

DESIGN REPORT
Sedimentation Structure
N6-I
Black Mesa Mine
Navajo County, Arizona
PEABODY COAL COMPANY



JAN 30 1989

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PLATE 1 - Site Plan

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Introduction

Sedimentation Structure N6-I will be an earthen embankment, designed and constructed by Peabody Coal Company as a temporary sedimentation structure to control runoff and sediment from disturbed areas of the Black Mesa Mine. The location of Structure N6-I is shown on Plate 1, Site Plan, Drawing No. 85400 (Sheet K-7), and Drawing No. 85405.

This design report contains information specific to Structure N6-I. 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 proposed site of Structure N6-I was inspected by a compliance engineer from Peabody Coal Company in August, 1988 to ensure that the site is suitable and no adverse conditions exist to prevent the successful construction of the structure. A detailed geotechnical investigation was not performed, rather the information in Chapter 6, Attachment D will be utilized for embankment design during construction.

Site Description

Land Use

Structure N6-I has a 98-acre tributary drainage area and is located on a tributary of Coal Mine Wash at the Black Mesa Mine. The watershed is classified as 15 percent Pinon/Juniper, 7 percent Sage-grass, 21 reclaimed, and 57 disturbed.

Embankment

A homogeneous earthen embankment, a minimum of fifteen feet wide, was assumed for the hydraulic analysis and to develop the stage-capacity chart shown on Plate 2. An upstream slope of 3:1 (horizontal to vertical) and a downstream slope of 4:1 were used. The assumed slopes were not specifically evaluated for geotechnical considerations such as slope stability since the foundation or embankment material types have not been determined. The assumed slopes were selected on the basis of Table 3-6, Attachment "D", of the Black Mesa PAP. The slopes selected are conservative for the design height of embankment based on the results of the aforementioned generalized stability analysis. The incised portion of the structure will be excavated at 3:1 (horizontal to vertical) slopes.

Design Analyses

General

Structure N6-I was designed by a compliance engineer from Peabody 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 Coal Company files includes topographic maps developed from aerial photography flown in 1984 for Peabody Coal Company and was used in the analyses of the structure.

Stability

The slopes of Structure N6-I will be chosen based on the stability analyses performed for existing structures in the General Report. The embankment fill materials and the type of foundation will be identified in the field during construction and stable slopes will be chosen based on the category classification of the structure.

Hydrology

The hydrologic analysis was completed using the generalized computer program SEDCAD+ (see Appendix A, B, and C). Structure N6-I is not in series with any other structure nor does the structure fall under the guidelines of the 30 CFR Section 77.216 for MSHA size structures. Therefore, the spillway was analyzed using the 25-year, 6-hour storm. The storage capacity of Structure N6-I was analyzed using the 10-year, 24-hour storm.

The following parameters were used in the hydrologic analysis:

1. Water Course length, L	0.490 mi
2. Elevation Difference, H	129 ft
3. Time of Concentration, Tc	0.322 hr
4. SCS Curve Number	88
5. Rainfall Depth, 10-year, 24-hour storm	2.1 in
25-year, 6-hour storm	1.9 in
6. Drainage Area	98.0 ac

Hydraulics

The SEDCAD+ program was used to evaluate inflow to the planned 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.

N6-I HYDRAULICS

	Units	10-Year 24-Hour Storm	25-Year 6-Hour Storm
Initial Reservoir Volume Condition		Empty	Full to the spillway elevation
Inflow			
Peak Flow	cfs	70.9	83.2
Volume	acre-ft	8.5	7.2
Storage			
Peak Stage	ft	6529.0	6533.0
Spillway Elevation . . .	ft	6532.0	--
Peak Storage	acre-ft	8.5	--
Storage Capacity	acre-ft	12.4	--
Outflow			
Peak Flow	cfs	0	63.7
Embankment Crest Elevation	ft	--	6535.0
Peak Stage	ft	--	6533.0
Freeboard	ft	--	2.0
Spillway Channel			
Flow Depth	ft	--	1.0
Critical Velocity	fps	--	3.96
Manning's "n"		--	0.044
Outflow Channel			
Slope	%	--	25.0
Normal Velocity	fps	--	7.1
Normal Depth	ft	--	0.3
Manning's "n"		--	0.044

Emergency Spillway Channel

The emergency spillway channel for N6-I will be a trapezoidal channel with the following dimensions:

Channel Depth (Spillway)	. . . . .	3.0 ft.
(Outflow)	. . . . .	2.0 ft.
Channel Width	. . . . .	30 ft.
Channel Length (Spillway)	. . . . .	28 ft.
(Outflow)	. . . . .	175 ft.
Side Slopes (Horizontal to Vertical)	. . . . .	.3:1 or flatter
Average Exit Slope (Spillway)	. . . . .	0 percent
(Outflow)	. . . . .	25 percent
Inlet Elevation	. . . . .	6532.0

Storage Capacity

The impoundment volume-elevation curve is based on site specific surveys conducted for Peabody Coal Company's August 1984 inspection, and 1985 resurveys, where available. Additionally, the most current topographic maps available were used in developing Plate 2, Volume-Elevation Curve, N6-I.

The calculations for the sediment load entering Structure N6-I were made utilizing the revised Universal Soil Loss Equation with the following parameters:

1. Rainfall Factor, R 40
2. Soil Erodibility Factor, K 0.28
3. Slope Factor, LS 5.36
4. Cover Factor, C 0.30
5. Erosion Control Factor, P 1.00

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. The proposed storage capacity of N6-I and the results of the sediment inflow analysis are summarized in the following table.

N6-I STORAGE

Total Storage Capacity	. . . . .	12.39 acre-ft
10-year, 24-hour Storm Inflow	. . . . .	8.54 acre-ft
Available Sediment Storage Capacity	. . . . .	3.85 acre-ft
Sediment Inflow Rate	. . . . .	0.820 acre-ft/yr
Sediment Storage Life	. . . . .	4.70 years

The following plates and appendix are attached and complete this inspection report.

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Plate 1 - Site Plan N6-I

Plate 2 - Stage-Capacity Chart

Plate 3 - Channel Profile N6-I, A-A'

Plate 4 - Emergency Spillway Typical Cross Section

Appendix A - Hydrology and Hydraulic Calculations

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

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

The following plates and appendix are attached and complete this inspection report.

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Plate 1 - Site Plan N6-I

Plate 2 - Stage-Capacity Chart

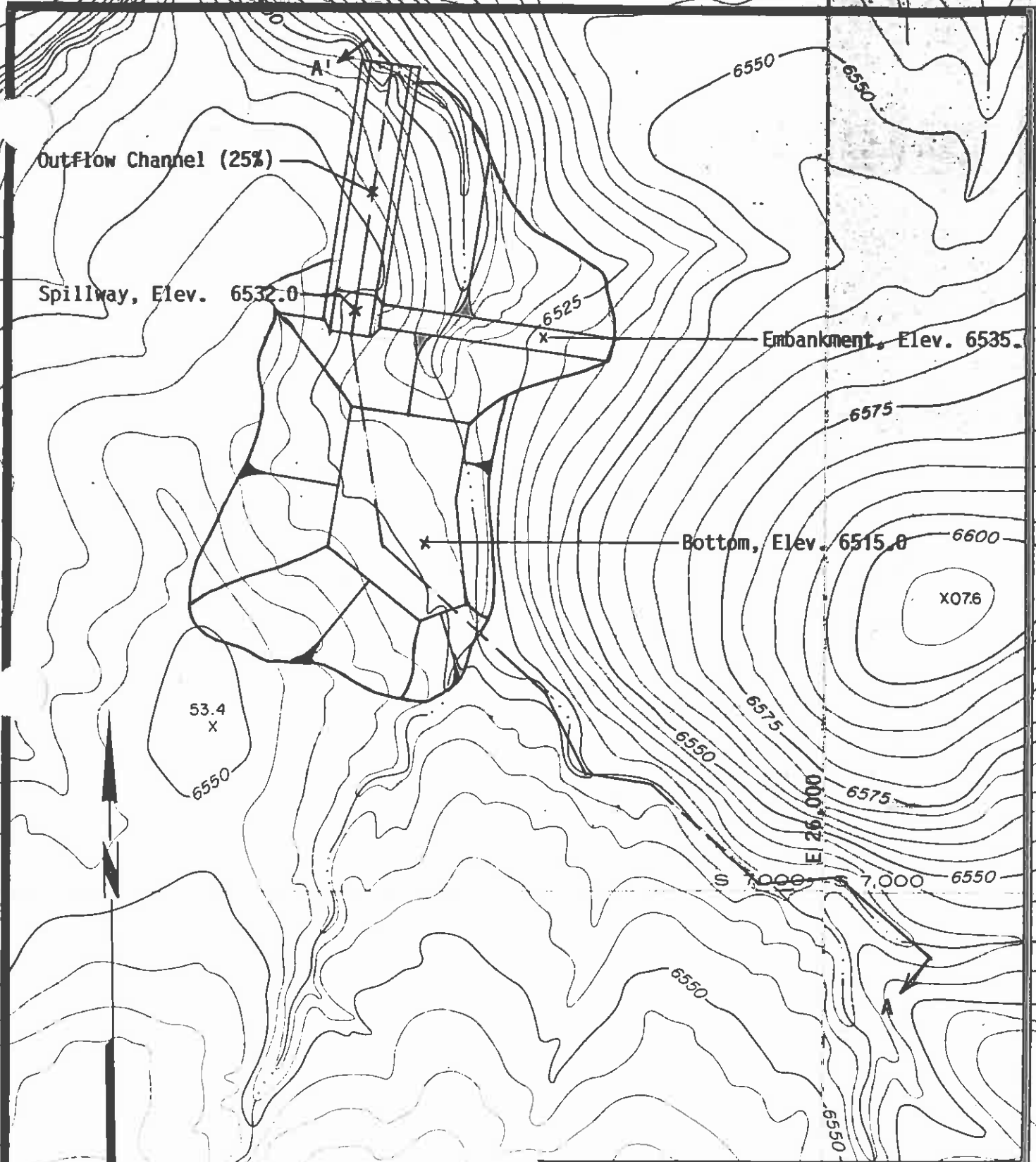
Plate 3 - Channel Profile N6-I, A-A'

Plate 4 - Emergency Spillway Typical Cross Section

Appendix A - Hydrology and Hydraulic Calculations

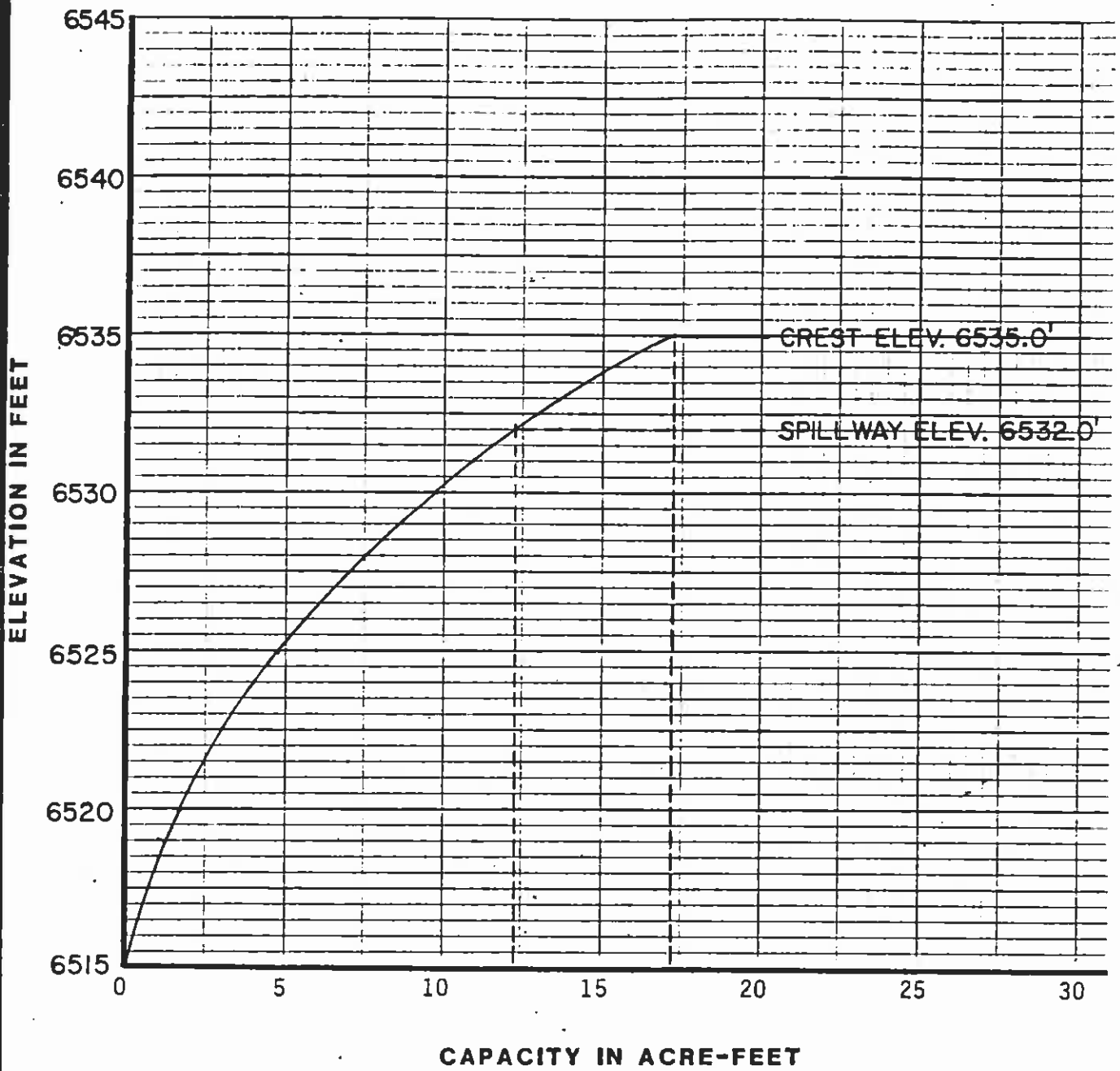
Appendix B - SEDCAD+ (Input and Output) 10-Year, 24-Hour Storm

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

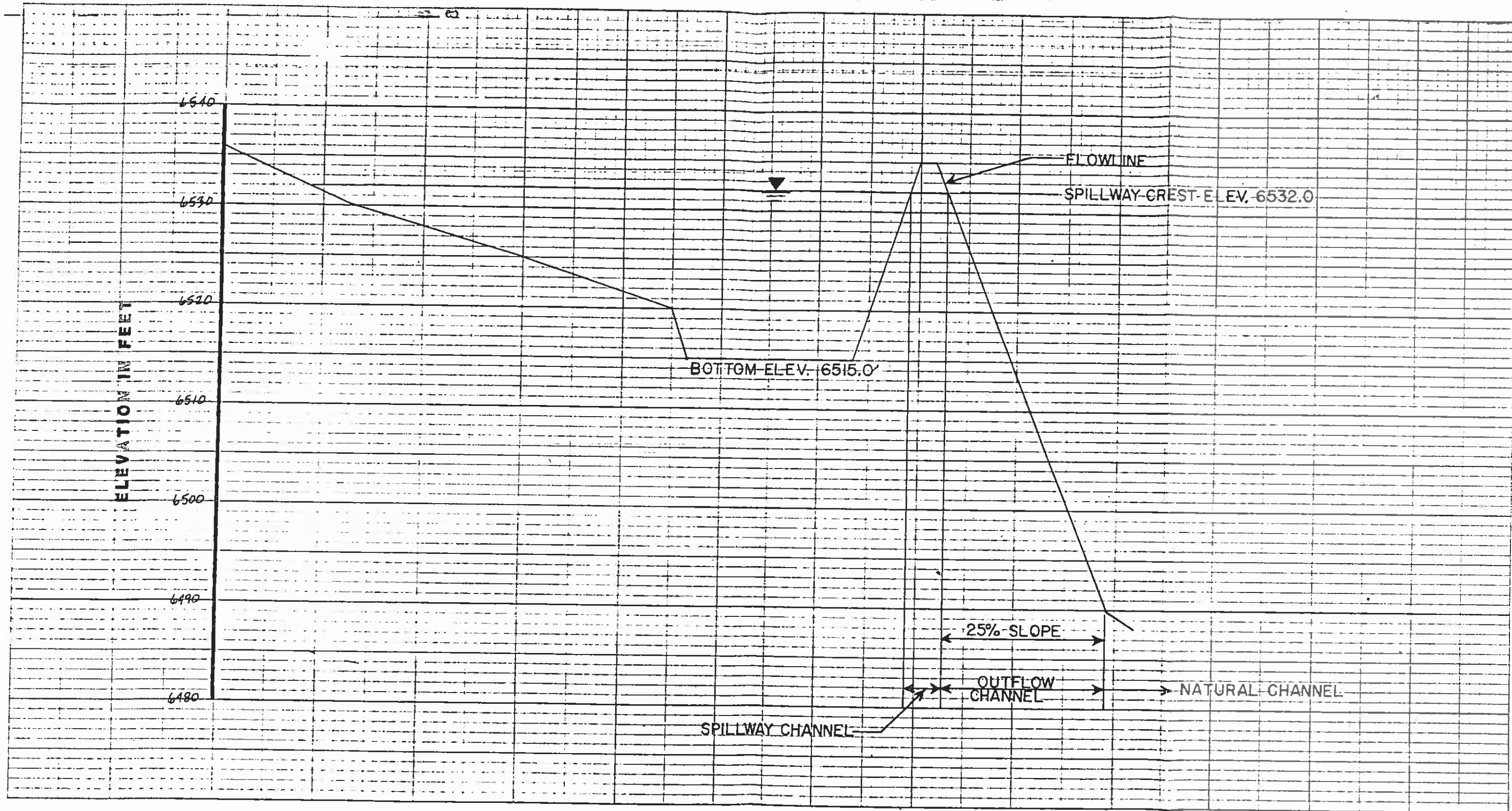


**SITE PLAN
N6-I**

**BY: PEABODY COAL
PLATE 1**



VOLUME-ELEVATION CURVE
N6-1

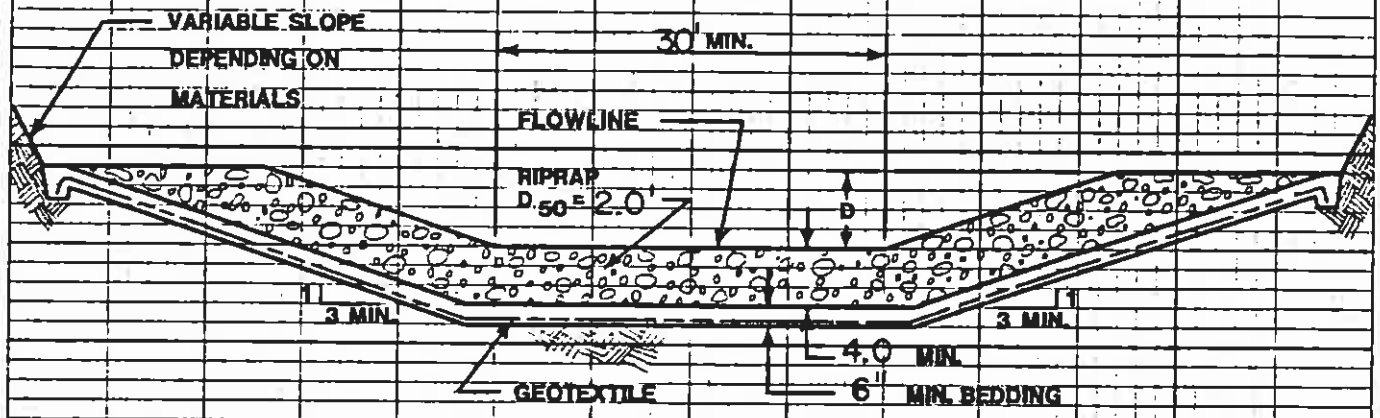


CHANNEL PROFILE A-A'
N6-I

Scale : 1" = 100'

SEE PLATE 1 FOR LOCATION

BY PEABODY COAL CO. Plate 3



SPILLWAY CHANNEL

D = 3.0 ft

LENGTH = 28.0 ft

FLOWLINE ELEV. = 6532.0 ft-msl

OUTFLOW CHANNEL

D = 2.0 ft

**SPILLWAY AND
OUTFLOW CHANNEL
CROSS SECTION**

N6-I

APPENDIX A

HYDROLOGY AND HYDRAULIC CALCULATIONS N6-I

N6-I

Hydrology and Hydraulic Calculations

Time of Concentration (T_c)

Overland Method (SEDCAD Utility)

Segment #1 = 2,690 ft. Horizontal
145 ft. Vertical

Near Bare, Overland, Land Use #5

$$T_c = 0.322 \text{ hrs.}$$

USLE Calculation

$$A = (R)(K)(LS)(C)(P)$$

$$R = 40$$

$$K = 0.28$$

$$LS = (L/72.6)^2(17.2 \sin \theta - 0.55)$$

$$= (420/72.6)^{0.6}(17.2 \sin(8.08) - 0.55) = 5.36$$

$$C = 0.30$$

$$P = 1.00$$

$$A = (40)(0.28)(5.36)(0.30)(1.00) = 17.99 \text{ tons/acre}$$

TRAPEZOIDAL CHANNEL ANALYSIS
CRITICAL DEPTH COMPUTATION
September 28, 1988

PROGRAM INPUT DATA:

DESCRIPTION	VALUE
Flow Rate (cubic feet per second).....	64.0
Manning's Roughness Coefficient (n-value).....	0.0440
Channel Side Slope - Left Side (horizontal/vertical)....	3.00
Channel Side Slope - Right Side (horizontal/vertical)...	3.00
Channel Bottom Width (feet).....	30.0

PROGRAM RESULTS:

DESCRIPTION	VALUE
Critical Depth (feet).....	0.51
Critical Slope (feet per foot).....	0.0361
Flow Velocity (feet per second).....	3.96
Froude Number.....	1.000
Velocity Head (feet).....	0.24
Energy Head (feet).....	0.76
Cross-Sectional Area of Flow (square feet).....	16.14
Top width of Flow (feet).....	33.07

TRAPEZOIDAL CHANNEL ANALYSIS COMPUTER PROGRAM, Version 1.1 (c) 1986
Dodson & Associates, Inc., 7015 W. Tidwell, #107, Houston, TX 77092
(713) 895-8322. A manual with equations & flow chart is available.

TRAPEZOIDAL CHANNEL ANALYSIS
NORMAL DEPTH COMPUTATION
September 28, 1988

=====

PROGRAM INPUT DATA:

DESCRIPTION	VALUE
Flow Rate (cubic feet per second).....	64.0
Channel Bottom Slope (feet per foot).....	0.2500
Manning's Roughness Coefficient (n-value).....	0.0420
Channel Side Slope - Left Side (horizontal/vertical)....	3.00
Channel Side Slope - Right Side (horizontal/vertical)...	3.00
Channel Bottom Width (feet).....	30.0

=====

PROGRAM RESULTS:

DESCRIPTION	VALUE
Normal Depth (feet).....	0.29
Flow Velocity (feet per second).....	7.21
Froude Number (Flow is Super-Critical).....	2.404
Velocity Head (feet).....	0.81
Energy Head (feet).....	1.10
Cross-Sectional Area of Flow (square feet).....	8.87
Top Width of Flow (feet).....	31.72

=====

TRAPEZOIDAL CHANNEL ANALYSIS COMPUTER PROGRAM, Version 1.1 (c) 1985
Dodson & Associates, Inc., 7015 W. Tidwell, #107, Houston, TX 77092
(713) 895-8322. A manual with equations & flow chart is available.

APPENDIX B

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

SEDCAD+(TM)
Sediment, Erosion, and Channel Design Computer Aided Design

Pamela J. Schweb
Civil Software Design
P.O. Box 1092
Lexington, Kentucky 40572

Version No. 2.13 (5/20/88)

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SEDCAD+(TM) Serial No. 194 has been Authorized and Released to:

Pasberry Coal Company
1300 E. Yale
Flagstaff, AZ 86001
(602) 877-5000

THE SEDCAD+ PROGRAM SYSTEM IS PROVIDED 'AS IS' WITHOUT WARRANTY OF ANY KIND, EITHER EXPRESS OR IMPLIED. IN NO EVENT SHALL THE AUTHORS OF CIVIL SOFTWARE DESIGN BE LIABLE FOR INCIDENTAL DAMAGES, CONSEQUENTIAL DAMAGES, LOST PROFITS, LOST BUSINESS OR OTHER DAMAGES ARISING OUT OF THE USE OR INABILITY TO USE THIS PROGRAM SYSTEM.

Printed Date and Time: 5/20/1988 15:32:26
Computed Date and Time: 5/20/1988 15:32:27
File Created By: WJS
File Currently Being Printed: 1-1

WATCHDOG IDENTIFICATION

WATCHDOG IDENTIFICATION

```

*****
* JUNCTIONS                WEATHER                STRUCTURES                *
*-----*-----*-----*-----*-----*-----*-----*-----*
*      J      W      S      T      I      E      S      T      I      O      N      *
*****

```

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***** DOCUMENTARY INPUTS *****
*
* Specific Gravity =                2.5
* Submerged Specific Gravity =      1.25
*-----*-----*-----*-----*-----*-----*-----*-----*-----*

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***** PERCENT FINER DISTRIBUTIONS *****
* NO. PARTICLE SIZE, (mm)    NO. %
*-----*-----*-----*-----*-----*-----*-----*-----*
* 1      38.1000             100.00
* 2      4.7600              100.00
* 3      2.3800              100.00
* 4      1.1900              100.00
* 5      0.7600              100.00
* 6      0.4760              100.00
* 7      0.2380              100.00
* 8      0.1190              78.00
* 9      0.0740              53.00
* 10     0.0476              39.00
* 11     0.0290              30.00
* 12     0.0190              25.00
* 13     0.0119              19.00
* 14     0.0074              17.00
* 15     0.0047              0.00
*****

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***** BETWEEN STRUCTURE ROUTING PARAMETERS *****
*
* TRAVEL TIME MUSK. K    MUSK. X
* (hours)    (hours)
*-----*-----*-----*-----*-----*-----*-----*-----*
* 1      1      0.000      0.000      0.000
*****

```

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*****
*****
** JUNCTION 1 , BRANCH 1 , STRUCTURE 1 **
**      POND STRUCTURE                **
**      N6-I                          **
**                                     **
*****
*****

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SUBWATERSHED INFORMATION

HYDRAULIC INPUT VALUES

WATER SHED	AREA (acre)	CURVE NUMBER	TC (hr)	TT (hr)	ROUTING COEFF K-(hr)	X	UNIT HYDRO RESPONSE
1	85.00	88.00	0.322	0.000	0.000	0.000	MED

SEDIMENT INPUT VALUES

WATER SHED	SEG NUM	SOIL K	LENGTH (feet)	SLOPE (%)	CP VALUE	PART OPT
1	1	0.00	420.0	14.5	0.000	1 (MUSLE)

COMPUTED VALUES FOR INDIVIDUAL WATERSHEDS

WATERSHED	PEAK FLOW (cfs)	RUNOFF (inches)	SEDIMENT (tons)	D50 (mm)
1	70.361	1.048	1727.92	0.100

*
* JUNCTION 1, BRANCH 1, STRUCTURE 1 *
* N6-I *
* COND STRUCTURE INFORMATION *
*

* Time Increment of the Routed Hydrograph = 0.10 hours *
* Dead Space of Permanent Pool = 10.00 % *
* Number of Continuous Stirred Reactors = 10 *
*

* RIPRAP EMERGENCY SPILLWAY INPUTS *
*

* Crest stage of the Emergency Spillway = 17.000 feet *
* Crest Length = 28.000 feet *
* Width = 30.000 feet *
* Outslope factors: *
* Slope = 25.00 % *
* Side Slope Ratio = 3.00:1 *
* Safety Factor = 1.20 *
*

* RESULTS TO No-1 *

Total Drainage Area to this Point = 98,000 acres
Basin trap Efficiency = 100.000 %

EMERGENCY SPILLWAY OUTSLOPE DESIGN:

Design Discharge = 34,602 cfs
Velocity = 6.782 fpm
Depth of Flow = 0.246 feet
Manning's n = 0.042
D50 Channel Bed = 1.522 feet
D50 Channel Bank = 1.054 feet

DETAILED STAGE-DISCHARGE INFORMATION

ELEVATION	STAGE (ft)	PSW #1 (cfs)	ESW (cfs)	TOTAL DISCHARGE (cfs)
6513.00	0.00	0.00	0.00	0.00
6513.50	0.50	0.00	0.00	0.00
6514.00	1.00	0.00	0.00	0.00
6514.50	1.50	0.00	0.00	0.00
6515.00	2.00	0.00	0.00	0.00
6515.50	2.50	0.00	0.00	0.00
6516.00	3.00	0.00	0.00	0.00
6516.50	3.50	0.00	0.00	0.00
6517.00	4.00	0.00	0.00	0.00
6517.50	4.50	0.00	0.00	0.00
6518.00	5.00	0.00	0.00	0.00
6518.50	5.50	0.00	0.00	0.00
6519.00	6.00	0.00	0.00	0.00
6519.50	6.50	0.00	0.00	0.00
6520.00	7.00	0.00	0.00	0.00
6520.50	7.50	0.00	0.00	0.00
6521.00	8.00	0.00	0.00	0.00
6521.50	8.50	0.00	0.00	0.00
6522.00	9.00	0.00	0.00	0.00
6522.50	9.50	0.00	0.00	0.00
6523.00	10.00	0.00	0.00	0.00
6523.50	10.50	0.00	0.00	0.00
6524.00	11.00	0.00	0.00	0.00
6524.50	11.50	0.00	0.00	0.00
6525.00	12.00	0.00	0.00	0.00
6525.50	12.50	0.00	0.00	0.00
6526.00	13.00	0.00	0.00	0.00

	6530.00	15.50	0.00	0.00	0.00	*
*	6531.00	16.00	0.00	0.00	0.00	*
	6531.50	16.50	0.00	0.00	0.00	*
*	6532.00	17.00	0.00	0.00	0.00	*
	6532.50	17.50	0.00	34.48	34.48	*
*	6532.80	17.80	0.00	44.57	44.57	*
*	6532.90	17.90	0.00	55.02	55.02	*
*	6533.00	18.00	0.00	67.13	67.18	*
*	6533.50	18.50	0.00	145.07	145.07	*
*	6534.00	19.00	0.00	236.89	236.89	*
*	6534.50	19.50	0.00	352.81	352.81	*
*	6535.00	20.00	0.00	492.90	492.90	*

RESULTS TO RC-1
 (continued)

INPUT AND CALCULATED BASIN GEOMETRY

ELEV- ATION	STAGE (ft)	AREA (ac)	DIS- CHARGE (cfs)	AVG. DEPTH (ft)	CAPACITY (ac-ft)	
6515.0	0.0	0.23	0.00	0.00	0.00	
6515.5	0.5	0.30	0.00	0.49	0.15	
6516.0	1.0	0.32	0.00	0.88	0.30	
6516.5	1.5	0.34	0.00	1.45	0.46	
6517.0	2.0	0.35	0.00	1.92	0.64	
6517.5	2.5	0.37	0.00	2.38	0.82	
6518.0	3.0	0.39	0.00	2.84	1.01	
6518.5	3.5	0.41	0.00	3.29	1.21	
6519.0	4.0	0.43	0.00	3.73	1.41	
6519.5	4.5	0.44	0.00	4.16	1.63	
6520.0	5.0	0.46	0.00	4.60	1.86	
6520.5	5.5	0.49	0.00	5.02	2.10	
6521.0	6.0	0.52	0.00	5.42	2.35	
6521.5	6.5	0.55	0.00	5.82	2.61	
6522.0	7.0	0.58	0.00	6.21	2.87	
6522.5	7.5	0.60	0.00	6.59	3.19	
6523.0	8.0	0.63	0.00	6.96	3.50	
6523.5	8.5	0.66	0.00	7.33	3.82	
6524.0	9.0	0.69	0.00	7.69	4.16	
6524.5	9.5	0.72	0.00	8.05	4.51	
6525.0	10.0	0.75	0.00	8.41	4.88	
6525.5	10.5	0.77	0.00	8.75	5.27	
6526.0	11.0	0.84	0.00	9.09	5.67	
6526.5	11.5	0.88	0.00	9.41	6.10	
6527.0	12.0	0.97	0.00	9.73	6.56	
6527.5	12.5	1.06	0.00	10.03	7.03	
6528.0	13.0	1.02	0.00	10.34	7.53	
6528.5	13.5	1.06	0.00	10.64	8.05	
6529.0	14.0	1.11	0.00	10.93	8.59	
6529.5	14.5	1.15	0.00	11.23	9.16	
6530.0	15.0	1.20	0.00	11.52	9.75	
6530.5	15.5	1.28	0.00	11.80	10.36	
6531.0	16.0	1.37	0.00	12.08	11.01	
6531.5	16.5	1.56	0.00	12.35	11.68	
6532.0	17.0	1.61	0.00	12.62	12.37	EMERGENCY SPILLWAY
6532.5	17.5	1.75	0.00	12.90	13.08	
6533.0	18.0	1.83	0.00	13.04	13.80	
6533.5	18.5	1.98	0.00	13.28	14.54	DOWN STAGE
6534.0	19.0	2.10	0.00	13.51	15.30	
6534.5	19.5	2.20	0.00	13.72	16.08	
6535.0	20.0	2.29	0.00	13.91	16.89	

	339.0	10.0	1.22	492.90	14.17	17.23
	RUNOFF	PEAK	PEAK SEDIMENT	PEAK SETTLEABLE	SEDIMENT	
	VOLUME	DISCHARGE	CONCENTRATION	CONCENTRATION	YIELD	
	(ac-ft)	(cfs)	(mg/l)	(ml/l)	(tons)	
* IN	8.343	70.861	242632.59	115.253	1727.93	
* OUT	8.546	54.602	0.00	0.000	0.00	
AVERAGE SETTLEABLE CONCENTRATION:						
	TIME OF	VOLUME WEIGHTED DURING	ARITHMETIC DURING			
	SIGNIFICANT	TIME OF	PEAK	TIME OF	PEAK	
	CONCENTRATION	SIGN. CONC.	24 HOUR	SIGN. CONC.	24 HOUR	
	(hrs)	(ml/l)	(ml/l)	(ml/l)	(ml/l)	
* IN	16.70	35.37	65.37	29.30	20.39	
* OUT	0.00	0.00	0.00	0.00	0.00	

JUNCTION 1 (BOUGH 1, STRUCTURE 1)
 NS-I

HYDROGRAPH (AND SEDIMENTGRAPH) OUT OF THE STRUCTURE

HYDROGRAPH (AND SEDIMENTGRAPH)

Time (hr)	Discharge (cfs)	Sed Disch (mg/l)	Time (hr)	Discharge (cfs)	Sed Disch (mg/l)
0.00	0.000	0.000	0.10	0.000	0.000
0.20	0.000	0.000	0.30	0.000	0.000
0.40	0.000	0.000	0.50	0.000	0.000
0.60	0.000	0.000	0.70	0.000	0.000
0.80	0.000	0.000	0.90	0.000	0.000
1.00	0.000	0.000	1.10	0.000	0.000
1.20	0.000	0.000	1.30	0.000	0.000
1.40	0.000	0.000	1.50	0.000	0.000
1.60	0.000	0.000	1.70	0.000	0.000
1.80	0.000	0.000	1.90	0.000	0.000
2.00	0.000	0.000	2.10	0.000	0.000
2.20	0.000	0.000	2.30	0.000	0.000
2.40	0.000	0.000	2.50	0.000	0.000
2.60	0.000	0.000	2.70	0.000	0.000
2.80	0.000	0.000	2.90	0.000	0.000
3.00	0.000	0.000	3.10	0.000	0.000
3.20	0.000	0.000	3.30	0.000	0.000
3.40	0.000	0.000	3.50	0.000	0.000
3.60	0.000	0.000	3.70	0.000	0.000
3.80	0.000	0.000	3.90	0.000	0.000
4.00	0.000	0.000	4.10	0.000	0.000
4.20	0.000	0.000	4.30	0.000	0.000
4.40	0.000	0.000	4.50	0.000	0.000
4.60	0.000	0.000	4.70	0.000	0.000
4.80	0.000	0.000	4.90	0.000	0.000
5.00	0.000	0.000	5.10	0.000	0.000
5.20	0.000	0.000	5.20	0.000	0.000
5.40	0.000	0.000	5.50	0.000	0.000
5.60	0.000	0.000	5.70	0.000	0.000
5.80	0.000	0.000	5.90	0.000	0.000
6.00	0.000	0.000	6.10	0.000	0.000
6.20	0.000	0.000	6.30	0.000	0.000
6.40	0.000	0.000	6.50	0.000	0.000
6.60	0.000	0.000	6.70	0.000	0.000
6.80	0.000	0.000	6.80	0.000	0.000
7.00	0.000	0.000	7.10	0.000	0.000
7.20	0.000	0.000	7.30	0.000	0.000
7.40	0.000	0.000	7.40	0.000	0.000
7.60	0.000	0.000	7.50	0.000	0.000
7.80	0.000	0.000	7.60	0.000	0.000
8.00	0.000	0.000	7.70	0.000	0.000
8.20	0.000	0.000	7.80	0.000	0.000
8.40	0.000	0.000	7.90	0.000	0.000
8.60	0.000	0.000	8.00	0.000	0.000
8.80	0.000	0.000	8.10	0.000	0.000
9.00	0.000	0.000	8.20	0.000	0.000
9.20	0.000	0.000	8.30	0.000	0.000
9.40	0.000	0.000	8.40	0.000	0.000
9.60	0.000	0.000	8.50	0.000	0.000
9.80	0.000	0.000	8.60	0.000	0.000
10.00	0.000	0.000	8.70	0.000	0.000
10.20	0.000	0.000	8.80	0.000	0.000
10.40	0.000	0.000	8.90	0.000	0.000
10.60	0.000	0.000	9.00	0.000	0.000
10.80	0.000	0.000	9.10	0.000	0.000
11.00	0.000	0.000	9.20	0.000	0.000
11.20	0.000	0.000	9.30	0.000	0.000
11.40	0.000	0.000	9.40	0.000	0.000
11.60	0.000	0.000	9.50	0.000	0.000
11.80	0.000	0.000	9.60	0.000	0.000
12.00	0.000	0.000	9.70	0.000	0.000
12.20	0.000	0.000	9.80	0.000	0.000
12.40	0.000	0.000	9.90	0.000	0.000
12.60	0.000	0.000	10.00	0.000	0.000
12.80	0.000	0.000	10.10	0.000	0.000
13.00	0.000	0.000	10.20	0.000	0.000
13.20	0.000	0.000	10.30	0.000	0.000
13.40	0.000	0.000	10.40	0.000	0.000
13.60	0.000	0.000	10.50	0.000	0.000
13.80	0.000	0.000	10.60	0.000	0.000
14.00	0.000	0.000	10.70	0.000	0.000
14.20	0.000	0.000	10.80	0.000	0.000
14.40	0.000	0.000	10.90	0.000	0.000
14.60	0.000	0.000	11.00	0.000	0.000
14.80	0.000	0.000	11.10	0.000	0.000
15.00	0.000	0.000	11.20	0.000	0.000
15.20	0.000	0.000	11.30	0.000	0.000
15.40	0.000	0.000	11.40	0.000	0.000
15.60	0.000	0.000	11.50	0.000	0.000
15.80	0.000	0.000	11.60	0.000	0.000
16.00	0.000	0.000	11.70	0.000	0.000
16.20	0.000	0.000	11.80	0.000	0.000
16.40	0.000	0.000	11.90	0.000	0.000
16.60	0.000	0.000	12.00	0.000	0.000

8.00	0.012	0.000	8.10	0.027	0.000	*
8.20	0.046	0.000	8.30	0.070	0.000	*
8.40	0.100	0.000	8.50	0.134	0.000	*
8.60	0.175	0.000	8.70	0.219	0.000	*
8.80	0.267	0.000	8.90	0.319	0.000	*
9.00	0.377	0.000	9.10	0.440	0.000	*
9.20	0.507	0.000	9.30	0.576	0.000	*
9.40	0.655	0.000	9.50	0.747	0.000	*
9.60	0.833	0.000	9.70	0.965	0.000	*
9.80	1.083	0.000	9.90	1.217	0.000	*
10.00	1.320	0.000	10.10	1.570	0.000	*
10.20	1.772	0.000	10.30	1.996	0.000	*
10.40	2.345	0.000	10.50	2.528	0.000	*
10.60	3.003	0.000	10.70	3.151	0.000	*
10.80	3.728	0.000	10.90	3.863	0.000	*
11.00	4.520	0.000	11.10	4.662	0.000	*
11.20	5.380	0.000	11.30	5.548	0.000	*
11.40	6.309	0.000	11.50	6.470	0.000	*
11.60	7.307	0.000	11.70	7.428	0.000	*
11.80	8.384	0.000	11.90	8.421	0.000	*
12.00	9.540	0.000	12.10	9.448	0.000	*
12.20	10.775	0.000	12.30	10.509	0.000	*
12.40	12.089	0.000	12.50	11.604	0.000	*
12.60	13.482	0.000	12.70	12.733	0.000	*
12.80	14.954	0.000	12.90	13.896	0.000	*
13.00	16.505	0.000	13.10	15.093	0.000	*
13.20	18.136	0.000	13.30	16.324	0.000	*
13.40	19.847	0.000	13.50	17.589	0.000	*
13.60	21.638	0.000	13.70	18.888	0.000	*
13.80	23.509	0.000	13.90	20.221	0.000	*
14.00	25.460	0.000	14.10	21.588	0.000	*
14.20	27.491	0.000	14.30	23.000	0.000	*
14.40	29.602	0.000	14.50	24.457	0.000	*
14.60	31.793	0.000	14.70	25.959	0.000	*
14.80	34.064	0.000	14.90	27.506	0.000	*
15.00	36.415	0.000	15.10	29.098	0.000	*
15.20	38.846	0.000	15.30	30.735	0.000	*
15.40	41.357	0.000	15.50	32.417	0.000	*
15.60	43.948	0.000	15.70	34.144	0.000	*
15.80	46.619	0.000	15.90	35.916	0.000	*
16.00	49.370	0.000	16.10	37.733	0.000	*
16.20	52.201	0.000	16.30	39.595	0.000	*
16.40	55.102	0.000	16.50	41.502	0.000	*
16.60	58.073	0.000	16.70	43.454	0.000	*
16.80	61.114	0.000	16.90	45.451	0.000	*
17.00	64.225	0.000	17.10	47.493	0.000	*
17.20	67.406	0.000	17.30	49.580	0.000	*
17.40	70.657	0.000	17.50	51.712	0.000	*
17.60	73.978	0.000	17.70	53.889	0.000	*
17.80	77.369	0.000	17.90	56.111	0.000	*
18.00	80.830	0.000	18.10	58.378	0.000	*
18.20	84.361	0.000	18.30	60.690	0.000	*
18.40	87.962	0.000	18.50	63.047	0.000	*
18.60	91.633	0.000	18.70	65.449	0.000	*
18.80	95.374	0.000	18.90	67.895	0.000	*
19.00	99.185	0.000	19.10	70.385	0.000	*
19.20	103.066	0.000	19.30	72.919	0.000	*
19.40	107.017	0.000	19.50	75.497	0.000	*
19.60	111.038	0.000	19.70	78.119	0.000	*
19.80	115.129	0.000	19.90	80.785	0.000	*
20.00	119.290	0.000	20.10	83.495	0.000	*

*	20.80	2.416	0.000	21.00	2.403	0.000	*
*	21.00	2.489	0.000	21.10	2.474	0.000	*
*	21.20	2.564	0.000	21.30	2.547	0.000	*
*	21.40	2.638	0.000	21.50	2.621	0.000	*
*	21.60	2.712	0.000	21.70	2.694	0.000	*
*	21.80	2.787	0.000	21.90	2.767	0.000	*
*	22.00	2.861	0.000	22.10	2.840	0.000	*
*	22.20	2.935	0.000	22.30	2.913	0.000	*
*	22.40	3.009	0.000	22.50	2.986	0.000	*
*	22.60	3.083	0.000	22.70	3.059	0.000	*
*	22.80	3.157	0.000	22.90	3.132	0.000	*
*	23.00	3.231	0.000	23.10	3.205	0.000	*
*	23.20	3.305	0.000	23.30	3.278	0.000	*
*	23.40	3.379	0.000	23.50	3.351	0.000	*
*	23.60	3.453	0.000	23.70	3.424	0.000	*
*	23.80	3.527	0.000	23.90	3.497	0.000	*
*	24.00	3.601	0.000	24.10	3.570	0.000	*
*	24.20	3.675	0.000	24.30	3.643	0.000	*
*	24.40	3.749	0.000	24.50	3.716	0.000	*
*	24.60	3.823	0.000	24.70	3.789	0.000	*
*	24.80	3.897	0.000	24.90	3.862	0.000	*
*	25.00	3.971	0.000	25.10	3.935	0.000	*
*	25.20	4.045	0.000	25.30	4.008	0.000	*
*	25.40	4.119	0.000	25.50	4.081	0.000	*
*	25.60	4.193	0.000	25.70	4.154	0.000	*
*	25.80	4.267	0.000	25.90	4.227	0.000	*
*	26.00	4.341	0.000	26.10	4.300	0.000	*
*	26.20	4.415	0.000	26.30	4.373	0.000	*
*	26.40	4.489	0.000	26.50	4.446	0.000	*
*	26.60	4.563	0.000	26.70	4.519	0.000	*
*	26.80	4.637	0.000	26.90	4.592	0.000	*
*	27.00	4.711	0.000	27.10	4.665	0.000	*
*	27.20	4.785	0.000	27.30	4.738	0.000	*

<<< SEDCAD+ >>>

Prestbury Coal Company

*** RUN COMPLETED ***

APPENDIX C

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

Pamela J. Schwab
Civil Software Design
P.O. Box 1630
Lexington, Kentucky 40512

Version No. 1.00 (8/20/88)

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SED CAD+(TM) Serial No. 194 has been Authorized and Released to:

Peabody Coal Company
1300 S. Yale
Flagstaff, AZ 86001
(602) 677-5299

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* Current Date and Time: 09-26-1988 15:37:58
* Computed Date and Time: 09-26-1988 15:31:42
* File Created By: MGD
* File Currently Being Printed: 1988-1

***** WATERSHED IDENTIFICATION *****

* 198-I WATERSHED (10Y?-24HR)
* (SECOND EMERGENCY OF JULY 9/81)

***** STORM SUMMARY *****

* Storm type: 247 FIVE 2
* Rainfall Depth: 1.9 inches
* Storm Duration: 6.0 hours

SECTION 1.0000
No. 1
10000

* Time Increment of the Riprap Hydraulic = 0.000000
* Dead Space of Permanent Work = 0.000000
* Number of Continuous Stirred Reactor = 0

RIPRAP EMERGENCY SLOTTWAY INPUTS

* Crest stage of the Emergency Sillway = 17.000 feet
* Crest Length = 28.000 feet
* width = 30.000 feet
* Outslope factors:
* Slope = 15.000
* Side Slope Ratio = 3.00:1
* Safety Factor = 1.00

RESULTS TO DATE

Total Drainage Area to This Point = 70,000 acres

Basin Trap Efficiency = 100.000

EMERGENCY SPILLWAY OUBLOVE DESIGN

Design Discharge = 63,716 cfs
 Velocity = 7.120 fps
 Depth of Flow = 0.272 feet
 Manning's n = 0.043
 D50 Channel Bed = 1.694 feet
 D50 Channel Bank = 1.168 feet

DETAILED STAGE-DISCHARGE INFORMATION

ELEVATION	STAGE (ft)	DSW #1 (cfs)	ECH (cfs)	TOTAL DISCHARGE (cfs)
6515.00	0.00	0.00	0.00	0.00
6515.50	0.50	0.00	0.00	0.00
6516.00	1.00	0.00	0.00	0.00
6516.50	1.50	0.00	0.00	0.00
6517.00	2.00	0.00	0.00	0.00
6517.50	2.50	0.00	0.00	0.00
6518.00	3.00	0.00	0.00	0.00
6518.50	3.50	0.00	0.00	0.00
6519.00	4.00	0.00	0.00	0.00
6519.50	4.50	0.00	0.00	0.00
6520.00	5.00	0.00	0.00	0.00
6520.50	5.50	0.00	0.00	0.00
6521.00	6.00	0.00	0.00	0.00
6521.50	6.50	0.00	0.00	0.00
6522.00	7.00	0.00	0.00	0.00
6522.50	7.50	0.00	0.00	0.00
6523.00	8.00	0.00	0.00	0.00
6523.50	8.50	0.00	0.00	0.00
6524.00	9.00	0.00	0.00	0.00
6524.50	9.50	0.00	0.00	0.00
6525.00	10.00	0.00	0.00	0.00
6525.50	10.50	0.00	0.00	0.00
6526.00	11.00	0.00	0.00	0.00
6526.50	11.50	0.00	0.00	0.00
6527.00	12.00	0.00	0.00	0.00
6527.50	12.50	0.00	0.00	0.00
6528.00	13.00	0.00	0.00	0.00
6528.50	13.50	0.00	0.00	0.00
6529.00	14.00	0.00	0.00	0.00
6529.50	14.50	0.00	0.00	0.00
6530.00	15.00	0.00	0.00	0.00

DATE	DESCRIPTION	AMOUNT	BALANCE
11/01/01	OPENING BALANCE	100.00	100.00
11/05/01	PAYROLL	200.00	300.00
11/10/01	RENT	150.00	150.00
11/15/01	SALES	100.00	250.00
11/20/01	EXPENSES	80.00	170.00
11/25/01	SALES	120.00	290.00
11/30/01	CLOSING BALANCE		290.00

INPUT AND CALCULATED DATA

ELEVATION	STAGE (ft)	AREA (ac)	DISCHARGE (cfs)	WATER DEPTH (ft)	WATER VELOCITY (ft/s)
6515.0	0.0	0.25	0.00	0.00	0.00
6515.5	0.5	0.30	0.10	0.40	0.15
6516.0	1.0	0.32	0.20	0.60	0.30
6516.5	1.5	0.34	0.30	0.80	0.45
6517.0	2.0	0.35	0.40	1.00	0.60
6517.5	2.5	0.37	0.50	1.20	0.80
6518.0	3.0	0.39	0.60	1.40	1.00
6518.5	3.5	0.41	0.70	1.60	1.20
6519.0	4.0	0.43	0.80	1.80	1.40
6519.5	4.5	0.44	0.90	2.00	1.60
6520.0	5.0	0.46	1.00	2.20	1.80
6520.5	5.5	0.48	1.10	2.40	2.10
6521.0	6.0	0.52	1.20	2.60	2.35
6521.5	6.5	0.55	1.30	2.80	2.60
6522.0	7.0	0.58	1.40	3.00	2.85
6522.5	7.5	0.60	1.50	3.20	3.10
6523.0	8.0	0.63	1.60	3.40	3.35
6523.5	8.5	0.66	1.70	3.60	3.60
6524.0	9.0	0.68	1.80	3.80	3.85
6524.5	9.5	0.72	1.90	4.00	4.10
6525.0	10.0	0.75	2.00	4.20	4.35
6525.5	10.5	0.79	2.10	4.40	4.60
6526.0	11.0	0.84	2.20	4.60	4.85
6526.5	11.5	0.88	2.30	4.80	5.10
6527.0	12.0	0.93	2.40	5.00	5.35
6527.5	12.5	0.97	2.50	5.20	5.60
6528.0	13.0	1.02	2.60	5.40	5.85
6528.5	13.5	1.06	2.70	5.60	6.10
6529.0	14.0	1.11	2.80	5.80	6.35
6529.5	14.5	1.15	2.90	6.00	6.60
6530.0	15.0	1.20	3.00	6.20	6.85
6530.5	15.5	1.25	3.10	6.40	7.10
6531.0	16.0	1.32	3.20	6.60	7.35
6531.5	16.5	1.38	3.30	6.80	7.60
6532.0	17.0	1.45	3.40	7.00	7.85
6532.7	17.7	1.53	3.50	7.20	8.10
6532.3	17.8	1.54	3.57	7.31	8.17
6532.9	17.9	1.56	3.61	7.39	8.24
6533.0	18.0	1.57	3.62	7.40	8.25
6533.5	18.5	1.63	3.67	7.49	8.33
6534.0	19.0	1.69	3.72	7.58	8.41
6534.5	19.5	1.75	3.77	7.67	8.49

EMERGENCY SPILLWAY

PEAK STAGE

0.100 10.0000 0.0000 0.0000 0.0000
 0.000 0.0000 0.0000 0.0000 0.0000
 0.000 0.0000 0.0000 0.0000 0.0000
 0.000 0.0000 0.0000 0.0000 0.0000

AVERAGE EFFLUENT CONCENTRATIONS:

	TIME OF SIGNIFICANT CONCENTRATION (hrs)	VOLUME WEIGHTED TIME OF SIGN. CONC. (ml/l)	24 HOUR (ml/l)	ARITHMETIC DURING 24 HOUR (ml/l)	24 HOUR (ml/l)
IN	5.10	74.29	74.29	0.00	0.00
OUT	0.00	0.00	0.00	0.00	0.00

WATER QUALITY REPORT

STATION NO. 100 TELINE TOP (MILE 10.0) & (MILE 10.0)

DATE: 10/10/78 TIME: 08:00

Time (hr)	Discharge (cfs)	HYDROGRAPH (AND TOTAL DISCHARGE)		Time (hr)	Discharge (cfs)	Sea Disch (mg/l)
		Sea Disch (mg/l)	Total Disch (cfs)			
* 0.00	0.000	0.000	0.000	0.10	0.000	0.000
* 0.20	0.000	0.000	0.000	0.30	0.000	0.000
* 0.40	0.000	0.000	0.000	0.50	0.000	0.000
* 0.60	0.000	0.000	0.000	0.70	0.000	0.000
* 0.80	0.000	0.000	0.000	0.90	0.000	0.000
* 1.00	0.000	0.000	0.000	1.10	0.000	0.000
* 1.20	0.000	0.000	0.000	1.30	0.000	0.000
* 1.40	0.000	0.000	0.000	1.50	0.000	0.000
* 1.60	0.000	0.000	0.000	1.70	0.000	0.000
* 1.80	0.000	0.000	0.000	1.90	0.000	0.000
* 2.00	0.000	0.000	0.000	2.10	0.000	0.000
* 2.20	0.000	0.000	0.000	2.30	0.000	0.000
* 2.40	0.055	0.000	0.055	2.50	0.173	0.000
* 2.60	0.217	0.000	0.217	2.70	2.399	0.000
* 2.80	7.095	0.000	7.095	2.90	15.404	0.000
* 3.00	26.575	0.000	26.575	3.10	42.405	0.000
* 3.20	59.404	0.000	59.404	3.30	63.716	0.000
* 3.40	53.945	0.000	53.945	3.50	52.134	0.000
* 3.60	45.917	0.000	45.917	3.70	42.953	0.000
* 3.80	39.057	0.000	39.057	3.90	35.020	0.000
* 4.00	32.653	0.000	32.653	4.10	30.409	0.000
* 4.20	28.042	0.000	28.042	4.30	25.559	0.000
* 4.40	23.083	0.000	23.083	4.50	20.818	0.000
* 4.60	18.375	0.000	18.375	4.70	17.227	0.000
* 4.80	15.768	0.000	15.768	4.90	14.470	0.000
* 5.00	13.117	0.000	13.117	5.10	12.401	0.000
* 5.20	11.506	0.000	11.506	5.30	10.725	0.000
* 5.40	10.020	0.000	10.020	5.50	9.407	0.000
* 5.60	8.832	0.000	8.832	5.70	8.367	0.000
* 5.80	7.970	0.000	7.970	5.90	7.652	0.000
* 6.00	7.365	0.000	7.365	6.10	7.122	0.000
* 6.20	6.756	0.000	6.756	6.30	6.153	0.000
* 6.40	6.376	0.000	6.376	6.50	4.573	0.000
* 6.60	2.847	0.000	2.847	6.70	3.123	0.000
* 6.80	2.453	0.000	2.453	6.90	2.219	0.000
* 7.00	1.711	0.000	1.711	7.10	1.470	0.000
* 7.20	1.225	0.000	1.225	7.30	0.722	0.000
* 7.40	0.738	0.000	0.738	7.50	0.545	0.000
* 7.60	0.314	0.000	0.314	7.70	0.314	0.000
* 7.80	0.159	0.000	0.159	7.90	0.181	0.000
* 8.00	0.136	0.000	0.136	8.10	0.105	0.000
* 8.20	0.079	0.000	0.079	8.30	0.060	0.000
* 8.40	0.040	0.000	0.040	8.50	0.035	0.000
* 8.60	0.020	0.000	0.020	8.70	0.020	0.000

