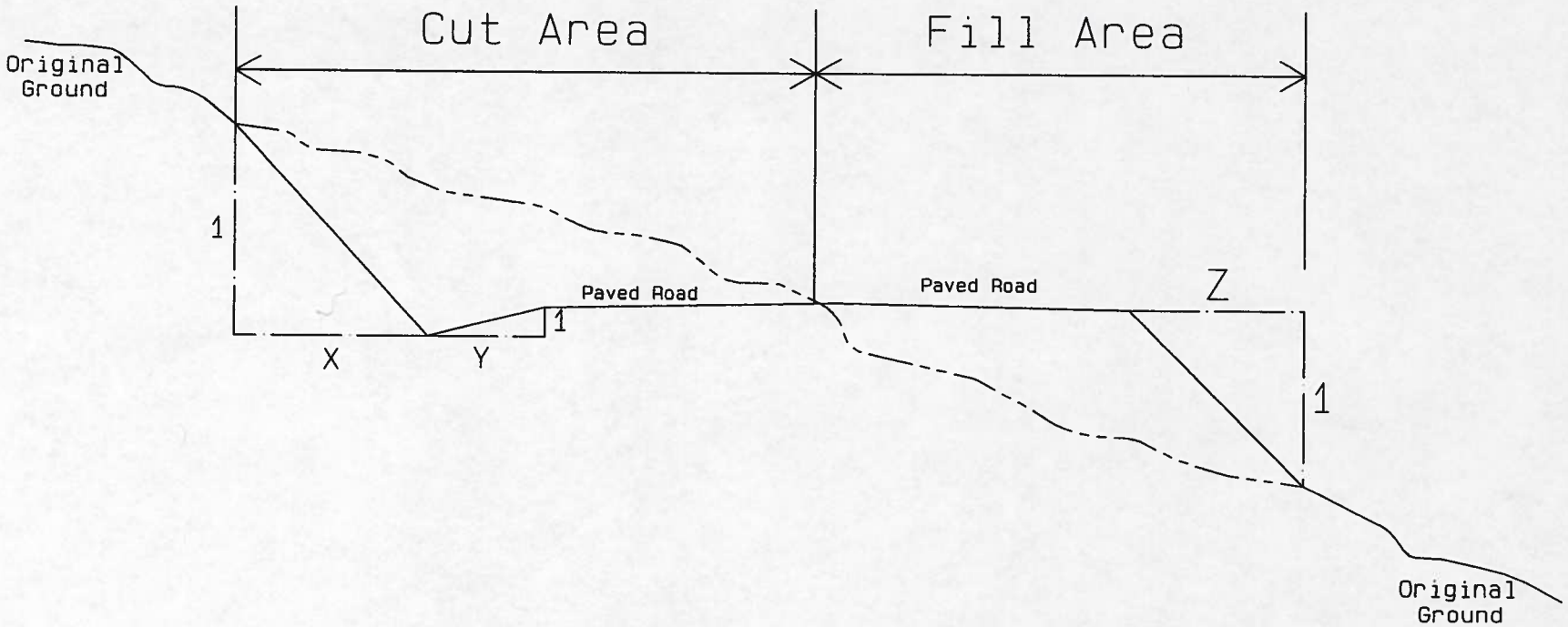
APPENDIX 11-M

AREA III MAIN ACCESS ROAD
VERIFICATION OF ADEQUACY OF SIDE DITCH AS-BUILT

(3/15/96)

Typical Side Ditch

"As Built"



	Minimum Slope	Maximum Slope
X	15.9	1.7
Y	13.9	2.1
Z	5.2	2.2

LEONARD RAYMOND
NEW MEXICO
6500
REGISTERED PROFESSIONAL ENGINEER
11-21-95

REV. NO.	DATE	DRAWN BY	REVISION DESCRIPTION	DWG.	E.M.	P.C.	R.S.	APPROVED
1	11/95	BTS	Submitted for OSM Approval					

BHP MINERALS INTERNATIONAL INC.
NAVAJO MINE
P.O. BOX 155 FRUITLAND, NEW MEXICO 87416

Area III Main Access Road
Typical Side Ditch

PREPARED BY BTS	DRAWN BY BTS	SCALE NOT TO SCALE
APPROVED BY LR	DATE Nov. 10, 1995	DWG. LOC.
DWG. NO. Exhibit 11-??	REF. DWG.	

BHP MINERALS
NAVAJO MINE

09-Nov-95

PROJECT: Area 3 Access Rd. Side ditch
ENGINEER BTS
FILE NO :
DRWG NO :
MMD REF:

Channel Design

Precipitation Event:	10yr-6hr		
Design Flow	Q10	2.58	CFS
Bottom Channel Width	W =	0.00	Ft (min)
Side Slopes (Z1:1)	Z1 =	1.70	Maximum
(Z2:1)	Z2 =	2.10	Maximum
Manning's Roughness Coefficient	n =	0.032	
Channel Bed Slope	S =	2.93	%

STAGE FLOW

Flow Depth (Ft)	Area (Sq Ft)	Hydraulic Radius	Discharge Rate (CFS)	Velocity (FPS)
0.00	0.00	0.00	0.00	0.00
0.25	0.12	0.11	0.22	1.82
0.50	0.48	0.22	1.38	2.90
0.75	1.07	0.33	4.07	3.80
1.00	1.90	0.44	8.76	4.61
1.25	2.97	0.55	15.90	5.36
1.50	4.28	0.66	25.87	6.05
1.75	5.82	0.77	39.05	6.71
2.00	7.60	0.88	55.77	7.34
2.25	9.62	0.99	76.39	7.94
2.50	11.88	1.11	101.20	8.52
2.75	14.37	1.22	130.53	9.08
3.00	17.10	1.33	164.66	9.63
3.25	20.07	1.44	203.90	10.16
3.50	23.28	1.55	248.51	10.68
3.75	26.72	1.66	298.78	11.18
4.00	30.40	1.77	354.96	11.68
4.25	34.32	1.88	417.33	12.16

Flow Depth at Peak Discharge	0.64	Ft
Minimum Channel Depth Required	0.94	Ft
Critical Depth	0.65	Ft
Flow Type	Supercritical flow	
Froude Number	0.75	
Flow Velocity	3.42	fps
Soil Type:	Silty sand with vegetation	
Erosive Velocity	3.50	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

BHP MINERALS
NAVAJO MINE

09-Nov-95

PROJECT: Area 3 Access Rd. Side ditch
ENGINEER BTS
FILE NO :
DRWG NO :
MMD REF:

Channel Design

Precipitation Event:	10yr-6hr		
Design Flow	Q10	2.58	CFS
Bottom Channel Width	W =	0.00	Ft (min)
Side Slopes (Z1:1)	Z1 =	15.90	Minimum
(Z2:1)	Z2 =	13.90	Minimum
Manning's Roughness Coefficient	n =	0.032	
Channel Bed Slope	S =	2.93	%

STAGE FLOW

Flow Depth (Ft)	Area (Sq Ft)	Hydraulic Radius	Discharge Rate (CFS)	Velocity (FPS)
0.00	0.00	0.00	0.00	0.00
0.25	0.93	0.12	1.84	1.98
0.50	3.73	0.25	11.71	3.14
0.75	8.38	0.37	34.57	4.12
1.00	14.90	0.50	74.53	5.00
1.25	23.28	0.62	135.23	5.81
1.50	33.53	0.75	220.03	6.56
1.75	45.63	0.87	332.06	7.28
2.00	59.60	1.00	474.31	7.96
2.25	75.43	1.12	649.59	8.61
2.50	93.13	1.25	860.62	9.24
2.75	112.68	1.37	1110.01	9.85
3.00	134.10	1.50	1400.31	10.44
3.25	157.38	1.62	1733.96	11.02
3.50	182.53	1.75	2113.35	11.58
3.75	209.53	1.87	2540.81	12.13
4.00	238.40	2.00	3018.63	12.66
4.25	269.13	2.12	3549.02	13.19

Flow Depth at Peak Discharge	0.29	Ft
Minimum Channel Depth Required	0.59	Ft
Critical Depth	0.29	Ft
Flow Type	Supercritical flow	
Froude Number	0.71	
Flow Velocity	2.18	fps
Soil Type: Silty sand with vegetation		
Erosive Velocity	3.50	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

HYDROLOGY CALCULATION FOR AREA III MAIN ACCESS ROAD

by

Name: Brian Sambirsky

Company Name: BHP MINERALS
File Name: B:\A3MAINRD

Date: 10-22-1995

Civil Software Design -- SEDCAD+ Version 3.1
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Company Name: BHP MINERALS
Filename: B:\A3MAINRD User: Brian Sambirsky
Date: 10-22-1995 Time: 16:47:14
Hydrology calculation for area III main access 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	5.00	80	M	0.049	0.000	0.000	0.0	0.08	2.58
		Type: Null			Label: area III road					
111	Structure	5.00							0.08	
111	Total IN/OUT	5.00							0.08	2.58

Civil Software Design -- SEDCAD+ Version 3.1
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Company Name: BHP MINERALS
Filename: B:\A3MAINRD User: Brian Sambirsky
Date: 10-22-1995 Time: 16:47:14
Hydrology calculation for area III main access 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	250.00	2.00	1.41	0.05	0.049		