APPENDIX 7-4

Sedimentation Pond Calculations

I hereby certify that the design contained herein was prepared by myself and is true and correct to the best of my knowledge.

Richard B. White

Richard B. White, P.E.

REGISTERED PROFESSIONAL ENGINEER
No. 7102
RICHARD B. WHITE
STATE OF UTAH

2/10/88

15/015/032
pending

EarthFax

EarthFax
Engineering Inc.
Engineers/Scientists
7324 South 1300 East
Suite 100
Midvale, Utah 84047
Telephone 801 561 1555

October 18, 1989

RECEIVED
OCT 19 1989
DIVISION OF
OIL, GAS & MINING

Mr. Alan Childs
Genwal Coal Company
P.O. Box 1201
Huntington, Utah 84528

Subject: Enclosure of Ditch DD-6

Dear Alan:

Pursuant to your request, I have reviewed the criteria used to design the ditch and adjacent culverts located at the Crandall Canyon Mine immediately south of the coal stockpile and associated truck loadout area. On Plates 7-5, 7-5a, and elsewhere in the Mining and Reclamation Plan, this ditch is referred to as DD-6, with the upstream culvert labeled C-2 and the downstream culvert labeled C-3.

Calculations presented in Appendix 7-7 of the MRP (pages 16, 17, 19, and 24) indicate that the subject ditch and culverts were all assessed using the same design flow. Since no runoff enters DD-6 other than that which flows through C-2, it is hydraulically acceptable to connect C-2 and C-3 using the same size of culvert material, thus eliminating DD-6. This enclosure of the ditch has the added advantages of (1) eliminating the potential for coal and debris to inadvertently fall into the ditch in an area of heavy traffic at the mine and (2) providing additional space at the mine.

I have appreciated the opportunity to review this information. Please contact us if you have any questions.

Sincerely,

Richard B. White

Richard B. White, P.E.
Principal Hydrologist

REGISTERED PROFESSIONAL ENGINEER
No. 7102
RICHARD B. WHITE
STATE OF UTAH

REVISED SEDIMENTATION POND DESIGN
CRANDALL CANYON MINE

Design Volume

Pond area (at 10-yr, 24-hr level) → A = 0.2 ac
Disturbed area drainage → A = 2.7 ac
Reclaimed area drainage → A = 2.0 ac
Undisturbed area (within site) → A = 0.2 ac
Undisturbed area (above site) → WS-4: A = 3.3 ac, WS-5: A = 2.0 ac } 5.5 ac total undisturbed

10-yr, 24-hr storm = 2.50 in (Miller et al., 1973)

Curve numbers:
Pond area → CN = 100 (100% runoff)
Disturbed area → CN = 90 (Typical CN for dirt roads w/ hyd. soil group D is 89 – see page 1a of this calc.).
Reclaimed area → CN = 75 (Typical CN for herbaceous community for 80% cover – see page 1a of this calc. For contemporaneous reclamation measures to be used to achieve this cover, see Section 3.5.1 of PAP)
Undisturbed area → CN = 69 (See below)
Six cover types are shown on Plate 9-1 of PAP. Cover data from Tables 3-D, 3-E, and 3-F of Chapter 9 of the PAP. Individual curve numbers from page 1a & 1b of this calc.

Cover Type	Area[a] (ac)	Percent Cover	Curve Number
Aspen	27.9	34.2	65
Mtn. Shrub / Grassland	29.3	23.1	75
Sagebrush	5.8	23.1	75
Spruce, Fir, Aspen	18.4	45.2	60
Rock Outcrop	1.6	0	96
Mixed Mtn. Shrub, Conifer / Aspen	1.0	34.2	65

[a] Areas planimetered by DOGM (personal communication, 9 Oct 1985)

$$\text{Weighted avg. CN} = \frac{(27.9)(65) + (29.3)(75) + (5.8)(75) + (18.4)(60) + (1.6)(96) + (1.0)(65)}{84.0}$$
$$= 69$$

Table 9.1.--Runoff curve numbers for hydrologic soil-cover complexes

(Antecedent moisture condition II, and $I_a = 0.2\ S$)

Land use	Cover: Treatment or practice	Cover: Hydrologic condition	Hydrologic soil group A	B	C	D
Fallow	Straight row	----	77	86	91	94
Row crops	"	Poor	72	81	88	91
	"	Good	67	78	85	89
	Contoured	Poor	70	79	84	88
	"	Good	65	75	82	86
	"and terraced	Poor	66	74	80	82
	" " "	Good	62	71	78	81
Small grain	Straight row	Poor	65	76	84	88
		Good	63	75	83	87
	Contoured	Poor	63	74	82	85
		Good	61	73	81	84
	"and terraced	Poor	61	72	79	82
		Good	59	70	78	81
Close-seeded legumes 1/ or rotation meadow	Straight row	Poor	66	77	85	89
	" "	Good	58	72	81	85
	Contoured	Poor	64	75	83	85
	"	Good	55	69	78	83
	"and terraced	Poor	63	73	80	83
	"and terraced	Good	51	67	76	80
Pasture or range		Poor	68	79	86	89
		Fair	49	69	79	84
		Good	39	61	74	80
	Contoured	Poor	47	67	81	88
	"	Fair	25	59	75	83
	"	Good	6	35	70	79
Meadow		Good	30	58	71	78
Woods		Poor	45	66	77	83
		Fair	36	60	73	79
		Good	25	55	70	77
Farmsteads		----	59	74	82	86
Roads (dirt) 2/		----	72	82	87	89
(hard surface) 2/		---	74	84	90	92

Bed, road. CN=90

Rock outcrop CN=96

1/ Close-drilled or broadcast.
2/ Including right-of-way.

Source → U.S. SCS (1972)

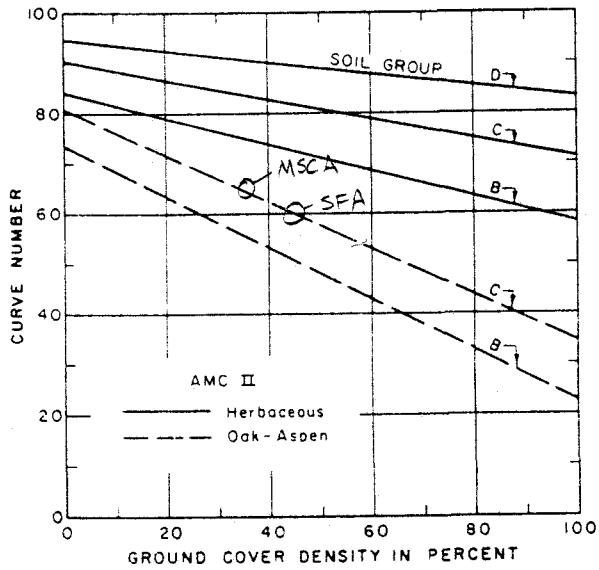

Figure 9.5.--Graph for estimating runoff curve numbers of forest-range complexes in western United States: herbaceous and oak-aspen complexes.

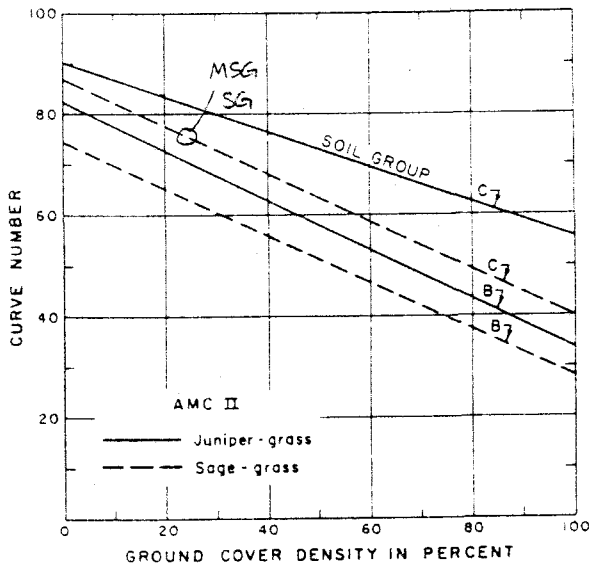

Figure 9.6.--Graph for estimating runoff curve numbers of forest-range complexes in western United States: juniper-grass and sage-grass complexes.

Source → U.S. SCS (1972)

Runoff storage volume:

Disturbed area: Q = 1.53 in = 0.34 AF
Reclaimed area: Q = 0.65 in = 0.11 AF
Undisturbed area: Q = 0.42 in = 0.19 AF
Pond area: Q = 2.52 in = 0.04 AF

Total required runoff storage = 0.68 AF

Sediment storage Volume:

Disturbed area: (2.7 ac)(0.1 AF/ac) = 0.27 AF (per reqs)

Reclaimed (use USLE)

$A = R \cdot K \cdot LS \cdot CP$

R = 28.12 (Israelsen et al., 1984)

K = 0.15 (see page 1d of this calc.)

$$LS = \left(\frac{650 + 450s + 65s^2}{10{,}000 + s^2}\right)\left(\frac{l}{72.6}\right)^m$$

s = 66.7% (1.5 h : 1 v)
l = 81 ft (from site map and field observations)
m = 0.6 (Clyde et al., 1978 — based on slope)

LS = 23.68

CP = 0.01 (from curve on page 1e of this calc. for anchored mulch — 1.5 tons/ac)

A = 1.00 tons/ac/yr

= 2.00 tons/yr (over 2.0 ac)

= 0.001 AF/yr (for a unit weight of 90 lbs/ft^3)

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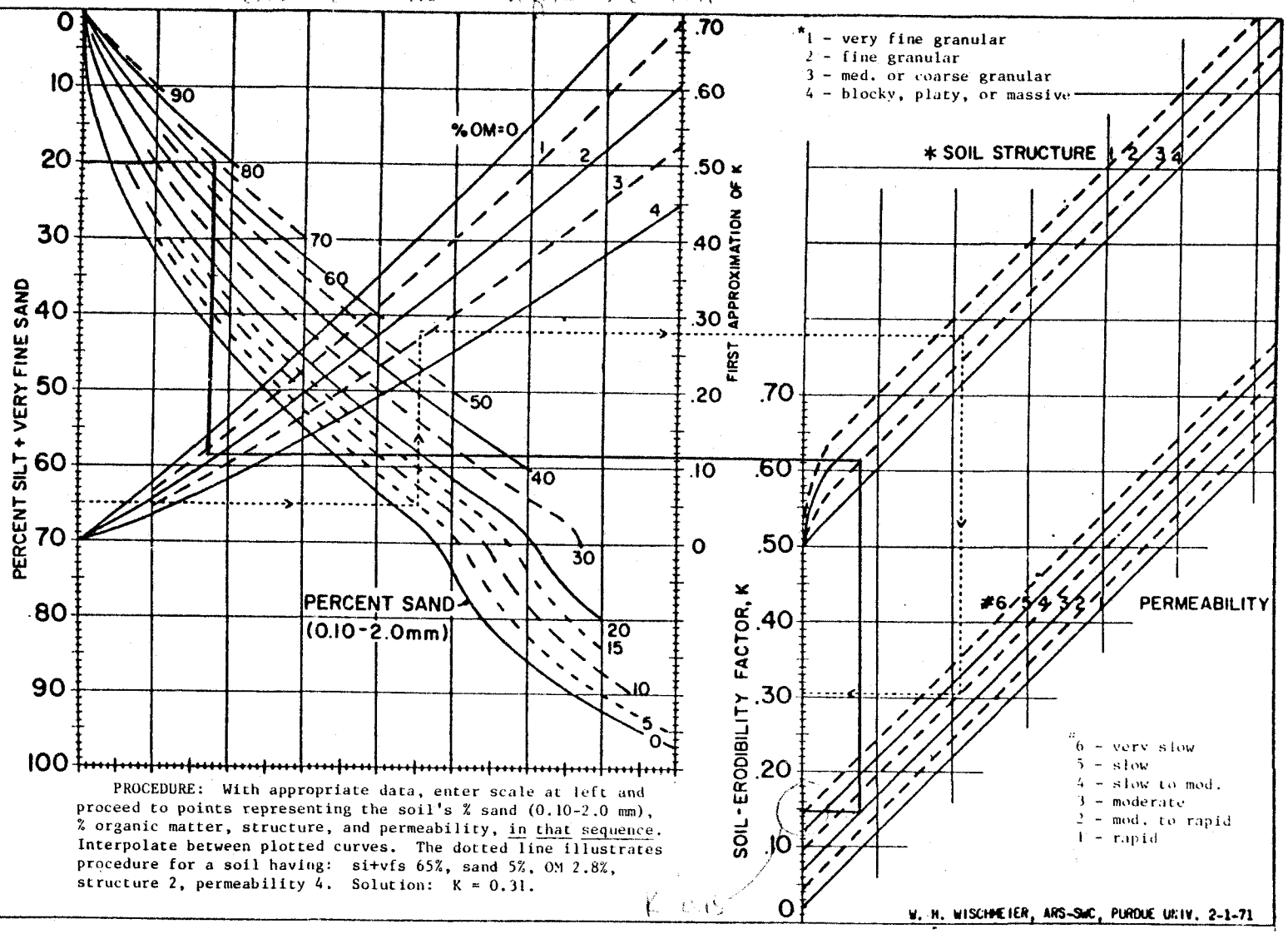
42-382 100 SHEETS 5 SQUARE
42-389 200 SHEETS 5 SQUARE
Made in U.S.A.

Soils data from Chapter 8 of PAP



PROCEDURE: With appropriate data, enter scale at left and proceed to points representing the soil's % sand (0.10-2.0 mm), % organic matter, structure, and permeability, in that sequence. Interpolate between plotted curves. The dotted line illustrates procedure for a soil having: si+vfs 65%, sand 5%, OM 2.8%, structure 2, permeability 4. Solution: K = 0.31.

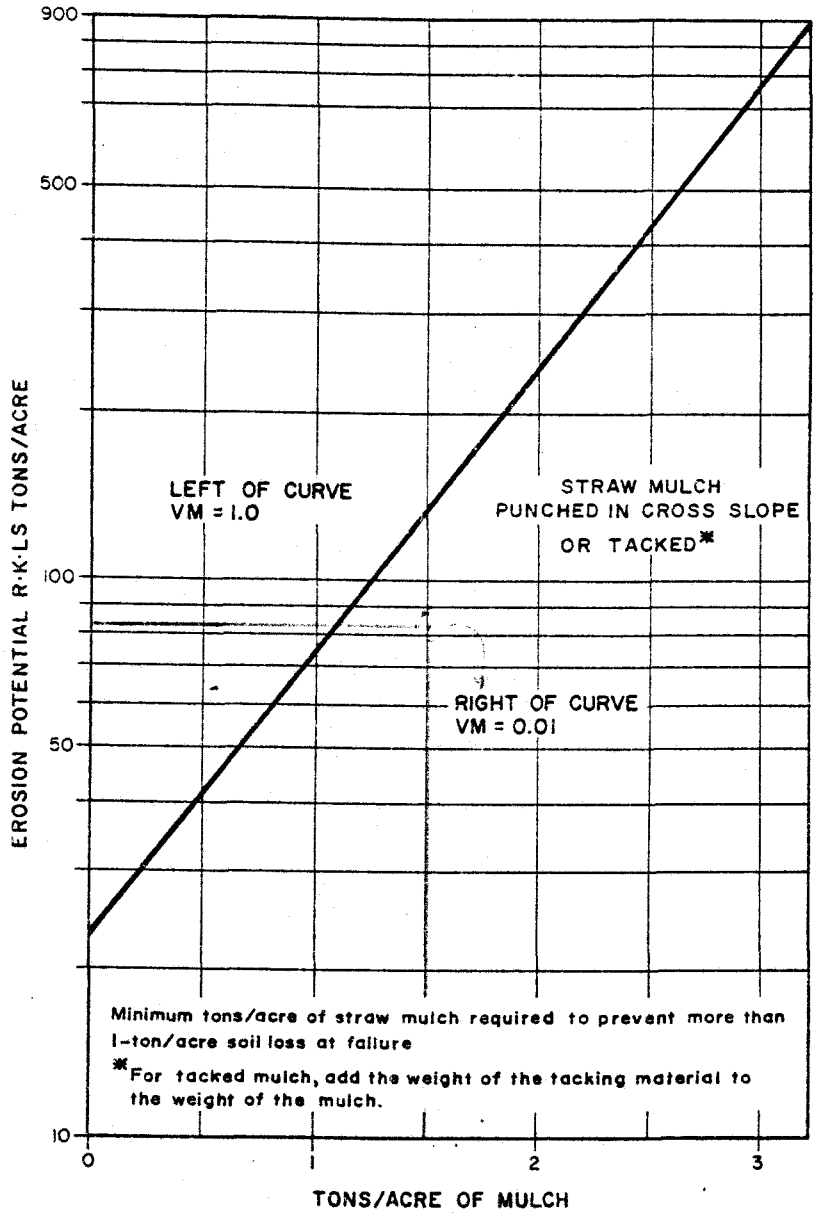
K = 0.15

R. White
11 May 1986

C-27-02 1d/

R. White
11 May 1986

C-27-02 | 1e/



Source: Clyde et al. (1978)

R·K·LS = 84.5

Use 1.5 tons/ac of mulch.

VM (or CP) = 0.01

Undisturbed area (use USLE)

R = 28.12 (same as previous)

K = 0.27 (DOGM value based on 52% sand, 35% silt, 10.7% clay, and 2.3% organic material, see Israelsen, 1984)

LS = 67.06 (DOGM value based on weighted average of WS-4, WS-5, and undisturbed area in site)

CP = 0.007 (DOGM value based on 50% cover)

A = 3.56 tons/ac/yr

= 20.31 tons/yr

= 0.01 AF/yr (for unit weight = 80 lb/ft^3 - lighter)

Pond area → no sediment contribution from water

Design for 3 years of sediment yield from reclaimed and undisturbed areas. Ignore sediment delivery ratio to be conservative.

Total sediment storage = 0.27 + (0.001 + 0.01)(3)

= 0.30 AF

Total required storage = 0.68 AF + 0.30 AF

= 0.98 AF

Stage - Area - Capacity Data

		Incremental Volume (AF)	Cumulative Volume (AF)
Elev. 7771 ft →	A = 0.021 ac		
		0.061	0.061
Elev. 7773 ft →	A = 0.040 ac		
		0.099	0.160
Elev. 7775 ft →	A = 0.059 ac		
		0.141	0.301
Elev. 7777 ft →	A = 0.082 ac		
		0.190	0.490
Elev. 7779 ft →	A = 0.108 ac		
		0.248	0.739
Elev. 7781 ft →	A = 0.140 ac		
		0.313	1.052
Elev. 7783 ft →	A = 0.173 ac		
		0.380	1.432
Elev. 7785 ft →	A = 0.207 ac		

Stage-area curve → see page 3 of this calc.
Stage-capacity curve → see page 4 of this calc.

Spillway Sizing

Methodology → SEDIMOT II (Wilson et al., 1980; Warner et al., 1980)
Design storm → 25-yr, 24-hr storm = 2.92 in (Miller et al., 1973)
Storm type → SCS Type II
Time increment of outflow hydrograph = 0.1 hr

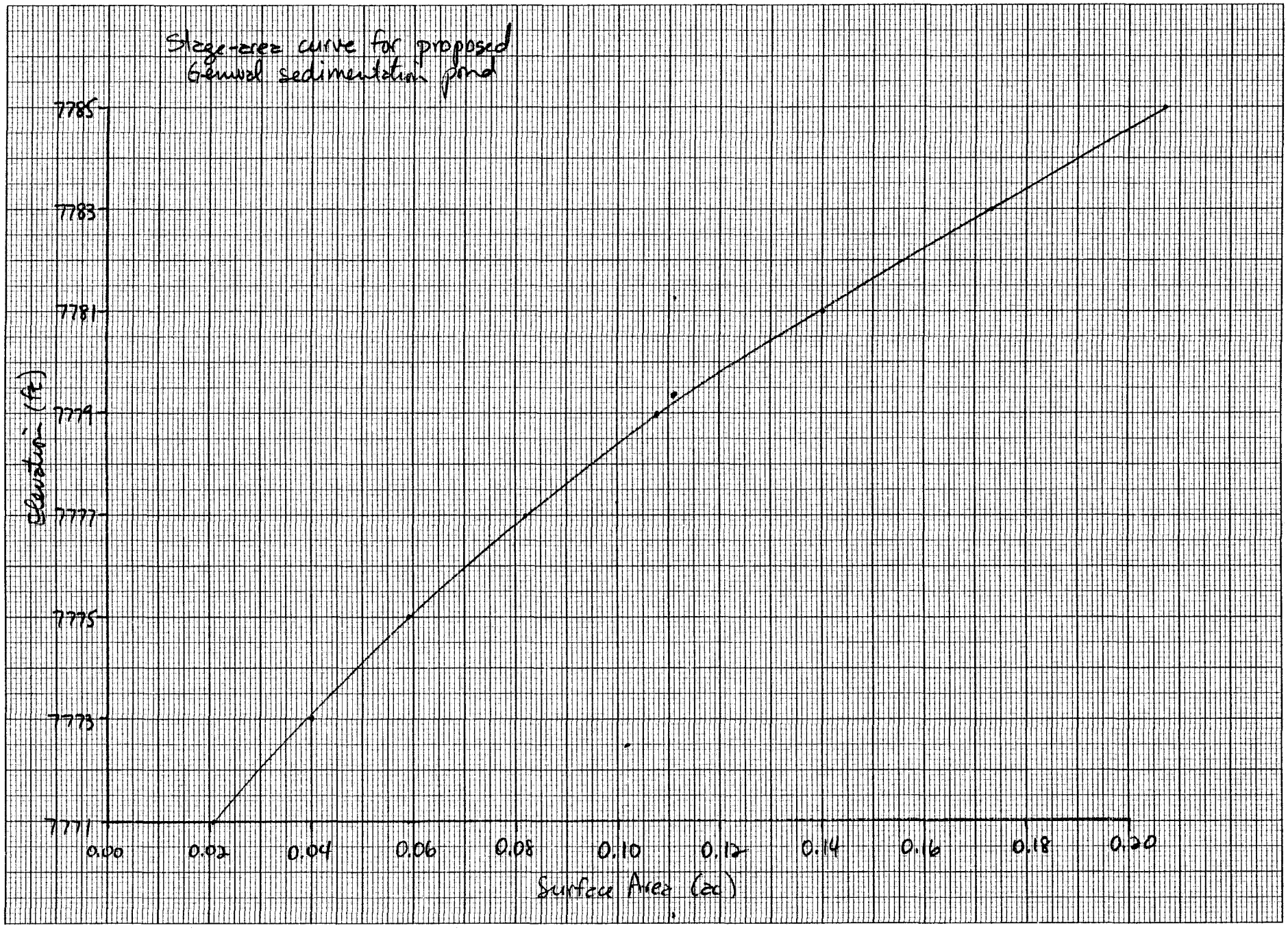
No. of junctions = 1
No. of branches = 1

Computation mode → hydro. and sed. (to allow routing through the pond)

Specific gravity of eroded sediment = 2.50 (default value)
Coefficient for distributing sed. load = 1.5 (default value)
Submerged bulk specific gravity = 1.25 (fine to medium)

Particle size distribution → according to Chapter 8 of the PAP, soils in the area are classified as "Rocky Land." Swenson et al. (1970) indicate that this soil is a fine sandy loam but give no gradation. According to Donahue et al. (1971), a fine sandy loam typically has the gradation shown on page 5 of this calc. Using this gradation, the following distribution is assumed to apply to this site:

K+E 10 X 10 TO THE CENTIMETER 18 X 25 CM. KEUFFEL & ESSER CO. MADE IN U.S.A. 46 1510



R. White
1 Feb 1986

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11 May 1986

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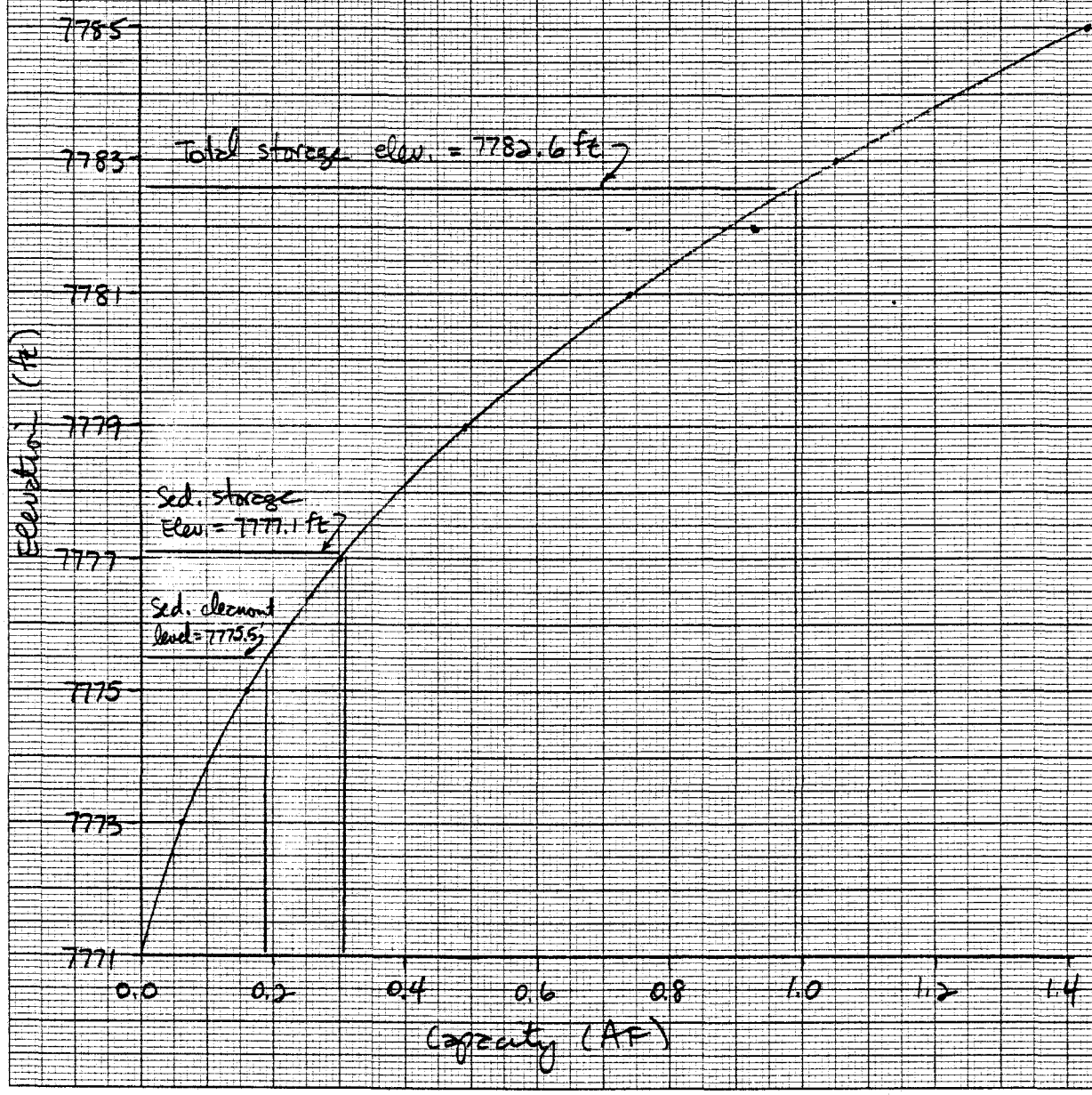
Stage-capacity curve for proposed
Genival sedimentation pond



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K+E 10 X 10 TO THE CENTIMETER 18 X 25 CM.
KEUFFEL & ESSER CO. MADE IN U.S.A.

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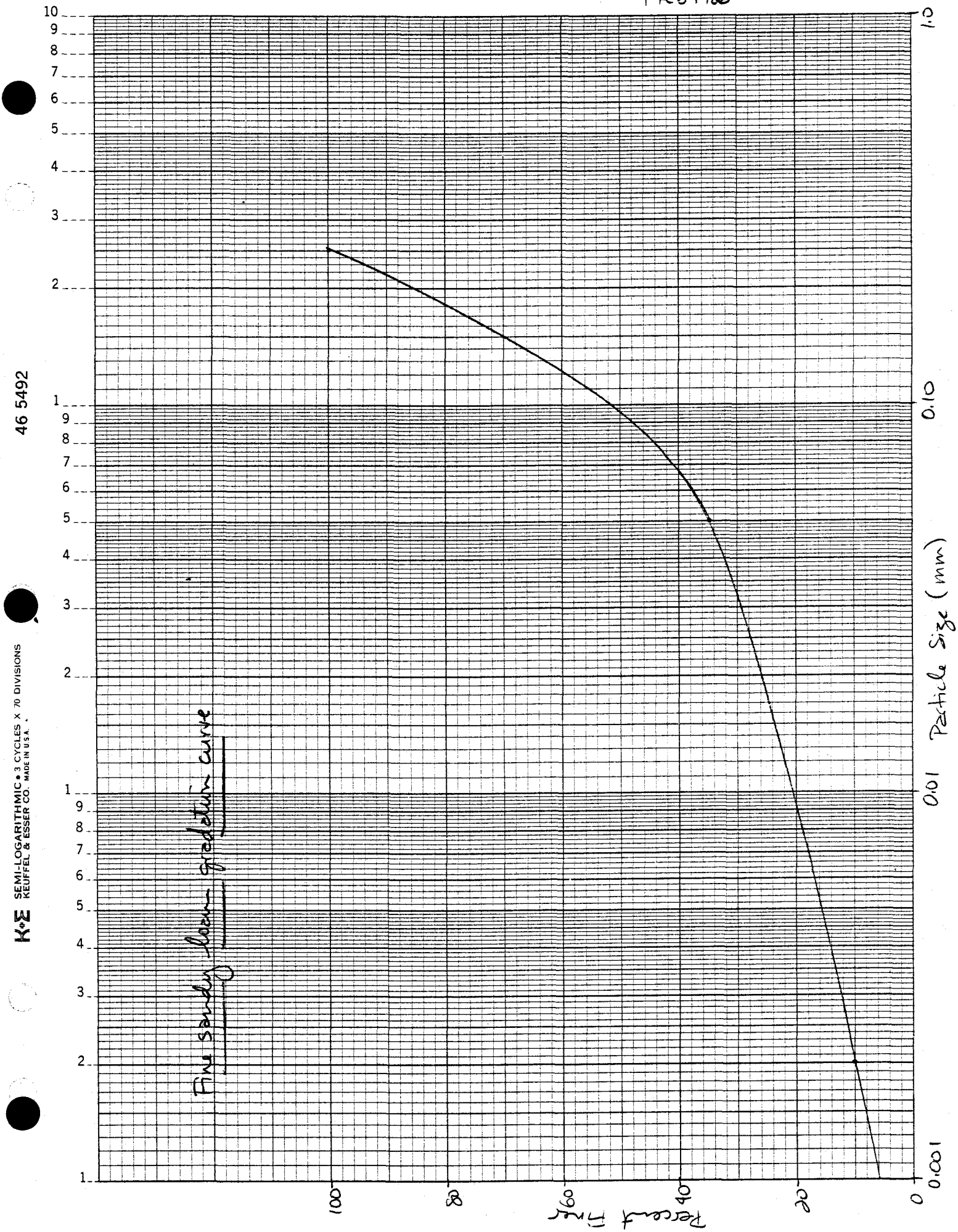


Size (mm)	Percent Finer
0.25	100
0.10	50
0.05	35
0.01	19
0.005	15
0.001	6
0.0001	0

7 values

No. of structures → 1 (sed. pond)

Between structures routing parameters → All Ø (no upstream structures or junctions)

No. of subwatersheds = 3 (disturbed, undisturbed, reclaimed)

Data for subwatershed 1 (disturbed):

$A = 2.9$ ac (pad + pond)

$$\overline{CN} = \frac{(2.7)(90) + 0.2(100)}{2.9} = 91$$

T_c → use upland method (U.S. SCS, 1972) — see pg. 7 of this calc.

600 ft @ 3% (portal pad to admin. pad)

$V = 3.5$ ft/s (using "paved area" curve)

$$(T_c)_1 = \frac{600}{3.5} = 170 \text{ s}$$

180 ft @ 1% (admin. pad)

$V = 2.0$ ft/s

$$(T_c)_2 = \frac{180}{2.0} = 90 \text{ s}$$

800 ft @ 8% (along main road to sed. pond)

$V = 5.6$ ft/s

$$(T_c)_3 = \frac{800}{5.6} = 140 \text{ s}$$

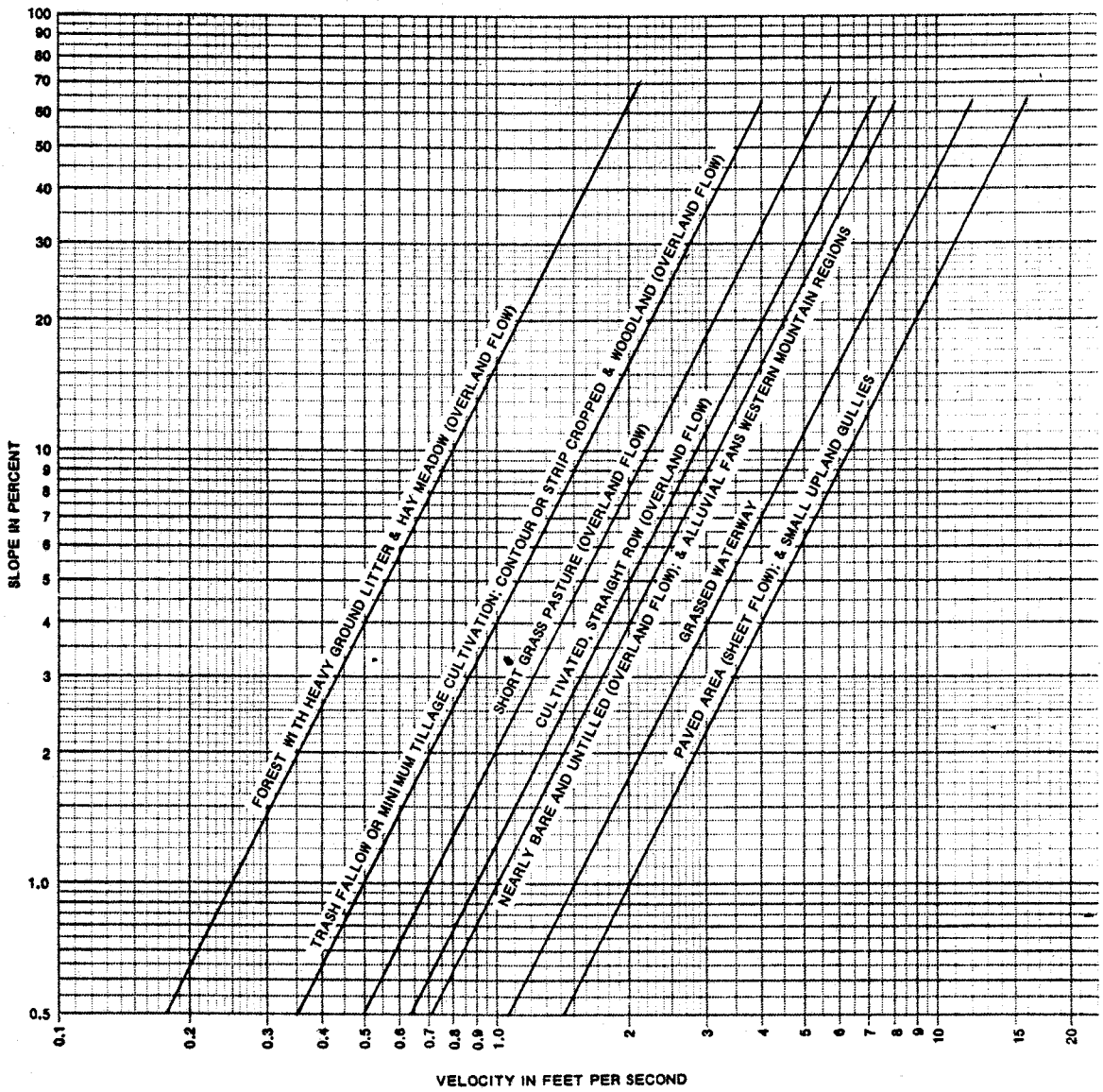
$$T_c = (170 + 90 + 140) = 400 \text{ s} = 0.11 \text{ hr}$$

Sediment yield calcs. → K = , L = , S = , CP = } All Ø (to suppress sed. output)

R. White
1 Feb 1986

C-27-02

7/



Source: U.S. SCS (1972)

NATIONAL 42-381 50 SHEETS 5 SQUARE 42-382 100 SHEETS 5 SQUARE 42-389 200 SHEETS 5 SQUARE

Data for subwatershed 2 (undisturbed):

$A = 5.5$ ac

$CN = 69$

$T_c \rightarrow$ use upland method

750 ft @ 69.6% — (WS-4) → Forest w/ heavy litter

$V = 2.1$ ft/s

$(T_c)_1 = \frac{750}{2.1} = 360$ s

$(T_c)_2 = 400$ s (pad area to pond)

$T_c = (400 + 360) = 760$ s

$= 0.21$ hr

Sediment yield calcs. → All factors Ø (as above)

Data for subwatershed 3 (reclaimed):

$A = 2.0$ ac

$CN = 75$

$T_c \rightarrow$ use upland method

100 ft @ 66.7%

$V = 5.6$ ft/s ("short grass pasture" curve)

$(T_c)_1 = \frac{100}{5.6} = 20$ s

$(T_c)_2 = 90 + 140 = 230$ s (across admin. pad to sed. pond)

$T_c = (230 + 20) = 250$ s

$= 0.07$ hr

Sediment yield calcs.

K =
L =
S = } All zero (to suppress sediment output – only routing is of concern).
CP =

Pond parameters:

Dead space → Effective pond width $= \frac{\text{Area}}{\text{Length}}$

$$= \frac{(0.207\ \text{ac})(43{,}560\ \text{ft}^2/\text{ac})}{280\ \text{ft}}$$

$$= 32.2\ \text{ft}$$

$\frac{\text{Length}}{\text{Eff. Width}} = \frac{280\ \text{ft}}{32.2\ \text{ft}} = 8.7$ } Efficient system ($L/W > 2.0$)

Assume dead space = 20%

Outflow withdrawal → surface
Inflow → completely mixed.

Stage-area data (for pond full to top of sed. storage level):

	Stage (ft)	Elev. (ft)	Area (ac)
	0.0	7777.1	0.083
	0.5	7777.6	0.090
	1.0	7778.1	0.096
	1.5	7778.6	0.103
	2.5	7779.6	0.117
	3.5	7780.6	0.133
	4.5	7781.6	0.149
Crest of principal spillway →	5.5	7782.6	0.166
	6.0	7783.1	0.175
	6.5	7783.6	0.183
	7.0	7784.1	0.192
	7.5	7784.6	0.201

} 12 values

No. of continuous stirred reactors = 2

Stage-discharge curve → to be computed by SEDIMOT II:

Barrel diameter = 18 in
Riser diameter = 24 in
Barrel length = 92 ft

From Barfield et al. (1981)
- Entrance loss coef. = 1.0
- Bend loss coef. = 0.5
- Wier flow coef. = 3.1
- Orifice flow coef. = 0.6
- Manning's n of pipe = 0.024

Barrel head drop = 16 ft

SEDIMOT II results (Attached) → Peak inflow = 8.44 cfs
Peak outflow = 7.04 cfs
Peak stage = 6.01 ft (above sed. storage level).

Elev. of peak stage = 7777.1 + 6.0 = 7783.1 ft

Emergency spillway not flowing at this elev. (spillway crest = 7784.0 ft).

Design Notes

① Required top width of embankment = $\left(\frac{14+35}{5}\right)$

= 9.8 ft ⇒ Construct at 10.0 ft

② Existing embankment crest elev. = 7783.0 ft (per survey). Final embankment height (design) = 7785.0 ft. Since the embankment has bee increased in height 0.4 ft more than required for outflow and freeboard, no accounting is required for subsequent settlement of the 2.0 ft addition.

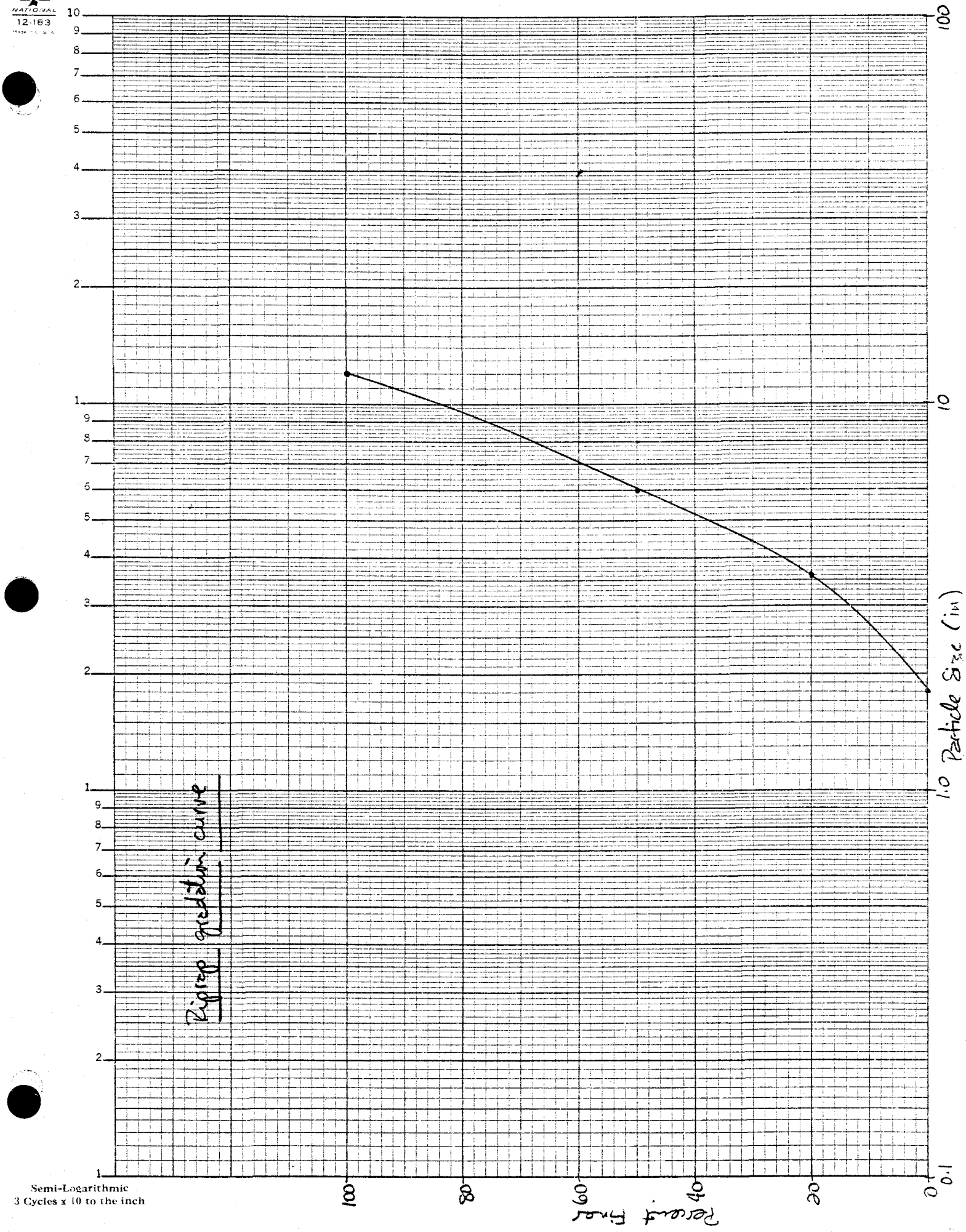
③ Overflow on existing riser at elev. 7779.4 ft (per survey). Raise 3.2 ft to 7782.6 ft (top of sed. and runoff storage level). Decant currently at 7776.4 ft (per survey). Raise 1.5 ft to 7777.9 ft (top of sed. storage level).

④ Crest of emergency spillway to be located at elev. 7784.0 ft (one ft above top of principal spillway). Riprap with following:

Size (in)	Percent Finer
3.6	20
6.0	50
12.0	100

see pg. 11 of this calc.

11/



Semi-Logarithmic
3 Cycles x 10 to the inch

Check for necessity of filter blanket beneath riprap:
Gradation of bed material (embankment) provided on pg. 13 of this calc. (similar to page 5 with addition of coarse fraction – see Delta Geotechnical Consultants, 1981). Design procedure from Searcy (1978).

$$\frac{D_{15}\ (\text{riprap})}{D_{85}\ (\text{bed})} = \frac{3.1\ \text{in}}{0.94\ \text{in}} = 3.3 < 5 \qquad \underline{\underline{\text{OK}}}$$

$$\frac{D_{15}\ (\text{riprap})}{D_{15}\ (\text{bed})} = \frac{3.1\ \text{in}}{0.0021\ \text{in}} = 1476 > 40 \qquad \underline{\underline{\text{UNSTABLE}}}$$

Assume the use of the sandy gravel shown on pg. 14 of this calc. for a filter blanket.

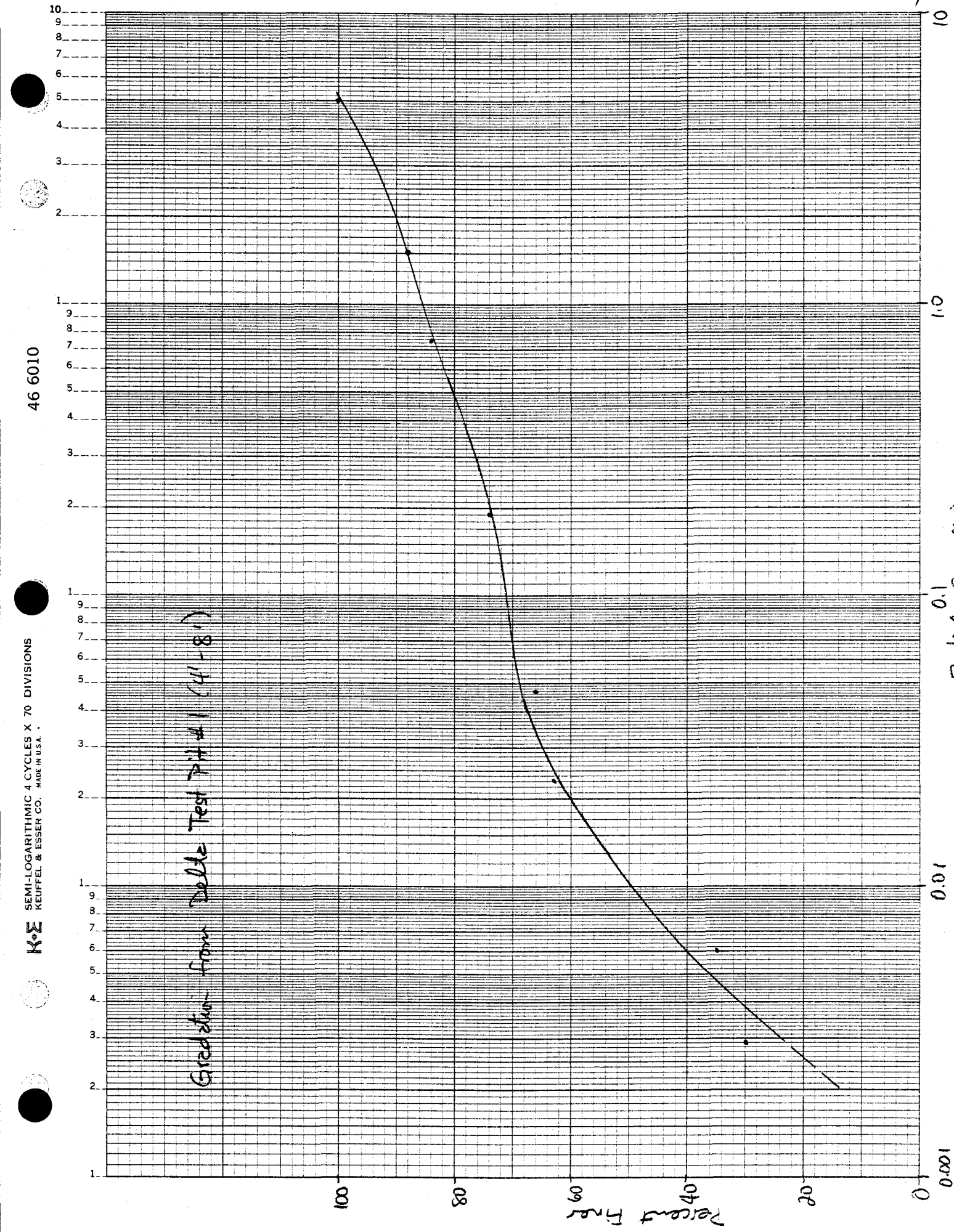
$$\frac{D_{15}\ (\text{riprap})}{D_{85}\ (\text{filter})} = \frac{3.1\ \text{in}}{0.62\ \text{in}} = 5.0 \qquad \underline{\underline{\text{OK}}}$$

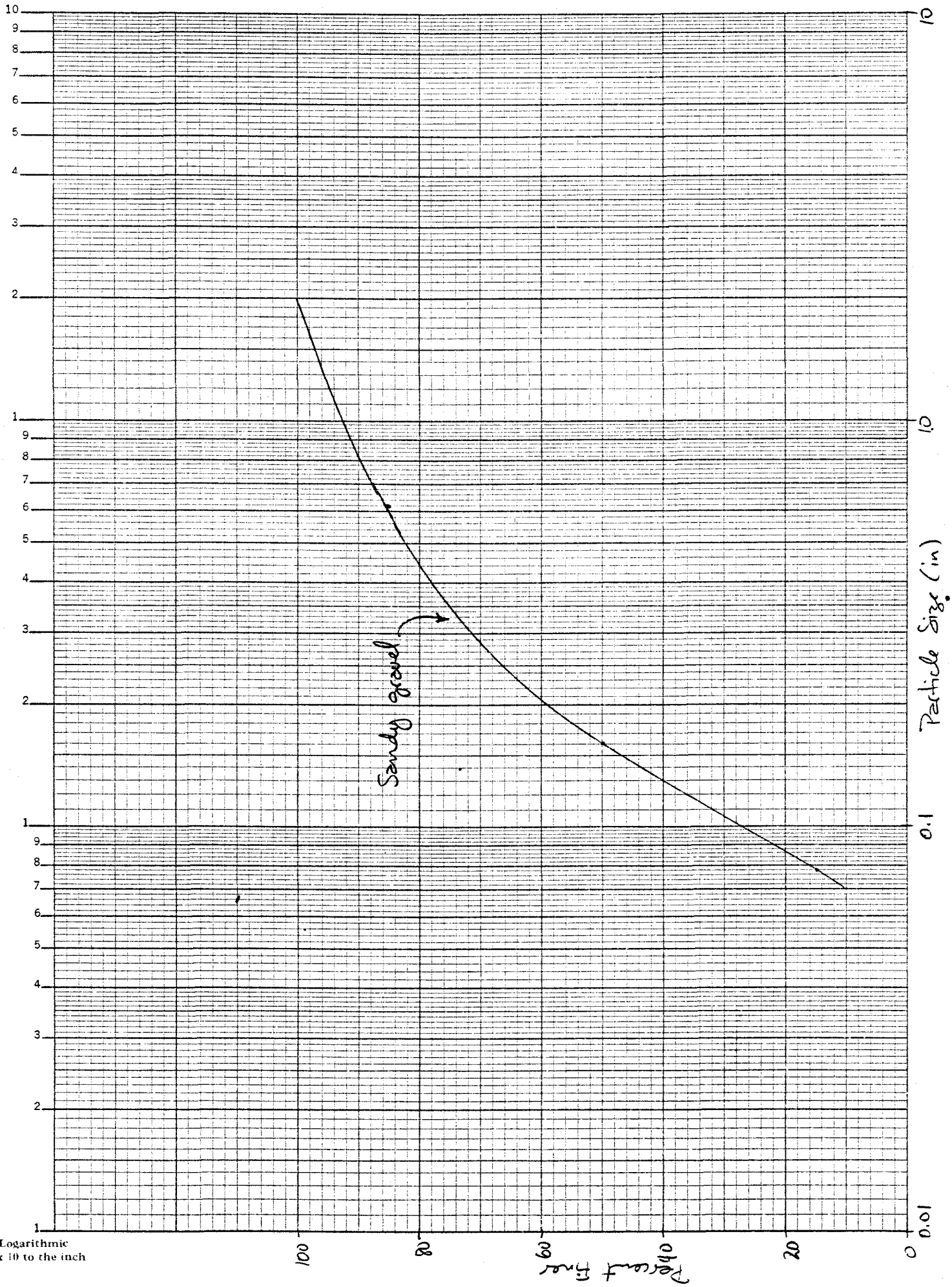
$$\frac{D_{15}\ (\text{riprap})}{D_{15}\ (\text{filter})} = \frac{3.1}{0.078\ \text{in}} = 39.7 < 40 \qquad \underline{\underline{\text{OK}}}$$

$$\frac{D_{15}\ (\text{filter})}{D_{85}\ (\text{bed})} = \frac{0.078\ \text{in}}{0.94\ \text{in}} = 0.08 < 5 \qquad \underline{\underline{\text{OK}}}$$

$$\frac{D_{15}\ (\text{filter})}{D_{15}\ (\text{bed})} = \frac{0.078\ \text{in}}{0.0021\ \text{in}} = 37.1 < 40 \qquad \underline{\underline{\text{OK}}}$$

Indicated sandy gravel is sufficient for a filter blanket.


Gradation from Delta Test Pit #1 (4'-8')
Percent Finer
80
60
40
20
0
Particle Size (in)
10
1.0
0.1
0.01
0.001
K+E SEMI-LOGARITHMIC 4 CYCLES X 70 DIVISIONS
KEUFFEL & ESSER CO. MADE IN U.S.A.
46 6010



Semi-Logarithmic
3 Cycles x 10 to the inch

(5) Embankment Sideslopes → 2:1 interior, 2:1 exterior. Insufficient room to flatten either slope and result in enough volume. This configuration was modeled by R&M Consultants (1981) and found to have a static factor of safety of 1.4 (w/ pond lined with 12" clay). Add weight to toe of dam to increase factor of safety.

(6) 12" layer of compacted clay to be used in pond bottom and interior embankment per R&M Consultants design to decrease seepage, increase stability.

(7) Revegetate exterior embankment slope following reconstruction.

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File Act/015/032-89C
pending

ITEM #1

Due to the effects of freeze/thaw action, the riser tower in the sediment pond has developed leaks at various joint locations throughout the length of the riser. The methods and techniques employed in the past to repair the leaking riser have proven to be only bandaids and the problem still exists (last repair 4/22/89).

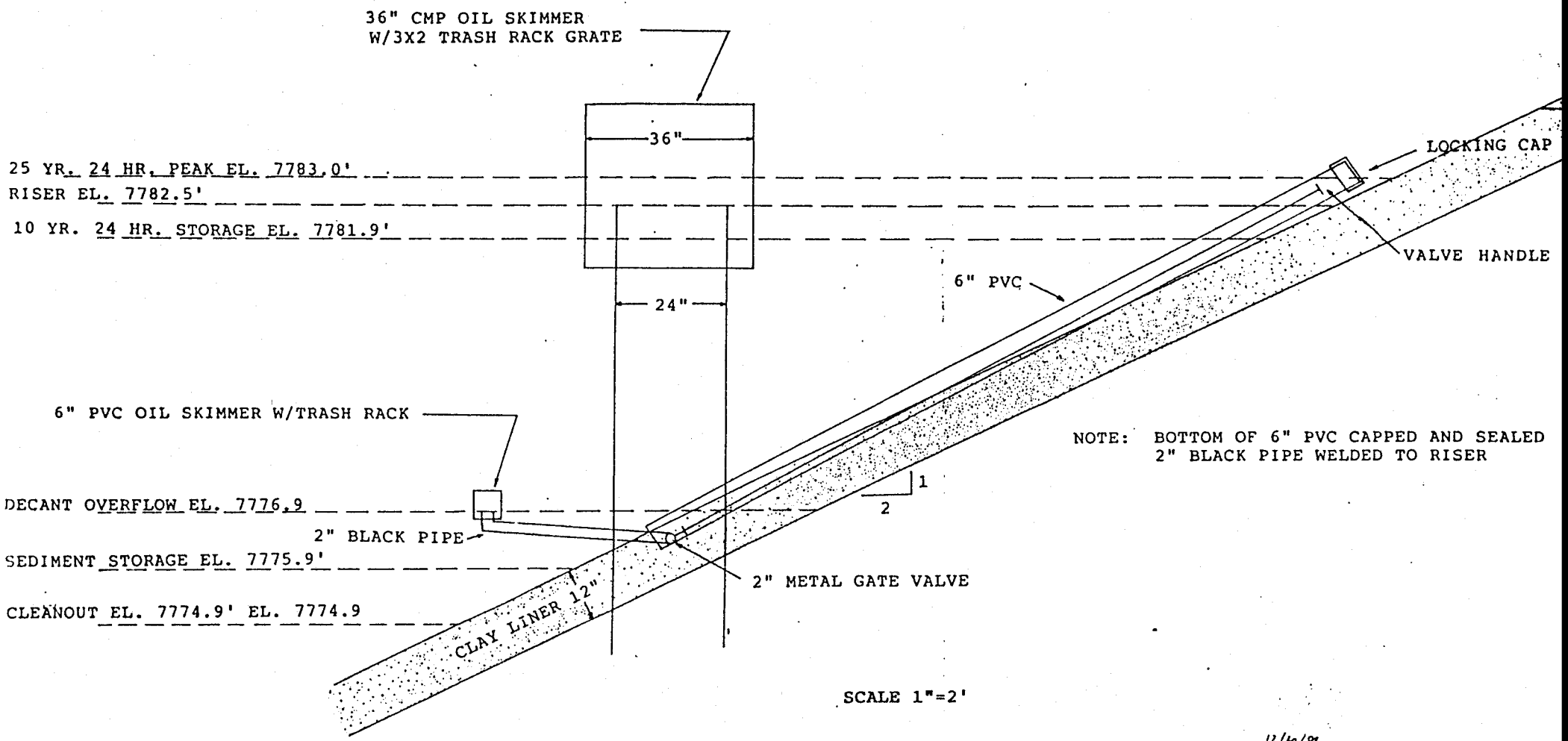
As a final solution to this problem, Genwal Coal Company formally proposes to amend the original riser detail. Plates 7-4a and 7-6a show the proposed modification.

1. Plug with concrete the bottom position of the 24" riser.

2. Cut of 24" riser 2" below 6" decant pipe.

3. Construct a 4'x4'x1' footing and imbed new 24" CMP riser and 36" CMP oil skimmer.

4. Trench and install 18" CMP discharge through dike and down slope. See Plates 7-4a and 7-6a.



12/30/92

Richard B. White

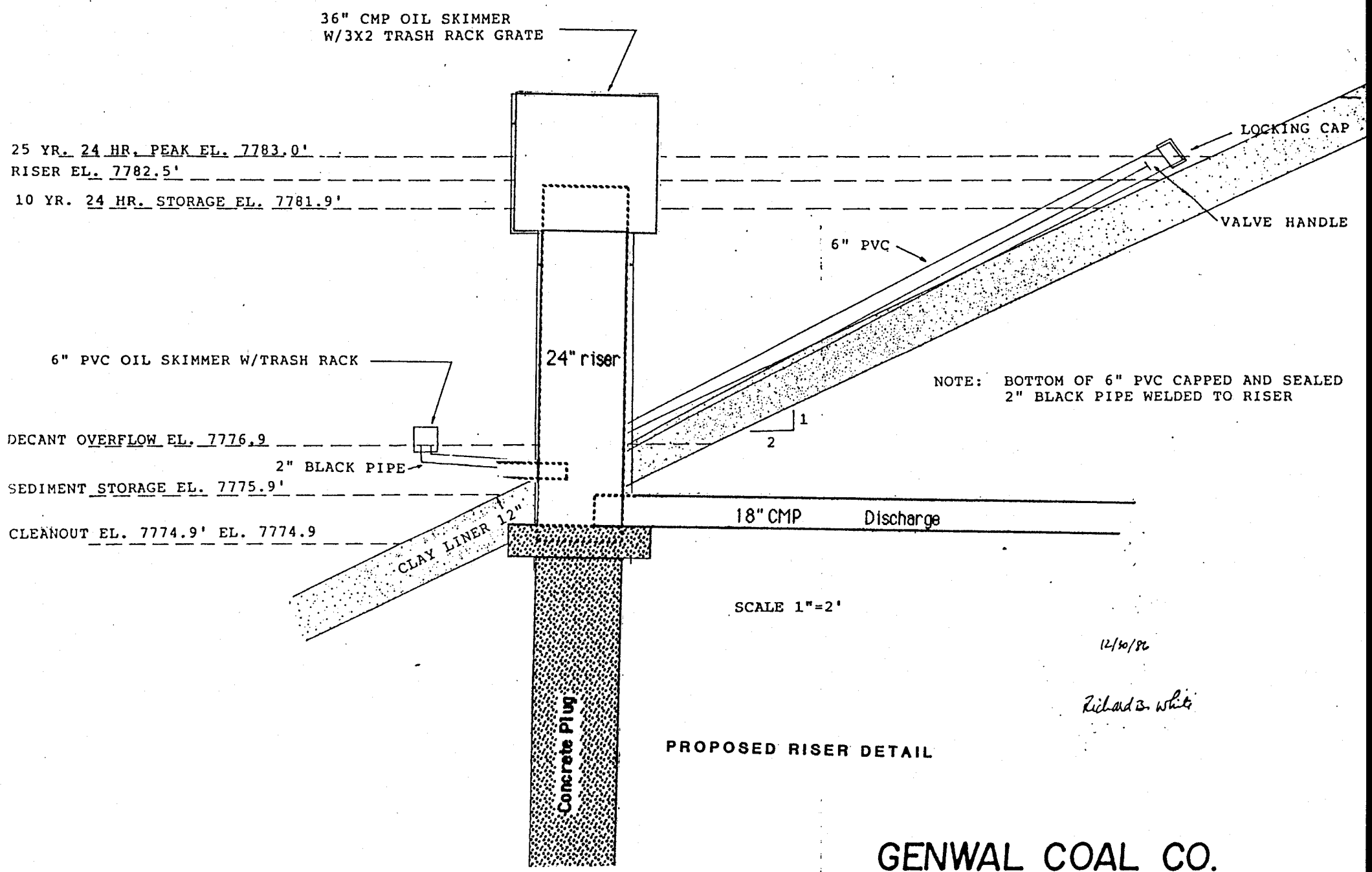
RISER DETAIL

GENWAL COAL CO.

SEDIMENT POND DETAIL (AS BUILT)

FEB. 10, 1988 **PLATE 7-4**

SCALE AS NOTED ACK



12/30/82

Richard B. White

PROPOSED RISER DETAIL

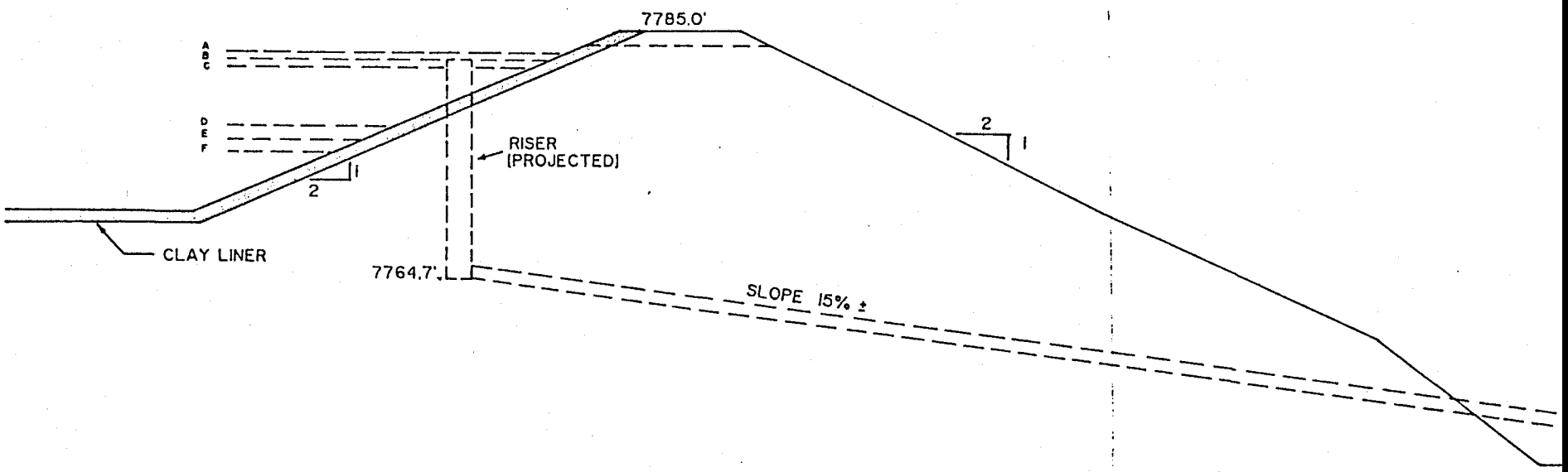
GENWAL COAL CO.

SEDIMENT POND DETAIL (AS BUILT)

FEB. 10, 1988 **PLATE 7-4**

SCALE AS NOTED

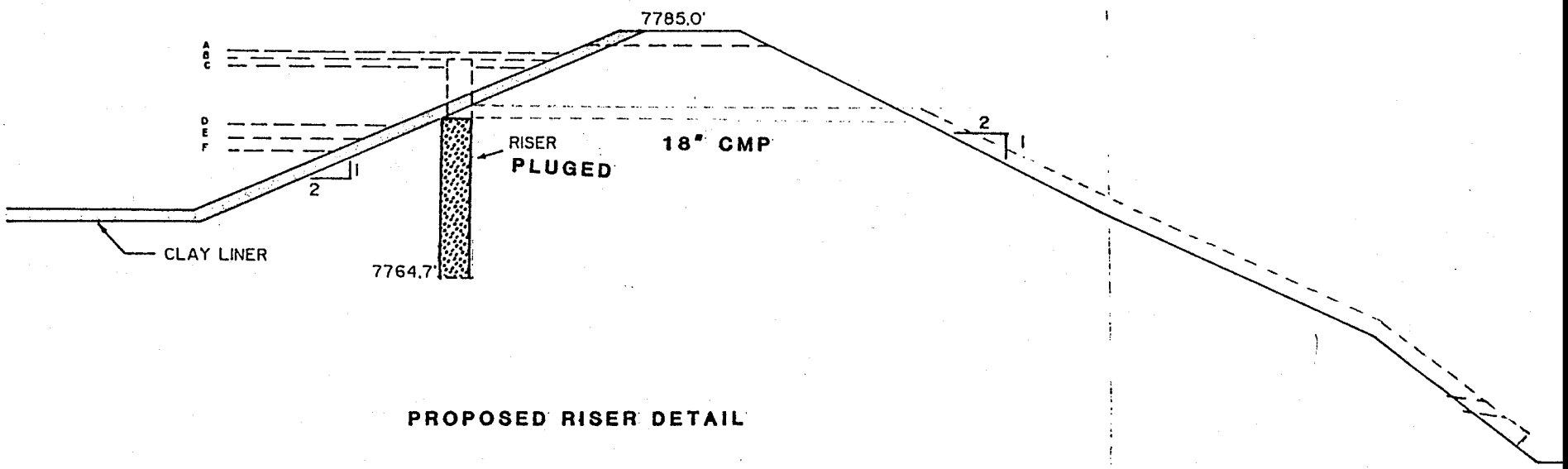
ACK



SECTION BB'

A
B
C
D
E
F

PLATE 7-6



PROPOSED RISER DETAIL

SECTION BB'

A
B
C
D
E
F

PLATE 7-6A

Spillway Modification

Primary spillway to be modified to control leakage through joints in riser. Fill riser with concrete in lower portion. Fill existing barrel with concrete. Install new barrel through and down embankment. Discharge into Crandall Creek.

Effects on spillway hydraulics → 24" riser, 18" barrel

Weir flow → $Q_w = CLH^{1.5}$

$= (3.1)(6.28)\,H^{1.5}$

$= 19.48\,H^{1.5}$

Orifice flow → $Q_o = C'A\,(2gH)^{1/2}$

$= (0.6)(3.14)(64.4\,H)^{1/2}$

$= 15.12\,H^{1/2}$

Pipe flow → $Q_p = A\,(2gH')^{1/2} / (1 + K_e + K_b + K_c L)^{0.5}$

$= (1.77)(64.4\,H')^{1/2} / (1 + 1.0 + 0.5 + 0.062L)^{1/2}$

$= 14.20\,(H')^{1/2} / (2.5 + 0.062\,L)^{1/2}$

Existing system (where $L = 92$ ft, $H' = H + 38$ ft):

Head (ft)	Weir Flow (cfs)	Orifice Flow (cfs)	Pipe Flow (cfs)	Actual Flow (cfs)
0.1	0.62	4.78	30.60	0.62
0.2	1.74	6.76	30.64	1.74
0.4	4.93	9.56	30.72	4.93
0.6	9.05	11.71	30.80	9.05
0.8	13.94	13.52	30.88	13.52
1.0	19.48	15.12	30.96	15.12

↑ Weir flow dominates

↓ Orifice flow dominates

Proposed system (where L = 90ft, H' = H + 38):

Head (ft)	Weir Flow (cfs)	Orifice Flow (cfs)	Pipe Flow (cfs)	Actual Flow (cfs)
0.1	0.62	4.78	30.84	0.62
0.2	1.74	6.76	30.88	1.74
0.4	4.93	9.56	30.96	4.93
0.6	9.05	11.71	31.04	9.05
0.8	13.94	13.52	31.12	13.52
1.0	19.48	15.12	31.20	15.12

Weir flow dominates ↑

Orifice flow dominates ↓

No change in outflow conditions between existing and modified spillway. Thus, SEDIMOT II calcs. are valid.

Discharge velocity:

Peak outflow rate ⟶ $q = 7.04$ cfs (see pg 10 of this calc.)

Full-flow capacity of 18" CMP:

$$Q = \frac{1.486\,A}{n} R^{2/3} S^{1/2}$$

$$= \left[\frac{(1.486)(1.767)}{0.024}\right](0.375)^{2/3}(0.50)^{1/2}$$

$$= 40.23 \text{ cfs}$$

R = 0.375 ft (see pg 19 of this calc.)
S = 0.50 (2:1 embankment slope)
n = 0.024
A = 1.767 ft² (see pg. 19 of this calc.)

Flow ratio to full flow $= \frac{7.04}{40.23} = 0.17$

Ratio of flow depths = 0.28 (see pg. 19)

Ratio of areas = 0.23 ⟹ Actual flow area = (0.23)(1.767) = 0.41 ft²

Ratio of R = 0.65 ⟹ Actual R = (0.65)(0.375) = 0.24 ft

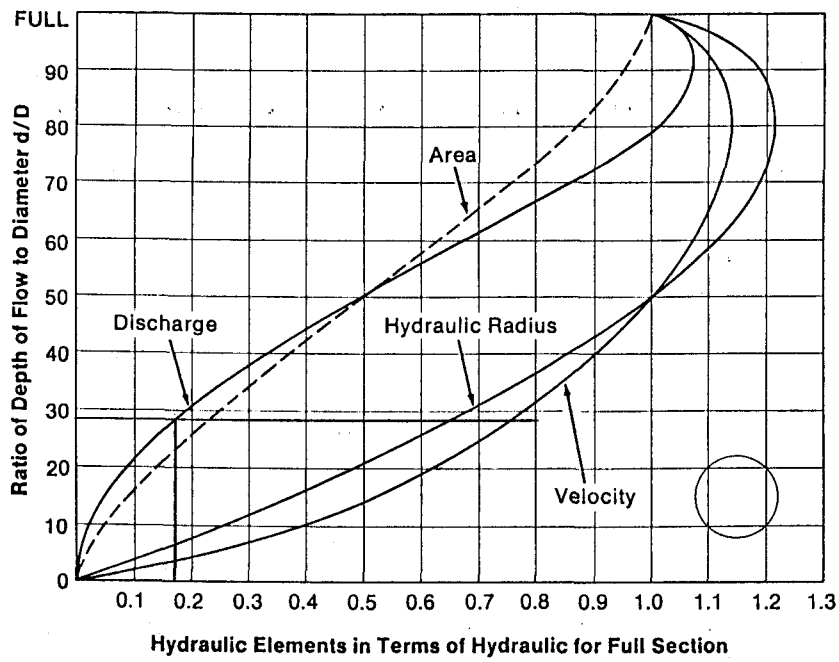


Figure 4-37 Hydraulic elements graph for circular corrugated steel pipe.

Table 4-14 Full Flow Data for Round Pipe

Diameter, in.	Area, ft²	Hydraulic Radius, ft	Diameter, in.	Area, ft²	Hydraulic Radius, ft
12	0.785	0.250	156	132.7	3.25
15	1.227	0.3125	162	143.1	3.375
18	1.767	0.375	168	153.9	3.5
21	2.405	0.437	174	165.1	3.625
24	3.142	0.50	180	176.7	3.75
30	4.909	0.625	186	188.7	3.875
36	7.069	0.75	192	201.1	4.0
42	9.621	0.875	198	213.8	4.125
48	12.566	1.0	204	227.0	4.25
54	15.904	1.125	210	240.5	4.375
60	19.635	1.25	216	254.5	4.5
66	23.758	1.375	222	268.8	4.625
72	28.27	1.5	228	283.5	4.75
78	33.18	1.625	234	298.6	4.875
84	38.49	1.75	240	314.2	5.0
90	44.18	1.875	246	330.1	5.125
96	50.27	2.0	252	346.4	5.25
108	63.62	2.25	258	363.1	5.375
114	70.88	2.375	264	380.1	5.5
120	78.54	2.5	270	397.6	5.625
126	86.59	2.625	276	415.5	5.75
132	95.03	2.75	282	433.7	5.875
138	103.87	2.875	288	452.4	6.0
144	113.10	3.00	294	471.4	6.125
150	122.7	3.125	300	490.9	6.25

Circular CMP hydraulic elements graph. (AISI, 1983)

$$\text{Velocity} = \frac{1.486}{n} R^{2/3} S^{1/2}$$

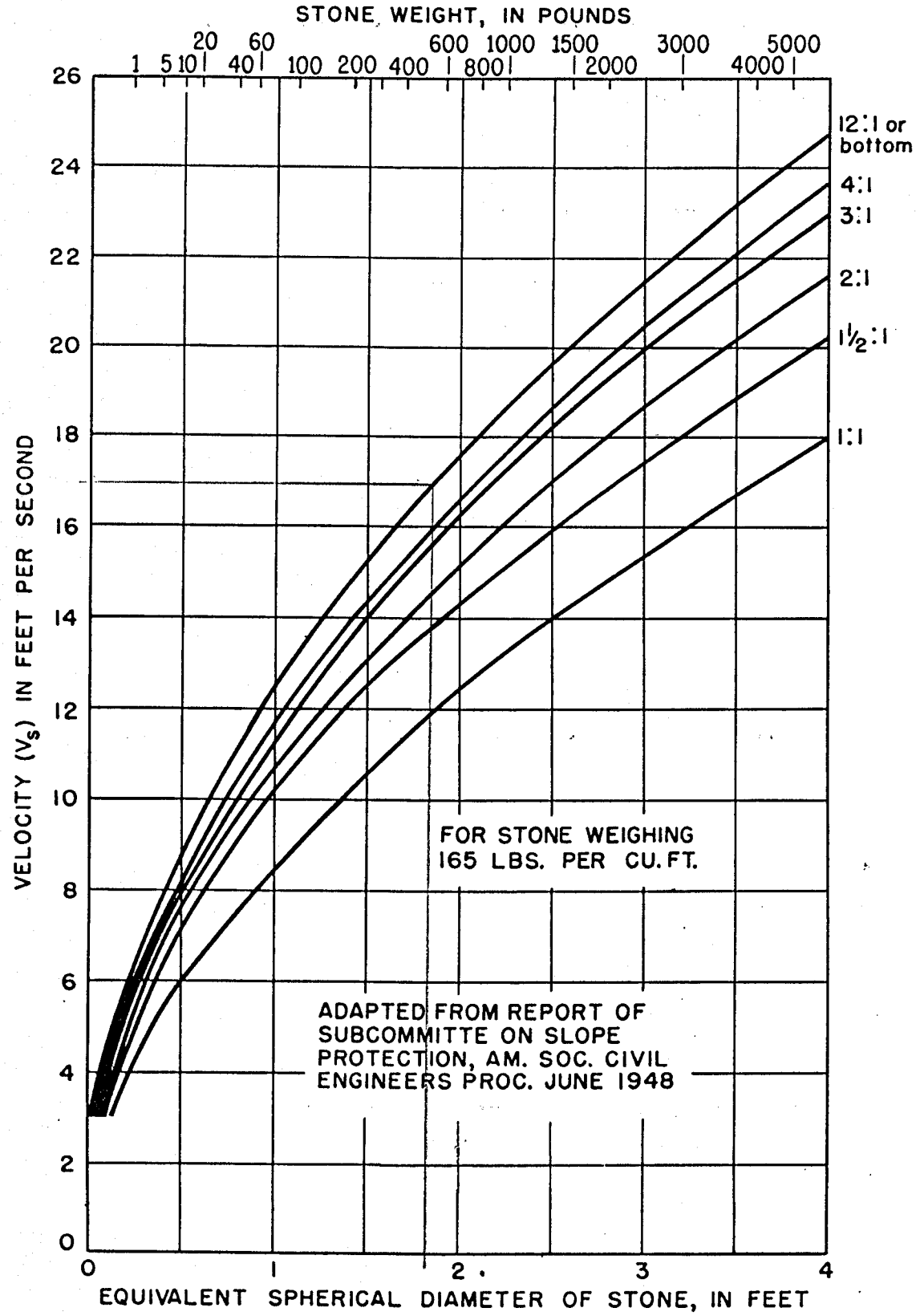
$$= \left[\frac{1.486}{0.024}\right] (0.24)^{2/3} (0.50)^{1/2}$$

$$= 16.9 \text{ ft/s}$$ ⟸ EXIT VELOCITY (velocity against stone)

Required riprap size = 1.8 ft (see pg. 21 of this calc.)

Stone size at discharge point > 2.0 ft median diameter (visual obs.).

Therefore, existing stone is adequate.



Source: HEC-11

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*****************************************************************
                    -- SEDPC --
            SEDIMOT II MODEL FOR THE IBM PC/XT
            CONVERTED BY TECH ENGINEERING INC.
              VERSION 1.10 NOVEMBER 17,1983
*****************************************************************

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*****************************************************************
      UNIVERSITY OF KENTUCKY COMPUTER MODEL
      OF SURFACE MINE HYDROLOGY AND SEDIMENTOLOGY
      FOR MORE INFORMATION CONTACT THE AGRICULTURAL
      ENGINEERING DEPARTMENT
      THE UK MODEL IS A DESIGN MODEL DEVELOPED TO PREDICT
      THE HYDRAULIC AND SEDIMENT RESPONSE FROM SURFACE
      MINED LANDS FOR A SPECIFIED RAINFALL EVENT (SINGLE STORM)
      VERSION DATE 9-23-83
      DISCLAIMER: NEITHER THE UNIVERSITY NOR ANY OF ITS EMPLOYEES
      ACCEPT ANY RESPONSIBILITY OR LEGAL LIABILITY FOR THE
      CONCLUSIONS DRAWN FROM THE RESULTS OF THIS MODEL
*****************************************************************
*****************************************************************
*****************************************************************
*                                                               *
*     THE FOLLOWING VALUES ARE NOW PREDICTED BY SEDIMOT II.     *
*     THEY CAN BE FOUND IN SUMMARY TABLES.                      *
*      1. PERIOD OF SIGNIFICANT CONCENTRATION                   *
*      2. VOLUME WEIGHTED AVERAGE SETTLEABLE CONCENTRATION      *
*         DURING PERIOD OF SIGNIFICANT CONCENTRATION            *
*      3. VOLUME WEIGHTED AVERAGE SETTLEABLE CONCENTRATION      *
*         DURING PEAK 24 HOUR PERIOD                            *
*      4. ARITHMETIC AVERAGE SETTLEABLE CONCENTRATION           *
*         DURING PERIOD OF SIGNIFICANT CONCENTRATION            *
*      5. ARITHMETIC AVERAGE SETTLEABLE CONCENTRATION           *
*         DURING PEAK 24 HOUR PERIOD                            *
*                                                               *
*     ALL CONCENTRATIONS ARE IN ML/L.                           *
*                                                               *
*****************************************************************
          ******************************************
              WATERSHED IDENTIFICATION CODE
              ------------------------------
 REVISED GENWAL SEDIMENTATION POND - 5/11/1986
          ******************************************
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INPUT PARTICLE SIZE-PERCENT FINER DISTRIBUTIONS

SIZE,MM	.250	.100	.050	.010	.005	.001
	.000					
PCT FINER NO. 1	100.000	50.000	35.000	19.000	15.000	6.000
	.000					

**********INPUT VALUES**********

STORM DURATION	=	24.00	HOURS
PRECIPATION DEPTH	=	2.92	INCHES
SPECIFIC GRAVITY	=	2.50	
LOAD RATE EXPONENT FACTOR	=	1.50	
SUBMERGED BULK SPECIFIC GRAVITY	=	1.25	

* *

JUNCTION 1, BRANCH 1, STRUCTURE 1

* *

***** RESULTS FROM SUBWATERSHED 1 *****

*** PARTICLE SIZE DISTRIBUTION OF SEDIMENT ***

SIZE,MM	.2500	.1000	.0500	.0100	.0050	.0010
PERCENT FINER	100.0000	50.0000	35.0000	19.0000	15.0000	6.0000
SIZE,MM	.0001					
PERCENT FINER	.0000					

*** HYDROGRAPH AND SEDIMENT GRAPH ***

(TWO CONSECUTIVE VALUES PER LINE)

TIME (HR)	DISCHARGE (CFS)	SED DISC (MG/L)	******* *	TIME (HR)	DISCHARGE (CFS)	SED DISC (MG/L)
.00	.000	.000	*	.10	.000	.000
.20	.000	.000	*	.30	.000	.000
.40	.000	.000	*	.50	.000	.000
.60	.000	.000	*	.70	.000	.000
.80	.000	.000	*	.90	.000	.000
1.00	.000	.000	*	1.10	.000	.000
1.20	.000	.000	*	1.30	.000	.000
1.40	.000	.000	*	1.50	.000	.000
1.60	.000	.000	*	1.70	.000	.000
1.80	.000	.000	*	1.90	.000	.000
2.00	.000	.000	*	2.10	.000	.000
2.20	.000	.000	*	2.30	.000	.000
2.40	.000	.000	*	2.50	.000	.000
2.60	.000	.000	*	2.70	.000	.000
2.80	.000	.000	*	2.90	.000	.000
3.00	.000	.000	*	3.10	.000	.000
3.20	.000	.000	*	3.30	.000	.000
3.40	.000	.000	*	3.50	.000	.000
3.60	.000	.000	*	3.70	.000	.000
3.80	.000	.000	*	3.90	.000	.000
4.00	.000	.000	*	4.10	.000	.000
4.20	.000	.000	*	4.30	.000	.000
4.40	.000	.000	*	4.50	.000	.000
4.60	.000	.000	*	4.70	.000	.000
4.80	.000	.000	*	4.90	.000	.000
5.00	.000	.000	*	5.10	.000	.000
5.20	.000	.000	*	5.30	.000	.000
5.40	.000	.000	*	5.50	.000	.000
5.60	.000	.000	*	5.70	.000	.000
5.80	.000	.000	*	5.90	.000	.000
6.00	.000	.000	*	6.10	.013	.000
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8.20	.059	.000	*	8.30	.061	.000
8.40	.063	.000	*	8.50	.065	.000
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8.80	.077	.000	*	8.90	.079	.000
9.00	.081	.000	*	9.10	.095	.000
9.20	.098	.000	*	9.30	.100	.000
9.40	.103	.000	*	9.50	.106	.000

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11.00	.289	.000	*	11.10	.459	.000
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11.40	.497	.000	*	11.50	.509	.000
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11.80	5.141	.000	*	11.90	5.380	.000
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14.80	.232	.000	*	14.90	.233	.000
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16.60	.141	.000	*	16.70	.141	.000
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17.00	.141	.000	*	17.10	.141	.000
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17.40	.141	.000	*	17.50	.141	.000
17.60	.141	.000	*	17.70	.141	.000
17.80	.141	.000	*	17.90	.141	.000
18.00	.141	.000	*	18.10	.141	.000
18.20	.141	.000	*	18.30	.141	.000
18.40	.141	.000	*	18.50	.141	.000
18.60	.141	.000	*	18.70	.141	.000
18.80	.141	.000	*	18.90	.141	.000
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19.20	.142	.000	*	19.30	.142	.000
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21.00	.095	.000	*	21.10	.095	.000
21.20	.095	.000	*	21.30	.095	.000
21.40	.095	.000	*	21.50	.095	.000
21.60	.095	.000	*	21.70	.095	.000
21.80	.095	.000	*	21.90	.095	.000
22.00	.095	.000	*	22.10	.095	.000
22.20	.095	.000	*	22.30	.095	.000
22.40	.095	.000	*	22.50	.095	.000
22.60	.095	.000	*	22.70	.095	.000

22.80	.095	.000	*	22.90	.095	.000
23.00	.095	.000	*	23.10	.095	.000
23.20	.095	.000	*	23.30	.095	.000
23.40	.095	.000	*	23.50	.095	.000
23.60	.095	.000	*	23.70	.095	.000

***** RESULTS FROM SUBWATERSHED 2 *****

*** PARTICLE SIZE DISTRIBUTION OF SEDIMENT ***

SIZE,MM	.2500	.1000	.0500	.0100	.0050	.0010
PERCENT FINER	100.0000	86.1898	60.3329	32.7521	25.8569	10.3428
SIZE,MM	.0001					
PERCENT FINER	.0000					

*** HYDROGRAPH AND SEDIMENT GRAPH ***

(TWO CONSECUTIVE VALUES PER LINE)

TIME (HR)	DISCHARGE (CFS)	SED DISC (MG/L)	******* *	TIME (HR)	DISCHARGE (CFS)	SED DISC (MG/L)
.00	.000	.000	*	.10	.000	.000
.20	.000	.000	*	.30	.000	.000
.40	.000	.000	*	.50	.000	.000
.60	.000	.000	*	.70	.000	.000
.80	.000	.000	*	.90	.000	.000
1.00	.000	.000	*	1.10	.000	.000
1.20	.000	.000	*	1.30	.000	.000
1.40	.000	.000	*	1.50	.000	.000
1.60	.000	.000	*	1.70	.000	.000
1.80	.000	.000	*	1.90	.000	.000
2.00	.000	.000	*	2.10	.000	.000
2.20	.000	.000	*	2.30	.000	.000
2.40	.000	.000	*	2.50	.000	.000
2.60	.000	.000	*	2.70	.000	.000
2.80	.000	.000	*	2.90	.000	.000
3.00	.000	.000	*	3.10	.000	.000
3.20	.000	.000	*	3.30	.000	.000
3.40	.000	.000	*	3.50	.000	.000
3.60	.000	.000	*	3.70	.000	.000
3.80	.000	.000	*	3.90	.000	.000
4.00	.000	.000	*	4.10	.000	.000
4.20	.000	.000	*	4.30	.000	.000
4.40	.000	.000	*	4.50	.000	.000
4.60	.000	.000	*	4.70	.000	.000
4.80	.000	.000	*	4.90	.000	.000
5.00	.000	.000	*	5.10	.000	.000
5.20	.000	.000	*	5.30	.000	.000
5.40	.000	.000	*	5.50	.000	.000
5.60	.000	.000	*	5.70	.000	.000
5.80	.000	.000	*	5.90	.000	.000
6.00	.000	.000	*	6.10	.000	.000
6.20	.000	.000	*	6.30	.000	.000
6.40	.000	.000	*	6.50	.000	.000
6.60	.000	.000	*	6.70	.000	.000
6.80	.000	.000	*	6.90	.000	.000
7.00	.000	.000	*	7.10	.000	.000
7.20	.000	.000	*	7.30	.000	.000
7.40	.000	.000	*	7.50	.000	.000
7.60	.000	.000	*	7.70	.000	.000
7.80	.000	.000	*	7.90	.000	.000
8.00	.000	.000	*	8.10	.000	.000
8.20	.000	.000	*	8.30	.000	.000
8.40	.000	.000	*	8.50	.000	.000
8.60	.000	.000	*	8.70	.000	.000
8.80	.000	.000	*	8.90	.000	.000
9.00	.000	.000	*	9.10	.000	.000
9.20	.000	.000	*	9.30	.000	.000
9.40	.000	.000	*	9.50	.000	.000
9.60	.000	.000	*	9.70	.000	.000
9.80	.000	.000	*	9.90	.000	.000

9.90	.000	.000		9.90	.000	.000
10.00	.000	.000	*	10.10	.000	.000
10.20	.000	.000	*	10.30	.000	.000
10.40	.000	.000	*	10.50	.000	.000
10.60	.000	.000	*	10.70	.000	.000
10.80	.000	.000	*	10.90	.000	.000
11.00	.000	.000	*	11.10	.000	.000
11.20	.000	.000	*	11.30	.000	.000
11.40	.000	.000	*	11.50	.000	.000
11.60	.000	.000	*	11.70	.018	.000
11.80	.156	.000	*	11.90	.457	.000
12.00	.869	.000	*	12.10	1.343	.000
12.20	1.519	.000	*	12.30	1.335	.000
12.40	1.155	.000	*	12.50	1.006	.000
12.60	.913	.000	*	12.70	.858	.000
12.80	.805	.000	*	12.90	.761	.000
13.00	.728	.000	*	13.10	.706	.000
13.20	.684	.000	*	13.30	.655	.000
13.40	.629	.000	*	13.50	.607	.000
13.60	.588	.000	*	13.70	.564	.000
13.80	.535	.000	*	13.90	.507	.000
14.00	.482	.000	*	14.10	.458	.000
14.20	.429	.000	*	14.30	.393	.000
14.40	.359	.000	*	14.50	.329	.000
14.60	.303	.000	*	14.70	.285	.000
14.80	.273	.000	*	14.90	.264	.000
15.00	.257	.000	*	15.10	.251	.000
15.20	.245	.000	*	15.30	.241	.000
15.40	.238	.000	*	15.50	.235	.000
15.60	.233	.000	*	15.70	.231	.000
15.80	.229	.000	*	15.90	.228	.000
16.00	.227	.000	*	16.10	.227	.000
16.20	.218	.000	*	16.30	.203	.000
16.40	.190	.000	*	16.50	.180	.000
16.60	.173	.000	*	16.70	.169	.000
16.80	.166	.000	*	16.90	.164	.000
17.00	.161	.000	*	17.10	.159	.000
17.20	.157	.000	*	17.30	.155	.000
17.40	.153	.000	*	17.50	.151	.000
17.60	.150	.000	*	17.70	.148	.000
17.80	.147	.000	*	17.90	.146	.000
18.00	.145	.000	*	18.10	.144	.000
18.20	.143	.000	*	18.30	.143	.000
18.40	.142	.000	*	18.50	.142	.000
18.60	.142	.000	*	18.70	.142	.000
18.80	.142	.000	*	18.90	.142	.000
19.00	.142	.000	*	19.10	.143	.000
19.20	.143	.000	*	19.30	.143	.000
19.40	.143	.000	*	19.50	.144	.000
19.60	.144	.000	*	19.70	.144	.000
19.80	.144	.000	*	19.90	.145	.000
20.00	.145	.000	*	20.10	.145	.000
20.20	.141	.000	*	20.30	.133	.000
20.40	.126	.000	*	20.50	.121	.000
20.60	.118	.000	*	20.70	.115	.000
20.80	.114	.000	*	20.90	.112	.000
21.00	.111	.000	*	21.10	.110	.000
21.20	.109	.000	*	21.30	.107	.000
21.40	.106	.000	*	21.50	.105	.000
21.60	.105	.000	*	21.70	.104	.000
21.80	.103	.000	*	21.90	.102	.000
22.00	.102	.000	*	22.10	.101	.000
22.20	.101	.000	*	22.30	.100	.000
22.40	.100	.000	*	22.50	.100	.000
22.60	.100	.000	*	22.70	.100	.000
22.80	.100	.000	*	22.90	.100	.000
23.00	.100	.000	*	23.10	.100	.000

23.00	.100	.000	*	23.10	.100	.000
23.20	.100	.000	*	23.30	.100	.000
23.40	.101	.000	*	23.50	.101	.000
23.60	.101	.000	*	23.70	.101	.000
23.80	.101	.000	*	23.90	.101	.000
24.00	.101	.000	*	24.10	.101	.000
24.20	.092	.000	*	24.30	.075	.000
24.40	.061	.000	*	24.50	.050	.000
24.60	.042	.000	*	24.70	.037	.000
24.80	.034	.000	*	24.90	.031	.000
25.00	.027	.000	*	25.10	.024	.000
25.20	.022	.000	*	25.30	.019	.000
25.40	.017	.000	*	25.50	.014	.000
25.60	.012	.000	*	25.70	.010	.000
25.80	.008	.000	*	25.90	.007	.000
26.00	.005	.000	*	26.10	.004	.000
26.20	.003	.000	*	26.30	.002	.000
26.40	.001	.000	*	26.50	.001	.000

***** RESULTS FROM SUBWATERSHED 3 *****

*** PARTICLE SIZE DISTRIBUTION OF SEDIMENT ***

SIZE,MM	.2500	.1000	.0500	.0100	.0050	.0010
PERCENT FINER	100.0000	50.0000	35.0000	19.0000	15.0000	6.0000
SIZE,MM	.0001					
PERCENT FINER	.0000					

*** HYDROGRAPH AND SEDIMENT GRAPH ***

(TWO CONSECUTIVE VALUES PER LINE)

TIME (HR)	DISCHARGE (CFS)	SED DISC (MG/L)	******* *	TIME (HR)	DISCHARGE (CFS)	SED DISC (MG/L)
.00	.000	.000	*	.10	.000	.000
.20	.000	.000	*	.30	.000	.000
.40	.000	.000	*	.50	.000	.000
.60	.000	.000	*	.70	.000	.000
.80	.000	.000	*	.90	.000	.000
1.00	.000	.000	*	1.10	.000	.000
1.20	.000	.000	*	1.30	.000	.000
1.40	.000	.000	*	1.50	.000	.000
1.60	.000	.000	*	1.70	.000	.000
1.80	.000	.000	*	1.90	.000	.000
2.00	.000	.000	*	2.10	.000	.000
2.20	.000	.000	*	2.30	.000	.000
2.40	.000	.000	*	2.50	.000	.000
2.60	.000	.000	*	2.70	.000	.000
2.80	.000	.000	*	2.90	.000	.000
3.00	.000	.000	*	3.10	.000	.000
3.20	.000	.000	*	3.30	.000	.000
3.40	.000	.000	*	3.50	.000	.000
3.60	.000	.000	*	3.70	.000	.000
3.80	.000	.000	*	3.90	.000	.000
4.00	.000	.000	*	4.10	.000	.000
4.20	.000	.000	*	4.30	.000	.000
4.40	.000	.000	*	4.50	.000	.000
4.60	.000	.000	*	4.70	.000	.000
4.80	.000	.000	*	4.90	.000	.000
5.00	.000	.000	*	5.10	.000	.000
5.20	.000	.000	*	5.30	.000	.000
5.40	.000	.000	*	5.50	.000	.000
5.60	.000	.000	*	5.70	.000	.000
5.80	.000	.000	*	5.90	.000	.000
6.00	.000	.000	*	6.10	.000	.000
6.20	.000	.000	*	6.30	.000	.000
6.40	.000	.000	*	6.50	.000	.000
6.60	.000	.000	*	6.70	.000	.000
6.80	.000	.000	*	6.90	.000	.000
7.00	.000	.000	*	7.10	.000	.000
7.20	.000	.000	*	7.30	.000	.000
7.40	.000	.000	*	7.50	.000	.000

7.60	.000	.000	*	7.70	.000	.000
7.80	.000	.000	*	7.90	.000	.000
8.00	.000	.000	*	8.10	.000	.000
8.20	.000	.000	*	8.30	.000	.000
8.40	.000	.000	*	8.50	.000	.000
8.60	.000	.000	*	8.70	.000	.000
8.80	.000	.000	*	8.90	.000	.000
9.00	.000	.000	*	9.10	.000	.000
9.20	.000	.000	*	9.30	.000	.000
9.40	.000	.000	*	9.50	.000	.000
9.60	.000	.000	*	9.70	.000	.000
9.80	.000	.000	*	9.90	.000	.000
10.00	.000	.000	*	10.10	.000	.000
10.20	.000	.000	*	10.30	.000	.000
10.40	.000	.000	*	10.50	.000	.000
10.60	.000	.000	*	10.70	.000	.000
10.80	.000	.000	*	10.90	.000	.000
11.00	.000	.000	*	11.10	.011	.000
11.20	.020	.000	*	11.30	.029	.000
11.40	.038	.000	*	11.50	.046	.000
11.60	.643	.000	*	11.70	1.075	.000
11.80	1.438	.000	*	11.90	1.746	.000
12.00	2.009	.000	*	12.10	.407	.000
12.20	.415	.000	*	12.30	.423	.000
12.40	.430	.000	*	12.50	.438	.000
12.60	.228	.000	*	12.70	.230	.000
12.80	.231	.000	*	12.90	.233	.000
13.00	.235	.000	*	13.10	.173	.000
13.20	.173	.000	*	13.30	.174	.000
13.40	.175	.000	*	13.50	.176	.000
13.60	.138	.000	*	13.70	.138	.000
13.80	.139	.000	*	13.90	.139	.000
14.00	.140	.000	*	14.10	.100	.000
14.20	.100	.000	*	14.30	.101	.000
14.40	.101	.000	*	14.50	.101	.000
14.60	.101	.000	*	14.70	.102	.000
14.80	.102	.000	*	14.90	.102	.000
15.00	.102	.000	*	15.10	.103	.000
15.20	.103	.000	*	15.30	.103	.000
15.40	.103	.000	*	15.50	.104	.000
15.60	.104	.000	*	15.70	.104	.000
15.80	.104	.000	*	15.90	.105	.000
16.00	.105	.000	*	16.10	.063	.000
16.20	.063	.000	*	16.30	.063	.000
16.40	.063	.000	*	16.50	.063	.000
16.60	.064	.000	*	16.70	.064	.000
16.80	.064	.000	*	16.90	.064	.000
17.00	.064	.000	*	17.10	.064	.000
17.20	.064	.000	*	17.30	.064	.000
17.40	.064	.000	*	17.50	.064	.000
17.60	.064	.000	*	17.70	.064	.000
17.80	.065	.000	*	17.90	.065	.000
18.00	.065	.000	*	18.10	.065	.000
18.20	.065	.000	*	18.30	.065	.000
18.40	.065	.000	*	18.50	.065	.000
18.60	.065	.000	*	18.70	.065	.000
18.80	.065	.000	*	18.90	.065	.000
19.00	.065	.000	*	19.10	.066	.000
19.20	.066	.000	*	19.30	.066	.000
19.40	.066	.000	*	19.50	.066	.000
19.60	.066	.000	*	19.70	.066	.000
19.80	.066	.000	*	19.90	.066	.000
20.00	.066	.000	*	20.10	.044	.000
20.20	.044	.000	*	20.30	.044	.000
20.40	.044	.000	*	20.50	.044	.000
20.60	.044	.000	*	20.70	.044	.000

20.80	.044	.000	*	20.90	.044	.000
21.00	.045	.000	*	21.10	.045	.000
21.20	.045	.000	*	21.30	.045	.000
21.40	.045	.000	*	21.50	.045	.000
21.60	.045	.000	*	21.70	.045	.000
21.80	.045	.000	*	21.90	.045	.000
22.00	.045	.000	*	22.10	.045	.000
22.20	.045	.000	*	22.30	.045	.000
22.40	.045	.000	*	22.50	.045	.000
22.60	.045	.000	*	22.70	.045	.000
22.80	.045	.000	*	22.90	.045	.000
23.00	.045	.000	*	23.10	.045	.000
23.20	.045	.000	*	23.30	.045	.000
23.40	.045	.000	*	23.50	.045	.000
23.60	.045	.000	*	23.70	.045	.000

*** HYDRAULIC INPUT VALUES FOR SUBWATERSHEDS ***

WATER SHED	AREA ACRES	CURVE NUMBER	TC HR	TT HR	ROUTING COEFFICIENTS K-HRS	X	UNIT HYDRO
1	2.90	91.00	.110	.000	.000	.00	.0
2	5.50	69.00	.210	.000	.000	.00	3.0
3	2.00	75.00	.070	.000	.000	.00	.0

*** SEDIMENT INPUT VALUES FOR SUBWATERSHEDS ***

WATER SHED	SEG NUM	SOIL K	LENGTH FEET	SLOPE PCT	CP VALUE	PART OPT	SURF COND
1	1	.00	.0	.00	.000	1.0	.0
2	1	.00	.0	.00	.000	1.0	.0
3	1	.00	.0	.00	.000	1.0	.0

* * * COMPUTED VALUES FOR INDIVIDUAL WATERSHEDS * * *

WATERSHED	PEAK FLOW (CFS)	RUNOFF (INCHES)	SEDIMENT TONS	DIAM (MM)	DELIVERY RATIO 1	DELIVERY RATIO 2
1	5.56	2.00	.00	.100	1.000	1.000
2	1.52	.63	.00	.027	.580	1.000
3	2.01	.91	.00	.100	1.000	1.000

NOTE: SEDIMENT DOES NOT INCLUDE POSSIBLE DEPOSITION BY DELIVERY RATIO 2

***** SUMMARY TABLE FOR TOTAL WATERSHED *****

RUNOFF VOLUME	=	.9215	ACRE-FT
PEAK DISCHARGE	=	8.4369	CFS
AREA	=	10.4000	ACRES
TIME OF PEAK DISCHARGE	=	12.00	HRS
BETA	=	1.0000	
RAINFALL EROSITIVITY FACTOR	=	49.63	EI UNIT
PEAK CONCENTRATION	=	.00	MG/L
PEAK SETTLEABLE CONCENTRATION	=	.00	ML/L
PEAK SETTLEABLE CONCENTRATION	=	.00	MG/L
TOTAL SEDIMENT YIELD	=	.0000	TONS
REPRESENTATIVE PARTICLE SIZE	=	.0001	MM
TIME OF PEAK CONCENTRATION	=	.00	HRS
PERIOD OF SIGNIFICANT CONCENTRATION	=	-26.80	HRS
VOLUME WEIGHTED AVERAGE SETTLEABLE CONCENTRATION DURING PERIOD OF SIGNIFICANT CONCENTRATION	=	.00	ML/L
VOLUME WEIGHTED AVERAGE SETTLEABLE CONCENTRATION DURING PEAK 24 HOUR PERIOD	=	.00	ML/L
ARITHMETIC AVERAGE SETTLEABLE CONCENTRATION DURING PERIOD OF SIGNIFICANT CONCENTRATION	=	.00	ML/L
ARITHMETIC AVERAGE SETTLEABLE CONCENTRATION DURING PEAK 24 HOUR PERIOD	=	.00	ML/L

***** GENERATED DATA FOR INPUT INTO STRUCTURE 1 *****

*** PARTICLE SIZE DISTRIBUTION OF SEDIMENT ***

SIZE,MM	.2500	.1000	.0500	.0100	.0050	.0010
PERCENT FINER	.0000	.0000	.0000	.0000	.0000	.0000
SIZE,MM	.0001					
PERCENT FINER	.0000					

*** HYDROGRAPH AND SEDIMENT GRAPH ***

(TWO CONSECUTIVE VALUES PER LINE)

TIME (HR)	DISCHARGE (CFS)	SED DISC (MG/L)	******* *	TIME (HR)	DISCHARGE (CFS)	SED DISC (MG/L)
.00	.000	.000	*	.10	.000	.000
.20	.000	.000	*	.30	.000	.000
.40	.000	.000	*	.50	.000	.000
.60	.000	.000	*	.70	.000	.000
.80	.000	.000	*	.90	.000	.000
1.00	.000	.000	*	1.10	.000	.000
1.20	.000	.000	*	1.30	.000	.000
1.40	.000	.000	*	1.50	.000	.000
1.60	.000	.000	*	1.70	.000	.000
1.80	.000	.000	*	1.90	.000	.000
2.00	.000	.000	*	2.10	.000	.000
2.20	.000	.000	*	2.30	.000	.000
2.40	.000	.000	*	2.50	.000	.000
2.60	.000	.000	*	2.70	.000	.000
2.80	.000	.000	*	2.90	.000	.000
3.00	.000	.000	*	3.10	.000	.000
3.20	.000	.000	*	3.30	.000	.000
3.40	.000	.000	*	3.50	.000	.000
3.60	.000	.000	*	3.70	.000	.000
3.80	.000	.000	*	3.90	.000	.000
4.00	.000	.000	*	4.10	.000	.000
4.20	.000	.000	*	4.30	.000	.000
4.40	.000	.000	*	4.50	.000	.000
4.60	.000	.000	*	4.70	.000	.000
4.80	.000	.000	*	4.90	.000	.000
5.00	.000	.000	*	5.10	.000	.000
5.20	.000	.000	*	5.30	.000	.000
5.40	.000	.000	*	5.50	.000	.000
5.60	.000	.000	*	5.70	.000	.000
5.80	.000	.000	*	5.90	.000	.000
6.00	.000	.000	*	6.10	.013	.000
6.20	.014	.000	*	6.30	.016	.000
6.40	.018	.000	*	6.50	.020	.000
6.60	.021	.000	*	6.70	.023	.000
6.80	.024	.000	*	6.90	.026	.000
7.00	.028	.000	*	7.10	.029	.000
7.20	.031	.000	*	7.30	.032	.000
7.40	.034	.000	*	7.50	.035	.000
7.60	.036	.000	*	7.70	.038	.000
7.80	.039	.000	*	7.90	.041	.000
8.00	.042	.000	*	8.10	.056	.000
8.20	.059	.000	*	8.30	.061	.000
8.40	.063	.000	*	8.50	.065	.000
8.60	.072	.000	*	8.70	.074	.000
8.80	.077	.000	*	8.90	.079	.000
9.00	.081	.000	*	9.10	.095	.000
9.20	.098	.000	*	9.30	.100	.000
9.40	.103	.000	*	9.50	.106	.000
9.60	.122	.000	*	9.70	.125	.000
9.80	.128	.000	*	9.90	.131	.000
10.00	.133	.000	*	10.10	.174	.000
10.20	.179	.000	*	10.30	.183	.000
10.40	.187	.000	*	10.50	.191	.000
10.60	.264	.000	*	10.70	.270	.000
10.80	.277	.000	*	10.90	.283	.000
11.00	.289	.000	*	11.10	.470	.000
11.20	.493	.000	*	11.30	.514	.000

11.20	[illegible]	[illegible]		11.30	[illegible]	[illegible]
11.40	.535	.000	*	11.50	.555	.000
11.60	5.000	.000	*	11.70	5.909	.000
11.80	6.736	.000	*	11.90	7.583	.000
12.00	8.437	.000	*	12.10	2.821	.000
12.20	3.009	.000	*	12.30	2.838	.000
12.40	2.669	.000	*	12.50	2.532	.000
12.60	1.701	.000	*	12.70	1.649	.000
12.80	1.599	.000	*	12.90	1.558	.000
13.00	1.528	.000	*	13.10	1.291	.000
13.20	1.270	.000	*	13.30	1.243	.000
13.40	1.219	.000	*	13.50	1.198	.000
13.60	1.048	.000	*	13.70	1.025	.000
13.80	.997	.000	*	13.90	.970	.000
14.00	.946	.000	*	14.10	.790	.000
14.20	.761	.000	*	14.30	.726	.000
14.40	.692	.000	*	14.50	.662	.000
14.60	.637	.000	*	14.70	.619	.000
14.80	.607	.000	*	14.90	.599	.000
15.00	.592	.000	*	15.10	.586	.000
15.20	.581	.000	*	15.30	.578	.000
15.40	.575	.000	*	15.50	.572	.000
15.60	.570	.000	*	15.70	.568	.000
15.80	.567	.000	*	15.90	.567	.000
16.00	.566	.000	*	16.10	.430	.000
16.20	.422	.000	*	16.30	.406	.000
16.40	.394	.000	*	16.50	.384	.000
16.60	.377	.000	*	16.70	.373	.000
16.80	.371	.000	*	16.90	.368	.000
17.00	.366	.000	*	17.10	.364	.000
17.20	.362	.000	*	17.30	.360	.000
17.40	.358	.000	*	17.50	.356	.000
17.60	.355	.000	*	17.70	.354	.000
17.80	.352	.000	*	17.90	.351	.000
18.00	.351	.000	*	18.10	.350	.000
18.20	.349	.000	*	18.30	.349	.000
18.40	.348	.000	*	18.50	.348	.000
18.60	.348	.000	*	18.70	.348	.000
18.80	.349	.000	*	18.90	.349	.000
19.00	.349	.000	*	19.10	.350	.000
19.20	.350	.000	*	19.30	.351	.000
19.40	.351	.000	*	19.50	.351	.000
19.60	.352	.000	*	19.70	.352	.000
19.80	.352	.000	*	19.90	.353	.000
20.00	.353	.000	*	20.10	.284	.000
20.20	.280	.000	*	20.30	.272	.000
20.40	.265	.000	*	20.50	.260	.000
20.60	.257	.000	*	20.70	.255	.000
20.80	.253	.000	*	20.90	.252	.000
21.00	.250	.000	*	21.10	.249	.000
21.20	.248	.000	*	21.30	.247	.000
21.40	.246	.000	*	21.50	.245	.000
21.60	.244	.000	*	21.70	.243	.000
21.80	.243	.000	*	21.90	.242	.000
22.00	.241	.000	*	22.10	.241	.000
22.20	.241	.000	*	22.30	.240	.000
22.40	.240	.000	*	22.50	.240	.000
22.60	.240	.000	*	22.70	.240	.000
22.80	.240	.000	*	22.90	.240	.000
23.00	.240	.000	*	23.10	.240	.000
23.20	.241	.000	*	23.30	.241	.000
23.40	.241	.000	*	23.50	.241	.000
23.60	.241	.000	*	23.70	.241	.000
23.80	.242	.000	*	23.90	.101	.000
24.00	.101	.000	*	24.10	.101	.000
24.20	.092	.000	*	24.30	.075	.000
24.40	.061	.000	*	24.50	.050	.000

24.60	.042	.000	*	24.70	.037	.000
24.80	.034	.000	*	24.90	.031	.000
25.00	.027	.000	*	25.10	.024	.000
25.20	.022	.000	*	25.30	.019	.000
25.40	.017	.000	*	25.50	.014	.000
25.60	.012	.000	*	25.70	.010	.000
25.80	.008	.000	*	25.90	.007	.000
26.00	.005	.000	*	26.10	.004	.000
26.20	.003	.000	*	26.30	.002	.000
26.40	.001	.000	*	26.50	.001	.000

* *

POND RESULTS

* *

***** CONTROL VARIABLES OPTIONS *****

FLOW	FRACTN	ISDO	NRHP	NSP	NCSTR
3	0	2	300	12	2

***** DROP SPILLWAY INPUTS *****

ENTRANCE LOSS COEFFICIENT	=	1.0000	
BEND LOSS COEFFICIENT	=	.5000	
WEIR COEFFICIENT	=	3.1000	
ORIFICE COEFFICIENT	=	.6000	
MANNING COEFFICIENT	=	.0240	
BARREL DIAMATER	=	18.00	INCHES
RISER DIAMETER	=	24.00	INCHES
LENGTH OF PIPE	=	92.00	FEET
VERTICAL HEAD DROP	=	16.00	FEET

***** BASIN GEOMETRY *****

STAGE (FT)	AREA (ACRES)	AVERAGE DEPTH (FT)	DISCHARGE (CFS)	CAPACITY (ACRES-FT)
.00	.083	.00	.00	.00
.50	.090	.49	.00	.04
1.00	.096	.97	.00	.09
1.50	.103	1.44	.00	.14
2.50	.117	2.35	.00	.25
3.50	.133	3.22	.00	.37
4.50	.149	4.06	.00	.52
5.50	.166	4.87	.00	.67
6.00	.175	5.27	6.89	.76
6.50	.183	5.66	15.13	.85
7.00	.192	6.04	18.53	.94
7.50	.201	6.42	20.99	1.04

***** STORM EVENT SUMMARY *****

TURBULENCE FACTOR	=	1.00	
PERMANENT POOL CAPACITY	=	.673	ACRE-FT
DEAD STORAGE	=	20.00	PERCENT
TIME INCREMENT OUTFLOW	=	.10	HRS
VISCOSITY	=	.009	CM**2/SEC
INFLOW RUNOFF VOLUME	=	.922	ACRE-FT
OUTFLOW ROUTED VOLUME	=	.922	ACRE-FT
STORM VOLUME DISCHARGED (PLUG FLOW)	=	.922	ACRE-FT
POND VOLUME AT PEAK STAGE	=	.760	ACRE-FT
PEAK STAGE	=	6.009	FT
PEAK INFLOW RATE	=	8.437	CFS
PEAK DISCHARGE RATE	=	7.042	CFS
PEAK INFLOW SEDIMENT CONCENTRATION	=	.00	MG/L
PEAK EFFLUENT SEDIMENT CONCENTRATION	=	.00	MG/L
PEAK EFFLUENT SETTLEABLE CONCENTRATION	=	.0000	ML/L
PEAK EFFLUENT SETTLEABLE CONCENTRATION	=	.00	MG/L
STORM AVERAGE EFFLUENT CONCENTRATION	=	.00	MG/L
AVERAGE EFFLUENT SEDIMENT CONCENTRATION	=	.00	MG/L
BASIN TRAP EFFICIENCY	=**********		PERCENT
DETENTION TIME OF FLOW WITH SEDIMENT	=	15	HRS

DETENTION TIME OF FLOW WITH SEDIMENT	=	.15	HRS
DETENTION TIME FROM HYDROGRAPH CENTERS	=	.15	HRS
DETENTION TIME INCLUDING STORED FLOW	=	.15	HRS
SEDIMENT LOAD DISCHARGED	=	.00	TONS
PERIOD OF SIGNIFICANT CONCENTRATION	=	-26.90	HRS
VOLUME WEIGHTED AVERAGE SETTLEABLE CONCENTRATION DURING PERIOD OF SIGNIFICANT CONCENTRATION	=	.00	ML/L
VOLUME WEIGHTED AVERAGE SETTLEABLE CONCENTRATION DURING PEAK 24 HOUR PERIOD	=	.00	ML/L
ARITHMETIC AVERAGE SETTLEABLE CONCENTRATION DURING PERIOD OF SIGNIFICANT CONCENTRATION	=	.00	ML/L
ARITHMETIC AVERAGE SETTLEABLE CONCENTRATION DURING PEAK 24 HOUR PERIOD	=	.00	ML/L

*** PARTICLE SIZE DISTRIBUTION OF SEDIMENT ***

SIZE,MM	.2500	.1000	.0500	.0100	.0050	.0010
PERCENT FINER	.0000	.0000	.0000	.0000	.0000	.0000
SIZE,MM	.0001					
PERCENT FINER	.0000					

*** HYDROGRAPH AND SEDIMENT GRAPH ***
(TWO CONSECUTIVE VALUES PER LINE)

TIME (HR)	DISCHARGE (CFS)	SED DISC (MG/L)	******* *	TIME (HR)	DISCHARGE (CFS)	SED DISC (MG/L)
.00	.000	.000	*	.10	.000	.000
.20	.000	.000	*	.30	.000	.000
.40	.000	.000	*	.50	.000	.000
.60	.000	.000	*	.70	.000	.000
.80	.000	.000	*	.90	.000	.000
1.00	.000	.000	*	1.10	.000	.000
1.20	.000	.000	*	1.30	.000	.000
1.40	.000	.000	*	1.50	.000	.000
1.60	.000	.000	*	1.70	.000	.000
1.80	.000	.000	*	1.90	.000	.000
2.00	.000	.000	*	2.10	.000	.000
2.20	.000	.000	*	2.30	.000	.000
2.40	.000	.000	*	2.50	.000	.000
2.60	.000	.000	*	2.70	.000	.000
2.80	.000	.000	*	2.90	.000	.000
3.00	.000	.000	*	3.10	.000	.000
3.20	.000	.000	*	3.30	.000	.000
3.40	.000	.000	*	3.50	.000	.000
3.60	.000	.000	*	3.70	.000	.000
3.80	.000	.000	*	3.90	.000	.000
4.00	.000	.000	*	4.10	.000	.000
4.20	.000	.000	*	4.30	.000	.000
4.40	.000	.000	*	4.50	.000	.000
4.60	.000	.000	*	4.70	.000	.000
4.80	.000	.000	*	4.90	.000	.000
5.00	.000	.000	*	5.10	.000	.000
5.20	.000	.000	*	5.30	.000	.000
5.40	.000	.000	*	5.50	.000	.000
5.60	.000	.000	*	5.70	.000	.000
5.80	.000	.000	*	5.90	.000	.000
6.00	.000	.000	*	6.10	.003	.000
6.20	.008	.000	*	6.30	.012	.000
6.40	.014	.000	*	6.50	.017	.000
6.60	.018	.000	*	6.70	.020	.000
6.80	.022	.000	*	6.90	.024	.000
7.00	.025	.000	*	7.10	.027	.000
7.20	.028	.000	*	7.30	.030	.000
7.40	.031	.000	*	7.50	.033	.000
7.60	.034	.000	*	7.70	.036	.000
7.80	.037	.000	*	7.90	.039	.000

[illegible]	[illegible]	[illegible]		[illegible]	[illegible]	[illegible]
8.00	.040	.000	*	8.10	.045	.000
8.20	.051	.000	*	8.30	.055	.000
8.40	.059	.000	*	8.50	.061	.000
8.60	.065	.000	*	8.70	.069	.000
8.80	.072	.000	*	8.90	.075	.000
9.00	.077	.000	*	9.10	.083	.000
9.20	.090	.000	*	9.30	.094	.000
9.40	.098	.000	*	9.50	.101	.000
9.60	.107	.000	*	9.70	.115	.000
9.80	.121	.000	*	9.90	.125	.000
10.00	.128	.000	*	10.10	.141	.000
10.20	.159	.000	*	10.30	.170	.000
10.40	.177	.000	*	10.50	.183	.000
10.60	.205	.000	*	10.70	.236	.000
10.80	.255	.000	*	10.90	.267	.000
11.00	.277	.000	*	11.10	.328	.000
11.20	.405	.000	*	11.30	.454	.000
11.40	.489	.000	*	11.50	.517	.000
11.60	1.648	.000	*	11.70	3.551	.000
11.80	4.937	.000	*	11.90	6.047	.000
12.00	7.042	.000	*	12.10	6.319	.000
12.20	4.614	.000	*	12.30	3.767	.000
12.40	3.259	.000	*	12.50	2.929	.000
12.60	2.522	.000	*	12.70	2.098	.000
12.80	1.860	.000	*	12.90	1.719	.000
13.00	1.630	.000	*	13.10	1.519	.000
13.20	1.400	.000	*	13.30	1.328	.000
13.40	1.279	.000	*	13.50	1.243	.000
13.60	1.183	.000	*	13.70	1.109	.000
13.80	1.060	.000	*	13.90	1.022	.000
14.00	.989	.000	*	14.10	.928	.000
14.20	.852	.000	*	14.30	.797	.000
14.40	.753	.000	*	14.50	.715	.000
14.60	.682	.000	*	14.70	.655	.000
14.80	.634	.000	*	14.90	.618	.000
15.00	.607	.000	*	15.10	.598	.000
15.20	.591	.000	*	15.30	.585	.000
15.40	.580	.000	*	15.50	.577	.000
15.60	.574	.000	*	15.70	.571	.000
15.80	.569	.000	*	15.90	.568	.000
16.00	.567	.000	*	16.10	.532	.000
16.20	.479	.000	*	16.30	.446	.000
16.40	.423	.000	*	16.50	.406	.000
16.60	.393	.000	*	16.70	.384	.000
16.80	.378	.000	*	16.90	.373	.000
17.00	.370	.000	*	17.10	.367	.000
17.20	.365	.000	*	17.30	.363	.000
17.40	.361	.000	*	17.50	.359	.000
17.60	.357	.000	*	17.70	.356	.000
17.80	.354	.000	*	17.90	.353	.000
18.00	.352	.000	*	18.10	.351	.000
18.20	.350	.000	*	18.30	.349	.000
18.40	.349	.000	*	18.50	.349	.000
18.60	.348	.000	*	18.70	.348	.000
18.80	.348	.000	*	18.90	.349	.000
19.00	.349	.000	*	19.10	.349	.000
19.20	.349	.000	*	19.30	.350	.000
19.40	.350	.000	*	19.50	.351	.000
19.60	.351	.000	*	19.70	.351	.000
19.80	.352	.000	*	19.90	.352	.000
20.00	.352	.000	*	20.10	.335	.000
20.20	.309	.000	*	20.30	.292	.000
20.40	.280	.000	*	20.50	.272	.000
20.60	.265	.000	*	20.70	.260	.000
20.80	.257	.000	*	20.90	.255	.000
21.00	.253	.000	*	21.10	.251	.000

21.00	.253	.000	*	21.10	.251	.000
21.20	.250	.000	*	21.30	.249	.000
21.40	.247	.000	*	21.50	.246	.000
21.60	.245	.000	*	21.70	.244	.000
21.80	.244	.000	*	21.90	.243	.000
22.00	.242	.000	*	22.10	.242	.000
22.20	.241	.000	*	22.30	.241	.000
22.40	.240	.000	*	22.50	.240	.000
22.60	.240	.000	*	22.70	.240	.000
22.80	.240	.000	*	22.90	.240	.000
23.00	.240	.000	*	23.10	.240	.000
23.20	.240	.000	*	23.30	.240	.000
23.40	.241	.000	*	23.50	.241	.000
23.60	.241	.000	*	23.70	.241	.000
23.80	.241	.000	*	23.90	.206	.000
24.00	.154	.000	*	24.10	.127	.000
24.20	.112	.000	*	24.30	.098	.000
24.40	.083	.000	*	24.50	.069	.000
24.60	.058	.000	*	24.70	.049	.000
24.80	.042	.000	*	24.90	.037	.000
25.00	.033	.000	*	25.10	.030	.000
25.20	.026	.000	*	25.30	.023	.000
25.40	.021	.000	*	25.50	.018	.000
25.60	.016	.000	*	25.70	.013	.000
25.80	.011	.000	*	25.90	.010	.000
26.00	.008	.000	*	26.10	.006	.000
26.20	.005	.000	*	26.30	.004	.000
26.40	.003	.000	*	26.50	.002	.000
26.60	.001	.000	*	26.70	.001	.000

*** RUN COMPLETED ****