CIVIL SOFTWARE DESIGN

SEDCAD+ Version 3

AS BUILT DESIGN SPECIFICATIONS FOR CP-1 AND CP-69

by

Name: Brian Sambirsky

Company Name: BHP MINERALS
File Name: C:\BRIAN\1_69

Date: 12-18-1995

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Company Name: BHP MINERALS
Filename: C:\BRIAN\1_69 User: Brian Sambirsky
Date: 12-18-1995 Time: 15:23:43
As built design specifications for CP-1 and CP-69
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	7.10	89	M	0.205	0.000	0.000	0.0	0.29	5.05
			Type: Null			Label: CP-69				
111	Structure	7.10							0.29	
111	Total IN/OUT	7.10							0.29	5.05
211	1	85.00	89	M	0.515	0.000	0.000	0.0	3.43	38.36
			Type: Null			Label: CP-1				
211	Structure	85.00							3.72	
211	Total IN/OUT	92.10							3.72	40.02
111 to 211 Routing						0.510	0.244			
			Type: Null			Label: CP-19				
311	Structure	85.00							3.72	
311	Total IN/OUT	92.10							3.72	40.02
211 to 311 Routing						0.000	0.000			

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Company Name: BHP MINERALS
Filename: C:\BRIAN\1_69 User: Brian Sambirsky
Date: 12-18-1995 Time: 15:23:43
As built design specifications for CP-1 and CP-69
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)	X
1	1	1	1	-a	5	650.00	0.77	0.88	0.21	0.205		
2	1	1	1	-a	5	3200.00	2.97	1.72	0.52	0.515		

SEDCAD+ CULVERT SIZING UTILITY

CP-1

Design Discharge	=	40.020 cfs
Entrance Loss Coefficient	=	0.2
Pipe Length	=	76.000 feet
Pipe Slope	=	2.500 %
Manning's n	=	0.020
Maximum Headwater	=	13.700 feet
Tailwater Depth	=	0.000 feet

Smallest Diameter Required to Pass Flow is 24 inches

PERFORMANCE CURVES:

Diameter: 18 inches

Headwater (ft)	Discharge (cfs)	Control	Flow Type
1.37	5.04	Inlet (Supercritical)	3
2.74	11.32	Inlet	5
4.11	14.55	Outlet	6
5.48	16.53	Outlet	6
6.85	18.30	Outlet	6
8.22	19.92	Outlet	6
9.59	21.39	Outlet	6
10.96	22.78	Outlet	6
12.33	24.11	Outlet	6
13.70	25.34	Outlet	6
15.07	26.53	Outlet	6
16.44	27.67	Outlet	6
17.81	28.75	Outlet	6
19.18	29.81	Outlet	6
20.55	30.81	Outlet	6

Diameter: 21 inches

Headwater (ft)	Discharge (cfs)	Control	Flow Type
1.37	5.88	Inlet (Supercritical)	3
2.74	14.53	Inlet	5
4.11	20.19	Inlet	5
5.48	23.80	Outlet	6
6.85	26.43	Outlet	6
8.22	28.81	Outlet	6
9.59	31.01	Outlet	6
10.96	33.07	Outlet	6
12.33	35.01	Outlet	6
13.70	36.84	Outlet	6
15.07	38.59	Outlet	6
16.44	40.27	Outlet	6
17.81	41.88	Outlet	6
19.18	43.42	Outlet	6
20.55	44.91	Outlet	6

Diameter: 24 inches

Headwater (ft)	Discharge (cfs)	Control	Flow Type
1.37	6.72	Inlet (Supercritical)	3
2.74	17.81	Inlet	5
4.11	25.53	Inlet	5
5.48	31.40	Inlet	5
6.85	36.11	Outlet	6
8.22	39.46	Outlet	6
9.59	42.55	Outlet	6
10.96	45.43	Outlet	6
12.33	48.14	Outlet	6
13.70	50.70	Outlet	6
15.07	53.14	Outlet	6
16.44	55.48	Outlet	6
17.81	57.72	Outlet	6
19.18	59.88	Outlet	6
20.55	61.96	Outlet	6

Diameter: 30 inches

Headwater (ft)	Discharge (cfs)	Control	Flow Type
1.37	8.40	Inlet (Supercritical)	3
2.74	23.74	Inlet (Supercritical)	3
4.11	37.11	Inlet	5
5.48	46.84	Inlet	5
6.85	54.88	Inlet	5
8.22	61.88	Inlet	5
9.59	68.16	Inlet	5
10.96	73.92	Inlet	5
12.33	79.25	Inlet	5
13.70	84.25	Inlet	5
15.07	88.96	Inlet	5
16.44	93.44	Inlet	5
17.81	97.65	Outlet	6
19.18	101.40	Outlet	6
20.55	105.00	Outlet	6

Diameter: 36 inches

Headwater (ft)	Discharge (cfs)	Control	Flow Type
1.37	10.07	Inlet (Supercritical)	3
2.74	28.49	Inlet (Supercritical)	3
4.11	49.10	Inlet	5
5.48	64.08	Inlet	5
6.85	76.16	Inlet	5
8.22	86.57	Inlet	5
9.59	95.86	Inlet	5
10.96	104.33	Inlet	5
12.33	112.16	Inlet	5
13.70	119.47	Inlet	5

15.07	126.36	Inlet	5
16.44	132.88	Inlet	5
17.81	139.12	Inlet	5
19.18	145.09	Inlet	5
20.55	150.81	Inlet	5

Diameter: 42 inches

Headwater (ft)	Discharge (cfs)	Control	Flow Type
1.37	11.75	Inlet (Supercritical)	3
2.74	33.24	Inlet (Supercritical)	3
4.11	61.06	Inlet (Supercritical)	3
5.48	82.35	Inlet	5
6.85	99.61	Inlet	5
8.22	114.29	Inlet	5
9.59	127.28	Inlet	5
10.96	139.06	Inlet	5
12.33	149.93	Inlet	5
13.70	160.06	Inlet	5
15.07	169.58	Inlet	5
16.44	178.59	Inlet	5
17.81	187.17	Inlet	5
19.18	195.38	Inlet	5
20.55	203.25	Inlet	5

SEDCAD+ CULVERT SIZING UTILITY

CP-69

Design Discharge	=	5.050 cfs
Entrance Loss Coefficient	=	0.9
Pipe Length	=	83.000 feet
Pipe Slope	=	1.100 %
Manning's n	=	0.026
Maximum Headwater	=	7.000 feet
Tailwater Depth	=	0.000 feet

Smallest Diameter Required to Pass Flow is 15 inches

PERFORMANCE CURVES:

Diameter: 9 inches

Headwater (ft)	Discharge (cfs)	Control	Flow Type
0.70	0.64	Inlet (Supercritical)	4
1.40	1.08	Outlet	6
2.10	1.25	Outlet	6
2.80	1.42	Outlet	6
3.50	1.59	Outlet	6
4.20	1.76	Outlet	6
4.90	1.93	Outlet	6
5.60	2.06	Outlet	6
6.30	2.16	Outlet	6
7.00	2.27	Outlet	6
7.70	2.37	Outlet	6
8.40	2.47	Outlet	6
9.10	2.57	Outlet	6
9.80	2.68	Outlet	6
10.50	2.78	Outlet	6

Diameter: 12 inches

Headwater (ft)	Discharge (cfs)	Control	Flow Type
0.70	1.02	Outlet (Subcritical)	1
1.40	2.19	Outlet (Subcritical)	2
2.10	2.62	Inlet (Supercritical)	4
2.80	3.04	Outlet	6
3.50	3.36	Outlet	6
4.20	3.68	Outlet	6
4.90	4.00	Outlet	6
5.60	4.26	Outlet	6
6.30	4.51	Outlet	6
7.00	4.76	Outlet	6
7.70	5.01	Outlet	6
8.40	5.21	Outlet	6
9.10	5.42	Outlet	6
9.80	5.62	Outlet	6
10.50	5.83	Outlet	6

7.70	19.71	Outlet	6
8.40	20.66	Outlet	6
9.10	21.56	Outlet	6
9.80	22.43	Outlet	6
10.50	23.27	Outlet	6

Diameter: 24 inches

Headwater (ft)	Discharge (cfs)	Control	Flow Type
0.70	4.72	Outlet (Subcritical)	1
1.40	6.35	Outlet (Subcritical)	1
2.10	11.33	Outlet (Subcritical)	1
2.80	14.56	Outlet	6
3.50	16.91	Outlet	6
4.20	18.97	Outlet	6
4.90	20.83	Outlet	6
5.60	22.53	Outlet	6
6.30	24.11	Outlet	6
7.00	25.59	Outlet	6
7.70	27.00	Outlet	6
8.40	28.33	Outlet	6
9.10	29.60	Outlet	6
9.80	30.82	Outlet	6
10.50	32.01	Outlet	6

Diameter: 15 inches

Headwater (ft)	Discharge (cfs)	Control	Flow Type
0.70	1.78	Outlet (Subcritical)	1
1.40	3.37	Inlet (Supercritical)	3
2.10	4.41	Outlet	6
2.80	5.16	Outlet	6
3.50	5.80	Outlet	6
4.20	6.37	Outlet	6
4.90	6.92	Outlet	6
5.60	7.40	Outlet	6
6.30	7.87	Outlet	6
7.00	8.30	Outlet	6
7.70	8.71	Outlet	6
8.40	9.12	Outlet	6
9.10	9.49	Outlet	6
9.80	9.86	Outlet	6
10.50	10.21	Outlet	6

Diameter: 18 inches

Headwater (ft)	Discharge (cfs)	Control	Flow Type
0.70	2.54	Outlet (Subcritical)	1
1.40	4.57	Outlet (Subcritical)	1
2.10	6.66	Inlet (Supercritical)	4
2.80	7.84	Outlet	6
3.50	8.90	Outlet	6
4.20	9.84	Outlet	6
4.90	10.70	Outlet	6
5.60	11.50	Outlet	6
6.30	12.25	Outlet	6
7.00	12.95	Outlet	6
7.70	13.61	Outlet	6
8.40	14.25	Outlet	6
9.10	14.86	Outlet	6
9.80	15.44	Outlet	6
10.50	16.01	Outlet	6

Diameter: 21 inches

Headwater (ft)	Discharge (cfs)	Control	Flow Type
0.70	3.53	Outlet (Subcritical)	1
1.40	5.23	Outlet (Subcritical)	1
2.10	9.25	Outlet (Subcritical)	2
2.80	11.02	Outlet	6
3.50	12.62	Outlet	6
4.20	14.06	Outlet	6
4.90	15.35	Outlet	6
5.60	16.55	Outlet	6
6.30	17.67	Outlet	6
7.00	18.72	Outlet	6

CIVIL SOFTWARE DESIGN

SEDCAD+ Version 3

AS BUILT DESIGN SPECIFICATIONS FOR CP-3

by

Name: Brian Sambirsky

Company Name: BHP MINERALS
File Name: C:\BRIAN\03

Date: 12-05-1995

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Company Name: BHP MINERALS
Filename: C:\BRIAN\03 User: Brian Sambirsky
Date: 12-06-1995 Time: 09:38:45
As built design specifications for CP-3
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	87.60	89	M	0.424	0.000	0.000	0.0	3.54	44.35
			Type: Null		Label: CP-3					
111	Structure	87.60							3.54	
111	Total IN/OUT	87.60							3.54	44.35

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Company Name: BHP MINERALS
Filename: C:\BRIAN\03 User: Brian Sambirsky
Date: 12-05-1995 Time: 10:04:27
As built design specifications for CP-3
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	2950.00	3.73	1.93	0.42	0.424		

SEDCAD+ CULVERT SIZING UTILITY

CP-3

Design Discharge	=	44.350 cfs
Entrance Loss Coefficient	=	0.2
Pipe Length	=	100.000 feet
Pipe Slope	=	2.600 %
Manning's n	=	0.020
Maximum Headwater	=	18.600 feet
Tailwater Depth	=	0.000 feet

Smallest Diameter Required to Pass Flow is 24 inches

PERFORMANCE CURVES:

Diameter: 18 inches

Headwater (ft)	Discharge (cfs)	Control	Flow Type
1.86	7.76	Inlet	5
3.72	13.40	Outlet	6
5.58	15.86	Outlet	6
7.44	17.87	Outlet	6
9.30	19.67	Outlet	6
11.16	21.31	Outlet	6
13.02	22.85	Outlet	6
14.88	24.30	Outlet	6
16.74	25.65	Outlet	6
18.60	26.94	Outlet	6
20.46	28.18	Outlet	6
22.32	29.35	Outlet	6
24.18	30.48	Outlet	6
26.04	31.58	Outlet	6
27.90	32.63	Outlet	6

Diameter: 21 inches

Headwater (ft)	Discharge (cfs)	Control	Flow Type
1.86	9.30	Inlet (Supercritical)	3
3.72	18.75	Inlet	5
5.58	22.98	Outlet	6
7.44	26.00	Outlet	6
9.30	28.67	Outlet	6
11.16	31.13	Outlet	6
13.02	33.41	Outlet	6
14.88	35.54	Outlet	6
16.74	37.55	Outlet	6
18.60	39.46	Outlet	6
20.46	41.28	Outlet	6
22.32	43.02	Outlet	6
24.18	44.70	Outlet	6
26.04	46.32	Outlet	6
27.90	47.88	Outlet	6

Diameter: 24 inches

Headwater (ft)	Discharge (cfs)	Control	Flow Type
1.86	10.64	Inlet (Supercritical)	3
3.72	23.59	Inlet	5
5.58	31.41	Outlet	6
7.44	35.77	Outlet	6
9.30	39.56	Outlet	6
11.16	43.01	Outlet	6
13.02	46.22	Outlet	6
14.88	49.20	Outlet	6
16.74	52.03	Outlet	6
18.60	54.70	Outlet	6
20.46	57.25	Outlet	6
22.32	59.69	Outlet	6
24.18	62.04	Outlet	6
26.04	64.30	Outlet	6
27.90	66.48	Outlet	6

Diameter: 30 inches

Headwater (ft)	Discharge (cfs)	Control	Flow Type
1.86	13.29	Inlet (Supercritical)	3
3.72	33.84	Inlet	5
5.58	47.48	Inlet	5
7.44	58.00	Inlet	5
9.30	66.78	Inlet	5
11.16	73.03	Outlet	6
13.02	78.65	Outlet	6
14.88	83.90	Outlet	6
16.74	88.83	Outlet	6
18.60	93.51	Outlet	6
20.46	97.94	Outlet	6
22.32	102.21	Outlet	6
24.18	106.31	Outlet	6
26.04	110.24	Outlet	6
27.90	114.03	Outlet	6

Diameter: 36 inches

Headwater (ft)	Discharge (cfs)	Control	Flow Type
1.86	15.94	Inlet (Supercritical)	3
3.72	43.94	Inlet	5
5.58	65.03	Inlet	5
7.44	80.81	Inlet	5
9.30	93.98	Inlet	5
11.16	105.50	Inlet	5
13.02	115.90	Inlet	5
14.88	125.42	Inlet	5
16.74	134.27	Inlet	5
18.60	142.58	Inlet	5

20.46	150.44	Outlet	6
22.32	157.17	Outlet	6
24.18	163.57	Outlet	6
26.04	169.73	Outlet	6
27.90	175.69	Outlet	6

Diameter: 42 inches

Headwater (ft)	Discharge (cfs)	Control	Flow Type
1.86	18.60	Inlet (Supercritical)	3
3.72	52.58	Inlet (Supercritical)	3
5.58	83.74	Inlet	5
7.44	106.18	Inlet	5
9.30	124.63	Inlet	5
11.16	140.70	Inlet	5
13.02	155.10	Inlet	5
14.88	168.28	Inlet	5
16.74	180.51	Inlet	5
18.60	191.95	Inlet	5
20.46	202.74	Inlet	5
22.32	212.99	Inlet	5
24.18	222.77	Inlet	5
26.04	232.15	Inlet	5
27.90	241.16	Inlet	5

CIVIL SOFTWARE DESIGN

SEDCAD+ Version 3

AS BUILT DESIGN SPECIFICATIONS FOR CP-4

by

Name: Brian Sambirsky

Company Name: BHP MINERALS
File Name: C:\BRIAN\04

Date: 12-05-1995

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Company Name: BHP MINERALS
Filename: C:\BRIAN\04 User: Brian Sambirsky
Date: 12-06-1995 Time: 09:38:24
As built design specifications for CP-4
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	40.90	89	M	0.280	0.000	0.000	0.0	1.65	25.50
			Type: Null			Label: CP-4				
111	Structure	40.90							1.65	
111	Total IN/OUT	40.90							1.65	25.50

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Company Name: BHP MINERALS
Filename: C:\BRIAN\04
User: Brian Sambirsky
Date: 12-05-1995 Time: 10:04:30
As built design specifications for CP-4
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	2170.00	4.61	2.15	0.28	0.280		

SEDCAD+ CULVERT SIZING UTILITY

CP-4

Design Discharge	=	25.500 cfs
Entrance Loss Coefficient	=	0.2
Pipe Length	=	68.000 feet
Pipe Slope	=	1.800 %
Manning's n	=	0.020
Maximum Headwater	=	13.800 feet
Tailwater Depth	=	0.000 feet

Smallest Diameter Required to Pass Flow is 18 inches

PERFORMANCE CURVES:

Diameter: 12 inches

Headwater (ft)	Discharge (cfs)	Control	Flow Type
1.38	3.09	Inlet	5
2.76	4.44	Outlet	6
4.14	5.34	Outlet	6
5.52	6.12	Outlet	6
6.90	6.79	Outlet	6
8.28	7.41	Outlet	6
9.66	7.99	Outlet	6
11.04	8.51	Outlet	6
12.42	9.02	Outlet	6
13.80	9.49	Outlet	6
15.18	9.95	Outlet	6
16.56	10.37	Outlet	6
17.94	10.79	Outlet	6
19.32	11.19	Outlet	6
20.70	11.57	Outlet	6

Diameter: 15 inches

Headwater (ft)	Discharge (cfs)	Control	Flow Type
1.38	4.22	Inlet (Supercritical)	3
2.76	7.56	Outlet	6
4.14	9.18	Outlet	6
5.52	10.55	Outlet	6
6.90	11.76	Outlet	6
8.28	12.87	Outlet	6
9.66	13.88	Outlet	6
11.04	14.79	Outlet	6
12.42	15.70	Outlet	6
13.80	16.53	Outlet	6
15.18	17.32	Outlet	6
16.56	18.11	Outlet	6
17.94	18.82	Outlet	6
19.32	19.53	Outlet	6
20.70	20.22	Outlet	6

15.18	54.04	Outlet	6
16.56	56.51	Outlet	6
17.94	58.88	Outlet	6
19.32	61.17	Outlet	6
20.70	63.37	Outlet	6

Diameter: 30 inches

Headwater (ft)	Discharge (cfs)	Control	Flow Type
1.38	8.49	Inlet (Supercritical)	3
2.76	24.00	Inlet (Supercritical)	3
4.14	37.35	Inlet	5
5.52	47.10	Inlet	5
6.90	55.15	Inlet	5
8.28	62.17	Inlet	5
9.66	68.47	Inlet	5
11.04	74.24	Inlet	5
12.42	79.59	Inlet	5
13.80	84.60	Inlet	5
15.18	89.33	Inlet	5
16.56	93.83	Inlet	5
17.94	98.12	Inlet	5
19.32	102.23	Inlet	5
20.70	106.18	Inlet	5

Diameter: 18 inches

Headwater (ft)	Discharge (cfs)	Control	Flow Type
1.38	5.09	Inlet (Supercritical)	3
2.76	11.31	Inlet	5
4.14	14.10	Outlet	6
5.52	16.29	Outlet	6
6.90	18.24	Outlet	6
8.28	20.01	Outlet	6
9.66	21.60	Outlet	6
11.04	23.10	Outlet	6
12.42	24.51	Outlet	6
13.80	25.85	Outlet	6
15.18	27.11	Outlet	6
16.56	28.33	Outlet	6
17.94	29.48	Outlet	6
19.32	30.60	Outlet	6
20.70	31.68	Outlet	6

Diameter: 21 inches

Headwater (ft)	Discharge (cfs)	Control	Flow Type
1.38	5.94	Inlet (Supercritical)	3
2.76	14.63	Inlet	5
4.14	20.05	Outlet	6
5.52	23.34	Outlet	6
6.90	26.24	Outlet	6
8.28	28.83	Outlet	6
9.66	31.21	Outlet	6
11.04	33.43	Outlet	6
12.42	35.51	Outlet	6
13.80	37.47	Outlet	6
15.18	39.33	Outlet	6
16.56	41.11	Outlet	6
17.94	42.82	Outlet	6
19.32	44.46	Outlet	6
20.70	46.05	Outlet	6

Diameter: 24 inches

Headwater (ft)	Discharge (cfs)	Control	Flow Type
1.38	6.79	Inlet (Supercritical)	3
2.76	17.96	Inlet	5
4.14	25.67	Inlet	5
5.52	31.56	Outlet	6
6.90	35.71	Outlet	6
8.28	39.36	Outlet	6
9.66	42.70	Outlet	6
11.04	45.80	Outlet	6
12.42	48.69	Outlet	6
13.80	51.43	Outlet	6

CIVIL SOFTWARE DESIGN

SEDCAD+ Version 3

AS BUILT HYDROLOGY CALCULATIONS FOR CP-5, CP-31, CP-32, CP-33 & CP-34

by

Name: Brian Sambirsky

Company Name: BHP MINERALS
File Name: C:\BRIAN\5_31-34

Date: 12-19-1995

Culvert CP-31, CP-32, CP-33 and CP-34 (Yazzie "Y") and CP-5 Chinde Arroyo Post-Mining Hydrology

The Hydrology model is presented on Exhibit 11-75. The location of Culvert CP-31 thru CP-34 and CP-5 are at Structure 41 and 23, respectively.

LR

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General Information

Storm Information:

Storm Type:	Type II-70
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	==>	#42	1.386	0.156	
Null	#3	==>	#5	0.000	0.000	
Null	#4	==>	#5	0.000	0.000	
Null	#5	==>	#6	0.778	0.334	
Null	#6	==>	#40	1.118	0.289	
Null	#7	==>	#27	1.112	0.333	
Null	#8	==>	#27	0.980	0.337	
Null	#9	==>	#27	0.967	0.336	
Null	#10	==>	#27	0.897	0.335	
Null	#11	==>	#27	0.809	0.337	
Null	#12	==>	#27	0.706	0.342	
Null	#13	==>	#27	0.598	0.352	
Null	#14	==>	#38	0.749	0.206	
Null	#15	==>	#41	0.000	0.000	
Null	#16	==>	#38	0.153	0.368	
Null	#17	==>	#32	0.000	0.000	
Null	#18	==>	#41	0.076	0.313	
Null	#19	==>	#33	0.000	0.000	
Null	#21	==>	#27	0.467	0.332	
Null	#22	==>	#30	0.621	0.218	
Culvert	#23	==>	#24	0.494	0.312	Culvert CP-5
Null	#24	==>	End	0.000	0.000	
Null	#25	==>	#27	0.302	0.350	
Null	#26	==>	#29	0.144	0.211	
Null	#27	==>	#28	0.348	0.313	
Null	#28	==>	#23	0.101	0.361	
Null	#29	==>	#40	0.653	0.305	
Null	#30	==>	#33	0.000	0.000	
Null	#31	==>	#32	0.274	0.297	
Null	#32	==>	#23	0.403	0.327	
Null	#33	==>	#18	0.349	0.315	
Null	#34	==>	#38	0.601	0.202	
Null	#35	==>	#23	0.080	0.367	
Null	#36	==>	#27	1.462	0.217	
Null	#37	==>	#4	1.717	0.316	
Null	#38	==>	#39	0.165	0.329	Doby Channel
Null	#39	==>	#15	0.342	0.321	Doby Permanent Imp.
Null	#40	==>	#41	0.000	0.000	
Culvert	#41	==>	#32	0.307	0.299	Culvert CP-31, 32, 33 & 34 (Yazzie "Y")
Null	#42	==>	#3	1.479	0.221	

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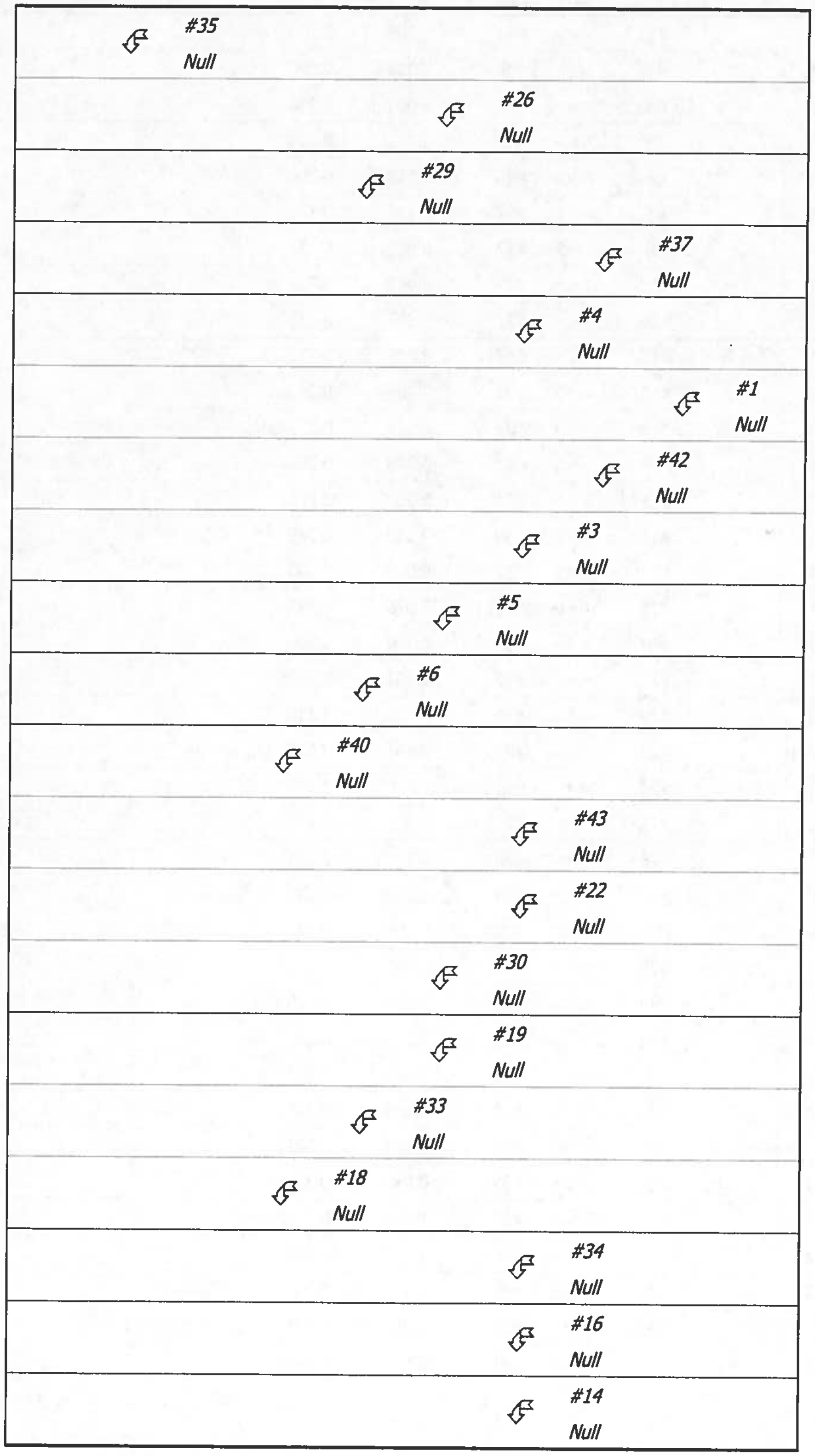
Type	Stru #	(flows into)	Stru #	Musk. K (hrs)	Musk. X	Description
Null	#43	==>	#30	0.479	0.208	



#38 Null
#39 Null
#15 Null
#41 Culvert
#31 Null
#17 Null
#32 Null
#36 Null
#25 Null
#21 Null
#13 Null
#12 Null
#11 Null
#10 Null
#9 Null
#8 Null
#7 Null
#27 Null
#28 Null
#23 Culvert
#24 Null

Structure Routing Details:

Stru #	Land Flow Condition	Slope (%)	Vert. Dist. (ft)	Horiz. Dist. (ft)	Velocity (fps)	Time (hrs)
#1	5. Nearly bare and untilled, and alluvial valley fans	0.60	23.00	3,844.22	0.77	1.386
#1	**Muskingum K:**					**1.386**
#5	8. Large gullies, diversions, and low flowing streams	1.30	124.00	9,554.00	3.41	0.778
#5	**Muskingum K:**					**0.778**
#6	8. Large gullies, diversions, and low flowing streams	0.61	57.00	9,384.26	2.33	1.118
#6	**Muskingum K:**					**1.118**
#7	8. Large gullies, diversions, and low flowing streams	1.28	174.00	13,577.00	3.39	1.112
#7	**Muskingum K:**					**1.112**
#8	8. Large gullies, diversions, and low flowing streams	1.37	169.00	12,356.00	3.50	0.980
#8	**Muskingum K:**					**0.980**
#9	8. Large gullies, diversions, and low flowing streams	1.36	165.00	12,151.00	3.49	0.967
#9	**Muskingum K:**					**0.967**
#10	8. Large gullies, diversions, and low flowing streams	1.33	149.00	11,179.00	3.46	0.897
#10	**Muskingum K:**					**0.897**
#11	8. Large gullies, diversions, and low flowing streams	1.38	142.00	10,259.00	3.52	0.809
#11	**Muskingum K:**					**0.809**
#12	8. Large gullies, diversions, and low flowing streams	1.51	142.00	9,382.00	3.69	0.706
#12	**Muskingum K:**					**0.706**
#13	8. Large gullies, diversions, and low flowing streams	1.81	157.00	8,689.00	4.03	0.598
#13	**Muskingum K:**					**0.598**
#14	5. Nearly bare and untilled, and alluvial valley fans	1.43	46.00	3,212.06	1.19	0.749
#14	**Muskingum K:**					**0.749**
#16	8. Large gullies, diversions, and low flowing streams	2.51	66.00	2,630.00	4.75	0.153
#16	**Muskingum K:**					**0.153**
#18	8. Large gullies, diversions, and low flowing streams	0.90	7.00	780.00	2.84	0.076
#18	**Muskingum K:**					**0.076**
#21	8. Large gullies, diversions, and low flowing streams	1.27	72.00	5,674.00	3.37	0.467
#21	**Muskingum K:**					**0.467**
#22	5. Nearly bare and untilled, and alluvial valley fans	1.74	51.00	2,930.02	1.31	0.621
#22	**Muskingum K:**					**0.621**
#23	8. Large gullies, diversions, and low flowing streams	0.88	44.00	5,006.00	2.81	0.494

Stru #	Land Flow Condition	Slope (%)	Vert. Dist. (ft)	Horiz. Dist. (ft)	Velocity (fps)	Time (hrs)
#23	**Muskingum K:**					**0.494**
#25	8. Large gullies, diversions, and low flowing streams	1.76	76.00	4,325.00	3.97	0.302
#25	**Muskingum K:**					**0.302**
#26	5. Nearly bare and untilled, and alluvial valley fans	1.55	10.00	646.03	1.24	0.144
#26	**Muskingum K:**					**0.144**
#27	8. Large gullies, diversions, and low flowing streams	0.90	32.00	3,558.00	2.84	0.348
#27	**Muskingum K:**					**0.348**
#28	8. Large gullies, diversions, and low flowing streams	2.16	35.00	1,618.00	4.41	0.101
#28	**Muskingum K:**					**0.101**
#29	8. Large gullies, diversions, and low flowing streams	0.80	50.00	6,282.00	2.67	0.653
#29	**Muskingum K:**					**0.653**
#31	8. Large gullies, diversions, and low flowing streams	0.69	17.00	2,459.00	2.49	0.274
#31	**Muskingum K:**					**0.274**
#32	8. Large gullies, diversions, and low flowing streams	1.14	53.00	4,654.00	3.20	0.403
#32	**Muskingum K:**					**0.403**
#33	8. Large gullies, diversions, and low flowing streams	0.93	34.00	3,640.25	2.89	0.349
#33	**Muskingum K:**					**0.349**
#34	5. Nearly bare and untilled, and alluvial valley fans	1.32	33.00	2,492.07	1.15	0.601
#34	**Muskingum K:**					**0.601**
#35	8. Large gullies, diversions, and low flowing streams	2.44	33.00	1,354.00	4.68	0.080
#35	**Muskingum K:**					**0.080**
#36	5. Nearly bare and untilled, and alluvial valley fans	1.71	117.00	6,844.00	1.30	1.462
#36	**Muskingum K:**					**1.462**
#37	5. Nearly bare and untilled, and alluvial valley fans	1.35	55.00	4,071.00	1.16	0.974
	8. Large gullies, diversions, and low flowing streams	1.49	146.00	9,792.00	3.66	0.743
#37	**Muskingum K:**					**1.717**
#38	8. Large gullies, diversions, and low flowing streams	1.19	23.00	1,938.00	3.26	0.165
#38	**Muskingum K:**					**0.165**
#39	8. Large gullies, diversions, and low flowing streams	1.04	39.00	3,758.00	3.05	0.342
#39	**Muskingum K:**					**0.342**
#41	8. Large gullies, diversions, and low flowing streams	0.71	20.00	2,800.00	2.53	0.307
#41	**Muskingum K:**					**0.307**

Stru #	Land Flow Condition	Slope (%)	Vert. Dist. (ft)	Horiz. Dist. (ft)	Velocity (fps)	Time (hrs)
#42	5. Nearly bare and untilled, and alluvial valley fans	1.84	132.00	7,189.15	1.35	1.479
#42	**Muskingum K:**					**1.479**
#43	5. Nearly bare and untilled, and alluvial valley fans	1.48	31.00	2,090.07	1.21	0.479
#43	**Muskingum K:**					**0.479**

Structure Summary:

	Immediate Contributing Area (ac)	Total Contributing Area (ac)	Peak Discharge (cfs)	Total Runoff Volume (ac-ft)
#35	104.800	104.800	14.85	0.82
#26	217.200	217.200	149.15	8.41
#29	90.200	307.400	148.23	9.55
#37	3,024.600	3,024.600	7.61	3.80
#4	2,965.700	5,990.300	111.72	22.46
#1	755.100	755.100	12.86	3.10
#42	2,360.600	3,115.700	16.14	7.29
#3	1,550.000	4,665.700	20.47	10.68
#5	0.000	10,656.000	117.92	33.14
#6	2,008.700	12,664.700	174.09	52.92
#40	155.400	13,127.500	177.29	63.67
#43	817.400	817.400	83.09	19.78
#22	163.500	163.500	79.81	5.25
#30	138.800	1,119.700	94.64	26.11
#19	452.600	452.600	68.58	8.30
#33	0.000	1,572.300	154.66	34.41
#18	119.500	1,691.800	154.23	35.34
#34	239.400	239.400	1.35	0.40
#16	1,217.400	1,217.400	8.84	2.66
#14	6,694.399	6,694.399	83.52	20.56
#38	0.000	8,151.199	87.49	23.63
#39	0.000	8,151.199	87.17	23.63
#15	640.700	8,791.899	97.64	29.31
#41	0.000	23,611.200	340.70	128.32
#31	120.200	120.200	14.23	0.94
#17	846.700	846.700	51.02	9.66
#32	178.400	24,756.500	357.69	140.31
#36	14.200	14.200	19.33	0.69
#25	359.300	359.300	125.36	11.55
#21	90.300	90.300	55.89	2.65
#13	23.300	23.300	19.75	0.92
#12	75.500	75.500	63.34	2.97
#11	154.900	154.900	121.44	5.98
#10	32.500	32.500	23.91	1.26
#9	15.000	15.000	20.41	0.72
#8	58.800	58.800	80.02	2.84
#7	204.800	204.800	115.07	7.23
#27	619.300	1,647.900	413.86	41.61

	Immediate Contributing Area (ac)	Total Contributing Area (ac)	Peak Discharge (cfs)	Total Runoff Volume (ac-ft)
#28	508.400	2,156.300	412.04	45.55
#23	192.200	27,209.800	631.09	188.87
#24	548.700	27,758.500	640.08	203.68

Structure Detail:

Structure #35 (Null)

Structure #26 (Null)

Structure #29 (Null)

Structure #37 (Null)

Structure #4 (Null)

Structure #1 (Null)

Structure #42 (Null)

Structure #3 (Null)

Structure #5 (Null)

Structure #6 (Null)

Structure #40 (Null)

Structure #43 (Null)

Structure #22 (Null)

Structure #30 (Null)

Structure #19 (Null)

Structure #33 (Null)

Structure #18 (Null)

Structure #34 (Null)

Structure #16 (Null)

Structure #14 (Null)

Structure #38 (Null)

Doby Channel

Structure #39 (Null)

Doby Permanent Imp.

Structure #15 (Null)

Structure #41 (Culvert)

Culvert CP-31, 32, 33 & 34 (Yazzie "Y")

Culvert Inputs:

Length (ft)	Slope (%)	Manning's n	Max. Headwater (ft)	Tailwater (ft)	Entrance Loss Coef. (Ke)
150.00	3.10	0.0200	9.00	0.00	0.90

Culvert Results:

Design Discharge = 340.70 cfs

Minimum pipe diameter: 1 - 84 inch pipe(s) required

Structure #31 (Null)

Structure #17 (Null)

Structure #32 (Null)

Structure #36 (Null)

Structure #25 (Null)

Structure #21 (Null)

Structure #13 (Null)

Structure #12 (Null)

Structure #11 (Null)

Structure #10 (Null)

Structure #9 (Null)

Structure #8 (Null)

Structure #7 (Null)

Structure #27 (Null)

Structure #28 (Null)

Structure #23 (Culvert)

Culvert CP-5

Culvert Inputs:

Length (ft)	Slope (%)	Manning's n	Max. Headwater (ft)	Tailwater (ft)	Entrance Loss Coef. (Ke)
311.00	0.70	0.0200	70.00	0.00	0.90

Culvert Results:

Design Discharge = 631.09 cfs

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

Structure #24 (Null)

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	104.800	0.255	0.000	0.000	76.000	M	14.85	0.818
	Σ	**104.800**						**14.85**	**0.818**
#26	1	217.200	0.311	0.000	0.000	91.000	M	149.15	8.407
	Σ	**217.200**						**149.15**	**8.407**
#29	1	90.200	0.179	0.000	0.000	79.750	M	25.94	1.146
	Σ	**307.400**						**148.23**	**9.554**
#37	1	3,024.600	5.355	0.000	0.000	67.000	M	7.61	3.796
	Σ	**3,024.600**						**7.61**	**3.796**
#4	1	654.900	1.236	0.423	0.345	69.000	M	7.48	1.431
	2	699.700	1.092	0.423	0.345	74.620	M	29.76	4.435
	3	547.300	0.989	0.423	0.345	75.300	M	28.19	3.837
	4	1,063.800	1.498	0.000	0.000	76.610	M	50.29	8.961
	Σ	**5,990.300**						**111.72**	**22.460**
#1	1	755.100	2.032	0.000	0.000	72.000	M	12.86	3.096
	Σ	**755.100**						**12.86**	**3.096**
#42	1	1,327.100	2.923	3.078	0.144	69.000	M	8.93	2.898
	2	894.200	3.620	0.000	0.000	67.000	M	2.97	1.122
	3	139.300	1.214	0.000	0.000	67.000	M	0.85	0.175
	Σ	**3,115.700**						**16.14**	**7.291**
#3	1	1,550.000	2.670	0.000	0.000	69.000	M	11.07	3.385
	Σ	**4,665.700**						**20.47**	**10.677**
#5	Σ	**10,656.000**						**117.92**	**33.137**
#6	1	505.100	2.338	0.620	0.328	72.000	M	7.81	2.071
	2	638.400	4.585	0.478	0.304	72.000	M	6.07	2.617
	3	557.000	2.219	0.000	0.000	82.000	M	39.86	8.960
	4	308.200	0.485	0.478	0.304	84.000	M	84.65	6.131
	Σ	**12,664.700**						**174.09**	**52.917**
#40	1	155.400	1.202	0.000	0.000	76.000	M	7.84	1.204
	Σ	**13,127.500**						**177.29**	**63.674**
#43	1	817.400	2.463	0.000	0.000	86.000	M	83.09	19.779
	Σ	**817.400**						**83.09**	**19.779**
#22	1	163.500	0.425	0.000	0.000	88.960	M	79.81	5.252

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	**163.500**						**79.81**	**5.252**
#30	1	138.800	0.282	0.000	0.000	76.000	M	18.54	1.081
	Σ	**1,119.700**						**94.64**	**26.111**
#19	1	452.600	1.009	0.000	0.000	83.230	M	68.58	8.300
	Σ	**452.600**						**68.58**	**8.300**
#33	Σ	**1,572.300**						**154.66**	**34.411**
#18	1	119.500	0.376	0.000	0.000	76.000	M	13.35	0.926
	Σ	**1,691.800**						**154.23**	**35.337**
#34	1	239.400	2.496	0.000	0.000	68.000	M	1.35	0.404
	Σ	**239.400**						**1.35**	**0.404**
#16	1	1,217.400	2.604	0.000	0.000	69.000	M	8.84	2.659
	Σ	**1,217.400**						**8.84**	**2.659**
#14	1	2,999.900	5.968	5.461	0.261	67.000	M	6.93	3.765
	2	1,855.400	3.914	1.286	0.322	67.000	M	5.85	2.329
	3	730.800	1.418	0.000	0.000	83.000	M	83.52	13.078
	4	1,108.300	2.763	1.418	0.312	67.000	M	4.31	1.391
	Σ	**6,694.399**						**83.52**	**20.563**
#38	Σ	**8,151.199**						**87.49**	**23.625**
#39	Σ	**8,151.199**						**87.17**	**23.625**
#15	1	640.700	1.116	0.000	0.000	77.000	M	39.99	5.686
	Σ	**8,791.899**						**97.64**	**29.311**
#41	Σ	**23,611.200**						**340.70**	**128.323**
#31	1	120.200	0.344	0.000	0.000	76.000	M	14.23	0.936
	Σ	**120.200**						**14.23**	**0.936**
#17	1	725.500	1.232	0.713	0.220	78.000	M	48.87	7.328
	2	121.200	0.456	0.000	0.000	83.700	M	33.49	2.334
	Σ	**846.700**						**51.02**	**9.662**
#32	1	128.500	0.672	0.108	0.329	76.000	M	9.72	0.997
	2	49.900	0.493	0.000	0.000	76.000	M	4.66	0.387
	Σ	**24,756.500**						**357.69**	**140.305**
#36	1	14.200	0.048	0.000	0.000	91.000	M	19.33	0.686
	Σ	**14.200**						**19.33**	**0.686**
#25	1	359.300	0.731	0.000	0.000	89.000	M	125.36	11.552

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	**359.300**						**125.36**	**11.552**
#21	1	90.300	0.204	0.000	0.000	88.000	M	55.89	2.652
	Σ	**90.300**						**55.89**	**2.652**
#13	1	23.300	0.162	0.000	0.000	91.000	M	19.75	0.917
	Σ	**23.300**						**19.75**	**0.917**
#12	1	75.500	0.172	0.000	0.000	91.000	M	63.34	2.965
	Σ	**75.500**						**63.34**	**2.965**
#11	1	154.900	0.208	0.000	0.000	91.000	M	121.44	5.983
	Σ	**154.900**						**121.44**	**5.983**
#10	1	32.500	0.258	0.000	0.000	91.000	M	23.91	1.261
	Σ	**32.500**						**23.91**	**1.261**
#9	1	15.000	0.099	0.000	0.000	91.000	M	20.41	0.725
	Σ	**15.000**						**20.41**	**0.725**
#8	1	58.800	0.116	0.000	0.000	91.000	M	80.02	2.842
	Σ	**58.800**						**80.02**	**2.842**
#7	1	204.800	0.394	0.000	0.000	90.000	M	115.07	7.230
	Σ	**204.800**						**115.07**	**7.230**
#27	1	619.300	1.560	0.000	0.000	76.000	M	25.82	4.797
	Σ	**1,647.900**						**413.86**	**41.609**
#28	1	508.400	0.555	0.000	0.000	76.000	M	43.82	3.941
	Σ	**2,156.300**						**412.04**	**45.550**
#23	1	192.200	0.380	0.000	0.000	79.000	M	33.29	2.198
	Σ	**27,209.800**						**631.09**	**188.871**
#24	1	341.800	0.456	0.000	0.000	87.620	M	141.34	9.666
	2	72.600	0.247	0.479	0.310	86.530	M	36.82	1.867
	3	134.300	0.224	0.023	0.370	86.000	M	67.57	3.281
	Σ	**27,758.500**						**640.08**	**203.685**

Subwatershed Time of Concentration Details:

Stru #	SWS #	Land Flow Condition	Slope (%)	Vert. Dist. (ft)	Horiz. Dist. (ft)	Velocity (fps)	Time (hrs)
#1	1	5. Nearly bare and untilled, and alluvial valley fans	4.45	103.00	2,312.00	2.110	0.304
		8. Large gullies, diversions, and low flowing streams	2.03	110.00	5,414.45	4.270	0.352

Stru #	SWS #	Land Flow Condition	Slope (%)	Vert. Dist. (ft)	Horiz. Dist. (ft)	Velocity (fps)	Time (hrs)
		5. Nearly bare and untilled, and alluvial valley fans	1.57	97.00	6,194.12	1.250	1.376
#1	**1**	**Time of Concentration:**					**2.032**
#3	1	5. Nearly bare and untilled, and alluvial valley fans	1.32	140.00	10,633.45	1.140	2.590
		8. Large gullies, diversions, and low flowing streams	5.53	113.00	2,042.00	7.050	0.080
#3	**1**	**Time of Concentration:**					**2.670**
#4	1	5. Nearly bare and untilled, and alluvial valley fans	1.72	60.00	3,483.10	1.310	0.738
		8. Large gullies, diversions, and low flowing streams	1.45	94.00	6,477.39	3.610	0.498
#4	**1**	**Time of Concentration:**					**1.236**
#4	2	5. Nearly bare and untilled, and alluvial valley fans	5.90	110.00	1,863.01	2.420	0.213
		8. Large gullies, diversions, and low flowing streams	1.43	163.00	11,361.26	3.590	0.879
#4	**2**	**Time of Concentration:**					**1.092**
#4	3	5. Nearly bare and untilled, and alluvial valley fans	5.81	100.00	1,722.00	2.400	0.199
		8. Large gullies, diversions, and low flowing streams	2.04	248.00	12,174.16	4.280	0.790
#4	**3**	**Time of Concentration:**					**0.989**
#4	4	5. Nearly bare and untilled, and alluvial valley fans	4.95	105.00	2,123.01	2.220	0.265
		8. Large gullies, diversions, and low flowing streams	1.96	366.00	18,657.28	4.200	1.233
#4	**4**	**Time of Concentration:**					**1.498**
#6	1	5. Nearly bare and untilled, and alluvial valley fans	1.36	125.00	9,201.32	1.160	2.203
		8. Large gullies, diversions, and low flowing streams	3.46	94.00	2,715.03	5.580	0.135
#6	**1**	**Time of Concentration:**					**2.338**
#6	2	5. Nearly bare and untilled, and alluvial valley fans	0.88	130.00	14,813.12	0.930	4.424
		8. Large gullies, diversions, and low flowing streams	4.76	181.00	3,801.00	6.540	0.161
#6	**2**	**Time of Concentration:**					**4.585**
#6	3	5. Nearly bare and untilled, and alluvial valley fans	0.70	35.00	5,028.01	0.830	1.682
		8. Large gullies, diversions, and low flowing streams	2.49	228.00	9,161.04	4.730	0.537
#6	**3**	**Time of Concentration:**					**2.219**
#6	4	5. Nearly bare and untilled, and alluvial valley fans	4.17	73.00	1,752.02	2.040	0.238
		8. Large gullies, diversions, and low flowing streams	3.61	183.00	5,073.04	5.690	0.247
#6	**4**	**Time of Concentration:**					**0.485**
#7	1	8. Large gullies, diversions, and low flowing streams	3.49	195.00	5,587.07	5.600	0.277

Stru #	SWS #	Land Flow Condition	Slope (%)	Vert. Dist. (ft)	Horiz. Dist. (ft)	Velocity (fps)	Time (hrs)
		5. Nearly bare and untilled, and alluvial valley fans	4.84	45.00	930.00	2.190	0.117
#7	**1**	**Time of Concentration:**					**0.394**
#8	1	8. Large gullies, diversions, and low flowing streams	4.91	123.00	2,506.06	6.640	0.104
		5. Nearly bare and untilled, and alluvial valley fans	38.04	105.00	276.00	6.160	0.012
#8	**1**	**Time of Concentration:**					**0.116**
#9	1	5. Nearly bare and untilled, and alluvial valley fans	8.33	45.00	540.00	2.880	0.052
		8. Large gullies, diversions, and low flowing streams	5.57	67.00	1,203.00	7.070	0.047
#9	**1**	**Time of Concentration:**					**0.099**
#10	1	5. Nearly bare and untilled, and alluvial valley fans	4.68	83.00	1,775.02	2.160	0.228
		5. Nearly bare and untilled, and alluvial valley fans	20.83	105.00	504.00	4.560	0.030
#10	**1**	**Time of Concentration:**					**0.258**
#11	1	8. Large gullies, diversions, and low flowing streams	4.55	190.00	4,176.00	6.390	0.181
		5. Nearly bare and untilled, and alluvial valley fans	12.60	45.00	357.00	3.550	0.027
#11	**1**	**Time of Concentration:**					**0.208**
#12	1	8. Large gullies, diversions, and low flowing streams	4.07	120.00	2,950.07	6.050	0.135
		5. Nearly bare and untilled, and alluvial valley fans	10.05	43.00	428.00	3.160	0.037
#12	**1**	**Time of Concentration:**					**0.172**
#13	1	5. Nearly bare and untilled, and alluvial valley fans	3.65	30.00	823.00	1.900	0.120
		8. Large gullies, diversions, and low flowing streams	5.15	53.00	1,030.00	6.800	0.042
#13	**1**	**Time of Concentration:**					**0.162**
#14	1	5. Nearly bare and untilled, and alluvial valley fans	1.01	216.00	21,486.12	1.000	5.968
#14	**1**	**Time of Concentration:**					**5.968**
#14	2	5. Nearly bare and untilled, and alluvial valley fans	1.41	235.00	16,630.10	1.180	3.914
#14	**2**	**Time of Concentration:**					**3.914**
#14	3	5. Nearly bare and untilled, and alluvial valley fans	2.19	43.00	1,966.00	1.470	0.371
		8. Large gullies, diversions, and low flowing streams	1.60	105.00	6,562.00	3.790	0.480
		5. Nearly bare and untilled, and alluvial valley fans	1.08	23.00	2,124.12	1.040	0.567
#14	**3**	**Time of Concentration:**					**1.418**
#14	4	5. Nearly bare and untilled, and alluvial valley fans	1.08	112.00	10,345.00	1.040	2.763
#14	**4**	**Time of Concentration:**					**2.763**

Stru #	SWS #	Land Flow Condition	Slope (%)	Vert. Dist. (ft)	Horiz. Dist. (ft)	Velocity (fps)	Time (hrs)
#15	1	5. Nearly bare and untilled, and alluvial valley fans	1.51	43.00	2,851.08	1.220	0.649
		8. Large gullies, diversions, and low flowing streams	2.54	42.00	1,652.04	4.780	0.096
		8. Large gullies, diversions, and low flowing streams	1.03	42.00	4,065.04	3.040	0.371
#15	**1**	**Time of Concentration:**					**1.116**
#16	1	5. Nearly bare and untilled, and alluvial valley fans	1.26	96.00	7,647.57	1.120	1.896
		8. Large gullies, diversions, and low flowing streams	0.18	6.00	3,264.41	1.280	0.708
#16	**1**	**Time of Concentration:**					**2.604**
#17	1	5. Nearly bare and untilled, and alluvial valley fans	2.23	127.00	5,692.00	1.490	1.061
		8. Large gullies, diversions, and low flowing streams	1.94	50.00	2,574.00	4.180	0.171
#17	**1**	**Time of Concentration:**					**1.232**
#17	2	5. Nearly bare and untilled, and alluvial valley fans	4.36	149.00	3,419.07	2.080	0.456
#17	**2**	**Time of Concentration:**					**0.456**
#18	1	5. Nearly bare and untilled, and alluvial valley fans	3.11	25.00	804.01	1.760	0.126
		8. Large gullies, diversions, and low flowing streams	1.41	45.00	3,196.02	3.550	0.250
#18	**1**	**Time of Concentration:**					**0.376**
#19	1	5. Nearly bare and untilled, and alluvial valley fans	4.92	45.00	914.00	2.210	0.114
		8. Large gullies, diversions, and low flowing streams	2.64	185.00	7,019.00	4.870	0.400
		5. Nearly bare and untilled, and alluvial valley fans	1.12	21.00	1,872.15	1.050	0.495
#19	**1**	**Time of Concentration:**					**1.009**
#21	1	5. Nearly bare and untilled, and alluvial valley fans	8.40	63.00	750.00	2.890	0.072
		8. Large gullies, diversions, and low flowing streams	4.57	140.00	3,064.06	6.410	0.132
#21	**1**	**Time of Concentration:**					**0.204**
#22	1	5. Nearly bare and untilled, and alluvial valley fans	4.15	54.00	1,300.01	2.030	0.177
		8. Large gullies, diversions, and low flowing streams	3.22	155.00	4,807.09	5.380	0.248
#22	**1**	**Time of Concentration:**					**0.425**
#23	1	5. Nearly bare and untilled, and alluvial valley fans	6.91	43.00	622.00	2.620	0.065
		8. Large gullies, diversions, and low flowing streams	2.65	147.00	5,545.07	4.880	0.315
#23	**1**	**Time of Concentration:**					**0.380**
#24	1	5. Nearly bare and untilled, and alluvial valley fans	5.30	55.00	1,038.01	2.300	0.125

Stru #	SWS #	Land Flow Condition	Slope (%)	Vert. Dist. (ft)	Horiz. Dist. (ft)	Velocity (fps)	Time (hrs)
		8. Large gullies, diversions, and low flowing streams	3.06	191.00	6,252.04	5.240	0.331
#24	**1**	**Time of Concentration:**					**0.456**
#24	2	5. Nearly bare and untilled, and alluvial valley fans	4.80	62.00	1,291.02	2.190	0.163
		8. Large gullies, diversions, and low flowing streams	5.86	130.00	2,217.03	7.260	0.084
#24	**2**	**Time of Concentration:**					**0.247**
#24	3	5. Nearly bare and untilled, and alluvial valley fans	9.91	145.00	1,463.00	3.140	0.129
		8. Large gullies, diversions, and low flowing streams	4.59	101.00	2,199.09	6.420	0.095
#24	**3**	**Time of Concentration:**					**0.224**
#25	1	5. Nearly bare and untilled, and alluvial valley fans	3.33	55.00	1,653.04	1.820	0.252
		8. Large gullies, diversions, and low flowing streams	2.90	256.00	8,816.03	5.110	0.479
#25	**1**	**Time of Concentration:**					**0.731**
#26	1	5. Nearly bare and untilled, and alluvial valley fans	9.72	75.00	772.00	3.110	0.068
		8. Large gullies, diversions, and low flowing streams	3.54	175.00	4,938.06	5.640	0.243
#26	**1**	**Time of Concentration:**					**0.311**
#27	1	5. Nearly bare and untilled, and alluvial valley fans	3.85	40.00	1,038.00	1.960	0.147
		8. Large gullies, diversions, and low flowing streams	0.84	117.00	13,940.18	2.740	1.413
#27	**1**	**Time of Concentration:**					**1.560**
#28	1	5. Nearly bare and untilled, and alluvial valley fans	7.19	120.00	1,669.00	2.680	0.172
		8. Large gullies, diversions, and low flowing streams	1.41	69.00	4,904.39	3.550	0.383
#28	**1**	**Time of Concentration:**					**0.555**
#29	1	8. Large gullies, diversions, and low flowing streams	3.73	105.00	2,814.03	5.790	0.135
		5. Nearly bare and untilled, and alluvial valley fans	2.15	5.00	233.00	1.460	0.044
#29	**1**	**Time of Concentration:**					**0.179**
#30	1	5. Nearly bare and untilled, and alluvial valley fans	16.59	38.00	229.00	4.070	0.015
		8. Large gullies, diversions, and low flowing streams	1.79	69.00	3,856.04	4.010	0.267
#30	**1**	**Time of Concentration:**					**0.282**
#31	1	5. Nearly bare and untilled, and alluvial valley fans	2.13	26.00	1,218.02	1.460	0.231
		9. Small streams flowing bankfull	0.97	35.00	3,606.01	8.860	0.113
#31	**1**	**Time of Concentration:**					**0.344**
#32	1	5. Nearly bare and untilled, and alluvial valley fans	2.41	27.00	1,118.00	1.550	0.200

Stru #	SWS #	Land Flow Condition	Slope (%)	Vert. Dist. (ft)	Horiz. Dist. (ft)	Velocity (fps)	Time (hrs)
		8. Large gullies, diversions, and low flowing streams	2.98	88.00	2,957.00	5.170	0.158
		5. Nearly bare and untilled, and alluvial valley fans	1.83	28.00	1,528.00	1.350	0.314
#32	**1**	**Time of Concentration:**					**0.672**
#32	2	5. Nearly bare and untilled, and alluvial valley fans	2.41	31.00	1,284.00	1.550	0.230
		8. Large gullies, diversions, and low flowing streams	0.71	17.00	2,394.02	2.520	0.263
#32	**2**	**Time of Concentration:**					**0.493**
#34	1	5. Nearly bare and untilled, and alluvial valley fans	1.50	164.00	10,964.76	1.220	2.496
#34	**1**	**Time of Concentration:**					**2.496**
#35	1	8. Large gullies, diversions, and low flowing streams	3.24	144.00	4,442.11	5.400	0.228
		5. Nearly bare and untilled, and alluvial valley fans	8.78	26.00	296.00	2.960	0.027
#35	**1**	**Time of Concentration:**					**0.255**
#36	1	5. Nearly bare and untilled, and alluvial valley fans	6.55	15.00	229.00	2.550	0.024
		8. Large gullies, diversions, and low flowing streams	8.56	66.00	771.00	8.770	0.024
#36	**1**	**Time of Concentration:**					**0.048**
#37	1	5. Nearly bare and untilled, and alluvial valley fans	1.16	240.00	20,629.19	1.070	5.355
#37	**1**	**Time of Concentration:**					**5.355**
#40	1	5. Nearly bare and untilled, and alluvial valley fans	2.78	20.00	720.00	1.660	0.120
		8. Large gullies, diversions, and low flowing streams	0.62	57.00	9,200.00	2.360	1.082
#40	**1**	**Time of Concentration:**					**1.202**
#42	1	5. Nearly bare and untilled, and alluvial valley fans	3.45	93.00	2,694.01	1.850	0.404
		8. Large gullies, diversions, and low flowing streams	2.37	100.00	4,211.05	4.620	0.253
		5. Nearly bare and untilled, and alluvial valley fans	1.17	103.00	8,811.70	1.080	2.266
#42	**1**	**Time of Concentration:**					**2.923**
#42	2	5. Nearly bare and untilled, and alluvial valley fans	0.62	63.00	10,166.21	0.780	3.620
#42	**2**	**Time of Concentration:**					**3.620**
#42	3	5. Nearly bare and untilled, and alluvial valley fans	1.24	60.00	4,853.19	1.110	1.214
#42	**3**	**Time of Concentration:**					**1.214**
#43	1	5. Nearly bare and untilled, and alluvial valley fans	1.12	93.00	8,290.98	1.050	2.193
		8. Large gullies, diversions, and low flowing streams	3.42	185.00	5,404.14	5.550	0.270
#43	**1**	**Time of Concentration:**					**2.463**

Subwatershed Muskingum Routing Details:

Stru #	SWS #	Land Flow Condition	Slope (%)	Vert. Dist. (ft)	Horiz. Dist. (ft)	Velocity (fps)	Time (hrs)
#4	1	8. Large gullies, diversions, and low flowing streams	1.61	93.00	5,787.18	3.800	0.423
#4	**1**	**Muskingum K:**					**0.423**
#4	2	8. Large gullies, diversions, and low flowing streams	1.61	93.00	5,787.18	3.800	0.423
#4	**2**	**Muskingum K:**					**0.423**
#4	3	8. Large gullies, diversions, and low flowing streams	1.61	93.00	5,787.00	3.800	0.423
#4	**3**	**Muskingum K:**					**0.423**
#6	1	8. Large gullies, diversions, and low flowing streams	1.16	84.00	7,218.35	3.230	0.620
#6	**1**	**Muskingum K:**					**0.620**
#6	2	8. Large gullies, diversions, and low flowing streams	0.77	35.00	4,531.33	2.630	0.478
#6	**2**	**Muskingum K:**					**0.478**
#6	4	8. Large gullies, diversions, and low flowing streams	0.77	35.00	4,531.33	2.630	0.478
#6	**4**	**Muskingum K:**					**0.478**
#14	1	5. Nearly bare and untilled, and alluvial valley fans	0.99	153.00	15,503.09	0.990	4.349
		8. Large gullies, diversions, and low flowing streams	1.65	125.00	7,564.29	3.850	0.545
		5. Nearly bare and untilled, and alluvial valley fans	1.08	23.00	2,124.12	1.040	0.567
#14	**1**	**Muskingum K:**					**5.461**
#14	2	8. Large gullies, diversions, and low flowing streams	1.65	125.00	7,564.29	3.850	0.545
		5. Nearly bare and untilled, and alluvial valley fans	1.46	11.00	755.02	1.200	0.174
		5. Nearly bare and untilled, and alluvial valley fans	1.08	23.00	2,124.12	1.040	0.567
#14	**2**	**Muskingum K:**					**1.286**
#14	4	5. Nearly bare and untilled, and alluvial valley fans	2.19	43.00	1,966.00	1.470	0.371
		8. Large gullies, diversions, and low flowing streams	1.60	105.00	6,562.00	3.790	0.480
		5. Nearly bare and untilled, and alluvial valley fans	1.08	23.00	2,124.00	1.040	0.567
#14	**4**	**Muskingum K:**					**1.418**
#17	1	5. Nearly bare and untilled, and alluvial valley fans	1.80	62.00	3,443.10	1.340	0.713
#17	**1**	**Muskingum K:**					**0.713**
#24	2	8. Large gullies, diversions, and low flowing streams	0.86	41.00	4,786.36	2.770	0.479
#24	**2**	**Muskingum K:**					**0.479**
#24	3	8. Large gullies, diversions, and low flowing streams	2.63	11.00	419.01	4.860	0.023

Stru #	SWS #	Land Flow Condition	Slope (%)	Vert. Dist. (ft)	Horiz. Dist. (ft)	Velocity (fps)	Time (hrs)
#24	**3**	**Muskingum K:**					**0.023**
#32	1	8. Large gullies, diversions, and low flowing streams	1.18	15.00	1,268.00	3.260	0.108
#32	**1**	**Muskingum K:**					**0.108**
#42	1	5. Nearly bare and untilled, and alluvial valley fans	0.48	37.00	7,646.20	0.690	3.078
#42	**1**	**Muskingum K:**					**3.078**

CIVIL SOFTWARE DESIGN

SEDCAD+ Version 3

AS BUILT DESIGN SPECIFICATIONS FOR CP-6

by

Name: Brian Sambirsky

Company Name: BHP MINERALS
File Name: C:\BRIAN\06

Date: 12-05-1995

Civil Software Design -- SEDCAD+ Version 3.1
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Company Name: BHP MINERALS
Filename: C:\BRIAN\06
User: Brian Sambirsky
Date: 12-05-1995 Time: 10:06:33
As built design specifications for CP-6
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	195.10	89	M	0.754	0.000	0.000	0.0	7.87	68.54
			Type: Null			Label: CP-6				
111 Structure		195.10							7.87	
111 Total IN/OUT		195.10							7.87	68.54

Civil Software Design -- SEDCAD+ Version 3.1
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Company Name: BHP MINERALS
Filename: C:\BRIAN\06
User: Brian Sambirsky
Date: 12-05-1995 Time: 10:06:33
As built design specifications for CP-6
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)	X
1	1	1	1	-a	5	4800.00	3.13	1.77	0.75	0.754		

SEDCAD+ CULVERT SIZING UTILITY

CP-6

Design Discharge	=	68.540 cfs
Entrance Loss Coefficient	=	0.5
Pipe Length	=	218.000 feet
Pipe Slope	=	2.100 %
Manning's n	=	0.024
Maximum Headwater	=	36.000 feet
Tailwater Depth	=	0.000 feet

Smallest Diameter Required to Pass Flow is 30 inches

PERFORMANCE CURVES:

Diameter: 21 inches

Headwater (ft)	Discharge (cfs)	Control	Flow Type
3.60	14.07	Outlet	6
7.20	17.47	Outlet	6
10.80	20.30	Outlet	6
14.40	22.80	Outlet	6
18.00	25.04	Outlet	6
21.60	27.09	Outlet	6
25.20	29.01	Outlet	6
28.80	30.79	Outlet	6
32.40	32.48	Outlet	6
36.00	34.08	Outlet	6
39.60	35.62	Outlet	6
43.20	37.10	Outlet	6
46.80	38.51	Outlet	6
50.40	39.87	Outlet	6
54.00	41.20	Outlet	6

Diameter: 24 inches

Headwater (ft)	Discharge (cfs)	Control	Flow Type
3.60	19.57	Outlet	6
7.20	24.42	Outlet	6
10.80	28.45	Outlet	6
14.40	31.98	Outlet	6
18.00	35.16	Outlet	6
21.60	38.07	Outlet	6
25.20	40.78	Outlet	6
28.80	43.31	Outlet	6
32.40	45.70	Outlet	6
36.00	47.98	Outlet	6
39.60	50.12	Outlet	6
43.20	52.19	Outlet	6
46.80	54.24	Outlet	6
50.40	56.12	Outlet	6
54.00	58.01	Outlet	6

Diameter: 30 inches

Headwater (ft)	Discharge (cfs)	Control	Flow Type
3.60	32.76	Inlet	5
7.20	42.33	Outlet	6
10.80	49.59	Outlet	6
14.40	55.89	Outlet	6
18.00	61.58	Outlet	6
21.60	66.79	Outlet	6
25.20	71.62	Outlet	6
28.80	76.15	Outlet	6
32.40	80.42	Outlet	6
36.00	84.49	Outlet	6
39.60	88.36	Outlet	6
43.20	92.05	Outlet	6
46.80	95.61	Outlet	6
50.40	99.07	Outlet	6
54.00	102.37	Outlet	6

Diameter: 36 inches

Headwater (ft)	Discharge (cfs)	Control	Flow Type
3.60	42.32	Inlet (Supercritical)	4
7.20	65.67	Outlet	6
10.80	77.44	Outlet	6
14.40	87.65	Outlet	6
18.00	96.78	Outlet	6
21.60	105.13	Outlet	6
25.20	112.86	Outlet	6
28.80	120.09	Outlet	6
32.40	126.90	Outlet	6
36.00	133.39	Outlet	6
39.60	139.56	Outlet	6
43.20	145.46	Outlet	6
46.80	151.14	Outlet	6
50.40	156.61	Outlet	6
54.00	161.90	Outlet	6

Diameter: 42 inches

Headwater (ft)	Discharge (cfs)	Control	Flow Type
3.60	50.07	Inlet (Supercritical)	3
7.20	94.48	Outlet	6
10.80	112.13	Outlet	6
14.40	127.38	Outlet	6
18.00	140.98	Outlet	6
21.60	153.39	Outlet	6
25.20	164.86	Outlet	6
28.80	175.58	Outlet	6
32.40	185.69	Outlet	6
36.00	195.27	Outlet	6

39.60	204.42	Outlet	6
43.20	213.16	Outlet	6
46.80	221.55	Outlet	6
50.40	229.65	Outlet	6
54.00	237.46	Outlet	6

Diameter: 45 inches

Headwater (ft)	Discharge (cfs)	Control	Flow Type
3.60	53.64	Inlet (Supercritical)	3
7.20	110.81	Outlet	6
10.80	132.01	Outlet	6
14.40	150.26	Outlet	6
18.00	166.50	Outlet	6
21.60	181.31	Outlet	6
25.20	194.99	Outlet	6
28.80	207.78	Outlet	6
32.40	219.82	Outlet	6
36.00	231.23	Outlet	6
39.60	242.10	Outlet	6
43.20	252.51	Outlet	6
46.80	262.51	Outlet	6
50.40	272.14	Outlet	6
54.00	281.44	Outlet	6

CIVIL SOFTWARE DESIGN

SEDCAD+ Version 3

AS BUILT DESIGN SPECIFICATIONS FOR CP-7

by

Name: Brian Sambirsky

Company Name: BHP MINERALS
File Name: C:\BRIAN\07

Date: 12-05-1995

Civil Software Design -- SEDCAD+ Version 3.1
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Company Name: BHP MINERALS
Filename: C:\BRIAN\07 User: Brian Sambirsky
Date: 12-06-1995 Time: 09:38:26
As built design specifications for CP-7
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	87.80	89	M	0.548	0.000	0.000	0.0	3.54	38.10
			Type: Null			Label: CP-7				
111	Structure	87.80							3.54	
111	Total IN/OUT	87.80							3.54	38.10

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Company Name: BHP MINERALS
Filename: C:\BRIAN\07
User: Brian Sambirsky
Date: 12-05-1995 Time: 10:04:36
As built design specifications for CP-7
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	3500.00	3.14	1.77	0.55	0.548		

SEDCAD+ CULVERT SIZING UTILITY

CP-7

Design Discharge	=	38.100 cfs
Entrance Loss Coefficient	=	0.2
Pipe Length	=	158.000 feet
Pipe Slope	=	1.100 %
Manning's n	=	0.020
Maximum Headwater	=	12.200 feet
Tailwater Depth	=	0.000 feet

Smallest Diameter Required to Pass Flow is 30 inches

PERFORMANCE CURVES:

Diameter: 21 inches

Headwater (ft)	Discharge (cfs)	Control	Flow Type
1.22	5.79	Outlet (Subcritical)	1
2.44	12.41	Inlet	5
3.66	15.00	Outlet	6
4.88	17.15	Outlet	6
6.10	19.09	Outlet	6
7.32	20.84	Outlet	6
8.54	22.47	Outlet	6
9.76	24.00	Outlet	6
10.98	25.40	Outlet	6
12.20	26.74	Outlet	6
13.42	28.04	Outlet	6
14.64	29.25	Outlet	6
15.86	30.43	Outlet	6
17.08	31.56	Outlet	6
18.30	32.65	Outlet	6

Diameter: 24 inches

Headwater (ft)	Discharge (cfs)	Control	Flow Type
1.22	5.65	Inlet (Supercritical)	3
2.44	15.85	Inlet (Supercritical)	4
3.66	20.44	Outlet	6
4.88	23.58	Outlet	6
6.10	26.34	Outlet	6
7.32	28.84	Outlet	6
8.54	31.14	Outlet	6
9.76	33.28	Outlet	6
10.98	35.30	Outlet	6
12.20	37.20	Outlet	6
13.42	39.01	Outlet	6
14.64	40.74	Outlet	6
15.86	42.41	Outlet	6
17.08	44.01	Outlet	6
18.30	45.55	Outlet	6

Diameter: 30 inches

Headwater (ft)	Discharge (cfs)	Control	Flow Type
1.22	7.05	Inlet (Supercritical)	3
2.44	22.39	Outlet (Subcritical)	1 *
3.66	33.30	Inlet	5
4.88	39.44	Outlet	6
6.10	44.47	Outlet	6
7.32	48.99	Outlet	6
8.54	53.13	Outlet	6
9.76	56.97	Outlet	6
10.98	60.56	Outlet	6
12.20	63.96	Outlet	6
13.42	67.18	Outlet	6
14.64	70.26	Outlet	6
15.86	73.20	Outlet	6
17.08	76.03	Outlet	6
18.30	78.76	Outlet	6

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

Diameter: 36 inches

Headwater (ft)	Discharge (cfs)	Control	Flow Type
1.22	8.47	Inlet (Supercritical)	3
2.44	23.94	Inlet (Supercritical)	3
3.66	43.72	Inlet (Supercritical)	4
4.88	58.00	Inlet	5
6.10	67.15	Outlet	6
7.32	74.50	Outlet	6
8.54	81.18	Outlet	6
9.76	87.35	Outlet	6
10.98	93.12	Outlet	6
12.20	98.55	Outlet	6
13.42	103.69	Outlet	6
14.64	108.59	Outlet	6
15.86	113.28	Outlet	6
17.08	117.79	Outlet	6
18.30	122.12	Outlet	6

Diameter: 42 inches

Headwater (ft)	Discharge (cfs)	Control	Flow Type
1.22	9.88	Inlet (Supercritical)	3
2.44	27.93	Inlet (Supercritical)	3
3.66	51.32	Inlet (Supercritical)	3
4.88	73.53	Inlet	5
6.10	90.57	Inlet	5
7.32	104.77	Inlet	5
8.54	114.94	Outlet	6
9.76	124.17	Outlet	6
10.98	132.76	Outlet	6

12.20	140.83	Outlet	6
13.42	148.44	Outlet	6
14.64	155.71	Outlet	6
15.86	162.63	Outlet	6
17.08	169.28	Outlet	6
18.30	175.69	Outlet	6

Diameter: 45 inches

Headwater (ft)	Discharge (cfs)	Control	Flow Type
1.22	10.58	Inlet (Supercritical)	3
2.44	29.93	Inlet (Supercritical)	3
3.66	54.98	Inlet (Supercritical)	3
4.88	81.13	Inlet	5
6.10	101.32	Inlet	5
7.32	118.11	Inlet	5
8.54	132.80	Inlet	5
9.76	144.86	Outlet	6
10.98	155.12	Outlet	6
12.20	164.74	Outlet	6
13.42	173.84	Outlet	6
14.64	182.49	Outlet	6
15.86	190.75	Outlet	6
17.08	198.65	Outlet	6
18.30	206.27	Outlet	6

CIVIL SOFTWARE DESIGN

SEDCAD+ Version 3

AS BUILT DESIGN SPECIFICATIONS FOR CP-8

by

Name: Brian Sambirsky

Company Name: BHP MINERALS
File Name: C:\BRIAN\08

Date: 12-05-1995

Civil Software Design -- SEDCAD+ Version 3.1
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Company Name: BHP MINERALS
Filename: C:\BRIAN\08 User: Brian Sambirsky
Date: 12-06-1995 Time: 09:38:28
As built design specifications for CP-8
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	48.50	89	M	0.336	0.000	0.000	0.0	1.96	27.74
			Type: Null			Label: CP-8				
111	Structure	48.50							1.96	
111	Total IN/OUT	48.50							1.96	27.74

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Company Name: BHP MINERALS
Filename: C:\BRIAN\08 User: Brian Sambirsky
Date: 12-05-1995 Time: 10:04:34
As built design specifications for CP-8
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	2175.00	3.22	1.79	0.34	0.336		

SEDCAD+ CULVERT SIZING UTILITY

CP-8

Design Discharge	=	27.740 cfs
Entrance Loss Coefficient	=	0.2
Pipe Length	=	80.000 feet
Pipe Slope	=	0.100 %
Manning's n	=	0.018
Maximum Headwater	=	10.700 feet
Tailwater Depth	=	0.000 feet

Smallest Diameter Required to Pass Flow is 21 inches

PERFORMANCE CURVES:

Diameter: 15 inches

Headwater (ft)	Discharge (cfs)	Control	Flow Type
1.07	2.41	Outlet (Subcritical)	1
2.14	4.95	Outlet	6
3.21	6.87	Outlet	6
4.28	8.35	Outlet	6
5.35	9.61	Outlet	6
6.42	10.73	Outlet	6
7.49	11.74	Outlet	6
8.56	12.67	Outlet	6
9.63	13.54	Outlet	6
10.70	14.35	Outlet	6
11.77	15.13	Outlet	6
12.84	15.86	Outlet	6
13.91	16.55	Outlet	6
14.98	17.23	Outlet	6
16.05	17.88	Outlet	6

Diameter: 18 inches

Headwater (ft)	Discharge (cfs)	Control	Flow Type
1.07	3.00	Outlet (Subcritical)	1
2.14	7.03	Outlet	6
3.21	10.26	Outlet	6
4.28	12.70	Outlet	6
5.35	14.74	Outlet	6
6.42	16.53	Outlet	6
7.49	18.14	Outlet	6
8.56	19.61	Outlet	6
9.63	20.98	Outlet	6
10.70	22.29	Outlet	6
11.77	23.51	Outlet	6
12.84	24.67	Outlet	6
13.91	25.78	Outlet	6
14.98	26.84	Outlet	6
16.05	27.87	Outlet	6

Diameter: 21 inches

Headwater (ft)	Discharge (cfs)	Control	Flow Type
1.07	3.73	Outlet (Subcritical)	1
2.14	9.02	Outlet	6
3.21	14.15	Outlet	6
4.28	17.86	Outlet	6
5.35	20.91	Outlet	6
6.42	23.59	Outlet	6
7.49	26.00	Outlet	6
8.56	28.19	Outlet	6
9.63	30.22	Outlet	6
10.70	32.13	Outlet	6
11.77	33.93	Outlet	6
12.84	35.63	Outlet	6
13.91	37.26	Outlet	6
14.98	38.82	Outlet	6
16.05	40.33	Outlet	6

Diameter: 24 inches

Headwater (ft)	Discharge (cfs)	Control	Flow Type
1.07	4.58	Outlet (Subcritical)	1
2.14	12.05	Outlet (Subcritical)	1
3.21	18.33	Outlet	6
4.28	23.72	Outlet	6
5.35	28.10	Outlet	6
6.42	31.88	Outlet	6
7.49	35.24	Outlet	6
8.56	38.33	Outlet	6
9.63	41.17	Outlet	6
10.70	43.84	Outlet	6
11.77	46.35	Outlet	6
12.84	48.73	Outlet	6
13.91	51.00	Outlet	6
14.98	53.18	Outlet	6
16.05	55.27	Outlet	6

Diameter: 30 inches

Headwater (ft)	Discharge (cfs)	Control	Flow Type
1.07	6.69	Outlet (Subcritical)	1
2.14	15.67	Outlet (Subcritical)	1
3.21	26.67	Outlet	6
4.28	36.95	Outlet	6
5.35	44.94	Outlet	6
6.42	51.71	Outlet	6
7.49	57.69	Outlet	6
8.56	63.10	Outlet	6
9.63	68.09	Outlet	6
10.70	72.73	Outlet	6

11.77	77.09	Inlet	5 *
12.84	81.14	Inlet	5
13.91	84.99	Inlet	5
14.98	88.66	Inlet	5
16.05	92.19	Inlet	5

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

Diameter: 36 inches

Headwater (ft)	Discharge (cfs)	Control	Flow Type
1.07	8.78	Outlet (Subcritical)	1
2.14	19.03	Outlet (Subcritical)	1
3.21	35.83	Outlet (Subcritical)	1
4.28	50.87	Outlet	6
5.35	62.81	Inlet	5 *
6.42	72.58	Inlet	5
7.49	81.19	Inlet	5
8.56	88.97	Inlet	5
9.63	96.12	Inlet	5
10.70	102.77	Inlet	5
11.77	109.02	Inlet	5
12.84	114.93	Inlet	5
13.91	120.55	Inlet	5
14.98	125.92	Inlet	5
16.05	131.07	Inlet	5

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

CIVIL SOFTWARE DESIGN

SEDCAD+ Version 3

AS BUILT DESIGN SPECIFICATIONS FOR CP-9

by

Name: Brian Sambirsky

Company Name: BHP MINERALS
File Name: C:\BRIAN\09

Date: 12-05-1995

Civil Software Design -- SEDCAD+ Version 3.1
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Company Name: BHP MINERALS
Filename: C:\BRIAN\09 User: Brian Sambirsky
Date: 12-06-1995 Time: 09:38:31
As built design specifications for CP-9
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	48.50	89	M	0.336	0.000	0.000	0.0	1.96	27.74
			Type: Null			Label: CP-9				
111	Structure	48.50							1.96	
111	Total IN/OUT	48.50							1.96	27.74

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Company Name: BHP MINERALS
Filename: C:\BRIAN\09 User: Brian Sambirsky
Date: 12-05-1995 Time: 10:04:32
As built design specifications for CP-9
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)	X
1	1	1	1	-a	5	2175.00	3.22	1.79	0.34	0.336		

SEDCAD+ CULVERT SIZING UTILITY

CP-9

Design Discharge	=	27.740 cfs
Entrance Loss Coefficient	=	0.2
Pipe Length	=	48.000 feet
Pipe Slope	=	4.300 %
Manning's n	=	0.018
Maximum Headwater	=	6.500 feet
Tailwater Depth	=	0.000 feet

Smallest Diameter Required to Pass Flow is 24 inches

PERFORMANCE CURVES:

Diameter: 18 inches

Headwater (ft)	Discharge (cfs)	Control	Flow Type
0.65	1.67	Inlet (Supercritical)	3
1.30	4.66	Inlet (Supercritical)	3
1.95	8.19	Inlet	5
2.60	10.83	Inlet	5
3.25	12.95	Inlet	5
3.90	14.76	Inlet	5
4.55	16.37	Inlet	5
5.20	17.84	Inlet	5
5.85	19.20	Inlet	5
6.50	20.46	Inlet	5
7.15	21.66	Inlet	5
7.80	22.79	Inlet	5
8.45	23.87	Inlet	5
9.10	24.90	Inlet	5
9.75	25.89	Inlet	5

Diameter: 21 inches

Headwater (ft)	Discharge (cfs)	Control	Flow Type
0.65	1.93	Inlet (Supercritical)	3
1.30	5.44	Inlet (Supercritical)	3
1.95	9.98	Inlet (Supercritical)	3
2.60	13.85	Inlet	5
3.25	16.88	Inlet	5
3.90	19.44	Inlet	5
4.55	21.70	Inlet	5
5.20	23.75	Inlet	5
5.85	25.63	Inlet	5
6.50	27.39	Inlet	5
7.15	29.04	Inlet	5
7.80	30.59	Inlet	5
8.45	32.09	Inlet	5
9.10	33.50	Inlet	5
9.75	34.86	Inlet	5

Diameter: 24 inches

Headwater (ft)	Discharge (cfs)	Control	Flow Type
0.65	2.21	Inlet (Supercritical)	3
1.30	6.21	Inlet (Supercritical)	3
1.95	11.41	Inlet (Supercritical)	3
2.60	16.83	Inlet	5
3.25	21.03	Inlet	5
3.90	24.51	Inlet	5
4.55	27.56	Inlet	5
5.20	30.30	Inlet	5
5.85	32.81	Inlet	5
6.50	35.15	Inlet	5
7.15	37.34	Inlet	5
7.80	39.41	Inlet	5
8.45	41.37	Inlet	5
9.10	43.25	Inlet	5
9.75	45.05	Inlet	5

Diameter: 30 inches

Headwater (ft)	Discharge (cfs)	Control	Flow Type
0.65	2.76	Inlet (Supercritical)	3
1.30	7.76	Inlet (Supercritical)	3
1.95	14.26	Inlet (Supercritical)	3
2.60	21.95	Inlet (Supercritical)	3
3.25	29.41	Inlet	5
3.90	35.38	Inlet	5
4.55	40.49	Inlet	5
5.20	45.02	Inlet	5
5.85	49.14	Inlet	5
6.50	52.94	Inlet	5
7.15	56.48	Inlet	5
7.80	59.82	Inlet	5
8.45	62.97	Inlet	5
9.10	65.99	Inlet	5
9.75	68.86	Inlet	5

Diameter: 36 inches

Headwater (ft)	Discharge (cfs)	Control	Flow Type
0.65	3.30	Inlet (Supercritical)	3
1.30	9.31	Inlet (Supercritical)	3
1.95	17.11	Inlet (Supercritical)	3
2.60	26.34	Inlet (Supercritical)	3
3.25	36.81	Inlet (Supercritical)	3
3.90	46.39	Inlet	5
4.55	54.37	Inlet	5
5.20	61.31	Inlet	5
5.85	67.55	Inlet	5
6.50	73.26	Inlet	5

7.15	78.56	Inlet	5
7.80	83.52	Inlet	5
8.45	88.20	Inlet	5
9.10	92.65	Inlet	5
9.75	96.89	Inlet	5

Diameter: 42 inches

Headwater (ft)	Discharge (cfs)	Control	Flow Type
0.65	3.85	Inlet (Supercritical)	3
1.30	10.86	Inlet (Supercritical)	3
1.95	19.96	Inlet (Supercritical)	3
2.60	30.73	Inlet (Supercritical)	3
3.25	42.94	Inlet (Supercritical)	3
3.90	56.44	Inlet (Supercritical)	3
4.55	68.20	Inlet	5
5.20	78.36	Inlet	5
5.85	87.35	Inlet	5
6.50	95.50	Inlet	5
7.15	103.00	Inlet	5
7.80	110.00	Inlet	5
8.45	116.57	Inlet	5
9.10	122.79	Inlet	5
9.75	128.71	Inlet	5

CIVIL SOFTWARE DESIGN

SEDCAD+ Version 3

AS BUILT DESIGN SPECIFICATIONS FOR CP-10

by

Name: Brian Sambirsky

Company Name: BHP MINERALS
File Name: C:\BRIAN\10

Date: 12-05-1995

Civil Software Design -- SEDCAD+ Version 3.1
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Company Name: BHP MINERALS
Filename: C:\BRIAN\10 User: Brian Sambirsky
Date: 12-05-1995 Time: 10:04:37
As built design specifications for CP-10
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	24.70	89	M	0.129	0.000	0.000	0.0	1.00	19.15
			Type: Null			Label: CP-10				
111	Structure	24.70							1.00	
111	Total IN/OUT	24.70							1.00	19.15

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Company Name: BHP MINERALS
Filename: C:\BRIAN\10 User: Brian Sambirsky
Date: 12-05-1995 Time: 10:04:37
As built design specifications for CP-10
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 Condition	Flow	Distance (ft)	Slope (%)	Velocity (fps)	Segment Time (hr)	Time Conc. (hr)	Muskingum K (hr)	X
1	1	1	1	-a	5		1150.00	6.09	2.47	0.13	0.129		

SEDCAD+ CULVERT SIZING UTILITY

CP-10

Design Discharge	=	19.150 cfs
Entrance Loss Coefficient	=	0.5
Pipe Length	=	119.000 feet
Pipe Slope	=	4.000 %
Manning's n	=	0.016
Maximum Headwater	=	8.200 feet
Tailwater Depth	=	0.000 feet

Smallest Diameter Required to Pass Flow is 18 inches

PERFORMANCE CURVES:

Diameter: 12 inches

Headwater (ft)	Discharge (cfs)	Control	Flow Type
0.82	1.58	Inlet (Supercritical)	3
1.64	3.72	Inlet	5
2.46	5.14	Inlet	5
3.28	6.11	Inlet	5
4.10	6.56	Outlet	6
4.92	7.01	Outlet	6
5.74	7.31	Outlet	6
6.56	7.61	Outlet	6
7.38	7.92	Outlet	6
8.20	8.20	Outlet	6
9.02	8.46	Outlet	6
9.84	8.73	Outlet	6
10.66	9.00	Outlet	6
11.48	9.24	Outlet	6
12.30	9.48	Outlet	6

Diameter: 15 inches

Headwater (ft)	Discharge (cfs)	Control	Flow Type
0.82	1.95	Inlet (Supercritical)	3
1.64	5.24	Inlet	5
2.46	7.61	Inlet	5
3.28	9.41	Inlet	5
4.10	10.92	Inlet	5
4.92	12.11	Inlet	5
5.74	12.67	Outlet	6
6.56	13.21	Outlet	6
7.38	13.73	Outlet	6
8.20	14.23	Outlet	6
9.02	14.71	Outlet	6
9.84	15.18	Outlet	6
10.66	15.63	Outlet	6
11.48	16.08	Outlet	6
12.30	16.50	Outlet	6

Diameter: 18 inches

Headwater (ft)	Discharge (cfs)	Control	Flow Type
0.82	2.35	Inlet (Supercritical)	3
1.64	6.60	Inlet (Supercritical)	3
2.46	10.32	Inlet	5
3.28	13.04	Inlet	5
4.10	15.27	Inlet	5
4.92	17.22	Inlet	5
5.74	18.98	Inlet	5
6.56	20.40	Inlet	5
7.38	21.36	Outlet	6
8.20	22.15	Outlet	6
9.02	22.92	Outlet	6
9.84	23.65	Outlet	6
10.66	24.36	Outlet	6
11.48	25.05	Outlet	6
12.30	25.74	Outlet	6

Diameter: 21 inches

Headwater (ft)	Discharge (cfs)	Control	Flow Type
0.82	2.73	Inlet (Supercritical)	3
1.64	7.70	Inlet (Supercritical)	3
2.46	13.11	Inlet	5
3.28	17.01	Inlet	5
4.10	20.16	Inlet	5
4.92	22.89	Inlet	5
5.74	25.31	Inlet	5
6.56	27.54	Inlet	5
7.38	29.59	Inlet	5
8.20	31.52	Inlet	5
9.02	32.95	Inlet	5
9.84	34.19	Outlet	6
10.66	35.24	Outlet	6
11.48	36.27	Outlet	6
12.30	37.26	Outlet	6

Diameter: 24 inches

Headwater (ft)	Discharge (cfs)	Control	Flow Type
0.82	3.11	Inlet (Supercritical)	3
1.64	8.80	Inlet (Supercritical)	3
2.46	15.81	Inlet	5
3.28	21.20	Inlet	5
4.10	25.48	Inlet	5
4.92	29.14	Inlet	5
5.74	32.40	Inlet	5
6.56	35.36	Inlet	5
7.38	38.09	Inlet	5
8.20	40.63	Inlet	5

9.02	43.02	Inlet	5
9.84	45.29	Inlet	5
10.66	47.45	Inlet	5
11.48	49.52	Inlet	5
12.30	51.06	Outlet	6

Diameter: 30 inches

Headwater (ft)	Discharge (cfs)	Control	Flow Type
0.82	3.89	Inlet (Supercritical)	3
1.64	10.99	Inlet (Supercritical)	3
2.46	20.20	Inlet (Supercritical)	3
3.28	29.70	Inlet	5
4.10	37.03	Inlet	5
4.92	43.13	Inlet	5
5.74	48.47	Inlet	5
6.56	53.28	Inlet	5
7.38	57.69	Inlet	5
8.20	61.78	Inlet	5
9.02	65.62	Inlet	5
9.84	69.25	Inlet	5
10.66	72.69	Inlet	5
11.48	75.99	Inlet	5
12.30	79.13	Inlet	5

CIVIL SOFTWARE DESIGN

SEDCAD+ Version 3

AS BUILT DESIGN SPECIFICATIONS FOR CP-11

by

Name: Brian Sambirsky

Company Name: BHP MINERALS
File Name: C:\BRIAN\11

Date: 12-05-1995

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Company Name: BHP MINERALS
Filename: C:\BRIAN\11
User: Brian Sambirsky
Date: 12-05-1995 Time: 10:04:39
As built design specifications for CP-11
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	12.20	89	M	0.034	0.000	0.000	0.0	0.49	13.15
			Type: Null			Label: CP-11				
111	Structure	12.20							0.49	
111	Total IN/OUT	12.20							0.49	13.15

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Company Name: BHP MINERALS
Filename: C:\BRIAN\11
User: Brian Sambirsky
Date: 12-05-1995 Time: 10:04:39
As built design specifications for CP-11
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)	X
1	1	1	1	-a	5	500.00	16.00	4.00	0.03	0.034		

SEDCAD+ CULVERT SIZING UTILITY

CP-11

Design Discharge	=	13.150 cfs
Entrance Loss Coefficient	=	0.5
Pipe Length	=	107.000 feet
Pipe Slope	=	0.600 %
Manning's n	=	0.016
Maximum Headwater	=	8.600 feet
Tailwater Depth	=	0.000 feet

Smallest Diameter Required to Pass Flow is 18 inches

PERFORMANCE CURVES:

Diameter: 12 inches

Headwater (ft)	Discharge (cfs)	Control	Flow Type
0.86	1.78	Outlet (Subcritical)	1
1.72	3.02	Outlet	6
2.58	3.76	Outlet	6
3.44	4.39	Outlet	6
4.30	4.97	Outlet	6
5.16	5.45	Outlet	6
6.02	5.92	Outlet	6
6.88	6.33	Outlet	6
7.74	6.73	Outlet	6
8.60	7.11	Outlet	6
9.46	7.46	Outlet	6
10.32	7.81	Outlet	6
11.18	8.14	Outlet	6
12.04	8.44	Outlet	6
12.90	8.75	Outlet	6

Diameter: 15 inches

Headwater (ft)	Discharge (cfs)	Control	Flow Type
0.86	2.23	Outlet (Subcritical)	1
1.72	4.87	Inlet	5
2.58	6.29	Outlet	6
3.44	7.44	Outlet	6
4.30	8.44	Outlet	6
5.16	9.33	Outlet	6
6.02	10.15	Outlet	6
6.88	10.90	Outlet	6
7.74	11.60	Outlet	6
8.60	12.26	Outlet	6
9.46	12.90	Outlet	6
10.32	13.49	Outlet	6
11.18	14.07	Outlet	6
12.04	14.62	Outlet	6
12.90	15.15	Outlet	6

Diameter: 18 inches

Headwater (ft)	Discharge (cfs)	Control	Flow Type
0.86	3.13	Outlet (Subcritical)	1
1.72	7.02	Outlet (Subcritical)	1
2.58	9.36	Outlet	6
3.44	11.25	Outlet	6
4.30	12.86	Outlet	6
5.16	14.29	Outlet	6
6.02	15.58	Outlet	6
6.88	16.79	Outlet	6
7.74	17.91	Outlet	6
8.60	18.96	Outlet	6
9.46	19.96	Outlet	6
10.32	20.91	Outlet	6
11.18	21.81	Outlet	6
12.04	22.68	Outlet	6
12.90	23.51	Outlet	6

Diameter: 21 inches

Headwater (ft)	Discharge (cfs)	Control	Flow Type
0.86	4.22	Outlet (Subcritical)	1
1.72	8.30	Outlet (Subcritical)	1
2.58	12.86	Outlet	6
3.44	15.72	Outlet	6
4.30	18.15	Outlet	6
5.16	20.28	Outlet	6
6.02	22.21	Outlet	6
6.88	23.97	Outlet	6
7.74	25.62	Outlet	6
8.60	27.19	Outlet	6
9.46	28.65	Outlet	6
10.32	30.04	Outlet	6
11.18	31.38	Outlet	6
12.04	32.66	Outlet	6
12.90	33.89	Outlet	6

Diameter: 24 inches

Headwater (ft)	Discharge (cfs)	Control	Flow Type
0.86	5.51	Outlet (Subcritical)	1
1.72	9.28	Outlet (Subcritical)	1
2.58	16.55	Outlet	6
3.44	20.75	Outlet	6
4.30	24.19	Outlet	6
5.16	27.23	Outlet	6
6.02	29.94	Outlet	6
6.88	32.43	Outlet	6
7.74	34.75	Outlet	6
8.60	36.93	Outlet	6

9.46	38.98	Outlet	6
10.32	40.92	Outlet	6
11.18	42.78	Outlet	6
12.04	44.56	Outlet	6
12.90	46.26	Outlet	6

Diameter: 30 inches

Headwater (ft)	Discharge (cfs)	Control	Flow Type
0.86	8.36	Outlet (Subcritical)	1
1.72	12.38	Outlet (Subcritical)	1
2.58	21.91	Outlet (Subcritical)	1
3.44	31.27	Inlet	5
4.30	38.18	Outlet	6
5.16	43.62	Outlet	6
6.02	48.46	Outlet	6
6.88	52.86	Outlet	6
7.74	56.92	Outlet	6
8.60	60.70	Outlet	6
9.46	64.26	Outlet	6
10.32	67.64	Outlet	6
11.18	70.86	Outlet	6
12.04	73.93	Outlet	6
12.90	76.89	Outlet	6

CIVIL SOFTWARE DESIGN

SEDCAD+ Version 3

CP-12 HYDROLOGY - BLOCK C AREA

by

Name: BH

Company Name: BHP MINERALS
File Name: C:\CP12\CP12

Date: 01-29-1999

Civil Software Design -- SEDCAD+ Version 3.1
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Cp12
Company Name: BHP MINERALS
Filename: C:\CP12\CP12 User: BH
Date: 01-29-1999 Time: 14:44:08
CP-12 HYDROLOGY - BLOCK C AREA
Storm: 1.30 inches, 10 year- 6 hour, Type II-60
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	26.50	89	M	0.177	0.000	0.000	0.0	1.07	18.52
			Type: Null		Label: CP-12					
111	Structure	26.50							1.07	
111	Total IN/OUT	26.50							1.07	18.52

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Company Name: BHP MINERALS
Filename: C:\CP12\CP12 User: BH
Date: 01-29-1999 Time: 14:44:08
CP-12 HYDROLOGY - BLOCK C AREA
Storm: 1.30 inches, 10 year- 6 hour, Type II-60
Hydrograph Convolution Interval: 0.1 hr

==========
DETAILED SUBWATERSHED INPUT/OUTPUT TABLE
==========

Seg. Land Flow Segment Time M

Cp12

uskingum

J	B	S	SWS X	#	Condition	Distance (ft)	Slope (%)	Velocity (fps)	Time (hr)	Conc. (hr)	K (hr)
1	1	1	1	-a	5	1600.00	6.25	2.50	0.18	0.177	

Cp12culv
SEDCAD+ CULVERT SIZING UTILITY

CP-12 BLOCK C AREA

Design Discharge	=	18.520 cfs
Entrance Loss Coefficient	=	0.5
Pipe Length	=	101.000 feet
Pipe Slope	=	2.200 %
Manning's n	=	0.016
Maximum Headwater	=	6.300 feet
Tailwater Depth	=	0.000 feet

Smallest Diameter Required to Pass Flow is 21 inches

PERFORMANCE CURVES:

Diameter: 15 inches

Headwater (ft)	Discharge (cfs)	Control	Flow Type
0.63	1.33	Inlet (Supercritical)	3
1.26	3.71	Inlet (Supercritical)	3
1.89	6.07	Inlet	5
2.52	7.76	Inlet	5
3.15	9.08	Inlet	5
3.78	9.72	Outlet	6
4.41	10.32	Outlet	6
5.04	10.90	Outlet	6
5.67	11.43	Outlet	6
6.30	11.96	Outlet	6
6.93	12.44	Outlet	6
7.56	12.93	Outlet	6
8.19	13.38	Outlet	6
8.82	13.83	Outlet	6
9.45	14.26	Outlet	6

Diameter: 18 inches

Headwater (ft)	Discharge (cfs)	Control	Flow Type
0.63	1.60	Inlet (Supercritical)	3

Cp12culv

1.26	4.45	Inlet (Supercritical)	3
1.89	7.91	Inlet	5
2.52	10.54	Inlet	5
3.15	12.64	Inlet	5
3.78	14.44	Inlet	5
4.41	15.80	Outlet	6
5.04	16.75	Outlet	6
5.67	17.60	Outlet	6
6.30	18.42	Outlet	6
6.93	19.21	Outlet	6
7.56	19.97	Outlet	6
8.19	20.69	Outlet	6
8.82	21.39	Outlet	6
9.45	22.07	Outlet	6

Diameter: 21 inches

Headwater (ft)	Discharge (cfs)	Control	Flow Type
0.63	1.85	Inlet (Supercritical)	3
1.26	5.19	Inlet (Supercritical)	3
1.89	9.53	Inlet (Supercritical)	3
2.52	13.42	Inlet	5
3.15	16.44	Inlet	5
3.78	19.00	Inlet	5
4.41	21.24	Inlet	5
5.04	23.26	Inlet	5
5.67	25.09	Inlet	5
6.30	26.35	Outlet	6
6.93	27.51	Outlet	6
7.56	28.62	Outlet	6
8.19	29.69	Outlet	6
8.82	30.72	Outlet	6
9.45	31.70	Outlet	6

Diameter: 24 inches

Headwater (ft)	Discharge (cfs)	Control	Flow Type
0.63	2.10	Inlet (Supercritical)	3

Cp12culv

1.26	5.92	Inlet (Supercritical)	3
1.89	10.88	Inlet (Supercritical)	3
2.52	16.24	Inlet	5
3.15	20.43	Inlet	5
3.78	23.91	Inlet	5
4.41	26.94	Inlet	5
5.04	29.65	Inlet	5
5.67	32.13	Inlet	5
6.30	34.45	Inlet	5
6.93	36.62	Inlet	5
7.56	38.66	Inlet	5
8.19	40.30	Outlet	6
8.82	41.77	Outlet	6
9.45	43.16	Outlet	6

Diameter: 30 inches

Headwater (ft)	Discharge (cfs)	Control	Flow Type
0.63	2.63	Inlet (Supercritical)	3
1.26	7.41	Inlet (Supercritical)	3
1.89	13.60	Inlet (Supercritical)	3
2.52	20.94	Inlet (Supercritical)	3
3.15	28.37	Inlet	5
3.78	34.35	Inlet	5
4.41	39.45	Inlet	5
5.04	43.95	Inlet	5
5.67	48.04	Inlet	5
6.30	51.80	Inlet	5
6.93	55.31	Inlet	5
7.56	58.61	Inlet	5
8.19	61.73	Inlet	5
8.82	64.71	Inlet	5
9.45	67.55	Inlet	5

Diameter: 36 inches

Headwater (ft)	Discharge (cfs)	Control	Flow Type
0.63	3.15	Inlet (Supercritical)	3

	Cp12culv		
1.26	8.89	Inlet (Supercritical)	3
1.89	16.32	Inlet (Supercritical)	3
2.52	25.13	Inlet (Supercritical)	3
3.15	35.12	Inlet (Supercritical)	3
3.78	44.76	Inlet	5
4.41	52.75	Inlet	5
5.04	59.68	Inlet	5
5.67	65.88	Inlet	5
6.30	71.55	Inlet	5
6.93	76.81	Inlet	5
7.56	81.72	Inlet	5
8.19	86.36	Inlet	5
8.82	90.76	Inlet	5
9.45	94.96	Inlet	5

CIVIL SOFTWARE DESIGN

SEDCAD+ Version 3

AS BUILT DESIGN SPECIFICATIONS FOR CP-13

by

Name: Brian Sambirsky

Company Name: BHP MINERALS
File Name: C:\BRIAN\13

Date: 12-05-1995

Civil Software Design -- SEDCAD+ Version 3.1
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Company Name: BHP MINERALS
Filename: C:\BRIAN\13 User: Brian Sambirsky
Date: 12-06-1995 Time: 09:38:36
As built design specifications for CP-13
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	79.30	89	M	0.485	0.000	0.000	0.0	3.20	37.13
		Type: Null			Label: CP-13					
111	Structure	79.30							3.20	
111	Total IN/OUT	79.30							3.20	37.13

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Company Name: BHP MINERALS
Filename: C:\BRIAN\13
User: Brian Sambirsky
Date: 12-05-1995 Time: 10:04:43
As built design specifications for CP-13
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)	X
1	1	1	1	-a	5	2900.00	2.76	1.66	0.49	0.485		

SEDCAD+ CULVERT SIZING UTILITY

CP-13

Design Discharge	=	37.130	cfs
Entrance Loss Coefficient	=	0.5	
Pipe Length	=	73.000	feet
Pipe Slope	=	3.500	%
Manning's n	=	0.018	
Maximum Headwater	=	13.400	feet
Tailwater Depth	=	0.000	feet

Smallest Diameter Required to Pass Flow is 21 inches

PERFORMANCE CURVES:

Diameter: 15 inches

Headwater (ft)	Discharge (cfs)	Control	Flow Type
1.34	4.05	Inlet (Supercritical)	3
2.68	8.14	Inlet	5
4.02	10.69	Outlet	6
5.36	12.05	Outlet	6
6.70	13.17	Outlet	6
8.04	14.20	Outlet	6
9.38	15.15	Outlet	6
10.72	16.08	Outlet	6
12.06	16.92	Outlet	6
13.40	17.75	Outlet	6
14.74	18.53	Outlet	6
16.08	19.27	Outlet	6
17.42	20.02	Outlet	6
18.76	20.69	Outlet	6
20.10	21.37	Outlet	6

Diameter: 18 inches

Headwater (ft)	Discharge (cfs)	Control	Flow Type
1.34	4.88	Inlet (Supercritical)	3
2.68	11.12	Inlet	5
4.02	15.04	Inlet	5
5.36	18.14	Inlet	5
6.70	20.24	Outlet	6
8.04	21.88	Outlet	6
9.38	23.39	Outlet	6
10.72	24.81	Outlet	6
12.06	26.18	Outlet	6
13.40	27.45	Outlet	6
14.74	28.68	Outlet	6
16.08	29.87	Outlet	6
17.42	30.99	Outlet	6
18.76	32.09	Outlet	6
20.10	33.13	Outlet	6

Diameter: 21 inches

Headwater (ft)	Discharge (cfs)	Control	Flow Type
1.34	5.69	Inlet (Supercritical)	3
2.68	14.25	Inlet	5
4.02	19.88	Inlet	5
5.36	24.22	Inlet	5
6.70	27.91	Inlet	5
8.04	31.09	Outlet	6
9.38	33.51	Outlet	6
10.72	35.59	Outlet	6
12.06	37.56	Outlet	6
13.40	39.43	Outlet	6
14.74	41.22	Outlet	6
16.08	42.93	Outlet	6
17.42	44.58	Outlet	6
18.76	46.17	Outlet	6
20.10	47.70	Outlet	6

Diameter: 24 inches

Headwater (ft)	Discharge (cfs)	Control	Flow Type
1.34	6.50	Inlet (Supercritical)	3
2.68	17.38	Inlet	5
4.02	25.09	Inlet	5
5.36	30.93	Inlet	5
6.70	35.85	Inlet	5
8.04	40.15	Inlet	5
9.38	44.04	Inlet	5
10.72	47.61	Inlet	5
12.06	50.91	Inlet	5
13.40	53.67	Outlet	6
14.74	56.14	Outlet	6
16.08	58.50	Outlet	6
17.42	60.77	Outlet	6
18.76	62.96	Outlet	6
20.10	65.07	Outlet	6

Diameter: 30 inches

Headwater (ft)	Discharge (cfs)	Control	Flow Type
1.34	8.12	Inlet (Supercritical)	3
2.68	22.97	Inlet (Supercritical)	3
4.02	36.38	Inlet	5
5.36	46.08	Inlet	5
6.70	54.06	Inlet	5
8.04	61.00	Inlet	5
9.38	67.23	Inlet	5
10.72	72.94	Inlet	5
12.06	78.23	Inlet	5
13.40	83.18	Inlet	5

14.74	87.85	Inlet	5
16.08	92.29	Inlet	5
17.42	96.52	Inlet	5
18.76	100.58	Inlet	5
20.10	104.48	Inlet	5

Diameter: 36 inches

Headwater (ft)	Discharge (cfs)	Control	Flow Type
1.34	9.75	Inlet (Supercritical)	3
2.68	27.56	Inlet (Supercritical)	3
4.02	47.96	Inlet	5
5.36	62.91	Inlet	5
6.70	74.93	Inlet	5
8.04	85.28	Inlet	5
9.38	94.50	Inlet	5
10.72	102.89	Inlet	5
12.06	110.65	Inlet	5
13.40	117.91	Inlet	5
14.74	124.74	Inlet	5
16.08	131.21	Inlet	5
17.42	137.37	Inlet	5
18.76	143.28	Inlet	5
20.10	148.96	Inlet	5

CIVIL SOFTWARE DESIGN

SEDCAD+ Version 3

AS BUILT DESIGN SPECIFICATIONS FOR CP-14

by

Name: Brian Sambirsky

Company Name: BHP MINERALS
File Name: C:\BRIAN\14

Date: 12-05-1995

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Company Name: BHP MINERALS
Filename: C:\BRIAN\14 User: Brian Sambirsky
Date: 12-06-1995 Time: 09:38:33
As built design specifications for CP-14
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	79.30	89	M	0.485	0.000	0.000	0.0	3.20	37.13
		Type: Null Label: CP-14								
111	Structure	79.30							3.20	
111	Total IN/OUT	79.30							3.20	37.13

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Company Name: BHP MINERALS
Filename: C:\BRIAN\14 User: Brian Sambirsky
Date: 12-05-1995 Time: 10:04:44
As built design specifications for CP-14
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	2900.00	2.76	1.66	0.49	0.485		

SEDCAD+ CULVERT SIZING UTILITY

CP-14

Design Discharge	=	37.130	cfs
Entrance Loss Coefficient	=	0.5	
Pipe Length	=	129.000	feet
Pipe Slope	=	3.700	%
Manning's n	=	0.018	
Maximum Headwater	=	8.500	feet
Tailwater Depth	=	0.000	feet

Smallest Diameter Required to Pass Flow is 24 inches

PERFORMANCE CURVES:

Diameter: 18 inches

Headwater (ft)	Discharge (cfs)	Control	Flow Type
0.85	2.48	Inlet (Supercritical)	3
1.70	6.96	Inlet (Supercritical)	3
2.55	10.65	Inlet	5
3.40	13.38	Inlet	5
4.25	15.65	Inlet	5
5.10	17.29	Inlet	5
5.95	18.15	Outlet	6
6.80	18.96	Outlet	6
7.65	19.72	Outlet	6
8.50	20.46	Outlet	6
9.35	21.17	Outlet	6
10.20	21.86	Outlet	6
11.05	22.53	Outlet	6
11.90	23.17	Outlet	6
12.75	23.79	Outlet	6

Diameter: 21 inches

Headwater (ft)	Discharge (cfs)	Control	Flow Type
0.85	2.88	Inlet (Supercritical)	3
1.70	8.12	Inlet (Supercritical)	3
2.55	13.58	Inlet	5
3.40	17.50	Inlet	5
4.25	20.69	Inlet	5
5.10	23.44	Inlet	5
5.95	25.80	Inlet	5
6.80	27.48	Outlet	6
7.65	28.62	Outlet	6
8.50	29.71	Outlet	6
9.35	30.77	Outlet	6
10.20	31.78	Outlet	6
11.05	32.77	Outlet	6
11.90	33.72	Outlet	6
12.75	34.66	Outlet	6

Diameter: 24 inches

Headwater (ft)	Discharge (cfs)	Control	Flow Type
0.85	3.29	Inlet (Supercritical)	3
1.70	9.29	Inlet (Supercritical)	3
2.55	16.46	Inlet	5
3.40	21.88	Inlet	5
4.25	26.18	Inlet	5
5.10	29.89	Inlet	5
5.95	33.19	Inlet	5
6.80	36.17	Inlet	5
7.65	38.95	Inlet	5
8.50	40.83	Outlet	6
9.35	42.33	Outlet	6
10.20	43.75	Outlet	6
11.05	45.14	Outlet	6
11.90	46.47	Outlet	6
12.75	47.77	Outlet	6

Diameter: 30 inches

Headwater (ft)	Discharge (cfs)	Control	Flow Type
0.85	4.11	Inlet (Supercritical)	3
1.70	11.61	Inlet (Supercritical)	3
2.55	21.32	Inlet (Supercritical)	3
3.40	30.89	Inlet	5
4.25	38.22	Inlet	5
5.10	44.36	Inlet	5
5.95	49.74	Inlet	5
6.80	54.61	Inlet	5
7.65	59.07	Inlet	5
8.50	63.22	Inlet	5
9.35	67.11	Inlet	5
10.20	70.78	Inlet	5
11.05	74.27	Inlet	5
11.90	77.61	Inlet	5
12.75	80.75	Outlet	6

Diameter: 36 inches

Headwater (ft)	Discharge (cfs)	Control	Flow Type
0.85	4.93	Inlet (Supercritical)	3
1.70	13.92	Inlet (Supercritical)	3
2.55	25.58	Inlet (Supercritical)	3
3.40	39.38	Inlet (Supercritical)	3
4.25	50.84	Inlet	5
5.10	60.30	Inlet	5
5.95	68.46	Inlet	5
6.80	75.75	Inlet	5
7.65	82.40	Inlet	5
8.50	88.55	Inlet	5

9.35	94.30	Inlet	5
10.20	99.72	Inlet	5
11.05	104.86	Inlet	5
11.90	109.76	Inlet	5
12.75	114.45	Inlet	5

Diameter: 42 inches

Headwater (ft)	Discharge (cfs)	Control	Flow Type
0.85	5.75	Inlet (Supercritical)	3
1.70	16.25	Inlet (Supercritical)	3
2.55	29.85	Inlet (Supercritical)	3
3.40	45.95	Inlet (Supercritical)	3
4.25	62.97	Inlet	5
5.10	76.89	Inlet	5
5.95	88.65	Inlet	5
6.80	99.03	Inlet	5
7.65	108.42	Inlet	5
8.50	117.06	Inlet	5
9.35	125.10	Inlet	5
10.20	132.66	Inlet	5
11.05	139.81	Inlet	5
11.90	146.61	Inlet	5
12.75	153.11	Inlet	5

CIVIL SOFTWARE DESIGN

SEDCAD+ Version 3

AS BUILT DESIGN SPECIFICATIONS FOR CP-15

by

Name: Brian Sambirsky

Company Name: BHP MINERALS
File Name: C:\BRIAN\15

Date: 12-05-1995

Civil Software Design -- SEDCAD+ Version 3.1
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Company Name: BHP MINERALS
Filename: C:\BRIAN\15 User: Brian Sambirsky
Date: 12-06-1995 Time: 09:38:35
As built design specifications for CP-15
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	28.00	89	M	0.184	0.000	0.000	0.0	1.13	20.88
		Type: Null			Label: CP-15					
111	Structure	28.00							1.13	
111	Total IN/OUT	28.00							1.13	20.88

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Company Name: BHP MINERALS
Filename: C:\BRIAN\15
User: Brian Sambirsky
Date: 12-05-1995 Time: 10:04:46
As built design specifications for CP-15
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	1300.00	3.85	1.96	0.18	0.184		

SEDCAD+ CULVERT SIZING UTILITY

CP-15

Design Discharge	=	20.880 cfs
Entrance Loss Coefficient	=	0.5
Pipe Length	=	108.000 feet
Pipe Slope	=	2.600 %
Manning's n	=	0.016
Maximum Headwater	=	11.900 feet
Tailwater Depth	=	0.000 feet

Smallest Diameter Required to Pass Flow is 18 inches

PERFORMANCE CURVES:

Diameter: 12 inches

Headwater (ft)	Discharge (cfs)	Control	Flow Type
1.19	2.65	Inlet (Supercritical)	4
2.38	5.01	Inlet	5
3.57	5.72	Outlet	6
4.76	6.33	Outlet	6
5.95	6.88	Outlet	6
7.14	7.37	Outlet	6
8.33	7.85	Outlet	6
9.52	8.29	Outlet	6
10.71	8.71	Outlet	6
11.90	9.11	Outlet	6
13.09	9.49	Outlet	6
14.28	9.86	Outlet	6
15.47	10.22	Outlet	6
16.66	10.56	Outlet	6
17.85	10.90	Outlet	6

Diameter: 15 inches

Headwater (ft)	Discharge (cfs)	Control	Flow Type
1.19	3.41	Inlet (Supercritical)	3
2.38	7.41	Inlet	5
3.57	9.76	Outlet	6
4.76	10.90	Outlet	6
5.95	11.86	Outlet	6
7.14	12.74	Outlet	6
8.33	13.56	Outlet	6
9.52	14.34	Outlet	6
10.71	15.09	Outlet	6
11.90	15.79	Outlet	6
13.09	16.45	Outlet	6
14.28	17.09	Outlet	6
15.47	17.73	Outlet	6
16.66	18.33	Outlet	6
17.85	18.90	Outlet	6

Diameter: 18 inches

Headwater (ft)	Discharge (cfs)	Control	Flow Type
1.19	4.08	Inlet (Supercritical)	3
2.38	10.02	Inlet	5
3.57	13.87	Inlet	5
4.76	16.57	Inlet	5
5.95	18.31	Outlet	6
7.14	19.71	Outlet	6
8.33	21.01	Outlet	6
9.52	22.26	Outlet	6
10.71	23.42	Outlet	6
11.90	24.53	Outlet	6
13.09	25.60	Outlet	6
14.28	26.62	Outlet	6
15.47	27.60	Outlet	6
16.66	28.55	Outlet	6
17.85	29.47	Outlet	6

Diameter: 21 inches

Headwater (ft)	Discharge (cfs)	Control	Flow Type
1.19	4.76	Inlet (Supercritical)	3
2.38	12.66	Inlet	5
3.57	18.18	Inlet	5
4.76	22.38	Inlet	5
5.95	25.91	Inlet	5
7.14	28.31	Outlet	6
8.33	30.24	Outlet	6
9.52	32.06	Outlet	6
10.71	33.77	Outlet	6
11.90	35.39	Outlet	6
13.09	36.95	Outlet	6
14.28	38.45	Outlet	6
15.47	39.90	Outlet	6
16.66	41.28	Outlet	6
17.85	42.62	Outlet	6

Diameter: 24 inches

Headwater (ft)	Discharge (cfs)	Control	Flow Type
1.19	5.44	Inlet (Supercritical)	3
2.38	15.27	Inlet (Supercritical)	4
3.57	22.79	Inlet	5
4.76	28.47	Inlet	5
5.95	33.18	Inlet	5
7.14	37.31	Inlet	5
8.33	40.96	Inlet	5
9.52	43.72	Outlet	6
10.71	46.10	Outlet	6
11.90	48.36	Outlet	6

13.09	50.53	Outlet	6
14.28	52.60	Outlet	6
15.47	54.60	Outlet	6
16.66	56.52	Outlet	6
17.85	58.39	Outlet	6

Diameter: 30 inches

Headwater (ft)	Discharge (cfs)	Control	Flow Type
1.19	6.80	Inlet (Supercritical)	3
2.38	19.23	Inlet (Supercritical)	3
3.57	32.48	Inlet	5
4.76	42.02	Inlet	5
5.95	49.75	Inlet	5
7.14	56.43	Inlet	5
8.33	62.41	Inlet	5
9.52	67.86	Inlet	5
10.71	72.90	Inlet	5
11.90	77.61	Inlet	5
13.09	82.06	Inlet	5
14.28	86.28	Inlet	5
15.47	90.30	Inlet	5
16.66	94.15	Inlet	5
17.85	97.71	Outlet	6

CIVIL SOFTWARE DESIGN

SEDCAD+ Version 3

CP-16 HYDROLOGY

by

Name: BEN HOSKIE

Company Name: BHP MINERALS
File Name: C:\BEN\BARMOD\CP_16

Date: 05-22-1998

Civil Software Design -- SEDCAD+ Version 3.1
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Company Name: BHP MINERALS
Filename: C:\BEN\BARMOD\CP_16 User: BEN HOSKIE
Date: 06-11-1998 Time: 13:24:02
CP-16 HYDROLOGY
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	31.90	76	M	1.256	0.000	0.000	0.0	0.30	4.15
			Type: Null			Label: CP-119				
111	Structure	31.90							0.30	
111	Total IN/OUT	31.90							0.30	4.15
211	1	164.52	76	M	1.635	0.000	0.000	0.0	1.54	11.89
			Type: Null			Label: CP-16				
211	Structure	164.52							1.84	
211	Total IN/OUT	196.42							1.84	15.18
111 to 211 Routing						0.127	0.359			

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Company Name: BHP MINERALS
Filename: C:\BEN\BARMOD\CP_16 User: BEN HOSKIE
Date: 05-22-1998 Time: 13:24:02
CP-16 HYDROLOGY
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)	X
1	1	1	1	-a	5	1875.00	4.12	2.03	0.26	0.256		
2	1	1	1	-a	5	3325.00	2.11	1.45	0.64	0.635		

SEDCAD+ CULVERT SIZING UTILITY

CP-16

Design Discharge	=	15.180 cfs
Entrance Loss Coefficient	=	0.5
Pipe Length	=	153.000 feet
Pipe Slope	=	1.100 %
Manning's n	=	0.017
Maximum Headwater	=	42.500 feet
Tailwater Depth	=	0.000 feet

Smallest Diameter Required to Pass Flow is 15 inches

PERFORMANCE CURVES:

Diameter: 9 inches

Headwater (ft)	Discharge (cfs)	Control	Flow Type
4.25	2.18	Outlet	6
8.50	2.98	Outlet	6
12.75	3.55	Outlet	6
17.00	4.08	Outlet	6
21.25	4.47	Outlet	6
25.50	4.87	Outlet	6
29.75	5.26	Outlet	6
34.00	5.66	Outlet	6
38.25	6.04	Outlet	6
42.50	6.32	Outlet	6
46.75	6.60	Outlet	6
51.00	6.89	Outlet	6
55.25	7.17	Outlet	6
59.50	7.45	Outlet	6
63.75	7.73	Outlet	6

Diameter: 12 inches

Headwater (ft)	Discharge (cfs)	Control	Flow Type
4.25	4.48	Outlet	6
8.50	6.16	Outlet	6
12.75	7.41	Outlet	6
17.00	8.51	Outlet	6
21.25	9.47	Outlet	6
25.50	10.36	Outlet	6
29.75	11.15	Outlet	6
34.00	11.95	Outlet	6
38.25	12.62	Outlet	6
42.50	13.29	Outlet	6
46.75	13.96	Outlet	6
51.00	14.55	Outlet	6
55.25	15.13	Outlet	6

59.50	15.71	Outlet	6
63.75	16.26	Outlet	6

Diameter: 15 inches

Headwater (ft)	Discharge (cfs)	Control	Flow Type
4.25	7.88	Outlet	6
8.50	10.76	Outlet	6
12.75	13.04	Outlet	6
17.00	14.98	Outlet	6
21.25	16.70	Outlet	6
25.50	18.27	Outlet	6
29.75	19.70	Outlet	6
34.00	21.02	Outlet	6
38.25	22.29	Outlet	6
42.50	23.47	Outlet	6
46.75	24.60	Outlet	6
51.00	25.68	Outlet	6
55.25	26.71	Outlet	6
59.50	27.72	Outlet	6
63.75	28.68	Outlet	6

Diameter: 18 inches

Headwater (ft)	Discharge (cfs)	Control	Flow Type
4.25	12.21	Outlet	6
8.50	16.87	Outlet	6
12.75	20.52	Outlet	6
17.00	23.61	Outlet	6
21.25	26.34	Outlet	6
25.50	28.81	Outlet	6
29.75	31.08	Outlet	6
34.00	33.20	Outlet	6
38.25	35.20	Outlet	6
42.50	37.08	Outlet	6
46.75	38.88	Outlet	6
51.00	40.59	Outlet	6
55.25	42.24	Outlet	6
59.50	43.77	Outlet	6
63.75	45.30	Outlet	6

Diameter: 21 inches

Headwater (ft)	Discharge (cfs)	Control	Flow Type
4.25	17.52	Outlet	6
8.50	24.51	Outlet	6
12.75	29.93	Outlet	6
17.00	34.48	Outlet	6

21.25	38.51	Outlet	6
25.50	42.16	Outlet	6
29.75	45.46	Outlet	6
34.00	48.59	Outlet	6
38.25	51.56	Outlet	6
42.50	54.30	Outlet	6
46.75	56.99	Outlet	6
51.00	59.46	Outlet	6
55.25	61.94	Outlet	6
59.50	64.22	Outlet	6
63.75	66.50	Outlet	6

Diameter: 24 inches

Headwater (ft)	Discharge (cfs)	Control	Flow Type
4.25	23.79	Outlet	6
8.50	33.68	Outlet	6
12.75	41.26	Outlet	6
17.00	47.63	Outlet	6
21.25	53.25	Outlet	6
25.50	58.34	Outlet	6
29.75	63.03	Outlet	6
34.00	67.41	Outlet	6
38.25	71.50	Outlet	6
42.50	75.35	Outlet	6
46.75	79.03	Outlet	6
51.00	82.57	Outlet	6
55.25	85.93	Outlet	6
59.50	89.17	Outlet	6
63.75	92.33	Outlet	6

Culvert CP-17 & 18, Downdrains 19, 20 & 21

Revised 7/14/03

LR

BHP Navajo Coal Company
Navajo Mine
PO Box 1717
Fruitland, NM 87415

Phone: 505-598-5861

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
Culvert	#3	==>	#4	0.284	0.339	Culvert CP-92
Culvert	#4	==>	#8	0.048	0.380	Culvert CP-18
Culvert	#5	==>	#4	0.000	0.000	Downdrain DD-19
Culvert	#6	==>	#4	0.000	0.000	Downdrain DD-20
Culvert	#7	==>	#8	0.023	0.413	Downdrain DD-21
Culvert	#8	==>	End	0.000	0.000	Culvert CP-17

#7 Culvert		
	#6 Culvert	
	#5 Culvert	
	#3 Culvert	
#4 Culvert		
#8 Culvert		

Structure Routing Details:

Stru #	Land Flow Condition	Slope (%)	Vert. Dist. (ft)	Horiz. Dist. (ft)	Velocity (fps)	Time (hrs)
#3	8. Large gullies, diversions, and low flowing streams	1.42	52.00	3,660.16	3.57	0.284
#3	**Muskingum K:**					**0.284**
#4	8. Large gullies, diversions, and low flowing streams	3.22	30.00	932.00	5.38	0.048
#4	**Muskingum K:**					**0.048**
#7	8. Large gullies, diversions, and low flowing streams	7.24	50.00	691.00	8.06	0.023
#7	**Muskingum K:**					**0.023**

Structure Summary:

	Immediate Contributing Area (ac)	Total Contributing Area (ac)	Peak Discharge (cfs)	Total Runoff Volume (ac-ft)
#7	5.300	5.300	3.86	0.26
#6	1.400	1.400	1.62	0.07
#5	4.300	4.300	4.98	0.21
#3	138.700	138.700	50.60	6.71
#4	321.000	465.400	143.32	22.53
#8	21.900	492.600	145.80	23.85

Structure Detail:

Structure #7 (Culvert)

Downdrain DD-21

Culvert Inputs:

Length (ft)	Slope (%)	Manning's n	Max. Headwater (ft)	Tailwater (ft)	Entrance Loss Coef. (Ke)
68.00	45.00	0.0200	5.00	0.00	0.90

Culvert Results:

Design Discharge = 3.86 cfs

Minimum pipe diameter: 1 - 10 inch pipe(s) required

Structure #6 (Culvert)

Downdrain DD-20

Culvert Inputs:

Length (ft)	Slope (%)	Manning's n	Max. Headwater (ft)	Tailwater (ft)	Entrance Loss Coef. (Ke)
55.00	36.00	0.0200	4.50	0.00	0.90

Culvert Results:

Design Discharge = 1.62 cfs

Minimum pipe diameter: 1 - 6 inch pipe(s) required

Structure #5 (Culvert)

Downdrain DD-19

Culvert Inputs:

Length (ft)	Slope (%)	Manning's n	Max. Headwater (ft)	Tailwater (ft)	Entrance Loss Coef. (Ke)
55.00	36.00	0.0200	5.00	0.00	0.90

Culvert Results:

Design Discharge = 4.98 cfs

Minimum pipe diameter: 1 - 10 inch pipe(s) required

Structure #3 (Culvert)

Culvert CP-92

Culvert Inputs:

Length (ft)	Slope (%)	Manning's n	Max. Headwater (ft)	Tailwater (ft)	Entrance Loss Coef. (Ke)
50.00	3.50	0.0200	4.00	0.00	0.90

Culvert Results:

Design Discharge = 50.60 cfs

Minimum pipe diameter: 1 - 42 inch pipe(s) required

Structure #4 (Culvert)

Culvert CP-18

Culvert Inputs:

Length (ft)	Slope (%)	Manning's n	Max. Headwater (ft)	Tailwater (ft)	Entrance Loss Coef. (Ke)
305.00	3.00	0.0200	36.60	0.00	0.90

Culvert Results:

Design Discharge = 143.32 cfs

Minimum pipe diameter: 1 - 42 inch pipe(s) required

Structure #8 (Culvert)

Culvert CP-17

Culvert Inputs:

Length (ft)	Slope (%)	Manning's n	Max. Headwater (ft)	Tailwater (ft)	Entrance Loss Coef. (Ke)
187.00	0.30	0.0160	8.60	0.00	0.90

Culvert Results:

Design Discharge = 145.80 cfs

Minimum pipe diameter: 1 - 54 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)
#7	1	5.300	0.141	0.000	0.000	91.000	M	3.86	0.257
	Σ	**5.300**						**3.86**	**0.257**
#6	1	1.400	0.075	0.000	0.000	91.000	M	1.62	0.068
	Σ	**1.400**						**1.62**	**0.068**
#5	1	4.300	0.119	0.000	0.000	91.000	M	4.98	0.208
	Σ	**4.300**						**4.98**	**0.208**
#3	1	138.700	0.772	0.000	0.000	91.000	M	50.60	6.715
	Σ	**138.700**						**50.60**	**6.715**
#4	1	321.000	1.070	0.000	0.000	91.000	M	94.22	15.540
	Σ	**465.400**						**143.32**	**22.530**
#8	1	21.900	0.119	0.000	0.000	91.000	M	25.35	1.060
	Σ	**492.600**						**145.80**	**23.847**

Subwatershed Time of Concentration Details:

Stru #	SWS #	Land Flow Condition	Slope (%)	Vert. Dist. (ft)	Horiz. Dist. (ft)	Velocity (fps)	Time (hrs)
#3	1	5. Nearly bare and untilled, and alluvial valley fans	2.72	125.00	4,590.00	1.650	0.772
#3	**1**	**Time of Concentration:**					**0.772**
#4	1	5. Nearly bare and untilled, and alluvial valley fans	2.75	175.00	6,360.00	1.650	1.070
#4	**1**	**Time of Concentration:**					**1.070**
#5	1	8. Large gullies, diversions, and low flowing streams	3.66	90.00	2,459.00	5.730	0.119
#5	**1**	**Time of Concentration:**					**0.119**
#6	1	8. Large gullies, diversions, and low flowing streams	1.50	15.00	998.00	3.670	0.075
#6	**1**	**Time of Concentration:**					**0.075**
#7	1	8. Large gullies, diversions, and low flowing streams	3.02	80.00	2,653.00	5.200	0.141
#7	**1**	**Time of Concentration:**					**0.141**
#8	1	5. Nearly bare and untilled, and alluvial valley fans	6.62	55.00	831.00	2.570	0.089
		8. Large gullies, diversions, and low flowing streams	2.11	10.00	473.01	4.360	0.030

Stru #	SWS #	Land Flow Condition	Slope (%)	Vert. Dist. (ft)	Horiz. Dist. (ft)	Velocity (fps)	Time (hrs)
#8	**1**	**Time of Concentration:**					**0.119**

BLANK PAGES (106 - 110)

Due to CP-18, CP-19, Downdrains 19, 20, & 21 data update

CP-68 data removed in 4/18/2000 submission
CP-151 data removed in 7/15/2003 submission

CIVIL SOFTWARE DESIGN

SEDCAD+ Version 3

CP-19 & CP-20 CULVERT AT THE NECK AREA

by

Name: BEN HOSKIE

Company Name: BHP MINERALS
File Name: C:\BEN\CP19\19_20

Date: 05-28-1998

Civil Software Design -- SEDCAD+ Version 3.1
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Company Name: BHP MINERALS
Filename: C:\BEN\CP19\19_20 User: BEN HOSKIE
Date: 05-28-1998 Time: 11:44:00
CP-19 & CP-20 CULVERT AT THE NECK AREA
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	42.20	89	M	0.260	0.000	0.000	0.0	1.70	27.18
			Type: Null		Label: CP-20					
111	Structure	42.20							1.70	
111	Total IN/OUT	42.20							1.70	27.18
			Type: Null		Label: CP-20					
112	Structure	42.20							1.70	
112	Total IN/OUT	42.20							1.70	27.18
111 to 112 Routing						0.022	0.325			
			Type: Null		Label: CP-20					
113	Structure	42.20							1.70	
113	Total IN/OUT	42.20							1.70	24.88
112 to 113 Routing						0.090	0.287			
121	1	30.13	89	M	0.116	0.000	0.000	0.0	1.22	32.48
			Type: Null		Label: CP-19					
121	Structure	30.13							1.22	
121	Total IN/OUT	30.13							1.22	32.48
			Type: Null		Label: CP-19					
211	Structure	30.13							2.92	
211	Total IN/OUT	72.33							2.92	49.45
113 to 211 Routing						0.036	0.239			

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Company Name: BHP MINERALS
Filename: C:\BEN\CP19\19_20 User: BEN HOSKIE
Date: 05-28-1998 Time: 11:44:00
CP-19 & CP-20 CULVERT AT THE NECK AREA
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	2130.00	5.16	2.27	0.26	0.260		
1	2	1	1	-a	5	810.00	3.70	1.92	0.12	0.116		

SEDCAD+ CULVERT SIZING UTILITY

CP-19

Design Discharge	=	49.450 cfs
Entrance Loss Coefficient	=	0.9
Pipe Length	=	203.000 feet
Pipe Slope	=	0.600 %
Manning's n	=	0.018
Maximum Headwater	=	23.400 feet
Tailwater Depth	=	0.000 feet

Smallest Diameter Required to Pass Flow is 30 inches

PERFORMANCE CURVES:

Diameter: 21 inches

Headwater (ft)	Discharge (cfs)	Control	Flow Type
2.34	10.02	Outlet	6
4.68	14.60	Outlet	6
7.02	18.09	Outlet	6
9.36	20.98	Outlet	6
11.70	23.54	Outlet	6
14.04	25.84	Outlet	6
16.38	27.96	Outlet	6
18.72	29.92	Outlet	6
21.06	31.76	Outlet	6
23.40	33.49	Outlet	6
25.74	35.14	Outlet	6
28.08	36.72	Outlet	6
30.42	38.24	Outlet	6
32.76	39.70	Outlet	6
35.10	41.10	Outlet	6

Diameter: 24 inches

Headwater (ft)	Discharge (cfs)	Control	Flow Type
2.34	12.87	Inlet (Supercritical)	3
4.68	19.90	Outlet	6
7.02	24.82	Outlet	6
9.36	28.93	Outlet	6
11.70	32.52	Outlet	6
14.04	35.76	Outlet	6
16.38	38.72	Outlet	6
18.72	41.47	Outlet	6
21.06	44.06	Outlet	6
23.40	46.49	Outlet	6
25.74	48.81	Outlet	6
28.08	51.02	Outlet	6
30.42	53.14	Outlet	6

32.76	88.18	Outlet	6
35.10	87.14	Outlet	6

Diameter: 30 inches

Headwater (ft)	Discharge (cfs)	Control	Flow Type
2.34	16.58	Outlet (Subcritical)	1
4.68	32.64	Outlet	6
7.02	41.55	Outlet	6
9.36	48.86	Outlet	6
11.70	55.21	Outlet	6
14.04	60.91	Outlet	6
16.38	66.12	Outlet	6
18.72	70.94	Outlet	6
21.06	75.45	Outlet	6
23.40	79.69	Outlet	6
25.74	83.73	Outlet	6
28.08	87.59	Outlet	6
30.42	91.31	Outlet	6
32.76	94.84	Outlet	6
35.10	98.26	Outlet	6

Diameter: 36 inches

Headwater (ft)	Discharge (cfs)	Control	Flow Type
2.34	19.60	Outlet (Subcritical)	1
4.68	47.78	Outlet	6
7.02	62.28	Outlet	6
9.36	74.00	Outlet	6
11.70	84.06	Outlet	6
14.04	93.07	Outlet	6
16.38	101.30	Outlet	6
18.72	108.88	Outlet	6
21.06	116.00	Outlet	6
23.40	122.67	Outlet	6
25.74	129.01	Outlet	6
28.08	135.06	Outlet	6
30.42	140.85	Outlet	6
32.76	146.41	Outlet	6
35.10	151.76	Outlet	6

Diameter: 42 inches

Headwater (ft)	Discharge (cfs)	Control	Flow Type
2.34	26.51	Outlet (Subcritical)	1
4.68	64.45	Outlet	6
7.02	86.47	Outlet	6
9.36	103.92	Outlet	6

11.70	113.85	Outlet	6
14.04	132.11	Outlet	6
16.38	144.14	Outlet	6
18.72	155.26	Outlet	6
21.06	165.63	Outlet	6
23.40	175.38	Outlet	6
25.74	184.61	Outlet	6
28.08	193.40	Outlet	6
30.42	201.82	Outlet	6
32.76	209.90	Outlet	6
35.10	217.67	Outlet	6

Diameter: 45 inches

Headwater (ft)	Discharge (cfs)	Control	Flow Type
2.34	30.51	Outlet (Subcritical)	1
4.68	73.02	Outlet	6
7.02	99.66	Outlet	6
9.36	120.57	Outlet	6
11.70	138.34	Outlet	6
14.04	154.08	Outlet	6
16.38	168.36	Outlet	6
18.72	181.53	Outlet	6
21.06	193.78	Outlet	6
23.40	205.33	Outlet	6
25.74	216.25	Outlet	6
28.08	226.64	Outlet	6
30.42	236.58	Outlet	6
32.76	246.12	Outlet	6
35.10	255.30	Outlet	6

SEDCAD+ CULVERT SIZING UTILITY

CP-20

Design Discharge	=	27.180 cfs
Entrance Loss Coefficient	=	0.9
Pipe Length	=	262.000 feet
Pipe Slope	=	2.500 %
Manning's n	=	0.016
Maximum Headwater	=	27.000 feet
Tailwater Depth	=	0.000 feet

Smallest Diameter Required to Pass Flow is 21 inches

PERFORMANCE CURVES:

Diameter: 15 inches

Headwater (ft)	Discharge (cfs)	Control	Flow Type
2.70	7.61	Inlet	5
5.40	9.69	Outlet	6
8.10	10.87	Outlet	6
10.80	11.87	Outlet	6
13.50	12.85	Outlet	6
16.20	13.72	Outlet	6
18.90	14.56	Outlet	6
21.60	15.35	Outlet	6
24.30	16.08	Outlet	6
27.00	16.82	Outlet	6
29.70	17.49	Outlet	6
32.40	18.15	Outlet	6
35.10	18.80	Outlet	6
37.80	19.41	Outlet	6
40.50	20.00	Outlet	6

Diameter: 18 inches

Headwater (ft)	Discharge (cfs)	Control	Flow Type
2.70	11.18	Inlet	5
5.40	15.31	Outlet	6
8.10	17.15	Outlet	6
10.80	18.80	Outlet	6
13.50	20.31	Outlet	6
16.20	21.72	Outlet	6
18.90	23.07	Outlet	6
21.60	24.30	Outlet	6
24.30	25.50	Outlet	6
27.00	26.64	Outlet	6
29.70	27.73	Outlet	6
32.40	28.79	Outlet	6
35.10	29.80	Outlet	6
37.80	30.79	Outlet	6
40.50	31.73	Outlet	6

Diameter: 21 inches

Headwater (ft)	Discharge (cfs)	Control	Flow Type
2.70	14.33	Inlet	5
5.40	22.28	Outlet	6
8.10	25.08	Outlet	6
10.80	27.53	Outlet	6
13.50	29.78	Outlet	6
16.20	31.87	Outlet	6
18.90	33.83	Outlet	6
21.60	35.69	Outlet	6
24.30	37.46	Outlet	6
27.00	39.15	Outlet	6
29.70	40.76	Outlet	6
32.40	42.31	Outlet	6
35.10	43.81	Outlet	6
37.80	45.27	Outlet	6
40.50	46.67	Outlet	6

Diameter: 24 inches

Headwater (ft)	Discharge (cfs)	Control	Flow Type
2.70	17.52	Inlet	5
5.40	30.73	Outlet	6
8.10	34.70	Outlet	6
10.80	38.15	Outlet	6
13.50	41.31	Outlet	6
16.20	44.24	Outlet	6
18.90	47.01	Outlet	6
21.60	49.60	Outlet	6
24.30	52.07	Outlet	6
27.00	54.43	Outlet	6
29.70	56.69	Outlet	6
32.40	58.87	Outlet	6
35.10	60.97	Outlet	6
37.80	62.99	Outlet	6
40.50	64.96	Outlet	6

Diameter: 30 inches

Headwater (ft)	Discharge (cfs)	Control	Flow Type
2.70	23.23	Inlet (Supercritical)	3
5.40	46.33	Inlet	5
8.10	59.11	Outlet	6
10.80	65.17	Outlet	6
13.50	70.68	Outlet	6
16.20	75.82	Outlet	6
18.90	80.63	Outlet	6
21.60	85.17	Outlet	6
24.30	89.48	Outlet	6
27.00	93.60	Outlet	6

29.70	97.55	Outlet	6
32.40	101.34	Outlet	6
35.10	104.97	Outlet	6
37.80	108.50	Outlet	6
40.50	111.94	Outlet	6

Diameter: 36 inches

Headwater (ft)	Discharge (cfs)	Control	Flow Type
2.70	27.87	Inlet (Supercritical)	3
5.40	63.30	Inlet	5
8.10	85.69	Inlet	5
10.80	99.86	Outlet	6
13.50	108.59	Outlet	6
16.20	116.69	Outlet	6
18.90	124.22	Outlet	6
21.60	131.36	Outlet	6
24.30	138.11	Outlet	6
27.00	144.54	Outlet	6
29.70	150.71	Outlet	6
32.40	156.64	Outlet	6
35.10	162.35	Outlet	6
37.80	167.86	Outlet	6
40.50	173.19	Outlet	6

CIVIL SOFTWARE DESIGN

SEDCAD+ Version 3

AS BUILT DESIGN SPECIFICATIONS FOR CP-21

by

Name: Brian Sambirsky

Company Name: BHP MINERALS
File Name: C:\BRIAN\21

Date: 12-05-1995

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Company Name: BHP MINERALS
Filename: C:\BRIAN\21
User: Brian Sambirsky
Date: 12-05-1995 Time: 10:04:53
As built design specifications for CP-21
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	37.30	89	M	0.479	0.000	0.000	0.0	1.51	17.59
111 Structure		37.30	Type: Null			Label: CP-21			1.51	
111 Total IN/OUT		37.30							1.51	17.59

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Company Name: BHP MINERALS
Filename: C:\BRIAN\21
User: Brian Sambirsky
Date: 12-05-1995 Time: 10:04:53
As built design specifications for CP-21
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	3100.00	3.23	1.80	0.48	0.479		

SEDCAD+ CULVERT SIZING UTILITY

CP-21

Design Discharge	=	17.590	cfs
Entrance Loss Coefficient	=	0.9	
Pipe Length	=	191.000	feet
Pipe Slope	=	1.500	%
Manning's n	=	0.024	
Maximum Headwater	=	12.800	feet
Tailwater Depth	=	0.000	feet

Smallest Diameter Required to Pass Flow is 21 inches

PERFORMANCE CURVES:

Diameter: 15 inches

Headwater (ft)	Discharge (cfs)	Control	Flow Type
1.28	3.38	Outlet (Subcritical)	1
2.56	4.98	Outlet	6
3.84	5.65	Outlet	6
5.12	6.26	Outlet	6
6.40	6.82	Outlet	6
7.68	7.33	Outlet	6
8.96	7.82	Outlet	6
10.24	8.27	Outlet	6
11.52	8.70	Outlet	6
12.80	9.11	Outlet	6
14.08	9.50	Outlet	6
15.36	9.88	Outlet	6
16.64	10.24	Outlet	6
17.92	10.59	Outlet	6
19.20	10.93	Outlet	6

Diameter: 18 inches

Headwater (ft)	Discharge (cfs)	Control	Flow Type
1.28	3.98	Outlet (Subcritical)	1
2.56	7.76	Inlet	5
3.84	8.90	Outlet	6
5.12	9.90	Outlet	6
6.40	10.80	Outlet	6
7.68	11.63	Outlet	6
8.96	12.40	Outlet	6
10.24	13.14	Outlet	6
11.52	13.83	Outlet	6
12.80	14.49	Outlet	6
14.08	15.12	Outlet	6
15.36	15.71	Outlet	6
16.64	16.29	Outlet	6
17.92	16.87	Outlet	6
19.20	17.41	Outlet	6

Diameter: 21 inches

Headwater (ft)	Discharge (cfs)	Control	Flow Type
1.28	5.47	Outlet (Subcritical)	1
2.56	11.26	Outlet	6
3.84	12.96	Outlet	6
5.12	14.46	Outlet	6
6.40	15.80	Outlet	6
7.68	17.08	Outlet	6
8.96	18.22	Outlet	6
10.24	19.33	Outlet	6
11.52	20.36	Outlet	6
12.80	21.36	Outlet	6
14.08	22.30	Outlet	6
15.36	23.21	Outlet	6
16.64	24.07	Outlet	6
17.92	24.93	Outlet	6
19.20	25.73	Outlet	6

Diameter: 24 inches

Headwater (ft)	Discharge (cfs)	Control	Flow Type
1.28	7.24	Outlet (Subcritical)	1
2.56	15.11	Outlet (Subcritical)	1
3.84	17.82	Outlet	6
5.12	19.97	Outlet	6
6.40	21.92	Outlet	6
7.68	23.71	Outlet	6
8.96	25.37	Outlet	6
10.24	26.94	Outlet	6
11.52	28.40	Outlet	6
12.80	29.80	Outlet	6
14.08	31.14	Outlet	6
15.36	32.42	Outlet	6
16.64	33.65	Outlet	6
17.92	34.85	Outlet	6
19.20	35.99	Outlet	6

Diameter: 30 inches

Headwater (ft)	Discharge (cfs)	Control	Flow Type
1.28	7.59	Inlet (Supercritical)	3
2.56	18.49	Outlet (Subcritical)	1 *
3.84	29.96	Outlet	6
5.12	33.90	Outlet	6
6.40	37.42	Outlet	6
7.68	40.64	Outlet	6
8.96	43.62	Outlet	6
10.24	46.41	Outlet	6
11.52	49.05	Outlet	6
12.80	51.54	Outlet	6

14.08	53.92	Outlet	6
15.36	56.20	Outlet	6
16.64	58.40	Outlet	6
17.92	60.51	Outlet	6
19.20	62.55	Outlet	6

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

Diameter: 36 inches

Headwater (ft)	Discharge (cfs)	Control	Flow Type
1.28	9.10	Inlet (Supercritical)	3
2.56	23.79	Outlet (Subcritical)	2 *
3.84	44.94	Outlet	6
5.12	51.43	Outlet	6
6.40	57.17	Outlet	6
7.68	62.37	Outlet	6
8.96	67.19	Outlet	6
10.24	71.67	Outlet	6
11.52	75.89	Outlet	6
12.80	79.89	Outlet	6
14.08	83.70	Outlet	6
15.36	87.34	Outlet	6
16.64	90.84	Outlet	6
17.92	94.20	Outlet	6
19.20	97.46	Outlet	6

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

For CP-22 data, please see Lowe By-pass Road Modification Culverts CP-172, CP173, CP22 and Road Side Ditch Designs

Pages 126 through 131 blank due to text reformatting.

Pages 132 through 143 Appendix 11-V

Blank due to Update

CP-30

Revised/Supplemental

Design Information

1/29/98

Reference Design Data for CP-121 & Exhibit 11-130

CIVIL SOFTWARE DESIGN

SEDCAD+ Version 3

RIP RAP DROP STRUCTURE @ STA 14+64

by

Name: BH

Company Name: BHP MINERALS
File Name: J:\OSM_SUBM\PER_PROG\CH_11\11-130\SEDCAD\DROP_STR\N_HOST

Date: 01-05-1998

Civil Software Design -- SEDCAD+ Version 3.1
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Company Name: BHP MINERALS
Filename: C:\BEN\NHOST\N_HOST User: BH
Date: 11-05-1997 Time: 15:11:24
RIP RAP DROP STRUCTURE @ STA 14+64
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	31.77	78	M	0.245	0.000	0.000	0.0	0.40	6.09
		Type: Null		Label: J1B1S1 @ SIDE DITCH						
111	Structure	31.77							0.40	
111	Total IN/OUT	31.77							0.40	6.09

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Company Name: BHP MINERALS
Filename: C:\BEN\NHOST\N_HOST User: BH
Date: 11-05-1997 Time: 15:11:24
RIP RAP DROP STRUCTURE @ STA 14+64
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	1474.00	2.78	1.67	0.25	0.245		

CIVIL SOFTWARE DESIGN

SEDCAD+ Version 3

CP-30 HYDROLOGY

by

Name: BH

Company Name: BHP MINERALS
File Name: J:\OSM_SUBM\PER_PROG\CH_11\11-130\SEDCAD\CP_30\CP_30

Date: 01-05-1998

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Company Name: BHP MINERALS
Filename: C:\BEN\CP_30 User: BEN HOSKIE
Date: 11-12-1997 Time: 15:38:38
CP-30 HYDROLOGY
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	31.77	78	M	0.245	0.000	0.000	0.0	0.40	6.09
		Type: Null		Label: DROP STRUC STA 14+64						
111	Structure	31.77							0.40	
111	Total IN/OUT	31.77							0.40	6.09
211	1	32.00	89	M	0.299	0.000	0.000	0.0	1.29	19.36
		Type: Null		Label: CP-30						
211	Structure	32.00							1.69	
211	Total IN/OUT	63.77							1.69	23.74
111 to 211 Routing						0.124	0.314			

Civil Software Design -- SEDCAD+ Version 3.1
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Company Name: BHP MINERALS
Filename: C:\BEN\CP_30 User: BEN HOSKIE
Date: 11-12-1997 Time: 15:38:38
CP-30 HYDROLOGY
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	1474.00	2.78	1.67	0.25	0.245		
2	1	1	1	-a	5	1800.00	2.78	1.67	0.30	0.299		

SEDCAD+ CULVERT SIZING UTILITY

CP-30 NORTH HOSTEEN ROAD

Design Discharge	=	23.740	cfs
Entrance Loss Coefficient	=	0.9	
Pipe Length	=	104.000	feet
Pipe Slope	=	2.800	%
Manning's n	=	0.020	
Maximum Headwater	=	14.400	feet
Tailwater Depth	=	0.000	feet

Smallest Diameter Required to Pass Flow is 21 inches

PERFORMANCE CURVES:

Diameter: 15 inches

Headwater (ft)	Discharge (cfs)	Control	Flow Type
1.44	4.46	Inlet (Supercritical)	4
2.88	7.69	Outlet	6
4.32	8.85	Outlet	6
5.76	9.83	Outlet	6
7.20	10.72	Outlet	6
8.64	11.54	Outlet	6
10.08	12.31	Outlet	6
11.52	13.04	Outlet	6
12.96	13.69	Outlet	6
14.40	14.35	Outlet	6
15.84	15.00	Outlet	6
17.28	15.57	Outlet	6
18.72	16.15	Outlet	6
20.16	16.72	Outlet	6
21.60	17.26	Outlet	6

Diameter: 18 inches

Headwater (ft)	Discharge (cfs)	Control	Flow Type
1.44	5.43	Inlet (Supercritical)	3
2.88	11.79	Inlet	5
4.32	13.66	Outlet	6
5.76	15.24	Outlet	6
7.20	16.66	Outlet	6
8.64	17.96	Outlet	6
10.08	19.20	Outlet	6
11.52	20.33	Outlet	6
12.96	21.42	Outlet	6
14.40	22.45	Outlet	6
15.84	23.44	Outlet	6
17.28	24.38	Outlet	6
18.72	25.30	Outlet	6
20.16	26.18	Outlet	6
21.60	27.04	Outlet	6

Diameter: 21 inches

Headwater (ft)	Discharge (cfs)	Control	Flow Type

1.44	6.34	Inlet (Supercritical)	3
2.88	15.22	Inlet	5
4.32	19.61	Outlet	6
5.76	21.93	Outlet	6
7.20	24.03	Outlet	6
8.64	25.96	Outlet	6
10.08	27.76	Outlet	6
11.52	29.45	Outlet	6
12.96	31.06	Outlet	6
14.40	32.57	Outlet	6
15.84	34.01	Outlet	6
17.28	35.41	Outlet	6
18.72	36.75	Outlet	6
20.16	38.03	Outlet	6
21.60	39.29	Outlet	6

Diameter: 24 inches

Headwater (ft)	Discharge (cfs)	Control	Flow Type
1.44	7.24	Inlet (Supercritical)	3
2.88	18.75	Inlet	5
4.32	26.35	Outlet	6
5.76	29.87	Outlet	6
7.20	32.83	Outlet	6
8.64	35.52	Outlet	6
10.08	38.03	Outlet	6
11.52	40.38	Outlet	6
12.96	42.61	Outlet	6
14.40	44.72	Outlet	6
15.84	46.74	Outlet	6
17.28	48.68	Outlet	6
18.72	50.53	Outlet	6
20.16	52.33	Outlet	6
21.60	54.06	Outlet	6

Diameter: 30 inches

Headwater (ft)	Discharge (cfs)	Control	Flow Type
1.44	9.05	Inlet (Supercritical)	3
2.88	25.47	Inlet (Supercritical)	3
4.32	38.77	Inlet	5
5.76	48.60	Inlet	5
7.20	54.49	Outlet	6
8.64	59.21	Outlet	6
10.08	63.56	Outlet	6
11.52	67.64	Outlet	6
12.96	71.49	Outlet	6
14.40	75.15	Outlet	6
15.84	78.63	Outlet	6
17.28	81.96	Outlet	6
18.72	85.17	Outlet	6
20.16	88.25	Outlet	6
21.60	91.24	Outlet	6

Diameter: 36 inches

Headwater (ft)	Discharge (cfs)	Control	Flow Type

1.44	10.86	Inlet (Supercritical)	3
2.88	30.70	Inlet (Supercritical)	3
4.32	51.68	Inlet	5
5.76	66.73	Inlet	5
7.20	78.95	Inlet	5
8.64	88.68	Outlet	6
10.08	95.51	Outlet	6
11.52	101.88	Outlet	6
12.96	107.88	Outlet	6
14.40	113.56	Outlet	6
15.84	118.98	Outlet	6
17.28	124.15	Outlet	6
18.72	129.11	Outlet	6
20.16	133.89	Outlet	6
21.60	138.50	Outlet	6

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Civil Software Design

CULVERT CP-35A & B

The culvert watershed is presented on Exhibit 11-12D. CP-35A & B are existing 24 inch diameter culverts.

LR

BHP Navajo Coal Company
Navajo Mine
PO Box 1717
Fruitland, NM 87415

Phone: 505-598-5861

CULVERT CP-35 WATERSHED
CURVE NUMBER (CN) DETERMINATION

NRCS Soil Mapping Symbol	Hydrologic Group	Estimated % of Watershed	CN	Weighted CN
Du, So, Da & Sp	B	55	78	42.9
Sc & Sd	A	10	65	6.5
Ba & Mo	D	35	91	31.9
			Weighted Average CN	**81.3**

Used CN of 82 in Sedcad analysis

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	==>	End	0.000	0.000	CP-35

#1
Null

Structure Summary:

	Immediate Contributing Area (ac)	Total Contributing Area (ac)	Peak Discharge (cfs)	Total Runoff Volume (ac-ft)
#1	662.400	662.400	36.44	13.39

Structure Detail:

Structure #1 (Null)

CP-35

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)
#1	1	662.400	2.801	0.000	0.000	82.000	M	36.44	13.389
	Σ	**662.400**						**36.44**	**13.389**

Subwatershed Time of Concentration Details:

Stru #	SWS #	Land Flow Condition	Slope (%)	Vert. Dist. (ft)	Horiz. Dist. (ft)	Velocity (fps)	Time (hrs)
#1	1	5. Nearly bare and untilled, and alluvial valley fans	1.43	171.58	12,000.00	1.190	2.801
#1	**1**	**Time of Concentration:**					**2.801**

CULVERT CP-35A & B - (Design Discharge = 36.44/2 or 18.3 cfs)

Culvert Inputs:

Length (ft)	Slope (%)	Manning's n	Max. Headwater (ft)	Tailwater (ft)	Entrance Loss Coef. (Ke)
70.00	0.80	0.0160	4.30	0.00	0.90

Culvert Results:

Minimum pipe diameter: 1 - 21 inch pipe(s) required

Detailed Performance Curves

Design Discharge = 18.30 cfs

Maximum Headwater = 4.30 ft

(BOLD indicates design pipe size)

Headwater (ft)	Discharge (cfs) (18 in)	**Discharge (cfs) (21 in)**	Discharge (cfs) (24 in)
0.43	0.90	**1.04**	1.18
0.86	2.51	**2.93**	3.34
1.29	3.94	**5.37**	6.14
1.72	6.23	**6.93**	9.45
2.15	8.67	**10.19**	11.21
2.58	9.89	**13.30**	16.69
3.01	10.96	**14.93**	19.21
3.44	11.95	**16.40**	21.30
3.87	12.86	**17.76**	23.21
4.30	13.71	**19.01**	24.97
4.73	14.50	**20.18**	26.62
5.16	15.26	**21.29**	28.17
5.59	15.98	**22.35**	29.64
6.02	16.68	**23.36**	31.04
6.45	17.34	**24.32**	32.38

CIVIL SOFTWARE DESIGN

SEDCAD+ Version 3

AS BUILT DESIGN SPECIFICATIONS FOR CP-36

by

Name: Brian Sambirsky

Company Name: BHP MINERALS
File Name: C:\BRIAN\CP36

Date: 02-17-1996

Civil Software Design -- SEDCAD+ Version 3.1
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Company Name: BHP MINERALS
Filename: C:\BRIAN\CP36 User: Brian Sambirsky
Date: 02-17-1996 Time: 07:33:03
As built design specifications for CP-36
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 Discharg (cfs)
111	1	19.10	93	M	0.325	0.000	0.000	0.0	1.11	15.97
			Type: Null		Label: CP-36					
111	Structure	19.10							1.11	
111	Total IN/OUT	19.10							1.11	15.97

Civil Software Design -- SEDCAD+ Version 3.1
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Company Name: BHP MINERALS
Filename: C:\BRIAN\CP36 User: Brian Sambirsky
Date: 02-17-1996 Time: 07:33:03
As built design specifications for CP-36
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)	X
1	1	1	1	-a	5	1900.00	2.63	1.62	0.33	0.325		

SEDCAD+ CULVERT SIZING UTILITY

CP-36

Design Discharge	=	15.970 cfs
Entrance Loss Coefficient	=	0.9
Pipe Length	=	70.000 feet
Pipe Slope	=	0.600 %
Manning's n	=	0.020
Maximum Headwater	=	6.500 feet
Tailwater Depth	=	0.000 feet

Smallest Diameter Required to Pass Flow is 21 inches

PERFORMANCE CURVES:

Diameter: 15 inches

Headwater (ft)	Discharge (cfs)	Control	Flow Type
0.65	1.61	Outlet (Subcritical)	1
1.30	3.25	Outlet (Subcritical)	2
1.95	4.67	Outlet	6
2.60	5.73	Outlet	6
3.25	6.61	Outlet	6
3.90	7.39	Outlet	6
4.55	8.11	Outlet	6
5.20	8.75	Outlet	6
5.85	9.36	Outlet	6
6.50	9.93	Outlet	6
7.15	10.46	Outlet	6
7.80	10.98	Outlet	6
8.45	11.46	Outlet	6
9.10	11.94	Outlet	6
9.75	12.38	Outlet	6

Diameter: 18 inches

Headwater (ft)	Discharge (cfs)	Control	Flow Type
0.65	2.25	Outlet (Subcritical)	1
1.30	4.05	Outlet (Subcritical)	1
1.95	6.72	Inlet	5
2.60	8.43	Outlet	6
3.25	9.89	Outlet	6
3.90	11.15	Outlet	6
4.55	12.28	Outlet	6
5.20	13.32	Outlet	6
5.85	14.28	Outlet	6
6.50	15.18	Outlet	6
7.15	16.04	Outlet	6
7.80	16.84	Outlet	6
8.45	17.61	Outlet	6
9.10	18.35	Outlet	6
9.75	19.06	Outlet	6

Diameter: 21 inches

Headwater (ft)	Discharge (cfs)	Control	Flow Type
0.65	3.05	Outlet (Subcritical)	1
1.30	4.79	Outlet (Subcritical)	1
1.95	8.83	Outlet (Subcritical)	1
2.60	11.43	Outlet	6
3.25	13.65	Outlet	6
3.90	15.55	Outlet	6
4.55	17.24	Outlet	6
5.20	18.78	Outlet	6
5.85	20.21	Outlet	6
6.50	21.54	Outlet	6
7.15	22.79	Outlet	6
7.80	23.98	Outlet	6
8.45	25.11	Outlet	6
9.10	26.19	Outlet	6
9.75	27.23	Outlet	6

Diameter: 24 inches

Headwater (ft)	Discharge (cfs)	Control	Flow Type
0.65	3.89	Outlet (Subcritical)	1
1.30	5.89	Outlet (Subcritical)	1
1.95	10.15	Outlet (Subcritical)	1
2.60	14.55	Outlet	6
3.25	17.78	Outlet	6
3.90	20.50	Outlet	6
4.55	22.91	Outlet	6
5.20	25.08	Outlet	6
5.85	27.08	Outlet	6
6.50	28.94	Outlet	6
7.15	30.68	Outlet	6
7.80	32.34	Outlet	6
8.45	33.92	Outlet	6
9.10	35.42	Outlet	6
9.75	36.86	Outlet	6

Diameter: 30 inches

Headwater (ft)	Discharge (cfs)	Control	Flow Type
0.65	5.66	Outlet (Subcritical)	1
1.30	9.03	Outlet (Subcritical)	1
1.95	12.12	Outlet (Subcritical)	1
2.60	19.70	Outlet (Subcritical)	1
3.25	26.43	Outlet	6
3.90	31.50	Outlet	6
4.55	35.87	Outlet	6
5.20	39.76	Outlet	6
5.85	43.29	Outlet	6
6.50	46.56	Outlet	6

7.15	49.62	Outlet	6
7.80	52.50	Outlet	6
8.45	55.23	Outlet	6
9.10	57.83	Outlet	6
9.75	60.32	Outlet	6

Diameter: 36 inches

Headwater (ft)	Discharge (cfs)	Control	Flow Type
0.65	7.42	Outlet (Subcritical)	1
1.30	12.47	Outlet (Subcritical)	1
1.95	16.65	Outlet (Subcritical)	1
2.60	23.00	Outlet (Subcritical)	1
3.25	33.14	Outlet (Subcritical)	1
3.90	42.85	Outlet	6
4.55	50.11	Outlet	6
5.20	56.44	Outlet	6
5.85	62.13	Outlet	6
6.50	67.33	Outlet	6
7.15	72.17	Outlet	6
7.80	76.70	Outlet	6
8.45	80.98	Outlet	6
9.10	85.04	Outlet	6
9.75	88.92	Outlet	6

CIVIL SOFTWARE DESIGN

SEDCAD+ Version 3

AS BUILT DESIGN SPECIFICATIONS FOR CP-37

by

Name: Brian Sambirsky

Company Name: BHP MINERALS
File Name: C:\BRIAN\37

Date: 12-05-1995

Civil Software Design -- SEDCAD+ Version 3.1
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Company Name: BHP MINERALS
Filename: C:\BRIAN\37
User: Brian Sambirsky
Date: 12-05-1995 Time: 10:05:04
As built design specifications for CP-37
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	21.30	89	M	0.330	0.000	0.000	0.0	0.86	12.29
			Type: Null			Label: CP-37				
111	Structure	21.30							0.86	
111	Total IN/OUT	21.30							0.86	12.29

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Company Name: BHP MINERALS
Filename: C:\BRIAN\37
User: Brian Sambirsky
Date: 12-05-1995 Time: 10:05:04
As built design specifications for CP-37
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	2150.00	3.26	1.80	0.33	0.330		

SEDCAD+ CULVERT SIZING UTILITY

CP-37

Design Discharge	=	12.290 cfs
Entrance Loss Coefficient	=	0.5
Pipe Length	=	160.000 feet
Pipe Slope	=	1.500 %
Manning's n	=	0.016
Maximum Headwater	=	5.500 feet
Tailwater Depth	=	0.000 feet

Smallest Diameter Required to Pass Flow is 18 inches

PERFORMANCE CURVES:

Diameter: 12 inches

Headwater (ft)	Discharge (cfs)	Control	Flow Type
0.55	0.90	Inlet (Supercritical)	3
1.10	2.38	Inlet (Supercritical)	4
1.65	3.43	Inlet	5
2.20	4.04	Outlet	6
2.75	4.31	Outlet	6
3.30	4.58	Outlet	6
3.85	4.85	Outlet	6
4.40	5.09	Outlet	6
4.95	5.31	Outlet	6
5.50	5.53	Outlet	6
6.05	5.75	Outlet	6
6.60	5.97	Outlet	6
7.15	6.16	Outlet	6
7.70	6.34	Outlet	6
8.25	6.53	Outlet	6

Diameter: 15 inches

Headwater (ft)	Discharge (cfs)	Control	Flow Type
0.55	1.08	Inlet (Supercritical)	3
1.10	3.02	Inlet (Supercritical)	3
1.65	5.27	Inlet	5
2.20	6.83	Outlet	6
2.75	7.44	Outlet	6
3.30	7.94	Outlet	6
3.85	8.38	Outlet	6
4.40	8.82	Outlet	6
4.95	9.23	Outlet	6
5.50	9.63	Outlet	6
6.05	10.02	Outlet	6
6.60	10.38	Outlet	6
7.15	10.73	Outlet	6
7.70	11.08	Outlet	6
8.25	11.41	Outlet	6

Diameter: 18 inches

Headwater (ft)	Discharge (cfs)	Control	Flow Type
0.55	1.31	Inlet (Supercritical)	3
1.10	3.63	Inlet (Supercritical)	3
1.65	6.66	Inlet (Supercritical)	3
2.20	9.29	Inlet	5
2.75	11.22	Inlet	5
3.30	12.25	Outlet	6
3.85	13.00	Outlet	6
4.40	13.69	Outlet	6
4.95	14.36	Outlet	6
5.50	15.00	Outlet	6
6.05	15.61	Outlet	6
6.60	16.20	Outlet	6
7.15	16.76	Outlet	6
7.70	17.31	Outlet	6
8.25	17.84	Outlet	6

Diameter: 21 inches

Headwater (ft)	Discharge (cfs)	Control	Flow Type
0.55	1.52	Inlet (Supercritical)	3
1.10	4.23	Inlet (Supercritical)	3
1.65	7.77	Inlet (Supercritical)	3
2.20	11.59	Inlet	5
2.75	14.60	Inlet	5
3.30	17.09	Inlet	5
3.85	18.65	Outlet	6
4.40	19.70	Outlet	6
4.95	20.69	Outlet	6
5.50	21.64	Outlet	6
6.05	22.55	Outlet	6
6.60	23.42	Outlet	6
7.15	24.27	Outlet	6
7.70	25.09	Outlet	6
8.25	25.87	Outlet	6

Diameter: 24 inches

Headwater (ft)	Discharge (cfs)	Control	Flow Type
0.55	1.73	Inlet (Supercritical)	3
1.10	4.84	Inlet (Supercritical)	3
1.65	8.88	Inlet (Supercritical)	3
2.20	13.67	Inlet (Supercritical)	3
2.75	17.89	Inlet	5
3.30	21.31	Inlet	5
3.85	24.26	Inlet	5
4.40	26.72	Outlet	6
4.95	28.21	Outlet	6
5.50	29.55	Outlet	6

6.05	30.83	Outlet	6
6.60	32.07	Outlet	6
7.15	33.25	Outlet	6
7.70	34.40	Outlet	6
8.25	35.50	Outlet	6

Diameter: 30 inches

Headwater (ft)	Discharge (cfs)	Control	Flow Type
0.55	2.14	Inlet (Supercritical)	3
1.10	6.04	Inlet (Supercritical)	3
1.65	11.10	Inlet (Supercritical)	3
2.20	17.08	Inlet (Supercritical)	3
2.75	23.87	Inlet (Supercritical)	3
3.30	29.91	Inlet	5
3.85	34.97	Inlet	5
4.40	39.37	Inlet	5
4.95	43.34	Inlet	5
5.50	46.97	Inlet	5
6.05	50.34	Inlet	5
6.60	53.29	Outlet	6
7.15	55.52	Outlet	6
7.70	57.54	Outlet	6
8.25	59.49	Outlet	6

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BLOCK B ROAD MODIFICATION

Culvert CP-49

The location and watershed are shown on Exhibit 11-12D.

RYazzie

BHP Navajo Coal Company
PO Box 1717
Fruitland, NM
87416

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General Information

Storm Information:

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

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Structure Networking:

Type	Stru #	(flows into)	Stru #	Musk. K (hrs)	Musk. X	Description
Culvert	#1	==>	End	0.000	0.000	CP-49

#1
Culvert

Structure Summary:

	Immediate Contributing Area (ac)	Total Contributing Area (ac)	Peak Discharge (cfs)	Total Runoff Volume (ac-ft)
#1	2.600	2.600	3.01	0.13

Structure Detail:

Structure #1 (Culvert)

CP-49

Culvert Inputs:

Length (ft)	Slope (%)	Manning's n	Max. Headwater (ft)	Tailwater (ft)	Entrance Loss Coef. (Ke)
140.00	2.00	0.0150	8.00	0.00	0.90

Culvert Results:

Design Discharge = 3.01 cfs

Minimum pipe diameter: 1 - 10 inch pipe(s) required

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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)
#1	1	2.600	0.026	0.000	0.000	91.000	M	3.01	0.126
	Σ	**2.600**						**3.01**	**0.126**

Subwatershed Time of Concentration Details:

Stru #	SWS #	Land Flow Condition	Slope (%)	Vert. Dist. (ft)	Horiz. Dist. (ft)	Velocity (fps)	Time (hrs)
#1	1	5. Nearly bare and untilled, and alluvial valley fans	3.60	3.00	83.24	1.890	0.012
		8. Large gullies, diversions, and low flowing streams	5.56	19.90	358.17	7.070	0.014
#1	**1**	**Time of Concentration:**					**0.026**

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BLOCK B ROAD MODIFICATION

Culvert CP-50

The location and watershed are shown on Exhibit 11-12D.

RYazzie

BHP Navajo Coal Company
PO Box 1717
Fruitland, NM
87416

General Information

Storm Information:

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

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Structure Networking:

Type	Stru #	(flows into)	Stru #	Musk. K (hrs)	Musk. X	Description
Culvert	#1	==>	End	0.000	0.000	CP-50

#1
Culvert

Structure Summary:

	Immediate Contributing Area (ac)	Total Contributing Area (ac)	Peak Discharge (cfs)	Total Runoff Volume (ac-ft)
#1	72.200	72.200	49.00	3.50

Structure Detail:

Structure #1 (Culvert)

CP-50

Culvert Inputs:

Length (ft)	Slope (%)	Manning's n	Max. Headwater (ft)	Tailwater (ft)	Entrance Loss Coef. (Ke)
140.00	2.10	0.0150	7.00	0.00	0.90

Culvert Results:

Design Discharge = 49.00 cfs

Minimum pipe diameter: 1 - 30 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)
#1	1	72.200	0.203	0.000	0.000	91.000	M	49.00	3.495
	Σ	**72.200**						**49.00**	**3.495**

Subwatershed Time of Concentration Details:

Stru #	SWS #	Land Flow Condition	Slope (%)	Vert. Dist. (ft)	Horiz. Dist. (ft)	Velocity (fps)	Time (hrs)
#1	1	5. Nearly bare and untilled, and alluvial valley fans	1.59	5.00	313.48	1.260	0.069
		8. Large gullies, diversions, and low flowing streams	3.82	108.50	2,837.20	5.860	0.134
#1	**1**	**Time of Concentration:**					**0.203**

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BLOCK B ROAD MODIFICATION

Culvert CP-51

The location and watershed are shown on Exhibit 11-12D.

RYazzie

BHP Navajo Coal Company
PO Box 1717
Fruitland, NM
87416

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General Information

Storm Information:

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

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Structure Networking:

Type	Stru #	(flows into)	Stru #	Musk. K (hrs)	Musk. X	Description
Culvert	#1	==>	End	0.000	0.000	CP-51

#1
Culvert

Structure Summary:

	Immediate Contributing Area (ac)	Total Contributing Area (ac)	Peak Discharge (cfs)	Total Runoff Volume (ac-ft)
#1	122.100	122.100	71.06	5.91

Structure Detail:

Structure #1 (Culvert)

CP-51

Culvert Inputs:

Length (ft)	Slope (%)	Manning's n	Max. Headwater (ft)	Tailwater (ft)	Entrance Loss Coef. (Ke)
134.00	1.10	0.0150	6.70	0.00	0.90

Culvert Results:

Design Discharge = 71.06 cfs

Minimum pipe diameter: 1 - 36 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)
#1	1	122.100	0.327	0.000	0.000	91.000	M	71.06	5.911
	Σ	**122.100**						**71.06**	**5.911**

Subwatershed Time of Concentration Details:

Stru #	SWS #	Land Flow Condition	Slope (%)	Vert. Dist. (ft)	Horiz. Dist. (ft)	Velocity (fps)	Time (hrs)
#1	1	5. Nearly bare and untilled, and alluvial valley fans	1.50	2.74	182.31	1.220	0.041
		8. Large gullies, diversions, and low flowing streams	3.09	167.70	5,427.70	5.270	0.286
#1	**1**	**Time of Concentration:**					**0.327**

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BLOCK B ROAD MODIFICATION

Culverts CP-52 & 53, see utility runs for culvert sizing.The location and watershed are shown on Exhibit 11-12D.

RYazzie

BHP Navajo Coal Company
PO Box 1717
Fruitland, NM
87416

General Information

Storm Information:

Storm Type:	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	==>	End	0.000	0.000	CP-52 & 53

#1
Null

Structure Summary:

	Immediate Contributing Area (ac)	Total Contributing Area (ac)	Peak Discharge (cfs)	Total Runoff Volume (ac-ft)
#1	510.600	510.600	223.96	24.72

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)
#1	1	510.600	0.571	0.000	0.000	91.000	M	223.96	24.718
	Σ	**510.600**						**223.96**	**24.718**

Subwatershed Time of Concentration Details:

Stru #	SWS #	Land Flow Condition	Slope (%)	Vert. Dist. (ft)	Horiz. Dist. (ft)	Velocity (fps)	Time (hrs)
#1	1	5. Nearly bare and untilled, and alluvial valley fans	1.08	5.00	462.88	1.030	0.124
		8. Large gullies, diversions, and low flowing streams	2.72	217.50	7,982.89	4.950	0.447
#1	**1**	**Time of Concentration:**					**0.571**

Culvert CP-52 and 53, Design Storm 10 yr- 6 hr

Culvert Inputs:

Length (ft)	Slope (%)	Manning's n	Max. Headwater (ft)	Tailwater (ft)	Entrance Loss Coef. (Ke)
142.00	0.70	0.0150	8.60	0.00	0.90

Culvert Results:

Minimum pipe diameter: 1 - 42 inch pipe(s) required

Detailed Performance Curves

Design Discharge = 112.00 cfs

Maximum Headwater = 8.60 ft

(BOLD indicates design pipe size)

Headwater (ft)	Discharge (cfs) (36 in)	**Discharge (cfs) (42 in)**	Discharge (cfs) (45 in)
0.86	5.01	**5.85**	6.27
1.72	14.17	**16.53**	17.72
2.58	26.04	**30.37**	32.54
3.44	37.80	**46.76**	50.10
4.30	51.44	**60.10**	70.01
5.16	59.55	**77.77**	86.18
6.02	66.27	**89.24**	100.10
6.88	72.38	**98.38**	112.32
7.74	78.00	**106.69**	122.20
8.60	83.26	**114.36**	131.32
9.46	88.17	**121.58**	139.85
10.32	92.85	**128.37**	147.90
11.18	97.31	**134.82**	155.53
12.04	101.56	**140.99**	162.81
12.90	105.63	**146.91**	169.76

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BLOCK B ROAD MODIFICATION

Culvert CP-54

The location and watershed are shown on Exhibit 11-12D.

RYazzie

BHP Navajo Coal Company
PO Box 1717
Fruitland, NM
87416

General Information

Storm Information:

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

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Structure Networking:

Type	Stru #	(flows into)	Stru #	Musk. K (hrs)	Musk. X	Description
Culvert	#1	==>	End	0.000	0.000	CP-54

#1
Culvert

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Structure Summary:

	Immediate Contributing Area (ac)	Total Contributing Area (ac)	Peak Discharge (cfs)	Total Runoff Volume (ac-ft)
#1	18.500	18.500	13.47	0.90

Structure Detail:

Structure #1 (Culvert)

CP-54

Culvert Inputs:

Length (ft)	Slope (%)	Manning's n	Max. Headwater (ft)	Tailwater (ft)	Entrance Loss Coef. (Ke)
178.00	1.10	0.0150	12.50	0.00	0.90

Culvert Results:

Design Discharge = 13.47 cfs

Minimum pipe diameter: 1 - 18 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)
#1	1	18.500	0.154	0.000	0.000	91.000	M	13.47	0.896
	Σ	**18.500**						**13.47**	**0.896**

Subwatershed Time of Concentration Details:

Stru #	SWS #	Land Flow Condition	Slope (%)	Vert. Dist. (ft)	Horiz. Dist. (ft)	Velocity (fps)	Time (hrs)
#1	1	5. Nearly bare and untilled, and alluvial valley fans	1.12	3.53	314.01	1.060	0.082
		8. Large gullies, diversions, and low flowing streams	4.00	62.13	1,554.64	5.990	0.072
#1	**1**	**Time of Concentration:**					**0.154**

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BLOCK B ROAD MODIFICATION

Culvert: CP-55

The location and watershed are shown on Exhibit 11-12D.

RYazzie

BHP Navajo Coal Company
PO Box 1717
Fruitland, NM
87416

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General Information

Storm Information:

Storm Type:	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
Culvert	#1	==>	End	0.000	0.000	CP-55

#1
Culvert

Structure Summary:

	Immediate Contributing Area (ac)	Total Contributing Area (ac)	Peak Discharge (cfs)	Total Runoff Volume (ac-ft)
#1	319.070	319.070	139.63	14.11

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Structure Detail:

Structure #1 (Culvert)

CP-55

Culvert Inputs:

Length (ft)	Slope (%)	Manning's n	Max. Headwater (ft)	Tailwater (ft)	Entrance Loss Coef. (Ke)
204.00	1.60	0.0150	11.50	0.00	0.90

Culvert Results:

Design Discharge = 139.63 cfs

Minimum pipe diameter: 1 - 42 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)
#1	1	319.070	0.483	0.000	0.000	90.000	M	139.63	14.110
	Σ	**319.070**						**139.63**	**14.110**

Subwatershed Time of Concentration Details:

Stru #	SWS #	Land Flow Condition	Slope (%)	Vert. Dist. (ft)	Horiz. Dist. (ft)	Velocity (fps)	Time (hrs)
#1	1	5. Nearly bare and untilled, and alluvial valley fans	2.26	10.00	441.74	1.500	0.081
		8. Large gullies, diversions, and low flowing streams	2.83	206.80	7,301.32	5.040	0.402
#1	**1**	**Time of Concentration:**					**0.483**

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BLOCK B ROAD MODIFICATION

Culvert CP-56

The location and watershed are shown on Exhibit 11-12D.

RYazzie

BHP Navajo Coal Company
PO Box 1717
Fruitland, NM
87416

General Information

Storm Information:

Storm Type:	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
Culvert	#1	==>	End	0.000	0.000	CP-56

#1
Culvert

Structure Summary:

	Immediate Contributing Area (ac)	Total Contributing Area (ac)	Peak Discharge (cfs)	Total Runoff Volume (ac-ft)
#1	195.100	195.100	109.90	9.44

Structure Detail:

Structure #1 (Culvert)

CP-56

Culvert Inputs:

Length (ft)	Slope (%)	Manning's n	Max. Headwater (ft)	Tailwater (ft)	Entrance Loss Coef. (Ke)
170.00	1.70	0.0150	16.50	0.00	0.90

Culvert Results:

Design Discharge = 109.90 cfs

Minimum pipe diameter: 1 - 36 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)
#1	1	195.100	0.354	0.000	0.000	91.000	M	109.90	9.445
	Σ	**195.100**						**109.90**	**9.445**

Subwatershed Time of Concentration Details:

Stru #	SWS #	Land Flow Condition	Slope (%)	Vert. Dist. (ft)	Horiz. Dist. (ft)	Velocity (fps)	Time (hrs)
#1	1	5. Nearly bare and untilled, and alluvial valley fans	2.45	5.00	204.23	1.560	0.036
		8. Large gullies, diversions, and low flowing streams	3.22	198.61	6,169.46	5.380	0.318
#1	**1**	**Time of Concentration:**					**0.354**

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BLOCK B ROAD MODIFICATION

Culvert CP-57

The location and watershed are shown on Exhibit 11-12D.

RYazzie

BHP Navajo Coal Company
PO Box 1717
Fruitland, NM
87416

General Information

Storm Information:

Storm Type:	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
Culvert	#1	==>	End	0.000	0.000	CP-57

#1
Culvert

Structure Summary:

	Immediate Contributing Area (ac)	Total Contributing Area (ac)	Peak Discharge (cfs)	Total Runoff Volume (ac-ft)
#1	3.700	3.700	4.28	0.18

Structure Detail:

Structure #1 (Culvert)

CP-57

Culvert Inputs:

Length (ft)	Slope (%)	Manning's n	Max. Headwater (ft)	Tailwater (ft)	Entrance Loss Coef. (Ke)
174.00	3.00	0.0150	10.40	0.00	0.90

Culvert Results:

Design Discharge = 4.28 cfs

Minimum pipe diameter: 1 - 10 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)
#1	1	3.700	0.011	0.000	0.000	91.000	M	4.28	0.179
	Σ	**3.700**						**4.28**	**0.179**

Subwatershed Time of Concentration Details:

Stru #	SWS #	Land Flow Condition	Slope (%)	Vert. Dist. (ft)	Horiz. Dist. (ft)	Velocity (fps)	Time (hrs)
#1	1	5. Nearly bare and untilled, and alluvial valley fans	40.14	3.40	8.47	6.330	0.000
		8. Large gullies, diversions, and low flowing streams	11.49	47.44	412.81	10.160	0.011
#1	**1**	**Time of Concentration:**					**0.011**

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BLOCK B ROAD MODIFICATION

Culvert CP-58

The location and watershed are shown on Exhibit 11-12D.

RYazzie

BHP Navajo Coal Company
PO Box 1717
Fruitland, NM
87416

General Information

Storm Information:

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

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Structure Networking:

Type	Stru #	(flows into)	Stru #	Musk. K (hrs)	Musk. X	Description
Culvert	#1	==>	End	0.000	0.000	CP-58

#1
Culvert

Structure Summary:

	Immediate Contributing Area (ac)	Total Contributing Area (ac)	Peak Discharge (cfs)	Total Runoff Volume (ac-ft)
#1	4.700	4.700	5.44	0.23

Structure Detail:

Structure #1 (Culvert)

CP-58

Culvert Inputs:

Length (ft)	Slope (%)	Manning's n	Max. Headwater (ft)	Tailwater (ft)	Entrance Loss Coef. (Ke)
140.00	3.30	0.0150	9.80	0.00	0.90

Culvert Results:

Design Discharge = 5.44 cfs

Minimum pipe diameter: 1 - 12 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)
#1	1	4.700	0.059	0.000	0.000	91.000	M	5.44	0.228
	Σ	**4.700**						**5.44**	**0.228**

Subwatershed Time of Concentration Details:

Stru #	SWS #	Land Flow Condition	Slope (%)	Vert. Dist. (ft)	Horiz. Dist. (ft)	Velocity (fps)	Time (hrs)
#1	1	5. Nearly bare and untilled, and alluvial valley fans	1.71	2.50	146.30	1.300	0.031
		8. Large gullies, diversions, and low flowing streams	7.85	67.07	854.59	8.400	0.028
#1	**1**	**Time of Concentration:**					**0.059**

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BLOCK B ROAD MODIFICATION

Culvert CP-59

The location and watershed are shown on Exhibit 11-12D.

RYazzie

BHP Navajo Coal Company
PO Box 1717
Fruitland, NM
87416

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General Information

Storm Information:

Storm Type:	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
Culvert	#1	==>	End	0.000	0.000	CP-59

#1
Culvert

Structure Summary:

	Immediate Contributing Area (ac)	Total Contributing Area (ac)	Peak Discharge (cfs)	Total Runoff Volume (ac-ft)
#1	4.530	4.530	5.24	0.22

Structure Detail:

Structure #1 (Culvert)

CP-59

Culvert Inputs:

Length (ft)	Slope (%)	Manning's n	Max. Headwater (ft)	Tailwater (ft)	Entrance Loss Coef. (Ke)
142.00	3.40	0.0150	9.60	0.00	0.90

Culvert Results:

Design Discharge = 5.24 cfs

Minimum pipe diameter: 1 - 10 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)
#1	1	4.530	0.028	0.000	0.000	91.000	M	5.24	0.219
	Σ	**4.530**						**5.24**	**0.219**

Subwatershed Time of Concentration Details:

Stru #	SWS #	Land Flow Condition	Slope (%)	Vert. Dist. (ft)	Horiz. Dist. (ft)	Velocity (fps)	Time (hrs)
#1	1	5. Nearly bare and untilled, and alluvial valley fans	12.06	10.80	89.58	3.470	0.007
		8. Large gullies, diversions, and low flowing streams	8.41	56.81	675.60	8.690	0.021
#1	**1**	**Time of Concentration:**					**0.028**

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BLOCK B ROAD MODIFICATION

Culvert CP-60

The location and watershed are shown on Exhibit 11-12D.

RYazzie

BHP Navajo Coal Company
PO Box 1717
Fruitland, NM
87416

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General Information

Storm Information:

Storm Type:	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
Culvert	#1	==>	End	0.000	0.000	CP-60

Structure Summary:

	Immediate Contributing Area (ac)	Total Contributing Area (ac)	Peak Discharge (cfs)	Total Runoff Volume (ac-ft)
#1	13.780	13.780	15.95	0.67

Structure Detail:

Structure #1 (Culvert)

CP-60

Culvert Inputs:

Length (ft)	Slope (%)	Manning's n	Max. Headwater (ft)	Tailwater (ft)	Entrance Loss Coef. (Ke)
230.00	2.50	0.0150	7.00	0.00	0.90

Culvert Results:

Design Discharge = 15.95 cfs

Minimum pipe diameter: 1 - 18 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)
#1	1	13.780	0.116	0.000	0.000	91.000	M	15.95	0.667
	Σ	**13.780**						**15.95**	**0.667**

Subwatershed Time of Concentration Details:

Stru #	SWS #	Land Flow Condition	Slope (%)	Vert. Dist. (ft)	Horiz. Dist. (ft)	Velocity (fps)	Time (hrs)
#1	1	5. Nearly bare and untilled, and alluvial valley fans	3.16	13.00	411.22	1.770	0.064
		8. Large gullies, diversions, and low flowing streams	5.59	75.01	1,342.88	7.090	0.052
#1	**1**	**Time of Concentration:**					**0.116**

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BLOCK B ROAD MODIFICATION

Culvert CP-61

The location and watershed are shown on Exhibit 11-12.

RYazzie

BHP Navajo Coal Company
PO Box 1717
Fruitland, NM
87416

General Information

Storm Information:

Storm Type:	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
Culvert	#1	==>	End	0.000	0.000	CP-61

#1
Culvert

Structure Summary:

	Immediate Contributing Area (ac)	Total Contributing Area (ac)	Peak Discharge (cfs)	Total Runoff Volume (ac-ft)
#1	53.870	53.870	39.23	2.61

Structure Detail:

Structure #1 (Culvert)

CP-61

Culvert Inputs:

Length (ft)	Slope (%)	Manning's n	Max. Headwater (ft)	Tailwater (ft)	Entrance Loss Coef. (Ke)
140.00	2.90	0.0150	6.50	0.00	0.90

Culvert Results:

Design Discharge = 39.23 cfs

Minimum pipe diameter: 1 - 30 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)
#1	1	53.870	0.158	0.000	0.000	91.000	M	39.23	2.608
	Σ	**53.870**						**39.23**	**2.608**

Subwatershed Time of Concentration Details:

Stru #	SWS #	Land Flow Condition	Slope (%)	Vert. Dist. (ft)	Horiz. Dist. (ft)	Velocity (fps)	Time (hrs)
#1	1	5. Nearly bare and untilled, and alluvial valley fans	0.75	1.00	134.15	0.860	0.043
		8. Large gullies, diversions, and low flowing streams	5.95	180.83	3,041.26	7.310	0.115
#1	**1**	**Time of Concentration:**					**0.158**

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BLOCK B ROAD MODIFICATION

Culvert CP-62

the location and watershed are shown on Exhibit 11-12D.

RYazzie

BHP Navajo Coal Company
PO Box 1717
Fruitland, NM
87416

General Information

Storm Information:

Storm Type:	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
Culvert	#1	==>	End	0.000	0.000	CP-62

#1
Culvert

Structure Summary:

	Immediate Contributing Area (ac)	Total Contributing Area (ac)	Peak Discharge (cfs)	Total Runoff Volume (ac-ft)
#1	8.700	8.700	10.07	0.42

Structure Detail:

Structure #1 (Culvert)

CP-62

Culvert Inputs:

Length (ft)	Slope (%)	Manning's n	Max. Headwater (ft)	Tailwater (ft)	Entrance Loss Coef. (Ke)
128.00	3.60	0.0150	3.70	0.00	0.90

Culvert Results:

Design Discharge = 10.07 cfs

Minimum pipe diameter: 1 - 15 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)
#1	1	8.700	0.059	0.000	0.000	91.000	M	10.07	0.421
	Σ	**8.700**						**10.07**	**0.421**

Subwatershed Time of Concentration Details:

Stru #	SWS #	Land Flow Condition	Slope (%)	Vert. Dist. (ft)	Horiz. Dist. (ft)	Velocity (fps)	Time (hrs)
#1	1	5. Nearly bare and untilled, and alluvial valley fans	10.45	10.00	95.69	3.230	0.008
		8. Large gullies, diversions, and low flowing streams	5.92	80.61	1,360.65	7.300	0.051
#1	**1**	**Time of Concentration:**					**0.059**

CIVIL SOFTWARE DESIGN

SEDCAD+ Version 3

AS BUILT DESIGN SPECIFICATIONS FOR CP-63

by

Name: Brian Sambirsky

Company Name: BHP MINERALS
File Name: C:\BRIAN\63

Date: 12-05-1995

Civil Software Design -- SEDCAD+ Version 3.1
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Company Name: BHP MINERALS
Filename: C:\BRIAN\63 User: Brian Sambirsky
Date: 12-05-1995 Time: 10:05:11
As built design specifications for CP-63
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	9.40	89	M	0.105	0.000	0.000	0.0	0.38	10.13
		Type: Null			Label: CP-63					
111	Structure	9.40							0.38	
111	Total IN/OUT	9.40							0.38	10.13

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Company Name: BHP MINERALS
Filename: C:\BRIAN\63 User: Brian Sambirsky
Date: 12-05-1995 Time: 10:05:11
As built design specifications for CP-63
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	950.00	6.32	2.51	0.11	0.105		

SEDCAD+ CULVERT SIZING UTILITY

CP-63a

Design Discharge	=	10.130 cfs
Entrance Loss Coefficient	=	0.9
Pipe Length	=	40.000 feet
Pipe Slope	=	1.000 %
Manning's n	=	0.013
Maximum Headwater	=	4.740 feet
Tailwater Depth	=	0.000 feet

Smallest Diameter Required to Pass Flow is 15 inches

PERFORMANCE CURVES:

Diameter: 9 inches

Headwater (ft)	Discharge (cfs)	Control	Flow Type
0.47	0.64	Outlet (Subcritical)	2
0.95	1.30	Inlet (Supercritical)	4
1.42	1.99	Outlet	6
1.90	2.31	Outlet	6
2.37	2.63	Outlet	6
2.84	2.95	Outlet	6
3.32	3.19	Outlet	6
3.79	3.42	Outlet	6
4.27	3.65	Outlet	6
4.74	3.88	Outlet	6
5.21	4.08	Outlet	6
5.69	4.26	Outlet	6
6.16	4.43	Outlet	6
6.64	4.61	Outlet	6
7.11	4.79	Outlet	6

Diameter: 12 inches

Headwater (ft)	Discharge (cfs)	Control	Flow Type
0.47	0.78	Outlet (Subcritical)	2
0.95	1.94	Inlet (Supercritical)	3
1.42	3.25	Inlet	5
1.90	4.19	Inlet	5
2.37	4.90	Outlet	6
2.84	5.47	Outlet	6
3.32	6.01	Outlet	6
3.79	6.47	Outlet	6
4.27	6.93	Outlet	6
4.74	7.34	Outlet	6
5.21	7.73	Outlet	6
5.69	8.12	Outlet	6
6.16	8.47	Outlet	6
6.64	8.82	Outlet	6
7.11	9.15	Outlet	6

Diameter: 15 inches

Headwater (ft)	Discharge (cfs)	Control	Flow Type
0.47	0.90	Inlet (Supercritical)	3
0.95	2.43	Inlet (Supercritical)	3
1.42	4.39	Inlet (Supercritical)	4
1.90	6.09	Inlet	5
2.37	7.39	Inlet	5
2.84	8.50	Inlet	5
3.32	9.48	Inlet	5
3.79	10.34	Outlet	6
4.27	11.10	Outlet	6
4.74	11.81	Outlet	6
5.21	12.47	Outlet	6
5.69	13.11	Outlet	6
6.16	13.72	Outlet	6
6.64	14.30	Outlet	6
7.11	14.86	Outlet	6

Diameter: 18 inches

Headwater (ft)	Discharge (cfs)	Control	Flow Type
0.47	1.03	Inlet (Supercritical)	3
0.95	2.90	Inlet (Supercritical)	3
1.42	5.33	Inlet (Supercritical)	3
1.90	7.94	Inlet	5
2.37	9.99	Inlet	5
2.84	11.67	Inlet	5
3.32	13.15	Inlet	5
3.79	14.47	Inlet	5
4.27	15.69	Inlet	5
4.74	16.82	Inlet	5
5.21	17.87	Inlet	5
5.69	18.87	Inlet	5
6.16	19.82	Inlet	5
6.64	20.72	Inlet	5
7.11	21.59	Inlet	5

Diameter: 21 inches

Headwater (ft)	Discharge (cfs)	Control	Flow Type
0.47	1.22	Inlet (Supercritical)	3
0.95	3.39	Inlet (Supercritical)	3
1.42	6.22	Inlet (Supercritical)	3
1.90	9.57	Inlet (Supercritical)	3
2.37	12.60	Inlet	5
2.84	15.06	Inlet	5
3.32	17.16	Inlet	5
3.79	19.04	Inlet	5
4.27	20.74	Inlet	5
4.74	22.32	Inlet	5

5.21	23.79	Inlet	5
5.69	25.18	Inlet	5
6.16	26.49	Inlet	5
6.64	27.74	Inlet	5
7.11	28.94	Inlet	5

Diameter: 24 inches

Headwater (ft)	Discharge (cfs)	Control	Flow Type
0.47	1.39	Inlet (Supercritical)	3
0.95	3.87	Inlet (Supercritical)	3
1.42	7.10	Inlet (Supercritical)	3
1.90	10.93	Inlet (Supercritical)	3
2.37	15.20	Inlet (Supercritical)	3
2.84	18.51	Inlet	5
3.32	21.41	Inlet	5
3.79	23.97	Inlet	5
4.27	26.27	Inlet	5
4.74	28.39	Inlet	5
5.21	30.36	Inlet	5
5.69	32.21	Inlet	5
6.16	33.97	Inlet	5
6.64	35.63	Inlet	5
7.11	37.22	Inlet	5

SEDCAD+ CULVERT SIZING UTILITY

CP-63b

Design Discharge	=	10.130 cfs
Entrance Loss Coefficient	=	0.9
Pipe Length	=	133.000 feet
Pipe Slope	=	2.800 %
Manning's n	=	0.013
Maximum Headwater	=	4.500 feet
Tailwater Depth	=	0.000 feet

Smallest Diameter Required to Pass Flow is 15 inches

PERFORMANCE CURVES:

Diameter: 9 inches

Headwater (ft)	Discharge (cfs)	Control	Flow Type
0.45	0.61	Outlet (Subcritical)	2
0.90	1.25	Inlet (Supercritical)	4
1.35	1.97	Inlet	5
1.80	2.34	Inlet	5
2.25	2.69	Outlet	6
2.70	3.01	Outlet	6
3.15	3.11	Outlet	6
3.60	3.21	Outlet	6
4.05	3.31	Outlet	6
4.50	3.41	Outlet	6
4.95	3.52	Outlet	6
5.40	3.62	Outlet	6
5.85	3.72	Outlet	6
6.30	3.82	Outlet	6
6.75	3.92	Outlet	6

Diameter: 12 inches

Headwater (ft)	Discharge (cfs)	Control	Flow Type
0.45	0.74	Outlet (Subcritical)	2
0.90	1.81	Inlet (Supercritical)	3
1.35	3.09	Inlet	5
1.80	4.05	Inlet	5
2.25	4.82	Inlet	5
2.70	5.48	Inlet	5
3.15	6.05	Inlet	5
3.60	6.34	Inlet	5
4.05	6.64	Outlet	6
4.50	6.93	Outlet	6
4.95	7.15	Outlet	6
5.40	7.35	Outlet	6
5.85	7.54	Outlet	6
6.30	7.74	Outlet	6
6.75	7.94	Outlet	6

Diameter: 15 inches

Headwater (ft)	Discharge (cfs)	Control	Flow Type
0.45	0.85	Inlet (Supercritical)	3
0.90	2.25	Inlet (Supercritical)	3
1.35	4.10	Inlet (Supercritical)	3
1.80	5.78	Inlet	5
2.25	7.09	Inlet	5
2.70	8.18	Inlet	5
3.15	9.15	Inlet	5
3.60	10.03	Inlet	5
4.05	10.83	Inlet	5
4.50	11.57	Inlet	5
4.95	12.15	Inlet	5
5.40	12.50	Inlet	5
5.85	12.85	Outlet	6
6.30	13.19	Outlet	6
6.75	13.51	Outlet	6

Diameter: 18 inches

Headwater (ft)	Discharge (cfs)	Control	Flow Type
0.45	0.97	Inlet (Supercritical)	3
0.90	2.70	Inlet (Supercritical)	3
1.35	4.93	Inlet (Supercritical)	3
1.80	7.46	Inlet (Supercritical)	4
2.25	9.50	Inlet	5
2.70	11.18	Inlet	5
3.15	12.64	Inlet	5
3.60	13.96	Inlet	5
4.05	15.15	Inlet	5
4.50	16.25	Inlet	5
4.95	17.29	Inlet	5
5.40	18.27	Inlet	5
5.85	19.20	Inlet	5
6.30	20.06	Inlet	5
6.75	20.63	Outlet	6

Diameter: 21 inches

Headwater (ft)	Discharge (cfs)	Control	Flow Type
0.45	1.12	Inlet (Supercritical)	3
0.90	3.13	Inlet (Supercritical)	3
1.35	5.75	Inlet (Supercritical)	3
1.80	8.85	Inlet (Supercritical)	3
2.25	11.90	Inlet	5
2.70	14.35	Inlet	5
3.15	16.44	Inlet	5
3.60	18.30	Inlet	5
4.05	19.99	Inlet	5
4.50	21.54	Inlet	5

4.95	22.99	Inlet	5
5.40	24.35	Inlet	5
5.85	25.63	Inlet	5
6.30	26.86	Inlet	5
6.75	28.04	Inlet	5

Diameter: 24 inches

Headwater (ft)	Discharge (cfs)	Control	Flow Type
0.45	1.29	Inlet (Supercritical)	3
0.90	3.59	Inlet (Supercritical)	3
1.35	6.57	Inlet (Supercritical)	3
1.80	10.11	Inlet (Supercritical)	3
2.25	14.13	Inlet (Supercritical)	3
2.70	17.54	Inlet	5
3.15	20.43	Inlet	5
3.60	22.97	Inlet	5
4.05	25.25	Inlet	5
4.50	27.34	Inlet	5
4.95	29.28	Inlet	5
5.40	31.10	Inlet	5
5.85	32.82	Inlet	5
6.30	34.46	Inlet	5
6.75	36.02	Inlet	5

Page 245-263 Blank due to culvert removals and updates.

CIVIL SOFTWARE DESIGN

SEDCAD+ Version 3

AS BUILT DESIGN SPECIFICATIONS FOR CP-70, CP-71 AND CP-72

by

Name: bts

Company Name: BHP MINERALS
File Name: C:\BRIAN\707172

Date: 07-05-1996

Civil Software Design -- SEDCAD+ Version 3.1
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Company Name: BHP MINERALS
Filename: C:\BRIAN\707172 User: bts
Date: 07-05-1996 Time: 05:58:26
As built design specifications for cp-70, cp-71 and cp-72
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	6.10	82	M	0.496	0.000	0.000	0.0	0.12	1.31
		Type: Culvert Label: CP-70								
111	Structure	6.10							0.12	
111	Total IN/OUT	6.10							0.12	1.31
112	1	25.40	89	M	0.319	0.000	0.000	0.0	1.03	14.89
		Type: Null Label: CP-71								
112	Structure	25.40							1.15	
112	Total IN/OUT	31.50							1.15	15.64
111 to 112 Routing						0.155	0.208			
121	1	20.30	89	M	0.329	0.000	0.000	0.0	0.82	11.73
		Type: Null Label: CP-72								
121	Structure	20.30							0.82	
121	Total IN/OUT	20.30							0.82	11.73

Civil Software Design -- SEDCAD+ Version 3.1
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Company Name: BHP MINERALS
Filename: C:\BRIAN\707172 User: bts
Date: 07-05-1996 Time: 05:58:26
As built design specifications for cp-70, cp-71 and cp-72
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)	X
1	1	1	1	-a	5	2000.00	1.25	1.12	0.50	0.496		
1	1	2	1	-a	5	2100.00	3.33	1.82	0.32	0.319		
1	2	1	1	-a	5	1520.00	1.64	1.28	0.33	0.329		

4.40	6.23	Outlet	6
4.80	6.45	Outlet	6
5.20	6.67	Outlet	6
5.60	6.89	Outlet	6
6.00	7.10	Outlet	6

Diameter: 15 inches

Headwater (ft)	Discharge (cfs)	Control	Flow Type
0.40	0.76	Outlet (Subcritical)	2
0.80	1.88	Inlet (Supercritical)	3
1.20	3.45	Inlet (Supercritical)	3
1.60	5.10	Inlet	5
2.00	6.39	Inlet	5
2.40	7.46	Inlet	5
2.80	8.40	Inlet	5
3.20	9.15	Inlet	5
3.60	9.63	Outlet	6
4.00	10.09	Outlet	6
4.40	10.49	Outlet	6
4.80	10.89	Outlet	6
5.20	11.26	Outlet	6
5.60	11.63	Outlet	6
6.00	11.99	Outlet	6

Diameter: 8 inches

Headwater (ft)	Discharge (cfs)	Control	Flow Type
0.40	0.49	Outlet (Subcritical)	2
0.80	0.99	Inlet	5
1.20	1.19	Inlet	5
1.60	1.39	Inlet	5
2.00	1.59	Outlet	6
2.40	1.79	Outlet	6
2.80	1.99	Outlet	6
3.20	2.07	Outlet	6
3.60	2.15	Outlet	6
4.00	2.22	Outlet	6
4.40	2.30	Outlet	6
4.80	2.38	Outlet	6
5.20	2.45	Outlet	6
5.60	2.53	Outlet	6
6.00	2.61	Outlet	6

Diameter: 9 inches

Headwater (ft)	Discharge (cfs)	Control	Flow Type
0.40	0.54	Outlet (Subcritical)	2
0.80	1.10	Inlet (Supercritical)	3
1.20	1.73	Inlet (Supercritical)	4
1.60	2.09	Inlet	5
2.00	2.25	Inlet	5
2.40	2.40	Inlet	5
2.80	2.56	Outlet	6
3.20	2.71	Outlet	6
3.60	2.87	Outlet	6
4.00	3.02	Outlet	6
4.40	3.12	Outlet	6
4.80	3.21	Outlet	6
5.20	3.31	Outlet	6
5.60	3.41	Outlet	6
6.00	3.51	Outlet	6

Diameter: 12 inches

Headwater (ft)	Discharge (cfs)	Control	Flow Type
0.40	0.65	Outlet (Subcritical)	2
0.80	1.53	Inlet (Supercritical)	3
1.20	2.68	Inlet (Supercritical)	4
1.60	3.63	Inlet	5
2.00	4.35	Inlet	5
2.40	4.95	Outlet	6
2.80	5.24	Outlet	6
3.20	5.50	Outlet	6
3.60	5.76	Outlet	6
4.00	6.01	Outlet	6

SEDCAD+ CULVERT SIZING UTILITY

CP-70

Design Discharge	=	1.310 cfs
Entrance Loss Coefficient	=	0.9
Pipe Length	=	101.000 feet
Pipe Slope	=	1.900 %
Manning's n	=	0.014
Maximum Headwater	=	4.000 feet
Tailwater Depth	=	0.000 feet

Smallest Diameter Required to Pass Flow is 8 inches

PERFORMANCE CURVES:

Diameter: 4 inches

Headwater (ft)	Discharge (cfs)	Control	Flow Type
0.40	0.01		0
0.80	0.02		0
1.20	0.03		0
1.60	0.05		0
2.00	0.06		0
2.40	0.07		0
2.80	0.08		0
3.20	0.09	Outlet (Subcritical)	1
3.60	0.10	Outlet (Subcritical)	1
4.00	0.12	Outlet (Subcritical)	1
4.40	0.13	Outlet (Subcritical)	1
4.80	0.14	Outlet (Subcritical)	1
5.20	0.15	Outlet (Subcritical)	1
5.60	0.16	Outlet (Subcritical)	1
6.00	0.17	Outlet (Subcritical)	1

Diameter: 6 inches

Headwater (ft)	Discharge (cfs)	Control	Flow Type
0.40	0.13	Outlet (Subcritical)	1
0.80	0.27	Outlet (Subcritical)	2
1.20	0.40	Outlet (Subcritical)	2
1.60	0.53	Inlet (Supercritical)	3
2.00	0.67	Inlet (Supercritical)	4
2.40	0.80	Inlet	5
2.80	0.94	Outlet	6
3.20	1.02	Outlet	6
3.60	1.05	Outlet	6
4.00	1.07	Outlet	6
4.40	1.10	Outlet	6
4.80	1.13	Outlet	6
5.20	1.16	Outlet	6
5.60	1.19	Outlet	6
6.00	1.22	Outlet	6

Diameter: 15 inches

Headwater (ft)	Discharge (cfs)	Control	Flow Type
0.35	0.66	Outlet (Subcritical)	2
0.70	1.56	Inlet (Supercritical)	3
1.05	2.83	Inlet (Supercritical)	3
1.40	4.30	Inlet (Supercritical)	4
1.75	5.61	Inlet	5
2.10	6.67	Inlet	5
2.45	7.48	Inlet	5
2.80	8.12	Outlet	6
3.15	8.55	Outlet	6
3.50	8.99	Outlet	6
3.85	9.37	Outlet	6
4.20	9.76	Outlet	6
4.55	10.13	Outlet	6
4.90	10.48	Outlet	6
5.25	10.83	Outlet	6

Diameter: 18 inches

Headwater (ft)	Discharge (cfs)	Control	Flow Type
0.35	0.75	Outlet (Subcritical)	2
0.70	1.85	Inlet (Supercritical)	3
1.05	3.39	Inlet (Supercritical)	3
1.40	5.21	Inlet (Supercritical)	3
1.75	7.22	Inlet (Supercritical)	3
2.10	8.87	Inlet	5
2.45	10.28	Inlet	5
2.80	11.52	Inlet	5
3.15	12.64	Inlet	5
3.50	13.44	Inlet	5
3.85	14.09	Outlet	6
4.20	14.69	Outlet	6
4.55	15.28	Outlet	6
4.90	15.84	Outlet	6
5.25	16.38	Outlet	6

Diameter: 21 inches

Headwater (ft)	Discharge (cfs)	Control	Flow Type
0.35	0.83	Outlet (Subcritical)	2
0.70	2.15	Inlet (Supercritical)	3
1.05	3.94	Inlet (Supercritical)	3
1.40	6.07	Inlet (Supercritical)	3
1.75	8.49	Inlet (Supercritical)	3
2.10	10.97	Inlet	5
2.45	13.05	Inlet	5
2.80	14.85	Inlet	5
3.15	16.44	Inlet	5
3.50	17.91	Inlet	5

SEDCAD+ CULVERT SIZING UTILITY

CP-71A & CP-71B

Design Discharge	=	7.820	cfs
Entrance Loss Coefficient	=	0.9	
Pipe Length	=	101.000	feet
Pipe Slope	=	1.400	%
Manning's n	=	0.014	
Maximum Headwater	=	3.500	feet
Tailwater Depth	=	0.000	feet

Smallest Diameter Required to Pass Flow is 15 inches

PERFORMANCE CURVES:

Diameter: 9 inches

Headwater (ft)	Discharge (cfs)	Control	Flow Type
0.35	0.47	Outlet (Subcritical)	1
0.70	0.95	Inlet (Supercritical)	3
1.05	1.39	Inlet (Supercritical)	4
1.40	1.82	Inlet	5
1.75	2.07	Outlet	6
2.10	2.19	Outlet	6
2.45	2.31	Outlet	6
2.80	2.43	Outlet	6
3.15	2.56	Outlet	6
3.50	2.68	Outlet	6
3.85	2.80	Outlet	6
4.20	2.92	Outlet	6
4.55	3.03	Outlet	6
4.90	3.11	Outlet	6
5.25	3.20	Outlet	6

Diameter: 12 inches

Headwater (ft)	Discharge (cfs)	Control	Flow Type
0.35	0.57	Outlet (Subcritical)	2
0.70	1.25	Inlet (Supercritical)	3
1.05	2.24	Inlet (Supercritical)	3
1.40	3.20	Inlet	5
1.75	3.96	Inlet	5
2.10	4.28	Inlet	5
2.45	4.58	Outlet	6
2.80	4.88	Outlet	6
3.15	5.14	Outlet	6
3.50	5.36	Outlet	6
3.85	5.59	Outlet	6
4.20	5.82	Outlet	6
4.55	6.04	Outlet	6
4.90	6.23	Outlet	6
5.25	6.42	Outlet	6

3.85	19.25	Inlet	5
4.20	20.45	Inlet	5
4.55	21.40	Outlet	6
4.90	22.22	Outlet	6
5.25	23.02	Outlet	6

Diameter: 24 inches

Headwater (ft)	Discharge (cfs)	Control	Flow Type
0.35	0.91	Inlet (Supercritical)	3
0.70	2.47	Inlet (Supercritical)	3
1.05	4.51	Inlet (Supercritical)	3
1.40	6.94	Inlet (Supercritical)	3
1.75	9.70	Inlet (Supercritical)	3
2.10	12.75	Inlet (Supercritical)	3
2.45	15.74	Inlet (Supercritical)	4
2.80	18.22	Inlet	5
3.15	20.43	Inlet	5
3.50	22.43	Inlet	5
3.85	24.26	Inlet	5
4.20	25.97	Inlet	5
4.55	27.56	Inlet	5
4.90	29.07	Inlet	5
5.25	30.51	Inlet	5

SEDCAD+ CULVERT SIZING UTILITY

CP-72A & CP-72B

Design Discharge	=	5.870 cfs
Entrance Loss Coefficient	=	0.9
Pipe Length	=	81.000 feet
Pipe Slope	=	2.300 %
Manning's n	=	0.013
Maximum Headwater	=	4.500 feet
Tailwater Depth	=	0.000 feet

Smallest Diameter Required to Pass Flow is 12 inches

PERFORMANCE CURVES:

Diameter: 8 inches

Headwater (ft)	Discharge (cfs)	Control	Flow Type
0.45	0.55	Inlet (Supercritical)	3
0.90	1.08	Inlet	5
1.35	1.50	Inlet	5
1.80	1.91	Outlet	6
2.25	2.09	Outlet	6
2.70	2.20	Outlet	6
3.15	2.32	Outlet	6
3.60	2.43	Outlet	6
4.05	2.54	Outlet	6
4.50	2.65	Outlet	6
4.95	2.77	Outlet	6
5.40	2.88	Outlet	6
5.85	2.99	Outlet	6
6.30	3.08	Outlet	6
6.75	3.16	Outlet	6

Diameter: 9 inches

Headwater (ft)	Discharge (cfs)	Control	Flow Type
0.45	0.61	Outlet (Subcritical)	2
0.90	1.25	Inlet (Supercritical)	4
1.35	1.97	Inlet	5
1.80	2.30	Inlet	5
2.25	2.62	Outlet	6
2.70	2.93	Outlet	6
3.15	3.11	Outlet	6
3.60	3.26	Outlet	6
4.05	3.40	Outlet	6
4.50	3.54	Outlet	6
4.95	3.69	Outlet	6
5.40	3.83	Outlet	6
5.85	3.97	Outlet	6
6.30	4.09	Outlet	6
6.75	4.20	Outlet	6

4.95	17.29	Inlet	5
5.40	18.27	Inlet	5
5.85	19.20	Inlet	5
6.30	20.08	Inlet	5
6.75	20.87	Outlet	6

Diameter: 21 inches

Headwater (ft)	Discharge (cfs)	Control	Flow Type
0.45	1.12	Inlet (Supercritical)	3
0.90	3.13	Inlet (Supercritical)	3
1.35	5.75	Inlet (Supercritical)	3
1.80	8.85	Inlet (Supercritical)	3
2.25	11.90	Inlet	5
2.70	14.35	Inlet	5
3.15	16.44	Inlet	5
3.60	18.30	Inlet	5
4.05	19.99	Inlet	5
4.50	21.54	Inlet	5
4.95	22.99	Inlet	5
5.40	24.35	Inlet	5
5.85	25.63	Inlet	5
6.30	26.86	Inlet	5
6.75	28.04	Inlet	5

Diameter: 12 inches

Headwater (ft)	Discharge (cfs)	Control	Flow Type
0.45	0.74	Outlet (Subcritical)	2
0.90	1.81	Inlet (Supercritical)	3
1.35	3.09	Inlet	5
1.80	4.05	Inlet	5
2.25	4.82	Inlet	5
2.70	5.48	Inlet	5
3.15	6.05	Inlet	5
3.60	6.38	Inlet	5
4.05	6.70	Outlet	6
4.50	7.02	Outlet	6
4.95	7.29	Outlet	6
5.40	7.56	Outlet	6
5.85	7.83	Outlet	6
6.30	8.09	Outlet	6
6.75	8.32	Outlet	6

Diameter: 15 inches

Headwater (ft)	Discharge (cfs)	Control	Flow Type
0.45	0.85	Inlet (Supercritical)	3
0.90	2.25	Inlet (Supercritical)	3
1.35	4.10	Inlet (Supercritical)	3
1.80	5.78	Inlet	5
2.25	7.09	Inlet	5
2.70	8.18	Inlet	5
3.15	9.15	Inlet	5
3.60	10.03	Inlet	5
4.05	10.83	Inlet	5
4.50	11.53	Outlet	6
4.95	12.13	Outlet	6
5.40	12.60	Outlet	6
5.85	13.05	Outlet	6
6.30	13.48	Outlet	6
6.75	13.91	Outlet	6

Diameter: 18 inches

Headwater (ft)	Discharge (cfs)	Control	Flow Type
0.45	0.97	Inlet (Supercritical)	3
0.90	2.70	Inlet (Supercritical)	3
1.35	4.93	Inlet (Supercritical)	3
1.80	7.46	Inlet (Supercritical)	4
2.25	9.50	Inlet	5
2.70	11.18	Inlet	5
3.15	12.64	Inlet	5
3.60	13.96	Inlet	5
4.05	15.15	Inlet	5
4.50	16.25	275Inlet	5

Page 276-279 blank due to text re-formatting

CIVIL SOFTWARE DESIGN

SEDCAD+ Version 3

AS BUILT DESIGN SPECIFICATIONS FOR CP-74

by

Name: BRIAN SAMBIRSKY

Company Name: BHP MINERALS
File Name: C:\BRIAN\74

Date: 12-05-1995

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Company Name: BHP MINERALS
Filename: C:\BRIAN\74
User: BRIAN SAMBIRSKY
Date: 12-05-1995 Time: 10:05:02
AS BUILT DESIGN SPECIFICATIONS FOR CP-74
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	15.70	89	M	0.125	0.000	0.000	0.0	0.63	16.93
		Type: Null			Label: CP-74					
111	Structure	15.70							0.63	
111	Total IN/OUT	15.70							0.63	16.93

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Company Name: BHP MINERALS
Filename: C:\BRIAN\74
User: BRIAN SAMBIRSKY
Date: 12-05-1995 Time: 10:05:02
AS BUILT DESIGN SPECIFICATIONS FOR CP-74
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 Condition	Flow	Distance (ft)	Slope (%)	Velocity (fps)	Segment Time (hr)	Time Conc. (hr)	Muskingum K (hr)	Muskingum X
1	1	1	1	-a	5		850.00	3.53	1.88	0.13	0.125		

SEDCAD+ CULVERT SIZING UTILITY

CP-74

Design Discharge	=	16.930 cfs
Entrance Loss Coefficient	=	0.9
Pipe Length	=	110.000 feet
Pipe Slope	=	1.100 %
Manning's n	=	0.027
Maximum Headwater	=	7.000 feet
Tailwater Depth	=	0.000 feet

Smallest Diameter Required to Pass Flow is 24 inches

PERFORMANCE CURVES:

Diameter: 18 inches

Headwater (ft)	Discharge (cfs)	Control	Flow Type
0.70	2.59	Outlet (Subcritical)	1
1.40	4.53	Outlet (Subcritical)	1
2.10	6.25	Outlet	6
2.80	7.25	Outlet	6
3.50	8.13	Outlet	6
4.20	8.93	Outlet	6
4.90	9.65	Outlet	6
5.60	10.32	Outlet	6
6.30	10.97	Outlet	6
7.00	11.56	Outlet	6
7.70	12.13	Outlet	6
8.40	12.67	Outlet	6
9.10	13.20	Outlet	6
9.80	13.70	Outlet	6
10.50	14.18	Outlet	6

Diameter: 21 inches

Headwater (ft)	Discharge (cfs)	Control	Flow Type
0.70	3.57	Outlet (Subcritical)	1
1.40	5.22	Outlet (Subcritical)	1
2.10	8.72	Inlet	5
2.80	10.30	Outlet	6
3.50	11.64	Outlet	6
4.20	12.85	Outlet	6
4.90	13.96	Outlet	6
5.60	14.98	Outlet	6
6.30	15.93	Outlet	6
7.00	16.83	Outlet	6
7.70	17.68	Outlet	6
8.40	18.50	Outlet	6
9.10	19.28	Outlet	6
9.80	20.03	Outlet	6
10.50	20.75	Outlet	6

Diameter: 24 inches

Headwater (ft)	Discharge (cfs)	Control	Flow Type
0.70	4.84	Outlet (Subcritical)	1
1.40	6.03	Outlet (Subcritical)	1
2.10	11.21	Outlet (Subcritical)	1
2.80	13.79	Outlet	6
3.50	15.75	Outlet	6
4.20	17.48	Outlet	6
4.90	19.07	Outlet	6
5.60	20.52	Outlet	6
6.30	21.88	Outlet	6
7.00	23.17	Outlet	6
7.70	24.38	Outlet	6
8.40	25.53	Outlet	6
9.10	26.64	Outlet	6
9.80	27.70	Outlet	6
10.50	28.71	Outlet	6

Diameter: 30 inches

Headwater (ft)	Discharge (cfs)	Control	Flow Type
0.70	7.83	Outlet (Subcritical)	1
1.40	9.88	Outlet (Subcritical)	1
2.10	13.87	Outlet (Subcritical)	1
2.80	21.67	Outlet (Subcritical)	1
3.50	25.40	Outlet	6
4.20	28.63	Outlet	6
4.90	31.53	Outlet	6
5.60	34.20	Outlet	6
6.30	36.66	Outlet	6
7.00	38.97	Outlet	6
7.70	41.15	Outlet	6
8.40	43.22	Outlet	6
9.10	45.20	Outlet	6
9.80	47.09	Outlet	6
10.50	48.91	Outlet	6

Diameter: 36 inches

Headwater (ft)	Discharge (cfs)	Control	Flow Type
0.70	11.34	Outlet (Subcritical)	1
1.40	14.58	Outlet (Subcritical)	1
2.10	17.38	Outlet (Subcritical)	1
2.80	26.11	Outlet (Subcritical)	1
3.50	36.28	Outlet (Subcritical)	2
4.20	41.73	Outlet	6
4.90	46.55	Outlet	6
5.60	50.92	Outlet	6
6.30	54.95	Outlet	6
7.00	58.70	Outlet	6

7.70	62.23	Outlet	6
8.40	65.56	Outlet	6
9.10	68.74	Outlet	6
9.80	71.77	Outlet	6
10.50	74.68	Outlet	6

Diameter: 42 inches

Headwater (ft)	Discharge (cfs)	Control	Flow Type
0.70	15.22	Outlet (Subcritical)	1
1.40	19.97	Outlet (Subcritical)	1
2.10	24.06	Outlet (Subcritical)	1
2.80	29.43	Outlet (Subcritical)	1
3.50	42.94	Outlet (Subcritical)	1
4.20	55.79	Inlet	5
4.90	63.35	Outlet	6
5.60	70.07	Outlet	6
6.30	76.20	Outlet	6
7.00	81.87	Outlet	6
7.70	87.17	Outlet	6
8.40	92.17	Outlet	6
9.10	96.91	Outlet	6
9.80	101.43	Outlet	6
10.50	105.76	Outlet	6

CIVIL SOFTWARE DESIGN

SEDCAD+ Version 3

AS BUILT DESIGN SPECIFICATIONS FOR CP-75, CP-86 AND CP-87

by

Name: Brian Sambirsky

Company Name: BHP MINERALS
File Name: C:\BRIAN\75

Date: 12-18-1995

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Company Name: BHP MINERALS
Filename: C:\BRIAN\TEST
User: Brian Sambirsky
Date: 12-18-1995 Time: 15:06:52
As built design Specifications for CP-75, CP-86 and CP-87
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	23.90	89	M	0.243	0.000	0.000	0.0	0.96	15.89
		Type: Null		Label: CP-86					
111 Structure	23.90								
								0.96	
111 Total IN/OUT	23.90								
								0.96	15.89
121 1	6.00	89	M	0.127	0.000	0.000	0.0	0.24	4.65
		Type: Null		Label: CP-87					
121 Structure	6.00								
								0.24	
Total IN/OUT	6.00								
								0.24	4.65
211 1	7.50	89	M	0.251	0.000	0.000	0.0	0.30	4.91
		Type: Null		Label: CP-75					
211 Structure	7.50								
								1.51	
211 Total IN/OUT	37.40								
								1.51	20.88
111 to 211 Routing					0.176	0.227			
		Type: Null		Label: CP-75					
311 Structure	7.50								
								1.51	
311 Total IN/OUT	37.40								
								1.51	20.88
211 to 311 Routing					0.000	0.000			

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Company Name: BHP MINERALS
Filename: C:\BRIAN\TEST User: Brian Sambirsky
Date: 12-18-1995 Time: 15:06:52
As built design Specifications for CP-75, CP-86 and CP-87
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	1320.00	2.27	1.51	0.24	0.243		
1	2	1	1	-a	5	750.00	2.66	1.63	0.13	0.127		
2	1	1	1	-a	5	1270.00	1.97	1.40	0.25	0.251		

SEDCAD+ CULVERT SIZING UTILITY

CP-75A and CP-75B

Design Discharge	=	10.440	cfs
Entrance Loss Coefficient	=	0.5	
Pipe Length	=	106.000	feet
Pipe Slope	=	0.600	%
Manning's n	=	0.012	
Maximum Headwater	=	2.300	feet
Tailwater Depth	=	0.000	feet

Smallest Diameter Required to Pass Flow is 21 inches

PERFORMANCE CURVES:

Diameter: 15 inches

Headwater (ft)	Discharge (cfs)	Control	Flow Type
0.23	0.44	Outlet (Subcritical)	1
0.46	0.87	Inlet (Supercritical)	3
0.69	1.53	Inlet (Supercritical)	3
0.92	2.32	Inlet (Supercritical)	3
1.15	3.24	Inlet (Supercritical)	3
1.38	4.22	Inlet (Supercritical)	3
1.61	5.13	Inlet	5
1.84	5.91	Inlet	5
2.07	6.54	Outlet	6
2.30	7.10	Outlet	6
2.53	7.51	Outlet	6
2.76	7.92	Outlet	6
2.99	8.30	Outlet	6
3.22	8.66	Outlet	6
3.45	9.02	Outlet	6

Diameter: 18 inches

Headwater (ft)	Discharge (cfs)	Control	Flow Type
0.23	0.49	Outlet (Subcritical)	1
0.46	0.99	Inlet (Supercritical)	3
0.69	1.82	Inlet (Supercritical)	3
0.92	2.78	Inlet (Supercritical)	3
1.15	3.88	Inlet (Supercritical)	3
1.38	5.09	Inlet (Supercritical)	3
1.61	6.42	Inlet (Supercritical)	3
1.84	7.66	Inlet (Supercritical)	4
2.07	8.74	Inlet	5
2.30	9.70	Inlet	5
2.53	10.58	Inlet	5
2.76	11.39	Inlet	5
2.99	12.14	Inlet	5
3.22	12.81	Outlet	6
3.45	13.39	Outlet	6

Diameter: 21 inches

Headwater (ft)	Discharge (cfs)	Control	Flow Type
0.23	0.55	Outlet (Subcritical)	2
0.46	1.16	Inlet (Supercritical)	3
0.69	2.11	Inlet (Supercritical)	3
0.92	3.24	Inlet (Supercritical)	3
1.15	4.53	Inlet (Supercritical)	3
1.38	5.94	Inlet (Supercritical)	3
1.61	7.49	Inlet (Supercritical)	3
1.84	9.15	Inlet (Supercritical)	3
2.07	10.77	Inlet	5
2.30	12.20	Inlet	5
2.53	13.48	Inlet	5
2.76	14.65	Inlet	5
2.99	15.73	Inlet	5
3.22	16.75	Inlet	5
3.45	17.70	Inlet	5

Diameter: 24 inches

Headwater (ft)	Discharge (cfs)	Control	Flow Type
0.23	0.60	Outlet (Subcritical)	2
0.46	1.33	Inlet (Supercritical)	3
0.69	2.42	Inlet (Supercritical)	3
0.92	3.71	Inlet (Supercritical)	3
1.15	5.17	Inlet (Supercritical)	3
1.38	6.79	Inlet (Supercritical)	3
1.61	8.56	Inlet (Supercritical)	3
1.84	10.46	Inlet (Supercritical)	3
2.07	12.47	Inlet (Supercritical)	3
2.30	14.61	Inlet (Supercritical)	3
2.53	16.31	Inlet	5
2.76	17.96	Inlet	5
2.99	19.45	Inlet	5
3.22	20.85	Inlet	5
3.45	22.16	Inlet	5

Diameter: 30 inches

Headwater (ft)	Discharge (cfs)	Control	Flow Type
0.23	0.69	Outlet (Subcritical)	2
0.46	1.66	Inlet (Supercritical)	3
0.69	3.00	Inlet (Supercritical)	3
0.92	4.63	Inlet (Supercritical)	3
1.15	6.46	Inlet (Supercritical)	3
1.38	8.49	Inlet (Supercritical)	3
1.61	10.70	Inlet (Supercritical)	3
1.84	13.07	Inlet (Supercritical)	3
2.07	15.59	Inlet (Supercritical)	3
2.30	18.26	Inlet (Supercritical)	3

2.53	21.07	Inlet (Supercritical)	3
2.76	24.00	Inlet (Supercritical)	3
2.99	26.71	Inlet (Supercritical)	4
3.22	29.10	Inlet	5
3.45	31.37	Inlet	5

Diameter: 36 inches

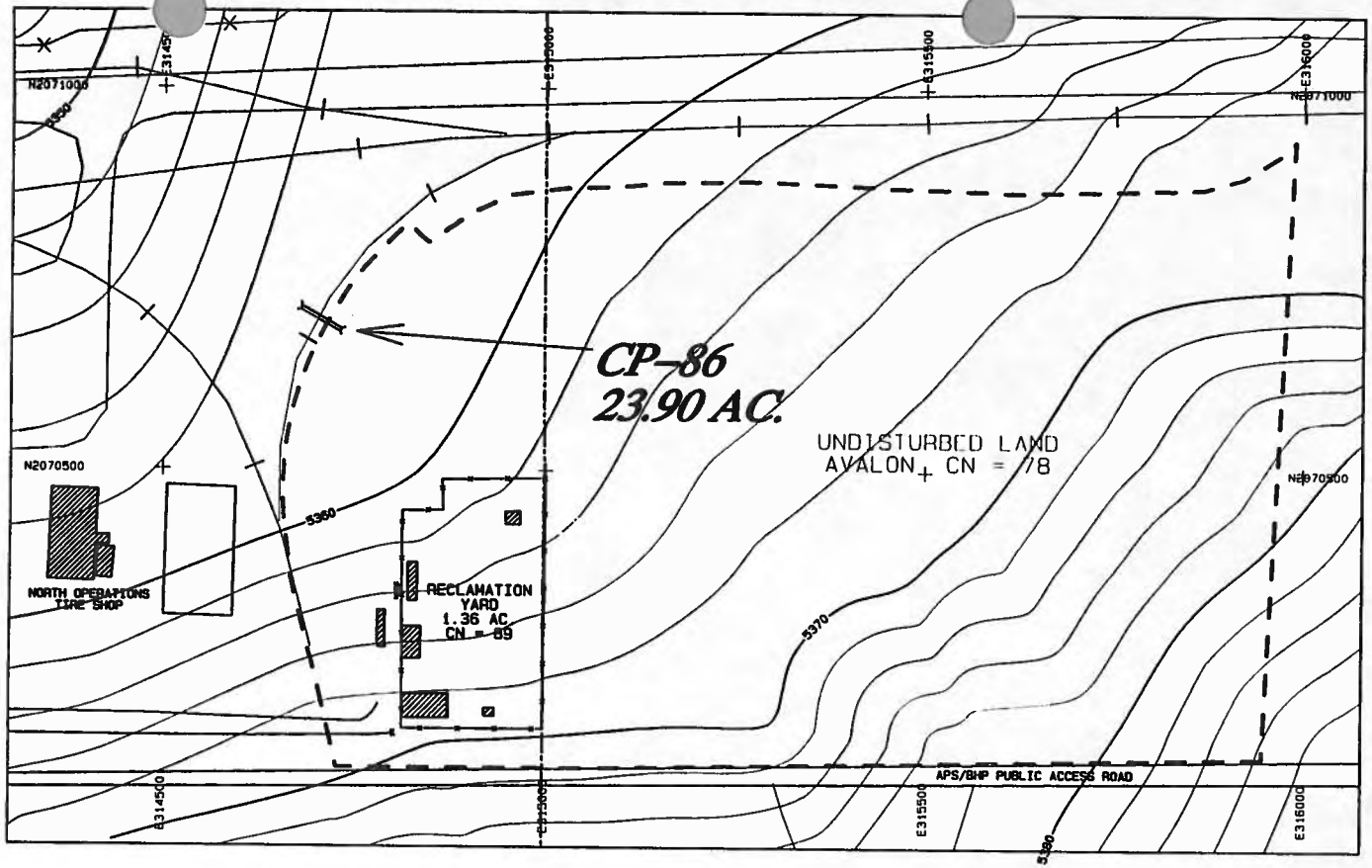
Headwater (ft)	Discharge (cfs)	Control	Flow Type
0.23	0.78	Outlet (Subcritical)	2
0.46	1.96	Inlet (Supercritical)	3
0.69	3.61	Inlet (Supercritical)	3
0.92	5.55	Inlet (Supercritical)	3
1.15	7.75	Inlet (Supercritical)	3
1.38	10.19	Inlet (Supercritical)	3
1.61	12.83	Inlet (Supercritical)	3
1.84	15.68	Inlet (Supercritical)	3
2.07	18.71	Inlet (Supercritical)	3
2.30	21.91	Inlet (Supercritical)	3
2.53	25.28	Inlet (Supercritical)	3
2.76	28.80	Inlet (Supercritical)	3
2.99	32.48	Inlet (Supercritical)	3
3.22	36.30	Inlet (Supercritical)	3
3.45	40.25	Inlet (Supercritical)	3

CP-86

Revised/Supplemental
Design Information

1/29/98

Reference Design Data for CP-121 & Exhibit 11-130



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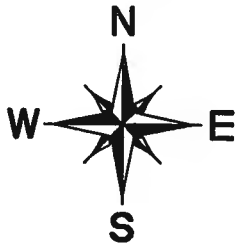
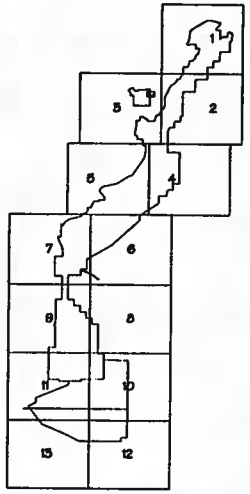


LEGEND

- ROAD
- BUILDING
- FENCE
- IRRIGATION LINE
- CULVERT
- RAILROAD
- TREES
- POWERLINE
- ×5338.5 SPOT ELEVATION
- 5300 INDEX CONTOUR
- 5298 INTERMEDIATE CONTOUR
- WATERSHED
- LEASE BOUNDARY



REV. No.	DATE	DRAFT. BY	REVISION DESCRIPTION	ENG	E.O.	P.E.	P.S.	CHIEF ENG.
A	01/30/98	BH	SUBMITTED TO OSM					

APPROVALS

NAVAJO COAL COMPANY

NAVAJO MINE

P.O. BOX 155 FRUITLAND, NEW MEXICO 87416

LEONARD RAYMOND
NEW MEXICO
6600
REGISTERED PROFESSIONAL ENGINEER

1-30-98

CERTIFICATION STATEMENT

I, Leonard Raymond, hereby certify that this drawing was reviewed by me and that the information shown is accurate and complete to the best of my knowledge.

CP-86 HYDROLOGY

PREPARED BY BH	DRAWN BY BH	SCALE AS NOTED
APPROVED BY LR	DATE 01/30/98	REF DWG
DWG LOC G:\USER\KFHOSBN\N_HOST\CP86.PRO		

CIVIL SOFTWARE DESIGN

SEDCAD+ Version 3

CP-86 HYDROLOGY

by

Name: BH

Company Name: BHP MINERALS
File Name: J:\OSM_SUBM\PER_PROG\CH_11\11-130\SEDCAD\CP_86\CP_86

Date: 01-05-1998

Civil Software Design -- SEDCAD+ Version 3.1
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Company Name: BHP MINERALS
Filename: C:\BEN\CP_86 User: BEN HOSKIE
Date: 11-12-1997 Time: 09:46:00
CP-86 HYDROLOGY
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	23.90	79	M	0.243	0.000	0.000	0.0	0.33	5.02
		Type: Null			Label: CP-86					
111	Structure	23.90							0.33	
111	Total IN/OUT	23.90							0.33	5.02

Civil Software Design -- SEDCAD+ Version 3.1
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Company Name: BHP MINERALS
Filename: C:\BEN\CP_86 User: BEN HOSKIE
Date: 11-12-1997 Time: 09:46:00
CP-86 HYDROLOGY
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	1320.00	2.27	1.51	0.24	0.243		

SEDCAD+ CULVERT SIZING UTILITY

CP-86

Design Discharge	=	5.020 cfs
Entrance Loss Coefficient	=	0.9
Pipe Length	=	14.000 feet
Pipe Slope	=	11.000 %
Manning's n	=	0.013
Maximum Headwater	=	2.250 feet
Tailwater Depth	=	0.000 feet

Smallest Diameter Required to Pass Flow is 15 inches

PERFORMANCE CURVES:

Diameter: 9 inches

Headwater (ft)	Discharge (cfs)	Control	Flow Type
0.22	0.30	Outlet (Subcritical)	1
0.45	0.61	Outlet (Subcritical)	2
0.67	0.91	Inlet (Supercritical)	3
0.90	1.25	Inlet (Supercritical)	4
1.13	1.61	Inlet (Supercritical)	4
1.35	1.97	Inlet	5
1.58	2.20	Inlet	5
1.80	2.42	Inlet	5
2.03	2.63	Inlet	5
2.25	2.85	Inlet	5
2.47	3.05	Inlet	5
2.70	3.21	Inlet	5
2.92	3.36	Inlet	5
3.15	3.52	Inlet	5
3.37	3.67	Inlet	5

Diameter: 12 inches

Headwater (ft)	Discharge (cfs)	Control	Flow Type
0.22	0.37	Outlet (Subcritical)	1
0.45	0.74	Outlet (Subcritical)	2
0.67	1.18	Inlet (Supercritical)	3
0.90	1.81	Inlet (Supercritical)	3
1.13	2.46	Inlet (Supercritical)	4
1.35	3.09	Inlet	5
1.58	3.58	Inlet	5
1.80	4.05	Inlet	5
2.03	4.44	Inlet	5
2.25	4.82	Inlet	5
2.47	5.16	Inlet	5
2.70	5.48	Inlet	5
2.92	5.79	Inlet	5
3.15	6.09	Inlet	5
3.37	6.35	Inlet	5

Diameter: 15 inches

Headwater (ft)	Discharge (cfs)	Control	Flow Type

0.22	0.43	Outlet (Subcritical)	1
0.45	0.85	Inlet (Supercritical)	3
0.67	1.48	Inlet (Supercritical)	3
0.90	2.25	Inlet (Supercritical)	3
1.13	3.13	Inlet (Supercritical)	3
1.35	4.10	Inlet (Supercritical)	3
1.58	5.01	Inlet	5
1.80	5.78	Inlet	5
2.03	6.46	Inlet	5
2.25	7.09	Inlet	5
2.47	7.65	Inlet	5
2.70	8.18	Inlet	5
2.92	8.68	Inlet	5
3.15	9.15	Inlet	5
3.37	9.59	Inlet	5

Diameter: 18 inches

Headwater (ft)	Discharge (cfs)	Control	Flow Type
0.22	0.48	Outlet (Subcritical)	1
0.45	0.97	Inlet (Supercritical)	3
0.67	1.76	Inlet (Supercritical)	3
0.90	2.70	Inlet (Supercritical)	3
1.13	3.76	Inlet (Supercritical)	3
1.35	4.93	Inlet (Supercritical)	3
1.58	6.21	Inlet (Supercritical)	3
1.80	7.46	Inlet (Supercritical)	4
2.03	8.53	Inlet	5
2.25	9.50	Inlet	5
2.47	10.37	Inlet	5
2.70	11.18	Inlet	5
2.92	11.94	Inlet	5
3.15	12.64	Inlet	5
3.37	13.31	Inlet	5

Diameter: 21 inches

Headwater (ft)	Discharge (cfs)	Control	Flow Type
0.22	0.53	Outlet (Subcritical)	2
0.45	1.12	Inlet (Supercritical)	3
0.67	2.03	Inlet (Supercritical)	3
0.90	3.13	Inlet (Supercritical)	3
1.13	4.38	Inlet (Supercritical)	3
1.35	5.75	Inlet (Supercritical)	3
1.58	7.25	Inlet (Supercritical)	3
1.80	8.85	Inlet (Supercritical)	3
2.03	10.47	Inlet (Supercritical)	4
2.25	11.90	Inlet	5
2.47	13.19	Inlet	5
2.70	14.35	Inlet	5
2.92	15.43	Inlet	5
3.15	16.44	Inlet	5
3.37	17.40	Inlet	5

Diameter: 24 inches

Headwater (ft)	Discharge (cfs)	Control	Flow Type

0.22	0.58	Outlet (Subcritical)	2
0.45	1.29	Inlet (Supercritical)	3
0.67	2.34	Inlet (Supercritical)	3
0.90	3.59	Inlet (Supercritical)	3
1.13	5.00	Inlet (Supercritical)	3
1.35	6.57	Inlet (Supercritical)	3
1.58	8.28	Inlet (Supercritical)	3
1.80	10.11	Inlet (Supercritical)	3
2.03	12.07	Inlet (Supercritical)	3
2.25	14.13	Inlet (Supercritical)	3
2.47	15.91	Inlet	5
2.70	17.54	Inlet	5
2.92	19.05	Inlet	5
3.15	20.43	Inlet	5
3.37	21.74	Inlet	5

SEDCAD+ CULVERT SIZING UTILITY

CP-87

Design Discharge	=	4.650 cfs
Entrance Loss Coefficient	=	0.9
Pipe Length	=	19.000 feet
Pipe Slope	=	10.220 %
Manning's n	=	0.013
Maximum Headwater	=	3.800 feet
Tailwater Depth	=	0.000 feet

Smallest Diameter Required to Pass Flow is 12 inches

PERFORMANCE CURVES:

Diameter: 8 inches

Headwater (ft)	Discharge (cfs)	Control	Flow Type
0.38	0.47	Outlet (Subcritical)	2
0.76	0.94	Inlet	5
1.14	1.33	Inlet	5
1.52	1.71	Inlet	5
1.90	2.06	Inlet	5
2.28	2.29	Inlet	5
2.66	2.52	Inlet	5
3.04	2.74	Inlet	5
3.42	2.97	Inlet	5
3.80	3.14	Inlet	5
4.18	3.31	Inlet	5
4.56	3.47	Inlet	5
4.94	3.64	Inlet	5
5.32	3.80	Inlet	5
5.70	3.96	Inlet	5

Diameter: 9 inches

Headwater (ft)	Discharge (cfs)	Control	Flow Type
0.38	0.51	Outlet (Subcritical)	2
0.76	1.03	Inlet (Supercritical)	3
1.14	1.64	Inlet (Supercritical)	4
1.52	2.15	Inlet	5
1.90	2.51	Inlet	5
2.28	2.88	Inlet	5
2.66	3.18	Inlet	5
3.04	3.44	Inlet	5
3.42	3.70	Inlet	5
3.80	3.96	Inlet	5
4.18	4.18	Inlet	5
4.56	4.38	Inlet	5
4.94	4.58	Inlet	5
5.32	4.79	Inlet	5
5.70	4.99	Inlet	5

Diameter: 12 inches

Headwater (ft)	Discharge (cfs)	Control	Flow Type
0.38	0.62	Outlet (Subcritical)	2
0.76	1.42	Inlet (Supercritical)	3
1.14	2.50	Inlet (Supercritical)	4
1.52	3.46	Inlet	5
1.90	4.22	Inlet	5
2.28	4.87	Inlet	5
2.66	5.42	Inlet	5
3.04	5.95	Inlet	5
3.42	6.40	Inlet	5
3.80	6.85	Inlet	5
4.18	7.26	Inlet	5
4.56	7.64	Inlet	5
4.94	8.03	Inlet	5
5.32	8.37	Inlet	5
5.70	8.71	Inlet	5

Diameter: 15 inches

Headwater (ft)	Discharge (cfs)	Control	Flow Type
0.38	0.72	Outlet (Subcritical)	2
0.76	1.75	Inlet (Supercritical)	3
1.14	3.19	Inlet (Supercritical)	3
1.52	4.79	Inlet	5
1.90	6.10	Inlet	5
2.28	7.16	Inlet	5
2.66	8.09	Inlet	5
3.04	8.93	Inlet	5
3.42	9.68	Inlet	5
3.80	10.39	Inlet	5
4.18	11.06	Inlet	5
4.56	11.67	Inlet	5
4.94	12.26	Inlet	5
5.32	12.83	Inlet	5
5.70	13.37	Inlet	5

Diameter: 18 inches

Headwater (ft)	Discharge (cfs)	Control	Flow Type
0.38	0.81	Outlet (Subcritical)	2
0.76	2.09	Inlet (Supercritical)	3
1.14	3.83	Inlet (Supercritical)	3
1.52	5.89	Inlet (Supercritical)	3
1.90	7.96	Inlet	5
2.28	9.62	Inlet	5
2.66	11.05	Inlet	5
3.04	12.30	Inlet	5
3.42	13.44	Inlet	5
3.80	14.49	Inlet	5

4.18	15.47	Inlet	5
4.56	16.39	Inlet	5
4.94	17.27	Inlet	5
5.32	18.10	Inlet	5
5.70	18.90	Inlet	5

Diameter: 21 inches

Headwater (ft)	Discharge (cfs)	Control	Flow Type
0.38	0.90	Inlet (Supercritical)	3
0.76	2.44	Inlet (Supercritical)	3
1.14	4.47	Inlet (Supercritical)	3
1.52	6.87	Inlet (Supercritical)	3
1.90	9.60	Inlet (Supercritical)	3
2.28	12.08	Inlet	5
2.66	14.16	Inlet	5
3.04	15.97	Inlet	5
3.42	17.58	Inlet	5
3.80	19.07	Inlet	5
4.18	20.44	Inlet	5
4.56	21.74	Inlet	5
4.94	22.96	Inlet	5
5.32	24.11	Inlet	5
5.70	25.21	Inlet	5

CIVIL SOFTWARE DESIGN

SEDCAD+ Version 3

AS BUILT DESIGN SPECIFICATIONS FOR CP-76

by

Name: Brian Sambirsky

Company Name: BHP MINERALS
File Name: C:\BRIAN\76

Date: 12-05-1995

Civil Software Design -- SEDCAD+ Version 3.1
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Company Name: BHP MINERALS
Filename: C:\BRIAN\76 User: Brian Sambirsky
Date: 12-05-1995 Time: 10:06:26
As built design specifications for CP-76
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	4.10	89	M	0.135	0.000	0.000	0.0	0.17	3.18
		Type: Null			Label: CP-76					
111	Structure	4.10							0.17	
111	Total IN/OUT	4.10							0.17	3.18

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Company Name: BHP MINERALS
Filename: C:\BRIAN\76
User: Brian Sambirsky
Date: 12-05-1995 Time: 10:06:26
As built design specifications for CP-76
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)	X
1	1	1	1	-a	5	755.00	2.38	1.54	0.14	0.135		

SEDCAD+ CULVERT SIZING UTILITY

CP-76

Design Discharge	=	3.180 cfs
Entrance Loss Coefficient	=	0.9
Pipe Length	=	89.140 feet
Pipe Slope	=	1.300 %
Manning's n	=	0.016
Maximum Headwater	=	3.000 feet
Tailwater Depth	=	0.000 feet

Smallest Diameter Required to Pass Flow is 12 inches

PERFORMANCE CURVES:

Diameter: 8 inches

Headwater (ft)	Discharge (cfs)	Control	Flow Type
0.30	0.37	Outlet (Subcritical)	2
0.60	0.74	Inlet (Supercritical)	4
0.90	1.03	Inlet	5
1.20	1.12	Inlet	5
1.50	1.21	Inlet	5
1.80	1.30	Inlet	5
2.10	1.39	Inlet	5
2.40	1.49	Inlet	5
2.70	1.58	Outlet	6
3.00	1.67	Outlet	6
3.30	1.76	Outlet	6
3.60	1.85	Outlet	6
3.90	1.95	Outlet	6
4.20	2.02	Outlet	6
4.50	2.07	Outlet	6

Diameter: 9 inches

Headwater (ft)	Discharge (cfs)	Control	Flow Type
0.30	0.41	Outlet (Subcritical)	1
0.60	0.81	Outlet (Subcritical)	2
0.90	1.12	Inlet (Supercritical)	3
1.20	1.35	Inlet (Supercritical)	4
1.50	1.58	Inlet	5
1.80	1.80	Inlet	5
2.10	2.01	Outlet	6
2.40	2.11	Outlet	6
2.70	2.20	Outlet	6
3.00	2.29	Outlet	6
3.30	2.39	Outlet	6
3.60	2.48	Outlet	6
3.90	2.57	Outlet	6
4.20	2.66	Outlet	6
4.50	2.76	Outlet	6

Diameter: 12 inches

Headwater (ft)	Discharge (cfs)	Control	Flow Type
0.30	0.49	Outlet (Subcritical)	1
0.60	0.98	Inlet (Supercritical)	3
0.90	1.81	Inlet (Supercritical)	3
1.20	2.68	Inlet (Supercritical)	4
1.50	3.22	Inlet	5
1.80	3.58	Outlet	6
2.10	3.93	Outlet	6
2.40	4.17	Outlet	6
2.70	4.39	Outlet	6
3.00	4.61	Outlet	6
3.30	4.82	Outlet	6
3.60	5.03	Outlet	6
3.90	5.21	Outlet	6
4.20	5.38	Outlet	6
4.50	5.56	Outlet	6

Diameter: 15 inches

Headwater (ft)	Discharge (cfs)	Control	Flow Type
0.30	0.57	Outlet (Subcritical)	2
0.60	1.24	Inlet (Supercritical)	3
0.90	2.25	Inlet (Supercritical)	3
1.20	3.45	Inlet (Supercritical)	3
1.50	4.71	Inlet (Supercritical)	4
1.80	5.78	Inlet	5
2.10	6.40	Inlet	5
2.40	6.91	Outlet	6
2.70	7.32	Outlet	6
3.00	7.70	Outlet	6
3.30	8.08	Outlet	6
3.60	8.42	Outlet	6
3.90	8.76	Outlet	6
4.20	9.09	Outlet	6
4.50	9.39	Outlet	6

Diameter: 18 inches

Headwater (ft)	Discharge (cfs)	Control	Flow Type
0.30	0.64	Outlet (Subcritical)	2
0.60	1.49	Inlet (Supercritical)	3
0.90	2.70	Inlet (Supercritical)	3
1.20	4.13	Inlet (Supercritical)	3
1.50	5.78	Inlet (Supercritical)	3
1.80	7.46	Inlet (Supercritical)	4
2.10	8.87	Inlet	5
2.40	10.07	Inlet	5
2.70	10.89	Outlet	6
3.00	11.52	Outlet	6

3.30	12.11	Outlet	6
3.60	12.66	Outlet	6
3.90	13.20	Outlet	6
4.20	13.71	Outlet	6
4.50	14.21	Outlet	6

Diameter: 21 inches

Headwater (ft)	Discharge (cfs)	Control	Flow Type
0.30	0.71	Outlet (Subcritical)	2
0.60	1.73	Inlet (Supercritical)	3
0.90	3.13	Inlet (Supercritical)	3
1.20	4.82	Inlet (Supercritical)	3
1.50	6.74	Inlet (Supercritical)	3
1.80	8.85	Inlet (Supercritical)	3
2.10	10.97	Inlet	5
2.40	12.77	Inlet	5
2.70	14.35	Inlet	5
3.00	15.78	Inlet	5
3.30	16.81	Outlet	6
3.60	17.66	Outlet	6
3.90	18.45	Outlet	6
4.20	19.21	Outlet	6
4.50	19.95	Outlet	6

CIVIL SOFTWARE DESIGN

SEDCAD+ Version 3

AS BUILT DESIGN SPECIFICATIONS FOR CP-77

by

Name: Brian Sambirsky

Company Name: BHP MINERALS
File Name: C:\BRIAN\77

Date: 12-05-1995

Civil Software Design -- SEDCAD+ Version 3.1
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Company Name: BHP MINERALS
Filename: C:\BRIAN\77
User: Brian Sambirsky
Date: 12-05-1995 Time: 10:05:22
As built design specifications for CP-77
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	46.50	89	M	0.920	0.000	0.000	0.0	1.88	14.22
			Type: Null			Label: CP-77				
111 Structure		46.50							1.88	
111 Total IN/OUT		46.50							1.88	14.22

Civil Software Design -- SEDCAD+ Version 3.1
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Company Name: BHP MINERALS
Filename: C:\BRIAN\77 User: Brian Sambirsky
Date: 12-05-1995 Time: 10:05:22
As built design specifications for CP-77
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	3800.00	1.32	1.15	0.92	0.920		

SEDCAD+ CULVERT SIZING UTILITY

CP-77

Design Discharge	=	14.220 cfs
Entrance Loss Coefficient	=	0.5
Pipe Length	=	231.000 feet
Pipe Slope	=	1.000 %
Manning's n	=	0.019
Maximum Headwater	=	6.000 feet
Tailwater Depth	=	0.000 feet

Smallest Diameter Required to Pass Flow is 21 inches

PERFORMANCE CURVES:

Diameter: 15 inches

Headwater (ft)	Discharge (cfs)	Control	Flow Type
0.60	2.30	Outlet (Subcritical)	1
1.20	3.45	Outlet (Subcritical)	1
1.80	4.62	Inlet (Supercritical)	4
2.40	5.21	Outlet	6
3.00	5.61	Outlet	6
3.60	6.02	Outlet	6
4.20	6.36	Outlet	6
4.80	6.71	Outlet	6
5.40	7.05	Outlet	6
6.00	7.35	Outlet	6
6.60	7.65	Outlet	6
7.20	7.94	Outlet	6
7.80	8.21	Outlet	6
8.40	8.48	Outlet	6
9.00	8.74	Outlet	6

Diameter: 18 inches

Headwater (ft)	Discharge (cfs)	Control	Flow Type
0.60	3.39	Outlet (Subcritical)	1
1.20	3.99	Outlet (Subcritical)	1
1.80	7.17	Outlet (Subcritical)	2
2.40	8.11	Outlet	6
3.00	8.78	Outlet	6
3.60	9.41	Outlet	6
4.20	10.01	Outlet	6
4.80	10.56	Outlet	6
5.40	11.10	Outlet	6
6.00	11.60	Outlet	6
6.60	12.09	Outlet	6
7.20	12.55	Outlet	6
7.80	13.01	Outlet	6
8.40	13.44	Outlet	6
9.00	13.86	Outlet	6

Diameter: 21 inches

Headwater (ft)	Discharge (cfs)	Control	Flow Type
0.60	4.71	Outlet (Subcritical)	1
1.20	5.59	Outlet (Subcritical)	1
1.80	8.93	Outlet (Subcritical)	1
2.40	11.61	Outlet	6
3.00	12.70	Outlet	6
3.60	13.66	Outlet	6
4.20	14.55	Outlet	6
4.80	15.40	Outlet	6
5.40	16.20	Outlet	6
6.00	16.97	Outlet	6
6.60	17.70	Outlet	6
7.20	18.40	Outlet	6
7.80	19.08	Outlet	6
8.40	19.73	Outlet	6
9.00	20.36	Outlet	6

Diameter: 24 inches

Headwater (ft)	Discharge (cfs)	Control	Flow Type
0.60	2.00	Inlet (Supercritical)	3
1.20	7.37	Outlet (Subcritical)	1 *
1.80	9.91	Outlet (Subcritical)	1
2.40	15.48	Inlet (Supercritical)	3
3.00	17.33	Outlet	6
3.60	18.72	Outlet	6
4.20	20.02	Outlet	6
4.80	21.22	Outlet	6
5.40	22.37	Outlet	6
6.00	23.46	Outlet	6
6.60	24.50	Outlet	6
7.20	25.50	Outlet	6
7.80	26.46	Outlet	6
8.40	27.39	Outlet	6
9.00	28.29	Outlet	6

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

Diameter: 30 inches

Headwater (ft)	Discharge (cfs)	Control	Flow Type
0.60	2.45	Inlet (Supercritical)	3
1.20	6.88	Inlet (Supercritical)	3
1.80	12.64	Inlet (Supercritical)	3
2.40	19.18	Outlet (Subcritical)	1 *
3.00	26.84	Inlet (Supercritical)	4
3.60	31.15	Outlet	6
4.20	33.52	Outlet	6
4.80	35.73	Outlet	6
5.40	37.83	Outlet	6

6.00	39.81	Outlet	6
6.60	41.69	Outlet	6
7.20	43.50	Outlet	6
7.80	45.24	Outlet	6
8.40	46.91	Outlet	6
9.00	48.52	Outlet	6

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

Diameter: 36 inches

Headwater (ft)	Discharge (cfs)	Control	Flow Type
0.60	2.92	Inlet (Supercritical)	3
1.20	8.26	Inlet (Supercritical)	3
1.80	15.17	Inlet (Supercritical)	3
2.40	23.36	Inlet (Supercritical)	3
3.00	32.18	Outlet (Subcritical)	1 *
3.60	42.42	Inlet (Supercritical)	4
4.20	49.83	Inlet	5
4.80	53.78	Outlet	6
5.40	57.22	Outlet	6
6.00	60.45	Outlet	6
6.60	63.52	Outlet	6
7.20	66.45	Outlet	6
7.80	69.26	Outlet	6
8.40	71.95	Outlet	6
9.00	74.55	Outlet	6

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

PAGES 310 THROUGH 315 BLANK
DUE TO CULVERT REMOVAL

Pages 316 through 333 Appendix 11-V

Blank due to Update

CIVIL SOFTWARE DESIGN

SEDCAD+ Version 3

AS BUILT DESIGN SPECIFICATIONS FOR CP-82

by

Name: Brian Sambirsky

Company Name: BHP MINERALS
File Name: C:\BRIAN\82

Date: 12-05-1995

Civil Software Design -- SEDCAD+ Version 3.1
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Company Name: BHP MINERALS
Filename: C:\BRIAN\82
User: Brian Sambirsky
Date: 12-05-1995 Time: 10:05:29
As built design specifications for CP-82
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	37.00	89	M	0.394	0.000	0.000	0.0	1.49	19.50
			Type: Null			Label: CP-82				
111	Structure	37.00							1.49	
111	Total IN/OUT	37.00							1.49	19.50

Civil Software Design -- SEDCAD+ Version 3.1
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Company Name: BHP MINERALS
Filename: C:\BRIAN\82 User: Brian Sambirsky
Date: 12-05-1995 Time: 10:05:29
As built design specifications for CP-82
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	2720.00	3.68	1.92	0.39	0.394		

SEDCAD+ CULVERT SIZING UTILITY

CP-82

Design Discharge	=	19.500 cfs
Entrance Loss Coefficient	=	0.9
Pipe Length	=	49.000 feet
Pipe Slope	=	2.780 %
Manning's n	=	0.013
Maximum Headwater	=	2.000 feet
Tailwater Depth	=	0.000 feet

Smallest Diameter Required to Pass Flow is 42 inches

PERFORMANCE CURVES:

Diameter: 30 inches

Headwater (ft)	Discharge (cfs)	Control	Flow Type
0.20	0.60	Outlet (Subcritical)	2
0.40	1.35	Inlet (Supercritical)	3
0.60	2.45	Inlet (Supercritical)	3
0.80	3.75	Inlet (Supercritical)	3
1.00	5.24	Inlet (Supercritical)	3
1.20	6.88	Inlet (Supercritical)	3
1.40	8.68	Inlet (Supercritical)	3
1.60	10.60	Inlet (Supercritical)	3
1.80	12.64	Inlet (Supercritical)	3
2.00	14.81	Inlet (Supercritical)	3
2.20	17.08	Inlet (Supercritical)	3
2.40	19.46	Inlet (Supercritical)	3
2.60	21.95	Inlet (Supercritical)	3
2.80	24.53	Inlet (Supercritical)	3
3.00	26.80	Inlet	5

Diameter: 36 inches

Headwater (ft)	Discharge (cfs)	Control	Flow Type
0.20	0.68	Outlet (Subcritical)	2
0.40	1.62	Inlet (Supercritical)	3
0.60	2.92	Inlet (Supercritical)	3
0.80	4.50	Inlet (Supercritical)	3
1.00	6.29	Inlet (Supercritical)	3
1.20	8.26	Inlet (Supercritical)	3
1.40	10.41	Inlet (Supercritical)	3
1.60	12.72	Inlet (Supercritical)	3
1.80	15.17	Inlet (Supercritical)	3
2.00	17.77	Inlet (Supercritical)	3
2.20	20.50	Inlet (Supercritical)	3
2.40	23.36	Inlet (Supercritical)	3
2.60	26.34	Inlet (Supercritical)	3
2.80	29.43	Inlet (Supercritical)	3
3.00	32.64	Inlet (Supercritical)	3

Diameter: 42 inches

Headwater (ft)	Discharge (cfs)	Control	Flow Type
0.20	0.75	Outlet (Subcritical)	2
0.40	1.87	Inlet (Supercritical)	3
0.60	3.42	Inlet (Supercritical)	3
0.80	5.25	Inlet (Supercritical)	3
1.00	7.33	Inlet (Supercritical)	3
1.20	9.64	Inlet (Supercritical)	3
1.40	12.14	Inlet (Supercritical)	3
1.60	14.83	Inlet (Supercritical)	3
1.80	17.70	Inlet (Supercritical)	3
2.00	20.73	Inlet (Supercritical)	3
2.20	23.91	Inlet (Supercritical)	3
2.40	27.25	Inlet (Supercritical)	3
2.60	30.72	Inlet (Supercritical)	3
2.80	34.34	Inlet (Supercritical)	3
3.00	38.08	Inlet (Supercritical)	3

Diameter: 45 inches

Headwater (ft)	Discharge (cfs)	Control	Flow Type
0.20	0.79	Outlet (Subcritical)	2
0.40	1.99	Inlet (Supercritical)	3
0.60	3.66	Inlet (Supercritical)	3
0.80	5.63	Inlet (Supercritical)	3
1.00	7.85	Inlet (Supercritical)	3
1.20	10.32	Inlet (Supercritical)	3
1.40	13.01	Inlet (Supercritical)	3
1.60	15.89	Inlet (Supercritical)	3
1.80	18.96	Inlet (Supercritical)	3
2.00	22.21	Inlet (Supercritical)	3
2.20	25.62	Inlet (Supercritical)	3
2.40	29.19	Inlet (Supercritical)	3
2.60	32.92	Inlet (Supercritical)	3
2.80	36.79	Inlet (Supercritical)	3
3.00	40.80	Inlet (Supercritical)	3

Diameter: 48 inches

Headwater (ft)	Discharge (cfs)	Control	Flow Type
0.20	0.82	Outlet (Subcritical)	2
0.40	2.13	Inlet (Supercritical)	3
0.60	3.90	Inlet (Supercritical)	3
0.80	5.99	Inlet (Supercritical)	3
1.00	8.38	Inlet (Supercritical)	3
1.20	11.01	Inlet (Supercritical)	3
1.40	13.87	Inlet (Supercritical)	3
1.60	16.95	Inlet (Supercritical)	3
1.80	20.23	Inlet (Supercritical)	3
2.00	23.69	Inlet (Supercritical)	3

2.20	27.33	Inlet (Supercritical)	3
2.40	31.14	Inlet (Supercritical)	3
2.60	35.11	Inlet (Supercritical)	3
2.80	39.24	Inlet (Supercritical)	3
3.00	43.52	Inlet (Supercritical)	3

Diameter: 54 inches

Headwater (ft)	Discharge (cfs)	Control	Flow Type
0.20	0.89	Inlet (Supercritical)	3
0.40	2.40	Inlet (Supercritical)	3
0.60	4.39	Inlet (Supercritical)	3
0.80	6.75	Inlet (Supercritical)	3
1.00	9.43	Inlet (Supercritical)	3
1.20	12.39	Inlet (Supercritical)	3
1.40	15.61	Inlet (Supercritical)	3
1.60	19.07	Inlet (Supercritical)	3
1.80	22.76	Inlet (Supercritical)	3
2.00	26.65	Inlet (Supercritical)	3
2.20	30.75	Inlet (Supercritical)	3
2.40	35.03	Inlet (Supercritical)	3
2.60	39.50	Inlet (Supercritical)	3
2.80	44.15	Inlet (Supercritical)	3
3.00	48.96	Inlet (Supercritical)	3

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GORMAN ROAD
CULVERT CP-83

THE CULVERT LOCATION AND WATERSHED AREA ARE SHOWN ON EXHIBIT 11-12C.

RYazzie

BHP Navajo Coal Company
PO Box 1717
Fruitland, NM
87416

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General Information

Storm Information:

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

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Structure Networking:

Type	Stru #	(flows into)	Stru #	Musk. K (hrs)	Musk. X	Description
Culvert	#1	==>	End	0.000	0.000	CP-83

#1
Culvert

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Structure Summary:

	Immediate Contributing Area (ac)	Total Contributing Area (ac)	Peak Discharge (cfs)	Total Runoff Volume (ac-ft)
#1	64.650	64.650	7.99	0.69

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Structure Detail:

Structure #1 (Culvert)

CP-83

Culvert Inputs:

Length (ft)	Slope (%)	Manning's n	Max. Headwater (ft)	Tailwater (ft)	Entrance Loss Coef. (Ke)
155.00	14.00	0.0150	10.54	0.00	0.90

Culvert Results:

Design Discharge = 7.99 cfs

Minimum pipe diameter: 1 - 12 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)
#1	1	64.650	0.250	0.000	0.000	76.700	M	7.99	0.692
	Σ	**64.650**						**7.99**	**0.692**

Subwatershed Time of Concentration Details:

Stru #	SWS #	Land Flow Condition	Slope (%)	Vert. Dist. (ft)	Horiz. Dist. (ft)	Velocity (fps)	Time (hrs)
#1	1	5. Nearly bare and untilled, and alluvial valley fans	1.25	4.00	319.24	1.110	0.079
		8. Large gullies, diversions, and low flowing streams	2.52	73.94	2,935.89	4.760	0.171
#1	**1**	**Time of Concentration:**					**0.250**

CIVIL SOFTWARE DESIGN

SEDCAD+ Version 3

AS BUILT DESIGN SPECIFICATIONS FOR CP-84 AND CP-85

by

Name: Brian Sambirsky

Company Name: BHP MINERALS
File Name: C:\BRIAN\84_85

Date: 12-05-1995

Civil Software Design -- SEDCAD+ Version 3.1
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Company Name: BHP MINERALS
Filename: C:\BRIAN\84_85 User: Brian Sambirsky
Date: 12-05-1995 Time: 10:05:46
As built design specifications for CP-84 and CP-85
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	5.20	89	M	0.187	0.000	0.000	0.0	0.21	3.85
Type: Null Label: CP-85									
111 Structure	5.20							0.21	
111 Total IN/OUT	5.20							0.21	3.85
Type: Null Label: CP-85									
211 Structure	5.20							0.21	
211 Total IN/OUT	5.20							0.21	3.85
1[illegible] to 211 Routing					0.022	0.258			
Type: Null Label: CP-85									
212 Structure	5.20							0.21	
212 Total IN/OUT	5.20							0.21	3.85
211 to 212 Routing					0.022	0.258			
221 1	0.30	89	M	0.022	0.000	0.000	0.0	0.01	0.32
Type: Null Label: CP-84									
221 Structure	0.30							0.01	
221 Total IN/OUT	0.30							0.01	0.32
Type: Null Label: CP-84									
311 Structure	0.30							0.22	
311 Total IN/OUT	5.50							0.22	3.90
212 to 311 Routing					0.001	0.416			

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Company Name: BHP MINERALS
Filename: C:\BRIAN\84_85
User: Brian Sambirsky
Date: 12-05-1995 Time: 10:05:46
As built design specifications for CP-84 and CP-85
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	1220.00	3.28	1.81	0.19	0.187		
2	2	1	1	-a	5	150.00	3.33	1.83	0.02	0.022		

SEDCAD+ CULVERT SIZING UTILITY

CP-84

Design Discharge	=	3.900 cfs
Entrance Loss Coefficient	=	0.9
Pipe Length	=	48.000 feet
Pipe Slope	=	0.900 %
Manning's n	=	0.013
Maximum Headwater	=	2.500 feet
Tailwater Depth	=	0.000 feet

Smallest Diameter Required to Pass Flow is 12 inches

PERFORMANCE CURVES:

Diameter: 8 inches

Headwater (ft)	Discharge (cfs)	Control	Flow Type
0.25	0.31	Outlet (Subcritical)	2
0.50	0.62	Inlet (Supercritical)	3
0.75	0.92	Inlet	5
1.00	1.12	Inlet	5
1.25	1.29	Inlet	5
1.50	1.46	Inlet	5
1.75	1.62	Outlet	6
2.00	1.79	Outlet	6
2.25	1.95	Outlet	6
2.50	2.07	Outlet	6
2.75	2.16	Outlet	6
3.00	2.25	Outlet	6
3.25	2.34	Outlet	6
3.50	2.43	Outlet	6
3.75	2.52	Outlet	6

Diameter: 9 inches

Headwater (ft)	Discharge (cfs)	Control	Flow Type
0.25	0.34	Outlet (Subcritical)	1
0.50	0.68	Outlet (Subcritical)	2
0.75	1.01	Inlet (Supercritical)	3
1.00	1.36	Inlet (Supercritical)	4
1.25	1.71	Inlet	5
1.50	2.03	Outlet	6
1.75	2.19	Outlet	6
2.00	2.34	Outlet	6
2.25	2.50	Outlet	6
2.50	2.66	Outlet	6
2.75	2.82	Outlet	6
3.00	2.98	Outlet	6
3.25	3.10	Outlet	6
3.50	3.22	Outlet	6
3.75	3.33	Outlet	6

Diameter: 12 inches

Headwater (ft)	Discharge (cfs)	Control	Flow Type
0.25	0.41	Outlet (Subcritical)	1
0.50	0.82	Outlet (Subcritical)	2
0.75	1.39	Inlet (Supercritical)	3
1.00	2.09	Inlet (Supercritical)	3
1.25	2.83	Inlet	5
1.50	3.42	Inlet	5
1.75	3.96	Inlet	5
2.00	4.32	Inlet	5
2.25	4.67	Outlet	6
2.50	5.01	Outlet	6
2.75	5.29	Outlet	6
3.00	5.56	Outlet	6
3.25	5.83	Outlet	6
3.50	6.09	Outlet	6
3.75	6.32	Outlet	6

Diameter: 15 inches

Headwater (ft)	Discharge (cfs)	Control	Flow Type
0.25	0.47	Outlet (Subcritical)	1
0.50	0.95	Inlet (Supercritical)	3
0.75	1.72	Inlet (Supercritical)	3
1.00	2.63	Inlet (Supercritical)	3
1.25	3.67	Inlet (Supercritical)	3
1.50	4.71	Inlet (Supercritical)	4
1.75	5.61	Inlet	5
2.00	6.39	Inlet	5
2.25	7.09	Inlet	5
2.50	7.71	Inlet	5
2.75	8.29	Inlet	5
3.00	8.83	Outlet	6
3.25	9.29	Outlet	6
3.50	9.73	Outlet	6
3.75	10.15	Outlet	6

Diameter: 18 inches

Headwater (ft)	Discharge (cfs)	Control	Flow Type
0.25	0.54	Outlet (Subcritical)	2
0.50	1.12	Inlet (Supercritical)	3
0.75	2.04	Inlet (Supercritical)	3
1.00	3.15	Inlet (Supercritical)	3
1.25	4.40	Inlet (Supercritical)	3
1.50	5.78	Inlet (Supercritical)	3
1.75	7.22	Inlet (Supercritical)	3
2.00	8.42	Inlet	5
2.25	9.50	Inlet	5
2.50	10.47	Inlet	5

2.75	11.35	Inlet	5
3.00	12.18	Inlet	5
3.25	12.95	Inlet	5
3.50	13.67	Inlet	5
3.75	14.36	Inlet	5

Diameter: 21 inches

Headwater (ft)	Discharge (cfs)	Control	Flow Type
0.25	0.59	Outlet (Subcritical)	2
0.50	1.32	Inlet (Supercritical)	3
0.75	2.40	Inlet (Supercritical)	3
1.00	3.67	Inlet (Supercritical)	3
1.25	5.12	Inlet (Supercritical)	3
1.50	6.74	Inlet (Supercritical)	3
1.75	8.49	Inlet (Supercritical)	3
2.00	10.31	Inlet (Supercritical)	4
2.25	11.90	Inlet	5
2.50	13.32	Inlet	5
2.75	14.60	Inlet	5
3.00	15.78	Inlet	5
3.25	16.88	Inlet	5
3.50	17.91	Inlet	5
3.75	18.88	Inlet	5

SEDCAD+ CULVERT SIZING UTILITY

CP-85

Design Discharge	=	3.850 cfs
Entrance Loss Coefficient	=	0.9
Pipe Length	=	65.000 feet
Pipe Slope	=	0.900 %
Manning's n	=	0.013
Maximum Headwater	=	2.500 feet
Tailwater Depth	=	0.000 feet

Smallest Diameter Required to Pass Flow is 12 inches

PERFORMANCE CURVES:

Diameter: 8 inches

Headwater (ft)	Discharge (cfs)	Control	Flow Type
0.25	0.31	Outlet (Subcritical)	2
0.50	0.62	Inlet (Supercritical)	3
0.75	0.92	Inlet	5
1.00	1.11	Inlet	5
1.25	1.25	Inlet	5
1.50	1.39	Inlet	5
1.75	1.53	Outlet	6
2.00	1.67	Outlet	6
2.25	1.81	Outlet	6
2.50	1.95	Outlet	6
2.75	2.05	Outlet	6
3.00	2.12	Outlet	6
3.25	2.20	Outlet	6
3.50	2.28	Outlet	6
3.75	2.35	Outlet	6

Diameter: 9 inches

Headwater (ft)	Discharge (cfs)	Control	Flow Type
0.25	0.34	Outlet (Subcritical)	1
0.50	0.68	Outlet (Subcritical)	2
0.75	1.01	Inlet (Supercritical)	3
1.00	1.33	Inlet (Supercritical)	4
1.25	1.64	Inlet	5
1.50	1.95	Outlet	6
1.75	2.12	Outlet	6
2.00	2.25	Outlet	6
2.25	2.38	Outlet	6
2.50	2.52	Outlet	6
2.75	2.65	Outlet	6
3.00	2.79	Outlet	6
3.25	2.92	Outlet	6
3.50	3.04	Outlet	6
3.75	3.14	Outlet	6

Diameter: 12 inches

Headwater (ft)	Discharge (cfs)	Control	Flow Type
0.25	0.41	Outlet (Subcritical)	1
0.50	0.82	Outlet (Subcritical)	2
0.75	1.39	Inlet (Supercritical)	3
1.00	2.09	Inlet (Supercritical)	3
1.25	2.83	Inlet	5
1.50	3.40	Inlet	5
1.75	3.92	Outlet	6
2.00	4.25	Outlet	6
2.25	4.54	Outlet	6
2.50	4.83	Outlet	6
2.75	5.10	Outlet	6
3.00	5.34	Outlet	6
3.25	5.58	Outlet	6
3.50	5.82	Outlet	6
3.75	6.05	Outlet	6

Diameter: 15 inches

Headwater (ft)	Discharge (cfs)	Control	Flow Type
0.25	0.47	Outlet (Subcritical)	1
0.50	0.95	Inlet (Supercritical)	3
0.75	1.72	Inlet (Supercritical)	3
1.00	2.63	Inlet (Supercritical)	3
1.25	3.67	Inlet (Supercritical)	3
1.50	4.71	Inlet (Supercritical)	4
1.75	5.61	Inlet	5
2.00	6.39	Inlet	5
2.25	7.08	Inlet	5
2.50	7.65	Outlet	6
2.75	8.16	Outlet	6
3.00	8.60	Outlet	6
3.25	9.03	Outlet	6
3.50	9.41	Outlet	6
3.75	9.80	Outlet	6

Diameter: 18 inches

Headwater (ft)	Discharge (cfs)	Control	Flow Type
0.25	0.54	Outlet (Subcritical)	2
0.50	1.12	Inlet (Supercritical)	3
0.75	2.04	Inlet (Supercritical)	3
1.00	3.15	Inlet (Supercritical)	3
1.25	4.40	Inlet (Supercritical)	3
1.50	5.78	Inlet (Supercritical)	3
1.75	7.22	Inlet (Supercritical)	3
2.00	8.42	Inlet	5
2.25	9.50	Inlet	5
2.50	10.47	Inlet	5

2.75	11.35	Inlet	5
3.00	12.18	Inlet	5
3.25	12.95	Inlet	5
3.50	13.67	Inlet	5
3.75	14.31	Inlet	5

Diameter: 21 inches

Headwater (ft)	Discharge (cfs)	Control	Flow Type
0.25	0.59	Outlet (Subcritical)	2
0.50	1.32	Inlet (Supercritical)	3
0.75	2.40	Inlet (Supercritical)	3
1.00	3.67	Inlet (Supercritical)	3
1.25	5.12	Inlet (Supercritical)	3
1.50	6.74	Inlet (Supercritical)	3
1.75	8.49	Inlet (Supercritical)	3
2.00	10.31	Inlet (Supercritical)	4
2.25	11.90	Inlet	5
2.50	13.32	Inlet	5
2.75	14.60	Inlet	5
3.00	15.78	Inlet	5
3.25	16.88	Inlet	5
3.50	17.91	Inlet	5
3.75	18.88	Inlet	5

CIVIL SOFTWARE DESIGN

SEDCAD+ Version 3

AS BUILT DESIGN SPECIFICATIONS FOR CP-88

by

Name: BRIAN SAMBIRSKY

Company Name: BHP MINERALS
File Name: C:\BRIAN\88

Date: 12-05-1995

Civil Software Design -- SEDCAD+ Version 3.1
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Company Name: BHP MINERALS
Filename: C:\BRIAN\88
User: BRIAN SAMBIRSKY
Date: 12-05-1995 Time: 10:05:30
AS BUILT DESIGN SPECIFICATIONS FOR CP-88
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	3.90	89	M	0.596	0.000	0.000	0.0	0.16	1.60
			Type: Null			Label: CP-88				
111	Structure	3.90							0.16	
111	Total IN/OUT	3.90							0.16	1.60

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Company Name: BHP MINERALS
Filename: C:\BRIAN\88 User: BRIAN SAMBIRSKY
Date: 12-05-1995 Time: 10:05:30
AS BUILT DESIGN SPECIFICATIONS FOR CP-88
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	2400.00	1.25	1.12	0.60	0.596		

SEDCAD+ CULVERT SIZING UTILITY

CP-88

Design Discharge	=	1.600 cfs
Entrance Loss Coefficient	=	0.9
Pipe Length	=	39.000 feet
Pipe Slope	=	1.790 %
Manning's n	=	0.012
Maximum Headwater	=	2.700 feet
Tailwater Depth	=	0.000 feet

Smallest Diameter Required to Pass Flow is 8 inches

PERFORMANCE CURVES:

Diameter: 4 inches

Headwater (ft)	Discharge (cfs)	Control	Flow Type
0.27	0.02		0
0.54	0.04		0
0.81	0.06		0
1.08	0.09	Outlet (Subcritical)	1
1.35	0.11	Outlet (Subcritical)	1
1.62	0.13	Outlet (Subcritical)	1
1.89	0.15	Outlet (Subcritical)	1
2.16	0.17	Outlet (Subcritical)	1
2.43	0.19	Outlet (Subcritical)	1
2.70	0.21	Outlet (Subcritical)	1
2.97	0.23	Outlet (Subcritical)	1
3.24	0.26	Outlet (Subcritical)	2
3.51	0.28	Outlet (Subcritical)	2
3.78	0.30	Outlet (Subcritical)	2
4.05	0.32	Outlet (Subcritical)	2

Diameter: 6 inches

Headwater (ft)	Discharge (cfs)	Control	Flow Type
0.27	0.17	Outlet (Subcritical)	1
0.54	0.35	Outlet (Subcritical)	2
0.81	0.52	Inlet (Supercritical)	3
1.08	0.70	Inlet (Supercritical)	4
1.35	0.87	Inlet	5
1.62	1.01	Outlet	6
1.89	1.06	Outlet	6
2.16	1.11	Outlet	6
2.43	1.16	Outlet	6
2.70	1.21	Outlet	6
2.97	1.26	Outlet	6
3.24	1.31	Outlet	6
3.51	1.36	Outlet	6
3.78	1.41	Outlet	6
4.05	1.46	Outlet	6

2.97	5.85	Inlet	5
3.24	6.19	Inlet	5
3.51	6.51	Inlet	5
3.78	6.83	Inlet	5
4.05	7.12	Inlet	5

Diameter: 15 inches

Headwater (ft)	Discharge (cfs)	Control	Flow Type
0.27	0.51	Outlet (Subcritical)	2
0.54	1.04	Inlet (Supercritical)	3
0.81	1.92	Inlet (Supercritical)	3
1.08	2.94	Inlet (Supercritical)	3
1.35	4.10	Inlet (Supercritical)	3
1.62	5.17	Inlet	5
1.89	6.07	Inlet	5
2.16	6.84	Inlet	5
2.43	7.54	Inlet	5
2.70	8.18	Inlet	5
2.97	8.77	Inlet	5
3.24	9.33	Inlet	5
3.51	9.86	Inlet	5
3.78	10.35	Inlet	5
4.05	10.83	Inlet	5

Pages 360 through 371 Appendix 11-V

Blank due to Update

Culvert CP-92

LR

BHP Navajo Coal Company
PO Box 1717
Fruitland, NM 87416

Phone: 505-598-5861

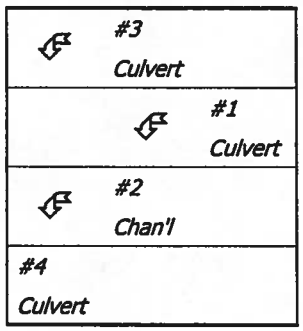
General Information

Storm Information:

Storm Type:	Type II - 60
Design Storm:	2 yr - 6 hr
Rainfall Depth:	0.800 inches

Structure Networking:

Type	Stru #	(flows into)	Stru #	Musk. K (hrs)	Musk. X	Description
Culvert	#1	==>	#2	0.000	0.000	Culvert CP-151
Channel	#2	==>	#4	0.198	0.337	Riprap @ CP-151 Outlet
Culvert	#3	==>	#4	0.284	0.339	Culvert CP-92
Culvert	#4	==>	End	0.000	0.000	Culvert CP-18



Structure Routing Details:

Stru #	Land Flow Condition	Slope (%)	Vert. Dist. (ft)	Horiz. Dist. (ft)	Velocity (fps)	Time (hrs)
#2	8. Large gullies, diversions, and low flowing streams	1.39	35.00	2,520.00	3.53	0.198
#2	**Muskingum K:**					**0.198**
#3	8. Large gullies, diversions, and low flowing streams	1.42	52.00	3,660.00	3.57	0.284
#3	**Muskingum K:**					**0.284**

Structure Detail:

Structure #3 (Culvert)

Culvert CP-92

Culvert Inputs:

Length (ft)	Slope (%)	Manning's n	Max. Headwater (ft)	Tailwater (ft)	Entrance Loss Coef. (Ke)
50.00	3.50	0.0200	4.00	0.00	0.90

Culvert Results:

Design Discharge = 18.89 cfs

Minimum pipe diameter: 1 - 21 inch pipe(s) required

Structure #1 (Culvert)

Culvert CP-151

Culvert Inputs:

Length (ft)	Slope (%)	Manning's n	Max. Headwater (ft)	Tailwater (ft)	Entrance Loss Coef. (Ke)
110.00	1.36	0.0200	4.00	0.00	0.90

Culvert Results:

Design Discharge = 0.69 cfs

Minimum pipe diameter: 1 - 6 inch pipe(s) required

Structure #2 (Riprap Channel)

Riprap @ CP-151 Outlet

Trapezoidal Riprap Channel Inputs:

Material: Riprap

Bottom Width (ft)}	Left Sideslope Ratio	Right Sideslope Ratio	Slope (%)	Freeboard Depth (ft)	Freeboard % of Depth	Freeboard Mult. x (VxD)
2.00	3.0:1	3.0:1	15.0	1.00		

Riprap Channel Results:

Simons/OSM Method - Steep Slope Design

	w/o Freeboard	w/ Freeboard
Design Discharge:	0.69 cfs	
Depth:	0.10 ft	1.10 ft
Top Width:	2.60 ft	8.60 ft
Velocity*:		
X-Section Area:	0.23 sq ft	
Hydraulic Radius:	0.087	
Froude Number*:		
Manning's n*:		
Dmin:	3.00 in	
D50:	9.00 in	
Dmax:	11.25 in	

Velocity and Manning's n calculations may not apply for this method.

Structure #4 (Culvert)

Culvert CP-18

Culvert Inputs:

Length (ft)	Slope (%)	Manning's n	Max. Headwater (ft)	Tailwater (ft)	Entrance Loss Coef. (Ke)
305.00	3.00	0.0200	36.60	0.00	0.90

Culvert Results:

Design Discharge = 53.41 cfs

Minimum pipe diameter: 1 - 30 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)
#3	1	138.800	0.772	0.000	0.000	91.000	M	18.89	2.636
	Σ	**138.800**						**18.89**	**2.636**
#1	1	3.100	0.238	0.000	0.000	90.000	M	0.69	0.051
	Σ	**3.100**						**0.69**	**0.051**
#2	Σ	**3.100**						**0.69**	**0.051**
#4	1	318.700	1.070	0.000	0.000	91.000	M	35.00	6.053
	Σ	**460.600**						**53.41**	**8.740**

Subwatershed Time of Concentration Details:

Stru #	SWS #	Land Flow Condition	Slope (%)	Vert. Dist. (ft)	Horiz. Dist. (ft)	Velocity (fps)	Time (hrs)
#1	1	5. Nearly bare and untilled, and alluvial valley fans	2.15	27.00	1,255.00	1.460	0.238
#1	**1**	**Time of Concentration:**					**0.238**
#3	1	5. Nearly bare and untilled, and alluvial valley fans	2.72	125.00	4,590.00	1.650	0.772
#3	**1**	**Time of Concentration:**					**0.772**
#4	1	5. Nearly bare and untilled, and alluvial valley fans	2.75	175.00	6,360.00	1.650	1.070
#4	**1**	**Time of Concentration:**					**1.070**

CIVIL SOFTWARE DESIGN

SEDCAD+ Version 3

AS BUILT DESIGN SPECIFICATIONS FOR CP-93

by

Name: Brian Sambirsky

Company Name: BHP MINERALS
File Name: C:\BRIAN\93

Date: 12-05-1995

Civil Software Design -- SEDCAD+ Version 3.1
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Company Name: BHP MINERALS
Filename: C:\BRIAN\93
User: Brian Sambirsky
Date: 12-05-1995 Time: 10:05:34
As built design specifications for CP-93
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	51.20	89	M	0.516	0.000	0.000	0.0	2.07	23.08
		Type: Null			Label: CP-93					
111	Structure	51.20							2.07	
111	Total IN/OUT	51.20							2.07	23.08

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Company Name: BHP MINERALS
Filename: C:\BRIAN\93
User: Brian Sambirsky
Date: 12-05-1995 Time: 10:05:34
As built design specifications for CP-93
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	2400.00	1.67	1.29	0.52	0.516		

SEDCAD+ CULVERT SIZING UTILITY

CP-93

Design Discharge	=	23.080 cfs
Entrance Loss Coefficient	=	0.5
Pipe Length	=	230.000 feet
Pipe Slope	=	1.000 %
Manning's n	=	0.020
Maximum Headwater	=	4.000 feet
Tailwater Depth	=	0.000 feet

Smallest Diameter Required to Pass Flow is 30 inches

PERFORMANCE CURVES:

Diameter: 21 inches

Headwater (ft)	Discharge (cfs)	Control	Flow Type
0.40	4.33	Outlet (Subcritical)	1
0.80	4.72	Outlet (Subcritical)	1
1.20	5.35	Outlet (Subcritical)	1
1.60	7.37	Outlet (Subcritical)	1
2.00	10.16	Outlet (Subcritical)	2
2.40	11.17	Outlet	6
2.80	11.85	Outlet	6
3.20	12.48	Outlet	6
3.60	13.10	Outlet	6
4.00	13.67	Outlet	6
4.40	14.23	Outlet	6
4.80	14.77	Outlet	6
5.20	15.28	Outlet	6
5.60	15.79	Outlet	6
6.00	16.27	Outlet	6

Diameter: 24 inches

Headwater (ft)	Discharge (cfs)	Control	Flow Type
0.40	5.95	Outlet (Subcritical)	1
0.80	6.50	Outlet (Subcritical)	1
1.20	7.06	Outlet (Subcritical)	1
1.60	8.15	Outlet (Subcritical)	1
2.00	11.93	Outlet (Subcritical)	1
2.40	15.16	Outlet (Subcritical)	2
2.80	16.17	Outlet	6
3.20	17.09	Outlet	6
3.60	17.97	Outlet	6
4.00	18.81	Outlet	6
4.40	19.61	Outlet	6
4.80	20.37	Outlet	6
5.20	21.12	Outlet	6
5.60	21.83	Outlet	6
6.00	22.53	Outlet	6

Diameter: 30 inches

Headwater (ft)	Discharge (cfs)	Control	Flow Type
0.40	2.88	Inlet (Supercritical)	3
0.80	3.75	Inlet (Supercritical)	3
1.20	6.88	Inlet (Supercritical)	3
1.60	12.70	Outlet (Subcritical)	1 *
2.00	14.11	Outlet (Subcritical)	1
2.40	19.40	Outlet (Subcritical)	1
2.80	24.87	Outlet (Subcritical)	1
3.20	28.33	Outlet	6
3.60	29.97	Outlet	6
4.00	31.51	Outlet	6
4.40	32.99	Outlet	6
4.80	34.40	Outlet	6
5.20	35.76	Outlet	6
5.60	37.06	Outlet	6
6.00	38.32	Outlet	6

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

Diameter: 36 inches

Headwater (ft)	Discharge (cfs)	Control	Flow Type
0.40	2.91	Inlet (Supercritical)	3
0.80	4.50	Inlet (Supercritical)	3
1.20	8.26	Inlet (Supercritical)	3
1.60	12.72	Inlet (Supercritical)	3
2.00	17.77	Inlet (Supercritical)	3
2.40	22.05	Outlet (Subcritical)	1 *
2.80	28.97	Outlet (Subcritical)	1
3.20	36.32	Outlet (Subcritical)	1
3.60	42.61	Inlet (Supercritical)	3
4.00	47.10	Outlet	6
4.40	49.54	Outlet	6
4.80	51.88	Outlet	6
5.20	54.11	Outlet	6
5.60	56.25	Outlet	6
6.00	58.32	Outlet	6

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

Diameter: 42 inches

Headwater (ft)	Discharge (cfs)	Control	Flow Type
0.40	1.99	Inlet (Supercritical)	3
0.80	5.25	Inlet (Supercritical)	3
1.20	9.64	Inlet (Supercritical)	3
1.60	14.83	Inlet (Supercritical)	3
2.00	20.73	Inlet (Supercritical)	3
2.40	27.25	Inlet (Supercritical)	3
2.80	34.34	Inlet (Supercritical)	3
3.20	40.77	Outlet (Subcritical)	1 *

3.60	50.02	Outlet (Subcritical)	1
4.00	59.45	Outlet (Subcritical)	1
4.40	65.63	Inlet	5
4.80	72.16	Inlet	5
5.20	75.69	Outlet	6
5.60	78.96	Outlet	6
6.00	82.11	Outlet	6

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

Diameter: 45 inches

Headwater (ft)	Discharge (cfs)	Control	Flow Type
0.40	2.00	Inlet (Supercritical)	3
0.80	5.63	Inlet (Supercritical)	3
1.20	10.32	Inlet (Supercritical)	3
1.60	15.89	Inlet (Supercritical)	3
2.00	22.21	Inlet (Supercritical)	3
2.40	29.19	Inlet (Supercritical)	3
2.80	36.79	Inlet (Supercritical)	3
3.20	44.95	Inlet (Supercritical)	3
3.60	52.59	Outlet (Subcritical)	1 *
4.00	63.04	Outlet (Subcritical)	1
4.40	72.68	Outlet (Subcritical)	2
4.80	79.63	Inlet	5
5.20	86.88	Inlet	5
5.60	91.45	Outlet	6
6.00	95.25	Outlet	6

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

CIVIL SOFTWARE DESIGN

SEDCAD+ Version 3

AS BUILT DESIGN SPECIFICATIONS FOR CP-94

by

Name: Brian Sambirsky

Company Name: BHP MINERALS
File Name: C:\BRIAN\94

Date: 12-05-1995

Civil Software Design -- SEDCAD+ Version 3.1
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Company Name: BHP MINERALS
Filename: C:\BRIAN\94 User: Brian Sambirsky
Date: 12-05-1995 Time: 10:05:41
As built design specifications for CP-94
Storm: 1.30 inches, 10 year- 6 hour, Type II-65
Hydrograph Convolution Interval: 0.1 hr

SUBWATERSHED/STRUCTURE INPUT/OUTPUT TABLE

JBS	SWS	Area (ac)	CN	UHS	Tc (hrs)	K (hrs)	X	Base-Flow (cfs)	Runoff Volume (ac-ft)	Peak Discharge (cfs)
			-Hydrology-							
111	1	1.70	92	M	0.034	0.000	0.000	0.0	0.09	2.22
		Type: Null			Label: CP-94					
111	Structure	1.70							0.09	
111	Total IN/OUT	1.70							0.09	2.22

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Company Name: BHP MINERALS
Filename: C:\BRIAN\94
User: Brian Sambirsky
Date: 12-05-1995 Time: 10:05:41
As built design specifications for CP-94
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)	X
1	1	1	1	-a	5	390.00	10.00	3.16	0.03	0.034		

SEDCAD+ CULVERT SIZING UTILITY

CP-94

Design Discharge	=	2.220 cfs
Entrance Loss Coefficient	=	0.9
Pipe Length	=	30.000 feet
Pipe Slope	=	0.900 %
Manning's n	=	0.012
Maximum Headwater	=	2.000 feet
Tailwater Depth	=	0.000 feet

Smallest Diameter Required to Pass Flow is 9 inches

PERFORMANCE CURVES:

Diameter: 6 inches

Headwater (ft)	Discharge (cfs)	Control	Flow Type
0.20	0.12	Outlet (Subcritical)	1
0.40	0.23	Outlet (Subcritical)	1
0.60	0.35	Outlet (Subcritical)	2
0.80	0.46	Inlet (Supercritical)	3
1.00	0.58	Inlet (Supercritical)	3
1.20	0.69	Inlet (Supercritical)	4
1.40	0.81	Inlet	5
1.60	0.92	Outlet	6
1.80	1.01	Outlet	6
2.00	1.06	Outlet	6
2.20	1.10	Outlet	6
2.40	1.14	Outlet	6
2.60	1.18	Outlet	6
2.80	1.23	Outlet	6
3.00	1.27	Outlet	6

Diameter: 8 inches

Headwater (ft)	Discharge (cfs)	Control	Flow Type
0.20	0.25	Outlet (Subcritical)	1
0.40	0.49	Outlet (Subcritical)	2
0.60	0.74	Inlet (Supercritical)	4
0.80	0.99	Inlet	5
1.00	1.16	Inlet	5
1.20	1.34	Inlet	5
1.40	1.51	Outlet	6
1.60	1.68	Outlet	6
1.80	1.86	Outlet	6
2.00	2.02	Outlet	6
2.20	2.11	Outlet	6
2.40	2.21	Outlet	6
2.60	2.30	Outlet	6
2.80	2.40	Outlet	6
3.00	2.50	Outlet	6

Diameter: 9 inches

Headwater (ft)	Discharge (cfs)	Control	Flow Type
0.20	0.27	Outlet (Subcritical)	1
0.40	0.54	Outlet (Subcritical)	2
0.60	0.81	Outlet (Subcritical)	2
0.80	1.10	Inlet (Supercritical)	3
1.00	1.41	Inlet (Supercritical)	4
1.20	1.73	Inlet (Supercritical)	4
1.40	2.03	Inlet	5
1.60	2.19	Inlet	5
1.80	2.36	Inlet	5
2.00	2.53	Outlet	6
2.20	2.69	Outlet	6
2.40	2.86	Outlet	6
2.60	3.02	Outlet	6
2.80	3.13	Outlet	6
3.00	3.25	Outlet	6

Diameter: 12 inches

Headwater (ft)	Discharge (cfs)	Control	Flow Type
0.20	0.33	Outlet (Subcritical)	1
0.40	0.65	Outlet (Subcritical)	2
0.60	0.98	Inlet (Supercritical)	3
0.80	1.53	Inlet (Supercritical)	3
1.00	2.09	Inlet (Supercritical)	3
1.20	2.68	Inlet (Supercritical)	4
1.40	3.20	Inlet	5
1.60	3.63	Inlet	5
1.80	4.05	Inlet	5
2.00	4.39	Inlet	5
2.20	4.73	Inlet	5
2.40	5.06	Inlet	5
2.60	5.34	Inlet	5
2.80	5.61	Inlet	5
3.00	5.89	Inlet	5

Diameter: 15 inches

Headwater (ft)	Discharge (cfs)	Control	Flow Type
0.20	0.38	Outlet (Subcritical)	1
0.40	0.76	Outlet (Subcritical)	2
0.60	1.24	Inlet (Supercritical)	3
0.80	1.88	Inlet (Supercritical)	3
1.00	2.63	Inlet (Supercritical)	3
1.20	3.45	Inlet (Supercritical)	3
1.40	4.30	Inlet (Supercritical)	4
1.60	5.10	Inlet	5
1.80	5.78	Inlet	5
2.00	6.39	Inlet	5

2.20	6.96	Inlet	5
2.40	7.46	Inlet	5
2.60	7.96	Inlet	5
2.80	8.40	Inlet	5
3.00	8.84	Inlet	5

Diameter: 18 inches

Headwater (ft)	Discharge (cfs)	Control	Flow Type
0.20	0.43	Outlet (Subcritical)	1
0.40	0.86	Inlet (Supercritical)	3
0.60	1.49	Inlet (Supercritical)	3
0.80	2.26	Inlet (Supercritical)	3
1.00	3.15	Inlet (Supercritical)	3
1.20	4.13	Inlet (Supercritical)	3
1.40	5.21	Inlet (Supercritical)	3
1.60	6.36	Inlet (Supercritical)	3
1.80	7.46	Inlet (Supercritical)	4
2.00	8.42	Inlet	5
2.20	9.29	Inlet	5
2.40	10.10	Inlet	5
2.60	10.83	Inlet	5
2.80	11.52	Inlet	5
3.00	12.18	Inlet	5

CIVIL SOFTWARE DESIGN

SEDCAD+ Version 3

AS BUILT DESIGN SPECIFICATIONS FOR DD-1, DD-2 AND DD-3

by

Name: Brian Sambirsky

Company Name: BHP MINERALS
File Name: C:\BRIAN\DD1_2_3

Date: 12-05-1995

Civil Software Design -- SEDCAD+ Version 3.1
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Company Name: BHP MINERALS
Filename: C:\BRIAN\DD1_2_3 User: Brian Sambirsky
Date: 12-05-1995 Time: 10:06:37
As built design specifications for DD-1, DD-2 and DD-3
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	19.50	89	M	0.888	0.000	0.000	0.0	0.79	6.11
		Type: Null		Label: DD-1, DD-2 and DD-3						
111 Structure		19.50							0.79	
111 Total IN/OUT		19.50							0.79	6.11

Civil Software Design -- SEDCAD+ Version 3.1
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Company Name: BHP MINERALS
Filename: C:\BRIAN\DD1_2_3 User: Brian Sambirsky
Date: 12-05-1995 Time: 10:06:37
As built design specifications for DD-1, DD-2 and DD-3
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	3130.00	0.96	0.98	0.89	0.888		

SEDCAD+ CULVERT SIZING UTILITY

DD-1

Design Discharge	=	2.040 cfs
Entrance Loss Coefficient	=	0.5
Pipe Length	=	36.000 feet
Pipe Slope	=	34.010 %
Manning's n	=	0.018
Maximum Headwater	=	4.000 feet
Tailwater Depth	=	0.000 feet

Smallest Diameter Required to Pass Flow is 8 inches

PERFORMANCE CURVES:

Diameter: 4 inches

Headwater (ft)	Discharge (cfs)	Control	Flow Type
0.40	0.04		0
0.80	0.09	Outlet (Subcritical)	1
1.20	0.13	Outlet (Subcritical)	1
1.60	0.18	Outlet (Subcritical)	1
2.00	0.22	Outlet (Subcritical)	1
2.40	0.26	Outlet (Subcritical)	2
2.80	0.31	Outlet (Subcritical)	2
3.20	0.35	Outlet (Subcritical)	2
3.60	0.39	Outlet (Subcritical)	2
4.00	0.44	Inlet (Supercritical)	3
4.40	0.48	Inlet (Supercritical)	3
4.80	0.53	Inlet (Supercritical)	3
5.20	0.57	Inlet (Supercritical)	3
5.60	0.61	Inlet (Supercritical)	4
6.00	0.66	Inlet (Supercritical)	4

Diameter: 6 inches

Headwater (ft)	Discharge (cfs)	Control	Flow Type
0.40	0.28	Outlet (Subcritical)	1
0.80	0.57	Inlet (Supercritical)	3
1.20	0.85	Inlet (Supercritical)	4
1.60	1.06	Inlet	5
2.00	1.19	Inlet	5
2.40	1.32	Inlet	5
2.80	1.44	Inlet	5
3.20	1.57	Inlet	5
3.60	1.70	Inlet	5
4.00	1.82	Inlet	5
4.40	1.95	Inlet	5
4.80	2.03	Inlet	5
5.20	2.08	Inlet	5
5.60	2.14	Inlet	5
6.00	2.19	Inlet	5

Diameter: 8 inches

Headwater (ft)	Discharge (cfs)	Control	Flow Type
0.40	0.49	Outlet (Subcritical)	2
0.80	0.99	Inlet	5
1.20	1.39	Inlet	5
1.60	1.79	Inlet	5
2.00	2.12	Inlet	5
2.40	2.36	Inlet	5
2.80	2.60	Inlet	5
3.20	2.84	Inlet	5
3.60	3.06	Inlet	5
4.00	3.23	Inlet	5
4.40	3.40	Inlet	5
4.80	3.58	Inlet	5
5.20	3.75	Inlet	5
5.60	3.92	Inlet	5
6.00	4.07	Inlet	5

Diameter: 9 inches

Headwater (ft)	Discharge (cfs)	Control	Flow Type
0.40	0.54	Outlet (Subcritical)	2
0.80	1.10	Inlet (Supercritical)	3
1.20	1.73	Inlet (Supercritical)	4
1.60	2.22	Inlet	5
2.00	2.61	Inlet	5
2.40	3.00	Inlet	5
2.80	3.27	Inlet	5
3.20	3.55	Inlet	5
3.60	3.83	Inlet	5
4.00	4.08	Inlet	5
4.40	4.29	Inlet	5
4.80	4.51	Inlet	5
5.20	4.72	Inlet	5
5.60	4.94	Inlet	5
6.00	5.13	Inlet	5

Diameter: 12 inches

Headwater (ft)	Discharge (cfs)	Control	Flow Type
0.40	0.65	Outlet (Subcritical)	2
0.80	1.53	Inlet (Supercritical)	3
1.20	2.68	Inlet (Supercritical)	4
1.60	3.63	Inlet	5
2.00	4.39	Inlet	5
2.40	5.06	Inlet	5
2.80	5.61	Inlet	5
3.20	6.14	Inlet	5
3.60	6.61	Inlet	5
4.00	7.07	Inlet	5

4.40	7.48	Inlet	5
4.80	7.89	Inlet	5
5.20	8.26	Inlet	5
5.60	8.62	Inlet	5
6.00	8.98	Inlet	5

Diameter: 15 inches

Headwater (ft)	Discharge (cfs)	Control	Flow Type
0.40	0.76	Outlet (Subcritical)	2
0.80	1.88	Inlet (Supercritical)	3
1.20	3.45	Inlet (Supercritical)	3
1.60	5.10	Inlet	5
2.00	6.39	Inlet	5
2.40	7.46	Inlet	5
2.80	8.40	Inlet	5
3.20	9.25	Inlet	5
3.60	10.03	Inlet	5
4.00	10.74	Inlet	5
4.40	11.41	Inlet	5
4.80	12.06	Inlet	5
5.20	12.65	Inlet	5
5.60	13.23	Inlet	5
6.00	13.78	Inlet	5

SEDCAD+ CULVERT SIZING UTILITY

DD-2

Design Discharge	=	2.040 cfs
Entrance Loss Coefficient	=	0.5
Pipe Length	=	53.000 feet
Pipe Slope	=	34.940 %
Manning's n	=	0.018
Maximum Headwater	=	4.000 feet
Tailwater Depth	=	0.000 feet

Smallest Diameter Required to Pass Flow is 8 inches

PERFORMANCE CURVES:

Diameter: 4 inches

Headwater (ft)	Discharge (cfs)	Control	Flow Type
0.40	0.04		0
0.80	0.07		0
1.20	0.11	Outlet (Subcritical)	1
1.60	0.14	Outlet (Subcritical)	1
2.00	0.18	Outlet (Subcritical)	1
2.40	0.21	Outlet (Subcritical)	1
2.80	0.25	Outlet (Subcritical)	1
3.20	0.28	Outlet (Subcritical)	2
3.60	0.32	Outlet (Subcritical)	2
4.00	0.35	Outlet (Subcritical)	2
4.40	0.39	Outlet (Subcritical)	2
4.80	0.42	Inlet (Supercritical)	3
5.20	0.46	Inlet (Supercritical)	3
5.60	0.49	Inlet (Supercritical)	3
6.00	0.53	Inlet (Supercritical)	3

Diameter: 6 inches

Headwater (ft)	Discharge (cfs)	Control	Flow Type
0.40	0.28	Outlet (Subcritical)	1
0.80	0.57	Inlet (Supercritical)	3
1.20	0.85	Inlet (Supercritical)	4
1.60	1.06	Inlet	5
2.00	1.19	Inlet	5
2.40	1.32	Inlet	5
2.80	1.44	Inlet	5
3.20	1.57	Inlet	5
3.60	1.70	Inlet	5
4.00	1.82	Inlet	5
4.40	1.95	Inlet	5
4.80	2.02	Inlet	5
5.20	2.06	Inlet	5
5.60	2.10	Inlet	5
6.00	2.14	Inlet	5

Diameter: 8 inches

Headwater (ft)	Discharge (cfs)	Control	Flow Type
0.40	0.49	Outlet (Subcritical)	2
0.80	0.99	Inlet	5
1.20	1.39	Inlet	5
1.60	1.79	Inlet	5
2.00	2.12	Inlet	5
2.40	2.36	Inlet	5
2.80	2.60	Inlet	5
3.20	2.84	Inlet	5
3.60	3.06	Inlet	5
4.00	3.23	Inlet	5
4.40	3.40	Inlet	5
4.80	3.58	Inlet	5
5.20	3.75	Inlet	5
5.60	3.92	Inlet	5
6.00	4.07	Inlet	5

Diameter: 9 inches

Headwater (ft)	Discharge (cfs)	Control	Flow Type
0.40	0.54	Outlet (Subcritical)	2
0.80	1.10	Inlet (Supercritical)	3
1.20	1.73	Inlet (Supercritical)	4
1.60	2.22	Inlet	5
2.00	2.61	Inlet	5
2.40	3.00	Inlet	5
2.80	3.27	Inlet	5
3.20	3.55	Inlet	5
3.60	3.83	Inlet	5
4.00	4.08	Inlet	5
4.40	4.29	Inlet	5
4.80	4.51	Inlet	5
5.20	4.72	Inlet	5
5.60	4.94	Inlet	5
6.00	5.13	Inlet	5

Diameter: 12 inches

Headwater (ft)	Discharge (cfs)	Control	Flow Type
0.40	0.65	Outlet (Subcritical)	2
0.80	1.53	Inlet (Supercritical)	3
1.20	2.68	Inlet (Supercritical)	4
1.60	3.63	Inlet	5
2.00	4.39	Inlet	5
2.40	5.06	Inlet	5
2.80	5.61	Inlet	5
3.20	6.14	Inlet	5
3.60	6.61	Inlet	5
4.00	7.07	Inlet	5

4.40	7.48	Inlet	5
4.80	7.89	Inlet	5
5.20	8.26	Inlet	5
5.60	8.62	Inlet	5
6.00	8.98	Inlet	5

Diameter: 15 inches

Headwater (ft)	Discharge (cfs)	Control	Flow Type
0.40	0.76	Outlet (Subcritical)	2
0.80	1.88	Inlet (Supercritical)	3
1.20	3.45	Inlet (Supercritical)	3
1.60	5.10	Inlet	5
2.00	6.39	Inlet	5
2.40	7.46	Inlet	5
2.80	8.40	Inlet	5
3.20	9.25	Inlet	5
3.60	10.03	Inlet	5
4.00	10.74	Inlet	5
4.40	11.41	Inlet	5
4.80	12.06	Inlet	5
5.20	12.65	Inlet	5
5.60	13.23	Inlet	5
6.00	13.78	Inlet	5

SEDCAD+ CULVERT SIZING UTILITY

DD-3

Design Discharge	=	2.040 cfs
Entrance Loss Coefficient	=	0.5
Pipe Length	=	53.000 feet
Pipe Slope	=	37.600 %
Manning's n	=	0.018
Maximum Headwater	=	4.000 feet
Tailwater Depth	=	0.000 feet

Smallest Diameter Required to Pass Flow is 8 inches

PERFORMANCE CURVES:

Diameter: 4 inches

Headwater (ft)	Discharge (cfs)	Control	Flow Type
0.40	0.04		0
0.80	0.08		0
1.20	0.12	Outlet (Subcritical)	1
1.60	0.16	Outlet (Subcritical)	1
2.00	0.20	Outlet (Subcritical)	1
2.40	0.24	Outlet (Subcritical)	1
2.80	0.28	Outlet (Subcritical)	2
3.20	0.32	Outlet (Subcritical)	2
3.60	0.36	Outlet (Subcritical)	2
4.00	0.40	Outlet (Subcritical)	2
4.40	0.44	Inlet (Supercritical)	3
4.80	0.48	Inlet (Supercritical)	3
5.20	0.52	Inlet (Supercritical)	3
5.60	0.56	Inlet (Supercritical)	3
6.00	0.60	Inlet (Supercritical)	4

Diameter: 6 inches

Headwater (ft)	Discharge (cfs)	Control	Flow Type
0.40	0.28	Outlet (Subcritical)	1
0.80	0.57	Inlet (Supercritical)	3
1.20	0.85	Inlet (Supercritical)	4
1.60	1.06	Inlet	5
2.00	1.19	Inlet	5
2.40	1.32	Inlet	5
2.80	1.44	Inlet	5
3.20	1.57	Inlet	5
3.60	1.70	Inlet	5
4.00	1.82	Inlet	5
4.40	1.95	Inlet	5
4.80	2.03	Inlet	5
5.20	2.07	Inlet	5
5.60	2.12	Inlet	5
6.00	2.16	Inlet	5

Diameter: 8 inches

Headwater (ft)	Discharge (cfs)	Control	Flow Type
0.40	0.49	Outlet (Subcritical)	2
0.80	0.99	Inlet	5
1.20	1.39	Inlet	5
1.60	1.79	Inlet	5
2.00	2.12	Inlet	5
2.40	2.36	Inlet	5
2.80	2.60	Inlet	5
3.20	2.84	Inlet	5
3.60	3.06	Inlet	5
4.00	3.23	Inlet	5
4.40	3.40	Inlet	5
4.80	3.58	Inlet	5
5.20	3.75	Inlet	5
5.60	3.92	Inlet	5
6.00	4.07	Inlet	5

Diameter: 9 inches

Headwater (ft)	Discharge (cfs)	Control	Flow Type
0.40	0.54	Outlet (Subcritical)	2
0.80	1.10	Inlet (Supercritical)	3
1.20	1.73	Inlet (Supercritical)	4
1.60	2.22	Inlet	5
2.00	2.61	Inlet	5
2.40	3.00	Inlet	5
2.80	3.27	Inlet	5
3.20	3.55	Inlet	5
3.60	3.83	Inlet	5
4.00	4.08	Inlet	5
4.40	4.29	Inlet	5
4.80	4.51	Inlet	5
5.20	4.72	Inlet	5
5.60	4.94	Inlet	5
6.00	5.13	Inlet	5

Diameter: 12 inches

Headwater (ft)	Discharge (cfs)	Control	Flow Type
0.40	0.65	Outlet (Subcritical)	2
0.80	1.53	Inlet (Supercritical)	3
1.20	2.68	Inlet (Supercritical)	4
1.60	3.63	Inlet	5
2.00	4.39	Inlet	5
2.40	5.06	Inlet	5
2.80	5.61	Inlet	5
3.20	6.14	Inlet	5
3.60	6.61	Inlet	5
4.00	7.07	Inlet	5

4.40	7.48	Inlet	5
4.80	7.89	Inlet	5
5.20	8.26	Inlet	5
5.60	8.62	Inlet	5
6.00	8.98	Inlet	5

Diameter: 15 inches

Headwater (ft)	Discharge (cfs)	Control	Flow Type
0.40	0.76	Outlet (Subcritical)	2
0.80	1.88	Inlet (Supercritical)	3
1.20	3.45	Inlet (Supercritical)	3
1.60	5.10	Inlet	5
2.00	6.39	Inlet	5
2.40	7.46	Inlet	5
2.80	8.40	Inlet	5
3.20	9.25	Inlet	5
3.60	10.03	Inlet	5
4.00	10.74	Inlet	5
4.40	11.41	Inlet	5
4.80	12.06	Inlet	5
5.20	12.65	Inlet	5
5.60	13.23	Inlet	5
6.00	13.78	Inlet	5

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DD-04

Shawn Smith

Navajo Coal Company
P.O. Box 1717
Fruitland, NM 87414

Phone: (505) 598-3376
Email: shawn.smith@bhpbilliton.com

General Information

Storm Information:

Storm Type:	Type II-70
Design Storm:	10 yr - 6 hr
Rainfall Depth:	1.300 inches

Structure Networking:

Type	Stru #	(flows into)	Stru #	Musk. K (hrs)	Musk. X	Description
Culvert	#1	==>	End	0.000	0.000	DD-04

#1
Culvert

Structure Summary:

	Immediate Contributing Area (ac)	Total Contributing Area (ac)	Peak Discharge (cfs)	Total Runoff Volume (ac-ft)
#1	1.710	1.710	1.12	0.07

Structure Detail:

Structure #1 (Culvert)

DD-04

Culvert Inputs:

Length (ft)	Slope (%)	Manning's n	Max. Headwater (ft)	Tailwater (ft)	Entrance Loss Coef. (Ke)
64.70	66.34	0.0130	2.00	0.00	0.90

Culvert Results:

Design Discharge = 1.12 cfs

Minimum pipe diameter: 1 - 6 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)
#1	1	1.710	0.433	0.000	0.000	89.000	F	1.12	0.065
	Σ	**1.710**						**1.12**	**0.065**

Subwatershed Time of Concentration Details:

Stru #	SWS #	Land Flow Condition	Slope (%)	Vert. Dist. (ft)	Horiz. Dist. (ft)	Velocity (fps)	Time (hrs)
#1	1	5. Nearly bare and untilled, and alluvial valley fans	0.75	10.05	1,341.00	0.860	0.433
#1	**1**	**Time of Concentration:**					**0.433**

DD-05

Shawn Smith

Navajo Coal Company
P.O. Box 1717
Fruitland, NM 87414

Phone: (505) 598-3376
Email: shawn.smith@bhpbilliton.com

General Information

Storm Information:

Storm Type:	Type II-70
Design Storm:	10 yr - 6 hr
Rainfall Depth:	1.300 inches

Structure Networking:

Type	Stru #	(flows into)	Stru #	Musk. K (hrs)	Musk. X	Description
Culvert	#1	==>	End	0.000	0.000	DD-05

#1
Culvert

Structure Summary:

	Immediate Contributing Area (ac)	Total Contributing Area (ac)	Peak Discharge (cfs)	Total Runoff Volume (ac-ft)
#1	10.410	10.410	3.22	0.25

Structure Detail:

Structure #1 (Culvert)

DD-05

Culvert Inputs:

Length (ft)	Slope (%)	Manning's n	Max. Headwater (ft)	Tailwater (ft)	Entrance Loss Coef. (Ke)
29.00	28.62	0.0150	4.00	0.00	0.90

Culvert Results:

Design Discharge = 3.22 cfs

Minimum pipe diameter: 1 - 8 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)
#1	1	10.410	0.560	0.000	0.000	86.000	M	3.22	0.252
	Σ	**10.410**						**3.22**	**0.252**

Subwatershed Time of Concentration Details:

Stru #	SWS #	Land Flow Condition	Slope (%)	Vert. Dist. (ft)	Horiz. Dist. (ft)	Velocity (fps)	Time (hrs)
#1	1	5. Nearly bare and untilled, and alluvial valley fans	2.72	90.00	3,309.00	1.640	0.560
#1	**1**	**Time of Concentration:**					**0.560**

CIVIL SOFTWARE DESIGN

SEDCAD+ Version 3

AS BUILT DESIGN SPECIFICATIONS FOR DD-6

by

Name: Brian Sambirsky

Company Name: BHP MINERALS
File Name: C:\BRIAN\DD6

Date: 12-05-1995

Civil Software Design -- SEDCAD+ Version 3.1
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Company Name: BHP MINERALS
Filename: C:\BRIAN\DD6
User: Brian Sambirsky
Date: 12-05-1995 Time: 10:06:40
As built design specifications for DD-6
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	15.20	89	M	0.810	0.000	0.000	0.0	0.61	5.08
111 Structure		15.20	Type: Null		Label: DD-6				0.61	
111 Total IN/OUT		15.20							0.61	5.08

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Company Name: BHP MINERALS
Filename: C:\BRIAN\DD6
User: Brian Sambirsky
Date: 12-05-1995 Time: 10:06:40
As built design specifications for DD-6
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	4800.00	2.71	1.65	0.81	0.810		

SEDCAD+ CULVERT SIZING UTILITY

DD-6

Design Discharge	=	5.080 cfs
Entrance Loss Coefficient	=	0.5
Pipe Length	=	44.000 feet
Pipe Slope	=	19.690 %
Manning's n	=	0.013
Maximum Headwater	=	4.000 feet
Tailwater Depth	=	0.000 feet

Smallest Diameter Required to Pass Flow is 12 inches

PERFORMANCE CURVES:

Diameter: 8 inches

Headwater (ft)	Discharge (cfs)	Control	Flow Type
0.40	0.49	Outlet (Subcritical)	2
0.80	0.99	Inlet	5
1.20	1.39	Inlet	5
1.60	1.79	Inlet	5
2.00	2.12	Inlet	5
2.40	2.36	Inlet	5
2.80	2.60	Inlet	5
3.20	2.84	Inlet	5
3.60	3.06	Inlet	5
4.00	3.23	Inlet	5
4.40	3.40	Inlet	5
4.80	3.58	Inlet	5
5.20	3.75	Inlet	5
5.60	3.92	Inlet	5
6.00	4.07	Inlet	5

Diameter: 9 inches

Headwater (ft)	Discharge (cfs)	Control	Flow Type
0.40	0.54	Outlet (Subcritical)	2
0.80	1.10	Inlet (Supercritical)	3
1.20	1.73	Inlet (Supercritical)	4
1.60	2.22	Inlet	5
2.00	2.61	Inlet	5
2.40	3.00	Inlet	5
2.80	3.27	Inlet	5
3.20	3.55	Inlet	5
3.60	3.83	Inlet	5
4.00	4.08	Inlet	5
4.40	4.29	Inlet	5
4.80	4.51	Inlet	5
5.20	4.72	Inlet	5
5.60	4.94	Inlet	5
6.00	5.13	Inlet	5

Diameter: 12 inches

Headwater (ft)	Discharge (cfs)	Control	Flow Type
0.40	0.65	Outlet (Subcritical)	2
0.80	1.53	Inlet (Supercritical)	3
1.20	2.68	Inlet (Supercritical)	4
1.60	3.63	Inlet	5
2.00	4.39	Inlet	5
2.40	5.06	Inlet	5
2.80	5.61	Inlet	5
3.20	6.14	Inlet	5
3.60	6.61	Inlet	5
4.00	7.07	Inlet	5
4.40	7.48	Inlet	5
4.80	7.89	Inlet	5
5.20	8.26	Inlet	5
5.60	8.62	Inlet	5
6.00	8.98	Inlet	5

Diameter: 15 inches

Headwater (ft)	Discharge (cfs)	Control	Flow Type
0.40	0.76	Outlet (Subcritical)	2
0.80	1.88	Inlet (Supercritical)	3
1.20	3.45	Inlet (Supercritical)	3
1.60	5.10	Inlet	5
2.00	6.39	Inlet	5
2.40	7.46	Inlet	5
2.80	8.40	Inlet	5
3.20	9.25	Inlet	5
3.60	10.03	Inlet	5
4.00	10.74	Inlet	5
4.40	11.41	Inlet	5
4.80	12.06	Inlet	5
5.20	12.65	Inlet	5
5.60	13.23	Inlet	5
6.00	13.78	Inlet	5

Diameter: 18 inches

Headwater (ft)	Discharge (cfs)	Control	Flow Type
0.40	0.86	Inlet (Supercritical)	3
0.80	2.26	Inlet (Supercritical)	3
1.20	4.13	Inlet (Supercritical)	3
1.60	6.36	Inlet (Supercritical)	3
2.00	8.42	Inlet	5
2.40	10.10	Inlet	5
2.80	11.52	Inlet	5
3.20	12.80	Inlet	5
3.60	13.96	Inlet	5
4.00	15.02	Inlet	5

4.40	16.02	Inlet	5
4.80	16.96	Inlet	5
5.20	17.84	Inlet	5
5.60	18.69	Inlet	5
6.00	19.50	Inlet	5

Diameter: 21 inches

Headwater (ft)	Discharge (cfs)	Control	Flow Type
0.40	0.95	Inlet (Supercritical)	3
0.80	2.64	Inlet (Supercritical)	3
1.20	4.82	Inlet (Supercritical)	3
1.60	7.42	Inlet (Supercritical)	3
2.00	10.31	Inlet (Supercritical)	4
2.40	12.77	Inlet	5
2.80	14.85	Inlet	5
3.20	16.66	Inlet	5
3.60	18.30	Inlet	5
4.00	19.81	Inlet	5
4.40	21.20	Inlet	5
4.80	22.51	Inlet	5
5.20	23.75	Inlet	5
5.60	24.93	Inlet	5
6.00	26.05	Inlet	5

CIVIL SOFTWARE DESIGN

SEDCAD+ Version 3

AS BUILT DESIGN SPECIFICATIONS FOR DOWNDRAINS 7, 8, 9, 10, 11 AND 12

by

Name: Brian Sambirsky

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

Date: 12-05-1995

Civil Software Design -- SEDCAD+ Version 3.1
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Company Name: BHP MINERALS
Filename: C:\BRIAN\BIGFILLA
Date: 12-05-1995 Time: 10:06:22 User: Brian Sambirsky
As built design specifications for downdrains 7, 8, 9, 10, 11 and 12
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	56.20	89	M	1.056	0.000	0.000	0.0	2.27	15.56
111 Structure	Type: Null		Label: Downdrains 7, 8 & 9						
	56.20								
111 Total IN/OUT	56.20							2.27	
121 1	4.60	89	M	1.464	0.000	0.000	0.0	2.27	15.56
121 Structure	Type: Null		Label: Downdrains 10,11&12					0.19	1.00
	4.60								
121 Total IN/OUT	4.60							0.19	
211 Structure	Type: Null		Label: Downdrains 10,11&12					0.19	1.00
	4.60								
211 Total IN/OUT	60.80							2.45	
111 to 211 Routing				0.001	0.271			2.45	16.39

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Company Name: BHP MINERALS
Filename: C:\BRIAN\BIGFILLA User: Brian Sambirsky
Date: 12-05-1995 Time: 10:06:22
As built design specifications for downdrains 7, 8, 9, 10, 11 and 12
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)	X
1	1	1	1	-a	5	5800.00	2.33	1.53	1.06	1.056		
1	2	1	1	-a	5	4600.00	0.76	0.87	1.46	1.464		

SEDCAD+ CULVERT SIZING UTILITY

DD-7

Design Discharge	=	5.180 cfs
Entrance Loss Coefficient	=	0.5
Pipe Length	=	325.000 feet
Pipe Slope	=	20.350 %
Manning's n	=	0.013
Maximum Headwater	=	2.250 feet
Tailwater Depth	=	0.000 feet

Smallest Diameter Required to Pass Flow is 15 inches

PERFORMANCE CURVES:

Diameter: 9 inches

Headwater (ft)	Discharge (cfs)	Control	Flow Type
0.22	0.30	Outlet (Subcritical)	1
0.45	0.61	Outlet (Subcritical)	2
0.67	0.91	Inlet (Supercritical)	3
0.90	1.25	Inlet (Supercritical)	4
1.13	1.61	Inlet (Supercritical)	4
1.35	1.97	Inlet	5
1.58	2.20	Inlet	5
1.80	2.42	Inlet	5
2.03	2.63	Inlet	5
2.25	2.85	Inlet	5
2.47	3.05	Inlet	5
2.70	3.21	Inlet	5
2.92	3.36	Inlet	5
3.15	3.52	Inlet	5
3.37	3.67	Inlet	5

Diameter: 12 inches

Headwater (ft)	Discharge (cfs)	Control	Flow Type
0.22	0.37	Outlet (Subcritical)	1
0.45	0.74	Outlet (Subcritical)	2
0.67	1.18	Inlet (Supercritical)	3
0.90	1.81	Inlet (Supercritical)	3
1.13	2.46	Inlet (Supercritical)	4
1.35	3.09	Inlet	5
1.58	3.58	Inlet	5
1.80	4.05	Inlet	5
2.03	4.44	Inlet	5
2.25	4.82	Inlet	5
2.47	5.16	Inlet	5
2.70	5.48	Inlet	5
2.92	5.79	Inlet	5
3.15	6.09	Inlet	5
3.37	6.35	Inlet	5

Diameter: 15 inches

Headwater (ft)	Discharge (cfs)	Control	Flow Type
0.22	0.43	Outlet (Subcritical)	1
0.45	0.85	Inlet (Supercritical)	3
0.67	1.48	Inlet (Supercritical)	3
0.90	2.25	Inlet (Supercritical)	3
1.13	3.13	Inlet (Supercritical)	3
1.35	4.10	Inlet (Supercritical)	3
1.58	5.01	Inlet	5
1.80	5.78	Inlet	5
2.03	6.46	Inlet	5
2.25	7.09	Inlet	5
2.47	7.65	Inlet	5
2.70	8.18	Inlet	5
2.92	8.68	Inlet	5
3.15	9.15	Inlet	5
3.37	9.59	Inlet	5

Diameter: 18 inches

Headwater (ft)	Discharge (cfs)	Control	Flow Type
0.22	0.48	Outlet (Subcritical)	1
0.45	0.97	Inlet (Supercritical)	3
0.67	1.76	Inlet (Supercritical)	3
0.90	2.70	Inlet (Supercritical)	3
1.13	3.76	Inlet (Supercritical)	3
1.35	4.93	Inlet (Supercritical)	3
1.58	6.21	Inlet (Supercritical)	3
1.80	7.46	Inlet (Supercritical)	4
2.03	8.53	Inlet	5
2.25	9.50	Inlet	5
2.47	10.37	Inlet	5
2.70	11.18	Inlet	5
2.92	11.94	Inlet	5
3.15	12.64	Inlet	5
3.37	13.31	Inlet	5

Diameter: 21 inches

Headwater (ft)	Discharge (cfs)	Control	Flow Type
0.22	0.53	Outlet (Subcritical)	2
0.45	1.12	Inlet (Supercritical)	3
0.67	2.03	Inlet (Supercritical)	3
0.90	3.13	Inlet (Supercritical)	3
1.13	4.38	Inlet (Supercritical)	3
1.35	5.75	Inlet (Supercritical)	3
1.58	7.25	Inlet (Supercritical)	3
1.80	8.85	Inlet (Supercritical)	3
2.03	10.47	Inlet (Supercritical)	4
2.25	11.90	Inlet	5

2.47	13.19	Inlet	5
2.70	14.35	Inlet	5
2.92	15.43	Inlet	5
3.15	16.44	Inlet	5
3.37	17.40	Inlet	5

Diameter: 24 inches

Headwater (ft)	Discharge (cfs)	Control	Flow Type
0.22	0.58	Outlet (Subcritical)	2
0.45	1.29	Inlet (Supercritical)	3
0.67	2.34	Inlet (Supercritical)	3
0.90	3.59	Inlet (Supercritical)	3
1.13	5.00	Inlet (Supercritical)	3
1.35	6.57	Inlet (Supercritical)	3
1.58	8.28	Inlet (Supercritical)	3
1.80	10.11	Inlet (Supercritical)	3
2.03	12.07	Inlet (Supercritical)	3
2.25	14.13	Inlet (Supercritical)	3
2.47	15.91	Inlet	5
2.70	17.54	Inlet	5
2.92	19.05	Inlet	5
3.15	20.43	Inlet	5
3.37	21.74	Inlet	5

SEDCAD+ CULVERT SIZING UTILITY

DD-8

Design Discharge	=	5.180 cfs
Entrance Loss Coefficient	=	0.5
Pipe Length	=	90.000 feet
Pipe Slope	=	67.420 %
Manning's n	=	0.013
Maximum Headwater	=	2.250 feet
Tailwater Depth	=	0.000 feet

Smallest Diameter Required to Pass Flow is 15 inches

PERFORMANCE CURVES:

Diameter: 9 inches

Headwater (ft)	Discharge (cfs)	Control	Flow Type
0.22	0.30	Outlet (Subcritical)	1
0.45	0.61	Outlet (Subcritical)	2
0.67	0.91	Inlet (Supercritical)	3
0.90	1.25	Inlet (Supercritical)	4
1.13	1.61	Inlet (Supercritical)	4
1.35	1.97	Inlet	5
1.58	2.20	Inlet	5
1.80	2.42	Inlet	5
2.03	2.63	Inlet	5
2.25	2.85	Inlet	5
2.47	3.05	Inlet	5
2.70	3.21	Inlet	5
2.92	3.36	Inlet	5
3.15	3.52	Inlet	5
3.37	3.67	Inlet	5

Diameter: 12 inches

Headwater (ft)	Discharge (cfs)	Control	Flow Type
0.22	0.37	Outlet (Subcritical)	1
0.45	0.74	Outlet (Subcritical)	2
0.67	1.18	Inlet (Supercritical)	3
0.90	1.81	Inlet (Supercritical)	3
1.13	2.46	Inlet (Supercritical)	4
1.35	3.09	Inlet	5
1.58	3.58	Inlet	5
1.80	4.05	Inlet	5
2.03	4.44	Inlet	5
2.25	4.82	Inlet	5
2.47	5.16	Inlet	5
2.70	5.48	Inlet	5
2.92	5.79	Inlet	5
3.15	6.09	Inlet	5
3.37	6.35	Inlet	5

Diameter: 15 inches

Headwater (ft)	Discharge (cfs)	Control	Flow Type
0.22	0.43	Outlet (Subcritical)	1
0.45	0.85	Inlet (Supercritical)	3
0.67	1.48	Inlet (Supercritical)	3
0.90	2.25	Inlet (Supercritical)	3
1.13	3.13	Inlet (Supercritical)	3
1.35	4.10	Inlet (Supercritical)	3
1.58	5.01	Inlet	5
1.80	5.78	Inlet	5
2.03	6.46	Inlet	5
2.25	7.09	Inlet	5
2.47	7.65	Inlet	5
2.70	8.18	Inlet	5
2.92	8.68	Inlet	5
3.15	9.15	Inlet	5
3.37	9.59	Inlet	5

Diameter: 18 inches

Headwater (ft)	Discharge (cfs)	Control	Flow Type
0.22	0.48	Outlet (Subcritical)	1
0.45	0.97	Inlet (Supercritical)	3
0.67	1.76	Inlet (Supercritical)	3
0.90	2.70	Inlet (Supercritical)	3
1.13	3.76	Inlet (Supercritical)	3
1.35	4.93	Inlet (Supercritical)	3
1.58	6.21	Inlet (Supercritical)	3
1.80	7.46	Inlet (Supercritical)	4
2.03	8.53	Inlet	5
2.25	9.50	Inlet	5
2.47	10.37	Inlet	5
2.70	11.18	Inlet	5
2.92	11.94	Inlet	5
3.15	12.64	Inlet	5
3.37	13.31	Inlet	5

Diameter: 21 inches

Headwater (ft)	Discharge (cfs)	Control	Flow Type
0.22	0.53	Outlet (Subcritical)	2
0.45	1.12	Inlet (Supercritical)	3
0.67	2.03	Inlet (Supercritical)	3
0.90	3.13	Inlet (Supercritical)	3
1.13	4.38	Inlet (Supercritical)	3
1.35	5.75	Inlet (Supercritical)	3
1.58	7.25	Inlet (Supercritical)	3
1.80	8.85	Inlet (Supercritical)	3
2.03	10.47	Inlet (Supercritical)	4
2.25	11.90	Inlet	5

2.47	13.19	Inlet	5
2.70	14.35	Inlet	5
2.92	15.43	Inlet	5
3.15	16.44	Inlet	5
3.37	17.40	Inlet	5

Diameter: 24 inches

Headwater (ft)	Discharge (cfs)	Control	Flow Type
0.22	0.58	Outlet (Subcritical)	2
0.45	1.29	Inlet (Supercritical)	3
0.67	2.34	Inlet (Supercritical)	3
0.90	3.59	Inlet (Supercritical)	3
1.13	5.00	Inlet (Supercritical)	3
1.35	6.57	Inlet (Supercritical)	3
1.58	8.28	Inlet (Supercritical)	3
1.80	10.11	Inlet (Supercritical)	3
2.03	12.07	Inlet (Supercritical)	3
2.25	14.13	Inlet (Supercritical)	3
2.47	15.91	Inlet	5
2.70	17.54	Inlet	5
2.92	19.05	Inlet	5
3.15	20.43	Inlet	5
3.37	21.74	Inlet	5

SEDCAD+ CULVERT SIZING UTILITY

DD-9

Design Discharge	=	5.180 cfs
Entrance Loss Coefficient	=	0.5
Pipe Length	=	87.000 feet
Pipe Slope	=	66.340 %
Manning's n	=	0.013
Maximum Headwater	=	2.250 feet
Tailwater Depth	=	0.000 feet

Smallest Diameter Required to Pass Flow is 15 inches

PERFORMANCE CURVES:

Diameter: 9 inches

Headwater (ft)	Discharge (cfs)	Control	Flow Type
0.22	0.30	Outlet (Subcritical)	1
0.45	0.61	Outlet (Subcritical)	2
0.67	0.91	Inlet (Supercritical)	3
0.90	1.25	Inlet (Supercritical)	4
1.13	1.61	Inlet (Supercritical)	4
1.35	1.97	Inlet	5
1.58	2.20	Inlet	5
1.80	2.42	Inlet	5
2.03	2.63	Inlet	5
2.25	2.85	Inlet	5
2.47	3.05	Inlet	5
2.70	3.21	Inlet	5
2.92	3.36	Inlet	5
3.15	3.52	Inlet	5
3.37	3.67	Inlet	5

Diameter: 12 inches

Headwater (ft)	Discharge (cfs)	Control	Flow Type
0.22	0.37	Outlet (Subcritical)	1
0.45	0.74	Outlet (Subcritical)	2
0.67	1.18	Inlet (Supercritical)	3
0.90	1.81	Inlet (Supercritical)	3
1.13	2.46	Inlet (Supercritical)	4
1.35	3.09	Inlet	5
1.58	3.58	Inlet	5
1.80	4.05	Inlet	5
2.03	4.44	Inlet	5
2.25	4.82	Inlet	5
2.47	5.16	Inlet	5
2.70	5.48	Inlet	5
2.92	5.79	Inlet	5
3.15	6.09	Inlet	5
3.37	6.35	Inlet	5

Diameter: 15 inches

Headwater (ft)	Discharge (cfs)	Control	Flow Type
0.22	0.43	Outlet (Subcritical)	1
0.45	0.85	Inlet (Supercritical)	3
0.67	1.48	Inlet (Supercritical)	3
0.90	2.25	Inlet (Supercritical)	3
1.13	3.13	Inlet (Supercritical)	3
1.35	4.10	Inlet (Supercritical)	3
1.58	5.01	Inlet	5
1.80	5.78	Inlet	5
2.03	6.46	Inlet	5
2.25	7.09	Inlet	5
2.47	7.65	Inlet	5
2.70	8.18	Inlet	5
2.92	8.68	Inlet	5
3.15	9.15	Inlet	5
3.37	9.59	Inlet	5

Diameter: 18 inches

Headwater (ft)	Discharge (cfs)	Control	Flow Type
0.22	0.48	Outlet (Subcritical)	1
0.45	0.97	Inlet (Supercritical)	3
0.67	1.76	Inlet (Supercritical)	3
0.90	2.70	Inlet (Supercritical)	3
1.13	3.76	Inlet (Supercritical)	3
1.35	4.93	Inlet (Supercritical)	3
1.58	6.21	Inlet (Supercritical)	3
1.80	7.46	Inlet (Supercritical)	4
2.03	8.53	Inlet	5
2.25	9.50	Inlet	5
2.47	10.37	Inlet	5
2.70	11.18	Inlet	5
2.92	11.94	Inlet	5
3.15	12.64	Inlet	5
3.37	13.31	Inlet	5

Diameter: 21 inches

Headwater (ft)	Discharge (cfs)	Control	Flow Type
0.22	0.53	Outlet (Subcritical)	2
0.45	1.12	Inlet (Supercritical)	3
0.67	2.03	Inlet (Supercritical)	3
0.90	3.13	Inlet (Supercritical)	3
1.13	4.38	Inlet (Supercritical)	3
1.35	5.75	Inlet (Supercritical)	3
1.58	7.25	Inlet (Supercritical)	3
1.80	8.85	Inlet (Supercritical)	3
2.03	10.47	Inlet (Supercritical)	4
2.25	11.90	Inlet	5

2.47	13.19	Inlet	5
2.70	14.35	Inlet	5
2.92	15.43	Inlet	5
3.15	16.44	Inlet	5
3.37	17.40	Inlet	5

Diameter: 24 inches

Headwater (ft)	Discharge (cfs)	Control	Flow Type
0.22	0.58	Outlet (Subcritical)	2
0.45	1.29	Inlet (Supercritical)	3
0.67	2.34	Inlet (Supercritical)	3
0.90	3.59	Inlet (Supercritical)	3
1.13	5.00	Inlet (Supercritical)	3
1.35	6.57	Inlet (Supercritical)	3
1.58	8.28	Inlet (Supercritical)	3
1.80	10.11	Inlet (Supercritical)	3
2.03	12.07	Inlet (Supercritical)	3
2.25	14.13	Inlet (Supercritical)	3
2.47	15.91	Inlet	5
2.70	17.54	Inlet	5
2.92	19.05	Inlet	5
3.15	20.43	Inlet	5
3.37	21.74	Inlet	5

SEDCAD+ CULVERT SIZING UTILITY

DD-10

Design Discharge	=	0.330	cfs
Entrance Loss Coefficient	=	0.5	
Pipe Length	=	105.000	feet
Pipe Slope	=	50.340	%
Manning's n	=	0.013	
Maximum Headwater	=	1.250	feet
Tailwater Depth	=	0.000	feet

Smallest Diameter Required to Pass Flow is 4 inches

PERFORMANCE CURVES:

Diameter: 2 inches

Headwater (ft)	Discharge (cfs)	Control	Flow Type
0.13	0.00		0
0.25	0.00		0
0.38	0.00		0
0.50	0.00		0
0.63	0.00		0
0.75	0.00		0
0.88	0.00		0
1.00	0.00		0
1.13	0.00		0
1.25	0.00		0
1.38	0.00		0
1.50	0.00		0
1.63	0.00		0
1.75	0.00		0
1.88	0.00		0

Diameter: 4 inches

Headwater (ft)	Discharge (cfs)	Control	Flow Type
0.13	0.02		0
0.25	0.05		0
0.38	0.07		0
0.50	0.09		0
0.63	0.11	Outlet (Subcritical)	1
0.75	0.14	Outlet (Subcritical)	1
0.88	0.16	Outlet (Subcritical)	1
1.00	0.18	Outlet (Subcritical)	1
1.13	0.20	Outlet (Subcritical)	1
1.25	0.23	Outlet (Subcritical)	1
1.38	0.25	Outlet (Subcritical)	1
1.50	0.27	Outlet (Subcritical)	1
1.63	0.29	Outlet (Subcritical)	1
1.75	0.32	Outlet (Subcritical)	2
1.88	0.34	Outlet (Subcritical)	2

Diameter: 6 inches

Headwater (ft)	Discharge (cfs)	Control	Flow Type
0.13	0.09		0
0.25	0.18	Outlet (Subcritical)	1
0.38	0.27	Outlet (Subcritical)	1
0.50	0.36	Outlet (Subcritical)	2
0.63	0.44	Outlet (Subcritical)	2
0.75	0.53	Inlet (Supercritical)	3
0.88	0.62	Inlet (Supercritical)	3
1.00	0.71	Inlet (Supercritical)	4
1.13	0.80	Inlet (Supercritical)	4
1.25	0.89	Inlet (Supercritical)	4
1.38	0.98	Inlet	5
1.50	1.03	Inlet	5
1.63	1.07	Inlet	5
1.75	1.11	Inlet	5
1.88	1.15	Inlet	5

Diameter: 8 inches

Headwater (ft)	Discharge (cfs)	Control	Flow Type
0.13	0.15	Outlet (Subcritical)	1
0.25	0.31	Outlet (Subcritical)	2
0.38	0.46	Outlet (Subcritical)	2
0.50	0.62	Inlet (Supercritical)	3
0.63	0.77	Inlet (Supercritical)	4
0.75	0.92	Inlet	5
0.88	1.06	Inlet	5
1.00	1.19	Inlet	5
1.13	1.32	Inlet	5
1.25	1.44	Inlet	5
1.38	1.57	Inlet	5
1.50	1.69	Inlet	5
1.63	1.82	Inlet	5
1.75	1.94	Inlet	5
1.88	2.04	Inlet	5

Diameter: 9 inches

Headwater (ft)	Discharge (cfs)	Control	Flow Type
0.13	0.17	Outlet (Subcritical)	1
0.25	0.34	Outlet (Subcritical)	1
0.38	0.51	Outlet (Subcritical)	2
0.50	0.68	Outlet (Subcritical)	2
0.63	0.84	Inlet (Supercritical)	3
0.75	1.02	Inlet (Supercritical)	3
0.88	1.21	Inlet (Supercritical)	3
1.00	1.41	Inlet (Supercritical)	4
1.13	1.61	Inlet (Supercritical)	4
1.25	1.81	Inlet	5

1.38	2.01	Inlet	5
1.50	2.13	Inlet	5
1.63	2.25	Inlet	5
1.75	2.37	Inlet	5
1.88	2.49	Inlet	5

SEDCAD+ CULVERT SIZING UTILITY

DD-11

Design Discharge	=	0.330	cfs
Entrance Loss Coefficient	=	0.5	
Pipe Length	=	408.000	feet
Pipe Slope	=	12.120	%
Manning's n	=	0.013	
Maximum Headwater	=	1.250	feet
Tailwater Depth	=	0.000	feet

Smallest Diameter Required to Pass Flow is 4 inches

PERFORMANCE CURVES:

Diameter: 2 inches

Headwater (ft)	Discharge (cfs)	Control	Flow Type
0.13	0.00		0
0.25	0.00		0
0.38	0.00		0
0.50	0.00		0
0.63	0.00		0
0.75	0.00		0
0.88	0.00		0
1.00	0.00		0
1.13	0.00		0
1.25	0.00		0
1.38	0.00		0
1.50	0.00		0
1.63	0.00		0
1.75	0.00		0
1.88	0.00		0

Diameter: 4 inches

Headwater (ft)	Discharge (cfs)	Control	Flow Type
0.13	0.00		0
0.25	0.00		0
0.38	0.01		0
0.50	0.01		0
0.63	0.01		0
0.75	0.01		0
0.88	0.02		0
1.00	0.02		0
1.13	0.02		0
1.25	0.02		0
1.38	0.02		0
1.50	0.03		0
1.63	0.03		0
1.75	0.03		0
1.88	0.03		0

Diameter: 6 inches

Headwater (ft)	Discharge (cfs)	Control	Flow Type
0.13	0.09		0
0.25	0.18	Outlet (Subcritical)	1
0.38	0.27	Outlet (Subcritical)	1
0.50	0.36	Outlet (Subcritical)	2
0.63	0.44	Outlet (Subcritical)	2
0.75	0.53	Inlet (Supercritical)	3
0.88	0.62	Inlet (Supercritical)	3
1.00	0.71	Inlet (Supercritical)	4
1.13	0.80	Inlet (Supercritical)	4
1.25	0.89	Inlet (Supercritical)	4
1.38	0.98	Inlet	5
1.50	1.03	Inlet	5
1.63	1.07	Inlet	5
1.75	1.11	Inlet	5
1.88	1.15	Inlet	5

Diameter: 8 inches

Headwater (ft)	Discharge (cfs)	Control	Flow Type
0.13	0.15	Outlet (Subcritical)	1
0.25	0.31	Outlet (Subcritical)	2
0.38	0.46	Outlet (Subcritical)	2
0.50	0.62	Inlet (Supercritical)	3
0.63	0.77	Inlet (Supercritical)	4
0.75	0.92	Inlet	5
0.88	1.06	Inlet	5
1.00	1.19	Inlet	5
1.13	1.32	Inlet	5
1.25	1.44	Inlet	5
1.38	1.57	Inlet	5
1.50	1.69	Inlet	5
1.63	1.82	Inlet	5
1.75	1.94	Inlet	5
1.88	2.04	Inlet	5

Diameter: 9 inches

Headwater (ft)	Discharge (cfs)	Control	Flow Type
0.13	0.17	Outlet (Subcritical)	1
0.25	0.34	Outlet (Subcritical)	1
0.38	0.51	Outlet (Subcritical)	2
0.50	0.68	Outlet (Subcritical)	2
0.63	0.84	Inlet (Supercritical)	3
0.75	1.02	Inlet (Supercritical)	3
0.88	1.21	Inlet (Supercritical)	3
1.00	1.41	Inlet (Supercritical)	4
1.13	1.61	Inlet (Supercritical)	4
1.25	1.81	Inlet	5

1.38	2.01	Inlet	5
1.50	2.13	Inlet	5
1.63	2.25	Inlet	5
1.75	2.37	Inlet	5
1.88	2.49	Inlet	5

SEDCAD+ CULVERT SIZING UTILITY

DD-12

Design Discharge	=	0.330 cfs
Entrance Loss Coefficient	=	0.5
Pipe Length	=	67.500 feet
Pipe Slope	=	58.770 %
Manning's n	=	0.013
Maximum Headwater	=	1.250 feet
Tailwater Depth	=	0.000 feet

Smallest Diameter Required to Pass Flow is 4 inches

PERFORMANCE CURVES:

Diameter: 2 inches

Headwater (ft)	Discharge (cfs)	Control	Flow Type
0.13	0.00		0
0.25	0.00		0
0.38	0.00		0
0.50	0.00		0
0.63	0.00		0
0.75	0.00		0
0.88	0.00		0
1.00	0.00		0
1.13	0.00		0
1.25	0.00		0
1.38	0.00		0
1.50	0.00		0
1.63	0.00		0
1.75	0.00		0
1.88	0.00		0

Diameter: 4 inches

Headwater (ft)	Discharge (cfs)	Control	Flow Type
0.13	0.02		0
0.25	0.05		0
0.38	0.07		0
0.50	0.09		0
0.63	0.11	Outlet (Subcritical)	1
0.75	0.14	Outlet (Subcritical)	1
0.88	0.16	Outlet (Subcritical)	1
1.00	0.18	Outlet (Subcritical)	1
1.13	0.20	Outlet (Subcritical)	1
1.25	0.23	Outlet (Subcritical)	1
1.38	0.25	Outlet (Subcritical)	1
1.50	0.27	Outlet (Subcritical)	1
1.63	0.29	Outlet (Subcritical)	1
1.75	0.32	Outlet (Subcritical)	2
1.88	0.34	Outlet (Subcritical)	2

Diameter: 6 inches

Headwater (ft)	Discharge (cfs)	Control	Flow Type
0.13	0.09		0
0.25	0.18	Outlet (Subcritical)	1
0.38	0.27	Outlet (Subcritical)	1
0.50	0.36	Outlet (Subcritical)	2
0.63	0.44	Outlet (Subcritical)	2
0.75	0.53	Inlet (Supercritical)	3
0.88	0.62	Inlet (Supercritical)	3
1.00	0.71	Inlet (Supercritical)	4
1.13	0.80	Inlet (Supercritical)	4
1.25	0.89	Inlet (Supercritical)	4
1.38	0.98	Inlet	5
1.50	1.03	Inlet	5
1.63	1.07	Inlet	5
1.75	1.11	Inlet	5
1.88	1.15	Inlet	5

Diameter: 8 inches

Headwater (ft)	Discharge (cfs)	Control	Flow Type
0.13	0.15	Outlet (Subcritical)	1
0.25	0.31	Outlet (Subcritical)	2
0.38	0.46	Outlet (Subcritical)	2
0.50	0.62	Inlet (Supercritical)	3
0.63	0.77	Inlet (Supercritical)	4
0.75	0.92	Inlet	5
0.88	1.06	Inlet	5
1.00	1.19	Inlet	5
1.13	1.32	Inlet	5
1.25	1.44	Inlet	5
1.38	1.57	Inlet	5
1.50	1.69	Inlet	5
1.63	1.82	Inlet	5
1.75	1.94	Inlet	5
1.88	2.04	Inlet	5

Diameter: 9 inches

Headwater (ft)	Discharge (cfs)	Control	Flow Type
0.13	0.17	Outlet (Subcritical)	1
0.25	0.34	Outlet (Subcritical)	1
0.38	0.51	Outlet (Subcritical)	2
0.50	0.68	Outlet (Subcritical)	2
0.63	0.84	Inlet (Supercritical)	3
0.75	1.02	Inlet (Supercritical)	3
0.88	1.21	Inlet (Supercritical)	3
1.00	1.41	Inlet (Supercritical)	4
1.13	1.61	Inlet (Supercritical)	4
1.25	1.81	Inlet	5

1.38	2.01	Inlet	5
1.50	2.13	Inlet	5
1.63	2.25	Inlet	5
1.75	2.37	Inlet	5
1.88	2.49	Inlet	5

CIVIL SOFTWARE DESIGN

SEDCAD+ Version 3

AS BUILT DESIGN SPECIFICATIONS FOR DOWNDRAINS 13,14,15,16,17,&18

by

Name: Brian Sambirsky

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

Date: 12-05-1995

Civil Software Design -- SEDCAD+ Version 3.1
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Company Name: BHP MINERALS
Filename: C:\BRIAN\BIGFILLB User: Brian Sambirsky
Date: 12-05-1995 Time: 10:06:18
As built design specifications for downdrains 13,14,15,16,17,&18
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	15.00	89	M	1.679	0.000	0.000	0.0	0.61	2.92
		Type: Null		Label: Downdrains 13,14,15						
111	Structure	15.00							0.61	
111	Total IN/OUT	15.00							0.61	2.92
121	1	61.60	89	M	0.674	0.000	0.000	0.0	2.49	23.36
		Type: Null		Label: Downdrains 16,17,18						
121	Structure	61.60							2.49	
	Total IN/OUT	61.60							2.49	23.36
		Type: Null		Label: Downdrains 16,17,18						
211	Structure	61.60							3.09	
211	Total IN/OUT	76.60							3.09	24.90
111 to 211 Routing						0.001	0.271			

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Company Name: BHP MINERALS
Filename: C:\BRIAN\BIGFILLB User: Brian Sambirsky
Date: 12-05-1995 Time: 10:06:18
As built design specifications for downdrains 13,14,15,16,17,&18
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)	X
1	1	1	1	-a	5	6350.00	1.10	1.05	1.68	1.679		
1	2	1	1	-a	5	4300.00	3.14	1.77	0.67	0.674		

SEDCAD+ CULVERT SIZING UTILITY

DD-13

Design Discharge	=	0.970 cfs
Entrance Loss Coefficient	=	0.5
Pipe Length	=	206.000 feet
Pipe Slope	=	27.880 %
Manning's n	=	0.013
Maximum Headwater	=	1.250 feet
Tailwater Depth	=	0.000 feet

Smallest Diameter Required to Pass Flow is 8 inches

PERFORMANCE CURVES:

Diameter: 4 inches

Headwater (ft)	Discharge (cfs)	Control	Flow Type
0.13	0.02		0
0.25	0.05		0
0.38	0.07		0
0.50	0.09		0
0.63	0.11	Outlet (Subcritical)	1
0.75	0.14	Outlet (Subcritical)	1
0.88	0.16	Outlet (Subcritical)	1
1.00	0.18	Outlet (Subcritical)	1
1.13	0.20	Outlet (Subcritical)	1
1.25	0.23	Outlet (Subcritical)	1
1.38	0.25	Outlet (Subcritical)	1
1.50	0.27	Outlet (Subcritical)	1
1.63	0.29	Outlet (Subcritical)	1
1.75	0.32	Outlet (Subcritical)	2
1.88	0.34	Outlet (Subcritical)	2

Diameter: 6 inches

Headwater (ft)	Discharge (cfs)	Control	Flow Type
0.13	0.09		0
0.25	0.18	Outlet (Subcritical)	1
0.38	0.27	Outlet (Subcritical)	1
0.50	0.36	Outlet (Subcritical)	2
0.63	0.44	Outlet (Subcritical)	2
0.75	0.53	Inlet (Supercritical)	3
0.88	0.62	Inlet (Supercritical)	3
1.00	0.71	Inlet (Supercritical)	4
1.13	0.80	Inlet (Supercritical)	4
1.25	0.89	Inlet (Supercritical)	4
1.38	0.98	Inlet	5
1.50	1.03	Inlet	5
1.63	1.07	Inlet	5
1.75	1.11	Inlet	5
1.88	1.15	Inlet	5

Diameter: 8 inches

Headwater (ft)	Discharge (cfs)	Control	Flow Type
0.13	0.15	Outlet (Subcritical)	1
0.25	0.31	Outlet (Subcritical)	2
0.38	0.46	Outlet (Subcritical)	2
0.50	0.62	Inlet (Supercritical)	3
0.63	0.77	Inlet (Supercritical)	4
0.75	0.92	Inlet	5
0.88	1.06	Inlet	5
1.00	1.19	Inlet	5
1.13	1.32	Inlet	5
1.25	1.44	Inlet	5
1.38	1.57	Inlet	5
1.50	1.69	Inlet	5
1.63	1.82	Inlet	5
1.75	1.94	Inlet	5
1.88	2.04	Inlet	5

Diameter: 9 inches

Headwater (ft)	Discharge (cfs)	Control	Flow Type
0.13	0.17	Outlet (Subcritical)	1
0.25	0.34	Outlet (Subcritical)	1
0.38	0.51	Outlet (Subcritical)	2
0.50	0.68	Outlet (Subcritical)	2
0.63	0.84	Inlet (Supercritical)	3
0.75	1.02	Inlet (Supercritical)	3
0.88	1.21	Inlet (Supercritical)	3
1.00	1.41	Inlet (Supercritical)	4
1.13	1.61	Inlet (Supercritical)	4
1.25	1.81	Inlet	5
1.38	2.01	Inlet	5
1.50	2.13	Inlet	5
1.63	2.25	Inlet	5
1.75	2.37	Inlet	5
1.88	2.49	Inlet	5

Diameter: 12 inches

Headwater (ft)	Discharge (cfs)	Control	Flow Type
0.13	0.20	Outlet (Subcritical)	1
0.25	0.41	Outlet (Subcritical)	1
0.38	0.61	Outlet (Subcritical)	2
0.50	0.82	Outlet (Subcritical)	2
0.63	1.04	Inlet (Supercritical)	3
0.75	1.39	Inlet (Supercritical)	3
0.88	1.74	Inlet (Supercritical)	3
1.00	2.09	Inlet (Supercritical)	3
1.13	2.46	Inlet (Supercritical)	4
1.25	2.83	Inlet	5

1.38	3.14	Inlet	5
1.50	3.42	Inlet	5
1.63	3.69	Inlet	5
1.75	3.96	Inlet	5
1.88	4.18	Inlet	5

Diameter: 15 inches

Headwater (ft)	Discharge (cfs)	Control	Flow Type
0.13	0.24	Outlet (Subcritical)	1
0.25	0.47	Outlet (Subcritical)	1
0.38	0.71	Outlet (Subcritical)	2
0.50	0.95	Inlet (Supercritical)	3
0.63	1.32	Inlet (Supercritical)	3
0.75	1.72	Inlet (Supercritical)	3
0.88	2.15	Inlet (Supercritical)	3
1.00	2.63	Inlet (Supercritical)	3
1.13	3.13	Inlet (Supercritical)	3
1.25	3.67	Inlet (Supercritical)	3
1.38	4.20	Inlet (Supercritical)	3
1.50	4.71	Inlet (Supercritical)	4
1.63	5.18	Inlet	5
1.75	5.61	Inlet	5
1.88	6.03	Inlet	5

SEDCAD+ CULVERT SIZING UTILITY

DD-14

Design Discharge	=	0.970 cfs
Entrance Loss Coefficient	=	0.5
Pipe Length	=	153.000 feet
Pipe Slope	=	34.390 %
Manning's n	=	0.013
Maximum Headwater	=	1.250 feet
Tailwater Depth	=	0.000 feet

Smallest Diameter Required to Pass Flow is 8 inches

PERFORMANCE CURVES:

Diameter: 4 inches

Headwater (ft)	Discharge (cfs)	Control	Flow Type
0.13	0.02		0
0.25	0.05		0
0.38	0.07		0
0.50	0.09		0
0.63	0.11	Outlet (Subcritical)	1
0.75	0.14	Outlet (Subcritical)	1
0.88	0.16	Outlet (Subcritical)	1
1.00	0.18	Outlet (Subcritical)	1
1.13	0.20	Outlet (Subcritical)	1
1.25	0.23	Outlet (Subcritical)	1
1.38	0.25	Outlet (Subcritical)	1
1.50	0.27	Outlet (Subcritical)	1
1.63	0.29	Outlet (Subcritical)	1
1.75	0.32	Outlet (Subcritical)	2
1.88	0.34	Outlet (Subcritical)	2

Diameter: 6 inches

Headwater (ft)	Discharge (cfs)	Control	Flow Type
0.13	0.09		0
0.25	0.18	Outlet (Subcritical)	1
0.38	0.27	Outlet (Subcritical)	1
0.50	0.36	Outlet (Subcritical)	2
0.63	0.44	Outlet (Subcritical)	2
0.75	0.53	Inlet (Supercritical)	3
0.88	0.62	Inlet (Supercritical)	3
1.00	0.71	Inlet (Supercritical)	4
1.13	0.80	Inlet (Supercritical)	4
1.25	0.89	Inlet (Supercritical)	4
1.38	0.98	Inlet	5
1.50	1.03	Inlet	5
1.63	1.07	Inlet	5
1.75	1.11	Inlet	5
1.88	1.15	Inlet	5

Diameter: 8 inches

Headwater (ft)	Discharge (cfs)	Control	Flow Type
0.13	0.15	Outlet (Subcritical)	1
0.25	0.31	Outlet (Subcritical)	2
0.38	0.46	Outlet (Subcritical)	2
0.50	0.62	Inlet (Supercritical)	3
0.63	0.77	Inlet (Supercritical)	4
0.75	0.92	Inlet	5
0.88	1.06	Inlet	5
1.00	1.19	Inlet	5
1.13	1.32	Inlet	5
1.25	1.44	Inlet	5
1.38	1.57	Inlet	5
1.50	1.69	Inlet	5
1.63	1.82	Inlet	5
1.75	1.94	Inlet	5
1.88	2.04	Inlet	5

Diameter: 9 inches

Headwater (ft)	Discharge (cfs)	Control	Flow Type
0.13	0.17	Outlet (Subcritical)	1
0.25	0.34	Outlet (Subcritical)	1
0.38	0.51	Outlet (Subcritical)	2
0.50	0.68	Outlet (Subcritical)	2
0.63	0.84	Inlet (Supercritical)	3
0.75	1.02	Inlet (Supercritical)	3
0.88	1.21	Inlet (Supercritical)	3
1.00	1.41	Inlet (Supercritical)	4
1.13	1.61	Inlet (Supercritical)	4
1.25	1.81	Inlet	5
1.38	2.01	Inlet	5
1.50	2.13	Inlet	5
1.63	2.25	Inlet	5
1.75	2.37	Inlet	5
1.88	2.49	Inlet	5

Diameter: 12 inches

Headwater (ft)	Discharge (cfs)	Control	Flow Type
0.13	0.20	Outlet (Subcritical)	1
0.25	0.41	Outlet (Subcritical)	1
0.38	0.61	Outlet (Subcritical)	2
0.50	0.82	Outlet (Subcritical)	2
0.63	1.04	Inlet (Supercritical)	3
0.75	1.39	Inlet (Supercritical)	3
0.88	1.74	Inlet (Supercritical)	3
1.00	2.09	Inlet (Supercritical)	3
1.13	2.46	Inlet (Supercritical)	4
1.25	2.83	Inlet	5

1.38	3.14	Inlet	5
1.50	3.42	Inlet	5
1.63	3.69	Inlet	5
1.75	3.96	Inlet	5
1.88	4.18	Inlet	5

Diameter: 15 inches

Headwater (ft)	Discharge (cfs)	Control	Flow Type
0.13	0.24	Outlet (Subcritical)	1
0.25	0.47	Outlet (Subcritical)	1
0.38	0.71	Outlet (Subcritical)	2
0.50	0.95	Inlet (Supercritical)	3
0.63	1.32	Inlet (Supercritical)	3
0.75	1.72	Inlet (Supercritical)	3
0.88	2.15	Inlet (Supercritical)	3
1.00	2.63	Inlet (Supercritical)	3
1.13	3.13	Inlet (Supercritical)	3
1.25	3.67	Inlet (Supercritical)	3
1.38	4.20	Inlet (Supercritical)	3
1.50	4.71	Inlet (Supercritical)	4
1.63	5.18	Inlet	5
1.75	5.61	Inlet	5
1.88	6.03	Inlet	5

SEDCAD+ CULVERT SIZING UTILITY

DD-15

Design Discharge	=	0.970 cfs
Entrance Loss Coefficient	=	0.5
Pipe Length	=	154.000 feet
Pipe Slope	=	32.420 %
Manning's n	=	0.013
Maximum Headwater	=	1.250 feet
Tailwater Depth	=	0.000 feet

Smallest Diameter Required to Pass Flow is 8 inches

PERFORMANCE CURVES:

Diameter: 4 inches

Headwater (ft)	Discharge (cfs)	Control	Flow Type
0.13	0.02		0
0.25	0.05		0
0.38	0.07		0
0.50	0.09		0
0.63	0.11	Outlet (Subcritical)	1
0.75	0.14	Outlet (Subcritical)	1
0.88	0.16	Outlet (Subcritical)	1
1.00	0.18	Outlet (Subcritical)	1
1.13	0.20	Outlet (Subcritical)	1
1.25	0.23	Outlet (Subcritical)	1
1.38	0.25	Outlet (Subcritical)	1
1.50	0.27	Outlet (Subcritical)	1
1.63	0.29	Outlet (Subcritical)	1
1.75	0.32	Outlet (Subcritical)	2
1.88	0.34	Outlet (Subcritical)	2

Diameter: 6 inches

Headwater (ft)	Discharge (cfs)	Control	Flow Type
0.13	0.09		0
0.25	0.18	Outlet (Subcritical)	1
0.38	0.27	Outlet (Subcritical)	1
0.50	0.36	Outlet (Subcritical)	2
0.63	0.44	Outlet (Subcritical)	2
0.75	0.53	Inlet (Supercritical)	3
0.88	0.62	Inlet (Supercritical)	3
1.00	0.71	Inlet (Supercritical)	4
1.13	0.80	Inlet (Supercritical)	4
1.25	0.89	Inlet (Supercritical)	4
1.38	0.98	Inlet	5
1.50	1.03	Inlet	5
1.63	1.07	Inlet	5
1.75	1.11	Inlet	5
1.88	1.15	Inlet	5

Diameter: 8 inches

Headwater (ft)	Discharge (cfs)	Control	Flow Type
0.13	0.15	Outlet (Subcritical)	1
0.25	0.31	Outlet (Subcritical)	2
0.38	0.46	Outlet (Subcritical)	2
0.50	0.62	Inlet (Supercritical)	3
0.63	0.77	Inlet (Supercritical)	4
0.75	0.92	Inlet	5
0.88	1.06	Inlet	5
1.00	1.19	Inlet	5
1.13	1.32	Inlet	5
1.25	1.44	Inlet	5
1.38	1.57	Inlet	5
1.50	1.69	Inlet	5
1.63	1.82	Inlet	5
1.75	1.94	Inlet	5
1.88	2.04	Inlet	5

Diameter: 9 inches

Headwater (ft)	Discharge (cfs)	Control	Flow Type
0.13	0.17	Outlet (Subcritical)	1
0.25	0.34	Outlet (Subcritical)	1
0.38	0.51	Outlet (Subcritical)	2
0.50	0.68	Outlet (Subcritical)	2
0.63	0.84	Inlet (Supercritical)	3
0.75	1.02	Inlet (Supercritical)	3
0.88	1.21	Inlet (Supercritical)	3
1.00	1.41	Inlet (Supercritical)	4
1.13	1.61	Inlet (Supercritical)	4
1.25	1.81	Inlet	5
1.38	2.01	Inlet	5
1.50	2.13	Inlet	5
1.63	2.25	Inlet	5
1.75	2.37	Inlet	5
1.88	2.49	Inlet	5

Diameter: 12 inches

Headwater (ft)	Discharge (cfs)	Control	Flow Type
0.13	0.20	Outlet (Subcritical)	1
0.25	0.41	Outlet (Subcritical)	1
0.38	0.61	Outlet (Subcritical)	2
0.50	0.82	Outlet (Subcritical)	2
0.63	1.04	Inlet (Supercritical)	3
0.75	1.39	Inlet (Supercritical)	3
0.88	1.74	Inlet (Supercritical)	3
1.00	2.09	Inlet (Supercritical)	3
1.13	2.46	Inlet (Supercritical)	4
1.25	2.83	Inlet	5

1.38	3.14	Inlet	5
1.50	3.42	Inlet	5
1.63	3.69	Inlet	5
1.75	3.96	Inlet	5
1.88	4.18	Inlet	5

Diameter: 15 inches

Headwater (ft)	Discharge (cfs)	Control	Flow Type
0.13	0.24	Outlet (Subcritical)	1
0.25	0.47	Outlet (Subcritical)	1
0.38	0.71	Outlet (Subcritical)	2
0.50	0.95	Inlet (Supercritical)	3
0.63	1.32	Inlet (Supercritical)	3
0.75	1.72	Inlet (Supercritical)	3
0.88	2.15	Inlet (Supercritical)	3
1.00	2.63	Inlet (Supercritical)	3
1.13	3.13	Inlet (Supercritical)	3
1.25	3.67	Inlet (Supercritical)	3
1.38	4.20	Inlet (Supercritical)	3
1.50	4.71	Inlet (Supercritical)	4
1.63	5.18	Inlet	5
1.75	5.61	Inlet	5
1.88	6.03	Inlet	5

SEDCAD+ CULVERT SIZING UTILITY

DD-16

Design Discharge	=	7.790 cfs
Entrance Loss Coefficient	=	0.5
Pipe Length	=	160.000 feet
Pipe Slope	=	28.910 %
Manning's n	=	0.013
Maximum Headwater	=	2.750 feet
Tailwater Depth	=	0.000 feet

Smallest Diameter Required to Pass Flow is 15 inches

PERFORMANCE CURVES:

Diameter: 9 inches

Headwater (ft)	Discharge (cfs)	Control	Flow Type
0.28	0.37	Outlet (Subcritical)	1
0.55	0.74	Outlet (Subcritical)	2
0.83	1.14	Inlet (Supercritical)	3
1.10	1.57	Inlet (Supercritical)	4
1.38	2.01	Inlet	5
1.65	2.27	Inlet	5
1.92	2.54	Inlet	5
2.20	2.80	Inlet	5
2.48	3.05	Inlet	5
2.75	3.24	Inlet	5
3.03	3.43	Inlet	5
3.30	3.62	Inlet	5
3.58	3.81	Inlet	5
3.85	4.00	Inlet	5
4.13	4.15	Inlet	5

Diameter: 12 inches

Headwater (ft)	Discharge (cfs)	Control	Flow Type
0.28	0.45	Outlet (Subcritical)	1
0.55	0.90	Inlet (Supercritical)	3
0.83	1.60	Inlet (Supercritical)	3
1.10	2.38	Inlet (Supercritical)	4
1.38	3.14	Inlet	5
1.65	3.74	Inlet	5
1.92	4.27	Inlet	5
2.20	4.73	Inlet	5
2.48	5.16	Inlet	5
2.75	5.55	Inlet	5
3.03	5.93	Inlet	5
3.30	6.26	Inlet	5
3.58	6.58	Inlet	5
3.85	6.91	Inlet	5
4.13	7.20	Inlet	5

Diameter: 15 inches

Headwater (ft)	Discharge (cfs)	Control	Flow Type
0.28	0.52	Outlet (Subcritical)	2
0.55	1.08	Inlet (Supercritical)	3
0.83	1.96	Inlet (Supercritical)	3
1.10	3.02	Inlet (Supercritical)	3
1.38	4.20	Inlet (Supercritical)	3
1.65	5.27	Inlet	5
1.92	6.17	Inlet	5
2.20	6.96	Inlet	5
2.48	7.65	Inlet	5
2.75	8.29	Inlet	5
3.03	8.90	Inlet	5
3.30	9.45	Inlet	5
3.58	9.99	Inlet	5
3.85	10.48	Inlet	5
4.13	10.96	Inlet	5

Diameter: 18 inches

Headwater (ft)	Discharge (cfs)	Control	Flow Type
0.28	0.59	Outlet (Subcritical)	2
0.55	1.31	Inlet (Supercritical)	3
0.83	2.37	Inlet (Supercritical)	3
1.10	3.63	Inlet (Supercritical)	3
1.38	5.07	Inlet (Supercritical)	3
1.65	6.66	Inlet (Supercritical)	3
1.92	8.08	Inlet	5
2.20	9.29	Inlet	5
2.48	10.37	Inlet	5
2.75	11.35	Inlet	5
3.03	12.25	Inlet	5
3.30	13.10	Inlet	5
3.58	13.88	Inlet	5
3.85	14.63	Inlet	5
4.13	15.34	Inlet	5

Diameter: 21 inches

Headwater (ft)	Discharge (cfs)	Control	Flow Type
0.28	0.65	Outlet (Subcritical)	2
0.55	1.52	Inlet (Supercritical)	3
0.83	2.76	Inlet (Supercritical)	3
1.10	4.23	Inlet (Supercritical)	3
1.38	5.91	Inlet (Supercritical)	3
1.65	7.77	Inlet (Supercritical)	3
1.92	9.79	Inlet (Supercritical)	3
2.20	11.59	Inlet	5
2.48	13.19	Inlet	5
2.75	14.60	Inlet	5

3.03	15.90	Inlet	5
3.30	17.09	Inlet	5
3.58	18.20	Inlet	5
3.85	19.25	Inlet	5
4.13	20.25	Inlet	5

Diameter: 24 inches

Headwater (ft)	Discharge (cfs)	Control	Flow Type
0.28	0.71	Outlet (Subcritical)	2
0.55	1.73	Inlet (Supercritical)	3
0.83	3.14	Inlet (Supercritical)	3
1.10	4.84	Inlet (Supercritical)	3
1.38	6.76	Inlet (Supercritical)	3
1.65	8.88	Inlet (Supercritical)	3
1.92	11.19	Inlet (Supercritical)	3
2.20	13.67	Inlet (Supercritical)	3
2.48	15.91	Inlet	5
2.75	17.89	Inlet	5
3.03	19.67	Inlet	5
3.30	21.31	Inlet	5
3.58	22.84	Inlet	5
3.85	24.26	Inlet	5
4.13	25.61	Inlet	5

SEDCAD+ CULVERT SIZING UTILITY

DD-17

Design Discharge	=	7.790 cfs
Entrance Loss Coefficient	=	0.5
Pipe Length	=	126.000 feet
Pipe Slope	=	29.360 %
Manning's n	=	0.013
Maximum Headwater	=	2.750 feet
Tailwater Depth	=	0.000 feet

Smallest Diameter Required to Pass Flow is 15 inches

PERFORMANCE CURVES:

Diameter: 9 inches

Headwater (ft)	Discharge (cfs)	Control	Flow Type
0.28	0.37	Outlet (Subcritical)	1
0.55	0.74	Outlet (Subcritical)	2
0.83	1.14	Inlet (Supercritical)	3
1.10	1.57	Inlet (Supercritical)	4
1.38	2.01	Inlet	5
1.65	2.27	Inlet	5
1.92	2.54	Inlet	5
2.20	2.80	Inlet	5
2.48	3.05	Inlet	5
2.75	3.24	Inlet	5
3.03	3.43	Inlet	5
3.30	3.62	Inlet	5
3.58	3.81	Inlet	5
3.85	4.00	Inlet	5
4.13	4.15	Inlet	5

Diameter: 12 inches

Headwater (ft)	Discharge (cfs)	Control	Flow Type
0.28	0.45	Outlet (Subcritical)	1
0.55	0.90	Inlet (Supercritical)	3
0.83	1.60	Inlet (Supercritical)	3
1.10	2.38	Inlet (Supercritical)	4
1.38	3.14	Inlet	5
1.65	3.74	Inlet	5
1.92	4.27	Inlet	5
2.20	4.73	Inlet	5
2.48	5.16	Inlet	5
2.75	5.55	Inlet	5
3.03	5.93	Inlet	5
3.30	6.26	Inlet	5
3.58	6.58	Inlet	5
3.85	6.91	Inlet	5
4.13	7.20	Inlet	5

Diameter: 15 inches

Headwater (ft)	Discharge (cfs)	Control	Flow Type
0.28	0.52	Outlet (Subcritical)	2
0.55	1.08	Inlet (Supercritical)	3
0.83	1.96	Inlet (Supercritical)	3
1.10	3.02	Inlet (Supercritical)	3
1.38	4.20	Inlet (Supercritical)	3
1.65	5.27	Inlet	5
1.92	6.17	Inlet	5
2.20	6.96	Inlet	5
2.48	7.65	Inlet	5
2.75	8.29	Inlet	5
3.03	8.90	Inlet	5
3.30	9.45	Inlet	5
3.58	9.99	Inlet	5
3.85	10.48	Inlet	5
4.13	10.96	Inlet	5

Diameter: 18 inches

Headwater (ft)	Discharge (cfs)	Control	Flow Type
0.28	0.59	Outlet (Subcritical)	2
0.55	1.31	Inlet (Supercritical)	3
0.83	2.37	Inlet (Supercritical)	3
1.10	3.63	Inlet (Supercritical)	3
1.38	5.07	Inlet (Supercritical)	3
1.65	6.66	Inlet (Supercritical)	3
1.92	8.08	Inlet	5
2.20	9.29	Inlet	5
2.48	10.37	Inlet	5
2.75	11.35	Inlet	5
3.03	12.25	Inlet	5
3.30	13.10	Inlet	5
3.58	13.88	Inlet	5
3.85	14.63	Inlet	5
4.13	15.34	Inlet	5

Diameter: 21 inches

Headwater (ft)	Discharge (cfs)	Control	Flow Type
0.28	0.65	Outlet (Subcritical)	2
0.55	1.52	Inlet (Supercritical)	3
0.83	2.76	Inlet (Supercritical)	3
1.10	4.23	Inlet (Supercritical)	3
1.38	5.91	Inlet (Supercritical)	3
1.65	7.77	Inlet (Supercritical)	3
1.92	9.79	Inlet (Supercritical)	3
2.20	11.59	Inlet	5
2.48	13.19	Inlet	5
2.75	14.60	Inlet	5

3.03	15.90	Inlet	5
3.30	17.09	Inlet	5
3.58	18.20	Inlet	5
3.85	19.25	Inlet	5
4.13	20.25	Inlet	5

Diameter: 24 inches

Headwater (ft)	Discharge (cfs)	Control	Flow Type
0.28	0.71	Outlet (Subcritical)	2
0.55	1.73	Inlet (Supercritical)	3
0.83	3.14	Inlet (Supercritical)	3
1.10	4.84	Inlet (Supercritical)	3
1.38	6.76	Inlet (Supercritical)	3
1.65	8.88	Inlet (Supercritical)	3
1.92	11.19	Inlet (Supercritical)	3
2.20	13.67	Inlet (Supercritical)	3
2.48	15.91	Inlet	5
2.75	17.89	Inlet	5
3.03	19.67	Inlet	5
3.30	21.31	Inlet	5
3.58	22.84	Inlet	5
3.85	24.26	Inlet	5
4.13	25.61	Inlet	5

SEDCAD+ CULVERT SIZING UTILITY

DD-18

Design Discharge	=	7.790 cfs
Entrance Loss Coefficient	=	0.5
Pipe Length	=	170.000 feet
Pipe Slope	=	23.810 %
Manning's n	=	0.013
Maximum Headwater	=	2.750 feet
Tailwater Depth	=	0.000 feet

Smallest Diameter Required to Pass Flow is 15 inches

PERFORMANCE CURVES:

Diameter: 9 inches

Headwater (ft)	Discharge (cfs)	Control	Flow Type
0.28	0.37	Outlet (Subcritical)	1
0.55	0.74	Outlet (Subcritical)	2
0.83	1.14	Inlet (Supercritical)	3
1.10	1.57	Inlet (Supercritical)	4
1.38	2.01	Inlet	5
1.65	2.27	Inlet	5
1.92	2.54	Inlet	5
2.20	2.80	Inlet	5
2.48	3.05	Inlet	5
2.75	3.24	Inlet	5
3.03	3.43	Inlet	5
3.30	3.62	Inlet	5
3.58	3.81	Inlet	5
3.85	4.00	Inlet	5
4.13	4.15	Inlet	5

Diameter: 12 inches

Headwater (ft)	Discharge (cfs)	Control	Flow Type
0.28	0.45	Outlet (Subcritical)	1
0.55	0.90	Inlet (Supercritical)	3
0.83	1.60	Inlet (Supercritical)	3
1.10	2.38	Inlet (Supercritical)	4
1.38	3.14	Inlet	5
1.65	3.74	Inlet	5
1.92	4.27	Inlet	5
2.20	4.73	Inlet	5
2.48	5.16	Inlet	5
2.75	5.55	Inlet	5
3.03	5.93	Inlet	5
3.30	6.26	Inlet	5
3.58	6.58	Inlet	5
3.85	6.91	Inlet	5
4.13	7.20	Inlet	5

Diameter: 15 inches

Headwater (ft)	Discharge (cfs)	Control	Flow Type
0.28	0.52	Outlet (Subcritical)	2
0.55	1.08	Inlet (Supercritical)	3
0.83	1.96	Inlet (Supercritical)	3
1.10	3.02	Inlet (Supercritical)	3
1.38	4.20	Inlet (Supercritical)	3
1.65	5.27	Inlet	5
1.92	6.17	Inlet	5
2.20	6.96	Inlet	5
2.48	7.65	Inlet	5
2.75	8.29	Inlet	5
3.03	8.90	Inlet	5
3.30	9.45	Inlet	5
3.58	9.99	Inlet	5
3.85	10.48	Inlet	5
4.13	10.96	Inlet	5

Diameter: 18 inches

Headwater (ft)	Discharge (cfs)	Control	Flow Type
0.28	0.59	Outlet (Subcritical)	2
0.55	1.31	Inlet (Supercritical)	3
0.83	2.37	Inlet (Supercritical)	3
1.10	3.63	Inlet (Supercritical)	3
1.38	5.07	Inlet (Supercritical)	3
1.65	6.66	Inlet (Supercritical)	3
1.92	8.08	Inlet	5
2.20	9.29	Inlet	5
2.48	10.37	Inlet	5
2.75	11.35	Inlet	5
3.03	12.25	Inlet	5
3.30	13.10	Inlet	5
3.58	13.88	Inlet	5
3.85	14.63	Inlet	5
4.13	15.34	Inlet	5

Diameter: 21 inches

Headwater (ft)	Discharge (cfs)	Control	Flow Type
0.28	0.65	Outlet (Subcritical)	2
0.55	1.52	Inlet (Supercritical)	3
0.83	2.76	Inlet (Supercritical)	3
1.10	4.23	Inlet (Supercritical)	3
1.38	5.91	Inlet (Supercritical)	3
1.65	7.77	Inlet (Supercritical)	3
1.92	9.79	Inlet (Supercritical)	3
2.20	11.59	Inlet	5
2.48	13.19	Inlet	5
2.75	14.60	Inlet	5

3.03	15.90	Inlet	5
3.30	17.09	Inlet	5
3.58	18.20	Inlet	5
3.85	19.25	Inlet	5
4.13	20.25	Inlet	5

Diameter: 24 inches

Headwater (ft)	Discharge (cfs)	Control	Flow Type
0.28	0.71	Outlet (Subcritical)	2
0.55	1.73	Inlet (Supercritical)	3
0.83	3.14	Inlet (Supercritical)	3
1.10	4.84	Inlet (Supercritical)	3
1.38	6.76	Inlet (Supercritical)	3
1.65	8.88	Inlet (Supercritical)	3
1.92	11.19	Inlet (Supercritical)	3
2.20	13.67	Inlet (Supercritical)	3
2.48	15.91	Inlet	5
2.75	17.89	Inlet	5
3.03	19.67	Inlet	5
3.30	21.31	Inlet	5
3.58	22.84	Inlet	5
3.85	24.26	Inlet	5
4.13	25.61	Inlet	5

BLANK PAGES (462 - 481)

Due to CP-18, CP-19, Downdrains 19, 20, & 21 data update

See CP-17 and CP-18 for downdrain data

CIVIL SOFTWARE DESIGN

SEDCAD+ Version 3

CP-95 CULVERT AT AREA III FACILITIES.

by

Name: lr

Company Name: BHP MINERALS
File Name: C:\LR\CP95

Date: 09-30-1996

Civil Software Design -- SEDCAD+ Version 3.1
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Company Name: BHP MINERALS
Filename: C:\LR\CP95 User: lr
Date: 09-30-1996 Time: 12:27:46
cp-95 culvert at area III facilities.
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	7.90	91	F	0.138	0.000	0.000	0.0	0.38	8.44
111	2	1.70	91	F	0.027	0.079	0.311	0.0	0.08	2.09
		Type: Null			Label: culvert cp-95					
111	Structure	9.60							0.46	
111	Total IN/OUT	9.60				-			0.46	9.94

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Company Name: BHP MINERALS
Filename: C:\LR\CP95 User: lr
Date: 09-30-1996 Time: 12:27:46
cp-95 culvert at area III facilities.
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	1000.00	4.00	2.00	0.14	0.138		
1	1	1	2	-a	5	325.00	10.77	3.28	0.03	0.027		
1	1	1	2	-1	8	800.03	0.88	2.81	0.08		0.079	0.311

SEDCAD+ CULVERT SIZING UTILITY

cp-95 culvert at area III facilities

Design Discharge	=	9.940 cfs
Entrance Loss Coefficient	=	0.9
Pipe Length	=	26.000 feet
Pipe Slope	=	1.000 %
Manning's n	=	0.015
Maximum Headwater	=	3.500 feet
Tailwater Depth	=	0.000 feet

Smallest Diameter Required to Pass Flow is 18 inches

PERFORMANCE CURVES:

Diameter: 12 inches

Headwater (ft)	Discharge (cfs)	Control	Flow Type
0.35	0.57	Outlet (Subcritical)	2
0.70	1.25	Inlet (Supercritical)	3
1.05	2.24	Inlet (Supercritical)	3
1.40	3.19	Inlet	5
1.75	3.91	Outlet	6
2.10	4.45	Outlet	6
2.45	4.97	Outlet	6
2.80	5.40	Outlet	6
3.15	5.82	Outlet	6
3.50	6.21	Outlet	6
3.85	6.57	Outlet	6
4.20	6.93	Outlet	6
4.55	7.25	Outlet	6
4.90	7.56	Outlet	6
5.25	7.87	Outlet	6

Diameter: 15 inches

Headwater (ft)	Discharge (cfs)	Control	Flow Type
0.35	0.66	Outlet (Subcritical)	2
0.70	1.56	Inlet (Supercritical)	3
1.05	2.83	Inlet (Supercritical)	3
1.40	4.30	Inlet (Supercritical)	4
1.75	5.61	Inlet	5
2.10	6.67	Inlet	5
2.45	7.59	Inlet	5
2.80	8.40	Inlet	5
3.15	9.15	Inlet	5
3.50	9.82	Outlet	6
3.85	10.44	Outlet	6
4.20	11.03	Outlet	6
4.55	11.58	Outlet	6
4.90	12.11	Outlet	6
5.25	12.61	Outlet	6

Diameter: 18 inches

Headwater (ft)	Discharge (cfs)	Control	Flow Type
0.35	0.75	Outlet (Subcritical)	2
0.70	1.85	Inlet (Supercritical)	3
1.05	3.39	Inlet (Supercritical)	3
1.40	5.21	Inlet (Supercritical)	3
1.75	7.22	Inlet (Supercritical)	3
2.10	8.87	Inlet	5
2.45	10.28	Inlet	5
2.80	11.52	Inlet	5
3.15	12.64	Inlet	5
3.50	13.67	Inlet	5
3.85	14.63	Inlet	5
4.20	15.52	Inlet	5
4.55	16.37	Inlet	5
4.90	17.18	Inlet	5
5.25	17.95	Inlet	5

Diameter: 21 inches

Headwater (ft)	Discharge (cfs)	Control	Flow Type
0.35	0.83	Outlet (Subcritical)	2
0.70	2.15	Inlet (Supercritical)	3
1.05	3.94	Inlet (Supercritical)	3
1.40	6.07	Inlet (Supercritical)	3
1.75	8.49	Inlet (Supercritical)	3
2.10	10.97	Inlet	5
2.45	13.05	Inlet	5
2.80	14.85	Inlet	5
3.15	16.44	Inlet	5
3.50	17.91	Inlet	5
3.85	19.25	Inlet	5
4.20	20.51	Inlet	5
4.55	21.70	Inlet	5
4.90	22.83	Inlet	5
5.25	23.90	Inlet	5

Diameter: 24 inches

Headwater (ft)	Discharge (cfs)	Control	Flow Type
0.35	0.91	Inlet (Supercritical)	3
0.70	2.47	Inlet (Supercritical)	3
1.05	4.51	Inlet (Supercritical)	3
1.40	6.94	Inlet (Supercritical)	3
1.75	9.70	Inlet (Supercritical)	3
2.10	12.75	Inlet (Supercritical)	3
2.45	15.74	Inlet (Supercritical)	4
2.80	18.22	Inlet	5
3.15	20.43	Inlet	5
3.50	22.43	Inlet	5

3.85	24.26	Inlet	5
4.20	25.97	Inlet	5
4.55	27.56	Inlet	5
4.90	29.07	Inlet	5
5.25	30.51	Inlet	5

Diameter: 30 inches

Headwater (ft)	Discharge (cfs)	Control	Flow Type
0.35	1.09	Inlet (Supercritical)	3
0.70	3.07	Inlet (Supercritical)	3
1.05	5.64	Inlet (Supercritical)	3
1.40	8.68	Inlet (Supercritical)	3
1.75	12.12	Inlet (Supercritical)	3
2.10	15.93	Inlet (Supercritical)	3
2.45	20.07	Inlet (Supercritical)	3
2.80	24.53	Inlet (Supercritical)	3
3.15	28.37	Inlet	5
3.50	31.84	Inlet	5
3.85	34.97	Inlet	5
4.20	37.83	Inlet	5
4.55	40.50	Inlet	5
4.90	43.00	Inlet	5
5.25	45.36	Inlet	5

CIVIL SOFTWARE DESIGN

SEDCAD+ Version 3

CP-96 CULVERT AT TURNOUT TO TIRE SHOP

by

Name: lr

Company Name: BHP MINERALS
File Name: C:\LR\CP96

Date: 09-27-1996

Civil Software Design -- SEDCAD+ Version 3.1
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Company Name: BHP MINERALS
Filename: C:\LR\CP96 User: lr
Date: 09-27-1996 Time: 15:29:34
cp-96 culvert at turnout to tire shop
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	2.30	91	F	0.415	0.000	0.000	0.0	0.11	1.75
		Type: Null			Label: culvert cp-96					
111	Structure	2.30							0.11	
111	Total IN/OUT	2.30							0.11	1.75

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Company Name: BHP MINERALS
Filename: C:\LR\CP96 User: lr
Date: 09-27-1996 Time: 15:29:34
cp-96 culvert at turnout to tire shop
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)	X
1	1	1	1	-a	5	1700.00	1.29	1.14	0.42	0.415		

SEDCAD+ CULVERT SIZING UTILITY

cp-96 culvert at turnout to tire shop

Design Discharge	=	1.800 cfs
Entrance Loss Coefficient	=	0.9
Pipe Length	=	144.000 feet
Pipe Slope	=	0.500 %
Manning's n	=	0.015
Maximum Headwater	=	2.000 feet
Tailwater Depth	=	0.000 feet

Smallest Diameter Required to Pass Flow is 12 inches

PERFORMANCE CURVES:

Diameter: 8 inches

Headwater (ft)	Discharge (cfs)	Control	Flow Type
0.20	0.14	Outlet (Subcritical)	1
0.40	0.29	Outlet (Subcritical)	2
0.60	0.43	Inlet (Supercritical)	3
0.80	0.57	Inlet (Supercritical)	3
1.00	0.71	Inlet (Supercritical)	4
1.20	0.86	Inlet	5
1.40	1.00	Outlet	6
1.60	1.04	Outlet	6
1.80	1.09	Outlet	6
2.00	1.13	Outlet	6
2.20	1.17	Outlet	6
2.40	1.21	Outlet	6
2.60	1.26	Outlet	6
2.80	1.30	Outlet	6
3.00	1.34	Outlet	6

Diameter: 9 inches

Headwater (ft)	Discharge (cfs)	Control	Flow Type
0.20	0.25		0
0.40	0.50		0
0.60	0.74	Outlet (Subcritical)	1
0.80	0.99	Outlet (Subcritical)	1
1.00	1.08	Outlet (Subcritical)	1
1.20	1.16	Outlet (Subcritical)	2
1.40	1.24	Outlet (Subcritical)	2
1.60	1.32	Inlet (Supercritical)	3
1.80	1.39	Inlet (Supercritical)	3
2.00	1.47	Inlet (Supercritical)	3
2.20	1.55	Inlet (Supercritical)	4
2.40	1.63	Inlet (Supercritical)	4
2.60	1.71	Inlet	5
2.80	1.79	Inlet	5
3.00	1.87	Inlet	5

Diameter: 12 inches

Headwater (ft)	Discharge (cfs)	Control	Flow Type
0.20	0.41		0
0.40	0.81	Outlet (Subcritical)	1
0.60	1.19	Outlet (Subcritical)	1
0.80	1.56	Outlet (Subcritical)	1
1.00	1.92	Outlet (Subcritical)	1
1.20	2.18	Outlet (Subcritical)	2
1.40	2.41	Inlet (Supercritical)	3
1.60	2.63	Inlet (Supercritical)	4
1.80	2.86	Inlet	5
2.00	3.06	Outlet	6
2.20	3.20	Outlet	6
2.40	3.34	Outlet	6
2.60	3.49	Outlet	6
2.80	3.63	Outlet	6
3.00	3.78	Outlet	6

Diameter: 15 inches

Headwater (ft)	Discharge (cfs)	Control	Flow Type
0.20	1.28	Outlet (Subcritical)	1
0.40	1.49	Outlet (Subcritical)	1
0.60	1.70	Outlet (Subcritical)	1
0.80	1.91	Outlet (Subcritical)	1
1.00	2.38	Outlet (Subcritical)	1
1.20	3.06	Outlet (Subcritical)	1
1.40	3.88	Outlet (Subcritical)	1
1.60	4.31	Inlet (Supercritical)	3
1.80	4.67	Inlet (Supercritical)	4
2.00	5.03	Outlet	6
2.20	5.30	Outlet	6
2.40	5.58	Outlet	6
2.60	5.86	Outlet	6
2.80	6.11	Outlet	6
3.00	6.35	Outlet	6

Diameter: 18 inches

Headwater (ft)	Discharge (cfs)	Control	Flow Type
0.20	1.92	Outlet (Subcritical)	1
0.40	2.24	Outlet (Subcritical)	1
0.60	2.54	Outlet (Subcritical)	1
0.80	2.85	Outlet (Subcritical)	1
1.00	3.25	Outlet (Subcritical)	1
1.20	3.77	Outlet (Subcritical)	1
1.40	4.60	Outlet (Subcritical)	1
1.60	5.72	Outlet (Subcritical)	1
1.80	6.68	Inlet (Supercritical)	4
2.00	7.32	Outlet	6

2.20	7.82	Outlet	6
2.40	8.28	Outlet	6
2.60	8.72	Outlet	6
2.80	9.14	Outlet	6
3.00	9.53	Outlet	6

Diameter: 21 inches

Headwater (ft)	Discharge (cfs)	Control	Flow Type
0.20	2.56	Outlet (Subcritical)	1
0.40	3.08	Outlet (Subcritical)	1
0.60	3.51	Outlet (Subcritical)	1
0.80	3.95	Outlet (Subcritical)	1
1.00	4.32	Outlet (Subcritical)	1
1.20	4.69	Outlet (Subcritical)	1
1.40	5.19	Outlet (Subcritical)	1
1.60	6.50	Outlet (Subcritical)	1
1.80	7.92	Outlet (Subcritical)	1
2.00	9.34	Outlet (Subcritical)	1
2.20	10.49	Inlet (Supercritical)	3
2.40	11.31	Outlet	6
2.60	11.99	Outlet	6
2.80	12.62	Outlet	6
3.00	13.23	Outlet	6

CIVIL SOFTWARE DESIGN

SEDCAD+ Version 3

DD-22 RR DOWNDRAIN NORTH OF MASON

by

Name: lr

Company Name: BHP MINERALS
File Name: C:\LR\DD22

Date: 09-27-1996

Civil Software Design -- SEDCAD+ Version 3.1
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Company Name: BHP MINERALS
Filename: C:\LR\DD22 User: lr
Date: 09-27-1996 Time: 15:49:56
dd-22 rr downdrain north of mason
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	0.18	91	F	0.098	0.000	0.000	0.0	0.01	0.22
		Type: Null			Label: downdrain dd-22					
111	Structure	0.18							0.01	
111	Total IN/OUT	0.18							0.01	0.22

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Company Name: BHP MINERALS
Filename: C:\LR\DD22 User: lr
Date: 09-27-1996 Time: 15:49:56
dd-22 rr downdrain north of mason
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)	X
1	1	1	1	-a	5	370.00	1.08	1.04	0.10	0.098		

SEDCAD+ CULVERT SIZING UTILITY

rr downdrain dd-22 north of mason

Design Discharge	=	0.220	cfs
Entrance Loss Coefficient	=	0.9	
Pipe Length	=	250.000	feet
Pipe Slope	=	50.000	%
Manning's n	=	0.015	
Maximum Headwater	=	1.500	feet
Tailwater Depth	=	0.000	feet

Smallest Diameter Required to Pass Flow is 4 inches

PERFORMANCE CURVES:

Diameter: 2 inches

Headwater (ft)	Discharge (cfs)	Control	Flow Type
0.15	0.00		0
0.30	0.00		0
0.45	0.00		0
0.60	0.00		0
0.75	0.00		0
0.90	0.00		0
1.05	0.00		0
1.20	0.00		0
1.35	0.00		0
1.50	0.00		0
1.65	0.00		0
1.80	0.00		0
1.95	0.00		0
2.10	0.00		0
2.25	0.00		0

Diameter: 4 inches

Headwater (ft)	Discharge (cfs)	Control	Flow Type
0.15	0.03		0
0.30	0.05		0
0.45	0.08		0
0.60	0.11	Outlet (Subcritical)	1
0.75	0.14	Outlet (Subcritical)	1
0.90	0.16	Outlet (Subcritical)	1
1.05	0.19	Outlet (Subcritical)	1
1.20	0.22	Outlet (Subcritical)	1
1.35	0.24	Outlet (Subcritical)	1
1.50	0.27	Outlet (Subcritical)	1
1.65	0.30	Outlet (Subcritical)	1
1.80	0.32	Outlet (Subcritical)	2
1.95	0.35	Outlet (Subcritical)	2
2.10	0.38	Outlet (Subcritical)	2
2.25	0.41	Outlet (Subcritical)	2

Diameter: 6 inches

Headwater (ft)	Discharge (cfs)	Control	Flow Type
0.15	0.11	Outlet (Subcritical)	1
0.30	0.21	Outlet (Subcritical)	1
0.45	0.32	Outlet (Subcritical)	2
0.60	0.43	Outlet (Subcritical)	2
0.75	0.53	Inlet (Supercritical)	3
0.90	0.64	Inlet (Supercritical)	3
1.05	0.75	Inlet (Supercritical)	4
1.20	0.85	Inlet (Supercritical)	4
1.35	0.96	Inlet	5
1.50	1.03	Inlet	5
1.65	1.08	Inlet	5
1.80	1.12	Inlet	5
1.95	1.17	Inlet	5
2.10	1.22	Inlet	5
2.25	1.27	Inlet	5

Diameter: 8 inches

Headwater (ft)	Discharge (cfs)	Control	Flow Type
0.15	0.18	Outlet (Subcritical)	1
0.30	0.37	Outlet (Subcritical)	2
0.45	0.55	Inlet (Supercritical)	3
0.60	0.74	Inlet (Supercritical)	4
0.75	0.92	Inlet	5
0.90	1.09	Inlet	5
1.05	1.24	Inlet	5
1.20	1.39	Inlet	5
1.35	1.54	Inlet	5
1.50	1.69	Inlet	5
1.65	1.84	Inlet	5
1.80	1.99	Inlet	5
1.95	2.09	Inlet	5
2.10	2.18	Inlet	5
2.25	2.27	Inlet	5

Diameter: 9 inches

Headwater (ft)	Discharge (cfs)	Control	Flow Type
0.15	0.20	Outlet (Subcritical)	1
0.30	0.41	Outlet (Subcritical)	1
0.45	0.61	Outlet (Subcritical)	2
0.60	0.81	Outlet (Subcritical)	2
0.75	1.02	Inlet (Supercritical)	3
0.90	1.25	Inlet (Supercritical)	4
1.05	1.49	Inlet (Supercritical)	4
1.20	1.73	Inlet (Supercritical)	4
1.35	1.97	Inlet	5
1.50	2.13	Inlet	5

1.65	2.27	Inlet	5
1.80	2.42	Inlet	5
1.95	2.56	Inlet	5
2.10	2.71	Inlet	5
2.25	2.85	Inlet	5

CIVIL SOFTWARE DESIGN

SEDCAD+ Version 3

HYDROLOGY FOR CP-103 CULVERT

by

Name: BEN HOSKIE

Company Name: BHP MINERALS
File Name: A:\CP-103

Date: 05-19-1998

Civil Software Design -- SEDCAD+ Version 3.1
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Company Name: BHP MINERALS
Filename: A:\CP-103 User: BEN HOSKIE
Date: 05-19-1998 Time: 13:51:41
HYDROLOGY FOR CP-103 CULVERT
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	17.00	89	M	0.113	0.000	0.000	0.0	0.69	18.33
			Type: Null			Label: J1B1				
111	Structure	17.00							0.69	
111	Total IN/OUT	17.00							0.69	18.33
121	1	11.60	89	M	0.401	0.000	0.000	0.0	0.47	6.06
			Type: Null			Label: J1B2				
121	Structure	11.60							0.47	
121	Total IN/OUT	11.60							0.47	6.06
131	1	0.60	89	M	0.256	0.000	0.000	0.0	0.02	0.39
			Type: Null			Label: J1B3				
131	Structure	0.60							0.02	
131	Total IN/OUT	0.60							0.02	0.39
211	1	0.00	0	M	0.000	0.000	0.000	0.0	0.00	0.00
			Type: Null			Label: J2B1				
211	Structure	0.00							1.18	
211	Total IN/OUT	29.20							1.18	22.75
111 to 211 Routing						0.009	0.227			

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Company Name: BHP MINERALS
Filename: A:\CP-103 User: BEN HOSKIE
Date: 05-19-1998 Time: 13:51:41
HYDROLOGY FOR CP-103 CULVERT
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	2	1	1	-a	5	2028.00	1.97	1.40	0.40	0.401		

SEDCAD+ CULVERT SIZING UTILITY

CP-103

Design Discharge	=	22.750 cfs
Entrance Loss Coefficient	=	0.9
Pipe Length	=	124.000 feet
Pipe Slope	=	1.000 %
Manning's n	=	0.024
Maximum Headwater	=	5.000 feet
Tailwater Depth	=	0.000 feet

Smallest Diameter Required to Pass Flow is 30 inches

PERFORMANCE CURVES:

Diameter: 21 inches

Headwater (ft)	Discharge (cfs)	Control	Flow Type
0.50	3.46	Outlet (Subcritical)	1
1.00	4.24	Outlet (Subcritical)	1
1.50	5.89	Outlet (Subcritical)	1
2.00	9.03	Outlet (Subcritical)	1
2.50	10.13	Outlet	6
3.00	11.19	Outlet	6
3.50	12.17	Outlet	6
4.00	13.08	Outlet	6
4.50	13.92	Outlet	6
5.00	14.71	Outlet	6
5.50	15.46	Outlet	6
6.00	16.19	Outlet	6
6.50	16.88	Outlet	6
7.00	17.54	Outlet	6
7.50	18.18	Outlet	6

Diameter: 24 inches

Headwater (ft)	Discharge (cfs)	Control	Flow Type
0.50	4.66	Outlet (Subcritical)	1
1.00	5.58	Outlet (Subcritical)	1
1.50	6.81	Outlet (Subcritical)	1
2.00	10.57	Outlet (Subcritical)	1
2.50	13.52	Inlet (Supercritical)	4
3.00	15.02	Outlet	6
3.50	16.43	Outlet	6
4.00	17.73	Outlet	6
4.50	18.95	Outlet	6
5.00	20.09	Outlet	6
5.50	21.16	Outlet	6
6.00	22.19	Outlet	6
6.50	23.17	Outlet	6

7.00	24.11	Outlet	6
7.50	25.01	Outlet	6

Diameter: 30 inches

Headwater (ft)	Discharge (cfs)	Control	Flow Type
0.50	7.46	Outlet (Subcritical)	1
1.00	9.10	Outlet (Subcritical)	1
1.50	10.53	Outlet (Subcritical)	1
2.00	12.69	Outlet (Subcritical)	1
2.50	18.51	Outlet (Subcritical)	1
3.00	23.74	Inlet	5
3.50	26.44	Outlet	6
4.00	28.87	Outlet	6
4.50	31.10	Outlet	6
5.00	33.18	Outlet	6
5.50	35.13	Outlet	6
6.00	36.99	Outlet	6
6.50	38.75	Outlet	6
7.00	40.44	Outlet	6
7.50	42.07	Outlet	6

Diameter: 36 inches

Headwater (ft)	Discharge (cfs)	Control	Flow Type
0.50	10.70	Outlet (Subcritical)	1
1.00	13.27	Outlet (Subcritical)	1
1.50	15.53	Outlet (Subcritical)	1
2.00	17.58	Outlet (Subcritical)	1
2.50	21.41	Outlet (Subcritical)	1
3.00	29.19	Outlet (Subcritical)	1
3.50	36.92	Outlet (Subcritical)	1
4.00	41.77	Outlet	6
4.50	45.49	Outlet	6
5.00	48.92	Outlet	6
5.50	52.14	Outlet	6
6.00	55.15	Outlet	6
6.50	58.03	Outlet	6
7.00	60.75	Outlet	6
7.50	63.37	Outlet	6

Diameter: 42 inches

Headwater (ft)	Discharge (cfs)	Control	Flow Type
0.50	14.21	Outlet (Subcritical)	1
1.00	17.95	Outlet (Subcritical)	1
1.50	21.25	Outlet (Subcritical)	1
2.00	24.25	Outlet (Subcritical)	1

2.50	26.99	Outlet (Subcritical)	1
3.00	32.91	Outlet (Subcritical)	1
3.50	42.82	Outlet (Subcritical)	1
4.00	52.85	Outlet (Subcritical)	1
4.50	61.26	Outlet	6
5.00	66.57	Outlet	6
5.50	71.49	Outlet	6
6.00	76.09	Outlet	6
6.50	80.42	Outlet	6
7.00	84.54	Outlet	6
7.50	88.46	Outlet	6

Diameter: 45 inches

Headwater (ft)	Discharge (cfs)	Control	Flow Type
0.50	16.03	Outlet (Subcritical)	1
1.00	20.43	Outlet (Subcritical)	1
1.50	24.34	Outlet (Subcritical)	1
2.00	27.88	Outlet (Subcritical)	1
2.50	31.13	Outlet (Subcritical)	1
3.00	34.44	Outlet (Subcritical)	1
3.50	45.22	Outlet (Subcritical)	1
4.00	56.44	Outlet (Subcritical)	1
4.50	67.45	Outlet (Subcritical)	1
5.00	75.81	Outlet	6
5.50	81.78	Outlet	6
6.00	87.34	Outlet	6
6.50	92.57	Outlet	6
7.00	97.53	Outlet	6
7.50	102.24	Outlet	6

SEDCAD+ BASIN DISCHARGE UTILITY

CP-103 DROP STRUCTURE

DROP INLET INPUTS:

Riser Diameter	30.000	inches
Riser Height	4.200	feet
Barrel Diameter	30.000	inches
Barrel Length	124.000	feet
Barrel Slope	1.000	%
Manning's n of Pipe	0.019	
Pipe Spillway Elevation	5274.50	

Elevation	Drop Inlet (cfs)	Total Discharge (cfs)
5274.00	0.0	0.0
5274.50	0.0	0.0
5275.00	8.6	8.6
5275.50	23.6	23.6
5276.00	28.9	28.9
5276.50	33.4	33.4
5277.00	37.4	37.4

Pages 507 to 509 blank due to text reformatting

CIVIL SOFTWARE DESIGN

SEDCAD+ Version 3

HYDROLOGY FOR CP-104 CULVERT

by

Name: RUSSELL HARRIS

Company Name: BHP MINERALS
File Name: C:\RUSSWORK\JENSEN\CP-104

Date: 01-30-1997

Civil Software Design -- SEDCAD+ Version 3.1
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Company Name: BHP MINERALS
Filename: C:\RUSSWORK\JENSEN\CP-104 User: RUSSELL HARRIS
Date: 01-30-1997 Time: 09:38:38
HYDROLOGY FOR CP-104 CULVERT
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	27.00	89	M	0.275	0.000	0.000	0.0	1.09	16.97
Type: Null Label: J1B1									
111 Structure	27.00							1.09	
111 Total IN/OUT	27.00							1.09	16.97
121 1	36.00	89	M	0.555	0.000	0.000	0.0	1.45	15.50
Type: Null Label: J1B2									
121 Structure	36.00							1.45	
121 Total IN/OUT	36.00							1.45	15.50
131 1	6.00	89	M	0.398	0.000	0.000	0.0	0.24	3.14
Type: Null Label: J1B3									
131 Structure	6.00							0.24	
131 Total IN/OUT	6.00							0.24	3.14
211 1	0.00	0	M	0.000	0.000	0.000	0.0	0.00	0.00
Type: Null Label: J2B1									
211 Structure	0.00							2.78	
211 Total IN/OUT	69.00							2.78	31.55
111 to 211 Routing					0.009	0.227			

SEDCAD+ RIPRAP CHANNEL DESIGN

CP-104-INLET-RIPRAP

INPUT VALUES:

Shape	TRAPEZOIDAL	
Discharge	31.55 cfs	
Slope	20.00 %	
Sideslopes (L and R)	3.00:1	5.00:1
Bottom Width	10.00 feet	
Freeboard	0.6 ft	

RESULTS:

Steep Slope Design - PADER Method

Depth	0.42 ft
with Freeboard	1.02 ft
Top Width	13.33 ft
with Freeboard	18.13 ft
Velocity	6.50 fps
Cross Sectional Area	4.85 sq ft
Hydraulic Radius	0.36 ft
Manning's n	0.052
Froude Number	1.90
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-104

Design Discharge =	31.550 cfs
Entrance Loss Coefficient =	0.9
Pipe Length =	161.000 feet
Pipe Slope =	2.000 %
Manning's n =	0.024
Maximum Headwater =	4.000 feet
Tailwater Depth =	0.000 feet

Smallest Diameter Required to Pass Flow is 30 inches.
Allowing for a factor of safety, a 36 inch pipe will be used.

PERFORMANCE CURVES:

Diameter: 21 inches

Headwater (ft)	Discharge (cfs)	Control	Flow Type
0.40	0.95	Inlet (Supercritical)	3
0.80	2.64	Inlet (Supercritical)	3
1.20	4.82	Inlet (Supercritical)	3
1.60	7.42	Inlet (Supercritical)	3
2.00	8.93	Outlet (Subcritical)	1 *
2.40	12.24	Inlet	5
2.80	12.96	Outlet	6
3.20	13.52	Outlet	6
3.60	14.06	Outlet	6
4.00	14.57	Outlet	6
4.40	15.08	Outlet	6
4.80	15.56	Outlet	6
5.20	16.03	Outlet	6
5.60	16.48	Outlet	6
6.00	16.93	Outlet	6

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

Diameter: 24 inches

Headwater (ft)	Discharge (cfs)	Control	Flow Type
0.40	1.07	Inlet (Supercritical)	3
0.80	3.00	Inlet (Supercritical)	3
1.20	5.51	Inlet (Supercritical)	3
1.60	8.48	Inlet (Supercritical)	3
2.00	11.85	Inlet (Supercritical)	3

2.40	13.78	Outlet (Subcritical)	1 *
2.80	17.59	Outlet	6
3.20	18.54	Outlet	6
3.60	19.32	Outlet	6
4.00	20.06	Outlet	6
4.40	20.77	Outlet	6
4.80	21.46	Outlet	6
5.20	22.13	Outlet	6
5.60	22.78	Outlet	6
6.00	23.41	Outlet	6

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

Diameter: 30 inches

Headwater (ft)	Discharge (cfs)	Control	Flow Type
0.40	1.35	Inlet (Supercritical)	3
0.80	3.75	Inlet (Supercritical)	3
1.20	6.88	Inlet (Supercritical)	3
1.60	10.60	Inlet (Supercritical)	3
2.00	14.81	Inlet (Supercritical)	3
2.40	19.46	Inlet (Supercritical)	3
2.80	24.53	Inlet (Supercritical)	3
3.20	28.90	Inlet	5
3.60	32.30	Inlet	5
4.00	33.69	Outlet	6
4.40	34.99	Outlet	6
4.80	36.24	Outlet	6
5.20	37.45	Outlet	6
5.60	38.62	Outlet	6
6.00	39.76	Outlet	6

Diameter: 36 inches

Headwater (ft)	Discharge (cfs)	Control	Flow Type
0.40	1.62	Inlet (Supercritical)	3
0.80	4.50	Inlet (Supercritical)	3
1.20	8.26	Inlet (Supercritical)	3
1.60	12.72	Inlet (Supercritical)	3
2.00	17.77	Inlet (Supercritical)	3
2.40	23.36	Inlet (Supercritical)	3
2.80	29.43	Inlet (Supercritical)	3
3.20	35.96	Inlet (Supercritical)	3
3.60	42.48	Inlet (Supercritical)	4
4.00	47.70	Inlet	5

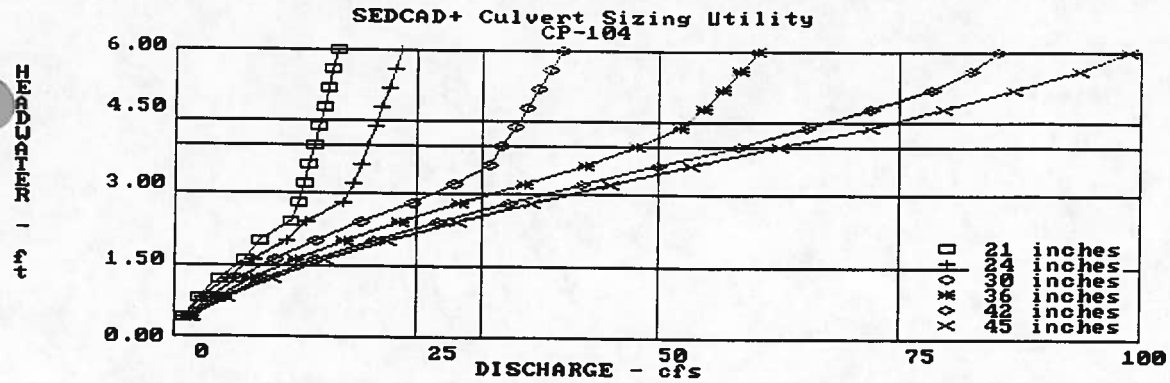
4.40	52.35	Inlet	5
4.80	54.74	Outlet	6
5.20	56.71	Outlet	6
5.60	58.61	Outlet	6
6.00	60.45	Outlet	6

Diameter: 42 inches

Headwater (ft)	Discharge (cfs)	Control	Flow Type
0.40	1.87	Inlet (Supercritical)	3
0.80	5.25	Inlet (Supercritical)	3
1.20	9.64	Inlet (Supercritical)	3
1.60	14.83	Inlet (Supercritical)	3
2.00	20.73	Inlet (Supercritical)	3
2.40	27.25	Inlet (Supercritical)	3
2.80	34.34	Inlet (Supercritical)	3
3.20	41.95	Inlet (Supercritical)	3
3.60	50.06	Inlet (Supercritical)	3
4.00	58.63	Inlet (Supercritical)	3
4.40	65.63	Inlet	5
4.80	72.28	Inlet	5
5.20	78.36	Inlet	5
5.60	82.38	Outlet	6
6.00	85.15	Outlet	6

Diameter: 45 inches

Headwater (ft)	Discharge (cfs)	Control	Flow Type
0.40	1.99	Inlet (Supercritical)	3
0.80	5.63	Inlet (Supercritical)	3
1.20	10.32	Inlet (Supercritical)	3
1.60	15.89	Inlet (Supercritical)	3
2.00	22.21	Inlet (Supercritical)	3
2.40	29.19	Inlet (Supercritical)	3
2.80	36.79	Inlet (Supercritical)	3
3.20	44.95	Inlet (Supercritical)	3
3.60	53.63	Inlet (Supercritical)	3
4.00	62.82	Inlet (Supercritical)	3
4.40	72.29	Inlet (Supercritical)	3
4.80	79.63	Inlet	5
5.20	86.88	Inlet	5
5.60	93.58	Inlet	5
6.00	98.84	Outlet	6


SEDCAD+ Culvert Sizing Utility
CP-104
HEADWATER - ft
6.00
4.50
3.00
1.50
0.00
0
25
50
75
100
DISCHARGE - cfs
21 inches
24 inches
30 inches
36 inches
42 inches
45 inches

SEDCAD+ RIPRAP CHANNEL DESIGN

CP-104-OUTLET-RIPRAP

INPUT VALUES:

Shape	TRAPEZOIDAL	
Discharge	31.55 cfs	
Slope	10.00 %	
Sideslopes (L and R)	3.00:1	3.00:1
Bottom Width	4.00 feet	
Freeboard	0.6 ft	

RESULTS:

Steep Slope Design - PADER Method

Depth	0.77 ft
with Freeboard	1.37 ft
Top Width	8.59 ft
with Freeboard	12.19 ft
Velocity	6.55 fps
Cross Sectional Area	4.82 sq ft
Hydraulic Radius	0.54 ft
Manning's n	0.048
Froude Number	1.54
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

CP-106?

HYDROLOGY FOR CP-104 CULVERT

by

Name: BEN HOSKIE

Company Name: BHP MINERALS
File Name: C:\BEN\CP104\CP-104

Date: 05-20-1998

Civil Software Design -- SEDCAD+ Version 3.1
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Company Name: BHP MINERALS
Filename: C:\BEN\CP104\CP-104 User: BEN HOSKIE
Date: 05-20-1998 Time: 07:04:56
HYDROLOGY FOR CP-104 CULVERT
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	22.20	89	M	0.275	0.000	0.000	0.0	0.90	13.96
			Type: Null			Label: J1B1				
111	Structure	22.20							0.90	
111	Total IN/OUT	22.20							0.90	13.96
121	1	35.60	89	M	0.555	0.000	0.000	0.0	1.44	15.33
			Type: Null			Label: J1B2				
121	Structure	35.60							1.44	
121	Total IN/OUT	35.60							1.44	15.33
131	1	6.40	89	M	0.398	0.000	0.000	0.0	0.26	3.35
			Type: Null			Label: J1B3				
131	Structure	6.40							0.26	
131	Total IN/OUT	6.40							0.26	3.35
211	1	0.00	0	M	0.000	0.000	0.000	0.0	0.00	0.00
			Type: Null			Label: J2B1				
211	Structure	0.00							2.59	
211	Total IN/OUT	64.20							2.59	28.78
111 to 211 Routing						0.009	0.227			

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Company Name: BHP MINERALS
Filename: C:\BEN\CP104\CP-104 User: BEN HOSKIE
Date: 05-20-1998 Time: 07:04:56
HYDROLOGY FOR CP-104 CULVERT
Storm: 1.30 inches, 10 year- 6 hour, type II-65
Hydrograph Convolution Interval: 0.1 hr

==========
DETAILED SUBWATERSHED INPUT/OUTPUT TABLE
==========

SEDCAD+ CULVERT SIZING UTILITY

CP-104

Design Discharge	=	28.780 cfs
Entrance Loss Coefficient	=	0.9
Pipe Length	=	161.000 feet
Pipe Slope	=	2.000 %
Manning's n	=	0.024
Maximum Headwater	=	4.000 feet
Tailwater Depth	=	0.000 feet

Smallest Diameter Required to Pass Flow is 30 inches

PERFORMANCE CURVES:

Diameter: 21 inches

Headwater (ft)	Discharge (cfs)	Control	Flow Type
0.40	0.95	Inlet (Supercritical)	3
0.80	2.64	Inlet (Supercritical)	3
1.20	4.82	Inlet (Supercritical)	3
1.60	7.42	Inlet (Supercritical)	3
2.00	8.93	Outlet (Subcritical)	1 *
2.40	12.24	Inlet	5
2.80	12.96	Outlet	6
3.20	13.52	Outlet	6
3.60	14.06	Outlet	6
4.00	14.57	Outlet	6
4.40	15.08	Outlet	6
4.80	15.56	Outlet	6
5.20	16.03	Outlet	6
5.60	16.48	Outlet	6
6.00	16.93	Outlet	6

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

Diameter: 24 inches

Headwater (ft)	Discharge (cfs)	Control	Flow Type
0.40	1.07	Inlet (Supercritical)	3
0.80	3.00	Inlet (Supercritical)	3
1.20	5.51	Inlet (Supercritical)	3
1.60	8.48	Inlet (Supercritical)	3
2.00	11.85	Inlet (Supercritical)	3
2.40	13.78	Outlet (Subcritical)	1 *
2.80	17.59	Outlet	6
3.20	18.54	Outlet	6
3.60	19.32	Outlet	6
4.00	20.06	Outlet	6
4.40	20.77	Outlet	6
4.80	21.46	Outlet	6

5.20	22.13	Outlet	6
5.60	22.78	Outlet	6
6.00	23.41	Outlet	6

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

Diameter: 30 inches

Headwater (ft)	Discharge (cfs)	Control	Flow Type
0.40	1.35	Inlet (Supercritical)	3
0.80	3.75	Inlet (Supercritical)	3
1.20	6.88	Inlet (Supercritical)	3
1.60	10.60	Inlet (Supercritical)	3
2.00	14.81	Inlet (Supercritical)	3
2.40	19.46	Inlet (Supercritical)	3
2.80	24.53	Inlet (Supercritical)	3
3.20	28.90	Inlet	5
3.60	32.30	Inlet	5
4.00	33.69	Outlet	6
4.40	34.99	Outlet	6
4.80	36.24	Outlet	6
5.20	37.45	Outlet	6
5.60	38.62	Outlet	6
6.00	39.76	Outlet	6

Diameter: 36 inches

Headwater (ft)	Discharge (cfs)	Control	Flow Type
0.40	1.62	Inlet (Supercritical)	3
0.80	4.50	Inlet (Supercritical)	3
1.20	8.26	Inlet (Supercritical)	3
1.60	12.72	Inlet (Supercritical)	3
2.00	17.77	Inlet (Supercritical)	3
2.40	23.36	Inlet (Supercritical)	3
2.80	29.43	Inlet (Supercritical)	3
3.20	35.96	Inlet (Supercritical)	3
3.60	42.48	Inlet (Supercritical)	4
4.00	47.70	Inlet	5
4.40	52.35	Inlet	5
4.80	54.74	Outlet	6
5.20	56.71	Outlet	6
5.60	58.61	Outlet	6
6.00	60.45	Outlet	6

Diameter: 42 inches

Headwater (ft)	Discharge (cfs)	Control	Flow Type
0.40	1.87	Inlet (Supercritical)	3
0.80	5.25	Inlet (Supercritical)	3

1.20	9.64	Inlet (Supercritical)	3
1.60	14.83	Inlet (Supercritical)	3
2.00	20.73	Inlet (Supercritical)	3
2.40	27.25	Inlet (Supercritical)	3
2.80	34.34	Inlet (Supercritical)	3
3.20	41.95	Inlet (Supercritical)	3
3.60	50.06	Inlet (Supercritical)	3
4.00	58.63	Inlet (Supercritical)	3
4.40	65.63	Inlet	5
4.80	72.28	Inlet	5
5.20	78.36	Inlet	5
5.60	82.38	Outlet	6
6.00	85.15	Outlet	6

Diameter: 45 inches

Headwater (ft)	Discharge (cfs)	Control	Flow Type
0.40	1.99	Inlet (Supercritical)	3
0.80	5.63	Inlet (Supercritical)	3
1.20	10.32	Inlet (Supercritical)	3
1.60	15.89	Inlet (Supercritical)	3
2.00	22.21	Inlet (Supercritical)	3
2.40	29.19	Inlet (Supercritical)	3
2.80	36.79	Inlet (Supercritical)	3
3.20	44.95	Inlet (Supercritical)	3
3.60	53.63	Inlet (Supercritical)	3
4.00	62.82	Inlet (Supercritical)	3
4.40	72.29	Inlet (Supercritical)	3
4.80	79.63	Inlet	5
5.20	86.88	Inlet	5
5.60	93.58	Inlet	5
6.00	98.84	Outlet	6

Pages 524 & 525 blank due to text reformatting

CIVIL SOFTWARE DESIGN

SEDCAD+ Version 3

HYDROLOGY FOR CP-107

by

Name: VAH

Company Name: BHP MINERALS
File Name: J:\OSM_SUBM\PER_PROG\CH_11\11-12\SEDCAD\CP-107

Date: 06-03-1997

Civil Software Design -- SEDCAD+ Version 3.1
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Company Name: BHP MINERALS
Filename: C:\11-12\CP-107B User: VAH
Date: 06-03-1997 Time: 09:13:27
Hydrology for CP-107
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	4.57	90	M	0.575	0.000	0.000	0.0	0.20	2.12
Type: Culvert Label: CP-107									
Structure	4.57							0.20	
Total IN/OUT	4.57							0.20	2.12

Civil Software Design -- SEDCAD+ Version 3.1

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Company Name: BHP MINERALS

Filename: C:\11-12\CP-107B User: VAH

Date: 06-03-1997 Time: 09:13:27

Hydrology for CP-107

Storm: 1.30 inches, 10 year- 6 hour, type II-65

Hydrograph Convolution Interval: 0.1 hr

DETAILED SUBWATERSHED INPUT/OUTPUT TABLE

S	SWS	Seg. #	Land Flow Condition	Distance (ft)	Slope (%)	Velocity (fps)	Segment Time (hr)	Time Conc. (hr)	Muskingum K (hr)	X
1	1	-a	5	1410.00	0.57	0.75	0.58	0.575		

Civil Software Design -- SEDCAD+ Version 3.1
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Company Name: BHP MINERALS
Filename: C:\11-12\CP-107B User: VAH
Date: 06-03-1997 Time: 09:13:27
Hydrology for CP-107
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
CP-107

Drainage Area from J1, B1, S1, SWS(s)1: 4.6 acres
Total Contributing Drainage Area: 4.6 acres

Entrance Loss Coefficient	Maximum Headwater (ft)	Pipe Length (ft)	Pipe Slope (%)	Manning's n	Tailwater (ft)
0.90	1.5	75.0	9.0	0.017	0.0

Minimum Pipe Diameter Required: 9.0 inches
(See Culvert Utility Program for full performance curves)

	Runoff Volume (ac-ft)	Peak Discharge (cfs)
IN/OUT	0.20	2.12

****

SEDCAD+ CULVERT SIZING UTILITY

CP-107

Design Discharge	=	2.120 cfs
Entrance Loss Coefficient	=	0.9
Pipe Length	=	75.000 feet
Pipe Slope	=	9.000 %
Manning's n	=	0.017
Maximum Headwater	=	1.500 feet
Tailwater Depth	=	0.000 feet

Smallest Diameter Required to Pass Flow is 9 inches

PERFORMANCE CURVES:

Diameter: 6 inches

Headwater (ft)	Discharge (cfs)	Control	Flow Type
0.15	0.11	Outlet (Subcritical)	1
0.30	0.21	Outlet (Subcritical)	1
0.45	0.32	Outlet (Subcritical)	2
0.60	0.43	Outlet (Subcritical)	2
0.75	0.53	Inlet (Supercritical)	3
0.90	0.64	Inlet (Supercritical)	3
1.05	0.75	Inlet (Supercritical)	4
1.20	0.85	Inlet (Supercritical)	4
1.35	0.96	Inlet	5
1.50	1.01	Inlet	5
1.65	1.02	Inlet	5
1.80	1.03	Inlet	5
1.95	1.05	Inlet	5
2.10	1.06	Inlet	5
2.25	1.07	Inlet	5

Diameter: 8 inches

Headwater (ft)	Discharge (cfs)	Control	Flow Type
0.15	0.18	Outlet (Subcritical)	1
0.30	0.37	Outlet (Subcritical)	2
0.45	0.55	Inlet (Supercritical)	3
0.60	0.74	Inlet (Supercritical)	4
0.75	0.92	Inlet	5
0.90	1.09	Inlet	5
1.05	1.24	Inlet	5
1.20	1.39	Inlet	5
1.35	1.54	Inlet	5
1.50	1.69	Inlet	5
1.65	1.84	Inlet	5
1.80	1.99	Inlet	5
1.95	2.07	Inlet	5
2.10	2.14	Inlet	5
2.25	2.21	Inlet	5

Diameter: 9 inches

Headwater (ft)	Discharge (cfs)	Control	Flow Type
0.15	0.20	Outlet (Subcritical)	1
0.30	0.41	Outlet (Subcritical)	1
0.45	0.61	Outlet (Subcritical)	2
0.60	0.81	Outlet (Subcritical)	2
0.75	1.02	Inlet (Supercritical)	3
0.90	1.25	Inlet (Supercritical)	4
1.05	1.49	Inlet (Supercritical)	4
1.20	1.73	Inlet (Supercritical)	4
1.35	1.97	Inlet	5
1.50	2.13	Inlet	5
1.65	2.27	Inlet	5
1.80	2.42	Inlet	5
1.95	2.56	Inlet	5
2.10	2.71	Inlet	5
2.25	2.85	Inlet	5

Diameter: 12 inches

Headwater (ft)	Discharge (cfs)	Control	Flow Type
0.15	0.25	Outlet (Subcritical)	1
0.30	0.49	Outlet (Subcritical)	1
0.45	0.74	Outlet (Subcritical)	2
0.60	0.98	Inlet (Supercritical)	3
0.75	1.39	Inlet (Supercritical)	3
0.90	1.81	Inlet (Supercritical)	3
1.05	2.24	Inlet (Supercritical)	3
1.20	2.68	Inlet (Supercritical)	4
1.35	3.09	Inlet	5
1.50	3.42	Inlet	5
1.65	3.74	Inlet	5
1.80	4.05	Inlet	5
1.95	4.31	Inlet	5
2.10	4.56	Inlet	5
2.25	4.82	Inlet	5

Diameter: 15 inches

Headwater (ft)	Discharge (cfs)	Control	Flow Type
0.15	0.28	Outlet (Subcritical)	1
0.30	0.57	Outlet (Subcritical)	2
0.45	0.85	Inlet (Supercritical)	3
0.60	1.24	Inlet (Supercritical)	3
0.75	1.72	Inlet (Supercritical)	3
0.90	2.25	Inlet (Supercritical)	3
1.05	2.83	Inlet (Supercritical)	3
1.20	3.45	Inlet (Supercritical)	3
1.35	4.10	Inlet (Supercritical)	3
1.50	4.71	Inlet (Supercritical)	4

1.65	5.27	Inlet	5
1.80	5.78	Inlet	5
1.95	6.24	Inlet	5
2.10	6.67	Inlet	5
2.25	7.09	Inlet	5

Diameter: 18 inches

Headwater (ft)	Discharge (cfs)	Control	Flow Type
0.15	0.32	Outlet (Subcritical)	1
0.30	0.64	Outlet (Subcritical)	2
0.45	0.97	Inlet (Supercritical)	3
0.60	1.49	Inlet (Supercritical)	3
0.75	2.04	Inlet (Supercritical)	3
0.90	2.70	Inlet (Supercritical)	3
1.05	3.39	Inlet (Supercritical)	3
1.20	4.13	Inlet (Supercritical)	3
1.35	4.93	Inlet (Supercritical)	3
1.50	5.78	Inlet (Supercritical)	3
1.65	6.66	Inlet (Supercritical)	3
1.80	7.46	Inlet (Supercritical)	4
1.95	8.19	Inlet	5
2.10	8.87	Inlet	5
2.25	9.50	Inlet	5

CIVIL SOFTWARE DESIGN

SEDCAD+ Version 3

CP-108 MC

YAZZIE CULVERT DESIGN

by

Name: FTJ

Company Name: BHP MINERALS
File Name: C:\FTJ\YAZZIE

Date: 06-07-1997

Civil Software Design -- SEDCAD+ Version 3.1
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Company Name: BHP MINERALS
Filename: C:\FTJ\YAZZIE User: FTJ
Date: 06-07-1997 Time: 12:35:00
YAZZIE CULVERT DESIGN
Storm: 0.80 inches, 2 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

****

Civil Software Design -- SEDCAD+ Version 3.1
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Company Name: BHP MINERALS
Filename: C:\FTJ\YAZZIE User: FTJ
Date: 06-07-1997 Time: 12:35:00
YAZZIE CULVERT DESIGN
Storm: 0.80 inches, 2 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	332.00	93	M	1.643	0.000	0.000	0.0	8.32	**40.8**
		Type: Null			Label: YAZZIE CULVERT					
111	Structure	332.00							8.32	
111	Total IN/OUT	332.00							8.32	**40.8**

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Company Name: BHP MINERALS
Filename: C:\FTJ\YAZZIE User: FTJ
Date: 06-07-1997 Time: 12:35:00
YAZZIE CULVERT DESIGN
Storm: 0.80 inches, 2 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)	X
1	1	1	1	-a	5	10385.00	3.08	1.76	1.64	1.643		

SEDCAD+ CULVERT SIZING UTILITY

Yazzie Culvert

Design Discharge	=	40.860	cfs
Entrance Loss Coefficient	=	0.9	
Pipe Length	=	34.000	feet
Pipe Slope	=	8.500	%
Manning's n	=	0.024	
Maximum Headwater	=	7.000	feet
Tailwater Depth	=	0.000	feet

Smallest Diameter Required to Pass Flow is **30 inches**

PERFORMANCE CURVES:

Diameter: 21 inches

Headwater (ft)	Discharge (cfs)	Control	Flow Type
0.70	2.15	Inlet (Supercritical)	3
1.40	6.07	Inlet (Supercritical)	3
2.10	10.97	Inlet	5
2.80	14.85	Inlet	5
3.50	17.91	Inlet	5
4.20	20.51	Inlet	5
4.90	22.83	Inlet	5
5.60	24.93	Inlet	5
6.30	26.86	Inlet	5
7.00	28.66	Inlet	5
7.70	30.31	Inlet	5
8.40	31.70	Outlet	6
9.10	32.85	Outlet	6
9.80	33.94	Outlet	6
10.50	34.98	Outlet	6

Diameter: 24 inches

Headwater (ft)	Discharge (cfs)	Control	Flow Type
0.70	2.47	Inlet (Supercritical)	3
1.40	6.94	Inlet (Supercritical)	3
2.10	12.75	Inlet (Supercritical)	3
2.80	18.22	Inlet	5
3.50	22.43	Inlet	5
4.20	25.97	Inlet	5
4.90	29.06	Inlet	5
5.60	31.88	Inlet	5
6.30	34.45	Inlet	5
7.00	36.84	Inlet	5
7.70	39.10	Inlet	5
8.40	41.23	Inlet	5
9.10	43.25	Inlet	5
9.80	45.18	Inlet	5
10.50	46.97	Inlet	5

Diameter: 30 inches

Headwater (ft)	Discharge (cfs)	Control	Flow Type
0.70	3.07	Inlet (Supercritical)	3
1.40	8.68	Inlet (Supercritical)	3
2.10	15.93	Inlet (Supercritical)	3
2.80	24.53	Inlet (Supercritical)	3
3.50	31.84	Inlet	5
4.20	37.83	Inlet	5
4.90	42.99	Inlet	5
5.60	47.60	Inlet	5
6.30	51.81	Inlet	5
7.00	55.69	Inlet	5
7.70	59.32	Inlet	5
8.40	62.74	Inlet	5
9.10	65.99	Inlet	5
9.80	69.07	Inlet	5
10.50	72.04	Inlet	5

Diameter: 36 inches

Headwater (ft)	Discharge (cfs)	Control	Flow Type
0.70	3.69	Inlet (Supercritical)	3
1.40	10.41	Inlet (Supercritical)	3
2.10	19.12	Inlet (Supercritical)	3
2.80	29.44	Inlet (Supercritical)	3
3.50	41.13	Inlet (Supercritical)	3
4.20	50.23	Inlet	5
4.90	58.21	Inlet	5
5.60	65.22	Inlet	5
6.30	71.55	Inlet	5
7.00	77.37	Inlet	5
7.70	82.77	Inlet	5
8.40	87.85	Inlet	5
9.10	92.65	Inlet	5
9.80	97.21	Inlet	5
10.50	101.56	Inlet	5

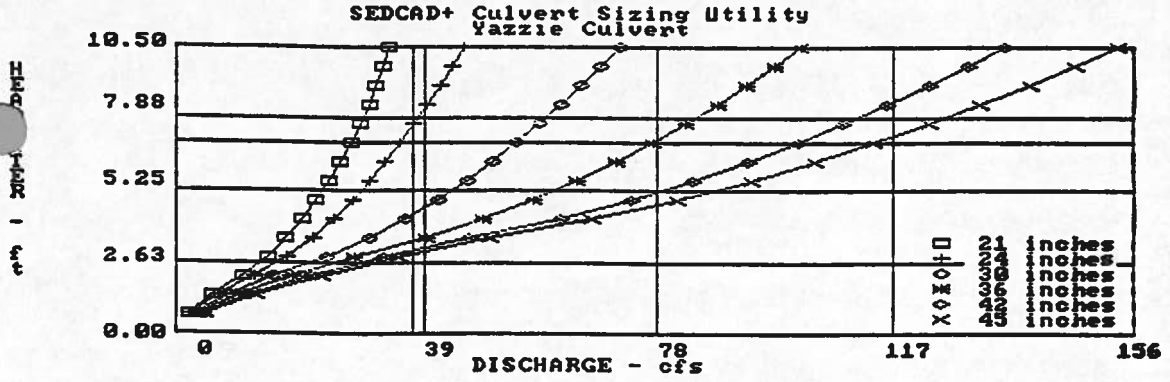
Diameter: 42 inches

Headwater (ft)	Discharge (cfs)	Control	Flow Type
0.70	4.30	Inlet (Supercritical)	3
1.40	12.14	Inlet (Supercritical)	3
2.10	22.30	Inlet (Supercritical)	3
2.80	34.34	Inlet (Supercritical)	3
3.50	47.99	Inlet (Supercritical)	3
4.20	62.62	Inlet (Supercritical)	4
4.90	73.85	Inlet	5
5.60	84.01	Inlet	5
6.30	93.06	Inlet	5
7.00	101.32	Inlet	5

7.70	108.94	Inlet	5
8.40	116.08	Inlet	5
9.10	122.79	Inlet	5
9.80	129.16	Inlet	5
10.50	135.22	Inlet	5

Diameter: 45 inches

Headwater (ft)	Discharge (cfs)	Control	Flow Type
0.70	4.61	Inlet (Supercritical)	3
1.40	13.01	Inlet (Supercritical)	3
2.10	23.90	Inlet (Supercritical)	3
2.80	36.79	Inlet (Supercritical)	3
3.50	51.42	Inlet (Supercritical)	3
4.20	67.59	Inlet (Supercritical)	3
4.90	81.50	Inlet	5
5.60	93.58	Inlet	5
6.30	104.26	Inlet	5
7.00	113.95	Inlet	5
7.70	122.87	Inlet	5
8.40	131.19	Inlet	5
9.10	139.02	Inlet	5
9.80	146.42	Inlet	5
10.50	153.47	Inlet	5


SEDCAD+ Culvert Sizing Utility
Yazzie Culvert
HEAD WATER - ft
10.50
7.88
5.25
2.63
0.00
0
39
78
117
156
DISCHARGE - cfs
21 inches
24 inches
30 inches
36 inches
42 inches
45 inches

CIVIL SOFTWARE DESIGN

SEDCAD+ Version 3

CP-108

YAZZIE POWERLINE SERVICE ROAD CULVERT - AS BUILT

by

Name: Francis T. Johnson

Company Name: BHP MINERALS
File Name: C:\FTJ\YAZZIE2

Date: 02-05-1998

Civil Software Design -- SEDCAD+ Version 3.1
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Company Name: BHP MINERALS
Filename: C:\FTJ\YAZZIE2 User: Francis T. Johnson
Date: 02-05-1998 Time: 08:38:41
Yazzie Powerline Service Road Culvert - As Built
Storm: 0.80 inches, 2 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

****

Detailed Between Structure Routing:

J	B	To S	Seg. #	Land Flow Condition	Distance (ft)	Slope (%)	Velocity (fps)	Segment Time (hr)	Muskingum K (hr)	Muskingum X
2	1	1	1	5	1.00	0.00	0.03	0.01	0.008	0.009

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Company Name: BHP MINERALS
Filename: C:\FTJ\YAZZIE2 User: Francis T. Johnson
Date: 02-05-1998 Time: 08:38:41
Yazzie Powerline Service Road Culvert - As Built
Storm: 0.80 inches, 2 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	24.40	91	M	0.148	0.000	0.000	0.0	0.46	8.98
		Type: Null			Label: Yazzie North Area					
111	Structure	24.40							0.46	
111	Total IN/OUT	24.40							0.46	8.98
121	1	307.90	91	M	1.643	0.000	0.000	0.0	5.85	28.06
		Type: Null			Label: Yazzie South Area					
121	Structure	307.90							5.85	
121	Total IN/OUT	307.90							5.85	28.06
211	1	0.00	0	M	0.000	0.000	0.000	0.0	0.00	0.00
		Type: Null			Label: Yazzie Total					
211	Structure	0.00							6.31	
211	Total IN/OUT	332.30							6.31	29.08
111 to 211 Routing						0.008	0.009			

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Company Name: BHP MINERALS
Filename: C:\FTJ\YAZZIE2 User: Francis T. Johnson
Date: 02-05-1998 Time: 08:38:41
Yazzie Powerline Service Road Culvert - As Built
Storm: 0.80 inches, 2 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)	X
1	1	1	1	-a	5	1717.00	10.25	3.20	0.15	0.148		
1	2	1	1	-a	5	10385.00	3.08	1.76	1.64	1.643		
2	1	1	1	-a	5	1.00	0.00	0.03	0.01	0.000		

SEDCAD+ CULVERT SIZING UTILITY

Yazzie Culvert - As Built

Design Discharge	=	29.080	cfs
Entrance Loss Coefficient	=	0.9	
Pipe Length	=	28.000	feet
Pipe Slope	=	0.139	%
Manning's n	=	0.024	
Maximum Headwater	=	5.400	feet
Tailwater Depth	=	0.000	feet

Smallest Diameter Required to Pass Flow is 30 inches

PERFORMANCE CURVES:

Diameter: 21 inches

Headwater (ft)	Discharge (cfs)	Control	Flow Type
0.54	1.72	Outlet (Subcritical)	1
1.08	3.57	Outlet (Subcritical)	1
1.62	6.36	Outlet (Subcritical)	1
2.16	8.97	Outlet	6
2.70	11.85	Outlet	6
3.24	14.18	Outlet	6
3.78	16.17	Outlet	6
4.32	17.95	Outlet	6
4.86	19.56	Outlet	6
5.40	21.06	Outlet	6
5.94	22.45	Outlet	6
6.48	23.76	Outlet	6
7.02	25.01	Outlet	6
7.56	26.19	Outlet	6
8.10	27.32	Outlet	6

Diameter: 24 inches

Headwater (ft)	Discharge (cfs)	Control	Flow Type
0.54	2.05	Outlet (Subcritical)	1
1.08	4.41	Outlet (Subcritical)	1
1.62	7.25	Outlet (Subcritical)	1
2.16	11.43	Outlet (Subcritical)	1
2.70	14.62	Outlet	6
3.24	18.03	Outlet	6
3.78	20.88	Outlet	6
4.32	23.39	Outlet	6
4.86	25.66	Outlet	6
5.40	27.74	Outlet	6
5.94	29.68	Outlet	6
6.48	31.49	Outlet	6
7.02	33.21	Outlet	6
7.56	34.85	Outlet	6
8.10	36.40	Outlet	6

Diameter: 30 inches

Headwater (ft)	Discharge (cfs)	Control	Flow Type

0.54	2.63	Outlet (Subcritical)	1
1.08	6.32	Outlet (Subcritical)	1
1.62	9.41	Outlet (Subcritical)	1
2.16	14.27	Outlet (Subcritical)	1
2.70	20.36	Outlet (Subcritical)	1
3.24	25.36	Outlet	6
3.78	30.73	Outlet	6
4.32	35.29	Outlet	6
4.86	39.32	Outlet	6
5.40	42.99	Outlet	6
5.94	46.35	Outlet	6
6.48	49.49	Outlet	6
7.02	52.45	Outlet	6
7.56	55.25	Outlet	6
8.10	57.90	Outlet	6

Diameter: 36 inches

Headwater (ft)	Discharge (cfs)	Control	Flow Type
0.54	3.10	Outlet (Subcritical)	1
1.08	8.20	Outlet (Subcritical)	1
1.62	12.76	Outlet (Subcritical)	1
2.16	16.84	Outlet (Subcritical)	1
2.70	24.30	Outlet (Subcritical)	1
3.24	32.46	Outlet (Subcritical)	1
3.78	39.67	Outlet	6
4.32	47.38	Outlet	6
4.86	53.98	Outlet	6
5.40	59.87	Outlet	6
5.94	65.23	Outlet	6
6.48	70.18	Outlet	6
7.02	74.80	Outlet	6
7.56	79.16	Outlet	6
8.10	83.28	Outlet	6

Diameter: 42 inches

Headwater (ft)	Discharge (cfs)	Control	Flow Type
0.54	3.50	Outlet (Subcritical)	1
1.08	9.97	Outlet (Subcritical)	1
1.62	16.18	Outlet (Subcritical)	1
2.16	21.64	Outlet (Subcritical)	1
2.70	27.79	Outlet (Subcritical)	1
3.24	37.63	Outlet (Subcritical)	1
3.78	48.02	Outlet (Subcritical)	1
4.32	57.85	Outlet	6
4.86	68.21	Outlet	6
5.40	77.20	Outlet	6
5.94	85.24	Outlet	6
6.48	92.58	Outlet	6
7.02	99.39	Outlet	6
7.56	105.75	Outlet	6
8.10	111.76	Outlet	6

Diameter: 45 inches

Headwater (ft)	Discharge (cfs)	Control	Flow Type

0.54	3.68	Outlet	(Subcritical)	1
1.08	10.80	Outlet	(Subcritical)	1
1.62	17.89	Outlet	(Subcritical)	1
2.16	24.19	Outlet	(Subcritical)	1
2.70	29.79	Outlet	(Subcritical)	1
3.24	39.95	Outlet	(Subcritical)	1
3.78	51.40	Outlet	(Subcritical)	1
4.32	62.96	Outlet	(Subcritical)	1
4.86	74.61	Outlet		6
5.40	85.57	Outlet		6
5.94	95.29	Outlet		6
6.48	104.10	Outlet		6
7.02	112.22	Outlet		6
7.56	119.79	Outlet		6
8.10	126.91	Outlet		6

Pages 543 through 552 Appendix 11-V

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CIVIL SOFTWARE DESIGN

SEDCAD+ Version 3

CULVERT CP-119 HYDROLOGY

by

Name: BH

Company Name: BHP MINERALS
File Name: C:\BEN\CP-119

Date: 08-15-1997

Civil Software Design -- SEDCAD+ Version 3.1
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Company Name: BHP MINERALS
Filename: C:\BEN\CP-119 User: BH
Date: 08-15-1997 Time: 08:16:03
CULVERT CP-119 HYDROLOGY
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	32.43	76	M	0.256	0.000	0.000	0.0	0.30	4.22
		Type: Null			Label: CP-119 HYDROLOGY					
111	Structure	32.43							0.30	
111	Total IN/OUT	32.43							0.30	4.22

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Company Name: BHP MINERALS
Filename: C:\BEN\CP-119 User: BH
Date: 08-15-1997 Time: 08:16:03
CULVERT CP-119 HYDROLOGY
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)	X
1	1	1	1	-a	5	1875.00	4.12	2.03	0.26	0.256		

SEDCAD+ CULVERT SIZING UTILITY

CP-119

Design Discharge	=	4.220 cfs
Entrance Loss Coefficient	=	0.9
Pipe Length	=	90.000 feet
Pipe Slope	=	1.854 %
Manning's n	=	0.017
Maximum Headwater	=	3.830 feet
Tailwater Depth	=	0.000 feet

Smallest Diameter Required to Pass Flow is 12 inches

PERFORMANCE CURVES:

Diameter: 8 inches

Headwater (ft)	Discharge (cfs)	Control	Flow Type
0.38	0.47	Outlet (Subcritical)	2
0.77	0.94	Inlet	5
1.15	1.10	Inlet	5
1.53	1.22	Inlet	5
1.91	1.34	Inlet	5
2.30	1.45	Inlet	5
2.68	1.57	Outlet	6
3.06	1.69	Outlet	6
3.45	1.81	Outlet	6
3.83	1.92	Outlet	6
4.21	2.02	Outlet	6
4.60	2.08	Outlet	6
4.98	2.14	Outlet	6
5.36	2.20	Outlet	6
5.74	2.26	Outlet	6

Diameter: 9 inches

Headwater (ft)	Discharge (cfs)	Control	Flow Type
0.38	0.52	Outlet (Subcritical)	2
0.77	1.02	Inlet (Supercritical)	3
1.15	1.38	Inlet (Supercritical)	4
1.53	1.73	Inlet	5
1.91	2.03	Outlet	6
2.30	2.13	Outlet	6
2.68	2.24	Outlet	6
3.06	2.35	Outlet	6
3.45	2.45	Outlet	6
3.83	2.56	Outlet	6
4.21	2.67	Outlet	6
4.60	2.78	Outlet	6
4.98	2.88	Outlet	6
5.36	2.99	Outlet	6
5.74	3.07	Outlet	6

Diameter: 12 inches

Headwater (ft)	Discharge (cfs)	Control	Flow Type
0.38	0.63	Outlet (Subcritical)	2
0.77	1.43	Inlet (Supercritical)	3
1.15	2.53	Inlet (Supercritical)	4
1.53	3.38	Inlet	5
1.91	4.02	Outlet	6
2.30	4.27	Outlet	6
2.68	4.52	Outlet	6
3.06	4.77	Outlet	6
3.45	5.02	Outlet	6
3.83	5.23	Outlet	6
4.21	5.43	Outlet	6
4.60	5.64	Outlet	6
4.98	5.84	Outlet	6
5.36	6.04	Outlet	6
5.74	6.22	Outlet	6

Diameter: 15 inches

Headwater (ft)	Discharge (cfs)	Control	Flow Type
0.38	0.73	Outlet (Subcritical)	2
0.77	1.77	Inlet (Supercritical)	3
1.15	3.23	Inlet (Supercritical)	3
1.53	4.84	Inlet	5
1.91	6.14	Inlet	5
2.30	7.11	Inlet	5
2.68	7.59	Outlet	6
3.06	8.06	Outlet	6
3.45	8.46	Outlet	6
3.83	8.85	Outlet	6
4.21	9.23	Outlet	6
4.60	9.58	Outlet	6
4.98	9.94	Outlet	6
5.36	10.27	Outlet	6
5.74	10.59	Outlet	6

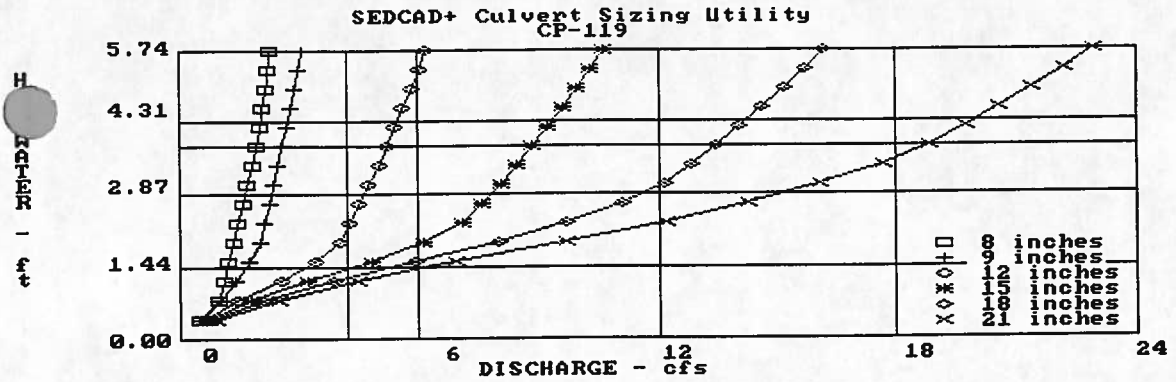
Diameter: 18 inches

Headwater (ft)	Discharge (cfs)	Control	Flow Type
0.38	0.82	Outlet (Subcritical)	2
0.77	2.11	Inlet (Supercritical)	3
1.15	3.87	Inlet (Supercritical)	3
1.53	5.96	Inlet (Supercritical)	3
1.91	8.03	Inlet	5
2.30	9.69	Inlet	5
2.68	11.11	Inlet	5
3.06	12.15	Outlet	6
3.45	12.80	Outlet	6
3.83	13.42	Outlet	6

4.21	14.03	Outlet	6
4.60	14.59	Outlet	6
4.98	15.15	Outlet	6
5.36	15.67	Outlet	6
5.74	16.19	Outlet	6

Diameter: 21 inches

Headwater (ft)	Discharge (cfs)	Control	Flow Type
0.38	0.91	Inlet (Supercritical)	3
0.77	2.47	Inlet (Supercritical)	3
1.15	4.52	Inlet (Supercritical)	3
1.53	6.95	Inlet (Supercritical)	3
1.91	9.71	Inlet (Supercritical)	3
2.30	12.19	Inlet	5
2.68	14.26	Inlet	5
3.06	16.07	Inlet	5
3.45	17.69	Inlet	5
3.83	18.87	Outlet	6
4.21	19.77	Outlet	6
4.60	20.61	Outlet	6
4.98	21.42	Outlet	6
5.36	22.21	Outlet	6
5.74	22.96	Outlet	6


SEDCAD+ Culvert Sizing Utility
CP-119
5.74
4.31
2.87
1.44
0.00
H WATER - ft
0
6
12
18
24
DISCHARGE - cfs
8 inches
9 inches
12 inches
15 inches
18 inches
21 inches

CULVERT CP-120
(MASON HAULROAD)

The location and watershed area are presented on Exhibit 11-12D.

LR

BHP Navajo Coal Company
P.O. Box 1717
Fruitland, NM 87416

Phone: 505-598-4200

General Information

Storm Information:

Storm Type:	NM TYPE II 70
Design Storm:	10 yr - 6 hr
Rainfall Depth:	1.230 inches

Structure Networking:

Type	Stru #	(flows into)	Stru #	Musk. K (hrs)	Musk. X	Description
Culvert	#1	==>	End	0.000	0.000	CULVERT CP-120

#1
Culvert

Structure Summary:

	Immediate Contributing Area (ac)	Total Contributing Area (ac)	Peak Discharge (cfs)	Total Runoff Volume (ac-ft)
#1	95.200	95.200	35.03	1.83

Structure Detail:

Structure #1 (Culvert)

CULVERT CP-120

Culvert Inputs:

Length (ft)	Slope (%)	Manning's n	Max. Headwater (ft)	Tailwater (ft)	Entrance Loss Coef. (Ke)
100.00	1.50	0.0160	5.00	0.00	0.90

Culvert Results:

Design Discharge = 35.03 cfs

Minimum pipe diameter: 1 - 30 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)
#1	1	95.200	0.272	0.000	0.000	84.900	M	35.03	1.831
	Σ	**95.200**						**35.03**	**1.831**

Subwatershed Time of Concentration Details:

Stru #	SWS #	Land Flow Condition	Slope (%)	Vert. Dist. (ft)	Horiz. Dist. (ft)	Velocity (fps)	Time (hrs)
#1	1	5. Nearly bare and untilled, and alluvial valley fans	6.06	14.00	231.00	2.460	0.026
		8. Large gullies, diversions, and low flowing streams	1.46	47.00	3,216.00	3.620	0.246
#1	**1**	**Time of Concentration:**					**0.272**

CMP CP-121 NORTH HOSTEEN ROAD

1.0 LOCATION AND FUNCTION

CMP CP-121 will be installed on North Hosteen Road to discharge surface runoff (from the watershed area located due east) into Hosteen Pit. Facilitating the culvert, will be a down drain pipe and rip-rap drop structure placed along the road. Placement of these structures will provide erosion control on the cut slopes and ultimately to protect the underlying water pipe.

2.0 BACKGROUND AND CONCERN

Currently, North Hosteen Road has improper drainage with erosional problems in certain areas. Specifically, the drainage problem is characterized by excessive ponding in the eastern side ditch. In addition, routing of the surface runoff from the undisturbed land to the side ditch causes erosion of the cut slope. For proper drainage and control of erosion, placement of a culvert, downdrain pipe, and rip-rap drop structure are proposed.

3.0 DESIGN

3.1 Culvert Design

The watershed area for CP-121 is measured to be 40.52 acres, yielding a calculated peak flow of 7.49 CFS. The soil type is predominately Avalon (AZ) soil with properties of hydrologic group B and a curve number of 78. For this undisturbed landtype, the SEDCAD program computed a culvert sizing of 18 inches. Installation of the culvert will include a minimum cover of 2 ft. and a slope of 1%.

3.2 Drop Structure Design

The watershed area for DD-26 is measured to be 20.65 acres, giving a peak flow of 4.25 CFS. Similar to the culvert, the curve number utilized in this calculation was 78. The down drain is modeled to be an 18 in. corrugated metal pipe with a 28° elbow and measuring a total length of 30 feet. This structure will have a 6 in. concrete head wall projecting 2 ft. above and below the diameter of the pipe.

The designed rip-rap channel has a watershed area of 31.81 acres with a peak flow of 6.09 CFS. Again, the curve number 78 was used for the hydrology calculation. The channel geometry will include a trapezoidal shape with side slopes of 3:1 and a bottom width of 3 ft. The channel will be sloped at 14 % from the catchment area to the side ditch of the road.

The drainage control structures shall be maintained as outlined in CHAPTER 11, Section 11.5.6.1.6. For hydrology and design information on the culvert, down drain pipe, and rip-rap drop structure, refer to Appendix 11-Z in the approved PAP.

5.0 REMOVAL AND RECLAMATION

Refer to the CHAPTER 12, Section 12.3.2 of the Navajo Mine PAP for culvert/drop structure removal and reclamation of Primary Roads.

CIVIL SOFTWARE DESIGN

SEDCAD+ Version 3

CP-121 NORTH HOSTEEN ROAD

by

Name: BH

Company Name: BHP MINERALS
File Name: J:\OSM_SUBM\PER_PROG\CH_11\11-130\SEDCAD\CP_121\CP_121

Date: 09-29-1997

Civil Software Design -- SEDCAD+ Version 3.1
Copyright (C) 1987-1992. Pamela J. Schwab. All rights reserved.

Company Name: BHP MINERALS
Filename: C:\BEN\CP_121 User: BH
Date: 09-29-1997 Time: 06:37:00
CP-121 NORTH HOSTEEN ROAD
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	20.65	78	M	0.211	0.000	0.000	0.0	0.26	4.26
111	2	19.87	78	M	0.327	0.017	0.340	0.0	0.25	3.23
		Type: Null Label: J1B1S1								
111	Structure	40.52							0.51	
111	Total IN/OUT	40.52							0.51	7.49

Civil Software Design -- SEDCAD+ Version 3.1
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Company Name: BHP MINERALS
Filename: C:\BEN\CP_121 User: BH
Date: 09-29-1997 Time: 06:37:00
CP-121 NORTH HOSTEEN ROAD
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	1515.00	3.95	1.99	0.21	0.211		
1	1	1	2	-a	5	2159.87	3.36	1.83	0.33	0.327		
1	1	1	2	-1	8	230.73	1.47	3.63	0.02		0.017	0.34(

SEDCAD+ CULVERT SIZING UTILITY

CP-121 NORTH HOSTEEN ROAD

Design Discharge	=	7.490	cfs
Entrance Loss Coefficient	=	0.9	
Pipe Length	=	88.000	feet
Pipe Slope	=	1.000	%
Manning's n	=	0.018	
Maximum Headwater	=	3.500	feet
Tailwater Depth	=	0.000	feet

Smallest Diameter Required to Pass Flow is 18 inches

PERFORMANCE CURVES:

Diameter: 12 inches

Headwater (ft)	Discharge (cfs)	Control	Flow Type
0.35	1.11	Outlet (Subcritical)	1
0.70	1.56	Outlet (Subcritical)	1
1.05	2.00	Outlet (Subcritical)	1
1.40	2.64	Inlet (Supercritical)	4
1.75	3.12	Outlet	6
2.10	3.40	Outlet	6
2.45	3.67	Outlet	6
2.80	3.95	Outlet	6
3.15	4.18	Outlet	6
3.50	4.39	Outlet	6
3.85	4.61	Outlet	6
4.20	4.82	Outlet	6
4.55	5.03	Outlet	6
4.90	5.21	Outlet	6
5.25	5.38	Outlet	6

Diameter: 15 inches

Headwater (ft)	Discharge (cfs)	Control	Flow Type
0.35	1.67	Outlet (Subcritical)	1
0.70	2.10	Outlet (Subcritical)	1
1.05	2.72	Outlet (Subcritical)	1
1.40	3.86	Outlet (Subcritical)	1
1.75	5.10	Outlet	6
2.10	5.63	Outlet	6
2.45	6.14	Outlet	6
2.80	6.58	Outlet	6
3.15	7.03	Outlet	6
3.50	7.42	Outlet	6
3.85	7.81	Outlet	6
4.20	8.17	Outlet	6
4.55	8.51	Outlet	6
4.90	8.86	Outlet	6
5.25	9.18	Outlet	6

Diameter: 18 inches

Headwater (ft)	Discharge (cfs)	Control	Flow Type
0.35	0.75	Outlet (Subcritical)	2
0.70	1.85	Inlet (Supercritical)	3
1.05	3.22	Inlet (Supercritical)	3
1.40	4.38	Outlet (Subcritical)	1 *
1.75	6.46	Outlet (Subcritical)	1
2.10	8.29	Outlet	6
2.45	9.11	Outlet	6
2.80	9.85	Outlet	6
3.15	10.54	Outlet	6
3.50	11.19	Outlet	6
3.85	11.81	Outlet	6
4.20	12.39	Outlet	6
4.55	12.96	Outlet	6
4.90	13.48	Outlet	6
5.25	14.01	Outlet	6

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

Diameter: 21 inches

Headwater (ft)	Discharge (cfs)	Control	Flow Type
0.35	0.83	Outlet (Subcritical)	2
0.70	2.15	Inlet (Supercritical)	3
1.05	3.94	Inlet (Supercritical)	3
1.40	6.03	Inlet (Supercritical)	3
1.75	7.17	Outlet (Subcritical)	1 *
2.10	9.86	Outlet (Subcritical)	1
2.45	12.47	Outlet	6
2.80	13.61	Outlet	6
3.15	14.65	Outlet	6
3.50	15.63	Outlet	6
3.85	16.55	Outlet	6
4.20	17.42	Outlet	6
4.55	18.25	Outlet	6
4.90	19.05	Outlet	6
5.25	19.81	Outlet	6

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

Diameter: 24 inches

Headwater (ft)	Discharge (cfs)	Control	Flow Type
0.35	0.91	Inlet (Supercritical)	3
0.70	2.47	Inlet (Supercritical)	3
1.05	4.51	Inlet (Supercritical)	3
1.40	6.94	Inlet (Supercritical)	3
1.75	9.24	Inlet (Supercritical)	3
2.10	10.80	Outlet (Subcritical)	1 *
2.45	14.12	Outlet (Subcritical)	1
2.80	17.74	Outlet	6

3.15	19.24	Outlet	6
3.50	20.64	Outlet	6
3.85	21.95	Outlet	6
4.20	23.18	Outlet	6
4.55	24.35	Outlet	6
4.90	25.46	Outlet	6
5.25	26.53	Outlet	6

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

Diameter: 30 inches

Headwater (ft)	Discharge (cfs)	Control	Flow Type
0.35	1.09	Inlet (Supercritical)	3
0.70	3.07	Inlet (Supercritical)	3
1.05	5.64	Inlet (Supercritical)	3
1.40	8.68	Inlet (Supercritical)	3
1.75	12.12	Inlet (Supercritical)	3
2.10	15.93	Inlet (Supercritical)	3
2.45	20.07	Inlet (Supercritical)	3
2.80	21.74	Outlet (Subcritical)	2 *
3.15	25.38	Outlet (Subcritical)	1 *
3.50	31.77	Outlet	6
3.85	34.19	Outlet	6
4.20	36.41	Outlet	6
4.55	38.50	Outlet	6
4.90	40.49	Outlet	6
5.25	42.39	Outlet	6

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

CIVIL SOFTWARE DESIGN

SEDCAD+ Version 3

DD-26 NORTH HOSTEEN ROAD HYDROLOGY

by

Name: BH

Company Name: BHP MINERALS
File Name: J:\OSM_SUBM\PER_PROG\CH_11\11-30\SEDCAD\DD_26\N_HOST3

Date: 09-28-1997

Civil Software Design -- SEDCAD+ Version 3.1
Copyright (C) 1987-1992. Pamela J. Schwab. All rights reserved.

Company Name: BHP MINERALS
Filename: C:\BEN\N_HOST3 User: BH
Date: 09-28-1997 Time: 06:10:15
DD-26 NORTH HOSTEEN ROAD HYDROLOGY
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 Discharg (cfs)
111	1	20.65	78	M	0.212	0.000	0.000	0.0	0.26	4.25
			Type: Null			Label: J1B1S1				
111	Structure	20.65							0.26	
111	Total IN/OUT	20.65							0.26	4.25

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Company Name: BHP MINERALS
Filename: C:\BEN\N_HOST3 User: BH
Date: 09-28-1997 Time: 06:10:15
DD-26 NORTH HOSTEEN ROAD HYDROLOGY
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	1420.00	3.44	1.85	0.21	0.212		

SEDCAD+ CULVERT SIZING UTILITY

DD-26 NORTH HOSTEEN ROAD

Design Discharge	=	4.250	cfs
Entrance Loss Coefficient	=	0.5	
Pipe Length	=	31.000	feet
Pipe Slope	=	59.000	%
Manning's n	=	0.018	
Maximum Headwater	=	3.500	feet
Tailwater Depth	=	0.000	feet

Smallest Diameter Required to Pass Flow is 12 inches

PERFORMANCE CURVES:

Diameter: 8 inches

Headwater (ft)	Discharge (cfs)	Control	Flow Type
0.35	0.43	Outlet (Subcritical)	2
0.70	0.86	Inlet (Supercritical)	4
1.05	1.24	Inlet	5
1.40	1.59	Inlet	5
1.75	1.94	Inlet	5
2.10	2.18	Inlet	5
2.45	2.39	Inlet	5
2.80	2.60	Inlet	5
3.15	2.81	Inlet	5
3.50	3.02	Inlet	5
3.85	3.17	Inlet	5
4.20	3.32	Inlet	5
4.55	3.47	Inlet	5
4.90	3.62	Inlet	5
5.25	3.77	Inlet	5

Diameter: 9 inches

Headwater (ft)	Discharge (cfs)	Control	Flow Type
0.35	0.47	Outlet (Subcritical)	1
0.70	0.95	Inlet (Supercritical)	3
1.05	1.49	Inlet (Supercritical)	4
1.40	2.03	Inlet	5
1.75	2.37	Inlet	5
2.10	2.71	Inlet	5
2.45	3.03	Inlet	5
2.80	3.27	Inlet	5
3.15	3.52	Inlet	5
3.50	3.76	Inlet	5
3.85	4.00	Inlet	5
4.20	4.19	Inlet	5
4.55	4.37	Inlet	5
4.90	4.56	Inlet	5
5.25	4.75	Inlet	5

Diameter: 12 inches

Headwater (ft)	Discharge (cfs)	Control	Flow Type
0.35	0.57	Outlet (Subcritical)	2
0.70	1.25	Inlet (Supercritical)	3
1.05	2.24	Inlet (Supercritical)	3
1.40	3.20	Inlet	5
1.75	3.96	Inlet	5
2.10	4.56	Inlet	5
2.45	5.13	Inlet	5
2.80	5.61	Inlet	5
3.15	6.09	Inlet	5
3.50	6.50	Inlet	5
3.85	6.91	Inlet	5
4.20	7.28	Inlet	5
4.55	7.63	Inlet	5
4.90	7.99	Inlet	5
5.25	8.30	Inlet	5

Diameter: 15 inches

Headwater (ft)	Discharge (cfs)	Control	Flow Type
0.35	0.66	Outlet (Subcritical)	2
0.70	1.56	Inlet (Supercritical)	3
1.05	2.83	Inlet (Supercritical)	3
1.40	4.30	Inlet (Supercritical)	4
1.75	5.61	Inlet	5
2.10	6.67	Inlet	5
2.45	7.59	Inlet	5
2.80	8.40	Inlet	5
3.15	9.15	Inlet	5
3.50	9.84	Inlet	5
3.85	10.48	Inlet	5
4.20	11.09	Inlet	5
4.55	11.66	Inlet	5
4.90	12.20	Inlet	5
5.25	12.73	Inlet	5

Diameter: 18 inches

Headwater (ft)	Discharge (cfs)	Control	Flow Type
0.35	0.75	Outlet (Subcritical)	2
0.70	1.85	Inlet (Supercritical)	3
1.05	3.39	Inlet (Supercritical)	3
1.40	5.21	Inlet (Supercritical)	3
1.75	7.22	Inlet (Supercritical)	3
2.10	8.87	Inlet	5
2.45	10.28	Inlet	5
2.80	11.52	Inlet	5
3.15	12.64	Inlet	5
3.50	13.67	Inlet	5

3.85	14.63	Inlet	5
4.20	15.52	Inlet	5
4.55	16.37	Inlet	5
4.90	17.18	Inlet	5
5.25	17.95	Inlet	5

Diameter: 21 inches

Headwater (ft)	Discharge (cfs)	Control	Flow Type
0.35	0.83	Outlet (Subcritical)	2
0.70	2.15	Inlet (Supercritical)	3
1.05	3.94	Inlet (Supercritical)	3
1.40	6.07	Inlet (Supercritical)	3
1.75	8.49	Inlet (Supercritical)	3
2.10	10.97	Inlet	5
2.45	13.05	Inlet	5
2.80	14.85	Inlet	5
3.15	16.44	Inlet	5
3.50	17.91	Inlet	5
3.85	19.25	Inlet	5
4.20	20.51	Inlet	5
4.55	21.70	Inlet	5
4.90	22.83	Inlet	5
5.25	23.90	Inlet	5

CIVIL SOFTWARE DESIGN

SEDCAD+ Version 3

RIP RAP DROP STRUCTURE @ STA 14+64

by

Name: BH

Company Name: BHP MINERALS
File Name: J:\OSM_SUBM\PER_PROG\CH_11\11-130\SEDCAD\DROP_STR\N_HOST

Date: 09-30-1997

Civil Software Design -- SEDCAD+ Version 3.1
Copyright (C) 1987-1992. Pamela J. Schwab. All rights reserved.

Company Name: BHP MINERALS
Filename: C:\BEN\N_HOST User: BH
Date: 09-30-1997 Time: 12:46:29
RIP RAP DROP STRUCTURE @ STA 14+64
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	31.81	78	M	0.245	0.000	0.000	0.0	0.40	6.09
		Type: Null		Label: J1B1S1 @ SIDE DITCH						
111	Structure	31.81							0.40	
111	Total IN/OUT	31.81							0.40	6.09

Civil Software Design -- SEDCAD+ Version 3.1
Copyright (C) 1987-1992. Pamela J. Schwab. All rights reserved.

Company Name: BHP MINERALS
Filename: C:\BEN\N_HOST User: BH
Date: 09-30-1997 Time: 12:46:29
RIP RAP DROP STRUCTURE @ STA 14+64
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)	X
1	1	1	1	-a	5	1474.00	2.78	1.67	0.25	0.245		

SEDCAD+ RIPRAP CHANNEL DESIGN

RIP RAP DROP STRUCTURE @ STA 14+64

INPUT VALUES:

Shape	TRAPEZOIDAL	
Discharge	6.09 cfs	
Slope	14.00 %	
Sideslopes (L and R)	3.00:1	3.00:1
Bottom Width	3.00 feet	
Freeboard	1 ft	

RESULTS:

Steep Slope Design - PADER Method

Depth	0.33 ft
with Freeboard	1.33 ft
Top Width	5.00 ft
with Freeboard	11.00 ft
Velocity	4.56 fps
Cross Sectional Area	1.34 sq ft
Hydraulic Radius	0.26 ft
Manning's n	0.050
Froude Number	1.55
Dmax	0.313 ft (3.75 in)
D50	0.250 ft (3.00 in)
D10	0.083 ft (1.00 in)

CIVIL SOFTWARE DESIGN

SEDCAD+ Version 3

CP-119 HYDROLOGY

by

Name: BEN HOSKIE

Company Name: BHP MINERALS

File Name: J:\OSM_SUBM\PER_PROG\CH_11\11-129\SEDCAD\CP-119

Date: 01-30-1998

Civil Software Design -- SEDCAD+ Version 3.1
Copyright (C) 1987-1992. Pamela J. Schwab. All rights reserved.

Company Name: BHP MINERALS User: BH
Filename: C:\BEN\CP-119 Date: 11-07-1997 Time: 10:08:29
CULVERT CP-119 HYDROLOGY
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	31.90	76	M	0.256	0.000	0.000	0.0	0.30	4.15
		Type: Null			Label: CP-119 HYDROLOGY					
111	Structure	31.90							0.30	4.15
111	Total IN/OUT	31.90								

Civil Software Design -- SEDCAD+ Version 3.1
Copyright (C) 1987-1992. Pamela J. Schwab. All rights reserved.

Company Name: BHP MINERALS
User: BH
Filename: C:\BEN\CP-119
Date: 11-07-1997 Time: 10:08:29
CULVERT CP-119 HYDROLOGY
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)	X
1	1	1	1	-a	5	1875.00	4.12	2.03	0.26	0.256		

CIVIL SOFTWARE DESIGN

SEDCAD+ Version 3

NORTHWEST DITCH HYDROLOGY-STA 0+00 TO 5+00 BARBER MODIFICATION

by

Name: BEN HOSKIE

Company Name: BHP MINERALS
File Name: J:\OSM_SUBM\PER_PROG\CH_11\11-129\SEDCAD\NW_DIT

Date: 01-30-1998

Civil Software Design -- SEDCAD+ Version 3.1
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Company Name: BHP MINERALS
Filename: C:\BEN\BARMOD\NW_DIT User: BEN HOSKIE
Date: 11-04-1997 Time: 13:11:34
NORTHWEST DITCH HYDROLOGY-STA 0+00 TO 5+00 BARBER MODIFICATION
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 Discharg (cfs)
111	1	3.92	77	M	0.081	0.000	0.000	0.0	0.05	1.50
			Type: Null		Label: J1B1S1					
111	Structure	3.92							0.05	
111	Total IN/OUT	3.92							0.05	1.50

Civil Software Design -- SEDCAD+ Version 3.1
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Company Name: BHP MINERALS
Filename: C:\BEN\BARMOD\NW_DIT User: BEN HOSKIE
Date: 11-04-1997 Time: 13:11:34
NORTHWEST DITCH HYDROLOGY-STA 0+00 TO 5+00 BARBER MODIFICATION
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	753.00	6.61	2.57	0.08	0.081		

SEDCAD+ ERODIBLE CHANNEL DESIGN

NW DITCH HYDROLOGY STA 0+00 TO 5+00

Limiting Velocity Technique
Sediment-laden Water

INPUT VALUES:

Shape	TRIANGULAR	
Discharge	1.50 cfs	
Slope	3.50 %	
Sideslopes	3.00:1 (L)	2.00:1 (R)
Manning's n	0.025	
Max. Velocity	5.00 fps	
Material	CLAYEY SPOIL MATERIAL	
Freeboard	1 ft	

RESULTS:

Actual Discharge	1.50 cfs
Depth	0.40 ft
with Freeboard	1.40 ft
Top Width	2.02 ft
with Freeboard	7.02 ft
Velocity	3.66 fps
Cross Sectional Area	0.41 sq ft
Hydraulic Radius	0.19 ft
Froude Number	1.43

SEDCAD+ CHANNEL DESIGN
NW DITCH HYDROLOGY STA 0+00 TO 5+00

MATERIAL: CLAYEY SPOIL MATERIAL
Limiting Variable: Velocity = 5.000 fps
Sediment-laden Water

						w/ Freeboard:	
Discharge	=	1.50 cfs	Depth (d)	=	0.40	(D = 1.40)	ft
			Top width (t)	=	2.02	(T = 7.02)	ft
Side slopes (Z)	=	3.0:1(L) 2.0:1(R)	Velocity	=	3.66	fps	
Bed Slope	=	3.50 %	Hydraulic Radius	=	0.19	ft	
Manning's n	=	0.025	Froude number	=	1.43		

CIVIL SOFTWARE DESIGN

SEDCAD+ Version 3

SOUTHWEST DITCH HYDROLOGY-STA 0+00 TO 5+00 BARBER MODIFICATION

by

Name: BEN HOSKIE

Company Name: BHP MINERALS
File Name: J:\OSM_SUBM\PER_PROG\CH_11\11-129\SEDCAD\SW_DIT

Date: 01-30-1998

Civil Software Design -- SEDCAD+ Version 3.1
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Company Name: BHP MINERALS
Filename: C:\BEN\BARMOD\SW_DIT User: BEN HOSKIE
Date: 11-04-1997 Time: 13:16:02
SOUTHWEST DITCH HYDROLOGY-STA 0+00 TO 5+00 BARBER MODIFICATION
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 Discharg (cfs)**
111	1	3.68	77	M	0.079	0.000	0.000	0.0	0.04	**1.40**
		Type: Null			Label: J1B1S1					
111	Structure	3.68							0.04	
111	Total IN/OUT	3.68							0.04	**1.40**

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Company Name: BHP MINERALS
Filename: C:\BEN\BARMOD\SW_DIT User: BEN HOSKIE
Date: 11-04-1997 Time: 13:16:02
SOUTHWEST DITCH HYDROLOGY-STA 0+00 TO 5+00 BARBER MODIFICATION
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)
1	1	1	1	-a	5	789.00	7.58	2.75	0.08	0.079	

SEDCAD+ ERODIBLE CHANNEL DESIGN

SW DITCH HYDROLOGY STA 0+00 TO 5+00

Limiting Velocity Technique
Sediment-laden Water

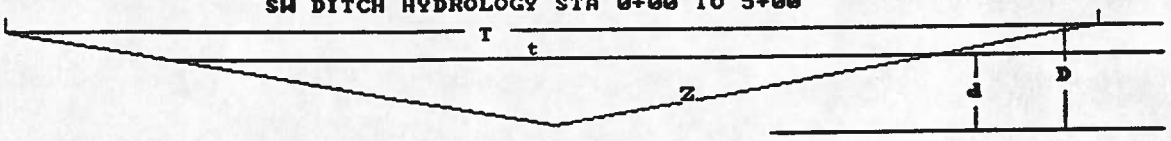
INPUT VALUES:

Shape	TRIANGULAR	
Discharge	1.40 cfs	
Slope	3.50 %	
Sideslopes	3.00:1 (L)	2.00:1 (R)
Manning's n	0.025	
Max. Velocity	5.00 fps	
Material	CLAYEY SPOIL MATERIAL	
Freeboard	1 ft	

RESULTS:

Actual Discharge	1.40 cfs
Depth	0.39 ft
with Freeboard	1.39 ft
Top Width	1.97 ft
with Freeboard	6.97 ft
Velocity	3.60 fps
Cross Sectional Area	0.39 sq ft
Hydraulic Radius	0.18 ft
Froude Number	1.43

SEDCAD+ CHANNEL DESIGN
SW DITCH HYDROLOGY STA 0+00 TO 5+00



MATERIAL: CLAYEY SPOIL MATERIAL
Limiting Variable: Velocity = 5.000 fps
Sediment-laden Water

Discharge	=	1.40 cfs	Depth (d)	=	0.39	w/ Freeboard: (D =	1.39) ft
			Top width (t)	=	1.97	(T =	6.97) ft
Side slopes (Z)	=	3.0:1(L) 2.0:1(R)	Velocity	=	3.60 fps		
Bed Slope	=	3.50 %	Hydraulic Radius	=	0.18 ft		
Manning's n	=	0.025	Froude number	=	1.43		

CIVIL SOFTWARE DESIGN

SEDCAD+ Version 3

NORTHEAST DITCH HYDROLOGY-STA 5+00 TO 12+00 BARBER MODIFICATION

by

Name: BEN HOSKIE

Company Name: BHP MINERALS
File Name: J:\OSM_SUBM\PER_PROG\CH_11\11-129\SEDCAD\NE_DIT

Date: 01-30-1998

Civil Software Design -- SEDCAD+ Version 3.1
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Company Name: BHP MINERALS
Filename: C:\BEN\BARMOD\NE_DIT User: BEN HOSKIE
Date: 11-04-1997 Time: 13:19:25
NORTHEAST DITCH HYDROLOGY-STA 5+00 TO 12+00 BARBER MODIFICATION
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 Discharg (cfs)
111	1	4.36	78	M	0.130	0.000	0.000	0.0	0.05	0.97
		Type: Null Label: J1B1S1								
111	Structure	4.36							0.05	
111	Total IN/OUT	4.36							0.05	0.97

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Company Name: BHP MINERALS
Filename: C:\BEN\BARMOD\NE_DIT User: BEN HOSKIE
Date: 11-04-1997 Time: 13:19:25
NORTHEAST DITCH HYDROLOGY-STA 5+00 TO 12+00 BARBER MODIFICATION
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	1049.00	5.00	2.24	0.13	0.130		

SEDCAD+ ERODIBLE CHANNEL DESIGN

NE DITCH HYDROLOGY STA 5+00 TO 12+00

Limiting Velocity Technique
Sediment-laden Water

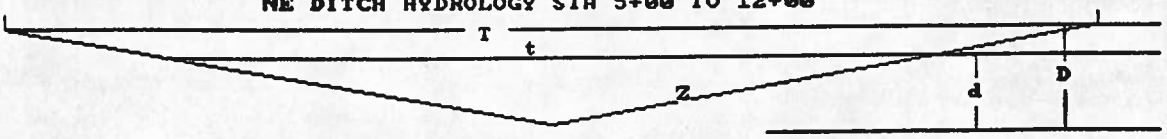
INPUT VALUES:

Shape	TRIANGULAR	
Discharge	0.97 cfs	
Slope	4.50 %	
Sideslopes	3.00:1 (L)	2.00:1 (R)
Manning's n	0.025	
Max. Velocity	5.00 fps	
Material	CLAYEY SPOIL MATERIAL	
Freeboard	1 ft	

RESULTS:

Actual Discharge	0.97 cfs
Depth	0.33 ft
with Freeboard	1.33 ft
Top Width	1.64 ft
with Freeboard	6.64 ft
Velocity	3.61 fps
Cross Sectional Area	0.27 sq ft
Hydraulic Radius	0.15 ft
Froude Number	1.57

SEDCAD+ CHANNEL DESIGN
NE DITCH HYDROLOGY STA 5+00 TO 12+00



MATERIAL: CLAYEY SPOIL MATERIAL
Limiting Variable: Velocity = 5.000 fps
Sediment-laden Water

							w/ Freeboard:	
Discharge	=	0.97 cfs	Depth (d)	=	0.33	(D =	1.33)	ft
			Top width (t)	=	1.64	(T =	6.64)	ft
Side slopes (Z)	=	3.0:1(L) 2.0:1(R)	Velocity	=	3.61	fps		
Bed Slope	=	4.50 %	Hydraulic Radius	=	0.15	ft		
Manning's n	=	0.025	Froude number	=	1.57			

CIVIL SOFTWARE DESIGN

SEDCAD+ Version 3

SOUTHEAST DITCH HYDROLOGY-STA 5+00 TO 12+00 BARBER MODIFICATION

by

Name: BEN HOSKIE

Company Name: BHP MINERALS
File Name: J:\OSM_SUBM\PER_PROG\CH_11\11-129\SEDCAD\SE_DIT

Date: 01-30-1998

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Company Name: BHP MINERALS
Filename: C:\BEN\BARMOD\SE_DIT User: BEN HOSKIE
Date: 11-04-1997 Time: 13:21:45
SOUTHEAST DITCH HYDROLOGY-STA 5+00 TO 12+00 BARBER MODIFICATION
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	**2.23**	79	M	0.134	0.000	0.000	0.0	0.03	**0.61**
			Type: Null			Label: J1B1S1				
111	Structure	2.23							0.03	
111	Total IN/OUT	2.23							0.03	**0.61**

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Company Name: BHP MINERALS
Filename: C:\BEN\BARMOD\SE_DIT User: BEN HOSKIE
Date: 11-04-1997 Time: 13:21:45
SOUTHEAST DITCH HYDROLOGY-STA 5+00 TO 12+00 BARBER MODIFICATION
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	1010.00	4.36	2.09	0.13	0.134		

SEDCAD+ ERODIBLE CHANNEL DESIGN

SE DITCH HYDROLOGY STA 5+00 TO 12+00

Limiting Velocity Technique
Sediment-laden Water

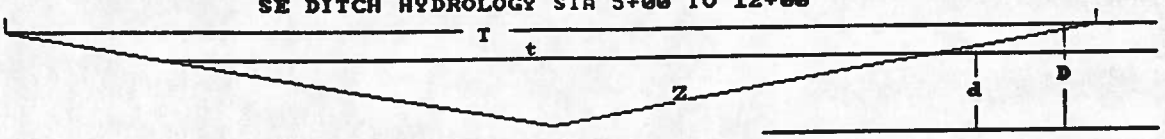
INPUT VALUES:

Shape	TRIANGULAR	
Discharge	0.61 cfs	
Slope	4.50 %	
Sideslopes	3.00:1 (L)	2.00:1 (R)
Manning's n	0.025	
Max. Velocity	5.00 fps	
Material	CLAYEY SPOIL MATERIAL	
Freeboard	1 ft	

RESULTS:

Actual Discharge	0.61 cfs
Depth	0.28 ft
with Freeboard	1.28 ft
Top Width	1.38 ft
with Freeboard	6.38 ft
Velocity	3.21 fps
Cross Sectional Area	0.19 sq ft
Hydraulic Radius	0.13 ft
Froude Number	1.52

SEDCAD+ CHANNEL DESIGN
SE DITCH HYDROLOGY STA 5+00 TO 12+00



MATERIAL: CLAYEY SPOIL MATERIAL
Limiting Variable: Velocity = 5.000 fps
Sediment-laden Water

Discharge	=	0.61 cfs	Depth (d)	=	0.28	w/ Freeboard: (D =	1.28) ft
			Top width (t)	=	1.38	(T =	6.38) ft
Side slopes (Z)	=	3.0:1(L) 2.0:1(R)	Velocity	=	3.21 fps		
Bed Slope	=	4.50 %	Hydraulic Radius	=	0.13 ft		
Manning's n	=	0.025	Froude number	=	1.52		

CIVIL SOFTWARE DESIGN

SEDCAD+ Version 3

SOUTH DITCH HYDROLOGY-FILL AREA STA 12+00 TO 17+00 BARBER MODIFICATION

by

Name: BEN HOSKIE

Company Name: BHP MINERALS
File Name: J:\OSM_SUBM\PER_PROG\CH_11\11-129\SEDCAD\S_DIT

Date: 01-30-1998

Civil Software Design -- SEDCAD+ Version 3.1
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Company Name: BHP MINERALS
Filename: C:\BEN\BARMOD\S_DIT User: BEN HOSKIE
Date: 11-04-1997 Time: 13:41:13
SOUTH DITCH HYDROLOGY-FILL AREA STA 12+00 TO 17+00 BARBER MODIFICATION
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	2.89	80	M	0.212	0.000	0.000	0.0	0.05	0.82
			Type: Null			Label: J1B1S1				
111	Structure	2.89							0.05	
111	Total IN/OUT	2.89							0.05	0.82

Civil Software Design -- SEDCAD+ Version 3.1
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Company Name: BHP MINERALS
Filename: C:\BEN\BARMOD\S_DIT User: BEN HOSKIE
Date: 11-04-1997 Time: 13:41:13
SOUTH DITCH HYDROLOGY-FILL AREA STA 12+00 TO 17+00 BARBER MODIFICATION
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	1510.00	3.91	1.98	0.21	0.212		

SEDCAD+ ERODIBLE CHANNEL DESIGN

S DITCH HYDROLOGY STA 12+00 TO 17+00

Limiting Velocity Technique
Sediment-laden Water

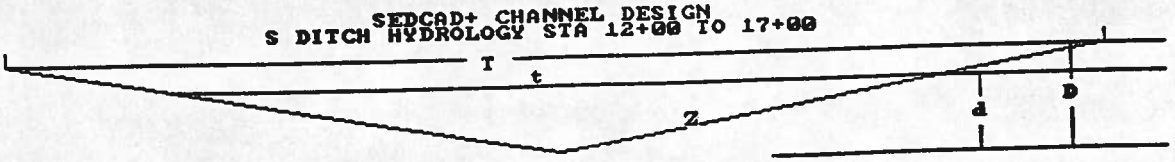
INPUT VALUES:

Shape	TRIANGULAR
Discharge	0.82 cfs
Slope	4.50 %
Sideslopes	4.00:1 (L) 58.00:1 (R)
Manning's n	0.020
Max. Velocity	3.00 fps
Material	SILT LOAM NONCOLLOIDAL
Freeboard	1 ft

RESULTS:

Actual Discharge	0.82 cfs
Depth	0.11 ft
with Freeboard	1.11 ft
Top Width	6.71 ft
with Freeboard	68.71 ft
Velocity	2.26 fps
Cross Sectional Area	0.36 sq ft
Hydraulic Radius	0.05 ft
Froude Number	1.71

SEDCAD+ CHANNEL DESIGN
S DITCH HYDROLOGY STA 12+00 TO 17+00



MATERIAL: SILT LOAM NONCOLLOIDAL
Limiting Variable: Velocity = 3.000 fps
Sediment-laden Water

						w/ Freeboard:	
Discharge	=	0.82 cfs	Depth (d)	=	0.11	(D = 1.11)	ft
			Top width (t)	=	6.71	(T = 68.71)	ft
Side slopes (Z)	=	4.0:1(L) 58.0:1(R)	Velocity	=	2.26	fps	
Bed Slope	=	4.50 %	Hydraulic Radius	=	0.05	ft	
Manning's n	=	0.020	Froude number	=	1.71		

CIVIL SOFTWARE DESIGN

SEDCAD+ Version 3

CMP CP-119 HYDROLOGY DOWN STREAM

by

Name: BEN HOSKIE

Company Name: BHP MINERALS
File Name: J:\OSM_SUBM\PER_PROG\CH_11\11-129\SEDCAD\BARBER

Date: 01-30-1998

Civil Software Design -- SEDCAD+ Version 3.1
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Company Name: BHP MINERALS
Filename: C:\BEN\BARBER User: BH
Date: 11-07-1997 Time: 10:11:07
CMP CP-119 HYDROLOGY DOWN STREAM
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 Discharg (cfs)
111	1	31.52	76	M	0.346	0.000	0.000	0.0	0.29	3.40
			Type: Null			Label: J1B1S1				
111	Structure	31.52							0.29	
111	Total IN/OUT	31.52							0.29	3.40

Civil Software Design -- SEDCAD+ Version 3.1
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Company Name: BHP MINERALS
User: BH
Filename: C:\BEN\BARBER
Date: 11-07-1997 Time: 10:11:07
CMP CP-119 HYDROLOGY DOWN STREAM
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	2488.00	3.98	1.99	0.35	0.346		

BHP MINERALS
NAVAJO MINE

07-Nov-97

PROJECT: CMP-119 DOWNSTREAM HYDROLOGY
ENGINEER: Ben Hoskie
FILE NO :
DRWG NO : EXHIBIT 11-129
MMD REF:

Channel Design:

Precipitation Event	10yr-6hr		
Design Flow	Q10	7.55	CFS
Bottom Channel Width	W =	0.00	Ft (min)
Side Slopes (Z1:1)	Z1 =	22.00	
(Z2:1)	Z2 =	22.00	
Manning's Roughness Coefficient	n =	0.032	
Channel Bed Slope	S =	2.76	%

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	1.38	0.12	2.64	1.92
0.50	5.50	0.25	16.79	3.05
0.75	12.38	0.37	49.58	4.01
1.00	22.00	0.50	106.89	4.86
1.25	34.38	0.62	193.94	5.64
1.50	49.50	0.75	315.56	6.38
1.75	67.38	0.87	476.25	7.07
2.00	88.00	1.00	680.26	7.73
2.25	111.38	1.12	931.64	8.36
2.50	137.50	1.25	1234.31	8.98
2.75	166.38	1.37	1591.99	9.57
3.00	198.00	1.50	2008.34	10.14
3.25	232.38	1.62	2486.86	10.70
3.50	269.50	1.75	3030.99	11.25
3.75	309.38	1.87	3644.07	11.78
4.00	352.00	2.00	4329.36	12.30
4.25	397.38	2.12	5090.04	12.81

Flow Depth at Peak Discharge	0.38	Ft
Minimum Channel Depth Required	0.68	Ft
Critical Depth	0.38	Ft
Flow Type	Subcritical flow	
Froude Number	0.73	
Flow Velocity	2.54	fps
Soil Type: SANDY LOAM		
Erosive Velocity	3.00	fps

Flow Velocity is Less than Erosive Velocity, Therefore No Riprap Required

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

CP-16 HYDROLOGY

by

Name: BEN HOSKIE

Company Name: BHP MINERALS
File Name: J:\OSM_SUBM\PER_PROG\CH_11\11-129\SEDCAD\CP_16

Date: 01-30-1998

Civil Software Design -- SEDCAD+ Version 3.1
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Company Name: BHP MINERALS
Filename: C:\BEN\CP_16 User: BEN HOSKIE
Date: 11-10-1997 Time: 15:14:56
CULVERT CP-16
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 Discharg (cfs)
111	1	31.90	76	M	0.256	0.000	0.000	0.0	0.30	4.15
			Type: Null		Label: CP-119					
111	Structure	31.90							0.30	
111	Total IN/OUT	31.90							0.30	4.15
211	1	172.50	76	M	0.635	0.000	0.000	0.0	1.61	12.47
			Type: Null		Label: CP-16					
211	Structure	172.50							1.91	
211	Total IN/OUT	204.40							1.91	15.70
111	to 211 Routing					0.127	0.359			

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Company Name: BHP MINERALS
Filename: C:\BEN\CP_16 User: BEN HOSKIE
Date: 11-10-1997 Time: 15:14:56
CULVERT CP-16
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)	X
1	1	1	1	-a	5	1875.00	4.12	2.03	0.26	0.256		
2	1	1	1	-a	5	3325.00	2.11	1.45	0.64	0.635		

SEDCAD+ CULVERT SIZING UTILITY

CP-16 RAILROAD CULVERT

Design Discharge	=	15.760	cfs
Entrance Loss Coefficient	=	0.5	
Pipe Length	=	153.000	feet
Pipe Slope	=	1.100	%
Manning's n	=	0.017	
Maximum Headwater	=	42.500	feet
Tailwater Depth	=	0.000	feet

Smallest Diameter Required to Pass Flow is 15 inches

PERFORMANCE CURVES:

Diameter: 9 inches

Headwater (ft)	Discharge (cfs)	Control	Flow Type
4.25	2.18	Outlet	6
8.50	2.98	Outlet	6
12.75	3.55	Outlet	6
17.00	4.08	Outlet	6
21.25	4.47	Outlet	6
25.50	4.87	Outlet	6
29.75	5.26	Outlet	6
34.00	5.66	Outlet	6
38.25	6.04	Outlet	6
42.50	6.32	Outlet	6
46.75	6.60	Outlet	6
51.00	6.89	Outlet	6
55.25	7.17	Outlet	6
59.50	7.45	Outlet	6
63.75	7.73	Outlet	6

Diameter: 12 inches

Headwater (ft)	Discharge (cfs)	Control	Flow Type
4.25	4.48	Outlet	6
8.50	6.16	Outlet	6
12.75	7.41	Outlet	6
17.00	8.51	Outlet	6
21.25	9.47	Outlet	6
25.50	10.36	Outlet	6
29.75	11.15	Outlet	6
34.00	11.95	Outlet	6
38.25	12.62	Outlet	6
42.50	13.29	Outlet	6
46.75	13.96	Outlet	6
51.00	14.55	Outlet	6
55.25	15.13	Outlet	6
59.50	15.71	Outlet	6
63.75	16.26	Outlet	6

Diameter: 15 inches

Headwater (ft)	Discharge (cfs)	Control	Flow Type

4.25	7.88	Outlet	6
8.50	10.76	Outlet	6
12.75	13.04	Outlet	6
17.00	14.98	Outlet	6
21.25	16.70	Outlet	6
25.50	18.27	Outlet	6
29.75	19.70	Outlet	6
34.00	21.02	Outlet	6
38.25	22.29	Outlet	6
42.50	23.47	Outlet	6
46.75	24.60	Outlet	6
51.00	25.68	Outlet	6
55.25	26.71	Outlet	6
59.50	27.72	Outlet	6
63.75	28.68	Outlet	6

Diameter: 18 inches

Headwater (ft)	Discharge (cfs)	Control	Flow Type
4.25	12.21	Outlet	6
8.50	16.87	Outlet	6
12.75	20.52	Outlet	6
17.00	23.61	Outlet	6
21.25	26.34	Outlet	6
25.50	28.81	Outlet	6
29.75	31.08	Outlet	6
34.00	33.20	Outlet	6
38.25	35.20	Outlet	6
42.50	37.08	Outlet	6
46.75	38.88	Outlet	6
51.00	40.59	Outlet	6
55.25	42.24	Outlet	6
59.50	43.77	Outlet	6
63.75	45.30	Outlet	6

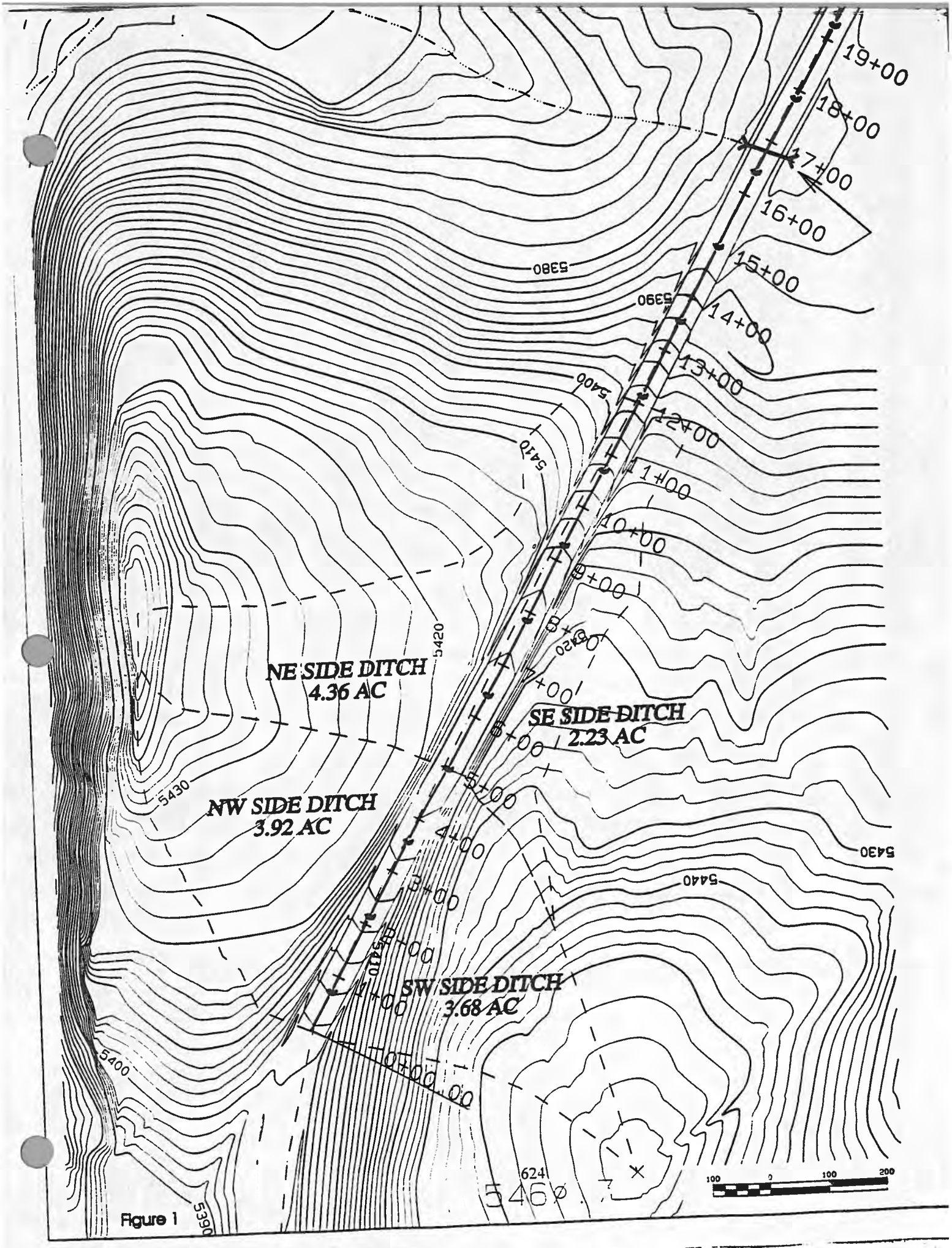
Diameter: 21 inches

Headwater (ft)	Discharge (cfs)	Control	Flow Type
4.25	17.52	Outlet	6
8.50	24.51	Outlet	6
12.75	29.93	Outlet	6
17.00	34.48	Outlet	6
21.25	38.51	Outlet	6
25.50	42.16	Outlet	6
29.75	45.46	Outlet	6
34.00	48.59	Outlet	6
38.25	51.56	Outlet	6
42.50	54.30	Outlet	6
46.75	56.99	Outlet	6
51.00	59.46	Outlet	6
55.25	61.94	Outlet	6
59.50	64.22	Outlet	6
63.75	66.50	Outlet	6

Diameter: 24 inches

Headwater (ft)	Discharge (cfs)	Control	Flow Type

4.25	23.79	Outlet	6
8.50	33.68	Outlet	6
12.75	41.26	Outlet	6
17.00	47.63	Outlet	6
21.25	53.25	Outlet	6
25.50	58.34	Outlet	6
29.75	63.03	Outlet	6
34.00	67.41	Outlet	6
38.25	71.50	Outlet	6
42.50	75.35	Outlet	6
46.75	79.03	Outlet	6
51.00	82.57	Outlet	6
55.25	85.93	Outlet	6
59.50	89.17	Outlet	6
63.75	92.33	Outlet	6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2+00
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NE SIDE DITCH
4.36 AC
NW SIDE DITCH
3.92 AC
SE SIDE DITCH
2.23 AC
SW SIDE DITCH
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5380
5390
5400
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5430
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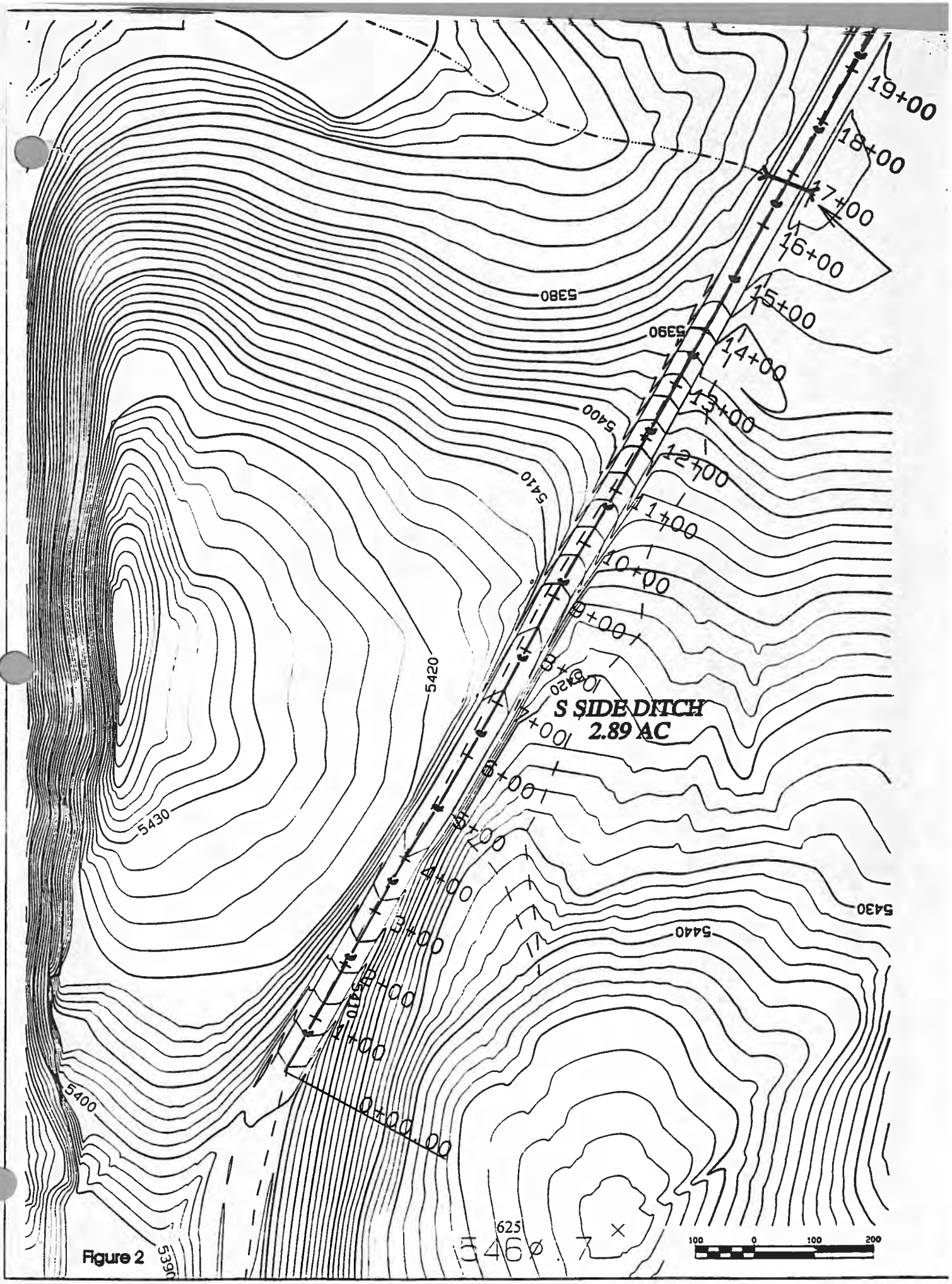
624
546

Figure 1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3+00
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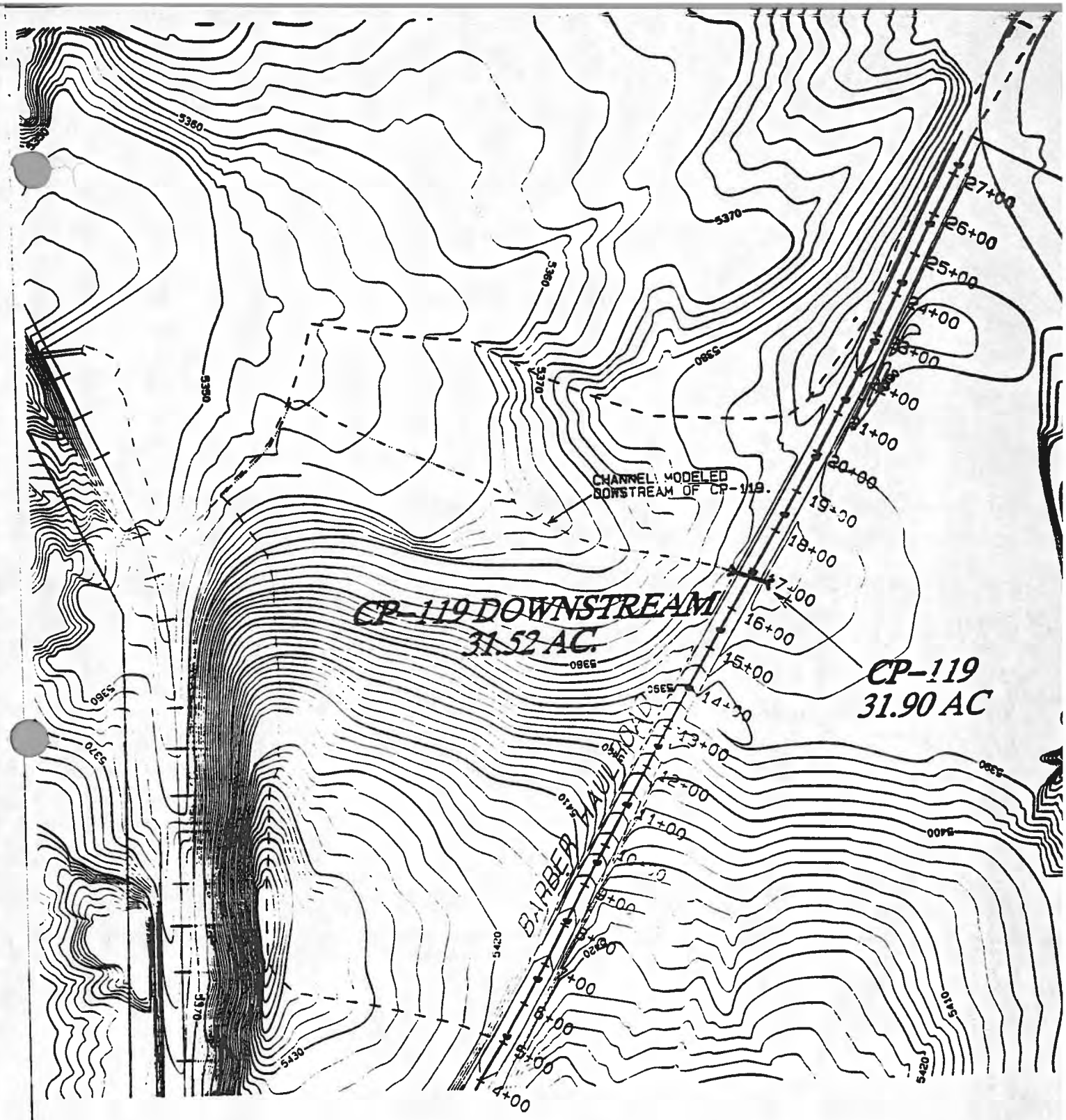
Figure 2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31.52 AC.
CP-119
31.90 AC
BARBER HAUL ROAD
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22+00
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17+00
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6+00
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4+00
5380
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5410
5420
5430

Figure 3

CIVIL SOFTWARE DESIGN

SEDCAD+ Version 3

CULVERT CP-124 RAMP 7

by

Name: RY

Company Name: BHP MINERALS
File Name: C:\RAY\CP-124

Date: 04-01-1998

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Company Name: BHP MINERALS
Filename: C:\RAY\CP-124 User: RY
Date: 04-01-1998 Time: 12:02:57
CULVERT CP-124 RAMP 7
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	372.00	72	M	1.566	0.000	0.000	0.0	1.92	7.74
			Type: Null			Label: CP-124				
111	Structure	372.00							1.92	
111	Total IN/OUT	372.00							1.92	7.74

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Company Name: BHP MINERALS
Filename: C:\RAY\CP-124 User: RY
Date: 04-01-1998 Time: 12:02:57
CULVERT CP-124 RAMP 7
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)	X
1	1	1	1	-a	5	6566.00	1.36	1.16	1.57	1.566		

SEDCAD+ CULVERT SIZING UTILITY

CP-124

Design Discharge	=	7.740 cfs
Entrance Loss Coefficient	=	0.9
Pipe Length	=	50.000 feet
Pipe Slope	=	3.000 %
Manning's n	=	0.018
Maximum Headwater	=	3.300 feet
Tailwater Depth	=	0.000 feet

Smallest Diameter Required to Pass Flow is 15 inches

PERFORMANCE CURVES:

Diameter: 9 inches

Headwater (ft)	Discharge (cfs)	Control	Flow Type
0.33	0.45	Outlet (Subcritical)	1
0.66	0.89	Inlet (Supercritical)	3
0.99	1.40	Inlet (Supercritical)	4
1.32	1.92	Inlet	5
1.65	2.12	Inlet	5
1.98	2.27	Inlet	5
2.31	2.41	Inlet	5
2.64	2.56	Outlet	6
2.97	2.70	Outlet	6
3.30	2.85	Outlet	6
3.63	2.99	Outlet	6
3.96	3.09	Outlet	6
4.29	3.18	Outlet	6
4.62	3.28	Outlet	6
4.95	3.37	Outlet	6

Diameter: 12 inches

Headwater (ft)	Discharge (cfs)	Control	Flow Type
0.33	0.54	Outlet (Subcritical)	2
0.66	1.14	Inlet (Supercritical)	3
0.99	2.06	Inlet (Supercritical)	3
1.32	3.02	Inlet	5
1.65	3.74	Inlet	5
1.98	4.32	Inlet	5
2.31	4.81	Outlet	6
2.64	5.15	Outlet	6
2.97	5.39	Outlet	6
3.30	5.64	Outlet	6
3.63	5.88	Outlet	6
3.96	6.10	Outlet	6
4.29	6.31	Outlet	6

4.62	6.52	Outlet	6
4.95	6.72	Outlet	6

Diameter: 15 inches

Headwater (ft)	Discharge (cfs)	Control	Flow Type
0.33	0.63	Outlet (Subcritical)	2
0.66	1.43	Inlet (Supercritical)	3
0.99	2.59	Inlet (Supercritical)	3
1.32	3.97	Inlet (Supercritical)	3
1.65	5.27	Inlet	5
1.98	6.33	Inlet	5
2.31	7.24	Inlet	5
2.64	8.05	Inlet	5
2.97	8.77	Inlet	5
3.30	9.30	Inlet	5
3.63	9.74	Outlet	6
3.96	10.16	Outlet	6
4.29	10.52	Outlet	6
4.62	10.89	Outlet	6
4.95	11.24	Outlet	6

Diameter: 18 inches

Headwater (ft)	Discharge (cfs)	Control	Flow Type
0.33	0.71	Outlet (Subcritical)	2
0.66	1.71	Inlet (Supercritical)	3
0.99	3.10	Inlet (Supercritical)	3
1.32	4.77	Inlet (Supercritical)	3
1.65	6.66	Inlet (Supercritical)	3
1.98	8.33	Inlet	5
2.31	9.74	Inlet	5
2.64	10.98	Inlet	5
2.97	12.08	Inlet	5
3.30	13.10	Inlet	5
3.63	14.04	Inlet	5
3.96	14.92	Inlet	5
4.29	15.70	Outlet	6
4.62	16.33	Outlet	6
4.95	16.88	Outlet	6

Diameter: 21 inches

Headwater (ft)	Discharge (cfs)	Control	Flow Type
0.33	0.78	Outlet (Subcritical)	2
0.66	1.97	Inlet (Supercritical)	3
0.99	3.62	Inlet (Supercritical)	3
1.32	5.56	Inlet (Supercritical)	3

1.65	7.77	Inlet (Supercritical)	3
1.98	10.18	Inlet (Supercritical)	3
2.31	12.26	Inlet	5
2.64	14.06	Inlet	5
2.97	15.64	Inlet	5
3.30	17.09	Inlet	5
3.63	18.42	Inlet	5
3.96	19.66	Inlet	5
4.29	20.83	Inlet	5
4.62	21.94	Inlet	5
4.95	22.99	Inlet	5

Diameter: 24 inches

Headwater (ft)	Discharge (cfs)	Control	Flow Type
0.33	0.86	Inlet (Supercritical)	3
0.66	2.26	Inlet (Supercritical)	3
0.99	4.13	Inlet (Supercritical)	3
1.32	6.36	Inlet (Supercritical)	3
1.65	8.88	Inlet (Supercritical)	3
1.98	11.67	Inlet (Supercritical)	3
2.31	14.70	Inlet (Supercritical)	3
2.64	17.12	Inlet	5
2.97	19.33	Inlet	5
3.30	21.31	Inlet	5
3.63	23.13	Inlet	5
3.96	24.81	Inlet	5
4.29	26.38	Inlet	5
4.62	27.87	Inlet	5
4.95	29.28	Inlet	5

CIVIL SOFTWARE DESIGN

SEDCAD+ Version 3

CP-125 HYDROLOGY

by

Name: BEN HOSKIE

Company Name: BHP MINERALS
File Name: C:\BEN\CP125\CP_125

Date: 05-03-1998

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Company Name: BHP MINERALS
Filename: C:\BEN\CP125\CP_125 User: BEN HOSKIE
Date: 05-03-1998 Time: 11:46:18
CP-125 HYDROLOGY
Storm: 0.80 inches, 2 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	4.18	89	M	0.178	0.000	0.000	0.0	0.06	1.12
		Type: Culvert			Label: CP-125					
111	Structure	4.18							0.06	
111	Total IN/OUT	4.18							0.06	1.12

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Company Name: BHP MINERALS
Filename: C:\BEN\CP125\CP_125 User: BEN HOSKIE
Date: 05-03-1998 Time: 11:46:18
CP-125 HYDROLOGY
Storm: 0.80 inches, 2 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	1475.00	5.24	2.29	0.18	0.178		

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Company Name: BHP MINERALS
Filename: C:\BEN\CP125\CP_125 User: BEN HOSKIE
Date: 05-03-1998 Time: 11:46:18
CP-125 HYDROLOGY
Storm: 0.80 inches, 2 year- 6 hour, type II-65
Hydrograph Convolution Interval: 0.1 hr

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

J1, B1, S1
CP-125

Drainage Area from J1, B1, S1, SWS(s)1: 4.2 acres
Total Contributing Drainage Area: 4.2 acres

Entrance Loss Coefficient	Maximum Headwater (ft)	Pipe Length (ft)	Pipe Slope (%)	Manning's n	Tailwater (ft)
0.90	1.8	28.4	1.3	0.017	0.0

Minimum Pipe Diameter Required: 8.0 inches
(See Culvert Utility Program for full performance curves)

	Runoff Volume (ac-ft)	Peak Discharge (cfs)
IN/OUT	0.06	1.12

****

SEDCAD+ CULVERT SIZING UTILITY

CP-125

Design Discharge	=	1.120 cfs
Entrance Loss Coefficient	=	0.9
Pipe Length	=	28.400 feet
Pipe Slope	=	1.300 %
Manning's n	=	0.017
Maximum Headwater	=	1.800 feet
Tailwater Depth	=	0.000 feet

Smallest Diameter Required to Pass Flow is 8 inches

PERFORMANCE CURVES:

Diameter: 4 inches

Headwater (ft)	Discharge (cfs)	Control	Flow Type
0.18	0.01		0
0.36	0.02		0
0.54	0.03		0
0.72	0.04		0
0.90	0.05		0
1.08	0.06		0
1.26	0.07		0
1.44	0.08	Outlet (Subcritical)	1
1.62	0.09	Outlet (Subcritical)	1
1.80	0.10	Outlet (Subcritical)	1
1.98	0.12	Outlet (Subcritical)	1
2.16	0.13	Outlet (Subcritical)	1
2.34	0.14	Outlet (Subcritical)	1
2.52	0.15	Outlet (Subcritical)	1
2.70	0.16	Outlet (Subcritical)	1

Diameter: 6 inches

Headwater (ft)	Discharge (cfs)	Control	Flow Type
0.18	0.08		0
0.36	0.15	Outlet (Subcritical)	1
0.54	0.23	Outlet (Subcritical)	1
0.72	0.30	Outlet (Subcritical)	2
0.90	0.38	Outlet (Subcritical)	2
1.08	0.46	Inlet (Supercritical)	3
1.26	0.53	Inlet (Supercritical)	3
1.44	0.61	Inlet (Supercritical)	4
1.62	0.69	Inlet (Supercritical)	4
1.80	0.76	Inlet	5
1.98	0.84	Inlet	5
2.16	0.91	Inlet	5
2.34	0.99	Outlet	6

2.52	1.02	Outlet	6
2.70	1.05	Outlet	6

Diameter: 8 inches

Headwater (ft)	Discharge (cfs)	Control	Flow Type
0.18	0.22	Outlet (Subcritical)	1
0.36	0.44	Outlet (Subcritical)	2
0.54	0.67	Inlet (Supercritical)	3
0.72	0.89	Inlet (Supercritical)	4
0.90	1.05	Inlet	5
1.08	1.16	Inlet	5
1.26	1.27	Inlet	5
1.44	1.37	Inlet	5
1.62	1.48	Inlet	5
1.80	1.59	Outlet	6
1.98	1.69	Outlet	6
2.16	1.80	Outlet	6
2.34	1.91	Outlet	6
2.52	2.01	Outlet	6
2.70	2.07	Outlet	6

Diameter: 9 inches

Headwater (ft)	Discharge (cfs)	Control	Flow Type
0.18	0.22		0
0.36	0.44		0
0.54	0.65	Outlet (Subcritical)	1
0.72	0.87	Outlet (Subcritical)	1
0.90	1.10	Outlet (Subcritical)	1
1.08	1.33	Inlet (Supercritical)	3
1.26	1.57	Inlet (Supercritical)	4
1.44	1.81	Inlet	5
1.62	2.02	Outlet	6
1.80	2.13	Outlet	6
1.98	2.24	Outlet	6
2.16	2.35	Outlet	6
2.34	2.46	Outlet	6
2.52	2.57	Outlet	6
2.70	2.68	Outlet	6

Diameter: 12 inches

Headwater (ft)	Discharge (cfs)	Control	Flow Type
0.18	0.29	Outlet (Subcritical)	1
0.36	0.59	Outlet (Subcritical)	2
0.54	0.88	Inlet (Supercritical)	3
0.72	1.30	Inlet (Supercritical)	3

0.90	1.81	Inlet (Supercritical)	3
1.08	2.32	Inlet (Supercritical)	4
1.26	2.85	Inlet	5
1.44	3.24	Inlet	5
1.62	3.56	Outlet	6
1.80	3.89	Outlet	6
1.98	4.16	Outlet	6
2.16	4.39	Outlet	6
2.34	4.62	Outlet	6
2.52	4.85	Outlet	6
2.70	5.07	Outlet	6

Diameter: 15 inches

Headwater (ft)	Discharge (cfs)	Control	Flow Type
0.18	0.34	Outlet (Subcritical)	1
0.36	0.68	Outlet (Subcritical)	2
0.54	1.04	Inlet (Supercritical)	3
0.72	1.63	Inlet (Supercritical)	3
0.90	2.25	Inlet (Supercritical)	3
1.08	2.94	Inlet (Supercritical)	3
1.26	3.71	Inlet (Supercritical)	3
1.44	4.46	Inlet (Supercritical)	4
1.62	5.17	Inlet	5
1.80	5.78	Inlet	5
1.98	6.32	Inlet	5
2.16	6.82	Outlet	6
2.34	7.25	Outlet	6
2.52	7.63	Outlet	6
2.70	8.01	Outlet	6

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Civil Software Design

CP-126 Block C Haul Road

ry

BHP Ccal Company - Navajo Mine
PO Box 1717
Fruitland, NM 87416

Phone: (505) 598-3206

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Civil Software Design

General Information

Storm Information:

Storm Type:	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
Culvert	#1	==>	End	0.000	0.000	CP-126

#1
Culvert

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Civil Software Design

Structure Summary:

	Immediate Contributing Area (ac)	Total Contributing Area (ac)	Peak Discharge (cfs)	Total Runoff Volume (ac-ft)
#1	24.600	24.600	13.21	1.05

Structure Detail:

Structure #1 (Culvert)

CP-126

Culvert Inputs:

Length (ft)	Slope (%)	Manning's n	Max. Headwater (ft)	Tailwater (ft)	Entrance Loss Coef. (Ke)
144.00	1.50	0.0240	3.60	0.00	0.90

Culvert Results:

Minimum pipe diameter required: 24 inches

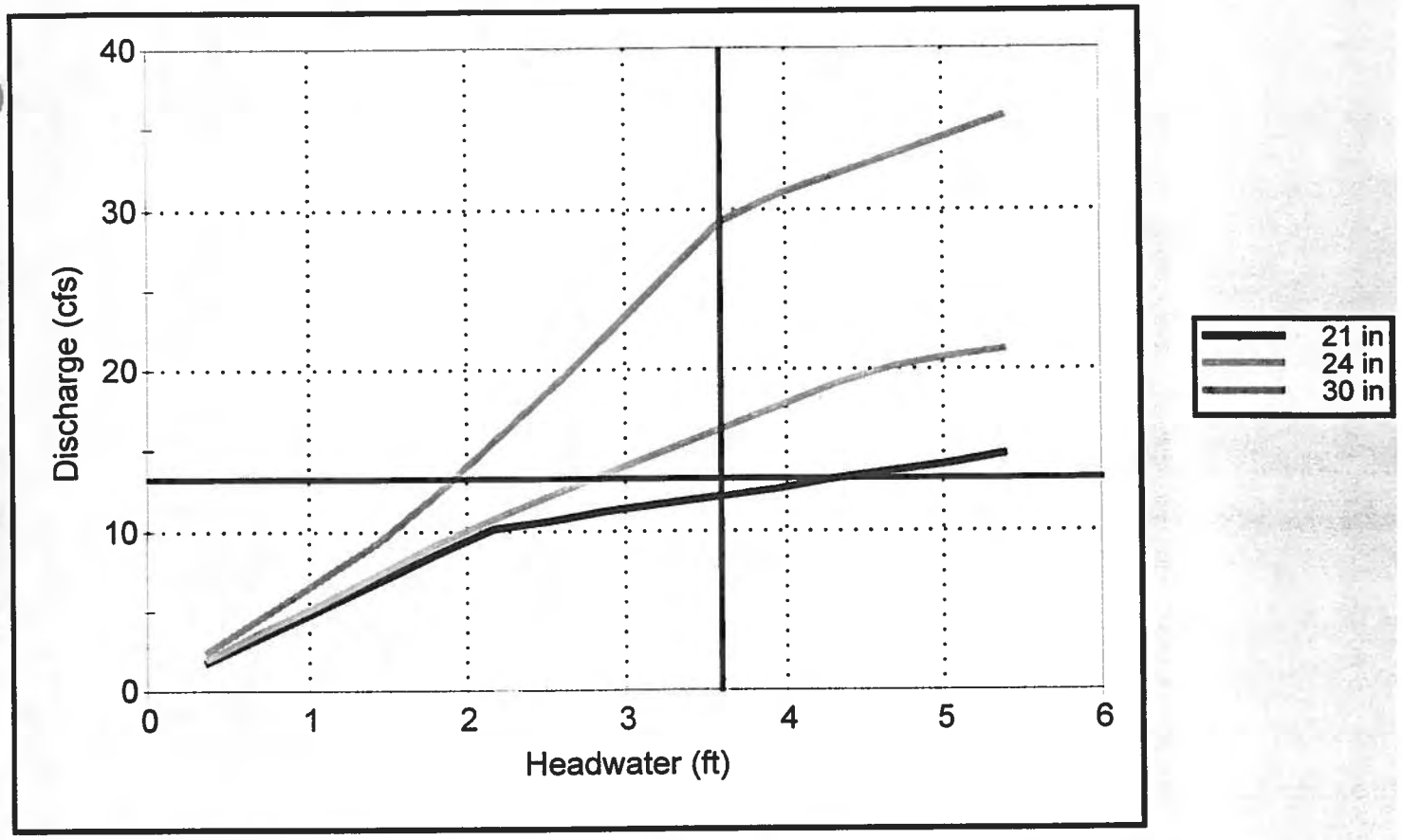
Subwatershed Hydrology Detail:

Stru #	SWS #	SWS Area (ac)	Time of Conc (hrs)	Musk K (hrs)	Musk X	Curve Number	UHS	Peak Discharge (cfs)	Runoff Volume (ac-ft)
#1	1	24.600	0.291	0.000	0.000	89.650	M	13.21	1.05
	Σ	**24.600**						**13.21**	**1.05**

Subwatershed Time of Concentration Details:

Stru #	SWS #	Land Flow Condition	Slope (%)	Vert. Dist. (ft)	Horiz. Dist. (ft)	Velocity (fps)	Time (hrs)
#1	1	5. Nearly bare and untilled, and alluvial valley fans	4.56	102.00	2,237.00	2.130	0.291
#1	**1**	**Time of Concentration:**					**0.291**

Culvert Performance Curves - Structure # 1



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Dixon Haulroad Culvert: CP-128

Kriss Bergethon

General Information

Storm Information:

Storm Type:	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
Culvert	#1	==>	End	0.000	0.000	CP-128

#1
Culvert

Structure Summary:

	Immediate Contributing Area (ac)	Total Contributing Area (ac)	Peak Discharge (cfs)	Total Runoff Volume (ac-ft)
#1	58.640	58.640	14.23	0.95

Structure Detail:

Structure #1 (Culvert)

CP-128

Culvert Inputs:

Length (ft)	Slope (%)	Manning's n	Max. Headwater (ft)	Tailwater (ft)	Entrance Loss Coef. (Ke)
120.00	1.00	0.0150	8.00	0.00	0.90

Culvert Results:

Minimum pipe diameter required: 18 inches

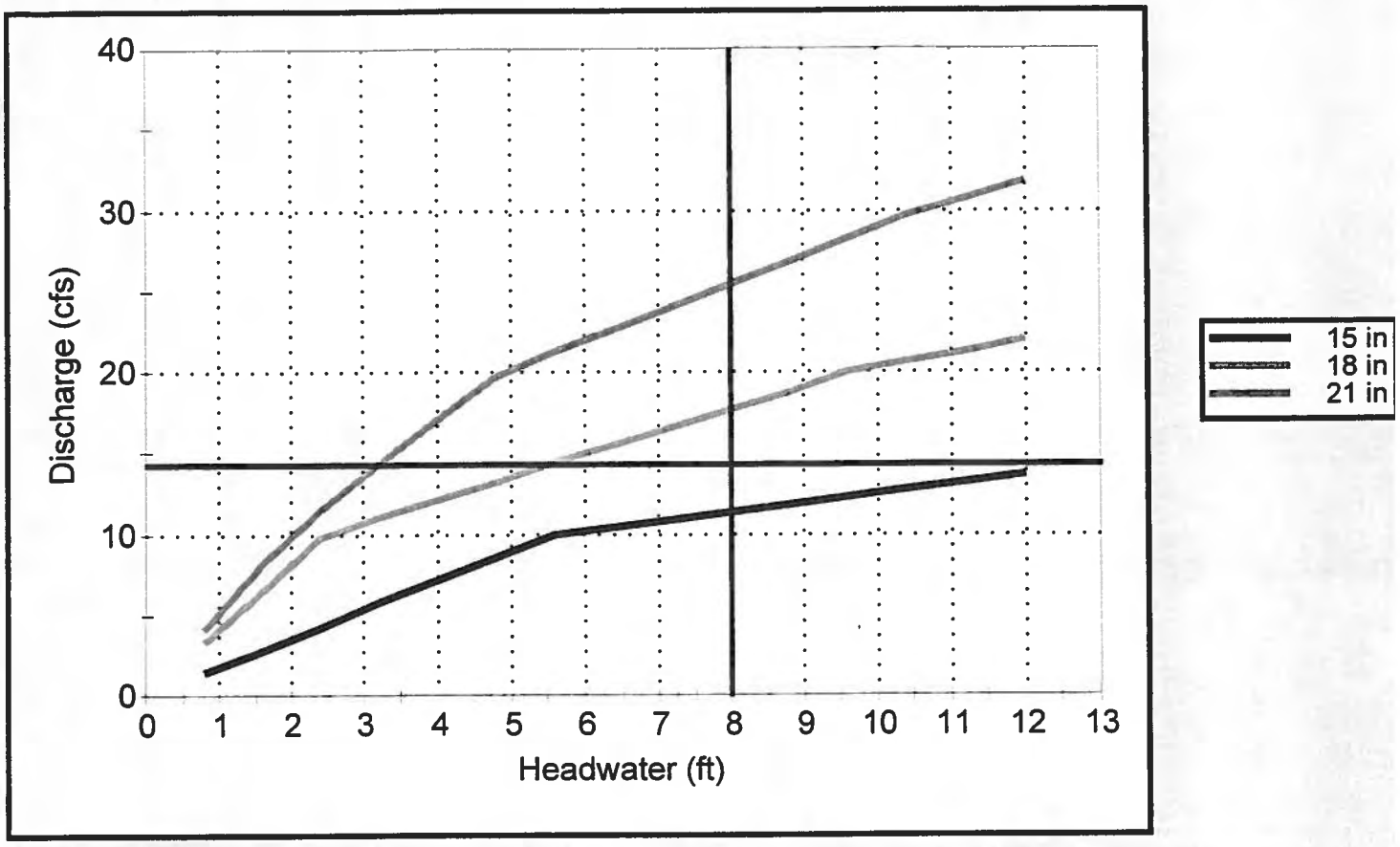
Subwatershed Hydrology Detail:

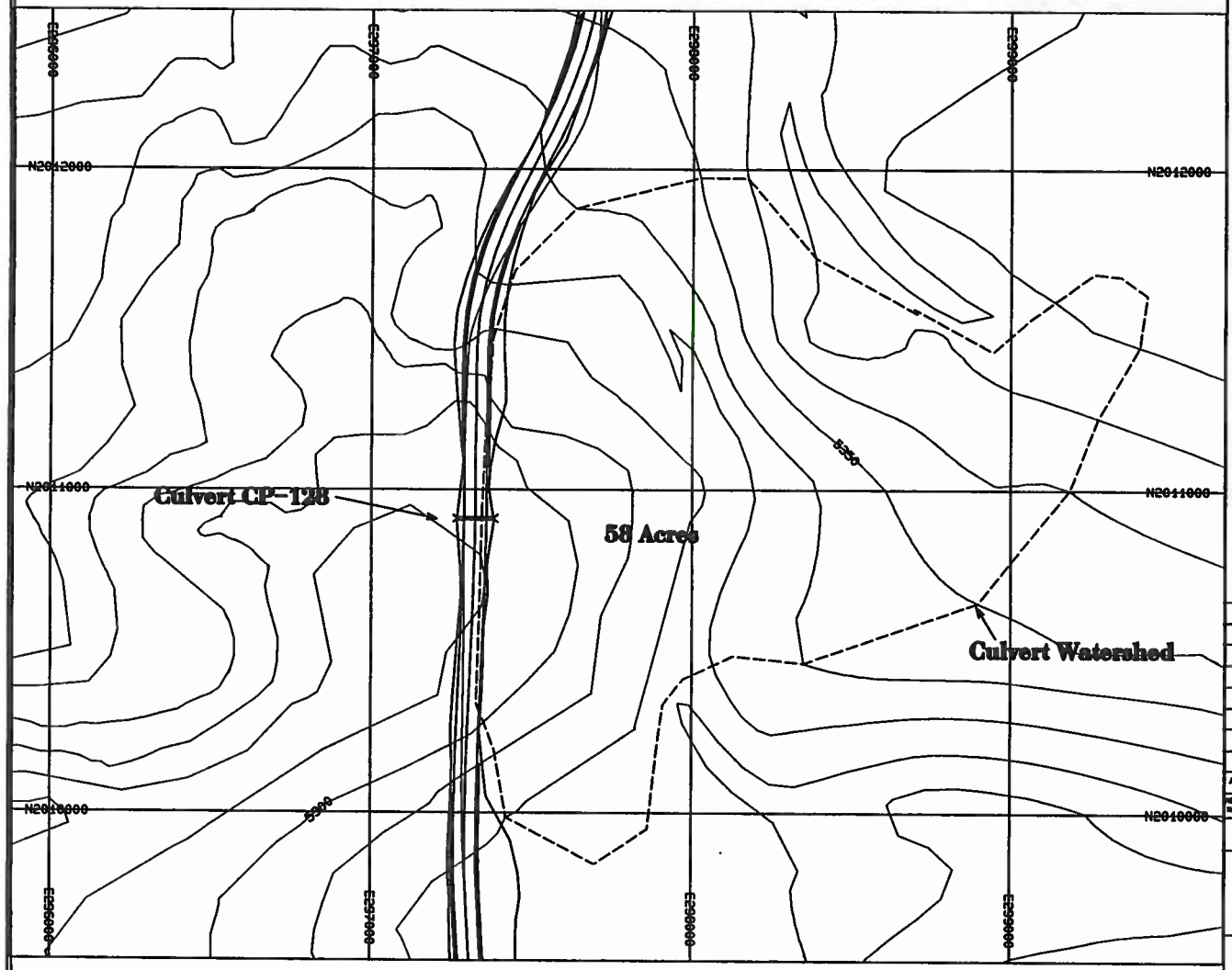
Stru #	SWS #	SWS Area (ac)	Time of Conc (hrs)	Musk K (hrs)	Musk X	Curve Number	UHS	Peak Discharge (cfs)	Runoff Volume (ac-ft)
#1	1	58.640	0.131	0.000	0.000	80.000	M	14.23	0.95
	Σ	**58.640**						**14.23**	**0.95**

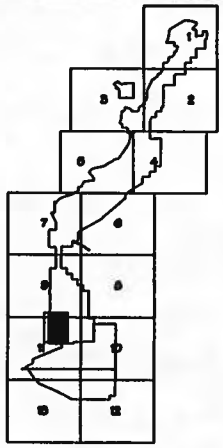
Subwatershed Time of Concentration Details:

Stru #	SWS #	Land Flow Condition	Slope (%)	Vert. Dist. (ft)	Horiz. Dist. (ft)	Velocity (fps)	Time (hrs)
#1	1	5. Nearly bare and untilled, and alluvial valley fans	7.14	90.00	1,260.01	2.670	0.131
#1	**1**	**Time of Concentration:**					**0.131**

Culvert Performance Curves - Structure # 1







CERTIFICATION STATEMENT

I, Leonard Raymond, hereby certify that this drawing was reviewed by me and that the information shown is accurate and complete to the best of my knowledge.

LEONARD RAYMOND
NEW MEXICO
6600
REGISTERED PROFESSIONAL ENGINEER

4-28-99

REV. NO.	DATE	DRAFT. BY	REVISION DESCRIPTION	DRG.	E.G.	P.E.	P.G.	CHIEF ENG.
A	03/29/99	KB	SUBMITTED TO OSM FOR APPROVAL					

Appendix 11-V

NAVAJO COAL COMPANY

NAVAJO MINE

P.O. BOX 195 FRUITLAND, NEW MEXICO 87416

CP-128 Watershed FSC Topography

PREPARED BY KB	DRAWN BY KB	SCALE AS NOTED
APPROVED BY LR	DATE 03/29/99	REF DWG
DWG LOC		

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AS-BUILT
Mason Road Culvert: CP-140
Mason Pond East Inlet Riprap

AAY

BHP-Navajo Mine
P.O. Box 1717
Fruitland, NM 87416

Phone: (505) 598-5861

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Civil Software Design

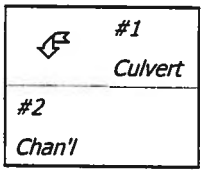
General Information

Storm Information:

Storm Type:	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
Culvert	#1	==>	#2	0.000	0.000	CP-140
Channel	#2	==>	End	0.000	0.000	Pond Inlet



Structure Summary:

	Immediate Contributing Area (ac)	Total Contributing Area (ac)	Peak Discharge (cfs)	Total Runoff Volume (ac-ft)
#1	19.520	19.520	2.61	0.19
#2	0.000	19.520	2.61	0.19

Structure Detail:

Structure #1 (Culvert)

CP-140

Culvert Inputs:

Length (ft)	Slope (%)	Manning's n	Max. Headwater (ft)	Tailwater (ft)	Entrance Loss Coef. (Ke)
100.00	1.50	0.0240	2.50	0.00	0.90

Culvert Results:

Design Discharge = 2.61 cfs

Minimum pipe diameter: 1 - 12 inch pipe(s) required

Structure #2 (Riprap Channel)

Pond Inlet

Trapezoidal Riprap Channel Inputs:

Material: Riprap

Bottom Width (ft)}	Left Sideslope Ratio	Right Sideslope Ratio	Slope (%)	Freeboard Depth (ft)	Freeboard % of Depth	Freeboard Mult. x (VxD)
4.00	4.0:1	3.5:1	21.0	1.00		

Riprap Channel Results:

Simons/OSM Method - Steep Slope Design

	w/o Freeboard	w/ Freeboard
Design Discharge:	2.61 cfs	
Depth:	0.06 ft	1.06 ft
Top Width:	4.45 ft	11.95 ft
Velocity*:		
X-Section Area:	0.26 sq ft	
Hydraulic Radius:	0.057	
Froude Number*:		
Manning's n*:		
Dmin:	3.00 in	
D50:	9.00 in	
Dmax:	11.25 in	

Velocity and Manning's n calculations may not apply for this method.

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)
#1	1	19.520	0.142	0.000	0.000	76.000	M	2.61	0.190
	Σ	**19.520**						**2.61**	**0.190**
#2	Σ	**19.520**						**2.61**	**0.190**

Subwatershed Time of Concentration Details:

Stru #	SWS #	Land Flow Condition	Slope (%)	Vert. Dist. (ft)	Horiz. Dist. (ft)	Velocity (fps)	Time (hrs)
#1	1	5. Nearly bare and untilled, and alluvial valley fans	4.44	48.00	1,080.01	2.100	0.142
#1	**1**	**Time of Concentration:**					**0.142**

HOSTEEN YAZZIE HAULROAD
HYDROLOGY

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HOSTEEN YAZZIE HAULROAD CP-129 HYDROLOGY

BH

BHP Coal Company - Navajo Mine
PO Box 1717
Fruitland, NM 87416

Phone: (505) 598-3206

General Information

Storm Information:

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

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)
#1	1	1.700	0.051	0.000	0.000	91.000	M	1.97	0.082
	Σ	**1.700**						**1.97**	**0.082**

Subwatershed Time of Concentration Details:

Stru #	SWS #	Land Flow Condition	Slope (%)	Vert. Dist. (ft)	Horiz. Dist. (ft)	Velocity (fps)	Time (hrs)
#1	1	5. Nearly bare and untilled, and alluvial valley fans	8.22	44.00	535.00	2.860	0.051
#1	**1**	**Time of Concentration:**					**0.051**

CP-129 HYDROLOGY- 10 yr-6 hr event

Culvert Inputs:

Length (ft)	Slope (%)	Manning's n	Max. Headwater (ft)	Tailwater (ft)	Entrance Loss Coef. (Ke)
102.00	1.00	0.0240	3.00	0.00	0.90

Culvert Results:

Minimum pipe diameter: 1 - 10 inch pipe(s) required

Detailed Performance Curves

Design Discharge = 1.97 cfs

Maximum Headwater = 3.00 ft

(BOLD indicates design pipe size)

Headwater (ft)	Discharge (cfs) (8 in)	**Discharge (cfs) (10 in)**	Discharge (cfs) (12 in)
0.30	0.36	**0.64**	0.90
0.60	0.50	**0.77**	1.14
0.90	0.65	**1.08**	1.55
1.20	0.79	**1.35**	1.99
1.50	0.85	**1.46**	2.27
1.80	0.90	**1.58**	2.46
2.10	0.96	**1.70**	2.65
2.40	1.01	**1.81**	2.82
2.70	1.07	**1.90**	2.98
3.00	1.12	**1.99**	3.13
3.30	1.18	**2.08**	3.28
3.60	1.23	**2.17**	3.42
3.90	1.29	**2.26**	3.55
4.20	1.33	**2.34**	3.68
4.50	1.36	**2.41**	3.81

HOSTEEN YAZZIE HAULROAD
CP-130

BH

BHP Coal Company - Navajo Mine
PO Box 1717
Fruitland, NM 87416

Phone: (505) 598-3206

General Information

Storm Information:

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

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)
#1	1	0.900	0.027	0.000	0.000	91.000	M	1.04	0.044
	Σ	**0.900**						**1.04**	**0.044**

Subwatershed Time of Concentration Details:

Stru #	SWS #	Land Flow Condition	Slope (%)	Vert. Dist. (ft)	Horiz. Dist. (ft)	Velocity (fps)	Time (hrs)
#1	1	5. Nearly bare and untilled, and alluvial valley fans	10.63	34.00	320.00	3.250	0.027
#1	**1**	**Time of Concentration:**					**0.027**

CP-130 HYDROLOGY- 10 yr-6 hr event

Culvert Inputs:

Length (ft)	Slope (%)	Manning's n	Max. Headwater (ft)	Tailwater (ft)	Entrance Loss Coef. (Ke)
122.00	1.00	0.0240	7.00	0.00	0.90

Culvert Results:

Minimum pipe diameter: 1 - 8 inch pipe(s) required

Detailed Performance Curves

Design Discharge = 1.04 cfs

Maximum Headwater = 7.00 ft

(BOLD indicates design pipe size)

Headwater (ft)	Discharge (cfs) (6 in)	**Discharge (cfs) (8 in)**	Discharge (cfs) (10 in)
0.70	0.23	**0.61**	0.92
1.40	0.30	**0.76**	1.36
2.10	0.37	**0.90**	1.64
2.80	0.45	**1.04**	1.84
3.50	0.52	**1.15**	2.03
4.20	0.60	**1.23**	2.20
4.90	0.63	**1.32**	2.35
5.60	0.66	**1.40**	2.51
6.30	0.69	**1.49**	2.65
7.00	0.72	**1.57**	2.78
7.70	0.75	**1.64**	2.91
8.40	0.78	**1.70**	3.03
9.10	0.80	**1.76**	3.15
9.80	0.83	**1.82**	3.26
10.50	0.86	**1.88**	3.37

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HOSTEEN YAZZIE HAULROAD

CP-131

BH

BHP Coal Company - Navajo Mine
PO Box 1717
Fruitland, NM 87416

Phone: (505) 598-3206

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General Information

Storm Information:

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

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)
#1	1	19.000	0.232	0.000	0.000	91.000	M	12.47	0.920
	Σ	**19.000**						**12.47**	**0.920**

Subwatershed Time of Concentration Details:

Stru #	SWS #	Land Flow Condition	Slope (%)	Vert. Dist. (ft)	Horiz. Dist. (ft)	Velocity (fps)	Time (hrs)
#1	1	5. Nearly bare and untilled, and alluvial valley fans	7.89	185.00	2,345.00	2.800	0.232
#1	**1**	**Time of Concentration:**					**0.232**

CP-131 HYDROLOGY- 10 yr-6 hr event

Culvert Inputs:

Length (ft)	Slope (%)	Manning's n	Max. Headwater (ft)	Tailwater (ft)	Entrance Loss Coef. (Ke)
129.00	1.00	0.0240	8.00	0.00	0.90

Culvert Results:

Minimum pipe diameter: 1 - 18 inch pipe(s) required

Detailed Performance Curves

Design Discharge = 12.47 cfs

Maximum Headwater = 8.00 ft

(BOLD indicates design pipe size)

Headwater (ft)	Discharge (cfs) (15 in)	**Discharge (cfs) (18 in)**	Discharge (cfs) (21 in)
0.80	1.93	**2.76**	3.89
1.60	3.83	**5.59**	6.55
2.40	4.58	**6.98**	9.86
3.20	5.23	**8.06**	11.52
4.00	5.80	**9.01**	12.96
4.80	6.33	**9.87**	14.26
5.60	6.82	**10.67**	15.45
6.40	7.27	**11.40**	16.56
7.20	7.70	**12.09**	17.59
8.00	8.10	**12.74**	18.57
8.80	8.49	**13.36**	19.48
9.60	8.86	**13.96**	20.38
10.40	9.21	**14.53**	21.22
11.20	9.56	**15.07**	22.04
12.00	9.88	**15.61**	22.83

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HOSTEEN YAZZIE HAULROAD
CP-132

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BHP Coal Company - Navajo Mine
PO Box 1717
Fruitland, NM 87416

Phone: (505) 598-3206

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General Information

Storm Information:

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

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)
#1	1	12.000	0.268	0.000	0.000	91.000	M	7.51	0.581
	$\sum$	**12.000**						**7.51**	**0.581**

Subwatershed Time of Concentration Details:

Stru #	SWS #	Land Flow Condition	Slope (%)	Vert. Dist. (ft)	Horiz. Dist. (ft)	Velocity (fps)	Time (hrs)
#1	1	5. Nearly bare and untilled, and alluvial valley fans	7.16	185.00	2,585.00	2.670	0.268
#1	**1**	**Time of Concentration:**					**0.268**

CP-132 HYDROLOGY- 10 yr-6 hr event

Culvert Inputs:

Length (ft)	Slope (%)	Manning's n	Max. Headwater (ft)	Tailwater (ft)	Entrance Loss Coef. (Ke)
124.00	1.00	0.0240	3.00	0.00	0.90

Culvert Results:

Minimum pipe diameter: 1 - 18 inch pipe(s) required

Detailed Performance Curves

Design Discharge = 7.51 cfs

Maximum Headwater = 3.00 ft

(BOLD indicates design pipe size)

Headwater (ft)	Discharge (cfs) (15 in)	**Discharge (cfs) (18 in)**	Discharge (cfs) (21 in)
0.30	1.47	**2.26**	3.19
0.60	1.65	**2.54**	3.62
0.90	1.95	**2.83**	4.01
1.20	3.02	**3.56**	4.47
1.50	3.68	**5.10**	5.89
1.80	4.04	**6.07**	7.87
2.10	4.34	**6.57**	9.18
2.40	4.61	**7.03**	9.90
2.70	4.88	**7.47**	10.57
3.00	5.12	**7.88**	11.20
3.30	5.36	**8.27**	11.80
3.60	5.58	**8.64**	12.36
3.90	5.81	**8.99**	12.90
4.20	6.01	**9.34**	13.42
4.50	6.22	**9.67**	13.92

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HOSTEEN YAZZIE HAULROAD

CP-133

BH

BHP Coal Company - Navajo Mine
PO Box 1717
Fruitland, NM 87416

Phone: (505) 598-3206

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Civil Software Design

General Information

Storm Information:

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

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)
#1	1	4.600	0.098	0.000	0.000	91.000	M	5.32	0.223
	Σ	**4.600**						**5.32**	**0.223**

Subwatershed Time of Concentration Details:

Stru #	SWS #	Land Flow Condition	Slope (%)	Vert. Dist. (ft)	Horiz. Dist. (ft)	Velocity (fps)	Time (hrs)
#1	1	5. Nearly bare and untilled, and alluvial valley fans	6.44	58.00	900.00	2.530	0.098
#1	**1**	**Time of Concentration:**					**0.098**

CP-133 HYDROLOGY- 10 yr-6 hr event

Culvert Inputs:

Length (ft)	Slope (%)	Manning's n	Max. Headwater (ft)	Tailwater (ft)	Entrance Loss Coef. (Ke)
121.00	1.00	0.0240	10.00	0.00	0.90

Culvert Results:

Minimum pipe diameter: 1 - 15 inch pipe(s) required

Detailed Performance Curves

Design Discharge = 5.32 cfs

Maximum Headwater = 10.00 ft

(BOLD indicates design pipe size)

Headwater (ft)	Discharge (cfs) (12 in)	**Discharge (cfs) (15 in)**	Discharge (cfs) (18 in)
1.00	1.71	**2.25**	2.98
2.00	2.51	**4.25**	6.39
3.00	3.00	**5.13**	7.90
4.00	3.41	**5.90**	9.15
5.00	3.78	**6.59**	10.25
6.00	4.13	**7.19**	11.25
7.00	4.44	**7.76**	12.16
8.00	4.72	**8.28**	13.01
9.00	4.99	**8.78**	13.81
10.00	5.25	**9.24**	14.56
11.00	5.51	**9.70**	15.25
12.00	5.75	**10.11**	15.94
13.00	5.97	**10.53**	16.62
14.00	6.19	**10.92**	17.22
15.00	6.41	**11.30**	17.83

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HOSTEEN YAZZIE HAULROAD CULVERT CP-134

LR

BHP Navajo Coal Company
Navajo Mine
PO Box 1717
Fruitland, NM 87415

Phone: 505-598-5861

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Civil Software Design

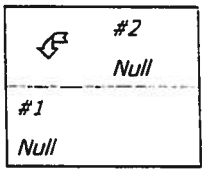
General Information

Storm Information:

Storm Type:	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	==>	End	0.000	0.000	CP-134&135
Null	#2	==>	#1	0.121	0.369	



Structure Routing Details:

Stru #	Land Flow Condition	Slope (%)	Vert. Dist. (ft)	Horiz. Dist. (ft)	Velocity (fps)	Time (hrs)
#2	8. Large gullies, diversions, and low flowing streams	2.54	53.00	2,090.00	4.77	0.121
#2	**Muskingum K:**					**0.121**

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)
#2	1	82.200	0.245	0.000	0.000	90.800	M	52.10	3.908
	Σ	**82.200**						**52.10**	**3.908**
#1	1	54.800	0.331	0.000	0.000	91.000	M	31.74	2.653
	Σ	**137.000**						**81.03**	**6.561**

Subwatershed Time of Concentration Details:

Stru #	SWS #	Land Flow Condition	Slope (%)	Vert. Dist. (ft)	Horiz. Dist. (ft)	Velocity (fps)	Time (hrs)
#1	1	5. Nearly bare and untilled, and alluvial valley fans	5.18	140.00	2,705.00	2.270	0.331
#1	**1**	**Time of Concentration:**					**0.331**
#2	1	5. Nearly bare and untilled, and alluvial valley fans	6.66	152.00	2,282.00	2.580	0.245
#2	**1**	**Time of Concentration:**					**0.245**

CP-134, 10 yr - 6 hr storm event, used 42" culvert

Culvert Inputs:

Length (ft)	Slope (%)	Manning's n	Max. Headwater (ft)	Tailwater (ft)	Entrance Loss Coef. (Ke)
132.00	1.66	0.0200	13.50	0.00	0.90

Culvert Results:

Minimum pipe diameter: 1 - 36 inch pipe(s) required

Detailed Performance Curves

Design Discharge = 81.00 cfs

Maximum Headwater = 13.50 ft

(BOLD indicates design pipe size)

Headwater (ft)	Discharge (cfs) (30 in)	**Discharge (cfs) (36 in)**	Discharge (cfs) (42 in)
1.35	8.21	**9.86**	11.51
2.70	23.23	**27.87**	32.51
4.05	36.54	**48.35**	59.75
5.40	42.10	**62.40**	81.23
6.75	47.01	**70.26**	97.47
8.10	51.46	**77.34**	107.93
9.45	55.55	**83.80**	117.48
10.80	59.32	**89.81**	126.31
12.15	62.91	**95.45**	134.53
13.50	66.33	**100.78**	142.31
14.85	69.51	**105.83**	149.67
16.20	72.61	**110.65**	156.70
17.55	75.57	**115.26**	163.40
18.90	78.40	**119.70**	169.86
20.25	81.17	**123.98**	176.08

HOSTEEN YAZZIE HAULROAD
CP-138

Installed for Hosteen/Yazzie Road Re-Alignment. Watershed information in Exhibit 11-12C

BH

BHPBilliton
PO Box 1717
Fruitland, NM 87415

Phone: 505 598 5861

Structure Summary:

	Immediate Contributing Area (ac)	Total Contributing Area (ac)	Peak Discharge (cfs)	Total Runoff Volume (ac-ft)
#1	2.200	2.200	2.06	0.11

CP-138

Culvert Inputs:

Length (ft)	Slope (%)	Manning's n	Max. Headwater (ft)	Tailwater (ft)	Entrance Loss Coef. (Ke)
218.00	1.00	0.0240	15.00	0.00	0.90

Culvert Results:

Minimum pipe diameter required: 10 inches

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HOSTEEN YAZZIE HAULROAD
CP-139

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BHP Coal Company - Navajo Mine
PO Box 1717
Fruitland, NM 87416

Phone: (505) 598-3206

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General Information

Storm Information:

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

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Structure Summary:

	Immediate Contributing Area (ac)	Total Contributing Area (ac)	Peak Discharge (cfs)	Total Runoff Volume (ac-ft)
#1	22.600	22.600	16.45	1.09

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)
#1	1	22.600	0.167	0.000	0.000	91.000	M	16.45	1.094
	Σ	**22.600**						**16.45**	**1.094**

Subwatershed Time of Concentration Details:

Stru #	SWS #	Land Flow Condition	Slope (%)	Vert. Dist. (ft)	Horiz. Dist. (ft)	Velocity (fps)	Time (hrs)
#1	1	5. Nearly bare and untilled, and alluvial valley fans	6.08	90.00	1,480.00	2.460	0.167
#1	**1**	**Time of Concentration:**					**0.167**

CP-139 HYDROLOGY- 10 yr-6 hr event

Culvert Inputs:

Length (ft)	Slope (%)	Manning's n	Max. Headwater (ft)	Tailwater (ft)	Entrance Loss Coef. (Ke)
158.00	1.00	0.0240	6.00	0.00	0.90

Culvert Results:

Minimum pipe diameter: 1 - 24 inch pipe(s) required

Detailed Performance Curves

Design Discharge = 16.45 cfs

Maximum Headwater = 6.00 ft

(BOLD indicates design pipe size)

Headwater (ft)	Discharge (cfs) (21 in)	**Discharge (cfs) (24 in)**	Discharge (cfs) (30 in)
0.60	3.73	**5.07**	8.31
1.20	4.46	**5.96**	9.89
1.80	7.85	**8.92**	11.35
2.40	9.68	**12.98**	17.33
3.00	10.78	**14.60**	23.53
3.60	11.79	**16.04**	26.26
4.20	12.71	**17.37**	28.73
4.80	13.57	**18.61**	30.99
5.40	14.38	**19.76**	33.11
6.00	15.14	**20.85**	35.09
6.60	15.87	**21.89**	36.98
7.20	16.57	**22.88**	38.77
7.80	17.23	**23.83**	40.48
8.40	17.88	**24.75**	42.11
9.00	18.50	**25.61**	43.69

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HOSTEEN YAZZIE HAULROAD
CP-141

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BHP Coal Company - Navajo Mine
PO Box 1717
Fruitland, NM 87416

Phone: (505) 598-3206

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General Information

Storm Information:

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

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)
#1	1	6.000	0.049	0.000	0.000	91.000	M	6.95	0.290
	Σ	**6.000**						**6.95**	**0.290**

Subwatershed Time of Concentration Details:

Stru #	SWS #	Land Flow Condition	Slope (%)	Vert. Dist. (ft)	Horiz. Dist. (ft)	Velocity (fps)	Time (hrs)
#1	1	5. Nearly bare and untilled, and alluvial valley fans	10.43	60.00	575.00	3.230	0.049
#1	**1**	**Time of Concentration:**					**0.049**

CP-141 HYDROLOGY- 10 yr-6 hr event

Culvert Inputs:

Length (ft)	Slope (%)	Manning's n	Max. Headwater (ft)	Tailwater (ft)	Entrance Loss Coef. (Ke)
114.00	1.00	0.0240	3.00	0.00	0.90

Culvert Results:

Minimum pipe diameter: 1 - 18 inch pipe(s) required

Detailed Performance Curves

Design Discharge = 6.95 cfs

Maximum Headwater = 3.00 ft

(BOLD indicates design pipe size)

Headwater (ft)	Discharge (cfs) (15 in)	**Discharge (cfs) (18 in)**	Discharge (cfs) (21 in)
0.30	1.45	**2.21**	3.11
0.60	1.64	**2.52**	3.57
0.90	1.96	**2.82**	3.99
1.20	3.02	**3.56**	4.47
1.50	3.71	**5.10**	5.89
1.80	4.07	**6.09**	7.87
2.10	4.39	**6.63**	9.22
2.40	4.68	**7.12**	9.98
2.70	4.96	**7.57**	10.69
3.00	5.22	**8.00**	11.35
3.30	5.47	**8.41**	11.97
3.60	5.71	**8.81**	12.57
3.90	5.94	**9.18**	13.14
4.20	6.16	**9.54**	13.68
4.50	6.37	**9.88**	14.20

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HOSTEEN YAZZIE HAULROAD
CP-142

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General Information

Storm Information:

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

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)
#1	1	4.000	0.052	0.000	0.000	91.000	M	4.63	0.194
	Σ	**4.000**						**4.63**	**0.194**

Subwatershed Time of Concentration Details:

Stru #	SWS #	Land Flow Condition	Slope (%)	Vert. Dist. (ft)	Horiz. Dist. (ft)	Velocity (fps)	Time (hrs)
#1	1	5. Nearly bare and untilled, and alluvial valley fans	12.21	80.00	655.00	3.490	0.052
#1	**1**	**Time of Concentration:**					**0.052**

CP-142 HYDROLOGY- 10 yr-6 hr event

Culvert Inputs:

Length (ft)	Slope (%)	Manning's n	Max. Headwater (ft)	Tailwater (ft)	Entrance Loss Coef. (Ke)
160.00	1.00	0.0240	24.00	0.00	0.90

Culvert Results:

Minimum pipe diameter: 1 - 12 inch pipe(s) required

Detailed Performance Curves

Design Discharge = 4.63 cfs

Maximum Headwater = 24.00 ft

(BOLD indicates design pipe size)

Headwater (ft)	Discharge (cfs) (10 in)	**Discharge (cfs) (12 in)**	Discharge (cfs) (15 in)
2.40	1.62	**2.53**	4.39
4.80	2.12	**3.37**	5.96
7.20	2.51	**4.07**	7.11
9.60	2.90	**4.63**	8.19
12.00	3.21	**5.15**	9.08
14.40	3.48	**5.61**	9.97
16.80	3.76	**6.05**	10.70
19.20	4.03	**6.41**	11.42
21.60	4.25	**6.77**	12.13
24.00	4.46	**7.13**	12.74
26.40	4.68	**7.49**	13.35
28.80	4.89	**7.85**	13.97
31.20	5.09	**8.16**	14.51
33.60	5.27	**8.44**	15.04
36.00	5.44	**8.72**	15.57

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HOSTEEN YAZZIE HAULROAD

CP-143

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General Information

Storm Information:

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

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)
#1	1	4.200	0.051	0.000	0.000	91.000	M	4.86	0.203
	Σ	**4.200**						**4.86**	**0.203**

Subwatershed Time of Concentration Details:

Stru #	SWS #	Land Flow Condition	Slope (%)	Vert. Dist. (ft)	Horiz. Dist. (ft)	Velocity (fps)	Time (hrs)
#1	1	5. Nearly bare and untilled, and alluvial valley fans	13.33	90.00	675.00	3.650	0.051
#1	**1**	**Time of Concentration:**					**0.051**

CP-143 HYDROLOGY- 10 yr-6 hr event

Culvert Inputs:

Length (ft)	Slope (%)	Manning's n	Max. Headwater (ft)	Tailwater (ft)	Entrance Loss Coef. (Ke)
192.00	1.00	0.0240	18.00	0.00	0.90

Culvert Results:

Minimum pipe diameter: 1 - 12 inch pipe(s) required

Detailed Performance Curves

Design Discharge = 4.86 cfs

Maximum Headwater = 18.00 ft

(BOLD indicates design pipe size)

Headwater (ft)	Discharge (cfs) (10 in)	**Discharge (cfs) (12 in)**	Discharge (cfs) (15 in)
1.80	1.39	**2.26**	3.84
3.60	1.80	**2.84**	5.00
5.40	2.12	**3.37**	5.93
7.20	2.39	**3.80**	6.74
9.00	2.62	**4.20**	7.47
10.80	2.83	**4.58**	8.11
12.60	3.03	**4.90**	8.71
14.40	3.24	**5.22**	9.25
16.20	3.44	**5.53**	9.79
18.00	3.61	**5.80**	10.32
19.80	3.76	**6.07**	10.80
21.60	3.92	**6.33**	11.24
23.40	4.07	**6.58**	11.68
25.20	4.23	**6.81**	12.13
27.00	4.38	**7.04**	12.56

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HOSTEEN YAZZIE HAULROAD
CP-144

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BHP Coal Company - Navajo Mine
PO Box 1717
Fruitland, NM 87416

Phone: (505) 598-3206

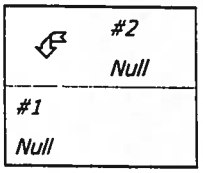
General Information

Storm Information:

Storm Type:	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	==>	End	0.000	0.000	CP-144
Null	#2	==>	#1	0.130	0.366	



Structure Routing Details:

Stru #	Land Flow Condition	Slope (%)	Vert. Dist. (ft)	Horiz. Dist. (ft)	Velocity (fps)	Time (hrs)
#2	8. Large gullies, diversions, and low flowing streams	2.39	52.00	2,180.00	4.63	0.130
#2	**Muskingum K:**					**0.130**

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)
#2	1	59.300	0.315	0.000	0.000	91.000	M	35.02	2.871
	Σ	**59.300**						**35.02**	**2.871**
#1	1	46.400	0.292	0.000	0.000	91.000	M	28.19	2.246
	Σ	**105.700**						**58.82**	**5.117**

Subwatershed Time of Concentration Details:

Stru #	SWS #	Land Flow Condition	Slope (%)	Vert. Dist. (ft)	Horiz. Dist. (ft)	Velocity (fps)	Time (hrs)
#1	1	5. Nearly bare and untilled, and alluvial valley fans	5.13	122.00	2,377.00	2.260	0.292
#1	**1**	**Time of Concentration:**					**0.292**
#2	1	5. Nearly bare and untilled, and alluvial valley fans	6.03	168.00	2,785.00	2.450	0.315
#2	**1**	**Time of Concentration:**					**0.315**

CP-144 HYDROLOGY- 10 yr-6 hr event

Culvert Inputs:

Length (ft)	Slope (%)	Manning's n	Max. Headwater (ft)	Tailwater (ft)	Entrance Loss Coef. (Ke)
183.00	1.00	0.0240	23.00	0.00	0.90

Culvert Results:

Minimum pipe diameter: 1 - 30 inch pipe(s) required

Detailed Performance Curves

Design Discharge = 58.82 cfs

Maximum Headwater = 23.00 ft

(BOLD indicates design pipe size)

Headwater (ft)	Discharge (cfs) (24 in)	**Discharge (cfs) (30 in)**	Discharge (cfs) (36 in)
2.30	12.35	**16.15**	19.31
4.60	17.63	**29.53**	44.05
6.90	21.50	**36.56**	55.64
9.20	24.77	**42.46**	65.18
11.50	27.67	**47.63**	73.50
13.80	30.28	**52.31**	80.98
16.10	32.65	**56.58**	87.82
18.40	34.85	**60.54**	94.15
20.70	37.04	**64.26**	100.09
23.00	38.96	**67.82**	105.70
25.30	40.87	**71.17**	111.03
27.60	42.70	**74.35**	116.11
29.90	44.41	**77.45**	120.97
32.20	46.11	**80.38**	125.65
34.50	47.73	**83.24**	130.16

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HOSTEEN YAZZIE HAULROAD
CP-145

BH

BHP Coal Company - Navajo Mine
PO Box 1717
Fruitland, NM 87416

Phone: (505) 598-3206

Filename: hycp145.sc4

Printed 01-14-2000

General Information

Storm Information:

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

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)
#1	1	23.000	0.210	0.000	0.000	91.000	M	15.46	1.113
	Σ	**23.000**						**15.46**	**1.113**

Subwatershed Time of Concentration Details:

Stru #	SWS #	Land Flow Condition	Slope (%)	Vert. Dist. (ft)	Horiz. Dist. (ft)	Velocity (fps)	Time (hrs)
#1	1	5. Nearly bare and untilled, and alluvial valley fans	5.20	90.00	1,730.00	2.280	0.210
#1	**1**	**Time of Concentration:**					**0.210**

CP-145 HYDROLOGY- 10 yr-6 hr event

Culvert Inputs:

Length (ft)	Slope (%)	Manning's n	Max. Headwater (ft)	Tailwater (ft)	Entrance Loss Coef. (Ke)
162.00	1.00	0.0240	5.00	0.00	0.90

Culvert Results:

Minimum pipe diameter: 1 - 24 inch pipe(s) required

Detailed Performance Curves

Design Discharge = 15.46 cfs

Maximum Headwater = 5.00 ft

(BOLD indicates design pipe size)

Headwater (ft)	Discharge (cfs) (21 in)	**Discharge (cfs) (24 in)**	Discharge (cfs) (30 in)
0.50	3.63	**4.93**	8.08
1.00	4.17	**5.69**	9.42
1.50	5.89	**6.62**	10.62
2.00	8.84	**10.56**	12.70
2.50	9.84	**13.25**	18.51
3.00	10.74	**14.55**	23.55
3.50	11.57	**15.74**	25.77
4.00	12.34	**16.86**	27.84
4.50	13.07	**17.90**	29.76
5.00	13.75	**18.89**	31.57
5.50	14.41	**19.82**	33.28
6.00	15.04	**20.72**	34.91
6.50	15.64	**21.58**	36.45
7.00	16.22	**22.40**	37.95
7.50	16.78	**23.20**	39.39

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HOSTEEN YAZZIE HAULROAD CULVERT CP-146

BH

BHP Navajo Coal Company
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PO Box 1717
Fruitland, NM 87415

Phone: 505-598-5861

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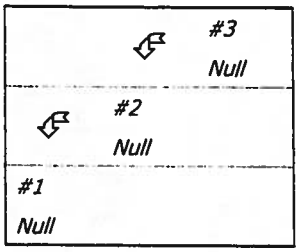
General Information

Storm Information:

Storm Type:	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	==>	End	0.000	0.000	CP-146&147
Null	#2	==>	#1	0.169	0.345	
Null	#3	==>	#2	0.164	0.379	



Structure Routing Details:

Stru #	Land Flow Condition	Slope (%)	Vert. Dist. (ft)	Horiz. Dist. (ft)	Velocity (fps)	Time (hrs)
#2	8. Large gullies, diversions, and low flowing streams	1.60	37.00	2,310.18	3.79	0.169
#2	**Muskingum K:**					**0.169**
#3	8. Large gullies, diversions, and low flowing streams	3.17	100.00	3,158.00	5.33	0.164
#3	**Muskingum K:**					**0.164**

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)
#3	1	215.900	1.056	0.000	0.000	87.500	M	44.81	7.577
	Σ	**215.900**						**44.81**	**7.577**
#2	1	121.300	0.467	0.000	0.000	91.000	M	59.69	5.872
	Σ	**337.200**						**74.31**	**13.449**
#1	1	62.000	0.599	0.000	0.000	91.000	M	26.44	3.001
	Σ	**399.200**						**95.70**	**16.451**

Subwatershed Time of Concentration Details:

Stru #	SWS #	Land Flow Condition	Slope (%)	Vert. Dist. (ft)	Horiz. Dist. (ft)	Velocity (fps)	Time (hrs)
#1	1	5. Nearly bare and untilled, and alluvial valley fans	1.80	52.00	2,890.00	1.340	0.599
#1	**1**	**Time of Concentration:**					**0.599**
#2	1	5. Nearly bare and untilled, and alluvial valley fans	5.13	195.00	3,800.00	2.260	0.467
#2	**1**	**Time of Concentration:**					**0.467**
#3	1	5. Nearly bare and untilled, and alluvial valley fans	3.08	205.00	6,655.00	1.750	1.056
#3	**1**	**Time of Concentration:**					**1.056**

CP-146, 10 yr - 6 hr storm event

Culvert Inputs:

Length (ft)	Slope (%)	Manning's n	Max. Headwater (ft)	Tailwater (ft)	Entrance Loss Coef. (Ke)
162.00	2.67	0.0200	11.50	0.00	0.90

Culvert Results:

Minimum pipe diameter: 1 - 42 inch pipe(s) required

Detailed Performance Curves

Design Discharge = 95.80 cfs

Maximum Headwater = 11.50 ft

(BOLD indicates design pipe size)

Headwater (ft)	Discharge (cfs) (36 in)	**Discharge (cfs) (42 in)**	Discharge (cfs) (45 in)
1.15	7.75	**9.04**	9.69
2.30	21.92	**25.57**	27.39
3.45	40.26	**46.96**	50.32
4.60	54.94	**69.01**	75.73
5.75	66.60	**86.01**	95.95
6.90	76.18	**100.18**	112.59
8.05	82.19	**112.54**	127.08
9.20	86.87	**122.64**	140.10
10.35	91.32	**129.47**	150.91
11.50	95.57	**135.68**	158.28
12.65	99.63	**141.61**	165.34
13.80	103.50	**147.31**	172.08
14.95	107.25	**152.80**	178.59
16.10	110.89	**158.10**	184.87
17.25	114.41	**163.23**	190.93

Pages 738 – 745 Appendix 11-V

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Culvert CP-150

LR

BHP Navajo Coal Company
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Phone: 505-598-5861

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General Information

Storm Information:

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

Structure Summary:

	Immediate Contributing Area (ac)	Total Contributing Area (ac)	Peak Discharge (cfs)	Total Runoff Volume (ac-ft)
#1	12.800	12.800	13.91	0.57

Structure Detail:

Structure #1 (Culvert)

Culvert CP-150

Culvert Inputs:

Length (ft)	Slope (%)	Manning's n	Max. Headwater (ft)	Tailwater (ft)	Entrance Loss Coef. (Ke)
110.00	2.18	0.0200	4.00	0.00	0.90

Culvert Results:

Design Discharge = 13.91 cfs

Minimum pipe diameter: 1 - 21 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)
#1	1	12.800	0.097	0.000	0.000	90.000	M	13.91	0.566
	Σ	**12.800**						**13.91**	**0.566**

Subwatershed Time of Concentration Details:

Stru #	SWS #	Land Flow Condition	Slope (%)	Vert. Dist. (ft)	Horiz. Dist. (ft)	Velocity (fps)	Time (hrs)
#1	1	5. Nearly bare and untilled, and alluvial valley fans	4.00	28.00	700.00	2.000	0.097
#1	**1**	**Time of Concentration:**					**0.097**

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Due to CP-18 data update and removal of CP-151

CULVERT CP-157

The watershed areas for the culverts are shown on Exhibits 11-12F and 11-12F.

LR

BHP Navajo Coal Company
Navajo Mine
PO Box 1717
Fruitland, NM 87415

Phone: 505-598-5861

General Information

Storm Information:

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

Structure Summary:

	Immediate Contributing Area (ac)	Total Contributing Area (ac)	Peak Discharge (cfs)	Total Runoff Volume (ac-ft)
#1	28.700	28.700	20.90	1.39

Structure Detail:

Structure #1 (Culvert)

CULVERT CP-157

Culvert Inputs:

Length (ft)	Slope (%)	Manning's n	Max. Headwater (ft)	Tailwater (ft)	Entrance Loss Coef. (Ke)
86.00	2.33	0.0200	4.10	0.00	0.90

Culvert Results:

Design Discharge = 20.90 cfs

Minimum pipe diameter: 1 - 24 inch pipe(s) required

CULVERT CP-158

The watershed areas for the culverts are shown on Exhibits 11-12E and 11-12F.

LR

BHP Navajo Coal Company
Navajo Mine
PO Box 1717
Fruitland, NM 87415

Phone: 505-598-5861

General Information

Storm Information:

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

Structure Summary:

	Immediate Contributing Area (ac)	Total Contributing Area (ac)	Peak Discharge (cfs)	Total Runoff Volume (ac-ft)
#1	38.900	38.900	28.33	1.88

Structure Detail:

Structure #1 (Culvert)

CULVERT CP-158

Culvert Inputs:

Length (ft)	Slope (%)	Manning's n	Max. Headwater (ft)	Tailwater (ft)	Entrance Loss Coef. (Ke)
94.00	2.02	0.0200	6.10	0.00	0.90

Culvert Results:

Design Discharge = 28.33 cfs

Minimum pipe diameter: 1 - 24 inch pipe(s) required

CULVERT CP-159

The watershed areas for the culverts are shown on Exhibits 11-12E and 11-12F

LR

BHP Navajo Coal Company
Navajo Mine
PO Box 1717
Fruitland, NM 87415

Phone: 505-598-5861

General Information

Storm Information:

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

Structure Summary:

	Immediate Contributing Area (ac)	Total Contributing Area (ac)	Peak Discharge (cfs)	Total Runoff Volume (ac-ft)
#1	11.400	11.400	13.20	0.55

Structure Detail:

Structure #1 (Culvert)

CULVERT CP-159

Culvert Inputs:

Length (ft)	Slope (%)	Manning's n	Max. Headwater (ft)	Tailwater (ft)	Entrance Loss Coef. (Ke)
94.00	4.79	0.0200	4.70	0.00	0.90

Culvert Results:

Design Discharge = 13.20 cfs

Minimum pipe diameter: 1 - 18 inch pipe(s) required

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Civil Software Design

CULVERT CP-160

The watershed areas for the culverts are shown on Exhibits 11-12E and 11-12F.

LR

BHP Navajo Coal Company
Navajo Mine
PO Box 1717
Fruitland, NM 87415

Phone: 505-598-5861

General Information

Storm Information:

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

Structure Summary:

	Immediate Contributing Area (ac)	Total Contributing Area (ac)	Peak Discharge (cfs)	Total Runoff Volume (ac-ft)
#1	23.700	23.700	16.66	1.15

Structure Detail:

Structure #1 (Culvert)

CULVERT CP-160

Culvert Inputs:

Length (ft)	Slope (%)	Manning's n	Max. Headwater (ft)	Tailwater (ft)	Entrance Loss Coef. (Ke)
90.00	0.89	0.0200	4.90	0.00	0.90

Culvert Results:

Design Discharge = 16.66 cfs

Minimum pipe diameter: 1 - 21 inch pipe(s) required

CULVERT CP-161

The watershed areas for the culverts are shown on Exhibits 11-12E and 11-12F.

LR

BHP Navajo Coal Company
Navajo Mine
PO Box 1717
Fruitland, NM 87415

Phone: 505-598-5861

General Information

Storm Information:

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

Structure Summary:

	Immediate Contributing Area (ac)	Total Contributing Area (ac)	Peak Discharge (cfs)	Total Runoff Volume (ac-ft)
#1	102.100	102.100	59.76	4.94

Structure Detail:

Structure #1 (Culvert)

CULVERT CP-161

Culvert Inputs:

Length (ft)	Slope (%)	Manning's n	Max. Headwater (ft)	Tailwater (ft)	Entrance Loss Coef. (Ke)
100.00	3.00	0.0200	4.40	0.00	0.90

Culvert Results:

Design Discharge = 59.76 cfs

Minimum pipe diameter: 1 - 42 inch pipe(s) required

CULVERT CP-162

The watershed areas for the culverts are shown on Exhibits 11-12E and 11-12F.

LR

BHP Navajo Coal Company
Navajo Mine
PO Box 1717
Fruitland, NM 87415

Phone: 505-598-5861

General Information

Storm Information:

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

Structure Summary:

	Immediate Contributing Area (ac)	Total Contributing Area (ac)	Peak Discharge (cfs)	Total Runoff Volume (ac-ft)
#1	40.200	40.200	28.88	1.95

Structure Detail:

Structure #1 (Culvert)

CULVERT CP-162

Culvert Inputs:

Length (ft)	Slope (%)	Manning's n	Max. Headwater (ft)	Tailwater (ft)	Entrance Loss Coef. (Ke)
86.00	2.09	0.0200	8.00	0.00	0.90

Culvert Results:

Design Discharge = 28.88 cfs

Minimum pipe diameter: 1 - 24 inch pipe(s) required

Culvert CP-163, 10yr-6hr Event, Refer to Sedcad run in Appendix 11-X Structure 33

Culvert Inputs:

Length (ft)	Slope (%)	Manning's n	Max. Headwater (ft)	Tailwater (ft)	Entrance Loss Coef. (Ke)
150.00	0.93	0.0220	13.60	0.00	0.90

Culvert Results:

Minimum pipe diameter: 1 - 96 inch pipe(s) required

Detailed Performance Curves

Design Discharge = 647.00 cfs

Maximum Headwater = 13.60 ft

(BOLD indicates design pipe size)

Headwater (ft)	Discharge (cfs) (84 in)	**Discharge (cfs) (96 in)**	Discharge (cfs) (108 in)
1.36	23.25	**26.57**	29.89
2.72	65.76	**75.15**	84.53
4.08	120.80	**138.05**	155.30
5.44	184.66	**212.54**	239.10
6.80	218.03	**297.03**	334.16
8.16	301.13	**328.67**	439.26
9.52	403.63	**432.09**	469.20
10.88	455.57	**565.88**	591.60
12.24	502.18	**636.62**	759.66
13.60	544.80	**697.26**	844.58
14.96	584.33	**752.90**	921.73
16.32	621.35	**804.70**	992.89
17.68	656.28	**853.36**	1,059.30
19.04	689.46	**899.40**	1,121.76
20.40	721.09	**943.18**	1,180.94

CULVERT CP-164

The watershed areas for the culverts are shown on Exhibits 11-12E and 11-12F.

LR

BHP Navajo Coal Company
Navajo Mine
PO Box 1717
Fruitland, NM 87415

Phone: 505-598-5861

General Information

Storm Information:

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

Structure Summary:

	Immediate Contributing Area (ac)	Total Contributing Area (ac)	Peak Discharge (cfs)	Total Runoff Volume (ac-ft)
#1	45.500	45.500	27.11	2.20

Structure Detail:

Structure #1 (Culvert)

CULVERT CP-164

Culvert Inputs:

Length (ft)	Slope (%)	Manning's n	Max. Headwater (ft)	Tailwater (ft)	Entrance Loss Coef. (Ke)
94.00	1.49	0.0200	4.50	0.00	0.90

Culvert Results:

Design Discharge = 27.11 cfs

Minimum pipe diameter: 1 - 30 inch pipe(s) required

CULVERT CP-165

The watershed areas for the culverts are shown on Exhibits 11-12E and 11-12F.

LR

BHP Navajo Coal Company
Navajo Mine
PO Box 1717
Fruitland, NM 87415

Phone: 505-598-5861

General Information

Storm Information:

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

Structure Summary:

	Immediate Contributing Area (ac)	Total Contributing Area (ac)	Peak Discharge (cfs)	Total Runoff Volume (ac-ft)
#1	14.700	14.700	10.54	0.71

Structure Detail:

Structure #1 (Culvert)

CULVERT CP-165

Culvert Inputs:

Length (ft)	Slope (%)	Manning's n	Max. Headwater (ft)	Tailwater (ft)	Entrance Loss Coef. (Ke)
86.00	1.40	0.0200	3.60	0.00	0.90

Culvert Results:

Design Discharge = 10.54 cfs

Minimum pipe diameter: 1 - 18 inch pipe(s) required

CULVERT CP-166

The watershed areas for the culverts are shown on Exhibits 11-12E and 11-12F.

LR

BHP Navajo Coal Company
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PO Box 1717
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Phone: 505-598-5861

General Information

Storm Information:

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

Structure Summary:

	Immediate Contributing Area (ac)	Total Contributing Area (ac)	Peak Discharge (cfs)	Total Runoff Volume (ac-ft)
#1	13.000	13.000	15.05	0.63

Structure Detail:

Structure #1 (Culvert)

CULVERT CP-166

Culvert Inputs:

Length (ft)	Slope (%)	Manning's n	Max. Headwater (ft)	Tailwater (ft)	Entrance Loss Coef. (Ke)
100.00	2.00	0.0200	5.00	0.00	0.90

Culvert Results:

Design Discharge = 15.05 cfs

Minimum pipe diameter: 1 - 21 inch pipe(s) required

CULVERT CP-167

The watershed areas for the culverts are shown on Exhibits 11-12E and 11-12F.

LR

BHP Navajo Coal Company
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Fruitland, NM 87415

Phone: 505-598-5861

General Information

Storm Information:

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

Structure Summary:

	Immediate Contributing Area (ac)	Total Contributing Area (ac)	Peak Discharge (cfs)	Total Runoff Volume (ac-ft)
#1	1.300	1.300	1.50	0.06

Structure Detail:

Structure #1 (Culvert)

CULVERT CP-167

Culvert Inputs:

Length (ft)	Slope (%)	Manning's n	Max. Headwater (ft)	Tailwater (ft)	Entrance Loss Coef. (Ke)
136.00	8.80	0.0200	5.00	0.00	0.90

Culvert Results:

Design Discharge = 1.50 cfs

Minimum pipe diameter: 1 - 8 inch pipe(s) required

CULVERT CP-168

The watershed areas for the culverts are shown on Exhibits 11-12E and 11-12F.

LR

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Navajo Mine
PO Box 1717
Fruitland, NM 87415

Phone: 505-598-5861

General Information

Storm Information:

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

Structure Summary:

	Immediate Contributing Area (ac)	Total Contributing Area (ac)	Peak Discharge (cfs)	Total Runoff Volume (ac-ft)
#1	0.700	0.700	0.81	0.03

Structure Detail:

Structure #1 (Culvert)

CULVERT CP-168

Culvert Inputs:

Length (ft)	Slope (%)	Manning's n	Max. Headwater (ft)	Tailwater (ft)	Entrance Loss Coef. (Ke)
110.00	9.73	0.0200	2.50	0.00	0.90

Culvert Results:

Design Discharge = 0.81 cfs

Minimum pipe diameter: 1 - 6 inch pipe(s) required

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Lowe By-pass Road Modification
Culvert CP-171

The watershed is presented on Exhibit 11-12E. Watershed of the reclaimed area was modified based on South Dixon Pond 1 Watershed. The culvert is designed for a 10 year -6 hour strom (Primary Road Design).

Shawn Smith

Navajo Coal Company
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Email: shawn.smith@bhpbilliton.com

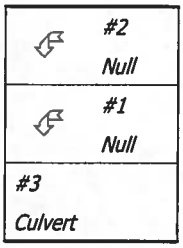
General Information

Storm Information:

Storm Type:	Type II-70
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	==>	#3	0.040	0.424	Reclaimed area
Null	#2	==>	#3	0.000	0.000	Regraded spoils
Culvert	#3	==>	End	0.000	0.000	Culvert CP-171



Structure Routing Details:

Stru #	Land Flow Condition	Slope (%)	Vert. Dist. (ft)	Horiz. Dist. (ft)	Velocity (fps)	Time (hrs)
#1	9. Small streams flowing bankfull	1.10	15.00	1,365.00	9.43	0.040
#1	**Muskingum K:**					**0.040**

Structure Summary:

	Immediate Contributing Area (ac)	Total Contributing Area (ac)	Peak Discharge (cfs)	Total Runoff Volume (ac-ft)
#2	38.500	38.500	18.14	1.24
#1	207.800	207.800	11.09	1.61
#3	0.000	246.300	22.28	2.85

Structure Detail:

Structure #2 (Null)

Regraded spoils

Structure #1 (Null)

Reclaimed area

Structure #3 (Culvert)

Culvert CP-171

Culvert Inputs:

Length (ft)	Slope (%)	Manning's n	Max. Headwater (ft)	Tailwater (ft)	Entrance Loss Coef. (Ke)
60.00	2.70	0.0160	4.00	0.00	0.90

Culvert Results:

Design Discharge = 22.28 cfs

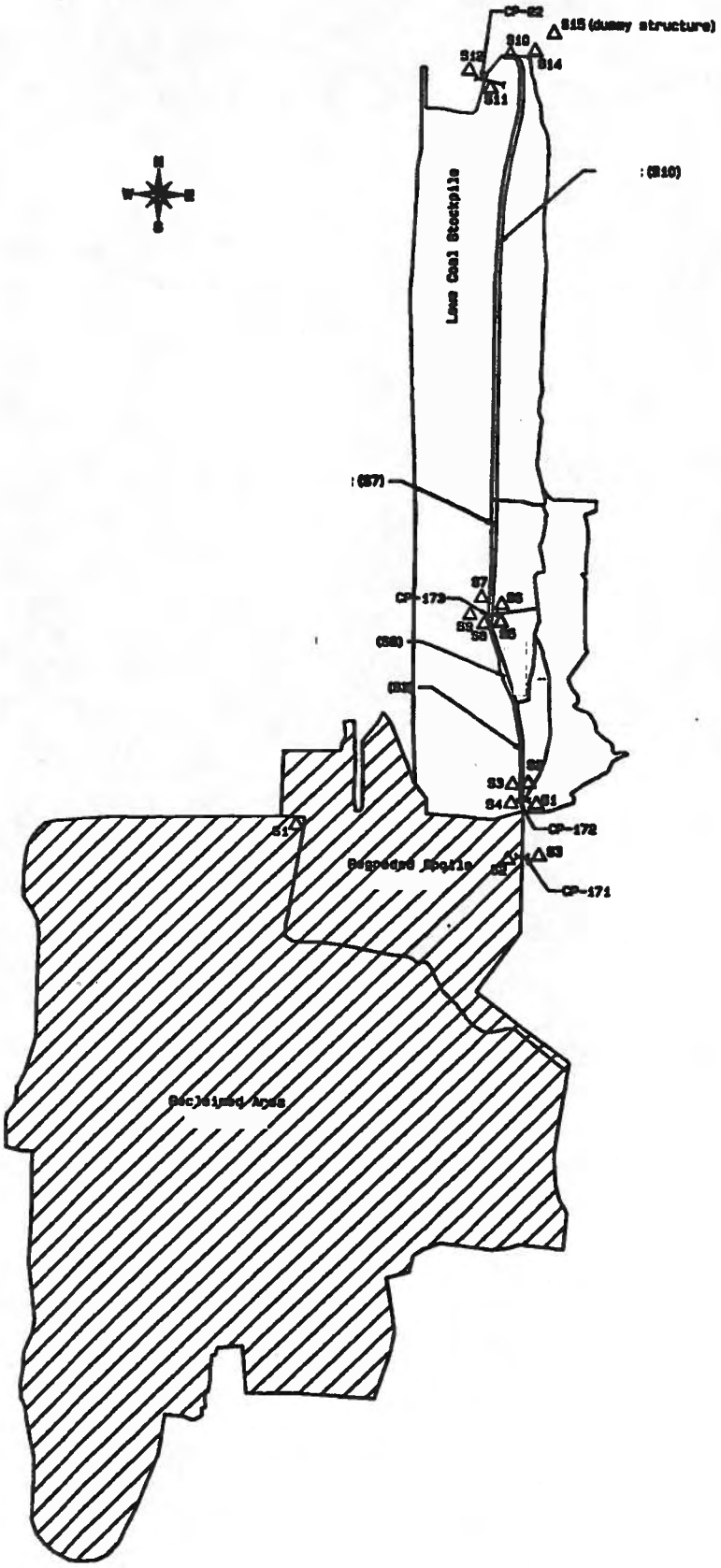
Minimum pipe diameter: 1 - 24 inch pipe(s) required

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)
#2	1	38.500	0.455	0.000	0.000	89.000	M	18.14	1.238
	Σ	**38.500**						**18.14**	**1.238**
#1	1	207.800	1.112	0.000	0.000	76.000	M	11.09	1.609
	Σ	**207.800**						**11.09**	**1.609**
#3	Σ	**246.300**						**22.28**	**2.848**

Subwatershed Time of Concentration Details:

Stru #	SWS #	Land Flow Condition	Slope (%)	Vert. Dist. (ft)	Horiz. Dist. (ft)	Velocity (fps)	Time (hrs)
#1	1	5. Nearly bare and untilled, and alluvial valley fans	0.60	5.00	835.00	0.770	0.301
		8. Large gullies, diversions, and low flowing streams	0.82	65.00	7,913.00	2.710	0.811
#1	**1**	**Time of Concentration:**					**1.112**
#2	1	5. Nearly bare and untilled, and alluvial valley fans	0.51	5.00	975.00	0.710	0.381
		8. Large gullies, diversions, and low flowing streams	0.73	5.00	688.00	2.550	0.074
#2	**1**	**Time of Concentration:**					**0.455**



Note: The cross hatched area is the model for culvert CP-171.
This map is to show how the watershed is divided. For acreage please see Appendix 11-V and actual watershed boundary is on Exhibit 11-12E

Lowe By-pass Road Modification Culverts CP-91, CP173 , CP22 and Lowe By-Pass Ditch Designs

The hydrology model is presented on the attached sheet. The watershed for the culverts are also presented on Exhibit 11-12E.

Shawn Smith

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P.O. Box 1717
Fruitland, NM 87414

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Email: shawn.smith@bhpbilliton.com

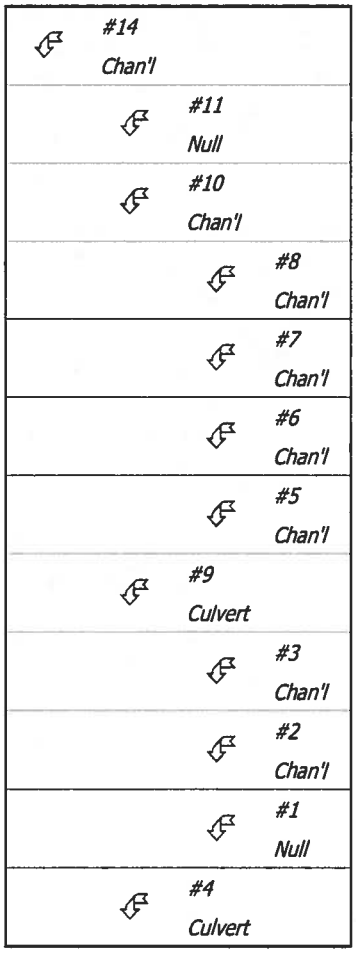
General Information

Storm Information:

Storm Type:	Type II-70
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	==>	#4	0.000	0.000	
Channel	#2	==>	#4	0.000	0.000	E road ditch N of Str. 1
Channel	#3	==>	#4	0.000	0.000	W road ditch N of Str. 1
Culvert	#4	==>	#12	0.509	0.299	CP-91
Channel	#5	==>	#9	0.000	0.000	E road ditch S of CP173
Channel	#6	==>	#9	0.000	0.000	E road ditch N of CP173
Channel	#7	==>	#9	0.000	0.000	W road ditch N of CP173
Channel	#8	==>	#9	0.000	0.000	W road ditch S of CP173
Culvert	#9	==>	#12	0.323	0.314	Culvert CP-173
Channel	#10	==>	#12	0.000	0.000	W road ditch S of CP22
Null	#11	==>	#12	0.000	0.000	
Culvert	#12	==>	#15	0.000	0.000	Culvert CP-22 (outlet str.)
Channel	#14	==>	#15	0.000	0.000	E road ditch S of Ramp 2
Null	#15	==>	End	0.000	0.000	Dummy structure



	#12 *Culvert*
#15 *Null*	

Structure Routing Details:

Stru #	Land Flow Condition	Slope (%)	Vert. Dist. (ft)	Horiz. Dist. (ft)	Velocity (fps)	Time (hrs)
#4	8. Large gullies, diversions, and low flowing streams	0.71	33.00	4,639.00	2.53	0.509
#4	**Muskingum K:**					**0.509**
#9	8. Large gullies, diversions, and low flowing streams	0.92	31.00	3,359.00	2.88	0.323
#9	**Muskingum K:**					**0.323**

Structure Summary:

	Immediate Contributing Area (ac)	Total Contributing Area (ac)	Peak Discharge (cfs)	Total Runoff Volume (ac-ft)
#14	15.020	15.020	9.12	0.49
#11	54.200	54.200	21.62	1.74
#10	1.800	1.800	1.11	0.06
#8	0.320	0.320	0.39	0.01
#7	0.430	0.430	0.52	0.02
#6	4.020	4.020	4.85	0.16
#5	2.030	2.030	2.45	0.08
#9	0.000	6.800	8.21	0.27
#3	0.270	0.270	0.33	0.01
#2	3.000	3.000	3.62	0.12
#1	14.570	14.570	9.35	0.47
#4	0.000	17.840	10.95	0.60
#12	0.000	80.640	32.15	2.68
#15	0.000	95.660	37.76	3.16

Structure Detail:

Structure #14 (Erodible Channel)

E road ditch S of Ramp 2

Triangular Erodible Channel Inputs:

Material: Shales and hardpans

Left Sideslope Ratio	Right Sideslope Ratio	Slope (%)	Manning's n	Freeboard Depth (ft)	Freeboard % of Depth	Freeboard Mult. x (VxD)	Limiting Velocity (fps)
3.0:1	2.0:1	3.6	0.0250	1.00			6.0

Erodible Channel Results:

	w/o Freeboard	w/ Freeboard
Design Discharge:	9.12 cfs	
Depth:	0.79 ft	1.79 ft
Top Width:	3.96 ft	8.96 ft
Velocity:	5.81 fps	
X-Section Area:	1.57 sq ft	
Hydraulic Radius:	0.368 ft	
Froude Number:	1.63	

Structure #11 (Null)

Structure #10 (Erodible Channel)

W road ditch S of CP22

Triangular Erodible Channel Inputs:

Material: Stiff clay very colloidal

Left Sideslope Ratio	Right Sideslope Ratio	Slope (%)	Manning's n	Freeboard Depth (ft)	Freeboard % of Depth	Freeboard Mult. x (VxD)	Limiting Velocity (fps)
2.0:1	3.0:1	3.6	0.0290	1.00			6.0

Erodible Channel Results:

	w/o Freeboard	w/ Freeboard
Design Discharge:	1.11 cfs	
Depth:	0.38 ft	1.38 ft
Top Width:	1.90 ft	6.90 ft
Velocity:	3.07 fps	

	w/o Freeboard	w/ Freeboard
X-Section Area:	0.36 sq ft	
Hydraulic Radius:	0.176 ft	
Froude Number:	1.24	

Structure #8 (Erodible Channel)

W road ditch S of CP173

Triangular Erodible Channel Inputs:

Material: Stiff clay very colloidal

Left Sideslope Ratio	Right Sideslope Ratio	Slope (%)	Manning's n	Freeboard Depth (ft)	Freeboard % of Depth	Freeboard Mult. x (VxD)	Limiting Velocity (fps)
2.0:1	3.0:1	4.9	0.0290	1.00			6.0

Erodible Channel Results:

	w/o Freeboard	w/ Freeboard
Design Discharge:	0.39 cfs	
Depth:	0.24 ft	1.24 ft
Top Width:	1.20 ft	6.20 ft
Velocity:	2.64 fps	
X-Section Area:	0.14 sq ft	
Hydraulic Radius:	0.112 ft	
Froude Number:	1.34	

Structure #7 (Erodible Channel)

W road ditch N of CP173

Triangular Erodible Channel Inputs:

Material: Stiff clay very colloidal

Left Sideslope Ratio	Right Sideslope Ratio	Slope (%)	Manning's n	Freeboard Depth (ft)	Freeboard % of Depth	Freeboard Mult. x (VxD)	Limiting Velocity (fps)
2.0:1	3.0:1	0.9	0.0290	1.00			6.0

Erodible Channel Results:

	w/o Freeboard	w/ Freeboard
Design Discharge:	0.52 cfs	
Depth:	0.37 ft	1.37 ft
Top Width:	1.85 ft	6.85 ft

	w/o Freeboard	w/ Freeboard
Velocity:	1.51 fps	
X-Section Area:	0.34 sq ft	
Hydraulic Radius:	0.172 ft	
Froude Number:	0.62	

Structure #6 (Erodible Channel)

E road ditch N of CP173

Triangular Erodible Channel Inputs:

Material: Stiff clay very colloidal

Left Sideslope Ratio	Right Sideslope Ratio	Slope (%)	Manning's n	Freeboard Depth (ft)	Freeboard % of Depth	Freeboard Mult. x (VxD)	Limiting Velocity (fps)
2.0:1	3.0:1	0.9	0.0290	1.00			6.0

Erodible Channel Results:

	w/o Freeboard	w/ Freeboard
Design Discharge:	4.85 cfs	
Depth:	0.86 ft	1.86 ft
Top Width:	4.29 ft	9.29 ft
Velocity:	2.64 fps	
X-Section Area:	1.84 sq ft	
Hydraulic Radius:	0.398 ft	
Froude Number:	0.71	

Structure #5 (Erodible Channel)

E road ditch S of CP173

Triangular Erodible Channel Inputs:

Material: Stiff clay very colloidal

Left Sideslope Ratio	Right Sideslope Ratio	Slope (%)	Manning's n	Freeboard Depth (ft)	Freeboard % of Depth	Freeboard Mult. x (VxD)	Limiting Velocity (fps)
2.0:1	3.0:1	4.9	0.0290	1.00			6.0

Erodible Channel Results:

	w/o Freeboard	w/ Freeboard
Design Discharge:	2.45 cfs	
Depth:	0.48 ft	1.48 ft

	w/o Freeboard	w/ Freeboard
Top Width:	2.41 ft	7.41 ft
Velocity:	4.20 fps	
X-Section Area:	0.58 sq ft	
Hydraulic Radius:	0.224 ft	
Froude Number:	1.51	

Structure #9 (Culvert)

Culvert CP-173

Culvert Inputs:

Length (ft)	Slope (%)	Manning's n	Max. Headwater (ft)	Tailwater (ft)	Entrance Loss Coef. (Ke)
74.00	3.50	0.0160	4.30	0.00	0.90

Culvert Results:

Design Discharge = 8.21 cfs

Minimum pipe diameter: 1 - 15 inch pipe(s) required

Structure #3 (Erodible Channel)

W road ditch N of Str. 1

Triangular Erodible Channel Inputs:

Material: Stiff clay very colloidal

Left Sideslope Ratio	Right Sideslope Ratio	Slope (%)	Manning's n	Freeboard Depth (ft)	Freeboard % of Depth	Freeboard Mult. x (VxD)	Limiting Velocity (fps)
2.0:1	3.0:1	5.9	0.0290	1.00			6.0

Erodible Channel Results:

	w/o Freeboard	w/ Freeboard
Design Discharge:	0.33 cfs	
Depth:	0.22 ft	1.22 ft
Top Width:	1.10 ft	6.10 ft
Velocity:	2.72 fps	
X-Section Area:	0.12 sq ft	
Hydraulic Radius:	0.102 ft	
Froude Number:	1.45	

Structure #2 (Erodible Channel)

E road ditch N of Str. 1

Triangular Erodible Channel Inputs:

Material: Stiff clay very colloidal

Left Sideslope Ratio	Right Sideslope Ratio	Slope (%)	Manning's n	Freeboard Depth (ft)	Freeboard % of Depth	Freeboard Mult. x (VxD)	Limiting Velocity (fps)
3.0:1	2.0:1	3.0	0.0290	1.00			6.0

Erodible Channel Results:

	w/o Freeboard	w/ Freeboard
Design Discharge:	3.62 cfs	
Depth:	0.61 ft	1.61 ft
Top Width:	3.06 ft	8.06 ft
Velocity:	3.85 fps	
X-Section Area:	0.94 sq ft	
Hydraulic Radius:	0.284 ft	
Froude Number:	1.23	

Structure #1 (Null)

Structure #4 (Culvert)

CP-91

Culvert Inputs:

Length (ft)	Slope (%)	Manning's n	Max. Headwater (ft)	Tailwater (ft)	Entrance Loss Coef. (Ke)
70.00	1.00	0.0150	2.80	0.00	0.90

Culvert Results:

Design Discharge = 10.95 cfs

Minimum pipe diameter: 1 - 18 inch pipe(s) required

Structure #12 (Culvert)

Culvert CP-22 (outlet str.)

Culvert Inputs:

Length (ft)	Slope (%)	Manning's n	Max. Headwater (ft)	Tailwater (ft)	Entrance Loss Coef. (Ke)
282.00	1.00	0.0200	10.00	0.00	0.90

Culvert Results:

Design Discharge = 32.15 cfs

Minimum pipe diameter: 1 - 30 inch pipe(s) required

Structure #15 (Null)

Dummy structure

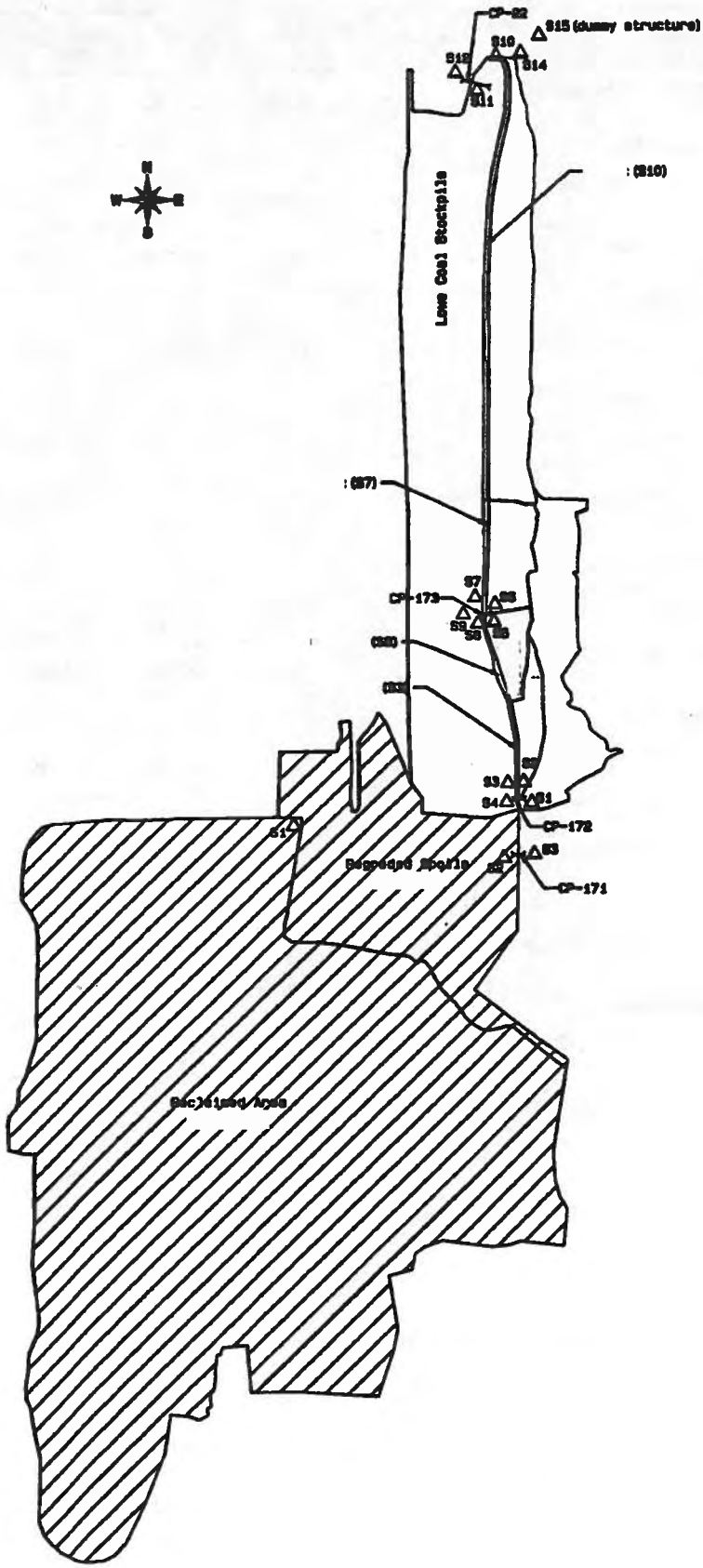
Subwatershed Hydrology Detail:

Stru #	SWS #	SWS Area (ac)	Time of Conc (hrs)	Musk K (hrs)	Musk X	Curve Number	UHS	Peak Discharge (cfs)	Runoff Volume (ac-ft)
#14	1	15.020	0.270	0.000	0.000	89.000	M	9.12	0.485
	Σ	**15.020**						**9.12**	**0.485**
#11	1	54.200	0.598	0.000	0.000	89.000	M	21.62	1.744
	Σ	**54.200**						**21.62**	**1.744**
#10	1	1.800	0.257	0.000	0.000	89.000	M	1.11	0.058
	Σ	**1.800**						**1.11**	**0.058**
#8	1	0.320	0.018	0.000	0.000	89.000	M	0.39	0.012
	Σ	**0.320**						**0.39**	**0.012**
#7	1	0.430	0.078	0.000	0.000	89.000	M	0.52	0.017
	Σ	**0.430**						**0.52**	**0.017**
#6	1	4.020	0.078	0.000	0.000	89.000	M	4.85	0.162
	Σ	**4.020**						**4.85**	**0.162**
#5	1	2.030	0.022	0.000	0.000	89.000	M	2.45	0.082
	Σ	**2.030**						**2.45**	**0.082**
#9	Σ	**6.800**						**8.21**	**0.272**
#3	1	0.270	0.026	0.000	0.000	89.000	M	0.33	0.010
	Σ	**0.270**						**0.33**	**0.010**
#2	1	3.000	0.058	0.000	0.000	89.000	M	3.62	0.121
	Σ	**3.000**						**3.62**	**0.121**
#1	1	14.570	0.234	0.000	0.000	89.000	M	9.35	0.473
	Σ	**14.570**						**9.35**	**0.473**
#4	Σ	**17.840**						**10.95**	**0.604**
#12	Σ	**80.640**						**32.15**	**2.679**
#15	Σ	**95.660**						**37.76**	**3.164**

Subwatershed Time of Concentration Details:

Stru #	SWS #	Land Flow Condition	Slope (%)	Vert. Dist. (ft)	Horiz. Dist. (ft)	Velocity (fps)	Time (hrs)
#1	1	5. Nearly bare and untilled, and alluvial valley fans	4.00	20.00	500.00	2.000	0.069

Stru #	SWS #	Land Flow Condition	Slope (%)	Vert. Dist. (ft)	Horiz. Dist. (ft)	Velocity (fps)	Time (hrs)
		5. Nearly bare and untilled, and alluvial valley fans	5.19	70.00	1,350.00	2.270	0.165
#1	**1**	**Time of Concentration:**					**0.234**
#2	1	5. Nearly bare and untilled, and alluvial valley fans	16.41	85.00	518.00	4.050	0.035
		8. Large gullies, diversions, and low flowing streams	4.64	25.00	539.00	6.460	0.023
#2	**1**	**Time of Concentration:**					**0.058**
#3	1	8. Large gullies, diversions, and low flowing streams	4.49	27.00	602.00	6.350	0.026
#3	**1**	**Time of Concentration:**					**0.026**
#5	1	5. Nearly bare and untilled, and alluvial valley fans	50.00	60.00	120.00	7.070	0.004
		8. Large gullies, diversions, and low flowing streams	4.38	18.00	411.00	6.270	0.018
#5	**1**	**Time of Concentration:**					**0.022**
#6	1	5. Nearly bare and untilled, and alluvial valley fans	50.19	130.00	259.00	7.080	0.010
		8. Large gullies, diversions, and low flowing streams	0.77	5.00	647.00	2.630	0.068
#6	**1**	**Time of Concentration:**					**0.078**
#7	1	8. Large gullies, diversions, and low flowing streams	0.70	5.00	712.00	2.510	0.078
#7	**1**	**Time of Concentration:**					**0.078**
#8	1	8. Large gullies, diversions, and low flowing streams	4.34	18.00	415.00	6.240	0.018
#8	**1**	**Time of Concentration:**					**0.018**
#10	1	8. Large gullies, diversions, and low flowing streams	0.98	27.00	2,750.00	2.970	0.257
#10	**1**	**Time of Concentration:**					**0.257**
#11	1	5. Nearly bare and untilled, and alluvial valley fans	1.56	7.00	450.00	1.240	0.100
		8. Large gullies, diversions, and low flowing streams	0.60	25.00	4,162.00	2.320	0.498
#11	**1**	**Time of Concentration:**					**0.598**
#14	1	5. Nearly bare and untilled, and alluvial valley fans	48.33	130.00	269.00	6.950	0.010
		8. Large gullies, diversions, and low flowing streams	0.92	25.00	2,706.00	2.880	0.260
#14	**1**	**Time of Concentration:**					**0.270**



Note: **The cross hatched area is the model for culvert CP-171.**
This map is to show how the watershed is divided. For acreage please see Appendix 11-V and actual watershed boundary is on Exhibit 11-12E

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CULVERT CP-175

South Dixon Powerline Road, see Exhibit 11-12E for culvert location and watershed.

RYazzie

BHP NAVAJO COAL COMPANY
P.O. BOX 1717
FRUITLAND, NM, 87416

Phone: 505-598-3203

General Information

Storm Information:

Storm Type:	NRCS TYPE II-60
Design Storm:	2 yr - 6 hr
Rainfall Depth:	0.800 inches

Structure Networking:

Type	Stru #	(flows into)	Stru #	Musk. K (hrs)	Musk. X	Description
Culvert	#1	==>	End	0.000	0.000	CP-175

#1
Culvert

Structure Summary:

	Immediate Contributing Area (ac)	Total Contributing Area (ac)	Peak Discharge (cfs)	Total Runoff Volume (ac-ft)
#1	14.400	14.400	5.88	0.21

Structure Detail:

Structure #1 (Culvert)

CP-175

Culvert Inputs:

Length (ft)	Slope (%)	Manning's n	Max. Headwater (ft)	Tailwater (ft)	Entrance Loss Coef. (Ke)
40.00	1.50	0.0160	2.20	0.00	0.90

Culvert Results:

Design Discharge = 5.88 cfs

Minimum pipe diameter: 1 - 15 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)
#1	1	14.400	0.084	0.000	0.000	89.000	M	5.88	0.205
	Σ	**14.400**						**5.88**	**0.205**

Subwatershed Time of Concentration Details:

Stru #	SWS #	Land Flow Condition	Slope (%)	Vert. Dist. (ft)	Horiz. Dist. (ft)	Velocity (fps)	Time (hrs)
#1	1	5. Nearly bare and untilled, and alluvial valley fans	3.62	3.40	94.00	1.900	0.013
		8. Large gullies, diversions, and low flowing streams	4.47	72.80	1,630.00	6.340	0.071
#1	**1**	**Time of Concentration:**					**0.084**

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CULVERT CP-176

South Dixon Powerline Road, see Exhibit 11-12E for culvert location and watershed.

RYazzie

BHP NAVAJO COAL COMPANY
P.O. BOX 1717
FRUITLAND, NM, 87416

Phone: 505-598-3203

General Information

Storm Information:

Storm Type:	NRCS TYPE II-60
Design Storm:	2 yr - 6 hr
Rainfall Depth:	0.800 inches

Structure Networking:

Type	Stru #	(flows into)	Stru #	Musk. K (hrs)	Musk. X	Description
Culvert	#1	==>	End	0.000	0.000	CP-176

#1
Culvert

Structure Summary:

	Immediate Contributing Area (ac)	Total Contributing Area (ac)	Peak Discharge (cfs)	Total Runoff Volume (ac-ft)
#1	2.600	2.600	1.06	0.04

Structure Detail:

Structure #1 (Culvert)

CP-176

Culvert Inputs:

Length (ft)	Slope (%)	Manning's n	Max. Headwater (ft)	Tailwater (ft)	Entrance Loss Coef. (Ke)
35.00	4.50	0.0160	1.90	0.00	0.90

Culvert Results:

Design Discharge = 1.06 cfs

Minimum pipe diameter: 1 - 6 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)
#1	1	2.600	0.042	0.000	0.000	89.000	M	1.06	0.037
	$\sum$	**2.600**						**1.06**	**0.037**

Subwatershed Time of Concentration Details:

Stru #	SWS #	Land Flow Condition	Slope (%)	Vert. Dist. (ft)	Horiz. Dist. (ft)	Velocity (fps)	Time (hrs)
#1	1	5. Nearly bare and untilled, and alluvial valley fans	5.49	7.31	133.20	2.340	0.015
		8. Large gullies, diversions, and low flowing streams	6.49	48.61	749.03	7.640	0.027
#1	**1**	**Time of Concentration:**					**0.042**

CULVERT CP-178

South Dixon Powerline Road, see Exhibit 11-12E for culvert location and watershed.

RYazzie

BHP NAVAJO COAL COMPANY
P.O. BOX 1717
FRUITLAND, NM, 87416

Phone: 505-598-3203

General Information

Storm Information:

Storm Type:	NRCS TYPE II-60
Design Storm:	2 yr - 6 hr
Rainfall Depth:	0.800 inches

Structure Networking:

Type	Stru #	(flows into)	Stru #	Musk. K (hrs)	Musk. X	Description
Culvert	#1	==>	End	0.000	0.000	CP-178

#1
Culvert

Structure Summary:

	Immediate Contributing Area (ac)	Total Contributing Area (ac)	Peak Discharge (cfs)	Total Runoff Volume (ac-ft)
#1	0.600	0.600	0.25	0.01

Structure Detail:

Structure #1 (Culvert)

CP-178

Culvert Inputs:

Length (ft)	Slope (%)	Manning's n	Max. Headwater (ft)	Tailwater (ft)	Entrance Loss Coef. (Ke)
36.00	3.00	0.0160	1.60	0.00	0.90

Culvert Results:

Design Discharge = 0.25 cfs

Minimum pipe diameter: 1 - 4 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)
#1	1	0.600	0.018	0.000	0.000	89.000	M	0.25	0.009
	Σ	**0.600**						**0.25**	**0.009**

Subwatershed Time of Concentration Details:

Stru #	SWS #	Land Flow Condition	Slope (%)	Vert. Dist. (ft)	Horiz. Dist. (ft)	Velocity (fps)	Time (hrs)
#1	1	5. Nearly bare and untilled, and alluvial valley fans	9.17	10.00	109.00	3.020	0.010
		8. Large gullies, diversions, and low flowing streams	4.18	8.31	198.60	6.130	0.008
#1	**1**	**Time of Concentration:**					**0.018**

CULVERT CP-179

South Dixon Powerline Road, see Exhibit 11-12E for culvert location and watershed.

RYazzie

BHP NAVAJO COAL COMPANY
P.O. BOX 1717
FRUITLAND, NM, 87416

Phone: 505-598-3203

General Information

Storm Information:

Storm Type:	NRCS TYPE II-60
Design Storm:	2 yr - 6 hr
Rainfall Depth:	0.800 inches

Structure Networking:

Type	Stru #	(flows into)	Stru #	Musk. K (hrs)	Musk. X	Description
Culvert	#1	==>	End	0.000	0.000	CP-179

#1
Culvert

Structure Summary:

	Immediate Contributing Area (ac)	Total Contributing Area (ac)	Peak Discharge (cfs)	Total Runoff Volume (ac-ft)
#1	0.700	0.700	0.29	0.01

Structure Detail:

Structure #1 (Culvert)

CP-179

Culvert Inputs:

Length (ft)	Slope (%)	Manning's n	Max. Headwater (ft)	Tailwater (ft)	Entrance Loss Coef. (Ke)
40.00	4.00	0.0160	1.90	0.00	0.90

Culvert Results:

Design Discharge = 0.29 cfs

Minimum pipe diameter: 1 - 4 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)
#1	1	0.700	0.020	0.000	0.000	89.000	M	0.29	0.010
	Σ	**0.700**						**0.29**	**0.010**

Subwatershed Time of Concentration Details:

Stru #	SWS #	Land Flow Condition	Slope (%)	Vert. Dist. (ft)	Horiz. Dist. (ft)	Velocity (fps)	Time (hrs)
#1	1	5. Nearly bare and untilled, and alluvial valley fans	8.26	10.00	121.00	2.870	0.011
		8. Large gullies, diversions, and low flowing streams	4.90	10.96	223.72	6.640	0.009
#1	**1**	**Time of Concentration:**					**0.020**

CULVERT CP-181 A&B

South Dixon Powerline Road, see Exhibit 11-12E for culvert location and watershed.

RYazzie

BHP NAVAJO COAL COMPANY
P.O. BOX 1717
FRUITLAND, NM, 87416

Phone: 505-598-3203

General Information

Storm Information:

Storm Type:	NRCS TYPE II-60
Design Storm:	2 yr - 6 hr
Rainfall Depth:	0.800 inches

Structure Networking:

Type	Stru #	(flows into)	Stru #	Musk. K (hrs)	Musk. X	Description
Null	#1	==>	End	0.000	0.000	Culvert CP-181A&B

#1
Null

Structure Summary:

	Immediate Contributing Area (ac)	Total Contributing Area (ac)	Peak Discharge (cfs)	Total Runoff Volume (ac-ft)
#1	23.000	23.000	9.39	0.33

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)
#1	1	23.000	0.113	0.000	0.000	89.000	M	9.39	0.327
	Σ	**23.000**						**9.39**	**0.327**

Subwatershed Time of Concentration Details:

Stru #	SWS #	Land Flow Condition	Slope (%)	Vert. Dist. (ft)	Horiz. Dist. (ft)	Velocity (fps)	Time (hrs)
#1	1	5. Nearly bare and untilled, and alluvial valley fans	5.13	10.00	195.00	2.260	0.023
		8. Large gullies, diversions, and low flowing streams	2.73	44.00	1,610.00	4.950	0.090
#1	**1**	**Time of Concentration:**					**0.113**

Culvert CP-181A&B

Culvert Inputs:

Length (ft)	Slope (%)	Manning's n	Max. Headwater (ft)	Tailwater (ft)	Entrance Loss Coef. (Ke)
33.00	2.40	0.0160	2.70	0.00	0.90

Culvert Results:

Minimum pipe diameter: 1 - 12 inch pipe(s) required

Detailed Performance Curves

Design Discharge = 4.70 cfs

Maximum Headwater = 2.70 ft

(BOLD indicates design pipe size)

Headwater (ft)	Discharge (cfs) (10 in)	**Discharge (cfs) (12 in)**	Discharge (cfs) (15 in)
0.27	0.25	**0.29**	0.38
0.54	0.70	**0.83**	1.05
0.81	1.27	**1.53**	1.91
1.08	1.87	**2.35**	2.94
1.35	2.35	**3.09**	4.11
1.62	2.74	**3.70**	5.18
1.89	3.04	**4.22**	6.07
2.16	3.32	**4.68**	6.85
2.43	3.51	**5.10**	7.55
2.70	3.69	**5.46**	8.19
2.97	3.87	**5.77**	8.78
3.24	4.03	**6.03**	9.34
3.51	4.20	**6.29**	9.86
3.78	4.36	**6.53**	10.36
4.05	4.50	**6.76**	10.84

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CULVERT CP-182

Shop By-Pass Road. See Exhibit 11-12D for Culvert location and watershed.

RYazzie

BHP Navajo Coal Company
Navajo Mine
PO Box 1717
Fruitland, NM 87415

Phone: 505-598-5861

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Civil Software Design

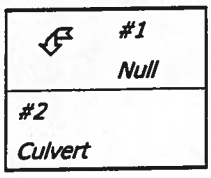
General Information

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	0.040	0.361	
Culvert	#2	==>	End	0.000	0.000	CP-182



Structure Routing Details:

Stru #	Land Flow Condition	Slope (%)	Vert. Dist. (ft)	Horiz. Dist. (ft)	Velocity (fps)	Time (hrs)
#1	8. Large gullies, diversions, and low flowing streams	2.19	14.00	639.31	4.43	0.040
#1	**Muskingum K:**					**0.040**

Structure Summary:

	Immediate Contributing Area (ac)	Total Contributing Area (ac)	Peak Discharge (cfs)	Total Runoff Volume (ac-ft)
#1	19.100	19.100	11.21	0.77
#2	15.000	34.100	24.91	1.38

Structure Detail:

Structure #2 (Culvert)

CP-182

Culvert Inputs:

Length (ft)	Slope (%)	Manning's n	Max. Headwater (ft)	Tailwater (ft)	Entrance Loss Coef. (Ke)
140.00	2.00	0.0150	5.00	0.00	0.90

Culvert Results:

Design Discharge = 24.91 cfs

Minimum pipe diameter: 1 - 24 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)
#1	1	19.100	0.192	0.000	0.000	89.000	M	11.21	0.771
	Σ	**19.100**						**11.21**	**0.771**
#2	1	15.000	0.068	0.000	0.000	89.000	M	15.26	0.605
	Σ	**34.100**						**24.91**	**1.376**

Subwatershed Time of Concentration Details:

Stru #	SWS #	Land Flow Condition	Slope (%)	Vert. Dist. (ft)	Horiz. Dist. (ft)	Velocity (fps)	Time (hrs)
#1	1	5. Nearly bare and untilled, and alluvial valley fans	1.00	2.00	200.84	0.990	0.056
		5. Nearly bare and untilled, and alluvial valley fans	13.53	20.00	147.83	3.670	0.011
		8. Large gullies, diversions, and low flowing streams	1.07	15.00	1,397.94	3.100	0.125
#1	**1**	**Time of Concentration:**					**0.192**
#2	1	5. Nearly bare and untilled, and alluvial valley fans	7.63	5.00	65.53	2.760	0.006
		8. Large gullies, diversions, and low flowing streams	2.33	24.00	1,032.25	4.570	0.062
#2	**1**	**Time of Concentration:**					**0.068**

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CULVERT CP-183

Shop By-Pass Road. See Exhibit 11-12D for Culvert location and watershed.

RYazzie

BHP Navajo Coal Company
Navajo Mine
PO Box 1717
Fruitland, NM 87415

Phone: 505-598-5861

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Civil Software Design

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
Culvert	#1	==>	End	0.000	0.000	CP-183

#1
Culvert

Structure Summary:

	Immediate Contributing Area (ac)	Total Contributing Area (ac)	Peak Discharge (cfs)	Total Runoff Volume (ac-ft)
#1	6.500	6.500	6.61	0.26

Structure Detail:

Structure #1 (Culvert)

CP-183

Culvert Inputs:

Length (ft)	Slope (%)	Manning's n	Max. Headwater (ft)	Tailwater (ft)	Entrance Loss Coef. (Ke)
130.00	2.00	0.0150	3.85	0.00	0.90

Culvert Results:

Design Discharge = 6.61 cfs

Minimum pipe diameter: 1 - 15 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)
#1	1	6.500	0.088	0.000	0.000	89.000	M	6.61	0.262
	Σ	**6.500**						**6.61**	**0.262**

Subwatershed Time of Concentration Details:

Stru #	SWS #	Land Flow Condition	Slope (%)	Vert. Dist. (ft)	Horiz. Dist. (ft)	Velocity (fps)	Time (hrs)
#1	1	5. Nearly bare and untilled, and alluvial valley fans	1.67	5.00	300.00	1.290	0.064
		8. Large gullies, diversions, and low flowing streams	3.22	15.00	465.42	5.380	0.024
#1	**1**	**Time of Concentration:**					**0.088**

Yazzie Spoil Side Road

Cp - 186

RYazzie

BHP NAVAJO COAL COMPANY
P.O. BOX 1717
FRUITLAND, NM, 87416

Phone: 505-598-3203

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
Culvert	#1	==>	End	0.000	0.000	CP-186

#1
Culvert

Structure Summary:

	Immediate Contributing Area (ac)	Total Contributing Area (ac)	Peak Discharge (cfs)	Total Runoff Volume (ac-ft)
#1	108.450	108.450	13.02	1.06

Structure Detail:

Structure #1 (Culvert)

CP-186

Culvert Inputs:

Length (ft)	Slope (%)	Manning's n	Max. Headwater (ft)	Tailwater (ft)	Entrance Loss Coef. (Ke)
206.00	2.95	0.0150	5.30	0.00	0.90

Culvert Results:

Design Discharge = 13.02 cfs

Minimum pipe diameter: 1 - 18 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)
#1	1	108.450	0.208	0.000	0.000	76.000	M	13.02	1.055
	$\sum$	**108.450**						**13.02**	**1.055**

Subwatershed Time of Concentration Details:

Stru #	SWS #	Land Flow Condition	Slope (%)	Vert. Dist. (ft)	Horiz. Dist. (ft)	Velocity (fps)	Time (hrs)
#1	1	5. Nearly bare and untilled, and alluvial valley fans	3.24	5.00	154.31	1.800	0.023
		8. Large gullies, diversions, and low flowing streams	2.17	64.00	2,948.90	4.410	0.185
#1	**1**	**Time of Concentration:**					**0.208**

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YAZZIE SPOIL SIDE ROAD

CP - 187

RYazzie

BHP NAVAJO COAL COMPANY
P.O. BOX 1717
FRUITLAND, NM, 87416

Phone: 505-598-3203

General Information

Storm Information:

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

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Civil Software Design

Structure Networking:

Type	Stru #	(flows into)	Stru #	Musk. K (hrs)	Musk. X	Description
Culvert	#1	==>	End	0.000	0.000	CP-187

#1
Culvert

Structure Summary:

	Immediate Contributing Area (ac)	Total Contributing Area (ac)	Peak Discharge (cfs)	Total Runoff Volume (ac-ft)
#1	54.490	54.490	4.95	0.53

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Structure Detail:

Structure #1 (Culvert)

CP-187

Culvert Inputs:

Length (ft)	Slope (%)	Manning's n	Max. Headwater (ft)	Tailwater (ft)	Entrance Loss Coef. (Ke)
206.00	1.50	0.0150	3.95	0.00	0.90

Culvert Results:

Design Discharge = 4.95 cfs

Minimum pipe diameter: 1 - 15 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)
#1	1	54.490	0.345	0.000	0.000	76.000	M	4.95	0.530
	Σ	**54.490**						**4.95**	**0.530**

Subwatershed Time of Concentration Details:

Stru #	SWS #	Land Flow Condition	Slope (%)	Vert. Dist. (ft)	Horiz. Dist. (ft)	Velocity (fps)	Time (hrs)
#1	1	5. Nearly bare and untilled, and alluvial valley fans	1.30	11.21	861.71	1.140	0.209
		8. Large gullies, diversions, and low flowing streams	1.13	17.79	1,570.99	3.190	0.136
#1	**1**	**Time of Concentration:**					**0.345**

Culvert CP-190

Yazzie Powerline Road

RYazzie

BHP Navajo Coal Company
PO Box 1717
Fruitland, NM 87416

Phone: 505-598-5861

General Information

Storm Information:

Storm Type:	NRCS Type II - 60
Design Storm:	2 yr - 6 hr
Rainfall Depth:	0.800 Inches

Structure Networking:

Type	Stru #	(flows into)	Stru #	Musk. K (hrs)	Musk. X	Description
Culvert	#1	==>	End	0.000	0.000	Culvert CP-190

#1
Culvert

Structure Summary:

	Immediate Contributing Area (ac)	Total Contributing Area (ac)	Peak Discharge (cfs)	Total Runoff Volume (ac-ft)
#1	1.100	1.100	0.56	0.02

Structure Detail:

Structure #1 (Culvert)

Culvert CP-190

Culvert Inputs:

Length (ft)	Slope (%)	Manning's n	Max. Headwater (ft)	Tailwater (ft)	Entrance Loss Coef. (Ke)
40.00	1.30	0.0160	4.80	0.00	0.90

Culvert Results:

Design Discharge = 0.56 cfs

Minimum pipe diameter: 1 - 6 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)
#1	1	1.100	0.005	0.000	0.000	91.000	M	0.56	0.021
	Σ	**1.100**						**0.56**	**0.021**

Subwatershed Time of Concentration Details:

Stru #	SWS #	Land Flow Condition	Slope (%)	Vert. Dist. (ft)	Horiz. Dist. (ft)	Velocity (fps)	Time (hrs)
#1	1	5. Nearly bare and untilled, and alluvial valley fans	14.92	3.94	26.40	3.860	0.001
		8. Large gullies, diversions, and low flowing streams	27.34	75.61	276.59	15.680	0.004
#1	**1**	**Time of Concentration:**					**0.005**

GORMAN ROAD
CULVERT CP-185

THE CULVERT LOCATION AND WATERSHED AREA ARE SHOWN ON EXHIBIT 11-12C.

RYazzie

BHP Navajo Coal Company
PO Box 1717
Fruitland, NM
87416

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General Information

Storm Information:

Storm Type:	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
Culvert	#1	==>	End	0:000	0:000	CP-185

#1
Culvert

Structure Summary:

	Immediate Contributing Area (ac)	Total Contributing Area (ac)	Peak Discharge (cfs)	Total Runoff Volume (ac-ft)
#1	24.380	24.380	9.94	0.32

Structure Detail:

Structure #1 (Culvert)

CP-185

Culvert Inputs:

Length (ft)	Slope (%)	Manning's n	Max. Headwater (ft)	Tailwater (ft)	Entrance Loss Coef. (Ke)
130.00	9.00	0.0150	3.20	0.00	0.90

Culvert Results:

Design Discharge = 9.94 cfs

Minimum pipe diameter: 1 - 18 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)
#1	1	24.380	0.094	0.000	0.000	78.200	M	9.94	0.317
	Σ	**24.380**						**9.94**	**0.317**

Subwatershed Time of Concentration Details:

Stru #	SWS #	Land Flow Condition	Slope (%)	Vert. Dist. (ft)	Horiz. Dist. (ft)	Velocity (fps)	Time (hrs)
#1	1	5. Nearly bare and untilled, and alluvial valley fans	1.34	1.50	111.53	1.150	0.026
		8. Large gullies, diversions, and low flowing streams	4.97	82.50	1,658.26	6.690	0.068
#1	**1**	**Time of Concentration:**					**0.094**

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GORMAN ROAD
DOWN DRAIN DD-29

THE CULVERT LOCATION AND WATERSHED AREA ARE SHOWN ON EXHIBIT 11-12C.

RYazzie

BHP Navajo Coal Company
PO Box 1717
Fruitland, NM
87416

General Information

Storm Information:

Storm Type:	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
Culvert	#1	==>	End	0.000	0.000	CP-18S

#1
Culvert

Structure Summary:

	Immediate Contributing Area (ac)	Total Contributing Area (ac)	Peak Discharge (cfs)	Total Runoff Volume (ac-ft)
#1	1.810	1.810	1.84	0.07

Structure Detail:

Structure #1 (Culvert)

CP-185

Culvert Inputs:

Length (ft)	Slope (%)	Manning's n	Max. Headwater (ft)	Tailwater (ft)	Entrance Loss Coef. (Ke)
73.00	49.00	0.0160	5.00	0.00	0.90

Culvert Results:

Design Discharge = 1.84 cfs

Minimum pipe diameter: 1 - 6 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)
#1	1	1.260	0.066	0.000	0.000	89.000	M	1.28	0.051
	2	0.550	0.046	0.000	0.000	89.000	M	0.56	0.022
	Σ	**1.810**						**1.84**	**0.073**

Subwatershed Time of Concentration Details:

Stru #	SWS #	Land Flow Condition	Slope (%)	Vert. Dist. (ft)	Horiz. Dist. (ft)	Velocity (fps)	Time (hrs)
#1	1	8. Large gullies, diversions, and low flowing streams	2.14	22.50	1,052.93	4.380	0.066
#1	**1**	**Time of Concentration:**					**0.066**
#1	2	8. Large gullies, diversions, and low flowing streams	0.82	3.76	458.00	2.710	0.046
#1	**2**	**Time of Concentration:**					**0.046**

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CULVERT CP-202

SOUTH OF EMPLOYEE COAL DUMP ALONG POWERLINE ROAD. THE WATERSHED AREA IS SHOWN ON EXHIBIT 11-12D.

RYazzie

BHP Navajo Coal Company
PO Box 1717
Fruitland, NM
87416

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General Information

Storm Information:

Storm Type:	Type II-60
Design Storm:	2 yr - 6 hr
Rainfall Depth:	0.800 inches

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Structure Networking:

Type	Stru #	(flows into)	Stru #	Musk. K (hrs)	Musk. X	Description
Culvert	#1	==>	End	0.000	0.000	CP-202

#1
Culvert

Structure Summary:

	Immediate Contributing Area (ac)	Total Contributing Area (ac)	Peak Discharge (cfs)	Total Runoff Volume (ac-ft)
#1	2.900	2.900	1.18	0.04

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Structure Detail:

Structure #1 (Culvert)

CP-202

Culvert Inputs:

Length (ft)	Slope (%)	Manning's n	Max. Headwater (ft)	Tailwater (ft)	Entrance Loss Coef. (Ke)
30.00	3.80	0.0150	3.50	0.00	0.90

Culvert Results:

Design Discharge = 1.18 cfs

Minimum pipe diameter: 1 - 6 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)
#1	1	2.900	0.031	0.000	0.000	89.000	M	1.18	0.041
	Σ	**2.900**						**1.18**	**0.041**

Subwatershed Time of Concentration Details:

Stru #	SWS #	Land Flow Condition	Slope (%)	Vert. Dist. (ft)	Horiz. Dist. (ft)	Velocity (fps)	Time (hrs)
#1	1	5. Nearly bare and untilled, and alluvial valley fans	4.62	5.50	119.00	2.140	0.015
		8. Large gullies, diversions, and low flowing streams	6.38	28.23	442.53	7.570	0.016
#1	**1**	**Time of Concentration:**					**0.031**

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CULVERT CP-203

SOUTH OF EMPLOYEE COAL DUMP ALONG POWERLINE ROAD. THE WATERSHED AREA IS SHOWN ON EXHIBIT 11-12D.

RYazzie

BHP Navajo Coal Company
PO Box 1717
Fruitland, NM
87416

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General Information

Storm Information:

Storm Type:	Type II-60
Design Storm:	2 yr - 6 hr
Rainfall Depth:	0.800 inches

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Structure Networking:

Type	Stru #	(flows into)	Stru #	Musk. K (hrs)	Musk. X	Description
Culvert	#1	==>	End	0.000	0.000	CP-203

#1
Culvert

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Structure Summary:

	Immediate Contributing Area (ac)	Total Contributing Area (ac)	Peak Discharge (cfs)	Total Runoff Volume (ac-ft)
#1	4.200	4.200	1.72	0.06

Structure Detail:

Structure #1 (Culvert)

CP-203

Culvert Inputs:

Length (ft)	Slope (%)	Manning's n	Max. Headwater (ft)	Tailwater (ft)	Entrance Loss Coef. (Ke)
30.00	4.90	0.0150	2.50	0.00	0.90

Culvert Results:

Design Discharge = 1.72 cfs

Minimum pipe diameter: 1 - 8 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)
#1	1	4.200	0.030	0.000	0.000	89.000	M	1.72	0.060
	Σ	**4.200**						**1.72**	**0.060**

Subwatershed Time of Concentration Details:

Stru #	SWS #	Land Flow Condition	Slope (%)	Vert. Dist. (ft)	Horiz. Dist. (ft)	Velocity (fps)	Time (hrs)
#1	1	5. Nearly bare and untilled, and alluvial valley fans	1.52	1.00	65.83	1.230	0.014
		8. Large gullies, diversions, and low flowing streams	6.25	27.50	439.69	7.500	0.016
#1	**1**	**Time of Concentration:**					**0.030**

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CULVERT CP-204

SOUTH OF EMPLOYEE COAL DUMP ALONG POWERLINE ROAD. THE WATERSHED AREA IS SHOWN ON EXHIBIT 11-12D.

RYazzie

BHP Navajo Coal Company
PO Box 1717
Fruitland, NM
87416

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General Information

Storm Information:

Storm Type:	Type II-60
Design Storm:	2 yr - 6 hr
Rainfall Depth:	0.800 inches

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Structure Networking:

Type	Stru #	(flows into)	Stru #	Musk. K (hrs)	Musk. X	Description
Culvert	#1	==>	End	0.000	0.000	CP-204

#1
Culvert

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Structure Summary:

	Immediate Contributing Area (ac)	Total Contributing Area (ac)	Peak Discharge (cfs)	Total Runoff Volume (ac-ft)
#1	3.500	3.500	1.43	0.05

Structure Detail:

Structure #1 (Culvert)

CP-204

Culvert Inputs:

Length (ft)	Slope (%)	Manning's n	Max. Headwater (ft)	Tailwater (ft)	Entrance Loss Coef. (Ke)
61.00	2.60	0.0150	6.00	0.00	0.90

Culvert Results:

Design Discharge = 1.43 cfs

Minimum pipe diameter: 1 - 6 inch pipe(s) required

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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)
#1	1	3.500	0.052	0.000	0.000	89.000	M	1.43	0.050
	Σ	**3.500**						**1.43**	**0.050**

Subwatershed Time of Concentration Details:

Stru #	SWS #	Land Flow Condition	Slope (%)	Vert. Dist. (ft)	Horiz. Dist. (ft)	Velocity (fps)	Time (hrs)
#1	1	5. Nearly bare and untilled, and alluvial valley fans	1.90	1.50	78.98	1.370	0.016
		8. Large gullies, diversions, and low flowing streams	4.87	42.11	864.57	6.620	0.036
#1	**1**	**Time of Concentration:**					**0.052**

Ancillary Culvert (CP-184)

The watershed is presented on Exhibit 11-12E. SedCad is being updated to reflect watershed changes due to mining. Road is desined for a 2 year-6 hour storm event (Ancillary Road design).

Shawn Smith

Navajo Coal Company
P.O. Box 1717
Fruitland, NM 87414

Phone: (505) 598-3376
Email: shawn.smith@bhpbilliton.com

General Information

Storm Information:

Storm Type:	Type II-70
Design Storm:	2 yr - 6 hr
Rainfall Depth:	0.800 inches

Structure Networking:

Type	Stru #	(flows into)	Stru #	Musk. K (hrs)	Musk. X	Description
Culvert	#1	==>	End	0.000	0.000	CP-184

#1
Culvert

Structure Summary:

	Immediate Contributing Area (ac)	Total Contributing Area (ac)	Peak Discharge (cfs)	Total Runoff Volume (ac-ft)
#1	11.430	11.430	4.04	0.16

Structure Detail:

Structure #1 (Culvert)

CP-184

Culvert Inputs:

Length (ft)	Slope (%)	Manning's n	Max. Headwater (ft)	Tailwater (ft)	Entrance Loss Coef. (Ke)
191.00	0.20	0.0140	2.00	0.00	0.90

Culvert Results:

Design Discharge = 4.04 cfs

Minimum pipe diameter: 1 - 15 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)
#1	1	11.430	0.152	0.000	0.000	89.000	F	4.04	0.157
	Σ	**11.430**						**4.04**	**0.157**

Subwatershed Time of Concentration Details:

Stru #	SWS #	Land Flow Condition	Slope (%)	Vert. Dist. (ft)	Horiz. Dist. (ft)	Velocity (fps)	Time (hrs)
#1	1	5. Nearly bare and untilled, and alluvial valley fans	2.84	0.52	18.31	1.680	0.003
		8. Large gullies, diversions, and low flowing streams	1.48	29.13	1,966.38	3.650	0.149
#1	**1**	**Time of Concentration:**					**0.152**

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DOWN DRAIN CULVERT(DD-30)

The watershed is presented on Exhibit 11-12D.

RYazzie

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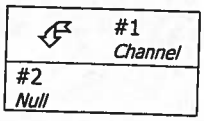
General Information

Storm Information:

Storm Type:	NRCS TYPE 11-60
Design Storm:	2 yr - 6 hr
Rainfall Depth:	0.800 inches

Structure Networking:

Type	Stru #	(flows into)	Stru #	Musk. K (hrs)	Musk. X	Description
Channel	#1	==>	#2	0.000	0.000	
Null	#2	==>	End	0.000	0.000	DD-30



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Structure Summary:

	Immediate Contributing Area (ac)	Total Contributing Area (ac)	Peak Discharge (cfs)	Total Runoff Volume (ac-ft)
#1	6.300	6.300	1.09	0.09
#2	0.000	0.000	1.09	0.09

Structure Detail:

Structure #1 (Riprap Channel)

Trapezoidal Riprap Channel Inputs:

Material: Riprap

Bottom Width (ft)	Left Sideslope Ratio	Right Sideslope Ratio	Slope (%)	Freeboard Depth (ft)	Freeboard % of Depth	Freeboard Mult. x (VxD)
4.00	6.0:1	6.0:1	15.0			

Riprap Channel Results:

Simons/OSM Method - Steep Slope Design

	w/o Freeboard	w/ Freeboard
Depth:	0.07 ft	0.00 ft
Top Width:	4.86 ft	0.00 ft
Velocity*:		
X-Section Area:	0.32 sq ft	
Hydraulic Radius:	0.065	
Froude Number*:		
Manning's n*:		
Dmin:	2.00 in	
D50:	6.00 in	
Dmax:	7.50 in	

Velocity and Manning's n calculations may not apply for this method.

Structure #2 (Null)

DD-30

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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)
#1	1	4.990	0.223	0.000	0.000	89.000	M	0.98	0.07
	2	1.310	0.078	0.000	0.000	89.000	M	0.54	0.02
	S	**6.300**						**1.09**	**0.09**
#2	**S**	**0.000**						**1.09**	**0.09**

Subwatershed Time of Concentration Details:

Stru #	SWS #	Land Flow Condition	Slope (%)	Vert. Dist. (ft)	Horiz. Dist. (ft)	Velocity (fps)	Time (hrs)
#1	1	5. Nearly bare and untilled, and alluvial valley fans	11.76	4.10	34.87	3.420	0.002
		8. Large gullies, diversions, and low flowing streams	0.63	11.85	1,893.54	2.370	0.221
#1	**1**	**Time of Concentration:**					**0.223**
#1	2	5. Nearly bare and untilled, and alluvial valley fans	4.18	1.09	26.06	2.040	0.003
		8. Large gullies, diversions, and low flowing streams	2.10	24.85	1,182.48	4.340	0.075
#1	**2**	**Time of Concentration:**					**0.078**

Burnham Road Re-alignment
Construction Yard Access Road
Culvert CP-205

The Watershed area for the culverts are shown on Exhibit 11-12F.

RYazzie

General Information

Storm Information:

Storm Type:	NRCS TYPE II-70
Design Storm:	10 yr - 6 hr
Rainfall Depth:	1.300 inches

Structure Networking:

Type	Stru #	(flows into)	Stru #	Musk. K (hrs)	Musk. X	Description
Culvert	#1	==>	End	0.000	0.000	CP-205

#1
Culvert

Structure Summary:

	Immediate Contributing Area (ac)	Total Contributing Area (ac)	Peak Discharge (cfs)	Total Runoff Volume (ac-ft)
#1	10.760	10.760	14.64	0.52

Structure Detail:

Structure #1 (Culvert)

CP-205

Culvert Inputs:

Length (ft)	Slope (%)	Manning's n	Max. Headwater (ft)	Tailwater (ft)	Entrance Loss Coef. (Ke)
60.00	1.50	0.0150	3.40	0.00	0.90

Culvert Results:

Minimum pipe diameter required: 21 inches

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)
#1	1	10.760	0.081	0.000	0.000	91.000	M	14.64	0.52
	S	**10.760**						**14.64**	**0.52**

Subwatershed Time of Concentration Details:

Stru #	SWS #	Land Flow Condition	Slope (%)	Vert. Dist. (ft)	Horiz. Dist. (ft)	Velocity (fps)	Time (hrs)
#1	1	5. Nearly bare and untilled, and alluvial valley fans	3.39	2.00	59.00	1.840	0.008
		8. Large gullies, diversions, and low flowing streams	2.20	26.00	1,181.63	4.450	0.073
#1	**1**	**Time of Concentration:**					**0.081**

Burnham Road Re-alignment
Construction Yard Access Road
Culvert CP-206

The Watershed area for the culverts are shown on Exhibit 11-12F.

RYazzie

General Information

Storm Information:

Storm Type:	NRCS TYPE II-70
Design Storm:	10 yr - 6 hr
Rainfall Depth:	1.300 inches

Structure Networking:

Type	Stru #	(flows into)	Stru #	Musk. K (hrs)	Musk. X	Description
Culvert	#1	==>	End	0.000	0.000	CP-206

#1
Culvert

Structure Summary:

	Immediate Contributing Area (ac)	Total Contributing Area (ac)	Peak Discharge (cfs)	Total Runoff Volume (ac-ft)
#1	12.670	12.670	17.24	0.61

Structure Detail:

Structure #1 (Culvert)

CP-206

Culvert Inputs:

Length (ft)	Slope (%)	Manning's n	Max. Headwater (ft)	Tailwater (ft)	Entrance Loss Coef. (Ke)
60.00	2.00	0.0150	3.50	0.00	0.90

Culvert Results:

Minimum pipe diameter required: 21 inches

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)
#1	1	12.670	0.109	0.000	0.000	91.000	M	17.24	0.61
	S	**12.670**						**17.24**	**0.61**

Subwatershed Time of Concentration Details:

Stru #	SWS #	Land Flow Condition	Slope (%)	Vert. Dist. (ft)	Horiz. Dist. (ft)	Velocity (fps)	Time (hrs)
#1	1	5. Nearly bare and untilled, and alluvial valley fans	28.00	7.00	25.00	5.290	0.001
		8. Large gullies, diversions, and low flowing streams	2.03	34.00	1,675.00	4.270	0.108
#1	**1**	**Time of Concentration:**					**0.109**

Burnham Road Re-alignment
Construction Yard Access Road
Culvert CP-207

The Watershed area for the culverts are shown on Exhibit 11-12F.

RYazzie

General Information

Storm Information:

Storm Type:	NRCS TYPE II-70
Design Storm:	10 yr - 6 hr
Rainfall Depth:	1.300 inches

Structure Networking:

Type	Stru #	(flows into)	Stru #	Musk. K (hrs)	Musk. X	Description
Culvert	#1	==>	End	0.000	0.000	CP-207

#1
Culvert

Structure Summary:

	Immediate Contributing Area (ac)	Total Contributing Area (ac)	Peak Discharge (cfs)	Total Runoff Volume (ac-ft)
#1	5.120	5.120	6.97	0.25

Structure Detail:

Structure #1 (Culvert)

CP-207

Culvert Inputs:

Length (ft)	Slope (%)	Manning's n	Max. Headwater (ft)	Tailwater (ft)	Entrance Loss Coef. (Ke)
44.00	1.50	0.0150	3.20	0.00	0.90

Culvert Results:

Minimum pipe diameter required: 15 inches

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)
#1	1	5.120	0.047	0.000	0.000	91.000	M	6.97	0.25
	S	**5.120**						**6.97**	**0.25**

Subwatershed Time of Concentration Details:

Stru #	SWS #	Land Flow Condition	Slope (%)	Vert. Dist. (ft)	Horiz. Dist. (ft)	Velocity (fps)	Time (hrs)
#1	1	5. Nearly bare and untilled, and alluvial valley fans	7.40	7.13	96.38	2.710	0.009
		8. Large gullies, diversions, and low flowing streams	1.93	11.28	583.45	4.170	0.038
#1	**1**	**Time of Concentration:**					**0.047**

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Lowe Silos Access Road Culvert CP-45

The watershed area for the culvert are shown on Exhibit 11-12E.

RYazzie

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General Information

Storm Information:

Storm Type:	NRCS TYPE II-70
Design Storm:	10 yr - 6 hr
Rainfall Depth:	1.300 inches

Structure Networking:

Type	Stru #	(flows into)	Stru #	Musk. K (hrs)	Musk. X	Description
Culvert	#1	==>	End	0.000	0.000	CP-45

#1
Culvert

Structure Summary:

	Immediate Contributing Area (ac)	Total Contributing Area (ac)	Peak Discharge (cfs)	Total Runoff Volume (ac-ft)
#1	135.000	135.000	7.51	1.05

Structure Detail:

Structure #1 (Culvert)

CP-45

Culvert Inputs:

Length (ft)	Slope (%)	Manning's n	Max. Headwater (ft)	Tailwater (ft)	Entrance Loss Coef. (Ke)
58.00	1.04	0.0150	3.00	0.00	0.90

Culvert Results:

Design Discharge = 7.51 cfs

Minimum pipe diameter: 1 - 15 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)
#1	1	135.000	1.049	0.000	0.000	76.000	M	7.51	1.045
	Σ	**135.000**						**7.51**	**1.045**

Subwatershed Time of Concentration Details:

Stru #	SWS #	Land Flow Condition	Slope (%)	Vert. Dist. (ft)	Horiz. Dist. (ft)	Velocity (fps)	Time (hrs)
#1	1	5. Nearly bare and untilled, and alluvial valley fans	0.96	6.00	625.00	0.970	0.178
		8. Large gullies, diversions, and low flowing streams	0.81	68.30	8,442.52	2.690	0.871
#1	**1**	**Time of Concentration:**					**1.049**

(Culvert CP-300)

Burnham Road Temporary Re-route

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General Information

Storm Information:

Storm Type:	NRCS TYPE II-70
Design Storm:	10 yr - 6 hr
Rainfall Depth:	1.300 inches

Structure Networking:

Type	Stru #	(flows into)	Stru #	Musk. K (hrs)	Musk. X	Description
Culvert	#1	==>	End	0.000	0.000	CP-300

#1
Culvert

Structure Summary:

	Immediate Contributing Area (ac)	Total Contributing Area (ac)	Peak Discharge (cfs)	Total Runoff Volume (ac-ft)
#1	8.870	8.870	4.59	0.22

Structure Detail:

Structure #1 (Culvert)

CP-300

Culvert Inputs:

Length (ft)	Slope (%)	Manning's n	Max. Headwater (ft)	Tailwater (ft)	Entrance Loss Coef. (Ke)
110.00	8.20	0.0150	3.20	0.00	0.90

Culvert Results:

Design Discharge = 4.59 cfs

Minimum pipe diameter: 1 - 12 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)
#1	1	8.870	0.207	0.000	0.000	86.000	M	4.59	0.215
	Σ	**8.870**						**4.59**	**0.215**

Subwatershed Time of Concentration Details:

Stru #	SWS #	Land Flow Condition	Slope (%)	Vert. Dist. (ft)	Horiz. Dist. (ft)	Velocity (fps)	Time (hrs)
#1	1	5. Nearly bare and untilled, and alluvial valley fans	1.53	2.00	131.00	1.230	0.029
		8. Large gullies, diversions, and low flowing streams	0.70	11.20	1,602.05	2.500	0.178
#1	**1**	**Time of Concentration:**					**0.207**

(Culvert CP-301)

Burnham Road Temporary Re-route

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General Information

Storm Information:

Storm Type:	Type II-70
Design Storm:	10 yr - 6 hr
Rainfall Depth:	1.300 inches

Structure Networking:

Type	Stru #	(flows into)	Stru #	Musk. K (hrs)	Musk. X	Description
Culvert	#1	==>	End	0.000	0.000	CP-301

#1
Culvert

Structure Summary:

	Immediate Contributing Area (ac)	Total Contributing Area (ac)	Peak Discharge (cfs)	Total Runoff Volume (ac-ft)
#1	1.250	1.250	1.24	0.04

Structure Detail:

Structure #1 (Culvert)

CP-301

Culvert Inputs:

Length (ft)	Slope (%)	Manning's n	Max. Headwater (ft)	Tailwater (ft)	Entrance Loss Coef. (Ke)
122.00	6.30	0.0150	8.90	0.00	0.90

Culvert Results:

Design Discharge = 1.24 cfs

Minimum pipe diameter: 1 - 6 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)
#1	1	1.250	0.021	0.000	0.000	86.000	M	1.24	0.038
	Σ	**1.250**						**1.24**	**0.038**

Subwatershed Time of Concentration Details:

Stru #	SWS #	Land Flow Condition	Slope (%)	Vert. Dist. (ft)	Horiz. Dist. (ft)	Velocity (fps)	Time (hrs)
#1	1	5. Nearly bare and untilled, and alluvial valley fans	1.56	1.00	64.00	1.250	0.014
		8. Large gullies, diversions, and low flowing streams	10.66	28.00	262.56	9.790	0.007
#1	**1**	**Time of Concentration:**					**0.021**

(Culvert CP-302)

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General Information

Storm Information:

Storm Type:	Type II-70
Design Storm:	10 yr - 6 hr
Rainfall Depth:	1.300 inches

Structure Networking:

Type	Stru #	(flows into)	Stru #	Musk. K (hrs)	Musk. X	Description
Culvert	#1	==>	End	0.000	0.000	CP-302

#1
Culvert

Structure Summary:

	Immediate Contributing Area (ac)	Total Contributing Area (ac)	Peak Discharge (cfs)	Total Runoff Volume (ac-ft)
#1	8.380	8.380	8.31	0.25

Structure Detail:

Structure #1 (Culvert)

CP-302

Culvert Inputs:

Length (ft)	Slope (%)	Manning's n	Max. Headwater (ft)	Tailwater (ft)	Entrance Loss Coef. (Ke)
80.00	5.60	0.0150	3.50	0.00	0.90

Culvert Results:

Design Discharge = 8.31 cfs

Minimum pipe diameter: 1 - 15 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)
#1	1	8.380	0.074	0.000	0.000	86.000	M	8.31	0.254
	Σ	**8.380**						**8.31**	**0.254**

Subwatershed Time of Concentration Details:

Stru #	SWS #	Land Flow Condition	Slope (%)	Vert. Dist. (ft)	Horiz. Dist. (ft)	Velocity (fps)	Time (hrs)
#1	1	5. Nearly bare and untilled, and alluvial valley fans	1.24	2.00	161.00	1.110	0.040
		8. Large gullies, diversions, and low flowing streams	5.81	51.48	886.54	7.220	0.034
#1	**1**	**Time of Concentration:**					**0.074**

(Culvert CP-303)

Burnham Road Temporary Re-route

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General Information

Storm Information:

Storm Type:	NRCS TYPE II-70
Design Storm:	10 yr - 6 hr
Rainfall Depth:	1.300 inches

Structure Networking:

Type	Stru #	(flows into)	Stru #	Musk. K (hrs)	Musk. X	Description
Culvert	#1	==>	End	0.000	0.000	CP-303

#1
Culvert

Structure Summary:

	Immediate Contributing Area (ac)	Total Contributing Area (ac)	Peak Discharge (cfs)	Total Runoff Volume (ac-ft)
#1	2.360	2.360	2.85	0.10

Structure Detail:

Structure #1 (Culvert)

CP-303

Culvert Inputs:

Length (ft)	Slope (%)	Manning's n	Max. Headwater (ft)	Tailwater (ft)	Entrance Loss Coef. (Ke)
86.00	4.10	0.0150	3.30	0.00	0.90

Culvert Results:

Design Discharge = 2.85 cfs

Minimum pipe diameter: 1 - 10 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)
#1	1	2.360	0.032	0.000	0.000	89.000	M	2.85	0.095
	Σ	**2.360**						**2.85**	**0.095**

Subwatershed Time of Concentration Details:

Stru #	SWS #	Land Flow Condition	Slope (%)	Vert. Dist. (ft)	Horiz. Dist. (ft)	Velocity (fps)	Time (hrs)
#1	1	5. Nearly bare and untilled, and alluvial valley fans	2.00	1.00	50.00	1.410	0.009
		8. Large gullies, diversions, and low flowing streams	7.46	51.80	694.80	8.190	0.023
#1	**1**	**Time of Concentration:**					**0.032**

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(Culvert CP-304)

Burnham Road Temporary Re-route

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General Information

Storm Information:

Storm Type:	Type II-70
Design Storm:	10 yr - 6 hr
Rainfall Depth:	1.300 inches

Structure Networking:

Type	Stru #	(flows into)	Stru #	Musk. K (hrs)	Musk. X	Description
Culvert	#1	==>	End	0.000	0.000	CP-304

#1
Culvert

Structure Summary:

	Immediate Contributing Area (ac)	Total Contributing Area (ac)	Peak Discharge (cfs)	Total Runoff Volume (ac-ft)
#1	2.250	2.250	2.23	0.07

Structure Detail:

Structure #1 (Culvert)

CP-304

Culvert Inputs:

Length (ft)	Slope (%)	Manning's n	Max. Headwater (ft)	Tailwater (ft)	Entrance Loss Coef. (Ke)
80.00	5.00	0.0150	2.80	0.00	0.90

Culvert Results:

Design Discharge = 2.23 cfs

Minimum pipe diameter: 1 - 8 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)
#1	1	2.250	0.021	0.000	0.000	86.000	M	2.23	0.068
	Σ	**2.250**						**2.23**	**0.068**

Subwatershed Time of Concentration Details:

Stru #	SWS #	Land Flow Condition	Slope (%)	Vert. Dist. (ft)	Horiz. Dist. (ft)	Velocity (fps)	Time (hrs)
#1	1	5. Nearly bare and untilled, and alluvial valley fans	2.78	1.00	36.00	1.660	0.006
		8. Large gullies, diversions, and low flowing streams	8.03	38.20	475.46	8.500	0.015
#1	**1**	**Time of Concentration:**					**0.021**

(Culvert CP-305A and CP-305B)

Burnham Road Temporary Re-route

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General Information

Storm Information:

Storm Type:	Type II-70
Design Storm:	10 yr - 6 hr
Rainfall Depth:	1.300 inches

Structure Networking:

Type	Stru #	(flows into)	Stru #	Musk. K (hrs)	Musk. X	Description
Culvert	#1	==>	End	0.000	0.000	CP-305A_CP-305B

#1
Culvert

Structure Summary:

	Immediate Contributing Area (ac)	Total Contributing Area (ac)	Peak Discharge (cfs)	Total Runoff Volume (ac-ft)
#1	14.620	14.620	8.23	0.36

Structure Detail:

Structure #1 (Culvert)

CP-305A_CP-305B

Culvert Inputs:

Length (ft)	Slope (%)	Manning's n	Max. Headwater (ft)	Tailwater (ft)	Entrance Loss Coef. (Ke)
120.00	6.30	0.0150	2.60	0.00	0.90

Culvert Results:

Design Discharge = 8.23 cfs

Minimum pipe diameter: 1 - 18 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)
#1	1	14.620	0.125	0.000	0.000	86.000	M	8.23	0.361
	Σ	**14.620**						**8.23**	**0.361**

Subwatershed Time of Concentration Details:

Stru #	SWS #	Land Flow Condition	Slope (%)	Vert. Dist. (ft)	Horiz. Dist. (ft)	Velocity (fps)	Time (hrs)
#1	1	5. Nearly bare and untilled, and alluvial valley fans	0.93	2.08	223.00	0.960	0.064
		8. Large gullies, diversions, and low flowing streams	4.14	55.50	1,340.00	6.100	0.061
#1	**1**	**Time of Concentration:**					**0.125**

(Culvert CP-306)

Burnham Road Temporary Re-route

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General Information

Storm Information:

Storm Type:	Type II-70
Design Storm:	10 yr - 6 hr
Rainfall Depth:	1.300 inches

Structure Networking:

Type	Stru #	(flows into)	Stru #	Musk. K (hrs)	Musk. X	Description
Culvert	#1	==>	End	0.000	0.000	CP-306

#1
Culvert

Structure Summary:

	Immediate Contributing Area (ac)	Total Contributing Area (ac)	Peak Discharge (cfs)	Total Runoff Volume (ac-ft)
#1	2.690	2.690	2.67	0.08

Structure Detail:

Structure #1 (Culvert)

CP-306

Culvert Inputs:

Length (ft)	Slope (%)	Manning's n	Max. Headwater (ft)	Tailwater (ft)	Entrance Loss Coef. (Ke)
80.00	3.30	0.0150	5.50	0.00	0.90

Culvert Results:

Design Discharge = 2.67 cfs

Minimum pipe diameter: 1 - 8 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)
#1	1	2.690	0.021	0.000	0.000	86.000	M	2.67	0.082
	Σ	**2.690**						**2.67**	**0.082**

Subwatershed Time of Concentration Details:

Stru #	SWS #	Land Flow Condition	Slope (%)	Vert. Dist. (ft)	Horiz. Dist. (ft)	Velocity (fps)	Time (hrs)
#1	1	4. Cultivated, straight row	14.71	5.00	34.00	3.420	0.002
		8. Large gullies, diversions, and low flowing streams	7.42	41.47	559.03	8.170	0.019
#1	**1**	**Time of Concentration:**					**0.021**

(Culvert CP-307)

Burnham Road Temporary Re-route

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General Information

Storm Information:

Storm Type:	Type II-70
Design Storm:	10 yr - 6 hr
Rainfall Depth:	1.300 inches

Structure Networking:

Type	Stru #	(flows into)	Stru #	Musk. K (hrs)	Musk. X	Description
Culvert	#1	==>	End	0.000	0.000	CP-307

#1
Culvert

Structure Summary:

	Immediate Contributing Area (ac)	Total Contributing Area (ac)	Peak Discharge (cfs)	Total Runoff Volume (ac-ft)
#1	20.610	20.610	11.50	0.51

Structure Detail:

Structure #1 (Culvert)

CP-307

Culvert Inputs:

Length (ft)	Slope (%)	Manning's n	Max. Headwater (ft)	Tailwater (ft)	Entrance Loss Coef. (Ke)
80.00	5.40	0.0150	6.80	0.00	0.90

Culvert Results:

Design Discharge = 11.50 cfs

Minimum pipe diameter: 1 - 15 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)
#1	1	20.610	0.171	0.000	0.000	86.000	M	11.50	0.509
	Σ	**20.610**						**11.50**	**0.509**

Subwatershed Time of Concentration Details:

Stru #	SWS #	Land Flow Condition	Slope (%)	Vert. Dist. (ft)	Horiz. Dist. (ft)	Velocity (fps)	Time (hrs)
#1	1	5. Nearly bare and untilled, and alluvial valley fans	1.12	2.00	178.00	1.050	0.047
		8. Large gullies, diversions, and low flowing streams	2.85	64.50	2,259.73	5.060	0.124
#1	**1**	**Time of Concentration:**					**0.171**

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(Culvert CP-308A and CP-308B)

Burnham Road Temporary Re-route

Added 2-18" culverts.

R. Yazzie

BHP Navajo Coal Company
P.O, Box 1717
Fruitland, NM, 87416

Phone: (505) 598-3376
Email: shawn.smith@bhpbilliton.com

General Information

Storm Information:

Storm Type:	Type II-70
Design Storm:	10 yr - 6 hr
Rainfall Depth:	1.300 inches

Structure Networking:

Type	Stru #	(flows into)	Stru #	Musk. K (hrs)	Musk. X	Description
Culvert	#1	==>	End	0.000	0.000	CP-308A_CP-308B

#1
Culvert

Structure Summary:

	Immediate Contributing Area (ac)	Total Contributing Area (ac)	Peak Discharge (cfs)	Total Runoff Volume (ac-ft)
#1	22.230	22.230	12.01	0.55

Structure Detail:

Structure #1 (Culvert)

CP-308A_CP-308B

Culvert Inputs:

Length (ft)	Slope (%)	Manning's n	Max. Headwater (ft)	Tailwater (ft)	Entrance Loss Coef. (Ke)
80.00	2.70	0.0150	2.30	0.00	0.90

Culvert Results:

Design Discharge = 12.01 cfs

Minimum pipe diameter: 1 - 21 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)
#1	1	22.230	0.186	0.000	0.000	86.000	M	12.01	0.545
	Σ	**22.230**						**12.01**	**0.545**

Subwatershed Time of Concentration Details:

Stru #	SWS #	Land Flow Condition	Slope (%)	Vert. Dist. (ft)	Horiz. Dist. (ft)	Velocity (fps)	Time (hrs)
#1	1	5. Nearly bare and untilled, and alluvial valley fans	1.08	2.00	186.00	1.030	0.050
		8. Large gullies, diversions, and low flowing streams	2.66	63.88	2,398.47	4.890	0.136
#1	**1**	**Time of Concentration:**					**0.186**

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(Culvert CP-309)

Burnham Road Temporary Re-route

R. Yazzie

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P.O, Box 1717
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Phone: (505) 598-3376
Email: shawn.smith@bhpbilliton.com

General Information

Storm Information:

Storm Type:	Type II-70
Design Storm:	10 yr - 6 hr
Rainfall Depth:	1.300 inches

Structure Networking:

Type	Stru #	(flows into)	Stru #	Musk. K (hrs)	Musk. X	Description
Culvert	#1	==>	End	0.000	0.000	CP-309

#1
Culvert

Structure Summary:

	Immediate Contributing Area (ac)	Total Contributing Area (ac)	Peak Discharge (cfs)	Total Runoff Volume (ac-ft)
#1	9.160	9.160	9.08	0.28

Structure Detail:

Structure #1 (Culvert)

CP-309

Culvert Inputs:

Length (ft)	Slope (%)	Manning's n	Max. Headwater (ft)	Tailwater (ft)	Entrance Loss Coef. (Ke)
80.00	2.30	0.0150	5.00	0.00	0.90

Culvert Results:

Design Discharge = 9.08 cfs

Minimum pipe diameter: 1 - 15 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)
#1	1	9.160	0.052	0.000	0.000	86.000	M	9.08	0.278
	Σ	**9.160**						**9.08**	**0.278**

Subwatershed Time of Concentration Details:

Stru #	SWS #	Land Flow Condition	Slope (%)	Vert. Dist. (ft)	Horiz. Dist. (ft)	Velocity (fps)	Time (hrs)
#1	1	5. Nearly bare and untilled, and alluvial valley fans	3.94	5.00	127.00	1.980	0.017
		8. Large gullies, diversions, and low flowing streams	6.07	57.20	943.10	7.380	0.035
#1	**1**	**Time of Concentration:**					**0.052**

CP-310, CP-311, CP-312, CP-313, CP-314, CP-315, CP-316, CP-317, CP-177, CP-178, & CP-179

Burnham Temporary Road #2 Culverts

Please see Exhbit 11-77 for CP-310 and Exhibit 11-10 for all other culverts.

The

Shawn Smith

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General Information

Storm Information:

Storm Type:	Type II-70
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	==>	#3	0.000	0.000	NAPI diverted watershed in Cottonwood
Pond	#2	==>	#3	0.000	0.000	1000 ac. used to simulate 200 cfs NAPI discharge
Null	#3	==>	#4	0.964	0.340	Stu. #24
Null	#4	==>	#6	1.454	0.333	Stu. #25
Null	#5	==>	#6	1.454	0.333	Stu. #26
Null	#6	==>	#8	0.800	0.323	Stu. #27
Null	#7	==>	#8	0.800	0.323	Stu. #28
Null	#8	==>	#11	0.479	0.298	Stu. #29
Null	#9	==>	#11	0.479	0.298	Stu. #30
Null	#10	==>	#12	0.000	0.000	Stu. #31
Null	#11	==>	#12	0.000	0.000	Stu. #32
Culvert	#12	==>	#19	0.755	0.279	Stu. #33, CP-310
Culvert	#13	==>	#19	0.740	0.280	CP-311
Culvert	#14	==>	#19	0.701	0.286	CP-312
Culvert	#15	==>	#19	0.314	0.315	CP-313
Culvert	#16	==>	#19	0.307	0.305	CP-314
Culvert	#17	==>	#19	0.273	0.295	CP-315
Culvert	#18	==>	#19	0.262	0.288	CP-316
Culvert	#19	==>	End	0.000	0.000	CP-317

#18
Culvert

#17
Culvert

#16
Culvert

#15
Culvert

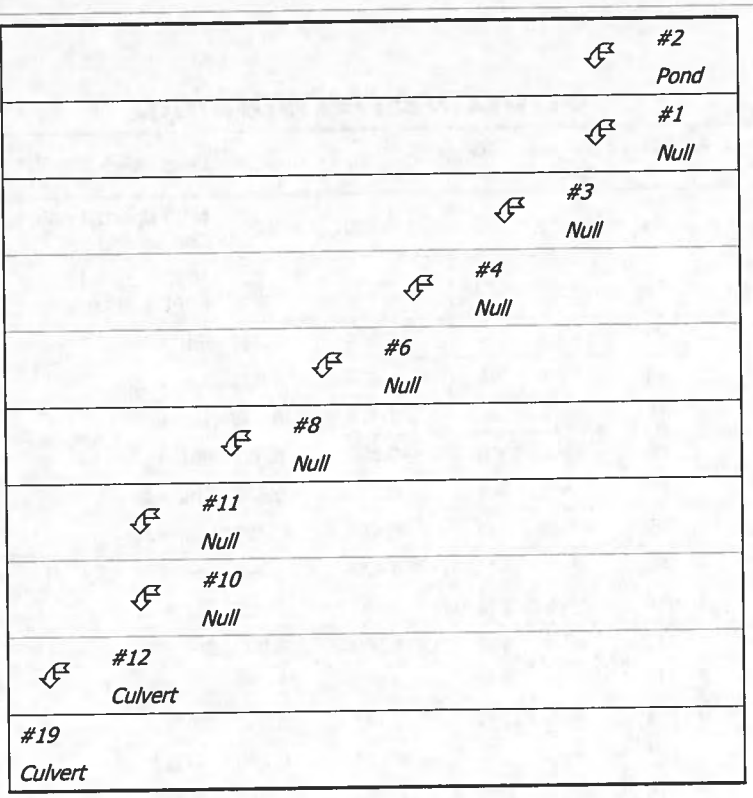
#14
Culvert

#13
Culvert

#9
Null

#7
Null

#5
Null



Structure Routing Details:

Stru #	Land Flow Condition	Slope (%)	Vert. Dist. (ft)	Horiz. Dist. (ft)	Velocity (fps)	Time (hrs)
#3	8. Large gullies, diversions, and low flowing streams	1.46	184.00	12,568.30	3.62	0.964
#3	**Muskingum K:**					**0.964**
#4	8. Large gullies, diversions, and low flowing streams	1.28	228.00	17,755.00	3.39	1.454
#4	**Muskingum K:**					**1.454**
#5	8. Large gullies, diversions, and low flowing streams	1.28	228.00	17,755.62	3.39	1.454
#5	**Muskingum K:**					**1.454**
#6	8. Large gullies, diversions, and low flowing streams	1.07	96.00	8,939.00	3.10	0.800
#6	**Muskingum K:**					**0.800**
#7	8. Large gullies, diversions, and low flowing streams	1.07	96.00	8,938.54	3.10	0.800
#7	**Muskingum K:**					**0.800**
#8	8. Large gullies, diversions, and low flowing streams	0.70	30.00	4,313.44	2.50	0.479
#8	**Muskingum K:**					**0.479**
#9	8. Large gullies, diversions, and low flowing streams	0.70	30.00	4,313.44	2.50	0.479
#9	**Muskingum K:**					**0.479**

Stru #	Land Flow Condition	Slope (%)	Vert. Dist. (ft)	Horiz. Dist. (ft)	Velocity (fps)	Time (hrs)
#12	8. Large gullies, diversions, and low flowing streams	0.51	29.87	5,822.61	2.14	0.755
#12	**Muskingum K:**					**0.755**
#13	8. Large gullies, diversions, and low flowing streams	0.52	30.00	5,760.60	2.16	0.740
#13	**Muskingum K:**					**0.740**
#14	8. Large gullies, diversions, and low flowing streams	0.58	33.56	5,760.60	2.28	0.701
#14	**Muskingum K:**					**0.701**
#15	8. Large gullies, diversions, and low flowing streams	0.94	30.81	3,283.00	2.90	0.314
#15	**Muskingum K:**					**0.314**
#16	8. Large gullies, diversions, and low flowing streams	0.80	23.50	2,952.44	2.67	0.307
#16	**Muskingum K:**					**0.307**
#17	8. Large gullies, diversions, and low flowing streams	0.66	15.97	2,404.03	2.44	0.273
#17	**Muskingum K:**					**0.273**
#18	8. Large gullies, diversions, and low flowing streams	0.60	13.05	2,187.02	2.31	0.262
#18	**Muskingum K:**					**0.262**

Structure Summary:

		Immediate Contributing Area (ac)	Total Contributing Area (ac)	Peak Discharge (cfs)	Total Runoff Volume (ac-ft)
#18		23.680	23.680	11.08	0.48
#17		84.470	84.470	31.67	1.68
#16		10.370	10.370	8.90	0.26
#15		9.400	9.400	8.07	0.23
#14		5.540	5.540	4.76	0.14
#13		37.900	37.900	17.73	0.77
#9		476.400	476.400	8.02	1.40
#7		1,217.900	1,217.900	308.91	36.73
#5		2,486.400	2,486.400	47.12	14.26
#2	In	1,000.000	1,000.000	1,910.40	98.74
	Out			200.00	98.85
#1		6,059.000	6,059.000	57.53	24.84
#3		8,061.800	15,120.800	325.90	164.81
#4		1,015.700	16,136.500	327.97	176.79
#6		1,783.700	20,406.600	348.24	212.13
#8		966.000	22,590.500	475.80	277.30
#11		293.700	23,360.600	486.22	290.04
#10		957.100	957.100	302.41	34.64
#12		0.000	24,317.700	564.05	324.67
#19		198.310	24,687.370	561.93	332.17

Structure Detail:

Structure #18 (Culvert)

CP-316

Culvert Inputs:

Length (ft)	Slope (%)	Manning's n	Max. Headwater (ft)	Tailwater (ft)	Entrance Loss Coef. (Ke)
100.00	2.00	0.0150	6.30	0.00	0.90

Culvert Results:

Design Discharge = 11.08 cfs

Minimum pipe diameter: 1 - 15 inch pipe(s) required

Structure #17 (Culvert)

CP-315

Culvert Inputs:

Length (ft)	Slope (%)	Manning's n	Max. Headwater (ft)	Tailwater (ft)	Entrance Loss Coef. (Ke)
100.00	1.30	0.0150	6.50	0.00	0.90

Culvert Results:

Design Discharge = 31.67 cfs

Minimum pipe diameter: 1 - 24 inch pipe(s) required

Structure #16 (Culvert)

CP-314

Culvert Inputs:

Length (ft)	Slope (%)	Manning's n	Max. Headwater (ft)	Tailwater (ft)	Entrance Loss Coef. (Ke)
80.00	1.10	0.0150	3.00	0.00	0.90

Culvert Results:

Design Discharge = 8.90 cfs

Minimum pipe diameter: 1 - 18 inch pipe(s) required

Structure #15 (Culvert)

CP-313

Culvert Inputs:

Length (ft)	Slope (%)	Manning's n	Max. Headwater (ft)	Tailwater (ft)	Entrance Loss Coef. (Ke)
100.00	2.00	0.0150	2.60	0.00	0.90

Culvert Results:

Design Discharge = 8.07 cfs

Minimum pipe diameter: 1 - 18 inch pipe(s) required

Structure #14 (Culvert)

CP-312

Culvert Inputs:

Length (ft)	Slope (%)	Manning's n	Max. Headwater (ft)	Tailwater (ft)	Entrance Loss Coef. (Ke)
80.00	2.40	0.0150	2.60	0.00	0.90

Culvert Results:

Design Discharge = 4.76 cfs

Minimum pipe diameter: 1 - 12 inch pipe(s) required

Structure #13 (Culvert)

CP-311

Culvert Inputs:

Length (ft)	Slope (%)	Manning's n	Max. Headwater (ft)	Tailwater (ft)	Entrance Loss Coef. (Ke)
100.00	1.30	0.0150	7.30	0.00	0.90

Culvert Results:

Design Discharge = 17.73 cfs

Minimum pipe diameter: 1 - 18 inch pipe(s) required

Structure #9 (Null)

Stu. #30

Structure #7 (Null)

Stu. #28

Structure #5 (Null)

Stu. #26

Structure #2 (Pond)

1000 ac. used to simulate 200 cfs NAPI discharge

Pond Inputs:

Initial Pool Elev:	0.01 ft
Initial Pool:	0.00 ac-ft

Pond Results:

Peak Elevation:	5.07 ft
Dewater Time:	0.00 days

Dewatering time is calculated from peak stage to lowest spillway

Elevation-Capacity-Discharge Table

Elevation	Area (ac)	Capacity (ac-ft)	Discharge (cfs)	Dewater Time (hrs)	
0.00	0.000	0.000	0.000		
0.01	0.001	0.000	0.000		
0.50	0.416	0.071	200.000		
1.00	1.603	0.544	200.000		
1.50	3.569	1.804	200.000		
2.00	6.314	4.243	200.000		
2.50	9.837	8.248	200.000		
3.00	14.140	14.210	200.000		
3.50	19.221	22.518	200.000		
4.00	25.081	33.561	200.000		
4.50	31.720	47.729	200.000		
5.00	39.138	65.411	200.000		
5.07	40.679	68.596	200.000	0.00	Peak Stage
5.50	47.335	86.997	200.000		
6.00	56.310	112.876	200.000		
6.50	66.064	143.437	200.000		
7.00	76.597	179.070	200.000		
7.50	87.909	220.164	200.000		
8.00	100.000	267.109	200.000		

Detailed Discharge Table

Elevation (ft)	User-input discharge (cfs)	Combined Total Discharge (cfs)
0.00	0.000	0.000
0.01	0.000	0.000
0.50	200.000	200.000
1.00	200.000	200.000
1.50	200.000	200.000
2.00	200.000	200.000
2.50	200.000	200.000
3.00	200.000	200.000
3.50	200.000	200.000
4.00	200.000	200.000
4.50	200.000	200.000
5.00	200.000	200.000
5.50	200.000	200.000
6.00	200.000	200.000
6.50	200.000	200.000
7.00	200.000	200.000
7.50	200.000	200.000
8.00	200.000	200.000

Structure #1 (Null)

NAPI diverted watershed in Cottonwood

Structure #3 (Null)

Stu. #24

Structure #4 (Null)

Stu. #25

Structure #6 (Null)

Stu. #27

Structure #8 (Null)

Stu. #29

Structure #11 (Null)

Stu. #32

Structure #10 (Null)

Stu. #31

Structure #12 (Culvert)

Stu. #33, CP-310

Culvert Inputs:

Length (ft)	Slope (%)	Manning's n	Max. Headwater (ft)	Tailwater (ft)	Entrance Loss Coef. (Ke)
120.00	1.00	0.0150	12.50	0.00	0.90

Culvert Results:

Design Discharge = 564.05 cfs

Minimum pipe diameter: 1 - 96 inch pipe(s) required

Structure #19 (Culvert)

CP-317

Culvert Inputs:

Length (ft)	Slope (%)	Manning's n	Max. Headwater (ft)	Tailwater (ft)	Entrance Loss Coef. (Ke)
93.00	1.00	0.0150	13.00	0.00	0.90

Culvert Results:

Design Discharge = 561.93 cfs

Minimum pipe diameter: 1 - 96 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)
#18	1	23.680	0.159	0.000	0.000	84.000	M	11.08	0.480
	Σ	**23.680**						**11.08**	**0.480**
#17	1	84.470	0.282	0.000	0.000	84.000	M	31.67	1.684
	Σ	**84.470**						**31.67**	**1.684**
#16	1	10.370	0.074	0.000	0.000	84.000	M	8.90	0.258
	Σ	**10.370**						**8.90**	**0.258**
#15	1	9.400	0.069	0.000	0.000	84.000	M	8.07	0.234
	Σ	**9.400**						**8.07**	**0.234**
#14	1	5.540	0.060	0.000	0.000	84.000	M	4.76	0.138
	Σ	**5.540**						**4.76**	**0.138**
#13	1	37.900	0.142	0.000	0.000	84.000	M	17.73	0.768
	Σ	**37.900**						**17.73**	**0.768**
#9	1	476.400	1.131	0.000	0.000	70.300	M	8.02	1.398
	Σ	**476.400**						**8.02**	**1.398**
#7	1	772.300	0.657	0.523	0.334	88.300	M	270.64	23.288
	2	445.600	0.587	0.000	0.000	88.300	M	168.24	13.443
	Σ	**1,217.900**						**308.91**	**36.731**
#5	1	447.600	2.192	0.000	0.000	71.800	M	6.95	1.769
	2	2,038.800	3.000	0.000	0.000	74.400	M	40.61	12.489
	Σ	**2,486.400**						**47.12**	**14.258**
#2	1	1,000.000	0.100	0.000	0.000	99.000	F	1,910.40	98.741
	Σ	**1,000.000**						**1,910.40**	**98.741**
#1	1	6,059.000	4.593	0.000	0.000	72.000	M	57.53	24.842
	Σ	**6,059.000**						**57.53**	**24.842**
#3	1	2,607.500	5.367	2.377	0.305	72.800	M	25.37	12.318
	2	2,331.900	4.813	2.431	0.304	72.300	M	22.59	10.093
	3	1,758.500	2.231	1.788	0.297	73.900	M	40.00	9.963
	4	1,363.900	2.618	0.000	0.000	74.700	M	31.57	8.745
	Σ	**15,120.800**						**325.90**	**164.808**
#4	1	515.200	0.990	0.342	0.357	75.900	M	29.38	3.936
	2	130.500	0.787	0.342	0.357	75.800	M	8.56	0.983
	3	370.000	0.516	0.000	0.000	83.600	M	93.33	7.061

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	**16,136.500**						**327.97**	**176.787**
#6	1	354.400	0.612	1.233	0.337	81.000	M	58.33	5.114
	2	305.200	0.529	1.054	0.328	81.900	M	62.04	4.866
	3	289.800	0.692	0.551	0.328	72.900	M	11.80	1.394
	4	253.000	0.361	0.551	0.328	77.200	M	35.06	2.314
	5	581.300	0.980	0.000	0.000	79.900	M	60.12	7.394
	Σ	**20,406.600**						**348.24**	**212.127**
#8	1	508.800	0.409	0.416	0.312	87.300	M	217.35	14.003
	2	233.200	0.521	0.291	0.312	89.600	M	107.30	7.931
	3	224.000	0.467	0.000	0.000	87.900	M	93.82	6.508
	Σ	**22,590.500**						**475.80**	**277.300**
#11	1	293.700	0.576	0.000	0.000	91.000	M	145.07	11.337
	Σ	**23,360.600**						**486.22**	**290.035**
#10	1	431.100	0.588	0.450	0.336	89.400	M	180.59	14.395
	2	325.800	0.432	0.149	0.327	91.000	M	191.18	12.590
	3	200.200	0.373	0.000	0.000	90.900	M	125.59	7.654
	Σ	**957.100**						**302.41**	**34.640**
#12	Σ	**24,317.700**						**564.05**	**324.675**
#19	1	198.310	0.755	0.000	0.000	84.000	M	40.25	3.938
	Σ	**24,687.370**						**561.93**	**332.174**

Subwatershed Time of Concentration Details:

Stru #	SWS #	Land Flow Condition	Slope (%)	Vert. Dist. (ft)	Horiz. Dist. (ft)	Velocity (fps)	Time (hrs)
#1	1	5. Nearly bare and untilled, and alluvial valley fans	0.28	3.00	1,069.13	0.520	0.571
		8. Large gullies, diversions, and low flowing streams	0.82	322.00	39,244.00	2.710	4.022
#1	**1**	**Time of Concentration:**					**4.593**
#3	1	5. Nearly bare and untilled, and alluvial valley fans	1.71	430.00	25,118.29	1.300	5.367
#3	**1**	**Time of Concentration:**					**5.367**
#3	2	5. Nearly bare and untilled, and alluvial valley fans	1.84	430.00	23,393.72	1.350	4.813
#3	**2**	**Time of Concentration:**					**4.813**
#3	3	5. Nearly bare and untilled, and alluvial valley fans	1.82	155.00	8,498.27	1.350	1.748
		8. Large gullies, diversions, and low flowing streams	0.84	40.00	4,771.56	2.740	0.483

Stru #	SWS #	Land Flow Condition	Slope (%)	Vert. Dist. (ft)	Horiz. Dist. (ft)	Velocity (fps)	Time (hrs)
#3	**3**	**Time of Concentration:**					**2.231**
#3	4	5. Nearly bare and untilled, and alluvial valley fans	1.24	50.00	4,042.03	1.110	1.011
		8. Large gullies, diversions, and low flowing streams	0.49	60.00	12,150.66	2.100	1.607
#3	**4**	**Time of Concentration:**					**2.618**
#13	1	5. Nearly bare and untilled, and alluvial valley fans	4.63	5.00	108.00	2.150	0.013
		8. Large gullies, diversions, and low flowing streams	2.55	57.00	2,234.00	4.790	0.129
#13	**1**	**Time of Concentration:**					**0.142**
#14	1	5. Nearly bare and untilled, and alluvial valley fans	1.22	1.00	82.00	1.100	0.020
		8. Large gullies, diversions, and low flowing streams	3.42	27.60	806.68	5.540	0.040
#14	**1**	**Time of Concentration:**					**0.060**
#15	1	5. Nearly bare and untilled, and alluvial valley fans	12.82	5.00	39.00	3.580	0.003
		8. Large gullies, diversions, and low flowing streams	2.67	31.40	1,174.10	4.900	0.066
#15	**1**	**Time of Concentration:**					**0.069**
#16	1	5. Nearly bare and untilled, and alluvial valley fans	11.11	5.00	45.00	3.330	0.003
		8. Large gullies, diversions, and low flowing streams	2.70	34.30	1,269.43	4.930	0.071
#16	**1**	**Time of Concentration:**					**0.074**
#17	1	5. Nearly bare and untilled, and alluvial valley fans	1.53	2.00	131.00	1.230	0.029
		8. Large gullies, diversions, and low flowing streams	2.47	106.00	4,292.81	4.710	0.253
#17	**1**	**Time of Concentration:**					**0.282**
#19	1	8. Large gullies, diversions, and low flowing streams	0.51	29.87	5,822.61	2.140	0.755
#19	**1**	**Time of Concentration:**					**0.755**

Subwatershed Muskingum Routing Details:

Stru #	SWS #	Land Flow Condition	Slope (%)	Vert. Dist. (ft)	Horiz. Dist. (ft)	Velocity (fps)	Time (hrs)
#3	1	8. Large gullies, diversions, and low flowing streams	0.79	180.00	22,770.39	2.660	2.377
#3	**1**	**Muskingum K:**					**2.377**
#3	2	8. Large gullies, diversions, and low flowing streams	0.78	180.00	23,112.48	2.640	2.431
#3	**2**	**Muskingum K:**					**2.431**

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(Culvert CP-318)

Burnham Road Temporary Re-route

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General Information

Storm Information:

Storm Type:	NRCS TYPE II-70
Design Storm:	10 yr - 6 hr
Rainfall Depth:	1.300 inches

Structure Networking:

Type	Stru #	(flows into)	Stru #	Musk. K (hrs)	Musk. X	Description
Culvert	#1	==>	End	0.000	0.000	CP-318

#1
Culvert

Structure Summary:

	Immediate Contributing Area (ac)	Total Contributing Area (ac)	Peak Discharge (cfs)	Total Runoff Volume (ac-ft)
#1	5.150	5.150	6.22	0.21

Structure Detail:

Structure #1 (Culvert)

CP-318

Culvert Inputs:

Length (ft)	Slope (%)	Manning's n	Max. Headwater (ft)	Tailwater (ft)	Entrance Loss Coef. (Ke)
92.00	1.60	0.0150	5.60	0.00	0.90

Culvert Results:

Design Discharge = 6.22 cfs

Minimum pipe diameter: 1 - 12 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)
#1	1	5.150	0.078	0.000	0.000	89.000	M	6.22	0.207
	Σ	**5.150**						**6.22**	**0.207**

Subwatershed Time of Concentration Details:

Stru #	SWS #	Land Flow Condition	Slope (%)	Vert. Dist. (ft)	Horiz. Dist. (ft)	Velocity (fps)	Time (hrs)
#1	1	5. Nearly bare and untilled, and alluvial valley fans	1.56	2.30	147.00	1.250	0.032
		8. Large gullies, diversions, and low flowing streams	3.32	30.10	907.61	5.460	0.046
#1	**1**	**Time of Concentration:**					**0.078**

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(Culvert CP-319)

Burnham Road Temporary Re-route

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General Information

Storm Information:

Storm Type:	NRCS TYPE II-70
Design Storm:	10 yr - 6 hr
Rainfall Depth:	1.300 inches

Structure Networking:

Type	Stru #	(flows into)	Stru #	Musk. K (hrs)	Musk. X	Description
Culvert	#1	==>	End	0.000	0.000	CP-319

#1
Culvert

Structure Summary:

	Immediate Contributing Area (ac)	Total Contributing Area (ac)	Peak Discharge (cfs)	Total Runoff Volume (ac-ft)
#1	6.230	6.230	7.52	0.25

Structure Detail:

Structure #1 (Culvert)

CP-319

Culvert Inputs:

Length (ft)	Slope (%)	Manning's n	Max. Headwater (ft)	Tailwater (ft)	Entrance Loss Coef. (Ke)
100.00	2.40	0.0150	4.00	0.00	0.90

Culvert Results:

Design Discharge = 7.52 cfs

Minimum pipe diameter: 1 - 15 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)
#1	1	6.230	0.059	0.000	0.000	89.000	M	7.52	0.251
	Σ	**6.230**						**7.52**	**0.251**

Subwatershed Time of Concentration Details:

Stru #	SWS #	Land Flow Condition	Slope (%)	Vert. Dist. (ft)	Horiz. Dist. (ft)	Velocity (fps)	Time (hrs)
#1	1	5. Nearly bare and untilled, and alluvial valley fans	2.34	3.00	128.00	1.530	0.023
		8. Large gullies, diversions, and low flowing streams	3.76	28.86	768.00	5.810	0.036
#1	**1**	**Time of Concentration:**					**0.059**

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CP-320A AND CP-320B

Burnham Road Temporary Re-route

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General Information

Storm Information:

Storm Type:	NRCS TYPE II-70
Design Storm:	10 yr - 6 hr
Rainfall Depth:	1.300 inches

Structure Networking:

Type	Stru #	(flows into)	Stru #	Musk. K (hrs)	Musk. X	Description
Culvert	#1	==>	End	0.000	0.000	CP-320A_CP-320B

#1
Culvert

Structure Summary:

	Immediate Contributing Area (ac)	Total Contributing Area (ac)	Peak Discharge (cfs)	Total Runoff Volume (ac-ft)
#1	9.950	9.950	12.01	0.40

Structure Detail:

Structure #1 (Culvert)

CP-320A_CP-320B

Culvert Inputs:

Length (ft)	Slope (%)	Manning's n	Max. Headwater (ft)	Tailwater (ft)	Entrance Loss Coef. (Ke)
80.00	1.30	0.0150	4.90	0.00	0.90

Culvert Results:

Design Discharge = 12.01 cfs

Minimum pipe diameter: 1 - 18 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)
#1	1	9.950	0.065	0.000	0.000	89.000	M	12.01	0.401
	Σ	**9.950**						**12.01**	**0.401**

Subwatershed Time of Concentration Details:

Stru #	SWS #	Land Flow Condition	Slope (%)	Vert. Dist. (ft)	Horiz. Dist. (ft)	Velocity (fps)	Time (hrs)
#1	1	5. Nearly bare and untilled, and alluvial valley fans	9.28	9.00	97.00	3.040	0.008
		8. Large gullies, diversions, and low flowing streams	3.24	36.50	1,125.01	5.400	0.057
#1	**1**	**Time of Concentration:**					**0.065**

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(Culvert CP-321)

Burnham Road Temporary Re-route

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General Information

Storm Information:

Storm Type:	NRCS TYPE II-70
Design Storm:	10 yr - 6 hr
Rainfall Depth:	1.300 inches

Structure Networking:

Type	Stru #	(flows into)	Stru #	Musk. K (hrs)	Musk. X	Description
Culvert	#1	==>	End	0.000	0.000	CP-321

#1
Culvert

Structure Summary:

	Immediate Contributing Area (ac)	Total Contributing Area (ac)	Peak Discharge (cfs)	Total Runoff Volume (ac-ft)
#1	28.440	28.440	34.34	1.15

Structure Detail:

Structure #1 (Culvert)

CP-321

Culvert Inputs:

Length (ft)	Slope (%)	Manning's n	Max. Headwater (ft)	Tailwater (ft)	Entrance Loss Coef. (Ke)
100.00	1.40	0.0150	7.10	0.00	0.90

Culvert Results:

Design Discharge = 34.34 cfs

Minimum pipe diameter: 1 - 24 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)
#1	1	28.440	0.118	0.000	0.000	89.000	M	34.34	1.146
	Σ	**28.440**						**34.34**	**1.146**

Subwatershed Time of Concentration Details:

Stru #	SWS #	Land Flow Condition	Slope (%)	Vert. Dist. (ft)	Horiz. Dist. (ft)	Velocity (fps)	Time (hrs)
#1	1	5. Nearly bare and untilled, and alluvial valley fans	3.13	4.00	128.00	1.760	0.020
		8. Large gullies, diversions, and low flowing streams	2.92	53.00	1,815.60	5.120	0.098
#1	**1**	**Time of Concentration:**					**0.118**

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(Culvert CP-322)

Burnham Road Temporary Re-route

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General Information

Storm Information:

Storm Type:	NRCS TYPE II-70
Design Storm:	10 yr - 6 hr
Rainfall Depth:	1.300 inches

Structure Networking:

Type	Stru #	(flows into)	Stru #	Musk. K (hrs)	Musk. X	Description
Culvert	#1	==>	End	0.000	0.000	CP-322

#1
Culvert

Structure Summary:

	Immediate Contributing Area (ac)	Total Contributing Area (ac)	Peak Discharge (cfs)	Total Runoff Volume (ac-ft)
#1	28.680	28.680	20.79	0.94

Structure Detail:

Structure #1 (Culvert)

CP-322

Culvert Inputs:

Length (ft)	Slope (%)	Manning's n	Max. Headwater (ft)	Tailwater (ft)	Entrance Loss Coef. (Ke)
60.00	1.30	0.0150	4.80	0.00	0.90

Culvert Results:

Design Discharge = 20.79 cfs

Minimum pipe diameter: 1 - 21 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)
#1	1	28.680	0.131	0.000	0.000	89.000	M	20.79	0.941
	Σ	**28.680**						**20.79**	**0.941**

Subwatershed Time of Concentration Details:

Stru #	SWS #	Land Flow Condition	Slope (%)	Vert. Dist. (ft)	Horiz. Dist. (ft)	Velocity (fps)	Time (hrs)
#1	1	5. Nearly bare and untilled, and alluvial valley fans	16.67	5.00	30.00	4.080	0.002
		8. Large gullies, diversions, and low flowing streams	2.36	50.53	2,144.00	4.600	0.129
#1	**1**	**Time of Concentration:**					**0.131**

Culvert (CP-323)

Culvert Location along Dixon Haulroad.

R. Yazzie

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Navajo Mine
PO Box 1717
Fruitland, NM 87416

Phone: 505 598 2007

General Information

Storm Information:

Storm Type:	NRCS TYPE II-70
Design Storm:	10 yr - 6 hr
Rainfall Depth:	1.300 inches

Structure Networking:

Type	Stru #	(flows into)	Stru #	Musk. K (hrs)	Musk. X	Description
Culvert	#1	==>	End	0.000	0.000	CP-323

#1
Culvert

Structure Summary:

	Immediate Contributing Area (ac)	Total Contributing Area (ac)	Peak Discharge (cfs)	Total Runoff Volume (ac-ft)
#1	106.800	106.800	7.03	0.44

Structure Detail:

Structure #1 (Culvert)

CP-323

Culvert Inputs:

Length (ft)	Slope (%)	Manning's n	Max. Headwater (ft)	Tailwater (ft)	Entrance Loss Coef. (Ke)
124.00	1.00	0.0150	3.00	0.00	0.90

Culvert Results:

Design Discharge = 7.03 cfs

Minimum pipe diameter: 1 - 15 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)
#1	1	106.800	0.245	0.000	0.000	72.000	M	7.03	0.442
	Σ	**106.800**						**7.03**	**0.442**

Subwatershed Time of Concentration Details:

Stru #	SWS #	Land Flow Condition	Slope (%)	Vert. Dist. (ft)	Horiz. Dist. (ft)	Velocity (fps)	Time (hrs)
#1	1	5. Nearly bare and untilled, and alluvial valley fans	4.34	22.00	507.47	2.080	0.067
		8. Large gullies, diversions, and low flowing streams	2.38	70.50	2,963.43	4.620	0.178
#1	**1**	**Time of Concentration:**					**0.245**