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.

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2/10/88

# 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) 3.0 1.8 $\Sigma$ 4.8

Curve numbers:
Pond area → CN = 100 (100% runoff)
Disturbed area → CN = 90 (Typical CN for dirt roads w/ hydro. 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 |

Pad, roads CN=90

Rock outcrop CN=96

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

Source → U.S. SCS (1972)

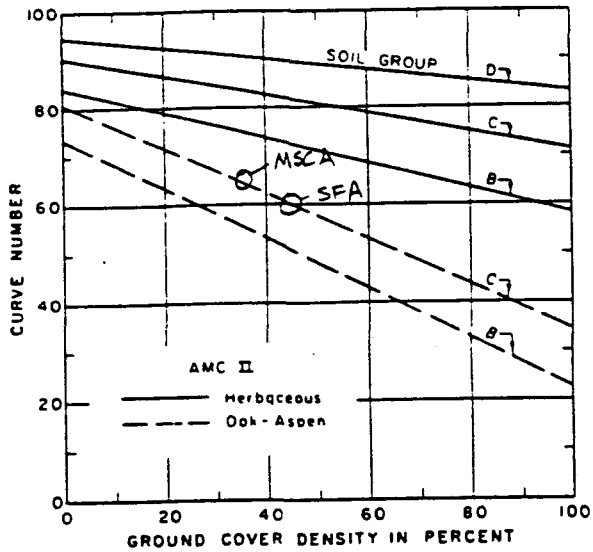



Figure 9.5.--Graph for estimating runoff curve numbers of forest-range complexes in western United States: herbaceous and oak-aspen complexes.

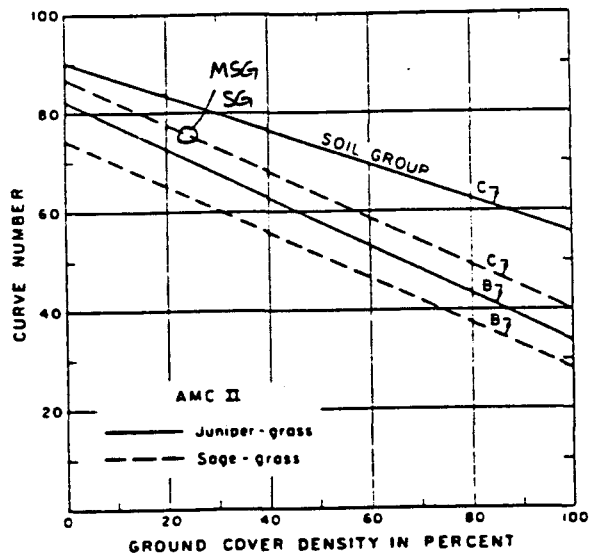



Figure 9.6.--Graph for estimating runoff curve numbers of forest-range complexes in western United States: juniper-grass and sage-grass complexes.

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 = 0.09 AF

Total required runoff storage = 0.68 AF

Sediment storage Volume:

Disturbed area: (3.7 ac)(0.1 AF/ac) = 0.37 AF (per reg.)

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.)

$$LS = \left(\frac{650 + 450s + 45s^2}{10{,}000 + s^2}\right)\left(\frac{l}{72.6}\right)^m$$

s = 66.7% (1.5 h : 1 v)
l = 51 ft (from site map and field observations)
m = 0.6 (Clyde et al., 1978 – based on slope)

LS = 23.68

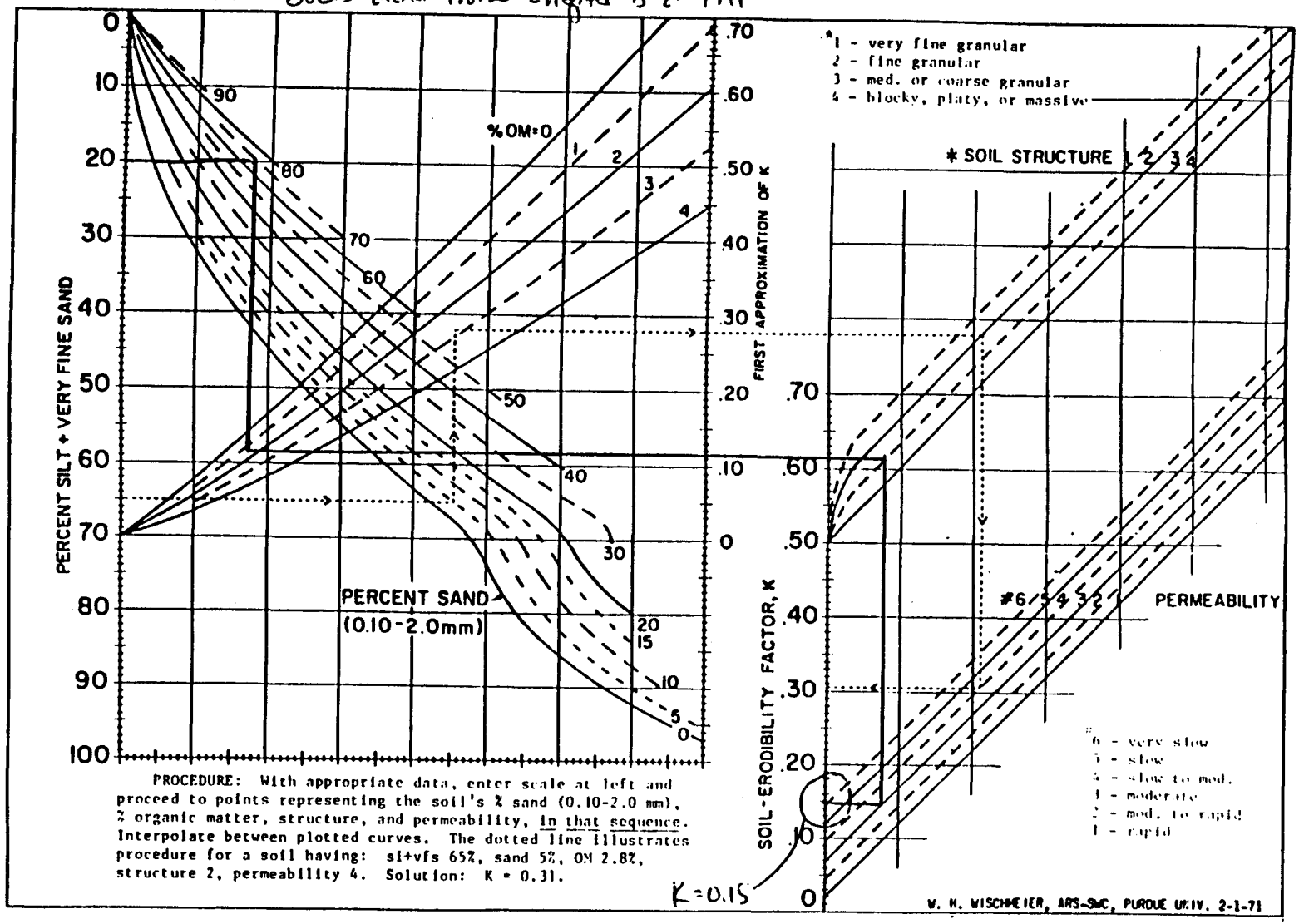
CP = 0.01 (from curve on page 1e of this calc. for anchored mulch – 1.5 tons/ac)

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/ft³)

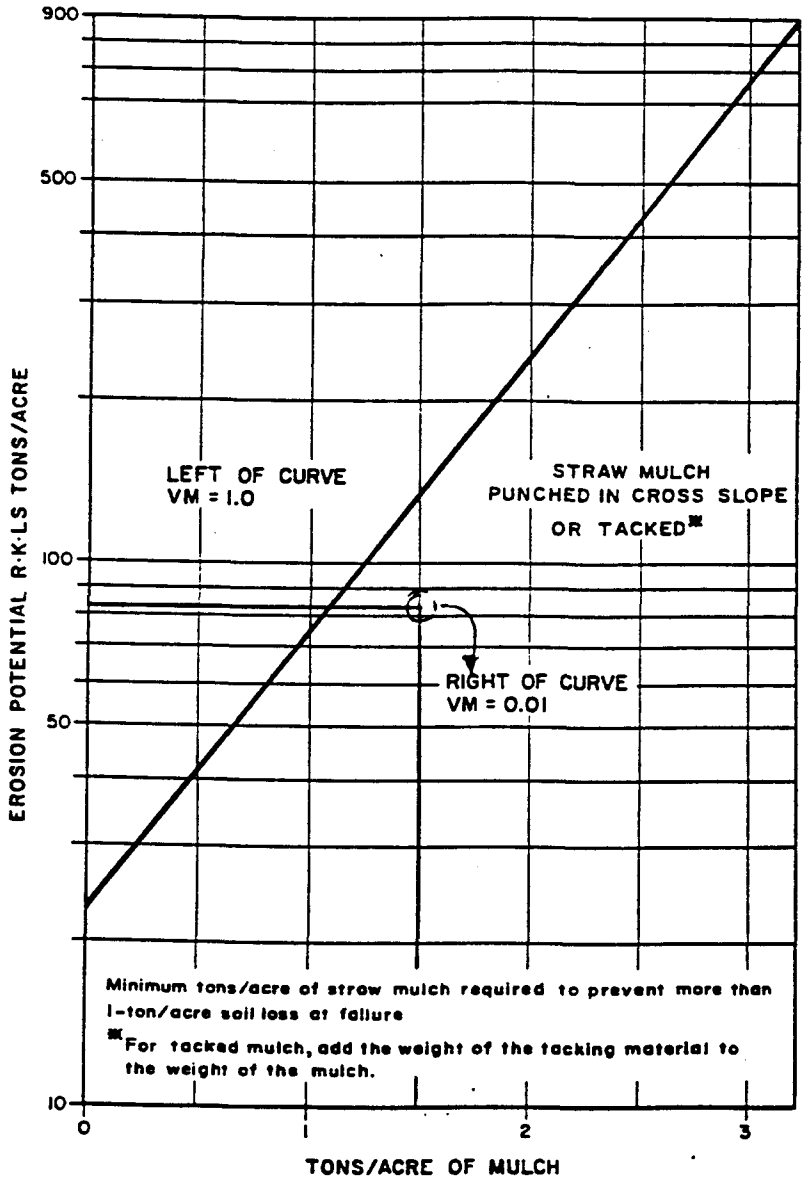
Soils data from Chapter 8 of PAP




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.

N. Wynne
11 May 1986

C-27-02 1d/




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 = 29.12 (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 = 0.63 AF + 0.30 AF

= 0.93 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

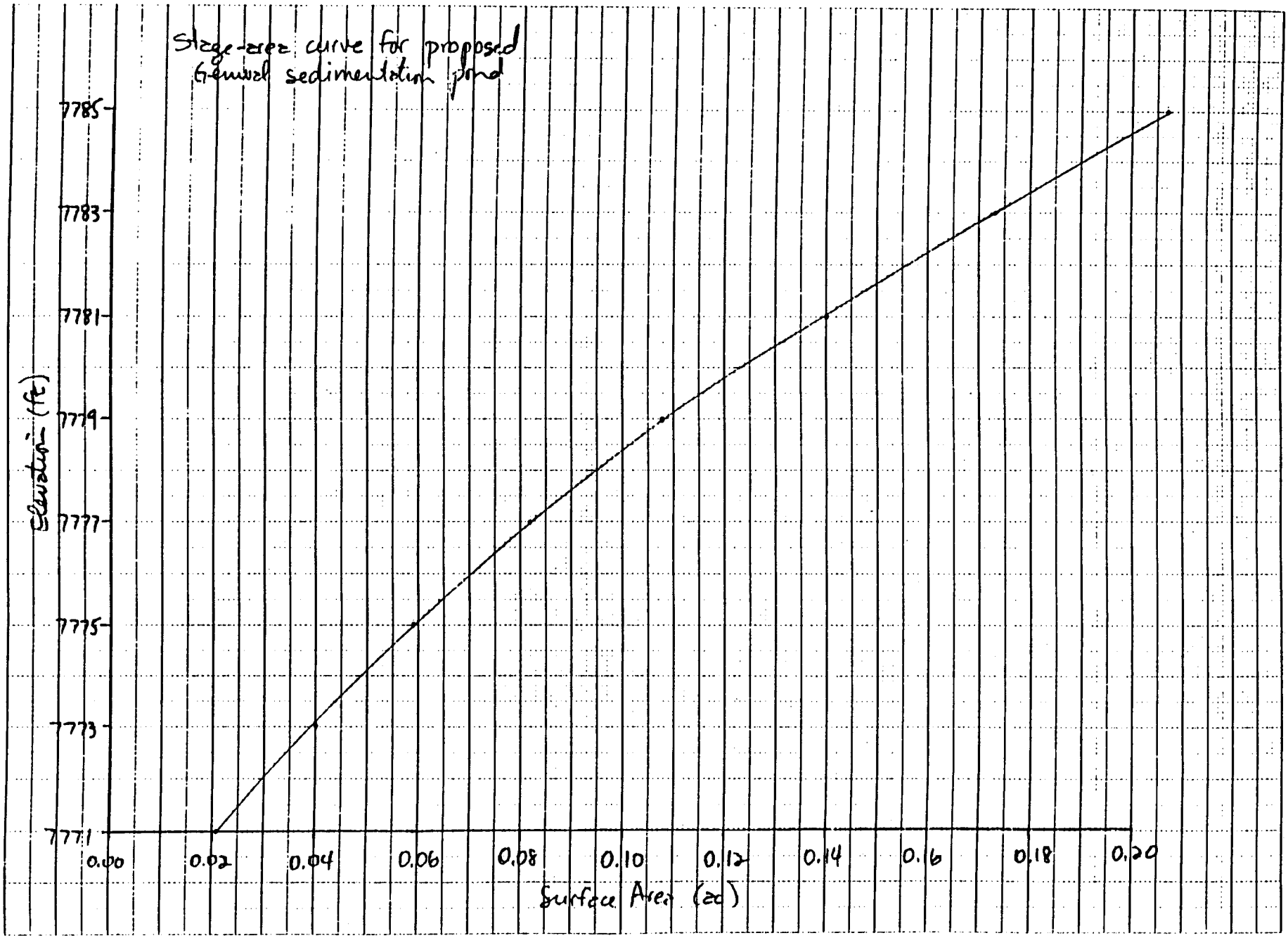
No. of junctions = 1
No. of branches = 1

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 46 1510




K. Wade
1 Feb 1986

C-27-02

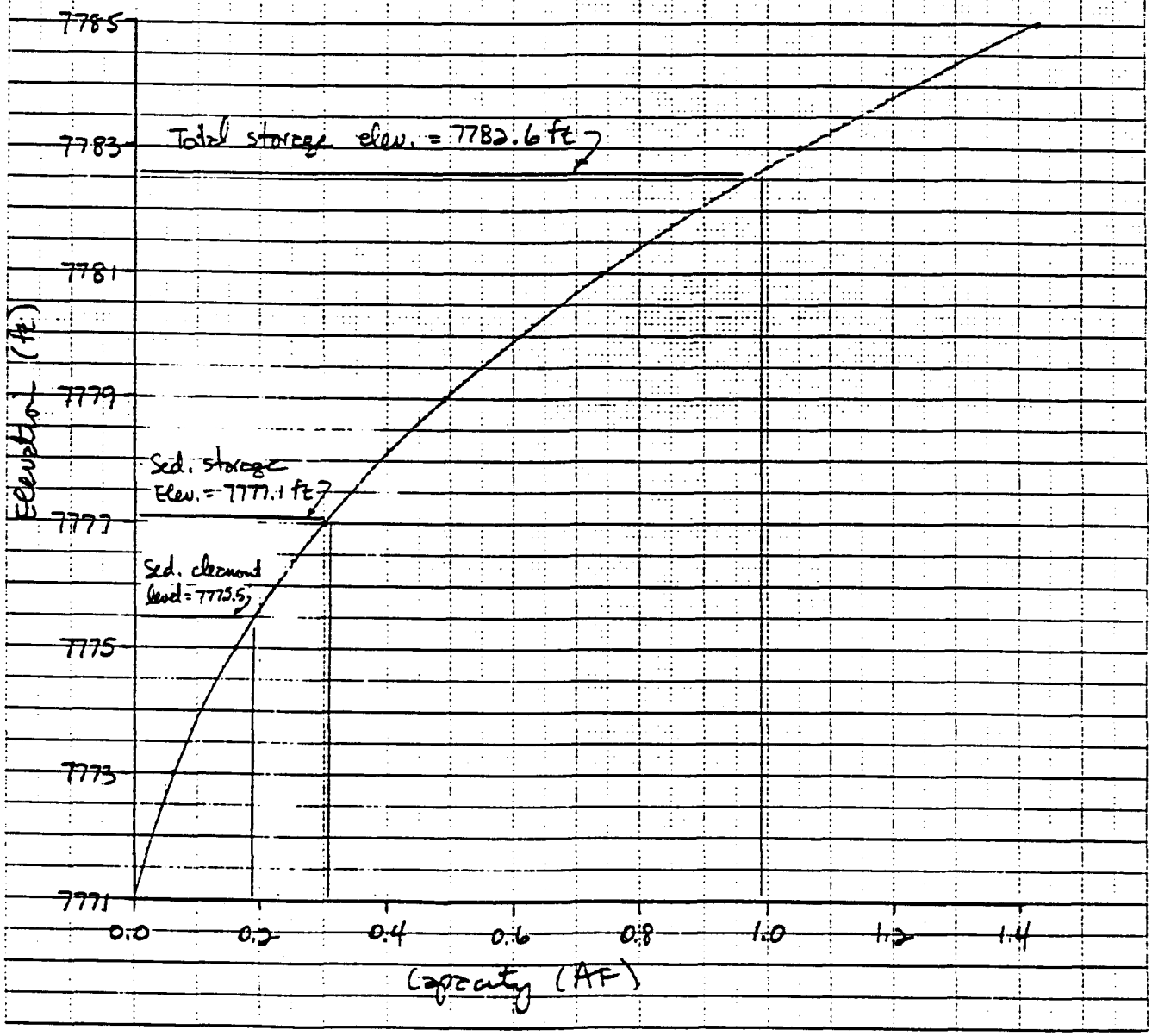
5/

L. White
11 May 1986

6-27-02

4/

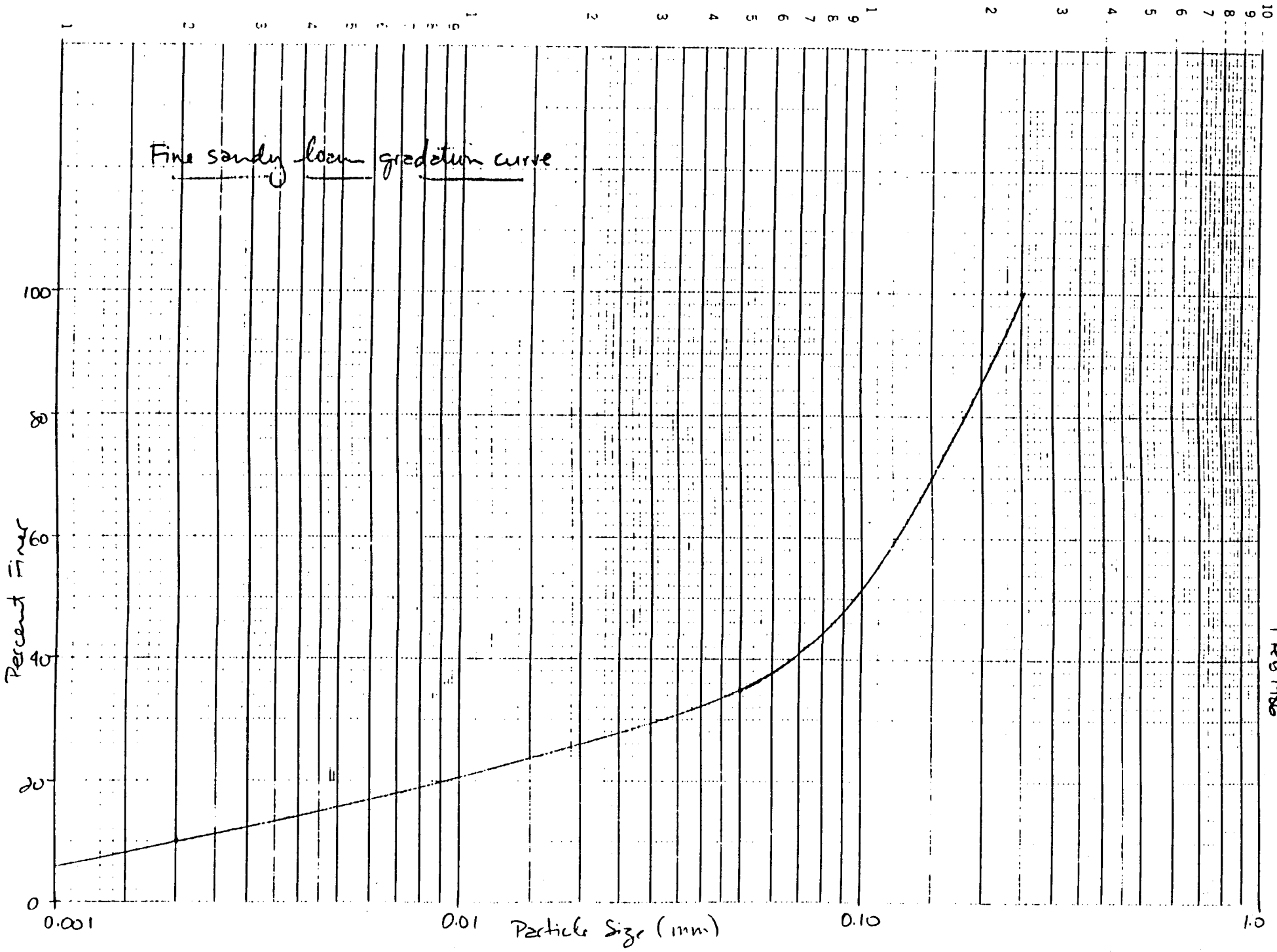
Stage-capacity curve for proposed
Grenvol sedimentation pond




461510

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

K+E SEMI-LOGARITHMIC 46 5492




1 Feb 1986

C-27-02

| 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

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

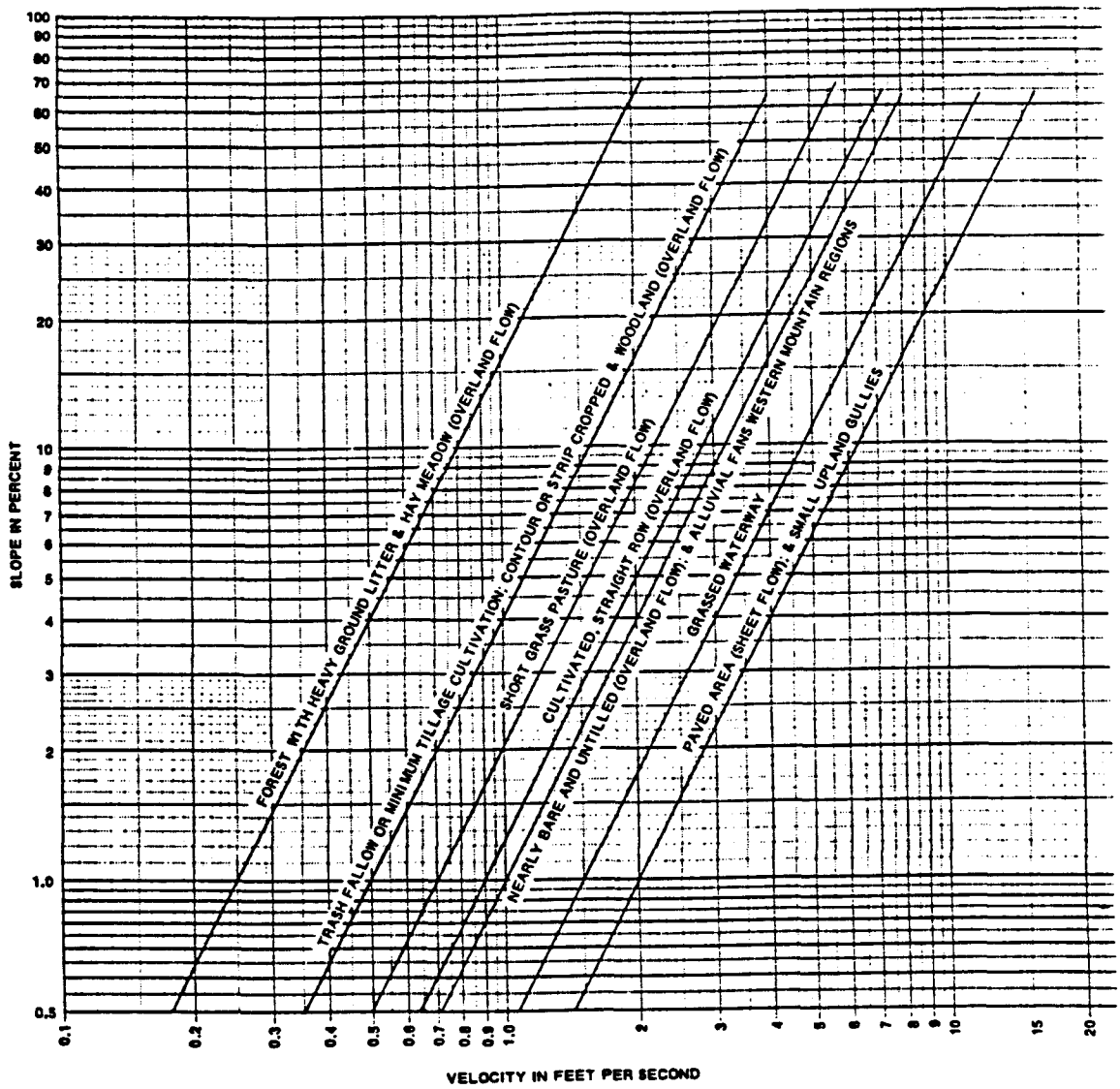
800 ft @ 8% (along main road to sed. pond)

$V = 5.6$ 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)




Source: U.S. SCS (1972)

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 ∅ (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

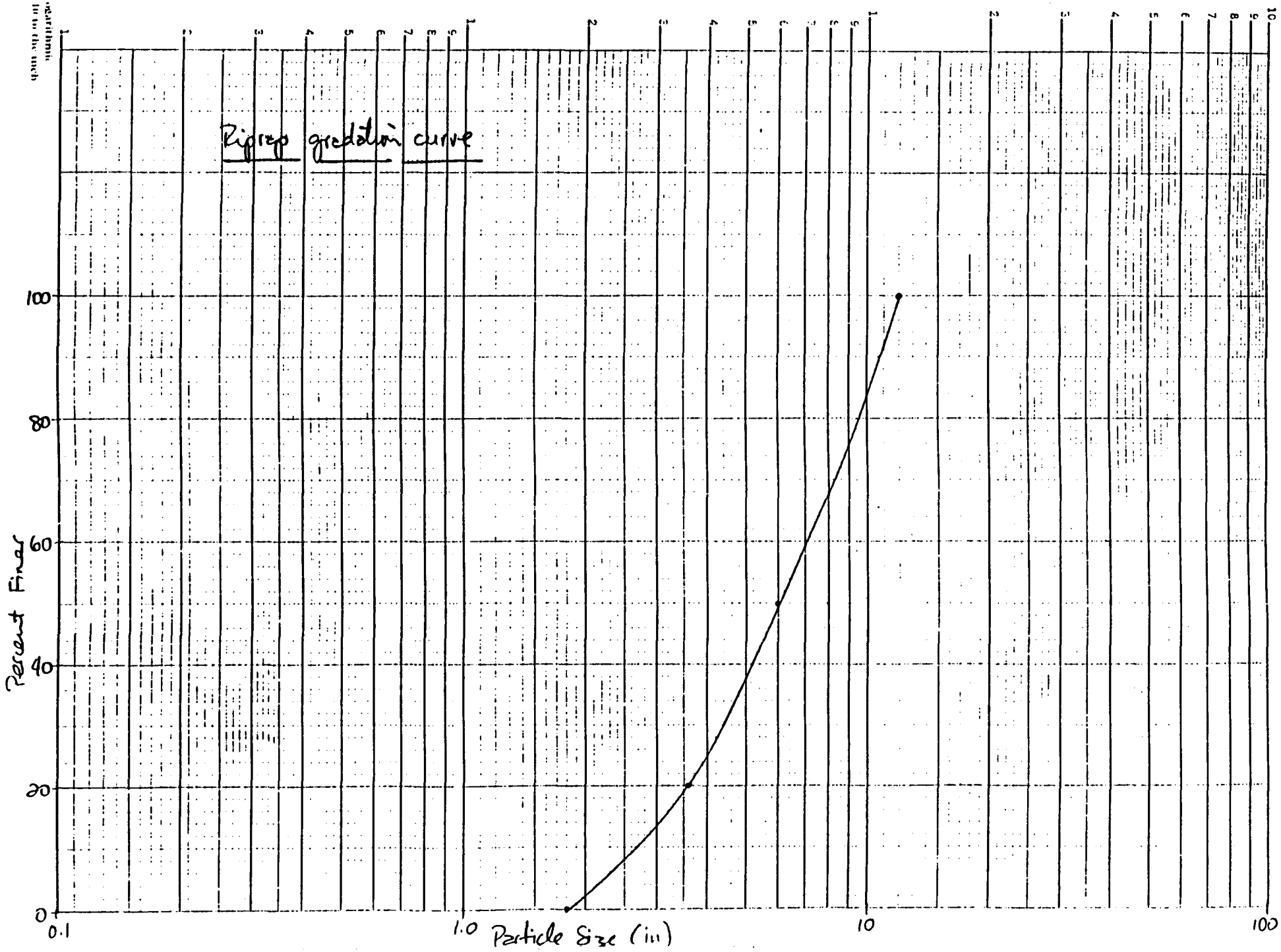
② Existing embankment crest elev. = 7783.0 ft (per survey). Final embankment height (design) = 7785.0 ft. Since the embankment has bee increased in height 0.4 ft more than required for outflow and freeboard, no accounting is required for subsequent settlement of the 2.0 ft addition.

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


Riprap gradation curve
Percent Finer
100
80
60
40
20
0
0.1
1.0
10
100
Particle Size (in)

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.

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

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

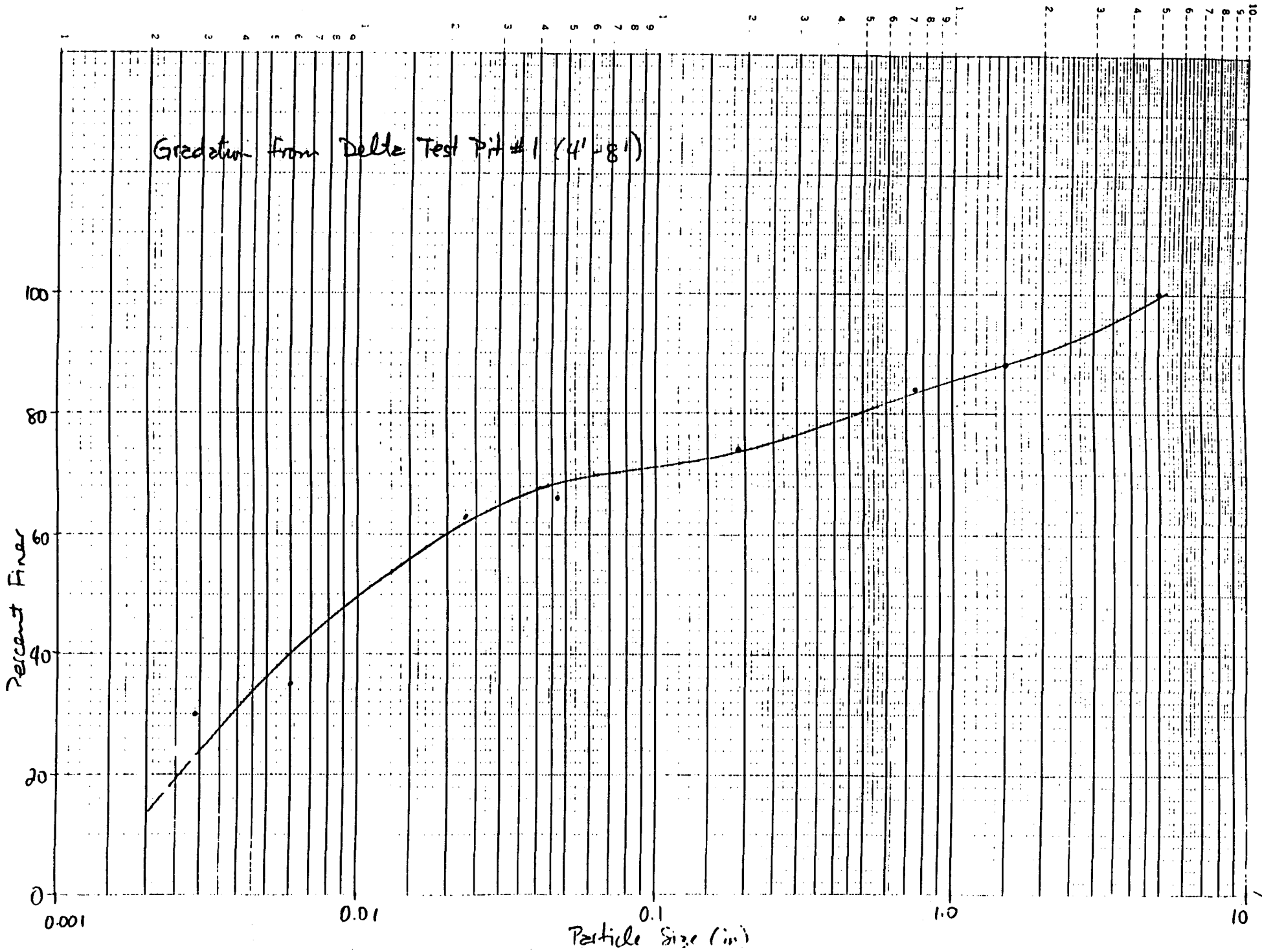
$$\frac{D_{15}\ (\text{filter})}{D_{85}\ (\text{bed})} = \frac{0.078\ \text{in}}{0.94\ \text{in}} = 0.08 < 5 \qquad \underline{\underline{\text{OK}}}$$

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

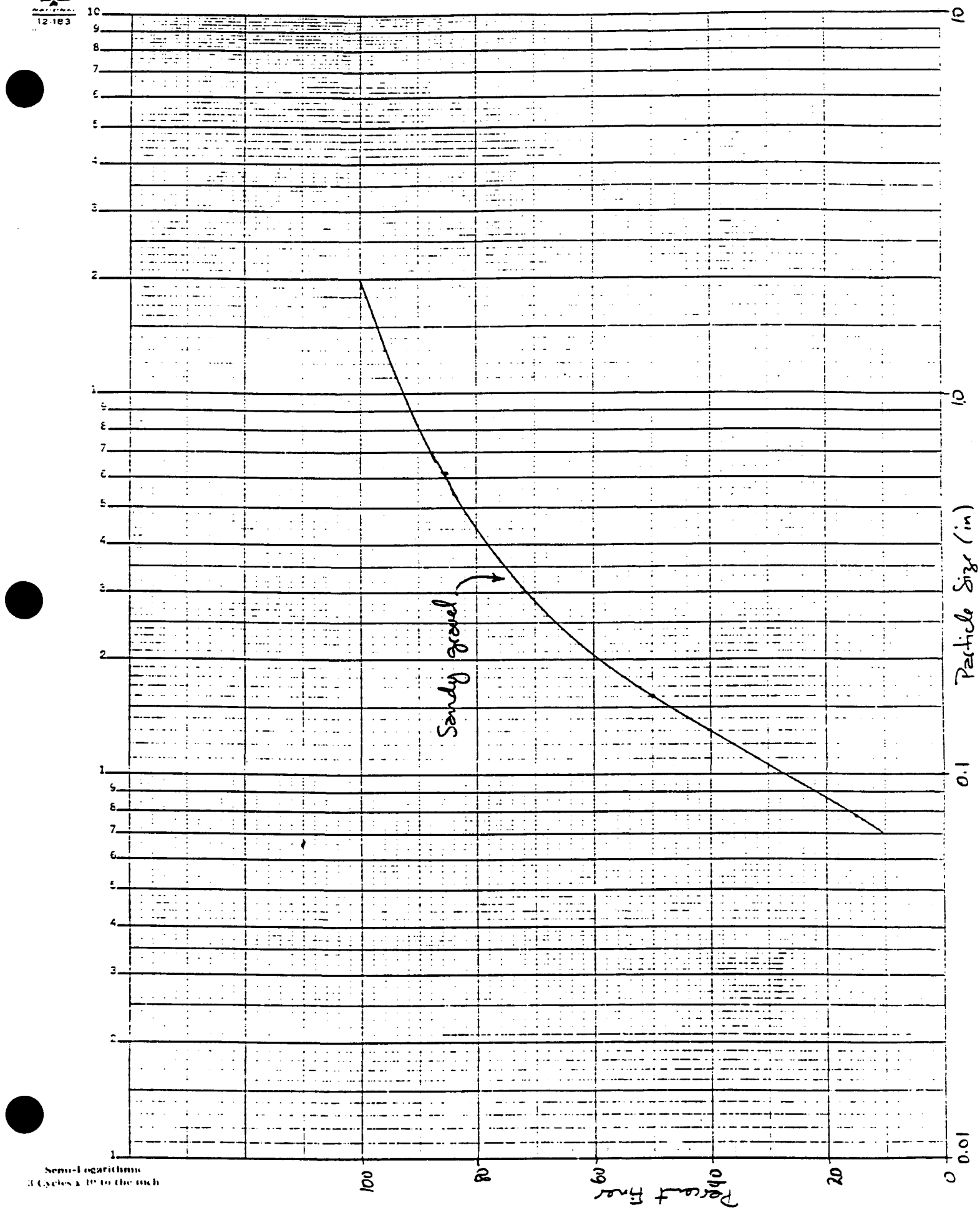
Indicated sandy gravel is sufficient for a filter blanket.

K+E SEMI-LOGARITHMIC 4 CYCLES X 70 DIVISIONS
KEUFFEL & ESSER CO. MADE IN U.S.A.

46 6010




13




12-183
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 1.0 (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.

References

Barfield, B.J., R.C. Warner, and C.T. Haan. 1981. Applied Hydrology and Sedimentology for Disturbed Areas. Oklahoma Technical Press. Stillwater, Oklahoma.

Clyde, C.G., C.E. Israelsen, R.E. Packer, E.E. Farmer, J.E. Fletcher, E.K. Israelsen, F.W. Haws, N.V. Rao, and J. Hansen. 1978. Manual of Erosion Control Principles and Practices. Hydraulics and Hydrology Series Report H-78-002. Utah Water Research Laboratory. Utah State University. Logan, Utah.

Delta Geotechnical Consultants, Inc. 1981. Slope Stability Investigation, Portal Pads and Portal Access Roads, Genwal Coal Mine, Huntington, Utah. Project Report prepared for Genwal Coal Company. Salt Lake City, Utah.

Donahue, R.L., J.C. Shickluna, and L.S. Robertson. 1971. Soils. Prentice-Hall, Inc. Englewood Cliffs, New Jersey.

Israelsen, C.E., J.E. Fletcher, F.W. Haws, E.K. Israelsen. 1984. Erosion and Sedimentation in Utah: A Guide for Control. Hydraulics and Hydrology Series Report H-84-003. Utah Water Research Laboratory. Utah State University. Logan, Utah.

Miller, J.F., R.H. Frederick, and R.J. Tracey. 1973. Precipitation-Frequency Atlas of the Western United States. Volume VI - Utah. NOAA Atlas 2. National Weather Service. Silver Spring, Maryland

R&M Consultants, Inc. 1981. Embankment Slope Stability Study, Sedimentation Pond, Crandall Canyon Mine, Huntington, Utah. Project report prepared for Genwal Coal Company. Salt Lake City, Utah.

Searcy, J.K. 1978. Use of Riprap for Bank Protection. Hydraulic Engineering Circular No. 11. U.S. Department of Transportation. Washington, D.C.

Swenson, J.L., D.T. Erickson, K.M. Donaldson, J.J. Shiozaki, 1970, Soil Survey of Carbon-Emery Area, Utah. U.S. Soil Conservation Service. Salt Lake City, Utah.

U.S. Bureau of Reclamation. 1977. Design of Small Dams. U.S. Government Printing Office. Washington, D.C.

U.S. Soil Conservation Service. 1968. Hydraulics of Broad-Crested Spillways. Technical Release No. 39. Washington, D.C.

U.S. Soil Conservation Service. 1972. National Engineering Handbook - Section 4: Hydrology. Washington, D.C.

Warner, R.C., B.N. Wilson, B.J. Barfield, D.S. Lorsden, and P.J. Nibgan. 1980. A Hydrology and Sedimentology Watershed Model, Part II: Users Manual. Dept. of Ag. Eng., University of Kentucky. Lexington, Kentucky

Wilson, B.N., B.J. Barfield, and I.D. Moore. 1980. A Hydrology and Sedimentology Watershed Model, Part I: Modeling Techniques. Dept. of Ag. Eng. University of Kentucky. Lexington, Kentucky.

## 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 Crandell 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 $\longrightarrow$ $q = 7.04$ cfs (see pg 10 of this calc.)

Full-flow capacity of 18" CMP:

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

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

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

$$= 40.23 \text{ cfs}$$

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

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

Ratio of areas = 0.23 $\Rightarrow$ Actual flow area = (0.23)(1.767) = 0.41 ft$^2$

Ratio of R = 0.65 $\Rightarrow$ Actual R = (0.65)(0.375) = 0.24 ft

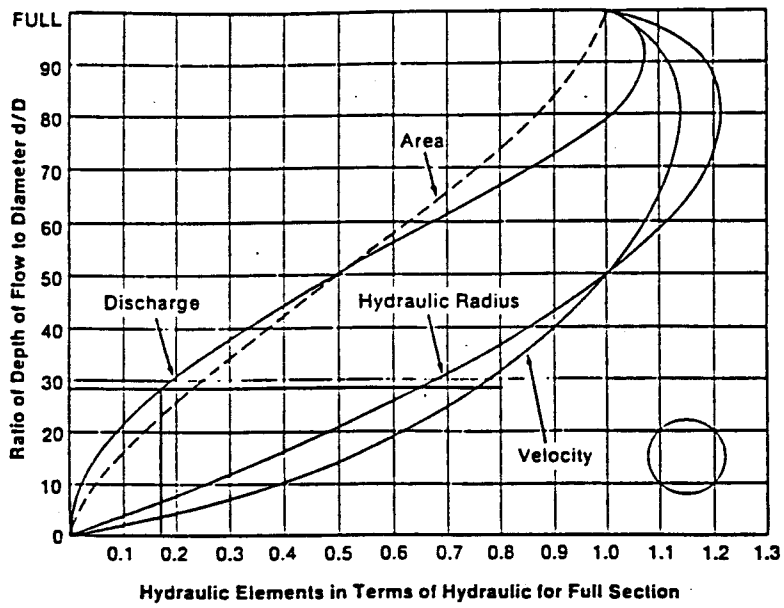



Figure 4-37 Hydraulic elements graph for circular corrugated steel pipe.

**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)

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

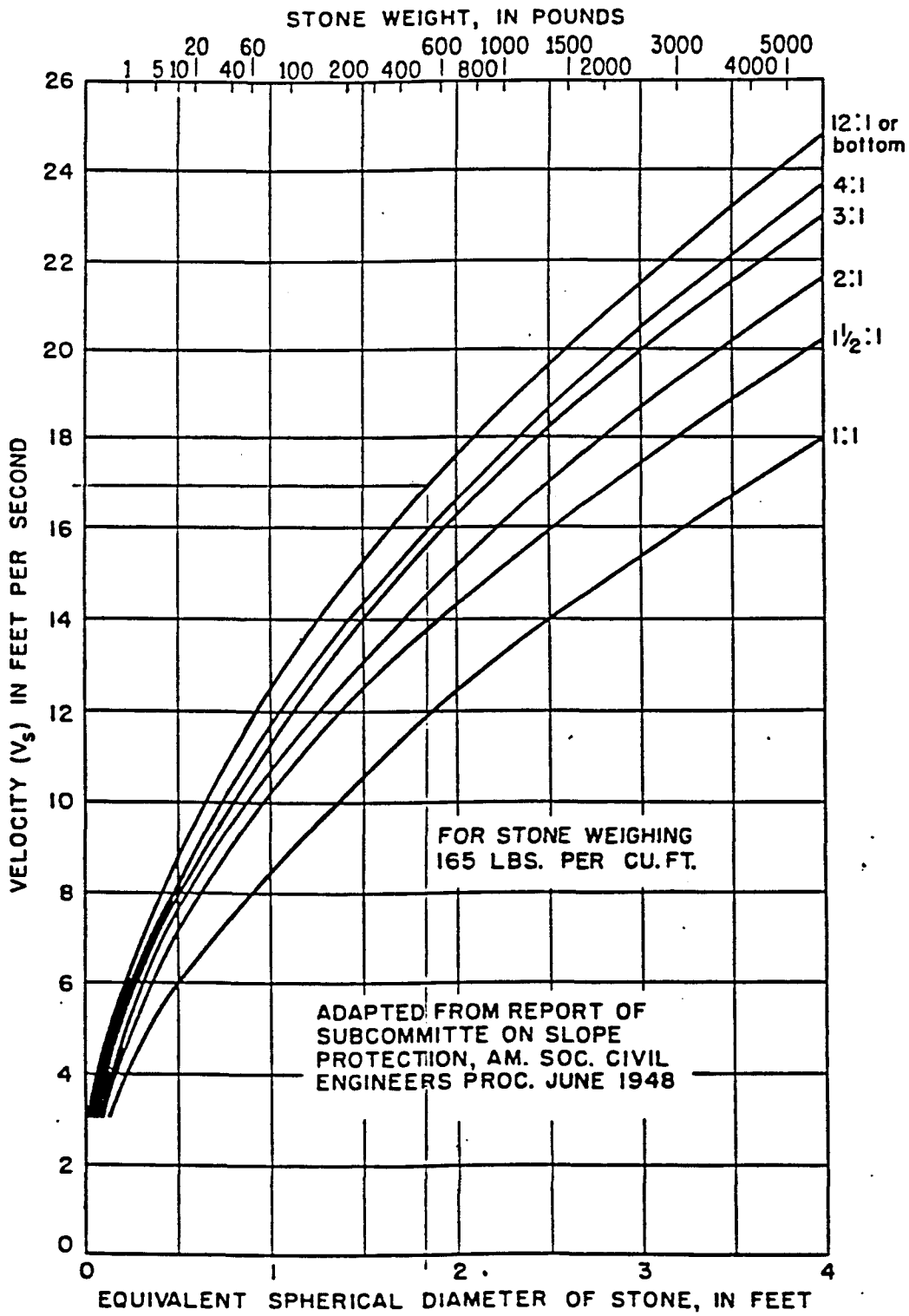
$$= \left[\frac{1.486}{0.024}\right] (0.24)^{2/3} (0.50)^{1/2}$$

$$= 16.9 \text{ ft/s}$$ ⟸ 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.

EARTHFAX ENGINEERING, INC.
ENGINEERS / SCIENTISTS

PROJECT C-27 PAGE 21 OF
COMPUTED RBW DATE 7 Aug 84
CHECKED DATE




Source: HEC-11

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

*****************************************************************
*****************************************************************
       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 9-21-83
       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 GENERAL SEDIMENTATION POND - 5/11/1986
*****************************************************************
```

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 | 1.000 | .000 |

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

| | | | |
|---|---|---|---|
| STORM DURATION | = | 24.00 | HOURS |
| PRECIPATION DEPTH | = | 1.92 | INCHES |
| SPECIFIC GRAVITY | = | 2.50 | |
| LOAD RATE EXPONENT FACTOR | = | 1.50 | |
| SUBMERGED BULK SPECIFIC GRAVITY | = | 1.15 | |

* * * * * * * * * * * * * * * * * * * * * * * * * * * * * *

JUNCTION 1, BRANCH 1, STRUCTURE 1

* * * * * * * * * * * * * * * * * * * * * * * * * * * * * *

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

*** PARTICLE SIZE DISTRIBUTION OF SEDIMENT ***

| | | | | | | |
|---|---|---|---|---|---|---|
| SIZE,MM | .2500 | .1000 | .0500 | .0250 | .0050 | .0010 |
| PERCENT FINER | 100.0000 | 50.0000 | 35.0000 | 15.0000 | 15.0000 | 4.0000 |
| 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 | .037 | .000 | * | 7.70 | .038 | .000 |
| 7.80 | .039 | .000 | * | 7.90 | .041 | .000 |
| 8.00 | .042 | .000 | * | 8.10 | .036 | .000 |
| 8.20 | .039 | .000 | * | 8.30 | .001 | .000 |
| 8.40 | .043 | .000 | * | 8.50 | .045 | .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 | .000 | .000 | * | 9.30 | .000 | .000 |
| [illegible] | [illegible] | [illegible] | * | [illegible] | [illegible] | [illegible] |

| | | | | | | |
|---|---|---|---|---|---|---|
| [illegible] | [illegible] | [illegible] | * | [illegible] | [illegible] | [illegible] |
| 9.80 | .126 | .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 | .459 | .000 |
| 11.20 | .472 | .000 | * | 11.30 | .485 | .000 |
| 11.40 | .497 | .000 | * | 11.50 | .509 | .000 |
| 11.60 | 4.356 | .000 | * | 11.70 | 4.815 | .000 |
| 11.80 | 5.141 | .000 | * | 11.90 | 5.360 | .000 |
| 12.00 | 5.589 | .000 | * | 12.10 | 1.070 | .000 |
| 12.20 | 1.075 | .000 | * | 12.30 | 1.080 | .000 |
| 12.40 | 1.084 | .000 | * | 12.50 | 1.088 | .000 |
| 12.60 | .561 | .000 | * | 12.70 | .562 | .000 |
| 12.80 | .563 | .000 | * | 12.90 | .564 | .000 |
| 13.00 | .565 | .000 | * | 13.10 | .413 | .000 |
| 13.20 | .413 | .000 | * | 13.30 | .414 | .000 |
| 13.40 | .414 | .000 | * | 13.50 | .415 | .000 |
| 13.60 | .323 | .000 | * | 13.70 | .323 | .000 |
| 13.80 | .323 | .000 | * | 13.90 | .324 | .000 |
| 14.00 | .324 | .000 | * | 14.10 | .232 | .000 |
| 14.20 | .232 | .000 | * | 14.30 | .232 | .000 |
| 14.40 | .232 | .000 | * | 14.50 | .232 | .000 |
| 14.60 | .232 | .000 | * | 14.70 | .232 | .000 |
| 14.80 | .232 | .000 | * | 14.90 | .233 | .000 |
| 15.00 | .233 | .000 | * | 15.10 | .233 | .000 |
| 15.20 | .233 | .000 | * | 15.30 | .233 | .000 |
| 15.40 | .233 | .000 | * | 15.50 | .233 | .000 |
| 15.60 | .233 | .000 | * | 15.70 | .234 | .000 |
| 15.80 | .234 | .000 | * | 15.90 | .234 | .000 |
| 16.00 | .234 | .000 | * | 16.10 | .140 | .000 |
| 16.20 | .140 | .000 | * | 16.30 | .140 | .000 |
| 16.40 | .141 | .000 | * | 16.50 | .141 | .000 |
| 16.60 | .141 | .000 | * | 16.70 | .141 | .000 |
| 16.80 | .141 | .000 | * | 16.90 | .141 | .000 |
| 17.00 | .141 | .000 | * | 17.10 | .141 | .000 |
| 17.20 | .141 | .000 | * | 17.30 | .141 | .000 |
| 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 |
| 19.00 | .142 | .000 | * | 19.10 | .142 | .000 |
| 19.20 | .142 | .000 | * | 19.30 | .142 | .000 |
| 19.40 | .142 | .000 | * | 19.50 | .142 | .000 |
| 19.60 | .142 | .000 | * | 19.70 | .142 | .000 |
| 19.80 | .142 | .000 | * | 19.90 | .142 | .000 |
| 20.00 | .142 | .000 | * | 20.10 | .095 | .000 |
| 20.20 | .095 | .000 | * | 20.30 | .095 | .000 |
| 20.40 | .095 | .000 | * | 20.50 | .095 | .000 |
| 20.60 | .095 | .000 | * | 20.70 | .095 | .000 |
| 20.80 | .095 | .000 | * | 20.90 | .095 | .000 |
| 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 |
| [illegible] | .095 | .000 | * | [illegible] | [illegible] | [illegible] |

| | | | | | | |
|---|---|---|---|---|---|---|
| [illegible] | [illegible] | [illegible] | | [illegible] | [illegible] | [illegible] |
| 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 | 86.1[illegible] | 69.3329 | 32.7821 | 25.[illegible] | 17.34[illegible] |
| SIZE,MM | .0001 | | | | | |
| PERCENT FINER | .000[illegible] | | | | | |

*** 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 |
| [illegible] | [illegible] | [illegible] | * | [illegible] | [illegible] | [illegible] |

| | | | | | | |
|---|---|---|---|---|---|---|
| 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 | .519 | .000 | * | 12.10 | 1.043 | .000 |
| 12.20 | 1.519 | .000 | * | 12.30 | 1.335 | .000 |
| 12.40 | 1.155 | .000 | * | 12.50 | 1.[illegible] | .000 |
| 12.60 | .913 | .000 | * | 12.70 | .[illegible] | .000 |
| 12.80 | .805 | .000 | * | 12.90 | .711 | .000 |
| 13.00 | .726 | .000 | * | 13.10 | .706 | .000 |
| 13.20 | .664 | .000 | * | 13.30 | .635 | .000 |
| 13.40 | .629 | .000 | * | 13.50 | .607 | .000 |
| 13.60 | .583 | .000 | * | 13.70 | .566 | .000 |
| 13.80 | .535 | .000 | * | 13.90 | .507 | .000 |
| 14.00 | .462 | .000 | * | 14.10 | .435 | .000 |
| 14.20 | .429 | .000 | * | 14.30 | .393 | .000 |
| 14.40 | .353 | .000 | * | 14.50 | .326 | .000 |
| 14.60 | .303 | .000 | * | 14.70 | .265 | .000 |
| 14.80 | .273 | .000 | * | 14.90 | .254 | .000 |
| 15.00 | .257 | .000 | * | 15.10 | .251 | .000 |
| 15.20 | .245 | .000 | * | 15.30 | .241 | .000 |
| 15.40 | .236 | .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 | .226 | .000 | * | 16.30 | .223 | .000 |
| 16.40 | .193 | .000 | * | 16.50 | .190 | .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 | .128 | .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 | .104 | .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 |
| [illegible] | [illegible] | [illegible] | * | [illegible] | [illegible] | [illegible] |

| | | | | | | |
|---|---|---|---|---|---|---|
| 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 | 1[illegible].0000 | 15.0000 | [illegible].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 |

| | | | | | | |
|---|---|---|---|---|---|---|
| 7.80 | .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 | .033 | .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 | 1.039 | .000 | * | 12.10 | .407 | .000 |
| 12.20 | .415 | .000 | * | 12.30 | .423 | .000 |
| 12.40 | .430 | .000 | * | 12.50 | .436 | .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 |
| [illegible] | [illegible] | [illegible] | * | [illegible] | [illegible] | [illegible] |

| | | | | | | |
|---|---|---|---|---|---|---|
| [illegible] | [illegible] | [illegible] | | [illegible] | [illegible] | [illegible] |
| 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 | 1.90 | 81.00 | .110 | .000 | .000 | .00 | .0 |
| 2 | 3.50 | 65.00 | .210 | .000 | .000 | .00 | 3.0 |
| 3 | 2.00 | 73.00 | .070 | .000 | .000 | .00 | .0 |

*** SEDIMENT INPUT VALUES FOR SUBWATERSHEDS ***

| WATER SHED | SEG NO. | 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 | 3.56 | 2.00 | .00 | .100 | 1.000 | 1.000 |
| 2 | 1.52 | .63 | .00 | .027 | .500 | 1.000 |
| 3 | 2.01 | .91 | .00 | .100 | 1.000 | 1.000 |

NOTE: SEDIMENT DOES NOT INCLUDE POSSIBLE DEPOSITION BY DELIVERY RATIO 1

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

| | | | |
|---|---|---|---|
| RUNOFF VOLUME | = | .0215 | ACRE-FT |
| PEAK DISCHARGE | = | 6.4369 | CFS |
| AREA | = | 10.4000 | ACRES |
| TIME OF PEAK DISCHARGE | = | 12.00 | HRS |
| BETA | = | 1.0000 | |
| RAINFALL EROSITIVITY FACTOR | = | 43.63 | 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 | = | -26.00 | 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 ***

| | | | | | | |
|---|---|---|---|---|---|---|
| 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 | .062 | .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 | [illegible] | .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 |
| [illegible] | [illegible] | [illegible] | * | [illegible] | [illegible] | [illegible] |

| | | | | | | |
|---|---|---|---|---|---|---|
| 11.00 | 3.000 | .000 | * | 11.10 | 3.919 | .000 |
| 11.80 | 6.736 | .000 | * | 11.90 | 7.503 | .000 |
| 12.00 | 6.437 | .000 | * | 12.10 | 2.621 | .000 |
| 12.20 | 3.009 | .000 | * | 12.30 | 2.833 | .000 |
| 12.40 | 2.069 | .000 | * | 12.50 | 2.302 | .000 |
| 12.60 | 1.701 | .000 | * | 12.70 | 1.646 | .000 |
| 12.80 | 1.599 | .000 | * | 12.90 | 1.530 | .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 | 1.043 | .000 | * | 13.70 | 1.015 | .000 |
| 13.80 | .997 | .000 | * | 13.90 | .970 | .000 |
| 14.00 | .946 | .000 | * | 14.10 | .790 | .000 |
| 14.20 | .761 | .000 | * | 14.30 | .720 | .000 |
| 14.40 | .692 | .000 | * | 14.50 | .662 | .000 |
| 14.60 | .637 | .000 | * | 14.70 | .615 | .000 |
| 14.80 | .607 | .000 | * | 14.90 | .599 | .000 |
| 15.00 | .592 | .000 | * | 15.10 | .586 | .000 |
| 15.20 | .581 | .000 | * | 15.30 | .576 | .000 |
| 15.40 | .575 | .000 | * | 15.50 | .572 | .000 |
| 15.60 | .570 | .000 | * | 15.70 | .567 | .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 | .374 | .000 |
| 16.60 | .377 | .000 | * | 16.70 | .373 | .000 |
| 16.80 | .371 | .000 | * | 16.90 | .368 | .000 |
| 17.00 | .365 | .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 | .264 | .000 |
| 20.20 | .260 | .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 |
| [illegible] | [illegible] | [illegible] | * | [illegible] | [illegible] | [illegible] |

| | | | | | | |
|---|---|---|---|---|---|---|
| 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 | ISP | NCSTR |
|---|---|---|---|---|---|
| 3 | [illegible] | 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 DIAMETER | = | 18.00 | INCHES |
| RISER DIAMETER | = | 24.00 | INCHES |
| LENGTH OF PIPE | = | 92.00 | FEET |
| VERTICAL HEAD DROP | = | 10.00 | FEET |

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

| STAGE (FT) | AREA (ACRES) | AVERAGE DEPTH (FT) | DISCHARGE (CFS) | CAPACITY (ACRES-FT) |
|---|---|---|---|---|
| .00 | .083 | .00 | .00 | .00 |
| .50 | .096 | .49 | .00 | .04 |
| 1.00 | .096 | .97 | .00 | .09 |
| 1.50 | .103 | 1.44 | .00 | .14 |
| 2.00 | .117 | 2.35 | .00 | .25 |
| 2.50 | .133 | 3.22 | .00 | .37 |
| 3.00 | .149 | 4.06 | .00 | .52 |
| 3.50 | .166 | 4.87 | .00 | .67 |
| 4.00 | .175 | 5.27 | 6.85 | .76 |
| 4.50 | .183 | 5.66 | 15.13 | .85 |
| 5.00 | .192 | 6.04 | 18.53 | .94 |
| 5.50 | .201 | 6.42 | 20.99 | 1.04 |

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

| | | | |
|---|---|---|---|
| TURBULENCE FACTOR | = | 1.00 | |
| PERMANENT POOL CAPACITY | = | .173 | 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) | = | .912 | ACRE-FT |
| POND VOLUME AT PEAK STAGE | = | .766 | ACRE-FT |
| PEAK STAGE | = | [illegible] | FT |
| PEAK INFLOW RATE | = | .437 | CFS |
| PEAK DISCHARGE RATE | = | 7.[illegible]42 | CFS |
| PEAK INFLOW SEDIMENT CONCENTRATION | = | .00 | MG/L |
| PEAK EFFLUENT SEDIMENT CONCENTRATION | = | .00 | MG/L |
| PEAK EFFLUENT SETTLEABLE CONCENTRATION | = | .000 | ML/L |
| PEAK EFFLUENT SETTLEABLE CONCENTRATION | = | .00 | ML/L |
| STORM AVERAGE EFFLUENT CONCENTRATION | = | .00 | MG/L |
| AVERAGE EFFLUENT SEDIMENT CONCENTRATION | = | .00 | MG/L |
| BASIN TRAP EFFICIENCY | =********** | | PERCENT |
| [illegible] | = | [illegible] | [illegible] |

| | | | |
|---|---|---|---|
| DETENTION TIME FROM HYDROGRAPH SERIES | = | [illegible] | HRS |
| DETENTION TIME INCLUDING STORED FLOW | = | .15 | HRS |
| SEDIMENT LOAD DISCHARGED | = | .00 | TONS |
| PERIOD OF SIGNIFICANT CONCENTRATION | = | -26.00 | HRS |
| VOLUME WEIGHTED AVERAGE SETTLEABLE CONCENTRATION DURING PERIOD OF SIGNIFICANT CONCENTRATION | = | .00 | ML/L |
| VOLUME WEIGHTED AVERAGE SETTLEABLE CONCENTRATION DURING PEAK 24 HOUR PERIOD | = | [illegible] | ML/L |
| ARITHMETIC AVERAGE SETTLEABLE CONCENTRATION DURING PERIOD OF SIGNIFICANT CONCENTRATION | = | [illegible] | ML/L |
| ARITHMETIC AVERAGE SETTLEABLE CONCENTRATION DURING PEAK 24 HOUR PERIOD | = | [illegible] | ML/L |

*** PARTICLE SIZE DISTRIBUTION OF SEDIMENT ***

| | | | | | | |
|---|---|---|---|---|---|---|
| SIZE,MM | [illegible] | [illegible] | [illegible] | [illegible] | [illegible] | [illegible] |
| PERCENT FINER | [illegible] | [illegible] | [illegible] | [illegible] | [illegible] | [illegible] |
| SIZE,MM | [illegible] | | | | | |
| PERCENT FINER | [illegible] | | | | | |

*** 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) |
|---|---|---|---|---|---|---|
| [illegible] | [illegible] | [illegible] | * | [illegible] | [illegible] | [illegible] |
| [illegible] | [illegible] | [illegible] | * | [illegible] | [illegible] | [illegible] |
| [illegible] | [illegible] | [illegible] | * | [illegible] | [illegible] | [illegible] |
| [illegible] | [illegible] | [illegible] | * | [illegible] | [illegible] | [illegible] |
| [illegible] | [illegible] | [illegible] | * | [illegible] | [illegible] | [illegible] |
| [illegible] | [illegible] | [illegible] | * | [illegible] | [illegible] | [illegible] |
| [illegible] | [illegible] | [illegible] | * | [illegible] | [illegible] | [illegible] |
| [illegible] | [illegible] | [illegible] | * | [illegible] | [illegible] | [illegible] |
| [illegible] | [illegible] | [illegible] | * | [illegible] | [illegible] | [illegible] |
| [illegible] | [illegible] | [illegible] | * | [illegible] | [illegible] | [illegible] |
| [illegible] | [illegible] | [illegible] | * | [illegible] | [illegible] | [illegible] |
| [illegible] | [illegible] | [illegible] | * | [illegible] | [illegible] | [illegible] |
| [illegible] | [illegible] | [illegible] | * | [illegible] | [illegible] | [illegible] |
| [illegible] | [illegible] | [illegible] | * | [illegible] | [illegible] | [illegible] |
| [illegible] | [illegible] | [illegible] | * | [illegible] | [illegible] | [illegible] |
| [illegible] | [illegible] | [illegible] | * | [illegible] | [illegible] | [illegible] |
| [illegible] | [illegible] | [illegible] | * | [illegible] | [illegible] | [illegible] |
| [illegible] | [illegible] | [illegible] | * | [illegible] | [illegible] | [illegible] |
| [illegible] | [illegible] | [illegible] | * | [illegible] | [illegible] | [illegible] |
| [illegible] | [illegible] | [illegible] | * | [illegible] | [illegible] | [illegible] |
| [illegible] | [illegible] | [illegible] | * | [illegible] | [illegible] | [illegible] |
| [illegible] | [illegible] | [illegible] | * | [illegible] | [illegible] | [illegible] |
| [illegible] | [illegible] | [illegible] | * | [illegible] | [illegible] | [illegible] |
| [illegible] | [illegible] | [illegible] | * | [illegible] | [illegible] | [illegible] |
| [illegible] | [illegible] | [illegible] | * | [illegible] | [illegible] | [illegible] |
| [illegible] | [illegible] | [illegible] | * | [illegible] | [illegible] | [illegible] |
| [illegible] | [illegible] | [illegible] | * | [illegible] | [illegible] | [illegible] |
| [illegible] | [illegible] | [illegible] | * | [illegible] | [illegible] | [illegible] |
| [illegible] | [illegible] | [illegible] | * | [illegible] | [illegible] | [illegible] |
| [illegible] | [illegible] | [illegible] | * | [illegible] | [illegible] | [illegible] |
| [illegible] | [illegible] | [illegible] | * | [illegible] | [illegible] | [illegible] |
| [illegible] | [illegible] | [illegible] | * | [illegible] | [illegible] | [illegible] |
| [illegible] | [illegible] | [illegible] | * | [illegible] | [illegible] | [illegible] |
| [illegible] | [illegible] | [illegible] | * | [illegible] | [illegible] | [illegible] |
| [illegible] | [illegible] | [illegible] | * | [illegible] | [illegible] | [illegible] |
| [illegible] | [illegible] | [illegible] | * | [illegible] | [illegible] | [illegible] |
| [illegible] | [illegible] | [illegible] | * | [illegible] | [illegible] | [illegible] |
| [illegible] | [illegible] | [illegible] | * | [illegible] | [illegible] | [illegible] |
| [illegible] | [illegible] | [illegible] | * | [illegible] | [illegible] | [illegible] |
| [illegible] | [illegible] | [illegible] | * | [illegible] | [illegible] | [illegible] |
| [illegible] | [illegible] | [illegible] | * | [illegible] | [illegible] | [illegible] |
| [illegible] | [illegible] | [illegible] | * | [illegible] | [illegible] | [illegible] |
| [illegible] | [illegible] | [illegible] | * | [illegible] | [illegible] | [illegible] |
| [illegible] | [illegible] | [illegible] | * | [illegible] | [illegible] | [illegible] |
| [illegible] | [illegible] | [illegible] | * | [illegible] | [illegible] | [illegible] |
| [illegible] | [illegible] | [illegible] | * | [illegible] | [illegible] | [illegible] |
| [illegible] | [illegible] | [illegible] | * | [illegible] | [illegible] | [illegible] |
| [illegible] | [illegible] | [illegible] | * | [illegible] | [illegible] | [illegible] |
| [illegible] | [illegible] | [illegible] | * | [illegible] | [illegible] | [illegible] |
| [illegible] | [illegible] | [illegible] | * | [illegible] | [illegible] | [illegible] |
| [illegible] | [illegible] | [illegible] | * | [illegible] | [illegible] | [illegible] |
| [illegible] | [illegible] | [illegible] | * | [illegible] | [illegible] | [illegible] |
| [illegible] | [illegible] | [illegible] | * | [illegible] | [illegible] | [illegible] |
| [illegible] | [illegible] | [illegible] | * | [illegible] | [illegible] | [illegible] |
| [illegible] | [illegible] | [illegible] | * | [illegible] | [illegible] | [illegible] |
| [illegible] | [illegible] | [illegible] | * | [illegible] | [illegible] | [illegible] |
| [illegible] | [illegible] | [illegible] | * | [illegible] | [illegible] | [illegible] |
| [illegible] | [illegible] | [illegible] | * | [illegible] | [illegible] | [illegible] |
| [illegible] | [illegible] | [illegible] | * | [illegible] | [illegible] | [illegible] |
| [illegible] | [illegible] | [illegible] | * | [illegible] | [illegible] | [illegible] |
| [illegible] | [illegible] | [illegible] | * | [illegible] | [illegible] | [illegible] |
| [illegible] | [illegible] | [illegible] | * | [illegible] | [illegible] | [illegible] |
| [illegible] | [illegible] | [illegible] | * | [illegible] | [illegible] | [illegible] |
| [illegible] | [illegible] | [illegible] | * | [illegible] | [illegible] | [illegible] |
| [illegible] | [illegible] | [illegible] | * | [illegible] | [illegible] | [illegible] |
| [illegible] | [illegible] | [illegible] | * | [illegible] | [illegible] | [illegible] |
| [illegible] | [illegible] | [illegible] | * | [illegible] | [illegible] | [illegible] |
| [illegible] | [illegible] | [illegible] | * | [illegible] | [illegible] | [illegible] |

| | | | | | | |
|---|---|---|---|---|---|---|
| [illegible] | [illegible] | [illegible] | * | [illegible] | [illegible] | [illegible] |
| 8.20 | .051 | .000 | * | 8.30 | .055 | .000 |
| 8.40 | .059 | .000 | * | 8.50 | .061 | [illegible] |
| 8.60 | .065 | .000 | * | 8.70 | .069 | .000 |
| 8.80 | .072 | .000 | * | 8.90 | .075 | [illegible] |
| 9.00 | .077 | .000 | * | 9.10 | .083 | .000 |
| 9.20 | .090 | .000 | * | 9.30 | .094 | [illegible] |
| 9.40 | .098 | .000 | * | 9.50 | .1.1 | .000 |
| 9.60 | .107 | .000 | * | 9.70 | .115 | [illegible] |
| 9.80 | .121 | .000 | * | 9.90 | .125 | .000 |
| 10.00 | .126 | .000 | * | 10.10 | .141 | [illegible] |
| 10.20 | .159 | .000 | * | 10.30 | .170 | .000 |
| 10.40 | .177 | .000 | * | 10.50 | .183 | [illegible] |
| 10.60 | .205 | .000 | * | 10.70 | .236 | .000 |
| 10.80 | .255 | .000 | * | 10.90 | .267 | [illegible] |
| 11.00 | .277 | .000 | * | 11.10 | .320 | .000 |
| 11.20 | .405 | .000 | * | 11.30 | .454 | [illegible] |
| 11.40 | .409 | .000 | * | 11.50 | .517 | .000 |
| 11.60 | 1.646 | .000 | * | 11.70 | 3.381 | [illegible] |
| 11.80 | 4.537 | .000 | * | 11.90 | 5.047 | .000 |
| 12.00 | 7.042 | [illegible] | * | 12.10 | [illegible] | [illegible] |
| 12.20 | 4.614 | .000 | * | 12.30 | 2.707 | .000 |
| 12.40 | 3.289 | .000 | * | 12.50 | 2.123 | [illegible] |
| 12.60 | 2.522 | .000 | * | 12.70 | 2.000 | .000 |
| 12.80 | 1.880 | .000 | * | 12.90 | 1.719 | [illegible] |
| 13.00 | 1.630 | .000 | * | 13.10 | 1.519 | .000 |
| 13.20 | 1.400 | .000 | * | 13.30 | 1.320 | [illegible] |
| 13.40 | 1.279 | .000 | * | 13.50 | 1.143 | .000 |
| 13.60 | 1.103 | .000 | * | 13.70 | 1.139 | [illegible] |
| 13.80 | 1.000 | .000 | * | 13.90 | 1.022 | .000 |
| 14.00 | .939 | .000 | * | 14.10 | .923 | [illegible] |
| 14.20 | .852 | .000 | * | 14.30 | .797 | .000 |
| 14.40 | .753 | .000 | * | 14.50 | .715 | [illegible] |
| 14.60 | .662 | .000 | * | 14.70 | .655 | .000 |
| 14.80 | .634 | .000 | * | 14.90 | .618 | [illegible] |
| 15.00 | .607 | .000 | * | 15.10 | .590 | .000 |
| 15.20 | .591 | .000 | * | 15.30 | .585 | [illegible] |
| 15.40 | .580 | .000 | * | 15.50 | .577 | .000 |
| 15.60 | .574 | .000 | * | 15.70 | .571 | [illegible] |
| 15.80 | .569 | .000 | * | 15.90 | .566 | .000 |
| 16.00 | .567 | .000 | * | 16.10 | .532 | [illegible] |
| 16.20 | .479 | .000 | * | 16.30 | .446 | .000 |
| 16.40 | .423 | .000 | * | 16.50 | .406 | [illegible] |
| 16.60 | .393 | .000 | * | 16.70 | .384 | .000 |
| 16.80 | .376 | .000 | * | 16.90 | .373 | [illegible] |
| 17.00 | .370 | .000 | * | 17.10 | .367 | .000 |
| 17.20 | .365 | .000 | * | 17.30 | .363 | [illegible] |
| 17.40 | .361 | .000 | * | 17.50 | .359 | .000 |
| 17.60 | .357 | .000 | * | 17.70 | .356 | [illegible] |
| 17.80 | .354 | .000 | * | 17.90 | .353 | .000 |
| 18.00 | .352 | .000 | * | 18.10 | .351 | [illegible] |
| 18.20 | .350 | .000 | * | 18.30 | .349 | .000 |
| 18.40 | .349 | .000 | * | 18.50 | .349 | [illegible] |
| 18.60 | .348 | .000 | * | 18.70 | .348 | .000 |
| 18.80 | .348 | .000 | * | 18.90 | .348 | [illegible] |
| 19.00 | .349 | .000 | * | 19.10 | .349 | [illegible] |
| 19.20 | .349 | .000 | * | 19.30 | .350 | [illegible] |
| 19.40 | .350 | .000 | * | 19.50 | .351 | [illegible] |
| 19.60 | .351 | .000 | * | 19.70 | .351 | [illegible] |
| 19.80 | .352 | .000 | * | 19.90 | .352 | [illegible] |
| [illegible] | .352 | .000 | * | [illegible] | .353 | [illegible] |
| 20.20 | .300 | .000 | * | 20.30 | .261 | .000 |
| 20.40 | .266 | .000 | * | 20.50 | .279 | [illegible] |
| 20.60 | .265 | .000 | * | 20.70 | .260 | .000 |
| 20.80 | .257 | [illegible] | * | 20.90 | .253 | [illegible] |
| [illegible] | [illegible] | [illegible] | * | [illegible] | [illegible] | [illegible] |

| | | | | | | |
|---|---|---|---|---|---|---|
| [illegible] | [illegible] | [illegible] | | [illegible] | [illegible] | [illegible] |
| 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 | .200 | .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 ****