APPENDIX 7-10

Sedimentation Pond Calculations
(As-Built)

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

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

4/9/92

AS-BUILT REVIEW OF SEDIMENTATION POND
– CRANDALL CANYON MINE –

DESIGN VOLUME

Pond Area (at riser overflow) → A = 0.17 ac
Disturbed Area Drainage
Paved Roadway (planimetered area) → A = 1.1 ac
Nonpaved areas (see DD-10 calcs) → A = 1.35 ac – No longer accurate?
Reclaimed Area (DD-10 plus pond inslope) → A = 2.15 ac
Undisturbed Area (see DD-10 calcs) → A = 5.74 ac

10-YR, 24-hr storm event → 2.5 in.

Curve Numbers (see initial PAP)
Pond Area CN = 100
Disturbed Area
Paved Roadway CN = 95
Nonpaved Areas CN = 90
Reclaimed Area CN = 75
Undisturbed Area CN = 69

RUNOFF STORAGE VOLUME (MINIMUM REQUIRED)

Pond Area	Q = 2.5 in	=	0.04 AF
Disturbed Area			
Paved Roadway	Q = 1.97 in	=	0.18 AF
Nonpaved Areas	Q = 1.53 in	=	0.17 AF
Reclaimed Area	Q = 0.65 in	=	0.12 AF
Undisturbed Area	Q = 0.42 in	=	0.20 AF
Total Runoff Volume Required		=	0.71 AF

Total storage capacity (as-built) of sedimentation pond is 0.96 AF (Page 3 of this appendix). To accomodate surface runoff from the 10-YR, 24-hr storm event, 0.71 AF (see above calcs.) the max. sediment storage quantity that may accumulate in the sedimentation pond is 0.96 AF − 0.71 AF = 0.25 AF. The sediment storage elevation is thereby 7775.3 ft.

NOTE:
The sedimentation pond was originally designed to hold 0.67 AF of storm water (10-YR, 24-hr) and 0.28 AF of sediment. Paving of the roadway results in only an increase in runoff of 0.04 AF during the 10-YR/24 hr. storm event. By lowering the sediment clean-out level to 7775.3 ft. there is adequate room in the pond to contain the storm water. Original sediment yield were very liberal (0.1 AF/ac)

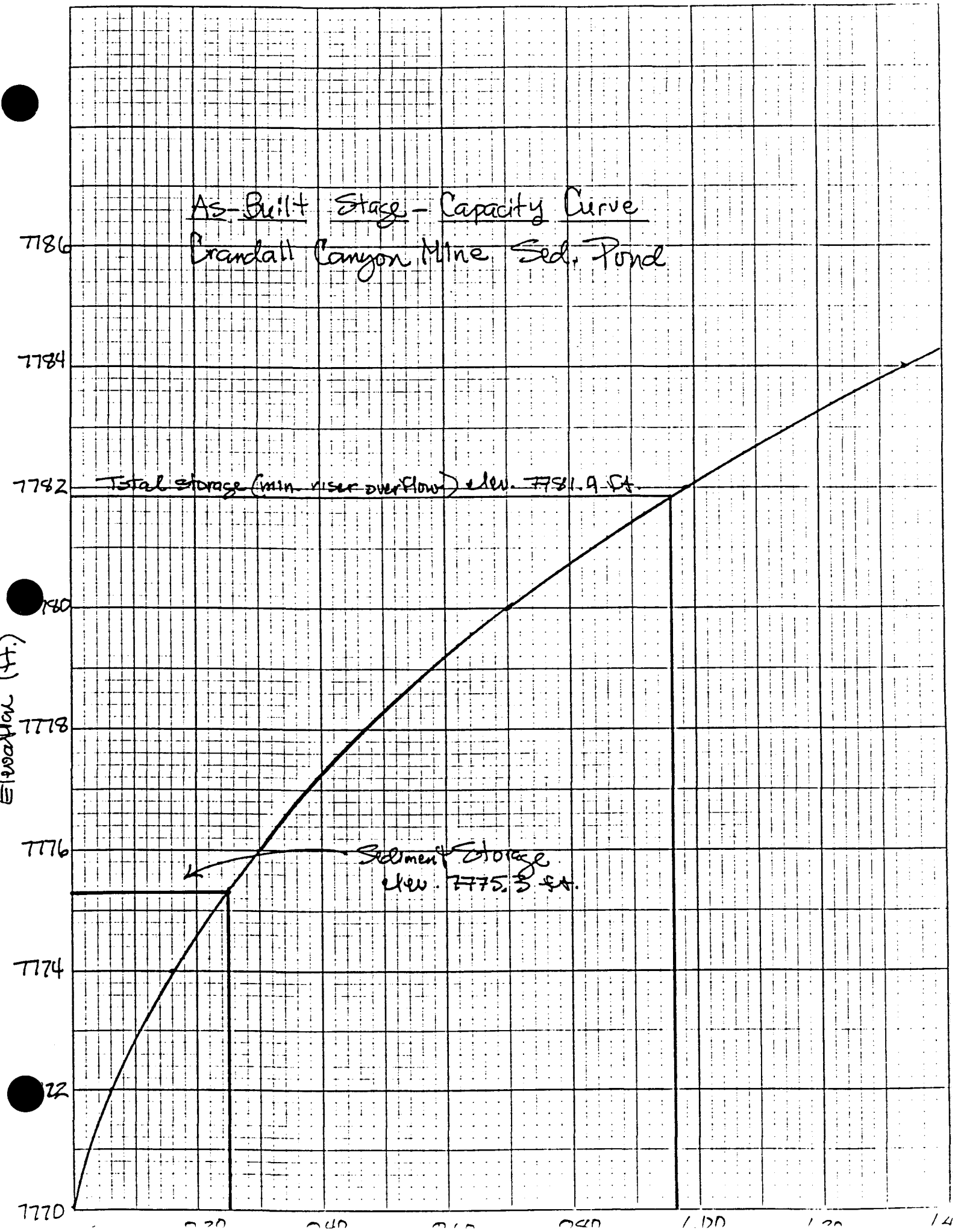
STAGE-AREA-CAPACITY DATA

Elevation (ft)	Area (ac)	Incremental Vol. (AF)	Cumulative Vol. (AF)
7770	0.025		
		0.065	0.065
7772	0.040		
		0.096	0.161
7774	0.056		
		0.134	0.295
7776	0.078		
		0.177	0.472
7778	0.099		
		0.226	0.698
7780	0.127		
		0.285	0.983
7782	0.158		
		0.357	1.340
7784	0.199		

stage-capacity curve - see page 3 of this calc.

As constructed → Riser overflow elev. = 7782.5 ft.
Min. required elev. = 7781.9 ft.

Decant overflow elev. = 7776.9 ft.
Min. required elev. = 7775.3 ft.


As-Built Stage - Capacity Curve
Crandall Canyon Mine Sed. Pond
7786
7784
7782
7780
7778
7776
7774
7770
Total Storage (min. riser overflow) elev. 7781.9 ft.
Sediment Storage
elev. 7775.3 ft.
Elevation (ft.)
1,120

Spillway Sizing

Methodology → SEDIMOT II. Use input parameters used in initial PAP except as noted below.

Data for subwatershed 1 (disturbed):

$A = 2.62$ ac (pad + pond)

$$\overline{CN} = \frac{(2.45)(90) + (0.17)(100)}{2.62} = 91$$

T_c → use upland method (see pg. 5 of this calc.)

① 640 ft @ 5.6% slope (portal pad to truck turnaround)
$V = 4.7$ ft/s ("small upland gullies)

$$(T_c)_1 = \frac{640}{4.7} = 140 \text{ s}$$

② 670 ft @ 7.7% slope (DD-5 thru DD-10)
$V = 5.6$ ft/s ("small upland gullies)

$$(T_c)_2 = \frac{670}{5.7} = 120 \text{ s}$$

$T_c = (140 \text{ s} + 120 \text{ s}) = 260 \text{ s} = 0.07$ hr

Sed. yield calcs. → all input = Ø (to suppress sed. output)

Data for subwatershed 2 (undisturbed)

$A = 5.74$ ac

$\overline{CN} = 69$

$T_c = 0.17$ hr (see DD-10 calcs.)

Sed. yield calcs. → all input = Ø

Data for subwatershed 3 (reclaimed)

$A = 2.15$ ac

$\overline{CN} = 75$

$$T_c = \underset{(DD-3)}{0.04} + \underset{(inc.\ DD-5)}{0.02} + \underset{(inc.\ DD-6)}{0.01} + \underset{(inc.\ DD-10)}{0.01} = 0.08 \text{ hr}$$

Sed yield calcs. → all input = Ø

5/7

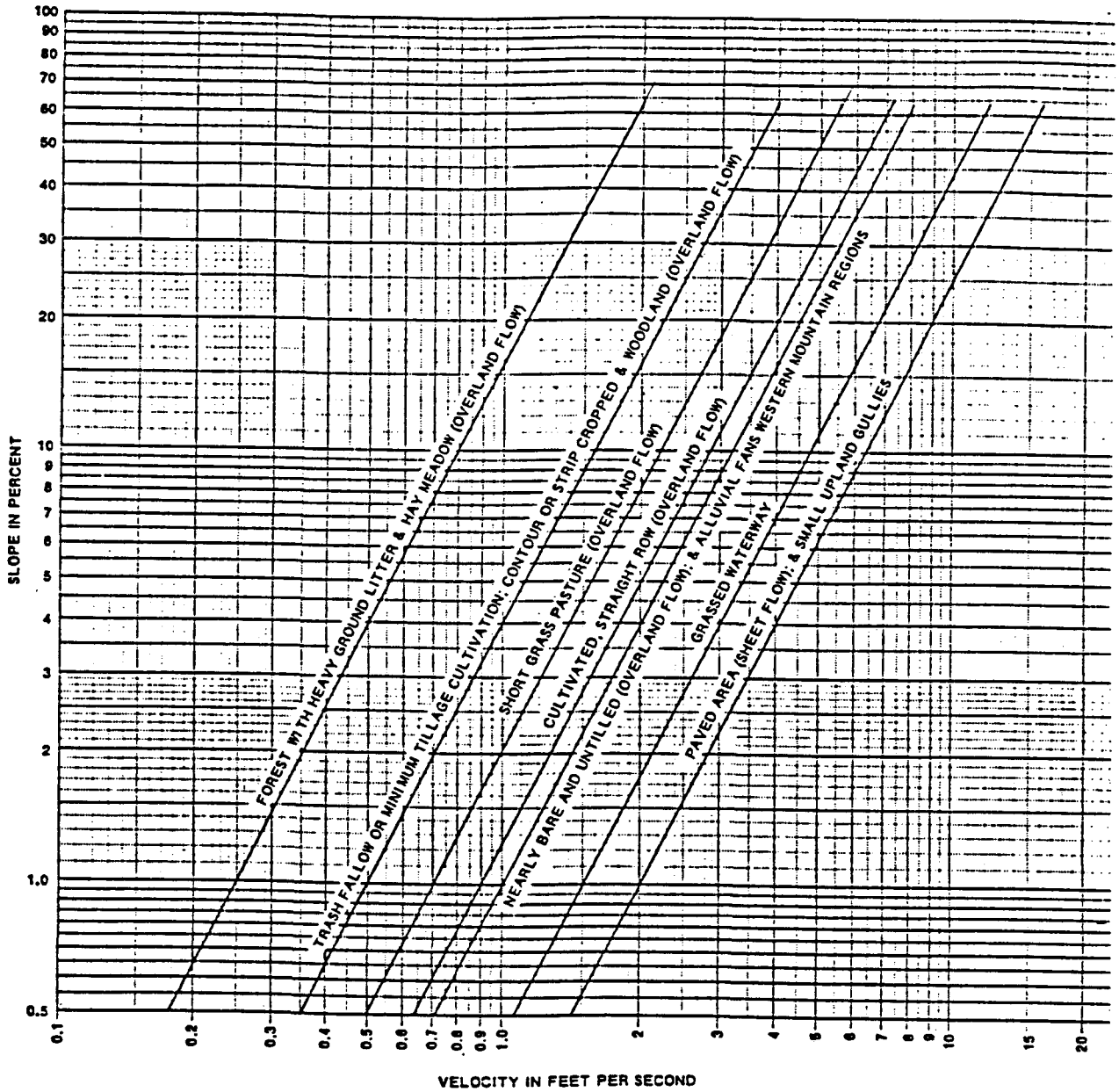


Figure 15.2.—Velocities for upland method of estimating T_c

Source: NEH-4

Stage-area data (see pg. 7 of this calc.) for pond full to decant level:

	Stage (ft)	Elev. (ft)	Area (ac)
	0.0	7776.9	0.086
	0.5	7777.4	0.092
	1.0	7777.9	0.098
	1.5	7778.4	0.104
	2.0	7778.9	0.110
	3.0	7779.9	0.125
	4.0	7780.9	0.140
Crest of principal spillway →	5.6	7782.5	0.167
	6.1	7783.0	0.179
	6.6	7783.5	0.188
	7.1	7784.0	0.199

11 values

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

Barrel diameter = 12 in
Riser diameter = 24 in
Barrel length = 92 ft

SEDIMOT II results (Attached) → Peak inflow rate = 8.72 cfs
Peak outflow rate = 6.90 cfs
Peak stage = 6.12 ft (above decant overflow)

Elev. of peak stage = 7776.9 ft + 6.1 ft = 7783.0 ft

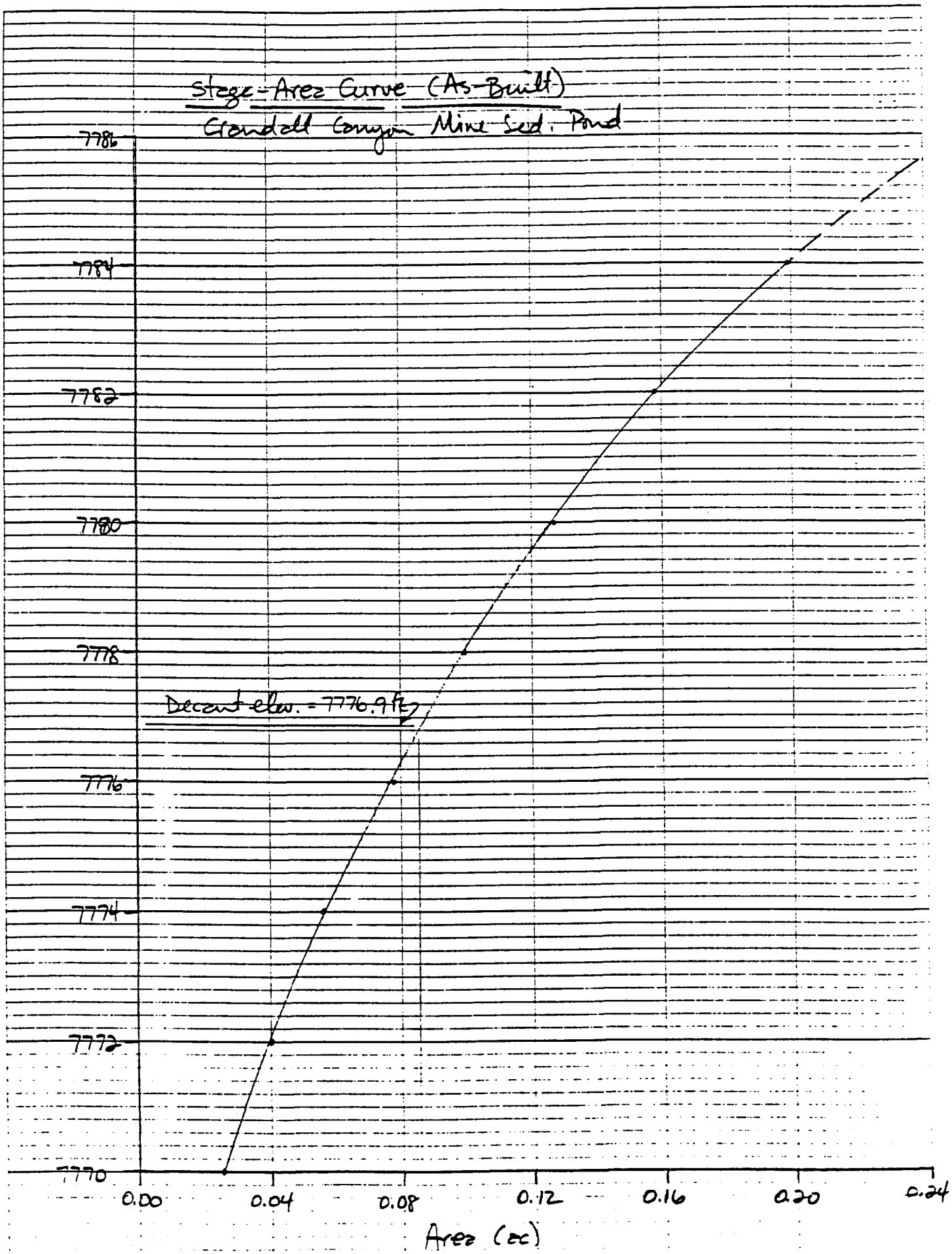
Emergency spillway not flowing at this stage (crest elev. = 7784.0 ft)

Thus, spillway is adequately sized and located.

$$\text{Required top width} = \frac{(7785-7770)+35}{5} = 10\text{ ft}$$

Actual top width = 10 ft ⇒ OK

Conclusion → Pond adequately constructed.



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*****************************************************************
                        -- 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 9-23-83
       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
                 -----------------------------
 AS-BUILT GENWAL SEDIMENTATION POND (12/30/86) - 25-YR 24-HR STORM
            ********************************************
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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

* *

*** HYDRAULIC INPUT VALUES FOR SUBWATERSHEDS ***

WATER SHED	AREA ACRES	CURVE NUMBER	TC HR	TT HR	ROUTING COEFFICIENTS K-HRS	X	UNIT HYDRO
1	2.62	91.00	.070	.000	.000	.00	.0
2	5.74	69.00	.170	.000	.000	.00	3.0
3	2.15	75.00	.080	.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

***** 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	.011	.000
6.20	.013	.000	*	6.30	.015	.000
6.40	.016	.000	*	6.50	.018	.000

[illegible]	[illegible]	[illegible]		[illegible]	[illegible]	[illegible]
6.80	.022	.000	*	6.90	.024	.000
7.00	.025	.000	*	7.10	.026	.000
7.20	.028	.000	*	7.30	.029	.000
7.40	.030	.000	*	7.50	.032	.000
7.60	.033	.000	*	7.70	.034	.000
7.80	.035	.000	*	7.90	.037	.000
8.00	.038	.000	*	8.10	.051	.000
8.20	.053	.000	*	8.30	.055	.000
8.40	.057	.000	*	8.50	.059	.000
8.60	.065	.000	*	8.70	.067	.000
8.80	.069	.000	*	8.90	.071	.000
9.00	.073	.000	*	9.10	.086	.000
9.20	.088	.000	*	9.30	.091	.000
9.40	.093	.000	*	9.50	.095	.000
9.60	.110	.000	*	9.70	.113	.000
9.80	.115	.000	*	9.90	.118	.000
10.00	.121	.000	*	10.10	.158	.000
10.20	.162	.000	*	10.30	.165	.000
10.40	.169	.000	*	10.50	.173	.000
10.60	.238	.000	*	10.70	.244	.000
10.80	.250	.000	*	10.90	.256	.000
11.00	.261	.000	*	11.10	.427	.000
11.20	.449	.000	*	11.30	.469	.000
11.40	.489	.000	*	11.50	.510	.000
11.60	4.641	.000	*	11.70	5.671	.000
11.80	6.704	.000	*	11.90	7.730	.000
12.00	8.717	.000	*	12.10	3.167	.000
12.20	2.896	.000	*	12.30	2.661	.000
12.40	2.499	.000	*	12.50	2.443	.000
12.60	1.724	.000	*	12.70	1.654	.000
12.80	1.599	.000	*	12.90	1.560	.000
13.00	1.537	.000	*	13.10	1.307	.000
13.20	1.266	.000	*	13.30	1.230	.000
13.40	1.198	.000	*	13.50	1.170	.000
13.60	1.013	.000	*	13.70	.970	.000
13.80	.929	.000	*	13.90	.892	.000
14.00	.859	.000	*	14.10	.698	.000
14.20	.660	.000	*	14.30	.634	.000
14.40	.616	.000	*	14.50	.602	.000
14.60	.593	.000	*	14.70	.586	.000
14.80	.580	.000	*	14.90	.575	.000
15.00	.571	.000	*	15.10	.568	.000
15.20	.565	.000	*	15.30	.563	.000
15.40	.561	.000	*	15.50	.560	.000
15.60	.559	.000	*	15.70	.559	.000
15.80	.559	.000	*	15.90	.559	.000
16.00	.559	.000	*	16.10	.422	.000
16.20	.404	.000	*	16.30	.389	.000
16.40	.379	.000	*	16.50	.373	.000
16.60	.370	.000	*	16.70	.367	.000
16.80	.364	.000	*	16.90	.361	.000
17.00	.359	.000	*	17.10	.356	.000
17.20	.354	.000	*	17.30	.352	.000
17.40	.351	.000	*	17.50	.349	.000
17.60	.348	.000	*	17.70	.347	.000
17.80	.346	.000	*	17.90	.346	.000
18.00	.345	.000	*	18.10	.345	.000
18.20	.345	.000	*	18.30	.345	.000
18.40	.346	.000	*	18.50	.346	.000
18.60	.347	.000	*	18.70	.347	.000
18.80	.347	.000	*	18.90	.348	.000
19.00	.348	.000	*	19.10	.348	.000
19.20	.349	.000	*	19.30	.349	.000
19.40	.350	.000	*	19.50	.350	.000
19.60	.350	.000	*	19.70	.351	.000

20.00	.352	.000	*	20.10	.281	.000
20.20	.271	.000	*	20.30	.264	.000
20.40	.258	.000	*	20.50	.255	.000
20.60	.253	.000	*	20.70	.251	.000
20.80	.249	.000	*	20.90	.248	.000
21.00	.246	.000	*	21.10	.245	.000
21.20	.244	.000	*	21.30	.243	.000
21.40	.242	.000	*	21.50	.241	.000
21.60	.240	.000	*	21.70	.240	.000
21.80	.239	.000	*	21.90	.239	.000
22.00	.239	.000	*	22.10	.238	.000
22.20	.238	.000	*	22.30	.239	.000
22.40	.239	.000	*	22.50	.239	.000
22.60	.239	.000	*	22.70	.239	.000
22.80	.239	.000	*	22.90	.239	.000
23.00	.240	.000	*	23.10	.240	.000
23.20	.240	.000	*	23.30	.240	.000
23.40	.240	.000	*	23.50	.240	.000
23.60	.241	.000	*	23.70	.241	.000
23.80	.241	.000	*	23.90	.106	.000
24.00	.106	.000	*	24.10	.097	.000
24.20	.076	.000	*	24.30	.060	.000
24.40	.048	.000	*	24.50	.040	.000
24.60	.036	.000	*	24.70	.032	.000
24.80	.028	.000	*	24.90	.024	.000
25.00	.021	.000	*	25.10	.018	.000
25.20	.015	.000	*	25.30	.012	.000
25.40	.010	.000	*	25.50	.008	.000
25.60	.006	.000	*	25.70	.004	.000
25.80	.003	.000	*	25.90	.002	.000
26.00	.001	.000	*	26.10	.000	.000

* *

POND RESULTS

* *

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

FLOW	FRACTN	ISDO	NRHP	NSP	NCSTR
3	0	2	300	11	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	=	12.00	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	.086	.00	.00	.00
.50	.092	.49	.00	.04
1.00	.098	.98	.00	.09
1.50	.104	1.45	.00	.14
2.00	.110	1.92	.00	.20
3.00	.125	2.81	.00	.31
4.00	.140	3.67	.00	.45
5.60	.167	4.97	.00	.69
6.10	.179	5.36	6.89	.78
6.60	.188	5.75	7.41	.87
7.10	.199	6.12	7.51	.97

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

TURBULENCE FACTOR	=	1.00	
PERMANENT POOL CAPACITY	=	.692	ACRE-FT
DEAD STORAGE	=	20.00	PERCENT
TIME INCREMENT OUTFLOW	=	.10	HRS
VISCOSITY	=	.009	CM**2/SEC
INFLOW RUNOFF VOLUME	=	.899	ACRE-FT
OUTFLOW ROUTED VOLUME	=	.899	ACRE-FT
STORM VOLUME DISCHARGED (PLUG FLOW)	=	.899	ACRE-FT
POND VOLUME AT PEAK STAGE	=	.781	ACRE-FT
PEAK STAGE	=	6.117	FT
PEAK INFLOW RATE	=	8.717	CFS
PEAK DISCHARGE RATE	=	6.904	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 FROM HYDROGRAPH CENTERS	=	.15	HRS
DETENTION TIME INCLUDING STORED FLOW	=	.15	HRS
SEDIMENT LOAD DISCHARGED	=	.00	TONS
PERIOD OF SIGNIFICANT CONCENTRATION	=	-26.50	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

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	.007	.000	*	6.30	.011	.000
6.40	.013	.000	*	6.50	.015	.000
6.60	.017	.000	*	6.70	.018	.000
6.80	.020	.000	*	6.90	.021	.000
7.00	.023	.000	*	7.10	.024	.000
7.20	.026	.000	*	7.30	.027	.000
7.40	.028	.000	*	7.50	.030	.000
7.60	.031	.000	*	7.70	.032	.000
7.80	.034	.000	*	7.90	.035	.000
8.00	.036	.000	*	8.10	.040	.000
8.20	.046	.000	*	8.30	.050	.000
8.40	.053	.000	*	8.50	.055	.000
8.60	.059	.000	*	8.70	.062	.000
8.80	.065	.000	*	8.90	.068	.000
9.00	.070	.000	*	9.10	.075	.000
9.20	.081	.000	*	9.30	.085	.000
9.40	.088	.000	*	9.50	.091	.000
9.60	.097	.000	*	9.70	.104	.000
9.80	.109	.000	*	9.90	.113	.000
10.00	.116	.000	*	10.10	.127	.000
10.20	.143	.000	*	10.30	.153	.000
10.40	.160	.000	*	10.50	.165	.000
10.60	.185	.000	*	10.70	.213	.000
10.80	.230	.000	*	10.90	.241	.000
11.00	.250	.000	*	11.10	.296	.000
11.20	.366	.000	*	11.30	.412	.000
11.40	.445	.000	*	11.50	.472	.000
11.60	1.513	.000	*	11.70	3.315	.000
11.80	4.736	.000	*	11.90	5.962	.000
12.00	6.904	.000	*	12.10	6.602	.000
12.20	4.834	.000	*	12.30	3.816	.000
12.40	3.203	.000	*	12.50	2.840	.000
12.60	2.465	.000	*	12.70	2.080	.000
12.80	1.855	.000	*	12.90	1.718	.000
13.00	1.634	.000	*	13.10	1.529	.000
13.20	1.409	.000	*	13.30	1.329	.000
13.40	1.272	.000	*	13.50	1.228	.000
13.60	1.160	.000	*	13.70	1.076	.000
13.80	1.013	.000	*	13.90	.962	.000
14.00	.919	.000	*	14.10	.849	.000
14.20	.765	.000	*	14.30	.706	.000
14.40	.666	.000	*	14.50	.638	.000
14.60	.618	.000	*	14.70	.604	.000
14.80	.593	.000	*	14.90	.585	.000
15.00	.579	.000	*	15.10	.574	.000
15.20	.570	.000	*	15.30	.567	.000
15.40	.564	.000	*	15.50	.562	.000
15.60	.561	.000	*	15.70	.560	.000
15.80	.559	.000	*	15.90	.559	.000
16.00	.559	.000	*	16.10	.525	.000
16.20	.469	.000	*	16.30	.433	.000
16.40	.409	.000	*	16.50	.393	.000
16.60	.382	.000	*	16.70	.375	.000
16.80	.370	.000	*	16.90	.366	.000

[illegible]	[illegible]	[illegible]	*	[illegible]	[illegible]	[illegible]
17.20	.358	.000	*	17.30	.355	.000
17.40	.353	.000	*	17.50	.352	.000
17.60	.350	.000	*	17.70	.349	.000
17.80	.348	.000	*	17.90	.347	.000
18.00	.346	.000	*	18.10	.345	.000
18.20	.345	.000	*	18.30	.345	.000
18.40	.345	.000	*	18.50	.346	.000
18.60	.346	.000	*	18.70	.346	.000
18.80	.347	.000	*	18.90	.347	.000
19.00	.347	.000	*	19.10	.348	.000
19.20	.348	.000	*	19.30	.348	.000
19.40	.349	.000	*	19.50	.349	.000
19.60	.350	.000	*	19.70	.350	.000
19.80	.350	.000	*	19.90	.351	.000
20.00	.351	.000	*	20.10	.334	.000
20.20	.305	.000	*	20.30	.287	.000
20.40	.274	.000	*	20.50	.265	.000
20.60	.259	.000	*	20.70	.256	.000
20.80	.253	.000	*	20.90	.251	.000
21.00	.249	.000	*	21.10	.247	.000
21.20	.246	.000	*	21.30	.245	.000
21.40	.243	.000	*	21.50	.242	.000
21.60	.241	.000	*	21.70	.241	.000
21.80	.240	.000	*	21.90	.239	.000
22.00	.239	.000	*	22.10	.239	.000
22.20	.238	.000	*	22.30	.238	.000
22.40	.238	.000	*	22.50	.239	.000
22.60	.239	.000	*	22.70	.239	.000
22.80	.239	.000	*	22.90	.239	.000
23.00	.239	.000	*	23.10	.239	.000
23.20	.240	.000	*	23.30	.240	.000
23.40	.240	.000	*	23.50	.240	.000
23.60	.240	.000	*	23.70	.240	.000
23.80	.240	.000	*	23.90	.207	.000
24.00	.157	.000	*	24.10	.130	.000
24.20	.108	.000	*	24.30	.088	.000
24.40	.071	.000	*	24.50	.058	.000
24.60	.048	.000	*	24.70	.041	.000
24.80	.035	.000	*	24.90	.031	.000
25.00	.027	.000	*	25.10	.023	.000
25.20	.020	.000	*	25.30	.017	.000
25.40	.014	.000	*	25.50	.011	.000
25.60	.009	.000	*	25.70	.007	.000
25.80	.005	.000	*	25.90	.004	.000
26.00	.003	.000	*	26.10	.002	.000
26.20	.001	.000	*	26.30	.001	.000

*** RUN COMPLETED ****

APPENDIX 7-10

April 26, 1988

EarthFax

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

Mr. James Leatherwood
Utah Division of Oil, Gas and Mining
355 West North Temple
3 Triad Center
Suite 350
Salt Lake City, Utah 84180-1203

Subject: Initial Certification of the Crandall Canyon Mine Sedimentation Pond

Dear Mr. Leatherwood:

During construction of the Crandall Canyon Mine sedimentation pond, I personally examined construction progress. In December 1986, subsequent to completion of construction, I prepared an analysis of the as-built characteristics of the sedimentation pond and compared the results of this analysis with the applicable regulatory requirements. The results of this analysis indicated that the pond was constructed in accordance with the applicable regulations of the Division. This as-built analysis was submitted to the Division by Genwal in January 1987 and subsequently re-submitted with the revised Mining and Reclamation Plan (MRP) in February 1988 (as Appendix 7-10 of that MRP).

Based on my examinations and reviews, I provide the following information and initial certification concerning the Crandall Canyon Mine sedimentation pond. This initial certification is submitted in accordance with Section 817.49(h) of the Coal Mining and Reclamation Permanent Program Regulations as promulgated by the Utah Board of Oil, Gas and Mining.

Monitoring Procedures and Instrumentation

The dam and pond will be inspected quarterly using the form provided in Figure 7-19 of the MRP. These inspections will include an examination of the embankment, abutments and foundation, spillway, pond basin, and outlet. Particular attention will be paid to identifying and quantifying seepage, slumps, and sinkholes. Any repairs required as a result of these inspections will be made immediately.

A piezometer has been installed in the dam at the location noted on Plate 7-4a of the MRP. Water level measurements will be collected from this piezometer on a monthly basis during operation of the pond. In addition, water-level measurements will be collected on a weekly basis for a period of one month immediately following full-scale cleanout of the sedimentation pond. If the post-cleaning water levels show no significant variation (as determined in

consultation with the Division) during the first month following cleanout, monitoring will return to a monthly schedule. If significant water-level changes occur in the piezometer during the first month following cleanout or if there is other evidence that the embankment is rapidly saturating, Genwal will contact the Division within a 15-day period of the water-level changes and mutually agree upon additional monitoring and remedial-action requirements.

Design Depth and Elevation of Impounded Waters

The design depth of water in the as-built sedimentation pond when filled to the top of the principal spillway is 12.5 feet (an elevation of 7782.5 feet above msl). During outflow of the spillway design event (runoff resulting from the 25-year, 24-hour precipitation event), the depth of water in the as-built pond is 13.0 feet (an elevation of 7783.0 feet above msl). These elevations are noted on Plate 7-4a of the MRP.

Existing Storage Capacity of the Dam

The as-built storage capacity of the dam at the elevation of the top of the principal spillway is 1.06 acre-feet. During outflow of the design event, the storage capacity of the dam is 1.14 acre-feet (compare Plate 7-4a and page 3 of 7 of Appendix 7-10 of the MRP).

Fires in Construction Material

No materials were used during construction of the dam or sedimentation pond that had previously been subjected to fire.

Dam Stability

No other aspects of the dam were noted that were not accounted for in the stability analysis presented in Appendix 7-6 of the MRP that would adversely affect the stability of the dam.

I hereby certify that the information contained in this report was prepared by myself and is true and correct to the best of my knowledge.

Sincerely,

Richard B. White

Richard B. White, P.E.
Principal Hydrologist

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

cc: Andy King