50.4)

REHABILITATE WITH MILL / FILL / OVERLAY (RP 0.0 - RP 17.7) **$ 12,550,000 TOT**

**Unit costs based on communication with MDT Glendive District (Jim Frank, 09/25/2012,*

ASPHALT SURFACE **WIDTH (FT) 24**

TYPE	UNITS	UNIT PRICE	QUANTITY / STA	COST / MI
Cold Milling	SQYD	$ 1.42	266.7	$ 19,994
Crushed Aggregate Course - 8"*	CUYD	$ 40.00	82.2	$ 173,606
Cover - Type 1	SQYD	$ 0.56	267	$ 7,895
Plant Mix Bit Surf Gr S (3/4") - 4"*	TON	$ 35.00	62.6	$ 115,685
Asphalt Cement PG 64-28	TON	$ 708.22	3.38	$ 126,392
Emulsified Asphalt CRS-2P	TON	$ 623.57	0.48	$ 15,804
Aggregate Treatment	SQYD	$ 0.42	318	$ 7,052
Subtotal				$ 466,427
Construction Contingency		15%		$ 69,964
Preliminary Engineering (PE)		10%		$ 46,643
Incidental and Indirect Costs (IDIC)		10%		$ 46,643
Total				**$ 629,676**

ASPHALT SURFACE **WIDTH (FT) 26**

TYPE	UNITS	UNIT PRICE	QUANTITY / STA	COST / MI
Cold Milling	SQYD	$ 1.42	288.9	$ 21,660
Crushed Aggregate Course - 8"*	CUYD	$ 40.00	87.1	$ 183,955
Cover - Type 1	SQYD	$ 0.56	289	$ 8,545
Plant Mix Bit Surf Gr S (3/4") - 4"*	TON	$ 35.00	67.3	$ 124,370
Asphalt Cement PG 64-28	TON	$ 708.22	3.63	$ 135,740
Emulsified Asphalt CRS-2P	TON	$ 623.57	0.52	$ 17,121
Aggregate Treatment	SQYD	$ 0.42	340	$ 7,540
Subtotal				$ 498,931
Construction Contingency		15%		$ 74,840
Preliminary Engineering (PE)		10%		$ 49,893
Incidental and Indirect Costs (IDIC)		10%		$ 49,893
Total				**$ 673,557**

ASPHALT SURFACE **WIDTH (FT) 32**

TYPE	UNITS	UNIT PRICE	QUANTITY / STA	COST / MI
Cold Milling	SQYD	$ 1.42	355.6	$ 26,658
Crushed Aggregate Course - 8"*	CUYD	$ 40.00	102.0	$ 215,424
Cover - Type 1	SQYD	$ 0.56	356	$ 10,526
Plant Mix Bit Surf Gr S (3/4") - 4"*	TON	$ 35.00	81.5	$ 150,612
Asphalt Cement PG 64-28	TON	$ 708.22	4.4	$ 164,534
Emulsified Asphalt CRS-2P	TON	$ 623.57	0.64	$ 21,072
Aggregate Treatment	SQYD	$ 0.42	407	$ 9,026
Subtotal				$ 597,851
Construction Contingency		15%		$ 89,678
Preliminary Engineering (PE)		10%		$ 59,785
Incidental and Indirect Costs (IDIC)		10%		$ 59,785
Total				**$ 807,099**

	WIDTH (FT)	LENGTH (MI)		
RP 0.0 - RP 5.7	26	5.7	$ 3,839,277	TOT
RP 5.7 - RP 12.2	32	6.5	$ 5,246,145	TOT
RP 12.2 - RP 17.7	24	5.5	$ 3,463,220	TOT

	WIDTH (FT)	LENGTH (MI)		
RECONSTRUCT AND WIDEN GRAVEL SECTION (RP 17.7 - RP 50.4)	36	32.7	**$ 34,200,000**	**TOT**

BRIDGE COST ESTIMATES **$ 2,550,000 TOT**

	Cost
Bridge Replacemtalong Gravel Section	$ 2,535,300

	WIDTH (FT)	LENGTH (MI)		
EXTENSION OF RECONSTRUCT AND WIDEN GRAVEL SECTION ON S-447			**$ 2,800,000**	**TOT**
RP 43.72 - RP 46.42	36	2.7		

CONCEPT 5 - RECONSTRUCT WITH PAVEMENT (RP 0.0 - RP 50.4)

**Cost from US 212 - Ashland East Project (July 2012)*	*Cost	$	12,326,887			
***Based on $150 / sqft cost*	**Bridge Length	$	587,760	Estimate	97.96	LENGTH (FT)
	Width (ft)		6.50			
			40			
Subtotal	Cost / sqft	$	8.55			
Construction Contingency	15%	$	1.28			
Preliminary Engineering (PE)	10%	$	0.86			
Incidental and Indirect Costs (IDIC)	10%	$	0.86			
Total		**$**	**11.54**			

RECONSTRUCT WITH PAVEMENT (RP 0.0 - RP 50.4)	**WIDTH (FT)**	**LENGTH (MI)**	**$**	**73,750,000 TOT**
	24	50.4		
RECONSTRUCT WITH PAVEMENT (RP 0.0 - RP 50.4)	**WIDTH (FT)**	**LENGTH (MI)**	**$**	**86,000,000 TOT**
	28	50.4		
RECONSTRUCT WITH PAVEMENT (RP 0.0 - RP 50.4)	**WIDTH (FT)**	**LENGTH (MI)**	**$**	**98,300,000 TOT**
	32	50.4		
RECONSTRUCT WITH PAVEMENT (RP 0.0 - RP 50.4)	**WIDTH (FT)**	**LENGTH (MI)**	**$**	**110,600,000 TOT**
	36	50.4		
RECONSTRUCT WITH PAVEMENT (RP 0.0 - RP 50.4)	**WIDTH (FT)**	**LENGTH (MI)**	**$**	**122,900,000 TOT**
	40	50.4		

BRIDGE COST ESTIMATES	**COST / SQFT**	**$**	**203**	**$**	**3,800,000 TOT**
Pumpkin Creek - RP 1.02	Length (ft)	Width (ft)	Cost		
	152	40	$ 1,231,200		
Bridge Replacement along Gravel Section			Cost		
			$ 2,550,000		

EXTENSION OF RECONSTRUCT WITH PAVEMENT ON S-447	**WIDTH (FT)**	**LENGTH (MI)**	**$**	**5,250,000 TOT**
RP 43.72 - RP 46.42	32	2.7		

COMMUNITY AND AGENCY PARTICIPATION PLAN (CAPP)

TONGUE RIVER ROAD (S-332) – Corridor Planning Study

Prepared for:

Montana Department of Transportation

Helena, Montana

Prepared by:

Robert Peccia & Associates

Helena, Montana

March 20, 2012

TABLE OF CONTENTS

FIGURES

ABBREVIATIONS / ACRONYMS

ADA	Americans with Disabilities Act
CAPP	Community and Agency Participation Plan
MDT	Montana Department of Transportation
MEPA	Montana Environmental Policy Act
NEPA	National Environmental Policy Act
RP	Reference Post
RPA	Robert Peccia and Associates
SAFETEA-LU	Safe, Accountable, Flexible, Efficient Transportation Equity Act: A Legacy for Users

COMMUNITY AND AGENCY PARTICIPATION PLAN (CAPP)

1.0 INTRODUCTION

The Montana Department of Transportation (MDT), in partnership with Custer and Rosebud Counties, has initiated a process to develop a Corridor Planning Study of Secondary Route 332 (S-332) from reference post (RP) 0.00 (MT-59 intersection) extending 50.4 miles southwest to RP 50.4 (S-447 intersection). Referred to as the *Tongue River Road Corridor Planning Study*, the study will identify financially feasible improvement options to address safety and geometrical concerns within the transportation corridor based on needs presented by the community, the study partners, and resource agencies. The *Study* will examine geometric characteristics, crash history, and existing and projected operational characteristics of the S-332 corridor. Existing and projected physical constraints, land uses, and environmental resources will also be analyzed.

The *Study* will include a comprehensive package of short- and long-term recommendations intended to address the transportation needs of the highway over the planning horizon (year 2032). These recommendations will assist the study partners in targeting the most critical needs and allocation of resources. The *Study* is expected to be completed by the end of November 2012.

MDT has established the corridor planning process in order to investigate improvement options for the corridor via a Pre-National Environmental Policy Act (NEPA) / Montana Environmental Policy Act (MEPA) study, as provided for in the Safe, Accountable, Flexible, Efficient Transportation Equity Act: A Legacy for Users (SAFETEA-LU). If improvement options are forwarded into project development, the corridor planning process will provide information into the NEPA / MEPA process, help advance viable improvement options into NEPA / MEPA, and provide the opportunity for partner involvement at all stages.

An initial step in the corridor planning study process is to develop a *Community and Agency Participation Plan (CAPP)* that provides for and identifies community, stakeholder, and other interested parties involvement activities needed to communicate information about existing and future corridor needs. The purpose of the *CAPP* is to establish a process that provides opportunities for interested parties to participate in all phases of the corridor study process. This is accomplished by providing complete information, timely notices, opportunities to make comments, and ensuring full access to key decisions.

1.1. Corridor Study Process

The purpose for a corridor study is to analyze existing data to determine current and future deficiencies and needs within the corridor, and identify potential environmental issues and mitigation opportunities. The *Tongue River Road Corridor Planning Study* is a pre-NEPA / MEPA study that allows flexibility in examining improvement options for the roadway system should any project be advanced forward. Community, stakeholder, and interested party involvement is an important component in any successful corridor planning study process. For this study, a number of involvement strategies are proposed with the goal being to reach the most people possible and to elicit meaningful participation. These opportunities will:

- Educate on the critical elements included in the Pre-NEPA/MEPA Corridor Study planning process for the S-332 corridor between Miles City and Ashland;
- Increase ability to provide input and ask questions throughout the corridor planning study; and

- Present findings and recommendations.

1.2. Study Area

The termini of the *Tongue River Road Corridor Planning Study* has been established by the MDT as beginning at RP 0.00 (intersection of S-332 and MT-59) and ending at RP 50.4 (intersection of S-332 and S-447). The study area generally includes a 0.5 mile buffer on each side of S-332. The corridor width is to be limited to approximately 100 yards beyond the existing right-of-way to reasonably capture potential areas where curve modification and/or roadway realignment may be identified. The study area boundary is shown in **Figure 1**.

1.3. Goals of Community Involvement and Outreach Effort

The goal of the study partners and the Consultant is to have ongoing involvement throughout the corridor planning study process. Education and outreach are an essential part of fulfilling the study partners' responsibility to successfully inform interested parties about the corridor study process. All study partners seek to encourage involvement and meaningful participation.

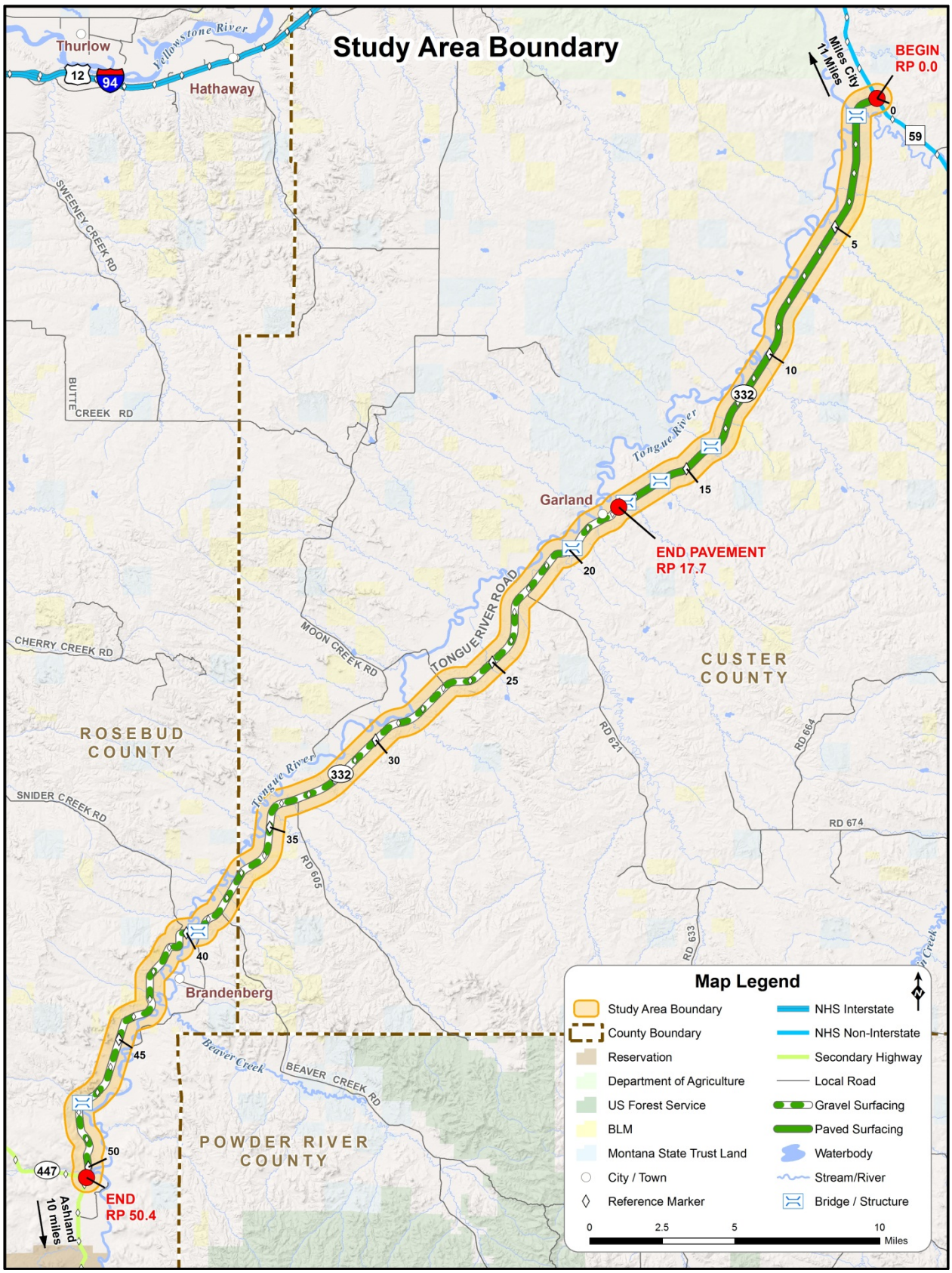

FIGURE 1: STUDY AREA BOUNDARY

2.0 COMMUNITY AND STAKEHOLDER PARTICIPATION PROCEDURES

The *CAPP* describes the information and input opportunities that will be provided as part of the development of the *Tongue River Road Corridor Planning Study*. This plan encourages active participation in identifying and commenting on corridor issues at every stage of the planning process. Participants in this community and stakeholder involvement process include:

- The general community – residents of Custer and Rosebud Counties, the Cities of Ashland and Miles City, and adjacent unincorporated areas affected by the planning efforts;
- Landowners and business owners affected within the study area boundary;
- Resource agencies; and
- Stakeholders and other interested parties.

Methods of notifying interested parties of the planning process, upcoming meetings, and other information are detailed in this document. Interested parties will be kept informed of all aspects of the plan and study, and their input will be sought throughout the process. The community and interested parties shall provide input to Custer and Rosebud Counties, MDT and the Consultant via the methods detailed herein.

2.1. STUDY CONTACTS

Contact information for Custer and Rosebud Counties, MDT and the Consultant will be provided. Telephone numbers and email addresses of study contacts will be published in all information that is released. This information is provided below.

- **Montana Department of Transportation (MDT)** – Glendive District Office
  503 North River Avenue (PO Box 890), Glendive, MT 59330-0890
  Contact: **Shane Mintz** – *District Administrator*
  (406) 345-8200
  smintz@mt.gov

- **Montana Department of Transportation (MDT)** – Statewide and Urban Planning
  2960 Prospect Avenue (PO Box 201001), Helena, MT 59620-1001
  Contact: **Tom Kahle** – *MDT Project Manager*
  (406) 444-9211
  tkahle@mt.gov

- **Rosebud County** – Rosebud County
  2975 Old Highway 10, Forsyth, MT 59327
  Contact: **Wayne Buck** – *Road Department Manager*
  (406) 346-2261
  dbuck@rosebudcountymt.com

- **Custer County**
  104 Sprandale Lane, Miles City, MT 59301
  Contact: **John Hamilton** – *Landowner / County Representative*
  (406) 234-5357
  cedarhillsranch@rangeweb.net

- **Robert Peccia and Associates (RPA)** – Consultant
  825 Custer Avenue (PO Box 5653), Helena, MT 59604
  Contact: **Jeff Key, P.E.** – *RPA Project Manager*
  (406) 447-5000
  jeff.key@rpa-hln.com

2.2. Publications

Meeting announcements will be developed jointly by RPA and MDT, and advertised by MDT at least three weeks prior to informational meetings. The ads will announce the meeting location, time, and date, the format and purpose of the meeting, and the locations where documents may be reviewed (if applicable). The following print newspaper will carry the display ads:

- Forsyth Independent Press – print
- Miles City Star – print and online: www.milescitystar.com
- Powder River Examiner – print and online: http://powderriveronline.com

In addition, newsletters will be made available one month prior to each formal informational meeting. The newsletters will describe work in progress, results achieved, preliminary recommendations, and other related topics. Each newsletter will be delivered to Custer and Rosebud Counties, MDT, and select stakeholders for their use in distribution and posting to their individual internet sites. In addition, a newsletter will be mailed to each property owner within the study area boundary, assuming a valid mailing address is available.

2.3. Radio and Television

Meetings may also be announced on local radio and/or television stations. Input from the Planning Team will identify the most popular radio and television stations on which announcements will be made.

2.4. Contact List

A contact list will be produced that will include individuals, businesses, or groups identified by Custer and Rosebud Counties and MDT. The intent of developing the contact list is to identify those individuals and groups to actively seek out and engage in all phases of the study process. Individuals who attend informational meetings will also be added to the mailing list. The groups or businesses (at a minimum) listed below will be included in the initial list, providing that addresses and/or emails are obtainable from each respective group for these purposes.

- Bill McChesney (House District 40)
- Eric Moore (Senate District 20)
- Montana State Highway Patrol
- Landowners in the Corridor
- Williston Basin Interstate Pipeline Company
- Janice Spear (Northern Cheyenne Tribe)
- George Luther (Arch Coal Consultant)

2.5. Document Availability

In general, all study deliverables and working draft technical memorandums will be available in hard copy format at the MDT Statewide and Urban Planning Section office (2960 Prospect Avenue). It is also anticipated that hard copy materials may also be made available at the following locations:

- Custer County Courthouse (1010 Main Street, Miles City, MT 59301)
- Rosebud County Courthouse (1200 Main Street, Forsyth, MT 59327)
- MDT Glendive District Office (503 North River Avenue, Glendive, MT 59330)
- MDT Miles City Area Office (217 North 4th Street, Mile City, MT 59301)
- St. Labre Indian School (1000 Tongue River Road, Ashland, MT 59003)

Approved electronic copies of study deliverables will be posted on the study website at the address shown below within seven days of receiving approval.

- www.mdt.mt.gov/pubinvolve/tongueriver

The following Americans with Disabilities Act (ADA)-required statement will be included on all published materials:

> *"Custer and Rosebud Counties, MDT, and RPA attempt to provide accommodations for any known disability that may interfere with a person participating in any service, program, or activity associated with this study. Alternative accessible formats of this information will be provided upon request. For further information, call (406) 447-5000 or TTY (800) 335-7592, or call Montana Relay at 711. Accommodation requests must be made at least 48 hours prior to the scheduled activity and / or meeting."*

3.0 MEETINGS

3.1.1. Planning Team Meetings

Planning Team meetings will be scheduled every three weeks for the duration of the ten-month study period for a total of 14 Planning Team meetings. Individual groups included in the meetings will be Custer and Rosebud Counties, MDT, the Consultant, and others as needed. The meetings are intended to track progress and address study development issues and questions. The meetings are considered an important aspect for the exchange of information and ideas during the development of the *Study*. Throughout the meetings, the issues, problems, and possible solutions will be identified and discussed.

3.1.2. Informational Meetings

Two formal informational meetings will be held throughout the study. The first informational meeting will be held early on in the study process and will serve to introduce the study and relevant features and process. This meeting will also serve to receive information from interested parties about the study area. The second informational meeting will occur after the draft *Tongue River Road Corridor Planning Study* has been completed. The purpose of this meeting will be to present the types of recommended improvements, and to receive feedback. Comments and concerns will be recorded at all meetings.

3.1.3. Resource Agency Meeting / Involvement

Concurrent to the first formal community meeting, a meeting will be scheduled and held with Resource Agencies. The meeting will be organized by MDT and facilitated by RPA with assistance from the study partners as necessary. The purpose of the meeting will be to present findings from the Draft Existing and Projected Conditions Report, and to discuss natural resources occurring within the study area. Resource Agencies will be asked to identify initial avoidance areas, mitigation needs, and opportunities.

3.2. Consideration for Traditionally Underserved Populations

It is recognized that additional efforts must be made to involve traditionally underserved segments of the population in the community process for the study, including the disabled, minorities, and low-income residents. Including these groups leads to planning that reflects the needs of everyone. The steps listed below will help with these efforts.

- **Plan Meeting Locations Carefully** – Informational meetings will be held in locations that are accessible and compliant with the ADA. If a targeted population is located in a certain geographic part of a City or County, then the meeting location should be in that area for convenience.
- **Seek Help from Community Leaders and Organizations** – To facilitate involvement of traditionally underserved populations, community leaders and organizations that represent these groups will be consulted about how to most effectively reach their members.
- **Be Sensitive to Diverse Audiences** – At informational meetings, study partner staff and the Consultant will attempt to communicate as effectively as possible. Technical jargon will be avoided and appropriate dress and conduct will be adhered to.

3.3. Study Schedule

Adherence to the study schedule is important to stay on track and to keep all participating parties engaged. The study schedule for the *Tongue River Road Corridor Planning Study* is shown in **Figure 2**. It is RPA's intent to adhere to this schedule.

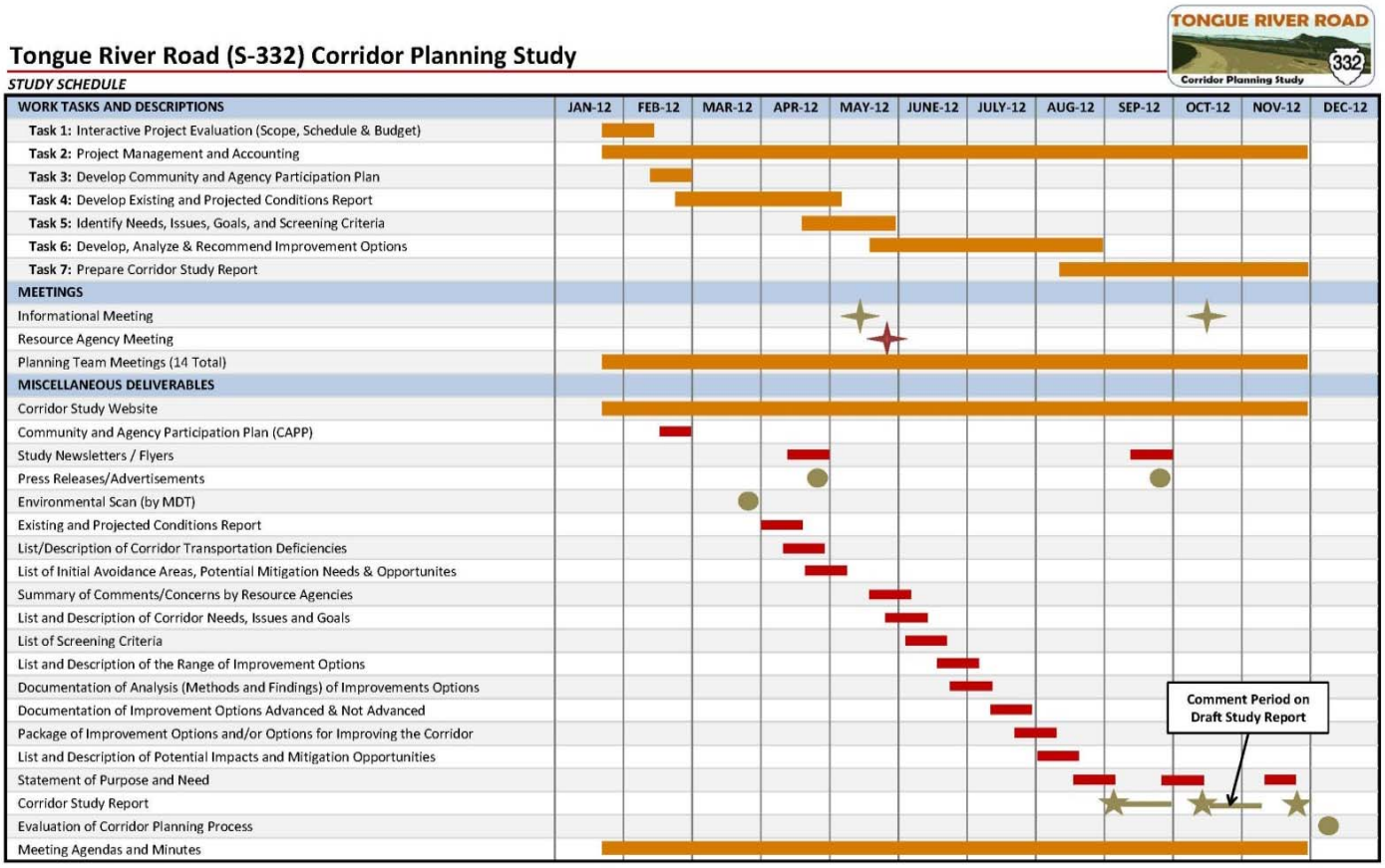

FIGURE 2: STUDY SCHEDULE

4.0 OVERALL STUDY COMMUNICATION

The *CAPP* establishes guidelines and procedures for encouraging participation. The following communication strategies and techniques may be used in their entirety (or partially) to distribute study information to interested parties and seek a higher level of engagement. The Consultant will utilize as many of these techniques as possible that best suit the *Tongue River Road Corridor Planning Study* development.

- All relevant deliverables and associated materials will be posted on the study website at the following address:
  - www.mdt.mt.gov/pubinvolve/tongueriver
- Public service announcements and interviews on radio and television may be conducted to explain the subject matter and promote participation.
- Articles and press releases for the newspaper or other widely circulated publications will be developed.
- Newsletters will be created and made available one month prior to each formal informational meeting.
- Informal presentations will be made at regional sites, open houses, round tables, or other community forums to receive input.
- Select mailings, as requested by interested parties, will be provided to individuals or groups that have expressed interest or made comments at meetings.

- Technical memorandums will be provided to the MDT for posting to the study's internet site, and will also be distributed to the Planning Team, to provide a better understanding of proposed corridor issues and recommendations and, in return, to provide the study entities with feedback and an opportunity for continual comment. Hard copies of all materials will be made available at the MDT Statewide and Urban Planning Section (2960 Prospect Avenue).
- Special presentations may be made, upon request, to community groups and organizations.
- Fact sheets may be used to explain corridor related issues.
- Special issues documents may be announced or reported at meetings and/or via email on relevant corridor issues.

Responses to questions and comments from interested parties concerning the participation process, working draft technical memorandums, the draft *Tongue River Road Corridor Planning Study* documents, and other work products will be made via written response in an Appendix to the actual documents.

EXISTING AND PROJECTED CONDITIONS

TONGUE RIVER ROAD (S-332) – Corridor Planning Study

FINAL

Prepared for:

Montana Department of Transportation

Helena, Montana

Prepared by:

Robert Peccia & Associates

Helena, Montana

July 25, 2012

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FIGURES

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ABBREVIATIONS / ACRONYMS

AADT	Average Annual Daily Traffic
ADT	Average Daily Traffic
BLM	Bureau of Land Management
DEQ	Department of Environmental Quality
EO	Executive Order
EPA	Environmental Protection Agency
ESA	Endangered Species Act
FEMA	Federal Emergency Management Agency
FHWA	Federal Highway Administration
FWP	Fish, Wildlife, and Parks
GIS	Geographic Information Systems
LUST	Leaking Underground Storage Tank
LWQD	Local Water Quality District
MDT	Montana Department of Transportation
MSAT	Mobile Source Air Toxics
NAAQS	National Ambient Air Quality Standards
NAC	Noise Ambient Criteria
NAICS	North American Industry Classification System
NPL	National Priority List
NPS	National Park Service
NRCS	Natural Resource Conservation Service
NRIS	Natural Resource Information Systems
RP	Reference Post
TMDL	Total Maximum Daily Loads
USACOE	US Army Corps of Engineers
USFWS	US Fish and Wildlife Service
UST	Underground Storage Tank
VPD	Vehicles per Day

EXISTING AND PROJECTED CONDITIONS

1.0 INTRODUCTION

The Secondary Highway 332 (S-332) corridor provides a link between Montana Highway 59 (MT-59) south of Miles City and Secondary Highway 447 (S-447) north of Ashland, Montana. S-332, locally known as "Tongue River Road", is approximately 50.4 miles in length. The corridor roughly parallels the Tongue River and traverses through level and rolling terrain that consists of mostly farm and ranch land.

The intent of this report is to identify the existing and projected roadway conditions and social, economic and environmental factors for S-332. The analysis includes an examination of the corridor utilizing technical and environmental factors such that known issues and/or areas of concern may be identified through a high-level planning analysis.

1.1. STUDY AREA

The study area for the *Tongue River Road Corridor Planning Study* includes a half-mile buffer on each side of S-332. The study area begins at the junction of MT-59 (Reference Post (RP) 0.0), approximately 11 miles south of Miles City, and ends at the junction of S-447 (RP 50.4), approximately nine miles north of Ashland. The study area boundary is shown in **Figure 1**.

S-332 is currently classified as a rural collector and is an integral part of the regional rural transportation network connecting local population and commerce to the National Highway System. The land use within the study area is predominantly for agricultural and ranch purposes. The majority of the land within the corridor is undeveloped.

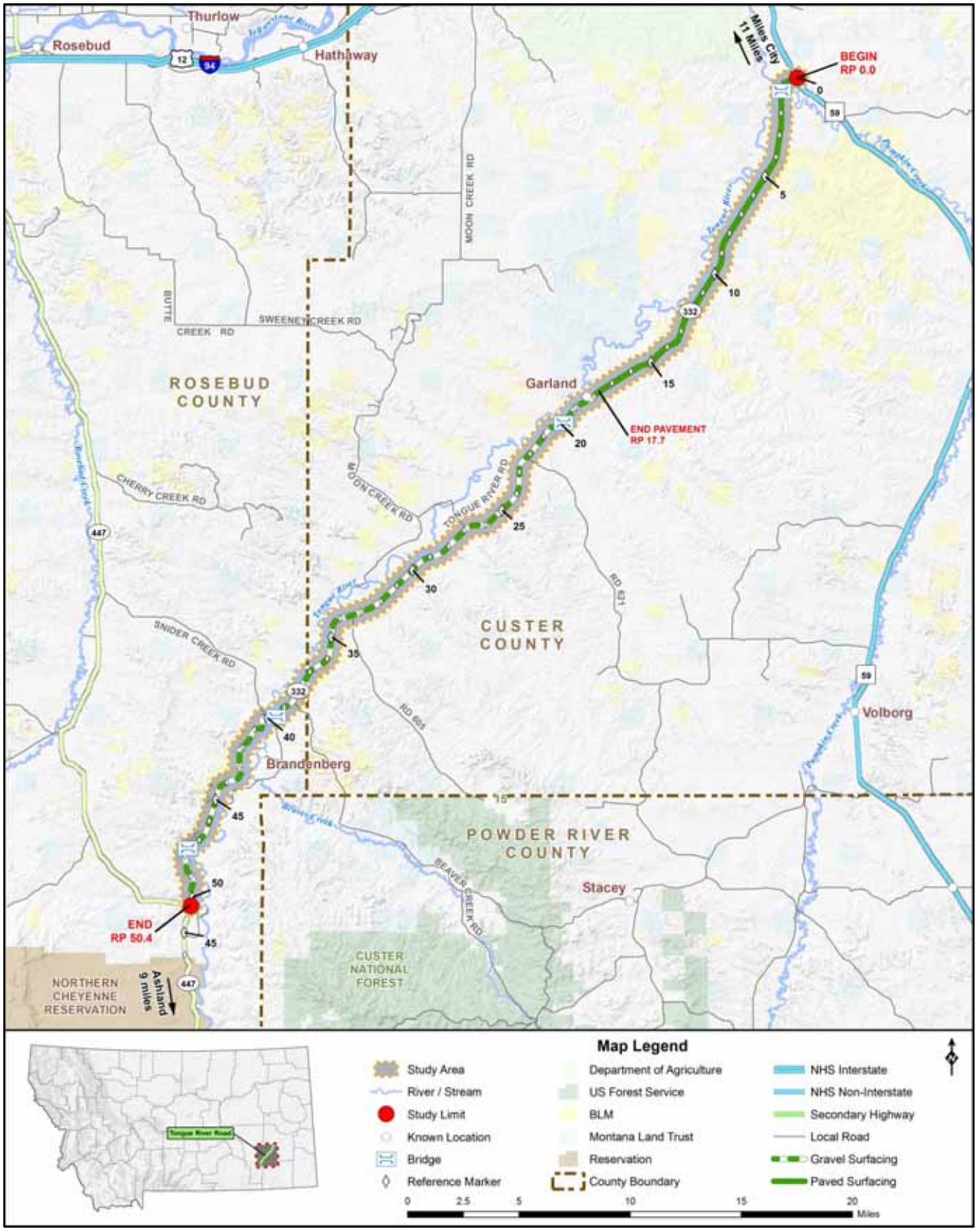


Figure 1: Study Area Boundary

2.0 DEMOGRAPHICS

There is a direct correlation between motor vehicle travel and socio-economics. Historic and recent trends in area demographics help define existing conditions and aid traffic forecasting techniques. This section provides an overview of social and economic characteristics for the region surrounding the study area.

Socio-economic data sources often lag considerably behind the current year. Also, economic data are often limited in rural counties. This analysis presents the most recent socio-economic statistics available and describes recent and potential future changes in the area.

2.1. POPULATION CHARACTERISTICS

A review of demographics within the study area is appropriate to gain an understanding of historical trends in population, age, race and ethnicity. Understanding the composition of the population is necessary, as the data may influence the types of improvements that are identified. For example, an aging population may indicate a need for specific types of transportation improvements such as transit services and/or non-motorized infrastructure improvements. Additionally, the presence of a disadvantaged population may warrant other consideration.

Over the last decade, the population growth in Custer County has remained flat with no measurable growth. In Rosebud County, the population has actually decreased by 1.6 percent. This is in contrast to the 9.7 percent growth experienced over the last decade in the State of Montana and the entire United States. According to the 2010 Census, Custer County has a population density of 3.1 persons per square mile, while Rosebud County has a density of 1.8 persons per square mile. Both of these densities are much less than the population density for the State of Montana and the United States. This population data is shown in **Table 1**.

Table 1: Population Growth & Density

Area	Population (2000)	Population (2010)	Percent Growth	Persons per Square Mile (2010)
Custer County	11,696	11,699	0.0%	3.1
Rosebud County	9,383	9,233	-1.6%	1.8
State of Montana	902,195	989,415	9.7%	6.8
United States	281,421,906	308,745,538	9.7%	87.4

Source: US Bureau of the Census, Census of the Population

Table 2 depicts the race and ethnicity characteristics in Custer County, Rosebud County, the State of Montana, and the United States during 2010. Of note is that Rosebud County has a much higher percentage of "American Indians and Alaska Natives" than Custer County and the State of Montana.

Between 1980 and 2010, the number of residents in both counties has decreased. County residents in the "less than 18 years old" and "between 18 and 64 years old" categories have decreased during the time period. The age group that has increased in both counties is the "65 and older" category. This points to the aging of the population, and follows similar trends within Montana and the United States. **Table 3** depicts the change in age composition for Custer County and Rosebud County.

Table 2: Population Race and Ethnicity Data (2010)

Area	Custer County		Rosebud County		State of Montana		United States	
Total Population	11,699		9,233		989,415		308,745,538	
White	11,174	95.5%	5,664	61.3%	884,961	89.4%	223,553,265	72.4%
Black or African American	34	0.3%	25	0.3%	4,027	0.4%	38,929,319	12.6%
American Indian and Alaska Native	196	1.7%	3,202	34.7%	62,555	6.3%	2,932,248	0.9%
Asian	37	0.3%	42	0.5%	6,253	0.6%	14,674,252	4.8%
Native Hawaiian and Other Pacific Islander	9	0.1%	3	0.0%	668	0.1%	540,013	0.2%
Some Other Race	64	0.5%	42	0.5%	5,975	0.6%	19,107,368	6.2%
Two or More Races	185	1.6%	255	2.8%	24,976	2.5%	9,009,073	2.9%
Hispanic or Latino (of any race)	263	2.2%	313	3.4%	28,565	2.9%	50,477,594	16.3%

Source: US Bureau of the Census, Census of the Population

Table 3: Age Distribution (1980 – 2010)

Year	<18		18-64		65+		Total
Custer County							
1980	3,869	29.5%	7,506	57.3%	1,734	13.2%	13,109
1990	3,334	28.5%	6,375	54.5%	1,988	17.0%	11,697
2000	2,939	25.1%	6,758	57.8%	1,999	17.1%	11,696
2010	2,657	22.7%	6,998	59.8%	2,044	17.5%	11,699
Change (1980 – 2010)	-1,212		-508		310		-1,410
Rosebud County							
1980	3,674	37.1%	5,657	57.1%	586	5.9%	9,899
1990	3,821	36.4%	5,963	56.8%	721	6.9%	10,505
2000	3,143	33.5%	5,407	57.6%	833	8.9%	9,383
2010	2,732	29.6%	5,433	58.8%	1,058	11.5%	9,233
Change (1980 – 2010)	-942		-224		472		-666

Source: US Bureau of the Census, Census of the Population

2.2. Employment and Income Characteristics

Employment by economic sector for Custer County and Rosebud County is represented in **Table 4**. The data includes the years 1970, 1980, 1990 and 2000. Of note is that for Custer County, total employment between years 1970 and 2000 increased by 1,498 jobs. More recent data shows that Custer County employment was recorded at 6,927 total jobs in year 2001 and 7,279 jobs in year 2009[1].

For Rosebud County, total employment between years 1970 and 2000 increased by 3,187 jobs. Year 2001 employment for Rosebud County was recorded at 5,831 jobs and year 2009 employment was recorded at 5,932 jobs.

[1] US Department of Commerce Bureau of Economic Analysis

Table 4: Employment Trends by Economic Sector (1970 – 2000)

Economic Sector	1970	1980	1990	2000	Change (1970 - 2000)
Custer County					
Farm	615	514	559	533	-82
Agricultural Services & Forestry	87	72	91	110	23
Mining	79	21	11	(L)	N/A
Construction	365	679	257	339	-26
Manufacturing	130	156	132	187	57
Transportation & Public Utilities	410	430	377	378	-32
Wholesale Trade	202	301	300	192	-10
Retail Trade	1,144	1,427	1,242	1,522	378
Finance, Insurance & Real Estate	310	374	343	500	190
Services	1,103	1,636	1,671	2,024	921
Federal & Civilian Government	304	479	408	264	-40
Military	95	78	90	61	-34
State & Local Government	636	921	943	861	225
Total Employment	5,480	7,088	6,424	6,978	1498
Rosebud County					
Farm	722	521	539	529	-193
Agricultural Services & Forestry	24	46	60	(D)	N/A
Mining	53	451	528	511	458
Construction	62	865	273	105	43
Manufacturing	226	155	167	(D)	N/A
Transportation & Public Utilities	(D)	(D)	897	795	N/A
Wholesale Trade	21	33	42	(D)	N/A
Retail Trade	313	583	601	665	352
Finance, Insurance & Real Estate	46	108	110	119	73
Services	(D)	(D)	986	999	N/A
Federal & Civilian Government	111	154	181	218	107
Military	46	60	137	49	3
State & Local Government	479	1,072	1,237	1,604	1125
Total Employment	2,649	5,101	5,758	5,836	3187

Source: US Department of Commerce Bureau of Economic Analysis – Table CA25.
(L) Indicates less than ten jobs, but the estimates are included in the totals.
(D) Not shown to avoid disclosure of confidential information, but the estimates for this item are included in the totals.
(N/A) Indicates change in this sector not calculated due to lack of available data.

Unemployment rates are represented in **Table 5** and are current as of January 2012. The data depicts an unemployment rate for Custer County lower than the State of Montana (4.2% versus 7.4%). For Rosebud County, the rate is higher than the State of Montana rate (8.2% versus 7.4%). All are lower, though, than the United States unemployment rate of 8.8 percent.

Table 5: Employment Statistics (2011)

Area	Total Labor Force	Employed	Unemployed	Unemployment Rate
Custer County	6,351	6,083	268	4.2%
Rosebud County	4,274	3,924	350	8.2%
State of Montana	500,189	463,045	37,144	7.4%
United States	153,485,000	139,944,000	13,541,000	8.8%

Source: MT Department of Labor and Industry, Research and Analysis Bureau – Labor Force Statistics, January 2012 (data is not seasonally adjusted).

Median household income between 1990 and 2010 is represented in **Table 6**. Custer County's year 2010 median household income of $39,469 is lower than the State of Montana's at $42,303. Rosebud County's median household income of $44,683 is higher than the State of Montana's. The median household income for both Custer County and Rosebud County is lower than the median household income for the United States, which is listed at $50,046.

Table 6: Median Household Income (1990 – 2010)

Area	1990	2000	2010	Change (1990 - 2010)
Custer County	$21,348	$31,361	$39,469	$18,121
Rosebud County	$27,192	$36,980	$44,683	$17,491
State of Montana	$23,375	$32,777	$42,303	$18,928
United States	$29,943	$41,990	$50,046	$20,103

Source: MT Department of Labor and Industry, Research and Analysis Bureau – Income Data Analysis (accessed March 2012).

2.3. Economic Development

The linkage of local economies to national and global conditions, particularly in natural resource-based rural regions like this one, can be direct and immediate. Industry and transportation changes far beyond the control of local people and governments can affect huge shifts in local investment and income. This region is a case in point.

Arch Coal is proposing a coal development that the firm estimates would add about 300 permanent jobs in coal mining in the state. The Montana Department of Transportation (MDT) estimated the economic impacts of such a development[2]. The following conclusions apply to all counties in eastern Montana.

- Otter Creek coal tracts are expected to generate $35 million more income per year in eastern Montana in the year it opens. That amount rises to $119 million per year after twenty years, in constant 2010 dollars.
- Counting the direct, indirect, and induced employment, the total employment impact is estimated at 590 in the first year, and 745 in the 20th.
- Total population increases are expected to be 222 in the first year of operations, and 1,865 by the 20th. Population growth will allow the region to capture earnings from increased spending on retail, housing, wholesale business, and direct suppliers to the area.
- Mining is the primary affected sector. Job growth in this region is also expected in the following industrial sectors: retail trade, construction, health care and social assistance, other services, and accommodations and food services. These sectors constitute over 90 percent of projected private sector employment impacts.

[2] MDT Transportation Planning, *Social and Economic Conditions*, 2012

- Job and population growth in the region would have effects on the communities that attract spending on housing and industrial activity. Community economic impacts include increased public sector demands such as children needing education, retirees needing services, etc.

Observation of recent mining developments suggests that the location of household settlement is influenced by basic family needs such as schools, shopping, services, and other jobs.

3.0 EXISTING TRANSPORTATION CONDITIONS

S-332 was initially constructed as a gravel road in the 1930's and placed on Montana's Secondary Highway System in 1945. The study corridor is functionally classified as a Rural Major Collector highway. The first approximately 17.7 miles of S-332 (RP 0.0 to RP 17.7) are paved and are maintained by MDT. The remaining portion of the corridor is maintained by the counties and has gravel surfacing.

3.1. EXISTING ROADWAY USERS

Primary users of the roadway consist of local residents, commuters between Ashland and Miles City, recreationalists, and commercial users. The study area primarily consists of ranch and farmland. Intermittent Bureau of Land Management (BLM) and Montana State Trust Land properties also exist within the study area. Noted recreational areas within the study area include the 12-Mile Dam Fishing Access Site (S-332, RP 1.0) and the Pumpkin Creek Recreational Area (S-332, RP 4.1).

3.2. TRAFFIC DATA

Historic traffic data was provided by MDT for the study area. **Table 7** shows the most recent 20 years of traffic data. The Average Annual Daily Traffic (AADT) for S-332 ranges from approximately 280 vehicles per day (vpd) on the northern end near MT-59, to 50 vpd on the southern end near the intersection with S-447.

Table 7: Average Annual Daily Traffic Data

Site	Location	1992	1993	1994	1995	1996	1997	1998	1999	2000	2001
9-2-9	RP 1.0	190	170	180	260	180	140	270	250	180	190
9-4-3	RP 11.0	140	150	90	80	80	160	180	90	110	130
9-4-4	RP 26.5	70	90	[a]	[a]	80	210	100	110	90	110
44-7-5	RP 39.5	100	100	70	90	[a]	90	40	10	[a]	[a]
44-8-4	RP 49.5	60	100	60	60	[a]	60	90	40	[a]	40

Site	Location	2002	2003	2004	2005	2006	2007	2008	2009	2010	2011
9-2-9	RP 1.0	190	290	220	[a]	220	230	220	220	280	[a]
9-4-3	RP 11.0	160	210	150	150	120	100	100	100	100	100
9-4-4	RP 26.5	100	140	100	130	90	70	70	70	70	80
44-7-5	RP 39.5	20	20	30	[a]	80	70	70	70	50	[a]
44-8-4	RP 49.5	70	30	90	[a]	60	60	60	60	50	[a]

Source: MDT Data and Statistics Bureau, Traffic Data Collection Section, 2012
[a] Data unavailable

The traffic data in **Table 7** is representative of yearly average traffic volumes. It is likely that seasonal peaks in traffic volumes occur due to recreational and agricultural use in the area. Vehicles traveling along the corridor currently do not experience vehicle delay or congestion. Trucks and agricultural equipment are common throughout the study area.

3.3. Right-of-Way and Jurisdiction

The existing road is predominately located adjacent to private property, with intermittent BLM and Montana State Land Trust lands. Exact right-of-way widths are unknown for the corridor. During the field review it was noted that right-of-way widths appear to be wider along the northern portion of S-332. Along the southern portion in Rosebud County, right-of-way widths appear to generally decrease.

Of particular concern would be between approximately RP 40.0 to RP 41.0 where multiple horizontal curves do not meet current standards. Pivot irrigation facilities currently exist adjacent to the substandard horizontal curves. Changes to the horizontal alignment may result in impacts to the existing pivot irrigation systems.

3.4. Crash Analysis

The MDT Traffic and Safety Bureau provided ten years of crash data for S-332 between January 1, 2001 and December 31, 2010. There were a total of 18 crashes reported along S-332 for the ten-year crash analysis period. One fatality, zero incapacitating injuries, two non-incapacitating injuries, and four other injuries resulted from the 18 reported crashes. An incapacitating injury is defined as an injury, other than a fatality, which prevents the injured person from walking, driving, or normally continuing the activities they were capable of performing before the injury.

All 18 reported crashes were single-vehicle crashes. Alcohol was listed as a contributing circumstance in two crashes. Six crashes involved either a wild or domestic animal. The majority of crashes involved driver error, either driving too fast for conditions or careless driving. There are no identifiable crash clusters during the analysis period.

A comparison of the crashes along S-332 to the statewide crashes along rural secondary highways was made based on crash rate, crash severity index, and crash severity rate. Crash rates are defined as the number of crashes per million vehicle miles of travel. For S-332, the crash rate is 0.86 crashes per million vehicle miles travelled between 2001 and 2010. By comparison, the statewide crash rate for a rural secondary highway is 1.40 crashes per million vehicle miles.

The crash severity index is the ratio of the sum of the level of crash degree to the total number of crashes. A crash severity index of 1.94 was calculated for S-332 versus the statewide rural secondary highway crash severity index of 2.25.

Crash severity rate is determined by multiplying the crash rate by the crash severity index. S-332 has a crash severity rate of 1.67; the statewide rural secondary rate is 3.17. **Table 8** shows the crash data metrics compared to the statewide rural secondary highway rates. A percent difference between the statewide and S-332 rates was calculated for comparison purposes. All three crash metrics are below statewide rates for similar roads.

Table 8: Crash Data Analysis

Crash Data	Crash Rate	Crash Severity Index	Crash Severity Rate
S-332 [(a)]	0.86	1.94	1.67
Statewide Secondary – Rural [(b)]	1.40	2.25	3.17
Percent Difference	-38.6%	-13.8%	-47.3%

Source: MDT Traffic and Safety Bureau, 2012
[(a)] Based on crashes occurring between 2001 and 2010
[(b)] Provided by MDT Traffic – Safety Management, 2011

3.5. Design Standards

The MDT *Road Design Manual* specifies general design principles and controls which determine the overall operational characteristics of the roadway and enhance the aesthetic appearance of the roadway. The geometric design criteria for the study corridor are based on the current MDT design criteria for a "Rural Collector Secondary Highway". The function of collector routes is to provide for both access and mobility. Rural collectors serve regional needs and provide connections to the arterial system. **Table 9** lists the current design standards for rural collectors according to MDT design criteria.

The design speed for a rural collector roadway ranges between 45 mph and 60 mph depending on terrain. MDT's *Road Design Manual* contains the following definitions for each terrain type:

- Level Terrain – The available stopping sight distances are generally long or can be made to be so without construction difficulty or major expense.
- Rolling Terrain – The natural slopes consistently fall below and rise above the roadway and occasional steep slopes offer some restriction to horizontal and vertical alignment.
- Mountainous Terrain – Longitudinal and traverse changes in elevation are abrupt and extensive grading is frequently needed to obtain acceptable alignments.

Based on these definitions, the majority of the study area appears to be level terrain (60 mph design speed) with some areas of rolling terrain (50 mph design speed). A determination of terrain type (i.e. level or rolling) has not been made for the study corridor, however. For the purposes of this study, areas that do not meet MDT's minimum design standards for level terrain were considered "areas of concern".

It is important to note there is a difference between a facility's design speed and its operating speed. The design speed is a selected speed used to determine the various geometric design features of the roadway. The operating speed is the highest overall speed at which a driver can travel on a given section of roadway under favorable weather conditions and under prevailing traffic conditions without at any time exceeding the safe speed as determined by the design speed. Posting of speed limits is typically accomplished by measuring the speeds at which 85 percent of the drivers are travelling at or below, and signing for that speed within 5 mph of the result. This is typically referred to as the 85th percentile speed.

Table 9: Geometric Design Criteria

Design Element			Design Criteria				
Design Controls	Design Forecast Year (Geometrics)		20 Years				
	Design Speed [a]	Level	60 mph				
		Rolling	50 mph				
		Mountainous	45 mph				
	Level of Service		Desirable: B Minimum: C				
Roadway Elements	TRAFFIC	Current AADT	0-299	300-999	1000-1999	2000-3000	> 3000
		DHV	50-99	100-199	200-299	300-400	>400
	Roadway Width (Travel Lanes & Shoulders) [a]		24'	28'	32'	36'	40'
	Cross Slope	Travel Lane [a]	2%				
		Shoulder	2%				
	Median Width		Varies				
Earth Cut Sections	Ditch	Inslope	DHV ≥ 200 - 6:1 (Width: 10') DHV < 200 - 4:1 (Width: 6')				
		Width	10' Min.				
		Slope	20:1 towards back slope				
	Back Slope; Cut Depth at Slope Stake	0' - 5'	5:1				
		5' - 10'	Level/Rolling: 4:1; Mountainous: 3:1				
		10' - 15'	Level/Rolling: 3:1; Mountainous: 2:1				
		15' - 20'	Level/Rolling: 2:1; Mountainous: 1.5:1				
		> 20'	1.5:1				
Earth Fill Slopes	Fill Height at Slope Stake	0' - 10'	DHV ≥ 200 - 6:1 DHV < 200 - 4:1				
		10' - 20'	DHV ≥ 200 - 4:1 DHV < 200 - 3:1				
		20' - 30'	3:1				
		> 30'	2:1				
Alignment Elements	DESIGN SPEED		45 mph	50 mph	60 mph		
	Stopping Sight Distance [a]		360'	425	570'		
	Passing Sight Distance		1625'	1835	2135'		
	Minimum Radius (e=8.0%) [a]		590'	760	1200'		
	Superelevation Rate [a]		e_{max} = 8.0%				
	Vertical Curvature (K-value) [a]	Crest	61	84	151		
		Sag	79	96	136		
	Maximum Grade [a]	Level	5%				
		Rolling	7%				
		Mountainous	10%				
	Minimum Vertical Clearance [a]		16.5				

Source: MDT Road Design Manual, Chapter 12, Figure 12-5, "Geometric Design Criteria for Rural Collector Roads (Secondary System)", 2008
[a] Controlling design criteria (see Section 8.8 of the MDT Road Design Manual)

3.1. Roadway Geometrics

Existing roadway geometrics were evaluated and compared to current MDT standards. The analysis was conducted based on a review of public information, MDT as-built drawings, Geographic Information Systems (GIS) data, and field observations. As-built drawings were not available for the entire length of the study corridor. As such, a field review of the study corridor was conducted in March 2012 to confirm and supplement information contained in as-built drawings as well as to identify additional areas of concern within the study area. **Appendix A**

provides a log of photos taken during the field review. **Appendix B** contains summary tables of data from available as-builts.

3.1.1. Horizontal Alignment

Elements comprising horizontal alignment include curvature, superelevation (i.e. the "bank" on the road), and sight distance. These horizontal alignment elements influence traffic operation and safety and are directly related to the design speed of the corridor. MDT's standards for horizontal curves are defined in terms of curve radius and vary based on design speed. For a 60 mph design speed (level terrain) the maximum recommended radius is 1,200 feet. The maximum recommended radius for a 50 mph design speed (rolling terrain) is 760 feet.

Horizontal curve radius was determined based either on as-built drawings, or for areas where as-built drawings were unavailable, estimates were made based on field review and aerial photography. Seven horizontal curves were identified that do not meet current MDT standards based on level terrain standards. **Table 10** provides a summary of the seven substandard horizontal curves.

Table 10: Substandard Horizontal Curves (Based on Level Terrain Standards)

RP	Element	Value (ft)
39.52	Radius	955
40.23	Radius	350 [(a)]
40.66	Radius	300 [(a)]
40.98	Radius	350 [(a)]
42.21	Radius	500 [(a)]
42.97	Radius	500 [(a)]
44.37	Radius	1,000 [(a)]

[(a)] Estimated based on field review and aerial photography.

3.1.2. Vertical Alignment

Vertical alignment is a measure of elevation change of a roadway. The length and steepness of grades directly affects the operational characteristics of the roadway. The MDT *Road Design Manual* lists recommendations for vertical alignment elements such as grade, rate of vertical curvature (K-value), and stopping sight distance. Recommendations are made based on roadway classification and terrain type.

According to the *Road Design Manual*, the maximum allowable grades are 5 percent for level terrain and 7 percent for rolling terrain. For vertical curves, stopping sight distance and K-values are controlling design criteria. K-values are defined as a function of the length of the curve compared to the algebraic change in grade which comprises either a sag or a crest vertical curve. **Table 11** provides a list of substandard vertical alignment areas based on level terrain standards.

Table 11: Substandard Vertical Alignment Areas (Based on Level Terrain Standards)

RP	Element	Value
3.06	Vertical Curvature	137.3
	Stopping Sight Distance	544.3'
3.20	Vertical Curvature	95.2
3.42	Vertical Curvature	150.9
3.42 - 3.66	Grade	-5.01%
3.66	Vertical Curvature	87.1
3.66 - 3.97	Grade	6.47%
17.82	Vertical Curvature	51.9
	Stopping Sight Distance	334.8'
17.82 - 17.97	Grade	5.93%
17.97	Vertical Curvature	69.4
18.84	Vertical Curvature	140.4
20.28	Vertical Curvature	99.5
23.86	Vertical Curvature	109.3
24.01	Vertical Curvature	117.6
	Stopping Sight Distance	503.9'
24.50	Vertical Curvature	67.6
	Stopping Sight Distance	381.9'
24.73	Vertical Curvature	67.8
24.40	Vertical Curvature	89.6
	Stopping Sight Distance	441.7'
25.53	Vertical Curvature	129.0
	Stopping Sight Distance	548.1'
25.89	Vertical Curvature	53.5
	Stopping Sight Distance	339.9'
26.04	Vertical Curvature	83.3
26.53	Vertical Curvature	125.0
	Stopping Sight Distance	519.4'
26.53 - 26.72	Grade	-6.96%
26.72	Vertical Curvature	54.3
27.09	Vertical Curvature	95.4
	Stopping Sight Distance	457.4'
27.27	Vertical Curvature	96.9
27.95	Vertical Curvature	122.0

RP	Element	Value
28.05	Vertical Curvature	61.6
	Stopping Sight Distance	364.7'
28.05 - 28.16	Grade	-5.13%
28.16	Vertical Curvature	56.1
28.26	Vertical Curvature	75.6
	Stopping Sight Distance	404.0'
28.58	Vertical Curvature	79.7
28.78	Vertical Curvature	100.3
29.03	Vertical Curvature	106.1
	Stopping Sight Distance	478.5'
29.24	Vertical Curvature	100.0
29.60	Vertical Curvature	90.9
31.54 - 31.76	Grade	-5.99%
31.76	Vertical Curvature	115.1
31.96 - 32.41	Grade	5.76%
32.41	Vertical Curvature	144.2
	Stopping Sight Distance	557.9'
33.76	Vertical Curvature	91.4
38.77	Vertical Curvature	117.5
39.35	Vertical Curvature	134.5
41.44	Stopping Sight Distance [(a)]	< 570'
41.56	Stopping Sight Distance [(a)]	< 570'
42.07	Stopping Sight Distance [(a)]	< 570'
42.45	Stopping Sight Distance [(a)]	< 570'
43.04	Stopping Sight Distance [(a)]	< 570'
43.27	Stopping Sight Distance [(a)]	< 570'
43.36	Stopping Sight Distance [(a)]	< 570'
45.46 - 45.69	Grade [(a)]	> 7.00%
46.46	Stopping Sight Distance [(a)]	< 570'
48.48	Stopping Sight Distance [(a)]	< 570'
49.69	Stopping Sight Distance [(a)]	< 570'
49.84	Stopping Sight Distance [(a)]	< 570'
50.03	Stopping Sight Distance [(a)]	< 570'
50.17 - 50.27	Grade [(a)]	> 7.00%

[(a)] *Estimated based on field review.*

3.1.3. Roadside Clear Zone

The roadside clear zone, starting at the edge of the traveled way, is the total roadside border area available for safe use by errant vehicles. This area may consist of a shoulder, a recoverable slope, a non-recoverable slope, and/or recovery area. The desired clear zone width varies depending on traffic volumes, speeds, and roadside geometry. Clear zones are evaluated individually based on the roadside cross section. According to MDT, clear zone should be attained by removing or shielding obstacles if costs are reasonable.

In certain instances within the study area, it may be impractical to protect or remove certain obstacles within the clear zone. As improvement options develop, roadside clear zones should be designated, to a practical extent, to meet current MDT design standards.

A list of roadside clear zone areas of concern was developed based on information obtained during field reviews. Features looked at during the field reviews were sight distances, side slopes, and roadside hazards. A table of roadside clear zone observations is presented in **Table 12**.

Table 12: Roadside Clear Zone Areas of Concern

RP	Comments
3.74	Slide Area
4.20	Slide Area
4.45	Slide Area
4.65	Slide Area
4.90	Steep Fill Slope
5.10	Steep Fill Slope
22.00	Steep Fill Slope
23.80	Steep Fill Slope
24.10	Steep Fill Slope
24.70	Steep Fill Slope
26.22	Slide Area
26.70	Steep Fill Slope
27.90	Slide Area
31.30	Steep Fill Slope
31.70	Steep Fill Slope
36.30	Slide Area
36.60	Steep Fill Slope
37.50	Steep Fill Slope
39.00	Steep Fill Slope
43.30	Steep Fill Slope
48.10	Steep Fill Slope
50.40	S-332 / S-447 Intersection

[a] *Estimated based on field review.*

Example of slide area - note abrupt pavement edge

Example of steep fill slope

3.2. Roadway Surfacing

Existing roadway surfacing characteristics were determined from MDT's 2011 *Montana Road Log* and on-site field review. The *Road Log* contains information for surface width, lane width, shoulder width, surfacing thickness, and base thickness. This information was supplemented through field data collection efforts. **Table 13** shows the existing roadway width and surfacing type.

The MDT *Road Design Manual* requires a minimum travel lane width of 12 feet. A surface width of 24 feet is recommended for a rural collector road with an AADT less than 300 vpd. For a rural collector road with an AADT between 300 vpd and 999 vpd, a minimum surface width of 28 feet is recommended. Note that the MDT Road Width Committee would ultimately determine the appropriate width during future project development.

S-332 is currently paved from RP 0.00 to RP 17.7; gravel surfacing exists from RP 17.7 to RP 50.4. Based on the road widths identified in the *Road Log* and current traffic volumes, S-332 currently meets minimum road width standards as defined by the *Road Design Manual*.

Table 13: Existing Roadway Surfacing

Begin RP	End RP	Lanes	Width			Surfacing
			Surface	Lane	Shoulder	
0.0	5.7	2	26	12	1	Asphalt
5.7	12.2	2	32	12	4	Asphalt
12.2	17.7	2	24	12	0	Asphalt
17.7	20.0	2	28	10	4	Gravel
39.6	41.0	2	32	12	4	Gravel
41.0	44.7	2	26	9	4	Gravel
44.7	50.4	2	28	10	4	Gravel

Source: MDT Road Log, 2011

3.3. Access Points

Access points were identified through a review of available GIS data and aerial photography. Based on this review, there are approximately 147 access points along S-332. The vast majority of the access points are private / farm field approaches. There are a total of 10 public approaches within the study area.

The angle of approach is the angle at which the approaching road intersects the major road. Desirably, approaching roadways should intersect at or as close to 90° as practical. Intersection skews greater than 30° from perpendicular are undesirable as the driver's line of sight for one of the sight triangles becomes restricted. Accordingly, based on MDT standards[3], the approach angle should be between 60° and 120°. **Table 14** provides a summary of access points grouped in incremental segments along the study area. The number of public approaches and approaches with substandard angles are noted.

Table 14: Access Points

Begin RP	End RP	Length (mi)	Access Points	Density (Access / mi)	< 60° Angle	Public Approach		Comments
						Access Points	< 60° Angle	
0.0	6.0	6.0	27	4.5	1	3	0	
6.0	12.0	6.0	26	4.3	1	0	0	
12.0	17.7	5.7	15	2.6	0	0	0	End of Pavement
17.7	24.0	6.3	20	3.2	3	1	1	
24.0	31.0	7.0	7	1.0	0	1	0	
31.0	37.2	6.2	20	3.2	2	1	0	County Boundary
37.2	44.0	6.8	21	3.1	5	3	2	
44.0	50.4	6.4	11	1.7	0	1	0	End of S-332
Total		**50.4**	**147**	**2.9**	**12**	**10**	**3**	

[3] Montana Department of Transportation, *Approach Standards for Montana Highways*, 1983

3.4. HYDRAULICS

3.4.1. Slides

2011 was a historic year for flooding in eastern Montana. Due to severe flooding, a number of slides occurred along S-332. Evidence of recent slides was noted at the following approximate locations along S-332 during the field review:

- RP 3.26
- RP 3.74
- RP 4.20
- RP 4.45
- RP 4.65
- RP 26.22
- RP 27.90
- RP 36.30
- RP 43.50

The majority of the identified slide locations received minor repair work intended as temporary mitigation. Evidence of continued subsurface failure was noted at some of these locations.

3.4.2. Bridges

Four bridge crossings are located within the study area. All four have recent inspection reports available listing review parameters for the bridges, including weight limits (see **Appendix C**). **Table 15** shows the location, date of most recent inspection, type, size, year constructed (or reconstructed), and waterbody crossed. **Table 16** depicts both the operating and inventory rating load for each of the structures, correlated to different truck sizes. The operating rating is the capacity rating that defines the absolute maximum permissible load level to which the structure may be subjected for the vehicle type used in the rating. It represents the total mass of the entire vehicle measured in metric tons (mton). The inventory rating is the capacity rating that defines the load level which can safely utilize an existing structure for an indefinite period of time. The three rating vehicles include Type 3 (single truck), Type 3-S3 (semi-truck and trailer) and Type 3-3 (truck and "pup"). Design loads are expressed in metric tons (mton), while ratings are expressed in tons, which is more common for posting.

Table 15: Bridge Locations and Type

Number	RP	Date of Last Inspection	Type of Bridge (Dimensions)	Year Constructed (Reconstructed)	Waterbody Traversed
S00332000+09001	1.02	4/13/2011	3-span concrete structure (27.17' wide x 139.21' long)	1959 (1973)	Pumpkin Creek
S00332019+08751	19.87	10/19/2010	2-span wood structure (26.02' wide x 38.00' long)	1953 (N/A)	Foster Creek
S00332039+06161	39.61	7/28/2010	4-span concrete structure (27.17' wide x 215.49' long)	1963 (N/A)	Tongue River
S00332047+08001	47.80	10/19/2010	1-span concrete structure (28.48' wide x 24.02' long)	1986 (N/A)	Roe and Cooper Creek

Source: MDT Bridge Management System, 2012

Table 16: Bridge Operating and Inventory Design Loads and Ratings

Rating / Truck Type	Bridge at RP 1.02	Bridge at RP 19.87	Bridge at RP 39.61	Bridge at RP 47.80
Operating Load (Design)	**(36.2 mton)**	**(35.2 mton)**	**(28.1 mton)**	**(32.6 mton)**
Truck 1 Type 3 Rating	*35 ton*	*32 ton*	*(a)*	*(a)*
Truck 2 Type 3-S3 Rating	*57 ton*	*50 ton*	*(a)*	*(a)*
Truck 3 Type 3-3 Rating	*71 ton*	*62 ton*	*51 ton*	*40 ton*
Inventory Load (Design)	**(24.4 mton)**	**(25.1 mton)**	**(24.4 mton)**	**(32.6 mton)**
Truck 1 Type 3 Rating	*(a)*	*23 ton*	*(a)*	*(a)*
Truck 2 Type 3-S3 Rating	*(a)*	*36 ton*	*(a)*	*(a)*
Truck 3 Type 3-3 Rating	*(a)*	*44 ton*	*(a)*	*(a)*

Source: MDT Bridge Management System, 2012
(a) Data unavailable

An important consideration in the evaluation of roadway bridge structures is its sufficiency rating. The sufficiency rating formula is a method of evaluating highway bridge data to obtain a numeric value indicating the sufficiency of the bridge to remain in service. The result of this method is the percentage in which 100 is an entirely sufficient bridge and 0 is an entirely deficient bridge. Structures with a sufficiency rating of 0 to 49.9 are eligible for replacement, and structures at 50 to 80 are eligible for rehabilitation unless otherwise approved by the Federal Highway Administration (FHWA). In order to receive funding through the Highway Bridge Replacement and Rehabilitation Program, structures must be "Structurally Deficient" or "Functionally Obsolete", and have a sufficiency rating of 80 or below.

Bridges are considered structurally deficient if significant load carrying elements are found to be in poor condition due to deterioration or the adequacy of the waterway opening provided by the bridge is determined to be extremely insufficient to point of causing intolerable traffic interruptions. The fact that a bridge is classified under the federal definition as "structurally deficient" does not imply that it is unsafe. A structurally deficient bridge, when left open to traffic, typically requires significant maintenance and repair to remain in service and eventual rehabilitation or replacement to address deficiencies. To remain in service, structurally deficient bridges are often posted with weight limits to restrict the gross weight of vehicles using the bridges to less than the maximum weight typically allowed by statute.

A functionally obsolete bridge is one that was built to standards that are not used today. These bridges are not automatically rated as structurally deficient, nor are they inherently unsafe. Functionally obsolete bridges are those that do not have adequate lane widths, shoulder widths, or vertical clearances to serve current traffic demand, or those that may be occasionally flooded. The following criteria determine whether or not a structure is deemed structurally deficient or functionally obsolete:

Structurally Deficient:

A condition of 4 or less for any of the following:

- Deck Rating
- Superstructure Rating
- Substructure Rating

Or, an appraisal of 2 or less for the following:

- Structure Rating
- Waterway Adequacy

Functionally Obsolete:

An appraisal of 3 or less for the following:

- Deck Geometry
- Under Clearance
- Approach Roadway Alignment

Or, an appraisal of 3 for the following:

- Structure Rating
- Waterway Adequacy

All four bridges within the study area were determined to be not structurally deficient and not functionally obsolete at the present time. The design loadings meet current MDT standards[4]. **Table 17** shows the sufficiency ratings of the four bridge crossings. For the "Under Clearance" criteria, a notation of "N" means that the structure does not pass over a highway or railroad and is not relevant to the functionally obsolete sufficiency rating criteria.

Table 17: Bridge Sufficiency Rating

Criteria		Bridge at RP 1.02	Bridge at RP 19.87	Bridge at RP 39.61	Bridge at RP 47.80
Structurally Deficiency Sufficiency Rating					
Deck Rating	≤ 4	7	6	7	6
Superstructure Rating	≤ 4	5	6	8	7
Substructure Rating	≤ 4	7	6	7	6
Structure Rating	≤ 2	5	6	6	6
Waterway Adequacy	≤ 2	8	8	8	8
Functionally Obsolete Sufficiency Rating					
Structure Rating	3	5	6	6	6
Deck Geometry	≤ 3	5	5	6	7
Under Clearance	≤ 3	N	N	N	N
Waterway Adequacy	3	8	8	8	8
Approach Roadway Alignment	≤ 3	8	8	6	6
Design Loading		3 MS 13.5 (HS 15)	2 M 13.5 (H 15)	3 MS 13.5 (HS 15)	5 MS 18 (HS 20)
Sufficiency Rating		68	90.1	91.3	97.7
Structure Status		**Not Deficient**	**Not Deficient**	**Not Deficient**	**Not Deficient**

Source: MDT Bridge Management System, 2012

3.5. Other Transportation Modes

Frank Wiley Field Airport is located in Miles City and serves an average of 31 aircraft per day. Service consists of transient general aviation (43%), local general aviation (29%), and air taxi (29%). The St. Labre Mission Airport, located in Ashland, serves an average of 50 aircraft per month. Transient general aviation consists of 83% of aircraft operations, with the remaining 17% categorized as air taxi.[5]

[4] Montana Department of Transportation, *Bridge Design Standards*
[5] AirNav, LLC., 2012, www.airnav.com

Some minor freight activity currently occurs within the study area. Most notably, freight trucks associated with agriculture and farming, as well as some mining trucks, currently use S-332. Horse and buggy were also noted means of transportation near the Amish community just south of S-332. There are currently no rail lines or transit services within the study area.

3.6. Utilities

Electric power is provided by the Tongue River Electric Cooperative. Overhead power lines are present intermittently within the study area. Range Telephone Cooperative provides telecommunications services to the area. Williston Basin Interstate Pipeline Company controls a natural gas line that is located within the study area. Water and sewer service is provided to individuals by wells and septic tanks, respectively.

4.0 PROJECTED TRANSPORTATION CONDITIONS

Projected transportation conditions were analyzed to estimate how traffic volumes and characteristics of the corridor may change compared to existing conditions. The analysis was based on known existing conditions and projected out 20 years to the year 2032.

4.1. Traffic Growth Rates

Historic traffic data was analyzed to determine traffic growth patterns along S-332. Average annual growth rates were calculated at each traffic count location during multiple time periods. Weighted average annual growth rates were calculated based on 2010 AADT. The weighted average annual growth rates provide a representative picture of traffic growth within the study area.

Traffic volumes have fluctuated throughout the study area and have resulted in both positive and negative growth rates as shown in **Table 18**. For the purposes of projecting traffic growth, a weighted average annual growth rate of 0.24% was calculated based on the most recent 20 years of traffic data. This growth rate was used to forecast ambient background traffic growth for S-332. Ambient background traffic growth accounts for general growth characteristics such as population growth, general economic expansion, and increased recreational activities.

Table 18: Average Annual Growth Rate

Site	Location	2010 AADT	Average Annual Growth Rate			
			1992 - 2011	1992 - 1999	2000 - 2011	2005 - 2011
9-2-9	RP 1.0	280	1.57%	3.77%	2.55%	4.48%
9-4-3	RP 11.0	100	-0.41%	-0.54%	-4.06%	-5.49%
9-4-4	RP 26.5	70	-1.49%	7.47%	-4.36%	-6.76%
44-7-5	RP 39.5	50	-2.07%	-21.67%	17.64%	-8.97%
44-8-4	RP 49.5	50	-1.15%	-3.87%	2.00%	-3.58%
Average		**110**	**0.24%**	**0.45%**	**1.79%**	**-0.72%**

[a] *MDT Data and Statistics Bureau, Traffic Data Collection Section, 2012*

4.2. Future Development

The southeastern region of Montana contains considerable mineral deposits with existing and projected mining developments. The most prevalent mining activity near the corridor is coal mining. Existing coal mines operate in the region, and the Tongue River Road is currently used to transport some coal by semi-truck. Most influential in terms of transporting coal within the area is the potential Otter Creek coal tracts development, located approximately 10 miles southeast of Ashland. The State of Montana awarded a bid to lease the Otter Creek coal

tracts to Ark Land Company, a subsidiary of Arch Coal of St. Louis Missouri, on March 18, 2010. Coupled with the Otter Creek coal tracts are additional tracts owned by Great Northern Properties. These additional tracts create a checkerboard land pattern with the State land. Great Northern Properties have also agreed to lease their tracts to Arch Coal for development. All told, the potential exists for 40 years of coal mining at the location with an estimated production of 10 million tons per year[6].

4.2.1. Mine Traffic Generation

It is anticipated that additional traffic would be generated by the Otter Creek coal tracts due to employees, general services, deliveries, and various other factors. In order to estimate trip generation from the coal tracts, data from the Absaloka Mine in Sarpy Creek, MT was looked at to approximate the amount of local traffic generated by a representative coal mine. The Absaloka Mine is accessed by Sarpy Basin Road, which intersects Secondary Highway 384 (S-384).

For the Absaloka Mine comparative analysis, it was assumed that traffic generated by the mine would come from Hardin, MT which is located west of Sarpy Basin Road. Traffic volumes along S-384 west of Sarpy Basin Road were assumed to include traffic generated by the mine in addition to local traffic. Traffic volumes along S-384 east of Sarpy Basin Road were assumed to include local traffic only. The difference in traffic volumes between the two locations along S-384 (i.e. east and west of Sarpy Basin Road) was assumed to account for the estimated traffic generated by the Absaloka Mine.

An estimate of trips generated per million tons of coal by the Absaloka Mine was then calculated based on historic coal production rates[7]. The traffic data and coal production rates were averaged for the most recent five years of available data to account for yearly variations. As shown in **Table 19**, the average trip generation rate for the Absaloka Mine was estimated to be 50.0 vehicles per million tons of coal. Based on these values, it is estimated that the Otter Creek coal tracts could generate approximately 500 general trips per day.

Table 19: Estimated Traffic Generated by Absaloka Mine

Site	Location			2003	2004	2006	2008	2009	Average
2-2-4 [(a)]	S-384	RP 23	NE of Sarpy Basin Rd	70	90	150	140	150	120
2-2-3 [(a)]	S-384	RP 24	1.5 mi W of Sarpy Basin Rd	200	220	440	430	720	402
Net Difference in AADT				130	130	290	290	570	282
Absaloka Mine Production - Million Tons of Coal [(b)]				5.975	6.474	6.807	6.391	4.738	6.077
Vehicles per Million Tons of Coal				21.8	20.1	42.6	45.4	120.3	50.0

[(a)] *MDT Data and Statistics Bureau, Traffic Data Collection Section, 2012*
[(b)] *Absaloka mine production from Coal Driver, http://coaldiver.org/mine/ABSALOKA-MINE*

4.2.2. Tongue River Railroad

Portions of the Tongue River Railroad (TRR) have been proposed for construction since 1983. There are three distinct segments that have been planned and approved over the past three decades by the U.S. Surface Transportation Board (STB) and its predecessor, the Interstate Commerce Commission. The first segment was approved in 1985 and connects Ashland to Miles City with an approximately 85 mile long new rail line. In 1991, the second segment was planned, and in 1996 approved, that connects Ashland with Decker to the south, resulting in approximately 41 miles of new track. Lastly, a third request for new rail was made in 1997 that modified the southern end of the second segment. Commonly referred to as the western alignment, it was approved in 2007.

[6] Norwest Corporation, *Otter Creek Property Summary Report – Volume I*, 2006
[7] Coal Diver, *Absaloka Mine*, 2012, http://coaldiver.org/mine/ABSALOKA-MINE

In June of 2012, however, the STB ruled that the TRR must reapply for a permit to carry coal from the Otter Creek coal tracts southeast of Ashland via a new rail line. This ruling was made in part because the Ninth Circuit U.S. Court of Appeals ruled in December of 2011 that the TRR's environmental impact statement was insufficient, and that due to the changes in the TRR's proposals, a new environmental impact statement and corresponding permit would be necessary. Refer to **Figure 2** for a graphical representation of the various segments.

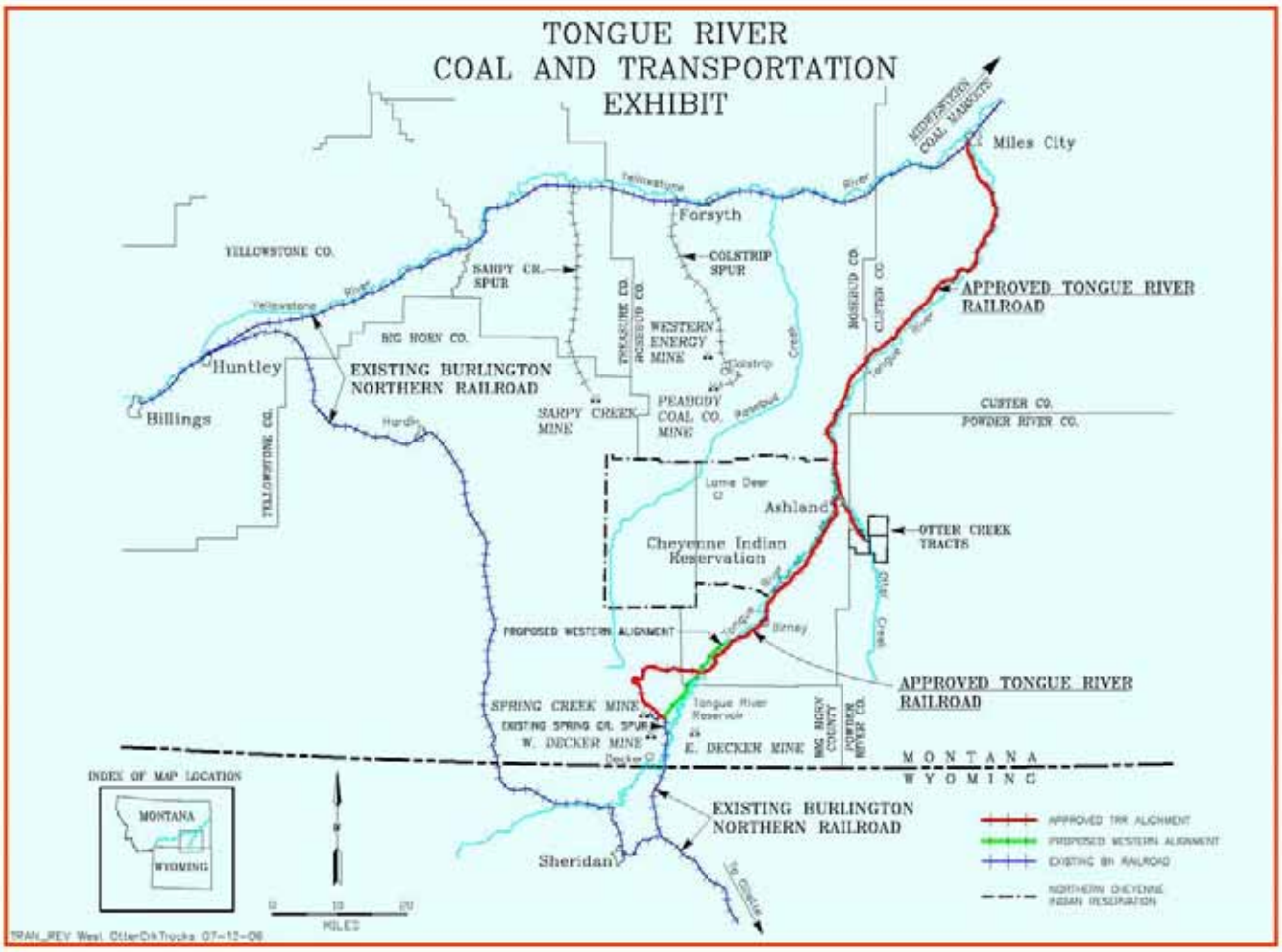


Figure 2: Tongue River Railroad Segments

Source: Montana DNRC Website, http://dnrc.mt.gov/Trust/MMB/OtterCreek/6TongueRiverRailroad/TRRCMapRailandOCTracts.pdf

4.2.3. Truck Traffic

The *Otter Creek Property Summary Report* contains data pertinent to the combined coal mining operations of the Otter Creek coal tracts and the Great Northern Properties tracts. Relative to conventional truck transportation, the report identifies certain parameters to arrive at a theoretical trucking scenario. It was estimated that 10 million tons per year of coal transported solely by trucks would result in the potential for 30 loaded trucks per hour. This is based on an assumed work schedule of 350 working days per year and 24 hours per day. The report goes on to state that this is the equivalent to one loaded truck every two minutes. In addition, an empty truck would pass by in the opposite direction every two minutes. In all, a total of 1,440 truck trips per day would be needed to haul the estimated coal production.

4.3. Future Traffic Projections

Since it is unknown what the future holds for development in the area, multiple growth scenarios were looked at relative to the Otter Creek coal tracts:

- **Baseline Traffic** accounts for existing traffic along S-332 projected out to the year 2032. As discussed previously, an average annual growth rate of 0.24 percent was used to forecast ambient background traffic.

- **Scenario 1: Base Traffic Generation** assumes that 100 percent of the base traffic generation resulting from the Otter Creek coal tracts discussed previously would utilize S-332 (i.e. 500 vpd). The base traffic generation is in addition to the baseline traffic forecasts. This scenario also assumes that the proposed Tongue River Railroad would be constructed and that coal produced from the Otter Creek coal tracts would be shipped by rail.

- **Scenario 2: Base Traffic Generation + Mining Truck Traffic** assumes that all coal produced from the Otter Creek coal tracts would be shipped via trucks along S-332. In addition, baseline traffic forecasts and base traffic generation from the mine were included.

- **Scenario 3: Base Traffic Generation + Percent Mining Truck Distribution** assumes that coal produced from the Otter Creek coal tracts would be shipped to both Colstrip and Miles City by trucks. Under this scenario, 25 percent of the truck traffic was applied to S-332. The remaining truck traffic would travel to Colstrip under this scenario. In addition, baseline traffic forecasts and base traffic generation from the mine were included.

Table 20 shows the future projected traffic values for the year 2032 under the previously discussed scenarios. Of note is that average future traffic projections range between 116 vpd to 2,056 vpd for S-332.

Table 20: Future Projected Traffic Data – Year 2032

Site	Location	Existing - 2010	Baseline	Scenario 1	Scenario 2	Scenario 3
9-2-9	RP 1.0	280	295	795	2,235	1,155
9-4-3	RP 11.0	100	105	605	2,045	965
9-4-4	RP 26.5	70	74	574	2,014	934
44-7-5	RP 39.5	50	53	553	1,993	913
44-8-4	RP 49.5	50	53	553	1,993	913
Average		**110**	**116**	**616**	**2,056**	**976**

[a] Baseline projection was based on an average annual growth rate of 0.24%.

5.0 ENVIRONMENTAL SETTING

This section provides a summary of the *Environmental Scan* developed by MDT[8]. The primary objective of the *Environmental Scan* is to determine the potential constraints and opportunities within the study area boundary. As a planning level scan, the information is obtained from various reports, websites and other documentation. This scan is not a detailed environmental investigation. Refer to the MDT *Environmental Scan* for more detailed information.

[8] MDT Environmental, *Environmental Scan – Tongue River Road*, 2012

5.1. Physical Resources

5.1.1. Land Ownership

GIS-based information was reviewed to assess the amount of public versus privately owned land in the study area. The land within the study area is predominantly agricultural and ranch land. Areas owned by BLM and Montana State Land Trust also exist intermittently throughout the study area.

5.1.2. Prime Farmland

Information regarding areas of prime farmland in the corridor area was compiled from the US Department of Agriculture, Natural Resource Conservation Service (NRCS).

The Farmland Protection Policy Act of 1981 (Title 7 United States Code, Chapter 73, Sections 4201-4209) has as its purpose "to minimize the extent to which federal programs contribute to the unnecessary and irreversible conversion of farmland to nonagricultural uses, and to assure that federal programs are administered in a manner that, to the extent practicable, will be compatible with State, unit of local government, and private programs and policies to protect farmland."

Farmland is defined by the act in Section 4201 as including prime farmland, unique farmland, and farmland, other than prime or unique farmland, that is of statewide or local importance.

Prime farmland soils are those that have the best combination of physical and chemical characteristics for producing food, feed, and forage; the area must also be available for these uses. Prime farmland can be either non-irrigated or lands that would be considered prime if irrigated. Farmland of statewide importance is land, in addition to prime and unique farmlands, that is of statewide importance for the production of food, feed, fiber, forage, and oilseed crops.

The CPA-106 Farmland Conversion Impact Rating Form for Linear Projects is a way for the NRCS to keep inventory of the Prime and Important farmlands within the state. Soil map units found within the project area have been classified as prime and important farmlands. Project activities associated with the construction of the Tongue River Road Corridor will likely create impacts to the soil map units with prime and important farmland status, thus it is likely that a completed CPA-106 Farmland Conversion Impact Rating Form for Linear Projects will be required. The process for completing this form requires mapping of the prime and important farmlands to be converted to non-farmable land, coordination with the NRCS, and final completion of the conversion form.

5.1.3. Geologic Resources

Information was obtained on geology in the study area. This geologic information may help determine any potential design and construction issues related to embankments and road design.

S-332 traverses the alluvial terraces of the Tongue River, occasionally climbing onto exposed area of the Fort Union Formation. Locally, the Fort Union consists of the Tongue River Member and is described as sandstone with thin interbeds of siltstone, mudstone, and clay. In some areas the rock has been metamorphosed into clinker by the natural burning of coal. The Alluvial Terrace Deposits typically consist of gravel, sand, silt, and clay.

5.1.4. Water Resources

5.1.4.1. Surface Water

Maps and GIS data were reviewed to identify the location of surface water bodies within the study area, including rivers, streams, lakes, or reservoirs.

S-332 travels through the Middle Yellowstone Watershed District. Information on the Tongue River and its tributaries within the study area was obtained from Montana Department of Environmental Quality's (DEQ) website. Section 303, subsection "d" of the Clean Water Act requires the State of Montana to develop a list, subject to US Environmental Protection Agency (EPA) approval, of water bodies that do not meet water quality standards. When water quality fails to meet state water quality standards, MDEQ determines the causes and sources of pollutants in a sub-basin assessment and sets maximum pollutant levels, called total maximum daily loads (TMDL).

A TMDL sets maximum pollutant levels in a watershed. The TMDLs become the basis for implementation plans to restore the water quality to a level that supports its designated beneficial uses. The implementation plans identify and describe pollutant controls and management measures to be undertaken (such as best management practices), the mechanisms by which the selected measures would be put into action, and the individuals and entities responsible for implementation projects.

Tongue River is listed as the only 303(d) water body within the study area. Probable causes of impairment are listed as cadmium, copper, iron, lead, low flow alterations, nickel, salinity, solids, and sulfates. Probable sources of impairment include irrigated crop production, dam construction, and stream bank modifications / destabilization.

5.1.4.2. Groundwater

Custer County and Rosebud County have not developed Local Water Quality District's (LWQD). LWQD's are established to protect, preserve, and improve the quality of surface water and groundwater within the district. Currently there are four in Montana. MDEQ provides support to LWQD programs, but does not have an active management role in their activities. LWQD serve as local government districts with a governing board of directors, and funding obtained from fees collected annually with county taxes. A significant component of selected district programs is the ability to participate in the enforcement of the Montana Water Quality Act and related rules.

If a LWQD is developed for Custer County or Rosebud County, water quality protection measures may have to be addressed at the local level, in addition to the federal level and state level.

5.1.4.3. Irrigation

Irrigated farmland exists in Custer County and Rosebud County within the study area. Impacts to irrigation facilities should be avoided to the greatest extent practicable. However, depending on recommended improvement option(s), there is a potential to impact lateral and longitudinal irrigation facilities. Operators of irrigation facilities would need to be contacted for flow requirements during project development to minimize impacts to farming operations.

Any potential impacts to irrigation facilities will need to be examined to determine if the irrigation facilities are considered waters of the U.S. and subject to jurisdiction by the U.S. Army Corps of Engineers (USACOE) and if other permits or authorizations are necessary such as SPA or 318.

5.1.4.4. Other Drainage Considerations

There are four existing bridges within the study corridor. Should a project be identified and advanced, it will be necessary to consider the potential impacts resulting from drainage off the existing or new bridge decks. MDEQ's 401 certification of the general conditions of the USACOE 404 permits requires that bridge deck drainage be directed to the ends of the bridge, rather than directly into the State water they span. Where practicable, this drainage needs to be directed to a detention/retention basin instead of directly discharging into State water.

MDEQ has stated that this same principle is desirable for roadside ditch drainage (.e. that roadside drainage that is directed to State waters should also be directed to a detention/retention basin prior to discharge into the State water.

Pertinent to drainage culverts, MDEQ and MFWP have both stated that culverts would need to be designed to provide both fish passage and aquatic organism passage (AOP). This would not only be applicable to perennial streams, but also some intermittent streams that may provide only seasonal flows yet still have a benefit for the fisheries system.

Lastly, both MDEQ and MFWP reiterated that culverts cannot be sized smaller to their current size, and that culverts should be sized to at least the appropriate "site specific" bankfull dimension.

5.1.5. Wetlands (EO 11988)

The USACOE defines wetlands as those areas that are inundated or saturated by surface or ground water at a frequency and duration sufficient to support, and that under normal circumstances do support, a prevalence of vegetation typically adapted for life in saturated soil conditions. Wetlands generally include swamps, marshes, bogs, and similar areas.

The study area encompasses portions of the Tongue River, and associated drainages, which have wetland areas associated with them. Formal wetland delineations will need to be conducted according to standard USACOE defined procedures if a project is developed. Wetland jurisdictional determinations will also need to be done during the project development process.

Wetland impacts should be avoided to the greatest extent practicable. All unavoidable wetland impacts will be mitigated as required by the USACOE.

5.1.6. Wild and Scenic Rivers

The Wild and Scenic Rivers Act, created by Congress in 1968, provided for the protection of certain selected rivers, and their immediate environments, that possess outstandingly remarkable scenic, recreational, geologic, fish and wildlife, historic, cultural, or other similar values. The U.S. National Park Service (NPS) website was accessed for information on river segments that may be located within the study area with wild and scenic designation. There are no wild or scenic rivers in the study area.

5.1.7. Floodplains (EO 11988) and Floodways

Executive Order (EO) 11988, Floodplain Management, requires federal agencies to avoid direct or indirect support of floodplain development whenever a practicable alternative exists. EO 11988 and 23 CFR 650 Part A requires an evaluation of project alternatives to determine the extent of any encroachment into the base floodplain. The base flood (100-year flood) is the regulatory standard used by federal agencies and most states to administer floodplain management programs. A "floodplain" is defined as lowland and relatively flat areas adjoining inland and coastal waters, including flood-prone areas of offshore islands, with a one percent or greater chance of flooding in a given

year. As described in Federal Highway Administration's (FHWA) floodplain regulation (23 CFR 650 Part A), floodplains provide natural and beneficial values serving as areas for fish, wildlife, plants, open space, natural flood moderation, water quality maintenance, and groundwater recharge.

5.1.8. Hazardous Substances

The Montana Natural Resource Information System (NRIS) database was searched for underground storage tank (UST) sites, leaking underground storage tank (LUST) sites, abandoned mine sites, remediation response sites, landfills, National Priority List (NPL) sites, hazardous waste, crude oil pipelines, and toxic release inventory sites in the study area.

There were no UST sites, LUST sites, remediation response sites, landfills, or NPL sites identified in the study area. There were four abandoned mine sites located south of Brandenberg and one abandoned mine site located south of Garland. All five of these abandoned mine sites appear to be minor coal prospects/explorations. Further evaluations would be needed to determine if any of these abandoned mine sites pose an environmental concern.

Further evaluation may also be needed at specific sites to determine if contamination will be encountered during any future construction. This may include reviewing MDEQ files and conducting subsurface investigation activities to determine soil and groundwater contamination. If contaminated soils or groundwater is encountered during construction, handling and disposing of the contaminated material will be conducted in accordance with State, Federal, and local laws and rules.

5.1.9. Air Quality

EPA designates communities that do not meet National Ambient Air Quality Standards (NAAQS) as "non-attainment areas." States are then required to develop a plan to control source emissions and ensure future attainment of NAAQS. S-332 is not located in a non-attainment area for PM-2.5, PM-10, or carbon monoxide.

An evaluation of mobile source air toxics (MSATs) may be required. MSATs are compounds emitted from highway vehicles and off-road equipment which are known or suspected to cause cancer or other serious health and environmental effects.

5.1.10. Noise

The majority of S-332 passes through farm and ranch land, therefore it appears unlikely that improving this road would cause any traffic noise impacts. However, a traffic noise study will need to be evaluated for any planned improvements to S-332.

If improvements are developed for S-332 that include a significant shift in the horizontal or vertical alignments or increasing the traffic speed and volume then the project would be considered a Type I project. A detailed noise analysis would be required if any future project is considered a Type I project. A detailed noise analysis includes measuring ambient noise levels at selected receivers and modeling design year noise levels using projected traffic volumes. Noise abatement measures would be considered for the project if noise levels approach or substantially exceed the noise abatement criteria (NAC) listed in MDT's Noise Policy.

If traffic noise impacts are shown to exist on the project, a number of possible abatement measures may be considered, including but not limited to the following:

- Altering the horizontal or vertical alignments;
- Constructing noise barriers such as sound walls or earthen berms; and/or

- Decreasing traffic speeds.

Any future construction activities along S-332 may cause localized, short-duration noise impacts. These impacts need to be minimized in accordance with MDT's standard specifications for the control of equipment noise during construction.

5.2. Visual Resources

Visual resources refer to the landscape character (what is seen), visual sensitivity (human preferences and values regarding what is seen), scenic integrity (degree of intactness and wholeness in landscape character), and landscape visibility (relative distance of seen areas) of a geographically defined view shed. The landscape throughout the study corridor contains an array of biological, scientific, historic, wildlife, ecological, and cultural resources mixed with a remote location.

There are no properties or corridors within the study area listed on the Department of Interior's National Landscape Monument System.

5.3. Biological Resources

Biological resources in the study area were identified using maps, aerial photographs, the endangered, threatened, proposed, and candidate species list for Montana counties (May 2009) from the US Fish and Wildlife Service (USFWS), Montana Natural Heritage Program data, and windshield surveys of the project site. This limited survey is in no way intended to be a complete and accurate biological survey of the study area. If a project is forwarded from the improvement option(s), consultations with MFWP and USFWS field biologists on techniques to perpetuate the riparian corridor, promote fish passage, and accommodate wildlife movement and connectivity will occur, and a complete biological survey of the study area will need to be completed. Due to potentially extensive mitigation measures, project costs may be higher than typically expected and should be budgeted for in the planning process.

5.3.1. Fish and Wildlife

General fish and wildlife resources in the study area will need to be surveyed during any future project development process. Montana Fish, Wildlife, and Parks (FWP) should be contacted during the project development process for local expertise of the study area. Riparian and river, stream or creek habitats should be avoided to the greatest extent practicable, including but not limited to, the Tongue River riparian and river habitat. Fish and wildlife species use waterway corridors during all life stages. Encroachment into the wetted width and waterway and the associated riparian habitat should be avoided, or minimized, to the maximum extent practicable. It is recommended that a riparian corridor remain on both sides of waterways to facilitate wildlife movement along the river corridor.

5.3.1.1. Threatened and Endangered Species

The federal list of endangered and threatened species is maintained by the USFWS. Species on this list receive protection under the Endangered Species Act (ESA). An 'endangered' species is one that is in danger of extinction throughout all or a significant portion of its range. A 'threatened' species is one that is likely to become endangered in the foreseeable future. The USFWS also maintains a list of species that are candidates or proposed for possible addition to the federal list.

The endangered, threatened, proposed, and candidate species list for Montana counties (August 2011) was obtained from the USFWS website. This list generally identifies the counties where one would reasonably expect the species to occur, not necessarily every county where the species is listed.

There are seven endangered, threatened, proposed, or candidate animal species listed for Custer and Rosebud Counties:

1. Black-footed Ferret (Listed Endangered – LE)
2. Pallid Sturgeon (Listed Endangered – LE)
3. Piping Plover (Listed Threatened, Critical Habitat – LT, CH)
4. Interior Least Tern (Listed Endangered – LE)
5. Whooping Crane (Listed Endangered – LE)
6. Greater Sage Grouse (Candidate – C)
7. Sprague's Pipit (Candidate – C)

Although the Pallid Sturgeon has not been recorded in the Tongue River in the Study corridor, junior Pallid Sturgeon do use the Tongue River near Miles City, and the Tongue River was historically used by adult Pallid Sturgeons. An evaluation of potential impacts to all endangered, threatened, proposed, or candidate species will need to be completed during the project development process.

5.3.1.2. Species of Concern

Montana Species of Concern are native animals breeding in the state that are considered to be "at risk" due to declining population trends, threats to their habitats, and/or restricted distribution. Designation of a species as a Montana Animal Species of Concern is not a statutory or regulatory classification. Instead, these designations provide a basis for resource managers and decision-makers to direct limited resources to priority data collection needs and address conservation needs proactively. Each species is assigned a state rank that ranges from S1 (greatest concern) to S5 (least concern). Other state ranks include SU (unrankable due to insufficient information), SH (historically occurred), and SX (believed to be extinct). State ranks may be followed by modifiers, such as B (breeding) or N (non-breeding).

A search of the Montana Heritage Program was conducted for Custer and Rosebud counties. A total of 39 species of concern for Custer County and 47 species of concern Rosebud County were listed. The results of a data search by the Montana Natural Heritage Program reflect the current status of their data collection efforts. These results are not intended as a final statement on sensitive species within a given area, or as a substitute for on-site surveys. If a project is forwarded from the improvement option(s), on-site surveys will need to be completed during the project development process.

5.3.1.3. Crucial Areas Planning System (CAPS) Report

The MFWP recently implemented a web-based tool to help identify and evaluate the fish, wildlife and recreational resources of Montana. The Crucial Areas Planning System (CAPS) is a mapping service intended to provide useful and non-regulatory information about highly valued fish and wildlife resources and recreation areas during the early planning stages of projects. The CAPS can provide information for specific areas of interest. The CAPS Report concludes that the study area yields high-quality wildlife and fisheries habitat and diversity, and suggests that due to this diversity project sponsors commit to working with the appropriate agencies if a project is forwarded from the improvement options(s) to identify and mitigate potential impacts directly attributable to the project.

5.3.1.4. Wildlife and Traffic Concerns

During the project development process, wildlife crossings and/or wildlife accident cluster areas along the corridor may need to be addressed. It is likely that most wildlife/vehicle collisions are unreported within the Study corridor.

5.3.1.5. Tongue River Fisheries Information

Due to recent habitat and conveyance improvements to the Tongue River, all Yellowstone River fish species have the potential to utilize the entire Tongue River and tributaries within the corridor study area. With the construction of the Muggli Bypass in 2007, and removal of SH Dam in 2008, Yellowstone River fish can now migrate upstream into the Tongue River. Prior to the bypass construction, Yellowstone River fish could not migrate upstream of T&Y Dam since its construction in 1886. Multiple fish species not documented upstream of T&Y Dam prior to bypass construction have now been documented upstream of the Muggli Bypass since 2007. These species are: goldeye, western silvery minnow, freshwater drum, bigmouth buffalo, smallmouth buffalo, and sturgeon chub. Over time it is likely that additional species will find their way upstream of T&Y Dam. Other species already present upstream of T&Y Dam have also been documented using the bypass and are adding to the overall numbers of fish utilizing the Tongue River in the corridor study area. Many of these species are cyprinids and suckers which are forage species for many of the larger predatory and game species in the Tongue and Yellowstone Rivers.

The increased fish usage upstream of T&Y Dam increases the need to maintain connectivity to all of the tributaries. Because of the close proximity of road crossings on tributaries to the Tongue River, adequately sized bridges or culverts will likely be required with future projects to allow for stream flow and function and provide for fish passage. Following are lists of tributaries and their potential for fish usage:

- Perennial tributaries with documented fish usage: Pumpkin Creek and Foster Creek.
- Large perennial tributaries capable of fish usage but not documented: Ash Creek and Liscom Creek.
- Intermittent and ephemeral creeks with strong potential for fish usage during flash rain/runoff events: Dry Creek, Prat Creek, Nelson Creek, Dry Creek, Jack Creek, Brown Creek, Haddow Creek, Cheever Creek, Sand Creek, Stony Creek, Elk Creek, Coon Creek, Garden Creek, Big John Creek, Freda Creek, Goodale Creek, Joe Leg Creek, Hammond Creek, and Lay Creek.

5.3.2. Vegetation

Native vegetation in the study area generally consists of wetland and riparian areas along the Tongue River and sagebrush/grasslands in the upland areas. The remaining vegetation consists of cultivated crop land.

5.3.2.1. Threatened and Endangered Plant Species

The federal list of threatened endangered and threatened species is maintained by the USFWS. Species on this list receive protection under the ESA. An 'endangered' species is one that is in danger of extinction throughout all or a significant portion of its range. A 'threatened' species is one that is likely to become endangered in the foreseeable future. The USFWS also maintains a list of species that are candidates or proposed for possible addition to the federal list.

Information regarding endangered, threatened, proposed, and candidate species list for Montana counties (August 2011) was obtained from the USFWS website. This list identifies the counties where one would reasonably expect the species to occur, not necessarily every county where the species is listed.

This list identified no endangered, threatened, proposed, or candidate plant species listed for Custer or Rosebud Counties, and none are currently expected to occur in the study area. An evaluation of all endangered, threatened, proposed, or candidate species will need be done during the project development process.

5.3.2.2. Species of Concern

Montana Species of Concern are native plants in the state that are considered to be "at risk" due to declining population trends, threats to their habitats, and/or restricted distribution. Designation of a species as a Montana Plant Species of Concern is not a statutory or regulatory classification. Instead, these designations provide a basis for resource managers and decision-makers to direct limited resources to priority data collection needs and address conservation needs proactively. Each species is assigned a state rank that ranges from S1 (greatest concern) to S5 (least concern). Other state ranks include SU (unrankable due to insufficient information), SH (historically occurred), and SX (believed to be extinct). State ranks may be followed by modifiers, such as B (breeding) or N (non-breeding).

The Montana Heritage Program lists nine plant species of concern in Custer County and eleven in Rosebud County. Two (2) of these plant species occur in both counties. The results of a data search by the Montana Natural Heritage Program reflect the current status of their data collection efforts. These results are not intended as a final statement on sensitive species within a given area, or as a substitute for on-site surveys. On-site surveys will need to be completed during the project development process.

5.3.2.3. Noxious Weeds

Noxious weeds degrade habitat, choke streams, crowd native plants, create fire hazards, poison and injure livestock and humans, and foul recreation sites. Areas with a history of disturbance are at particular risk of weed encroachment. There are 32 noxious weeds in Montana, as designated by the Montana Statewide Noxious Weed List (effective April 15, 2008). The study area will need be surveyed for noxious weeds. County Weed Control Supervisors should be contacted regarding specific measures for weed control during project development.

5.4. Cultural and Archaeological Resources

If a project is developed and is federally-funded, a cultural resource survey of the Area of Potential Effect for this project as specified in Section 106 of the National Historic Preservation Act (36 CFR 800) would need to be conducted. Section 106 requires Federal agencies to "take into account the effects of their undertakings on historic properties." The purpose of the Section 106 process is to identify historic properties that could be affected by the undertaking, assess the effects of the project and investigate methods to avoid, minimize or mitigate any adverse effects on historic properties. Special protections to these properties are recognized under Section 4(f) of the Transportation Act.

The Tongue River drains a vast area of north central Wyoming and Southeastern Montana. In the relatively dry grasslands of southeastern Montana the river has always acted as a focus of human activities. The Tongue River Valley and its surrounding breaks have a rich history from early pre-contact times through the 19th century Indian Wars. The 20th century brought mining, cattle and horse ranching.

A search of existing (known) cultural resources, both archaeological sites and historic properties, was conducted for the full, one mile wide study area. The study area is approximately 33,000 acres in size and within that area 97 separate cultural resources are known to exist. These resources include historic irrigation ditches, residences, and trash deposits, as well as stratified archaeological sites, lithic scatters, lithic quarries, cribbed log structures, stone cairns and rock art. Bison kills, tipi rings and human burials are very likely present in the study area as well.

The Tongue River drainage is full of high quality raw material (known as porcellanite) suitable for making stone tools. For that reason pre-contact lithic scatters are very common in the area. Lithic scatters may account for most of the known sites in the study corridor. Although S-332 does bisect some cultivated ground used for hay production, the vast majority of the land on either side of the existing road is native range. The high concentration of porcellanite lithic scatters coupled with the fact that most of the study corridor has never been subjected to plowing means that there are undoubtedly many hundreds of unidentified and undisturbed lithic scatters in the corridor.

Based on a review of prior cultural resource inventories we know that approximately 7 percent of the study area has had some past cultural resource survey. Some of these surveys date back to the 1970's when methods and expectations were not what they are today. On the other hand, many of the previous surveys in the study area date from the 2000's and meet present day cultural resource management methods. Approximately 75 percent of the previous cultural resource inventories in the corridor have been conducted on public land, mostly administered by the Bureau of Land Management. Based on existing data we can estimate that there are well over a thousand cultural resources in the study area. Since the majority of these resources are pre-contact archaeological sites (lithic scatters), archaeological testing may be a key component and expense of projects developed within the study area.

Compliance with applicable laws such as Section 106 of the National Historic Preservation Act, the Native American Graves Protection and Repatriation Act, the Montana State Burial Law, etc. will be required if a project is forwarded. Additionally, tribal consultation will be required at an early stage of project development.

5.4.1. 4(f) and 6(f) Resources

Reviews were also conducted to determine the presence of Section 4(f) and Section 6(f) properties along the corridor. Section 4(f) refers to the original section within the Department of Transportation Act of 1966 (49 U.S.C. 303), which set the requirement for consideration of park and recreational lands, wildlife and waterfowl refuges, and historic sites in transportation project development. Prior to approving a project that "uses" a Section 4(f) resource, FHWA must find that there is no prudent or feasible alternative that completely avoids 4(f) resources. "Use" can occur when land is permanently incorporated into a transportation facility or when there is a temporary occupancy of the land that is adverse to a 4(f) resource. Constructive "use" can also occur when a project's proximity impacts are so severe that the protected activities, features, or attributes that qualify a resource for protection under 4(f) are "substantially impacted". Section 4(f) resource information was gathered by field observation and review of the National Register of Historic Places (NRHP) list for Custer County and Rosebud County.

There are three NRHP 4(f) / 6(f) resources within the study area:

1. Twelve Mile Dam Fishing Access – 4(f) and 6(f)
2. Pumpkin Creek Ranch Recreational Area – 4(f)
3. Tongue / Yellowstone River Irrigation District Canal – 4(f)

Subsequent to completion of the study's Environmental Scan (document dated June 28, 2012), two additional 4(f) resources were identified by MFWP. These resources are conservation easements in place for the Bice Ranch and the Hirsch Ranch.

6.0 AREAS OF CONCERN AND CONSIDERATION SUMMARY

This section provides a list and description of areas of concern and consideration within the study area. These areas were identified through review of as-built drawings, field review, public databases, and other resources. More discussion has been provided in the previous sections, and it is reiterated here as appropriate.

6.1. TRANSPORTATION SYSTEM

The following transportation system areas of concern were noted:

Surfacing

- Longitudinal and transverse cracking in the asphalt surfacing.
- Evidence of asphalt failure due to recent slides.
- Gravel surfacing from RP 17.7 to RP 50.4.
- Presence of road generated dust inhibiting driver sight lines.

Drainage

- Nine locations with evidence of recent slides.

Horizontal Alignment

- Seven horizontal curves do not meet current standards.

Vertical Alignment

- 34 vertical curves do not meet current standards.
- 12 vertical curves were estimated to not meet current standards based on field review.
- Seven locations have grades that do not meet current standards.
- Two locations were estimated to have grades that do not meet current standards based on field review.

Clear Zones

- 22 locations were estimated to have clear zones that do not meet current standards based on field review.

Access Points

- Three public approaches do not meet current standards based on intersection angles.
- Nine private approaches do not meet current standards based on intersection angles.

Cost

- Due to potentially extensive mitigation measures, project costs may be higher than typically expected and should be budgeted for in the planning process.

6.2. ENVIRONMENTAL CONSIDERATIONS

The following environmental considerations were noted:

Prime Farmland

- Areas of prime farmland are located within the study area.

Water Resources

- Tongue River is located within the study area and is listed as a 303(d) waterbody.

- Irrigated farmland exists within the study area.

Wetlands

- Wetlands are located within the study area.

Hazardous Substances

- There are five abandoned mine sites within the study area.

Fish and Wildlife

- Seven endangered, threatened, proposed, or candidate species are listed for Custer and Rosebud Counties.
- 39 species of concern for Custer County and 47 species of concern for Rosebud County were listed.

Vegetation

- No endangered, threatened, proposed, or candidate plant species are expected to occur within the study area.
- Nine plant species of concern for Custer County and eleven for Rosebud County were listed.

Cultural and Archaeological Resources

- 97 separate cultural resources are known to exist within the study area.
- Three 4(f) and one 6(f) resources are located within the study area.

APPENDIX A

FIELD REVIEW PHOTO LOG

PHOTO 1: RP 0.0 LOOKING SOUTH

PHOTO 2: RP 1.0 LOOKING SOUTH – PUMPKIN CREEK BRIDGE

PHOTO 3: RP 1.1 LOOKING WEST – 12 MILE DAM FISHING ACCESS SITE

PHOTO 4: RP 2.0 LOOKING SOUTH

PHOTO 5: RP 3.0 LOOKING SOUTH

PHOTO 6: RP 3.7 LOOKING NORTH – RECENT SLIDE AREA

PHOTO 7: RP 4.1 LOOKING EAST – PUMPKIN CREEK RANCH RECREATION AREA

PHOTO 8: RP 4.2 LOOKING NORTH – RECENT SLIDE AREA

PHOTO 9: RP 4.5 LOOKING NORTH – RECENT SLIDE AREA

PHOTO 10: RP 4.7 LOOKING NORTH – RECENT SLIDE AREA

PHOTO 11: RP 5.0 LOOKING SOUTH

PHOTO 12: RP 6.0 LOOKING SOUTH

PHOTO 13: RP 7.0 LOOKING SOUTH

PHOTO 14: RP 8.0 LOOKING SOUTH – COAL TRANSPORT TRUCK

PHOTO 15: RP 9.0 LOOKING SOUTH

PHOTO 16: RP 10.0 LOOKING SOUTH

PHOTO 17: RP 11.0 LOOKING SOUTH

PHOTO 18: RP 12.0 LOOKING SOUTH

PHOTO 19: RP 13.0 LOOKING SOUTH

PHOTO 20: RP 14.0 LOOKING SOUTH

PHOTO 21: RP 15.0 LOOKING SOUTH

PHOTO 22: RP 16.0 LOOKING SOUTH

PHOTO 23: RP 17.0 LOOKING SOUTH

PHOTO 24: RP 17.7 LOOKING NORTH - END OF PAVEMENT

PHOTO 25: RP 18.0 LOOKING SOUTH

PHOTO 26: RP 19.0 LOOKING SOUTH

PHOTO 27: RP 19.9 LOOKING NORTH - FOSTER CREEK BRIDGE

PHOTO 28: RP 20.4 LOOKING NORTH - GARLAND SCHOOL

PHOTO 29: RP 21.0 LOOKING SOUTH

PHOTO 30: RP 22.0 LOOKING SOUTH

PHOTO 31: RP 23.0 LOOKING SOUTH

PHOTO 32: RP 24.0 LOOKING SOUTH

PHOTO 33: RP 25.0 LOOKING SOUTHWEST

PHOTO 34: RP 26.0 LOOKING WEST

PHOTO 35: RP 26.2 LOOKING EAST - RECENT SLIDE AREA

PHOTO 36: RP 27.0 LOOKING SOUTHWEST

PHOTO 37: RP 27.9 LOOKING NORTHEAST - RECENT SLIDE AREA

PHOTO 38: RP 28.0 LOOKING SOUTHWEST

PHOTO 39: RP 29.0 LOOKING WEST

PHOTO 40: RP 30.0 LOOKING SOUTHWEST

PHOTO 41: RP 31.0 LOOKING SOUTHWEST

PHOTO 42: RP 32.0 LOOKING SOUTHWEST

PHOTO 43: RP 32.5 LOOKING NORTH – PIPELINE TRANSMISSION BUILDING

PHOTO 44: RP 33.0 LOOKING WEST

PHOTO 45: RP 34.0 LOOKING WEST

PHOTO 46: RP 35.0 LOOKING SOUTH

PHOTO 47: RP 36.0 LOOKING SOUTHWEST

PHOTO 48: RP 36.3 LOOKING NORTHEAST - RECENT SLIDE AREA

PHOTO 49: RP 37.0 LOOKING SOUTHWEST

PHOTO 50: RP 38.0 LOOKING SOUTH WEST

PHOTO 51: RP 39.6 LOOKING EAST - TONGUE RIVER BRIDGE

PHOTO 52: RP 40.0 LOOKING WEST

PHOTO 53: RP 40.7 LOOKING EAST - SUBSTANDARD HORIZONTAL CURVE

PHOTO 54: RP 41.0 LOOKING SOUTH

PHOTO 55: RP 42.0 LOOKING SOUTH

PHOTO 56: RP 43.0 LOOKING SOUTH

PHOTO 57: RP 44.0 LOOKING WEST

PHOTO 58: RP 45.0 LOOKING SOUTH

PHOTO 59: RP 45.7 LOOKING NORTH - ROLLING TERRAIN

PHOTO 60: RP 46.0 LOOKING SOUTH

PHOTO 61: RP 47.0 LOOKING SOUTHWEST

PHOTO 62: RP 47.8 LOOKING NORTHEAST - UNNAMED DRAINAGE BRIDGE

PHOTO 63: RP 48.0 LOOKING SOUTH

PHOTO 64: RP 49.0 LOOKING SOUTH

PHOTO 65: RP 50.0 LOOKING SOUTH

PHOTO 66: RP 50.4 LOOKING NORTH - END OF S-332

APPENDIX B

AS-BUILT DATA SUMMARY

Hydraulic Data Summary

S-45(8)					
Station (ft)	**RP**	**Size (in)**		**Type**	**Stream Name**
31+80	0.60	36		Corrugated Metal Pipe	Dry Coulee
52+16	0.99	138'	24'	Prestressed Concrete Bridge	Pumpkin Creek
112+50	2.13	48		Corrugated Metal Pipe	
138+00	2.61	36		Corrugated Metal Pipe	
169+00	3.20	48		Corrugated Metal Pipe	
192+95	3.65	108		Structural Plate Pipe Culvert	
262+00	4.96	44		Structural Plate Pipe Culvert	
272+58	5.16	135	100	Structural Plate Pipe Culvert	

RS-45(14)					
Station (ft)	**RP**	**Size (in)**		**Type**	**Stream Name**
331+60	6.28	48		Corrugated Steel Pipe	
344+11	6.52	60		Corrugated Steel Pipe	
393+60	7.45	96		Structural Steel Plate Pipe Culvert	
408+29	7.73	48		Corrugated Steel Pipe	
416+96	7.90	72	44	Corrugated Steel Pipe - Arch	
432+32	8.19	48		Corrugated Steel Pipe	
448+56	8.50	58	36	Corrugated Steel Pipe - Arch	
454+57	8.61	58	36	Corrugated Steel Pipe - Arch	
462+00	8.75	36		Corrugated Steel Pipe	
474+50	8.99	42		Corrugated Steel Pipe	
495+31	9.38	36		Corrugated Steel Pipe	
510+14	9.66	60		Structural Steel Plate Pipe Culvert	
513+76	9.73	36		Corrugated Steel Pipe	
530+05	10.04	72		Corrugated Steel Pipe	
536+68	10.16	60		Corrugated Steel Pipe	
554+64	10.50	95	67	Structural Steel Plate Pipe Arch Culvert	Ash Creek
561+59	10.64	60		Corrugated Steel Pipe	
574+59	10.88	84		Structural Steel Plate Pipe Culvert	
602+20	11.41	43	27	Corrugated Steel Pipe - Arch	
615+00	11.65	43	27	Corrugated Steel Pipe - Arch	
633+49	12.00	43	27	Corrugated Steel Pipe - Arch	
642+64	12.17	72	44	Corrugated Steel Pipe - Arch	

STPS 332-1(7)12					
Station (m)	**RP**	**Size (mm)**		**Type**	**Stream Name**
198+24	12.32	910		Corrugated Metal Pipe	
206+12	12.81	2130		Corrugated Metal Pipe	Dry Creek
223+71	13.90	3000	2400	Reinforced Concrete Box	Jack Creek
229+12	14.24	2100		Reinforced Concrete Pipe	
253+37	15.74	1350		Reinforced Concrete Pipe	
258+23	16.05	3000	3000	Reinforced Concrete Box	Brown Creek
259+87	16.15	1050		Reinforced Concrete Pipe	
264+41	16.43	1350		Reinforced Concrete Pipe	
271+70	16.88	1200		Reinforced Concrete Pipe	
280+80	17.45	3000	3000	Reinforced Concrete Box	Haddow Creek
284+39	17.67	1350		Reinforced Concrete Pipe	

STPS 332-2(3)30					
Station (ft)	**RP**	**Size (in)**		**Type**	**Stream Name**
963+62	18.25	72	44	Corrugated Steel Pipe - Arch	
1029+35	19.50	84		Reinforced Concrete Pipe	Sand Creek
1115+49	21.13	36		Corrugated Steel Pipe	
1162+41	22.02	48		Corrugated Steel Pipe	

S-45(3)					
Station (ft)	**RP**	**Size (in)**		**Type**	**Stream Name**
1185+25	22.45	48		Corrugated Metal Pipe	
1196+50	22.66	72		Corrugated Metal Pipe	
1261+28	23.89	36		Corrugated Metal Pipe	
1275+88	24.16	36		Corrugated Metal Pipe	
1306+79	24.75	60		Corrugated Metal Pipe	
1326+71	25.13	150		Structural Plate Pipe Culvert	
1414+31	26.79	48		Corrugated Metal Pipe	
1442+27	27.32	36		Corrugated Metal Pipe	
1446+80	27.40	72		Corrugated Metal Pipe	
1478+95	28.01	36		Corrugated Metal Pipe	
1515+16	28.70	180		Structural Plate Pipe Culvert	
1587+28	30.06	48		Corrugated Metal Pipe	

S-45(4)					
Station (ft)	**RP**	**Size (in)**		**Type**	**Stream Name**
1608+70	30.47	36		Corrugated Metal Pipe	
1625+50	30.79	72		Structural Plate Pipe Culvert	
1676+52	31.75	150		Structural Plate Pipe Culvert	Cosh Creek
1741+38	32.98	54		Corrugated Metal Pipe	
1764+38	33.42	36		Corrugated Metal Pipe	
1785+25	33.81	90		Structural Plate Pipe Culvert	
1788+58	33.87	36		Corrugated Metal Pipe	
1810+50	34.29	180		Structural Plate Pipe Culvert	
1814+41	34.36	60		Structural Plate Pipe Culvert	
1848+34	35.01	42		Corrugated Metal Pipe	
1864+29	35.31	50	30	Corrugated Metal Pipe - Arch	
1884+09	35.68	36		Corrugated Metal Pipe	
1897+50	35.94	60		Structural Plate Pipe Culvert	
1937+00	36.69	84		Structural Plate Pipe Culvert	
1959+73	37.12	36		Corrugated Metal Pipe	
1982+94	37.56	60		Structural Plate Pipe Culvert	
2005+10	37.98	60		Structural Plate Pipe Culvert	
2022+90	38.31	72		Structural Plate Pipe Culvert	
2027+73	38.40	72	44	Structural Plate Pipe Stock Pass	
2041+13	38.66	70	91	Structural Plate Pipe Stock Pass	
2059+20	39.00	48		Corrugated Metal Pipe	
2093+94	39.66	214.5'	24'	Prestressed Precast Concrete Bridge	Tongue River

Horizontal Curve Summary

S-45(8)			
PI (STA ft)	**PI (RP)**	**Radius (ft)**	**Length (ft)**
40+18.50	0.76	2,083.60	2,463.00
134+06.60	2.54	5,730.00	1,042.50
216+85.30	4.11	5,730.00	2,316.70

RS-45(14)			
PI (STA ft)	**PI (RP)**	**Radius (ft)**	**Length (ft)**
307+00.00	5.81	17,190.00	550.00
321+50.00	6.09	17,190.00	550.00
458+58.80	8.69	5,730.00	3,421.70
497+04.60	9.41	5,730.00	3,441.70
625+52.10	11.85	17,190.00	1,500.00
658+35.00	12.47	5,730.00	2,080.00

STPS 332-1(7)12			
PI (STA m)	**PI (RP)**	**Radius (m)**	**Length (m)**
200+66.51	12.47	1,746.38	633.99
217+57.36	13.52	900.00	659.69
228+12.58	14.18	1,750.00	537.05
243+51.87	15.13	900.00	437.68
250+50.92	15.57	1,750.00	573.20
283+67.54	17.63	3,500.00	117.66

S-334-2(2)30			
PI (STA ft)	**PI (RP)**	**Radius (ft)**	**Length (ft)**
957+14.50	18.13	2,864.80	1,131.70
997+98.40	18.90	4,297.60	1,888.80
1026+67.10	19.44	5,730.00	1,190.00
1044+28.00	19.78	2,864.80	1,226.70
1068+30.10	20.23	4,297.60	1,147.50
1090+57.20	20.65	2,869.80	1,577.50
1157+97.30	21.93	5,730.00	760.00

S-45(3)			
PI (STA ft)	**PI (RP)**	**Radius (ft)**	**Length (ft)**
1201+52.30	22.76	2,865.00	2,204.20
1270+66.90	24.07	5,730.00	4,593.30
1374+65.30	26.04	2,865.00	2,104.20
1413+73.60	26.78	2,865.00	219.20
1512+85.40	28.65	5,730.00	3,483.30
1547+51.90	29.31	3,820.00	2,284.40

S-45(4)			
PI (STA ft)	**PI (RP)**	**Radius (ft)**	**Length (ft)**
1709+61.30	32.38	11,460.00	4,660.00
1776+99.00	33.66	11,460.00	1,438.30
1816+62.80	34.41	2,546.70	3,704.80
1905+89.80	36.10	3,820.00	3,584.40
1952+54.80	36.98	1,910.00	987.20
2046+01.80	38.75	2,865.00	1,776.70
2067+90.80	39.16	1,910.00	1,606.70
2087+45.70	39.54	955.00	1,057.20

Vertical Curve Summary

S-45(8)									
Center (STA ft)	**Center (RP)**	**Length (ft)**	**G1**	**G2**	**A**	**K-Value**	**Type**	**SSD**	**L (Driver Comfort)**
9+00.00	0.17	400.00	-1.80%	-1.11%	0.69	579.7	Sag	-	53.4
20+00.00	0.38	400.00	-1.11%	-0.63%	0.48	833.3	Sag	-	37.2
26+00.00	0.49	800.00	-0.63%	-3.50%	2.87	278.7	Crest	775.6	-
32+50.00	0.62	800.00	-3.50%	0.00%	3.50	228.6	Sag	-	271.0
57+54.00	1.09	400.00	0.00%	0.85%	0.85	470.6	Sag	-	65.8
66+00.00	1.25	1,000.00	0.85%	3.44%	2.59	386.1	Sag	-	200.5
76+00.00	1.44	1,000.00	3.44%	-1.03%	4.47	223.7	Crest	694.8	-
90+00.00	1.70	800.00	-1.03%	0.40%	1.43	559.4	Sag	-	110.7
115+20.00	2.18	800.00	0.40%	1.45%	1.05	761.9	Sag	-	81.3
130+00.00	2.46	800.00	1.45%	1.41%	0.04	20000.0	Crest	27375.0	-
146+00.00	2.77	800.00	1.41%	0.24%	1.17	683.8	Crest	1322.2	-
162+00.00	3.07	600.00	0.24%	-4.13%	4.37	137.3	Crest	544.3	-
169+00.00	3.20	800.00	-4.13%	4.27%	8.40	95.2	Sag	-	650.3
181+00.00	3.43	1,400.00	4.27%	-5.01%	9.28	150.9	Crest	570.6	-
193+35.00	3.66	1,000.00	-5.01%	6.47%	11.48	87.1	Sag	-	888.6
209+50.00	3.97	1,600.00	6.47%	-2.13%	8.60	186.0	Crest	633.6	-
220+00.00	4.17	400.00	-2.13%	-0.10%	2.03	196.9	Sag	-	157.3
252+00.00	4.77	1,200.00	-0.10%	-4.28%	4.18	287.1	Crest	787.1	-
271+80.00	5.15	800.00	-4.28%	1.44%	5.72	139.9	Sag	-	442.8
284+70.00	5.39	600.00	1.44%	0.07%	1.37	438.0	Crest	1087.6	-
294+60.00	5.58	500.00	0.07%	1.77%	1.70	294.1	Sag	-	131.6

RS-45(14)									
Center (STA ft)	**Center (RP)**	**Length (ft)**	**G1**	**G2**	**A**	**K-Value**	**Type**	**SSD**	**L (Driver Comfort)**
332+00.00	6.29	1,200.00	1.93%	-1.50%	3.43	349.7	Crest	868.6	-
340+00.00	6.44	1,000.00	-1.50%	1.46%	2.96	338.4	Sag	-	228.8
362+00.00	6.86	1,200.00	1.46%	-2.44%	3.89	308.5	Crest	815.9	-
385+00.00	7.29	1,000.00	-2.44%	-0.23%	2.20	453.7	Sag	-	170.6
398+00.00	7.54	800.00	-0.23%	0.34%	0.57	1396.2	Sag	-	44.4
417+00.00	7.90	1,000.00	0.34%	-0.19%	0.53	1876.2	Crest	2524.4	-
434+00.00	8.22	1,000.00	-0.19%	1.52%	1.71	584.8	Sag	-	132.4
447+00.00	8.47	1,000.00	1.52%	0.14%	1.38	726.7	Crest	1284.2	-
468+00.00	8.86	1,000.00	0.14%	2.27%	2.13	470.4	Sag	-	164.6
493+50.00	9.35	1,500.00	2.27%	-1.79%	4.06	369.2	Crest	892.6	-
533+00.00	10.09	1,000.00	-1.79%	0.14%	1.94	516.3	Sag	-	150.0
554+00.00	10.49	1,000.00	0.14%	-0.25%	0.39	2557.5	Crest	3259.6	-
564+50.00	10.69	800.00	-0.25%	0.05%	0.29	2730.4	Sag	-	22.7
600+00.00	11.36	1,000.00	0.05%	0.63%	0.59	1709.4	Sag	-	45.3
627+00.00	11.88	800.00	0.63%	0.64%	0.01	88888.9	Sag	-	0.7

S-332-2(3)12									
Center (STA ft)	**Center (RP)**	**Length (ft)**	**G1**	**G2**	**A**	**K-Value**	**Type**	**SSD**	**L (Driver Comfort)**
650+00.00	12.31	800.00	0.64%	3.75%	3.12	256.8	Sag	-	241.2
667+50.00	12.64	1,000.00	3.75%	-1.01%	4.76	210.1	Crest	673.3	-
676+50.00	12.81	800.00	-1.01%	2.65%	3.66	218.6	Sag	-	283.4
685+00.00	12.97	800.00	2.65%	1.26%	1.39	575.5	Crest	1176.3	-

STPS 332-1(7)12									
Center (STA m)	**Center (RP)**	**Length (m)**	**G1**	**G2**	**A**	**K-Value**	**Type**	**SSD**	**L (Driver Comfort)**
211+50.72	13.14	300.00	1.81%	3.77%	1.96	501.9	Sag	-	151.8
217+85.00	13.54	940.00	3.77%	-4.66%	8.43	365.8	Crest	888.5	-
224+67.00	13.96	400.00	-4.66%	1.71%	6.38	205.8	Sag	-	493.7
237+50.00	14.76	400.00	1.71%	3.56%	1.84	712.5	Sag	-	142.6
245+60.00	15.26	900.00	3.56%	-4.47%	8.03	367.9	Crest	891.1	-
258+00.00	16.03	980.00	-4.47%	2.40%	6.87	468.4	Sag	-	531.5
269+35.00	16.74	560.00	2.40%	-2.66%	5.06	363.2	Crest	885.3	-
279+95.00	17.40	380.00	-2.66%	1.85%	4.52	276.0	Sag	-	349.7

S-332-2(2)30
No profile

S-45(2)									
Center (STA ft)	**Center (RP)**	**Length (ft)**	**G1**	**G2**	**A**	**K-Value**	**Type**	**SSD**	**L (Driver Comfort)**
942+00.00	17.84	400.00	1.77%	-5.93%	7.70	51.9	Crest	334.8	-
950+25.00	18.00	400.00	-5.93%	-0.17%	5.76	69.4	Sag	-	445.9
955+00.00	18.09	400.00	-0.17%	1.27%	1.44	277.8	Sag	-	111.5
963+50.00	18.25	300.00	1.27%	0.00%	1.27	236.2	Crest	999.6	-
971+00.00	18.39	400.00	0.00%	1.99%	1.99	201.0	Sag	-	154.1
976+00.00	18.48	600.00	1.99%	-1.48%	3.47	172.9	Crest	611.0	-
988+00.00	18.71	400.00	-1.48%	1.46%	2.94	136.1	Sag	-	227.6
996+00.00	18.86	400.00	1.46%	-1.39%	2.85	140.4	Crest	578.6	-
1003+00.00	19.00	400.00	-1.39%	0.88%	2.27	176.2	Sag	-	175.7
1012+50.00	19.18	200.00	0.88%	1.56%	0.68	294.1	Sag	-	52.6
1017+00.00	19.26	400.00	1.56%	0.10%	1.47	273.0	Crest	936.5	-
1033+00.00	19.56	300.00	0.10%	-0.81%	0.91	331.5	Crest	1342.3	-
1041+00.00	19.72	100.00	-0.81%	-0.29%	0.53	190.5	Sag	-	40.6
1056+00.00	20.00	200.00	-0.29%	0.12%	0.40	497.5	Sag	-	31.1
1066+00.00	20.19	300.00	0.12%	-0.50%	0.62	486.2	Crest	1898.8	-
1072+00.00	20.30	200.00	-0.50%	1.51%	2.01	99.5	Sag	-	155.6

S-45(3)									
Center (STA ft)	**Center (RP)**	**Length (ft)**	**G1**	**G2**	**A**	**K-Value**	**Type**	**SSD**	**L (Driver Comfort)**
1086+00.00	20.57	400.00	1.51%	-0.46%	1.97	203.0	Crest	747.7	-
1105+00.00	20.93	400.00	-0.46%	1.00%	1.46	274.0	Sag	-	113.0
1115+00.00	21.12	300.00	1.00%	2.36%	1.36	220.6	Sag	-	105.3
1134+00.00	21.48	500.00	2.36%	-0.32%	2.68	186.6	Crest	652.6	-
1155+00.00	21.88	300.00	-0.32%	1.00%	1.32	227.3	Sag	-	102.2
1181+00.00	22.37	400.00	1.00%	0.03%	0.97	410.7	Crest	1307.8	-
1192+50.00	22.59	400.00	0.03%	1.32%	1.29	309.1	Sag	-	100.2
1197+00.00	22.67	500.00	1.32%	4.40%	3.08	162.3	Sag	-	238.5
1204+00.00	22.80	300.00	4.40%	2.46%	1.94	154.6	Crest	706.2	-
1215+00.00	23.01	200.00	2.46%	1.40%	1.06	188.7	Crest	1117.9	-
1220+00.00	23.11	300.00	1.40%	-0.36%	1.76	170.5	Crest	763.1	-
1225+00.00	23.20	600.00	-0.36%	3.42%	3.78	158.7	Sag	-	292.6
1233+00.00	23.35	200.00	3.42%	3.14%	0.28	714.3	Crest	3953.6	-
1248+00.00	23.64	800.00	3.14%	-1.36%	4.50	177.8	Crest	619.4	-
1261+00.00	23.88	400.00	-1.36%	2.30%	3.66	109.3	Sag	-	283.4
1269+00.00	24.03	600.00	2.30%	-2.80%	5.10	117.6	Crest	503.9	-
1287+50.00	24.38	1,000.00	-2.80%	2.12%	4.92	203.3	Sag	-	380.9

1295+00.00	24.53	400.00	2.12%	-3.80%	5.92	67.6	Crest	381.9	-
1307+00.00	24.75	400.00	-3.80%	2.10%	5.90	67.8	Sag	-	456.8
1313+00.00	24.87	400.00	2.10%	-2.37%	4.47	89.6	Crest	441.7	-
1329+00.00	25.17	800.00	-2.37%	2.72%	5.09	157.3	Sag	-	393.7
1335+00.00	25.28	200.00	2.72%	2.20%	0.52	384.6	Crest	2175.0	-
1342+00.00	25.42	200.00	2.20%	3.40%	1.20	166.7	Sag	-	92.9
1349+00.00	25.55	400.00	3.40%	0.30%	3.10	129.0	Crest	548.1	-
1355+00.00	25.66	600.00	0.30%	4.54%	4.24	141.5	Sag	-	328.3
1368+00.00	25.91	500.00	4.54%	-4.80%	9.34	53.5	Crest	339.9	-
1376+00.00	26.06	400.00	-4.80%	0.00%	4.80	83.3	Sag	-	371.6
1392+00.00	26.36	400.00	0.00%	2.64%	2.64	151.5	Sag	-	204.4
1402+00.00	26.55	1,200.00	2.64%	-6.96%	9.60	125.0	Crest	519.4	-
1412+00.00	26.74	400.00	-6.96%	0.41%	7.37	54.3	Sag	-	570.7
1431+50.00	27.11	400.00	0.41%	-3.78%	4.19	95.4	Crest	457.4	-
1441+00.00	27.29	400.00	-3.78%	0.35%	4.13	96.9	Sag	-	319.7
1466+00.00	27.77	400.00	0.35%	-1.92%	2.27	176.2	Crest	675.3	-
1477+00.00	27.97	400.00	-1.92%	1.36%	3.28	122.0	Sag	-	253.9
1482+00.00	28.07	400.00	1.36%	-5.13%	6.49	61.6	Crest	364.7	-
1488+00.00	28.18	400.00	-5.13%	2.00%	7.13	56.1	Sag	-	552.0
1493+50.00	28.29	500.00	2.00%	-4.61%	6.61	75.6	Crest	404.0	-
1510+00.00	28.60	400.00	-4.61%	0.41%	5.02	79.7	Sag	-	388.6
1520+50.00	28.80	400.00	0.41%	4.40%	3.99	100.3	Sag	-	308.9
1528+00.00	28.94	200.00	4.40%	3.54%	0.86	232.6	Crest	1354.7	-
1534+00.00	29.05	800.00	3.54%	-4.00%	7.54	106.1	Crest	478.5	-
1545+00.00	29.26	400.00	-4.00%	0.00%	4.00	100.0	Sag	-	309.7
1551+00.00	29.38	300.00	0.00%	1.20%	1.20	250.0	Sag	-	92.9
1559+00.00	29.53	600.00	1.20%	-2.40%	3.60	166.7	Crest	599.7	-
1564+00.00	29.62	300.00	-2.40%	0.90%	3.30	90.9	Sag	-	255.5
1569+00.00	29.72	300.00	0.90%	3.00%	2.10	142.9	Sag	-	162.6
1574+50.00	29.82	300.00	3.00%	1.30%	1.70	176.5	Crest	784.7	-
1589+00.00	30.09	200.00	1.30%	2.36%	1.06	188.7	Sag	-	82.1
1595+00.00	30.21	400.00	2.36%	0.70%	1.66	241.0	Crest	850.0	-

S-45(4)									
Center (STA ft)	**Center (RP)**	**Length (ft)**	**G1**	**G2**	**A**	**K-Value**	**Type**	**SSD**	**L (Driver Comfort)**
1608+00.00	30.45	400.00	0.70%	0.49%	0.21	1904.8	Crest	5338.1	-
1626+00.00	30.80	400.00	0.49%	0.98%	0.49	816.3	Sag	-	37.9
1639+00.00	31.04	400.00	0.98%	0.64%	0.34	1176.5	Crest	3373.5	-
1652+00.00	31.29	400.00	0.64%	1.79%	1.15	347.8	Sag	-	89.0
1665+20.00	31.54	1,200.00	1.79%	-5.99%	7.78	154.2	Crest	576.9	-
1678+00.00	31.78	1,000.00	-5.99%	2.70%	8.69	115.1	Sag	-	672.8
1687+50.00	31.96	500.00	2.70%	5.76%	3.06	163.4	Sag	-	236.9
1712+20.00	32.43	1,500.00	5.76%	-4.64%	10.40	144.2	Crest	557.9	-
1724+50.00	32.66	800.00	-4.64%	-2.15%	2.50	320.6	Sag	-	193.2
1739+00.00	32.94	800.00	-2.15%	-0.61%	1.54	521.2	Sag	-	118.8
1763+50.00	33.40	500.00	-0.61%	-3.19%	2.58	193.8	Crest	668.2	-
1773+50.00	33.59	1,200.00	-3.19%	-4.91%	1.72	696.1	Crest	1225.9	-
1783+50.00	33.78	500.00	-4.91%	0.56%	5.47	91.4	Sag	-	423.6
1797+00.00	34.03	400.00	0.56%	-1.07%	1.62	246.5	Crest	865.0	-
1814+75.00	34.37	600.00	-1.07%	2.39%	3.45	173.8	Sag	-	267.2
1824+50.00	34.55	800.00	2.39%	0.56%	1.83	438.1	Crest	990.9	-
1840+00.00	34.85	600.00	0.56%	-3.21%	3.77	159.2	Crest	586.0	-
1854+00.00	35.11	800.00	-3.21%	0.78%	3.99	200.5	Sag	-	308.9
1868+00.00	35.38	600.00	0.78%	0.53%	0.25	2400.0	Crest	4616.0	-
1879+00.00	35.59	400.00	0.53%	2.73%	2.20	182.1	Sag	-	170.0

1894+60.00	35.88	600.00	2.73%	0.51%	2.22	270.1	Crest	785.8	-
1927+00.00	36.50	600.00	0.51%	-1.68%	2.19	274.6	Crest	793.8	-
1937+00.00	36.69	400.00	-1.68%	-0.21%	1.47	272.1	Sag	-	113.8
1981+00.00	37.52	400.00	-0.21%	-1.39%	1.18	338.1	Crest	1112.1	-
1991+00.00	37.71	800.00	-1.39%	1.73%	3.12	256.2	Sag	-	241.8
2003+00.00	37.94	400.00	1.73%	-0.17%	1.90	210.5	Crest	767.9	-
2013+00.00	38.13	400.00	-0.17%	0.77%	0.94	425.5	Sag	-	72.8
2037+50.00	38.59	1,000.00	0.77%	-2.28%	3.05	327.9	Crest	841.2	-
2048+00.00	38.79	600.00	-2.28%	2.83%	5.11	117.5	Sag	-	395.2
2056+00.00	38.94	400.00	2.83%	1.91%	0.91	439.1	Crest	1384.4	-
2065+00.00	39.11	1,000.00	1.91%	-3.02%	4.94	202.5	Crest	661.1	-
2078+50.00	39.37	400.00	-3.02%	-0.05%	2.98	134.5	Sag	-	230.3
2086+00.00	39.51	400.00	-0.05%	-0.55%	0.50	804.8	Crest	2371.0	-
2104+00.00	39.85	400.00	-0.55%	0.06%	0.61	661.2	Sag	-	46.8
2121+00.00	40.17	400.00	0.06%	0.26%	0.20	2010.1	Sag	-	15.4

APPENDIX C

BRIDGE INSPECTION REPORTS

Montana Department of Transportation

INITIAL ASSESSMENT FORM FOR STRUCTURE :

S00332000+09001

Location : 12M S MILES CITY Structure Name: none

General Location Data

District Code, Number, Location : **04** **Dist 4** **GLENDIVE**
Division Code, Location : **43** **MILES CITY**
County Code, Location : **017** **CUSTER**
City Code, Location : **00000** **RURAL AREA**
Kind fo Hwy Code, Description : **3** **3 State Hwy**
Signed Route Number : **00332**
Str Owner Code, Description : **1** **State Highway Agency**
Maintained by Code, Description : **1** **State Highway Agency**
Intersecting Feature : **PUMPKIN CREEK**
Kilometer Post, Mile Post : **1.64 km** **1.02**

Structure on the State Highway System : [X]
Structure on the National Highway System : [ ]
Str Meet or Exceed NBIS Bridge Length : [X]
Latitude : **46°14'50"**
Longitude : **105°44'52"**

Construction Data

Construction Project Number : **S 45(7)**
Construction Station Number : **52+85.00**
Construction Drawing Number : **4082**
Construction Year : **1959**
Reconstruction Year : **1973**

Traffic Data

Current ADT : **220** ADT Count Year : **2009** Percent Trucks : **2 %**

Structure Loading, Rating and Posting Data

Loading Data :

Design Loading :		**3 MS 13.5 (HS 15)**
Inventory Load, Design :	**24.4 mton**	**2 AS Allowable Stress**
Operating Load, Design :	**36.2 mton**	**2 AS Allowable Stress**
Posting :		**5 At/Above Legal Loads**

Rating Data :

	Operating	Inventory	Posting
Truck 1 Type 3 :	**36**		
Truck 2 Type 3-S3 :	**57**		
Truck 3 Type 3-3 :	**71**		

Structure, Roadway and Clearance Data

Structure Deck, Roadway and Span Data :

Structure Length : **42.43 m**
Deck Area : **351.00 m sq**
Deck Roadway Width : **7.32 m**
Approach Roadway Width : **7.92 m**
Median Code, Description : **0 No median**

Structure Vertical and Horizontal Clearance Data :

Vertical Clearance Over the Structure : **99.99 m**
Reference Feature for Vertical Clearance : **N Feature not hwy or RR**
Vertical Clearance Under the Structure : **0.00 m**
Reference Feature for Lateral Underclearance : **N Feature not hwy or RR**
Minimum Lateral Under Clearance Right : **0.00 m**
Minimum Lateral Under Clearance Left : **0.00 m**

Span Data

Main Span

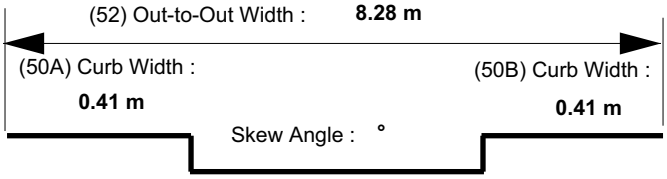
Number Spans : **3**
Material Type Code, Description : **5 Prestressed concrete**
Span Design Code, Description : **2 Stringer/Multi-beam or Girder**

Deck

Deck Structure Type : **1 Concrete Cast-in-Place**
Deck Surfacing Type : **6 Bituminous**
Deck Protection Type : **0 None**
Deck Membrain Type : **0 None**

Approach Span

Number of Spans : **0**
Material Type Code, Description :
Span Design Code, Description :



Structure Vertical and Horizontal Clearance Data Inventory Route :

Over / Under Direction Name	Inventory Route	South, West or Bi-directional Travel			North or East Travel		
		Direction	Vertical	Horizontal	Direction	Vertical	Horizontal
Route On Structure	S00332	Both	99.99 m	7.32 m	N/A		

INITIAL ASSESSMENT FORM FOR STRUCTURE :

S00332000+09001

Continue

Inspection Data

Inspection Due Date : 13 April 2013

Sufficiency Rating : **68**
Health Index : **97.04**
Structure Status :**Not Deficient**

(91) Inspection Fequency (months) : **24**

NBI Inspection Data

(90) Date of Last Inspection :	13 April 2011	Last Inspected By :	Troy Hafele - 2056
(90) Inspection Date :		Inspected By :	

(58) Deck Rating :	7	(68) Deck Geometry :	5	(36C) Approach Rail Rating :	1	(62) Culvert Rating :	N
(59) Superstructure Rating :	5	(67) Structure Rating :	5	(36A) Bridge Rail Rating :	0	(61) Channel Rating :	7
(60) Substructure Rating :	7	(69) Under Clearance :	N	(36B) Transition Rating :	0	(71) Waterway Adequacy :	8
(72) App Rdwy Align :	8	(41) Posting Status :	A	(36D) End Rail Rating :	0	(113) Scour Critical :	5

Unrepaired Spalls : 0 m sq

Deck Surfacing Depth : 2.50 in

Inspection Hours

Crew Hours for inspection :	1.5	Snooper Required :	N
Helper Hours :	-1	Snooper Hours for inspection :	-1
Special Crew Hours :	-1	Flagger Hours :	-1
Special Equipment Hours :	-1		

Inspection Work Candidates

Candidate ID	Date Requested	Status	Priority	Effected Structure Unit	Scope of Work	Action	Covered Condition States

INITIAL ASSESSMENT FORM FOR STRUCTURE :

S00332000+09001

Continue

Element Inspection Data

* * * * * * * * * * Span : **Main-0 - -1** * * * * * * * * * *

Element Description

Smart Flag	Scale Factor	Env	Quantity	Units	Insp Each	Pct Stat 1	Pct Stat 2	Pct Stat 3	Pct Stat 4	Pct Stat 5
Element 13 - Unp Conc Deck/AC Ovl 10 1/2 inch thickness										
	1	1	351	sq.m.	X	100	0	0	0	0
						%	%	%	%	%

Previous Inspection Notes :

04/13/2011 - underside has efflorscence at 3rd guardrail post on the left. (42.43 x 8.28 = 351.32) TH	TZKZ
11/10/2009 - None	RMCZ
10/15/2007 - None. (42.06 X 8.28 = 348.257)	YZKP
02/16/2005 - None	RZDZ
11/20/2000 - None	NKKM
01/28/1999 - None	RBKK
12/05/1996 - None	PTCR
12/01/1994 - None	REFI

Inspection Notes:

Element 109 - P/S Conc Open Girder 4 I beams per span

	1	1	168	m.		90	0	10	0	
						%	%	%	%	%

Previous Inspection Notes :

04/13/2011 - prestressed cables are exposed at all beam ends (photo), changed from 100,0 to 90,10 percent. TH	TZKZ
11/10/2009 - None	RMCZ
10/15/2007 - None	YZKP
02/16/2005 - None	RZDZ
11/20/2000 - None	NKKM
01/28/1999 - None	RBKK
12/05/1996 - None	PTCR
12/01/1994 - None	REFI

Inspection Notes:

Element 205 - R/Conc Column Bent 2 and 3

	1	2	4	ea.		95	5	0	0	
						%	%	%	%	%

Previous Inspection Notes :

04/13/2011 - Bent 3 has light scaling at waterline, changed from 100,0 to 95,5 percent. TH	TZKZ
11/10/2009 - None	RMCZ
10/15/2007 - None	YZKP
02/16/2005 - None	RZDZ
11/20/2000 - None	NKKM
01/28/1999 - None	RBKK
12/05/1996 - None	PTCR
12/01/1994 - None	REFI

Inspection Notes:

INITIAL ASSESSMENT FORM FOR STRUCTURE :

S00332000+09001

Continue

* * * * * * * * * * Span : **Main-0 - -1 (cont.)** * * * * * * * * * *

Element Description

Smart Flag	Scale Factor	Env	Quantity	Units	Insp Each	Pct Stat 1	Pct Stat 2	Pct Stat 3	Pct Stat 4	Pct Stat 5
Element 215 - R/Conc Abutment 1 and 4										
	1	2	22	m.		100	0	0	0	
						%	%	%	%	%

Previous Inspection Notes :

04/13/2011 - Abut 1 (photo). Abut 4 left side has 6" gap under cap, see element 228 for Abut 4 left exposed wood pile. TH TZKZ
11/10/2009 - None RMCZ
10/15/2007 - None YZKP
02/16/2005 - None RZDZ
11/20/2000 - None NKKM
01/28/1999 - None RBKK
12/05/1996 - None PTCR
12/01/1994 - None REFI

Inspection Notes:

Element 228 - Timb Submerged Pile wood pile

	1	2	1	ea.		100	0	0	0	
						%	%	%	%	%

Previous Inspection Notes :

04/13/2011 - added element for Abut 4's left outside pile is exposed 6" underneath cap. TH TZKZ

Inspection Notes:

Element 234 - R/Conc Cap Bents 2 and 3

	1	1	16	m.		95	5	0	0	
						%	%	%	%	%

Previous Inspection Notes :

04/13/2011 - Bent 2 right side has 2" diameter x 1/2" depth spall, left outside has crack at bearing seat. Bent 3 is rust strained, changed from 100,0 to 95,5 percent. TH TZKZ
11/10/2009 - None RMCZ
10/15/2007 - None YZKP
02/16/2005 - None RZDZ
11/20/2000 - None NKKM
01/28/1999 - None RBKK
12/05/1996 - None PTCR
12/01/1994 - None REFI

Inspection Notes:

Element 311 - Moveable Bearing Bent 3 span 2

	1	2	4	ea.		70	30	0		
						%	%	%	%	%

Previous Inspection Notes :

04/13/2011 - added element for Bent 3 span 2 side has slotted holes. Bearings have peeling paint with some surface rust. TH TZKZ

Inspection Notes:

INITIAL ASSESSMENT FORM FOR STRUCTURE :

S00332000+09001

Continue

* * * * * * * * * * Span : **Main-0 - -1 (cont.)** * * * * * * * * * *

Element Description

Smart Flag	Scale Factor	Env	Quantity	Units	Insp Each	Pct Stat 1	Pct Stat 2	Pct Stat 3	Pct Stat 4	Pct Stat 5
Element 313 - Fixed Bearing Bent 2 = 8, Bent 3 span 3 = 4										
	1	1	12	ea.		85	15	0		
						%	%	%	%	%

Previous Inspection Notes :

04/13/2011 - Bearings at Abut 1 and 4 are buried in the backwalls and are not included in quantity. Bent 2 has some freckled rust, Bent 3 has peeling paint with some surface rust. Changed quantity from 16 to 12. TH TZKZ
11/10/2009 - None RMCZ
10/15/2007 - Reduced by 8 as buried in back wall. YZKP
02/16/2005 - Same as previously reported. RZDZ
11/20/2000 - Same as last report. NKKM
01/28/1999 - Outside bearings at abut.1 covered in dirt. All bearings at abut.4 are starting to rust. RBKK
12/05/1996 - None PTCR
12/01/1994 - None REFI

Inspection Notes:

Element 334 - Metal Rail Coated painted W beam with no stiffner and 4 x 6 in. painted I beam posts, 10 1/2h x 19w in. concrete curb

	1	1	84	m.		85	10	5	0	0
						%	%	%	%	%

Previous Inspection Notes :

04/13/2011 - inside 1st drain chute on right side has exposed rebar in the curb. Bent 2 curb has spalls on left and right outsides. Changed from 95,5 to 85,10,5 percent. TH TZKZ
11/10/2009 - None RMCZ
10/15/2007 - None. (42.06 X 2 = 84.12) YZKP
02/16/2005 - Same as previously reported. RZDZ
11/20/2000 - None NKKM
01/28/1999 - Rail post has areas of speckled rust. APPR. rail mounted 6" lower than bridge rail. RBKK
12/05/1996 - None PTCR
12/01/1994 - None REFI

Inspection Notes:

INITIAL ASSESSMENT FORM FOR STRUCTURE :

S00332000+09001

Continue

General Inspection Notes

04/13/2011 - 14' underclearance to water and 16' to bottom of channel. Both abutments 1 (photo)and 4 have riprap. TH	TZKZ
11/10/2009 - None	RMCZ
10/15/2007 - None	YZKP
02/16/2005 - None	RZDZ
11/20/2000 - None	NKKM
01/28/1999 - None	RBKK
12/05/1996 - Sufficiency Rating Calculation Accepted by ops$a0241 at 9/2/97 14:31:13 OPS$A0241 inspection comments - Structure S00332000+09001 - Date 12/5/96 - Previous comments > Sufficiency Rating Calculation Accepted by ops$u5963 at 3/11/97 10:14:48 Sufficiency Rating Calculation Accepted by ops$u5963 at 3/11/97 09:56:58 Sufficiency Rating Calculation Accepted by ops$u9004 at 2/19/97 15:04:00	PTCR
12/01/1994 - Sufficiency Rating Calculation Accepted by ops$u5963 at 3/11/97 10:14:48 Sufficiency Rating Calculation Accepted by ops$u5963 at 3/11/97 09:56:58 Sufficiency Rating Calculation Accepted by ops$u9004 at 2/19/97 15:04:00	REFI
09/01/1992 - Updated with tape 1994	NB94
02/01/1991 - Updated with tape 1993	NB93
12/01/1988 - Updated with tape 1991	NB91
01/01/1987 - Updated with tape 1989	NB89
02/01/1985 - Updated with tape 1986	NB86
12/01/1982 - Updated with tape 1984	NB84
12/01/1980 - Updated with tape 1983	NB83
12/01/1978 - Updated with tape 1980	NB80

Montana Department of Transportation

INITIAL ASSESSMENT FORM FOR STRUCTURE :

S00332019+08751

Location : 31M SW MILES CITY Structure Name: none

General Location Data

District Code, Number, Location : **04** **Dist 4** **GLENDIVE**
Division Code, Location : **43** **MILES CITY**
County Code, Location : **017** **CUSTER**
City Code, Location : **00000** **RURAL AREA**
Kind fo Hwy Code, Description : **3** **3 State Hwy**
Signed Route Number : **00332**
Str Owner Code, Description : **2** **County Highway Agency**
Maintained by Code, Description : **2** **County Highway Agenc**
Intersecting Feature : **FOSTER CREEK**
Kilometer Post, Mile Post : **31.98 km** **19.87**

Structure on the State Highway System : [X]
Structure on the National Highway System : [ ]
Str Meet or Exceed NBIS Bridge Length : [X]
Latitude : **46°01'53"**
Longitude : **105°57'09"**

Construction Data

Construction Project Number : **S 45-2**
Construction Station Number : **1052+70.00**
Construction Drawing Number : **3128**
Construction Year : **1952**
Reconstruction Year :

Traffic Data

Current ADT : **100**
ADT Count Year : **2009**
Percent Trucks : **3 %**

Structure Loading, Rating and Posting Data

Loading Data :

Design Loading :		**2 M 13.5 (H 15)**
Inventory Load, Design :	**25.1 mton**	**2 AS Allowable Stress**
Operating Load, Design :	**35.2 mton**	**2 AS Allowable Stress**
Posting :		**5 At/Above Legal Loads**

Rating Data :

	Operating	Inventory	Posting
Truck 1 Type 3 :	**32**	**23**	
Truck 2 Type 3-S3 :	**50**	**36**	
Truck 3 Type 3-3 :	**62**	**44**	

Structure, Roadway and Clearance Data

Structure Deck, Roadway and Span Data :

Structure Length : **11.58 m**
Deck Area : **92.00 m sq**
Deck Roadway Width : **7.28 m**
Approach Roadway Width : **7.28 m**
Median Code, Description : **0 No median**

Structure Vertical and Horizontal Clearance Data :

Vertical Clearance Over the Structure : **99.99 m**
Reference Feature for Vertical Clearance : **N Feature not hwy or RR**
Vertical Clearance Under the Structure : **0.00 m**
Reference Feature for Lateral Underclearance : **N Feature not hwy or RR**
Minimum Lateral Under Clearance Right : **0.00 m**
Minimum Lateral Under Clearance Left : **0.00 m**

Span Data

Main Span

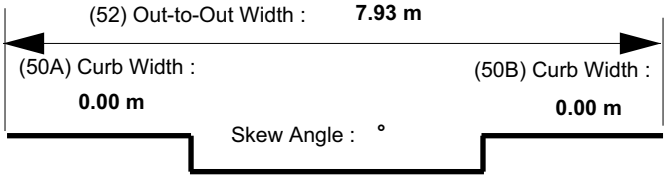
Number Spans : **2**
Material Type Code, Description : **7 Wood or Timber**
Span Design Code, Description : **2 Stringer/Multi-beam or Girder**

Deck

Deck Structure Type : **8 Wood or Timber**
Deck Surfacing Type : **6 Bituminous**
Deck Protection Type : **0 None**
Deck Membrain Type : **0 None**

Approach Span

Number of Spans : **0**
Material Type Code, Description :
Span Design Code, Description :



Structure Vertical and Horizontal Clearance Data Inventory Route :

Over / Under Direction Name	Inventory Route	South, West or Bi-directional Travel			North or East Travel		
		Direction	Vertical	Horizontal	Direction	Vertical	Horizontal
Route On Structure	S00332	Both	99.99 m	7.28 m	N/A		

Montana Department of Transportation

INITIAL ASSESSMENT FORM FOR STRUCTURE :

S00332019+08751

Continue

Inspection Data

Inspection Due Date : 19 October 2012

Sufficiency Rating : **90.1**
Health Index : **94.98**
Structure Status :**Not Deficient**

(91) Inspection Fequency (months) : **24**

NBI Inspection Data

(90) Date of Last Inspection :	19 October 2010	Last Inspected By :	Troy Hafele - 2056
(90) Inspection Date :		Inspected By :	

(58) Deck Rating :	6	(68) Deck Geometry :	5	(36C) Approach Rail Rating :	1	(62) Culvert Rating :	N
(59) Superstructure Rating :	6	(67) Structure Rating :	6	(36A) Bridge Rail Rating :	0	(61) Channel Rating :	6
(60) Substructure Rating :	6	(69) Under Clearance :	N	(36B) Transition Rating :	0	(71) Waterway Adequacy :	8
(72) App Rdwy Align :	8	(41) Posting Status :	A	(36D) End Rail Rating :	0	(113) Scour Critical :	4

Unrepaired Spalls :	0 m sq	Deck Surfacing Depth :	3.00 in

Inspection Hours

Crew Hours for inspection :	1.5	Snooper Required :	N
Helper Hours :	-1	Snooper Hours for inspection :	-1
Special Crew Hours :	-1	Flagger Hours :	-1
Special Equipment Hours :	-1		

Inspection Work Candidates

Candidate ID	Date Requested	Status	Priority	Effected Structure Unit	Scope of Work	Action	Covered Condition States

INITIAL ASSESSMENT FORM FOR STRUCTURE :

S00332019+08751

Continue

Element Inspection Data

* * * * * * * * * * Span : **Main-0 - -1** * * * * * * * * * *

Element Description

Smart Flag	Scale Factor	Env	Quantity	Units	Insp Each	Pct Stat 1	Pct Stat 2	Pct Stat 3	Pct Stat 4	Pct Stat 5
Element 32 - Timber Deck/AC Ovly 2 X 4 creosote boards on edge										
	1	2	92	sq.m.	X	0	100	0	0	
						%	%	%	%	%

Previous Inspection Notes :

10/19/2010 - plant mix mostly covered with gravel, underside is water stained. (11.58 x 7.93 = 91.83) TH	WZLZ
08/26/2008 - Repairs less than 2 pct.	ZZJS
01/30/2007 - None. (11.58 X 8.05 = 93.219)	BZMZ

Inspection Notes:

Smart Flag	Scale Factor	Env	Quantity	Units	Insp Each	Pct Stat 1	Pct Stat 2	Pct Stat 3	Pct Stat 4	Pct Stat 5
Element 111 - Timber Open Girder 13 - 6 x 17 1/2 inch creosote beams per span										
	1	1	151	m.		90	10	0	0	
						%	%	%	%	%

Previous Inspection Notes :

10/19/2010 - None	WZLZ
08/26/2008 - None	ZZJS
01/30/2007 - None	BZMZ
02/27/2003 - The beams are in same condition.	FXCZ
11/20/2000 - Same as last report.	NKKT
03/12/1999 - (span 2) lt outside has deep horizontal crack(split TH 10-22-10), 7th rt has diagonal crack.	LCDC
12/05/1996 - None	RBAN
12/01/1994 - None	YDNF
12/01/1992 - None	REFI

Inspection Notes:

Smart Flag	Scale Factor	Env	Quantity	Units	Insp Each	Pct Stat 1	Pct Stat 2	Pct Stat 3	Pct Stat 4	Pct Stat 5
Element 206 - Timber Column										
	1	2	17	ea.		70	30	0	0	
						%	%	%	%	%

Previous Inspection Notes :

10/19/2010 - None	WZLZ
08/26/2008 - None	ZZJS
01/30/2007 - None	BZMZ
02/27/2003 - Same as last insp.	FXCZ
11/20/2000 - Same as last report.	NKKT
03/12/1999 - Numerous piling has vertical cracking. Diagonal bracing is breaking down.	LCDC

Inspection Notes:

INITIAL ASSESSMENT FORM FOR STRUCTURE :

S00332019+08751

Continue

* * * * * * * * * * Span : **Main-0 - -1 (cont.)** * * * * * * * * * *

Element Description

Smart Flag	Scale Factor	Env	Quantity	Units	Insp Each	Pct Stat 1	Pct Stat 2	Pct Stat 3	Pct Stat 4	Pct Stat 5
Element 216 - Timber Abutment 3 x 12 inch creosote planks										
	1	2	29	m.		90	10	0	0	
						%	%	%	%	%

Previous Inspection Notes :

10/19/2010 - Abut 1 fill material is starting to slough under backwall planks(photo). TH	WZLZ
08/26/2008 - None	ZZJS
01/30/2007 - None	BZMZ
02/16/2005 - Same as previously reported.	RZDZ
02/27/2003 - The backing planks are badly weathered and cracking.	FXCZ
11/20/2000 - Same as last report.	NKKT
03/12/1999 - Backing planks are cracking and bowing inward.	LCDC
12/05/1996 - None	RBAN
12/01/1994 - None	YDNF
12/01/1992 - None	REFI

Inspection Notes:

Element 235 - Timber Cap

Smart Flag	Scale Factor	Env	Quantity	Units	Insp Each	Pct Stat 1	Pct Stat 2	Pct Stat 3	Pct Stat 4	Pct Stat 5
	1	1	24	m.		70	30	0	0	
						%	%	%	%	%

Previous Inspection Notes :

10/19/2010 - water stained but sound OK, changed from 40,55,5 to 70,30 percent. TH	WZLZ
08/26/2008 - None	ZZJS
01/30/2007 - None	BZMZ
02/16/2005 - Same as previously reported.	RZDZ
02/27/2003 - LT side cap at abut.1 large vertical split at the end.(see photo)	FXCZ
11/20/2000 - same as last report.	NKKT
03/12/1999 - All caps has vertical cracking, cap at abutment 3 has a horizontal crack.	LCDC
12/05/1996 - None	RBAN
12/01/1994 - None	YDNF
12/01/1992 - None	REFI

Inspection Notes:

INITIAL ASSESSMENT FORM FOR STRUCTURE :

S00332019+08751

Continue

* * * * * * * * * * Span : **Main-0 - -1 (cont.)** * * * * * * * * * *

Element Description										
Smart Flag	Scale Factor	Env	Quantity	Units	Insp Each	Pct Stat 1	Pct Stat 2	Pct Stat 3	Pct Stat 4	Pct Stat 5
Element 334 - Metal Rail Coated galvanized W beam with no stiffner and 12 inch block out, 7 1/2 inch wood posts and 11 1/4 inch curb										
	1	1	23	m.		95	5	0	0	0
						%	%	%	%	%

Previous Inspection Notes :

10/19/2010 - Abut 2 right side curb has some section loss. TH WZLZ
08/26/2008 - None ZZJS
01/30/2007 - None. (11.58 X 2 = 23.16) BZMZ
02/16/2005 - Same as previously reported. RZDZ
02/27/2003 - None FXCZ
11/20/2000 - Same as last report. NKKT
03/12/1999 - Rail mounted to low. LCDC
12/05/1996 - None RBAN
12/01/1994 - None YDNF
12/01/1992 - None REFI

Inspection Notes:

General Inspection Notes

10/19/2010 - 11' underclearance to bottom of channel. TH WZLZ
08/26/2008 - None ZZJS
01/30/2007 - None BZMZ
02/16/2005 - Same as previously reported. RZDZ
02/27/2003 - None FXCZ
11/20/2000 - Same as last report. NKKT
03/12/1999 - All rail mounted to low. LCDC
12/05/1996 - None RBAN
12/01/1994 - Sufficiency Rating Calculation Accepted by ops$u5963 at 3/11/97 10:14:50 YDNF
Sufficiency Rating Calculation Accepted by ops$u5963 at 3/11/97 09:57:00
Sufficiency Rating Calculation Accepted by ops$u9004 at 2/19/97 15:04:03
12/01/1992 - REFI
02/01/1991 - Updated with tape 1993 NB93
12/01/1988 - Updated with tape 1991 NB91
01/01/1987 - Updated with tape 1989 NB89
02/01/1985 - Updated with tape 1986 NB86
12/01/1982 - Updated with tape 1984 NB84
12/01/1980 - Updated with tape 1983 NB83
12/01/1978 - Updated with tape 1980 NB80

Montana Department of Transportation

INITIAL ASSESSMENT FORM FOR STRUCTURE :

S00332039+06161

Location : 20M NORTH ASHLAND Structure Name: none

General Location Data

District Code, Number, Location : **04** **Dist 4** **GLENDIVE**
Division Code, Location : **43** **MILES CITY**
County Code, Location : **087** **ROSEBUD**
City Code, Location : **00000** **RURAL AREA**
Kind fo Hwy Code, Description : **3** **3 State Hwy**
Signed Route Number : **00332**
Str Owner Code, Description : **2** **County Highway Agency**
Maintained by Code, Description : **2** **County Highway Agenc**
Intersecting Feature : **TONGUE RIVER**
Kilometer Post, Mile Post : **63.75 km** **39.61**
Structure on the State Highway System : **X**
Latitude : **45°50'23"**
Structure on the National Highway System :
Longitude : **106°13'13"**
Str Meet or Exceed NBIS Bridge Length : **X**

Construction Data

Construction Project Number : **S 45(6)**
Construction Station Number : **2095+00.00**
Construction Drawing Number : **3912**
Construction Year : **1963**
Reconstruction Year :

Traffic Data

Current ADT : **70**
ADT Count Year : **2009**
Percent Trucks : **3 %**

Structure Loading, Rating and Posting Data

Loading Data :

Design Loading :		**3 MS 13.5 (HS 15)**
Inventory Load, Design :	**24.4 mton**	**2 AS Allowable Stress**
Operating Load, Design :	**28.1 mton**	**2 AS Allowable Stress**
Posting :		**5 At/Above Legal Loads**

Rating Data :

	Operating	Inventory	Posting
Truck 1 Type 3 :			
Truck 2 Type 3-S3 :			
Truck 3 Type 3-3 :	**51**		

Structure, Roadway and Clearance Data

Structure Deck, Roadway and Span Data :

Structure Length : **65.68 m**
Deck Area : **544.00 m sq**
Deck Roadway Width : **7.32 m**
Approach Roadway Width : **7.32 m**
Median Code, Description : **0 No median**

Structure Vertical and Horizontal Clearance Data :

Vertical Clearance Over the Structure : **99.99 m**
Reference Feature for Vertical Clearance : **N Feature not hwy or RR**
Vertical Clearance Under the Structure : **0.00 m**
Reference Feature for Lateral Underclearance : **N Feature not hwy or RR**
Minimum Lateral Under Clearance Right : **0.00 m**
Minimum Lateral Under Clearance Left : **0.00 m**

Span Data

Main Span

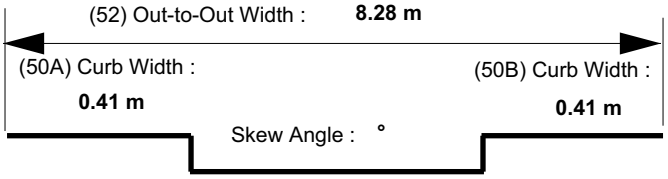
Number Spans : **4**
Material Type Code, Description : **5** **Prestressed concrete**
Span Design Code, Description : **2** **Stringer/Multi-beam or Girder**

Approach Span

Number of Spans : **0**
Material Type Code, Description :
Span Design Code, Description :

Deck

Deck Structure Type : **1 Concrete Cast-in-Place**
Deck Surfacing Type : **1 Monolithic concrete (concurrently placed with struct**
Deck Protection Type : **0 None**
Deck Membrain Type : **0 None**



Structure Vertical and Horizontal Clearance Data Inventory Route :

Over / Under Direction Name	Inventory Route	South, West or Bi-directional Travel			North or East Travel		
		Direction	Vertical	Horizontal	Direction	Vertical	Horizontal
Route On Structure	S00332	Both	99.99 m	7.32 m	N/A		

INITIAL ASSESSMENT FORM FOR STRUCTURE :

S00332039+06161

Continue

Inspection Data

Sufficiency Rating : **91.3**
Health Index : **100**
Structure Status :**Not Deficient**

Inspection Due Date : 28 July 2014
(91) Inspection Fequency (months) : **48**

Next Under Water Insp : **28 Jul 2014**
Under Water Insp Type : **Type I**

NBI Inspection Data

(90) Date of Last Inspection : 28 July 2010
Last Inspected By : Troy Hafele - 2056
(90) Inspection Date :
Inspected By :

(58) Deck Rating :	7	(68) Deck Geometry :	6	(36C) Approach Rail Rating :	N	(62) Culvert Rating :	N
(59) Superstructure Rating :	8	(67) Structure Rating :	6	(36A) Bridge Rail Rating :	0	(61) Channel Rating :	7
(60) Substructure Rating :	7	(69) Under Clearance :	N	(36B) Transition Rating :	N	(71) Waterway Adequacy :	8
(72) App Rdwy Align :	6	(41) Posting Status :	A	(36D) End Rail Rating :	0	(113) Scour Critical :	4

Unrepaired Spalls : 0 m sq
Deck Surfacing Depth : 0.00 in

Inspection Hours

Crew Hours for inspection :	2.5	Snooper Required :	N
Helper Hours :	-1	Snooper Hours for inspection :	-1
Special Crew Hours :	-1	Flagger Hours :	-1
Special Equipment Hours :	-1		

Inspection Work Candidates

Candidate ID	Date Requested	Status	Priority	Effected Structure Unit	Scope of Work	Action	Covered Condition States
D41-FY2010-000045	29 July 2010	Not Approved	High	All Spans	Bridge	Remove	
Remove trees. TH							

INITIAL ASSESSMENT FORM FOR STRUCTURE :

S00332039+06161

Continue

Element Inspection Data

* * * * * * * * * * Span : **Main-0 - -1** * * * * * * * * * *

Element Description

Smart Flag	Scale Factor	Env	Quantity	Units	Insp Each	Pct Stat 1	Pct Stat 2	Pct Stat 3	Pct Stat 4	Pct Stat 5
Element 12 - Bare Concrete Deck										
	1	1	544	sq.m.	X	100	0	0	0	0
						%	%	%	%	%

Previous Inspection Notes :

07/28/2010 - Changed from 0,100 to 100,0 percent. TH ZZEZ

10/18/2006 - light aggregate wear from the gravel being tracked on. SZJZ
(65.68 X 8.28 = 543.830)

11/10/2004 - same as previously reported. BQHE

11/20/2000 - Light map cracking and a few popouts. NKKJ

Inspection Notes:

Smart Flag	Scale Factor	Env	Quantity	Units	Insp Each	Pct Stat 1	Pct Stat 2	Pct Stat 3	Pct Stat 4	Pct Stat 5
Element 109 - P/S Conc Open Girder										
	1	1	262	m.		100	0	0	0	
						%	%	%	%	%

Previous Inspection Notes :

07/28/2010 - 4 I beams. TH ZZEZ

10/18/2006 - None SZJZ

11/10/2004 - None BQHE

11/20/2000 - None NKKJ

01/28/1999 - None RBAT

02/20/1997 - None MUAX

03/01/1995 - None YDNF

12/01/1992 - None REFI

Inspection Notes:

Smart Flag	Scale Factor	Env	Quantity	Units	Insp Each	Pct Stat 1	Pct Stat 2	Pct Stat 3	Pct Stat 4	Pct Stat 5
Element 205 - R/Conc Column										
	1	3	6	ea.		100	0	0	0	
						%	%	%	%	%

Previous Inspection Notes :

07/28/2010 - changed element from pier wall to columns. 10-18-06 Ice breakers have rust with section loss at waterline. TH ZZEZ

Inspection Notes:

INITIAL ASSESSMENT FORM FOR STRUCTURE :

S00332039+06161

Continue

* * * * * * * * * * Span : **Main-0 - -1 (cont.)** * * * * * * * * * *

Element Description										
Smart Flag	Scale Factor	Env	Quantity	Units	Insp Each	Pct Stat 1	Pct Stat 2	Pct Stat 3	Pct Stat 4	Pct Stat 5
Element 215 - R/Conc Abutment										
	1	2	22	m.		100	0	0	0	
						%	%	%	%	%

Previous Inspection Notes :

07/28/2010 - None ZZEZ
10/18/2006 - None SZJZ
11/10/2004 - None BQHE
11/20/2000 - None NKKJ
01/28/1999 - None RBAT
02/20/1997 - None MUAX
03/01/1995 - None YDNF
12/01/1992 - None REFI

Inspection Notes:

Element 234 - R/Conc Cap										
	1	1	24	m.		100	0	0	0	
						%	%	%	%	%

Previous Inspection Notes :

07/28/2010 - None ZZEZ
10/18/2006 - None SZJZ
11/10/2004 - None BQHE
11/20/2000 - None NKKJ
01/28/1999 - None RBAT
02/20/1997 - None MUAX
03/01/1995 - None YDNF
12/01/1992 - None REFI

Inspection Notes:

Element 313 - Fixed Bearing										
	1	1	24	ea.		100	0	0		
						%	%	%	%	%

Previous Inspection Notes :

07/28/2010 - Bearings at Abut 1 and 4 are buried in backwall and are not included in quantity. Bents 2,3 and 4 have 8 each, changed quantity from 32 to 24. TH ZZEZ
10/18/2006 - None SZJZ
11/10/2004 - None BQHE
11/20/2000 - None NKKJ
01/28/1999 - None RBAT
02/20/1997 - None MUAX
03/01/1995 - None YDNF
12/01/1992 - None REFI

Inspection Notes:

INITIAL ASSESSMENT FORM FOR STRUCTURE :

S00332039+06161

Continue

* * * * * * * * * * Span : **Main-0 - -1 (cont.)** * * * * * * * * * *

Element Description

Smart Flag	Scale Factor	Env	Quantity	Units	Insp Each	Pct Stat 1	Pct Stat 2	Pct Stat 3	Pct Stat 4	Pct Stat 5
Element 334 - Metal Rail Coated										
	1	1	131	m.		95	5	0	0	0
						%	%	%	%	%

Previous Inspection Notes :

07/28/2010 - Painted W beam with 5" painted steel I beam posts. W beam rail has primer showing with light surface rust and posts have some surface rust also. TH	ZZEZ
10/18/2006 - None. (65.68 X 2 = 131.36)	SZJZ
11/10/2004 - Same as previously reported.	BQHE
11/20/2000 - None	NKKJ
01/28/1999 - Areas of light rust on rail post.	RBAT
02/20/1997 - None	MUAX
03/01/1995 - None	YDNF
12/01/1992 - None	REFI

Inspection Notes:

General Inspection Notes

07/28/2010 - Stream gaging monitors on downstream side of Bents 2 and 3. TH	ZZEZ
10/18/2006 - No snooper insp. do to weather limitations of snooper.	SZJZ
11/10/2004 - Same as previously reported.	BQHE
11/20/2000 - Same as last report.	NKKJ
01/28/1999 - Structure at end of horizontal curve. Trees growing near structure.	RBAT
02/20/1997 - OPS$A0241 inspection comments - Structure S00332039+06161 - Date 2/20/97 - Previous comments > Sufficiency Rating Calculation Accepted by ops$u5963 at 3/11/97 10:14:50 Sufficiency Rating Calculation Accepted by ops$u5963 at 3/11/97 09:57:00 Sufficiency Rating Calculation Accepted by ops$u9004 at 2/19/97 15:04:04	MUAX
03/01/1995 - Sufficiency Rating Calculation Accepted by ops$u5963 at 3/11/97 10:14:50 Sufficiency Rating Calculation Accepted by ops$u5963 at 3/11/97 09:57:00 Sufficiency Rating Calculation Accepted by ops$u9004 at 2/19/97 15:04:04	YDNF
12/01/1992 -	REFI
10/01/1991 - Updated with tape 1993	NB93
09/01/1988 - Updated with tape 1991	NB91
01/01/1987 - Updated with tape 1988	NB88
02/01/1985 - Updated with tape 1986	NB86
12/01/1982 - Updated with tape 1984	NB84
12/01/1980 - Updated with tape 1983	NB83
12/01/1978 - Updated with tape 1980	NB80

Montana Department of Transportation

INITIAL ASSESSMENT FORM FOR STRUCTURE :

S00332047+08001

Location : 11M NORTH ASHLAND Structure Name: none

General Location Data

District Code, Number, Location : **04** **Dist 4** **GLENDIVE**
Division Code, Location : **43** **MILES CITY**
County Code, Location : **087** **ROSEBUD**
City Code, Location : **00000** **RURAL AREA**
Kind fo Hwy Code, Description : **3** **3 State Hwy**
Signed Route Number : **00332**
Str Owner Code, Description : **2** **County Highway Agency**
Maintained by Code, Description : **2** **County Highway Agenc**
Intersecting Feature : **DRAINAGE**
Kilometer Post, Mile Post : **76.93 km** **47.80**
Structure on the State Highway System : [X]
Latitude : **45°45'14"**
Structure on the National Highway System : [ ]
Longitude : **106°18'08"**
Str Meet or Exceed NBIS Bridge Length : [X]

Construction Data

Construction Project Number :
Construction Station Number :
Construction Drawing Number : **none**
Construction Year : **1986**
Reconstruction Year :

Traffic Data

Current ADT : **70**
ADT Count Year : **2009**
Percent Trucks : **3 %**

Structure Loading, Rating and Posting Data

Loading Data :

Design Loading :		**5 MS 18 (HS 20)**
Inventory Load, Design :	**32.6 mton**	**A LFD Assigned**
Operating Load, Design :	**32.6 mton**	**A LFD Assigned**
Posting :		**5 At/Above Legal Loads**

Rating Data :

	Operating	Inventory	Posting
Truck 1 Type 3 :			
Truck 2 Type 3-S3 :			
Truck 3 Type 3-3 :	**40**		

Structure, Roadway and Clearance Data

Structure Deck, Roadway and Span Data :

Structure Length : **7.32 m**
Deck Area : **64.00 m sq**
Deck Roadway Width : **8.60 m**
Approach Roadway Width : **7.20 m**
Median Code, Description : **0** **No median**

Structure Vertical and Horizontal Clearance Data :

Vertical Clearance Over the Structure : **99.99 m**
Reference Feature for Vertical Clearance : **N Feature not hwy or RR**
Vertical Clearance Under the Structure : **0.00 m**
Reference Feature for Lateral Underclearance : **N Feature not hwy or RR**
Minimum Lateral Under Clearance Right : **0.00 m**
Minimum Lateral Under Clearance Left : **0.00 m**

Span Data

Main Span

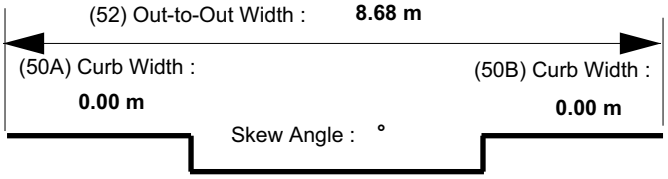
Number Spans : **1**
Material Type Code, Description : **5** **Prestressed concrete**
Span Design Code, Description : **4** **Tee Beam**

Approach Span

Number of Spans : **0**
Material Type Code, Description :
Span Design Code, Description :

Deck

Deck Structure Type : **N Not applicable**
Deck Surfacing Type : **1 Monolithic concrete (concurrently placed with struct**
Deck Protection Type : **0 None**
Deck Membrain Type : **0 None**



Structure Vertical and Horizontal Clearance Data Inventory Route :

Over / Under Direction Name	Inventory Route	South, West or Bi-directional Travel			North or East Travel		
		Direction	Vertical	Horizontal	Direction	Vertical	Horizontal
Route On Structure	S00332	Both	99.99 m	8.60 m	N/A		

INITIAL ASSESSMENT FORM FOR STRUCTURE :

S00332047+08001

Continue

Inspection Data

Inspection Due Date : 19 October 2012

Sufficiency Rating : **97.7**
Health Index : **92.11**
Structure Status :**Not Deficient**

(91) Inspection Fequency (months) : **24**

NBI Inspection Data

(90) Date of Last Inspection :	19 October 2010	Last Inspected By :	Troy Hafele - 2056
(90) Inspection Date :		Inspected By :	

(58) Deck Rating :	6	(68) Deck Geometry :	7	(36C) Approach Rail Rating :	N	(62) Culvert Rating :	N
(59) Superstructure Rating :	7	(67) Structure Rating :	6	(36A) Bridge Rail Rating :	0	(61) Channel Rating :	7
(60) Substructure Rating :	6	(69) Under Clearance :	N	(36B) Transition Rating :	0	(71) Waterway Adequacy :	8
(72) App Rdwy Align :	6	(41) Posting Status :	A	(36D) End Rail Rating :	0	(113) Scour Critical :	4

Unrepaired Spalls :	3 m sq	Deck Surfacing Depth :	0.00 in

Inspection Hours

Crew Hours for inspection :	1.5	Snooper Required :	N
Helper Hours :	-1	Snooper Hours for inspection :	-1
Special Crew Hours :	-1	Flagger Hours :	-1
Special Equipment Hours :	-1		

Inspection Work Candidates

Candidate ID	Date Requested	Status	Priority	Effected Structure Unit	Scope of Work	Action	Covered Condition States

INITIAL ASSESSMENT FORM FOR STRUCTURE :

S00332047+08001

Continue

Element Inspection Data

* * * * * * * * * * Span : **Main-0 - -1** * * * * * * * * * *

Element Description										
Smart Flag	Scale Factor	Env	Quantity	Units	Insp Each	Pct Stat 1	Pct Stat 2	Pct Stat 3	Pct Stat 4	Pct Stat 5
Element 62 - Bare Top Flang										
	1	1	64	sq.m.	X	0	100	0	0	0
						%	%	%	%	%

Previous Inspection Notes :

10/19/2010 - None ZLCT
08/25/2008 - Spalls less than 2 pct. ZZLZ
01/31/2007 - None MIIZ

Inspection Notes:

Element 109 - P/S Conc Open Girder 9 channel beams 15h x 38w inches										
	1	1	66	m.		95	5	0	0	
						%	%	%	%	%

Previous Inspection Notes :

10/19/2010 - None ZLCT
08/25/2008 - None ZZLZ
01/31/2007 - Area of unrepaired spalls. MIIZ
02/22/2005 - Same as previously reported. WZEG
02/27/2003 - Same comments as last report. FZCZ
11/20/2000 - None NKKS
01/28/1999 - Top of box has moderate traffic wear. RBAL
02/20/1997 - _ IMCD

Inspection Notes:

Element 201 - Unpnt Stl Column 9 1/2 inch diameter pipe										
	1	2	10	ea.		80	20	0	0	
						%	%	%	%	%

Previous Inspection Notes :

10/19/2010 - changed from 0,40,60 to 80,20 percent. TH ZLCT
08/25/2008 - Rust prevelant minor surface pitting. ZZLZ
02/22/2005 - Same as previously reported. WZEG
02/27/2003 - Piling are in the same condition as last report. FZCZ
11/20/2000 - None NKKS
01/28/1999 - Piling has light pitting occurring. RBAL
02/20/1997 - _ IMCD

Inspection Notes:

INITIAL ASSESSMENT FORM FOR STRUCTURE :

S00332047+08001

Continue

* * * * * * * * * * Span : **Main-0 - -1 (cont.)** * * * * * * * * * *

Element Description

Smart Flag	Scale Factor	Env	Quantity	Units	Insp Each	Pct Stat 1	Pct Stat 2	Pct Stat 3	Pct Stat 4	Pct Stat 5
Element 217 - Other Mtl Abutment sheet piling										
	1	2	25	m.		75	20	5	0	
						%	%	%	%	%

Previous Inspection Notes :

10/19/2010 - Abut 1's bottom 4' has speckled alkali corrosion, 1/8" depth. Changed from 0,95,5 to 75,20,5 percent. TH ZLCT
08/25/2008 - None ZZLZ
01/31/2007 - None MIIZ
02/22/2005 - Same as previously reported. WZEG
02/27/2003 - Same comments as last reports. FZCZ
11/20/2000 - None NKKS
01/28/1999 - Bottom of abut.1 has scaling rust the rest has pitting rust. RBAL
02/20/1997 - _ IMCD

Inspection Notes:

Smart Flag	Scale Factor	Env	Quantity	Units	Insp Each	Pct Stat 1	Pct Stat 2	Pct Stat 3	Pct Stat 4	Pct Stat 5
Element 230 - Unpnt Stl Cap 8 1/4 inch I beam										
	1	1	17	m.		80	20	0	0	
						%	%	%	%	%

Previous Inspection Notes :

10/19/2010 - some light/moderate surface rust, changed from 0,50,50 to 80,20 percent. TH ZLCT
08/25/2008 - Rust prevelant, minor surface pitting. ZZLZ
02/22/2005 - Same as previously reported. WZEG
02/27/2003 - Same as last insp. FZCZ
11/20/2000 - None NKKS
01/28/1999 - Caps has pitting rust occurring. RBAL
02/20/1997 - _ IMCD

Inspection Notes:

Smart Flag	Scale Factor	Env	Quantity	Units	Insp Each	Pct Stat 1	Pct Stat 2	Pct Stat 3	Pct Stat 4	Pct Stat 5
Element 334 - Metal Rail Coated galvanized W beam with no stiffner, 6 3/4 inch unpainted T posts										
	1	1	15	m.		90	10	0	0	0
						%	%	%	%	%

Previous Inspection Notes :

10/19/2010 - posts have light surface rust, changed from 100,0 to 90,10 percent. TH ZLCT
08/25/2008 - None ZZLZ
01/31/2007 - None. (7.32 X 2 = 14.64) MIIZ
02/22/2005 - None WZEG
02/27/2003 - None FZCZ
11/20/2000 - None NKKS
01/28/1999 - None RBAL
02/20/1997 - _ IMCD

Inspection Notes:

INITIAL ASSESSMENT FORM FOR STRUCTURE :

S00332047+08001

Continue

General Inspection Notes

10/19/2010 - 13' to bottom of channel. TH	ZLCT
08/25/2008 - None	ZZLZ
01/31/2007 - None	MIIZ
02/22/2005 - Same as previously reported.	WZEG
02/27/2003 - None	FZCZ
11/20/2000 - None	NKKS
01/28/1999 - Structure at bottom of vertical and middle of horizontal curves.	RBAL
02/20/1997 - Sufficiency Rating Calculation Accepted by ops$a0241 at 9/2/97 14:38:42 OPS$A0241 inspection comments - Structure S00332047+08001 - Date 2/20/97 - Previous comments > Sufficiency Rating Calculation Accepted by ops$u5963 at 3/11/97 10:14:53 Sufficiency Rating Calculation Accepted by ops$u5963 at 3/11/97 09:57:00 Sufficiency Rating Calculation Accepted by ops$u9004 at 2/19/97 15:04:05	IMCD
12/01/1994 - Sufficiency Rating Calculation Accepted by ops$u5963 at 3/11/97 10:14:53 Sufficiency Rating Calculation Accepted by ops$u5963 at 3/11/97 09:57:00 Sufficiency Rating Calculation Accepted by ops$u9004 at 2/19/97 15:04:05	REFI
12/01/1992 - Updated with tape 1994	NB94
02/01/1991 - Updated with tape 1993	NB93
12/01/1988 - Updated with tape 1991	NB91
01/01/1987 - Updated with tape 1989	NB89

NEEDS AND OBJECTIVES

TONGUE RIVER ROAD (S-332) – Corridor Planning Study

FINAL

Prepared for:

Montana Department of Transportation

Helena, Montana

Prepared by:

Robert Peccia & Associates

Helena, Montana

July 27, 2012

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CORRIDOR NEEDS AND OBJECTIVES

1.0 CORRIDOR NEEDS AND OBJECTIVES

Needs and Objectives for the Secondary Route 332 (S-332) corridor within the study area were identified based on a comprehensive review of existing data, and input from resource agencies, stakeholders and the public. The needs and objectives are important in explaining why an improvement option, or options, may be necessary. The discussion and analysis leading to the development of these needs and objectives recognizes the diverse nature of the corridor and takes into account social, economic and environmental conditions.

The following needs and objectives will be used in the development of improvement options. Note that needs and objectives will be met to the extent practicable given financial, public preference and environmental constraints within the corridor. Improvement options identified in this study may lead to future projects. The "Purpose and Need" statement for any future project should be consistent with the needs and objectives contained in this study. However, not all of the needs and objectives at the corridor level are required to be included in a project-level "Purpose and Need" statement. For example, a simple gravel road resurfacing project may have little to no effect on wildlife connectivity objectives, thus rendering compliance with the intent of that particular objective unnecessary.

1.1. NEED NUMBER 1: IMPROVE SAFETY AND OPERATION OF S-332

At the current time, S-332 primarily serves adjacent landowners by providing a travel route for various agricultural and ranching operations to the economic hub of Miles City. S-332 also provides a crucial link between Ashland and Miles City. In the future, and depending on the development of coal mining operations at the Otter Creek coal tracts, S-332 may realize increased passenger and vehicular traffic. Need number 1 recognizes that the roadway must be safe and efficient to meet the travelling needs of the public, both for through traffic and local traffic. To address this need, improvement options and /or management strategies are necessary for the corridor to achieve a higher level of safety and improve operations. This can be achieved by improving the roadway to meet current design standards (to the extent practicable), providing adequate clear zones, improving drainage conditions, providing consistent road and bridge widths for "all-weather" travel, and properly maintaining the roadway.

Objectives (To the Extent Practicable)

- Improve geometric elements to meet current MDT design criteria.
- Accommodate existing and future capacity demands within the corridor, including potential increases in semi-truck traffic.
- Provide adequate clear zones to meet current MDT design criteria.
- Provide appropriate drainage facilities throughout the corridor to minimize water on the roadway.
- Provide consistent roadway and bridge widths.
- Provide appropriate surfacing to allow for "all-weather" travel.
- Improve maintenance practices, given limited funding, to address washboards, potholes, and dust issues.

1.2. Need Number 2: Preserve the Environmental, Scenic, Cultural, Recreational and Agricultural Nature of the Corridor

S-332 has high scenic value, and provides access to agricultural and recreational lands. Because of the corridor's location, wildlife and aquatic connectivity, as well as historic, cultural and archaeological integrity, are areas of concern. All improvement options should be evaluated for their ability to reduce animal-vehicle collisions. Improvements should be considered that provide both wildlife and aquatic connectivity. Numerous animal-vehicle collisions are realized within the corridor. There must be sensitivity to the rich historic, cultural and archaeological integrity of the area. All improvements should be reviewed for their potential impact to the environmental, scenic, cultural, recreational and agricultural aspects of the corridor.

Objectives (To the Extent Practicable)

- Respect the scenic nature of the corridor with respect to view sheds and landscape features.
- Avoid adverse impacts to the extent practicable, otherwise minimize the environmental resource impacts of improvement options.
- Evaluate and incorporate "best practice" mitigation strategies as appropriate to promote wildlife connectivity across S-332.
- Evaluate and incorporate "best practice" mitigation strategies as appropriate to reduce animal-vehicle conflicts.
- Evaluate fish (aquatic organism) passage issues and incorporate appropriate solutions to improve aquatic connectivity and stream function through structures and culverts.
- Avoid adverse impacts to the extent practicable, otherwise minimize adverse impacts to historic, cultural, and archaeological resources that may result from improvement options.
- Provide reasonable access to recreational sites in the corridor.

1.3. Need Number 3: Minimize Conflicts Along the Corridor

This need recognizes the rural nature of the corridor and the predominately agricultural operations adjacent to the route. The presence of the Amish community, the Northern Cheyenne Indian Reservation and the St. Labre Indian School located south of the southern termini of S-332 are also noted. Improvement options should be sensitive to the day-to-day operations of adjacent landowners and the potential effect improvements may have on diverse populations near Ashland.

Objectives (To the Extent Practicable)

- Minimize impacts to existing residential and agricultural uses along the corridor.
- Minimize impacts to the Amish community, the Northern Cheyenne Indian Reservation and the St. Labre Indian School, all located south of the southern termini of S-332.
- Consider all modes of transportation in the corridor.

1.4. Need Number 4: Other

Improvement options should be sensitive to the availability of funding for construction, and also recurring maintenance costs. Limiting disruptions to adjacent properties during construction would be desirable, especially during harvest periods.

Objectives (To the Extent Practicable)

- Reduce roadway maintenance costs.
- Limit disruptions during construction as much as practicable.
- Availability and feasibility of funding.

IMPROVEMENT OPTIONS

TONGUE RIVER ROAD (S-332) – Corridor Planning Study

Prepared for:

Montana Department of Transportation

Helena, Montana

Prepared by:

Robert Peccia & Associates

Helena, Montana

October 1, 2012

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APPENDIX

IMPROVEMENT OPTIONS

1.0 INTRODUCTION

This memorandum identifies improvement options for the Secondary Highway 332 (S-332) corridor (locally known as "Tongue River Road") between Montana Highway 59 (MT-59) south of Miles City and Secondary Highway 447 (S-447) north of Ashland, Montana. The improvement options were identified based on field review, engineering analysis of as-built drawings, crash data analysis, consultation with various resource agencies, and information provided by the general public.

This memorandum provides a brief description of each improvement option, along with planning level cost estimates. A list of areas that do not meet current MDT standards was developed previously in the *Existing and Projected Conditions Report*. Strategies were developed to help address the identified issues and areas of concern. Some of the strategies examined were:

- Expand roadway widths to bring the roadway up to current MDT standards;
- Modify sub-standard vertical curves, and associated vertical grades, to bring vertical curves and grades up to current MDT standards;
- Improve clear zones by flattening slopes or installing guardrail;
- Reconstruct slide areas that were damaged during the 2011 flood events;
- Mill, fill and overlay the existing paved section;
- Place new gravel surfacing on the existing gravel section; Reconstruct and pave S-332 in its entirety, with four new replacement bridges; and
- Modify substandard horizontal curves to current MDT standards.

A fundamental consideration in identifying potential improvement options is the concept of paving S-332 in its entirety. Currently, asphalt surfacing exists between RP 0.00 and RP 17.7. The remaining section of S-332 (RP 17.7 to RP 50.4) contains gravel surfacing of varying widths. Although MDT does not have a defined paving threshold by which a secondary road must be paved, analysis of all state secondary roads in the Glendive District indicates that traffic volumes of approximately 200 vehicles per day (vpd) may be a potential threshold for paving a roadway. Most of the secondary roads in the Glendive District that carry 200 vpd or more are paved. This information is depicted in **Appendix A**.

2.0 ESTIMATE OF IMPROVEMENT COSTS

Planning level cost estimates were developed for the improvement options. These costs are for construction costs only and are in year 2012 dollars. The planning level costs do not include right-of-way acquisition, utility relocation, preliminary engineering (PE) or construction engineering (CE).

A number of factors were used to help estimate the planning level costs including as-built drawings, aerial photography, MDT's average unit costs for materials (see **Table 1**), past projects, local expertise, and engineering judgment. More detail about the planning level cost estimates is provided in the following sections. **Appendix B** contains a detailed summary of the planning level cost estimates.

Table 1: Estimated Unit Material Costs

Material	Units	Unit Price
Cold Milling	SQYD	$1.42
Crushed Aggregate Course [(a)]	CUYD	$40.00
Cover - Type 1	SQYD	$0.56
Plant Mix Bit Surf GR S (3/4") [(a)]	TON	$35.00
Asphalt Cement PG 64-28	TON	$708.22
Emulsified Asphalt CRS-2P	TON	$623.57
Aggregate Treatment	SQYD	$0.42
Excavation - Unclassified Borrow	CUYD	$5.43
Special Borrow	CUYD	$15.20
Guardrail – Steel Box Beam	LNFT	$42.97

(SQYD) square cubic yard; (CUYD) cubic square yard; (TON) ton; (LNFT) linear feet.
[(a)] Planning level unit costs based on communication with MDT Glendive District personnel (Jim Frank, 09/25/2012).

2.1. Vertical Curve Improvement Costs

Cost estimates for vertical curve improvements were developed by calculating quantities and resultant costs to bring sub-standard vertical curves up to current standards. The existing vertical curves were drawn using data from as-built drawings provided by MDT. A new curve length designed to meet current MDT standards was then developed and used to estimate excavation (or borrow) quantities. Unit costs listed in **Table 1** were used for the remainder of the items needed for the cost estimate. **Appendix B** contains the assumptions regarding the length of the required curve, and potential construction items necessary for the work.

Vertical curve improvements have been identified in both the paved and graveled sections of the roadway. As these projects are viewed as "stand-alone" spot improvements, the width of the roadway was assumed to be 26 feet for the paved sections and 28 feet for the gravel sections.

Note that as-built drawings were unavailable for some portions along the gravel section of the corridor. For these locations, an average cost was used based on all the calculated vertical curve improvements along the gravel section.

2.2. Slide Area Costs

Planning level cost estimates for slide area repair projects were calculated based on past MDT projects. An average cost per mile was calculated based on MDT slide area project award costs with letting dates between 2011 and 2012. The average cost per mile was multiplied by the estimated length for each improvement option along S-332 as determined based on aerial photography. **Table 2** shows the recent MDT slide repair projects and the associated award costs.

Table 2: MDT Slide Repair Projects (2011 – 2012)

Project	County	Letting Date	Length (mi)	Award	Cost per Mile
Clagget Hill Slide	Fergus	2/24/2011	0.19	$669,003	$3,532,338
Slide East of Noxon	Sanders	3/10/2011	0.13	$457,629	$3,509,329
US 191 Slides - S Mobridge	Fergus	5/26/2011	1.68	$3,133,525	$1,869,493
Cut Bank South Slide	Glacier	6/23/2011	0.22	$365,078	$1,653,523
E of Winnett - Slide Repair	Petroleum	11/17/2011	0.07	$525,738	$7,402,391
S of McLeod Slide Repair	Sweet Grass	11/17/2011	0.34	$835,658	$2,451,265
Slide Repair - NE of Glendive	Dawson	7/12/2012	0.11	$683,132	$6,011,559
Glasgow Slide Repair	Valley	7/12/2012	0.16	$482,262	$2,995,695
Slide Repair - 13 Miles East Glendive	Dawson	8/23/2012	0.12	$243,070	$1,974,472
TOTAL			3.03	$7,395,094	$2,443,544

Source: MDT Projects Awarded, http://www3.mdt.mt.gov:7782/mttplc/mttplc.tplk0007.project_init

2.3. Roadway Reconstruction & Widening Improvement Costs

Cost estimates for roadway reconstruction were gathered for both gravel and asphalt surfacing. These planning level costs came from a variety of sources that included the *Winifred to Big Sandy Corridor Study (May 2011),* the MDT's *US 212 – Ashland East* project, MDT's *Preliminary Estimating Tool Spreadsheet* (PET – Revised 09/2011), and personal communications with MDT Glendive District personnel. A summary of the estimated costs per square foot for roadway reconstruction are included in **Table 3**.

The recently awarded MDT *US 212 – Ashland East* project in the Glendive District was used to estimate costs associated with asphalt roadway reconstruction. This project includes the reconstruction of 6.5 miles of asphalt roadway to incorporate a 40-foot top width. This project was bid and awarded for approximately $12.3 million, including a single bridge, which accounted for an estimated cost of $588,000. The resultant cost for the road reconstruction (not including the bridge) is approximately $8.55 per square foot.

For gravel roadway reconstruction, costs contained in the *Winifred to Big Sandy Corridor Study* were utilized for cost estimating purposes. A planning level cost estimate of $559,680 per mile was used for the reconstruction of a 26-foot wide gravel roadway in the *Winifred to Big Sandy Corridor Study*. This cost equates to $4.08 per square foot.

A planning level cost estimate of $150 per square foot was used to estimate bridge reconstruction costs. This cost was determined through communications with MDT personnel and through past studies.

Table 3: Roadway Reconstruction Cost Estimates

Reconstruction Effort	Estimated Cost (per square foot)	Source
Asphalt Surface	$8.55	US 212 – Ashland East project
Gravel Surface	$4.08	Winifred to Big Sandy Corridor Study
Bridge Reconstruction	$150	MDT Planning

3.0 DESCRIPTION AND EVALUATION

Improvement options are described in terms of "concepts" as a way of packaging options together. The concepts identified for potential implementations are described as follows:

- **Concept 1 – Spot Improvements:** This concept resulted in the generation of several individual, geographically distinct spot improvements that could be developed as a stand-alone treatment or a series of treatments. These spot improvements included bringing past slide areas up to standards, fixing sub-standard vertical curves (and associated grades), improving sub-standard horizontal curvature just west of the Tongue River Bridge, and installing guardrail at locations with apparent high, steep fill slopes.

- **Concept 2 – Gravel without Reconstruction (RP 17.7 to RP 50.4):** This concept includes two sub-concepts that consist of a gravel roadway without major reconstruction. One concept includes the placement of new gravel surfacing on the currently graveled portion of S-332 while the other would consist of a double-shot / bitumen surfing treatment on top of the existing gravel road. Under both concepts, no reconstruction or widening of the roadway would occur.

- **Concept 3 – Reconstruct and Widen Gravel Section (RP 17.7 to RP 50.4):** This concept includes the reconstruction and widening of the existing gravel portion of the roadway to a new 32-foot wide gravel top width, but on a roadway base that would be suitable for a future 36-foot wide top width. Gravel surfacing would be utilized, and three existing bridges would be removed and replaced with new, 40-foot wide bridges.

- **Concept 4 – Rehabilitate with Mill / Fill / Overlay (RP 0.0 to RP 17.7) & Reconstruct and Widen Gravel Section (RP 17.7 to RP 50.4):** This concept includes a mill, fill and overlay of the existing pavement section between RP 0.0 and RP 17.7. It assumes that no improvements to the width of the roadway would be made. The mill, fill and overlay concept is proposed as a method to improve the riding service and extend the life of the existing pavement, but stop short of a full reconstruct to widen the roadway. No modifications to existing widths would occur, nor would any bridge or hydraulic structures be replaced. Also included with this concept is the reconstruction and widening of the existing gravel portion of the roadway (RP 17.7 to RP 50.4) to a new 32-foot wide gravel top width, but on a roadway base that would be suitable for a future 36-foot wide top width. Gravel surfacing would be utilized, and three existing bridges could be removed and replaced with new, 40-foot wide bridges.

- **Concept 5 – Reconstruct with Pavement (RP 0.00 to RP 50.4):** This concept includes a total reconstruction of S-332 from RP 0.0 to RP 50.4. This concept envisions an asphalt surface, although the exact top width would be dependent on future traffic volumes. The four existing bridges could be removed and replaced with new, 40-foot wide bridges.

These concepts are described in more detail in the following sections. It should be recognized that inherent to any improvement concept (or concepts) there will need to be sensitivity to wildlife and aquatic connectivity concerns. Due to the proximity to the Tongue River, implementation of any of the improvement concepts may necessitate close coordination with resource agencies to identify any areas of sensitivity in regards to wildlife and aquatic needs. Additional language concerning this can be found in the study's *Environmental Scan* document.

CONCEPT 1 - SPOT IMPROVEMENTS

Spot improvements were identified along the corridor that could address specific areas of concern. The description of each spot improvement option is included in this section. The location of each spot improvement is shown graphically in **Figure 1**. Spot improvements generally fall within the following categories:

- Vertical Curve Improvements – Consist of modifications to existing vertical crest and sag curves. Crest vertical curves would be flattened by shaving off the top of the curve to lower the road profile and increase the driver's sight distance. For sag vertical curves, the road profile would be raised by filling in the sag area. In most cases, the vertical curves would also be lengthened. Vertical curve improvements have been identified in both the existing paved and graveled portions of S-332.
- Slide Area Improvements – Numerous slide areas were identified through the field review and discussions with stakeholders and the public. The slide areas were a result of severe flooding during 2011. The slide areas were reconstructed as emergency repairs, under the premise additional work would be needed at a later date.
- Guardrail Installation – There are several areas documented along S-332 that contain steep side slopes and high embankments. MDT's strategy to deal with these hazards is to first remove the hazard. An example would be to flatten a steep side slope by re-grading. The second strategy would then be to consider the installation of barriers, such as guardrail. Spot improvements have been identified where guardrail should be considered for installation to mitigate clear zone concerns.
- Horizontal Curve Improvements – Between RP 39.52 and 40.98 a series of horizontal curves exist that may be a candidate for a roadway alignment modification. Modifications to the existing horizontal curves to improve sight distance and better match driver expectations would be desirable. By increasing the radius of the horizontal curve, the curve would be lengthened so that the change in direction is smoother. In some cases this may be difficult due to physical obstructions such as irrigation pivots or other constraints. In these circumstances, advance warning signs may be utilized to warn the driver of the abrupt shift in alignment.

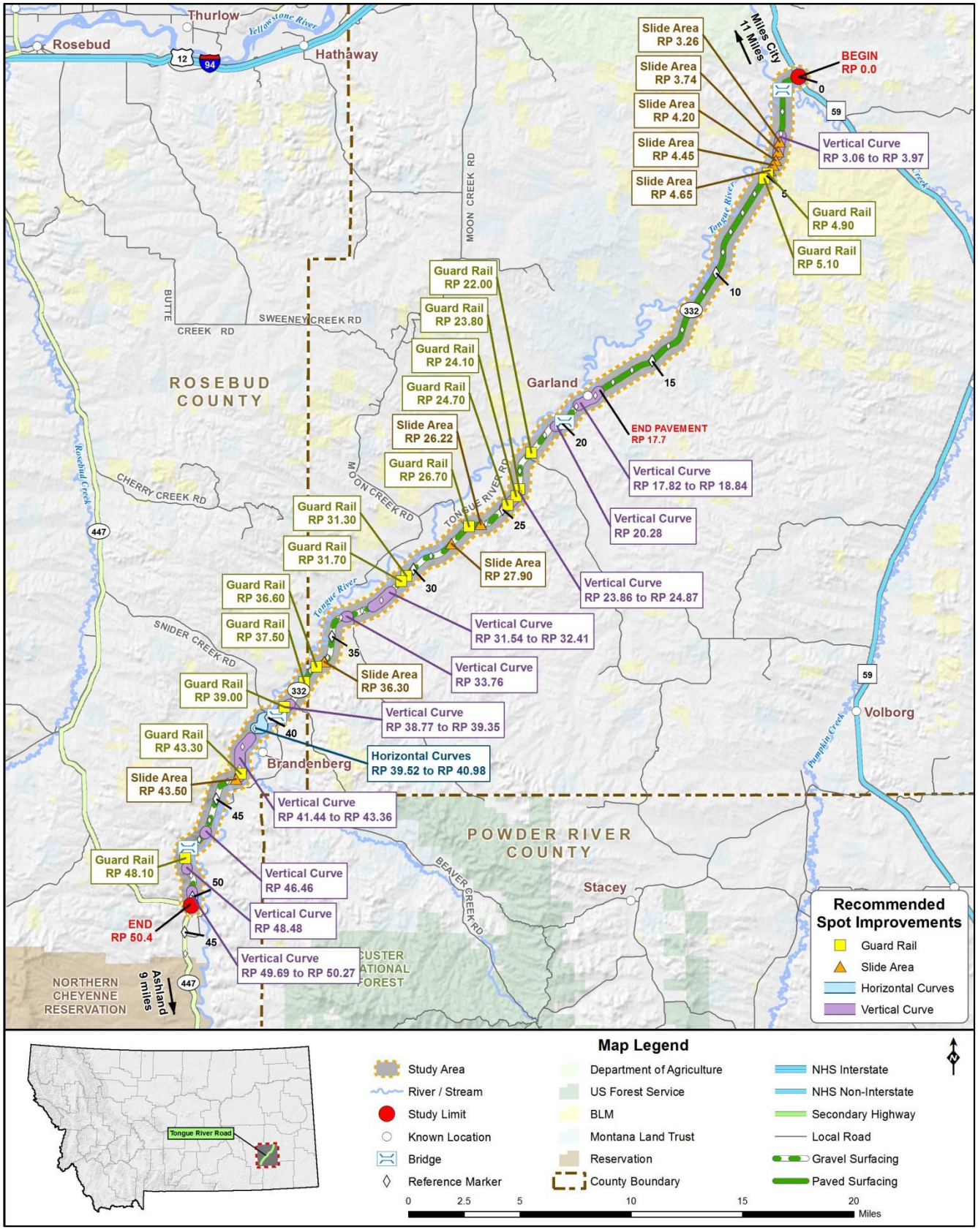

Figure 1: Concept 1 - Spot Improvements

1.A – Vertical Curves

Description:

Numerous vertical curves were identified through the analysis of as-built drawings and field review that do not meet current MDT standards. Spot improvements to address the sub-standard curves by modifying them to meet MDT standards are being forwarded for review. This improvement option could be completed on an individual curve basis, or by improving a series of curves adjacent to each other. **Table 4** portrays the vertical curves that are candidates for improvement to bring them up to standards, along with the estimated cost of improvement.

Some vertical curves have been identified that are relatively close to each other. In those cases, it would be possible to improve the curves in close proximity with one project. Crest vertical curves would be flattened by shaving off the top of the curve to lower the road profile and increase the driver's sight distance. The road profile would be raised by filling in the sag area for sag vertical curves.

As seen in **Table 4**, the majority of the identified vertical curves are in the graveled roadway section (i.e. beyond RP 17.7). The curve improvements are envisioned as spot improvements that can be addressed by project sponsors as funding and time allows. Another longer-term strategy that would address these curves would be a total reconstruction of the roadway as described under Concepts 3, 4 and 5.

Table 4: Vertical Curve Improvements

Location	Number of Vertical Curves	Estimated Cost
RP 3.06 to RP 3.97	4	$588,000
RP 17.82 to RP 18.84	3	$61,000
RP 20.28	1	$5,000
RP 23.86 to RP 24.87	5	$81,000
RP 25.53 to RP 29.60	16	$329,000
RP 31.54 to RP 32.41	2	$57,000
RP 33.76	1	$18,000
RP 38.77 to RP 39.35	2	$13,000
RP 41.44 to RP 43.36 [(a)]	7	$133,000
RP 46.46 [(a)]	1	$19,000
RP 48.48 [(a)]	1	$19,000
RP 49.69 to RP 50.27 [(a)]	3	$57,000
TOTAL	46	$1,380,000

[(a)] *Cost estimate was based on average cost for vertical curve improvements along the gravel section.*

Photo 1: Representative photograph of a vertical crest curve that does not meet standards (at RP 3.06 in the paved section of the roadway that begins a series of four vertical curves not meeting standards).

Benefits:

- Improves safety by addressing roadway geometrics.

Impacts:

- Would require spot roadway reconstruction along S-332.

Estimated Cost: **$1,380,000 (Total)**

1.B – Slide Areas

Description:

Several slides occurred in 2011 due to heavy rainfall and flooding in the area. The slide locations have had minor repair work completed as temporary mitigation. Several of these areas have already begun to deteriorate in terms of slope erosion, pavement settling, and drainage issues. Concepts 3, 4 and 5 present alternatives for the long-term reconstruction of the roadway, however, spot improvements have been identified to rectify the slide areas in a more permanent fashion. Slide area improvements have been identified in both the paved and graveled sections of S-332, and would include drainage culvert(s), embankment material and compaction, base course, and new asphalt. **Table 5** lists all the slide areas identified in the corridor along with the estimated cost of improvement.

Table 5: Slide Area Improvements

Location	Number of Slide Areas	Estimated Cost
RP 3.26	1	$195,000
RP 3.74 to RP 4.65	4	$1,197,000
RP 26.22	1	$195,000
RP 27.90	1	$367,000
RP 36.30	1	$318,000
RP 43.50	1	$489,000
TOTAL	9	$2,761,000

Photo 2: Representative photograph of a slide area that is deteriorating (at RP 3.74). In this image, note the erosion just off the pavement edge. The asphalt has begun to settle as well, resulting in an uneven driving surface.

Benefits:

- Improve drainage at this location.
- Ensure stability and safety of the roadway.

Impacts:

- Would require spot roadway reconstruction along S-332.

Estimated Cost: **$2,761,000 (Total)**

1.C – Guardrail

Description:

Multiple areas with steep fill slopes exist between RP 3.74 and RP 50.40. These areas are potential safety hazards due to the steep slopes, as they do not appear to be traversable and/or recoverable. A total reconstruction of the roadway in some of the areas could occur as described under Concepts 3, 4 and 5. However since any reconstruction would be a long-term endeavor, a stand-alone option may be to incorporate guardrail in the areas listed in **Table 6**.

Note that prior to installing guardrail, guardrail warrants would need to be evaluated. Because most of the areas have high embankments, it does not appear feasible to re-work the slopes to provide the proper slope ratio and recovery area that could be developed otherwise with a total reconstruction of the roadway. **Table 6** lists all of the potential guardrail areas that were identified within the corridor. The length of the potential guardrail treatments includes guardrail on both sides of the road, and in most cases traverses the entire length over an existing drainage.

Table 6: Guardrail Improvement Areas

Location	Estimated Length of Guardrail Needed (in feet)	Estimated Cost
RP 4.90	1,260	$54,142
RP 5.10	1,600	$68,752
RP 22.00	3,700	$158,989
RP 23.80	1,380	$59,299
RP 24.10	1,900	$81,643
RP 24.70	1,600	$68,752
RP 26.70	4,220	$181,333
RP 31.30	3,160	$135,785
RP 31.70	4,760	$204,537
RP 36.60	2,120	$91,096
RP 37.50	2,120	$91,096
RP 39.00	840	$36,095
RP 43.30	840	$36,095
RP 48.10	520	$22,344
TOTAL	30,020	$1,290,000

Photo 3: Representative photograph of a steep fill slope that may be a candidate for guardrail. Guardrail warrants should be evaluated prior to programming a project.

Benefits:

- Improve roadside safety.

Impacts:

- May cause difficulties with maintenance due to snow removal.
- Does not correct the roadway geometries.

Estimated Cost: **$1,290,000 (Total)**

1.D – Horizontal Curves (RP 39.52 – RP 40.98)

Description:

This improvement option has been identified between RP 39.52 to 40.98. This area has seven horizontal curves that do not meet current MDT design standards. A long-term improvement option is to reconstruct these horizontal curves to bring the geometrics up to current standards. This would necessitate a shift off of its present alignment. The work would be limited to just west of the Tongue River Bridge, thereby eliminating the need to replace the bridge in the short term. The envisioned project would be complicated by the presence of two irrigation pivot systems that currently irrigate fields that straddle both side of the existing roadway. To improve the sub-standard curves, the alignment shift would be off the present road and would require new right-of-way from adjacent, landowners.

Photo 4: This horizontal curve at RP 40.7 is in the series of curves that are good candidates for re-alignment.

Benefits:

- Improve geometrics and safety.

Impacts:

- Additional right-of-way would be required.
- Impacts to existing irrigation pivots and farm fields would be realized.
- Travel speeds may increase due to the elimination of numerous sharp horizontal curves.

Estimated Cost: **$1,006,000**

Concept 2 – Gravel Without Reconstruction (RP 17.7 to RP 50.4)

This improvement option has been identified between RP 17.7 and RP 50.4. This area of the corridor is currently a gravel roadway. This concept includes two sub-concepts.

2.A – Gravel Placement

Description:

This concept would place a new four-inch gravel layer on the roadway in order to improve the roadway surface. This option does not include widening the roadway or improve any other areas of concern. **Appendix B** contains the assumptions for gravel quantities based on widths of the existing roadway at various locations. Gravel

quantities are represented in cubic yards of gravel and the utilized unit cost (per cubic yard) includes placement and mobilization.

Benefits:

- Improve roadway surface.
- Less expensive than a full reconstruction.
- No additional right-of-way required.
- Better surfacing choice than asphalt for movement of livestock on the roadway.

Impacts:

- Does not address geometric deficiencies.
- Dust concerns may be elevated.
- More frequent maintenance activities than with a paved surface.
- Travel speeds may increase.

Estimated Cost: **$2,741,000**

2.B – Double Shot / Bitumen Treatment

Description:

This concept proposes a double-shot / bitumen surfacing treatment on top of the existing gravel road. This concept would seal the surfacing course which would improve the overall roadway surface condition and help to reduce dust and prove for lower maintenance requirements. Minor grading, elimination of soft spots, and incidental gravel placement prior to application would be included. This concept would be most appropriate for lower traffic volumes and would likely not hold up well under heavy traffic or truck traffic conditions.

Benefits:

- Improve roadway surface.
- Less expensive than a full reconstruction.
- No additional right-of-way required.
- Better surfacing choice than asphalt for movement of livestock on the roadway.
- Reduced dust.
- Reduced maintenance costs from a standard gravel roadway.

Impacts:

- Does not address geometric deficiencies.
- More frequent maintenance activities than with a paved surface.
- Travel speeds may increase.

Estimated Cost: **$2,183,000**

Concept 3 – Reconstruct and Widen Gravel Section (RP 17.7 to RP 50.4)

Description:

This improvement option has been identified between RP 17.7 and RP 50.4. This area of the corridor is currently a gravel roadway of inconsistent width. Multiple narrow sections are found throughout, especially just west of the Tongue River Bridge.

Narrow roadway widths can be a concern because vehicles may encroach upon the opposite travel lane, thereby creating a potentially unsafe condition. According to projected traffic volumes for the corridor, this area could potentially see an increase in traffic from an average of 110 vpd to 2,056 vpd. MDT standards recommend a roadway width of 28' for an Average Annual Daily Traffic (AADT) of 300 to 999, 32' for an AADT of 1,000 to 1,999, and 36' for an AADT of 2,000 and 3,000. Until which time that the higher traffic volumes are realized, this concept envisions reconstructing the existing gravel portion and placing a 32-foot wide gravel surfacing on top of a roadway base that could accommodate a 36-foot wide top width in the future. For cost estimating purposes, a 36-foot wide gravel roadway was assumed. New right-of-way may be required depending on the public right-of-way available (not included in the cost estimate).

Three new replacement bridges or culverts would be required to meet width requirements. To be conservative in planning level costs estimating, it is assumed that bridges would be required and would be built to a 40' top width, require 12 feet of clearance over existing topography, and utilize 2H:1V sloping abutments. The following bridges would need to be replaced:

- Foster Creek [RP 19.87] – 40' x 50' (Estimated cost = $300,000)
- Tongue River [RP 39.61] – 40' x 227' (Estimated cost = $1,362,000)
- Roe and Cooper Creek [RP 47.80] – 40' x 36' (Estimated cost = $216,000)

Also included in this concept is the extension of the reconstruct and widen gravel section from the end of S-332, along S-447, to the beginning of existing pavement at the Northern Cheyenne Reservation boundary. It may be desirable to reconstruct this segment of S-447 to the same standards as S-332 to ensure continuity of the roadway system.

Benefits:

- Improve geometrics and safety.
- Accommodate future traffic volumes.
- Improve roadway surface.

Impacts:

- Roadway reconstruction is required.
- Additional right-of-way required.
- Dust concerns may be elevated.
- More frequent maintenance activities than with a paved surface.
- Travel speeds may increase.

Estimated Cost: **$25,341,000 (Without Bridge Reconstruction)**
$1,878,000 (Bridge Reconstruction Only)
$2,092,000 (Extension on S-447)

Concept 4 – Rehabilitate with Mill / Fill / Overlay (RP 0.0 to RP 17.7) and Reconstruct and Widen Gravel Section (RP 17.7 TO RP 50.4)

Description:

This concept includes a mill, fill and overlay of the existing pavement section between RP 0.0 and RP 17.7. It assumes that no improvements to the width of the roadway would be made along this section. The mill, fill and overlay concept section is proposed as a method to improve the riding service and extend the life of the existing

pavement, but stops short of a full reconstruct to widen the roadway. This section of roadway is in good condition in terms of meeting geometric standards. Accordingly, the mill, fill and overlay would extend the life of the surfacing without a total reconstruct, and would be considered a rehabilitation effort. No modifications to existing widths would occur, nor would any bridge or hydraulic structures be replaced along this section.

Also included in this concept are the improvements described under Concept 3 (i.e. reconstruction and widening of the gravel section between RP 17.7 and RP 50.4, to include three new bridges).

Benefits:

- Improve roadway surface.
- Improve geometrics and safety.
- Accommodate future traffic volumes.

Impacts:

- Does not address geometric deficiencies (RP 0.0 to RP 17.7).
- The existing widths would be sub-standard if AADT rises above 2,000 vpd in the future (RP 0.0 to RP 17.7).
- Additional right-of-way required (RP 17.0 to RP 50.4).
- Dust concerns may be elevated (RP 17.0 to RP 50.4).
- More frequent maintenance activities than with a paved surface (RP 17.0 to RP 50.4).
- Travel speeds may increase.

Estimated Cost: **$10,690,000 (Pavement RP 0.0 – RP 17.7)**
$25,341,000 (Gravel RP 17.7 – RP 50.4, without Bridge Reconstruction)
$1,878,000 (Bridge Reconstruction Only RP 17.7 – RP 50.4)
$2,092,000 (Extension on S-447)

Concept 5 – Reconstruct With Pavement (RP 0.00 to RP 50.4)

Description:

This improvement option has been identified between RP 0.0 and RP 50.4 and would consist of asphalt pavement throughout the entire S-332 corridor. This option would address many of the issues and areas of concern previously identified.

According to projected traffic volumes for the corridor, the roadway could potentially experience an increase in traffic from an average of 110 vpd to 2,056 vpd. MDT standards recommend the following roadway widths based on AADT:

- AADT between 0-299 24’ width
- AADT between 300-999 28’ width
- AADT between 1,000-1,999 32’ width
- AADT between 2,000-3,000 36’ width
- AADT greater than 3,000 40’ width

Ultimately, the required width of the roadway would be determined based on future AADT values. Due to the overall uncertainty of coal development southeast of Ashland and resultant future AADT, cost estimates were provided for a variety of roadway widths.

In addition, four new replacement bridges or culverts would be necessary to meet width requirements. To be conservative in planning level costs estimating, it is assumed that bridges would be required and would be built to a 40' top width, require 12 feet of clearance over existing topography, and utilize 2H:1V sloping abutments. The following bridges would need to be replaces:

- Pumpkin Creek [RP 1.02] – 40' x 152' (Estimated Cost = $912,000)
- Foster Creek [RP 19.87] – 40' x 50' (Estimated cost = $300,000)
- Tongue River [RP 39.61] – 40' x 227' (Estimated cost = $1,362,000)
- Roe and Cooper Creek [RP 47.80] – 40' x 36' (Estimated cost = $216,000)

Also included in this concept is the extension of the reconstruct with pavement section from the end of S-332, along S-447, to the beginning of existing pavement at the Northern Cheyenne Reservation boundary. It may be desirable to reconstruct this segment of S-447 to the same standards as S-332 to ensure continuity of the roadway system.

Benefits:

- Improve geometrics and safety.
- Improve roadway surface.
- Accommodate future traffic volumes.
- Reduces frequency of maintenance activities.
- Eliminates dust issues.

Impacts:

- Roadway reconstruction is required.
- Additional right-of-way required.
- Potential impacts to movement of farm animals on and across the roadway.
- Travel speeds may increase.
- Induced growth and associated rise in traffic volumes may occur.

Estimated Cost:

$54,614,000 (24' Width without Bridge Reconstruction)
$63,716,000 (28' Width without Bridge Reconstruction)
$72,819,000 (32' Width without Bridge Reconstruction)
$81,921,000 (36' Width without Bridge Reconstruction)
$91,023,000 (40' Width without Bridge Reconstruction)
$2,790,000 (Bridge Reconstruction Only)
$4,389,000 (Extension on S-447)

4.0 ADDITIONAL CONSIDERATIONS

This section offers additional considerations regarding the S-332 corridor.

- Because the language authorizing the corridor study was very specific to S-332, the study concludes at the intersection of S-332 and S-447 (i.e. RP 50.4 on S-332). However, south of this intersection there is a two-mile length of roadway (S-447) that is currently gravel until just south of the Northern Cheyenne Indian Reservation's northern boundary. It is likely if reconstruction occurs along S-332 in the future, construction should be continued over this section of S-447 to ensure continuity of the roadway system. In this case, it would be desirable to reconstruct the stretch of S-447 to the same standard as S-332.

Special infrastructure considerations would be necessary to accommodate travel for the local Amish community in the area. Travel within this community is by horse-and-buggy, horseback, and walking. A separated, gravel surfacing pathway adjacent to the roadway in this area should be considered if and when a project develops, in addition to special speed zone considerations with signing.

- The Tongue River Railroad (TRR) is currently undergoing an Environmental Impact Statement (EIS) to document impacts and mitigation based on a variety of factors, most important of which is the potential impact of the Otter Creek coal tracts. An alignment for the future TRR is not available or known at this time. If and when the TRR is developed, it would be highly desirable to provide grade-separated crossings wherever the proposed railroad would intersect with S-332. Because railroad design standards necessitate a flat, gradual vertical profile, in most cases the roadway would have to cross rail facilities either above or below the rail infrastructure. These are general guidelines, and because of uncertainties regarding the TRR, no cost estimates for grade-separated facilities have been developed.

- The traffic forecasts made in this study's *Existing and Projected Conditions Report* suggest a conservative traffic volume of 2,056 vpd could potentially be realized in the future depending on development activities associated with the Otter Creek coal tracts. There is a concept called "induced demand" that suggests if a reconstructed, paved roadway was in place that additional traffic could be pulled off adjacent roadways and diverted to the newly improved roadway. Adjacent roadways that currently are paved and carry traffic in a general north-south direction are State Route 39 (Lame Deer to Forsyth) and State Route 59 (Broadus to Miles City). It is possible that some travelers between Ashland and Forsyth, or Ashland and Miles City, may currently avoid S-332 due to its gravel surfacing and sub-standard conditions. If the road was improved with pavement, some of these travelers may choose to alter their routes accordingly. B-In this case, S-332 may realize more than 2,056 vpd.

5.0 SUMMARY

This memorandum identifies improvement options for S-332 between MT-59 and S-447 using a series of "concepts" for consideration. The improvement options are based on the evaluation of several factors, including, but not limited to, field review, engineering analysis of as-built drawings, crash data analysis, consultation with various resource agencies, and information provided by the general public. Small scale improvement options (i.e. spot improvements) have been identified and may be as simple as installing guardrail. Larger, more complex improvements have also been identified. These include placing new gravel surfacing on the existing gravel roadway, widening the gravel section of the roadway to a consistent width, or paving the gravel portion of S-332.

Wildlife and aquatic concerns are found throughout the entire corridor. The improvement options should be considered with respect to wildlife and aquatic connectivity impacts. These should be more fully explored during project development activities. **Table 7** contains a summary of the potential improvements and their planning level costs.

Table 7: Improvement Options Summary

Concept Title	Description	Estimated Cost
CONCEPT 1 – SPOT IMPROVEMENTS		
1.A - Vertical Curves	• Modify existing vertical curves to increase the driver's sight distance. • Identified in both paved and graveled sections. • 46 total curves identified.	$1,380,000
1.B - Slide Areas	• Identified in both paved and graveled sections. • Nine (9) areas identified.	$2,761,000
1.C - Guardrail	• Protect drivers from potential safety hazards due to the steep slopes. • Guardrail warrants to be evaluated prior to installation. • Re-work of slopes may not be feasible.	$1,290,000
1.D - Horizontal Curves (RP 39.52 – RP 40.98)	• Improve seven (7) horizontal curves that do not meet current standards. • Limited to area just west of the Tongue River Bridge.	$1,006,000
CONCEPT 2 – GRAVEL WITHOUT RECONSTRUCTION (RP 17.7 to RP 50.4)		
2.A - Gravel Placement	• Place new 4" gravel surface on the roadway. • No widening of the roadway. • No reconstruction to address identified areas of concern.	$2,741,000
2.B - Double Shot / Bitumen Treatment	• Double chip seal coat on top of existing gravel road. • No widening of the roadway. • No reconstruction to address identified areas of concern.	$2,183,000
CONCEPT 3 – RECONSTRUCT AND WIDEN GRAVEL SECTION (RP 17.7 to RP 50.4)		
Reconstruct and Widen Gravel Section	• Reconstruct gravel portion to a base width of 36' with a 32' top surface. • May require additional right-of-way (not included in cost estimate).	$25,341,000
Bridge Replacement	• Replace three (3) bridges.	$1,878,000
Extension of Reconstruct and Widen Gravel on S-447	• Continue the reconstruct and widen gravel from S-337 / S-447 intersection to beginning of existing pavement on S-447 (approximately 2.7 miles).	$2,092,000
CONCEPT 4 – REHABILITATE WITH MILL / FILL / OVERLAY (RP 0.0 to RP 17.7) AND RECONSTRUCT AND WIDEN GRAVEL SECTION (RP 17.7 to RP 50.4)		
Rehabilitate with Mill / Fill / Overlay (RP 0.0 to RP 17.7)	• Mill the existing asphalt pavement, fill areas for better drainage (as needed), and place a new asphalt overlay. • No modifications to existing road widths. • No modifications to existing bridge or hydraulic structures.	$10,690,000
Reconstruct & Widen Gravel Section (RP 17.7 to RP 50.4)	• Reconstruct gravel portion to a base width of 36' with a 32' top surface. • May require additional right-of-way (not included in cost estimate).	$25,341,000
Bridge Replacement	• Replace three (3) bridges along gravel section.	$1,878,000
Extension of Reconstruct and Widen Gravel on S-447	• Continue the reconstruct and widen gravel from S-337 / S-447 intersection to beginning of existing pavement on S-447 (approximately 2.7 miles)	$2,092,000
CONCEPT 5 – RECONSTRUCT WITH PAVEMENT (RP 0.00 to RP 50.4)		
Reconstruct with Pavement (RP 0.0 to RP 50.4)	• Reconstruct both the paved and gravel section of the roadway to a paved section. • Width dependent on AADT • May require additional right-of-way (not included in cost estimate).	$54,614,000 (24') $63,716,000 (28') $72,819,000 (32') $81,921,000 (36') $91,023,000 (40')
Bridge Replacement	• Replace one (1) bridge along paved section. • Replace three (3) bridges along gravel section.	$2,790,000
Extension of Pavement on S-447	• Continue the reconstruct with pavement from S-332 / S-447 intersection to beginning of existing pavement on S-447 (approximately 2.7 miles).	$4,389,000

APPENDIX A

GLENDIVE DISTRICT PAVED/GRAVEL ROAD COMPARISON

AADT for Secondary Roads in the Glendive District

Site ID	Route	Description	AADT 2011	Type
42-1-4	S-201	S-201, RP 19, W of S-480	50 (A)	GRAVEL
42-1-1	S-201	S-201, RP 21, .5 mi E of S-480	60 (A)	GRAVEL
28-2-3	S-201	S-201, RP .5, .5 mi E of MT 13	100 (A)	PAVED
42-1-2	S-201	S-201, RP 34, 14 mi SE of S-480	250 (A)	PAVED
42-2-7	S-201	S-201, RP 46, 11.5 mi W of MT 16	550 (A)	PAVED
42-2-15	S-201	S-201, RP 69, W of Dawson Av, Fairview	830 (A)	PAVED
42-2-16	S-201	S-201 (1st), btwn Central & Ellery Avs (Fairv	1030 (A)	PAVED
42-2-9	S-201	S-201, RP 59, 1 mi E of MT 16	1110 (A)	PAVED
42-2-8	S-201	S-201, RP 57, 1 mi W of MT 16	1200 (A)	PAVED
42-2-10	S-201	S-201, RP 63.5, 5.5 mi E of MT 16	1220 (A)	PAVED
17-3-2	S-245	S-245, RP 37, 37 mi NW of Jordan	80 (E)	GRAVEL
17-3-1	S-245	S-245, RP 22, 22 mi NW of Jordan	90 (E)	GRAVEL
17-4-6	S-245	S-245, RP 6, 6 mi NW of Jordan	190 (A)	PAVED
17-4-14	S-245	S-245, W of MT 200 (Jordan)	200 (A)	PAVED
17-4-15	S-245	S-245, W of Purcell Av (Jordan)	300 (A)	PAVED
17-4-17	S-245	S-245, btwn Leavitt Av & Jordan Av (Jordan)	330 (A)	PAVED
53-4-14	S-246	S-246, RP 11, .5 mi SE of Tampico	110 (A)	GRAVEL
53-4-13	S-246	S-246, RP 4, S of Paisley	180 (A)	PAVED
53-4-27	S-246	S-246 (2nd Av S), W of 13th St S, Glasgow	520 (A)	PAVED
53-4-26	S-246	S-246 (2nd Av S), btwn S 7th & 8th Sts, Glasgow	2350 (A)	PAVED
53-4-25	S-246	S-246 (S 6th St), btwn 1st & 2nd Av S, Glasgow	5360 (E)	PAVED
43-1-3	S-250	S-250, RP 37, 12.5 mi NW of MT 13	20 (A)	GRAVEL
43-1-2	S-250	S-250, RP 26, 26 mi N of US 2	170 (A)	GRAVEL
43-1-4	S-250	S-250, RP 48.5, 1 mi W of MT 13	30 (A)	PAVED
43-3-13	S-250	S-250, RP 13, 13 mi N of US 2	300 (A)	PAVED
43-3-12	S-250	S-250, RP 1, 1 mi N of US 2	350 (A)	PAVED
28-3-3	S-252	S-252, RP 23.3, .5 mi E of Weldom	30 (A)	GRAVEL
28-3-2	S-252	S-252, RP 23.3, 12.5 mi NW of MT 200 (Circle)	70 (E)	GRAVEL
28-4-9	S-252	S-252, RP 7, 7.5 mi NW of MT 200 in Circle	140 (E)	PAVED
28-4-17	S-252	S-252, RP .5, at W city limits of Circle	290 (A)	PAVED
28-4-16	S-252	S-252 (10th St), btwn C & D Avs (Circle)	740 (E)	PAVED
28-4-7	S-254	S-254, RP 68.5, .5 mi E of MT 13	40 (A)	GRAVEL
11-1-6	S-254	S-254, RP 50.5, 6.5 mi NW of Richey	80 (A)	GRAVEL
11-1-5	S-254	S-254, RP 46, 2 mi NW of Richey	90 (A)	GRAVEL

Site ID	Route	Description	AADT 2011	Type
11-1-7	S-254	S-254, W of 2nd Av (Richey)	140 (A)	PAVED
11-2-7	S-254	S-254, RP 23, .5 mi S of Bloomfield	240 (A)	PAVED
11-1-9	S-254	S-254, W of MT 200 (Richey)	290 (A)	PAVED
11-1-8	S-254	S-254, btwn 2nd & 3rd St S (Richey)	340 (A)	PAVED
11-5A-27	S-254	S-254, W of MT 16	350 (A)	PAVED
11-2-6	S-254	S-254, RP 11, 11 mi NW of P-20	360 (A)	PAVED
11-1-4	S-254	S-254, RP 34, 9 mi SE of MT 200	370 (A)	PAVED
11-2-8	S-254	S-254, RP 24, .5 mi N of Bloomfield	410 (A)	PAVED
11-1-3	S-254	S-254, RP 42, 1 mi E of MT 200	450 (A)	PAVED
13-2-5	S-322	S-322, RP 25.5, 1.5 mi E of MT 7	40 (A)	GRAVEL
13-2-4	S-322	FAS 322, RP 16.5, .5 mi N of Webster	70 (A)	GRAVEL
13-2-3	S-322	S-322, RP .5, .5 mi SE of MT 7	340 (A)	PAVED
43-5-7	S-327	S-327, RP 4.5, 4.5 mi SE of US 2 (Bainville)	140 (A)	GRAVEL
43-5-9	S-327	S-327, RP 13, 1 mi SE of S-469	260 (A)	GRAVEL
43-5-34	S-327	FAS 327 (5th Av), E of Duval (Bainville)	290 (A)	PAVED
43-5-33	S-327	S-327, btwn Clark & Flynn Avs (Bainville)	600 (A)	PAVED
43-5-32	S-327	S-327, S of US 2	1130 (A)	PAVED
44-7-5	S-332	S-332, RP 39.5, 2 mi SW of Custer Co line	50 (E)	GRAVEL
44-8-4	S-332	S-332, RP 49.5, .5 mi N of S-447	50 (E)	GRAVEL
9-4-4	S-332	S-332, RP 26.5, 6 mi SW of Garland	80 (A)	GRAVEL
9-4-3	S-332	S-332, RP 11, 11 mi SW of MT 59	100 (A)	PAVED
9-2-9	S-332	S-332, RP 1, 1 mi SW of MT 59	280 (E)	PAVED
11-5-2	S-335	S-335, RP 8, 7.5 mi S of P-57	100 (A)	GRAVEL
11-5A-29	S-335	S-335, RP 2, 2 mi S of W Towne St	350 (A)	PAVED
11-5A-28	S-335	S-335, S of Clough St, Glendive	620 (A)	PAVED
11-5A-42	S-335	Merrill Av, S of Douglas St	670 (A)	PAVED
11-5A-41	S-335	Merrill Av (S-335), S of Towne	5480 (A)	PAVED
40-2-6	S-340	S-340, MP 8, .5 mi S of S-504, SE of Fallon	60 (E)	GRAVEL
40-2-5	S-340	S-340, MP 1.5, 1 mi SE of Fallon Intch	240 (E)	PAVED
40-2-9	S-340	S-340, SE of Fallon Int	460 (E)	PAVED
36-3-7	S-363	S-363, RP .3, S of US 2	130 (E)	GRAVEL
36-3-8	S-363	S-363, RP 2.5, 2.5 mi S of US 2	140 (E)	GRAVEL
36-3-9	S-363	S-363, RP 11, .5 mi NW of US 191	380 (A)	PAVED
38-5-4	S-391	S-391, RP 10, 10 mi SW of US 212	30 (E)	GRAVEL
38-2-8	S-391	S-391, RP 3.5, 3.5 mi SW of US 212	100 (A)	GRAVEL

Site ID	Route	Description	AADT 2011	Type
38-2-7	S-391	S-391, btwn 4th & 5th Sts, S of US 212, Brdus	170 (E)	PAVED
43-5-10	S-405	S-405, RP .5, .5 mi N of US 2 (Bainville)	50 (A)	GRAVEL
43-5-11	S-405	S-405, RP 6, 6 mi NE of US 2 (Bainville)	80 (A)	GRAVEL
43-5-12	S-405	S-405, RP 18, 10.5 mi E of MT 16 (Froid)	160 (A)	GRAVEL
43-5-13	S-405	S-405, RP 27, 1.5 mi NE of MT 16 (Froid)	260 (A)	PAVED
43-5-18	S-405	S-405, Main St, SW of BNRR (Froid)	460 (A)	PAVED
43-5-17	S-405	S-405, Main St, btwn 2nd & 3rd Avs (Froid)	730 (A)	PAVED
53-2-8	S-438	S-438, RP 53.5, 1 mi S of S-248 in Glentana	40 (A)	GRAVEL
53-2-7	S-438	S-438, RP 32, 12.5 mi S of Glentana	70 (A)	PAVED
53-5-2	S-438	S-438, RP 21, 21.5 mi N of US 2	90 (A)	PAVED
53-5-1	S-438	S-438, RP 10, 9.5 mi N of US 2	250 (A)	PAVED
53-8-6	S-438	S-438, RP 1, 1 mi N of US 2	280 (A)	PAVED
44-7-4	S-447	S-447, RP 34.5, 11 mi NW of S-332	40 (E)	GRAVEL
44-7-3	S-447	S-447, RP 25, 18.5 mi NW of S-332	50 (E)	GRAVEL
44-8-5	S-447	S-447, RP 46, S of S-332	150 (E)	PAVED
44-6-4	S-447	S-447, RP 1, 1 mi S of W Rosebud Int	160 (A)	PAVED
44-8-6	S-447	S-447, RP 51, 2 mi NW of US 212	540 (A)	PAVED
44-8-17	S-447	S-447, N of US 212, Ashland	1550 (E)	PAVED
38-4-5	S-484	S-484, S of Taylor Creek Rd	40 (A)	GRAVEL
38-4-6	S-484	S-484 (Tooley Ck Rd), W of Otter Ck Rd	40 (E)	GRAVEL
38-1-5	S-484	S-484, RP 9, 9 mi SE of US 212	120 (E)	PAVED
38-1-4	S-484	S-484, RP .5, .5 mi S of US 212	180 (A)	PAVED
13-2-6	S-494	FAS 494, RP 16, 7 mi W of MT 7, Willard	30 (A)	GRAVEL
13-2-7	S-494	S-494, RP 22.5, 1 mi W of MT 7	110 (A)	GRAVEL
13-1-13	S-494	S-494, RP 1, S of S Fk Sandstone Crk bridge	120 (E)	PAVED
13-1-28	S-494	S-494, S of US 12 (Plevna)	130 (E)	PAVED

Source: MDT Data and Statistics Bureau, Traffic Data Collection Section, 2012
(A) Actual
(E) Estimated

APPENDIX B

COST ESTIMATES

S-332 IMPROVEMENT OPTIONS - PLANNING LEVEL COST ESTIMATES

CONCEPT 1 - SPOT IMPROVEMENTS

1.A VERTICAL CURVES **$ 1,380,000 TOT**

**Unit costs based on communication with MDT Glendive District (Jim Frank, 09/25/2012,*

ASPHALT SURFACE **WIDTH (FT) 26**

TYPE	UNITS	UNIT PRICE	QUANTITY / STA	COST / MI
Cold Milling	SQYD	$ 1.42	288.9	$ 21,660
Crushed Aggregate Course - 8"*	CUYD	$ 40.00	87.1	$ 183,955
Cover - Type 1	SQYD	$ 0.56	289	$ 8,545
Plant Mix Bit Surf Gr S (3/4") - 4"*	TON	$ 35.00	67.3	$ 124,370
Asphalt Cement PG 64-28	TON	$ 708.22	3.63	$ 135,740
Emulsified Asphalt CRS-2P	TON	$ 623.57	0.52	$ 17,121
Aggregate Treatment	SQYD	$ 0.42	340	$ 7,540
Subtotal				$ 498,931

GRAVEL SURFACE **WIDTH (FT) 28**

TYPE	UNITS	UNIT PRICE	QUANTITY / STA	COST / MI
Crushed Aggregate Course - 4"*	CUYD	$ 40.00	34.6	$ 73,075
Aggregate Treatment	SQYD	$ 0.42	311	$ 6,897
Subtotal				$ 73,075

VERTICAL CURVES (RP 3.06 - RP 3.97) $ 588,000 TOT

VERTICAL CURVE (RP 3.06)	WIDTH (FT)	DEPTH (FT)	LENGTH (FT)	LENGTH (MI)	$ 72,039 EA
CREST	26	0.16	660	0.13	

TYPE	UNITS	UNIT PRICE	QUANTITY / STA	COST / MI
Asphalt Surfacing				$ 498,931
Excavation - Unclassified Borrow	CUYD	$ 5.43	7.70	$ 2,209
Special Borrow	CUYD	$ 15.20	0.00	$ -
Subtotal				$ 501,140
Contingency		15%		$ 75,171
Total				$ 576,311

VERTICAL CURVE (RP 3.20)	WIDTH (FT)	DEPTH (FT)	LENGTH (FT)	LENGTH (MI)	$ 141,400 EA
SAG	26	1.8	1142	0.22	

TYPE	UNITS	UNIT PRICE	QUANTITY / STA	COST / MI
Asphalt Surfacing				$ 498,931
Excavation - Unclassified Borrow	CUYD	$ 5.43	0.00	$ -
Special Borrow	CUYD	$ 15.20	86.67	$ 69,555
Subtotal				$ 568,487
Contingency		15%		$ 85,273
Total				$ 653,760

VERTICAL CURVE (RP 3.42)	WIDTH (FT)	DEPTH (FT)	LENGTH (FT)	LENGTH (MI)	$ 152,287 EA
CREST	26	0.01	1401	0.27	

TYPE	UNITS	UNIT PRICE	QUANTITY / STA	COST / MI
Asphalt Surfacing				$ 498,931
Excavation - Unclassified Borrow	CUYD	$ 5.43	0.48	$ 138
Special Borrow	CUYD	$ 15.20	0.00	$ -
Subtotal				$ 499,069
Contingency		15%		$ 74,860
Total				$ 573,930

VERTICAL CURVE (RP 3.66)	WIDTH (FT)	DEPTH (FT)	LENGTH (FT)	LENGTH (MI)	$ 222,446 EA
SAG	26	4.02	1561	0.30	

TYPE	UNITS	UNIT PRICE	QUANTITY / STA	COST / MI
Asphalt Surfacing				$ 498,931
Excavation - Unclassified Borrow	CUYD	$ 5.43	0.00	$ -
Special Borrow	CUYD	$ 15.20	193.56	$ 155,340
Subtotal				$ 654,271
Contingency		15%		$ 98,141
Total				$ 752,412

VERTICAL CURVES (RP 17.82 - RP 18.84)						$	61,000	TOT
VERTICAL CURVE (RP 17.82)		WIDTH (FT)	DEPTH (FT)	LENGTH (FT)	LENGTH (MI)	$	32,067	EA
CREST		28	3.6	1163	0.22			
TYPE	**UNITS**	**UNIT PRICE**		**QUANTITY / STA**	**COST / MI**			
Gravel Surfacing					$ 73,075			
Excavation - Unclassified Borrow	CUYD	$ 5.43		186.67	$ 53,518			
Special Borrow	CUYD	$ 15.20		0.00	$ -			
Subtotal					$ 126,593			
Contingency		15%			$ 18,989			
Total					$ 145,582			
VERTICAL CURVE (RP 17.97)		WIDTH (FT)	DEPTH (FT)	LENGTH (FT)	LENGTH (MI)	$	21,830	EA
SAG		28	1.32	783	0.15			
TYPE	**UNITS**	**UNIT PRICE**		**QUANTITY / STA**	**COST / MI**			
Gravel Surfacing					$ 73,075			
Excavation - Unclassified Borrow	CUYD	$ 5.43		0.00	$ -			
Special Borrow	CUYD	$ 15.20		68.44	$ 54,931			
Subtotal					$ 128,006			
Contingency		15%			$ 19,201			
Total					$ 147,207			
VERTICAL CURVE (RP 18.84)		WIDTH (FT)	DEPTH (FT)	LENGTH (FT)	LENGTH (MI)	$	6,913	EA
CREST		28	0.05	430	0.08			
TYPE	**UNITS**	**UNIT PRICE**		**QUANTITY / STA**	**COST / MI**			
Gravel Surfacing					$ 73,075			
Excavation - Unclassified Borrow	CUYD	$ 5.43		2.59	$ 743			
Special Borrow	CUYD	$ 15.20		0.00	$ -			
Subtotal					$ 73,819			
Contingency		15%			$ 11,073			
Total					$ 84,891			
VERTICAL CURVE (RP 20.28)						$	5,000	TOT
VERTICAL CURVE (RP 20.28)		WIDTH (FT)	DEPTH (FT)	LENGTH (FT)	LENGTH (MI)	$	4,568	TOT
SAG		28	0.09	273	0.05			
TYPE	**UNITS**	**UNIT PRICE**		**QUANTITY / STA**	**COST / MI**			
Gravel Surfacing					$ 73,075			
Excavation - Unclassified Borrow	CUYD	$ 5.43		0.00	$ -			
Special Borrow	CUYD	$ 15.20		4.67	$ 3,745			
Subtotal					$ 76,820			
Contingency		15%			$ 11,523			
Total					$ 88,344			
VERTICAL CURVES (RP 23.86 - RP 24.87)						$	81,000	TOT
VERTICAL CURVE (RP 23.86)		WIDTH (FT)	DEPTH (FT)	LENGTH (FT)	LENGTH (MI)	$	8,919	EA
SAG		28	0.22	498	0.09			
TYPE	**UNITS**	**UNIT PRICE**		**QUANTITY / STA**	**COST / MI**			
Gravel Surfacing					$ 73,075			
Excavation - Unclassified Borrow	CUYD	$ 5.43		0.00	$ -			
Special Borrow	CUYD	$ 15.20		11.41	$ 9,155			
Subtotal					$ 82,230			
Contingency		15%			$ 12,335			
Total					$ 94,565			
VERTICAL CURVE (RP 24.01)		WIDTH (FT)	DEPTH (FT)	LENGTH (FT)	LENGTH (MI)	$	13,602	EA
CREST		28	0.54	770	0.15			
TYPE	**UNITS**	**UNIT PRICE**		**QUANTITY / STA**	**COST / MI**			
Gravel Surfacing					$ 73,075			
Excavation - Unclassified Borrow	CUYD	$ 5.43		28.00	$ 8,028			
Special Borrow	CUYD	$ 15.20		0.00	$ -			
Subtotal					$ 81,103			
Contingency		15%			$ 12,165			
Total					$ 93,268			

VERTICAL CURVE (RP 24.50)	WIDTH (FT)	DEPTH (FT)	LENGTH (FT)	LENGTH (MI)	$ 19,497 EA
CREST	28	1.82	894	0.17	

TYPE	UNITS	UNIT PRICE	QUANTITY / STA	COST / MI
Gravel Surfacing				$ 73,075
Excavation - Unclassified Borrow	CUYD	$ 5.43	94.37	$ 27,056
Special Borrow	CUYD	$ 15.20	0.00	$ -
Subtotal				$ 100,132
Contingency		15%		$ 15,020
Total				$ 115,151

VERTICAL CURVE (RP 24.73)	WIDTH (FT)	DEPTH (FT)	LENGTH (FT)	LENGTH (MI)	$ 23,523 EA
SAG	28	1.48	802	0.15	

TYPE	UNITS	UNIT PRICE	QUANTITY / STA	COST / MI
Gravel Surfacing				$ 73,075
Excavation - Unclassified Borrow	CUYD	$ 5.43	0.00	$ -
Special Borrow	CUYD	$ 15.20	76.74	$ 61,589
Subtotal				$ 134,664
Contingency		15%		$ 20,200
Total				$ 154,864

VERTICAL CURVE (RP 24.87)	WIDTH (FT)	DEPTH (FT)	LENGTH (FT)	LENGTH (MI)	$ 15,454 EA
SAG	28	0.77	675	0.13	

TYPE	UNITS	UNIT PRICE	QUANTITY / STA	COST / MI
Gravel Surfacing				$ 73,075
Excavation - Unclassified Borrow	CUYD	$ 5.43	0.00	$ -
Special Borrow	CUYD	$ 15.20	39.93	$ 32,043
Subtotal				$ 105,118
Contingency		15%		$ 15,768
Total				$ 120,886

VERTICAL CURVES (RP 25.53 - RP 29.60)	$ 329,000 TOT

VERTICAL CURVE (RP 25.53)	WIDTH (FT)	DEPTH (FT)	LENGTH (FT)	LENGTH (MI)	$ 7,646 EA
CREST	28	0.13	468	0.09	

TYPE	UNITS	UNIT PRICE	QUANTITY / STA	COST / MI
Gravel Surfacing				$ 73,075
Excavation - Unclassified Borrow	CUYD	$ 5.43	6.74	$ 1,933
Special Borrow	CUYD	$ 15.20	0.00	$ -
Subtotal				$ 75,008
Contingency		15%		$ 11,251
Total				$ 86,259

VERTICAL CURVE (RP 25.89)	WIDTH (FT)	DEPTH (FT)	LENGTH (FT)	LENGTH (MI)	$ 46,684 EA
CREST	28	5.31	1410	0.27	

TYPE	UNITS	UNIT PRICE	QUANTITY / STA	COST / MI
Gravel Surfacing				$ 73,075
Excavation - Unclassified Borrow	CUYD	$ 5.43	275.33	$ 78,939
Special Borrow	CUYD	$ 15.20	0.00	$ -
Subtotal				$ 152,014
Contingency		15%		$ 22,802
Total				$ 174,817

VERTICAL CURVE (RP 26.04)	WIDTH (FT)	DEPTH (FT)	LENGTH (FT)	LENGTH (MI)	$ 14,773 EA
SAG	28	0.74	653	0.12	

TYPE	UNITS	UNIT PRICE	QUANTITY / STA	COST / MI
Gravel Surfacing				$ 73,075
Excavation - Unclassified Borrow	CUYD	$ 5.43	0.00	$ -
Special Borrow	CUYD	$ 15.20	38.37	$ 30,795
Subtotal				$ 103,870
Contingency		15%		$ 15,580
Total				$ 119,450

VERTICAL CURVE (RP 26.53)	WIDTH (FT)	DEPTH (FT)	LENGTH (FT)	LENGTH (MI)	$ 29,980 EA
CREST	28	1.47	1450	0.27	

TYPE	UNITS	UNIT PRICE	QUANTITY / STA	COST / MI
Gravel Surfacing				$ 73,075
Excavation - Unclassified Borrow	CUYD	$ 5.43	76.22	$ 21,853
Special Borrow	CUYD	$ 15.20	0.00	$ -
Subtotal				$ 94,928
Contingency		15%		$ 14,239
Total				$ 109,168

VERTICAL CURVE (RP 26.72)	WIDTH (FT)	DEPTH (FT)	LENGTH (FT)	LENGTH (MI)	$ 39,742 EA
SAG	28	2.62	1002	0.19	

TYPE	UNITS	UNIT PRICE	QUANTITY / STA	COST / MI
Gravel Surfacing				$ 73,075
Excavation - Unclassified Borrow	CUYD	$ 5.43	0.00	$ -
Special Borrow	CUYD	$ 15.20	135.85	$ 109,029
Subtotal				$ 182,104
Contingency		15%		$ 27,316
Total				$ 209,420

VERTICAL CURVE (RP 27.09)	WIDTH (FT)	DEPTH (FT)	LENGTH (FT)	LENGTH (MI)	$ 11,305 EA
CREST	28	0.6	633	0.12	

TYPE	UNITS	UNIT PRICE	QUANTITY / STA	COST / MI
Gravel Surfacing				$ 73,075
Excavation - Unclassified Borrow	CUYD	$ 5.43	31.11	$ 8,920
Special Borrow	CUYD	$ 15.20	0.00	$ -
Subtotal				$ 81,995
Contingency		15%		$ 12,299
Total				$ 94,294

VERTICAL CURVE (RP 27.27)	WIDTH (FT)	DEPTH (FT)	LENGTH (FT)	LENGTH (MI)	$ 11,033 EA
SAG	28	0.41	562	0.11	

TYPE	UNITS	UNIT PRICE	QUANTITY / STA	COST / MI
Gravel Surfacing				$ 73,075
Excavation - Unclassified Borrow	CUYD	$ 5.43	0.00	$ -
Special Borrow	CUYD	$ 15.20	21.26	$ 17,062
Subtotal				$ 90,137
Contingency		15%		$ 13,521
Total				$ 103,658

VERTICAL CURVE (RP 27.95)	WIDTH (FT)	DEPTH (FT)	LENGTH (FT)	LENGTH (MI)	$ 7,462 EA
SAG	28	0.09	446	0.08	

TYPE	UNITS	UNIT PRICE	QUANTITY / STA	COST / MI
Gravel Surfacing				$ 73,075
Excavation - Unclassified Borrow	CUYD	$ 5.43	0.00	$ -
Special Borrow	CUYD	$ 15.20	4.67	$ 3,745
Subtotal				$ 76,820
Contingency		15%		$ 11,523
Total				$ 88,344

VERTICAL CURVE (RP 28.05)	WIDTH (FT)	DEPTH (FT)	LENGTH (FT)	LENGTH (MI)	$ 33,737 EA
CREST	28	3.4	1253	0.24	

TYPE	UNITS	UNIT PRICE	QUANTITY / STA	COST / MI
Gravel Surfacing				$ 73,075
Excavation - Unclassified Borrow	CUYD	$ 5.43	176.30	$ 50,545
Special Borrow	CUYD	$ 15.20	0.00	$ -
Subtotal				$ 123,620
Contingency		15%		$ 18,543
Total				$ 142,163

VERTICAL CURVE (RP 28.16)	WIDTH (FT)	DEPTH (FT)	LENGTH (FT)	LENGTH (MI)	$ 37,506 EA
SAG	28	2.51	970	0.18	

TYPE	UNITS	UNIT PRICE	QUANTITY / STA	COST / MI
Gravel Surfacing				$ 73,075
Excavation - Unclassified Borrow	CUYD	$ 5.43	0.00	$ -
Special Borrow	CUYD	$ 15.20	130.15	$ 104,452
Subtotal				$ 177,527
Contingency		15%		$ 26,629
Total				$ 204,156

VERTICAL CURVE (RP 28.26)	WIDTH (FT)	DEPTH (FT)	LENGTH (FT)	LENGTH (MI)	$ 22,476 EA
CREST	28	2.04	998	0.19	

TYPE	UNITS	UNIT PRICE	QUANTITY / STA	COST / MI
Gravel Surfacing				$ 73,075
Excavation - Unclassified Borrow	CUYD	$ 5.43	105.78	$ 30,327
Special Borrow	CUYD	$ 15.20	0.00	$ -
Subtotal				$ 103,402
Contingency		15%		$ 15,510
Total				$ 118,912

VERTICAL CURVE (RP 28.58)	WIDTH (FT)	DEPTH (FT)	LENGTH (FT)	LENGTH (MI)	$ 16,399 EA
SAG	28	0.87	689	0.13	

TYPE	UNITS	UNIT PRICE	QUANTITY / STA	COST / MI
Gravel Surfacing				$ 73,075
Excavation - Unclassified Borrow	CUYD	$ 5.43	0.00	$ -
Special Borrow	CUYD	$ 15.20	45.11	$ 36,204
Subtotal				$ 109,280
Contingency		15%		$ 16,392
Total				$ 125,672

VERTICAL CURVE (RP 28.78)	WIDTH (FT)	DEPTH (FT)	LENGTH (FT)	LENGTH (MI)	$ 10,365 EA
SAG	28	0.35	543	0.10	

TYPE	UNITS	UNIT PRICE	QUANTITY / STA	COST / MI
Gravel Surfacing				$ 73,075
Excavation - Unclassified Borrow	CUYD	$ 5.43	0.00	$ -
Special Borrow	CUYD	$ 15.20	18.15	$ 14,565
Subtotal				$ 87,640
Contingency		15%		$ 13,146
Total				$ 100,786

VERTICAL CURVE (RP 29.03)	WIDTH (FT)	DEPTH (FT)	LENGTH (FT)	LENGTH (MI)	$ 24,029 EA
CREST	28	1.6	1139	0.22	

TYPE	UNITS	UNIT PRICE	QUANTITY / STA	COST / MI
Gravel Surfacing				$ 73,075
Excavation - Unclassified Borrow	CUYD	$ 5.43	82.96	$ 23,786
Special Borrow	CUYD	$ 15.20	0.00	$ -
Subtotal				$ 96,861
Contingency		15%		$ 14,529
Total				$ 111,390

VERTICAL CURVE (RP 29.24)	WIDTH (FT)	DEPTH (FT)	LENGTH (FT)	LENGTH (MI)	$ 10,384 EA
SAG	28	0.35	544	0.10	

TYPE	UNITS	UNIT PRICE	QUANTITY / STA	COST / MI
Gravel Surfacing				$ 73,075
Excavation - Unclassified Borrow	CUYD	$ 5.43	0.00	$ -
Special Borrow	CUYD	$ 15.20	18.15	$ 14,565
Subtotal				$ 87,640
Contingency		15%		$ 13,146
Total				$ 100,786

VERTICAL CURVE (RP 29.60)	WIDTH (FT)	DEPTH (FT)	LENGTH (FT)	LENGTH (MI)	$ 5,307 EA
SAG	28	0.04	326	0.06	

TYPE	UNITS	UNIT PRICE	QUANTITY / STA	COST / MI
Gravel Surfacing				$ 73,075
Excavation - Unclassified Borrow	CUYD	$ 5.43	0.00	$ -
Special Borrow	CUYD	$ 15.20	2.07	$ 1,665
Subtotal				$ 74,740
Contingency		15%		$ 11,211
Total				$ 85,951

VERTICAL CURVES (RP 31.54 - RP 32.41)	$ 57,000 TOT

VERTICAL CURVE (RP 31.54)	WIDTH (FT)	DEPTH (FT)	LENGTH (FT)	LENGTH (MI)	$ 29,312 EA
SAG	28	0.98	1182	0.22	

TYPE	UNITS	UNIT PRICE	QUANTITY / STA	COST / MI
Gravel Surfacing				$ 73,075
Excavation - Unclassified Borrow	CUYD	$ 5.43	0.00	$ -
Special Borrow	CUYD	$ 15.20	50.81	$ 40,782
Subtotal				$ 113,857
Contingency		15%		$ 17,079
Total				$ 130,936

VERTICAL CURVE (RP 32.41)	WIDTH (FT)	DEPTH (FT)	LENGTH (FT)	LENGTH (MI)	$ 27,276 EA
CREST	28	0.45	1570	0.30	

TYPE	UNITS	UNIT PRICE	QUANTITY / STA	COST / MI
Gravel Surfacing				$ 73,075
Excavation - Unclassified Borrow	CUYD	$ 5.43	23.33	$ 6,690
Special Borrow	CUYD	$ 15.20	0.00	$ -
Subtotal				$ 79,765
Contingency		15%		$ 11,965
Total				$ 91,730

VERTICAL CURVE (RP 33.76)	$ 18,000 TOT

VERTICAL CURVE (RP 33.76)	WIDTH (FT)	DEPTH (FT)	LENGTH (FT)	LENGTH (MI)	$ 17,506 TOT
SAG	28	0.84	744	0.14	

TYPE	UNITS	UNIT PRICE	QUANTITY / STA	COST / MI
Gravel Surfacing				$ 73,075
Excavation - Unclassified Borrow	CUYD	$ 5.43	0.00	$ -
Special Borrow	CUYD	$ 15.20	43.56	$ 34,956
Subtotal				$ 108,031
Contingency		15%		$ 16,205
Total				$ 124,236

VERTICAL CURVES (RP 38.77 - RP 39.35)	$ 13,000 TOT

VERTICAL CURVE (RP 38.77)	WIDTH (FT)	DEPTH (FT)	LENGTH (FT)	LENGTH (MI)	$ 12,951 TOT
SAG	28	0.3	695	0.13	

TYPE	UNITS	UNIT PRICE	QUANTITY / STA	COST / MI
Gravel Surfacing				$ 73,075
Excavation - Unclassified Borrow	CUYD	$ 5.43	0.00	$ -
Special Borrow	CUYD	$ 15.20	15.56	$ 12,484
Subtotal				$ 85,559
Contingency		15%		$ 12,834
Total				$ 98,393

VERTICAL CURVE (RP 39.35)	WIDTH (FT)	DEPTH (FT)	LENGTH (FT)	LENGTH (MI)	$ 6,467 TOT
SAG	28	0.01	404	0.08	

TYPE	UNITS	UNIT PRICE	QUANTITY / STA	COST / MI
Gravel Surfacing				$ 73,075
Excavation - Unclassified Borrow	CUYD	$ 5.43	0.00	$ -
Special Borrow	CUYD	$ 15.20	0.52	$ 416
Subtotal				$ 73,491
Contingency		15%		$ 11,024
Total				$ 84,515

	VERTICAL CURVES (RP 41.44 - RP 43.36)					$ 133,000	TOT
	Cost Per Curve - Gravel Surfacing	$ 18,957	EA				
	Number of Curves	7					
	VERTICAL CURVE (RP 46.46)					$ 19,000	TOT
	Cost Per Curve - Gravel Surfacing	$ 18,957	EA				
	Number of Curves	1					
	VERTICAL CURVE (RP 48.48)					$ 19,000	TOT
	Cost Per Curve - Gravel Surfacing	$ 18,957	EA				
	Number of Curves	1					
	VERTICAL CURVE (RP 49.69 - RP 50.27)					$ 57,000	TOT
	Cost Per Curve - Gravel Surfacing	$ 18,957	EA				
	Number of Curves	3					
1.B	**SLIDE AREAS**					**$ 2,761,000**	**TOT**

MDT SLIDE AREA PROJECTS (2011 - 2012)

NAME	LOCATION	LETTING DATE	LENGTH (FT)	LENGTH (MI)	COST	COST / MI
Clagget Hill Slide	Fergus	2/24/2011	1,000	0.19	$ 669,003	$ 3,532,338
Slide East of Noxon	Sanders	3/10/2011	689	0.13	$ 457,629	$ 4,017,125
US 191 Slides - S Mobridge	Fergus	5/26/2011	8,850	1.68	$ 3,133,525	$ 1,926,536
Cut Bank South Slide	Glacier	6/23/2011	1,166	0.22	$ 365,078	$ 2,013,385
E of Winnett - Slide Repair	Petroleum	11/17/2011	375	0.07	$ 525,738	$ 9,706,063
S of McLeod Slide Repair	Sweet Grass	11/17/2011	1,800	0.34	$ 835,658	$ 2,829,313
Slide Repair - NE of Glendive	Dawson	7/12/2012	600	0.11	$ 683,132	$ 6,810,883
Glasgow Slide Repair	Valley	7/12/2012	850	0.16	$ 482,262	$ 3,580,929
Slide Repair - 13 Miles East Glendive	Dawson	8/23/2012	650	0.12	$ 243,070	$ 1,636,703
Total			15,979	3.03	$ 7,395,094	$ 2,443,544

	SLIDE AREA (RP 3.26)	LENGTH (MI)	0.08		$ 195,000	TOT
	SLIDE AREAS (RP 3.74 - RP 4.65)				$ 1,197,000	TOT
	RP 3.74	LENGTH (MI)	0.09		$ 219,919	EA
	RP 4.20	LENGTH (MI)	0.2		$ 488,709	EA
	RP 4.45	LENGTH (MI)	0.1		$ 244,354	EA
	RP 4.65	LENGTH (MI)	0.1		$ 244,354	EA
	SLIDE AREA (RP 26.22)	LENGTH (MI)	0.08		$ 195,000	TOT
	SLIDE AREA (RP 27.90)	LENGTH (MI)	0.15		$ 367,000	TOT
	SLIDE AREA (RP 36.30)	LENGTH (MI)	0.13		$ 318,000	TOT
	SLIDE AREA (RP 43.50)	LENGTH (MI)	0.2		$ 489,000	TOT
1.C	**GUARDRAIL**				**$ 1,290,000**	**TOT**

TYPE	UNITS	UNIT PRICE
Guard Rail - Steel Box Beam	LNFT	$ 42.97

	STEEP FILL SLOPE (RP 4.90)	LENGTH (FT)	1,260		$ 54,142	EA
	STEEP FILL SLOPE (RP 5.10)	LENGTH (FT)	1,600		$ 68,752	EA
	STEEP FILL SLOPE (RP 22.00)	LENGTH (FT)	3,700		$ 158,989	EA
	STEEP FILL SLOPE (RP 23.80)	LENGTH (FT)	1,380		$ 59,299	EA
	STEEP FILL SLOPE (RP 24.10)	LENGTH (FT)	1,900		$ 81,643	EA
	STEEP FILL SLOPE (RP 24.70)	LENGTH (FT)	1,600		$ 68,752	EA

	STEEP FILL SLOPE (RP 26.70)	LENGTH (FT)	4,220		$	181,333	EA
	STEEP FILL SLOPE (RP 31.30)	LENGTH (FT)	3,160		$	135,785	EA
	STEEP FILL SLOPE (RP 31.70)	LENGTH (FT)	4,760		$	204,537	EA
	STEEP FILL SLOPE (RP 36.60)	LENGTH (FT)	2,120		$	91,096	EA
	STEEP FILL SLOPE (RP 37.50)	LENGTH (FT)	2,120		$	91,096	EA
	STEEP FILL SLOPE (RP 39.00)	LENGTH (FT)	840		$	36,095	EA
	STEEP FILL SLOPE (RP 43.30)	LENGTH (FT)	840		$	36,095	EA
	STEEP FILL SLOPE (RP 48.10)	LENGTH (FT)	520		$	22,344	EA
1.D	**HORIZONTAL CURVES (RP 39.52 - RP 40.98)**		**WIDTH (FT)**	**LENGTH (MI)**	**$**	**689,000**	**TOT**
	Approximate length to include approach work		32	1			
	**Costs from Winifred to Big Sandy Corridor Study (May 2011)*		Cost / mi*	$ 559,680			
			Width (ft)	26			
			Cost / sqft	$ 4.08			

CONCEPT 2 - GRAVEL WITHOUT RECONSTRUCTION (RP 17.7 - RP 50.4)

2.A GRAVEL PLACEMENT **$ 2,741,000 TOT**

**Unit costs based on communication with MDT Glendive District (Jim Frank, 09/25/2012)*

GRAVEL SURFACING **WIDTH (FT) 24**

TYPE	UNITS	UNIT PRICE	QUANTITY / STA	COST / MI
Crushed Aggregate Course - 4"*	CUYD	$ 40.00	29.6	$ 62,515
Aggregate Treatment	SQYD	$ 0.42	267	$ 5,921
Contingency		15%		$ 10,265.43
Total				$ 78,702

GRAVEL SURFACING **WIDTH (FT) 26**

TYPE	UNITS	UNIT PRICE	QUANTITY / STA	COST / MI
Crushed Aggregate Course - 4"*	CUYD	$ 40.00	32.1	$ 67,795
Aggregate Treatment	SQYD	$ 0.42	289	$ 6,409
Contingency		15%		$ 11,130.61
Total				$ 85,335

GRAVEL SURFACING **WIDTH (FT) 28**

TYPE	UNITS	UNIT PRICE	QUANTITY / STA	COST / MI
Crushed Aggregate Course - 4"*	CUYD	$ 40.00	34.6	$ 73,075
Aggregate Treatment	SQYD	$ 0.42	311	$ 6,897
Contingency		15%		$ 11,995.79
Total				$ 91,968

GRAVEL SURFACING **WIDTH (FT) 32**

TYPE	UNITS	UNIT PRICE	QUANTITY / STA	COST / MI
Crushed Aggregate Course - 4"*	CUYD	$ 40.00	39.5	$ 83,424
Aggregate Treatment	SQYD	$ 0.42	356	$ 7,895
Contingency		15%		$ 13,697.80
Total				$ 105,016

GRAVEL SURFACE (RP 17.7 - RP 20.0)	WIDTH (FT)	LENGTH (MI)	$ 211,526 TOT
	28	2.3	

GRAVEL SURFACE (RP 20.0 - RP 39.6)	WIDTH (FT)	LENGTH (MI)	$ 1,542,552 TOT
	24	19.6	

GRAVEL SURFACE (RP 39.6 - RP 41.0)	WIDTH (FT)	LENGTH (MI)	$ 147,023 TOT
	32	1.4	

GRAVEL SURFACE (RP 41.0 - RP 44.7)	WIDTH (FT)	LENGTH (MI)	$ 315,738 TOT
	26	3.7	

GRAVEL SURFACE (RP 44.7 - RP 50.4)	WIDTH (FT)	LENGTH (MI)	$ 524,216 TOT
	28	5.7	

2.B DOUBLE SHOT / BITUMEN TREATMENT **$ 2,183,000 TOT**

**Unit costs from "Ashland - East" project (July 2012)*

DOUBLE SHOT / BITUMEN TREATMENT **WIDTH (FT) 24**

TYPE	UNITS	UNIT PRICE	QUANTITY / STA	COST / MI
Emuls Asphalt CRS-2P*	TON	$ 726.15	0.95	$ 36,500
Cover - Type 1*	SQYD	$ 0.64	533	$ 18,022
Contingency		15%		$ 8,178.41
Total				$ 62,701

DOUBLE SHOT / BITUMEN TREATMENT **WIDTH (FT) 26**

TYPE	UNITS	UNIT PRICE	QUANTITY / STA	COST / MI
Emuls Asphalt CRS-2P*	TON	$ 726.15	1.03	$ 39,542
Cover - Type 1*	SQYD	$ 0.64	578	$ 19,524
Contingency		15%		$ 8,859.95
Total				$ 67,926

DOUBLE SHOT / BITUMEN TREATMENT			WIDTH (FT)	28
TYPE	UNITS	UNIT PRICE	QUANTITY / STA	COST / MI
Emuls Asphalt CRS-2P*	TON	$ 726.15	1.11	$ 42,584
Cover - Type 1*	SQYD	$ 0.64	622	$ 21,026
Contingency		15%		$ 9,541.48
Total				$ 73,151

DOUBLE SHOT / BITUMEN TREATMENT			WIDTH (FT)	32
TYPE	UNITS	UNIT PRICE	QUANTITY / STA	COST / MI
Emuls Asphalt CRS-2P*	TON	$ 726.15	1.27	$ 48,667
Cover - Type 1*	SQYD	$ 0.64	711	$ 24,030
Contingency		15%		$ 10,904.55
Total				$ 83,602

GRAVEL SURFACE W/ DOUBLE SHOT (RP 17.7 - RP 20.0)	WIDTH (FT)	LENGTH (MI)	$	168,248 TOT
	28	2.3		
GRAVEL SURFACE W/ DOUBLE SHOT (RP 20.0 - RP 39.6)	WIDTH (FT)	LENGTH (MI)	$	1,228,943 TOT
	24	19.6		
GRAVEL SURFACE W/ DOUBLE SHOT (RP 39.6 - RP 41.0)	WIDTH (FT)	LENGTH (MI)	$	117,042 TOT
	32	1.4		
GRAVEL SURFACE W/ DOUBLE SHOT (RP 41.0 - RP 44.7)	WIDTH (FT)	LENGTH (MI)	$	251,327 TOT
	26	3.7		
GRAVEL SURFACE W/ DOUBLE SHOT (RP 44.7 - RP 50.4)	WIDTH (FT)	LENGTH (MI)	$	416,963 TOT
	28	5.7		

CONCEPT 3 - RECONSTRUCT AND WIDEN GRAVEL SECTION (RP 17.7 - RP 50.4)

**Costs from Winifred to Big Sandy Corridor Study (May 2011)*	Cost / mi*	$ 559,680			
	Width (ft)	26			
	Cost / sqft	$ 4.08			
RECONSTRUCT AND WIDEN GRAVEL SECTION (RP 17.7 - RP 50.4)	**WIDTH (FT)***	**LENGTH (MI)**		**$ 25,341,000**	**TOT**
	36	32.7			
**36-foot base width was assumed for cost estimating purposes.*					
BRIDGE COST ESTIMATES*	**COST / SQFT**	**$ 150**		**$ 1,878,000**	**TOT**
**Planning level cost estimate from Toston Bridge Corridor Study, confirmed with MDT Glendive District Staf)*					
Foster Creek - RP 19.87	Length (ft)	Width (ft)	Cost		
	50	40	$ 300,000		
Tongue River - RP 39.61	Length (ft)	Width (ft)	Cost		
	227	40	$ 1,362,000		
Roe and Cooper Creek - RP 47.80	Length (ft)	Width (ft)	Cost		
	36	40	$ 216,000		
EXTENSION OF RECONSTRUCT AND WIDEN GRAVEL SECTION ON S-447	**WIDTH (FT)**	**LENGTH (MI)**		**$ 2,092,000**	**TOT**
RP 43.72 - RP 46.42	36	2.7			

CONCEPT 4 - REHABILITATE WITH MILL / FILL / OVERLAY (RP 0.0 - RP 17.7) AND RECONSTRUCT AND WIDEN GRAVEL SECTION (RP 17.7 - RP 50.4)

REHABILITATE WITH MILL / FILL / OVERLAY (RP 0.0 - RP 17.7) **$ 10,690,000 TOT**

**Unit costs based on communication with MDT Glendive District (Jim Frank, 09/25/2012,*

ASPHALT SURFACE **WIDTH (FT) 24**

TYPE	UNITS	UNIT PRICE	QUANTITY / STA	COST / MI
Cold Milling	SQYD	$ 1.42	266.7	$ 19,994
Crushed Aggregate Course - 8"*	CUYD	$ 40.00	82.2	$ 173,606
Cover - Type 1	SQYD	$ 0.56	267	$ 7,895
Plant Mix Bit Surf Gr S (3/4") - 4"*	TON	$ 35.00	62.6	$ 115,685
Asphalt Cement PG 64-28	TON	$ 708.22	3.38	$ 126,392
Emulsified Asphalt CRS-2P	TON	$ 623.57	0.48	$ 15,804
Aggregate Treatment	SQYD	$ 0.42	318	$ 7,052
Contingency		15%		$ 69,964
Subtotal				$ 536,391

ASPHALT SURFACE **WIDTH (FT) 26**

TYPE	UNITS	UNIT PRICE	QUANTITY / STA	COST / MI
Cold Milling	SQYD	$ 1.42	288.9	$ 21,660
Crushed Aggregate Course - 8"*	CUYD	$ 40.00	87.1	$ 183,955
Cover - Type 1	SQYD	$ 0.56	289	$ 8,545
Plant Mix Bit Surf Gr S (3/4") - 4"*	TON	$ 35.00	67.3	$ 124,370
Asphalt Cement PG 64-28	TON	$ 708.22	3.63	$ 135,740
Emulsified Asphalt CRS-2P	TON	$ 623.57	0.52	$ 17,121
Aggregate Treatment	SQYD	$ 0.42	340	$ 7,540
Contingency		15%		$ 74,840
Subtotal				$ 573,771

ASPHALT SURFACE **WIDTH (FT) 32**

TYPE	UNITS	UNIT PRICE	QUANTITY / STA	COST / MI
Cold Milling	SQYD	$ 1.42	355.6	$ 26,658
Crushed Aggregate Course - 8"*	CUYD	$ 40.00	102.0	$ 215,424
Cover - Type 1	SQYD	$ 0.56	356	$ 10,526
Plant Mix Bit Surf Gr S (3/4") - 4"*	TON	$ 35.00	81.5	$ 150,612
Asphalt Cement PG 64-28	TON	$ 708.22	4.4	$ 164,534
Emulsified Asphalt CRS-2P	TON	$ 623.57	0.64	$ 21,072
Aggregate Treatment	SQYD	$ 0.42	407	$ 9,026
Contingency		15%		$ 89,678
Subtotal				$ 687,529

	WIDTH (FT)	LENGTH (MI)		
RP 0.0 - RP 5.7	26	5.7	$ 3,270,495	TOT
RP 5.7 - RP 12.2	32	6.5	$ 4,468,939	TOT
RP 12.2 - RP 17.7	24	5.5	$ 2,950,150	TOT

	WIDTH (FT)	LENGTH (MI)		
RECONSTRUCT AND WIDEN GRAVEL SECTION (RP 17.7 - RP 50.4)	36	32.7	**$ 25,341,000**	**TOT**

BRIDGE COST ESTIMATES **$ 1,878,000 TOT**

	Cost
Bridge Replacemtalong Gravel Section	$ 1,878,000

	WIDTH (FT)	LENGTH (MI)		
EXTENSION OF RECONSTRUCT AND WIDEN GRAVEL SECTION ON S-447	36	2.7	**$ 2,092,000**	**TOT**
RP 43.72 - RP 46.42				

CONCEPT 5 - RECONSTRUCT WITH PAVEMENT (RP 0.0 - RP 50.4)

**Cost from US 212 - Ashland East Project (July 2012)*	*Cost	$	12,326,887			
***Based on $150 / sqft cost*	**Bridge	$	587,760	Estimate	97.96	LENGTH (FT)
	Length		6.50			
	Width (ft)		40			
	Cost / sqft	$	8.55			

RECONSTRUCT WITH PAVEMENT (RP 0.0 - RP 50.4)	**WIDTH (FT)**	**LENGTH (MI)**	**$**	**54,614,000**	**TOT**
	24	50.4			
RECONSTRUCT WITH PAVEMENT (RP 0.0 - RP 50.4)	**WIDTH (FT)**	**LENGTH (MI)**	**$**	**63,716,000**	**TOT**
	28	50.4			
RECONSTRUCT WITH PAVEMENT (RP 0.0 - RP 50.4)	**WIDTH (FT)**	**LENGTH (MI)**	**$**	**72,819,000**	**TOT**
	32	50.4			
RECONSTRUCT WITH PAVEMENT (RP 0.0 - RP 50.4)	**WIDTH (FT)**	**LENGTH (MI)**	**$**	**81,921,000**	**TOT**
	36	50.4			
RECONSTRUCT WITH PAVEMENT (RP 0.0 - RP 50.4)	**WIDTH (FT)**	**LENGTH (MI)**	**$**	**91,023,000**	**TOT**
	40	50.4			

BRIDGE COST ESTIMATES	**COST / SQFT**	**$ 150**	**$**	**2,790,000**	**TOT**

Pumpkin Creek - RP 1.02	Length (ft)	Width (ft)	Cost
	152	40	$ 912,000

Bridge Replacement along Gravel Section	Cost
	$ 1,878,000

EXTENSION OF RECONSTRUCT WITH PAVEMENT ON S-447	**WIDTH (FT)**	**LENGTH (MI)**	**$**	**4,389,000**	**TOT**
RP 43.72 - RP 46.42	36	2.7			