0046

Engineering Department
Kaiser Steel Corporation
Sunnyside Mines

June 15, 1979

HYDROLOGIC MONITORING PLAN

The Grassy Trail Creek watershed contains 26,742 acres within Whitmore Canyon which overlies the major portion of Kaiser Steels Sunnyside mines. The soil groups are A & Q with rating of "C", and the vegetative types are sagebrush grass, pinion-juniper woodland and mountain brush. The area has a mean annual precipitation of 16". Kaiser Steel has an on-site USDC/NOAA weather station called SUNNYSIDE, which indicates the average of precipitation highs over the last five years of 0.50"/day ('74 - .40"/d; '75 - .50"/d; '76 - .47"/d; '77 - .54"/d; '78 - .57"/d) which was used as the ten year storm value in the runoff calculations.

In reference to the ground water and stream flow Kaiser has not had a measurement program in the past. The only water Kaiser has monitored is the mine water which supply meets the industrial needs of the plant. The mine water has been filed with the State Engineer's Office and proofed up on under Appl. #28812 (91-231). Attached is a typical chemical report analyzed by Ford Chemical Co. as to the mine water quality. The mine produces about 650 gpm of water. The location of the mine water discharge points and metering stations are shown on the attached map.

Kaiser Steel Corporation has an active program to stabilize disturbed areas through land shaping and reinforcing, including revegetation. All mine waters are being monitored as to quantity and quality with monitoring of surface waters to check any adverse influences.

Attached are the computation sheets in determining the size of the sedimentation ponds required from the main complex and the manshaft. There are some minor disturbed areas where the fans are located and these will be revegetated so no sedimentation ponds will be required at these sites.

KAISER STEEL CORPORATION
HYDROLOGICAL PLAN/MONITORING POINTS
WHITMORE CANYON AREA

MINE WATER

POINT	DESCRIPTION	ACTION
001	Twin Shaft discharge	No longer used (discon.)
002	Exhaust Shaft discharge to creek	Metered & tested semi-mo.
003	Main Portal discharge to creek	Metered & tested semi-mo.
004	Twin Tank discharge to slurry ditch	Tested semi-mo.
005	Water Canyon discharge (disappears)	Meter (little used)
CWP	Clear water pond discharge to alfalfa field	Tested monthly
UGM(1)	Main line below outside raise to tanks	Metered
UGM(3)	#1 Left #3 Mine to tanks	Metered

SURFACE WATER

UPR	On creek above Twin Shaft	Tested quarterly
LWR	On creek in East Carbon City	Tested quarterly
USGS	On creek near Sunnyside	Metered

JH
5-30-79

Ford Chemical
LABORATORY, INC.
Bacteriological and Chemical Analysis
40 WEST LOUISE AVENUE
SALT LAKE CITY, UTAH 84115
PHONE 485-5761

March 16, 1979

Kaiser Steel Corporation
Sunnyside, Utah 84539

CERTIFICATE OF ANALYSIS
79-1271

Attn: Barry Grossley

Gentlemen:

The following analysis is on sample of wastewater received on March 5, 1979.

Sample: Wastewater dated 2/28/79.

	Station 001	Station 002	Station 003
Bio-Chemical Oxygen Demand mg/l	3.7	5.7	5.9
Suspended Solids mg/l	10.0	4.0	11.0
Total Dissolved Solids mg/l	1,674	1,882	1,622
Iron as Fe mg/l	0.364	0.658	0.017
Arsenic as As mg/l	0.007	0.001	0.005
Selenium as Se mg/l	<0.001	<0.001	<0.001
Silver as Ag mg/l	<0.001	<0.001	<0.001
Oil & Grease mg/l	<1.0	<1.0	<1.0
pH Units	8.13	7.75	8.05
Alkalinity as CaC03 mg/l	436.0	804.0	432.0
Acidity as CaC03 mg/l	<1.0	16.0	<1.0
Total Coliform MPN/100 ml	79	79	33
Fecal Coliform MPN/100 ml	<2	<2	<2

Sincerely,

FORD CHEMICAL LABORATORY, INC.

Lyle S. Ford

DOGM / DRAINAGE STUDY

SEDIMENTATION POND

MAIN COMPLEX AREA

use of UNIV. SOIL LOSS EQ. (USLE) per SCS-TR-51 on undev. & bare land —

A=RKLSCP where: R(rainfall) = 20 (from fig. 1)

K(erod.) = .30 (from SCS soil sci/avg. 5 soils)

LS(slope-grad) = .65 (from ext'd fig. 2/2% slope & 6500'L)

C (cropping) = .20 (from table 2 per 30% grd cov w/no apprec. canopy cover)

P (erosion) = .60 (table on pg. 12)

∴ A = 20(.30).65(.20).60 = 0.468 TONS/ACRE/YEAR

USE AREA OF 121 acres × 0.468 T/ac/yr = 56.6 Tons/yr (use silt sp. gr @ 115 pcf)

Then SEDIMENT VOLUME = $56.6^{T/yr} \times \frac{2000\ \#/T}{115\ \#/cf}$ = 985 cf/yr yielding 0.023 af/yr.

Wrong

RUNOFF — $8.3^{cfs}_{upr} + 8.2^{cfs}_{lwr}$ = 16.5 cfs (see attach'd comp. shts)

PROVIDE 24 hr. RETENTION — 16.5×60×60×24/43,560 = 32.73 af REQ.

+ SED. VOL. of .023 af

MIN. VOL. OF SED. POND = 32.750 af

EXIST. POND AREA OF 5.8 acres ∴ DEPTH REQ = $\frac{32.75}{5.8}$ = 5.65' SAY 6'D.

Must provide 1' freeboard ∴ min depth req. is 7' & EXIST. POND HAS 16'.

Therefore EXIST. POND more than adequate.

REGISTERED PROFESSIONAL ENGINEER
No. 3250
JOHN S. HUEFNER
STATE OF UTAH

John S. Huefner

6-13-79

STORM DRAINAGE DESIGN

Time of Concentration
Computation Sheet

RATIONAL METHOD

Project DOGM

DRAINAGE STUDY

INITIAL AREA MAIN COMPLEX (upper area)

A (Acres) = 40.3 C = .87 (prkg lot) H_1 6800

CA = 35.1 R_1 = .50 H_2 6680

CAR_1 = 17.5 (cfs) L (') = 2000 H 120

$S = \frac{H}{L} \times 10^{-3} = .060$

$\frac{L}{W} = \frac{L^2}{43560A} = 2.28$

$\frac{L}{W} = 2.3$

$\frac{P}{L} = 2.25 \times 10^{-4}$

P = .45

F = 4.0 overland flow

e = 0.655

1/e = 1.525

$W = \frac{4.3560A}{L}$

$B = \sqrt{\frac{P}{L}} = \sqrt{\frac{.45}{2000}} = .015$

$Q = 15(CAR_1\ FB)^{1.075} S^{0.265}$

$(CAR_1\ FB)^{1.075} = (1.050)^{1.075} = 1.054$

$S^{0.265} = (.060)^{0.265} = .474$

$Q = (15)(1.054)(.474) = 7.5$ CFS

$i_c = \frac{Q}{CAR_1} = \frac{7.5}{17.5} = .43$ "/hr

$t_c = \frac{60(R_1)^2}{i_c^{1/e}} \cdot \frac{60(.5)^2}{(.43)^{1.525}} = \frac{(15)}{(.275)}$ 55 min.

From Graph: i = .25 "/hr

$Q = CAi = (.87 \times 40.3 \times .25) = 8.8$ CFS

REGISTERED PROFESSIONAL ENGINEER No. 3250 JOHN S. HUEFNER STATE OF UTAH

[signature]

6-12-79

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based on: GREGORY-ARNOLD METHOD (as used by SLG.)

STORM DRAINAGE DESIGN

Time of Concentration
Computation Sheet

RATIONAL METHOD

Project DOGM

DRAINAGE STUDY

INITIAL AREA MAIN COMPLEX (Lower area)

A (acres) = 121.0　　C = .30 (undev.)　　H_1 6680

CA = 36.3　　R_1 (*/hr) = .50　　H_2 6570

CAR_1 (cfs) = 18.15　　L (') = 6500　　H 110

$S = \frac{H}{L} \times 10^{-3} =$ .017

$\frac{L}{W} = \frac{L^2}{43560A} =$ 8.02

P = .54

$\frac{L}{W} =$ 8.0

F = 4.0 (overland flow.)

e = 0.655

$\frac{P}{L} =$ 8.3×10^{-5}

1/e = 1.525

$W = \frac{4.3560A}{L}$

$B = \sqrt{\frac{P}{L}} = \sqrt{\frac{.54}{6500}} =$ .009

$Q = 15(CAR_1\ FB)^{1.015}\ S^{0.043}$

$(CAR_1\ FB)^{1.015} = (.653)^{1.015} =$ 0.649

$S^{0.043} = (.017)^{0.043} =$ 0.839

Q = (15) (.649) (.839) = 8.2 cfs

$i_c = \frac{Q}{CAR_1} = \frac{8.2}{18.15} =$ .45 "/hr

$t_c = \frac{60(R_1)^2}{i_c^{1/e}}$ $\frac{60(.5)^2}{(.45)^{1.525}} = \frac{(15)}{(.296)}$ 51 min.

From Graph: i = .25 "/hr

Q = CAi = (.30 × 121 × .25) = 9.0 cfs

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[signature]

6-12-79

based on: GREGORY-ARNOLD METHOD. (as used by SLC.)

DOGM / DRAINAGE STUDY

SEDIMENTATION POND

MANSHAFT AREA

use of UNIV. SOIL LOSS EQ. (USLE) per SCS-TR.51 on disturbed & bare land –

A = RKLSCP where: R(rainfall) = 20 (from fig. 1)

K(erodability) = .30 (from SCS Soil Sci/avg. 5 soils)

LS (slope-grade) = 19 (from fig 2 w/50% slope & 110'L)

C (cropping) = .45 (from table 2 per 0% gnd cov w/no apprec. canopy)

P (erosion) = 1.0 (table on pg 12)

∴ A = 20(.30) 19(.45) 1.0 = 51.3 Tons/acre/year

USE AREA OF 3. acres × 51.3 T/ac/yr = 154 Tons/yr (use silt sp.gr. @ 115 pcf)

Then SEDIMENT VOLUME $= 154\ T/y \times \frac{2000\ \#/T}{115\ \#/CF} = 2680$ CF/yr yielding 0.06 af/yr

RUNOFF – 1.18 cfs (see attach comp sht)

PROVIDE 24 hr. RETENTION — 1.18 × 60 × 60 × 24 / 43,560 = 2.34 af REQ.

+ SED. VOL. of .06 af

MIN. VOL. OF SED. POND = 2.40 af.

SED. POND DIM:

① 6' Depth w/ 100' width & 175' length; yields 2.41 af + .45 af from pond slopes (@ 2:1 sd s) (OK)

② 7' " w/ 90' " & 166' " 2.40 af + .43 af " " " (@ 1.5:1 sd s) (OK)

USE ② ∴ DES. POND DIM – 90'w × 166'L × 8'h (incl. 1' freeboard). [see dwg.]

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6-14-79

STORM DRAINAGE DESIGN

Time of Concentration
Computation Sheet

RATIONAL METHOD

Project DOGM

DRAINAGE STUDY

INITIAL AREA MANSHAFT

A (Acres) = 3.2 C = .60 H_1 7354

CA = 1.92 R_1 (in/hr) = .50 H_2 7288

CAR_1 (cfs) = 0.96 L (') = 320 H 66

$S = \frac{H}{L} \times 10^{-3} =$ .206

$\frac{L}{W} = \frac{L^2}{43560A} =$ .735

P = .46

$\frac{L}{W} =$ 0.735

F = 4.0

e = 0.655

$\frac{P}{L} =$ .0014

1/e = 1.525

$W = \frac{43560A}{L}$

$B = \sqrt{\frac{P}{L}} = \sqrt{\frac{.46}{320}} =$ 0.038

$Q = 15(CAR_1 FB)^{1.143} S^{0.2143}$

$(CAR_1 FB)^{1.143} = (0.146)^{1.143}$
$=$ 0.111

$S^{0.2143} = (.206)^{0.2143} =$ 0.713

$Q = (15)(.111)(.713) =$ 1.18 CFS

$i_c = \frac{Q}{CAR_1} = \frac{1.18}{.96} =$ 1.23 in/hr

$t_c = \frac{60}{i_c^{1/e}} \quad \frac{60}{(1.23)^{1.525}} = \frac{60}{(1.37)}$ 44 min.

From Graph: i = .60 in/hr

$Q = CAi = (.6 \times 3.2 \times .6) =$ 1.15 cfs

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6-8-79

based on: GREGORY-ARNOLD METHOD. (as used by SLCo.)