(FILE 007/007)
cc: SK, WAYNE, DAVID.

0017

KAISER STEEL

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1 September 1982

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

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

Dear Sally,

Please find attached the second revised calculations and plans for the Manshaft area ponds.

Hopefully these are correct and resolves the concerns.

We will appreciate you expediting the approval of these ponds since the mine water discharge pump is about ready to be installed.

Also I have sent a copy of these pond calculations to Mr. Steve McNeil of the Water Pollution Control Bureau.

Sincerely,

John S. Huefner

John S. Huefner, PE.
Civil Engineer

attachments

RECEIVED
SEP 07 1982
DIVISION OF
OIL, GAS & MINING

CALCULATION SHEET

SHT. 1
(8-12-82)
* rev. 8-27-82

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 = $30.93 \times 43{,}560/5280^2 = \underline{0.0483}\ mi^2$ (or $30.93/640 = .0483$)

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 = $9/12 \times \Delta = \frac{.0443}{12} \times 30.93 = \underline{0.114}$ af

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

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 Y is avg. slope.

$\underline{L} = (1638)^{.8}(6.67+1)^{.7}/1900(48.3)^{.5} = \underline{0.1175}$ hrs = t_L *

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(.1175) = $\underline{0.047}$ hrs.

STEP (4.) det. EFF. PEAK RUNOFF PERIOD ($7\Delta D$) = $7\Delta D$ = 7(.047) = $\underline{0.329}$ 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 — $P_B = 11.88 - 4.5(\overset{\Delta D}{.047}) = \underline{11.67}$ hrs & $P_E = 11.88 + 7(\overset{\Delta D}{.047}) = \underline{12.21}$ 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
$T_p = D/2 + L = 24/2 + .12 = 12.12$ hrs.
$T_c = T_L/.6 = .1175/.6 = .196$ hrs.
q_p from fig 5.2 SCS TR#55.

* so $q_p = \overset{q_p}{810}(.0483).0443 = \overset{(AMC-I)}{1.73}$ cfs.

$\Delta q_p = \frac{484\,A\,\Delta Q}{\frac{\Delta D}{2} + L} = \frac{484(.0483)\Delta Q}{\frac{.047}{2} + .1175} = \frac{23.372}{.141}\Delta Q = \underline{165.80}\,\Delta Q$

STEP (8.) PLOT WORKING CURVE OR USE EQUATION: mass Q = $\frac{(\text{mass } P - .2S)^2}{\text{mass } P + .8S}$
where mass P from fig 1/col 3 & S = 6.67 from CN of 60 (AMC-I)
AMC-II - CN 78 & S = 2.82 *

(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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MANSHAFT SED. POND

$$\text{mass } Q = \frac{(\text{mass } P - .2S_{II})^2}{\text{mass } P + .8S_I} = \frac{(\text{mass } P - .2CN)^2}{\text{mass } P + 2.256} \text{ (AMC-II)}$$

STEP (9.) construct TABLE:

① INCREMENT	② TIME	③ P_x/P_{24} ×1.9	④ mass P	⑤ mass Q	⑥ ΔQ ×165.8	⑦ Δq	× ⑧ Y	= ⑨ Y(Δq)
	11.67	.302	.574	.000				
ΔD_1	11.75	.397	.754	.012	.012	1.990	.2	.398
ΔD_2	11.82	.523	.994	.057	.045	7.461	.4	2.984
ΔD_3	11.90	.575	1.092	.083	.026	4.311	.6	2.586
ΔD_4	11.98	.650	1.235	.129	.046	7.627	.8	6.101
ΔD_5	12.06	.677	1.286	.147	.018	2.984	1.0	2.984
ΔD_6	12.13	.691	1.313	.157	.010	1.658	.67	1.111
ΔD_7	12.21	.706	1.341	.168	.011	1.824	.33	.602
							TOTAL	16.77 cfs

$\therefore q = 16.77$ cfs. (AMC-II)

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

R (Rainfall Factor) = 18 from fig 1 (M7-0-23697) EPA-908/4-77-0055 Publ. [adj. to div ln]
K (Soil Erodibility Factor) = .20 wtd avg from Appendix A of EPA Publ.
LS (Slope Grad. Factor) = 68.5 from $\left(\frac{\lambda}{72.6}\right)^{.5}\left(\frac{430x^2+30x+.43}{6.57415}\right)$ where $\lambda = l$ & $x = \sin(\text{slope } \gamma)$

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

C (Crop Factor) = .14 Est from Table 2 (TR-51).
P (Erosion Ctl Factor) = .90 Est. from ditches, contours, depressions, grade chgs, etc.

$\therefore A = RKLSCP = 18(.20)68.5(.14).90 = 31.1$ Tons/acre/yr × 30.93 ac = 961 Tons/yr
& 961T × $\frac{2000}{120}$ = 16,000 CF/YR
EXCESSIVE!

MODIFIED UNIV. SOIL LOSS EQ. (MUSLE)

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

$\therefore Y = 95(.0443 \times 16.77)^{.56} \times .20(68.5).14(.90) = 138.8$ Tons/event × $\frac{2000}{120}$ = 2315 CF/storm

DETERMINE SED. POND SIZE:

RUNOFF "Q" = .0443" = .114 ac-ft = 4966 CF say 5000 CF
SED YIELD "Y" = 138.8 T/ev = 2315 CF × 1.5 ev/yr × 3 yr = 10,410 CF
TOTAL 15,410 CF min. pond size

$\therefore$ MIN. POND SIZE = 5'd × 40'w × 78'l = 15,600 CF (OK)

SPILLWAY DESIGN – 25 yr/24 hr STORM – P = 2.3"

SOLVE for Q (AMC-II) = $\frac{(2.3 - .2 \times 2.82)^2}{2.3 + .8 \times 2.82}$ = .6615"

so $q_p = 810(.0483).6615 = 25.88$ CFS (AMC-II) say 26 cfs.

(refer to STEP 7.)

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CALC. SHT. (CONT.)

SHT 3
8-12-82

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 = 80.2 CFM = 115,510 CF/day
450 gpm = 60.2 CFM ≐ 86,630 CF/day.

SO, PRELIM. POND SIZE: 5'd × 120'w × 194'l
5'd × 100'w × 174'l

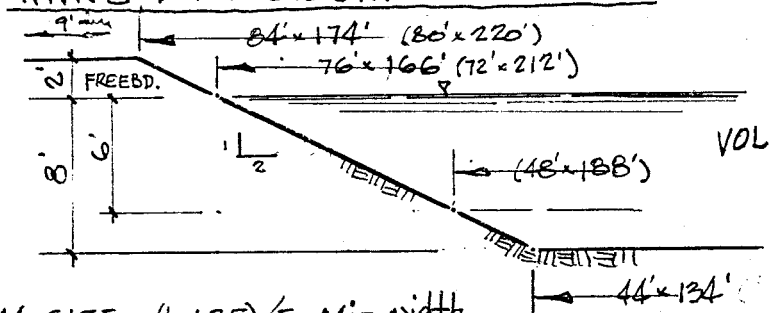
SIZE EXIST. SED. POND - 6'd × 60'w × 130'l = 46,800 CF → 13 hr ret @ 450 gpm
9 3/4 hr ret @ 600 GPM

CONVERT TO MINE WTR. DISCH. POND - Lengthen 20' & deepen 2':
8'd × 60'w × 150'l = 72,000 CF → 20 hr ret @ 450 GPM
15 hr 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 × 40'w × 78'l = 15,600 CF.

MINE WTR. DISCH. POND SECT.:

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



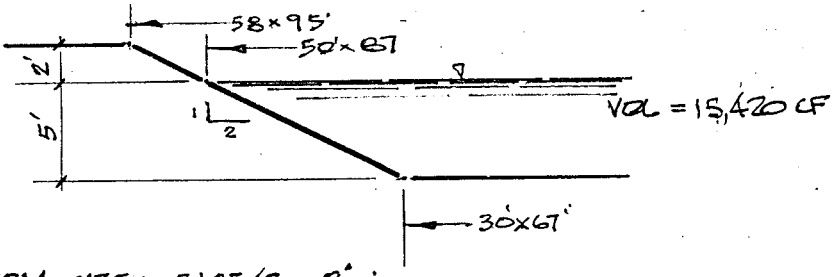
VOL: 6'd = 72,040 CF
8'd = 72,096 CF

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

SPILLWAY:
CAP. 25.9 cfs RUNOFF + 1.6 cfs Mine Wtr.
= 27.5 cfs
1'd × 10'w triangular ditch

OUTLET PIPE - 15"ϕ for 1820 gpm
15"ϕ @ 3 cfs (Vel 2.5 fps) & 12"ϕ (Vel 4.0 fps)

SEDIMENT POND SECT:



VOL = 15,420 CF

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

SPILLWAY:
CAP. 25.9 cfs say 26 cfs RUNOFF
1'd × 8'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 af = 4966 CF
Pond Vol. → (1.33'd × 44.67'w × 81.67'l) + (1.33'd × 2.67'w × 126.34'l) + $\frac{\pi}{3}$(2.67)^2 1.33
= 4852 + 168 + 10 = 5030 CF OK
SO OUTLET PIPE WILL BE SET VERTICAL @ ELEV. 110.00 F w/ 14" (1.33) SLOTTED END @ 108.67 F.

NOTE: SED. POND WTR SURFACE MUST BE 1.5' min. ABOVE MINE DISCH. POND, SO RUNOFF VOL. WILL FLOW TO MINE WATER POND.

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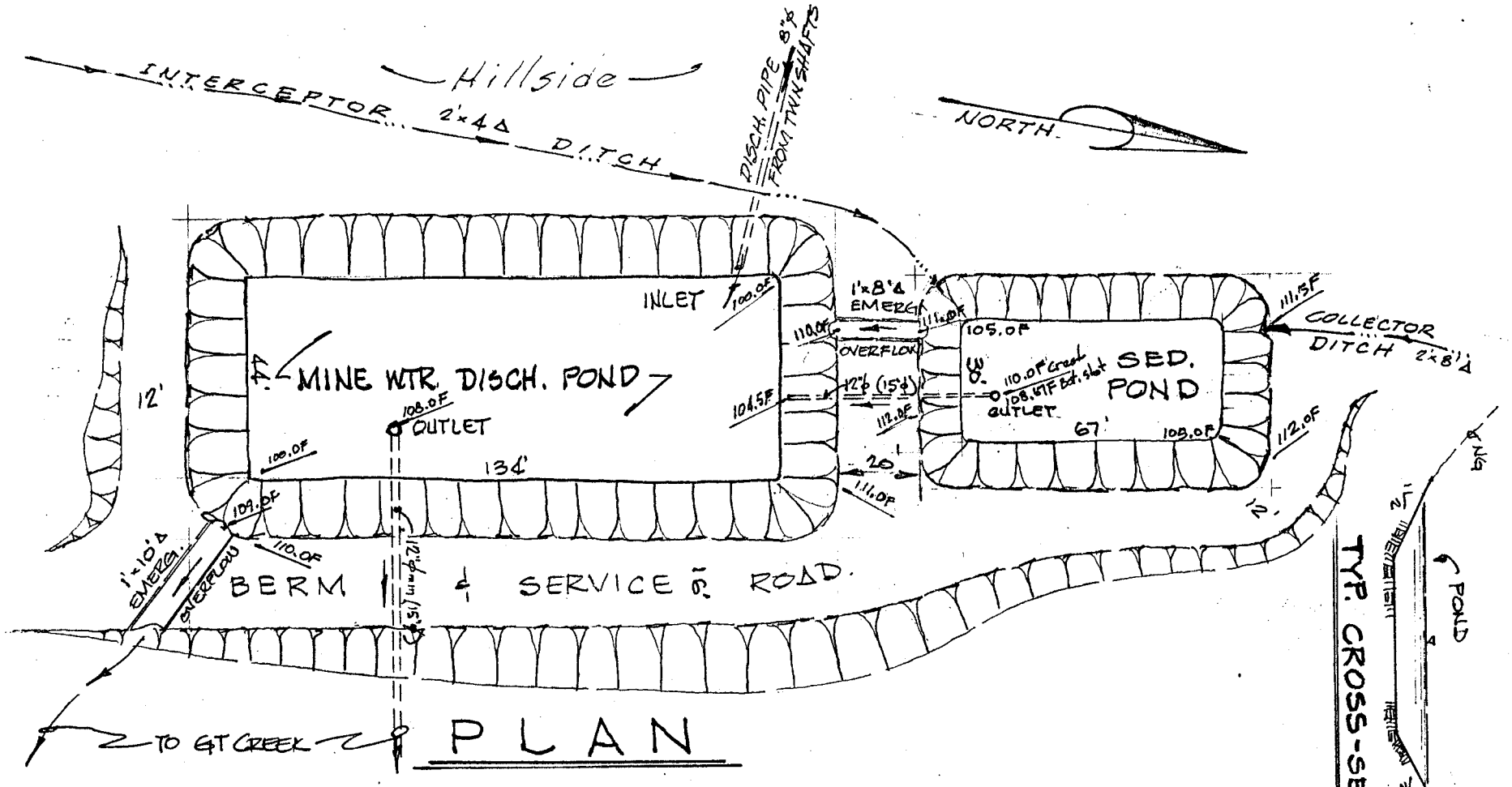
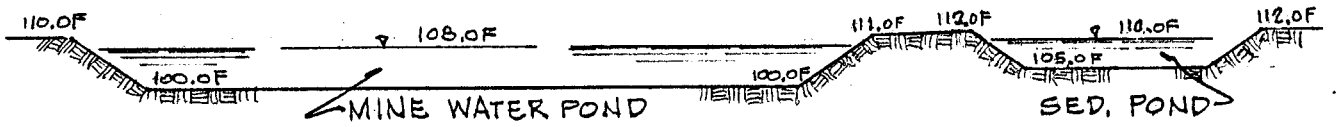
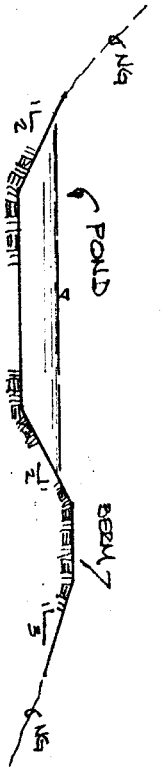


ELEV.'s ASSM'D.



SECTION

SCALE: 1" = 40'



TYP. CROSS-SECTION

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SHT. 4
7-8-82
rev1 8-12-82
rev2 8-30-82

MANSHAFT MINE WATER & SED. PONDS