

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



JAN 30 1969

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PLATE 3 - Channel Profile A-A'

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

Introduction

Sedimentation Structure N6-J 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-J 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-J. 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-J 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-J 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 40 percent Pinon/Juniper, 20 percent Sage-grass, and 40 percent 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.

N6-J 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	30.0	38.1
Volume acre-ft	2.3	1.9
Storage		
Peak Stage ft	6515.1	6518.6
Spillway Elevation. . . ft	6518.0	--
Peak Storage.acre-ft	2.3	--
Storage Capacity . acre-ft	4.5	--
Outflow		
Peak Flow cfs	0	19.8
Embankment Crest Elevation ft	--	6520.0
Peak Stage ft	--	6518.6
Freeboard ft	--	1.4
Spillway Channel		
Flow Depth ft	--	0.6
Critical Velocity. . . fps	--	3.08
Manning's "n".	--	0.034
Outflow Channel		
Slope. %	--	11.0
Normal Velocity. fps	--	4.84
Normal Depth ft	--	0.2
Manning's "n".	--	0.034

Emergency Spillway Channel

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

Channel Depth (Spillway)	. . . . .	2.0 ft.
(Outflow)	. . . . .	2.0 ft.
Channel Width	. . . . .	20 ft.
Channel Length (Spillway)	. . . . .	29 ft.
(Outflow)	. . . . .	205 ft.
Side Slopes (Horizontal to Vertical)	. . . . .	3:1 or flatter
Average Exit Slope (Spillway)	. . . . .	0 percent
(Outflow)	. . . . .	11 percent
Inlet Elevation	. . . . .	6518.0

Storage Capacity

The impoundment volume-elevation curve is based on site specific surveys conducted for Peabody Coal Company's August 1984 inspection, and 1935 resurveys, where available. Additionally, the most current topographic maps available were used in developing Plate 2, Volume-Elevation Curve, N6-J.

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

1. Rainfall Factor, R 40
2. Soil Erodibility Factor, K 0.36
3. Slope Factor, LS 3.50
4. Cover Factor, C 0.25
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-J and the results of the sediment inflow analysis are summarized in the following table.

N6-J STORAGE

Total Storage Capacity	. . . . .	4.54 acre-ft
10-year, 24-hour Storm Inflow	. . . . .	2.29 acre-ft
Available Sediment Storage Capacity	. . . . .	2.25 acre-ft
Sediment Inflow Rate	. . . . .	0.210 acre-ft/yr
Sediment Storage Life	. . . . .	10.68 years

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

* * *

Plate 1 - Site Plan N6-J

Plate 2 - Stage-Capacity Chart

Plate 3 - Channel Profile N6-J, 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

6500

Outflow Channel (117)

Spillway
Elev. 6518.0

Embankment
Elev. 6520.0

Bottom
Elev. 6510.0

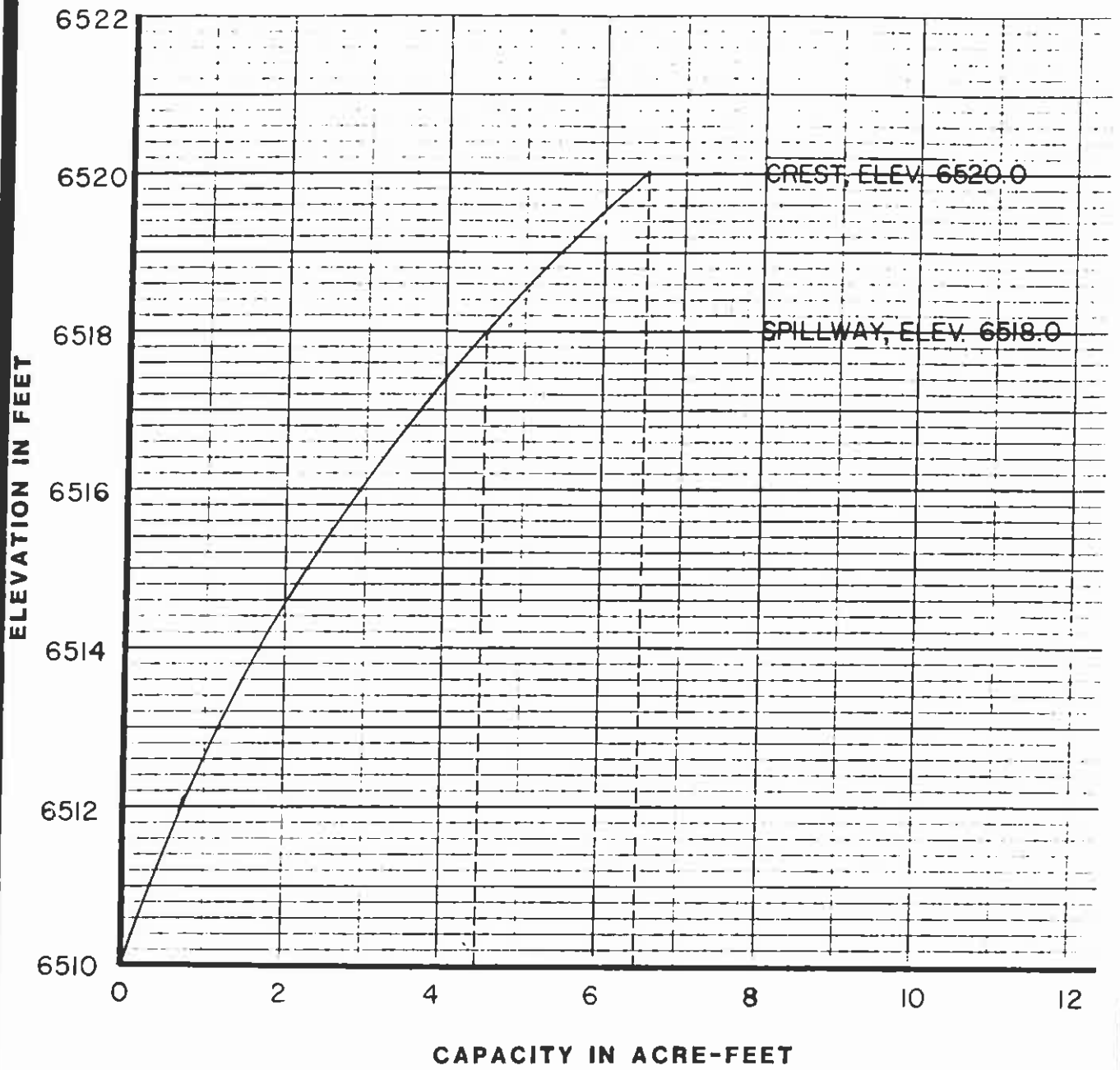
63

5 6.000

E 27.000

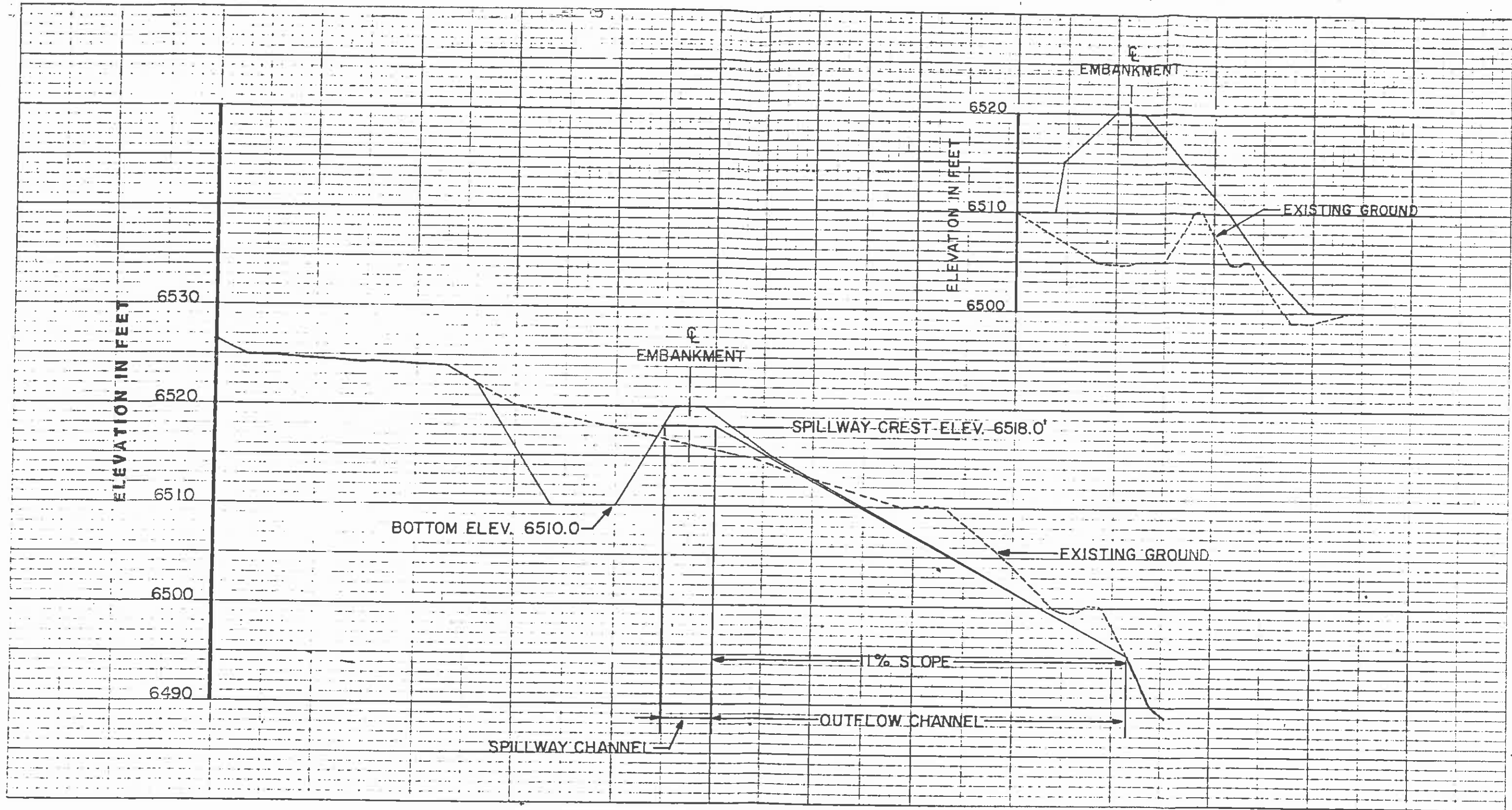


SITE PLAN
N6-J
BY: PEABODY COAL
PLATE 1



VOLUME-ELEVATION CURVE

N6-J

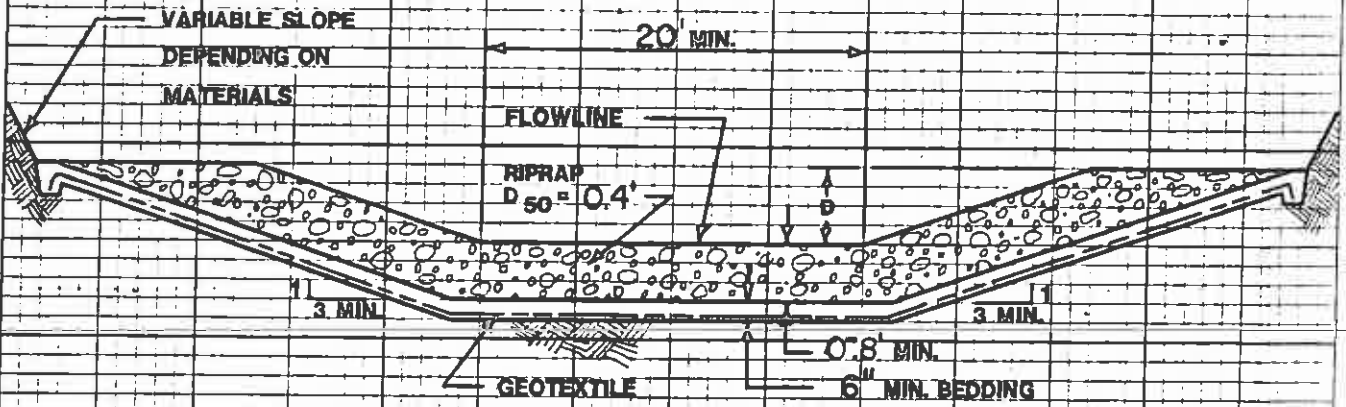


CHANNEL PROFILE A-A'
 EMBANKMENT PROFILE B-B'
 N6-J

Scale : 1" = 50'

SEE PLATE 1 FOR LOCATION

BY PEABODY COAL CO. Plate 3



SPILLWAY CHANNEL

D = 2.0 ft

LENGTH = 29.0 ft

FLOWLINE ELEV. = 6518.0 ft-msl

OUTFLOW CHANNEL

D = 2.0 ft

**SPILLWAY AND
OUTFLOW CHANNEL
CROSS SECTION**

N6—J

APPENDIX A

HYDROLOGY AND HYDRAULIC CALCULATIONS N6-J

N6-J

Hydrology and Hydraulic Calculations

Time of Concentration (T_c)

Overland Method (SEDCAD Utility)

Segment #1 = 880 ft. Horizontal
100 ft. Vertical

Near Bare, Overland, Land Use #5

Segment #2 - 800 ft. Horizontal
50 ft. Vertical

Upland Gullies, Land Use #7

$$T_c = 0.117 \text{ hrs.}$$

USLE Calculation

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

$$R = 40$$

$$K = 0.36$$

$$LS = (L/72.6)^0(17.2 \sin \theta - 0.55)$$

$$= (660/72.6)^{0.5}(17.2 \sin(5.71) - 0.55) = 3.50$$

$$C = 0.25$$

$$P = 1.00$$

$$A = (40)(0.36)(3.50)(0.25)(1.00) = 12.61 \text{ tons/acre}$$

TRAPEZOIDAL CHANNEL ANALYSIS
CRITICAL DEPTH COMPUTATION
October 11, 1986

PROGRAM INPUT DATA:

DESCRIPTION	VALUE
Flow Rate (cubic feet per second).....	19.8
Manning's Roughness Coefficient (n-value).....	0.0240
Channel Side Slope - Left Side (horizontal/vertical)....	3.00
Channel Side Slope - Right Side (horizontal/vertical)....	3.00
Channel Bottom Width (feet).....	20.0

PROGRAM RESULTS:

DESCRIPTION	VALUE
Critical Depth (feet).....	0.31
Critical Slope (feet per foot).....	0.0235
Flow Velocity (feet per second).....	3.08
Froude Number.....	1.000
Velocity Head (feet).....	0.15
Energy Head (feet).....	0.45
Cross-Sectional Area of Flow (square feet).....	6.43
Top Width of Flow (feet).....	21.84

TRAPEZOIDAL CHANNEL ANALYSIS COMPUTER PROGRAM, Version 1.1 (c) 1984
Dodson & Associates, Inc., 7015 W. Tidwell, #107, Houston, TX 77092
(713) 995-2322. A manual with equations & flow chart is available.

TRAPEZOIDAL CHANNEL ANALYSIS
 NORMAL DEPTH COMPUTATION
 October 31, 1988

PROGRAM INPUT DATA:
 DESCRIPTION

DESCRIPTION	VALUE
Flow Rate (cubic feet per second).....	19.8
Channel Bottom Slope (feet per foot).....	0.110
Manning's Roughness Coefficient (n-value).....	0.034
Channel Side Slope - Left Side (horizontal/vertical)....	3.00
Channel Side Slope - Right Side (horizontal/vertical)....	3.00
Channel Bottom Width (feet).....	20.0

PROGRAM RESULTS:
 DESCRIPTION

DESCRIPTION	VALUE
Normal Depth (feet).....	0.20
Flow Velocity (feet per second).....	4.84
Froude Number (Flow is Super-Critical).....	1.940
Velocity Head (feet).....	0.23
Energy Head (feet).....	0.56
Cross-Sectional Area of Flow (square feet).....	4.09
Top Width of Flow (feet).....	21.19

TRAPEZOIDAL CHANNEL ANALYSIS COMPUTER PROGRAM, Version 1.1 (c) 1988
 Dodson & Associates, Inc., 7015 W. Tidwell, #107, Houston, TX 77000
 (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, Discharge by Computer Aided Design *
*
* by *
*
* Pamela J. Schwab *
* Civil Software Design *
* P.O. Box 11092 *
* Lexington, Kentucky 40572 *
*
* Version No. 2.15 (6/20/88) *
*
* COPYRIGHT (c) 1987-1988 PAMELA J. SCHWAB. ALL RIGHTS RESERVED. *
*

*
* SEDCAD+(TM) Serial No. 194 has been Authorized and Released to: *
*
* Peabody Coal Company *
* 1300 S. Yale *
* Flagstaff, AZ 86001 *
* (602) 677-5289 *
*

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

*
* Current Date and Time: 10-31-1988 11:10:49 *
* Computed Date and Time: 10-31-1988 11:10:06 *
* File Created By: LGO *
* File Currently Being Printed: C:N6-J *
*

***** WATERSHED IDENTIFICATION *****
*
* N6-J *
*

***** STORM INPUT *****
*
* Storm Type SCS TYPE 2 *
* Rainfall Depth 2.1 inches *
* Storm Duration 24.0 hours *
*

***** WATERSHED NETWORK *****

```

*
*           JUNCTIONS           BRANCHES           STRUCTURES           *
*-----*
*           1                   1                   1                   *
*
*****

```

***** SEDIMENTOLOGY INPUTS *****

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*
* Specific Gravity =                2.5           *
* Submerged Bulk Specific Gravity = 1.25          *
*-----*

```

PERCENT FINER DISTRIBUTIONS:

* NO.	* PARTICLE SIZE, (mm)	* NO. 1	*
* 1	38.0000	100.00	*
* 2	4.7000	100.00	*
* 3	2.3800	100.00	*
* 4	1.1900	99.00	*
* 5	0.5900	98.00	*
* 6	0.2970	96.00	*
* 7	0.1490	90.00	*
* 8	0.0740	81.00	*
* 9	0.0370	69.00	*
* 10	0.0190	53.00	*
* 11	0.0090	44.00	*
* 12	0.0050	36.00	*
* 13	0.0020	26.00	*
* 14	0.0010	22.00	*
* 15	0.0001	0.00	*

***** BETWEEN STRUCTURE ROUTING PARAMETERS *****

* J	* B	* TRAVEL TIME (hours)	* MUSK. K (hours)	* MUSK. X
* 1	* 1	* Prior J or S to Structure 1	* 0.000	* 0.000

```

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

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*****
*
*          SUBWATERSHED INFORMATION          *
*
*****

```

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*
*          HYDRAULIC INPUT VALUES          *
*

```

WATER SHED	AREA (acre)	CURVE NUMBER	TC (hr)	TT (hr)	ROUTING K-(hr)	COEF'S X	UNIT HYDRO RESPONSE
1	36.00	83.00	0.117	0.000	0.000	0.000	INSTANT

```

*
*          SEDIMENT INPUT VALUES          *
*

```

WATER SHED	SEG NUM	SOIL K	LENGTH (feet)	SLOPE (%)	CP VALUE	PART OPT
1	1	0.36	660.0	10.0	0.250	1 (RUSLE)

```

*
*          COMPUTED VALUES FOR INDIVIDUAL WATERSHEDS          *
*

```

WATERSHED	PEAK FLOW (cfs)	RUNOFF (inches)	SEDIMENT (tons)	D50 (mm)
1	30.000	0.764	320.09	0.015

```

*****

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 * RESULTS TO N6-J *
 * *****

* Total Drainage Area to This Point = 36.000 acres *
 * Basin Trap Efficiency = 100.000 % *

EMERGENCY SPILLWAY OUTSLOPE DESIGN:

* Design Discharge = 17.383 cfs *
 * Velocity = 4.618 fps *
 * Depth of Flow = 0.179 feet *
 * Manning's n = 0.033 *
 * D50 Channel Bed = 0.362 feet *
 * D50 Channel Bank = 0.325 feet *

DETAILED STAGE-DISCHARGE INFORMATION

ELEVATION	STAGE (ft)	PSW #1 (cfs)	ESW (cfs)	TOTAL DISCHARGE (cfs)
6510.00	0.00	0.00	0.00	0.00
6510.50	0.50	0.00	0.00	0.00
6511.00	1.00	0.00	0.00	0.00
6511.50	1.50	0.00	0.00	0.00
6512.00	2.00	0.00	0.00	0.00
6512.50	2.50	0.00	0.00	0.00
6513.00	3.00	0.00	0.00	0.00
6513.50	3.50	0.00	0.00	0.00
6514.00	4.00	0.00	0.00	0.00
6514.50	4.50	0.00	0.00	0.00
6515.00	5.00	0.00	0.00	0.00
6515.50	5.50	0.00	0.00	0.00
6516.00	6.00	0.00	0.00	0.00
6516.50	6.50	0.00	0.00	0.00
6517.00	7.00	0.00	0.00	0.00
6517.50	7.50	0.00	0.00	0.00
6518.00	8.00	0.00	0.00	0.00
6518.70	8.70	0.00	23.16	23.16
6518.80	8.80	0.00	29.98	29.98
6518.90	8.90	0.00	37.36	37.36
6519.00	9.00	0.00	45.45	45.45
6519.50	9.50	0.00	100.23	100.23
6520.00	10.00	0.00	165.14	165.14

 * RESULTS TO N6-J *
 * (continued) *

* INPUT AND CALCULATED BASIN GEOMETRY *

ELEV- ATION	STAGE (ft)	AREA (ac)	DIS- CHARGE (cfs)	AVG. DEPTH (ft)	CAPACITY (ac-ft)
6510.0	0.0	0.30	0.00	0.00	0.00
6510.5	0.5	0.33	0.00	0.49	0.16
6511.0	1.0	0.36	0.00	0.96	0.33
6511.5	1.5	0.39	0.00	1.43	0.52
6512.0	2.0	0.42	0.00	1.88	0.72
6512.5	2.5	0.46	0.00	2.33	0.94
6513.0	3.0	0.49	0.00	2.76	1.18
6513.5	3.5	0.52	0.00	3.19	1.43
6514.0	4.0	0.55	0.00	3.61	1.70
6514.5	4.5	0.58	0.00	4.02	1.98
6515.0	5.0	0.61	0.00	4.43	2.28
6515.5	5.5	0.66	0.00	4.83	2.59
6516.0	6.0	0.71	0.00	5.21	2.93
6516.5	6.5	0.75	0.00	5.57	3.30
6517.0	7.0	0.80	0.00	5.93	3.69
6517.5	7.5	0.85	0.00	6.28	4.10
6518.0	8.0	0.90	0.00	6.63	4.54 EMERGENCY SPILLWAY
	8.5				5.03 PEAK STAGE
6518.7	8.7	0.97	23.16	7.11	5.19
6518.8	8.8	0.97	29.98	7.17	5.29
6518.9	8.9	0.98	37.36	7.24	5.38
6519.0	9.0	0.99	45.45	7.31	5.48
6519.5	9.5	1.04	100.23	7.65	5.99
6520.0	10.0	1.09	165.14	7.98	6.53

	RUNOFF VOLUME (ac-ft)	PEAK DISCHARGE (cfs)	PEAK SEDIMENT CONCENTRATION (mg/l)	PEAK SETTLEABLE CONCENTRATION (m1/l)	SEDIMENT YIELD (tons)
IN	2.293	30.000	187544.70	80.758	320.09
OUT	2.293	17.383	0.00	0.000	0.00

 * AVERAGE SETTLEABLE CONCENTRATION: *

	TIME OF SIGNIFICANT CONCENTRATION (hrs)	VOLUME WEIGHTED DURING TIME OF SIGN. CONC. (m1/l)	PEAK 24 HOUR (m1/l)	ARITHMETIC DURING TIME OF SIGN. CONC. (m1/l)	PEAK 24 HOUR (m1/l)
IN	13.40	41.99	41.99	18.56	10.36
OUT	0.00	0.00	0.00	0.00	0.00

```

*****
*
*           JUNCTION 1 , BRANCH 1 , STRUCTURE 1
*           N6-J
*   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	5.30	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	6.90	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	7.50	0.000	0.000	*
* 7.60	0.000	0.000	7.70	0.000	0.000	*
* 7.80	0.000	0.000	7.90	0.000	0.000	*
* 8.00	0.000	0.000	8.10	0.000	0.000	*
* 8.20	0.000	0.000	8.30	0.000	0.000	*
* 8.40	0.000	0.000	8.50	0.000	0.000	*
* 8.60	0.000	0.000	8.70	0.000	0.000	*

* 8.00	0.000	0.000	8.30	0.000	0.000	*
* 9.00	0.000	0.000	9.10	0.000	0.000	*
* 9.20	0.000	0.000	9.30	0.000	0.000	*
* 9.40	0.000	0.000	9.50	0.000	0.000	*
* 9.60	0.000	0.000	9.70	0.000	0.000	*
* 9.80	0.000	0.000	9.90	0.000	0.000	*
* 10.00	0.000	0.000	10.10	0.000	0.000	*
* 10.20	0.000	0.000	10.30	0.000	0.000	*
* 10.40	0.002	0.000	10.50	0.009	0.000	*
* 10.60	0.028	0.000	10.70	0.057	0.000	*
* 10.80	0.094	0.000	10.90	0.135	0.000	*
* 11.00	0.180	0.000	11.10	0.257	0.000	*
* 11.20	0.368	0.000	11.30	0.482	0.000	*
* 11.40	0.597	0.000	11.50	0.712	0.000	*
* 11.60	2.262	0.000	11.70	5.593	0.000	*
* 11.80	9.398	0.000	11.90	13.328	0.000	*
* 12.00	17.171	0.000	12.10	17.383	0.000	*
* 12.20	14.485	0.000	12.30	12.354	0.000	*
* 12.40	10.791	0.000	12.50	9.652	0.000	*
* 12.60	8.422	0.000	12.70	7.118	0.000	*
* 12.80	6.153	0.000	12.90	5.441	0.000	*
* 13.00	4.916	0.000	13.10	4.413	0.000	*
* 13.20	3.924	0.000	13.30	3.562	0.000	*
* 13.40	3.297	0.000	13.50	3.101	0.000	*
* 13.60	2.886	0.000	13.70	2.656	0.000	*
* 13.80	2.486	0.000	13.90	2.362	0.000	*
* 14.00	2.270	0.000	14.10	2.130	0.000	*
* 14.20	1.954	0.000	14.30	1.823	0.000	*
* 14.40	1.727	0.000	14.50	1.656	0.000	*
* 14.60	1.604	0.000	14.70	1.566	0.000	*
* 14.80	1.538	0.000	14.90	1.519	0.000	*
* 15.00	1.505	0.000	15.10	1.495	0.000	*
* 15.20	1.489	0.000	15.30	1.485	0.000	*
* 15.40	1.483	0.000	15.50	1.482	0.000	*
* 15.60	1.482	0.000	15.70	1.483	0.000	*
* 15.80	1.484	0.000	15.90	1.486	0.000	*
* 16.00	1.488	0.000	16.10	1.414	0.000	*
* 16.20	1.282	0.000	16.30	1.184	0.000	*
* 16.40	1.112	0.000	16.50	1.058	0.000	*
* 16.60	1.019	0.000	16.70	0.989	0.000	*
* 16.80	0.968	0.000	16.90	0.952	0.000	*
* 17.00	0.941	0.000	17.10	0.932	0.000	*
* 17.20	0.926	0.000	17.30	0.922	0.000	*
* 17.40	0.919	0.000	17.50	0.918	0.000	*
* 17.60	0.916	0.000	17.70	0.916	0.000	*
* 17.80	0.916	0.000	17.90	0.916	0.000	*
* 18.00	0.916	0.000	18.10	0.917	0.000	*
* 18.20	0.917	0.000	18.30	0.918	0.000	*
* 18.40	0.919	0.000	18.50	0.919	0.000	*
* 18.60	0.920	0.000	18.70	0.921	0.000	*
* 18.80	0.922	0.000	18.90	0.923	0.000	*
* 19.00	0.924	0.000	19.10	0.925	0.000	*
* 19.20	0.926	0.000	19.30	0.927	0.000	*
* 19.40	0.928	0.000	19.50	0.929	0.000	*
* 19.60	0.929	0.000	19.70	0.930	0.000	*
* 19.80	0.931	0.000	19.90	0.932	0.000	*
* 20.00	0.933	0.000	20.10	0.894	0.000	*
* 20.20	0.825	0.000	20.30	0.774	0.000	*
* 20.40	0.736	0.000	20.50	0.708	0.000	*
* 20.60	0.687	0.000	20.70	0.672	0.000	*

* 20.80	0.630	0.000	20.90	0.632	0.000	*
* 21.00	0.646	0.000	21.10	0.641	0.000	*
* 21.20	0.638	0.000	21.30	0.636	0.000	*
* 21.40	0.634	0.000	21.50	0.633	0.000	*
* 21.60	0.632	0.000	21.70	0.632	0.000	*
* 21.80	0.632	0.000	21.90	0.632	0.000	*
* 22.00	0.632	0.000	22.10	0.632	0.000	*
* 22.20	0.632	0.000	22.30	0.632	0.000	*
* 22.40	0.633	0.000	22.50	0.633	0.000	*
* 22.60	0.633	0.000	22.70	0.634	0.000	*
* 22.80	0.634	0.000	22.90	0.634	0.000	*
* 23.00	0.635	0.000	23.10	0.635	0.000	*
* 23.20	0.635	0.000	23.30	0.636	0.000	*
* 23.40	0.636	0.000	23.50	0.637	0.000	*
* 23.60	0.637	0.000	23.70	0.637	0.000	*
* 23.80	0.638	0.000	23.90	0.556	0.000	*
* 24.00	0.414	0.000	24.10	0.308	0.000	*
* 24.20	0.229	0.000	24.30	0.171	0.000	*
* 24.40	0.127	0.000	24.50	0.094	0.000	*
* 24.60	0.070	0.000	24.70	0.052	0.000	*
* 24.80	0.039	0.000	24.90	0.029	0.000	*
* 25.00	0.022	0.000	25.10	0.016	0.000	*
* 25.20	0.012	0.000	25.30	0.009	0.000	*
* 25.40	0.007	0.000	25.50	0.005	0.000	*
* 25.60	0.004	0.000	25.70	0.003	0.000	*
* 25.80	0.002	0.000	25.90	0.002	0.000	*
* 26.00	0.001	0.000	26.10	0.001	0.000	*
*						*

--- <<< SEDCAD+ >>> ---
Peabody Coal Company

*** RUN COMPLETED ***

APPENDIX C

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

*
* SEDCAD+(TM) *
* Sediment, Erosion, Discharge by Computer Aided Design *
* by *
* Pamela J. Schwab *
* Civil Software Design *
* P.O. Box 11092 *
* Lexington, Kentucky 40572 *
* Version No. 2.15 (6/20/88) *
* COPYRIGHT (c) 1987-1988 PAMELA J. SCHWAB. ALL RIGHTS RESERVED. *
*

* SEDCAD+(TM) Serial No. 194 has been Authorized and Released to: *
* Peabody Coal Company *
* 1300 S. Yale *
* Flagstaff, AZ 86001 *
* (602) 677-5289 *
*

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

*
* Current Date and Time: 10-31-1988 11:18:56 *
* Computed Date and Time: 10-31-1988 11:10:19 *
* File Created By: LGO *
* File Currently Being Printed: C:N6-J *
*

***** WATERSHED IDENTIFICATION *****
*
* N6-J *
* (SECOND EMERGENCY SPILLWAY RUN) *
*

***** STORM INPUT *****
*
* Storm Type SCS TYPE 2 *
* Rainfall Depth 1.9 inches *
* Storm Duration 6.0 hours *
*

***** WATERSHED NETWORK *****

JUNCTIONS	BRANCHES	STRUCTURES
1	1	1

***** SEDIMENTOLOGY INPUTS *****

* Specific Gravity = 2.5
 * Submerged Bulk Specific Gravity = 1.25

***** PERCENT FINER DISTRIBUTIONS: *****

NO.	PARTICLE SIZE, (mm)	NO. 1
1	38.0000	100.00
2	4.7000	100.00
3	2.3800	100.00
4	1.1900	99.00
5	0.5900	98.00
6	0.2970	96.00
7	0.1490	90.00
8	0.0740	81.00
9	0.0370	69.00
10	0.0190	53.00
11	0.0090	44.00
12	0.0050	36.00
13	0.0020	26.00
14	0.0010	22.00
15	0.0001	0.00

***** BETWEEN STRUCTURE ROUTING PARAMETERS *****

J	B	Prior J or S to Structure	TRAVEL TIME (hours)	MUSK. K (hours)	MUSK. X (hours)
1	1	Prior J or S to Structure 1	0.000	0.000	0.000

```

*****
*****
**          **
** JUNCTION 1 , BRANCH 1 , STRUCTURE 1 **
**          POND STRUCTURE          **
**          N6-J                      **
**          **
*****
*****
  
```

```

*
*          SUBWATERSHED INFORMATION          *
*
*****
  
```

```

*
*          HYDRAULIC INPUT VALUES          *
*
*****
  
```

WATER SHED	AREA (acre)	CURVE NUMBER	TC (hr)	TT (hr)	ROUTING K-(hr)	COEF'S X	UNIT HYDRO RESPONSE
1	36.00	83.00	0.117	0.000	0.000	0.000	INSTANT

```

*
*          SEDIMENT INPUT VALUES          *
*
*****
  
```

WATER SHED	SEG NUM	SOIL K	LENGTH (feet)	SLOPE (%)	CP VALUE	PART OPT
1	1	0.36	660.0	10.0	0.250	1 (RUSLE)

```

*
*          COMPUTED VALUES FOR INDIVIDUAL WATERSHEDS          *
*
*****
  
```

WATERSHED	PEAK FLOW (cfs)	RUNOFF (inches)	SEDIMENT (tons)	D50 (mm)
1	38.090	0.628	327.69	0.015

```
*****
*
*          JUNCTION 1 , BRANCH 1 , STRUCTURE 1          *
*          N6-J                                          *
*          POND STRUCTURE INFORMATION                    *
*
*****
*
* Time Increment of the Routed Hydrograph =      0.10 hours *
* Dead Space of Permanent Pool =                40.00 %   *
* Number of Continuous Stirred Reactors =        0         *
*
*
*          RIPRAP EMERGENCY SPILLWAY INPUTS              *
*
* Crest stage of the Emergency Spillway =          8.000 feet *
* Crest Length =                                29.000 feet *
* Width =                                       20.000 feet *
* Outslope factors:
*   Slope =                                     11.00 %      *
*   Side Slope Ratio =                          3.00:1     *
*   Safety Factor =                              1.20        *
*
*****
```

 *
 * RESULTS TO N6-J *
 *

* Total Drainage Area to This Point = 36.000 acres *
 * Basin Trap Efficiency = 100.000 % *

EMERGENCY SPILLWAY OUTSLOPE DESIGN:

* Design Discharge = 19.750 cfs *
 * Velocity = 4.809 fps *
 * Depth of Flow = 0.195 feet *
 * Manning's n = 0.034 *
 * D50 Channel Bed = 0.397 feet *
 * D50 Channel Bank = 0.354 feet *

DETAILED STAGE-DISCHARGE INFORMATION

ELEVATION	STAGE (ft)	PSW #1 (cfs)	ESW (cfs)	TOTAL DISCHARGE (cfs)
6510.00	0.00	0.00	0.00	0.00
6510.50	0.50	0.00	0.00	0.00
6511.00	1.00	0.00	0.00	0.00
6511.50	1.50	0.00	0.00	0.00
6512.00	2.00	0.00	0.00	0.00
6512.50	2.50	0.00	0.00	0.00
6513.00	3.00	0.00	0.00	0.00
6513.50	3.50	0.00	0.00	0.00
6514.00	4.00	0.00	0.00	0.00
6514.50	4.50	0.00	0.00	0.00
6515.00	5.00	0.00	0.00	0.00
6515.50	5.50	0.00	0.00	0.00
6516.00	6.00	0.00	0.00	0.00
6516.50	6.50	0.00	0.00	0.00
6517.00	7.00	0.00	0.00	0.00
6517.50	7.50	0.00	0.00	0.00
6518.00	8.00	0.00	0.00	0.00
6518.70	8.70	0.00	23.16	23.16
6518.80	8.80	0.00	29.98	29.98
6518.90	8.90	0.00	37.36	37.36
6519.00	9.00	0.00	45.45	45.45
6519.50	9.50	0.00	100.23	100.23
6520.00	10.00	0.00	165.14	165.14

RESULTS TO N6-J
 (continued)

INPUT AND CALCULATED BASIN GEOMETRY

ELEV- ATION	STAGE (ft)	AREA (ac)	DIS- CHARGE (cfs)	AVG. DEPTH (ft)	CAPACITY (ac-ft)
6510.0	0.0	0.30	0.00	0.00	0.00
6510.5	0.5	0.33	0.00	0.49	0.16
6511.0	1.0	0.36	0.00	0.96	0.33
6511.5	1.5	0.39	0.00	1.43	0.52
6512.0	2.0	0.42	0.00	1.88	0.72
6512.5	2.5	0.46	0.00	2.33	0.94
6513.0	3.0	0.49	0.00	2.76	1.18
6513.5	3.5	0.52	0.00	3.19	1.43
6514.0	4.0	0.55	0.00	3.61	1.70
6514.5	4.5	0.58	0.00	4.02	1.98
6515.0	5.0	0.61	0.00	4.43	2.28
6515.5	5.5	0.66	0.00	4.83	2.59
6516.0	6.0	0.71	0.00	5.21	2.93
6516.5	6.5	0.75	0.00	5.57	3.30
6517.0	7.0	0.80	0.00	5.93	3.69
6517.5	7.5	0.85	0.00	6.28	4.10
6518.0	8.0	0.90	0.00	6.63	4.54 EMERGENCY SPILLWAY
	8.6				5.09 PEAK STAGE
6518.7	8.7	0.97	23.16	7.11	5.19
6518.8	8.8	0.97	29.98	7.17	5.29
6518.9	8.9	0.98	37.36	7.24	5.38
6519.0	9.0	0.99	45.45	7.31	5.48
6519.5	9.5	1.04	100.23	7.65	5.99
6520.0	10.0	1.09	165.14	7.98	6.53

	RUNOFF VOLUME (ac-ft)	PEAK DISCHARGE (cfs)	PEAK SEDIMENT CONCENTRATION (mg/l)	PEAK SETTLEABLE CONCENTRATION (m1/l)	SEDIMENT YIELD (tons)
IN	1.883	38.090	194269.41	83.654	327.69
OUT	1.883	19.750	0.00	0.000	0.00

AVERAGE SETTLEABLE CONCENTRATION:

	TIME OF SIGNIFICANT CONCENTRATION (hrs)	VOLUME WEIGHTED DURING TIME OF SIGN. CONC. (m1/l)	PEAK 24 HOUR (m1/l)	ARITHMETIC DURING TIME OF SIGN. CONC. (m1/l)	PEAK 24 HOUR (m1/l)
IN	3.20	52.74	52.74	33.61	4.48
OUT	0.00	0.00	0.00	0.00	0.00

```

*****
*
*          JUNCTION 1 , BRANCH 1 , STRUCTURE 1
*          N6-J
*    HYDROGRAPH (AND SEDIMENTGRAPH) OUT OF THE STRUCTURE
*
*****
  
```

```

*
*          HYDROGRAPH (AND SEDIMENTGRAPH)
*
* Time      Discharge      Sed Disch      Time      Discharge      Sed Disch
* (hr)      (cfs)          (mg/l)          (hr)      (cfs)          (mg/l)
*-----*-----*-----*-----*-----*-----*
  
```

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	0.560	0.000	* 2.70	3.029	0.000
* 2.80	7.529	0.000	* 2.90	12.968	0.000
* 3.00	18.661	0.000	* 3.10	19.750	0.000
* 3.20	16.703	0.000	* 3.30	14.476	0.000
* 3.40	12.857	0.000	* 3.50	11.689	0.000
* 3.60	10.325	0.000	* 3.70	8.802	0.000
* 3.80	7.677	0.000	* 3.90	6.848	0.000
* 4.00	6.241	0.000	* 4.10	5.640	0.000
* 4.20	5.043	0.000	* 4.30	4.603	0.000
* 4.40	4.280	0.000	* 4.50	4.044	0.000
* 4.60	3.776	0.000	* 4.70	3.484	0.000
* 4.80	3.269	0.000	* 4.90	3.112	0.000
* 5.00	2.997	0.000	* 5.10	2.816	0.000
* 5.20	2.585	0.000	* 5.30	2.415	0.000
* 5.40	2.289	0.000	* 5.50	2.197	0.000
* 5.60	2.129	0.000	* 5.70	2.080	0.000
* 5.80	2.045	0.000	* 5.90	1.771	0.000
* 6.00	1.318	0.000	* 6.10	0.980	0.000
* 6.20	0.730	0.000	* 6.30	0.543	0.000
* 6.40	0.404	0.000	* 6.50	0.301	0.000
* 6.60	0.224	0.000	* 6.70	0.166	0.000
* 6.80	0.124	0.000	* 6.90	0.092	0.000
* 7.00	0.069	0.000	* 7.10	0.051	0.000
* 7.20	0.038	0.000	* 7.30	0.028	0.000
* 7.40	0.021	0.000	* 7.50	0.016	0.000
* 7.60	0.012	0.000	* 7.70	0.009	0.000
* 7.80	0.006	0.000	* 7.90	0.005	0.000
* 8.00	0.004	0.000	* 8.10	0.003	0.000
* 8.20	0.002	0.000	* 8.30	0.001	0.000
* 8.40	0.001	0.000	* 8.50	0.001	0.000

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*** RUN COMPLETED ***