0021

(FILE 007/007)
CC: SK WAYNE

KAISER STEEL

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17 August 1982

Ms. Sally Kefer
DIV. OF OIL, GAS & MINING
4241 State Office Bldg
Salt Lake City, Utah, 84114

re: Manshaft Mine Water & Sed Ponds
Sunnyside Mines
ACT/007/007

Dear Sally,

Submitted herewith are the corrected calculations & plans of the Manshaft ponds, and in response to your letter of 8-4-82.

Previously, mine water form 001 was discharged directly to Grassy Trail Creek, but that ended in Apr '79. However, mine activity has now increased in the area, necessitating reactivation of this point source, which we propose to pass thru a separate discharge pond. It is the intent to convert the existing sed. pond for this purpose, because of its proximity to the point of delivery, and to construct a new sediment pond a short distance to the north. The mine water will be piped directly to the discharge pond, which pond will be isolated from all surface runoff.

The surface runoff will be collected in ditches, pipes, and waterways and delivered to the sediment pond. This pond will have an overflow-decant pipe that will discharge into the mine water pond. Also the spillway flows to the mine water pond, which will serve as a flow-thru system from the sed. pond.

To confine the disturbance to a minimum, only one outflow and one spillway overflow will discharge directly into Grassy Trail Creek, which will be from the mine water pond. The same water quality standards apply to both ponds, so one sample location will suffice, being on the downstream side of the mine water pond.

The sediment collected in the ponds shall be removed when the capacity reaches 60% of the design depth. The settled material shall be used around the manshaft site to cover, fill & stabilize the disturbed area and then to be reseeded in the late fall planting.

If there are any further questions, don't hesitate to call.

Sincerely,

John S. Huefner

John S. Huefner, PE
Civil Engineer

Enclosures

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CALCULATION SHEET

MANSHAFT SED. POND:

Use SCS Method re: TP-149 "Method for Est. Vol. & Rate of Runoff in Sml. Watersheds".

SURFACE DRAINAGE AREA- $\boxed{30.93 \text{ acres}}$ by Planimeter on 1"=500' scale map.

Area in sq. Miles = $30.93 \times 43{,}560/5280^2 = \underline{0.0483 \text{ mi}^2}$

TOTAL PRECIP. (P_{24}) = $\boxed{1.9"}$ for 10yr/24hr STORM (from NOAA area charts).

DETERMINE CN: use fig. 9.5 NEH-4 w/factors → assm'd Ground Cover @ 40% GCD
- C-B soil from PSH/CIC soil type (zillion)
- Veg: MTB – Herbaceous.

so CN = 78 (AMC-II) CONVERT to AMC-I (table 10.1, NEH-4) ∴ $\underline{CN = 60}$ (AMC-I)

SOLVE $S = \frac{1000}{CN} - 10 = \frac{1000}{60} - 10 = 6.67$ (chk re: table 10.1, NEH-4)

CALCULATE Q (SCS) = $\frac{(P-.2S)^2}{P+.8S} = \frac{(1.9-.2\times6.67)^2}{1.9+.8\times6.67} = \boxed{0.0443"}$ VOL = $Q/12 \times A = \frac{.0443}{12} \times 30.93 = \underline{0.114 \text{ af}}$

AVG. SLOPE: 7800E(h) − 7220E(l) = 580' elev. diff. & Length = 1200' ∴ $\underline{\text{SLOPE}} = \frac{580}{1200} = \underline{.483}$ (48.3%)

SOLUTION – TP-149:

STEP (1.) det. HYDRAULIC LENGTH (l) = $209(a)^{.6} = 209(30.93)^{.6} = \underline{1638'}$

STEP (2.) det. WATERSHED LAG (L) = $\frac{l^{.8}(S+1)^{.7}}{1900\,Y^{.5}}$ where is avg. slope.

$\underline{L} = (1638)^{.8}(6.67+1)^{.7}/1900(.483)^{.5} = \underline{1.175}$ hrs. ($\times 60$ min/hr = 70½ min)

SHAPE FACTOR (l/w) where $l = 43{,}560\,a/w$ or $w = 43{,}560(30.93)/1638 = 822.5$

∴ $l/w = 1638/822.5 = 1.99$ say 2.0 WATERSHED SHAPE FACTOR.

STEP (3.) det. DURATION INCREMENT (ΔD) = $0.4L = .4(1.175) = \underline{0.47 \text{ hrs}}$.

STEP (4.) det. EFF. PEAK RUNOFF PERIOD ($7\Delta D$) = $7\Delta D = 7(.47) = \underline{3.29 \text{ hrs}}$.

STEP (5.) tab. Typ. RUNOFF DISTRIBUTION in table 1 [P_{24}=1.9"; CN=60; Q=.0443]
SEE STEP 9. (incorporated in TABLE).

STEP (6.) det. WORKING CURVE — $P_B = 11.88 - 4.5(\overset{\Delta D}{.47}) = 9.76$ hrs & $P_E = 11.88 + 7(\overset{\Delta D}{.47}) = 15.17$ hrs.

STEP (7.) det. INSTANT PEAK DISCHARGE —

Peak Rate of Discharge (q_p) = KAQ/T_p where A = area; Q = runoff; K = constant; T_p = time to peak.

$T_p = D/2 + L = 24/2 + 1.175 = 13.18$ hrs.

so $q_p = 484(30.93).0443/13.18 = \underline{50.34 \text{ cfs}}$. FOR SPILLWAY

$$\Delta q_p = \frac{484\,A\,\Delta Q}{\frac{\Delta D}{2} + L} = \frac{484(.0483)\Delta Q}{\frac{.47}{2} + 1.175} = \frac{233772}{1.41}\Delta Q = \underline{16.58\,\Delta Q}$$

STEP (8.) PLOT WORKING CURVE OR USE EQUATION: mass Q = $\frac{(\text{mass } P - .2S)^2}{\text{mass } P + .8S}$

where $S = \frac{1000}{CN} - 10 = 3.158$ (AMC-II)

(OPTED TO USE EQ SO SEE TABLE in STEP 9)

COL 1. 7 DIV. → ΔD.
" 2. time in step 6 div. in 7 increments.
" 3. P_x/P_{24} from fig 1 using case II.
" 4. mass P from col 3 × 1.9.
" 5 solve mass Q EQ. (see above).
" 6. diff between Col 5 Values.
" 7. Δq from ΔQ × 16.58 (see step 7)
" 9. result from Col 7 × Col 8.

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STEP (9.) construct TABLE:

① INCREMENT	② TIME	③ P_x/P_{24} ×19	④ mass P	⑤ mass Q	⑥ ΔQ ×16.58	⑦ Δq	× ⑧ Y	= ⑨ Y(Δq)
	9.76	.143	.272	—				
ΔD_1	10.53	.210	.399	.0001	.0001	.002	.2	—
ΔD_2	11.31	.262	.498	.0059	.0058	.096	.4	.039
ΔD_3	12.08	.675	1.282	.1111	.1052	1.744	.6	1.047
ΔD_4	12.85	.763	1.450	.1684	.0573	.950	.8	.760
ΔD_5	13.62	.805	1.530	.1990	.0306	.507	1.0	.507
ΔD_6	14.40	.834	1.585	.2211	.0221	.367	.67	.246
ΔD_7	15.17	.860	1.634	.2415	.0204	.339	.33	.112

TOTAL 2.71 cfs.

$\therefore \boxed{q_p = 2.71 \text{ cfs}}$

EST. SED. PRODUCTION (USLE): A = R K LS C P (refer TR-51) —

R (Rainfall Factor) = 18 from fig 1 (MT-0-23697) EPA-908/4-77-005 Publ [adj. to div. ln]

K (Soil Erodibility Factor) = .20 wt'd avg from appendix A of EPA Publ.

LS (Slope Gradient Factor) = 68.5 from $\left(\frac{\lambda}{72.6}\right)^{.5}\left(\frac{430x^2+30x+.43}{6.57415}\right)$ where $\lambda = l$ & $x = \sin(\text{slope } \angle)$

so $LS = \left(\frac{1638}{72.6}\right)^{.5}\left(\frac{430(\sin 25.78)^2+30(\sin 25.78)+.43}{6.57415}\right) = 68.5$

C (Crop Factor) = .14 Est from Table 2 (TR-51)

P (Erosion Control Factor) = .90 Est. from ditches, contour, depressions, grade chg's.

$\therefore A = RKLSCP = 18(.20)68.5(.14).90 = 31.1$ Tons/ac/yr × 30.93 ac = 961 Tons/yr

& 961T × $\frac{2000\#/T}{120\#/CF}$ = 16,000 CF/YR

EXCESSIVE! *

MODIFIED UNIV. SOIL LOSS EQ (MUSLE)

$Y = 95(Q \times q_p)^{.56}$ K LS CP is SED YIELD PER STORM EVENT. (10 yr 24 hr).

$\therefore Y = 95(.0443 \times 2.71)^{.56} \times .20(68.5).14(.90) = \underline{50.0}$ Tons/event × $\frac{2000}{120}$ = 834 CF/STORM.

SPILLWAY DESIGN — SEE STEP (7.) for q_{peak} = 50.34 cfs

25 yr/24 hr STORM - P_{24} = 2.3" & SOLVE FOR $Q = \frac{(2.3-.2(3.16))^2}{2.3+.8(3.16)}$ = 0.573" /12 × A = 1.485 ac-ft

= 44.9 CFM.

DETERMINE SED. POND SIZE:

RUNOFF "Q" = .0443" = .114 ac-ft = 4966 CF say 5000 CF

SED YIELD "Y" = 50 T/ev = 834 CF × 1.5 ev/yr × 3 yrs = 3753 CF say 4000 CF

TOTAL 9000 CF min. pond size

$\therefore$ MIN. POND DIM = 5'd × 36'w × 50'l = 9000 CF (OK)

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MANSHAFT MINE WATER POND-

EST. MAX. YIELD @ 600 GPM & MIN. (PRESENT) YIELD @ 450 GPM.
(GPM ÷ 7.48 gal/CF × 60 min/hr × 24 hr/day = CF/day).

@ FLOW RATE :	600 gpm	450 gpm
=	80.2 CFM	= 60.2 CFM
=	115,510 CF/day	= 86,630 CF/day.
SO. PRELIM. POND SIZE:	5'd × 120'w × 194'l	5'd × 100'w × 174'l

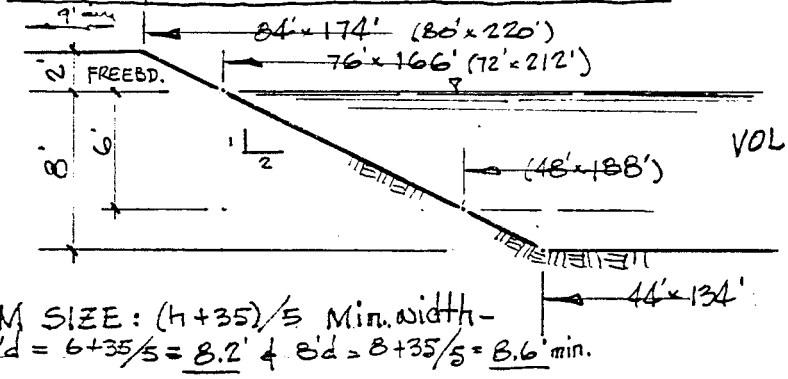
SIZE EXIST. SED. POND - 6'd × 60'w × 130'l = 46,800 CF → 13 hr ret @ 450 gpm
9 3/4 hrs ret @ 600 gpm

CONVERT TO MINE WTR DISCH. POND - Lengthen 20' & deepen 2':
8'd × 60'w × 150'l = 72,000 CF → 20 hrs ret @ 450 GPM
15 hrs ret @ 600 GPM OK.

∴ SIZE OF PONDS @ MANSHAFT:
MINE WTR DISCH POND — 8'd × 60'w × 150'l = 72,000 CF
SEDIMENT POND — 5'd × 36'w × 50'l = 9,000 CF.

MINE WTR. DISCH. POND SECT.:

(VOL = (w × l) + (xh(w+l)) + $\frac{\pi}{3}x^2h$)



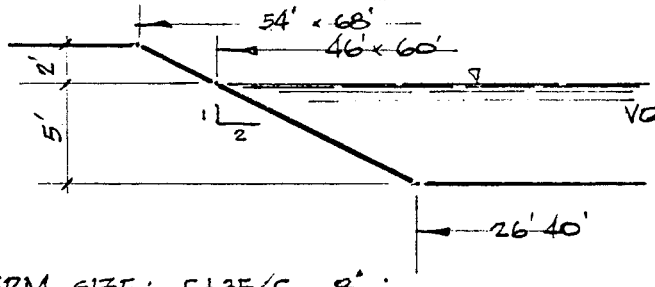
VOL: 6'd = 72,040 CF
8'd = 72,096 CF

BERM SIZE: (h+35)/5 Min. width -
6'd = 6+35/5 = 8.2' & 8'd = 8+35/5 = 8.6' min.

SPILLWAY:
CAP. 50.34 cfs (STP 7.) + 1.34 cfs (600 gpm)
= 52 cfs.
1'd × 16'w triangular ditch

OUTLET PIPE - 15"ϕ for 1870 gpm
15"ϕ @ 3 cfs (Vel 2.5 fps) & 12"ϕ (Vel 4.0 fps)

SEDIMENT POND SECT:



VOL = 9,024 CF

BERM SIZE: 5+35/5 = 8' min.

SPILLWAY:
CAP. 50.34 cfs (STP 7.)
1'd × 14'w triangular ditch

OUTLET PIPE - 15"ϕ for 1260 gpm
15"ϕ @ 2.8 cfs (Vel 2.3 fps) & 12"ϕ (Vel 3.8 fps).

RUNOFF VOL
Q = .0443" = .114 cfs = 4966 CF
Pond Vol. → (2.7'd × 35.2'w × 49.2'l) + (2.7'd × 84.4'l) + $\frac{\pi}{3}$(5.4)²2.7
= 4676 + 227.9 + 82.4 = 4986 CF OK

∴ SED. POND MUST BE 2.7' min. ABOVE MINE DISCH. POND.

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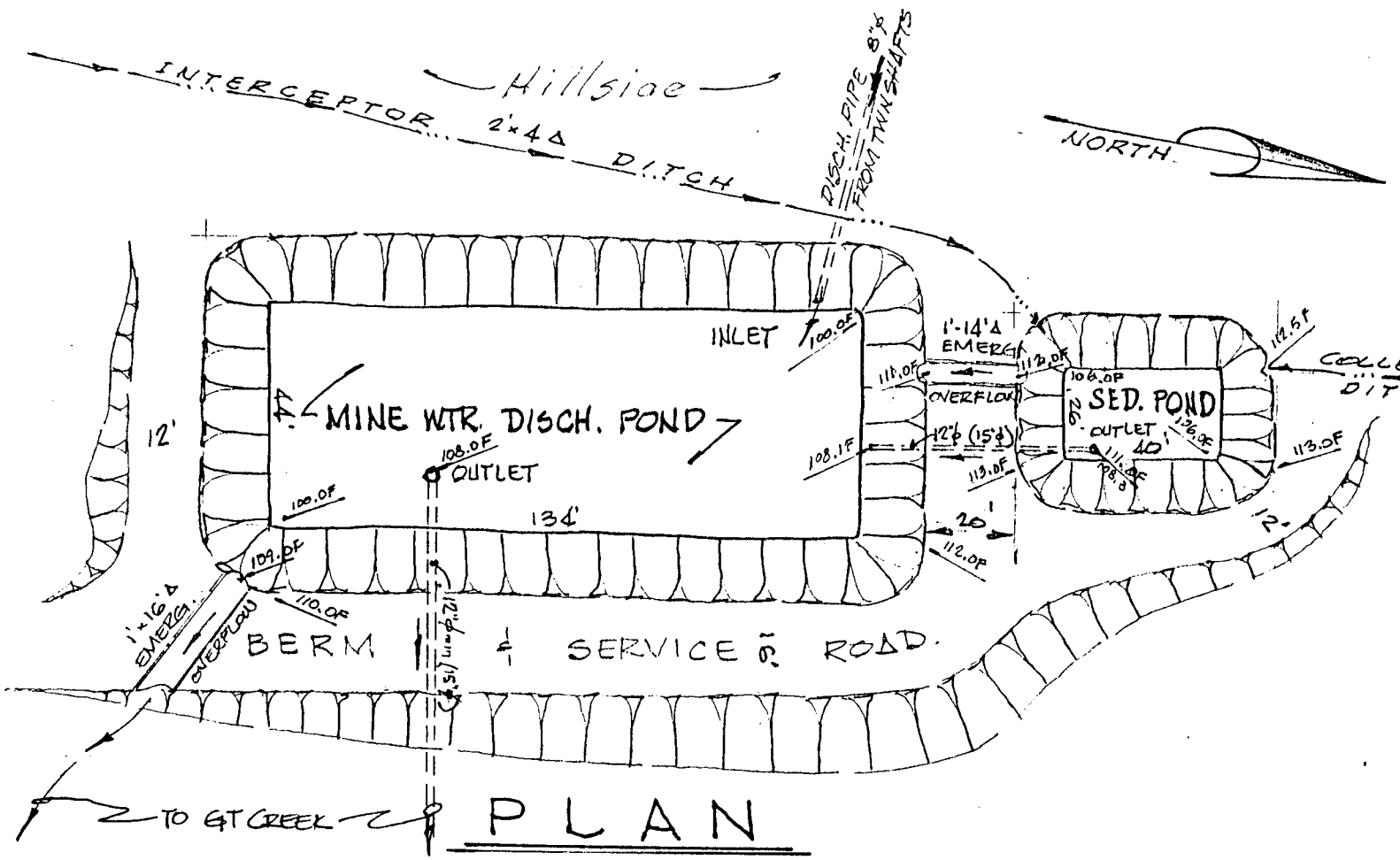
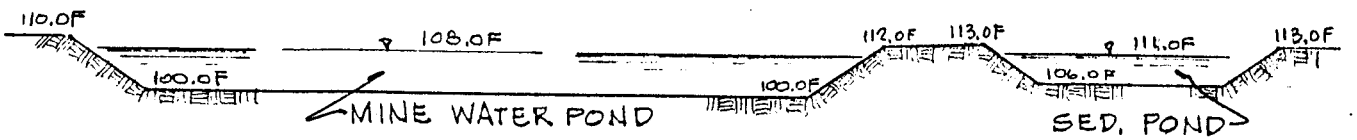


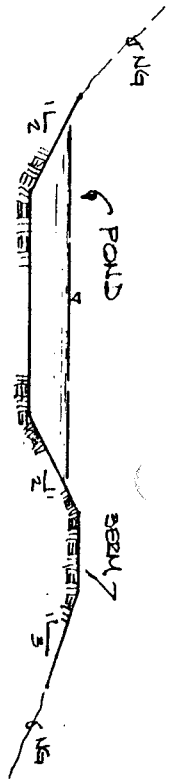
PLAN

ELEV.'s ASSM'D.



SECTION

SCALE: 1" = 40'



TYP. CROSS-SECTION

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SHT. 1
7-8-82
REV. 8-12-82

MANSHAFT MINE WATER & SED. PONDS