AS-BUILT REPORT

Permanent Impoundment

J21-C

Kayenta Mine

Navajo County, Arizona

Peabody Coal Company

JUL 09 1991

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INTRODUCTION

Sedimentation structure J21-C is an earthen embankment constructed in 1991 by Peabody Coal Company as a permanent impoundment structure to control runoff and sediment from disturbed areas at the Kayenta Mine. The location of structure J21-C and its watershed boundary is shown on Drawing No. 85400 (Sheet N-10), and Drawing No. 85405. The site-specific details and dimensions are shown on the attached J21-C (as-built) drawing.

This as-built report contains specific information based on an evaluation of J21-C located in series with sedimentation structure J21-C2. In addition, the spillway design for J21-C was evaluated using the 50- and 100-year, 6-hour storm without J21-C in series with J21-C2. This will be the condition in 2015 when J21-C2 is reclaimed and J21-C remains as a permanent structure. Regional site information is presented in the "General Report, Kayenta and Black Mesa Mines, Navajo County, Arizona for Peabody 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.

INSPECTION

The construction site of structure J21-C was inspected by a Registered Professional Engineer from Peabody Coal Company to ensure that the location was suitable and no adverse conditions existed to prevent the successful construction of the structure. A detailed geotechnical investigation was not performed, rather, the information in Chapter 6, Attachment D was utilized for embankment design and construction. An embankment category (A-3) was determined during construction. Periodic inspections were also conducted during construction.

SITE DESCRIPTION

Land Use

Structure J21-C has a 782-acre drainage area and is located on a tributary to Dinnebito Wash. The watershed is classified as 14 percent pinyon-juniper, 14 percent sagegrass, 28 percent disturbed, and 44 percent reclaimed.

DESIGN ANALYSES

General

Structure J21-C was designed by a Registered Professional Engineer from Peabody Coal Company. The design was performed in accordance with applicable 30 CFR 780 and 816 regulation 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 Peabody Coal Company files, including topographic maps developed from aerial photography flown in 1984, was used in the analyses of the structure. The as-built drawing was generated by the performance of field surveys and the use of aerial photography.

Stability

A homogeneous earthen embankment, compacted in lifts to design specification, a minimum of 14 feet wide, was constructed. An upstream slope of 3.2:1 (horizontal to vertical) and a downstream slope of 5.3:1 were used. Based on an embankment height of 19 feet, these slopes are flatter than the recommended slopes in Table 3-6, Attachment D, Chapter 6; therefore, the embankment will be stable. The principal spillway is a 36-inch diameter perforated drop inlet, corrugated metal pipe, and an 84-inch diameter corrugated metal pipe, trickle tube. The emergency spillway is an 83-foot wide, riprap lined trapezoidal channel.

Hydrology

The hydrologic analysis was completed using the generalized computer program SEDCAD+ (see Appendices A, B, C, and D). Structure J21-C is located downstream from structure J21-C2. The two structures have a combined capacity that is greater than 20 acre-feet. Therefore, the spillway was analyzed using the 50-year, 6-hour storm for a permanent impoundment and the 100-year, 6-hour storm. Structure J21-C2 was assumed to be reclaimed and structure J21-C was conservatively assumed to be full to the emergency spillway at the time of the 50- and 100-year storm. The treatment capability and storage capacity of structure J21-C was analyzed using the 10-year, 24-hour storm. The pond was conservatively assumed to be full of sediment and water to the bottom orifice on the perforated riser pipe at the time of the 10-year storm.

The following parameters were used in the hydrologic analysis:

1.	Water Course Length, L	2.37 mi
2.	Elevation Difference, H	430 ft
3.	Time of Concentration, Tc	0.356 hr
4.	SCS Curve Number	80
5.	Rainfall Depth, 10-year, 24-hour storm . .	2.1 in
	50-year, 6-hour storm . .	2.2 in
	100-year, 6-hour storm . .	2.4 in
6.	Drainage Area	782.0 ac

Hydraulics

The SEDCAD+ and Dodson Trapezoidal Channel computer programs were used to evaluate inflow to the sedimentation structure, outflow from the structure, and the resulting water surface elevations. The 10-year storm was routed through structure J21-C2 and into structure J21-C. The 50- and 100-year storm was analyzed with structure J21-C2 reclaimed. The initial conditions and results of the spillway analysis are summarized in the following J21-C hydraulics table.

J21-C HYDRAULICS TABLE

	Units	10-Year 24-Hour Storm	50-Year 6-Hour Storm	100-Year 6-Hour Storm
Initial Reservoir Volume				
Condition		Full to bottom of perforated riser elevation	Full to emergency spillway elevation	Full to emergency spillway elevation
Inflow				
Peak Flow	cfs	265.5	371.9	445.1
Volume	acre-ft	44.6	49.0	58.0
Storage				
Peak Stage	ft	6894.3	6896.0	6896.2
Emerg. Spillway Elev.	ft	6894.5	6894.5	6894.5
Peak Storage	acre-ft	19.2	24.1	24.6
Storage Capacity	acre-ft	19.8	19.8	19.8
Outflow				
Peak Flow	cfs	227.4	363.2	433.0
Embankment Crest Elevation.	ft	6898.0	6898.0	6898.0
Peak Stage	ft	14.9	16.6	16.8
Freeboard	ft	3.7	2.0	1.8
Principal Spillway				
Slope	%	1.9	-	-
Manning's "n"		0.019	-	-
Emergency Spillway Channel				
Flow Depth	ft	-	1.5	1.7
Critical Velocity	fps	-	5.1	5.4
Manning's "n"		-	0.040	0.040
Outflow Channel				
Slope	%	-	7.6	7.6
Normal Velocity	fps	-	7.1	7.6
Normal Depth	ft	-	0.6	0.7
Manning's "n"		-	0.040	0.040

Principal Spillway

The principal spillway for J21-C will be a 36-inch diameter perforated drop inlet, corrugated metal pipe and an 84-inch diameter corrugated metal pipe, trickle tube with the following dimensions:

Perforated Drop Inlet Pipe

Riser Diameter	36.0 in.
Barrel Diameter	36.0 in.
Pipe Length	180 ft.
Average Slope	1.9 %
Inlet Elevation	6889.5
Lowest Orifice Elevation	6882.5
Perforations	5 layers with 5 holes each layer, 4-inch diameter.

Trickle Tube Pipe

Barrel Diameter	84 in.
Pipe Length	72 ft.
Average Slope	2 %
Inlet Elevation	6889.5

Emergency Spillway and Outlet Channel

The emergency spillway and outlet channel for J21-C will be a trapezoidal channel with the following dimensions:

Minimum Channel Depth (Spillway)	2.7 ft.
(Outflow)	1.7 ft.
Channel Width	83 ft.
Channel Length (Spillway)	56 ft.
(Outflow)	520 ft.
Side Slopes (Horizontal to Vertical)	3:1 or flatter
Average Exit Slope (Spillway)	0 percent
(Outflow)	7.6 percent
Inlet Elevation	6894.5

The outflow channel has erosion protection at the outlet of the drop inlet corrugated metal pipe, trickle tube, and emergency spillway channel.

Storage Capacity

The impoundment volume-elevation table is based on site-specific aerial topography and field surveys (see J21-C (as-built) drawing).

The calculations for the sediment load entering structure J21-C were made utilizing the Revised Universal Soil Loss Equation with the following parameters:

1. Rainfall Factor, R 40
2. Soil Erodibility Factor, K 0.26
3. Slope Factor, LS 1.71
4. Cover Factor, C 0.21
5. Erosion Control Factor, P 0.76

The hydrologic analysis provides the storage volume required to treat the 10-year, 24-hour storm, and defines the remaining storage volume available for storing sediment. The proposed storage capacity of J21-C and the results of the sediment inflow analysis are summarized in the following table.

J21-C STORAGE

Total Storage Capacity	19.81 acre-ft
Active Storage Capacity	18.79 acre-ft
Sediment Storage Capacity	1.02 acre-ft
Sediment Inflow Rate	0.480 acre-ft/yr
Sediment Storage Life	2.1 years

Conclusion

A water quality analysis of J21-C was performed for settleable solids utilizing the SEDCAD+ computer model. NPDES Permit No. AZ0022179 issued to Peabody Coal, limits the discharge of settleable solids as the result of a rainfall event less than or equal to a 10-year, 24-hour precipitation event to a daily maximum of 0.5 ml/l. The result of the SEDCAD+ computer analysis indicates that J21-C will comply with the NPDES requirements.

Bond Release Review

Prior to bond release by the regulatory authorities, Peabody Coal Company will utilize a qualified Registered Professional Engineer to review the performance standard required for J21-C. The Engineer will recommend remedial work, if required, to modify or upgrade J21-C to assure compliance with the permanent impoundment regulations, proposed postmining land

use, and with the livestock and wildlife facility requirements in Chapter 23, Revegetation Plan, of the approved permit. The final permanent impoundment remedial plan for structure J21-C will be submitted to OSMRE approximately one year prior to final bond release.

The following appendices and drawing are attached and complete this as-built report:

Appendix A - Hydrology and Hydraulic Calculations

Appendix B - SEDCAD+ (Input and Output) 10-Year, 24-Hour Storm

Appendix C - SEDCAD+ (Input and Output) 50-Year, 6-Hour Storm

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

J21-C (As-Built) Drawing