APPENDIX 11-JJ

Chinde Crossing

- **Design**
- **As-Built**

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Chinde Diversion

Location and Function

The Chinde Crossing (road segment) will be located on permanent program lands in the northeastern portion of AREA II. Lands utilized for the crossing will be reclassified as permanent program lands. The crossing creates a route that connects regrade cut with regrade fill. The road will connect to an existing ancillary road to the south and the cut area to the north. The crossing will exist for an indefinite period of time pending soil mitigation. As-Built and design information for this road is available in Exhibit 11-74A and Exhibit 11-74B.

Design and Construction Specifications

The crossing is designed to meet primary road standards per section 11.5.6.1 of the Permit Application Package (PAP) NM-0003D and CFR30 Part 816.151. The subgrade material will consist of native material excavated during road construction and fill from nearby spoils, both materials will be compacted during placement. The surface will consist of native soils, no surfacing materials (e.g. gravel) will be utilized. All construction materials that will be used are classified as non-toxic and non-acid forming.

The length of the road will be about 600 feet and the width about 70 feet. The maximum elevation of the road is 5320 feet and the minimum elevation is 5311 feet. The road has typical cross-sections similar to those shown in Exhibit 11-84A of the PAP. Any special cross-sections (pipe and drop structures) are shown on Exhibit 11-74A. For safety reasons berms in excess of 5 feet will be constructed in locations where the fill height exceeds 4 feet. Road ditches will be established along the running surface and will be cut to a depth of 1.5 feet with side slopes of 2:1 and 4:1. All cuts and fill for the road will have slopes of 2:1.

Chinde Diversion Culvert

Included with the road, the crossing will consist of one 96 inch culvert near the midpoint of the road. The culvert has been sized to safely pass the 10yr-6hr storm event for the related Chinde Diversion area, consisting of more than 22,000 acres which produce 616 cfs (see Sedcad for more details). The culvert has also been structurally designed to handle a live load of 190 ton trucks with a minimum cover of 4 feet and a dead load of an embankment at 4-8 feet. To meet this criteria the culvert will be buried at a minimum depth of 4 feet and a maximum depth of 8 feet. During construction the culvert will be placed on 4 feet of compacted fill (preferably road base) and will be surrounded by similar compacted fill for about one culvert radius.

Surface Water Drainage (road only)

The Chinde Crossing involves a total drainage area of 1.062 acres. The drainage area is split by the crown of the road, which forms 2 watersheds, the West and the East. The West has an area of 0.536 acres which flows along the road ditch, through a drop structure (#1), and terminates in the Chinde Diversion. The East has an area of 0.526 acres which flows along the road ditch, through a drop structure (#2), and terminates in the Chinde Diversion. All adjacent areas will be diverted away from the crossing to prevent runoff from these areas from entering the Chinde Diversion. For more details see Exhibit 11-74A and the Sedcad runs.

Routine Maintenance

Regular road maintenance will be performed for surface repairs, ditch cleaning, safety berms, and dust suppression. Following all storm events all damage will be repaired in order to maintain the crossing within compliance parameters. The road will be inspected during use to ensure proper maintenance. Dust suppression will take place as required.

Restoration

When the crossing is no longer needed it will be removed. This includes all material and the culvert that lies within the Chinde Diversion. The original berms along the diversion will also be re-established. The remaining areas will be reclaimed with the adjacent lands.

Chinde Culvert Crossing

As-Built Description

The Chinde Crossing is located in the northeastern part of Area II. This crossing has been established to accommodate the reclamation process in the area. The crossing consists of a 96" diameter corrugated metal pipe (CMP) with a road connecting the reclamation activities.

The road consists of compacted material and is approximately 65 feet wide by 750 feet long. The minimum elevation of the road is estimated at 5318 feet and the maximum at 5324 feet. The cross sections of the road and the culvert crossing are shown on Exhibit 11-74B. The design and supporting design data for the crossing can be found on Exhibit 11-74A and the Sedcad runs in this section.

Two drop structures are constructed to control erosion in the vicinity of the culvert and are shown on Exhibit 11-74B. Two drainage areas are present, both draining alongside the road ditches and flowing into the drop structures and terminating in the Chinde Diversion. All adjacent areas are diverted away from the crossing to prevent runoff into the Chinde Diversion. Sedcad runs for these two watershed areas are included in this appendix under the as-built portion.

Culvert CP-111

Refer to the attach drawing for the hydrology model. Culvert CP-111 is at Structure 33.

LR

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General Information

Storm Information:

Storm Type:	NRCS Type II-60
Design Storm:	10 yr - 6 hr
Rainfall Depth:	1.300 inches

Structure Networking:

Type	Stru #	(flows into)	Stru #	Musk. K (hrs)	Musk. X	Description
Null	#1	==>	#2	2.838	0.176	
Null	#2	==>	#3	0.477	0.340	
Null	#3	==>	#5	0.000	0.000	
Null	#4	==>	#5	0.000	0.000	
Null	#5	==>	#6	0.532	0.358	
Null	#6	==>	#29	0.102	0.418	
Null	#7	==>	#27	0.626	0.318	
Null	#8	==>	#27	0.518	0.313	
Null	#9	==>	#27	0.445	0.319	
Null	#10	==>	#27	0.420	0.311	
Null	#11	==>	#27	0.317	0.322	
Null	#12	==>	#27	0.074	0.427	
Null	#13	==>	#27	0.112	0.351	
Null	#14	==>	#38	0.283	0.341	
Null	#15	==>	#32	0.000	0.000	
Null	#16	==>	#15	0.471	0.357	
Null	#17	==>	#32	0.000	0.000	
Null	#18	==>	#32	0.000	0.000	
Null	#19	==>	#33	0.000	0.000	
Null	#20	==>	#30	0.061	0.372	
Null	#21	==>	#28	0.674	0.323	
Null	#22	==>	#30	0.263	0.292	
Null	#23	==>	#24	0.330	0.323	
Null	#24	==>	End	0.000	0.000	
Null	#25	==>	#28	0.572	0.328	
Null	#26	==>	#29	0.053	0.385	
Null	#27	==>	#28	0.622	0.330	
Null	#28	==>	#23	0.129	0.347	
Null	#29	==>	#30	0.224	0.327	
Null	#30	==>	#33	0.000	0.000	
Null	#31	==>	#18	0.060	0.360	
Null	#32	==>	#23	0.476	0.318	
Culvert	#33	==>	#18	0.505	0.316	Culvert CP-111
Null	#34	==>	#38	0.237	0.331	
Null	#35	==>	#23	0.098	0.357	
Null	#36	==>	#27	0.034	0.341	
Null	#37	==>	#4	1.755	0.316	
Null	#38	==>	#39	0.270	0.326	
Null	#39	==>	#15	0.379	0.320	

#35
Null

#26
Null

#37
Null

#4
Null

#1
Null

#2
Null

#3
Null

#5
Null

#6
Null

#29
Null

#22
Null

#20
Null

#30
Null

#19
Null

#33
Culvert

#31
Null

#18
Null

#17
Null

#34
Null

#14
Null

#38
Null

						#39 *Null*
						#16 *Null*
				#15 *Null*		
		#32 *Null*				
						#36 *Null*
						#13 *Null*
						#12 *Null*
						#11 *Null*
						#10 *Null*
						#9 *Null*
						#8 *Null*
						#7 *Null*
				#27 *Null*		
				#25 *Null*		
				#21 *Null*		
		#28 *Null*				
	#23 *Null*					
#24 *Null*						

Structure Routing Details:

Stru #	Land Flow Condition	Slope (%)	Vert. Dist. (ft)	Horiz. Dist. (ft)	Velocity (fps)	Time (hrs)
#6	9. Small streams flowing bankfull	0.94	30.00	3,200.00	8.71	0.102
#6	**Muskingum K:**					**0.102**
#7	5. Nearly bare and untilled, and alluvial valley fans	10.00	50.00	500.00	3.16	0.043
	8. Large gullies, diversions, and low flowing streams	0.97	60.00	6,200.00	2.95	0.583
#7	**Muskingum K:**					**0.626**
#8	5. Nearly bare and untilled, and alluvial valley fans	10.00	70.00	700.00	3.16	0.061
	8. Large gullies, diversions, and low flowing streams	0.87	40.00	4,600.00	2.79	0.457
#8	**Muskingum K:**					**0.518**
#9	5. Nearly bare and untilled, and alluvial valley fans	10.00	70.00	700.00	3.16	0.061
	8. Large gullies, diversions, and low flowing streams	0.98	40.00	4,100.00	2.96	0.384
#9	**Muskingum K:**					**0.445**
#10	5. Nearly bare and untilled, and alluvial valley fans	12.00	60.00	500.00	3.46	0.040
	8. Large gullies, diversions, and low flowing streams	0.81	30.00	3,700.00	2.70	0.380
#10	**Muskingum K:**					**0.420**
#11	5. Nearly bare and untilled, and alluvial valley fans	12.00	60.00	500.00	3.46	0.040
	8. Large gullies, diversions, and low flowing streams	1.00	30.00	3,000.00	3.00	0.277
#11	**Muskingum K:**					**0.317**
#12	5. Nearly bare and untilled, and alluvial valley fans	15.00	60.00	400.00	3.87	0.028
	9. Small streams flowing bankfull	1.58	30.00	1,900.00	11.30	0.046
#12	**Muskingum K:**					**0.074**
#13	5. Nearly bare and untilled, and alluvial valley fans	10.00	80.00	800.00	3.16	0.070
	8. Large gullies, diversions, and low flowing streams	2.67	20.00	750.00	4.89	0.042
#13	**Muskingum K:**					**0.112**
#14	8. Large gullies, diversions, and low flowing streams	1.48	55.00	3,716.00	3.64	0.283
#14	**Muskingum K:**					**0.283**
#16	8. Large gullies, diversions, and low flowing streams	2.01	145.00	7,209.00	4.25	0.471
#16	**Muskingum K:**					**0.471**
#20	8. Large gullies, diversions, and low flowing streams	2.73	30.00	1,100.00	4.95	0.061
#20	**Muskingum K:**					**0.061**
#21	8. Large gullies, diversions, and low flowing streams	1.07	80.00	7,500.00	3.09	0.674

Stru #	Land Flow Condition	Slope (%)	Vert. Dist. (ft)	Horiz. Dist. (ft)	Velocity (fps)	Time (hrs)
#21	**Muskingum K:**					**0.674**
#22	5. Nearly bare and untilled, and alluvial valley fans	3.48	40.00	1,150.00	1.86	0.171
	8. Large gullies, diversions, and low flowing streams	1.00	10.00	1,000.00	3.00	0.092
#22	**Muskingum K:**					**0.263**
#25	5. Nearly bare and untilled, and alluvial valley fans	10.00	80.00	800.00	3.16	0.070
	8. Large gullies, diversions, and low flowing streams	1.19	70.00	5,900.00	3.26	0.502
#25	**Muskingum K:**					**0.572**
#26	8. Large gullies, diversions, and low flowing streams	3.64	40.00	1,100.00	5.72	0.053
#26	**Muskingum K:**					**0.053**
#27	8. Large gullies, diversions, and low flowing streams	1.22	90.00	7,400.00	3.30	0.622
#27	**Muskingum K:**					**0.622**
#28	8. Large gullies, diversions, and low flowing streams	1.67	30.00	1,800.00	3.87	0.129
#28	**Muskingum K:**					**0.129**
#29	8. Large gullies, diversions, and low flowing streams	1.15	30.00	2,600.00	3.22	0.224
#29	**Muskingum K:**					**0.224**
#31	8. Large gullies, diversions, and low flowing streams	2.11	20.00	950.00	4.35	0.060
#31	**Muskingum K:**					**0.060**
#32	8. Large gullies, diversions, and low flowing streams	0.98	50.00	5,100.00	2.97	0.476
#32	**Muskingum K:**					**0.476**
#33	8. Large gullies, diversions, and low flowing streams	0.94	50.00	5,300.00	2.91	0.505
#33	**Muskingum K:**					**0.505**
#34	8. Large gullies, diversions, and low flowing streams	1.23	35.00	2,841.00	3.32	0.237
#34	**Muskingum K:**					**0.237**
#35	8. Large gullies, diversions, and low flowing streams	2.00	30.00	1,500.00	4.24	0.098
#35	**Muskingum K:**					**0.098**
#36	5. Nearly bare and untilled, and alluvial valley fans	13.33	60.00	450.00	3.65	0.034
#36	**Muskingum K:**					**0.034**
#37	5. Nearly bare and untilled, and alluvial valley fans	1.22	50.00	4,087.30	1.10	1.032
	8. Large gullies, diversions, and low flowing streams	1.51	145.00	9,585.51	3.68	0.723
#37	**Muskingum K:**					**1.755**

Stru #	Land Flow Condition	Slope (%)	Vert. Dist. (ft)	Horiz. Dist. (ft)	Velocity (fps)	Time (hrs)
#38	8. Large gullies, diversions, and low flowing streams	1.13	35.00	3,101.00	3.18	0.270
#38	**Muskingum K:**					**0.270**
#39	8. Large gullies, diversions, and low flowing streams	1.02	42.00	4,129.00	3.02	0.379
#39	**Muskingum K:**					**0.379**

Structure Summary:

	Immediate Contributing Area (ac)	Total Contributing Area (ac)	Peak Discharge (cfs)	Total Runoff Volume (ac-ft)
#35	94.420	94.420	11.63	0.92
#26	192.840	192.840	140.43	9.34
#37	3,125.900	3,125.900	8.21	4.93
#4	2,906.830	6,032.730	103.37	28.27
#1	461.890	461.890	12.85	2.38
#2	2,706.150	3,168.040	24.19	7.95
#3	1,521.560	4,689.600	30.54	12.12
#5	0.000	10,722.330	108.67	40.39
#6	1,935.730	12,658.060	174.28	64.98
#29	180.900	13,031.800	225.83	77.15
#22	233.240	233.240	59.19	9.38
#20	739.390	739.390	80.28	22.48
#30	98.260	14,102.690	277.52	109.97
#19	472.910	472.910	62.53	10.89
#33	0.000	14,575.600	311.16	120.86
#31	125.800	125.800	16.83	1.22
#18	285.580	14,986.980	320.41	124.86
#17	862.260	862.260	37.09	12.45
#34	185.300	185.300	1.46	0.39
#14	5,677.210	5,677.210	92.00	23.98
#38	0.000	5,862.510	91.03	24.38
#39	0.000	5,862.510	89.92	24.38
#16	1,178.150	1,178.150	9.57	3.23
#15	690.540	7,731.200	109.38	33.43
#32	0.000	23,580.440	426.34	170.74
#36	32.140	32.140	37.20	1.56
#13	40.400	40.400	46.77	1.96
#12	76.220	76.220	40.09	3.69
#11	146.010	146.010	106.33	7.07
#10	35.810	35.810	23.87	1.73
#9	13.770	13.770	15.94	0.67
#8	70.710	70.710	51.49	3.42
#7	190.080	190.080	110.49	8.41
#27	404.670	1,009.810	255.61	32.44
#25	344.350	344.350	111.40	16.67
#21	97.540	97.540	43.31	3.59

	Immediate Contributing Area (ac)	Total Contributing Area (ac)	Peak Discharge (cfs)	Total Runoff Volume (ac-ft)
#28	865.010	2,316.710	403.13	61.11
#23	177.530	26,169.100	745.62	235.32
#24	522.500	26,691.600	766.59	253.60

Structure Detail:

Structure #33 (Culvert)

Culvert CP-111

Culvert Inputs:

Length (ft)	Slope (%)	Manning's n	Max. Headwater (ft)	Tailwater (ft)	Entrance Loss Coef. (Ke)
175.00	1.10	0.0200	12.00	0.00	0.90

Culvert Results:

Design Discharge = 311.16 cfs

Minimum pipe diameter: 1 - 66 inch pipe(s) required

Subwatershed Hydrology Detail:

Stru #	SWS #	SWS Area (ac)	Time of Conc (hrs)	Musk K (hrs)	Musk X	Curve Number	UHS	Peak Discharge (cfs)	Runoff Volume (ac-ft)
#35	1	94.420	0.198	0.000	0.000	76.000	M	11.63	0.919
	Σ	**94.420**						**11.63**	**0.919**
#26	1	192.840	0.140	0.000	0.000	91.000	M	140.43	9.335
	Σ	**192.840**						**140.43**	**9.335**
#37	1	3,125.900	5.055	0.000	0.000	67.000	M	8.21	4.930
	Σ	**3,125.900**						**8.21**	**4.930**
#4	1	602.390	0.976	0.265	0.360	69.000	M	6.68	1.653
	2	647.360	0.892	0.265	0.340	74.620	M	26.32	5.153
	3	564.330	1.077	0.263	0.350	75.300	M	23.29	4.970
	4	1,092.750	1.355	0.000	0.000	76.610	M	48.63	11.563
	Σ	**6,032.730**						**103.37**	**28.269**
#1	1	461.890	0.647	0.000	0.000	72.000	M	12.85	2.380
	Σ	**461.890**						**12.85**	**2.380**
#2	1	1,115.700	1.952	1.842	0.186	69.000	M	8.86	3.062
	2	1,346.190	3.778	0.000	0.000	67.000	M	4.34	2.123
	3	244.260	1.427	0.000	0.000	67.000	M	1.23	0.385
	Σ	**3,168.040**						**24.19**	**7.950**
#3	1	1,521.560	2.500	0.000	0.000	69.000	M	10.65	4.175
	Σ	**4,689.600**						**30.54**	**12.125**
#5	Σ	**10,722.330**						**108.67**	**40.394**
#6	1	561.070	1.759	0.265	0.360	72.000	M	9.48	2.891
	2	511.480	2.559	0.265	0.340	72.000	M	6.88	2.635
	3	521.580	1.799	0.263	0.350	82.000	M	39.78	10.543
	4	341.600	0.414	0.000	0.000	84.000	M	87.47	8.515
	Σ	**12,658.060**						**174.28**	**64.978**
#29	1	180.900	0.191	0.000	0.000	79.750	M	40.14	2.840
	Σ	**13,031.800**						**225.83**	**77.153**
#22	1	233.240	0.982	0.000	0.000	88.960	M	59.19	9.378
	Σ	**233.240**						**59.19**	**9.378**
#20	1	739.390	2.058	0.000	0.000	86.000	M	80.28	22.481
	Σ	**739.390**						**80.28**	**22.481**

Stru #	SWS #	SWS Area (ac)	Time of Conc (hrs)	Musk K (hrs)	Musk X	Curve Number	UHS	Peak Discharge (cfs)	Runoff Volume (ac-ft)
#30	1	98.260	0.232	0.000	0.000	76.000	M	11.19	0.956
	Σ	**14,102.690**						**277.52**	**109.968**
#19	1	472.910	1.024	0.000	0.000	83.230	M	62.53	10.890
	Σ	**472.910**						**62.53**	**10.890**
#33	Σ	**14,575.600**						**311.16**	**120.858**
#31	1	125.800	0.142	0.000	0.000	76.000	M	16.83	1.224
	Σ	**125.800**						**16.83**	**1.224**
#18	1	285.580	1.217	0.000	0.000	76.000	M	12.32	2.779
	Σ	**14,986.980**						**320.41**	**124.861**
#17	1	730.950	1.927	0.551	0.222	78.000	M	31.69	9.275
	2	131.310	0.325	0.000	0.000	83.700	M	37.08	3.174
	Σ	**862.260**						**37.09**	**12.450**
#34	1	185.300	1.048	0.000	0.000	68.000	M	1.46	0.393
	Σ	**185.300**						**1.46**	**0.393**
#14	1	2,955.900	6.005	5.147	0.270	67.000	M	6.79	4.662
	2	2,002.300	3.940	0.755	0.339	67.000	M	6.28	3.158
	3	719.010	1.032	0.000	0.000	83.000	M	92.00	16.164
	Σ	**5,677.210**						**92.00**	**23.984**
#38	Σ	**5,862.510**						**91.03**	**24.377**
#39	Σ	**5,862.510**						**89.92**	**24.377**
#16	1	1,178.150	1.866	0.000	0.000	69.000	M	9.57	3.233
	Σ	**1,178.150**						**9.57**	**3.233**
#15	1	690.540	0.567	0.000	0.000	75.000	M	37.90	5.819
	Σ	**7,731.200**						**109.38**	**33.429**
#32	Σ	**23,580.440**						**426.34**	**170.739**
#36	1	32.140	0.109	0.000	0.000	91.000	M	37.20	1.556
	Σ	**32.140**						**37.20**	**1.556**
#13	1	40.400	0.092	0.000	0.000	91.000	M	46.77	1.956
	Σ	**40.400**						**46.77**	**1.956**
#12	1	76.220	0.411	0.000	0.000	91.000	M	40.09	3.690
	Σ	**76.220**						**40.09**	**3.690**
#11	1	146.010	0.129	0.000	0.000	91.000	M	106.33	7.068

Stru #	SWS #	SWS Area (ac)	Time of Conc (hrs)	Musk K (hrs)	Musk X	Curve Number	UHS	Peak Discharge (cfs)	Runoff Volume (ac-ft)
	Σ	**146.010**						**106.33**	**7.068**
#10	1	35.810	0.218	0.000	0.000	91.000	M	23.87	1.734
	Σ	**35.810**						**23.87**	**1.734**
#9	1	13.770	0.101	0.000	0.000	91.000	M	15.94	0.667
	Σ	**13.770**						**15.94**	**0.667**
#8	1	70.710	0.126	0.000	0.000	91.000	M	51.49	3.423
	Σ	**70.710**						**51.49**	**3.423**
#7	1	190.080	0.255	0.000	0.000	90.000	M	110.49	8.406
	Σ	**190.080**						**110.49**	**8.406**
#27	1	404.670	0.870	0.000	0.000	76.000	M	21.22	3.938
	Σ	**1,009.810**						**255.61**	**32.437**
#25	1	344.350	0.928	0.000	0.000	91.000	M	111.40	16.670
	Σ	**344.350**						**111.40**	**16.670**
#21	1	97.540	0.316	0.000	0.000	88.000	M	43.31	3.588
	Σ	**97.540**						**43.31**	**3.588**
#28	1	865.010	0.623	0.000	0.000	76.000	M	54.51	8.417
	Σ	**2,316.710**						**403.13**	**61.112**
#23	1	177.530	0.521	0.000	0.000	79.000	M	20.64	2.549
	Σ	**26,169.100**						**745.62**	**235.319**
#24	1	446.280	0.598	0.000	0.000	87.620	M	136.17	15.840
	2	76.220	0.157	0.269	0.346	86.530	M	37.74	2.439
	Σ	**26,691.600**						**766.59**	**253.598**

Subwatershed Time of Concentration Details:

Stru #	SWS #	Land Flow Condition	Slope (%)	Vert. Dist. (ft)	Horiz. Dist. (ft)	Velocity (fps)	Time (hrs)
#4	1	5. Nearly bare and untilled, and alluvial valley fans	1.75	70.00	4,000.00	1.320	0.841
		8. Large gullies, diversions, and low flowing streams	2.27	50.00	2,200.00	4.520	0.135
#4	**1**	**Time of Concentration:**					**0.976**
#7	1	8. Large gullies, diversions, and low flowing streams	3.62	190.00	5,250.00	5.700	0.255
#7	**1**	**Time of Concentration:**					**0.255**

Stru #	SWS #	Land Flow Condition	Slope (%)	Vert. Dist. (ft)	Horiz. Dist. (ft)	Velocity (fps)	Time (hrs)
#8	1	8. Large gullies, diversions, and low flowing streams	5.16	160.00	3,100.00	6.810	0.126
#8	**1**	**Time of Concentration:**					**0.126**
#9	1	5. Nearly bare and untilled, and alluvial valley fans	9.09	100.00	1,100.00	3.010	0.101
#9	**1**	**Time of Concentration:**					**0.101**
#10	1	5. Nearly bare and untilled, and alluvial valley fans	7.14	150.00	2,100.00	2.670	0.218
#10	**1**	**Time of Concentration:**					**0.218**
#11	1	8. Large gullies, diversions, and low flowing streams	6.67	240.00	3,600.00	7.740	0.129
#11	**1**	**Time of Concentration:**					**0.129**
#12	1	5. Nearly bare and untilled, and alluvial valley fans	4.69	150.00	3,200.00	2.160	0.411
#12	**1**	**Time of Concentration:**					**0.411**
#14	1	5. Nearly bare and untilled, and alluvial valley fans	0.98	210.00	21,403.00	0.990	6.005
#14	**1**	**Time of Concentration:**					**6.005**
#14	2	5. Nearly bare and untilled, and alluvial valley fans	1.42	240.00	16,880.00	1.190	3.940
#14	**2**	**Time of Concentration:**					**3.940**
#14	3	5. Nearly bare and untilled, and alluvial valley fans	1.32	30.00	2,269.00	1.140	0.552
		8. Large gullies, diversions, and low flowing streams	1.94	140.00	7,212.00	4.170	0.480
#14	**3**	**Time of Concentration:**					**1.032**
#15	1	5. Nearly bare and untilled, and alluvial valley fans	5.56	100.00	1,800.00	2.350	0.212
		8. Large gullies, diversions, and low flowing streams	1.76	90.00	5,100.00	3.980	0.355
#15	**1**	**Time of Concentration:**					**0.567**
#16	1	5. Nearly bare and untilled, and alluvial valley fans	2.10	80.00	3,817.00	1.440	0.736
		8. Large gullies, diversions, and low flowing streams	0.38	28.00	7,451.00	1.830	1.130
#16	**1**	**Time of Concentration:**					**1.866**
#18	1	5. Nearly bare and untilled, and alluvial valley fans	2.41	130.00	5,400.00	1.550	0.967
		8. Large gullies, diversions, and low flowing streams	1.07	30.00	2,800.00	3.100	0.250
#18	**1**	**Time of Concentration:**					**1.217**
#23	1	5. Nearly bare and untilled, and alluvial valley fans	5.29	90.00	1,700.00	2.300	0.205
		8. Large gullies, diversions, and low flowing streams	1.11	40.00	3,600.00	3.160	0.316
#23	**1**	**Time of Concentration:**					**0.521**
#27	1	5. Nearly bare and untilled, and alluvial valley fans	9.17	110.00	1,200.00	3.020	0.110

Stru #	SWS #	Land Flow Condition	Slope (%)	Vert. Dist. (ft)	Horiz. Dist. (ft)	Velocity (fps)	Time (hrs)
		8. Large gullies, diversions, and low flowing streams	0.72	50.00	6,950.00	2.540	0.760
#27	**1**	**Time of Concentration:**					**0.870**
#28	1	5. Nearly bare and untilled, and alluvial valley fans	5.31	170.00	3,200.00	2.300	0.386
		8. Large gullies, diversions, and low flowing streams	1.11	30.00	2,700.00	3.160	0.237
#28	**1**	**Time of Concentration:**					**0.623**
#29	1	8. Large gullies, diversions, and low flowing streams	3.75	150.00	4,000.00	5.800	0.191
#29	**1**	**Time of Concentration:**					**0.191**
#30	1	5. Nearly bare and untilled, and alluvial valley fans	5.00	50.00	1,000.00	2.230	0.124
		8. Large gullies, diversions, and low flowing streams	1.88	30.00	1,600.00	4.100	0.108
#30	**1**	**Time of Concentration:**					**0.232**
#31	1	5. Nearly bare and untilled, and alluvial valley fans	6.00	30.00	500.00	2.440	0.056
		9. Small streams flowing bankfull	1.67	60.00	3,600.00	11.610	0.086
#31	**1**	**Time of Concentration:**					**0.142**
#34	1	5. Nearly bare and untilled, and alluvial valley fans	1.74	55.00	3,167.00	1.310	0.671
		8. Large gullies, diversions, and low flowing streams	1.94	110.00	5,672.00	4.170	0.377
#34	**1**	**Time of Concentration:**					**1.048**
#35	1	8. Large gullies, diversions, and low flowing streams	3.16	120.00	3,800.00	5.330	0.198
#35	**1**	**Time of Concentration:**					**0.198**
#37	1	5. Nearly bare and untilled, and alluvial valley fans	1.21	240.00	19,836.00	1.090	5.055
#37	**1**	**Time of Concentration:**					**5.055**

Subwatershed Muskingum Routing Details:

Stru #	SWS #	Land Flow Condition	Slope (%)	Vert. Dist. (ft)	Horiz. Dist. (ft)	Velocity (fps)	Time (hrs)
#14	1	5. Nearly bare and untilled, and alluvial valley fans	0.97	150.00	15,497.00	0.980	4.392
		8. Large gullies, diversions, and low flowing streams	1.43	140.00	9,761.00	3.590	0.755
#14	**1**	**Muskingum K:**					**5.147**
#14	2	8. Large gullies, diversions, and low flowing streams	1.43	140.00	9,761.00	3.590	0.755
#14	**2**	**Muskingum K:**					**0.755**
#24	2	8. Large gullies, diversions, and low flowing streams	1.62	60.00	3,700.00	3.820	0.269
#24	**2**	**Muskingum K:**					**0.269**

CIVIL SOFTWARE DESIGN

SEDCAD+ Version 3

CHINDE TEMP CROSSING EAST SIDE DRAINAGE 10YR-06HR EVENT

by

Name: DJR

Company Name: BHP MINERALS
File Name: C:\BRIAN\CHINDEE

Date: 08-10-1996

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Company Name: BHP MINERALS
Filename: C:\BRIAN\CHINDEE User: DJR
Date: 08-10-1996 Time: 07:38:05
CHINDE TEMP CROSSING EAST SIDE DRAINAGE 10YR-06HR EVENT
Storm: 1.30 inches, 10 year- 6 hour, type II-65
Hydrograph Convolution Interval: 0.1 hr

==========
GENERAL INPUT TABLE
==========

STORM #1:

User-Defined Distribution

Label: type II-65

	Accumulated Time (hrs)	Accumulated Dimensionless Depth
1	0.0	0.000
2	0.5	0.006
3	1.0	0.012
4	1.5	0.019
5	2.0	0.026
6	2.5	0.034
7	3.0	0.043
8	3.5	0.055
9	4.0	0.067
10	4.5	0.083
11	5.0	0.105
12	5.5	0.139
13	6.0	0.711
14	6.5	0.789
15	7.0	0.819
16	7.5	0.837
17	8.0	0.851
18	8.5	0.861
19	9.0	0.872
20	9.5	0.880
21	10.0	0.888
22	10.5	0.894
23	11.0	0.900
24	11.5	0.905
25	12.0	0.910
26	12.5	0.915
27	13.0	0.920
28	13.5	0.925
29	14.0	0.930
30	14.5	0.934
31	15.0	0.938
32	15.5	0.943
33	16.0	0.947
34	16.5	0.951
35	17.0	0.954
36	17.5	0.958
37	18.0	0.962

38	18.5	0.966
39	19.0	0.969
40	19.5	0.973
41	20.0	0.976
42	20.5	0.979
43	21.0	0.982
44	21.5	0.985
45	22.0	0.988
46	22.5	0.991
47	23.0	0.994
48	23.5	0.997
49	24.0	1.000

****

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Company Name: BHP MINERALS
Filename: C:\BRIAN\CHINDEE User: DJR
Date: 08-10-1996 Time: 07:38:05
CHINDE TEMP CROSSING EAST SIDE DRAINAGE 10YR-06HR EVENT
Storm: 1.30 inches, 10 year- 6 hour, type II-65
Hydrograph Convolution Interval: 0.1 hr

SUBWATERSHED/STRUCTURE INPUT/OUTPUT TABLE

-Hydrology-

JBS	SWS	Area (ac)	CN	UHS	Tc (hrs)	K (hrs)	X	Base-Flow (cfs)	Runoff Volume (ac-ft)	Peak Discharge (cfs)
111	1	0.53	89	M	0.059	0.000	0.000	0.0	0.02	0.57
	Type: Earthen Channel				Label: EAST SIDE ROAD DITCH					
111	Structure	0.53							0.02	
111	Total IN/OUT	0.53							0.02	0.57

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Company Name: BHP MINERALS
Filename: C:\BRIAN\CHINDEE User: DJR
Date: 08-10-1996 Time: 07:38:05
CHINDE TEMP CROSSING EAST SIDE DRAINAGE 10YR-06HR EVENT
Storm: 1.30 inches, 10 year- 6 hour, type II-65
Hydrograph Convolution Interval: 0.1 hr

DETAILED SUBWATERSHED INPUT/OUTPUT TABLE

J	B	S	SWS	Seg. #	Land Flow Condition	Distance (ft)	Slope (%)	Velocity (fps)	Segment Time (hr)	Time Conc. (hr)	Muskingum K (hr)	Muskingum X
1	1	1	1	-a	5	338.00	2.46	1.57	0.06	0.059		

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Company Name: BHP MINERALS
Filename: C:\BRIAN\CHINDEE User: DJR
Date: 08-10-1996 Time: 07:38:05
CHINDE TEMP CROSSING EAST SIDE DRAINAGE 10YR-06HR EVENT
Storm: 1.30 inches, 10 year- 6 hour, type II-65
Hydrograph Convolution Interval: 0.1 hr

==========
NON-POND STRUCTURE INPUT/OUTPUT TABLE
==========

J1, B1, S1
EAST SIDE ROAD DITCH

Drainage Area from J1, B1, S1, SWS(s)1: 0.5 acres
Total Contributing Drainage Area: 0.5 acres

MATERIAL: SANDSTONE COBBLES AND SHALE
Triangular Earthen Channel
Limiting Variable: Velocity = 5.000 fps
Sediment-laden Water

Design Discharge (cfs)	Bottom Width (ft)	ZLeft	ZRight	Slope (%)	Manning's n
0.57		2.0:1	4.0:1	5.5	0.025

	Depth (ft)	Velocity (fps)	Top Width (ft)	Hydraulic Radius	Froude Number
	0.24	3.28	1.4	0.114	1.67
w/ Freeboard:	0.74		4.4		

	Runoff Volume (ac-ft)	Peak Discharge (cfs)
IN/OUT	0.02	0.57

****

SEDCAD+ RIPRAP CHANNEL DESIGN

DROP STRUCTURE #2

INPUT VALUES:

Shape	TRIANGULAR	
Discharge	0.57 cfs	
Slope	3.97 %	
Sideslopes (L and R)	3.00:1	3.00:1
Freeboard	1 ft	

RESULTS:

Steep Slope Design - Simons/OSM Method

Depth	0.31 ft
with Freeboard	1.31 ft
Top Width	1.83 ft
with Freeboard	7.83 ft
Velocity	2.03 fps
Cross Sectional Area	0.28 sq ft
Hydraulic Radius	0.15 ft
Manning's n	0.034
Froude Number	0.92
Dmax	0.625 ft (7.50 in)
D50	0.500 ft (6.00 in)
D10	0.167 ft (2.00 in)

CIVIL SOFTWARE DESIGN

SEDCAD+ Version 3

CHINDE TEMP CROSSING WEST SIDE DRAINAGE 10YR-06HR EVENT

by

Name: DJR

Company Name: BHP MINERALS
File Name: C:\BRIAN\CHINDEW

Date: 08-10-1996

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Company Name: BHP MINERALS
Filename: C:\BRIAN\CHINDEW User: DJR
Date: 08-10-1996 Time: 07:33:28
CHINDE TEMP CROSSING WEST SIDE DRAINAGE 10YR-06HR EVENT
Storm: 1.30 inches, 10 year- 6 hour, type II-65
Hydrograph Convolution Interval: 0.1 hr

==========
GENERAL INPUT TABLE
==========

STORM #1:

User-Defined Distribution

Label: type II-65

	Accumulated Time (hrs)	Accumulated Dimensionless Depth
1	0.0	0.000
2	0.5	0.006
3	1.0	0.012
4	1.5	0.019
5	2.0	0.026
6	2.5	0.034
7	3.0	0.043
8	3.5	0.055
9	4.0	0.067
10	4.5	0.083
11	5.0	0.105
12	5.5	0.139
13	6.0	0.711
14	6.5	0.789
15	7.0	0.819
16	7.5	0.837
17	8.0	0.851
18	8.5	0.861
19	9.0	0.872
20	9.5	0.880
21	10.0	0.888
22	10.5	0.894
23	11.0	0.900
24	11.5	0.905
25	12.0	0.910
26	12.5	0.915
27	13.0	0.920
28	13.5	0.925
29	14.0	0.930
30	14.5	0.934
31	15.0	0.938
32	15.5	0.943
33	16.0	0.947
34	16.5	0.951
35	17.0	0.954
36	17.5	0.958
37	18.0	0.962

38	18.5	0.966
39	19.0	0.969
40	19.5	0.973
41	20.0	0.976
42	20.5	0.979
43	21.0	0.982
44	21.5	0.985
45	22.0	0.988
46	22.5	0.991
47	23.0	0.994
48	23.5	0.997
49	24.0	1.000

****

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Company Name: BHP MINERALS
Filename: C:\BRIAN\CHINDEW User: DJR
Date: 08-10-1996 Time: 07:33:28
CHINDE TEMP CROSSING WEST SIDE DRAINAGE 10YR-06HR EVENT
Storm: 1.30 inches, 10 year- 6 hour, type II-65
Hydrograph Convolution Interval: 0.1 hr

SUBWATERSHED/STRUCTURE INPUT/OUTPUT TABLE

-Hydrology-

JBS	SWS	Area (ac)	CN	UHS	Tc (hrs)	K (hrs)	X	Base-Flow (cfs)	Runoff Volume (ac-ft)	Peak Discharge (cfs)
111	1	0.54	89	M	0.063	0.000	0.000	0.0	0.02	0.58
	Type: Earthen Channel Label: WEST SIDE ROAD DITCH									
111	Structure	0.54							0.02	
111	Total IN/OUT	0.54							0.02	0.58

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Company Name: BHP MINERALS
Filename: C:\BRIAN\CHINDEW User: DJR
Date: 08-10-1996 Time: 07:33:28
CHINDE TEMP CROSSING WEST SIDE DRAINAGE 10YR-06HR EVENT
Storm: 1.30 inches, 10 year- 6 hour, type II-65
Hydrograph Convolution Interval: 0.1 hr

DETAILED SUBWATERSHED INPUT/OUTPUT TABLE

J	B	S	SWS	Seg. #	Land Flow Condition	Distance (ft)	Slope (%)	Velocity (fps)	Segment Time (hr)	Time Conc. (hr)	Muskingum K (hr)	Muskingum X
1	1	1	1	-a	5	352.00	2.37	1.54	0.06	0.063		

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Company Name: BHP MINERALS
Filename: C:\BRIAN\CHINDEW User: DJR
Date: 08-10-1996 Time: 07:33:28
CHINDE TEMP CROSSING WEST SIDE DRAINAGE 10YR-06HR EVENT
Storm: 1.30 inches, 10 year- 6 hour, type II-65
Hydrograph Convolution Interval: 0.1 hr

==========
NON-POND STRUCTURE INPUT/OUTPUT TABLE
==========

J1, B1, S1
WEST SIDE ROAD DITCH

Drainage Area from J1, B1, S1, SWS(s)1: 0.5 acres
Total Contributing Drainage Area: 0.5 acres

MATERIAL: SANDSTONE COBBLES AND SHALE
Triangular Earthen Channel
Limiting Variable: Velocity = 5.000 fps
Sediment-laden Water

Design Discharge (cfs)	Bottom Width (ft)	ZLeft	ZRight	Slope (%)	Manning's n
0.58		2.0:1	4.0:1	5.5	0.025

	Depth (ft)	Velocity (fps)	Top Width (ft)	Hydraulic Radius	Froude Number
	0.24	3.29	1.4	0.114	1.67
w/ Freeboard:	0.74		4.4		

	Runoff Volume (ac-ft)	Peak Discharge (cfs)
IN/OUT	0.02	0.58

****

SEDCAD+ RIPRAP CHANNEL DESIGN

DROP STRUCTURE #1

INPUT VALUES:

Shape	TRIANGULAR	
Discharge	0.58 cfs	
Slope	7.16 %	
Sideslopes (L and R)	3.00:1	3.00:1
Freeboard	1 ft	

RESULTS:

Steep Slope Design - Simons/OSM Method

Depth	0.25 ft
with Freeboard	1.25 ft
Top Width	1.49 ft
with Freeboard	7.49 ft
Velocity	3.15 fps
Cross Sectional Area	0.18 sq ft
Hydraulic Radius	0.12 ft
Manning's n	0.035
Froude Number	1.58
Dmax	0.625 ft (7.50 in)
D50	0.500 ft (6.00 in)
D10	0.167 ft (2.00 in)

SEDCAD+ CULVERT SIZING UTILITY

CP - 97 CHINDE TEMP CROSSING

Design Discharge	=	616.000 cfs
Entrance Loss Coefficient	=	0.9
Pipe Length	=	175.000 feet
Pipe Slope	=	1.147 %
Manning's n	=	0.024
Maximum Headwater	=	12.000 feet
Tailwater Depth	=	0.000 feet

Smallest Diameter Required to Pass Flow is 96 inches

PERFORMANCE CURVES:

Diameter: 72 inches

Headwater (ft)	Discharge (cfs)	Control	Flow Type
1.20	16.52	Inlet (Supercritical)	3
2.40	46.71	Inlet (Supercritical)	3
3.60	85.81	Inlet (Supercritical)	3
4.80	120.93	Outlet (Subcritical)	2 *
6.00	157.35	Outlet (Subcritical)	1 *
7.20	215.69	Outlet (Subcritical)	1
8.40	274.94	Outlet	6
9.60	304.44	Outlet	6
10.80	331.32	Outlet	6
12.00	356.18	Outlet	6
13.20	379.42	Outlet	6
14.40	401.31	Outlet	6
15.60	422.07	Outlet	6
16.80	441.85	Outlet	6
18.00	460.79	Outlet	6

* (Transition Region - Data may need to be smoothed.)

Diameter: 84 inches

Headwater (ft)	Discharge (cfs)	Control	Flow Type
1.20	19.27	Inlet (Supercritical)	3
2.40	54.50	Inlet (Supercritical)	3
3.60	100.11	Inlet (Supercritical)	3
4.80	154.14	Inlet (Supercritical)	3
6.00	210.58	Inlet (Supercritical)	3
7.20	239.50	Outlet (Subcritical)	1 *
8.40	314.62	Outlet (Subcritical)	1
9.60	404.58	Outlet	6
10.80	445.43	Outlet	6
12.00	482.83	Outlet	6
13.20	517.54	Outlet	6
14.40	550.07	Outlet	6
15.60	580.77	Outlet	6
16.80	609.93	Outlet	6
18.00	637.76	Outlet	6

* (Transition Region - Data may need to be smoothed.)

Diameter: 96 inches

Headwater (ft)	Discharge (cfs)	Control	Flow Type
1.20	22.02	Inlet (Supercritical)	3
2.40	62.28	Inlet (Supercritical)	3
3.60	114.42	Inlet (Supercritical)	3
4.80	176.16	Inlet (Supercritical)	3
6.00	246.18	Inlet (Supercritical)	3
7.20	323.62	Inlet (Supercritical)	3
8.40	344.88	Outlet (Subcritical)	1 *
9.60	435.76	Outlet (Subcritical)	1
10.80	561.46	Inlet	5
12.00	618.15	Outlet	6
13.20	667.63	Outlet	6
14.40	713.69	Outlet	6
15.60	0.00		0 *
16.80	0.00		0
18.00	0.00		0

* (Transition Region - Data may need to be smoothed.)

Diameter: 108 inches

Headwater (ft)	Discharge (cfs)	Control	Flow Type
1.20	24.78	Inlet (Supercritical)	3
2.40	70.06	Inlet (Supercritical)	3
3.60	128.72	Inlet (Supercritical)	3
4.80	198.18	Inlet (Supercritical)	3
6.00	276.96	Inlet (Supercritical)	3
7.20	364.07	Inlet (Supercritical)	3
8.40	458.78	Inlet (Supercritical)	3
9.60	507.90	Outlet (Subcritical)	2 *
10.80	579.64	Outlet (Subcritical)	1 *
12.00	0.00		0 *
13.20	0.00		0
14.40	0.00		0
15.60	0.00		0
16.80	0.00		0
18.00	0.00		0

* (Transition Region - Data may need to be smoothed.)

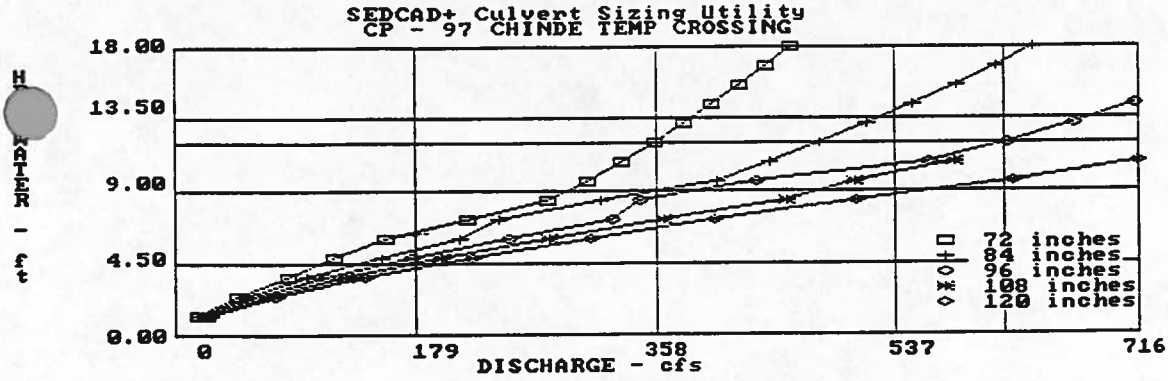
Diameter: 120 inches

Headwater (ft)	Discharge (cfs)	Control	Flow Type
1.20	27.53	Inlet (Supercritical)	3
2.40	77.85	Inlet (Supercritical)	3
3.60	143.02	Inlet (Supercritical)	3
4.80	220.19	Inlet (Supercritical)	3
6.00	307.73	Inlet (Supercritical)	3
7.20	404.52	Inlet (Supercritical)	3

8.40	509.75	Inlet (Supercritical)	3
9.60	622.80	Inlet (Supercritical)	3
10.80	716.10	Inlet (Supercritical)	3
12.00	0.00		0 *
13.20	0.00		0
14.40	0.00		0
15.60	0.00		0
16.80	0.00		0
18.00	0.00		0

* (Transition Region - Data may need to be smoothed.)

==========


SEDCAD+ Culvert Sizing Utility
CP - 97 CHINDE TEMP CROSSING
18.00
13.50
9.00
4.50
0.00
H WATER - ft
0
179
358
537
716
DISCHARGE - cfs
72 inches
84 inches
96 inches
108 inches
120 inches

SEDCAD Data for the Chinde Crossing As-Built for 10 year - 6 hour Storm Event

Civil Software Design -- SEDCAD+ Version 3.1
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Company Name: BHP MINERALS
Filename: C:\CHXG1 User: ftj
Date: 03-24-1997 Time: 14:11:53
Chinde Crossing drop structure #1
Storm: 1.30 inches, 10 year- 6 hour, type II-65
Hydrograph Convolution Interval: 0.1 hr

SUBWATERSHED/STRUCTURE INPUT/OUTPUT TABLE

-Hydrology-

SWS	Area (ac)	CN	UHS	Tc (hrs)	K (hrs)	X	Base-Flow (cfs)	Runoff Volume (ac-ft)	Peak Discharge (cfs)
1	0.72	89	M	0.145	0.000	0.000	0.0	0.03	0.56
		Type: Null		Label: chxg1					
Structure	0.72							0.03	
Total IN/OUT	0.72							0.03	0.56

NAVAJO COAL COMPANY
NAVAJO MINE

10-Apr-97

PROJECT: CHINDE CROSSING AS-BUILT
ENGINEER FRANCIS T. JOHNSON
FILE NO :
DRWG NO :
MMD REF:

Channel Design

Precipitation Event:	10YR-6HR		
Design Flow	Q10	0.56	CFS
Bottom Channel Width	W =	0.00	Ft (min)
Side Slopes (Z1:1)	Z1 =	4.00	
(Z2:1)	Z2 =	4.00	
Manning's Roughness Coefficient	n =	0.038	
Channel Bed Slope	S =	27.90	%

STAGE FLOW

Flow Depth (Ft)	Area (Sq Ft)	Hydraulic Radius	Discharge Rate (CFS)	Velocity (FPS)
0.00	0.00	0.00	0.00	0.00
0.25	0.25	0.12	1.26	5.04
0.50	1.00	0.24	8.02	8.02
0.75	2.25	0.36	23.67	10.52
1.00	4.00	0.49	51.02	12.76
1.25	6.25	0.61	92.58	14.81
1.50	9.00	0.73	150.63	16.74
1.75	12.25	0.85	227.33	18.56
2.00	16.00	0.97	324.72	20.29
2.25	20.25	1.09	444.72	21.96
2.50	25.00	1.21	589.19	23.57
2.75	30.25	1.33	759.93	25.12
3.00	36.00	1.46	958.67	26.63
3.25	42.25	1.58	1187.09	28.10
3.50	49.00	1.70	1446.83	29.53
3.75	56.25	1.82	1739.47	30.92
4.00	64.00	1.94	2066.59	32.29
4.25	72.25	2.06	2429.70	33.63

Flow Depth at Peak Discharge	0.19	Ft
Minimum Channel Depth Required	0.49	Ft
Critical Depth	0.27	Ft
Flow Type	Supercritical flow	
Froude Number	1.69	
Flow Velocity	4.19	fps
Soil Type: SANDY CLAY		
Erosive Velocity	3.50	fps
Flow Velocity is Greater than Erosive Velocity, Therefore Riprap Required		
D50 Rock Size Available	1.00	Ft
Angle of Repose of Riprap Material	40.00	Degree
Minimum D50 Rock Size Required	0.70	
Riprap Safety Factor for Minmum D50 Required		
A. Channel Bed	1.54	
B. Channel Slopes	2.14	
Safety Factor for Riprap Design	1.50	

Reference: 1. Hydraulic Engineering Circular No. 15;
Federal Highway Administration
2. Applied Hydrology and Sedimentology for Disturbed Areas
Chapter 3; B.J. Barfield and R.C. Warner
University of Kentucky

Civil Software Design -- SEDCAD+ Version 3.1
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Company Name: BHP MINERALS
Filename: C:\CHXING#2 User: ftj
Date: 03-24-1997 Time: 14:19:34
Chinde crossing drop structure #2
Storm: 1.30 inches, 10 year- 6 hour, type II-65
Hydrograph Convolution Interval: 0.1 hr

SUBWATERSHED/STRUCTURE INPUT/OUTPUT TABLE

-Hydrology-

SWS	Area (ac)	CN	UHS	Tc (hrs)	K (hrs)	X	Base-Flow (cfs)	Runoff Volume (ac-ft)	Peak Discharge (cfs)
1	0.63	89	M	0.085	0.000	0.000	0.0	0.03	0.67
		Type: Null		Label: chxing#2					
Structure	0.63							0.03	
Total IN/OUT	0.63							0.03	0.67

SEDCAD+ RIPRAP CHANNEL DESIGN

CHINDE CROSSING DS #2 (WEST)

INPUT VALUES:

Shape	TRIANGULAR	
Discharge	0.67 cfs	
Slope	15.60 %	
Sideslopes (L and R)	5.00:1	5.00:1
Freeboard	.5 ft	

RESULTS:

Steep Slope Design - Simons/OSM Method

Depth	0.13 ft
with Freeboard	0.63 ft
Top Width	1.28 ft
with Freeboard	6.28 ft
Velocity	8.21 fps
Cross Sectional Area	0.08 sq ft
Hydraulic Radius	0.06 ft
Manning's n	0.037
Froude Number	5.72
Dmax	0.938 ft (11.25 in)
D50	0.750 ft (9.00 in)
D10	0.250 ft (3.00 in)

LEGEND

△ S1	STRUCTURE LOCATION AND DESIGNATION
SW1	SUBWATERSHED DESIGNATION
———	CHANNEL
— · — · —	LEASE BOUNDARY
⬭	CHINDE DRAINAGE

SCALE: 1" = 2000'

N

PERMIT COPY
NM-0003-F

SHEET OF
DRAWING

HYDROLOGY MODEL FOR CP-111

LOCATION MAP

ACCOUNT: PERMITTING-N105A
DATE: MARCH 3, 2004
DESIGNED BY: LRAYMOND
DRAWN BY: RJFOSTER
CHECKED BY: LEONARD RAYMOND
APPROVED BY: LEONARD RAYMOND

BHP-NAVAJO COAL CO.
NAVAJO MINE
PO BOX 1717, FRUITLAND, NEW MEXICO, 87416

PROJECT MANAGER:
ENGR. of RECORD: REG. NO:
SRVYR of RECORD: REG. NO:

REVISION	DATE
1 Submitted to OSM for Approval	Oct. 21, 99
2	
3	
4	
5	