DESIGN REPORT

Temporary Impoundment Structure

BM-TW

Black Mesa Mine

Navajo County, Arizona

For

PEABODY WESTERN COAL COMPANY

MAY 0 1 1998

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INTRODUCTION

Impoundment Structure BM-TW is an earthen embankment, designed and constructed by Peabody Western Coal Company as a temporary impoundment structure to collect runoff from portions of the facilities area at the Black Mesa Mine. BM-TW was constructed to collect runoff and wash water from the truck wash area as secondary control after the truck wash sump. BM-TW is not designed as a sediment control structure. The sediment control for the BM-TW watershed is incorporated into the designs for downstream sediment structure BM-SS assuming BM-TW is non-existent. The location of Structure BM-TW and its watershed boundary are shown on Drawing No. 85400 (Sheet K-10) and Drawing No. 85405. The site-specific general construction plans are shown on the attached Exhibit 1.

This design report contains information specific to Structure BM-TW. Mine-wide design, construction, and reclamation information is presented in the "General Report, Kayenta and Black Mesa Mines, Navajo County, Arizona, for Peabody Western Coal Company", December, 1985 (PAP), Chapter 6, Attachment D, Volume 2, along with the methods and results of analyses used for slope stability, hydrology, and hydraulics, and in Chapter 6, Pages 11 to 42, "Sediment and Water Control Facility Plan".

INSPECTION

The construction site of the Structure BM-TW was inspected in February, 1998 by a Registered Professional Engineer from Peabody Western Coal Company, to assure that the site is suitable and no adverse conditions exist for this structure. A detailed geotechnical investigation was not performed, rather, the information in Chapter 6, Attachment D was utilized for embankment design.

SITE DESCRIPTION

LAND USE

Structure BM-TW has a 5.5-acre tributary area and is located upstream of sediment structure BM-SS. The watershed is classified as 100% disturbed.

DESIGN ANALYSES

GENERAL

Structure BM-TW was designed under the supervision of a Registered Professional Engineer from Peabody Western Coal Company. The design was performed in accordance with applicable 30 CFR 780 and 816 regulations of the United States Department of Interior, Office of Surface Mining (OSM) and included a review of available project files. The most current information contained in the Peabody Western Coal Company files includes topographic maps developed from aerial photography flown in 1990 for Peabody Western Coal Company and was used in the analyses of the structure.

STABILITY

Structure BM-TW is a Category A-5 embankment. A homogeneous earthen embankment, compacted in lifts to design specifications, and approximately 10 feet wide on top was constructed. An upstream slope of a minimum 1.75:1 (horizontal to vertical) and a downstream slope of 3.25:1 was utilized. Based on the total embankment height of approximately 13 feet, these slopes are equal to or flatter than the recommended "worst case" embankment/foundation condition slopes in Table 3-6, Attachment D, Chapter 6; therefore, the embankment will be stable.

HYDROLOGY

The hydrologic analysis was completed using the computer program SEDCAD+ (see Appendices A and B). Structure BM-TW is classified as a low hazard structure (see Drawing No. 85408). In addition, the mine area is sparsely populated with no one living in the downstream floodplain. The structure will impound less than 20 acre-feet and be less than 20 vertical feet in height from the upstream toe of the embankment of the natural stream elevation to the spillway invert elevation.

BM-TW has an 18-inch diameter culvert spillway. Adequate storage capacity, however, will be maintained in the impoundment above the normal operating level and below the spillway invert to contain the storm runoff from the 25-year, 6-hour storm event with no discharge through the spillway. To assure that adequate storm water storage capacity is available, the operating water level in the impoundment will be maintained at or below elevation 6486.5. Water level will be controlled and excess stormwater runoff accumulations will be removed by pumping (see Chapter 6 dewatering discussion), as required. This design methodology and compliance with applicable regulatory requirements were verified through discussions with OSM personnel.

The following parameters were used in the hydrologic analysis:

		25-yr,6-hr Storm	
1.	Water Course length, L	0.171	mi.
2.	Elevation Difference, H	37	ft
3.	Time of Concentration, T_c	0.084	hr
4.	SCS Curve Number	91	
5.	Rainfall Depth, 25-year, 6-hour storm	1.9	in
6.	Drainage Area	5.5	acres

HYDRAULICS

The SEDCAD+ computer program was used to evaluate inflow to the impoundment structure. The initial conditions and results of the analysis are summarized in the following table (supporting calculations are presented in Appendices A and B).

BM-TW POND HYDRAULICS TABLE

	Units	25-Yr, 6-Hr Storm
Initial Reservoir Volume Condition		Full to emergency spillway
Inflow		
Peak Flow	cfs	8.75
Volume	ac-ft	0.49
Storage		
Spillway Invert	msl	6488.0
Peak Stage	msl	6488.0
Operational Elev.	msl	6486.5
Peak Storage	ac-ft	2.38
Storage Capacity	ac-ft	1.89
Top of Impoundment	msl	6491.1
Freeboard	ft	3.1

Notes: The Storage Capacity figure reflects available pond storage up to the defined Operational Elevation.

The Peak Storage figure reflects available pond storage up to the Peak Stage elevation and includes Storage Capacity plus stormwater inflow volume (1.89 + 0.49).

SPILLWAY

The existing spillway for BM-TW is a corrugated metal pipe with dimensions listed below. The alignment and dimensions are shown on Exhibit 1. As designed, operating water levels will be maintained at or below 6486.5 elevation such that peak stage for the 25-year, 6-hour storm is at or below the spillway invert.

Pipe Diameter	(Spillway)	1.5	ft
Pipe Length	(Spillway)	40	ft
Average Slope	(Spillway)	0.1	%
Spillway Elevation		6488	ft

* * *

The following appendices and drawing are attached and complete this design report.

Appendix A - Hydrology Calculations

Appendix B - SEDCAD+ (Input and Output) 100-Year, 6-Hour Storm Event

Exhibit # 1 - BM-TW Temporary Impoundment Design

APPENDIX A

Hydrology Calculations

PEABODY WESTERN COAL COMPANY
CALCULATED HYDROLOGIC DATA

PROJECT: TEMPORARY IMPOUNDMENT

STRUCTURE: BM-TW

TIME OF CONCENTRATION:

Start Elevation (ft) =	6515
End Elevation (ft) =	6478
Elevation Difference, E (ft) =	37
Watercourse Length (ft) =	905
Watercourse Length, L (mi) =	0.171

Tc = (11.9L^3/E)^0.385 = 0.084 hours

SCS CURVE NUMBER:

Cover Type	Soil Group	Curve Number	Area (acres)	CN*Area
Disturbed	C	91	5.54	504.14
TOTAL:			5.54	504.14

Weighted CN = Total CN*Area/ Total Area = 91

DRAINAGE BASIN AREA:

5.5 Acres

APPENDIX B

SEDCAD+ (Input and Output) 25-Year, 6-Hour Storm Event

CIVIL SOFTWARE DESIGN

SEDCAD+ Version 3

PEABODY WESTERN COAL COMPANY : BM-TW TEMPORARY IMPOUNDMENT

by

Name: D. GLEASON

Company Name: ACZ, INC.
File Name: J:\861\1000\SEDCAD\BM-TW

Date: 04-14-1998

Company Name: ACZ, INC.
Filename: J:\861\1000\SEDCAD\BM-TW User: D. GLEASON
Date: 04-14-1998 Time: 10:16:53
PEABODY WESTERN COAL COMPANY : BM-TW TEMPORARY IMPOUNDMENT
Storm: 1.90 inches, 25 year- 6 hour, SCS Type II
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	5.50	91	F	0.084	0.000	0.000	0.0	0.49	8.75
		Type: Null Label: POND BM-TW								
111	Structure	5.50							0.49	
111	Total IN/OUT	5.50							0.49	8.75