

DESIGN REPORT
Sedimentation Structure
J3-G
Black Mesa Mine
Navajo County, Arizona
for
PEABODY COAL COMPANY



Dames & Moore
10139-011-22

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INTRODUCTION

Sedimentation Structure J3-G will be an internal impoundment, designed and constructed by Peabody Coal Company as a temporary sedimentation structure to control runoff and sediment from the proposed mine airport at the Black Mesa Mine. The location of Structure J3-G is shown on Plate 1, Site Plan.

This design report contains information specific to Structure J3-G. Regional site information is presented in the "General Report, Kayenta and Black Mesa Mines, Navajo County, Arizona for Peabody Coal Company," along with the methods and results of analyses used for slope stability, hydrology and hydraulics.

INSPECTION

The proposed site of Structure J3-G was inspected by a senior geotechnical engineer from Dames & Moore in October, 1985 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.

SITE DESCRIPTION

LAND USE

Structure J3-G has a 241.8-acre tributary drainage area and is located near Coal Mine Wash at the Black Mesa Mine. The watershed is classified as 86% reclaimed and 14% disturbed.

EMBANKMENT

The structure will not have an embankment.

DESIGN ANALYSES

GENERAL

Structure J3-G was designed by an interdisciplinary team of engineers from Dames & Moore. 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 1985 for Peabody Coal Company and was used in the analyses of the structure.

STABILITY

A stability analysis does not need to be performed for this structure.

HYDROLOGY

The hydrologic analysis was completed using the U.S. Army Corps of Engineers generalized computer program HEC-1, Flood Hydrograph Package. Structure J3-G does not have a spillway. Therefore, it was designed to contain the runoff from the Probable Maximum Precipitation (PMP).

The following parameters were used in the hydrologic analysis:

1.	Water Course length, L	1.28	mi
2.	Elevation Difference, H	83	ft
3.	Time of Concentration, T_c	0.630	h
4.	Lag time, $0.6T_c$	0.378	h
5.	SCS Curve Number	88	
6.	Rainfall Depth, Probable Maximum Precipitation		
	Local Storm (6 hour)	8.8	in.
	General Storm (72 hour - August) . . .	11.1	in.
	General Storm (6 hour - Augsut) . . .	4.7	in.
7.	Drainage Area	241.8	acres

HYDRAULICS

The HEC-1 program was used to evaluate inflow to the planned sedimentation structure and the resulting water surface elevations. The initial conditions and results of the analysis are summarized in the following table.

J3-G HYDRAULICS

	Units	General Storm PMP	Local Storm PMP
Initial Reservoir Volume Condition		Empty	Empty
Inflow			
Peak Flow	cfs	179	2052
Volume	acre-ft	193.8	144.3
Storage			
Maximum Allowable Water Surface Elevation	ft	6510.00	6510.00
Peak Stage	ft	6504.42	6501.90
Peak Storage	acre-ft	193.8	144.3
Storage Capacity	acre-ft	308.9	308.9

Spillway and Outflow Channel

Structure J3-G will not have a spillway or outflow channel because it is designed to contain all runoff from the PMP.

STORAGE CAPACITY

The impoundment volume-elevation curve shown on Plate 2, Volume-Elevation Curve, J3-G is based on site specific topographic data developed for Peabody Coal Company in 1985, and 1985 site specific surveys, where available.

The calculations for the sediment load entering Structure J3-G were made utilizing the Universal Soil Loss Equation with the following parameters:

1. Rainfall Factor, R 40
2. Soil Erodibility Factor, K 0.42
3. Slope Factor, LS 3.37
4. Cover Factor, C 0.269
5. Erosion Control Factor, P 1.0

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 storage capacity of J3-G is shown on Plate 2, Volume-Elevation Curve, J3-G, and the results of the sediment inflow analysis are summarized in the following table.

J3-G STORAGE

	General PMP	Local PMP	
Total Storage Capacity	308.9	308.9	acre-ft
Storm Inflow	193.8	144.3	acre-ft
Available Sediment Storage Capacity . .	115.1	164.6	acre-ft
Sediment Inflow Rate	1.71	1.71	acre-ft/yr
Sediment Storage Life	67	96	yrs

* * *

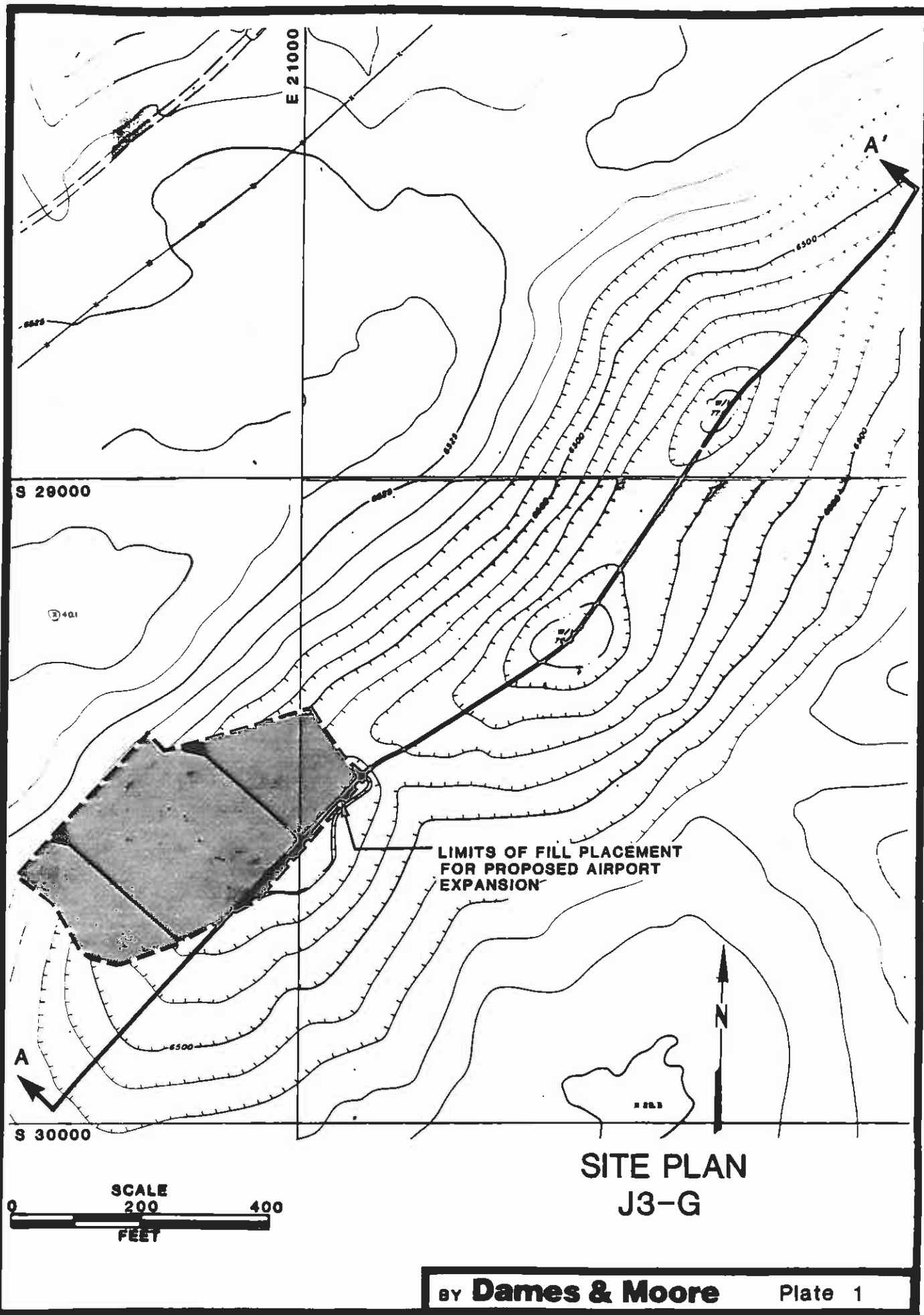
The following plates and appendix are attached and complete this design report.

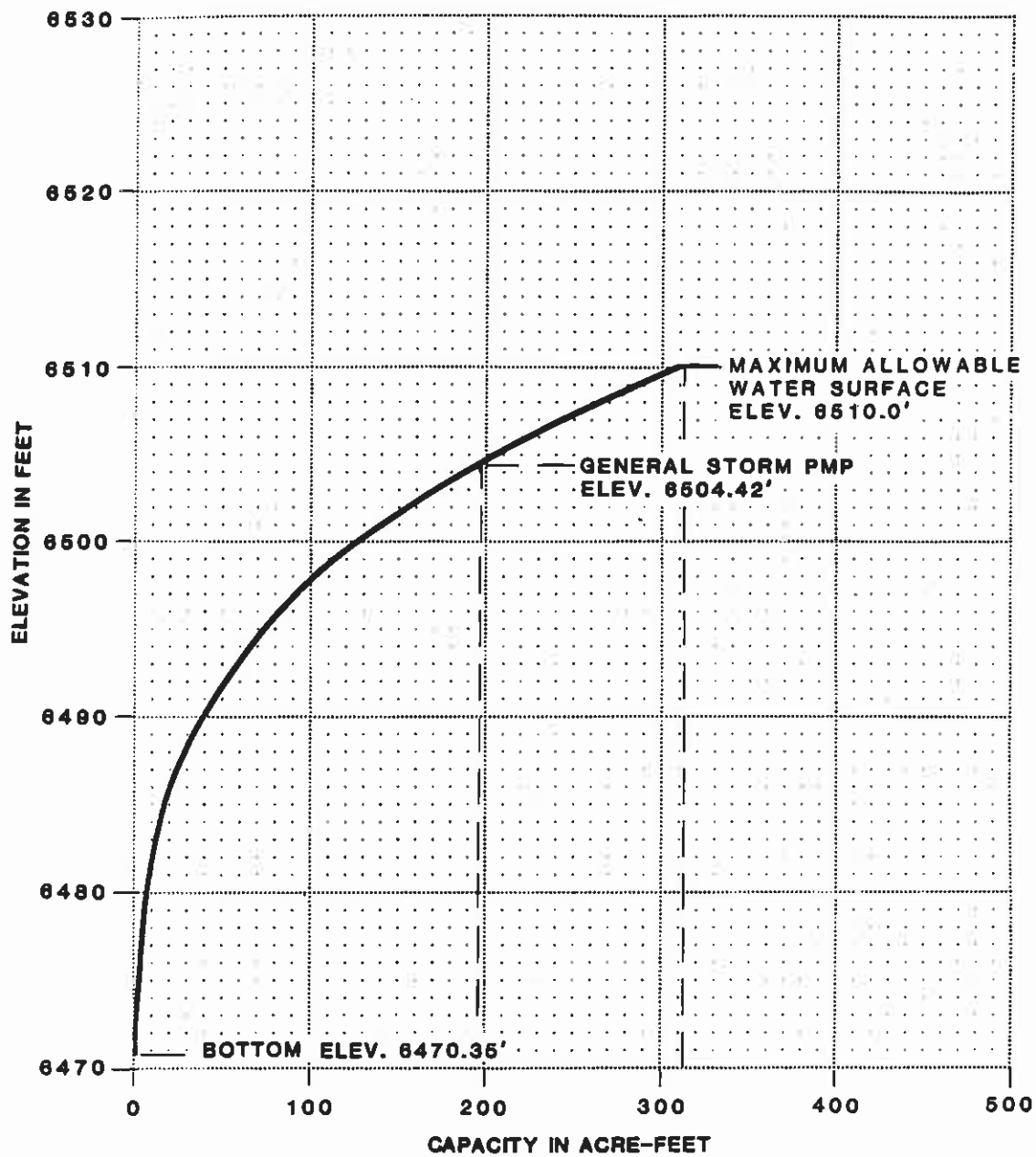
Plate 1 - Site Plan J3-G

Plate 2 - Volume-Elevation Curve J3-G

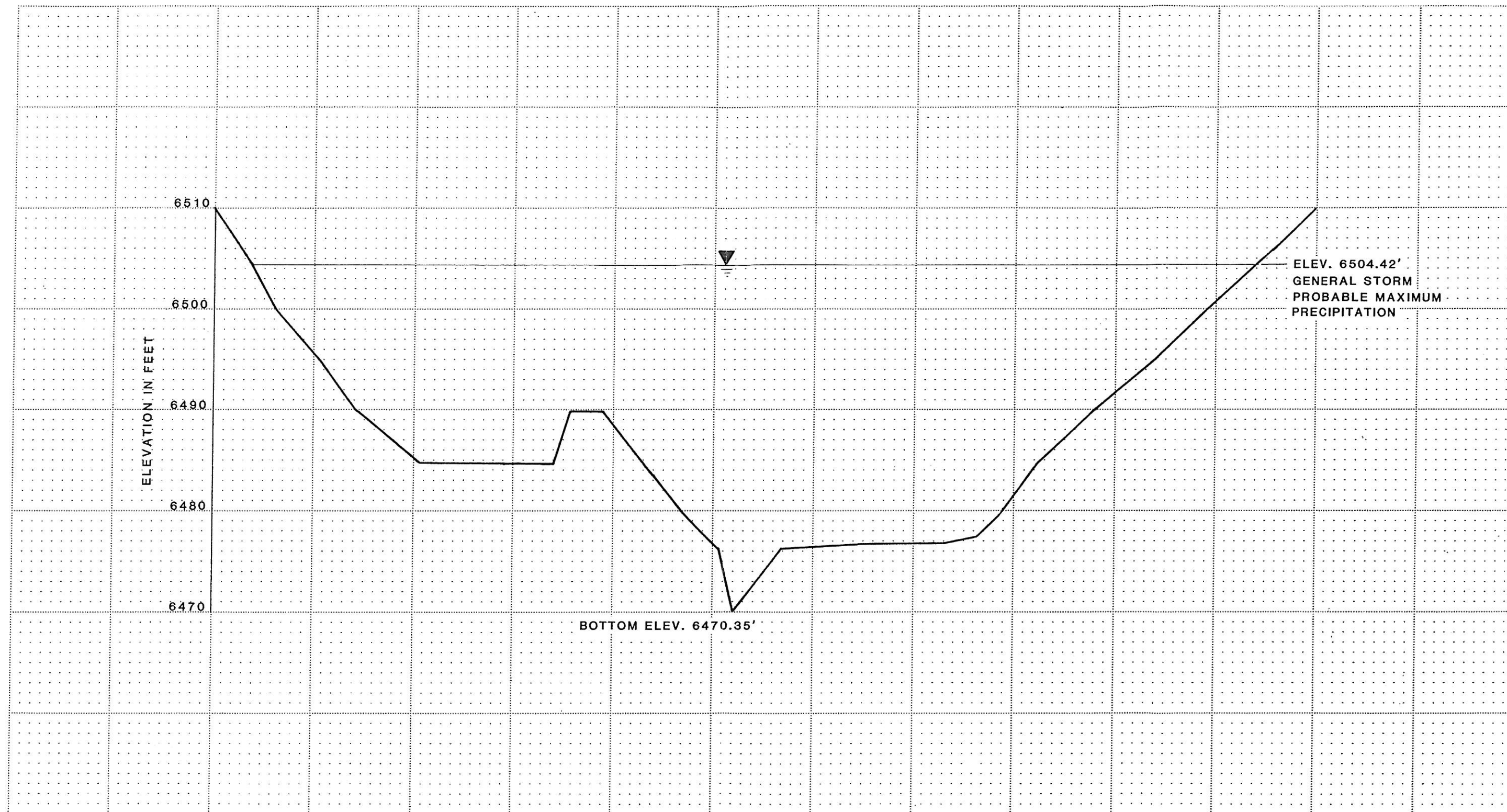
Plate 3 - Channel Profile J3-G, A-A'

Appendix A - Hydrology and Hydraulic Calculations

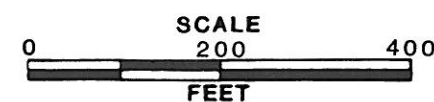




**VOLUME-ELEVATION
CURVE
J3-G**



CHANNEL PROFILE A-A'
J3-G



FOR LOCATION SEE PLATE 1

BY **Dames & Moore**

Plate 3

APPENDIX A
HYDROLOGY AND HYDRAULIC CALCULATIONS

TIME OF CONCENTRATION

ELEVATION DIFFERENCE = 83

WATER COURSE LENGTH = 6770' = 1.28 mi

$T_c = 0.630$ hr

Lag Time = $0.6 T_c = 0.378$ hr

SCS CURVE NUMBER

DRAINAGE AREA (ac)	COVER TYPE	HYDROLOGIC CONDITION	SOIL TYPE	WEIGHTED CURVE NUMBER
207.4	reclaimed (pre-law)	—	—	87 (.86)
34.4	disturbed (runway)	—	C	92 (.14)
				<u>87.7</u>

use 88

DRAINAGE BASIN AREA

241.8 ACRES

0.378 SQ MILES

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UNIVERSAL SOIL LOSS EQUATION

RAINFALL FACTOR

$R = 40$

SOIL ERODIBILITY FACTOR

SOIL TYPE = 100 % EA #35

$K = 0.42$

SLOPE FACTOR

<u>LENGTH (ft.)</u>	<u>Δ ELEV (ft.)</u>	<u>SLOPE (%)</u>	<u>LS</u>
800	105	13.1	5.92 4.68 (.4)
600	40	6.7	1.91 1.53 (.3)
700	35	5.	1.42 1.15 (.3)
			2.67 3.37

COVER FACTOR

<u>AREA (ac)</u>	<u>COVER TYPE</u>	<u>% COVER</u>	<u>CANOPY (%)</u>	<u>WEIGHTED C</u>
86%	reclaimed	—	—	(.15)(.86)
14%	disturbed	—	—	(1.0)(.14)
				<u>0.269</u>

EROSION CONTROL FACTOR

$P = 1.0$

SEDIMENT INFLOW

$A = 40(.42)(3.37)(.269)(1.0) = 15.23$ ton/acre/year

$A = 15.23 \left(\frac{1}{2047} \right) (241.8) \left(\frac{1}{0.95} \right) = 1.62$ acre-feet/year

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<u>Flow.</u>	<u>Vol.</u>	from Survey data bottom = 6470.35
6472.02	0	
6480	5.07	BOTTOM 6472.02'
6485	14.84	No SPILLWAY
6490	36.6	No CRIST
6495	71.0	
6500	126.1	
6505	202.6	
6510	308.9	
6515	443.8	

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