

PEABODY WESTERN COAL COMPANY

For

Navajo County, Arizona

Kayenta Mine

N9-C (Lower)

Temporary Sedimentation Structure

DESIGN REPORT

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EXHIBIT # 1 -N9-C1, and N9-C Proposed Sedimentation Ponds

The construction site of the proposed Structure N9-C was inspected in October, 2004 by a Registered Professional Engineer from Woodson Engineering, to assure that the site is suitable and no adverse conditions exist to prevent the successful construction of this structure. A detailed geotechnical investigation was not performed; rather, the information in Chapter 6, Attachment D was utilized for embankment design and will be utilized during construction to construct a stable embankment.

INSPECTION

This design report contains information specific to Structure N9-C that is in series with sedimentation structure N9-C1. N9-C is the lower pond in the series. 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".

Sedimentation Structure N9-C will be an earthen embankment, designed and constructed by Peabody Western Coal Company (PWC) as a temporary sedimentation structure to control runoff and sediment from portions of the N9 disturbed surface mining area at the Kayenta Mine. The location of Structure N9-C and its watershed boundary are shown on Drawing No. 85400, (Sheet K-6), and Drawing No. 85405. The site-specific general construction plans are shown on the attached Exhibit 1.

INTRODUCTION

SITE DESCRIPTION

The N9-C1 and N9-C Structures have a combined watershed of 496.49 acres and are located on a tributary upstream of Yellow Water Canyon Wash at the Kayenta Mine. The 19.25-acre watershed, which contributes directly to structure N9-C, is classified as 56% undisturbed and 44% spoil.

LAND USE

DESIGN ANALYSES

GENERAL

Structure N9-C 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 1983 for Peabody Western Coal Company and was used in the analyses of the structure

STABILITY

Structure N9-C is assumed to be a Category A-3 embankment. The structure will be a homogeneous earthen embankment, compacted in lifts to design specifications, and approximately 15 feet wide on top. A minimum upstream slope of 2H:1V and minimum downstream slope of 4H:1V were assumed. Based on the total embankment height of approximately 19.5 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. The emergency spillway will be a minimum 45-foot wide, riprap-lined, trapezoidal channel.

HYDROLOGY

The hydrologic analysis was completed using the computer program SEDCAD4 (see Appendices A, B, and C). Structure N9-C will be constructed in series with proposed Structure N9-C1. Structure N9-C is the lower pond in the series and 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 emergency spillway invert elevation. The two structures have a combined capacity greater than 20 acre-feet; therefore, the spillway was analyzed using the 100-year, 6-hour storm event in lieu of the 25-year, 6-hour storm. The structure was conservatively assumed to be full to the emergency spillway at the time of 100-year storm event. The storage capacity of structure N9-C was analyzed using the 10-year, 24-hour storm event. The combined ponds in series were verified to completely contain the 10-year, 24-hour storm event, and provide adequate sediment storage volume, without discharging into the Yellow Water Canyon Wash.

The following parameters were used in the hydrologic analysis:

1.	Water Course length, L	0.068 mi.
2.	Elevation Difference, H	20 ft
3.	Time of Concentration, T _c	0.036 hr
4.	NRCS Curve Number	79
5.	Rainfall Depth, 10-year, 24-hour storm 100-year, 6-hour storm	2.1 in 2.4 in
6.	Drainage Area	19.25 acres

Values reported represent the watershed, which drains directly to Pond N9-C. Hydrologic input parameters for structure N9-C1 are presented in a separate design report.

Muskingum routing parameters were utilized to route the 100-year hydrographs between the two structures. The routing parameters are presented in Appendices B and C, and are shown on a sub-watershed basis.

HYDRAULICS

The SEDCAD⁴ and HYDROCALC computer programs were used to evaluate inflow to the sedimentation structure, outflow from the structure and the resulting water surface elevations. The initial conditions and results of the analysis are summarized in the following table (supporting calculations are presented in Appendices A, B, and C).

N9-C SEDIMENTATION POND HYDRAULICS TABLE

	Units	10-Yr, 24-Hr Storm	100-Yr, 6-Hr Storm
Initial Reservoir Volume Condition		Empty	Full to emergency spillway
Inflow			
Peak Flow	cfs	12.88	405.59
Volume	ac-ft	0.93	40.25
Storage			
Peak Stage	msl	N/A	6638.3
Emerg. Spillway Elev.	msl	6636.1	6636.1
Peak Storage	ac-ft	N/A	23.6
Storage Capacity	ac-ft	19.63	19.63
Outflow			
Peak Flow	cfs	N/A	382.4
Spillway Elevation	msl	6636.1	6636.1
Embankment Crest Elev.	msl	6639.9	6639.9
Peak Stage	msl	--	6638.3
Freboard	ft	--	1.6
Emergency Spillway Channel			
Flow Depth	ft	--	2.2
Critical Velocity	fps	--	6.27
Mannings "n"	--	--	0.048
Width	ft	--	45
Outflow Channel			
Slope	%	--	25
Normal Velocity	fps	--	9.95
Normal Depth	ft	--	0.9
Mannings "n"	--	--	0.065
Riprap D ₅₀	in	--	9

1.	Rainfall Factor, R	40
2.	Soil Erodibility Factor, K	0.20
3.	Slope Factor, LS	3.74
4.	Cover Factor, C	0.56
5.	Erosion Control Factor, P	0.91

Universal Soil Loss Equation with the following parameters:

The calculations for the sediment load entering structure N9-C were made utilizing the Revised approximately 19.63 acre-foot.

The impoundment stage-capacity table (see Exhibit 1) is based on the 1983 aerial topographic mapping conducted for Peabody Western Coal Company. Structure N9-C is designed to contain

STORAGE CAPACITY

as a transition into the downstream channel.

A minimum 15-foot long riprap-lined channel will be constructed beyond the toe of the embankment

Minimum Channel Depth	(Spillway)	3.5	ft
Channel Width	(Spillway)	45	ft
Channel Length	(Spillway)	38	ft
Sideslopes (Horizontal to Vertical)		3:1	or flatter
Average Slope	(Spillway)	0	%
Maximum Slope	(Outflow)	25	%
Spillway Elevation		6636.1	ft

listed below. The alignment and dimensions are shown on Exhibit 1.

The emergency spillway and outlet channel for N9-C will be a trapezoidal channel with dimensions

EMERGENCY SPILLWAY AND OUTLET CHANNEL

Exhibit #1- N9-C1 and N9-C Proposed Sedimentation Ponds

Appendix C- SEDCAD4 (Input and Output) 100-Year, 6-Hour Storm Event

Appendix B- SEDCAD4 (Input and Output) 10-Year, 24-Hour Storm Event

Appendix A- Hydrology, Hydraulic, and Sedimentation Calculations

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

* * *

	N9-C1 (UPPER)	N9-C (LOWER)	COMBINED
Total Storage Capacity (ac-ft)	19.62	19.63	39.25
10-Year, 24-Hour Storm Inflow (ac-ft)	30.40	0.93	31.33
Available Sediment Storage Capacity (ac-ft)	-	-	7.92
Sediment Inflow Rate/Year (ac-ft/yr)	2.00	0.13	2.13
Sediment Storage Life (yr)	-	-	3.7

Combined Storage for Structures N9-C1 and N9-C

The hydrologic analysis gives the storage volume required to contain the 10-year, 24-hour storm, and the remaining storage volume available for storing sediment. Structure N9-C has sufficient storage capacity to contain the 10-year, 24-hour storm and has additional capacity to store excess runoff from the N9-C1 watersheds. The combined storage capacity was determined for all three structures in series and the results of the analysis are presented in the following table.

Hydrology, Hydraulic, and Sedimentation Calculations

APPENDIX A

**PEABODY WESTERN COAL COMPANY
CALCULATED HYDROLOGIC DATA**

PROJECT: N-9 MINING AREA

STRUCTURE: C

TIME OF CONCENTRATION:

Start Elevation (ft) = 6640

End Elevation (ft) = 6620

Elevation Difference, E (ft) = 20

Watercourse Length (ft) = 357

Watercourse Length (mi) = 0.068

$T_c = (11.9L\sqrt{3}/E)\sqrt{0.385} = 0.036$ hours

ROUTING PARAMETERS:

Between structure routing parameters were calculated using the SCS Upland method in SEDCAD4. Input and output parameters are shown on the SEDCAD4 printouts in Appendices C.

SCS CURVE NUMBER:

Cover Type	Soil Group	Curve Number	Area (acres)	CN*Area
Pinyon Juniper	B	65	1.717	111.605
Pinyon Juniper	D	83	5.521	458.243
Saltbrush	B	60	2.705	162.3
Saltbrush	D	79	0.804	63.516
Sagebrush	B	60	0.025	1.5
Disturbed Land	B	86	8.48	729.28
TOTAL:				1526.444
				19.252

Weighted CN = Total CN * Area / Total Area =

79

Note: During Operations the open pit will collect most of the runoff from disturbed areas. The worst case is when the open pit is reclaimed and runoff from a larger area or regraded soil reports directly to the pond.

DRAINAGE BASIN AREA:

19.252 Acres

PEABODY WESTERN COAL COMPANY
CALCULATED SEDIMENTOLOGY DATA

STRUCTURE: C

SOIL ERODIBILITY FACTOR:

Soil Type	Erodibility Factor, K	Area	K*Area
11C	0.49	0.152	0.07
12AB	0.43	3.172	1.36
3CD	0.16	5.923	0.95
3F	0.02	0.402	0.01
13A	0.37	1.123	0.42
Disturbed	0.12	8.48	1.02
TOTAL		19.252	3.83

Weighted K = Total K * Area / Total Area =

0.20

SLOPE FACTOR:

Length (ft)	Slope (%)	m	Slope Angle (deg)	LS Factor
668	7.49%	0.50	4.28	2.54
488	11.27%	0.60	6.43	4.33
649	7.70%	0.50	4.41	2.57
617	12.16%	0.60	6.93	5.51

Average LS = 3.74

The LS Factor was calculated by:

LS=(Slope Length/72.6)^m*(10.8sin(slope angle)+.03) for slopes < 9%
 LS=(Slope Length/72.6)^m*(16.8sin(slope angle)-0.5) for slopes > 9%

Where:

- Slope < 3% m = 0.3
- Slope = 4% m = 0.4
- 5% < Slope < 10% m = 0.5
- Slope > 10% m = 0.6

STRUCTURE: C

Cover and Practice Factors:

Cover Type	Cover (%)	Canopy (%)	Area (acres)	Cover Factor, C	C * Area	Practice Factor, P	P * Area	
Pinyon Juniper	40%	25%	7.238	0.22	1.59	1.00	7.238	
Sagebrush, Grass	40%	25%	0.025	0.2	0.01	1.00	0.025	
Saltbrush	40%	25%	3.509	0.2	0.70	1.00	3.509	
Disturbed	0%	0%	8.48	1	8.48	0.80	6.784	
TOTAL:							19.252	10.78
							17.56	

Weighted C = Total C * Area / Total Area = 0.56
 Weighted P = Total P * Area / Total Area = 0.91

RAINFALL FACTOR:
 R = 40

**PEABODY WESTERN COAL COMPANY
CALCULATED SEDIMENT YIELD**

STRUCTURE: C

The following spreadsheet calculates the predicted sediment yield for the project area. The gross sediment yield is determined according to the Revised Universal Soil Loss Equation.

PARAMETER DESCRIPTION	VALUE
Annual Rainfall Factor (R)	40.00
Soil Erodibility Factor (K)	0.20
Length Slope Factor (L)	3.74
Cover Factor(C)	0.56
Practice Factor (P)	0.91
Gross Annual Sediment Yield	15.18 tons/acre/year
Sediment Density	94.00 pcf
Gross Annual Sediment Yield	0.0074 acre-feet/acre/year
Sediment Delivery Ratio	90%
Estimated Annual Sediment Yield	0.0067 acre-feet/acre/year
Watershed Area	19.25 acres
Watershed Annual Sediment Yield	0.13 acre-feet/year
Number of Years	1.00 years
Calculated Sediment Volume	0.13 acre-feet

TRAPEZOIDAL CHANNEL ANALYSIS
CRITICAL DEPTH COMPUTATION

February 9, 2005

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PROGRAM INPUT DATA

DESCRIPTION	VALUE
Flow Rate (cfs)	405.59
Channel Bottom Slope (ft/ft)	0.005
Manning's Roughness Coefficient (n-value)	0.048
Channel Left Side Slope (horizontal/vertical)	3.0
Channel Right Side Slope (horizontal/vertical)	3.0
Channel Bottom Width (ft)	45.0

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COMPUTATION RESULTS

DESCRIPTION	VALUE
Critical Depth (ft)	1.32
Critical Slope (ft/ft)	0.0317
Flow Velocity (fps)	6.27
Froude Number	1.0
Velocity Head (ft)	0.61
Energy Head (ft)	1.93
Cross-Sectional Area of Flow (sq ft)	64.68
Top Width of Flow (ft)	52.93

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HYDROCALC Hydraulics for Windows, Version 1.0 Copyright (c) 1996
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 Phone: (281) 440-3787, Fax: (281) 440-4742, Email: software@dodson-hydro.com
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Design Discharge:	405.59 cfs
Depth:	0.86 ft
Top Width:	50.14 ft
Velocity:	9.95 fps
X-Section Area:	40.77 sq ft
Hydraulic Radius:	0.809
Froude Number:	1.94
Manning's n:	0.0650
Dmin:	5.00 in
D50:	9.00 in
Dmax:	12.00 in

PADER Method - Steep Slope Design

Bottom Width (ft)	Left Side Slope Ratio	Right Side Slope Ratio	Slope (%)	Freeboard	Depth (ft)	% of Depth	Freeboard Mult. x (VxD)
45.00	3.0:1	3.0:1	25.0	4.14			

Trapezoidal Channel

Material: Riprap

N9-C POND OUTFLOW CHANNEL

SEDCAD4 (Input and Output) 10-Year, 24-Hour Storm Event

APPENDIX B

Peabody Western Coal
Kayenta Mine
N9-C POND DESIGN
10YR 24HR STORM

Gary Altsisi

General Information

Storm Information:

Storm Type:	NRCS Type II
Design Storm:	10 yr - 24 hr
Rainfall Depth:	2.100 Inches

Structure Summary:

#	Immediate Contributing Area (ac)	Total Contributing Area (ac)	Peak Discharge (cfs)	Total Runoff Volume (ac-ft)
#1	19.250	19.250	12.88	0.93

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	19.250	0.036	0.000	0.000	79.000	F	12.88	0.934
Σ		19.250						12.88	0.934

SEDCAD4 (Input and Output) 100-Year, 6-Hour Storm Event

APPENDIX C

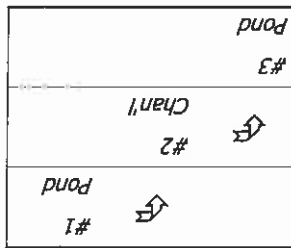
Peabody Western Coal
Kayenta Mine
N9-C POND DESIGN
100YR 6HR STORM

Gary Altsisi

General Information

Storm Information:

Storm Type:	NRCS Type II
Design Storm:	100 yr - 6 hr
Rainfall Depth:	2.400 inches



Type	#	Stru (flows into)	#	Musk. K (hrs)	Musk. X	Description
Pond	# 1	<=>	# 2	0.000	0.000	N9-C1 POND
Channel	# 2	<=>	# 3	0.000	0.000	N9-C1 SPILLWAY
Pond	# 3	<=>	End	0.000	0.000	N9-C POND

Structure Networking:

Structure Summary:

	Immediate Contributing Area (ac)	Total Contributing Area (ac)	Peak Discharge (cfs)	Total Runoff Volume (ac-ft)
#1 In	477.240	477.240	463.17	39.01
#1 Out			400.26	39.01
#2	0.000	477.240	400.26	39.01
In	19.250	496.490	405.59	40.25
#3 Out			382.43	40.25

Structure Detail:

Structure #1 (Pond)

N9-C1 POND

Pond Inputs:

Initial Pool Elev:	6,654.40
Initial Pool:	19.62 ac-ft

Emergency Spillway

Spillway Elev	6,654.40	Crest Length (ft)	45.00	Left Sideslope	3.00:1	Right Sideslope	3.00:1	Bottom Width (ft)	35.00
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Pond Results:

Dewatering time is calculated from peak stage to lowest spillway

Peak Elevation:	6,656.97
Dewater Time:	0.24 days

Elevation-Capacity-Discharge Table

Elevation	Area (ac)	Capacity (ac-ft)	Discharge (cfs)	Dewater Time (hrs)
6,640.00	0.911	0.000	0.000	0.000
6,640.50	0.939	0.463	0.000	0.000
6,641.00	0.968	0.939	0.000	0.000
6,641.50	0.997	1.430	0.000	0.000
6,642.00	1.026	1.936	0.000	0.000
6,642.50	1.056	2.457	0.000	0.000
6,643.00	1.086	2.992	0.000	0.000
6,643.50	1.117	3.543	0.000	0.000
6,644.00	1.148	4.110	0.000	0.000
6,644.50	1.180	4.692	0.000	0.000
6,645.00	1.212	5.290	0.000	0.000
6,645.50	1.243	5.903	0.000	0.000
6,646.00	1.274	6.532	0.000	0.000
6,646.50	1.305	7.177	0.000	0.000
6,647.00	1.337	7.838	0.000	0.000
6,647.50	1.369	8.514	0.000	0.000
6,648.00	1.402	9.207	0.000	0.000

Elevation (ac)	Area (ac)	Capacity (ac-ft)	Discharge (cfs)	Dewater Time (hrs)
6,648.50	1.435	9.916	0.000	
6,649.00	1.468	10.642	0.000	
6,649.50	1.502	11.384	0.000	
6,650.00	1.536	12.144	0.000	
6,650.50	1.572	12.921	0.000	
6,651.00	1.609	13.716	0.000	
6,651.50	1.646	14.530	0.000	
6,652.00	1.684	15.362	0.000	
6,652.50	1.722	16.214	0.000	
6,653.00	1.760	17.084	0.000	
6,653.50	1.799	17.974	0.000	
6,654.00	1.838	18.883	0.000	
6,654.40	1.870	19.625	0.000	Spillway #1
6,654.50	1.875	19.812	7.649	2.15
6,655.00	1.899	20.755	45.856	1.30
6,655.50	2.154	21.768	84.064	1.30
6,656.00	2.425	22.912	174.574	0.50
6,656.50	2.712	24.196	279.950	0.30
6,656.97	2.997	25.544	400.263	0.25 Peak Stage
6,657.00	3.014	25.626	407.605	
6,657.50	3.333	27.212	563.656	
6,658.00	3.668	28.962	745.489	
6,658.50	4.019	30.883	952.365	
6,659.00	4.385	32.983	1,172.390	
6,659.50	4.767	35.270	1,420.010	

Detailed Discharge Table

Combined Total Discharge (cfs)	Emergency Spillway (cfs)	Elevation
0.000	0.000	6,640.00
0.000	0.000	6,640.50
0.000	0.000	6,641.00
0.000	0.000	6,641.50
0.000	0.000	6,642.00
0.000	0.000	6,642.50
0.000	0.000	6,643.00
0.000	0.000	6,643.50
0.000	0.000	6,644.00

Structure #2 (Riprap Channel)

N9-C1 SPILLWAY

Trapezoidal Riprap Channel Inputs:

Material: Riprap

Combined	Elevation	Emergency	Total	Discharge
	(cfs)	Spillway (cfs)		(cfs)
6,644.50	0.000	0.000	0.000	
6,645.00	0.000	0.000	0.000	
6,645.50	0.000	0.000	0.000	
6,646.00	0.000	0.000	0.000	
6,646.50	0.000	0.000	0.000	
6,647.00	0.000	0.000	0.000	
6,647.50	0.000	0.000	0.000	
6,648.00	0.000	0.000	0.000	
6,648.50	0.000	0.000	0.000	
6,649.00	0.000	0.000	0.000	
6,649.50	0.000	0.000	0.000	
6,650.00	0.000	0.000	0.000	
6,650.50	0.000	0.000	0.000	
6,651.00	0.000	0.000	0.000	
6,651.50	0.000	0.000	0.000	
6,652.00	0.000	0.000	0.000	
6,652.50	0.000	0.000	0.000	
6,653.00	0.000	0.000	0.000	
6,653.50	0.000	0.000	0.000	
6,654.00	0.000	0.000	0.000	
6,654.40	0.000	0.000	0.000	
6,654.50	7.649	7.649	7.649	
6,655.00	45.856	45.856	45.856	
6,655.50	84.064	84.064	84.064	
6,656.00	174.574	174.574	174.574	
6,656.50	279.950	279.950	279.950	
6,657.00	407.605	407.605	407.605	
6,657.50	563.656	563.656	563.656	
6,658.00	745.489	745.489	745.489	
6,658.50	952.365	952.365	952.365	
6,659.00	1,172.390	1,172.390	1,172.390	
6,659.50	1,420.010	1,420.010	1,420.010	

Elevation-Capacity-Discharge Table

Dewatering time is calculated from peak stage to lowest spillway

Peak Elevation:	6,638.27
Dewater Time:	0.26 days

Pond Results:

Spillway Elev	6,636.10	Crest Length (ft)	38.40	Left Sideslope	3.00:1	Right Sideslope	3.00:1	Bottom Width (ft)	45.00
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Emergency Spillway

Initial Pool Elev:	6,636.10
Initial Pool:	19.63 ac-ft

Pond Inputs:

N9-C POND

Structure #3 (Pond)

Design Discharge:	400.26 cfs	Depth:	0.96 ft	Top Width:	40.74 ft	Velocity:	11.05 fps
						X-Section Area:	36.21 sq ft
						Hydraulic Radius:	0.882
						Froude Number:	2.07
						Manning's n:	0.0620
						Dmin:	5.00 in
						D50:	9.00 in
						Dmax:	12.00 in

PADER Method - Steep Slope Design

Riprap Channel Results:

Freeboard	Freeboard	Depth (ft)	% of Depth	Freeboard	Freeboard	Freeboard	Freeboard	Freeboard	Freeboard	Freeboard

Elevation	Area (ac)	Capacity (ac-ft)	Discharge (cfs)	Dewater Time (hrs)
6,620.00	0.700	0.000	0.000	0.000
6,620.50	0.733	0.358	0.000	0.000
6,621.00	0.766	0.733	0.000	0.000
6,621.50	0.800	1.125	0.000	0.000
6,622.00	0.835	1.533	0.000	0.000
6,622.50	0.871	1.960	0.000	0.000
6,623.00	0.908	2.405	0.000	0.000
6,623.50	0.945	2.868	0.000	0.000
6,624.00	0.983	3.350	0.000	0.000
6,624.50	1.021	3.851	0.000	0.000
6,625.00	1.061	4.371	0.000	0.000
6,625.50	1.082	4.907	0.000	0.000
6,626.00	1.103	5.453	0.000	0.000
6,626.50	1.124	6.010	0.000	0.000
6,627.00	1.145	6.577	0.000	0.000
6,627.50	1.167	7.155	0.000	0.000
6,628.00	1.189	7.744	0.000	0.000
6,628.50	1.211	8.344	0.000	0.000
6,629.00	1.233	8.955	0.000	0.000
6,629.50	1.255	9.577	0.000	0.000
6,630.00	1.278	10.210	0.000	0.000
6,630.50	1.321	10.860	0.000	0.000
6,631.00	1.365	11.531	0.000	0.000
6,631.50	1.409	12.225	0.000	0.000
6,632.00	1.455	12.941	0.000	0.000
6,632.50	1.501	13.680	0.000	0.000
6,633.00	1.547	14.442	0.000	0.000
6,633.50	1.595	15.227	0.000	0.000
6,634.00	1.643	16.036	0.000	0.000
6,634.50	1.692	16.870	0.000	0.000
6,635.00	1.741	17.728	0.000	0.000
6,635.50	1.727	18.595	0.000	0.000
6,636.00	1.714	19.455	0.000	0.000
6,636.10	1.711	19.627	0.000	Spillway #1
6,636.50	1.754	20.319	33.685	3.10
6,637.00	1.808	21.210	75.802	1.75
6,637.50	1.863	22.127	177.360	0.80
6,638.00	1.918	23.072	304.441	0.35
6,638.27	1.948	23.588	382.426	0.20 Peak Stage
6,638.50	1.975	24.046	451.538	
6,639.00	2.032	25.047	634.377	

Elevation	Area (ac)	Capacity (ac-ft)	Discharge (cfs)	Dewater Time (hrs)
6,639.50	2.090	26.078	846.252	
6,640.00	2.149	27.138	1,093.674	

Detailed Discharge Table

Combined	Total	Emergency	Spillway (cfs)	Discharge (cfs)
6,620.00	0.000	0.000	0.000	0.000
6,620.50	0.000	0.000	0.000	0.000
6,621.00	0.000	0.000	0.000	0.000
6,621.50	0.000	0.000	0.000	0.000
6,622.00	0.000	0.000	0.000	0.000
6,622.50	0.000	0.000	0.000	0.000
6,623.00	0.000	0.000	0.000	0.000
6,623.50	0.000	0.000	0.000	0.000
6,624.00	0.000	0.000	0.000	0.000
6,624.50	0.000	0.000	0.000	0.000
6,625.00	0.000	0.000	0.000	0.000
6,625.50	0.000	0.000	0.000	0.000
6,626.00	0.000	0.000	0.000	0.000
6,626.50	0.000	0.000	0.000	0.000
6,627.00	0.000	0.000	0.000	0.000
6,627.50	0.000	0.000	0.000	0.000
6,628.00	0.000	0.000	0.000	0.000
6,628.50	0.000	0.000	0.000	0.000
6,629.00	0.000	0.000	0.000	0.000
6,629.50	0.000	0.000	0.000	0.000
6,630.00	0.000	0.000	0.000	0.000
6,630.50	0.000	0.000	0.000	0.000
6,631.00	0.000	0.000	0.000	0.000
6,631.50	0.000	0.000	0.000	0.000
6,632.00	0.000	0.000	0.000	0.000
6,632.50	0.000	0.000	0.000	0.000
6,633.00	0.000	0.000	0.000	0.000
6,633.50	0.000	0.000	0.000	0.000
6,634.00	0.000	0.000	0.000	0.000
6,634.50	0.000	0.000	0.000	0.000
6,635.00	0.000	0.000	0.000	0.000
6,635.50	0.000	0.000	0.000	0.000

Combined	Total	Elevation	Emergency	Spillway (cfs)	Discharge
0.000	0.000	6,636.00	0.000	0.000	0.000
0.000	0.000	6,636.10	0.000	0.000	0.000
33.685	33.685	6,636.50	33.685	33.685	33.685
75.802	75.802	6,637.00	75.802	75.802	75.802
177.360	177.360	6,637.50	177.360	177.360	177.360
304.441	304.441	6,638.00	304.441	304.441	304.441
451.538	451.538	6,638.50	451.538	451.538	451.538
634.377	634.377	6,639.00	634.377	634.377	634.377
846.252	846.252	6,639.50	846.252	846.252	846.252
1,093.674	1,093.674	6,640.00	1,093.674	1,093.674	1,093.674

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	477.240	0.424	0.000	0.000	83.000	F	463.17	39.012
	Σ	477.240						463.17	39.012
#2	1	19.250	0.036	0.000	0.000	79.000	F	25.74	1.237
	Σ	477.240						400.26	39.012
	Σ	496.490						405.59	40.249

Gary Altstis

Peabody Western Coal
Kayenta Mine
N9-C POND TEMPORARY DIVERSION
DESIGN
100YR 6HR STORM

General Information

Storm Information:

Storm Type:	NRCS Type II
Design Storm:	100 yr - 6 hr
Rainfall Depth:	2.400 inches

Structure Networking:

Type	Stru #	(flows into)	Stru #	Musk. K (hrs)	Musk. X	Description
Null	#1	>=	End	0.000	0.000	

#1
Null

Structure Summary:

Immediate Contributing Area (ac)	Total Contributing Area (ac)	Peak Discharge (cfs)	Total Runoff Volume (ac-ft)
46.710	46.710	30.98	3.00
#1			

Structure Detail:

Structure #1 (Null)

Subwatershed Hydrology Detail:

Stru #	SWS #	SWS Area (ac)	Time of Conc (hrs)	Musk K	Musk X	Curve Number	UHS	Peak Discharge (cfs)	Runoff Volume (ac-ft)
#1	1	46.710	0.442	0.442	0.285	79.000	F	34.20	3.002
		Σ	46.710					30.98	3.002

Subwatershed Time of Concentration Details:

Stru #	SWS #	Land Flow Condition	Slope (%)	Vert. Dist. (ft)	Horz. Dist. (ft)	Velocity (fps)	Time (hrs)
#1	1	5. Nearly bare and untilled, and alluvial valley fans	5.14	185.00	3,600.06	2.260	0.442
		Time of Concentration:					0.442

Subwatershed Muskingum Routing Details:

Stru #	SWS #	Land Flow Condition	Slope (%)	Vert. Dist. (ft)	Horz. Dist. (ft)	Velocity (fps)	Time (hrs)
#1	1	5. Nearly bare and untilled, and alluvial valley fans	5.14	185.00	3,600.06	2.260	0.442
		Muskingum K:					0.442

Design Discharge:	30.98 cfs
Depth:	1.37 ft
Top Width:	8.23 ft
Velocity:	5.48 fps
X-Section Area:	5.65 sq ft
Hydraulic Radius:	0.651
Froude Number:	1.17

Limiting Velocity (fps)	Freeboard Mult. x (VxD)	Freeboard % of Depth	Freeboard Depth (ft)	Manning's n	Slope (%)	Right Sideslope Ratio	Left Sideslope Ratio
6.0		1.00	1.00	0.0250	1.5	3.0:1	3.0:1

Triangular Channel

Material: Shales and hardpans

N9-C POND TEMPORARY DIVERSION

