SECTION 1

SLOPE STABILITY EVALUATIONS AND ACCESS ROAD EMBANKMENTS

SEDIMENTATION PONDS

June 6, 1980

Coastal States Energy Company
411 West 7200 South
Suite 200
Midvale, UT 84047

Attention: Mr. Roland Heath

Gentlemen:

Consultation
Slope Stability Evaluations and Access
Road Embankments
Proposed Sedimentation Ponds
Skyline Coal Project
Near Scofield, Utah
For Coastal States Energy Company

This letter is written in response to a telephone conversation between Mr. Roland Heath of Coastal States Energy Company and Mr. Bill Gordon of Dames & Moore on June 6, 1980 during which Mr. Heath requested that Dames & Moore provide comment and supporting documentation regarding slope geometry proposed for the subject sedimentation pond and access road embankments.

The sedimentation pond is proposed near the coal storage and railroad facilities of the Skyline Mine Coal Project. Present design concepts are those shown on Drawing No. 3-201-C, dated March 6, 1980, as prepared by Kaiser Engineers of Oakland, California. Proposed geometry of the pond consists of a maximum upstream slope of 2.0 horizontal to 1.0 vertical with a minimum eight-foot crest width. Downstream slopes required at the eastern end of the proposed pond are proposed using slope ratios of 2.0 horizontal to 1.0 vertical. The remainder of the pond will be formed below existing and/or proposed final grade. Maximum embankment height forming the pond will be eight feet with the pond bottom being established at elevation 7915. Crest elevation will be elevation 7923.

Proposed pond construction is shown in section on Figure 1 of the attachments whereby the inner slopes of the pond and pond bottom will be formed by a three-foot-thick impervious liner placed on the constructed embankment section or on excavated slopes and bottom. Overlying the three-foot impervious liner will be a 12-inch coarse granular material. Maximum pond water levels are anticipated to be at elevation 7920 for a 10-year storm and elevation 7922 for a 100-year storm.

Slope stability analyses for the proposed pond configuration was performed for both upstream and downstream slopes considering both the end of construction and long-term stability utilizing chart solutions developed by Huang*. Analyses performed using these chart solutions in addition to all estimated soil properties and assumptions used for these analyses are stated on Figures 1 through 3.

Results of these analyses indicate that for the end-of-construction case, proposed geometry for upstream and downstream slopes utilizing 2.0 horizontal to 1.0 vertical slope ratios will provide factors of safety in excess of 2.0. Similarly, for the long-term stability case, minimum factors of safety on the order of 2.0 or greater can be demonstrated.

Although a majority of the proposed access road will be formed in cuts, there are portions that will require the construction of compacted earth embankments to provide desired grade. Proposed slope configurations for these access road embankments include utilizing slope ratios of 1.5 horizontal to 1.0 vertical. Maximum slope heights for these embankment fills are not anticipated to exceed 25 to 30 feet. Analyses performed to evaluate embankment stability of the proposed slopes indicate that a factor of safety equal to 1.8 can be provided utilizing the proposed slope configuration. Calculations and assumptions made in performing these analyses are shown on Figure 4.

oOo

*Huang, T.H., 1975, "Stability Charts of Earth Embankments," proceedings 54th Annual Meeting of the TRB, Washington, D.C., Jan., 1975.

We trust the information provided in this letter and in the accompanying calculations satisfies your immediate need to demonstrate the stability and adequate factors of safety provided by the present design concepts proposed for both the sedimentation pond and access road embankments. If you have any questions or if we can be of further service, please feel free to contact us.

Yours very truly,

DAMES & MOORE

William J. Gordon
Associate
Professional Engineer No. 3457
State of Utah

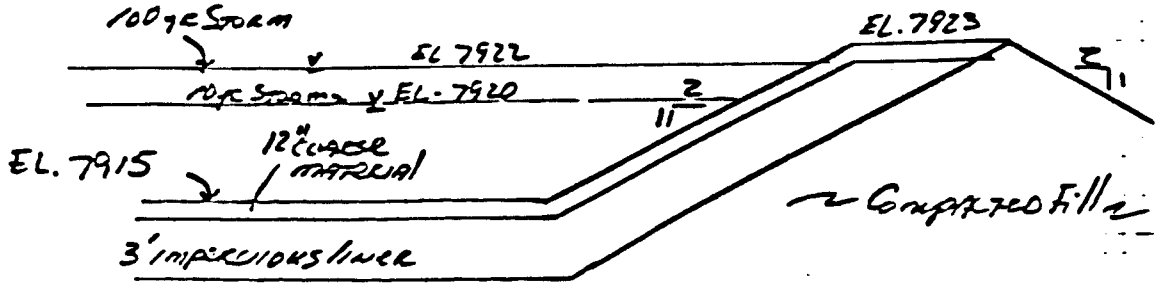
John F. Wallace
Project Engineer
Professional Engineer 5123
State of Utah

WJG/JFW/pc

Attachments: Figures 1 through 4

cc: Mr. Joe Hilton
c/o Morrison-Knudsen
2 Morrison-Knudsen Plaza
Post Office Box 7808
Boise, ID 83729

Slope Stability Evaluation of Sedimentation Ponds



Proposed Slope geometry ref Dwg: 3-201-C prepared by Kaiser Eng dated 3-6-80

Estimated Soil Properties

Impervious liner	Coarse Material	Compacted Fill	
$\gamma = 120$ pcf	$\gamma = 125$ pcf	$\gamma = 125$ pcf	
$S_u = 1000$ psf	$\phi = 45°$	$\phi = 40°$	$\phi = 35°$
$\bar{\phi} = 23°$	$\bar{c} = 0$	$\bar{c} = 100$ psf	$c = 250$ psf
$\bar{c} = 200$ psf			

Assumptions for estimating Soil Properties

1) Impervious Liner - moderately plastic soil compacted to 90% ASTM D-1557 max γ_{dry} min PI = 10

2) Coarse Material - random gravel cobble mixture - relatively clean -

3) Compacted fill - processed blast rock or available sand and gravel natural soils at site - compacted to 90% max γ_{dry} based on ASTM-D1557

DAMES & MOORE

figure 1

REVISIONS BY ____ DATE ____ TO EO ____ BY ____ DATE ____ TO EO ____

Analysis of upstream Slope

End of Construction Case

No water in Pond - shear strength of compacted clay liner governs stability - S_u = 1000 psf γ_t = 120 pcf

Maximum slope height = 8 ft

Based on Stability Charts developed by Huang (1975) Fig 1

For a minimum Stability Number N_s = 5.5 (2:1 slope) assuming infinite depth of clay soil D=10 and Y=1

an undrained shear strength S_u or c-cohesion equal to 175 psf is required for a F.S. = 1.0

Based on $N_s = \frac{\gamma H}{c}$ where N_s = 5.5, γ = 120 psf, H = 8', c = ?

$$c = \frac{120 \times 8}{5.5} \Rightarrow 174 \text{ psf}$$

$C_{available}$ = 1000 psf ∴ $F.S. = \frac{1000}{174} = \underline{5.7}$

if compacted fill controlled End of Construction Stability for γ = 125 ϕ = 33° c = 250 psf

As per Huang (1975) fig 4 S = 2:1

$$C.F. = \frac{100 \times 250}{125 \times 8} = 25$$

For C.F. = 25 use 20 conservative ϕ = 33° R_u = 0

F.S. > 2.5 off Chart

The preceding argument is applicable for both upstream + downstream slopes

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FIGURE 2

Long Term Stability

Upstream Slope

Assume liner material (clay) controls stability

Fully saturated $R_u = 0.5$ - conservative does not include drying resistance offered by pool in effecting rapid drawdown.

$\bar{\phi} = 23°$ $\bar{c} = 200$ psf $H = 8$ $R_u = 0.5$ $\gamma = 120$ $S = 2.0$

$$CF = \frac{100\bar{c}}{\gamma H} = \frac{100(200)}{8 \times 120} = 20.8$$

From fig 4 (Huang, 1975)

for 2:1 slope F.S. $\cong$ 2.0

Downstream Slope

worst case est $R_u = 0.30$ typically slope should be unsaturated as a result of the intermittant pool

For $\gamma = 125$ $\bar{\phi} = 40°$ $\bar{c} = 100$ psf $R_u = 0.3$

$$C.F. = \frac{100 \times 100}{8 \times 125} = 30.8$$

As per fig 4 (Huang, 1975)

F.S. $\gtrsim$ 2.0

for $\bar{c} = 50$ CF = 15 $R_u = 0.5$

F.S. $\cong$ 2.0

Similarly this argument can be applied to upstream slope w/ $R_u = 0.5$ if compacted fill were to govern stability
ASSUMED

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Slope Stability Evaluation of Access Road Embankment Slopes Slope Ratio 1.5 H:1V

Assumptions:

1) Embankment slopes will be constructed of properly compacted earth or rock fill developed from natural on site soil and/or blast rock from excavation operations on site.

2) Compacted Earth Fill Properties

$\gamma = 125$ $\bar{\phi} = 40°$ $\bar{c} = 100$ psf

$\phi = 35°$ $c = 250$ psf

3) Maximum Slope Heights on the order of 25-30 feet

4) Slopes are unsaturated

Analyses - Based on Huang Charts - 1975 attached

End of Construction - Total Stress 30 ft high Slope

$\phi = 35°$ $c = 250$ psf $\gamma = 125$ pcf

from figure 4. $CF = \frac{100 \times 250}{125 \times 30} = 6.7$ $R_u = 0$

$\phi = 35°$ $CF = 6.7$

for 1.5:1 (H:V) slope F.S. $\Rightarrow$ 1.80

Long Term Stability - Effective Stress Parameters

$\gamma = 125$ $\bar{\phi} = 40°$ $\bar{c} = 100$ psf 30' slope $R_u = 0$

$CF = \frac{100 \times 100}{125 \times 30} = 2.7$

for 1.5:1 (H:V) slope F.S. = 1.80

Conclusion

Slopes are safe at 1.5H:1V

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SECTION 2

ESTIMATE OF PEAK FLOW DISCHARGE

KAISER ENGINEERS

Job No. 78097

Sheet 1 of 7

SKYLINE MINE FINAL DESIGN
ESTIMATED OF PEAK FLOW DISCHARGE

DESIGNED BY BM DATE 10-30-79
CHECKED BY GAE DATE 4.10.80

1. OBJECTIVE OF THIS CALCS IS TO ESTIMATE THE PEAK FLOW DISCHARGE.

2. REFERENCES.

NOAA ATLAS 2, volume VI UTAH, (O.S.M) {Book 2 March 13-1979
PART II, PRELIMINARY DESIGN {Book 3 " "

3. CRITERIA FOR UNDERGROUND Drainage SYSTEM AT THE PORTAL AREA

a. Q - Discharge To be designed for 100 YR STORM rainfall frequency.

b. Soil Conservation method To be used for estimate of flow (peak discharge)

c. Inlets and outlets to be protected by erosion Control materials (Gunite or Riprap).

CALCULATION Form No. E-6 Rev. 10-71

CONT'D

DATA FROM NOAA ATLAS 2, VOLUME VI-UTAH

REFER TO FIG. 18: SUBJECT PROJECT LOCATED IN REGION 1

DEVELOPMENT OF RAIN FALL FREQUENCY DURATION & INTENSITY CURVES FOR THE REGION GOVERNING THE SUBJECT PROJECT AREA

& REGION OF APPLICABLE " "

FROM NOAA ATLAS 2, Volume VI-UTAH	TABLE II
EQUATION	CORR COEFF
$Y_2 = -0.011 + 0.942[(x_1)(x_1/x_2)]$	0.95
$Y_{100} = 0.494 + 0.755[(x_3)(x_3/x_4)]$	0.9

Y_2 = 2 YEAR 1-Hr estimated value
Y_{100} = 100 YEAR 1-Hr estimated value

1. DETERMINE THE PLANT LOCATION [LATITUDE & LONGITUDE]

FROM SOLDIER SUMMIT QUADRANGLE USGS 15 MINUTE SERIES

LOCATION OF PLANT AREA ASSCALED IS:
LONGITUDE OR DEPARTURE $111^\circ 11' 26'' = \underline{111.19^\circ}$
LATITUDE $39^\circ 40' 57'' = \underline{39.68^\circ}$

LOCATING THE PLANT SITE, ON ISOPLUVIALS MAP OF NOAA ATLAS 2 — FIGURE 19, READS

FIGURE 19,	2-YR 6-HR	$x_1 = 1.05$ IN
FIG 26	2-YR 24 HR	$x_2 = 1.65$ IN
FIG - 24	100-YR 6 HR	$x_3 = 2.25$ IN
FIG 30	100-YR 24 HR	$x_4 = 3.5$ IN

KAISER ENGINEERS

Job No. 78097-

Sheet 3 of 7

SKYLINE MINE FINAL DESIGN

ESTIMATED PEAK FLOW DISCHARGE

DESIGNED BY B.Y. DATE 10-30-79

CHECKED BY GHC DATE 4.10.80

CONT'D

$Y_2 = -0.011 + 0.942 [1.05 (1.05/1.65)] = 0.618 \times (0.95) = 0.588$ IN

$Y_{100} = 0.494 + 0.755 [2.25 (2.25/3.5)] = 1.585 \times (0.90) = 1.427$ IN.

BY PLOTING 100 YEARS & 2 YEARS PRECIPITATION VALUES ON FIG 6 BELOW WE DETERMINE THE 5, 10, 25, 50 Years RETURN PERIOD PRECIPITATION VALUES FOR PARTIAL DURATION SERIES.

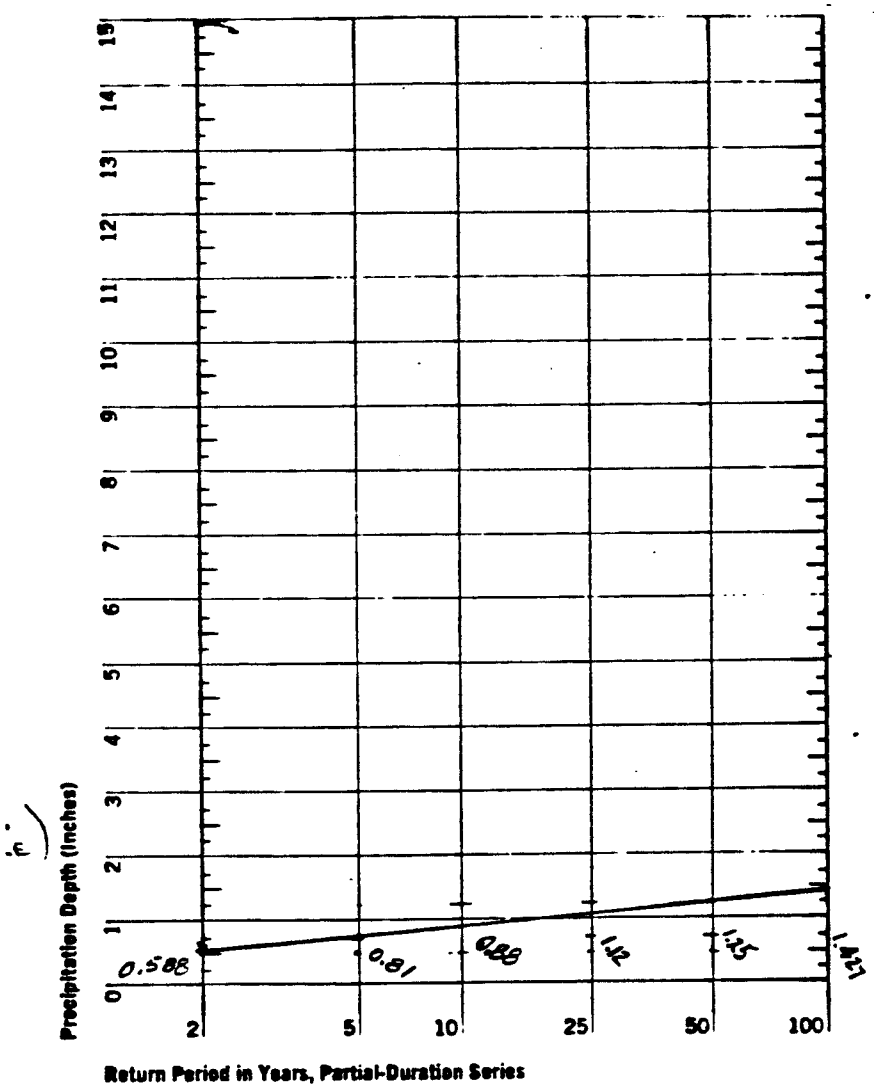


Figure 6. *Precipitation depth versus return period for partial-duration series.*

1 HR precipitation depth IN INCHES

Form No. E-8 Rev. 10-71

CALCULATION

SKYLINE MINE FINAL DESIGN

ESTIMATED PEAK FLOW DISCHARGE

DESIGNED BY BY DATE 10-31-79

CHECKED BY SHC DATE 4.10.80

ESTIMATE OF 2 AND 3 HR PRECIPITATION VALUES,

BY MATHEMATICAL SOLUTION REF. PAGE 16 VOLUM VII ATLAS

EQUATION
$$\begin{cases} 2\text{-hr} = 0.341(6\text{-hr}) + 0.659(1\text{-hr}) \\ 3\text{hr} = 0.569(6\text{-hr}) + 0.431(1\text{-hr}) \end{cases}$$

ESTIMATED PECIPITATION VALUES

2 YEARS

2HR = 0.341 X 1.05 + 0.659 X 0.588 = 0.743 IN

3HR = 0.569 X 1.05 + 0.431 X 0.588 = 0.851 IN

5 YEARS

2 HR = 0.341 X 1.32 + 0.659 X 0.81 = 0.984

3 HR = 0.569 X 1.32 + 0.431 X 0.81 = 1.100

10 YEARS

2HR = 0.341 X 1.5 + 0.659 X 0.88 = 1.091

3HR = 0.569 X 1.5 + 0.431 X 0.88 = 1.233

25 YEARS

2HR = 0.341 X 1.85 + 0.659 X 1.12 = 1.369

3HR = 0.569 X 1.85 + 0.431 X 1.12 = 1.535

50 YEARS

2HR = 0.341 X 2.05 + 0.659 X 1.25 = 1.523

3HR = 0.569 X 2.05 + 0.431 X 1.25 = 1.705

100 YEARS

2HR = 0.341 X 2.25 + 0.659 X 1.427 = 1.708

3HR = 0.569 X 2.25 + 0.431 X 1.427 = 1.895

KAISER ENGINEERS

JOB No. 78097

SHEET 5 OF 7

SKYLINE MINE FINAL DESIGN

ESTIMATED PEAK FLOW DISCHARGE

DESIGNED BY BJ DATE 11-4-79

CHECKED BY HC DATE 4.10.80

ESTIMATE PRECIPITATION VALUES OF DURATION LESS THAN 1HR

DURATION IN MIN		5	10	15	30
RATIO T 1HR VAL FROM ATLAS TABLE 12.		0.29	0.45	0.57	0.79
2 YEARS	0.588	2.029	1.307	1.032	0.744
5 YEARS	0.81	2.793	1.800	1.421	1.025
10 YEARS	0.88	3.034	1.956	1.544	1.114
25 YEARS	1.12	3.862	2.489	1.965	1.418
50 YEARS	1.25	4.310	2.778	2.193	1.582
100 YEARS	1.427	4.921	3.171	2.504	1.806

PRECIPITATION DEPTH-DURATION TABLE IN INCHES

YEARS	MINUTES				HOURS					
	5	10	15	30	1	2	3	6	12	24
2	2.029	1.307	1.032	0.744	0.588	0.743	0.851	1.05	1.37	1.64
5	2.793	1.800	1.421	1.025	0.81	0.984	1.100	1.32	1.685	2.05
10	3.034	1.956	1.544	1.114	0.88	1.091	1.233	1.50	1.965	2.43
25	3.862	2.489	1.965	1.418	1.12	1.369	1.535	1.85	2.35	2.85
50	4.310	2.778	2.193	1.582	1.25	1.523	1.705	2.05	2.575	3.10
100	4.921	3.171	2.504	1.806	1.427	1.708	1.895	2.25	2.875	3.5

CALCULATION Form No. E-8 Rev. 10-71

6-19-89
G. Taylor

Skyline Mine Site
Estimated Peak Flow Discharge

1. Objective of these calculations is to estimate the peak flow discharge using the Soil Conservation Method

Reference

1. Map 3.2.4-2 Eccles Creek Watershed Area
2. Slope: Σ Contour × Contour Interval / Area × 100
3. Permit Appendix Volume A-2 Soils and Vegetation

Area No.	Area in Acres (1)	CN (3)	Hydraulic Length (ft)	Σ of Contours (ft)	Slope % (2)	Contour Interval (ft)
Middle Branch (M-B)	256.04	65	4729.77	88,224.39	39.55	50
South Branch (S-B)	335.67	65	5525.18	103,493.58	35.39	50
North Branch (N-B)	148.64	70	3438.93	51,425.00	39.71	50
UDA-1	12.91	70	5134.37	5134.34	45.65	50
UDA-2	13.36	70	1945.96	5406.03	46.46	50
UDA-3	4.76	65	1533.38	1860.31	44.90	50
UDA-4	6.74	65	1899.53	2520.46	42.95	50

$Q_{10\text{-}24}$: 2.43 in.
$Q_{25\text{-}24}$: 2.85 in.
$Q_{50\text{-}24}$: 3.10 in.
$Q_{100\text{-}24}$: 3.50 in.

Values from page 5 of 7

6-19-89

PEAK FLOW (CFS)

AREA No.	T_C 1)	Q_{10-24} 2)	Q_{25-24} 2)	Q_{50-24} 2)	Q_{100-24} 2)
M-B	.444	33.09	63.41	85.54	125.75
S-B	.532	38.17	73.99	100.5	148.32
N-B	.301	47.98	75.72	94.50	127.80
UDA-1	.203	4.88	7.65	9.38	12.46
UDA-2	.177	1.31	2.02	2.49	3.30
UDA-3	.169	0.24	0.45	0.60	0.85
UDA-4	.206	0.34	0.63	0.83	1.19

1) KENTS FORMULA

$$T_C = (\text{HYD. LENGTH})^{.8} \left((1000/(CN-10)+1)^{.7} / (1900\sqrt{\text{SLOPE}})\right) / .6$$

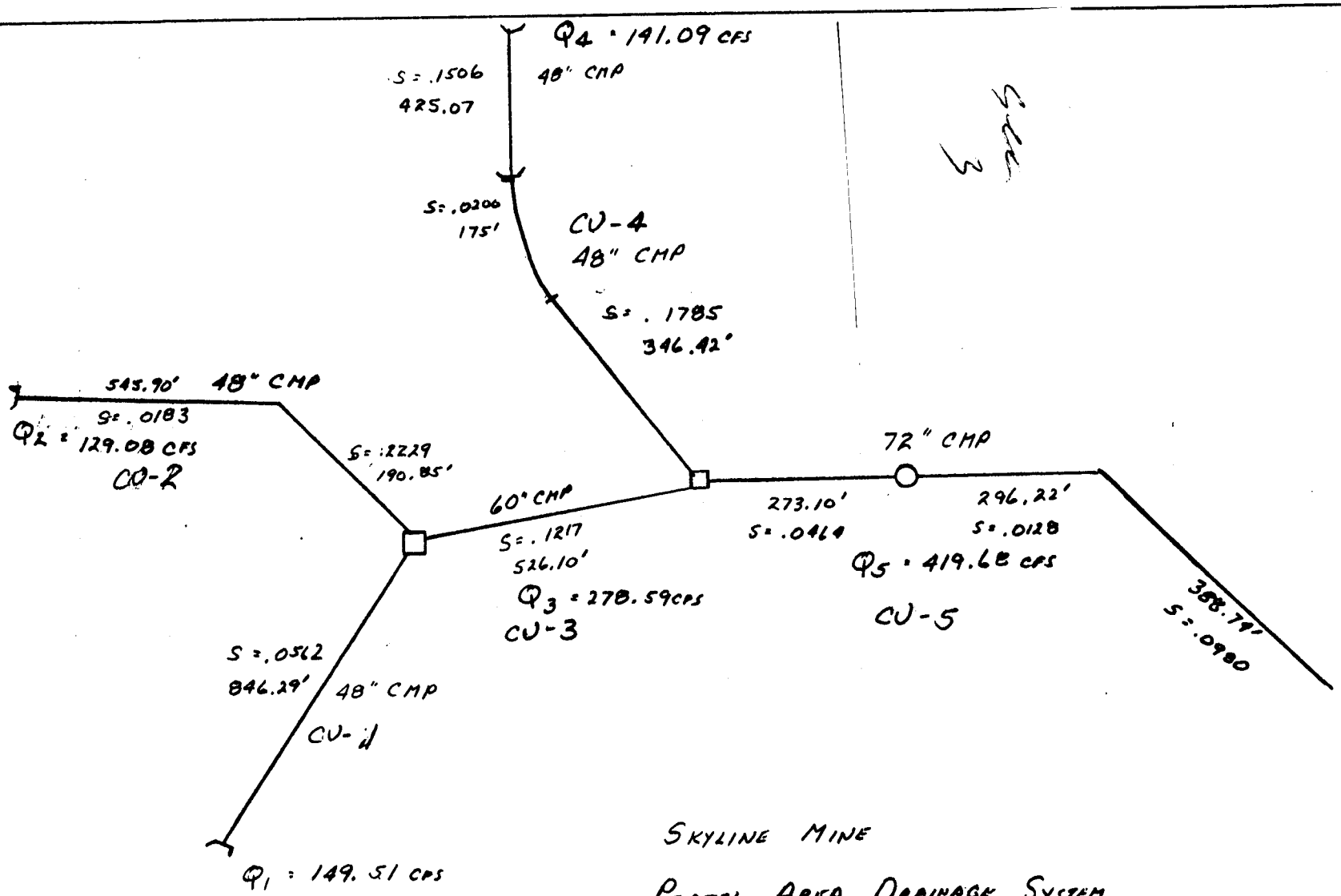
2) SCS UNIT HYDROGRAPH METHOD (NEH-4, 1972)

22-141 50 SHEETS
22-142 100 SHEETS
22-144 200 SHEETS
AMPAD

SECTION 3

MINE SITE CSP DESIGN

AMPAD 22-141 50 SHEETS
22-142 100 SHEETS
22-144 200 SHEETS



SKYLINE MINE

PORTAL AREA DRAINAGE SYSTEM

UNDERGROUND CMP

3-21-89
G. TAYLOR

REFER TO SECTION 2 ~~[illegible]~~ FOR INITIAL FLOW CALCULATIONS

Q_{cv-1} = SB + UDA-4

= 148.32 + 1.19

= 149.51 CFS

Q_{cv-2} = MB + UDA-3 + 3/4 UDA-2

= 125.75 + .85 + 2.48

= 129.08 CFS

Q_{cv-3} = Q_1 + Q_2

= 149.51 + 129.08

= 278.59 CFS

Q_{cv-4} = NB + UDA-1 + 1/4 UDA

= 127.80 + 12.46 + .83

= 141.09 CFS

Q_{cv-5} = Q_3 + Q_4

= 278.59 + 141.09

= 419.68 CFS

22-141 50 SHEETS
22-142 100 SHEETS
22-144 200 SHEETS
AMPAD

CULVERT SELECTION - SIZE DETERMINATION

A. CU-1, 48" CMP

PEAK RUN OFF Q_{100-24} = 149.51 CFS SECTION 3 PAGE 2

HW = 7.5 FT.

HW/D = 7.5 FT / 4 FT = 1.88

FIGURE 4.28 PAGE 189 HANDBOOK OF STEEL DRAINAGE + HIGHWAY CONSTRUCTION PRODUCTS 3rd EDITION

FROM THE NOMOGRAPH THE FLOW WOULD BE 148 CFS

THIS CULVERT IS PROPERLY SIZED

B. CU-2, 48" CMP

PEAK RUN OFF Q_{100-24} = 129.08 CFS

HW = 10 FT.

HW/D = 10/4 = 2.50

FIGURE 4.28 PAGE 189 HANDBOOK OF STEEL DRAINAGE + HIGHWAY CONSTRUCTION PRODUCTS 3rd EDITION

FROM THE NOMOGRAPH THE FLOW WOULD BE 170 CFS

THIS CULVERT IS PROPERLY SIZED

22-141 50 SHEETS
22-142 100 SHEETS
22-144 200 SHEETS
AMPAD

C, CU-3, 60" CMP

PEAK RUN OFF Q_{100-24} = CU-1 + CU-2 = 149.51 + 128.08 = 278.59 cfs

HW = 10 FT

HW/D = 10/5 = 2.0

FIGURE 4.28 PAGE 189 HANDBOOK OF STEEL DRAINAGE + HIGHWAY CONSTRUCTION PRODUCTS 3RD EDITION

FROM THE NOMOGRAPH THE FLOW WOULD BE 270 CFS

THIS CULVERT IS PROPERLY SIZE.

D. CU-4, 48" CMP

PEAK RUN OFF Q_{100-24} = 141.09 CFS

HW = 8 FT.

HW/D = 8 FT/4 FT = 2

FIGURE 4.28 PAGE 189 HANDBOOK OF STEEL DRAINAGE + HIGHWAY CONSTRUCTION PRODUCTS 3RD EDITION

FROM THE NOMOGRAPH THE FLOW WOULD BE 150 CFS

THIS CULVERT IS PROPERLY SIZED

E, CU-5, 72" CMP

PEAK RUN OFF Q_{100-24} = CU-3 + CU-4
= 278.59 + 141.09 = 419.68

HW = 12 FT

HW/D = 12 FT/6 FT = 2

FROM THE NOMOGRAPH THE FLOW WOULD BE 420 CFS

THIS CULVERT IS SIZE PROPERLY

22-141 50 SHEETS
22-142 100 SHEETS
22-144 200 SHEETS
AMPAD

G. TAYLOR
REVISED
11-15-89

F. CD-1, 24" CMP

PEAK FLOW = DA-1 + DA-2 = 12.71 CFS + 16.42 CFS = 29.13 CFS
SECTION 6 PAGE 1 OF 8 VOL. 5. 10YR-24HR.

HW = 3.8 FT

HW/D = 3.8/2 = 1.9

CHART 5 PAGE 5-25 HYDRAULIC ENGINEERING CIRCULAR No. 5
U.S DEPT. OF TRANSPORTATION

FROM THE NOMOGRAPH THE FLOW WOULD BE 29 CFS
THIS CULVERT WILL WORK.

G. CD-2, 24" CM

PEAK FLOW DA-3 = 11.82 CFS 10YR-24HR. SECTION 6 PAGE 1 OF 8 VOL. 5

HW = 2.5 FT

HW/D = 2.5/2 = 1.25

CHART 5 PAGE 5-25 HYDRAULIC ENGINEERING CIRCULAR No. 5
U.S. DEPT. OF TRANSPORTATION

FROM THE NOMOGRAPH THE FLOW WOULD BE 17 CFS
THIS CULVERT WILL WORK

H. CD-3, 24 CMP

SAME PEAK FLOW AS CD-1

HW = 3.4

HW/D = 3.4/2 = 1.7

CHART 5 PAGE 5-25 HYDRAULIC ENGINEERING CIRCULAR No. 5
U.S. DEPT. OF TRANSPORTATION

FROM THE NOMOGRAPH THE FLOW WOULD BE 23 CFS
THIS CULVERT WILL NOT CARRY ALL THE FLOW BUT THE REMAINING WATER WILL FLOW OVER A CONCRETE ROAD AND INTO THE SEDIMENTATION POND.

HYDROLOGY STUDY
CULVERT AT HIGHWAY
CROSSING AT SOUTH FORK

G. TAYLOR
REVISE 9-18-89

WATERSHED AREAS - MAP 3.2.4-2

WATERSHED	AREA (ACRES)	ΣC
MB	256.04	88,224.40
SB	335.67	103,493.60
NB	148.64	51,425.00
UDA-1	12.91	5,134.34
UDA-2	13.36	5,406.03
UDA-3	4.76	1,860.31
UDA-4	6.74	2,520.46
UDA-5	56.73	19,985.00
UDA-6	181.24	73,210.00
UDA-7	44.25	22,410
TOTAL	1,060.34	373,669.14

SLOPE = ΣCi / AREA

= 373,669.14 (50) / 1,060.34 × 43,560 = 40.45 %

ADD RECLAIMED AREAS

NB RECLAIM = 4.37

SB RECLAIM = 4.54

MB RECLAIM = 5.19

14.10

INPUT VALUES

AREA = 1,074.44
ΣC = 373,669.14
SLOPE = 39.90 %
CN WTD = 67

NB, UDA-1, UDA-2 = 174.91 @ CN = 70
MB, SB, UDA-3, UDA-4, UA-5, = 674.04 @ CN = 65
UDA-6 = 181.24 @ 72
UDA-7 = 44.25 @ 64

70(.163) + 65(.627) + 72(.169) + 64(.041) / .163 + .627 + .169 + .041 = 67.95

CN WTD = 67

H_L = 7876 ft.

9-18-89

DETERMINE T_c KENT'S FORMULA

APPLIED HYDROLOGY AND SEDIMENTOLOGY FOR DISTURBED AREAS, OKLAHOMA TECHNICAL PRESS

$T_c = L/0.6$ HOURS

$L = l^{.8}(S+1)^{.7}/1900\,Y^{.5}$

l = HYDRAULIC LENGTH
$S = (1000/CN - 10)$
Y = SLOPE

$T_c = 0.632$ HOURS

SECTION 2
PAGE 5 OF 7

		PEAK FLOW
Q_{10-24}	= 2.43 in	145.0 CFS
Q_{25-24}	= 2.85 in	264.9 CFS
Q_{50-24}	= 3.10 in	350.8 CFS
Q_{100-24}	= 3.5 in	540.2 CFS

DETERMINE IF PRESENT ARCH PIPE CULVERT WILL HANDLE THE FLOW OF 540.2 CFS

USE MANNING FORMULA

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

HANDBOOK OF STEEL DRAINAGE AND HIGHWAY CONSTRUCTION, PRODUCTS AMERICAN IRON AND STEEL INSTITUTE, 3RD EDITION

A = 38 SQ. FT.

n = .024

R = 1.67

S = .03

$Q = 38\text{ ft} \times 1.486/.024 \times (1.67)^{2/3} \times (.03)^{1/2}$

$= 38\,(61.92)(1.41)(.17)$

$= 574.64$ CFS

THE 8'-2" x 5'-9" STR. PLATE PIPE ARCH WILL HANDLE THE FLOW.

G. TAYLOR
11-15-89

PEAK FLOW FOR 25YR - 24HR WAS THE DESIGN EVENT

NOMOGRAPH FIGURE 4-31 A PAGE 192 HANDBOOK OF STEEL DRAINAGE & HIGHWAY CONSTRUCTION PRODUCTS

HW = 11.75 FT

HW/D = 11.75/5.75 = 1.99

PROJECTING FACE

FROM THE NOMOGRAPH THE FLOW WOULD BE 475 CFS
THE PIPE-ARCH WILL WORK

G. TAYLOR
6-22-89

INLET STRUCTURE - MIDDLE FORK

DROP INLET SPILLWAY - MAP 3.2.6-1C

$Q_{25-24} = 85.54$ CFS

SECTION 2, VOL. 5.

$Q_{100-24} = 125.75$ CFS

WEIR FLOW

$Q = CLH^{3/2}$ EQ 4.1 PAGE 231(1) $C = 3.0$, $L = 15.71$

$Q = 3.0(15.71)H^{3/2}$

$Q = 47.13\,H^{3/2}$

ORIFICE FLOW

$Q = C'a\sqrt{2gH}$ EQ 4.2 PAGE 231(1) $C' = .60$, $a = 19.63$

$= (.6)(19.63)(8.02)\sqrt{H}$

$Q = 94.48\sqrt{H}$

PIPE FLOW

$Q = a(2gH')^{1/2} / (1 + K_e + K_b + K_c L)^{1/2}$ EQ 4.4 PAGE 232 (1)

$H' = H + 18 - .6(4)$

$H' = H + 15.6$

$K_e = 1.0$
$K_b = .5$
$K_c = .0129$

$a = 12.57$
$L = 826$ FT

$Q = 12.57(2gH + 15.6)^{1/2} / (1 + 1.0 + .5 + .0129(826))^{1/2}$

$= 100.81(H + 15.6)^{1/2} / 3.63$

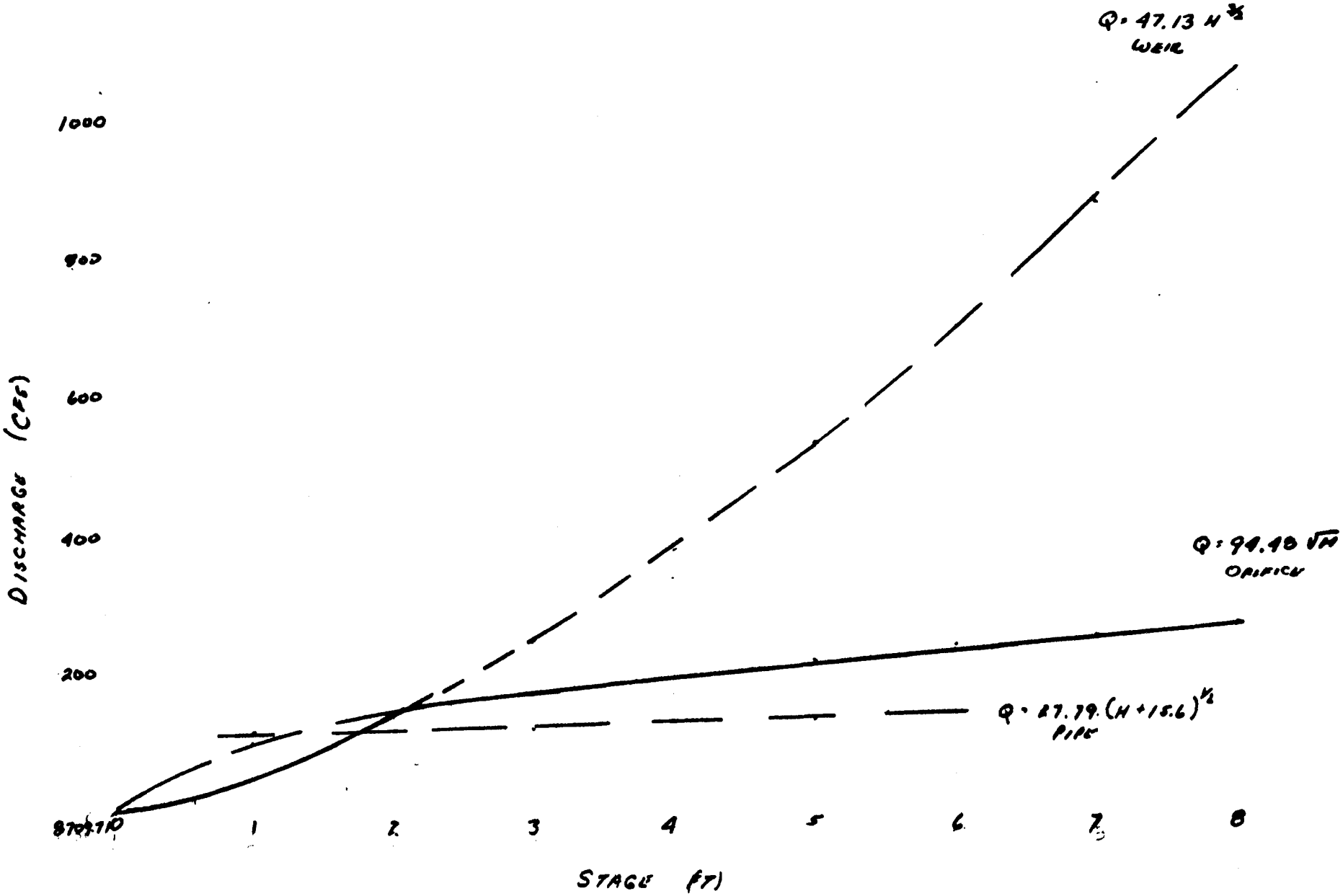
$Q = 27.79(H + 15.6)^{1/2}$

1) APPLIED HYDROLOGY AND SEDIMENTOLOGY FOR DISTURBED AREAS
OKLAHOMA TECHNICAL PRESS

HEAD (FT)	Q_{WEIR} (CFS)	$Q_{ORIFICE}$ (CFS)	Q_{PIPE} (CFS)
1	47.13	94.48	113.23
2	133.30	133.62	116.59
3	244.89	163.65	119.85
4	377.04	188.97	123.03
5	526.93	211.27	126.13
6	692.67	231.44	129.16
7	872.86	249.98	132.11
8	1,066.43	267.24	135.00
9	1272.51	283.45	137.83

THE AVAILABLE HEAD IS 26 FT. FROM MAP 3.2.6-1C

AMPAD 22-141 50 SHEETS
22-142 100 SHEETS
22-144 200 SHEETS



STAGE DISCHARGE CURVE

SECTION 4

PORTAL AREA SWALE AND CONCRETE V-DITCH DESIGN

G. Taylor
Revised
11-16-89

Portal Area Swale and Concrete V-Ditch
Refer to Map 3.2.1-1

A. SW-1 Determine Depth of Flow

Peak Flow DA-1 = 12.71 cfs 10YR-24hr (Section 6, Vol. 5)

Use Manning Formula

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

A = Area
R = Hydraulic Radius
n = Roughness
S = Slope

$A = Zd^2/2 + Zd^2/2$

$R = Zd/4\sqrt{Z^2+1} + Zd/4\sqrt{Z^2+1}$

n = .016 Asphalt Pavement, Rough Texture
S = .07 (Field Survey, Nov. 1989)

$Q = (Zd/2 + Zd^2/2) \times 1.486/n \times (Zd/4\sqrt{Z^2+1} + Zd/4\sqrt{Z^2+1})^{2/3} \times S^{1/2}$

$= (25d^2/2 + 14.29d^2/2) \times 1.486/.016 \times (25d/4\sqrt{25^2+1} + 14.29d/4\sqrt{14.29^2+1})^{2/3} \times (.07)^{1/2}$

$= (12.5d^2 + 7.15d^2) \times 92.88 \times (.25d + .25d)^{2/3} \times .26$

$= (19.65d^2) \times 92.88 \times (.50d)^{2/3} \times .26$

Try d = .3 ft.

$Q = (19.65(.3)^2) \times 92.88 \times (.50(.3))^{2/3} \times .26$

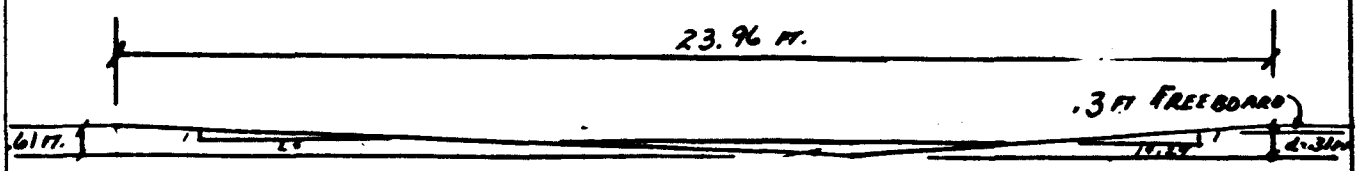
= 11.98 cfs

Try d = .31

$Q = (19.65(.31)^2) \times 92.88 \times (.5(.31))^{2/3} \times .26$

= 13.08

Use d = .31 ft.



$V = 1.486/n \times R^{2/3} \times S^{1/2}$

$= 1.486/.016 \times (.16)^{2/3} \times (.07)^{1/2}$

$= 92.88 \quad .29 \times .26$

$= 7.05$ FPS

$n = .016$
$R = .5(.31) = .16$
$S = .07$

B SW-2 DETERMINE DEPTH OF FLOW

PEAK FLOW DA-1 + DA-2 = 12.71 + 16.42 = 29.13 CFS 10 YR-24 HR
(SECTION 6, VOL. 5)

$Q = 29.13$ CFS
$A = zd^2/2 + zd^2/2$
$R = zd/4\sqrt{z^2+1} + zd/4\sqrt{z^2+1}$
$n = .016$ ASPHALT PAVEMENT, ROUGH TEXTURE
$S = .02$ (FIELD SURVEY, NOV. 1989)

$Q = (zd^2/2 + zd^2/2) \times 1.486/n \times (zd/4\sqrt{z^2+1} + zd/4\sqrt{z^2+1})^{2/3} \times S^{1/2}$

$= (50d^2/2 + 25d^2/2) \times 1.486/.016 \times (50d/4\sqrt{50^2+1} + 25d/4\sqrt{25^2+1})^{2/3} \times (.02)^{1/2}$

$= (25d^2 + 1250d^2) \times 92.88 \times (.25d + .25d)^{2/3} \times .14$

$= (37.50d^2) \times 92.88 \times (.5d)^{2/3} \times .14$

TRY $d = .4$

$Q = 37.50(.4)^2 \times 92.88 \times (.5(.4))^{2/3} \times .14$

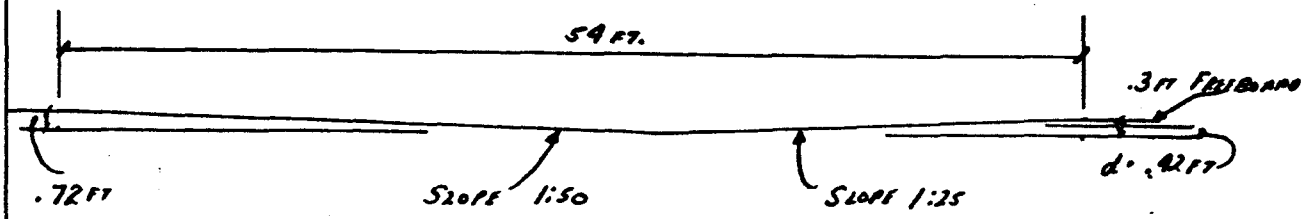
$= 26.54$ cfs

TRY $d = .42$

$Q = 37.50(.42)^2 \times 92.88 \times (.5(.42))^{2/3} \times .14$

$= 30.23$ cfs

USE $d = .42$ FT.



$V = 1.486/n \times R^{2/3} \times S^{1/2}$

$= 1.486/.016 \times (.21)^{2/3} \times (.02)^{1/2}$

$= 92.88 \times .35 \times .14$

$= 4.60$ FPS

$n = .016$
$R = .5(.42) = .21$
$S = .02$

G. TAYLOR
REVISED
11-13-89

17.

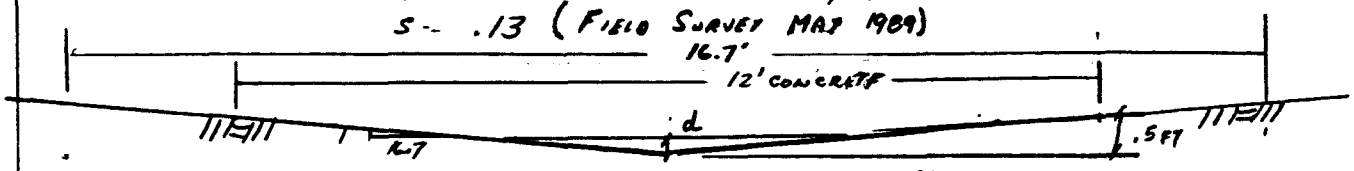
0, SW-4 - DETERMINE DEPTH OF FLOW

PEAK FLOW = ARA-1 = 4.82 CFS (SECTION 6, VOL. 5)

USING MANNING FORMULA

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

$Q = 4.82$ CFS
$A = zd^2$
$R = zd / 2\sqrt{z^2+1}$
$n = .014$ CONCRETE LINED, REGULAR FINISH
$S = .13$ (FIELD SURVEY MAY 1989)



$$Q = zd^2 \times 1.486/n \times \left(zd/2\sqrt{z^2+1}\right)^{2/3} \times (S)^{1/2}$$

$$Q = 16.7(d)^2 \times 1.486/.014 \times \left(zd/2\sqrt{(16.7)^2+1}\right)^{2/3} \times (.13)^{1/2}$$

$$Q = 16.7(d)^2 \times 106.91 \times (16.7d/33.46)^{2/3} \times .36$$

TRY: $d = .3$ FT

$$Q = 16.7(.3)^2 \times 106.91 \times (16.7(.3)/33.46)^{2/3} \times .36$$
$$= 16.09 \text{ CFS.}$$

G. TAYLOR
REVISED
11-13-09

TRY d = .1 FT

$$Q = 16.7(.1)^2 \times 106.14 \times \left(16.7(.1)/33.46\right)^{2/3} \times .36$$

$$= .86 \text{ CFS}$$

TRY d = .2 FT

$$Q = 16.7(.2)^2 \times 106.14 \times \left(16.7(.2)/33.46\right)^{2/3} \times .36$$

$$= 5.45 \text{ CFS}$$

TRY d = .19 FT.

$$Q = 16.7(.19)^2 \times 106.14 \times \left(16.7(.19)/33.46\right)^{2/3} \times .36$$

$$= 4.75 \text{ CFS}$$

THE DEPTH OF FLOW WILL BE ≈ .19 FT. THE DEPTH OF THE SWALE IS 1.5 FT. SWALE WILL WORK AS BUILT WITH .3 FT FREEBOARD

22-141 50 SHEETS
22-142 100 SHEETS
22-144 200 SHEETS
AMPAD

G. TAYLOR
REVISED
11-13-89

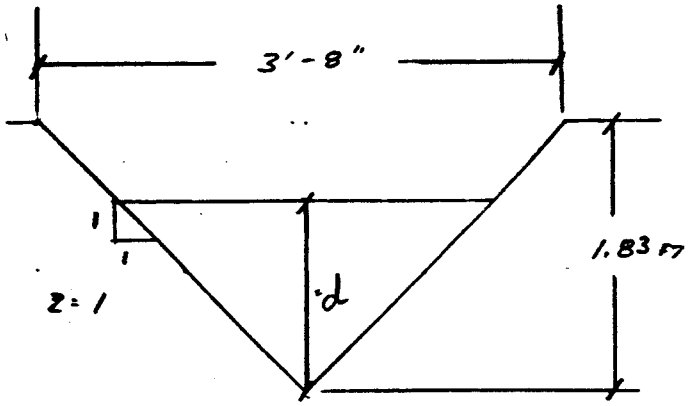
G DD-3 DETERMINE DEPTH OF FLOW

PEAK FLOW = DA-1 = (12.71 cfs)2 = 25.42 cfs
SECTION 2 VOL. 5

USE MANNING FORMULA

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

$Q = 25.42$ CFS
$A = zd^2$
$R = zd / 2\sqrt{z^2+1}$
$n = .014$ CONCRETE LINED, REGULAR FINISH
$S = .05$ (MAP 3.2, 1-1) (FIELD SURVEY, MAY 1989)



$Q = zd^2 \times 1.486/n \times (zd/2\sqrt{z^2+1})^{2/3} \times S^{1/2}$

$Q = d^2 \times 1.486/.014 \times (d/2\sqrt{(1)^2+1})^{2/3} \times (.05)^{1/2}$

$Q = d^2 \times 106.14 \times (d/2.83)^{2/3} \times .22$

TRY $d = .5$ FT.

$Q = (.5)^2 \times 106.14 \times (.05/2.83)^{2/3} \times .22$

$= .39$ CFS

TRY $d = 1$ FT.

$Q = (1)^2 \times 106.14 \times (1/2.83)^{2/3} \times .22$

$= 11.63$ CFS

G. TAYLOR
REVISED
11-13-89

TRY $d = 1.3$ FT

$$Q = (1.3)^2 \times 106.14 \times \left(1.3/2.83\right)^{.67} \times .22$$

$$= 23.43 \text{ CFS}$$

TRY $d = 1.34$

$$Q = (1.34)^2 \times 106.14 \times \left(1.34/2.83\right)^{2/3} \times .22$$

$$= 25.41 \text{ CFS}$$

THE DEPTH OF FLOW WILL BE ≈ 1.34 FT. THE DEPTH OF THE DITCH IS 1.63 FT. THE DITCH WILL WORK AS BUILT WITH .3 FT. FREEBOARD.

22-141 50 SHEETS
22-142 100 SHEETS
22-144 200 SHEETS
AMPAD

SECTION 5

UNDISTURBED AREAS
DRAINAGE DITCH DESIGNS

SEDIMENT TRAP
AND STREAM CHANNEL DESIGN

G. TAYLOR
10-15-90

1. ASSUMPTIONS

a. POND WIDTH 50 FT
b. DESIGN FLOW - 25 YR - 24 HR - 63.41 CFS - SECTION 2, VOLUME 5
c. TRAP WILL FUNCTION FOR TEMPERATURE DOWN TO 40°F
d. RETAIN 25% OF SEDIMENT HAVING A PARTICLE DIAMETER OF .0024 IN OR LARGER

2. DIMENSIONS OF THE POND

$\frac{LW}{Q} = F$

PAGE 563 BARFIELD, B.J., R.C. WARNER, C.T. HAAN
APPLIED HYDROLOGY AND SEDIMENTOLOGY FOR
DISTURBED AREAS, OKLAHOMA TECHNICAL PRESS

$F = 40$

FIGURE 7.36 PAGE 564

$LW/Q = 40$

$L(50)/63.41 = 40$

$L = (40)(63.41)/50$

$L = 2536.40/50$

$L = 50$ FT.

REMOVAL EFFICIENCY OF VARIOUS PARTICLE SIZES IS SHOWN BELOW

PARTICLE SIZE (IN)	TRAP EFFICIENCY (%)
.0002	.11
.0003	.50
.0006	2.0
.0012	8.0
.0024	25.0
.0049	69.0
.0098	96.0

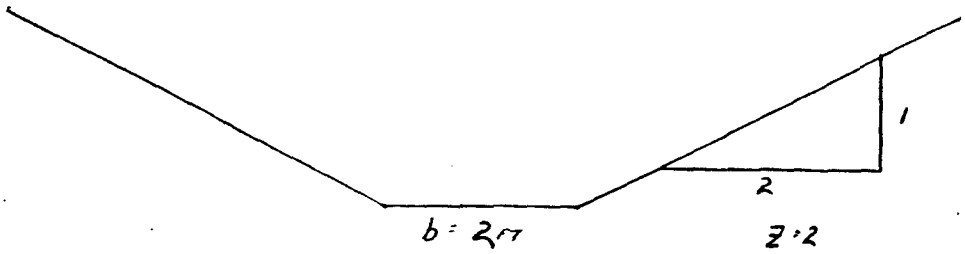
3 STREAM CHANNEL DESIGN

ANNUAL FLOW - 1.9 CFS SCS UNIT HYDROGRAPH METHOD
2 YR - 24 HR

A. ANNUAL FLOW DESIGN - TRAPOZIO CHANNEL

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

$S = .01$
$n = .033$ DENSE WEEDS OR AQUATIC PLANTS



$A = bd + Zd^2$

$R = bd + Zd^2 / b + 2d\sqrt{Z^2+1}$

$Q = 1.9$ CFS

$Q = bd + Zd^2 \times 1.486/n \times (bd + 2d^2/b + 2d\sqrt{Z^2+1})^{2/3} \times S^{1/2}$

$Q = 2d + 2d^2 \times 1.486/.033 \times (2d + 2d^2/2 + 2d\sqrt{2^2+1})^{2/3} \times (.01)^{1/2}$

$Q = 2d + 2d^2 \times 45.03\ (2d + 2d^2/2 + 4.47d)^{2/3} \times .10$

$1.9 = 2d + 2d^2 \times 4.50 \times (2d + 2d^2/2 + 4.47d)^{2/3}$

$.42 = 2d + 2d^2 \times (2d + 2d^2/2 + 4.47d)^{2/3}$

TRAIL d

d (FT)	Q (CFS)
.3	.29
.4	.50
.38	.45
.36	.41
.37	.43

$d = .43$

$V = 1.486/n \times R^{2/3} \times S^{1/2}$

$R = 2d + 2d^2/2 + 2d\sqrt{2^2+1} = 1.01/3.65 = .28$

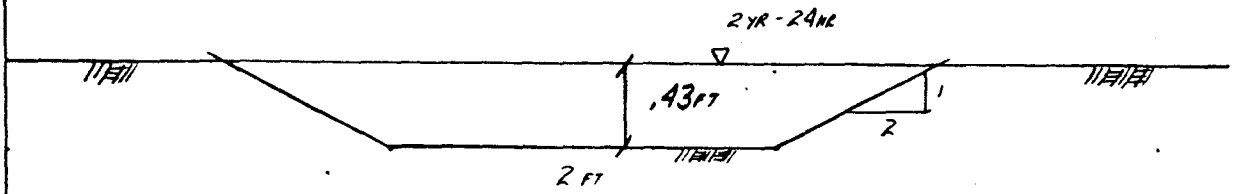
$S = .01$

$n = .033$

$= 1.486/.033 \times (.28)^{.67} \times (.01)^{.5}$

$= 45.03 \times .57 \times .10$

$= 2.55$ FPS



STREAM CHANNEL WEST OF
COAL STORAGE

22-141 50 SHEETS
22-142 100 SHEETS
22-144 200 SHEETS
AMPAD

Wm W. Shinn
12-21-90

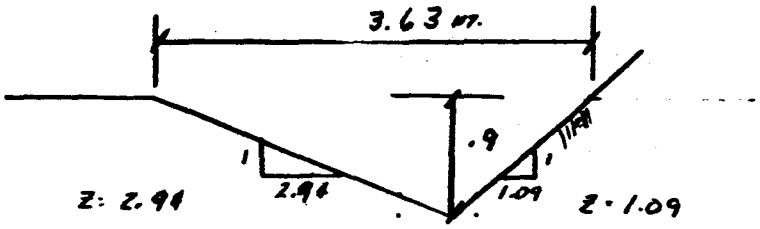
G. Tonor
6-26-89
Revised
11-15-89

Interceptor Ditch Design For 10 yr. -24 hr. Event

I Ditch DU-1 Map 3.2.1-1

DU-1 will intercept water from area UDA-1, Map 3.2.4-2 $Q_{10-24} = 4.88$ cfs Section 2, Vol. 5

Typical Ditch



Field Survey June 1989

A. Use Manning Formula to determine depth of flow

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

S = .10 Field Survey
n = .030 Earth Channel with considerable growth

$A = zd^2/2 + zd^2/2$

$R = zd/4\sqrt{z^2+1} + zd/4\sqrt{z^2+1}$

$Q = 1.486/n \left(zd^2/2 + zd^2/2\right)\left(zd/4\sqrt{z^2+1} + zd/4\sqrt{z^2+1}\right)^{2/3} S^{1/2}$

$= 1.486/.03 \left(2.94d^2/2 + 1.09d^2/2\right)\left(2.94d/4\sqrt{2.94^2+1} + 1.09d/4\sqrt{1.09^2+1}\right)^{2/3} (.10)^{1/2}$

$= 49.53 \left(1.47d^2 + .55d^2\right)\left(.24d + .18d\right)^{2/3} \times .32$

$4.88 = 49.53 \left(1.47d^2 + .55d^2\right)\left(.24d + .18d\right)^{2/3} \times .32$

Try $d = .61$ ft

$4.88 = 49.53 \times \left(1.47(.61)^2 + .55(.61)^2\right) \times \left(.24(.61) + .18(.61)\right)^{2/3} \times .32$

$= 49.53 \left(.55 + .20\right) \times \left(.15 + .11\right)^{2/3} \times .32$

$= 49.53 \left(.75\right) \times \left(.26\right)^{2/3} \times .32$

$= 49.53 \times (.75) \times (.41) \times .32$

$= 4.82$

DITCH DESIGN

DEPTH OF DITCH: FLOW DEPTH + FREE BOARD

$.61 + .3$

$= .91$

PRESENT DITCH WILL WORK AS SHOWN ON PAGE 1 OF THIS SECTION.

B. VELOCITY

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

$$= \frac{1.486}{n} \left(\frac{2d}{\sqrt{2^2+1}} + \frac{2d}{\sqrt{2^2+1}} \right)^{2/3} S^{1/2}$$

$$= \frac{1.486}{.030} \left(\frac{2.49(.61)}{\sqrt{(2.49)^2+1}} + \frac{1.09(.61)}{\sqrt{1.09^2+1}} \right)^{2/3} (.10)^{1/2}$$

$$= 49.53 \, (.14 + .11)^{2/3} \times (.10)^{1/2}$$

$$= 6.30 \text{ FPS}$$

DUE TO SLOPE STEEPEST ERROSION CONTROL MATERIAL MUST BE USED

C DETERMINE RIPRAP SIZE

FIG. 2 PAGE 11-6 - RIPRAP FOR BANK PROTECTION HYDRAULIC ENGINEERING CIRCULAR No. 11 - U.S. DEPT. OF TRANSPORTATION.

$D_{50} = .25$ FT OR 3 IN.

RIPRAP GRADATION

$1.25\ D_{50}$	=	3.75 IN	30%
D_{50}	=	3.00 IN	50%
$.5 D_{50}$	=	1.50 IN	10%
$.2 D_{50}$	=	.60 IN	10%

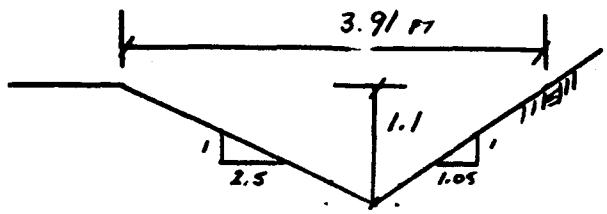
NO FILTER BLANKET WILL BE NEEDED THIS IS BASED ON FIELD INSPECTION.

G. Taylor
Reviewed
11-15-89

II DITCH DU-2 MAP 3.2.1-1

DU-2 WILL INTERCEPT WATER FROM AREA UDA-2, MAP 3.2.4-2 $Q_{10-24} = 1.31$ CFS SECTION 2, VOL. 5

TYPICAL DITCH



FIELD SURVEY
JUNE, 1989

A. USE MANNING FORMULA TO DETERMINE DEPTH OF FLOW

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

$S = .15$ FIELD SURVEY
$n = .030$ EARTH CHANNEL WITH CONSIDERABLE GROWTH

$A = zd^2/2 + zd^2/2$

$R = zd/4\sqrt{z^2+1} + zd/4\sqrt{z^2+1}$

$Q = 1.486/n \left(zd^2/2 + zd^2/2\right)\left(zd/4\sqrt{z^2+1} + zd/4\sqrt{z^2+1}\right)^{2/3} S^{1/2}$

$= 1.486/.03 \left(2.5d^2/2 + 1.05d^2/2\right)\left(2.5d/4\sqrt{(2.5)^2+1} + 1.05d/4\sqrt{(1.05)^2+1}\right)^{2/3} (.15)^{1/2}$

$1.31 = 49.53 \left(1.25d^2 + .53d^2\right)\left(.23d + .18d\right)^{2/3} .39$

TRY $d = .40$ FT.

$1.31 = 49.53 \times \left(1.25(.40)^2 + .53(.40)^2\right) \times \left(.23(.\quad + .18(\quad)\right)^{2/3} \times .32$

$= 49.53 \times (.20 + .08) \times (.09 + .07)^{2/3} \times .32$

$= 49.53 \times (.28) \times (.16)^{2/3} \times .32$

$= 49.53 \times .28 \times .29 \times .32$

$= 1.32$

G. Taylor
Revised
11-15-89

DITCH DESIGN

DEPTH OF FLOW = FLOW DEPTH + FREE BOARD

$= .40' + .30'$

$= .70$ FT

PRESENT DITCH WILL WORK AS SHOWN ON PAGE 3 OF THIS SECTION

B. VELOCITY

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

$= \frac{1.486}{n} \left(\frac{zd}{4\sqrt{z^2+1}} + \frac{zd}{4\sqrt{z^2+1}} \right)^{2/3} S^{1/2}$

$= \frac{1.486}{.03} \left(\frac{2.5(.40)}{4\sqrt{2.5^2+1}} + \frac{1.05(.40)}{4\sqrt{1.05^2+1}} \right)^{2/3} (.15)^{1/2}$

$= 49.53 \times (.09 + .07)^{2/3} \times .39$

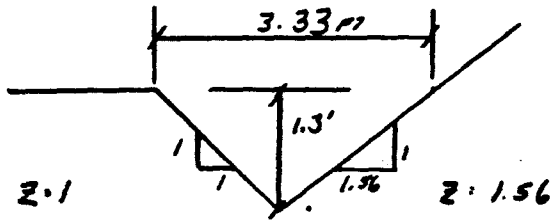
$= 5.66$ FPS

NO ERROSION CONTROL MATERIAL WILL BE NEEDED

III DITCH DU-3 MAP 3.2.1-1

DU-3 WILL INTERCEPT WATER FROM AREA UDA-3, MAP 3.2.4-2 $Q_{10-29} = .24$ CFS SECTION 2, VOL. 5

TYPICAL DITCH



FIELD SURVEY
JUNE, 1989

A. USE MANNING FORMULA TO DETERMINE DEPTH OF FLOW

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

$S = .25$ FIELD SURVEY
$n = .030$ EARTH CHANNEL WITH CONSIDERABLE GROWTH

$A = zd^2/2 + zd^2/2$

$R = zd/4\sqrt{z^2+1} + zd/4\sqrt{z^2+1}$

$Q = 1.486/n \times (zd^2/2 + zd^2/2) \times \left(zd/4\sqrt{z^2+1} + zd/4\sqrt{z^2+1}\right)^{2/3} \times S^{1/2}$

$= 1.486/.030 \times \left(\frac{1d^2}{2} + \frac{1.56d^2}{2}\right)\left(1d/4\sqrt{1^2+1} + 1.56d/4\sqrt{1.56^2+1}\right)^{2/3} \times (.25)^{1/2}$

$.24 = 49.53 \times (.5d^2 + .78d^2) \times (.18d + .21d)^{2/3} \times .50$

Try $d = .2$ FT

$.24 = 49.53 \times (.5(.2)^2 + .78(.2)^2) \times (.18(.2) + .21(.2))^{2/3} \times .50$

$= 49.53 \times (.02 + .03) \times (.04 + .04)^{2/3} \times .50$

$= 49.53 \times .05 \times (.08)^{2/3} \times .50$

$= 49.53 \times .05 \times .19 \times .50$

$= .24$

DITCH DESIGN

DEPTH OF FLOW = FLOW DEPTH + FREE BOARD

$= .2' + .3'$

$= .5$ FT

PRESENT DITCH WILL WORK AS SHOWN ON PAGE 4 OF THIS SECTION

G. Taylor
Revised
11-15-89

B. Velocity

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

$$= \frac{1.486}{n} \left(\frac{zd}{4\sqrt{z^2+1}} + \frac{zd}{4\sqrt{z^2+1}} \right)^{2/3} S^{1/2}$$

$$= \frac{1.486}{.03} \left(\frac{1(.2)}{4\sqrt{1^2+1}} + \frac{1.56(.2)}{4\sqrt{1.56^2+1}} \right)^{2/3} (.25)^{1/2}$$

$$= 49.53 \times (.04 + .04)^{2/3} \times .50$$

$$= 49.53 \times (.08)^{2/3} \times .50$$

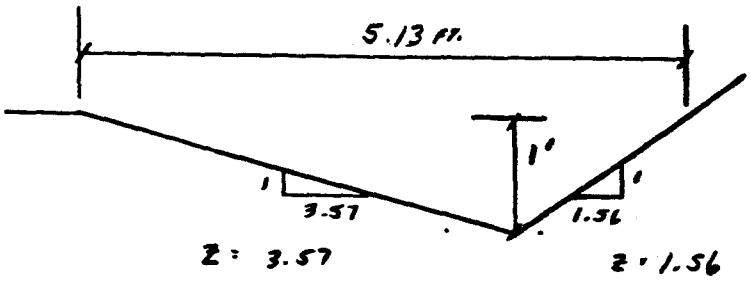
$$= 4.46 \text{ fps}$$

No errosion control material will be needed

IV Ditch DU-4 Map 3.2.1-1

DU-4 will intercept water from area UDA-4, Map 3.2.4-2 $Q_{10\text{-}24} = .34$ cfs Section 2, Vol. 5

Typical Ditch



Field Survey
June, 1989

A. Use Manning Formula to Determine Depth on Flow

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

S = .19 Field Survey
n = .030 Earth Channel with Considerable Growth

$$A = \frac{zd^2}{2} + \frac{zd^2}{2}$$

$$R = \frac{zd}{4\sqrt{z^2+1}} + \frac{zd}{4\sqrt{z^2+1}}$$

$$Q = \frac{1.486}{n} \times \left(\frac{2d^2}{2} + \frac{2d^2}{2}\right) \times \left(\frac{2d}{4\sqrt{2^2+1}} + \frac{2d}{4\sqrt{2^2+1}}\right)^{2/3} S^{1/2}$$

$$= \frac{1.486}{.03} \times \left(\frac{3.57d^2}{2} + \frac{1.56d^2}{2}\right)\left(\frac{3.57d}{4\sqrt{3.57^2+1}} + \frac{1.56d}{4\sqrt{1.56^2+1}}\right)^{2/3} (.19)^{1/2}$$

$$.34 = 49.53 \times (1.79d^2 + .78d^2) \times (.24d + .21d)^{2/3} \times .44$$

TRY $d = .18$ FT.

$$.34 = 49.53 \times (1.79(.18)^2 + .78(.18)^2) \times (.24(.18) + .21(.18))^{2/3} \times .44$$

$$= 49.53 \times (.06 + .02) \times (.04 + .04)^{2/3} \times .44$$

$$= 49.53 \times (.08) \times .19 \times .44$$

$$= .34$$

DITCH DESIGN

DEPTH OF FLOW = FLOW DEPTH + FREE BOARD

$= .34' + .3'$

$= .68$ FT.

PERSENT DITCH WILL WORK AS SHOWN ON PAGE 6 OF THIS SECTION.

B. VELOCITY

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

$$= \frac{1.486}{n} \left(\frac{2d}{4\sqrt{2^2+1}} + \frac{2d}{4\sqrt{2^2+1}}\right)^{2/3} S^{1/2}$$

$$= \frac{1.486}{.030} \left(\frac{3.57(.18)}{4\sqrt{3.57^2+1}} + \frac{1.56(.18)}{4\sqrt{1.56^2+1}}\right)^{2/3} \times (.19)^{1/2}$$

$$= 49.53 \times (.04 + .04)^{2/3} \times .44$$

$$= 49.53 \times .19 \times .44$$

$$= 4.05 \text{ FPS}$$

NO ERROSION CONTROL MATERIAL WILL BE NEEDED

G. TAYLOR
11-16-89

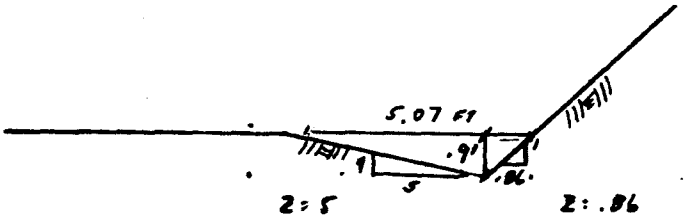
DITCH DU-5 MAP 3.2.1-1

APPROXIMATELY 1.22 ACRES OF WATERSHED UDA-2 ARE DIVERTED TO DU-5 ON THE WEST SIDE OF THE TOPSOIL STOCKPILE-
OR 1.22 ACRES / 13.36 ACRES = .09 ×100 9% OF THE RUNOFF

SECTION 2, VOL. 5 STATES THAT THE 10YR-24HR EVENT FOR UDA-2 IS 1.31 CFS. THE FLOW FOR DU-5 IS AS FOLLOWS

1.31 CFS × .09 = .12 CFS

DU-5 MUST BE DESIGNED TO HANDLE .12 CFS



FIELD SURVEY
NOV. 1989

USE MANNING EQUATION TO DETERMINE DEPTH OF FLOW

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

$$A = Zd^2/2 + Zd^2/2$$

$$R = Zd/4\sqrt{Z^2+1} + Zd/4\sqrt{Z^2+1}$$

$n = .11$ CHANNEL NOT MAINTAINED, DENSE WEEDS

$S = .012$ AVG SLOPE MAP 3.2.1-1

$$Q = (Zd^2/2 + Zd^2/2) \times 1.486/n \times (Zd/4\sqrt{Z^2+1} + Zd/4\sqrt{Z^2+1})^{2/3} \times S^{1/2}$$

$$= (5d^2/2 + .86d^2/2) \times 1.486/.11 \times (5d/4\sqrt{5^2+1} + .86d/4\sqrt{.86^2+1})^{2/3} \times (.012)^{1/2}$$

$$= (2.5d^2 + .43d^2) \times 13.51 \times (.25d + .16d)^{2/3} \times .11$$

$$= 2.93d^2 \times 13.51 \times (.41d)^{2/3} \times .11$$

TRY $d = .1$ FT

$$Q = 2.93(.1)^2 \times 13.51 \times (.41(.1))^{2/3} \times .11$$

$$= .01 \text{ CFS}$$

TRY $d = .34$

$$Q = 2.93(.34)^2 \times 13.51 \times (.41(.34))^{2/3} \times .11$$

$$= .13 \text{ CFS}$$

DITCH DESIGN

TOTAL DEPTH = FLOW DEPTH + FREEBOARD

= .34 + .3

= .64

PRESENT DITCH WILL WORK AS SHOWN

VELOCITY

$V = 1.486/n \times R^{2/3} \times S^{1/2}$

$= 1.486/.11 \times (.14)^{2/3} \times (.012)^{1/2}$

$= 13.51 \quad .27 \times .11$

$= .40$ FPS

$S = .012$
$R = .41(.34) = .14$
$n = .11$

22-141 50 SHEETS
22-142 100 SHEETS
22-144 200 SHEETS
AMPAD

G. TAYLOR
11-16-89

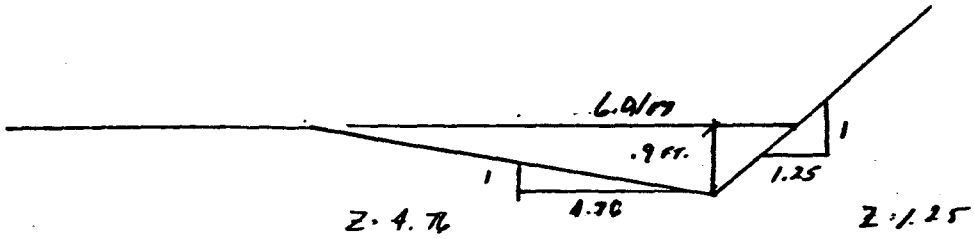
DITCH DU-6 MAP 3.2.1-1

APPROXIMATELY 2.07 ACRES OF WATER SHED UDA-1 ARE DIVERTED TO DU-6 ON THE EAST SIDE OF THE TOPSOIL STOCKPILE OR 2.07 ACRES / 12.91 ACRES = .16 × 100 16 % OF THE RUNOFF

SECTION 2, VOL. 5 STATES THAT THE 10 YR - 24 HR EVENT FOR UDA-1 IS 4.88 CFS. THE FLOW FOR DU-6 IS AS FOLLOWS

4.88 CFS × .16 = .78 CFS

DU-6 MUST BE DESIGNED TO HANDLE .78 CFS



USE MANNING EQUATION TO DETERMINE DEPTH OF FLOW

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

$A = Zd^2/2 + Zd^2/2$

$R = Zd/4\sqrt{Z^2+1} + Zd/4\sqrt{Z^2+1}$

$n = .065$ CHANNEL NOT MAINTAINED, CLEAN BOTTOM BRUSH ON THE SIDES

$S = .016$ AVG. SLOPE MAP 3.2.1-1

$Q = (Zd^2/2 + Zd^2/2) \times 1.486/n \times (Zd/4\sqrt{Z^2+1} + Zd/4\sqrt{Z^2+1})^{2/3}$

$= (4.76d^2/2 + 1.25d^2/2) \times 1.486/.065 \times (4.76d/4\sqrt{4.76^2+1} + 1.25d/4\sqrt{1.25^2+1})^{2/3} \times (.016)^{1/2}$

$= (2.38d^2 + .63d^2) \times 22.86 \times (.24d + .20d)^{2/3} \times .13$

$= 3.01d^2 \times 22.86 \times (.44d)^{2/3} \times .13$

TRY $d = .4$ FT.

$Q = 3.01(.4)^2 \times 22.86 \times (.44(.4))^{2/3} \times .13$

$= .45$ CFS

TRY $d = .49$ FT.

$Q = 3.01(.49)^2 \times 22.86 \times (.49(.49))^{2/3} \times .13$

$= .77$ CFS

DITCH DESIGN

TOTAL DEPTH = FLOW DEPTH + FREEBOARD

$= .49$ FT $+ .3$ FT

$= .79$ FT.

PRESENT DITCH WILL WORK AS SHOWN

VELOCITY

$V = 1.486/n \times R^{2/3} \times S^{1/2}$

$= 1.486/.065 \times (.22)^{2/3} \times (.016)^{1/2}$

$= 22.86 \; .36 \times .13$

$= 1.07$ FPS

$S = .016$
$R = .49(.49) = .22$
$n = .065$

INTERCEPTOR CULVERT DESIGN

I CULVERT CU-8 MAP 3.2.1-1

CU-8 WILL RECEIVE WATER FROM DU-1, $Q_{100-24} = 12.46$ CFS
SECTION 5, VOL 5 PAGE 10

CU-8 - 24" Ø

USE MANNING FORMULA

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

$S = .381$
$n = .024$ CORRUGATED METAL PIPE

$Q = 1.486/n \; \pi d^2/4 \; (\pi d^2/4 / \pi d)^{2/3} \; S^{1/2}$

$Q = 1.486/.024 \; \pi(2)^2/4 \; (\pi(2)^2/4 / \pi(2))^{2/3} \; (.38)^{1/2}$

$= 61.917 \times 3.14 \times (.5)^{2/3} \times .62$

$= 75.80$ CFS FULL FLOW

THE CULVERT HAS THE CAPACITY TO HANDLE THE 100 YR-24 EVENT.

II CULVERT CU-9 MAP 3.2.1-1

CU-9 WILL RECEIVE WATER FROM DU-2, $Q_{100-24} = 3.30$
SECTION 5, VOL. 5, PAGE 11

CU-9 - 24" Ø

USE MANNING FORMULA

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

$S = .82$
$n = .024$ CORRUGATED METAL PIPE

$Q = 1.486/n \; \pi d^2/4 \; (\pi d^2/4 / \pi d)^{2/3} \; S^{1/2}$

$= 1.486/.024 \; \pi(2)^2/4 \; (\pi(2)^2/4 / \pi(2))^{2/3} \; .82^{1/2}$

$= 61.92 \times 3.14 \times (.5)^{2/3} \times .91$

$= 111.26$ CFS FULL FLOW

THE CULVERT HAS THE CAPACITY TO HANDLE THE 100-24 EVENT

G. Taylor
8-30-89

CULVERT CU-8 MAP 3.2.1-1

24" Ø CMP

Q_{10-24} = 4.88 CFS SECTION 2, VOL. 5

DETERMINE INLET AND OUTLET CONTROL

A. INLET CONTROL

USE INLET CONTROL NOMOGRAPH - PAGE 189 [1]

HW/D = 24/24 = 1.0 GRAPH #3

Q = 12 CFS

THE PIPE WILL HANDLE THE FLOW WITH HW EQUAL TO THE PIPE DIAMETER

B. OUTLET CONTROL

Kc = 0.9 PAGE 181 [1]

L' = 205 FT × .44 = 90.20 FT

USE OUTLET CONTROL NOMOGRAPH - PAGE 194 [1]

Q = 10.5 CFS

THE PIPE WILL HANDLE THE FLOW

REFERENCES:

1) HANDBOOK OF STEEL DRAINAGE + HIGHWAY CONSTRUCTION PRODUCTS THIRD EDITION

B. Taylor
8-30-89

CULVERT CU-9 MAP 3.2.1-1

24" Φ CMP

Q_{10-29} = 1.31 cfs SECTION 2, VOL. 5

DETERMINE INLET AND OUTLET CONTROL

A. INLET CONTROL

USE INLET CONTROL NOMOGRAPH - PAGE 189[1)]

HW/D = 24/24 = 1.0 GRAPH 3

Q = 12 cfs

THE PIPE WILL HANDLE THE FLOW WITH HW EQUAL TO THE PIPE DIAMETER

B. OUTLET CONTROL

K_e = 0.9 PAGE 181[1)]

L' = 125 ft × .44 = 55 ft

USE OUTLET CONTROL NOMOGRAPH - PAGE 199[1)]

Q = 9 cfs

THE PIPE WILL HANDLE THE FLOW

REFERENCE:

1) HANDBOOK OF STEEL DRAINAGE + HIGHWAY CONSTRUCTION PRODUCTS THIRD EDITION

22-141 50 SHEETS
22-142 100 SHEETS
22-144 200 SHEETS
AMPAD

III Culvert CU-10 Map 3.2.1-1

CU-10 will receive water from DU-2, $Q_{100-24} = 2.30$
Section 5, Vol. 5 Page 11

CU-10 - 24"ϕ

Use Manning Formula

$S = .45$
$n = .024$ Corrugated metal pipe

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

$$= \frac{1.486}{n} \frac{\pi d^2}{4} \left(\frac{\pi d^2/4}{\pi d}\right)^{2/3} S^{1/2}$$

$$= \frac{1.486}{.024} \frac{\pi (2)^2}{4} \left(\frac{\pi (2)^2/4}{\pi (2)}\right)^{2/3} (.45)^{1/2}$$

$$= 61.92 \times 3.14 \times (5)^{2/3} \times .67$$

$$= 81.87 \text{ CFS}$$ Full Flow

The culvert has the capacity to handle the 100 YR-24 HR event.

IV Culvert CU-11 Map 3.2.1-1

CU-11 will receive water from DU-3, $Q_{100-24} = .85$
Section 5, Vol. 5 Page 13

CU-11 - 24"ϕ

Use Manning Formula

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

$S = .45$
$n = .024$ Corrugated metal pipe

$$Q = \frac{1.486}{n} \frac{\pi d^2}{4} \left(\frac{\pi d^2/4}{\pi d}\right)^{2/3} S^{1/2}$$

$$= \frac{1.486}{.030} \frac{\pi (2)^2}{4} \left(\frac{\pi (2)^2/4}{\pi (2)}\right)^{2/3} (.45)^{1/2}$$

$$= 61.92 \times 3.14 \times (5)^{2/3} \times .67$$

$$= 81.87 \text{ CFS}$$ Full Flow

The culvert has the capacity to handle the 100 YR-24 HR Event

G. Taylor
8-30-95

CULVERT CU-10 MAP 3.2.1-1

24" Ø CMP

Q_{10-24} = 1.31 cfs SECTION 2, VOL. 5

DETERMINE INLET AND OUTLET CONTROL

A. INLET CONTROL

USE INLET CONTROL NOMOGRAPH - PAGE 189 [1]

HW/D = 24/24 = 1.0 GRAPH 3

Q = 12 cfs

THE PIPE WILL HANDLE THE FLOW WITH HW EQUAL TO THE PIPE DIAMETER

B. OUTLET CONTROL

GRAPHS FOR OUTLET CONTROL WILL NOT. THE LENGTH OF THE PIPE IS TO SHORT

REFERENCES:

1) HANDBOOK OF STEEL DRAINAGE + HIGHWAY CONSTRUCTION PRODUCTS THIRD EDITION

22-141 50 SHEETS
22-142 100 SHEETS
22-144 200 SHEETS
AMPAD

G. Taylor
8-30-99

CULVERT CU-11 MAP 3.2.1-1

24" ϕ CMP

Q_{10-24} = .24 SECTION 2, VOL. 5

DETERMINE INLET AND OUTLET CONTROL

A. INLET CONTROL

USE INLET CONTROL NOMOGRAPH - PAGE 189

HW/D - 24/24 = 1.0 GRAPH 3

Q = 12 CFS

THE PIPE WILL HANDLE THE FLOW WITH HW EQUAL TO THE PIPE DIAMETER

B. OUTLET CONTROL

GRAPHS FOR OUTLET CONTROL WILL NOT WORK. THE LENGTH OF THE PIPE IS TO SHORT

REFERENCES:

1) HANDBOOK OF STEEL DRAINAGE + HIGHWAY CONSTRUCTION PRODUCTS THIRD EDITION

22-141 50 SHEETS
22-142 100 SHEETS
22-144 200 SHEETS
AMPAD

V CULVERT CU-12 MAP 3.2.1-1

CU-12 WILL RECEIVE WATER FROM DU-3, $Q_{100-24} = .85$ CFS
SECTION 5, VOL.5, PAGE 13

CU-12 24" HALF ROUND

USE MANNING FORMULA

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

$S = .13$
$n = .024$ CORRUGATED METAL PIPE

$A = \pi d^2/4 \div 2 = \pi d^2/8$

$R = \pi d^2/8 \div \pi d/2 = \pi d^2/8 \times 2/\pi d = d/4$

$Q = 1.486/n \times \pi d^2/8 \times (d/4)^{2/3} S^{1/2}$

$= 1.486/.024 \times \pi(2)^2/8 \times (2/4)^{2/3} (.13)^{1/2}$

$= 61.92 \times 1.57 \times (.5)^{2/3} \times .36$

$= 22.00$ CFS

THE HALF ROUND HAS THE CAPACITY TO HANDLE THE 100YR-24HR EVENT

REFERENCE: SURFACE MINING WATER DIVERSION DESIGN MANUAL
UNITED STATES DEPARTMENT OF THE INTERIOR
OFFICE OF SURFACE MINING

PORTAL AREA

DISTURBED AREA DRAINAGE -1) MAP 3.2.1-1

6-20-89
G. TAYLOR
REVISED
4-27-89

AREA	ACRES 1)	H_L 1)	Δ ELEVATION 1)	T_c 2)	CN 3)	Q (CFS) 10-24
DA-1	9.21	881.8'	8810 - 8690 = 130'	.050	88	12.71
DA-2	12.03	1191.21'	8800 - 8680 = 120'	.074	88	16.42
DA-3	7.91	650.38'	8670 - 8578 = 92'	.040	90	11.82

2) KIRPITCH FORMULA

$$T_c = \left[11.9\, L^3/H \right]^{.0385}$$

T_c = HOURS
L = HYDRAULIC LENGTH (MILES)
H = Δ ELEVATION (FT)

AREA	ACRES	CN 3)	H_L	Z OF CONTOUR (FT)	SLOPE %	CONTOUR INTERVAL	T_c 4)	Q 10-24
ARA-1	4.6	82	1151.4	12,982	64.79	10	.056	4.82

3) WT. AVG. BASED ON CN=90 FOR DISTURBED AREA AND CN=70 FOR UNDISTURBED AREA

4) KENT FORMULA

$$T_c = \left(\frac{L^{.8} \left(\left(1000/CN - 10 \right) + 1 \right)^{.7}}{1900\ S^{1/2}} \right) / .6$$

T_c = HOURS
L = HYD. LENGTH
CN = CURVE NUMBER
S = SLOPE

A. DITCHES IN AREA DA-1 WILL BE DESIGNED TO CARRY A PEAK FLOW OF 12.71 CFS SECOND. THE DITCH DESIGN WILL BE TYPICAL FOR DD-1,

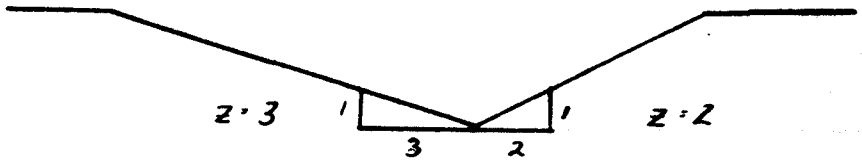
USING MANNING FORMULA

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

A = AREA
n = ROUGHNESS
R = HYRAULIC RADIUS
S = SLOPE

G. TAYLOR - 11-16-89

THE DITCH WILL BE A V SHAPE CUT BY A MOTOR GRADER WITH A FREEBOARD OF .3 FT.



DETERMINE DEPTH OF FLOW

$A = zd^2/2 + zd^2/2$

$R = zd/4\sqrt{z^2+1} + zd/4\sqrt{z^2+1}$

$n = .0225$ EARTH CHANNEL, WELL CONSTRUCTED, IN GOOD CONDITION
$S = .0375$ (MAP 3.2.1-1) AVG. SLOPE FOR DITCH
$Q = 12.71$ CFS (SECTION 6, VOL. 5)

$Q = (zd^2/2 + zd^2/2) \times 1.486/n \times (zd/4\sqrt{z^2+1} + zd/4\sqrt{z^2+1})^{2/3} \times S^{1/2}$

$= (3d^2/2 + 2d^2/2) \times 1.486/.0225 \times (3d/4\sqrt{3^2+1} + 2d/4\sqrt{2^2+1})^{2/3} \times (.0375)^{1/2}$

$Q = (1.5d^2 + d^2) \times 66.04 \times (.24d + .22d)^{2/3} \times .19$

TRY $d = .4$ FT.

$Q = (1.5(.4)^2 + (.4)^2) \times 66.04 \times (.24(.4) + .22(.4))^{2/3} \times .15$

$= 1.61$ CFS

TRY $d = .95$

$Q = (1.5(.95)^2 + (.95)^2) \times 66.04 \times (.24(.95) + .22(.95))^{2/3} \times .19$

$= 16.26$ CFS

TRY $d = .85$

$Q = (1.5(.85)^2 + (.85)^2) \times 66.04 \times (.24(.85) + .22(.85))^{2/3} \times .19$

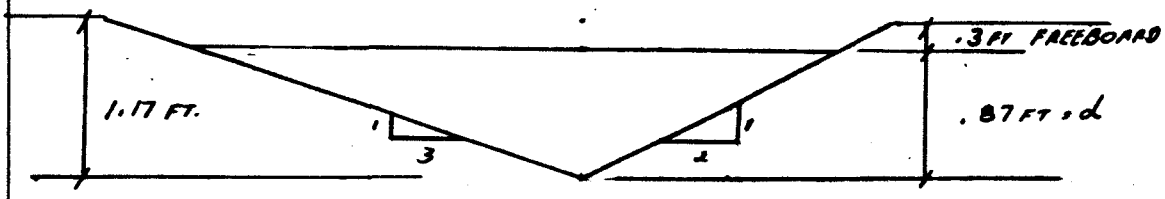
$= 12.08$ CFS

TRY $d = .87$

$Q = (1.5(.87)^2 + (.87)^2) \times 66.04 \times (.24(.87) + .22(.87))^{2/3} \times .19$
$= 12.85$ CFS

NOV 28 1989

G. Taylor 11-16-89



TYPICAL DITCH
FOR DD-1

$$V = \frac{1.486}{n} \times R^{2/3} \times S^{1/2}$$

$n = .0225$
$R = (.24(.87) + .22(.87)) = .40$
$S = .0375$

$$= 1.486/.0225 \times (.40)^{2/3} \times (.0375)^{1/2}$$

$$= 66.04 \times .54 \times .19$$

$$= 6.79 \text{ fps}$$

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OIL, GAS & MINING

22-141 50 SHEETS
22-142 100 SHEETS
22-144 200 SHEETS
AMPAD

G. TAYLOR
REVISED
11-16-89

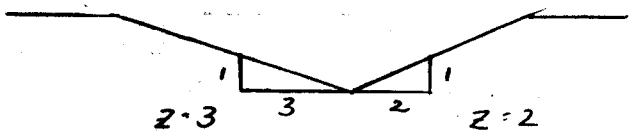
B DITCH IN AREA ARA-1 WILL BE DESIGNED TO CARRY A PEAK FLOW OF 4.82 CFS FOR 10YR-24HR SECTION 6 VOL. 5.

USING MANNING FORMULA

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

A = AREA
n = ROUGHNESS
R = HYDRAULIC RADIUS
S = SLOPE

THE DITCH WILL BE A V SHAPE CUT WITH A MOTOR GRADER WITH A FREEBOARD OF .3FT.



DETERMINE DEPTH OF FLOW DD-2

$$A = zd^2/2 + zd^2/2$$

$$R = zd/4\sqrt{z^2+1} + zd/4\sqrt{z^2+1}$$

n = .0225 EARTH CHANNEL, WELL CONSTRUCTED, IN GOOD CONDITION
S = .0746 MAP 3.2.1-1 AVG. SLOPE FOR DITCH
Q = 4.82CFS

$$Q = \left(zd^2/2 + zd^2/2\right) \times 1.486/n \times \left(zd/4\sqrt{z^2+1} + zd/4\sqrt{z^2+1}\right)^{2/3} \times S^{1/2}$$

$$= \left(3d^2/2 + 2d^2/2\right) \div 1.486/.0225 \times \left(3d/4\sqrt{3^2+1} + 2d/4\sqrt{2^2+1}\right) \times (.0746)^{1/2}$$

$$Q = (1.5d^2 + d^2) \times 66.04 \times (.24d + .22d)^{2/3} \times .27$$

TRY $d = .6$

$$Q = (1.5(.6)^2 + (.6)^2) \times 66.04 \times (.24(.6) + .22(.6))^{2/3} \times .27$$

$$= 6.77 \text{ cfs}$$

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NOV 28 1989
DIVISION OF
HIGHWAYS & RR

TRY $d = .5$ FT

$Q = (1.5(.5)^2 + (.5)^2) \times 66.04 \times (.24(.5) + .22(.5))^{2/3} \times .27$

$= 4.16$ CFS

TRY $d = .55$ FT.

$Q = (1.5(.55)^2 + (.55)^2) \times 66.04 \times (.24(.55) + .22(.55))^{2/3} \times .27$

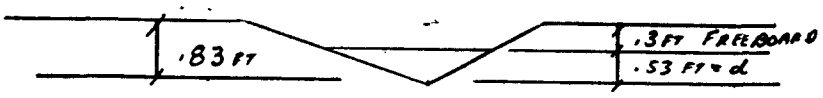
$= 5.37$ CFS

TRY $d = .53$ FT

$Q = (1.5(.53)^2 + (.53)^2) \times 66.04 \times (.24(.53) + .22(.53)) \times .27$

$= 4.86$ FT.

USE A $d = .53$ FT FOR DEPTH OF FLOW



TYPICAL DITCH
FOR OD-2

$V = 1.486/n \times R^{2/3} \times S^{1/2}$

$n = .0225$
$R = (.24(.53) + .22(.53)) = .24$
$S = .0746$

$= 1.486/.0225 \times (.24)^{2/3} \times (.0746)^{1/2}$

$= 66.04 \times .38 \times .27$

$= 6.85$ FPS ROCK CHANNEL

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22-141 50 SHEETS
22-142 100 SHEETS
22-144 200 SHEETS
AMPAD

C. DITCH DD-4 MAP 3.2.1-1

USE MANNING FORMULA

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

A = AREA
n = ROUGHNESS
R = HYDRAULIC RADIUS
S = SLOPE
Q = 4.82 CFS 10YR-24HR
SECTION 6, VOL 5.

Z = 20

Q = 4.82
$A = zd^2$
$R = zd / 2\sqrt{z^2+1}$
n = .016 ASPHALT, ROUGH
S = .03 (FIELD SURVEY MAY, 1989)

$Q = zd^2 \times 1.486/n \times \left(zd/2\sqrt{z^2+1}\right)^{2/3} \times S^{1/2}$

$= 20d^2 \times 1.486/.016 \times \left(20d/2\sqrt{20^2+1}\right)^{2/3} \times (.03)^{1/2}$

$= 20d^2 \times 92.88 \times (.50d)^{2/3} \times .17$

TRY d = .26 FT.

$Q = 20(.26)^2 \times 92.88 \times (.5(.26))^{2/3} \times .17$

= 5.44 CFS

TRY d = .24 FT.

$Q = 20(.24)^2 \times 92.88 \times (.5(.24))^{2/3} \times .17$

= 4.39 CFS

TRY d = .25 FT

$Q = 20(.25)^2 \times 92.88 \times (.5(.25))^{2/3} \times .17$

= 4.90 CFS

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AMPAD 22-141 50 SHEETS 22-142 100 SHEETS 22-144 200 SHEETS

VELOCITY

$V = 1.486/n \times R^{2/3} \times S^{1/2}$

$= 1.486/.016 \times (.13)^{2/3} \times (.03)^{1/2}$

$= 92.88 \; .25 \times .17$

$= 3.99$ FPS

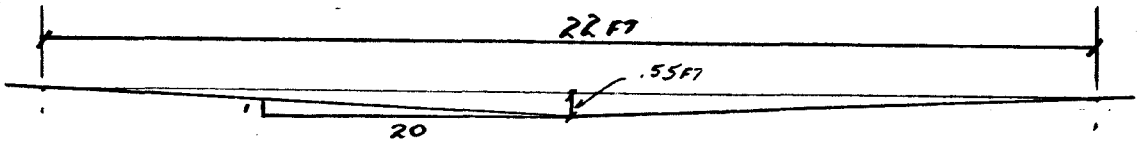
$n = .016$
$R = .5(.25) = .13$
$S = .03$

TOTAL DEPTH = DEPTH OF FLOW + FREEBOARD

$= .25$ FT $+ .3$ FT

$= .55$ FT.

DITCH DESIGN



TYPICAL DITCH
DD-4

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ENGINEERING & PLANNING

AMPAD 22-141 50 SHEETS 22-142 100 SHEETS 22-144 200 SHEETS

6-19-90
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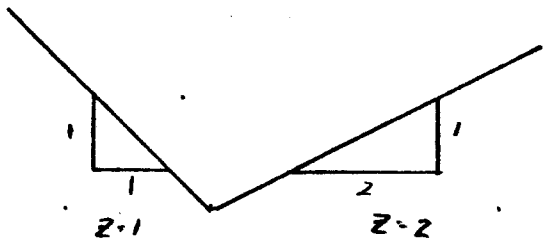
D. DD-5

DITCH WILL HANDLE WATER FROM DD-7 AND AREA DA-3
THE PEAK FLOW WILL BE 29.13 CFS + 11.82 CFS = 40.95 CFS
10 YR - 24 HRS.

THE DITCH WILL BE V SHAPE IN DESIGN WITH .3 FT. FREEBOARD



DETERMINE THE DEPTH OF FLOW

USE MANNING FORMULA

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

$$A = \text{AREA} = zd^2/2 + zd^2/2$$

$$R = zd/4\sqrt{z^2+1} + zd/4\sqrt{z^2+1}$$

n = .045 ROCK CHANNEL, JAGGED AND IRREGULAR

S = .054 MAP 3.2.1-1 AVG. SLOPE FOR DITCH

$$Q = 1.486/n \times (zd^2/2 + zd^2/2) \times \left(zd/4\sqrt{z^2+1} + zd/4\sqrt{z^2+1}\right)^{2/3} \times S^{1/2}$$

$$40.95 = 1.486/.045 \times (1d^2/2 + 2d^2/2) \times \left(1d/4\sqrt{1+1} + 2d/4\sqrt{2^2+1}\right)^{2/3} \times (.054)^{1/2}$$

$$40.95 = 33.02 \times (.5d^2 + d^2)^2 \times (.19d + .22d)^{2/3} \times .23$$

$$40.95 = 7.70 \times d^2(1.5) \times (.40d)^{2/3}$$

$$5.32 = d^2(1.5) \times (.40d)^{2/3}$$

6-19-90
G. Taylor

TRAIL d

d (ft)	Q (cfs)
1.0	.81
1.5	2.40
2.0	5.17
2.02	5.31

d = 2.02 FT

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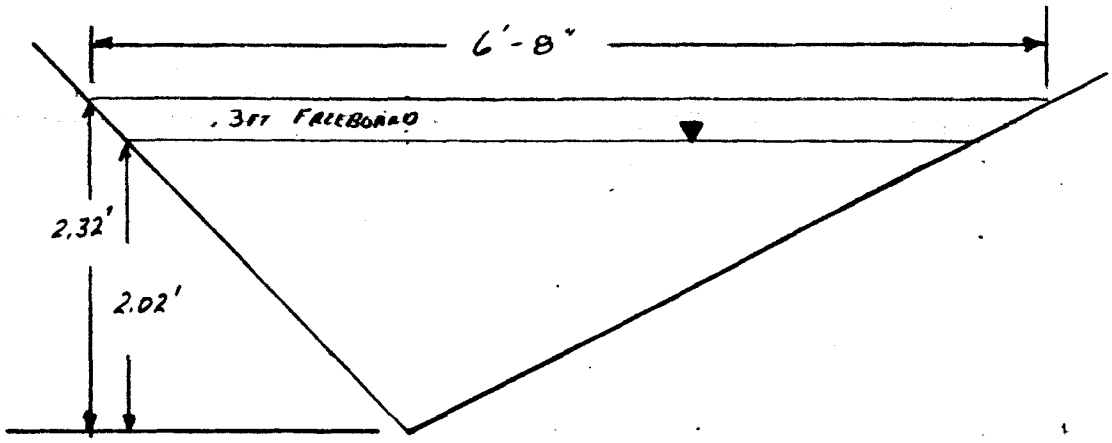
STATE OF UTAH

Wm W. Shriver, 11-21-90



TYPICAL DESIGN FOR
DITCH DD-5

DETERMINE VELOCITY

$V = 1.486/n \times R^{2/3} \times S^{1/2}$

$= 1.486/.045 \times (.81)^{2/3} \times (.054)^{1/2}$

$= 33.02 \quad .87 \times .23$

$= 6.65$ FPS

R = .81
S = .054
n = .045

NO PROTECTION WILL BE NEEDED BECAUSE CHANNEL IS IN ROCK

E. DD-6

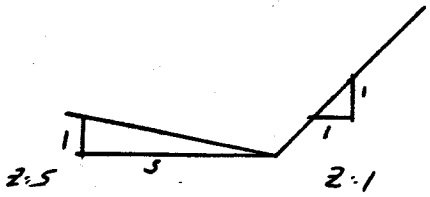
DITCHES IN AREA DA-1 WILL BE DESIGNED TO CARRY A PEAK FLOW OF 12.71 CFS 10YR-24HR EVENT SECTION 6, VOL. 5.

USING MANNING FORMULA

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

A = AREA
n = ROUGHNESS
R = HYDRAULIC RADIUS
S = SLOPE

THE DITCH WILL BE IN A V SHAPE WITH A FREEBOARD OF = .3 FT



DETERMINE DEPTH OF FLOW

$A = 2d^2/2 + 2d^2/2$

$R = 2d/4\sqrt{2^2+1} + 2d/4\sqrt{2^2+1}$

n = .043 EARTH, UNIFORM SECTION. ROCK JAGGED AND IRREGULAR

S = .0765 MAP 3.2.1-1 AVG. SLOPE FOR DITCH

$$Q = 2d^2/2 + 2d^2/2 \times 1.486/n \times \left(2d/4\sqrt{2^2+1} + 2d/4\sqrt{2^2+1}\right)^{2/3} \times S^{1/2}$$

$$= 5d^2/2 + 1d^2/2 \times 78.21 \times \left(5d/4\sqrt{5^2+1} + 1d/4\sqrt{1^2+1}\right)^{2/3} \times (.076)^{1/2}$$

$$= 2.5d^2 + .5d^2 \times 78.21 \times (.25d + .10d)^{2/3} \times .28$$

$$= 3.0d^2 \times 78.21 \times (.43d)^{2/3} \times .26$$

TRY $d = 1.2$ FT.

$$Q = 3(1.2)^2 \times 78.21 \times (.43(1.2))^{2/3} \times .28$$

$$= 60.73 \text{ CFS}$$

TRY $d = .6$ FT

$$Q = 3(.6)^2 \times 78.21 \times (.43(.6))^{2/3} \times .28$$

$$= 9.54 \text{ CFS}$$

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S & I

TRY $d = .8$ FT

$Q = 3(.8)^2 \times 78.21 \times (.43(.8))^{2/3} \times .28$

$= 20.57$ CFS

TRY $d = .67$ FT

$Q = 3(.67)^2 \times 78.21 \times (.43(.67))^{2/3} \times .28$

$= 12.81$

USE $d = .67$

TOTAL DEPTH = DEPTH OF FLOW + FREEBOARD

$= .67$ FT + 3 FT

$= .97$ FT.

VELOCITY

$V = 1.486/n \times R^{2/3} \times S^{1/2}$

$= 1.486/.019 \times (.29)^{2/3} \times (.0765)^{1/2}$

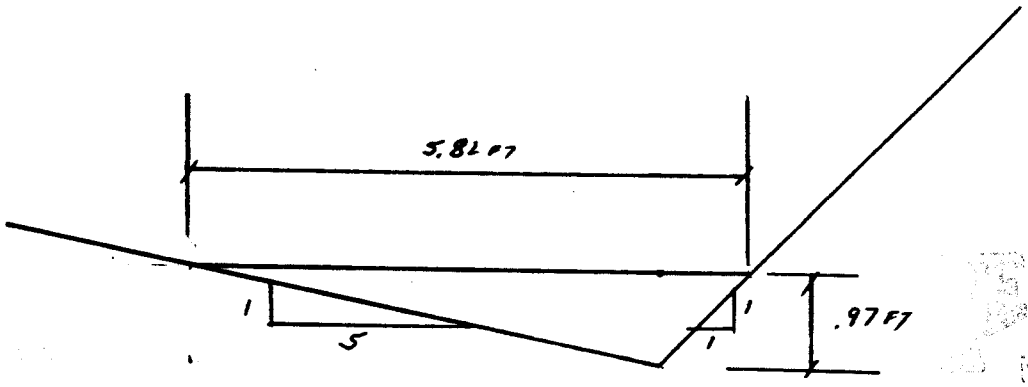
$= 78.21 \times .43 \times .28$

$= 9.90$ FPS

$n = .019$
$R = .43(.67) = .29$
$S = .0765$

DITCH HAS ROCK IN ALL READY RIPRAP WILL NOT BE NECESSARY

DITCH DESIGN



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G. TAYLOR
REVISED 10-11-90

CHANNEL DESIGN FROM MIDDLE BENCH TO LOWER BENCH
DD-7

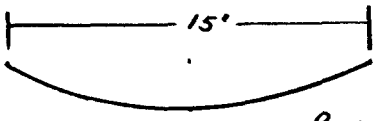
PEAK FLOW OF CHANNEL IS FROM DA-1 AND DA-2

DA-1 = 12.71 CFS
DA-2 = 16.42 CFS } SECTION 6, VOLUME 5, PAGE 1/11

TOTAL FLOW = 29.13 CFS

SLOPE = 64.76 % MAP 3.2.1-1

A. DETERMINE DEPTH OF FLOW (ASSUME CRITICAL DEPTH AS WE WILL HAVE SUPER CRITICAL FLOW IN THIS DITCH)



PARABOLA

USE MANNING FORMULA

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

$A = 2/3\, dT$
$R = 2dT^2/3T^2 + 8d^2$
$S = .6476$
$n = .020$ GUNITE, WAVY SECTION
$T = 15$ FT.
$Q = 29.13$ CFS

$Q = 1.486/n \times (2dT^2/3T^2 + 8d^2)^{2/3} \times 2/3\, dT \times S^{1/2}$

$29.13 = 1.486/.02 \times (2d(15)^2/3(15)^2 + 8d^2)^{2/3} \times 2/3\, d(15) \times (.6476)^{1/2}$

$29.13 = 74.30 \times (450d/675 + 8d^2)^{2/3} \times 10d \times .80$

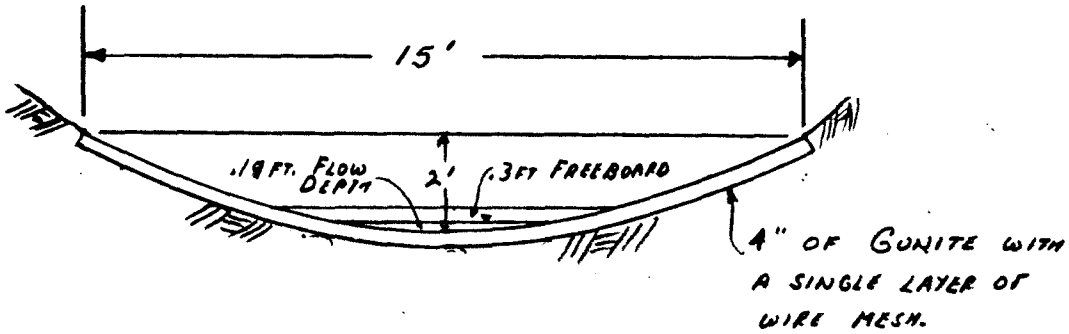
$.49 = (450d/675 + 8d^2)^{2/3} \times 10d$

TRAIL d

d FT	Q CFS
.1	.16
.15	.32
.17	.40
.18	.43
.19	.48

USE d = .49 FT

6-14-90
G. Taylor
Revised 10-11-90



TYPICAL CHANNEL

NOTE: The design and flow calculations for this Diversion Facility were performed under my direction and to the best of my Professional Knowledge are Correct.

REGISTERED PROFESSIONAL ENGINEER
8682
WILLIAM W. SHRIVER
STATE OF UTAH

Wm W. Shriver 11-1-90

22-141 50 SHEETS
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22-144 200 SHEETS
AMPAD

SECTION 7

STAGE VOLUME
PORTAL AREA

NOV 28 1989
DIVISION
OIL, GAS & MINING

NOTE:

Revision 3, dated 11/27/89 to drawing 3.2.1-1 moved the boundary of area tributary to the mine sedimentation pond up the hill and increased this area by 1.21 Ac. This increase in drainage area represents only a 3.35% increase which is within the limits of accuracy of the engineering techniques used and therefore does not warrant any recalculation of the pond hydrology.

Insert in front of
Eng. Calcs Sec 7

6-19-89
G. TAYLOR

PORTAL AREA
STAGE VOLUME

SIZING POND

1. SEDIMENT VOLUME

0.1 AC.-FT / AC. FOR EACH ACRE OF DISTURBED AREA

VOL. = 0.1 AC-FT/AC × 33.79 AC. (MAP 3.2 1-1)

= 3.39 AC-FT = 147,189 CU.FT

USE 147,190 CU.FT

2. STORM DETENTION

10 YR. - 24 HR STORM

P = 2.43 IN SECTION 2 PAGE 5 OF 7 1)

CN = 88 BASED CN: 90 FOR DISTURBED AREA AND CN: 70 FOR UNDISTURBED AREA.

S = 1000/CN - 10 Eq 2.39 PAGE B1
= 1000/88 - 10
= 1.36

Q = (P - .2S)²/(P + .8S) Eq 2.38 PAGE
= (2.43 - .2(1.36))²/(2.43 + .8(1.36))
= 4.65/3.52
= 1.32 ÷ 12 IN/FT = .11 FT.

APPLIED HYD. AND SEDIMENTOLOGY FOR DISTRUBED AREA BARFIELD AND HAHN 2)

33.79 ACRES × 43,560 SQ FT/AC × .11 FT = 162,259 CU.FT

USE 162,260 CU.FT

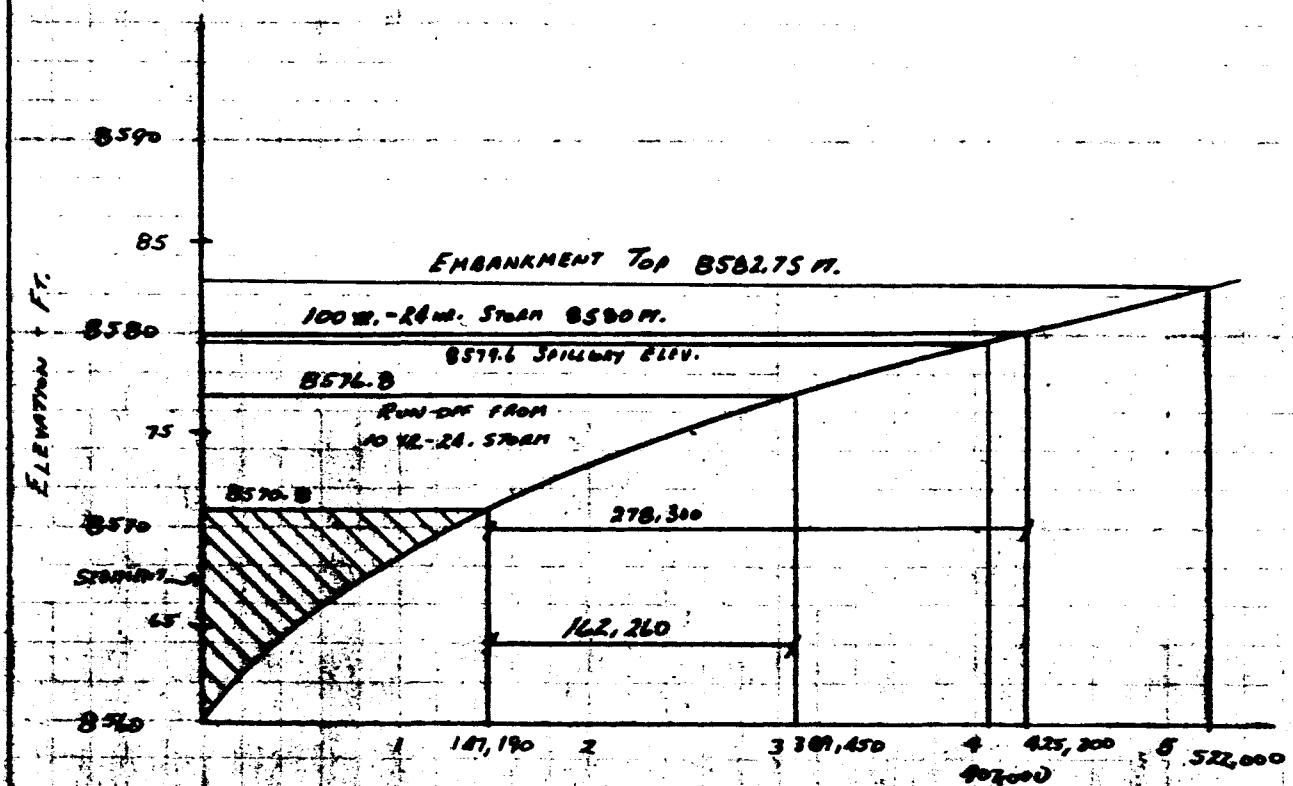
THEREFORE THE TOTAL STORAGE / DETENTION CAPACITY OF THE POND SHOULD NOT BE LESS THAN:

V_T = 147,190 + 162,260 = 309,450 CU.FT.

REVISED 9-19-89
G. TAYLOR

3. POND CAPACITY (MAP 3.2.1-2B)

	ELEVATION	AREA (FT²)	AVG AREA (FT²)	Δ VOL. (FT³)	ACC. VOL (FT³)
	8560	3,054			
			8,927	44,635	44,635
INTERMEDIATE CONTOUR	8565	14,800			
			17,900	89,500	134,135
	8570	21,000			
			24,200	121,000	255,135
INTERMEDIATE CONTOUR	8575	27,400			
			30,500	140,300	395,435
	8579.6	33,600			



407,000 CU.FT. - 309,450 CU.FT. = REMAINING WATER STORAGE FOR MINE DISCHARGE 97,550 CU.FT. OR 729,678 GALLONS

REVISED 9-18-89
G. TAYLOR

ORIFICE FLOW

$Q = C' a \sqrt{2gH}$

$C' = .60$
$a = 12.57\ FT^2$

EQ. 4.2 PAGE 230 APPLIED HYDROLOGY AND SEDIMENTOLOGY FOR DISTURBED AREAS - OKLAHOMA TECHNICAL PRESS

$= 60.51 \sqrt{H}$

PIPE FLOW

$Q = a (2gH')^{1/2} / (1 + K_e + K_b + K_c L)^{1/2}$

EQ. 4.4 PAGE 231

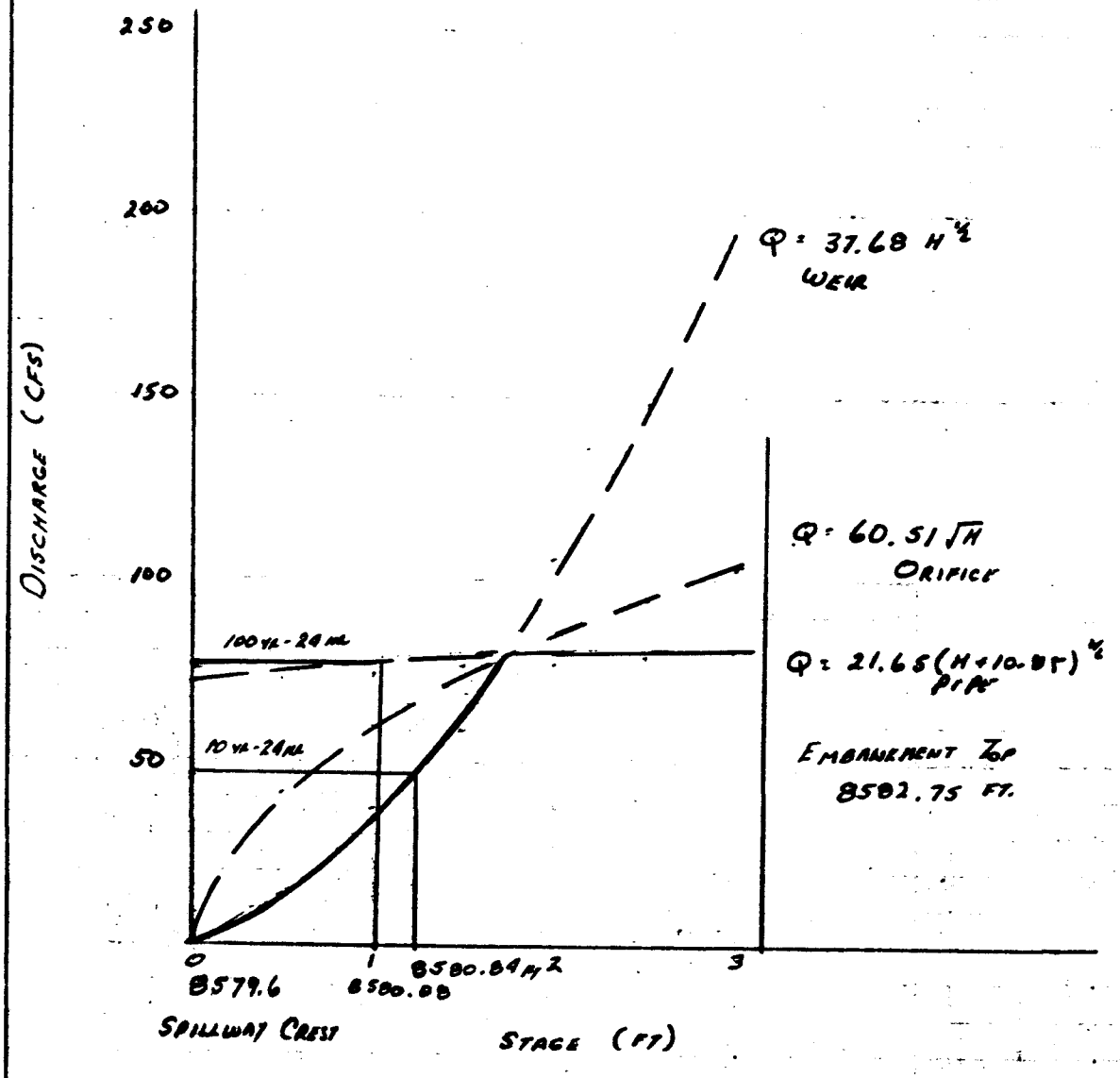
$a = 4.91\ FT^2$
$L = 63\ FT$
$K_e = 1.0$
$K_b = .5$
$K_c = .0129$ TABLE 4.1 PAGE 233

$H' = H + 12.35 - 1.50$
$= H + 10.85$

$Q = 4.91 (2g\ H + 10.85)^{1/2} / (1 + 1 + .5 + .0129(63))^{1/2}$
$= 39.40 (H + 10.85)^{1/2} / 1.82$
$= 21.65 (H + 10.85)^{1/2}$

H	Q_{weir}	$Q_{orifice}$	Q_{pipe}
0	0	0	71.31
.5	13.33	42.79	72.94
1.0	37.70	60.51	74.53
1.5	69.26	74.11	76.08
2.0	106.63	85.57	77.61
2.5	149.02	95.67	79.10
3.0	195.89	104.80	80.57

REVISE 9-18-99
G. Tanner



STAGE - DISCARGE CURVE

TRAIN LOADOUT
CULVERT DESIGN
24"Ø CMP - CD-8

G. TAYLOR
8-30-89

DETERMINE IF THERE IS INLET OR OUTLET CONTROL

A. INLET CONTROL

Section 12

Q_{10-24} = 18.41 CFS FROM SL — IP 3.2.1-3

USE THE INLET CONTROL NO — 39[1]

HW/D = 36/24 = 1.50

Q = 18 CFS FOR 24"Ø CMP

B. OUTLET CONTROL

K_c = 0.9 PAGE 181[1]

L' = 70 FT x .44 = 30.80

PAGE 194[1] - L' IS NOT PART OF THE NOMOGRAPH

REFERENCES

1) HANDBOOK OF STEEL DRAINAGE + HIGHWAY CONSTRUCTION PRODUCTS
THIRD EDITION

22-141 50 SHEETS
22-142 100 SHEETS
22-144 200 SHEETS
AMPAD

TRAIN LOADOUT
CULVERT DESIGN
36"Ø CMP - CO-9

G. TAYLOR
8-30-89

DETERMINE IF THERE IS INLET OR OUTLET CONTROL

A. INLET CONTROL

Q_{10-24} = 18.41 CFS FROM SECTION 10, VOL. 5, MAP 3.2.1-3

USE INLET CONTROL NOMOGRAPH PAGE 189 [1]

HW/D = 36/36 = 1.0 GRAPH #3

Q = 33 CFS FOR 36" Ø CMP

THE PIPE WILL HANDLE THE FLOW WITH HW EQUAL TO THE PIPE DIAMETER

B. OUTLET CONTROL

GRAPHS FOR OUTLET CONTROL WILL NOT WORK. THE LENGTH OF THE PIPE IS TO SHORT.

REFERENCES:

1) HANDBOOK OF STEEL DRAINAGE + HIGHWAY CONSTURCTION PRODUCTS THIRD EDITION

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8-30-89

CULVERT CD-12
30" Ø · CMP

DETERMINE IF THERE IS INLET OR OUTLET CONTROL

A. INLET CONTROL

Q_{10-24} = 1.23 CFS SECTION 12, VOL. 5, MAP 3.2.1-3

USE INLET CONTROL NOMOGRAPH - PAGE 189 [1]

HW/D = 30"/30 = 1.0 GRAPH #3

Q = 20 CFS FOR 30" Ø CMP

THE PIPE WILL HANDLE THE FLOW WITH HW EQUAL TO THE PIPE DIAMETER

B. OUTLET CONTROL

K_e = 0.9 PAGE 181 [1]

L' = 95 FT × .61 = 57.95 FT.

USE OUTLET CONTROL NOMOGRAPH - PAGE 194 [1]

Q = 18 CFS FOR 30" Ø CMP

THE PIPE WILL HANDLE THE FLOW

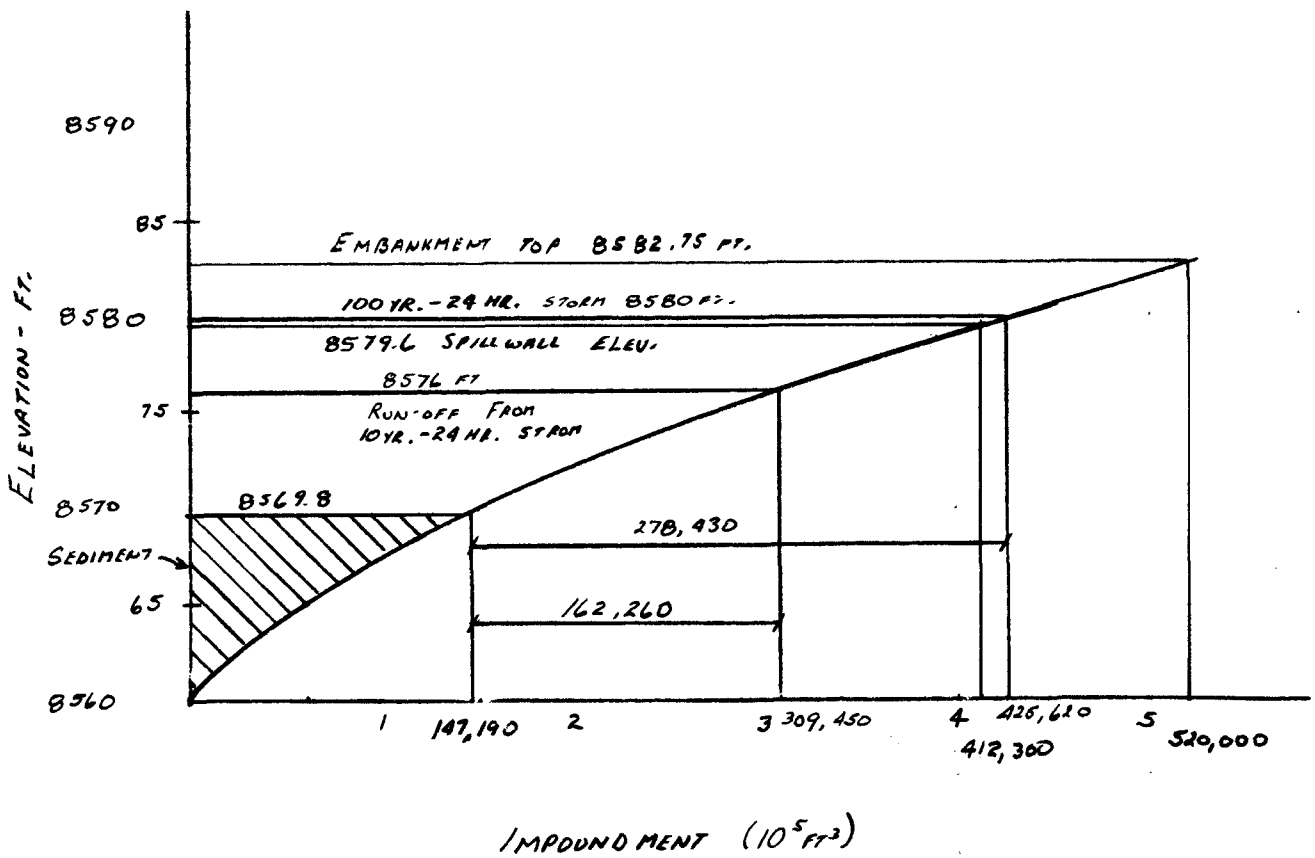
REFERENCE

1) HANDBOOK OF STEEL DRAINAGE + HIGHWAY CONSTRUCTION PRODUCTS THIRD EDITION

22-141 50 SHEETS
22-142 100 SHEETS
22-144 200 SHEETS
AMPAD

3. POND CAPACITY (MAP 3.2.1-2B)

	ELEVATION	AREA $(FT)^2$	AVG. AREA (FT^2)	Δ VOL. $(FT)^3$	ACC. VOL. (FT^3)
	8560	9,800			
			12,300	61,500	61,500
INTERPOLATED CONTOUR	8565	14,800			
			17,900	89,500	151,000
	8570	21,000			
			24,200	121,000	272,000
INTERPOLATED CONTOUR	8575	27,400			
			30,500	140,300	412,300
	8579.6	33,600			



412,300 CU.FT − 309,450 CU.FT. = REMAINING WATER STORAGE FOR MINE DISCHARGE 102,850 CU.FT. OR 769,318 GALLONS

4. 100 YR - 24 HR STORM

P = 3.5 IN SECTION 2 PAGE 5 OF 7

CN = 88 BASED CN = 90 FOR DISTURBED AREA AND CN = 70 FOR UNDISTURBED AREA.

L_c = .101 HRS

S = 1000/88 - 10 = 1.36 EQ 239 PAGE 81

Q = $(P - .2S)^2 / P + .8S$ APPLIED HYDROLOGY 2) AND SEDIMENTOLOGY FOR DISTURBED AREAS, OKLAHOMA TECHNICAL PRESS BARFIELD AND HAHN

= $(3.5 - .2(1.36))^2 / 3.5 + .8(1.36$ EQ 238 PAGE 81

= $(3.5 - .27)^2 / 3.5 + 1.09$

= $10.43 / 4.59$

= 2.27 INCH ÷ 12 IN/FT = .19 FT

33.79 ACRES × 43560 SQ FT/AC. × .19 FT = 278,432.98 2 -

USE 278,430 CUFT.

REFERENCE

1) SOIL CONSERVATION SERVICE - URBAN HYDROLOGY FOR SMALL WATERSHEDS, TR-55, 1986

2 BARFIELD, B. J., R.C. WARNER, C.T. HAHN APPLIED HYDROLOGY AND SEDIMENTOLOGY FOR DISTURBED AREAS. OKLAHOMA TECHNICAL PRESS

22-141 50 SHEETS
22-142 100 SHEETS
22-144 200 SHEETS
AMPAD

POTAL AREA DROP INLET
STAGE DISCHARGE CURVE

CN = 88

MAX FLOW LENGTH = 1951.98 FT (MAP 3.2.1-1)

DISTURBED AREA = 33.79 AC. (MAP 3.2.1-1)

CONCENTRATION TIME = .101 HRS KIRPICH FORMULA $t_c = .0078 L^{.77} (L/H)^{.385}$

10 YR - 24 HR = 2.43 IN
100 YR - 24 HR = 3.5 IN
} SECTION 2 PAGE 5

MINE DISCHARGE

321,000 GAL/DAY ÷ 24 DAY/HR = 13,375 GAL/HR ÷ 60 MIN/HR = 222.92 GPM

222.92 GPM × .00228 = .51 CFS

PEAK FLOW

10 YR - 24 HR = 45.62 CFS + .51 CFS = 46.13 CFS

100 YR - 24 HR = 74.30 CFS + .51 CFS = 74.81 CFS

Q_{100} 74.30 CFS

$Q_{25} = 26.81$

DATA - MAP - 3.2.1-2A

SPILLWAY CREST ELEVATION - 8579.6
JUNCTION OF RISER AND BARREL EL - 8567.9
SPILLWAY OUTLET ELEVATION - 8566.0
MAX. AVAILABLE WATER ELEVATION - 8582.75
RISER DIA. = 48"
BARREL DIA. = 30"

WEIR FLOW

$Q = CLH^{3/2}$ C = 3 L = 12.57 FT

$Q = 37.70 H^{3/2}$

EQ. 4.1 PAGE 230 APPLIED HYDROLOGY AND SEDIMENTOLOGY FOR DISTURBED AREAS OKLAHOMA TECHNICAL PRESS

ORIFICE FLOW

$Q = C' a \sqrt{2gH}$ $\quad C' = .60$ $\quad$ Eq 4.2 PAGE 232

$a = 12.57 \text{ FT}^2$

$Q = 60.51 \sqrt{H}$

APPLIED HYDROLOGY AND SEDIMENTOLOGY FOR DISTURBED AREAS · OKLAHOMA TECHNICAL PRESS

PIPE FLOW

Eq 4.4 PAGE 232

$Q = a (2gH')^{1/2} / (1 + K_e + K_b + K_c L)^{1/2}$

$a = 4.91 \text{ FT}^2$
$L = 63 \text{ FT}$
$K_e \quad 1.0$
$K_b = .5$
$K_c = .0129$ TABLE 4.1 PAGE 233

$H' = H + 12.35 - 1.50$
$= H + 10.85$

$Q = 4.91 (2g (H + 10.85))^{1/2} / (1 + 1 + .5 + .0129(63))^{1/2}$

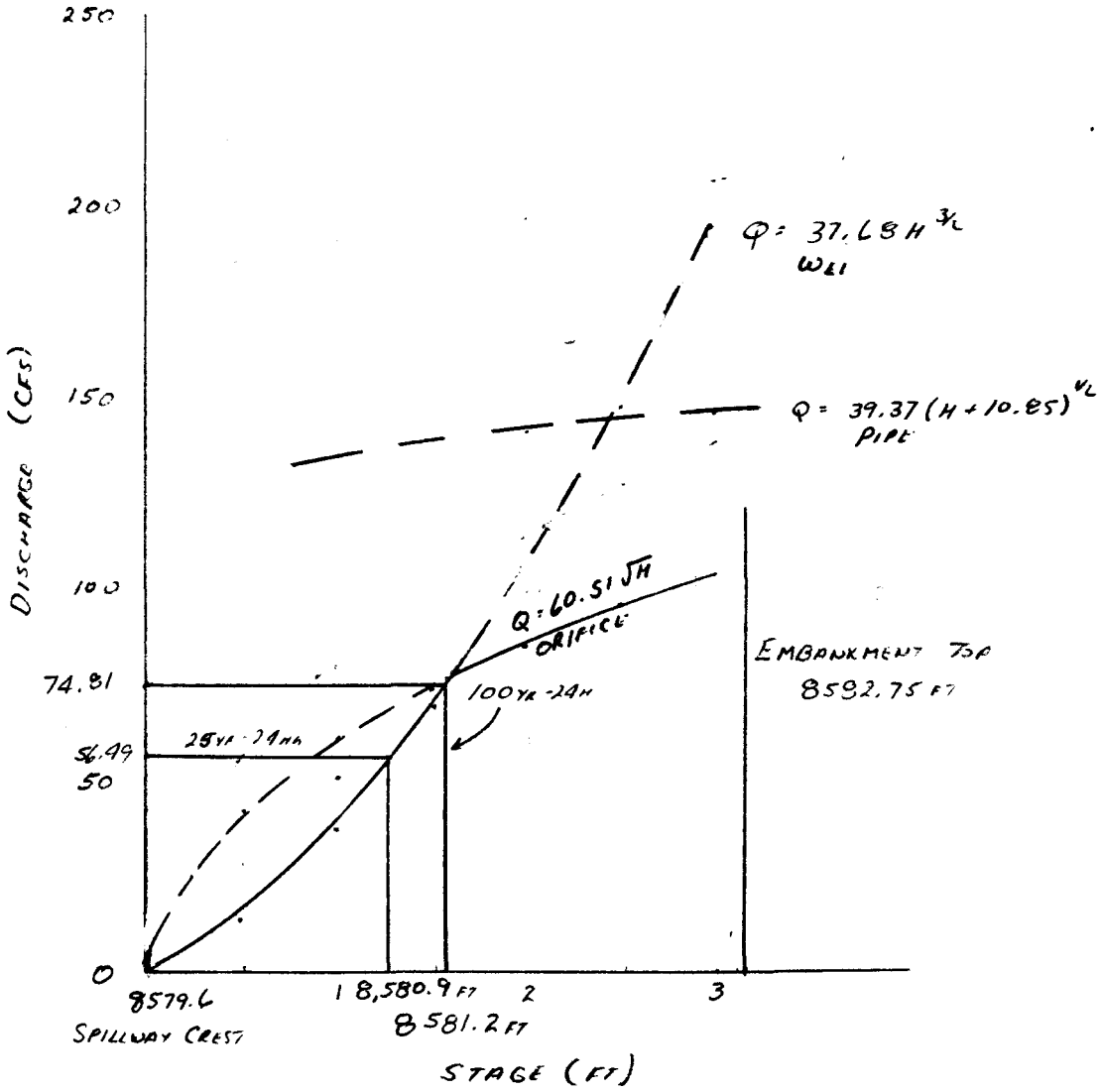
$= (4.91)(8.02)(H + 10.85)^{1/2} / 1.82$

$Q = 39.37 (H + 10.85)^{1/2}$

H	Q WEIR	Q ORIFICE	Q PIPE
0	0	0	0
.5	13.33	42.79	132.64
1.0	37.70	60.51	135.53
1.5	69.26	74.11	138.36
2.0	106.63	85.57	141.13
2.5	149.02	95.67	143.85
3.0	195.89	104.80	146.52

22-141 50 SHEETS
22-142 100 SHEETS
22-144 200 SHEETS
AMPAD

22-141 50 SHEETS
22-142 100 SHEETS
22-144 200 SHEETS
AMPAD



STAGE - DISCHARGE CURVE

SECTION 8

TOPSOIL DIVERSIONS

G. TAYLOR
6-26-09

TOPSOIL DIVERSIONS

THIS IS A TEMPORARY DIVERSION FOR THE NORTH BRANCH OF ECCLES CREEK. THE DIVERSION CONSISTS OF A 36"Ø HALF ROUND CMP, 36"Ø FULL ROUND AND A 24"Ø PLASTIC PIPE. SINCE THIS IS A TEMPORARY DIVERSION, IT MUST PASS THE 10 YR-24 HR. STORM EVENT. FROM SECTION 2, VOL. 5 PAGE 7 OF 7 THE PEAK FLOW 10YR-24HR IS 47.98 CFS.

I CU-13 MAP - 3.2.1-1

USE MANNING FORMULA

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

$A = \pi d^2/8$

$R = \frac{\pi d^2/8}{\pi d/2} = \frac{\pi d^2}{8} \cdot \frac{2}{\pi d} = d/4$

S = .07 (MAP 3.2.1-1)
n = .024 CORRUGATED METAL PIPE

$Q = \frac{1.486}{n} \times \frac{\pi d^2}{8} \times (d/4)^{2/3} \times S^{1/2}$

$= \frac{1.486}{.024} \times \frac{\pi (3)^2}{8} \times (3/4)^{2/3} \times (.07)^{1/2}$

$= 61.92 \times 3.53 \times (.75)^{2/3} \times .26$

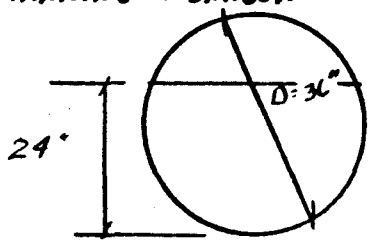
$= 47.69$ cfs

THE HALF ROUND WILL CARRY THE FLOW

II CU-14 MAP - 3.2.6-1A

USE MANNING FORMULA

S = .09 (MAP 3.2.1-1)
n = .024 CORRUGATED METAL PIPE



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

$\theta = 4 \cos^{-1}\sqrt{d/D} = 4 \cos^{-1}\sqrt{24/36} = 141.06°$

$A = \frac{D^2}{8}\left(2\pi - \frac{\pi\theta}{180} + \sin\theta\right)$

$R = \frac{450}{\pi(360-\theta)}\left(2\pi - \frac{\pi\theta}{180} + \sin\theta\right)$

PAGE 4.3 SURFACE MINING WATER DIVERSION DESIGN MANUAL - U.S DEPT. OF THE INTERIOR - OFFICE OF SURFACE MINING

G. Taylor
Revised 11-15-89

$$Q = \frac{1.486}{n} \frac{D^2}{8}\left(2\pi - \frac{\pi\theta}{180} + \sin\theta\right) \times \left(\frac{45D}{\pi(360-\theta)}\left(2\pi - \frac{\pi\theta}{180} + \sin\theta\right)\right)^{2/3} S^{1/2}$$

$$= \frac{1.486}{.028} \frac{(3)^2}{8}\left(2\pi - \frac{\pi(181.04)}{180} + \sin 181.04\right) \times \left(\frac{45(3)}{\pi(360-181.04)}\left(2\pi - \frac{\pi 181.04}{180} + \sin 181.04\right)\right)^{2/3} \times .09$$

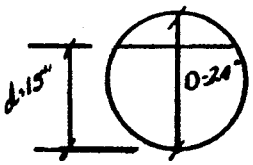
$$= 61.92 \times 3.59 \times (.63)^{2/3} \times .30$$

$$= 48.93 \text{ cfs}$$

THE 36" CULVERT WILL CARRY THE FLOW

II CU-15 MAP 3.2.1-1

USE MANNING FORMULA



$S = .25$ (MAP 3.2.1-1)
$n = .014$ PLASTIC

$$\theta = 4\cos^{-1}\sqrt{d/D} = 4\cos^{-1}\sqrt{15/24} = 151.04$$

$$A = \frac{D^2}{8}\left(2\pi - \frac{\pi\theta}{180} + \sin\theta\right)$$

$$R = \frac{45D}{\pi(360-\theta)}\left(2\pi - \frac{\pi\theta}{180} + \sin\theta\right)$$

PAGE 4.3 SURFACE MINING WATER DIVERSION DESIGN MANUAL - U.S. DEPT. OF THE INTERIOR - OFFICE OF SURFACE MINING

$$Q = \frac{1.486}{n} \frac{D^2}{8}\left(2\pi - \frac{\pi\theta}{180} + \sin\theta\right)\left(\frac{45D}{\pi(360-\theta)}\left(2\pi - \frac{\pi\theta}{180} + \sin\theta\right)\right)^{2/3} S^{1/2}$$

$$= \frac{1.486}{.014} \frac{(2)^2}{8}\left(2\pi - \frac{\pi 151.04}{180} + \sin 151.04\right)\left(\frac{45(2)}{\pi(360-151.04)}\left(2\pi - \frac{\pi(151.04)}{180} + \sin 151.04\right)\right)^{2/3} (.25)^{1/2}$$

$$= 106.14 \times 1.58 \times (.44)^{2/3} \times .5$$

$$= 48.51 \text{ CFS}$$

THE PLASTIC PIPE WILL CARRY THE FLOW

REFERRENCE:

1) SURFACE MINING WATER DIVERSION DESIGN MANUAL
UNITED STATES DEPARTMENT OF THE INTERIOR
OFFICE OF SURFACE MINING

SECTION 9

TRAIN LOADOUT
UNDISTURBED AREA DRAINAGE

TRAIN LOADOUT
UNDISTURED AREA DRAINAGE

G. TAYLOR
6-20-89
REVISED
11-20-89

DESIGN CRITERIA

LS-1 - MAP 3.2.8-3 WATERSHED AREAS TO THE DIVERSION DITCH UDD-1

SOIL SURVEY

TYPE	1) PERCENT	1) HYD GROUP	2) CN
UINTA FAMILY LOAM	45	B	55
TOZE FAMILY FINE SAND LOAM	35	B	55
COMODORE BOULDERY LOAM	15	D	77
MIDFORK FAMILY BOULDERY LOAM	5	B	55

1) SOIL SURVEY OF CARBON AREA, UTAH - UNITED STATES DEPARTMENT OF AGRICULTURE - SOIL CONSERVATION SERVICE

2 TABLE 2.20 PAGE 82 APPLIED HYDROLOGY AND SEDIMENTOLOGY FOR DISTURBED AREAS - BARFIELD AND HAAN
CN-55 FOREST LAND GOOD COVER CN-77 FOREST LAND GOOD COVER

CN: $.45(55) + .35(55) + .15(77) + .05(55) / .45 + .35 + .15 + .05$

$= 24.75 + 19.25 + 11.55 + 2.75 / 1$

$= 58.30$ USE **58**

AREA

$25 \times 13,698$ FT²/UNIT $=$ 342,450 FT²

SLOPE

$L = \Sigma C_i / AREA$

$= (1.425)(80) / 342,450$

$= .33$ OR 33%

KEM FORMULA

$t_c = (L^{.8} (1000/CN - 10) + 1)^{.7} / 1900\, Y^{1/2} / .6$

L = 1000 FT.
Y = .33
CN = 58

$t_c = ((1000)^{.8} (1000/58 - 10) + 1)^{.7} / 1900\, (33)^{1/2} / .6$

$= (209.51 / 1{,}091.47) / .6$

$= .32$ HRS

Eq = 2.59 PAGE 102
EQ = 2.60
APPLIED HYDROLOGY AND SEDIMENTOLOGY FOR DISTURBED AREA, OKLAHOMA TECHNICAL PAPERS

KIRPICH FORMULA

$t_c = .0078\, L^{.77} (L/H)^{.385}$

L = 1000 FT
H = 8160 - 8000
= 160

$t_c = .0078 (1000)^{.77} (1000/160)^{.385}$

= 3.23 MINUTE / 60 MIN/HR

= .054 HRS - USE = .1 HRS Tc = 0.10

Q_{10-24} = 2.43 IN

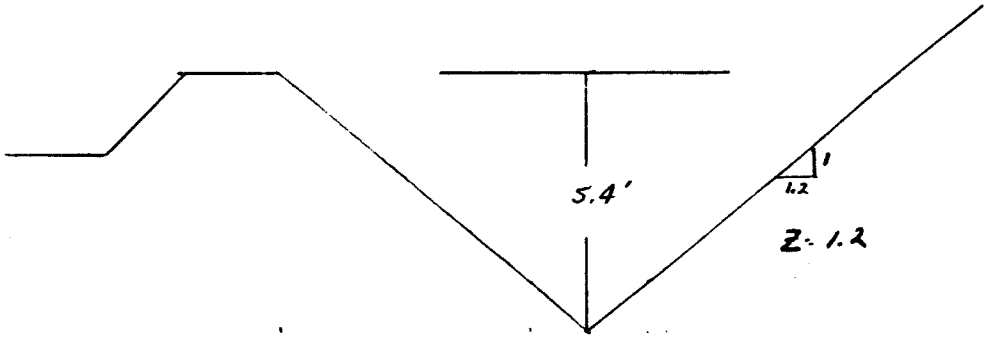
Q_{25-24} = 2.85 IN SECTION 2, VOL. 5 PAGE 5 OF 7

Q_{50-24} = 3.10 IN

Q_{100-24} = 3.5 IN

	Q_{10-24}	Q_{25-24}
T_c = .68 HRS	.23 CFS	1.24 CFS

UDD-1 - MAP 3.2.1-3



USE MANNING FORMULA

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

$$A = z d^2$$

$$R = z d / 2\sqrt{z^2+1}$$

$S = .16$ MAP 3.2.1-3

$Q = 1.24$ CFS SECTION 9 VOL. 5

$n = .032$ - EARTH BOTTOM RUBBLE SIDES

$$Q = z d^2 \times 1.486/n \times \left(z d / 2\sqrt{z^2+1} \right)^{2/3} \times S^{1/2}$$

$$= 1.2 d^2 \times 1.486/.032 \times \left(1.2 d / 2\sqrt{(1.2)^2+1} \right)^{2/3} \times (.16)^{1/2}$$

$$= 1.2 d^2 \times 46.44 \times \left(1.2 d / 3.12 \right)^{2/3} \times .4$$

$$1.24 = 1.2 d^2 \left(1.2 d / 3.12 \right)^{2/3} \times 18.56$$

$$.07 \text{ CFS} = 1.2 d^2 \left(1.2 d / 3.12 \right)^{2/3}$$

TRAIL d

d (FT)	Q
.5	.099
.4	.055
.45	.075
.43	.066
.44	.071

d = .44 FT THE DEPTH OF THE FLOW WILL BE ≈ .44 FT. THE DEPTH OF THE DITCH IS 5.4 FT. THE DITCH WILL WORK AS BUILT WITHOUT .3 FT. FREE BOARD.

22-141 50 SHEETS
22-142 100 SHEETS
22-144 200 SHEETS
AMPAD

VELOCITY

USE MANNING FORMULA

$$V = \frac{1.486}{n} \times R^{2/3} \times S^{1/2}$$

$$= \frac{1.486}{.032} \times (.17)^{2/3} \times (.16)^{1/2}$$

$$= 46.44 \times .31 \times .4$$

$$= 5.76 \text{ FPS}$$

THIS IS BELOW THE EROSION VELOCITY OF 6 FPS SO RIPRAP WILL NOT BE NECESSARY.

22-141 50 SHEETS
22-142 100 SHEETS
22-144 200 SHEETS
AMPAD

TRAIN LOADOUT
CULVERT DESIGN
30"Ø CMP - CU-6

USE PEAK FLOW RATE OF 1.24 CFS - MAP 3.2.1-3

Q = 1.24 CFS — SECTION 9, VOL. 5
L = 240 FT
S = .008 } MAP 3.2.1-3

USE MANNING FORMULA

$Q = A \times 1.486/n \times R^{2/3} \times S^{1/2}$ $R = .5768D/1.9576$ D = DEPTH OF FLOW

$A = \pi D^2/4 = \pi (2.5)^2/4 = 4.91$ SQ FT.

$n = .024$

$S = .008$

$Q = 4.91 FT^2 \times 1.486/.024 \times (.5768D/1.9576)^{2/3} \times (.008)^{1/2}$

$= 4.91 FT^2 \times 61.92 \times (.5768D/1.9576)^{2/3} \times .089$

$= 27.06 (.5768D/1.9576)^{2/3}$

TRAIL d

d	Q
.1	2.74
.05	1.60
.04	1.38
.03	1.14
.032	1.19
.034	1.24

$d = .034 FT \times 12 = .41$ IN

THE 30 IN CULVERT WILL HANDLE THE FLOW

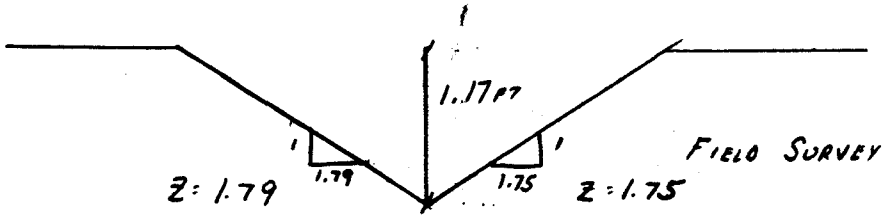
1) SOIL SURVEY OF CARBON AREA, UTAH - UNITED STATES DEPARTMENT OF AGRICULTURE - SOIL CONSERVATION SERVICE

2) BARFIELD, B.J., R.C. WARNER, C.T. HAAN, APPLIED HYDROLOGY AND SEDIMENTOLOGY FOR DISTURBED AREAS, OKLAHOMA TECHNICAL PRESS

22-141 50 SHEETS
22-142 100 SHEETS
22-144 200 SHEETS
AMPAD

UDO - 2 - MAP 3.2.1-3

G. Taylor
11-17-89



FIELD SURVEY NOV. 1989

Q_{25-24} = .27 CFS SECTION 12 VOL. 5

USE MANNING FORMULA

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

n = .10 CHANNEL NOT MAINTAINED - DENSE WEEDS HIGH AS FLOW DEPTH
S = .03 MAP 3.2.1-3

$A = Zd^2/2 + Zd^2/2$

$R = Zd/4\sqrt{Z^2+1} + Zd/4\sqrt{Z^2+1}$

$Q = (Zd^2/2 + Zd^2/2) \times 1.486/n \times (Zd/4\sqrt{Z^2+1} + Zd/4\sqrt{Z^2+1})^{2/3} \times S^{1/2}$

$= (1.79\,d^2/2 + 1.75\,d^2/2) \times 1.486/.10 \times (1.79d/4\sqrt{1.79^2+1} + 1.75d/4\sqrt{1.75^2+1})^{2/3} \times (.03)^{1/2}$

$= (.90\,d^2 + .88\,d^2) \times 14.86 \times (.22d + .22d)^{2/3} \times .17$

$= (1.78\,d^2) \times 14.86 \times (.44d)^{2/3} \times .17$

TRY d = .3 FT.

$Q = (1.78(.3)^2) \times 14.86 \times (.44(.3))^{2/3} \times .17$

= .10 CFS

TRY d = .4 FT

$Q = (1.78(.4)^2) \times 14.86 \times (.44(.4))^{2/3} \times .17$

= .22 CFS

TRY $d = .43$ FT.

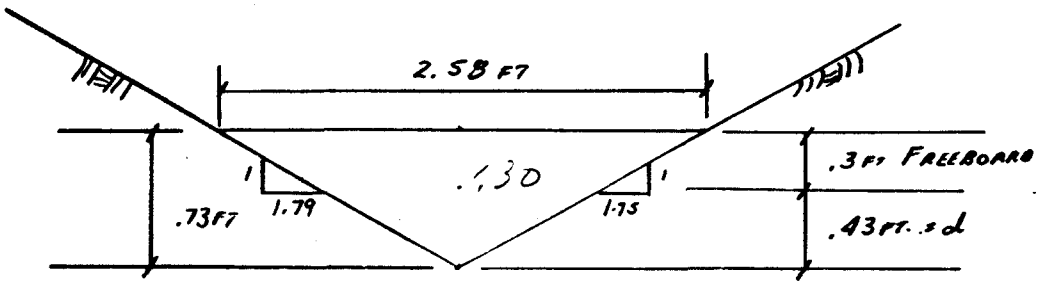
$Q = (1.78(.43)^2) \times 14.86 \times (.44(.43)^{2/3} \times .17$

$= .27$ CFS.

TOTAL DEPTH = FLOW DEPT + FREEBOARD

$= .43$ FT + $.3$ FT

$= .73$ FT.



TYPICAL UDD-2 MINIMUM
DITCH DESIGN

22-141 50 SHEETS
22-142 100 SHEETS
22-144 200 SHEETS
AMPAD

DITCH UDD-3 MAP 3.2.1-3

AREA IN SQ.FT (1)	CN (2)	HYDRAULIC LENGTH (1)	Σ OF CONTOURS	SLOPE % (3)	CONTOUR INTERVAL
67,518	69	1,680	2,365	35.03	10

1) MAP 3.2.1-3

2) * SILAS SOIL GROUP - C - 65% HYD. SOIL GROUP † CN = 74
BRYCAN SOIL GROUP - B - 35% HYD. SOIL GROUP CN = 61

$74(.65) + 61(.35) / .65 + .35 = 48.10 + 21.35 / 1 = 69.45$ USE 69

* SOIL SURVEY OF CARBON AREA, UTAH - UNITED STATES DEPT. OF AGRICULTURE - SOIL CONSERVATION SERVICE

† APPLIED HYDROLOGY AND SEDIMENTOLOGY FOR DISTURBED AREAS BARFIELD AND HAHN

3) % SLOPE = Σ CONTOURS * CONTOUR INTERVAL / AREA

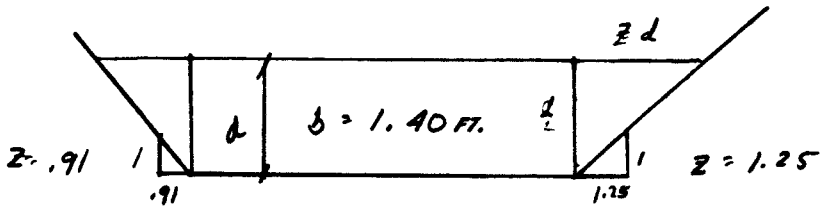
PEAK FLOW (CFS)(5)

AREA NO	t_c (4)	Q_{10-24}	Q_{25-24}	Q_{50-24}	Q_{100-24}
	.19 HRS	.54			1.57

4) KENT'S FORMULA
$T_c = (\text{HYD. LENGTH})^{.8} ((1000/CN - 10) + 1)^{.7} / (1900 \sqrt{\text{SLOPE}}) / .6$

5) SCS UNIT HYDROGRAPH METHOD (NEM-4, 1972

USE $Q_{100-20} = 1.57$



USE MANNING FORMULA

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

$$A = bd + zd^2/2 + zd^2/2$$

$$R = bd + zd^2/2 + zd^2/2 \Big/ d\sqrt{z^2+1} + b + d\sqrt{z^2+1}$$

$S = .03$ MAP 3.2.1-3

$n = .010$ CHANNEL NOT MAINTAINED, DENSE WEEDS, HIGH AS FLOW DEPTH

$$Q = \left(bd + zd^2/2 + zd^2/2\right) \times 1.486/n \times \left(bd + zd^2/2 + zd^2/2 \Big/ d\sqrt{z^2+1} + b + d\sqrt{z^2+1}\right)^{2/3} \times S^{1/2}$$

$$= \left(1.40d + \frac{.91d^2}{2} + 1.25\,d/2\right) \times 1.486/.010 \times \left(1.40d + .91d^2/2 + 1.25d^2/2 \Big/ d\sqrt{.91^2+1} + 1.40 + d\sqrt{1.25^2+1}\right)^{2/3} \times (.03)^{1/2}$$

$$= 1.40d + .46d + .63d^2 \times 148.60 \times \left(1.40d + .46d^2 + .63d^2 \Big/ d(1.35) + 1.40 + d\,1.60\right)^{2/3} \times .17$$

$$= (1.40d + 1.08d^2) \times 148.60 \times \left(1.40d + 1.08d^2 \Big/ 1.40 + 2.95d\right)^{2/3} \times .17$$

TRAIL d

d FT	Q (CFS)
.1	.75
.15	1.49
.16	1.66

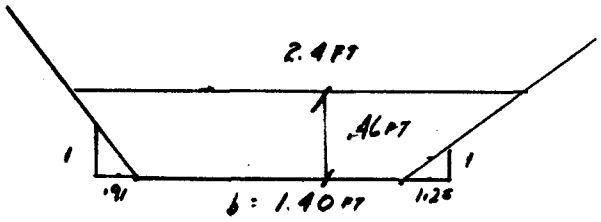
USE d = .16 FT.

TOTAL DEPTH = DEPTH OF FLOW + FREEBOARD

= .16 + .3

= .46 FT

DITCH DESIGN



22-141 50 SHEETS
22-142 100 SHEETS
22-144 200 SHEETS
AMPAD

SECTION 10

TRAIN LOADOUT
DISTURBED DRAINAGE

TRAIN LOADOUT
DISTURBED DRAINAGE

C. Taylor
6-20-89
REVISED
11-27-89

ASSUMED: ALL DIVERSIONS MAP 3.2.1-3 FOR 10 YR - 24 HR. PEAK FLOW FROM ENTIRE DISTURBED AREAS

AREA	HYDRAULIC LENGTH	Σ CONTOURS 3)	CN	SLOPE % 3)	Δ ELEV. FT
12.56	1962.99	10,043.31	90	18.36	(8150-7914) = 232'

T_c 2) HR	T_c 3)
.102	.149

NOTES:

1) KIRPITCH'S FORMULA - $t_c = .0078\, L^{.77} (L/H)^{.385}$

2) KENT FORMULA - $t_c = L^{.8} \left(\left(\frac{1000}{CN} - 10 \right) + 1 \right)^{.7} \Big/ 1900\, S^{1/2} / .6$

3) Σ CONTOURS - IS FOR AVAILABLE CONTOURS ONLY
THIS ESSENTIALLY IS A "PAD AREA" SLOPE
ASSUME SLOPE FOR UNDISTURBED AND WEIGHTED AVERAGE FOR SLOPE IN PEAK CALCULATION

USE KIRPITCH T_c FOR PEAK FLOW CALCULATIONS

P_{10-24} - 2.43 IN.
P_{25-24} - 2.85 IN
P_{100-24} - 3.50 IN.

} SECTION 2, VOL. 5

Q_{10-24} - 18.41 CFS

Q_{25-24} - 22.49 CFS

Q_{100-24} - 29.12 CFS

I DITCHES AT THE LOADOUT AREA WILL BE DESIGNED TO CARRY A PEAK FLOW OF Q_{10-24} = 18.41 CFS SECTION 10, VOL. 5 PAGE 1. THIS WILL BE A TYPICAL DESIGN FOR DD-7, DD-8, DD-9, DD-10 + DD-11

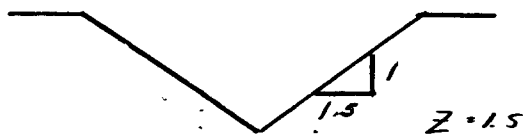
USE MANNING FORMULA

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

A = AREA
n = ROUGHNESS
R = HYDRAULIC RADIUS
S = SLOPE

THE DITCH WILL BE A V-SHAPE CUT BY A MOTOR GRADER WITH A FREEBOARD OF .3 FT

A. DETERMINE DEPTH OF FLOW



$A = zd^2$
$R = zd/2\sqrt{z^2+1}$ } PAGE 4.3 SURFACE MINING WATER DIVERSION DESIGN MANUAL
$n = .040$ SMALL DRAINAGE DITCH
$S = .029$ (MAP 3.2.1-3) AVG. SLOPE
$Q = 18.41$ CFS

$$Q = 1.486/n \times zd^2 \times \left(zd/2\sqrt{z^2+1}\right)^{2/3} \times S^{1/2}$$

$$= 1.486/.04 \times 1.5d^2 \times 1.5d/2\sqrt{1.5^2+1} \times (.029)^{1/2}$$

$$18.41 = 37.15 \times 1.5d \times \left(1.5d/3.61\right)^{2/3} \times .17$$

TRY $d = 1.2$ FT

$$Q = 37.15 \times 1.5(1.2)^2 \times \left(1.5(1.2)/3.61\right)^{2/3} \times .17$$

$$= 8.56 \text{ CFS}$$

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DIVISION OF
OIL, GAS & MINING

AMPAD 22-141 50 SHEETS 22-142 100 SHEETS 22-144 200 SHEETS

TRY $d = 1.4$ FT.

$Q = 37.15 \times 1.5(1.4)^2 \times \left(1.5(1.4)/3.61\right)^{2/3} \times .17$

$= 12.92$ CFS

TRY $d = 1.5$ FT.

$Q = 37.15 \times 1.5(1.5)^2 \times \left(1.5(1.5)/3.61\right)^{2/3} \times .17$

$= 15.53$ CFS

TRY $d = 1.6$ FT

$Q = 37.15 \times 1.5(1.6)^2 \times \left(1.5(1.6)/3.61\right)^{2/3} \times .17$

$= 18.45$ CFS

USE DEPTH OF FLOW 1.6 FT.

B. DETERMINE VELOCITY

$V = 1.486/n \; R^{2/3} \; S^{1/2}$

EQ 3.21 PAGE 157
APPLIED HYDROLOGY AND
SEDIMENTOLOGY FOR DISTURBED
AREAS, BARFIELD AND HAAN

$R = 1.5(1.6)/3.61 = .66$

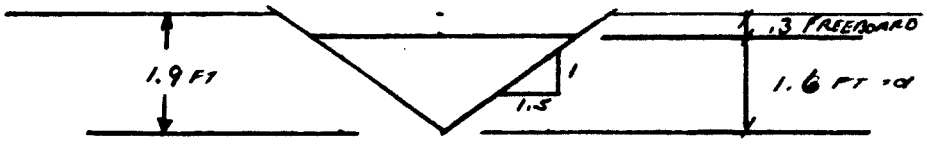
$V = 1.486/.04 \times (.66)^{2/3} \times (.029)^{1/2}$

$= 37.15 \times .76 \times .17$

$= 4.80$ FPS

RECEIVED
NOV 28 1989
DIVISION OF
OIL, GAS & MINING

22-141 50 SHEETS
22-142 100 SHEETS
22-144 200 SHEETS
AMPAD



TYPICAL DRAINAGE DITCH
FOR DD-7, DD-8, DD-9, DD-10 + DD-11

REFERENCE

1) SURFACE MINING WATER DIVERSION DESIGN MANNUAL
UNITED STATES DEPARTMENT OF THE INTERIOR
OFFICE OF SURFACE MINING.

2. BARFIELD, B.J., R.C. WARNER, C.T. HAAN, APPLIED HYDROLOGY AND SEDIMENTOLOGY FOR DISTURBED AREAS, OKLAHOMA TECHNICAL PRESS

RECEIVED
NOV 28 1989
DIVISION OF
OIL, GAS & MINING

22-141 50 SHEETS
22-142 100 SHEETS
22-144 200 SHEETS
AMPAD

SECTION 11

TRAIN LOADOUT AREA
SWALE DESIGN

G. TAYLOR
9-23-91

SWALE SW-10 AT THE LOADOUT AREA WILL BE DESIGNED TO CARRY A PEAK FLOW OF Q_{10-24} = 18.91 CFS SECTION 10, VOL. 5 PAGE 1

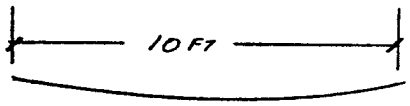
USE MANNING FORMULA

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

A : AREA
n : ROUGHNESS
R : HYDRAULIC RADIUS
S : SLOPE

THE SWALE WILL BE A PARABOLA WITH A FREE BOARD OF .3 FT.

A. DETERMINE DEPTH OF FLOW



A = $2/3\, d\, T$ $\quad T = 10$
R = $2 d T^2 / 3T^3 + 8d^2$

PAGE 4.3 SURFACE MINING WATER DIVERSION DESIGN MANUAL

n: .015 CONCRETE, SMOOTH FINISH

S: .0438

$$Q = 1.486/n \times 2/3\, d\, T \times (2 d T^2 / 3T^3 + 8d^2)^{2/3} \times S^{1/2}$$

$$= 1.486/.015 \times 6.67 d \times (200 d / 3{,}000 + 8d^2)^{2/3} \times (.0438)^{1/2}$$

$$= 99.07 \times 6.67 d \times (200 d / 3{,}000 + 8d^2)^{2/3} \times .21$$

$$= 20.73 \times 6.67 d \times (200 d / 3{,}000 + 8d^2)^{2/3}$$

TRAIL d

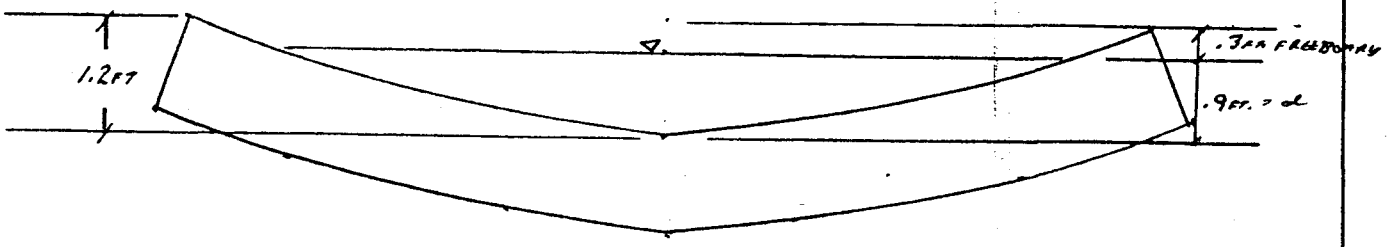
d (ft)	Q (cfs)
.5	7.08
1	22.49
.9	18.87

USE A DEPTH OF .9 FT.

DOGM DEPTH = 0.35'

V = 7.87

9-23-91
2 of 1



SWALE - 10

REFERENCE

1) SURFACE MINING WATER DIVERSION DESIGN MANUAL
UNITED STATES DEPARTMENT OF THE INTERIOR
OFFICE OF SURFACE MINING.

REGISTERED PROFESSIONAL ENGINEER
8632
WILLIAM W.
SHRIVER
STATE OF UTAH

Wm W. Shriver
9-23-91

SECTION 12

HYDROLOGY STUDY
CULVERT EAST END
TRAIN LOADOUT
CU-16

HYDROLOGY STUDY
CULVERT EAST END
TRAN LOADOCT
CU-16

G. TAYLOR
6-20-89
REVISED
11-17-89

WATER SHED LS-2 MAP 3.2.8-2

SOIL SURVEY -

SOIL TYPE	1) PERCENT	1) HYD. GROUP	2) CN
UNITA FAMILY LOAM	45	B	55
TOZE FAMILY FINE SANDY LOAM	35	B	55
COMODORE BOULDERY LOAM	15	D	77
MIDFORK FAMILY BOULDERY LOAM	5	B	55

1) SOIL SURVEY OF CARBON AREA, UTAH - UNITED STATES DEPARTMENT OF AGRICULTURE - SOIL CONSERVATION SERVICE

2) TABLE 2.20 PAGE 82 APPLIED HYDROLOGY AND SEDIMENTOLOGY FOR DISTURBED AREAS, BARFIELD AND HAAN
CN: 55 FOREST LAND GOOD COVER, CN: 77 FOREST LAND POOR COVER

CN: $55(.45) + 55(.35) + 77(.15) + 55(.05) / .45 + .35 + .15 + .05$

$= 24.75 + 19.25 + 11.55 + 2.75 / 1$

$= 58.30$ USE **58**

AREA

$6 \times 13{,}698 = 82{,}188$ SQ. FT.

SLOPE

$L = \Sigma C_i / AREA$

$= 360 \times 80 / 82{,}188$

$= .35$ OR 35%

CONCENTRATION TIME

KENTS FORUMLA - PAGE 102 - APPLIED HYDROLOGY AND SEDIMENTOLOGY FOR DISTURBED AREAS - BARFIELD AND HARN

$$t_c = L^{.8}\left(1000/CN - 10) + 1\right)^{.7} / 1900\, Y^{1/2} / L$$

$L = 1200$ ft
$Y = .35$
$CN = 58$

$$= 1200^{.8}\left(1000/58 - 10) + 1\right)^{.7} / 1900\,(.35)^{1/2} / 60$$

$$= 1{,}271.17 / 1{,}124.06 / 60$$

$$= .019 \text{ HRS}$$

KIRPICH - PAGE 102 - APPLIED HYDROLOGY AND SEDIMENTOLOGY FOR DISTURBED AREAS - BARFIELD AND HARN

$$t_c = .0078\, L^{.77} (L/H)^{.385}$$

$L = 1200$
$H = 8100 - 7800$
$= 220$

$$= .0078\,(1200)^{.77}\,(1200/220)^{.385}$$

$$= 1.83 \times 1.92$$

$$= 3.52 \text{ MIN.}$$

$$= .058 \text{ HRS}$$

$P_{10\text{-}24} = 2.43$ IN
$P_{25\text{-}29} = 2.85$ IN
$P_{30\text{-}39} = 3.10$ IN
$P_{40\text{-}99} = 3.5$ IN

SECTION 2, VOL. 5

$t_c = .189$ HR

SCS UNIT HYDROGRAPH METHOD (NEN-9, 1972)

$Q_{10\text{-}24} = .05$ CFS $\quad Q_{25\text{-}29} = .27$ CFS

CULVERT SELECTION - CU-16 18" HALF ROUND MAP 3.2.1-3

USE MANNING FORMULA

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

$S = .47$ (MAP 3.2.1-3)
$n = .024$ CORRUGATED METAL PIPE

$A = \pi d^2/8$

$R = \pi d^2/8 \,/\, \pi d/2 = \pi d^2/8 \times 2/\pi d = d/4$

PEAK FLOW $Q_{25\text{-}26} = .27$ CFS

$Q = 1.486/n \times \pi d^2/8 \times (d/4)^{2/3} \times S^{1/2}$

$= 1.486/.024 \times \pi d^2/8 \times (d/4)^{2/3} \times (.47)^{1/2}$

$= 61.92 \times \pi d^2/8 \times (d/4)^{2/3} \times .69$

TRY $d = .31$ FT

$Q = 1.486/.024 \times \pi (.31)^2/8 \times (.31/4)^{2/3} \times (.47)^{1/2}$

$= 61.92 \times .04 \times .18 \times .69$

$= .31$ CFS

THE DEPTH OF FLOW WILL BE ≈ .31 FT. THE DEPTH OF THE HALF ROUND IS 1.50 FT. THE HALF ROUND WILL WORK AS BUILT WITHOUT .3 FT FREEBOARD.

REFERENCE:

1) SOIL SURVEY OF CARBON AREA, UTAH - UNITED STATES DEPARTMENT OF AGRICULTURE - SOIL CONSERVATION SERVICE

2) BARFIELD, B.J., R.C. WARNER, C.T. HAN APPLIED HYDROLOGY AND SEDIMENTOLOGY FOR DISTURBED AREAS - OKLAHOMA TECHNICAL PRESS

G. Taylor
6-20-89
Revised 11-17-89

Train Loadout
Culvert Design
24"Ø CMP

Use the peak flow rate Q_{100-24} = 29.12 cfs from Section 10, Vol. 5 Map 3.2.1-3 for CD-5, CD-6, CD-7 and CD-8
Selecte CD-3 - insure that the 24"Ø CMP will handle the flow. This will be a typical calculation for all 24"Ø CMP.

Q = 29.12 cfs Section 10, Vol. 5
L = 70 ft. Map 3.2.1-3
S = .057 (Map 3.2.1-3).

Use Manning Formula

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

$R = \frac{.5768D}{1.9578}$ D = depth of flow

$A = \pi D^2/4 = \frac{\pi(2)^2}{4} = 3.14 ft^2$

n = .024 Corrugated Metal Pipe

S = .057 (Map 3.2.1-3)

$$Q = 3.14 ft^2 \times 1.486/.024 \times (.5768D/1.9578)^{2/3} \times (.057)^{1/2}$$

$$= 3.14 ft^2 \times 61.92 \times (.5768D/1.9578)^{2/3} \times .24$$

$$= 3.14 ft^2 \times 14.78 \times (.5768D/1.9578)^{2/3}$$

Try d = 1.7 ft.

$$Q = 3.14 ft^2 \times 14.78 \times (.5768(1.7)/1.9578)^{2/3}$$

$$= 29.20 \text{ cfs}$$

Use 1.7 ft or = 20.4 in.

All 24"Ø CMP will pass the 100 yr - 24 hr events without any backwater effect

TRAIN LOADOUT
CULVERT DESIGN
24"Ø CMP - CD-8

G. TAYLOR
8-30-89

DETERMINE IF THERE IS INLET OR OUTLET CONTROL

A. INLET CONTROL

Q_{10-24} = 18.41 CFS FROM SECTION 10, VOL. 5 MAP 3.2.1-3

USE THE INLET CONTROL NOMOGRAPH - PAGE 189[1]

HW/D = 36/24 = 1.50 GRAPH #3

Q = 18 CFS FOR 24"Ø CMP

B. OUTLET CONTROL

K_e = 0.9 PAGE 181[1]

L' = 70 FT x .44 = 30.80

PAGE 194[1] - L' IS NOT PART OF THE NOMOGRAPH

REFERENCES

1) HANDBOOK OF STEEL DRAINAGE + HIGHWAY CONSTRUCTION PRODUCTS
THIRD EDITION

22-141 50 SHEETS
22-142 100 SHEETS
22-144 200 SHEETS
AMPAD

G. Tarce
6-20-89

TRAIN LOADOUT
CULVERT DESIGN
36" ϕ CMP - CO-9

USE THE PEAK FLOW RATE Q_{Peak} = 29.12 CFS FROM SECTION 10, VOL.5

Q = 29.12 CFS SECTION 10, VOL 5
L = 40 FT (MAP 3.2.1-3)
S = .5/40 = .0125 (MAP 3.2.1-3) MAX. SLOPE

USE MANNING FORMULA

$Q = A \times 1.486/n \times R^{2/3} \times S^{1/2}$ $R = .5768D/1.9578$ D = DEPTH OF FLOW

$A = \pi D^2/4 = \pi(3)^2/4 = 7.07 ft^2$

$n = .024$

$Q = 7.07 ft^2 \times 1.486/.024 \times (.5768D/1.9578)^{2/3} \times (.0125)^{1/2}$

$= 7.07 ft^2 \times 61.92 \times (.5768D/1.9578)^{2/3} \times .11$

$= 7.07 \times 6.92 \times (.5768D/1.9578)^{2/3}$

TRY d = 1.3 FT.

$Q = 7.07 \times 6.92 \times (.5768(1.3)/1.9578)^{2/3}$

= 25.72 CFS

TRY d = 1.5 FT

$Q = 7.07 \times 6.92 \times (.5768(1.5)/1.9578)^{2/3}$

= 28.31 CFS

TRY d = 1.7 FT

$Q = 7.07 \times 6.92 \times (.5768(1.7)/1.9578)^{2/3}$

= 30.78

TRY d = 1.6 FT

$Q = 7.07 \times 6.92 \times (.5768(1.6)/1.9578)^{2/3}$

= 29.56

USE 1.6 FT OR 19.2 IN.

THE 36" Φ CMP WILL PASS THE 100 YR-24 HR EVENT WITHOUT ANY BACKWATER EFFECT.

22-141 50 SHEETS
22-142 100 SHEETS
22-144 200 SHEETS
AMPAD

TRAIN LOADOUT
CULVERT DESIGN
36"Ø CMP - CO-9

G. TAYLOR
8-30-89

DETERMINE IF THERE IS INLET OR OUTLET CONTROL

A. INLET CONTROL

Q_{10-24} = 18.41 CFS FROM SECTION 10, VOL. 5, MAP 3.2.1-3

USE INLET CONTROL NOMOGRAPH PAGE 189[1]

HW/D = 36/36 = 1.0 GRAPH #3

Q = 33 CFS FOR 36"Ø CMP

THE PIPE WILL HANDLE THE FLOW WITH HW EQUAL TO THE PIPE DIAMETER

B. OUTLET CONTROL

GRAPHS FOR OUTLET CONTROL WILL NOT WORK. THE LENGTH OF THE PIPE IS TO SHORT.

REFERENCES:

1) HANDBOOK OF STEEL DRAINAGE + HIGHWAY CONSTURCTION PRODUCTS THIRD EDITION

22-141 50 SHEETS
22-142 100 SHEETS
22-144 200 SHEETS
AMPAD

G. TAYLOR
6-29-89

HYDROLOGY STUDY
CULVERT CD - 12

WATER SHED - LS-3 MAP 3.2.8-3

SOIL SURVEY -

SOIL TYPE	1) PERCENT	1) HYD. GROUP	2) CN
UNITA FAMILY LOAM	45	B	55
TOZE FAMILY FINE SANDY LOAM	35	B	55
COMODORE BOULDERY LOAM	15	D	77
MIDFORK FAMILY BOULDERY LOAM	5	B	55

1) SOIL SURVEY OF CARBON AREA, UTAH - UNITED STATES DEPARTMENT OF AGRICULTURE - SOIL CONSERVATION SERVICE

2) TABLE 2.20 PAGE 82 APPLIED HYDROLOGY AND SEDIMENTOLOGY FOR DISTURBED AREAS, BARFIELD AND HAHN.
CN-55 FOREST LAND GOOD COVER, CN-77 - FOREST LAND POOR COVER

CN = $.45(55) + .35(55) + .15(77) + .05(55) / .45 + .35 + .15 + .05$

= $24.75 + 19.25 + 11.55 + 2.75 / 1$

= 58.30 USE 58

AREA

123 × 13,698 = 1,684,854 SQ FT

SLOPE

L = Σ CONTOUR i / AREA

= 7,260 × 80 / 1,684,854

= .34 OR 34%

CONCENTRATION TIME

KENTS FORMULA EQ. 2.60 PAGE 102 APPLIED HYDROLOGY AND SEDIMENTOLOGY FOR DISTURBED AREAS - BARFIELD & HARN

$t_c = L^{.8}(1000/CN - 10 + 1)^{.7} / 1900 \cdot Y^{1/2} / 60$

$L = 3600$
$Y = .34$
$CN = 58$

$= 3600^{.8}((1000/58 + 10) + 1)^{.7} / 1900 (.34)^{1/2} / 60$

$= 3063.67 / 1,107.99 / 60$

$= 2.76$ MIN $\div$ 60 MIN/HR

$= .046$ HRS

KIRPICH FORMULA EQ 2.58 PAGE 102 APPLIED HYDROLOGY AND SEDIMENTOLOGY FOR DISTURBED AREAS - BARFIELD AND HARN

$t_c = .0078\, L^{.77} (L/H)^{.385}$

$L = 3600$
$H = 8800 - 800 = 800$

$= .0078 (3600)^{.77} (3600/800)^{.385}$

$= 4.27 \times 1.784$

$= 7.62$ MIN

$= .127$ HRS

$P_{10-24} = 2.43$ IN
$P_{25-24} = 2.85$ IN
$P_{50-24} = 3.10$ IN
$P_{100-24} = 3.5$ IN

SECTION 2, VOL. 5

t_c: SCS UNIT HYDROGRAPH METHOD (NEH-4, 1973)

Q_{10-24} - 1.23 CFS
Q_{25-24} - 6.00 CFS
Q_{50-24} - 9.63 CFS
Q_{100-24} - 16.14 CFS

CULVERT SELECTION - CD-12 30" ø CMP MAP 3.2.1-3

USE MANNING FORMULA

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

S = .09 (MAP 3.2.1-3)
n = .024 CORRUGATED METAL PIPE
$Q_{100 \text{ yr}} = 16.14$ CFS

$A = \pi d^2/4$

$R = \pi d^2/4 / \pi d = \pi d^2/4 \cdot \frac{1}{\pi d} = d/4$

$Q = 1.486/n \times \pi d^2/4 \times (d/4)^{2/3} \times S^{1/2}$

$= 1.486/.024 \times \pi d^2/4 \times (d/4)^{2/3} \times (.09)^{1/2}$

$= 61.92 \times \pi d^2/4 \times (d/4)^{2/3} \times .30$

$16.14 = 61.92 \times \pi d^2/4 \times (d/4)^{2/3} \times .30$

TRY $d = 1.47$ FT.

$Q = 1.486/.024 \times \pi (1.47)^2/4 \times (1.47/4)^{2/3} \times .30$

$= 61.92 \times 1.70 \times .51 \times .30$

$= 16.15$ CFS

THE 30" ø CMP WILL CARRY THE 100 YR - 24 HR EVENT.

G. TAYLOR
8-30-89

CULVERT CD-12
30" Ø · CMP

DETERMINE IF THERE IS INLET OR OUTLET CONTROL

A. INLET CONTROL

Q_{10-24} = 1.23 CFS SECTION 12, VOL. 5, MAP 3.2.1-3

USE INLET CONTROL NOMOGRAPH - PAGE 189 [1]

HW/D = 30"/30 = 1.0 GRAPH #3

Q = 20 CFS FOR 30" Ø CMP

THE PIPE WILL HANDLE THE FLOW WITH HW EQUAL TO THE PIPE DIAMETER

B. OUTLET CONTROL

K_e = 0.9 PAGE 181 [1]

L' = 95 FT X .61 = 57.95 FT.

USE OUTLET CONTROL NOMOGRAPH - PAGE 194 [1]

Q = 18 CFS FOR 30" Ø CMP

THE PIPE WILL HANDLE THE FLOW

REFERENCE

1) HANDBOOK OF STEEL DRAINAGE + HIGHWAY CONSTRUCTION PRODUCTS THIRD EDITION

22-141 50 SHEETS
22-142 100 SHEETS
22-144 200 SHEETS
AMPAD

HYDROLOGY STUDY
CULVERT CD-10

G. TAYLOR
6-20-89
REVISED
11-17-89

WATER SHED - FOR CD-10 MAP 3.2.8-3

SOIL SURVEY	1) PERCENT	1) HYD GROUP	2) CN
CURRCANTI FAMILY LOAM	24	B	66
PATHEAD EXTREMELY BOULDERY FINE SANDY LOAM	10	C	77
PATHEAD EXTREMELY STONY LOAM	10	C	77
PERMA FAMILY	8	B	66
MIDFORK FAMILY BOULDERY LOAM	11	B	55
TRAG STONY LOAM	5	C	77
CROYDON LOAM	4	B	66
FALCON STONY SANDY LOAM	1	C	77
VINTA FAMILY LOAM	12	B	55
TOZE FAMILY FINE SANDY LOAM	12	B	55
COMODORE BOULDERY LOAM	2	D	77
ROCK OUTCROP	1	D	83

1) SOIL SURVEY OF CARBON AREA, UTAH - UNITED STATES DEPARTMENT OF AGRICULTURE - SOIL CONSERVATION SERVICE

2) TABLE 2.20 PAGE 82 APPLIED HYDROLOGY AND SEDIMENTOLOGY FOR DISTURBED AREAS, BARFIELD AND HAAN
CN: 55 - FOREST LAND GOOD COVER, CN: 66 FOREST LAND POOR COVER
CN: 77 FOREST LAND POOR COVER, CN: 83 FOREST LAND POOR COVER

CN: $66(.24) + 77(.10) + 77(.10) + 66(.08) + 55(.11) + 77(.05) + 66(.04) + 77(.01) + 55(.11) + 55(.12) + 77(.02) + 83(.01)/1$

$= 15.84 + 7.70 + 7.70 + 5.28 + 6.05 + 3.85 + 2.64 + .77 + 6.60 + 6.10 + 1.54 + .83/1$

$= 65.40$ USE **65**

G. Tatge
Revised 11-17-89

$S = 1000/CN - 10$

$= 1000/71 - 10$

$= 14.08 - 10$

$= 4.08$

Area of the Water Shed

$10,174.39 \times .0149 in^2 = 151.60 in^2 \times 22.96$ acres $/in^2 = 3,480.7$ acres

$3,480.7$ acres $\times 43,560$ ft^2/acre $= 151,619,292.1$ sq ft.

Time Parameters

Concentration Time

Kirpich Eq 2.58 page 102 Applied Hydrology and Sedimentology for Disturbed Areas - Barfield and Hahn

$t_c = .0078\, L^{.77} (L/H)^{.385}$ $L = 18,150$ $H = 1,920$

$t_c = .0078 (18,150)^{.77} (18,150/1920)^{.385}$

$= .0078 (1,902.55)(2.37)$

$= 35.24$ mins

$= .59$ hrs

Lag Time

$t_L = L^{.8} (S+1)^{.7} / 1900\, Y^{1/2}$ Eq 2.60 page 102 Applied Hydrology and Sedimentology for Disturbed Areas - Barfield and Hahn

$Y = \Sigma C i / Area$

$i = 80$ ft and 400 ft

$A = 151,967,771.9$ sq. ft.

G Taylor
Revised 11-17-89

	Σ C		
	600		9920
	900		9840
	1200		9760
	1800		9680
80' C	6975		9600
	16 050		9520
	28 200		9440
	44 250		9360
	50 925		9280
	64 950	215,850 x 80	9200
400' C	48 975		8800
	22 200		8400
	1200	72,375 x 400	8000

$$y = (215{,}850 \times 80) + (72{,}375 \times 400) / 3{,}480.7 \times 43{,}560$$

$$= 46{,}210{,}000 / 151{,}619{,}292.1$$

$$= 30.48\%$$

$$t_L = (18{,}150)^{.8} (4.08+1)^{.7} / 1900 (30.41)^{.5}$$

$$= (2{,}553.30)(3.12) / 1900 (5.51)$$

$$= 7{,}966.30 / 10{,}469$$

$$= .76 \text{ HRS}$$

$$= 45.66 \text{ MINS.} \quad \text{USE } 46 \text{ MINS.}$$

G. Taylor
Revised
11-17-09

$t_L = .6\, t_c$

$46 = .6\, t_c$

$76.67 = t_c$

76.67 mins $= t_c$

$t_c = 1.28$ hr

Peak flow using SCS curve method

Event	Peak flow
2 yr - 24 hr	
10 yr - 24 hr	212.3 cfs 222 cfs
50 yr - 24 hr	524.2 cfs
100 yr - 24 hr	768.5 cfs 813

Determine Maximum flow of the pipe

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

$n = .035$

$R \quad .83$

$S = .03$ (Map 3.2.1-3) Max Slope

$A = 15.69$ sq ft

$Q = 15.69 \text{ sq ft} \left(1.486/.035\right) (.83)^{.66} (.03)^{.5}$

$= (15.69 \text{ sq ft})(42.46)(.88)(.17)$

$= 99.35$ cfs

REFERENCE:

1) SOIL SURVEY OF CARBON AREA, UTAH - UNITED STATES DEPARTMENT OF AGRICULTURE - SOIL CONSERVATION SERVICE

2) BARFIELD, B.J., R.C. WARNER, C.T. HAAN, APPLIED HYDROLOGY AND SEDIMENTOLOGY FOR DISTURBED AREAS, OKLAHOMA TECHNICAL PRESS

22-141 50 SHEETS
22-142 100 SHEETS
22-144 200 SHEETS
AMPAD

18/24

Hydrometrics, Inc.
927 Airport Road • Helena, Montana 59601 • (406) 443-4150

November 17, 1988

Gary E. Taylor
Senior Mining Engineer
Utah Fuel Company
P. O. Box 719
Helper, UT 84526

Dear Gary,

Attached are flow capacity computations for the 72-inch diameter half-round CMP culvert with gravel invert at the Skyline Mine. Based on our telephone conversation, I assumed that inlet rather than outlet conditions controlled the flow. Flow capacities for various water depths above the top of the culvert are:

Depth of Water Above Top of Pipe - Feet	Discharge Capacity - CFS
0	125
2	150
6	190
10	225

Please let me know if you have any questions.

Sincerely,

Bob

Robert D. Braico, P. E.
Civil/Environmental Engineer

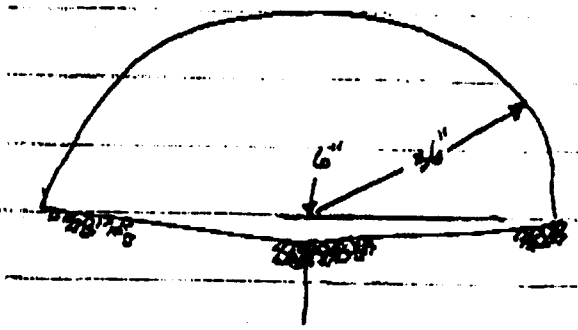
RDB:jy

Enclosures

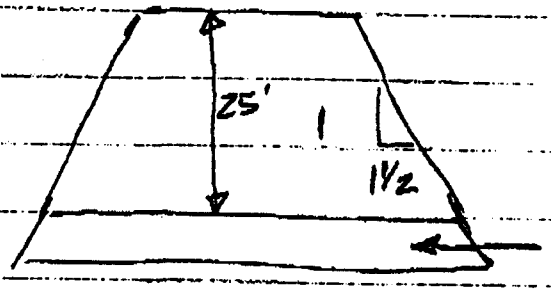
11/3/88.

1/6

Utah Fuel Co. - Skyline Mine



half-round CMP w/ gravel invert. Inlet is flared concrete with total width of 32'. Culvert is 161' long and installed on 3% slope. Discharge is to natural drainage w/o obstructions.



Need to calculate maximum discharge when:

(a) Water surface at inlet is at top of pipe
Q = 125 cfs

(b) Water surface is 2' ab. top of inlet
Q = 150 cfs

(c) 6' ab. inlet
Q = 190 cfs

(d) 10' ab. inlet
Q = 225 cfs

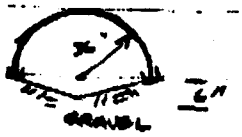
Answers From Smyant 11-17-88 Comps

UTAH FUEL. CO. SKYLINE MINE

S.M.y 11-17-88
p.2

CULVERT HYDRAULICS OF HORSESHOE STRUCTURAL PLATE ARCH SPAN = 6'-0" R = 36" RISE = 36" + 6" = 42"

INLET CONTROL (ASSUME THIS CONDITION EXISTS)



FIND HW/D FOR GIVEN CONDITIONS

L = 161'
S = 3%

a.) HW = D ∴ HW/D = 1.0

FOR CMPA ↓ FOR CMP ↓

b.) HW = D + 2 D = 3.5' ∴ HW = 5.5'

HW/D = 5.5/3.5 = 1.57

8.5/6 = 1.42

c.) HW = D + 6 D = 3.5 ∴ HW = 9.5

HW/D = 9.5/3.5 = 2.71

12.5/6 = 2.08

d.) HW = D + 10 D = 3.5 HW = 13.5

16.5/6 = 2.75

HW/D = 13.5/3.5 = 3.86

FIND ENTRANCE LOSS COEF. FOR INLET SECTION

INLET IS FLARED CONCRETE W/ TOTAL WIDTH = 32'

→ ASSUME SIMILAR TO PIPE WITH HEADWALL, 45° WINGWALL & SQUARE EDGE INLET (SOCKET END) $K_e = 0.2$

$K_o = 1.0$

UTAH FUEL C. 3/6
SKYLINE MINE Co.
SMY 11-17-88
p. 3

Adjustments to use nomographs

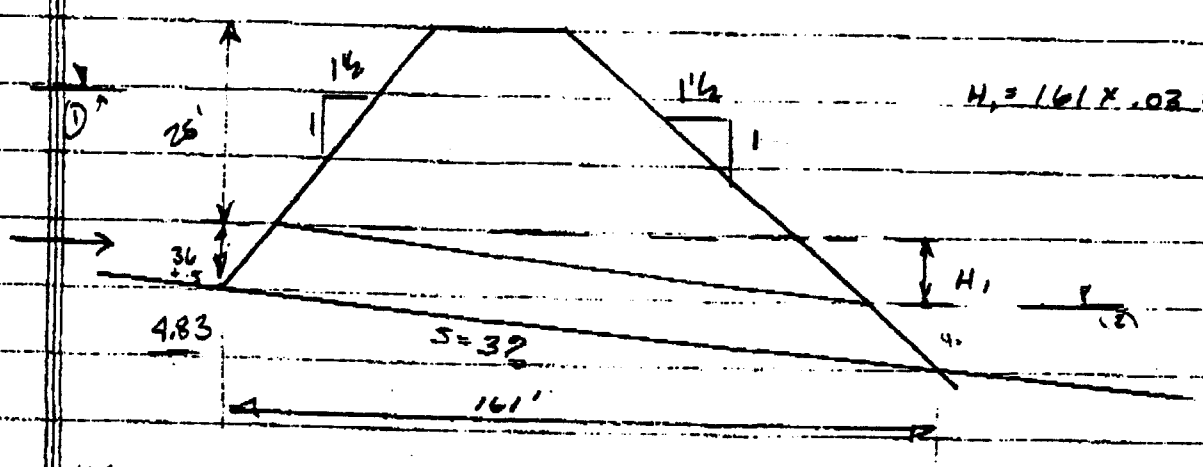
Dia. or Equiv. Dia.	Dimensions	Area ft^2		
60"	44" x 72"	17.6		
54"	40" x 65"	14.3		.82
66"	round	23.8		
72"	"	28.3	14.14	
78"	"	33.2	16.59	.3

FIND AREA
GIVEN PIPE:

$$A = \frac{\pi 3^2}{2} + \frac{1}{2} D^3 (.5) = \frac{28.27}{2} + .125 = 14.89\ ft^2$$

(See Nomographs p. 5 & 6)

X-SECTION



$H_1 = 161 \times .02 = 4.83$

USING NOMOGRAPHS		a)	b)	c)	d)
1) CMPA	18% above 40"x65"	83 cfs	130	175	210
2) CMP ½	30% above 72" ø	108	160	210	250

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11-17-88 SMyost
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Bernoulli Equation

$$\frac{V_1^2}{2g} + y_1 + z_1 = \frac{V_2^2}{2g} + y_2 + z_2 + \sum h_L$$

$$S \times L + H = \sum H_L \qquad \text{where } H = \Delta \text{ above pipe}$$

$$(.03)(161) + H = \sum H_L$$

$$4.83 + H = \sum H_L$$

$\sum H_L$ = entrance loss + outlet loss + friction loss

$$= K_e \frac{V^2}{2g} + K_o \frac{V^2}{2g} + \frac{2.87\, n^2 l V^2}{d^{4/3}}$$

$K_e = 0.2$

$K_o = 1.0$

$n = .027$

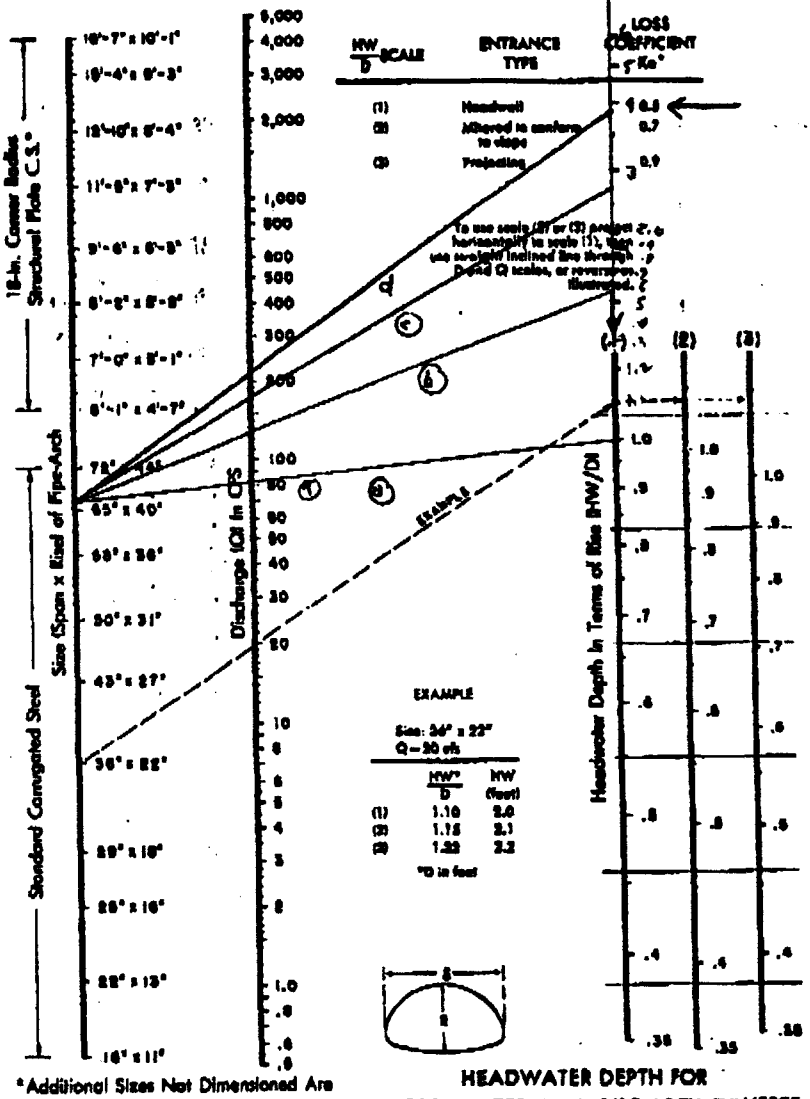
$l = 161$

$$d = \sqrt{\frac{A \cdot 4}{\pi}} = \sqrt{\frac{14.89 \cdot 4}{\pi}} = 4.354' = 52.25''$$

$$\therefore \sum H_L = V^2(.0660) \rightarrow V = \sqrt{\frac{\sum H_L}{(.0660)}}$$

	H $\sum H_L$	V	Q = A·V = 14.89 × V		
a)	4.83 ft	8.55 fps	127.35 cfs	Use	125 ←
b)	6.83	10.17	151.44		150 ←
c)	10.83	12.81	190.70		190 ←
d.	14.83	14.99	223.15		225 ←

these do check w/ nomographs



*Additional Sizes Not Dimensioned Are Listed In Fabricator's Catalog

Bureau of Public Roads Jan. 1963

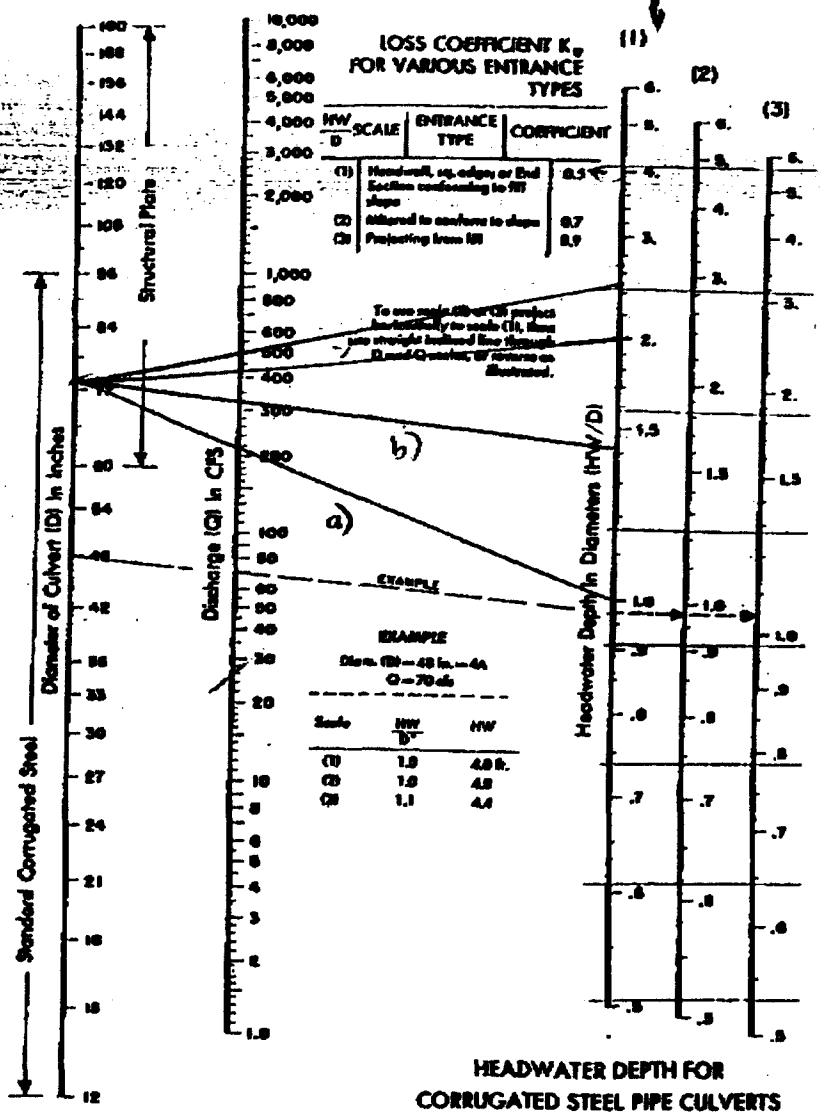
HEADWATER DEPTH FOR CORRUGATED STEEL PIPE-ARCH CULVERTS WITH INLET CONTROL

Fig. 4-20. *Inlet control* and headwater depths for corrugated steel *pipe-arch* culverts. Headwater depth should be kept low because pipe-arches are generally used where headroom is limited.

Reference: Handbook of Steel Drainage & Highway Construction Products, 1971.

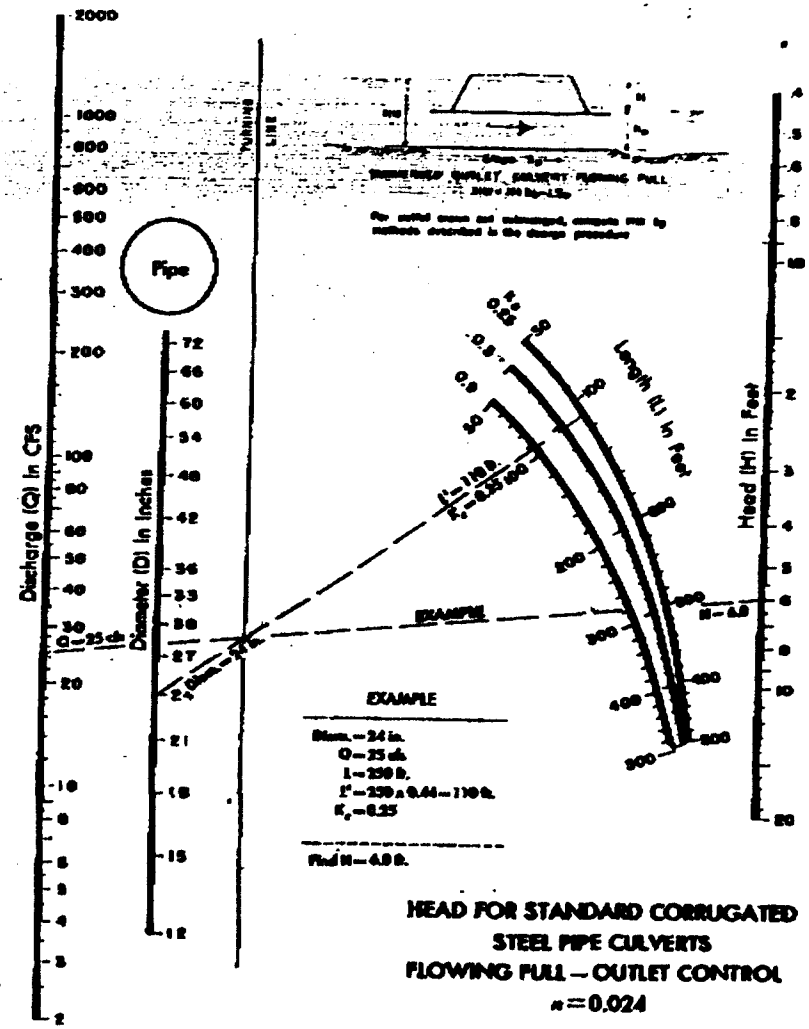
Skyline Mine

Fig. 2



HEADWATER DEPTH FOR CORRUGATED STEEL PIPE CULVERTS WITH INLET CONTROL

Fig. 15. Inlet Control Nomograph for corrugated steel pipe culverts.



HEAD FOR STANDARD CORRUGATED STEEL PIPE CULVERTS FLOWING FULL — OUTLET CONTROL
$n = 0.024$

Fig. 16. Outlet Control Nomograph for corrugated steel pipe culverts with submerged outlet and flowing full.

Say P.6

A 6" 60" 23.8
12" 28.3
18" 33.2

LENGTH ADJUSTMENT FOR OUTLET HYDRAULICS

Pipe Diameter in Inches	Roughness Factor n' for Helical Corr.*	Length Adjustment Factor $\left(\frac{n'}{n}\right)^2$
12	.011	.21
24	.016	.44
36	.019	.61
48	.020	.70

*Other values of roughness, n, are applicable to paved pipe, lined pipe and pipe with 2 x 1 in. corrugations. See page 31. To use the above chart for these types of pipe and pipe-arches, use "adjusted length factors" computed per the equation, page 29.

SECTION 13

LOADOUT AREA
SEDIMENTATION POND

RECEIVED
SEP 14 1989
DIVISION OF
OIL, GAS & MINING

SKYLINE MINE SEDIMENTATION POND
HYDRAULIC CALCULATIONS

UTAH FUEL COMPANY
Helper, Utah

Prepared by

EARTHFAX ENGINEERING, INC.
Salt Lake City, Utah

August 29, 1989

REGISTERED PROFESSIONAL ENGINEER
No. 8435
CAROL A.
BJORK
STATE OF UTAH

Carol A. Bjork
Aug. 29, 1989

SKYLINE MINE SEDIMENTATION POND HYDRAULIC CALCULATIONS

1.0 GENERAL

Upon the request of Utah Fuel Company, the existing sedimentation pond located at the load out facilities was evaluated to verify the present pond capacity. The minimum sediment storage volume and the runoff storage volume based on the 10-year, 24-hour storm event was calculated. In addition, the 25-year and 100-year, 24-hour storm events were routed through the sedimentation pond to determine the adequacy of the existing primary spillway.

The hydrology and hydraulic calculations were performed using the computer model SEDIMOT II. SEDIMOT II was developed by the University of Kentucky, Department of Agricultural Engineering, for the design of runoff and sediment control structures (Mayes, 1983).

2.0 POND CAPACITY

2.1 Runoff Volume. The runoff calculations for the existing watershed were performed by the SEDIMOT II model. The required input data

for the model are presented in Attachment A. The analysis was conducted for the 10-year, 24-hour storm event of 2.43 inches. The watershed information was provided by Mr. Gary Taylor of Utah Fuel Company. The size of the watershed is 12.56 acres, 8.3 of which is disturbed, and 4.26 of which is undisturbed (heavily vegetated forest). The computation of the runoff volume assumed an average curve number of 82 and a time of concentration of 0.102 hours.

The results of the SEDIMOT II calculations are presented in Attachment A. In summary, the total runoff volume entering the pond is 0.99 acre-foot, and the peak discharge is 12.9 cubic feet per second.

2.2 Sediment Storage. The annual sediment volumes entering the pond were calculated using a modified version of the universal soil loss equation (Israelson, 1984). The modified universal soil loss equation is:

$$A = R \times K \times LS \times VM$$

where,

A = computed amount of soil loss per unit area for the time interval represented by factor R (tons per acre per year).

R = rainfall factor. R values for Utah presented by Israelson (1984).

K = soil erodibility factor. K values for Utah presented by Israelson (1984). (tons per acre per year per unit of R).

LS = topographic factor based on length and steepness of slope. (dimensionless).

VM = erosion control factor based on vegetative, chemical, or mechanical measures. (dimensionless).

The calculations for the annual sediment yield from the disturbed and undisturbed areas are presented in Attachment A. The undisturbed drainage area contributes 0.003 acre-foot of sediment to the pond on an annual basis. The disturbed drainage area contributes 0.067 acre-foot of sediment to the pond yearly. Thus, the total annual sediment volume entering the pond is 0.07 acre-foot.

As required by the Utah Division of Oil, Gas & Mining (1987), UMC 817.46, the pond must contain a minimum sediment storage capacity equal to the 3-year sediment volume. Thus, the required sediment storage for the pond was determined to be 0.21 acre-foot from undisturbed and disturbed areas over a 3-year period.

Based on the elevation-capacity curve presented in Attachment A, the pond elevation which corresponds to the maximum sediment storage volume is 7915.6 feet. In addition, the 60% clean-out level is at 7915.2 feet.

2.3 Summary. In order to prevent the pond from spilling during the design storm event, a pond capacity of 1.20 acre-feet (0.99 acre-foot of runoff volume and 0.21 acre-foot of sediment storage) would be needed. Based on the elevation-capacity curve presented in Attachment A, the existing

permanent pool capacity of the sedimentation pond at the primary spillway elevation is 1.18 acre-foot. Thus, the existing pond will spill approximately 0.02 acre-foot of water during the design event with maximum sediment storage volume utilized. The primary spillway, if raised approximately 0.80 inches, would allow the pond to totally contain the design storm event.

The above discussion assumes that the pond would be empty of water down to the maximum sediment storage elevation prior to the occurrence of the design storm event. The existing sedimentation pond was constructed with a decant system which provides drainage down to the approximate maximum sediment storage elevation and, thus, the assumption is reasonable.

3.0 PRIMARY SPILLWAY

Based on the watershed information and sedimentation pond spillway data presented by Mr. Gary Taylor of Utah Fuel Company, and a sediment storage volume of 0.21 acre-foot, the 25-year and 100-year, 24-hour storm events were routed through the sediment pond using the computer model SEDIMOT II. The purpose was to determine the maximum stage and flow volume through the primary spillway. All stormflow discharging from the pond exits through the primary spillway since the pond was constructed without an emergency spillway outlet. The results of these analysis are contained in Attachment B.

The results provided by the SEDIMOT II model can be considered conservative since the program assumes that the sedimentation pond is full of water up to the primary spillway elevation prior to the storm event. This assumption was verified by Ms. Pamela Schwab of Civil Software Design, the current distributors of the SEDIMOT II software. Thus, based on SEDIMOT II calculations, outflow from the pond begins as soon as the storm runoff enters the pond.

Because the Skyline Mine sedimentation pond has the capability of releasing the stored water down to the maximum sediment storage level, it is reasonable to assume that this condition would exist prior to a storm event. Thus, the actual maximum stage during the design storm events would be less than that computed by SEDIMOT II.

From the analysis of the 25-year storm event, the maximum inflow rate is 17.3 cubic feet per second (cfs) and the maximum outflow rate is 9.4 cfs. The corresponding high water level is 7920.68, 0.97 foot above the primary spillway flowline.

From the analysis of the 100-year storm event, the maximum inflow rate is 24.2 cfs and the maximum outflow rate is 13.1 cfs. The corresponding water surface elevation is 7921.2 feet, 1.5 feet above the primary spillway flowline.

The elevation of the crest of the pond embankment is approximately 7922.0 feet. During the 100-year, 24-hour storm event, a freeboard of approximately 0.8 feet exists between the maximum stage elevation and the crest elevation.

4.0 REFERENCES

Barfield, B.J., R.C. Warner, and C.T. Haan. 1983. Applied Hydrology and Sedimentology for Disturbed Areas. Oklahoma Technical Press. Stillwater, Oklahoma.

Mayes, J.G. 1983. User's Guide to SEDIMOT II - PC Version. Oklahoma Technical Press. Stillwater, Oklahoma.

Miller, J.F., R.H. Frederick, and R.J. Tracey. 1973. Precipitation - Frequency Atlas of the Wester United States. Volume VI Utah. U.S. Department of Commerce. National Oceanic and Atmospheric Administration. Silver Spring, Maryland.

U.S. Environmental Protection Agency. 1976. Erosion and Sediment Control. Surface Mining in the Eastern U.S. EPA-625/3-76-006.

Utah Division of Oil, Gas and Mining. 1987. Utah Coal Mining and Reclamation Regulatory Program. Rules Pertaining to Underground Coal Mining Activities. Chapter I. Utah Department of Natural Resources. Salt Lake City, Utah.

ATTACHMENT A

Pond Capacity Calculations

Runoff calculations
10-Year 24-hour storm event

Information provided by Gary Taylor of Utah Fuel Co:

Watershed Area = 12.56 Acres
CN = 82 (Combined disturbed + undisturbed area)
Tc = 0.102 hrs
precip = 2.43 inches

SEDIMOT II results presented on next pages.

Summary: Peak discharge = 12.9 cfs
Runoff Volume = 0.99 Ac-feet

```
*****************************************************************
                        -- 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

10-YR, 24-HOUR STORM HYDROLOGY

****

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

STORM DURATION	-	24.00	HOURS
PRECIPITATION DEPTH	-	2.43	INCHES

* *
JUNCTION 1, BRANCH 1, STRUCTURE 1
* *

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

*** HYDROGRAPH AND SEDIMENT GRAPH ***
(TWO CONSECUTIVE VALUES PER LINE)

TIME (HR)	DISCHARGE (CFS)	******* *	TIME (HR)	DISCHARGE (CFS)
.00	.000	*	.10	.000
.20	.000	*	.30	.000
.40	.000	*	.50	.000
.60	.000	*	.70	.000
.80	.000	*	.90	.000
1.00	.000	*	1.10	.000
1.20	.000	*	1.30	.000
1.40	.000	*	1.50	.000
1.60	.000	*	1.70	.000
1.80	.000	*	1.90	.000
2.00	.000	*	2.10	.000
2.20	.000	*	2.30	.000
2.40	.000	*	2.50	.000
2.60	.000	*	2.70	.000
2.80	.000	*	2.90	.000
3.00	.000	*	3.10	.000
3.20	.000	*	3.30	.000
3.40	.000	*	3.50	.000

3.60	.000	*	3.70	.000
3.80	.000	*	3.90	.000
4.00	.000	*	4.10	.000
4.20	.000	*	4.30	.000
4.40	.000	*	4.50	.000
4.60	.000	*	4.70	.000
4.80	.000	*	4.90	.000
5.00	.000	*	5.10	.000
5.20	.000	*	5.30	.000
5.40	.000	*	5.50	.000
5.60	.000	*	5.70	.000
5.80	.000	*	5.90	.000
6.00	.000	*	6.10	.000
6.20	.000	*	6.30	.000
6.40	.000	*	6.50	.000
6.60	.000	*	6.70	.000
6.80	.000	*	6.90	.000
7.00	.000	*	7.10	.000
7.20	.000	*	7.30	.000
7.40	.000	*	7.50	.000
7.60	.000	*	7.70	.000
7.80	.000	*	7.90	.000
8.00	.000	*	8.10	.000
8.20	.000	*	8.30	.000
8.40	.000	*	8.50	.000
8.60	.000	*	8.70	.000
8.80	.000	*	8.90	.000
9.00	.000	*	9.10	.000
9.20	.000	*	9.30	.000
9.40	.000	*	9.50	.000
9.60	.000	*	9.70	.000
9.80	.000	*	9.90	.000
10.00	.000	*	10.10	.000
10.20	.022	*	10.30	.036
10.40	.050	*	10.50	.064
10.60	.107	*	10.70	.131
10.80	.154	*	10.90	.177
11.00	.199	*	11.10	.352
11.20	.403	*	11.30	.453
11.40	.501	*	11.50	.549
11.60	5.844	*	11.70	8.148
11.80	10.026	*	11.90	11.577
12.00	12.869	*	12.10	2.568
12.20	2.606	*	12.30	2.642
12.40	2.678	*	12.50	2.712
12.60	1.407	*	12.70	1.416
12.80	1.425	*	12.90	1.433
13.00	1.441	*	13.10	1.057
13.20	1.061	*	13.30	1.066
13.40	1.070	*	13.50	1.074
13.60	.838	*	13.70	.841
13.80	.843	*	13.90	.846
14.00	.848	*	14.10	.607
14.20	.609	*	14.30	.610

14.40	.611	*	14.50	.612
14.60	.613	*	14.70	.615
14.80	.616	*	14.90	.617
15.00	.618	*	15.10	.619
15.20	.620	*	15.30	.622
15.40	.623	*	15.50	.624
15.60	.625	*	15.70	.626
15.80	.627	*	15.90	.628
16.00	.629	*	16.10	.378
16.20	.379	*	16.30	.379
16.40	.379	*	16.50	.380
16.60	.380	*	16.70	.380
16.80	.381	*	16.90	.381
17.00	.382	*	17.10	.382
17.20	.382	*	17.30	.383
17.40	.383	*	17.50	.384
17.60	.384	*	17.70	.384
17.80	.385	*	17.90	.385
18.00	.385	*	18.10	.386
18.20	.386	*	18.30	.387
18.40	.387	*	18.50	.387
18.60	.388	*	18.70	.388
18.80	.388	*	18.90	.389
19.00	.389	*	19.10	.389
19.20	.390	*	19.30	.390
19.40	.390	*	19.50	.391
19.60	.391	*	19.70	.392
19.80	.392	*	19.90	.392
20.00	.393	*	20.10	.262
20.20	.262	*	20.30	.262
20.40	.262	*	20.50	.263
20.60	.263	*	20.70	.263
20.80	.263	*	20.90	.263
21.00	.263	*	21.10	.263
21.20	.264	*	21.30	.264
21.40	.264	*	21.50	.264
21.60	.264	*	21.70	.264
21.80	.264	*	21.90	.265
22.00	.265	*	22.10	.265
22.20	.265	*	22.30	.265
22.40	.265	*	22.50	.266
22.60	.266	*	22.70	.266
22.80	.266	*	22.90	.266
23.00	.266	*	23.10	.266
23.20	.267	*	23.30	.267
23.40	.267	*	23.50	.267
23.60	.267	*	23.70	.267

*** HYDRAULIC INPUT VALUES FOR SUBWATERSHEDS ***

WATER SHED	AREA ACRES	CURVE NUMBER	TC HR	TT HR	ROUTING COEFFICIENTS K-HRS	X	UNIT HYDRO
1	12.56	82.00	.102	.000	.000	.00	.0

* * * COMPUTED VALUES FOR INDIVIDUAL WATERSHEDS * * *

WATERSHED	PEAK FLOW (CFS)	RUNOFF (INCHES)
1	12.87	.95

NOTE: SEDIMENT DOES NOT INCLUDE POSSIBLE DEPOSITION BY DELIVERY RATIO 2

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

RUNOFF VOLUME	-	.9911	ACRE-FT
PEAK DISCHARGE	-	12.8694	CFS
AREA	-	12.5600	ACRES
TIME OF PEAK DISCHARGE	-	12.00	HRS

* * * * * * * * * * * *
NULL STRUCTURE
* * * * * * * * * * * *

*** RUN COMPLETED ****

SEDIMENT VOLUME CALCULATIONS

Disturbed Area to Pond:

Calculated using a planimeter at topo map; Scale: 1" = 50'. Plot of Disturbed area boundary.

8.1 in²
41.1
44.8
35.8
14.9

144.7 in² = 361,750 ft²
= 8.3 acres

Undisturbed Area to Pond:

12.56 Ac − 8.3 = 4.26 Acres

Information provided by Gary Taylor @ Utah Fuel.

POND Stage-area curve =

(Stage)	Elev	map in²	ft²*	Acres	Volume (Ac-ft)	Cum Vol. (Ac-ft)
0	7914	7.13	2852	.065	.269	0
2	7916	22.20	8880	0.204	.454	.269
4	7918	27.25	10,900	0.250	.543	.723
6	7920	31.92	12,768	0.293	.617	1.266
8	7922	38.59	15,436	0.354		1.913
5.71	7919.71	(Spillway)		0.267		1.18 (from curve)

* note: map scale is 1" = 20'

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PROJECT C117-02 PAGE 8 OF 13
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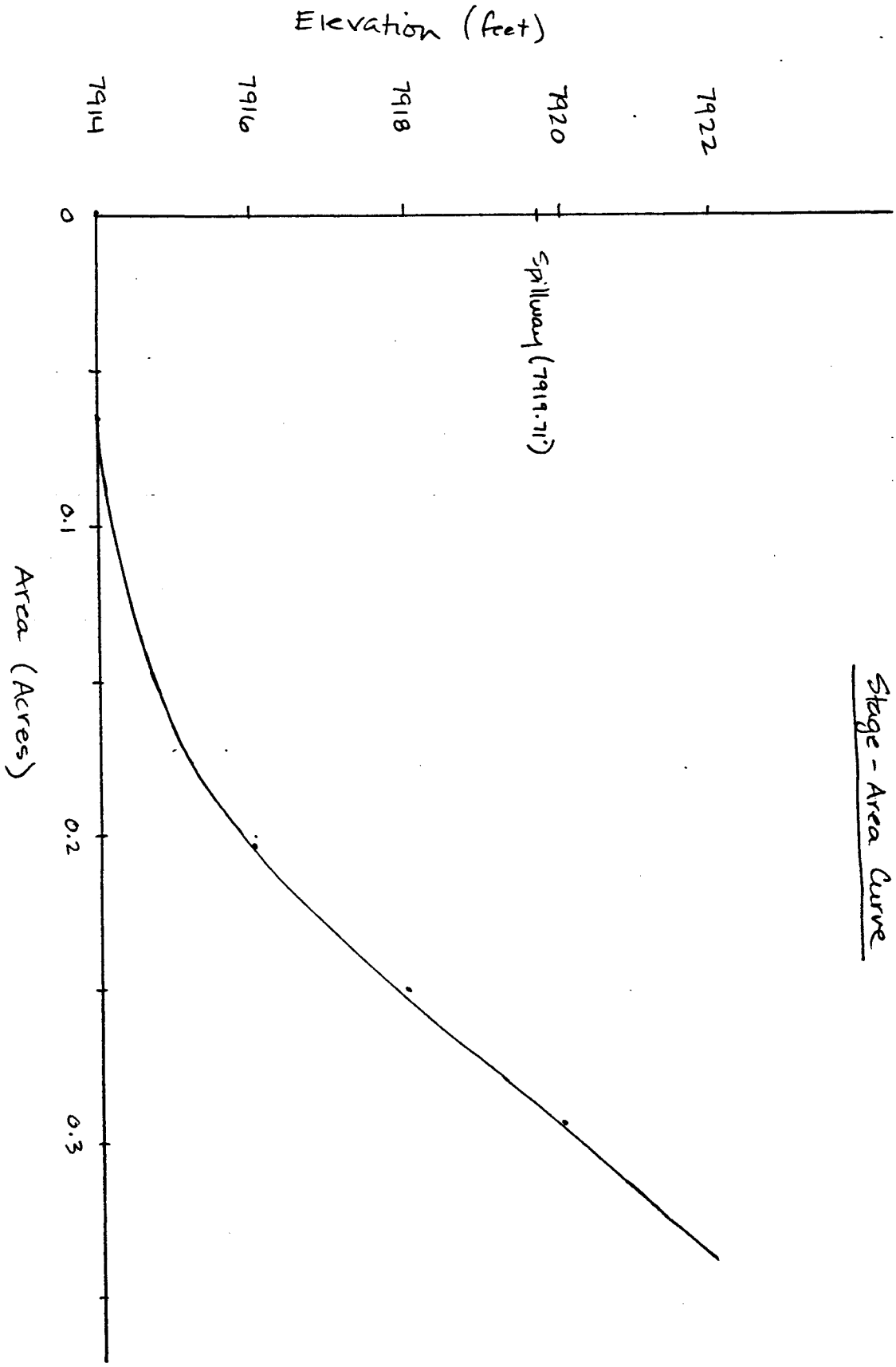
CHECKED DATE

Skyline Mine
Sedimentation Pond
Stage - Area Curve



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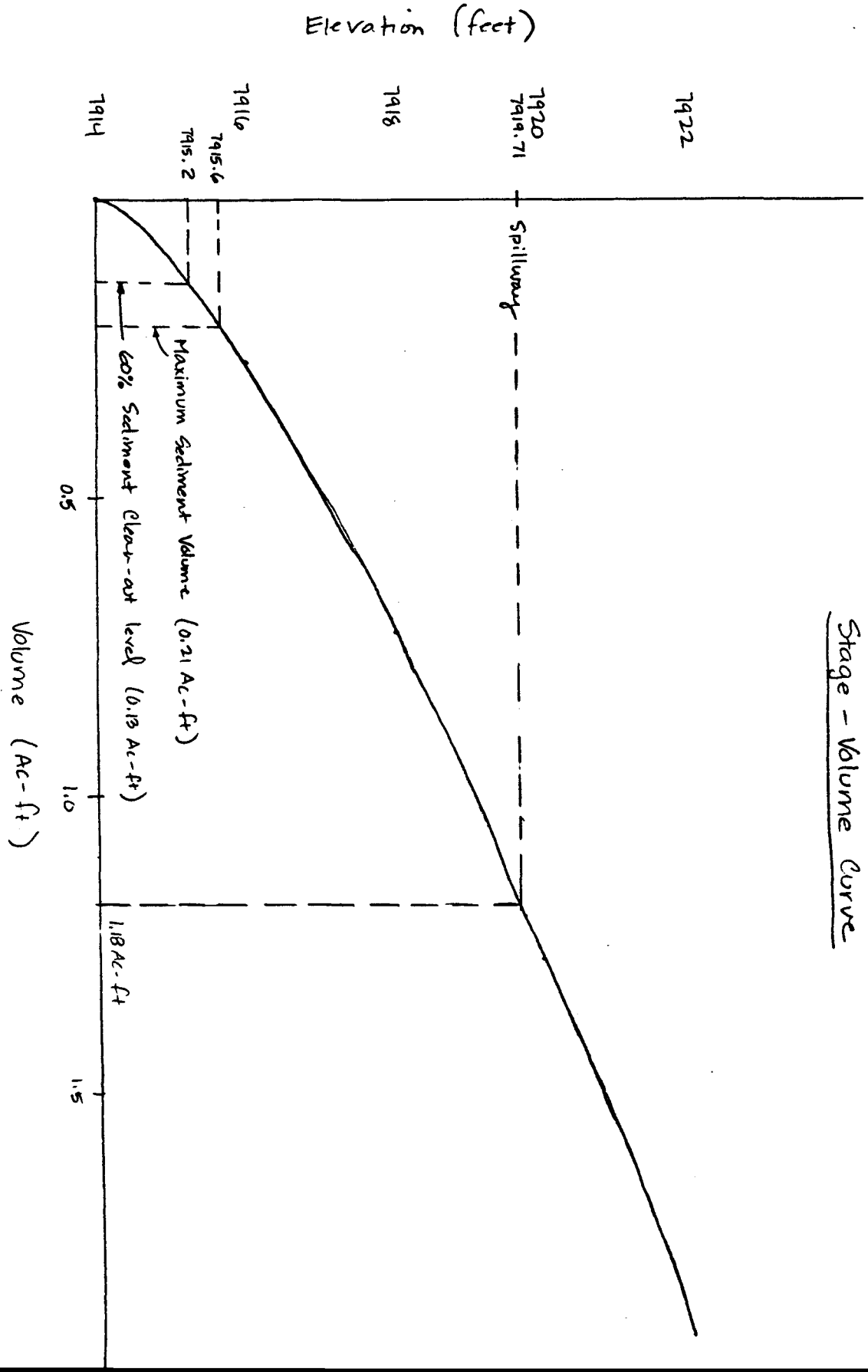
PROJECT C117-02 PAGE 9 OF 13
COMPUTED CAB DATE 8/26/89
CHECKED DATE

Skyline Hills Sedimentation Pond

Stage - Volume Curve



Sediment Storage Volume

Disturbed Area

Refer to Topo Map of Disturbed Area For Area Boundaries. Scale: 1" = 50'

Area 1 = 7.46 Acres (from topo map. Area calculated using planimeter)

$$\text{Ave. Slope} = \frac{8005 - 7920}{1500'} = .057$$

Use U.S.L.E.

$A = R \cdot K \cdot LS \cdot VM$ (Ref: Israelson, C.E., J.E. Fletcher, F.W. Haws, E.K. Israelson. 1984. Erosion + Sedimentation in Utah. Utah Water Research Laboratory. Logan, Utah.)

R = 17 (Israelson, 1984)

K = Soil erodibility Index
= 0.20 (from Map provided by Israelson, et al)

$$LS = \left(\frac{650 + 4150s + 65s^2}{10{,}000 + s^2}\right)\left(\frac{l}{72.6}\right)^m$$

(Ref: Clyde, et al, 1978. Manual of Erosion Control Principles + Practices. Utah Water Research Lab. - Logan)

s = 5.7% (from topo)
l = 1500' (approx. length of disturbed area - from topo)
m = 0.5 (Clyde, et al 1978 - based on slope)

LS = 2.41

VM - Control factor. Assume disturbed area is compacted soil + scraped. A worst-case condition

VM = 1.20

$$A = (17)(.20)(2.41)(1.20) = 9.83 \text{ tons/Ac/year}$$

= 73.3 tons/year

= 1630 ft^3/year (for a unit weight of 90 lbs/ft^3)

= 0.037 Ac-ft/year

Area 2 = 0.52 Acres (Area computed from Topo map using planimeter)

Slope length = 50'
Slope = 1:1

K = 0.20
R = 17

LS = 29.87 (Israelson, et. al, 1984)

VM = 0.90 (Israelson, et al, 1984) Assume a rough and irregular tracked surface to approximate existing rocky conditions.

A = (.20)(17)(29.87)(0.90) = 91.4 tons/Ac = 47.5 tons
= 1056 ft3 (assuming 90lb/ft3)
= .024 Ac-ft.

Area 3 = 0.32 Acres (Area calculated from Topo map using a planimeter)

Slope length = 60'
Slope = $\frac{10}{22}$ = 45%

K = 0.2
R = 17

LS = 11.77 (Israelson, et al, 1984)

VM = 0.90 (Israelson, et al, 1984) Assume a rough and irregular tracked surface to approximate existing rocky conditions.

A = (.20)(17)(11.77)(0.90) = 36 tons/Ac = 11.5 tons
= 256 ft3 (assuming 90lb/ft3)
= .006 Ac-ft

Undisturbed Area Contributing to pond:

Total Land Area contributing to pond = 12.56 Acres (Gary Taylor, Utah fuel)

Undisturbed Area to pond = 12.56 − 8.30 = 4.26 Acres

Undisturbed Area is heavily wooded + vegetated with conifers + brush

Slope length ≈ 450 ft
Slope ~ 50%

K = 0.20
R = 17

LS = 37.81 (Israelson, 1984)

VM = .01 (Israelson, 1984) Assume permanent seeding.

A = (.20)(17)(37.81)(.01) = 1.29 tons/Ac = 5.5 tons
= 122 ft3 (assuming 90 lb/ft3)
= .003 Ac-ft

Total Sediment to pond:

Disurbed Area:

Area 1	.037 Ac-ft/yr
Area 2	.024 Ac-ft/yr
Area 3	.006 Ac-ft/yr
Undisturbed Area	.003 Ac-ft/yr
	.070 Ac-ft/year

For 3-year period, total sediment to pond = 0.21 Ac-ft.

Contributions to pond:

Runoff volume = 0.99 Ac-ft
3-yr Sediment Storage = 0.21 Ac-ft

Total: 1.20 Ac-ft

Permanent pool capacity to primary spillway elevation = 1.18 Ac-feet. (refer to Stage-capacity curve).

The sedimentation pond nearly contains the design storm event and 3-year sediment volume without spilling. The spillway would need to be raised $\frac{.02 \text{ ac-ft}}{.3 \text{ Ac}}$ = .067 ft = 0.80 inches to provide total containment based on these calculations.

ATTACHMENT B

Primary Spillway Calculations

25-year and 100-year, 24 hour storm events.

Precipitation: 25-year, 24 hour = 2.9 inches
(Miller, 1973) 100-year, 24 hour = 3.6 inches

Pond information provided by Gary Taylor of Utah Fuel Co.:

Pond Length = 164 ft.
Riser diameter = 36" Rolled Plate
Barrel diameter = 18" Steel Pipe
Barrel Length = 60 ft.
Head draw elevation difference = 8.11 feet to top of pipe = 8.11 + 0.4(1.5') = 8.71' to a point 0.6 times the diameter above the pipe invert (Barfield, 1983)

Calculate Dead Space: Ref: EPA. 1976. Erosion and Sediment control. Surface Mining in the Eastern U.S. EPA 625/3-76-006

Effective pond width = $\frac{\text{Area}}{\text{length}} = \frac{12{,}500\,ft^2}{164\,ft} = 76.2$ ft

$\frac{\text{length}}{\text{eff. width}} = \frac{164}{76.2} = 2.1$ Efficient System

Assume dead space = 20% for an Efficient System (Sedimot II Users Manual).

Revised Stage - Area curve which accounts for sediment storage of 0.21 Acre-feet.

Stage	Elev	Area
0	7915.6	.176
0.4	7916.0	.204
2.4	7918.0	.250
4.11	7919.71	.287
4.4	7920.0	.293
6.4	7922.0	.354

Sedimot II output on following pages:

Summary of results:

25-year Storm:
runoff volume = 1.36 Ac-ft
peak inflow = 17.3 cfs
peak outflow = 9.4 cfs
Max stage = 5.08' = elev. 7920.68'

100-year Storm:
runoff volume = 1.95 Ac-ft
peak inflow = 24.2 cfs
peak outflow = 13.1 cfs
Max. stage = 5.6' = 7921.2' elev.

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*                                                               *
*     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

25-YR, 24-HR STORM EVENT

****

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	-	2.90	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	12.56	82.00	.102	.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

* * * COMPUTED VALUES FOR INDIVIDUAL WATERSHEDS * * *

WATERSHED	PEAK FLOW (CFS)	RUNOFF (INCHES)	SEDIMENT TONS	DIAM (MM)	DELIVERY RATIO 1	DELIVERY RATIO 2
1	17.34	1.30	.00	.100	1.000	1.000

NOTE: SEDIMENT DOES NOT INCLUDE POSSIBLE DEPOSITION BY DELIVERY RATIO 2

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

RUNOFF VOLUME	-	1.3614	ACRE-FT
PEAK DISCHARGE	-	17.3377	CFS
AREA	-	12.5600	ACRES
TIME OF PEAK DISCHARGE	-	12.00	HRS
BETA	-	1.0000	
RAINFALL EROSITIVITY FACTOR	-	48.89	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	-	-24.00	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

* *

POND RESULTS

* *

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

FLOW	FRACTN	ISDO	NRHP	NSP	NCSTR
3	0	2	300	6	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	-	18.00	INCHES
RISER DIAMETER	-	36.00	INCHES
LENGTH OF PIPE	-	60.00	FEET
VERTICAL HEAD DROP	-	8.71	FEET

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

STAGE (FT)	AREA (ACRES)	AVERAGE DEPTH (FT)	DISCHARGE (CFS)	CAPACITY (ACRES-FT)
.00	.176	.00	.00	.00
.40	.204	.39	.00	.08
2.40	.250	2.26	.00	.53
4.11	.287	3.81	.00	.99
4.40	.293	4.07	4.56	1.07
6.40	.354	5.75	18.85	1.72

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

TURBULENCE FACTOR	=	1.00	
PERMANENT POOL CAPACITY	=	.989	ACRE-FT
DEAD STORAGE	=	20.00	PERCENT
TIME INCREMENT OUTFLOW	=	.10	HRS
VISCOSITY	=	.009	CM**2/SEC
INFLOW RUNOFF VOLUME	=	1.361	ACRE-FT
OUTFLOW ROUTED VOLUME	=	1.361	ACRE-FT
STORM VOLUME DISCHARGED (PLUG FLOW)	=	1.361	ACRE-FT
POND VOLUME AT PEAK STAGE	=	1.294	ACRE-FT
PEAK STAGE	=	5.081	FT
PEAK INFLOW RATE	=	17.338	CFS
PEAK DISCHARGE RATE	=	9.426	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	=	.28	HRS
DETENTION TIME FROM HYDROGRAPH CENTERS	=	.28	HRS
DETENTION TIME INCLUDING STORED FLOW	=	.28	HRS
SEDIMENT LOAD DISCHARGED	=	.00	TONS
PERIOD OF SIGNIFICANT CONCENTRATION	=	-25.40	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

*** RUN COMPLETED ****

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*         DURING PERIOD OF SIGNIFICANT CONCENTRATION            *
*      5. ARITHMETIC AVERAGE SETTLEABLE CONCENTRATION           *
*         DURING PEAK 24 HOUR PERIOD                            *
*                                                               *
*     ALL CONCENTRATIONS ARE IN ML/L.                           *
*                                                               *
*****************************************************************
```

****

WATERSHED IDENTIFICATION CODE

100-YR, 24-HR STORM EVENT

****

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	-	3.60	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	12.56	82.00	.102	.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

* * * COMPUTED VALUES FOR INDIVIDUAL WATERSHEDS * * *

WATERSHED	PEAK FLOW (CFS)	RUNOFF (INCHES)	SEDIMENT TONS	DIAM (MM)	DELIVERY RATIO 1	DELIVERY RATIO 2
1	24.23	1.87	.00	.100	1.000	1.000

NOTE: SEDIMENT DOES NOT INCLUDE POSSIBLE DEPOSITION BY DELIVERY RATIO 2

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

RUNOFF VOLUME	-	1.9526	ACRE-FT
PEAK DISCHARGE	-	24.2297	CFS
AREA	-	12.5600	ACRES
TIME OF PEAK DISCHARGE	-	12.00	HRS
BETA	-	1.0000	
RAINFALL EROSITIVITY FACTOR	-	78.30	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	-	-24.00	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

* *

POND RESULTS

* *

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

FLOW	FRACTN	ISDO	NRHP	NSP	NCSTR
3	0	2	300	6	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	-	18.00	INCHES
RISER DIAMETER	-	36.00	INCHES
LENGTH OF PIPE	-	60.00	FEET
VERTICAL HEAD DROP	-	8.71	FEET

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

STAGE (FT)	AREA (ACRES)	AVERAGE DEPTH (FT)	DISCHARGE (CFS)	CAPACITY (ACRES-FT)
.00	.176	.00	.00	.00
.40	.204	.39	.00	.08
2.40	.250	2.26	.00	.53
4.11	.287	3.81	.00	.99
4.40	.293	4.07	4.56	1.07
6.40	.354	5.75	18.85	1.72

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

TURBULENCE FACTOR	-	1.00	
PERMANENT POOL CAPACITY	-	.989	ACRE-FT
DEAD STORAGE	-	20.00	PERCENT
TIME INCREMENT OUTFLOW	-	.10	HRS
VISCOSITY	-	.009	CM**2/SEC
INFLOW RUNOFF VOLUME	-	1.953	ACRE-FT
OUTFLOW ROUTED VOLUME	-	1.953	ACRE-FT
STORM VOLUME DISCHARGED (PLUG FLOW)	-	1.953	ACRE-FT
POND VOLUME AT PEAK STAGE	-	1.461	ACRE-FT
PEAK STAGE	-	5.600	FT
PEAK INFLOW RATE	-	24.230	CFS
PEAK DISCHARGE RATE	-	13.134	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	-	.31	HRS
DETENTION TIME FROM HYDROGRAPH CENTERS	-	.31	HRS
DETENTION TIME INCLUDING STORED FLOW	-	.31	HRS
SEDIMENT LOAD DISCHARGED	-	.00	TONS
PERIOD OF SIGNIFICANT CONCENTRATION	-	-25.50	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

*** RUN COMPLETED ****

TRAIN LOADOUT AREA
STAGE VOLUME

G. TAYLOR
6-20-89

SIZING POND

1. SEDIMENT VOLUME

0.1 AC.-FT. /AC FOR EACH ACRE OF DISTURBED AREA

VOL. = 0.1 AC-FT./AC × 12.56 ACRES (MNP 3.2.1-3)

= 1.26 AC-FT × 43,560 = 54,711.3

USE 54,710 CU. FT.

2. STORM DETENTION

CN = CN FOR PAD (AC. OF PAD) + CN FOR UNDISTURBED GROUND (AC. OF AREA) / TOTAL AC.

= 90(8.46) + 64(3.92)/12.56 = 80.60

= 81

10 YR - 24 HR STORM

P = 2.43 IN. SECTION 2 PAGE 5 OF 7, VOL. 5

S = 1000/CN - 10 EQ 2.39 PAGE 81 APPLIED HYD. AND SEDIMENTOLOGY FOR DISTURBED AREAS BARFIELD AND HAAN

= 1000/81 - 10

= 2.35

Q = (P - .25)²/P + .8S EQ 2.38 PAGE 81

= (2.43 - .2(2.35))²/2.43 + .8(2.35)

= .89 IN ÷ 12 IN/FT = .07 FT.

12.56 AC. × 43,560 SQ.FT./AC. × .07 FT. = 40,674

USE 40,670 CU.FT.

THEREFORE THE TOTAL STORAGE/DETENTION CAPACITY OF THE POND SHOULD NOT BE LESS THAN

V_T = 54,710 + 40,670 = 95,380 CU. FT.

3. POND CAPACITY (MAP 3.2.1-3)

ELEVATION	AREA (FT^2)	AVG. AREA (FT^2)	Δ VOL (FT^3)	ACC. VOL. (FT^3)
7914	2,600			
		6,000	12.000	12,000
7916	9,400			
		11,000	22,000	34,000
7918	12,600			
		13,440	22,980	56,980
7919.71	14,280			

POND TO SMALL

22-141 50 SHEETS
22-142 100 SHEETS
22-144 200 SHEETS
AMPAD

LOADOUT AREA DROP INLET
STAGE DISCHARGE CURVE

CN: 90 DISTURBED AREA

MAX FLOW LENGTH - 1962.94 FT.

CONCENTRATION TIME - .102 HRS

10 YR - 24 HR - 2.43 IN } SECTION 2 PAG 5 OF 7

100 YR - 24 HR - 3.50 IN

PEAK FLOW

10 YR - 24 HR = 13.41 CFS } SCS UNIT HYDROGRAPH METHOD NSH-4, 1972

100 YR - 24 HR - 29.12 CFS

DATA - MAP 3.2.1 - 4A

SPILLWAY CREST ELEVATION	-	7919.71
JUNCTION OF RISER AND BARREL ELEV.	-	7915.79
SPILLWAY OUTLET ELEVATION	-	7911.60
MAX. AVAILABLE WATER ELEV.	-	7923

DIA. RISER = 36 IN.

DIA. BARREL = 18 IN.

WEIR FLOW

$Q = CLH^{3/2}$ C = 3, L = 9.42 — EQ 4.1, PAGE 23D, APPLIED HYDROLOGY AND SEDIMENTOLOGY FOR DISTURBED AREAS, OKLAHOMA TECHNICAL PRESS

$Q = 28.27\ H^{3/2}$

ORIFICE FLOW

$Q = C'a\sqrt{2gH}$ C' = .60, a = 7.07 — EQ 4.2, PAGE 23D, APPLIED HYDROLOGY AND SEDIMENTOLOGY FOR DISTURBED AREA, OKLAHOMA TECHNICAL PRESS

$Q = 34.04\sqrt{H}$

22-141 50 SHEETS
22-142 100 SHEETS
22-144 200 SHEETS
AMPAD

PIPE FLOW

$$Q = a(2gH')^{1/2} / (1 + K_e + K_b + K_c L)^{1/2}$$

EQ 4 4
PAGE 232
APPLIED HYDROLOGY AND SEDIMENTOLOGY FOR DISTURBED AREAS.

$$H' = H + 8.11 - .6(1.5)$$
$$= H + 7.21$$

$K_e = 1.0$
$K_b = 5$
$K_c = .0476$
$a = 1.77$
$L = 60$

$$Q = 1.77\,[2g\,(H + 7.21)]^{1/2} / (1 + 1.0 + .5 + .0476\,(60))^{1/2}$$

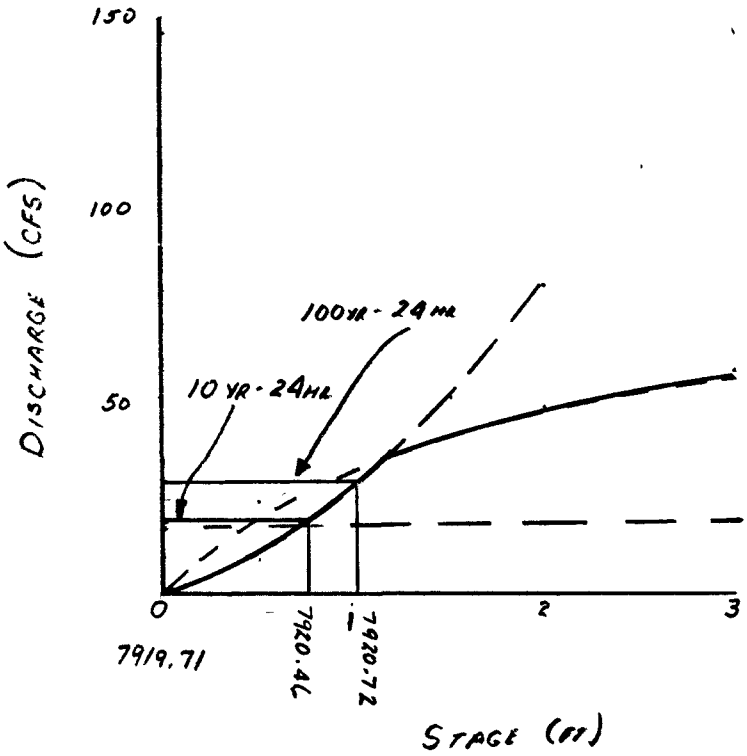
$$= 1.77\,(64.4\,(H + 7.21))^{1/2} / 2.31$$

$$Q = 6.15\,(H + 7.21)^{1/2}$$

H	Q WEIR	Q ORIFICE	Q PIPE
0	0	0	16.51
.5	9.99	24.07	17.08
1.0	28.27	32.04	17.62
1.5	51.94	41.69	18.15
2.0	79.96	48.14	18.66
2.5	111.75	53.82	19.16
3.0	146.90	58.96	19.65

22-141 50 SHEETS
22-142 100 SHEETS
22-144 200 SHEETS
AMPAD

22-141 50 SHEETS
22-142 100 SHEETS
22-144 200 SHEETS
AMPAD



STAGE - DISCHARGE CURVE

SECTION 13

G. TAYLOR
7-9-91

TRAIN LOADOUT
SEDIMENTATION POND EMERGENCY SPILLWAY

DETERMINE FLOW RATE FOR 25 YR -6 HR EVENT

USING SCS TYPE B METHOD

25 YR - 6 HR. 1.88 INCHES OF PRECIPITATION (1)

CN = 82

SLOPE = .057

HYD. DISTANCE = 1,500 FT.

AREA - 12.56 ACRES

Q = 5.26 CFS OR 2,361 GPM

USE A HORIZONTAL CRESTED WEIR

$Q = CLH^{3/2}$ (2)

EQU. 5-10 PAGE 5-3 HANDBOOK OF HYDRAULICS FIFTH EDITION

H = HEAD = .4 FT

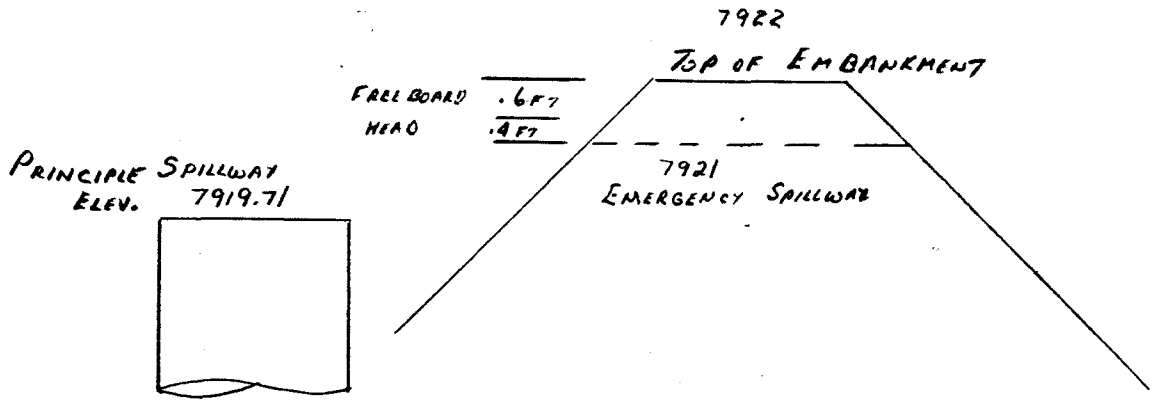
L = LENGTH OF WEIR = 10 FT

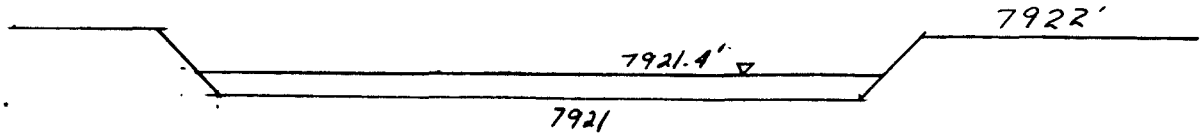
C = COEFFICIENT = 2.56

TABLE 5-3 PAGE 5-16 HANDBOOK OF HYDRAULICS FIFTH EDITION

$Q = 2.56\ (10)\ (.4)^{1.5}$

= 6.48 CFS





FRONT VIEW

CALCULATE VELOCITY

A = 10 FT × 15 FT = 150 SQ. FT MAR. 3.2.1-3

Q = 5.26 CFS

V = Q/A

= 5.26 CFS/150 SQ FT

= .04 FPS

RIPRAP IS NOT NEEDED

NOTE:

THE 10 YEAR - 24 HOUR EVENT GENERATES A FLOW RATE OF 18.41 CFS. THIS FLOW RATE WILL PASS THROUGH THE PRINCIPLE SPILLWAY REQUIRING ONLY .75 FEET OF HEAD, REFER TO THE STAGE - DISCHARGE CURVE SECTION 13 PAGE 5 OF 18 VOLUME 5. THERE IS 1.29 FEET OF ELEVTIONAL DIFFERENCE BETWEEN THE PRINCPLE SPILLWAY AND THE EMERGENCY SPILLWAY.

REFERENCE:

1) VOLUME 5, SECTION 1 PAGE 1 NATIONAL OCEANOGRAPHIC AND ATMOSPHERIC ADMINISTRATION, AND UTAH STATE UNIVERSITY

2) KING, H. W AND E. F. BRATER 1963 HANDBOOK OF HYDRAULICS. McGRAW-HILL. NEW YORK, NEW YORK.

REGISTERED PROFESSIONAL ENGINEER
8632
WILLIAM W.
SHRIVER
STATE OF UTAH

Wm W. Shriver
7-18-91

22-141 50 SHEETS
22-142 100 SHEETS
22-144 200 SHEETS
AMPAD

EarthFax

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

May 9, 1989

Gary Taylor
Utah Fuel Company
P.O. Box 719
Helper, Utah 84526

Subject: Sedimentation pond hydraulic calculations

Dear Mr. Taylor:

Attached are the results of our SEDIMOT II model run of the Skyline sedimentation pond. We used the input values provided by yourself on May 3, 1989.

The results (summarized on the last page of the output) indicate the following:

- Peak inflow rate = 12.9 cfs
- Peak outflow rate = 8.1 cfs
- Peak stage = 6.25 ft (i.e., 0.54 ft above the principal spillway)
- Detention time = 0.26 hr

USED CN=82

Please let me know if you need assistance in interpreting the data or additional support.

Sincerely,

Richard B. White

Richard B. White, P.E.
Principal Hydrologist

Attachment

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

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	=	2.43	INCHES
SPECIFIC GRAVITY	=	2.50	
LOAD RATE EXPONENT FACTOR	=	1.50	
SUBMERGED BULK SPECIFIC GRAVITY	=	1.25	

* *

JUNCTION 1, BRANCH 1, STRUCTURE 1

* *

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

*** PARTICLE SIZE DISTRIBUTION OF SEDIMENT ***

SIZE,MM	.2500	.1000	.0500	.0100	.0050	.0010
PERCENT FINER	100.0000	50.0000	35.0000	19.0000	15.0000	6.0000
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
7.60	.000	.000	*	7.70	.000	.000
7.80	.000	.000	*	7.90	.000	.000
8.00	.000	.000	*	8.10	.000	.000

9/8

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	.022	.000	*	10.30	.036	.000
10.40	.050	.000	*	10.50	.064	.000
10.60	.107	.000	*	10.70	.131	.000
10.80	.154	.000	*	10.90	.177	.000
11.00	.199	.000	*	11.10	.352	.000
11.20	.403	.000	*	11.30	.453	.000
11.40	.501	.000	*	11.50	.549	.000
11.60	5.844	.000	*	11.70	8.148	.000
11.80	10.026	.000	*	11.90	11.577	.000
12.00	12.869	.000	*	12.10	2.568	.000
12.20	2.606	.000	*	12.30	2.642	.000
12.40	2.678	.000	*	12.50	2.712	.000
12.60	1.407	.000	*	12.70	1.416	.000
12.80	1.425	.000	*	12.90	1.433	.000
13.00	1.441	.000	*	13.10	1.057	.000
13.20	1.061	.000	*	13.30	1.066	.000
13.40	1.070	.000	*	13.50	1.074	.000
13.60	.838	.000	*	13.70	.841	.000
13.80	.843	.000	*	13.90	.846	.000
14.00	.848	.000	*	14.10	.607	.000
14.20	.609	.000	*	14.30	.610	.000
14.40	.611	.000	*	14.50	.612	.000
14.60	.613	.000	*	14.70	.615	.000
14.80	.616	.000	*	14.90	.617	.000
15.00	.618	.000	*	15.10	.619	.000
15.20	.620	.000	*	15.30	.622	.000
15.40	.623	.000	*	15.50	.624	.000
15.60	.625	.000	*	15.70	.626	.000
15.80	.627	.000	*	15.90	.628	.000
16.00	.629	.000	*	16.10	.378	.000
16.20	.379	.000	*	16.30	.379	.000
16.40	.379	.000	*	16.50	.380	.000
16.60	.380	.000	*	16.70	.380	.000
16.80	.381	.000	*	16.90	.381	.000
17.00	.382	.000	*	17.10	.382	.000
17.20	.382	.000	*	17.30	.383	.000
17.40	.383	.000	*	17.50	.384	.000
17.60	.384	.000	*	17.70	.384	.000
17.80	.385	.000	*	17.90	.385	.000
18.00	.385	.000	*	18.10	.386	.000
18.20	.386	.000	*	18.30	.387	.000
18.40	.387	.000	*	18.50	.387	.000
18.60	.388	.000	*	18.70	.388	.000
18.80	.388	.000	*	18.90	.389	.000
19.00	.389	.000	*	19.10	.389	.000
19.20	.390	.000	*	19.30	.390	.000
19.40	.390	.000	*	19.50	.391	.000
19.60	.391	.000	*	19.70	.392	.000
19.80	.392	.000	*	19.90	.392	.000
20.00	.393	.000	*	20.10	.262	.000
20.20	.262	.000	*	20.30	.262	.000
20.40	.262	.000	*	20.50	.263	.000
20.60	.263	.000	*	20.70	.263	.000
20.80	.263	.000	*	20.90	.263	.000
21.00	.263	.000	*	21.10	.263	.000
21.20	.264	.000	*	21.30	.264	.000

22.20	.265	.000	*	22.30	.265	.000
22.40	.265	.000	*	22.50	.266	.000
22.60	.266	.000	*	22.70	.266	.000
22.80	.266	.000	*	22.90	.266	.000
23.00	.266	.000	*	23.10	.266	.000
23.20	.267	.000	*	23.30	.267	.000
23.40	.267	.000	*	23.50	.267	.000
23.60	.267	.000	*	23.70	.267	.000

*** HYDRAULIC INPUT VALUES FOR SUBWATERSHEDS ***

WATER SHED	AREA ACRES	CURVE NUMBER	TC HR	TT HR	ROUTING COEFFICIENTS K-HRS	X	UNIT HYDRO
1	12.56	82.00	.102	.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

* * * COMPUTED VALUES FOR INDIVIDUAL WATERSHEDS * * *

WATERSHED	PEAK FLOW (CFS)	RUNOFF (INCHES)	SEDIMENT TONS	DIAM (MM)	DELIVERY RATIO 1	DELIVERY RATIO 2
1	12.87	.95	.00	.100	1.000	1.000

NOTE: SEDIMENT DOES NOT INCLUDE POSSIBLE DEPOSITION BY DELIVERY RATIO 2

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

RUNOFF VOLUME	=	.9911	ACRE-FT
PEAK DISCHARGE	=	12.8694	CFS
AREA	=	12.5600	ACRES
TIME OF PEAK DISCHARGE	=	12.00	HRS
BETA	=	1.0000	
RAINFALL EROSITIVITY FACTOR	=	33.27	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	=	-24.00	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

* *

POND RESULTS

* *

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

FLOW	FRACTN	ISDO	NRHP	NSP	NCSTR
3	0	2	300	7	2

***** DROP SPILLWAY INPUTS *****

ENTRANCE LOSS COEFFICIENT	=	1.0000
BEND LOSS COEFFICIENT	=	.5000
WEIR COEFFICIENT	=	[illegible]

RISER DIAMETER	=	36.00	INCHES
LENGTH OF PIPE	=	60.00	FEET
VERTICAL HEAD DROP	=	8.71	FEET

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

STAGE (FT)	AREA (ACRES)	AVERAGE DEPTH (FT)	DISCHARGE (CFS)	CAPACITY (ACRES-FT)
.00	.060	.00	.00	.00
2.00	.216	1.43	.00	.28
4.00	.289	3.12	.00	.78
5.70	.326	4.57	.00	1.30
6.00	.345	4.82	4.80	1.40
7.00	.365	5.64	17.98	1.76
8.00	.398	6.45	18.86	2.14

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

TURBULENCE FACTOR	=	1.00	
PERMANENT POOL CAPACITY	=	1.304	ACRE-FT
DEAD STORAGE	=	20.00	PERCENT
TIME INCREMENT OUTFLOW	=	.10	HRS
VISCOSITY	=	.009	CM**2/SEC
INFLOW RUNOFF VOLUME	=	.991	ACRE-FT
OUTFLOW ROUTED VOLUME	=	.991	ACRE-FT
STORM VOLUME DISCHARGED (PLUG FLOW)	=	.991	ACRE-FT
POND VOLUME AT PEAK STAGE	=	1.493	ACRE-FT
PEAK STAGE	=	6.250	FT
PEAK INFLOW RATE	=	12.869	CFS
PEAK DISCHARGE RATE	=	8.089	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	=	.26	HRS
DETENTION TIME FROM HYDROGRAPH CENTERS	=	.26	HRS
DETENTION TIME INCLUDING STORED FLOW	=	.26	HRS
SEDIMENT LOAD DISCHARGED	=	.00	TONS
PERIOD OF SIGNIFICANT CONCENTRATION	=	-25.50	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

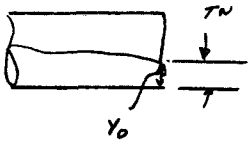
*** RUN COMPLETED ****

OUTLET PROTECTION AT LOADOUT SEDIMENTATION POND

ASSUME TAILWATER $TW < \frac{1}{2} D$ OR $TW = D - .60$
$= 1.5 FT - .9 FT$
$= .6 FT$

LENGTH OF BARREL	=	60 FT.
Δ ELEVATION	=	8.11 FT
SLOPE	=	.07
TIME DURATION	=	30 min ASSUMED
Q	=	18.41 SECTION 13 PAGE
DIA.	=	1.5 FT.

DETERMINE BRINK DEPTH



$Q/D^{2.5} = 18.41/(1.5)^{2.5} = 6.68$

$\frac{TW}{D} = .6/1.5 = .40$

$Y_0/D = 1.00$

$Y_0 = 1.00(1.5) = 1.5$ PIPE IS FLOWING FULL

DETERMINE AREA OF FLOW

$A = CD^2$ $Y_0 = d$ $d/D = \frac{1.5}{1.5} = 1$

$C = .78$ TABLE 7.9 PAGE 539 APPLIED HYDROLOGY AND SEDIMENTOLOGY FOR DISTURBED AREAS, OKLAHOMA TECHNICAL PRESS.

$A = .78(1.5)^2$
$= 1.76 FT^2$

CALCULATE EQUIVALENT DEPTH

$Y_E = (A/2)^{1/2} = (1.76/2)^{1/2} = .94$ FT.

SINCE $TW = .6 < .5D = .75$ USE TABLE 7.8 PAGE 530

CALCULATE DEPTH OF SCOUR

$H_s = \alpha (Y_e)^{\gamma} (Q/Y_e^{2.5})^{\beta} t^{\theta}$ EQ 7.5 PAGE 529

$= .82 (.94)^{.10} \times (18.41/(.94)^{2.5})^{.375} \cdot (30)^{.10}$
$= 3.42$ FT.

CALCULATE WIDTH OF SCOUR

$$W_s \propto (Y_e)^{\gamma} \left(Q/Y_e^{2.5}\right)^{\beta} t^{\theta}$$

$\alpha = .55$
$\beta = .915$
$\theta = .15$
$\gamma = 1$

$$= .55\,(.99)^{1}\left(18.91/(.99)^{2.5}\right)^{.915}(30)^{.15}$$

$$= 14.26 \text{ FT.}$$

CALCULATE LENGTH OF SCOUR

$$L_s = \alpha (Y_e)^{\gamma} \left(Q/Y_e^{2.5}\right)^{\beta} t^{\theta}$$

$\alpha = 1.67$
$\beta = .71$
$\theta = .125$
$\gamma = 1.0$

$$= 1.67\,(.99)^{1}\left(18.91/.99^{2.5}\right)^{.71}(30)^{.125}$$

$$= 21.20 \text{ FT.}$$

CALCULATE VOLUME OF SCOUR

$$V_s = \alpha (Y_e)^{\gamma} \left(Q/Y_e^{2.5}\right)^{\beta} t^{\theta}$$

$\alpha = .29$
$\beta = 2$
$\theta = .375$
$\gamma = 3$

$$= .29\,(.99)^{3}\left(18.91/.99^{2.5}\right)^{2}(30)^{.375}$$

$$= 399.26 \text{ FT}^3$$

CALCULATE VELOCITY

$V = Q/A$

$Q = 18.91$ CFS
$A = 1.76$ FT. AREA OF FLOW

$= 18.19/1.76$

$= 10.31$ FPS

RIPRAP WILL BE NEEDED

CALCULATE FROUDE NUMBER

$$FR = V/(g\,Y_e)^{1/2} =$$

EQ 3.10 PAGE 152 APPLIED HYDROLOGY AND SEDIMENTOLOGY FOR DISTURBED AREA, OKLAHOMA TECHNICAL PRESS

$$= 10.31/(32.2\,(.99))^{1/2}$$

$$= 1.87$$

22-141 50 SHEETS
22-142 100 SHEETS
22-144 200 SHEETS
AMPAD

ASSUME d_{50} SUCH THAT $.25 < d_{50}/y_c < .45$

$d_{50}/y_c < .45$

so, $d_{50} < .45(.99) = .42$ FT

$d_{50}/y_c > .25$

so $d_{50} > .25(.99$ FT$) = .24$ FT

$.24$ FT $\leq d_{50}/y_c \leq .42$ FT

$h_s/y_c = 1.48$ FIG. 7.23 PAGE 537

$h_s = 1.48(.99) = \underline{1.39 \text{ FT}}$

CHECK THAT $2 < h_s/d_{50} < 4$ OK USE d_{50} AVG. $= .33$ FT.

LENGTH OF ENERGY DISSIPATION POOL

$W_o = 1.5$ FT - DIA.

$\text{MAX}[10 h_s, 3 W_o] = [10(1.39)(3)(1.5)]$
$= [13.39, 4.5]$
$= 13.39$

OVERALL BASIN LENGTH

$\text{MAX}[15 h_s, 4 W_o] = [15(1.39), 4(1.5)]$
$= [20.85 \text{ FT}, 6.00]$
$= 20.85$ FT.

RIPRAP GRADATION

		Size IN	%
$1.25\ D_{50}$	-	5	30
D_{50}	-	4	50
$.5 D_{50}$	-	2	10
$.2 D_{50}$	-	.80	10

FILTER BLANKET DESIGN.

ASSUME BASE MATERIAL

$D_{85} = .09$ IN
$D_{50} = .024$ IN
$D_{15} = .006$ IN

RIPRAP PROPERTIES

$D_{85} = 4.25$ IN
$D_{50} = 4.00$ IN
$D_{15} = .75$ IN.

FILTER BLANKET WITH RESPECT TO BASE MATERIAL

D_{50} (FILTER)/D_{50} (BASE) < 40

SO, D_{50} (FILTER) < 40 × .024 = .96 IN

D_{15} (FILTER)/D_{15} (BASE) < 40

SO, D_{15} (FILTER) < 40 × .006 = .24 IN

D_{15} (FILTER)/D_{85} (BASE) < 5

SO, D_{15} (FILTER) < 5 × .09 = .45 IN

D_{15} (FILTER)/D_{15} (BASE) > 5

SO, D_{15} (FILTER) > 5 .03 IN.

.03 IN < D_{15} (FILTER) < .24 IN

D_{50} (FILTER) < .96 IN.

22-141 50 SHEETS
22-142 100 SHEETS
22-144 200 SHEETS
AMPAD

FILTER BLANKET WITH RESPECT TO RIPRAP MATERIAL

$D_{50}(\text{RIPRAP}) / D_{50}(\text{FILTER}) < 40$

SO, $D_{50}(\text{FILTER}) > 4/40 = .10$ IN

$D_{15}(\text{RIPRAP}) / D_{15}(\text{FILTER}) < 40$

SO, $D_{15}(\text{FILTER}) > .75/40 = .02$ IN.

$D_{15}(\text{RIPRAP}) / D_{85}(\text{FILTER}) < 5$

SO, $D_{85}(\text{FILTER}) > .75/5 = .15$ IN.

$D_{15}(\text{RIPRAP}) / D_{15}(\text{FILTER}) > 5$

SO, $D_{15}(\text{FILTER}) < .75/5 = .15$ MIN

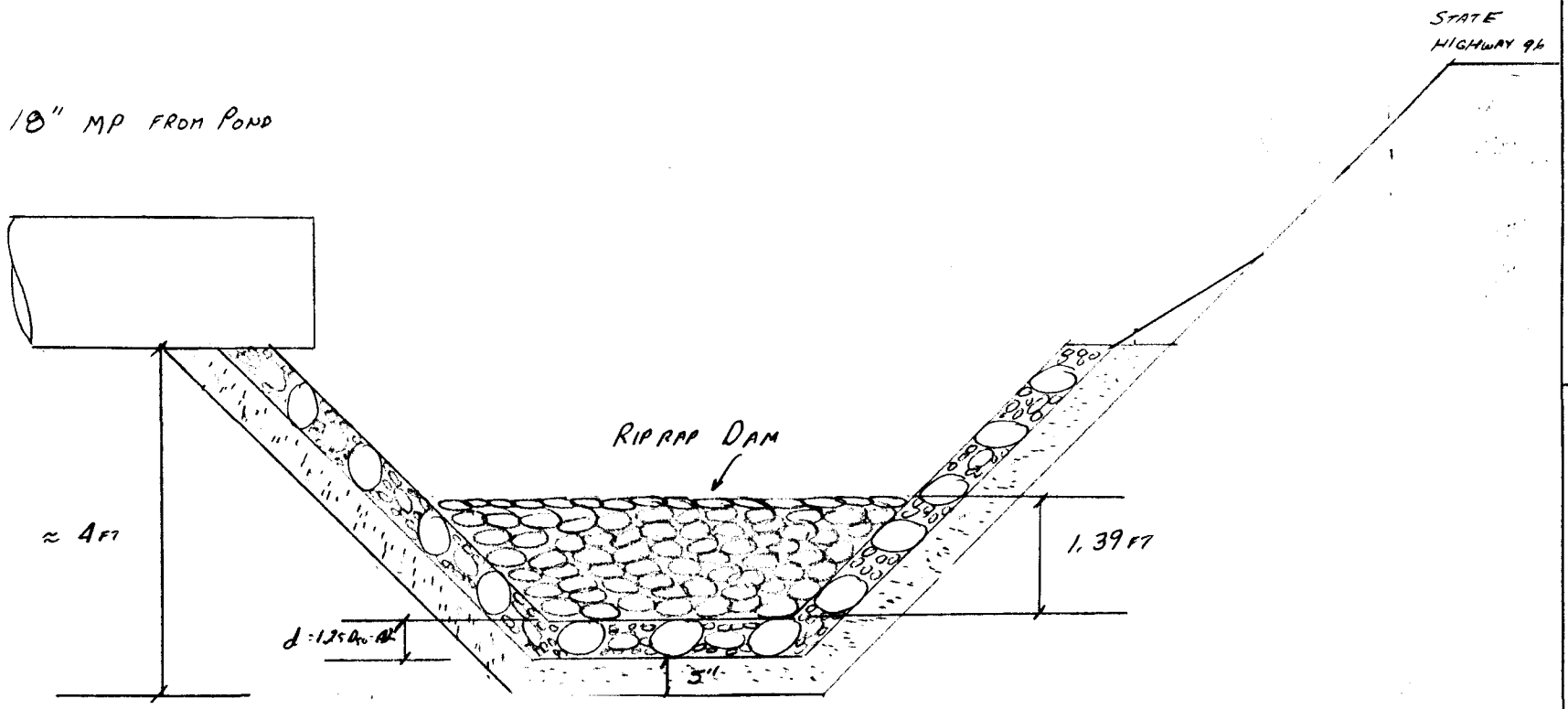
$.02\text{IN.} < D_{15}(\text{FILTER}) < .15$ MIN

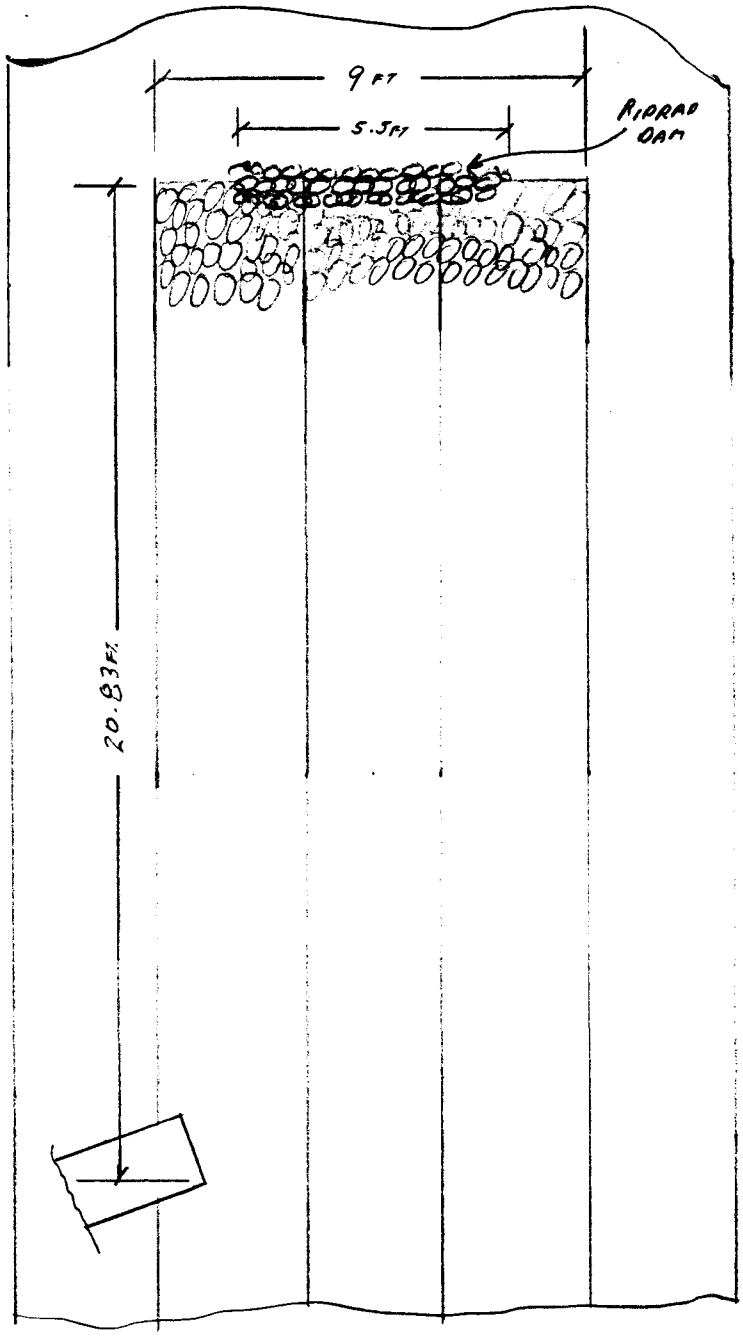
$D_{50}(\text{FILTER}) > .10$ IN

$D_{85}(\text{FILTER}) > .15$ MIN.

22-141 50 SHEETS
22-142 100 SHEETS
22-144 200 SHEETS
AMPAD

AMPAD
22-141 50 SHEETS
22-142 100 SHEETS
22-144 200 SHEETS





STATE HIGHWAY 96

AMPAD 22-141 50 SHEETS 22-142 100 SHEETS 22-144 200 SHEETS

SECTION 14

DRAINAGE CONTROL
WASTE ROCK DISPOSAL SITE

WASTE ROCK DISPOSAL SITE
CHANNEL DESIGN DU-5

E. Tyson
6-30-89
REVISED 11-17-89

1. DRAINAGE BASIN CHARACTERISTICS

AREA - 283.07 ACRES - SEE MAP 3.2.8-3
HYDRAULIC LENGTH: 5053.64 FT.
Σ OF CONTOURS = 55,280.53 FT.
SLOPE = .3587
CN = 77 SOIL GROUP C · FOREST LAND POOR COVER
t_c HATHWAY METHOD = .5 HRS
P_{10-24} = 2.43 IN
P_{100-24} = 3.5 IN

t_c Hwy = 0.3 hr
t_c = 0.5
Q_p = 131
Q_p = 291 cfs

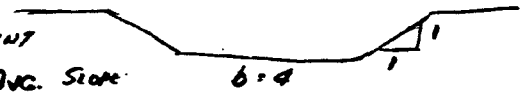
Q_{10-24} = 30.43 CFS 146.45

Q_{100-24} = 73.57 CFS

2. DRAINAGE DITCH DESIGN

a) DETERMINE DEPTH FLOW

S = .03 ACTUAL FIELD MEASUREMENT OF TEMPORARY CHANNEL AVG. SLOPE



n = .035 STONY BED, WEEDS ON BANK

$A = bd + zd^2$

$R = bd + zd^2 / b + 2d\sqrt{z^2+1}$

USE MANNING FORMULA

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

$Q = bd + zd^2 \times 1.486/n \times (bd + zd^2/b + 2d\sqrt{z^2+1})^{2/3} \times S^{1/2}$

$Q_1 = 4d + d^2 \times 1.486/.035 \times 4d + d^2/4 + 2d\sqrt{(1)^2+1} \times (.03)^{1/2}$

$73.57 = 4d + d^2 \times 42.46 \times (4d + d^2/4 + 2.83d)^{2/3} \times .17$

$10.19 = (4d + d^2)(4d + d^2/4 + 2.83d)^{2/3}$

TRAIL d

d ft	Q
2	13.88
1.9	12.63
1.8	11.45
1.7	10.33

USE d = 1.7 FT

b) DETERMINE VELOCITY

$$V = 1.486/n \times R^{2/3} \times S^{1/2}$$

$$R = bd + zd^2/6 + 2d\sqrt{z^2+1}$$

$$= 4(1.70) + (1)(1.70)^2/4 + 2(1.70)\sqrt{(1)^2+1}$$

$$= 6.80 + 2.89/4 + 4.81$$

$$= 1.10$$

$$V = 1.486/.035 \times (1.10)^{2/3} \times (.03)^{1/2}$$

$$= 42.46 \times 1.07 \times .17$$

$$= 7.69 \text{ FPS}$$

THE VELOCITY IS ABOVE 6 FPS, RIPRAP WILL BE NEEDED.

3. DESIGN RIPRAP SIZE

DESIGN FLOW - 73.57 CFS
CHANNEL SLOPE - .03

FROM FIG. 2 PAGE 11-2 (1)

D_{50} = .75 FT.

RIPRAP GRADATION

		Size	%
$1.25 D_{50}$	=	11.25 in	30
D_{50}	=	9. in	50
$.5 D_{50}$	=	4.5 in	10
$.2 D_{50}$	=	1.2 in	10

4. DESIGN FILTER BLANKET.

ASSUME BASE MATERIAL

D_{85} = .09 in
D_{50} = .024 in
D_{15} = .006 in

RIPRAP PROPERTIES

D_{85} = 9.56 in
D_{50} = 9 in
D_{15} = 1.69 in

a) EVALUATE THE NEED OF A FILTER BLANKET

D_{15} (RIPRAP.) / D_{85} (BASE) < 5

1.69/.09 = 18.78 > 5

D_{15} (RIPRAP) / D_{15} (BASE) < 40

1.69/.006 = 281.67 > 40

THE FILTER CRITERIA ARE EXCEEDED, A FILTER LAYER IS REQUIRED.

b) FILTER BLANKET WITH RESPECT TO BASE MATERIAL

D_{50} (FILTER) / D_{50} (BASE) < 40

so, D_{50} (FILTER) < 40 x .024 = .96 in

D_{15} (FILTER) / D_{15} (BASE) < 40

so, D_{15} (FILTER) < 40 x .006 = .24 in

D_{15} (FILTER) / D_{85} (BASE) < 5

so, D_{15} (FILTER) < 5 x .09 = .45 in.

D_{15} (FILTER) / D_{15} (BASE) > 5

so, D_{15} (FILTER) > 5 x .006 = .03 in.

.03 in < D_{15} (FILTER) < .45 in

D_{50} (FILTER) < .96 in

c) FILTER BLANKET WITH RESPECT TO RIPRAP

D_{50} (RIPRAP) / D_{50} (FILTER) < 40

so, D_{50} (FILTER) > 9/40 = .23 in.

D_{15} (RIPRAP) / D_{15} (FILTER) < 40

so, D_{15} (FILTER) > 1.69/40 = .04 in.

D_{15} (RIPRAP) / D_{85} (FILTER) < 5

so, D_{85} (FILTER) > 1.69/5 = .34 in

D_{15} (RIPRAP) / D_{15} (FILTER) > 5

so, D_{15} (FILTER) < 1.69/5 = .34 in.

.04 in < D_{15} (FILTER) < .34 in.

D_{50} (FILTER) > .23 in

D_{85} (FILTER) > .34 in.

d) THICKNESS OF FILTER BLANKET

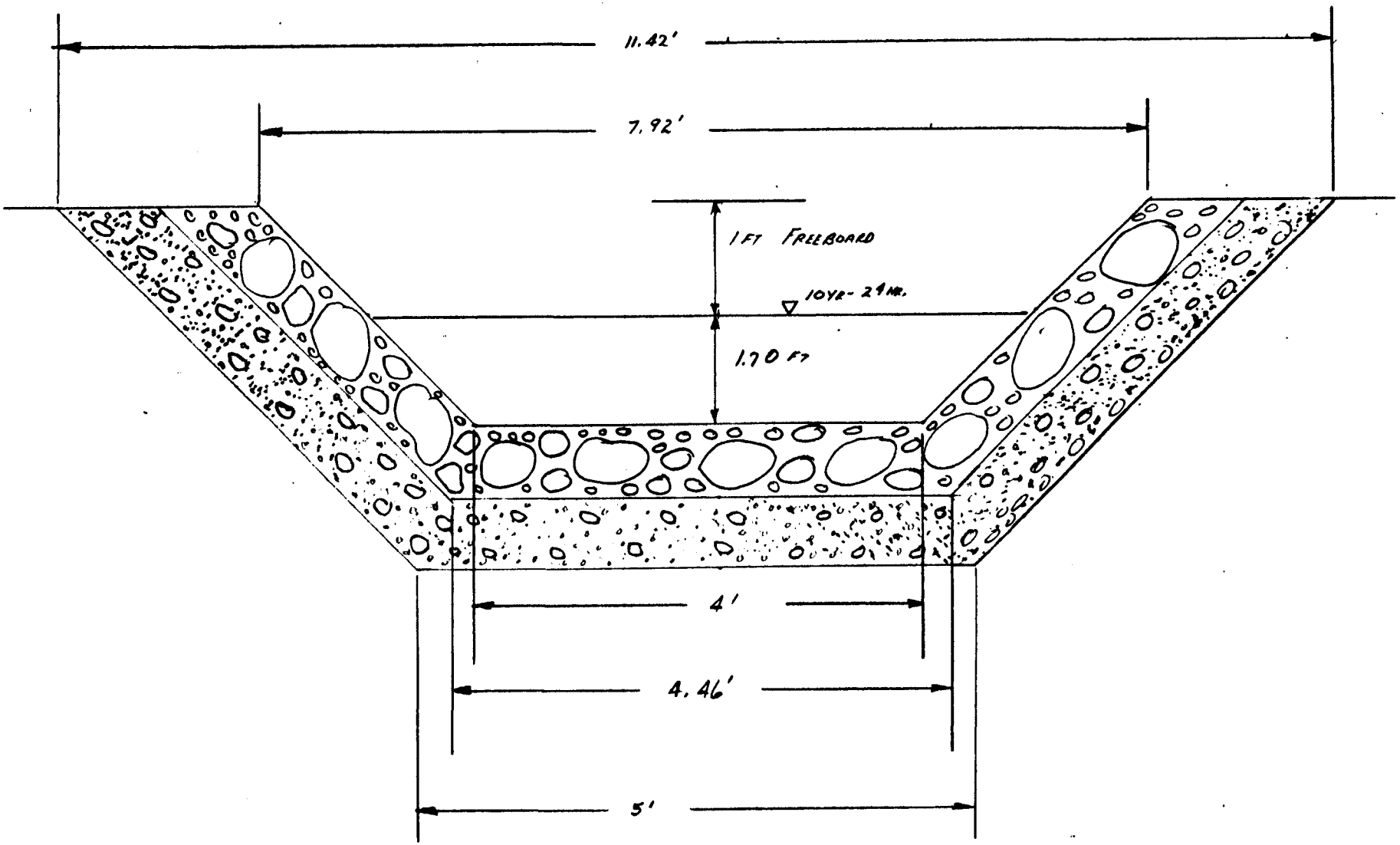
THICKNESS = MAX D_{50} = 9 in.

REFERENCE : 1) HYDRAULIC ENGINEERING CIRCULAR No. 11 - U.S. DEPARTMENT OF TRANSPORTATION

2) SURFACE MINING WATER DIVERSION DESIGN MANUAL, UNITED STATES DEPT. OF THE INTERIOR, OFFICE OF SURFACE MINING.

22-141 50 SHEETS
22-142 100 SHEETS
22-144 200 SHEETS
AMPAD

AMPAD 22-141 50 SHEETS
22-142 100 SHEETS
22-144 200 SHEETS



FINAL CHANNEL DIMENSIONS
FOR DU-5

G. Taylor
Revised
11-9-09

AREA No.	AREA IN SQ. FT. (1)	CN (2)	HYDRAULIC LENGTH (1)	Σ OF CONTOURS	SLOPE % (3)	CONTOUR INTERVAL
SW-11	5,210	87	235	55	10.56	10
SW-12	13,500	87	730	155	11.48	10
SW-13	20,250	87	874	195	9.63	10
SW-14	13,800	87	680	80	5.80	10

1). MAP 3.2.8-1 ACCESS ROAD TO ROCK WASTE DISPOSAL

2) TRAG SOIL GROUP - C HYD. SOIL GROUP; SOIL SURVEY OF CARBON AREA, UTAH - UNITED STATES DEPARTMENT OF AGRICULTURE - SOIL CONSERVATION SERVICE

CN: 87 STREETS AND ROADS DIRT - APPLIED HYDROLOGY AND SEDIMENTOLOGY FOR DISTURBED AREAS - BARFIELD AND HAAN

3) % SLOPE = Σ CONTOURS x CONTOUR INTERVAL / AREA

PEAK FLOW (CFS)

AREA No	T_c (4)	Q_{10-24} (5)	Q_{25-24} (5)	Q_{50-24} (5)	Q_{100-24} (5)
SW-11	.15				.3
SW-12	.12				.65
SW-13	.11				.97
SW-14	.13				.70

4) KENT'S FORMULA - $t_c = L^{0.8}(S+1)^{0.7} / 1900 Y^{0.5} / 0.6$ EQ 2.59 + 2.60 PAGE 102 APPLIED HYDROLOGY AND SEDIMENTOLOGY FOR DISTURBED AREAS - BARFIELD AND HAAN

5) SCS UNIT HYDROGRAPH METHOD (NEH-4, 1972)

WASTE ROCK DISPOSAL SITE
SWALES

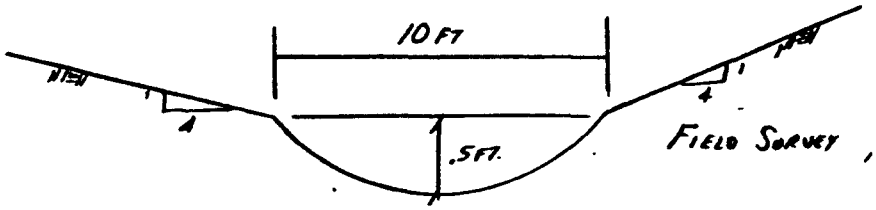
G. TAYLOR
11-17-89

A. SW-10 MAP 3.2.8-1

PEAK FLOWS 10 YR - 24 HR - 30.43 CFS
100 YR - 24 HR - 73.57 CFS

USE MANNING FORMULA

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



FIELD SURVEY, NOV. 1989

$A = \frac{2}{3} dT$
$R = 2dT^2 / 3T^2 + 8d^2$ } PAGE 4.3 SURFACE MINING WATER DIVERION DESIGN MANUAL SEPT. 1972 - OSM

$n = .014$ CONCRETE LINED, REGULAR FINISH
$S = .05$
$T = 10$ FT
$d = .5$ FT

$$Q = \frac{2}{3} dT \times 1.486/n \times \left(2dT^2/3T^2 + 8d^2\right)^{2/3} \times S^{1/2}$$

$$= \frac{2}{3} d\,10 \times 1.486/.014 \times \left(2d\,10^2/3\,10^2 + 8d^2\right)^{2/3} \times (.05)^{1/2}$$

$$= 6.67d \times 106.14 \times \left(200d/300 + 8d^2\right)^{2/3} \times .22$$

TRY $d = .47$ FT

$$Q = 6.67(.47) \times 106.14 \times \left(200(.47)/300 + 8(.47)^2\right)^{2/3} \times .22$$

$$= 33.51 \text{ CFS}$$

TRY $d = .44$

$$Q = 6.67(.44) \times 106.14 \times \left(200(.44)/300 + 8(.44)^2\right)^{2/3} \times .22$$

$$= 30.03 \text{ CFS}$$

TRY $d = .45$ FT

$$Q = 6.67(.45) \times 106.14 \times \left(200(.45)/300 + 8(.45)^2\right)^{4/3} \times .22$$

$$= 31.17$$

SWALE WILL WORK AS BUILT

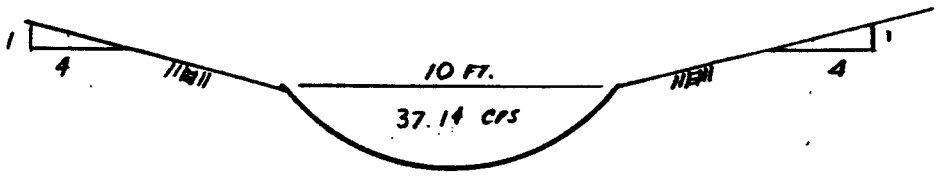
$Q_{100\text{-}24} = 73.57$ - FLOW OF SWALE 10 m - 2 km

WHEN SWALE 10 IS FULL

$$Q = 6.67(.5) \times 106.14 \times \left(200(.5)/300 + 8(.5)^2\right)^{2} \times .22 = 37.14$$

$$Q_{100\text{-}24} = 73.57 - 37.14$$
$$= 36.43$$

RECLAMATION SWALE SW-10



A TRAPEZOID FORMED WITH DIRT WILL ACT AS THE SWALE

$A = bd + zd^2$

$R = bd + zd^2 / b + 2d\sqrt{z^2+1}$

$n = .023$ EARTH, UNIFORM SECTION

$$Q = bd + zd^2 \times 1.486/n \times \left(bd + zd^2/b + 2d\sqrt{z^2+1}\right)^{2/3} \times S^{1/2}$$

$$= 10d + 4d^2 \times 1.486/.023 \times \left(10d + 4d^2/10 + 2d\sqrt{4^2+1}\right)^{2/3} \times (.05)^{1/2}$$

$$= 10d + 4d^2 \times 64.61 \times \left(10d + 4d^2/10 + 8.25d\right)^{2/3} \times .22$$

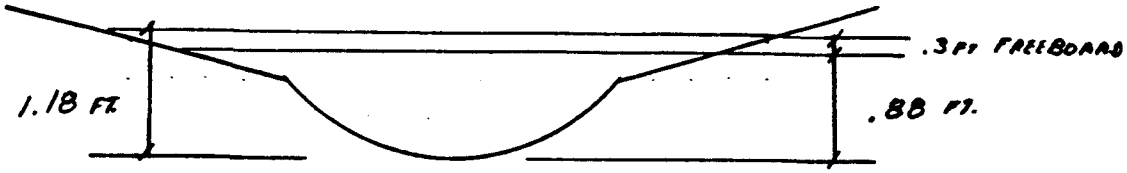
TRY $d = .45$ FT.

$$Q = 10(.45) + 4(.45)^2 \times 64.61 \times \left(\frac{10(.45) + 4(.45)^2}{10 + 8.25(.45)}\right)^{2/3} \times .22$$

TRY $d = .43$ FT.

$$Q = 10(.43) + 4(.43)^2 \times 64.61 \times \left(\frac{10(.43) + 4(.43)^2}{10 + 8.25(.43)}\right)^{2/3} \times .22$$

$$= 31.93$$



22-141 50 SHEETS
22-142 100 SHEETS
22-144 200 SHEETS
AMPAD

SWALES SW-11, SW-12, SW-13 AND SW-14 WILL BE DESIGNED FOR THE 100YR-24HR AS THE FLOWS FOR THE ROAD AT 10YR-24HR EVENTS ARE TO SMALL. THE OVERLAND FLOW TO THE DITCHS WILL BE EQUALLY DIVIDED BETWEEN THE FOUR SWALES.

$Q_{100-24} = 90.9$ CFS SECTION 14, VOL. 5

DITCH FLOW TO SWALES $= 90.9/4 = 22.73$ CFS

B SW-11

TOTAL FLOW = OVERLAND + ROAD

$= 22.73$ CFS $+ .3$ CFS

$= 23.03$ CFS

$Z = 33.33$ $Z = 20$

USE MANNING FORMULA TO DETERMINE DEPTH OF FLOW

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

$A = Zd^2/2 + Zd^2/2$

$R = Zd/4\sqrt{Z^2+1} + Zd/4\sqrt{Z^2+1}$

$n = .023$ EARTH, UNIFORM SECTION, GRAVELY SOIL

$S = .03$ FIELD SURVEY, NOV. 1999

$Q = (Zd^2/2 + Zd^2/2) \times 1.486/n \times (Zd/4\sqrt{Z^2+1} + Zd/4\sqrt{Z^2+1})^{2/3} \times S^{1/2}$

$= (33.33d^2/2 + 20d^2/2) \times 1.486/.023 \times (33.33d/4\sqrt{33.33^2+1} + 20d/4\sqrt{20^2+1})^{2/3} \times (.03)^{1/2}$

$= 16.67d^2 + 10d^2 \times 64.61 \times (.25d + .25d)^{2/3} \times .17$

$= (26.67d^2) \times 64.61 \times (.50d)^{2/3} \times .17$

TRY $d = .3$ FT

$Q = 26.67(.3)^2 \times 64.61 \times (.50(.3))^{2/3} \times .17$

$= 7.90$ CFS.

TRY d: .46

$Q = 26.67(.46)^2 \times 64.61 \times (.5(.46))^{2/3} \times .17$

$= 23.16$

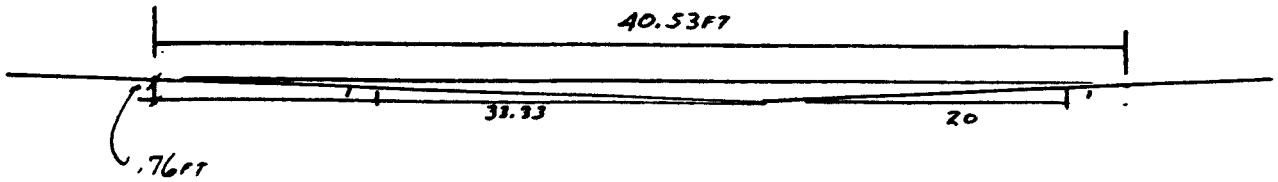
USE .46 FT

TOTAL DEPTH = DEPTH OF FLOW + FREEBOARD

= .46 FT + .3 FT

= .76 FT

SWALE DESIGN



C SW - 12

TOTAL FLOW = OVERLAND + ROAD

= 22.73 CFS + .65 CFS

= 23.38 CFS

USE MANNING FORMULA TO DETERMINE DEPTH OF FLOW

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

$A = 2d^2/2 + 2d^2/2$

$R = 2d/4\sqrt{2d^2+1} + 2d/4\sqrt{2d^2+1}$

$n = .023$

$S = .08$ FIELD SURVEY, NOV. 1989

$$Q = \left(\frac{2d^2}{2} + \frac{2d^2}{2}\right) \times \frac{1.486}{.03} \times \left(\frac{2d}{4\sqrt{2^2+1}} = \frac{2d}{4\sqrt{5}}\right)^{2/3} \times S^{1/2}$$

$$\cdot\left(\frac{25d^2}{2} + \frac{9.09d^2}{2}\right) \times \frac{1.486}{.023} \times \left(\frac{25d}{4\sqrt{25^2+1}} = \frac{9.09d}{4\sqrt{9.09^2+1}}\right)^{2/3} \times (.08)^{1/2}$$

$$= (12.50d^2 + 4.55d^2) \times 64.61 \times (.25d + .25d)^{2/3} \times .28$$

$$= (17.05d^2) \times 64.61 \times (.50d)^{2/3} \times .28$$

TRY $d = .5$ FT

$$Q = (17.05(.5)^2) \times 64.61\,(.50(.5)^{2/3} \times .28$$

$$= 30.46 \text{ CFS}$$

TRY $d = .45$ FT.

$$Q = (17.05(.45)^2) \times 64.61 \times (.50(.45)^{2/3} \times .28$$

$$= 22.99 \text{ CFS}$$

TRY $d = .46$ FT.

$$Q = (17.05(.46)^2) \times 64.61 \times (.5(.46)^{2/3} \times .28$$

$$= 24.38 \text{ CFS}$$

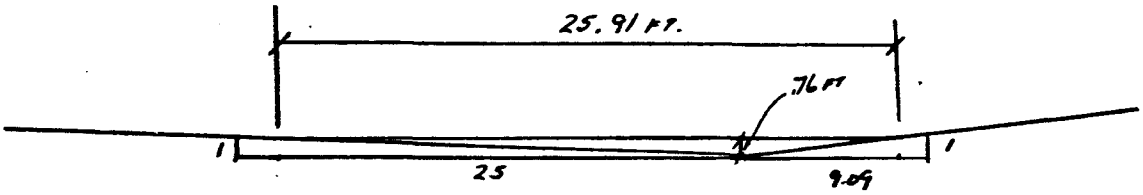
USE .46 FT

SWALE DESIGN

TOTAL DEPTH = DEPTH OF FLOW + FREEBOARD

= .46 FT + .3 FT

= .76 FT.



D. SW - 13

TOTAL FLOW = OVERLAND + ROAD

= 22.73 CFS + .97 CFS

= 23.70 CFS

USE MANNING FORMULA TO DETERMINE DEPTH OF FLOW

$Q = A \times 1.49/n \times R^{2/3} \times S^{1/2}$

$A = 2d^2/2 + 2d^2/2$

$R = 2d/4\sqrt{2^2+1} + 2d/4\sqrt{2^2+1}$

$n = .023$

$S = .03$

$Q = (2d^2/2 + 2d^2/2) \times 1.49/n \times (2d/4\sqrt{2^2+1} + 2d/4\sqrt{2^2+1})^{2/3} \times S^{1/2}$

$= (25d^2/2 + 8.33d^2/2) \times 1.49/.023 \times (25d/4\sqrt{25^2+1} + 8.33d/4\sqrt{8.33^2+1})^{2/3} \times (.03)^{1/2}$

$= (12.5d^2 + 4.17d^2) \times 64.61 \times (.25d + .25d)^{2/3} \times .17$

$= (16.67\,d^2) \times 64.61 \times (.5d)^{2/3} \times .17$

TRY $d = .46$ FT.

$Q = (16.67(.46)^2) \times 64.61 \times (.5(.46))^{2/3} \times .17$

$= 14.47$ CFS

TRY $d = .55$ FT.

$Q = (16.67(.55)^2) \times 64.61 \times (.5(.55))^{2/3} \times .17$

$= 23.32$ CFS

TRY $d = .56$

$Q = (16.67(.56)^2) \times 64.61 \times (.5(.56)^{2/3} \times .17$

$= 24.97$

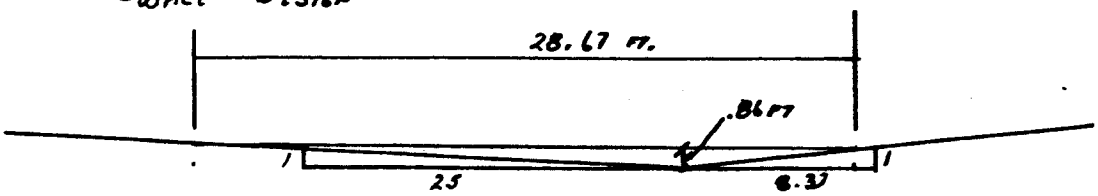
USE $d = .56$ FT

TOTAL DEPTH = DEPTH OF FLOW + FREEBOARD

= .56 FT + .3 FT

= .86 FT.

SWALE DESIGN



E SW-14

TOTAL FLOW = OVERLAND + ROAD

= 22.73 CFS + .70 CFS

= 23.43 CFS

USE MANNING FORMULA TO DETERMINE DEPTH OF FLOW

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

$A = 2d^2/2 + 2d^2/2$

$R = 2d/4\sqrt{2^2+1} + 2d/4\sqrt{2^2+1}$

$n = .023$

$S = .08$ FIELD SURVEY, NOV. 1989

$$Q = \left(\frac{2d^2}{2} + \frac{2d^2}{2}\right) \times \frac{1.486}{.03} \times \left(\frac{2d}{\sqrt{2^2+1}} + \frac{2d}{\sqrt{2^2+1}}\right)^{2/3} \times S^{1/2}$$

$$= \left(\frac{100d^2}{2} + \frac{14.29d^2}{2}\right) \times \frac{1.486}{.023} \times \left(\frac{100d}{\sqrt{100^2+1}} + \frac{14.29d}{\sqrt{14.29^2+1}}\right)^{2/3} \times (.02)^{1/2}$$

$$= (50d^2 + 7.15d^2) \times 64.61 \times (.25d + .22d)^{2/3} \times .28$$

$$= (57.12d^2) \times 64.61 \times (.50d)^{2/3} \times .28$$

TRY $d = .3$ ft

$$Q = (57.12(.3)^2) \times 64.61 \times (.5(.3))^{2/3} \times .28$$

$$= 21.09 \text{ cfs}$$

TRY $d = .28$ ft

$$Q = (57.12(.28)^2) \times 64.61 \times (.5(.28))^{2/3} \times .28$$

$$= 21.70 \text{ ft}$$

TRY $d = .29$ ft

$$Q = (57.12(.29)^2) \times 64.61 \times (.5(.29))^{2/3} \times .28$$

$$= 23.83$$

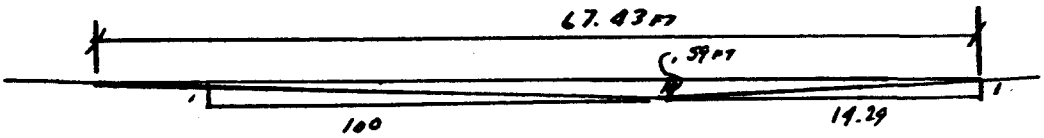
USE $d = .29$ ft

TOTAL DEPTH = DEPTH OF FLOW + FREEBOARD

$= .29$ ft $+ .3$ ft

$= .59$ ft

SWALE DESIGN

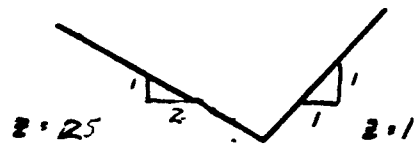


DITCH UDD-2 MAP 3.2.8-1

DETERMINE DEPTH OF FLOW FOR 10YR-24HR

USE MANNING FORMULA

PEAK FLOW $Q_{10-24} = 30.43$ CFS SECTION 14, VOL. 5



$n = .035$ STONY BED
$S = .13$

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

$$A = Zd^2/2 + Zd^2/2$$
$$R = Zd/4\sqrt{Z^2+1} + Zd/4\sqrt{Z^2+1}$$

$$Q = (Zd^2/2 + Zd^2/2) \times 1.486/n \times (Zd/4\sqrt{Z^2+1} + Zd/4\sqrt{Z^2+1})^{2/3} \times S^{1/2}$$

$$= (12d^2/2 + d^2/2) \times 1.486/.035 \times (12d/4\sqrt{12^2+1} + d/4\sqrt{1^2+1})^{2/3} \times (.13)^{1/2}$$

$$30.43 = (.6d^2 + .5d^2) \times 42.46 \times (.22d + .18d)^{2/3} \times .36$$

TRAIL d

d	Q
1.4	30.47

VELOCITY

$$V = 1.486/n \; R^{2/3} \; S^{1/2}$$

$$V = 1.486/n \; (.22d + .18d)^2 \; S^{1/2}$$

$$V = 1.486/.035 \times [.22(1.4)^{2/3} + .18(1.4)] \times (.13)^{1/2}$$

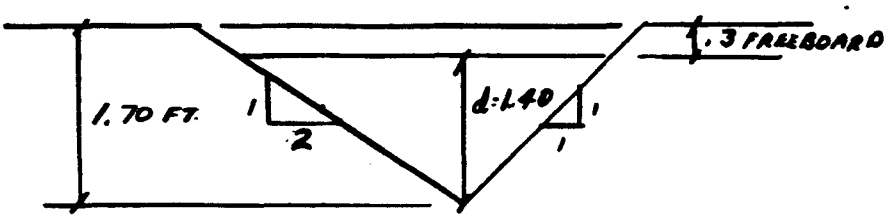
$$= 42.46 \times (.56)^{2/3} \times .36$$

$$= 10.36 \text{ FPS}$$

EVEN THROUGH THE VELOCITY IS GREATER THAN 6 FPS THE DITCH WAS CONSTRUCTED IN ROCK.

G. TAYLOR
REVIEWED
11-9-89

DITCH DESIGN

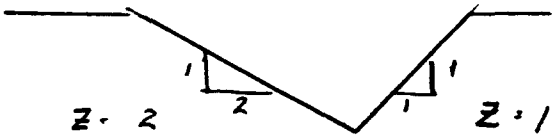


UDD-2 DITCH
DIMENSIONS
FOR 10YR-24HR EVENT

DETERMINE DEPTH OF FLOW FOR 100YR-24HR

USE MANNING FORMULA

PEAK FLOW $Q_{100-24} = 73.57$ CFS



$n = .035$ STONEY BED
$S = .13$

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

$$A = zd^2/2 + zd^2/2$$

$$R = zd/4\sqrt{z^2+1} + zd/4\sqrt{z^2+1}$$

$$Q = (zd^2/2 + zd^2/2) \times 1.486/n \times \left(zd/4\sqrt{z^2+1} + zd/4\sqrt{z^2+1}\right)^{2/3} \times S^{1/2}$$

$$= (2d^2/2 + 1d^2/2) \times 1.486/.035 \times \left(2d/4\sqrt{(2)^2+1} + d/4\sqrt{(1)^2+1}\right)^{2/3} \times (.13)^{1/2}$$

$$73.57 = (d^2 + .5d^2) \times 42.46 \times (.22d + .18d) \times .36$$

TRAIL d

d FT	Q CFS
2.8	193.94
2.0	78.98
1.95	73.82

VELOCITY

$$V = 1.486/n \times R^{2/3} \times S^{1/2}$$

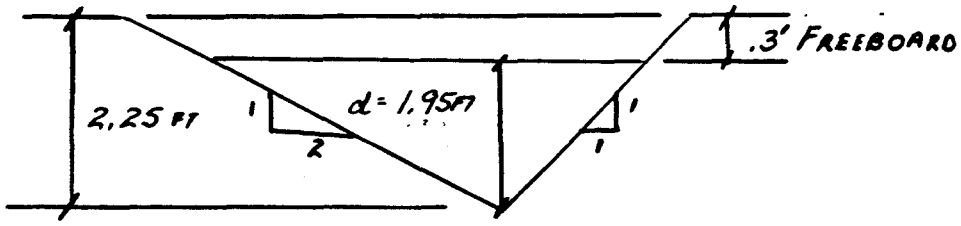
$$= 1.486/n \times (.22d + .18d)^{2/3} \times S^{1/2}$$

$$= 1.486/.035 \times (.22(1.95) + .18(1.95))^{2/3} \times (.13)^{1/2}$$

$$= 42.46 \times .85 \times .36$$

$$= 12.96 \text{ FPS}$$

EVEN THROUGH THE VELOCITY IS GREATER THAN 6 FPS THE DITCH WILL BE CONSTRUCTED IN ROCK.



UDD-2 DITCH
DIMENSIONS
FOR 100YR - 24 HR.

WASTE ROCK DISPOSAL SITE
ACCESS ROAD DITCH
DESIGN

ACCESS ROAD DITCH AREA - MAP 3.2.8-1

AREA IN SQ FT. (1)	CN (2)	HYDRAULIC LENGTH (1)	Σ OF CONTOURS	SLOPE % (3)	CONTOUR INTERVAL
3,684,762 = 84.59 acres	74	3,600	14,650	31.31	80

1) MAP 3.2.8-3

2) TRAG SOIL GROUP - C HYD. SOIL GROUP, SOIL SURVEY OF CARBON AREA, UTAH - UNITED STATES DEPARTMENT OF AGRICULTURE - SOIL CONSERVATION SERVICE

C: 74 RANGE LAND GOOD COVER - APPLIED HYDROLOGY AND SEDIMENTOLOGY FOR DISTURBED AREAS - BARFIELD AND HANN

3) % SLOPE = Σ CONTOURS × CONTOUR INTERVAL / AREA

PEAK FLOW (CFS)

AREA NO	T_c	$Q_{10\text{-}24}$	$Q_{25\text{-}24}$	$Q_{50\text{-}24}$	$Q_{100\text{-}24}$
	.315	38.6			90.9

4) KENT FORMULA $t_c = L^{0.8}(S+1)^{0.7} / 1900\, Y^{0.5} / 0.6$ EQ 2.59 + 2.60 PAGE 102 APPLIED HYDROLOGY AND SEDIMENTOLOGY FOR DISTURBED AREAS - BARFIELD AND HANN

5) SCS UNIT HYDROGRAPH METHOD (NEH-4, 1972)

DITCHES DO-12, DO-13, DO-14 AND DO-15 WILL BE DESIGNED FOR THE 100YR-24HR. THE OVERLAND FLOW TO THE DITCHES WILL BE EQUALLY DIVIDED BETWEEN THE FOUR DITCHES

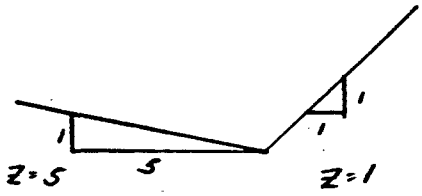
$Q_{100-24} = 90.9$ SECTION 14, VOL. 5

DITCH FLOW $= 90.9/4 = 22.73$ CFS $= Q$

A. DO-12 DETERMINE DEPTH OF FLOW

USE MANNING FORMULA

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



$n = .035$ STONEY BED
$S = .12$ MAP 3.2.8-1

$$A = \frac{Zd^2}{2} + \frac{Zd^2}{2}$$
$$R = \frac{Zd}{4\sqrt{Z^2+1}} + \frac{Zd}{4\sqrt{Z^2+1}}$$

$$Q = \left(\frac{Zd^2}{2} + \frac{Zd^2}{2}\right) \times 1.486/n \times \left(\frac{Zd}{4\sqrt{Z^2+1}} + \frac{Zd}{4\sqrt{Z^2+1}}\right)^{2/3} \times S^{1/2}$$

$$= \left(\frac{5d^2}{2} + \frac{1d^2}{2}\right) \times 1.486/.035 \times \left(\frac{5d}{4\sqrt{5^2+1}} + \frac{d}{4\sqrt{1^2+1}}\right)^{2/3} \times (.12)^{1/2}$$

$$= (2.5d^2 + .5d^2) \times 42.46 \times (.25d + .18d) \times .35$$

$$= (3d^2) \times 42.46 \times (.43d)^{2/3} \times .35$$

TRY $d = .5$ FT

$$Q = (3(.5)^2) \times 42.46\ (.43(.5))^{2/3} \times .35$$

$= 3.90$ CFS

TRY $d = 1$ FT

$$Q = (3(1)^2) \times 42.46\ (.43(1))^{2/3} \times .35$$

$= 25.33$ CFS

TRY $d = .96$

$$Q = (3(.96)^2) \times 42.46 \times (.43(.96))^{2/3} \times .35$$

$= 22.71$ CFS

VELOCITY

$V = 1.486/n \times R^{2/3} \times S^{1/2}$

$= 1.486/.035 \times (.41)^{2/3} \times (.12)^{1/2}$

$= 42.46 \quad (.55) \times .35$

$= 9.13$ FPS

$R = (.43)(.96) = .41$
$S = .12$
$n = .035$

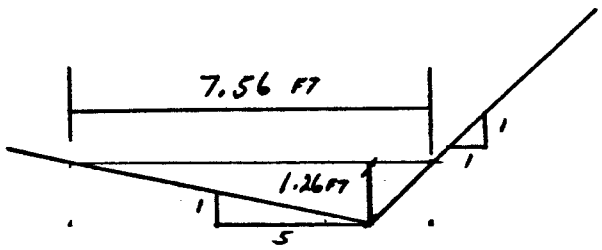
EVEN TROUGH THE VELOCITY IS GREATER THAN 6 FPS THE DITCH IS CONSTRUCTED IN ROCK.

TOTAL DEPTH = DEPTH OF FLOW + FREEBOARD

= .96 FT + .3 FT

= 1.26 FT.

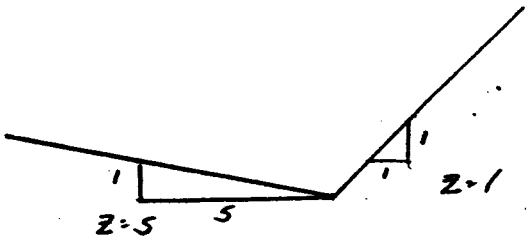
DITCH DESIGN



B. DD - 13 DETERMINE DEPTH OF FLOO

USE MANNING FORMULA

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



$n = .035$
$S = .11$ MAP 3.2.8-1

$A = 2d^2/2 + 2d^2/2$

$R = 2d^2/4\sqrt{2^2+1} + 2d/4\sqrt{2^2+1}$

$Q = (2d^2/2 + 2d^2/2) \times 1.486/n \times (2d/4\sqrt{2^2+1} + 2d/4\sqrt{2^2+1})^{2/3} \times S^{1/2}$

$= (5d^2/2 + 1d^2/2) \times 1.486/.035 \times (5d/4\sqrt{5^2+1} + 1d/4\sqrt{1^2+1})^{2/3} \times (.11)^{1/2}$

$= (2.5d^2 + .5d^2) \times 42.46 \times (.25d + .18d)^{2/3} \times .33$

$= 3d^2 \times 42.46 \times (.43d)^{2/3} \times .33$

TRY $d = .96$ FT

$Q = (3(.96)^2) \times 42.46 \times (.43(.96))^{2/3} \times .33$

$= 21.41$ CFS

TRY $d = .98$ FT

$Q = (3(.98)^2) \times 42.46 \times (.43(.98))^{2/3} \times .33$

$= 22.63$ CFS

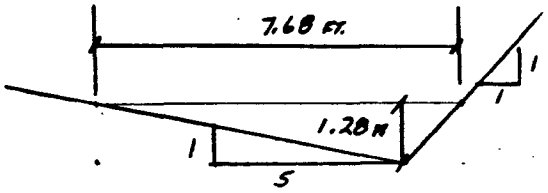
USE $d = .98$ FT

TOTAL DEPTH = DEPTH OF FLOW + FREEBOARD

$= .98$ FT $+ .3$ FT

$= 1.28$ FT.

DITCH DESIGN



VELOCITY

$R = (.43(.98)) = .42$
$S = .11$
$n = .035$

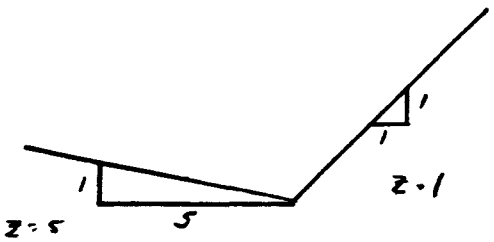
$V = 1.486/n \times R^{2/3} \times S^{1/2}$
$= 1.486/.035 \times (.42)^{2/3} \times .33$
$= 7.87$ FPS

EVEN THOUGH THE VELOCITY IS GREATER THAN 6 FPS THE DITCH IS CONSTRUCTED IN ROCK.

C DD-14 DETERMINE DEPTH OF FLOW

USE MANNING FORMULA

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



$n = .035$
$S = .08$ MAP 3.2.8-1

$A = zd^2/2 + zd^2/2$
$R = zd/4\sqrt{z^2+1} + zd/4\sqrt{z^2+1}$

$Q = (zd^2/2 + zd^2/2) \times 1.486/n \times (zd/4\sqrt{z^2+1} + zd/4\sqrt{z^2+1})^{2/3} \times S^{1/2}$

$= (5d^2/2 + 1d^2/2) \times 1.486/.035 \times (5d/4\sqrt{5^2+1} + d/4\sqrt{1^2+1})^{2/3} \times (.08)^{1/2}$

$= (2.5d^2 + .5d^2) \times 42.46 \times (.25d + .18d)^{2/3} \times .27$

$= 3d^2 \times 42.46 \times (.43d)^{2/3} \times .27$

TRY $d = 1.0$ FT

$Q = 3(1)^2 \times 42.46\,(.43(1))^{2/3} \times .27$

$= 19.54$ CFS

TRY $d = 1.05$ FT

$Q = 3(1.05)^2 \times 42.46 \times (.43(1.05))^{2/3} \times .27$ 22.26

$= 22.26$ CFS

TRY $d = 1.06$ FT

$Q = 3(1.06)^2 \times 42.46 \times (.43(1.06))^{2/3} \times .27$

$= 22.83$ CFS

USE $d = 1.06$ FT.

VELOCITY

$V = 1.486/n \times R^{2/3} \times S^{1/2}$

$= 1.486/.035 \times (.46)^{2/3} \times (.08)^{1/2}$

$= 42.46 \times .59 \times .28$

$= 7.09$

$R = (.43)(1.06) = .46$
$S = .08$
$n = .035$

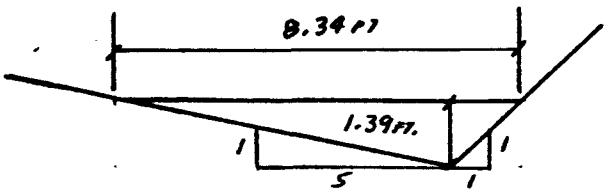
EVEN THROUGH THE VELOCITY IS GREATER THAN 6 FPS THE DITCH IS CONSTRUCTED IN ROCK.

TOTAL DEPTH = DEPTH OF FLOW + FREEBOARD

= 1.06 ft. + .3 ft

= 1.39 ft

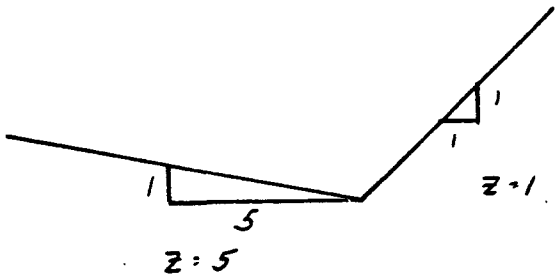
DITCH DESIGN



D. DD-15 DETERMINE DEPTH OF FLOW

USE MANNING FORMULA

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



$n = .035$
$S = .06$ MAP 3.2.8-1

$A = zd^2/2 + zd^2/2$
$R = zd/\sqrt{z^2+1} + zd/\sqrt{z^2+1}$

$$Q = \left(2d^2/2 + 2d^2/2\right) \times 1.49/n \times \left(2d/4\sqrt{d^2+1} + 2d/4\sqrt{d^2+1}\right)^{2/3} \times S^{1/2}$$

$$= 5d^2/2 + 1d^2/2 \times 1.49/.035 \times \left(5d/4\sqrt{5^2+1} + d/4\sqrt{1^2+1}\right)^{2/3} \times (.06)^{1/2}$$

$$= 2.5d^2 + .5d^2 \times 42.46 \times (.25d + .18d)^{2/3} \times .24$$

$$= 3d^2 \times 42.46 \times (.43d)^{2/3} \times .24$$

TRY $d = 1.1$ FT

$$Q = 3(1.1)^2 \times 42.46 \times (.43(1.1))^{2/3} \times .24$$

$$= 22.40 \text{ CFS}$$

TRY $d = 1.11$ FT

$$Q = 3(1.11)^2 \times 42.46 \times (.43(1.11))^{2/3} \times .24$$

$$= 22.95 \text{ CFS}$$

USE $d = 1.11$ FT

VELOCITY

$$V = 1.49/n \times R^{2/3} \times S^{1/2}$$

$$= 1.49/.035 \times (.48)^{2/3} \times .24$$

$$= 42.46 \; .61 \times .24$$

$$= 6.34 \text{ FPS}$$

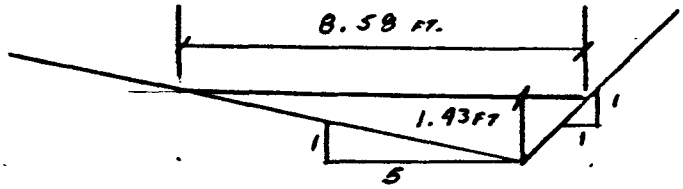
$R = .43(1.11) = .48$
$S = .06$
$n = .035$

EVEN THOUGH THE VELOCITY IS GREATER THAN 6 FPS THE DITCH IS CONSTRUCTED IN ROCK.

TOTAL DEPTH = DEPTH OF FLOW + FREEBOARD

$$= 1.11 + .3$$

$$= 1.43 \text{ FT.}$$



SECTION 15

WASTE ROCK DISPOSAL SEDIMENT POND

WASTE ROCK DISPOSAL
SEDIMENT POND

G. TAYLOR
6-30-89
REVISED 11-21-89

SIZING POND - DISPOSAL SITE - MAP 4.K.1-1B

1. RUNOFF FROM UNDISTURBED AREA

a) AREA

RECORDING	FACTOR	AREA FT²	ACRES
5	13,698	68,490	1.57

b) SOIL SURVEY

SOIL TYPE	PERCENT[1]	HYD GROUP[1]	CN[2]
CURECANTI FAMILY LOAM	30	B	66
PATHEAD EXTREMELY BOULDERY FINE SANDY LOAM	25	C	77
PATHEAD EXTREMELY STONY LOAM	25	C	77
PERMA FAMILY SOILS	13	B	66
MIDFORK FAMILY SOILS	7	B	66

1) SOIL SURVEY OF CARBON AREA, UTAH - UNITED STATES DEPARTMENT OF AGRICULTURE - SOIL CONSERVATION SERVICE

2) TABLE 2.20 PAGE 82 APPLIED HYDROLOGY AND SEDIMENTOLOGY FOR DISTURBED AREAS, BARFIELD AND HAAN
CN=66 FOREST LAND POOR COVER CN=77 FOREST LAND POOR COVER

$$CN = \frac{.30(66) + .25(77) + .25(77) + .13(66) + .07(66)}{.3 + .25 + .25 + .13 + .7}$$

$$= 19.80 + 19.25 + 19.25 + 8.58 + 4.62$$

$$= 71.50 \quad \text{USE } \underline{72}$$

$S = 1000/CN - 10 = 3.89$ EQ 2.39

$Q = (P - .25)^2 / P + 0.05$ EQ 2.38

} PAGE 81 APPLIED HYDROLOGY AND SEDIMETOLOGY FOR DISTURBED AREAS, BARFIELD AND HAAN

$P_{10-24} = 2.45$ IN

$P_{25-24} = 2.85$ IN

} SECTION 2, VOL 5 PAGE 5

Q - 10 YR - 24 HR

$Q_{10-24} = [2.45 in - .2(3.89)]^2 / 2.45 + .8(3.89)$

$= 2.80 / 5.56$

$= .50$ INCHES

Q = 25 YR - 24 HR

$Q_{25-24} = [2.85 - .2(3.89)]^2 / 2.85 + .8(3.89)$

$= 4.29 / 5.96$

$= .72$ INCHES

c) RUNOFF VOLUMES

10 YR - 24 HR

$RV = QA / 12 in/ft$

$= .50 in \times 1.57 ACRES / 12 in/ft = .07$ ACRE-FT

2,850 CU. FT.

25 YR - 24 HR

$RV = .72 in \times 1.57 ACRES / 12 in/ft = .09$ ACRE-FT

4,100 CU. FT.

22-141 50 SHEETS
22-142 100 SHEETS
22-144 200 SHEETS
AMPAD

2. RUNOFF FROM DISTURBED AREA - MAP 4.16.1-1B

a) AREA

PLANIMETER READING	FACTOR	AREA - FT²	ACRES
9113	10	91,130	2.09

c) SOIL AND CURVE NUMBER

ROCK - SANDSTONE AND SHALES

CN = 89 DIRT LOW INFILTRATION RATE

S = 1000/89 - 10 = 1.24 EQ 2.39

Q = (P - .2S)²/P + .8S EQ 2.38

PAGE 81 APPLIED HYDROLOGY AND SEDIMENTOLOGY FOR DISTURBED AREAS, BARFIELD AND HAAN.

Q = 10 YR - 24 HR

Q = (2.45 - .2(1.24))²/2.45 + .8(1.24)

= 4.85/3.44

= 1.41 IN.

Q = 25 YR - 24 HR

= [2.85 - .2(1.24)]²/2.85 + .8(1.24)

= 6.77/3.83

= 1.77 IN.

c) RUNOFF VOLUME

10 YR - 24 HR

RV = QA/12 IN/FT

= 1.41 IN × 2.09 ACRES/12 IN/FT = .25

10,697 CU. FT.

25YR - 24 HR

RV = QA/12 IN/FT

= 1.97 IN x 2.09 ACRE/12 IN/FT = .3289 ACRE-FT

13,428 CU. FT.

3 SEDIMENT VOLUME

0.1 AC-FT FOR EACH ACRE DISTURBED

VOL. = 0.1 AC-FT/AC x 2.09 AC

= .2090 AC-FT = 9,100 CF.FT.

4 TOTAL VOLUME

THE TOTAL STORAGE / DETENTION CAPACITY OF THE POND SHOULD BE LESS THAN :

10 YR - 24 HR

22,647 CU. FT

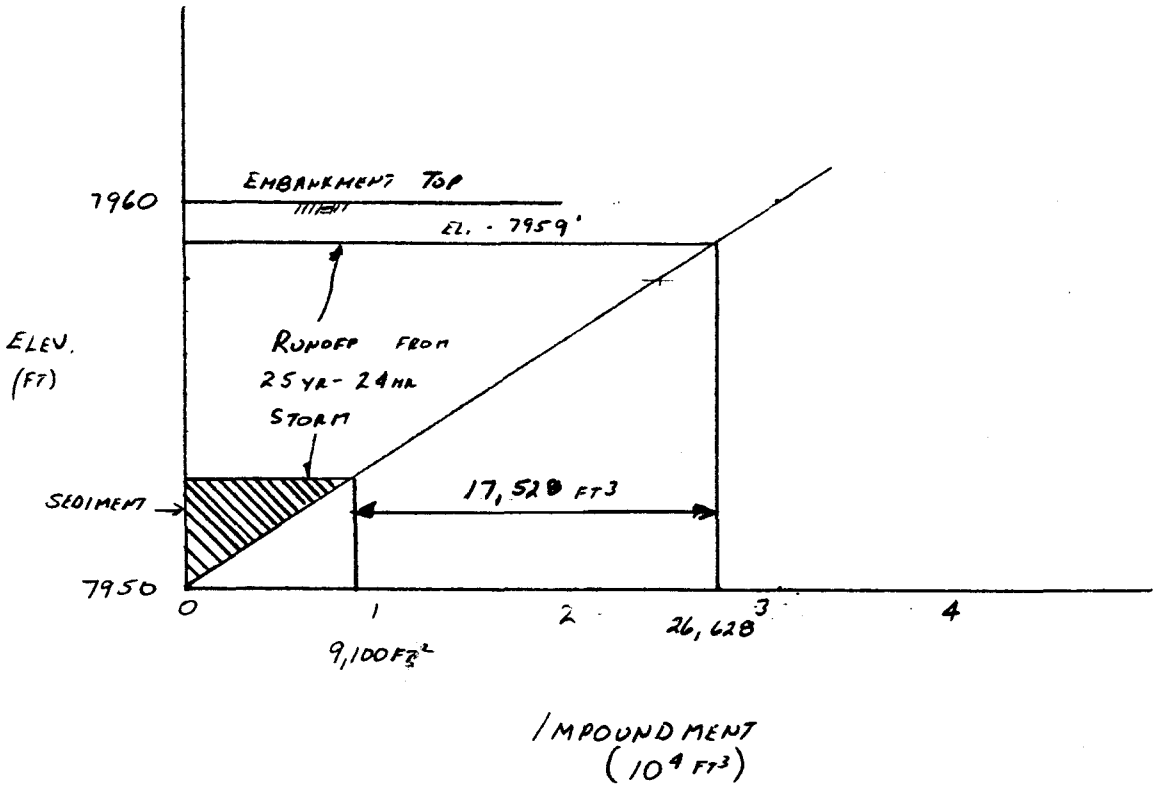
25 YR - 24 HR

26,628 CU. FT

22-141 50 SHEETS
22-142 100 SHEETS
22-144 200 SHEETS
AMPAD

5 POND CAPACITY

ELEV.	AREA (FT)^2	AVE AREA (FT^2)	VOLUME
7950	1560		
		3100	31,000
7960	4640		



DITCH DD-16 MAP 4.16.1-1B

AREA IN SQ. FT (1)	CN (2)	HYDRAULIC LENGTH (1)	Σ OF CONTOURS	SLOPE % (3)	CONTOUR INTERVAL
81,870	84	840	2,210	26.99	10

1) MAP 4.16.1-1B

2) *SILAS SOIL GROUP - C 65% HYD SOIL GROUP †CN = 86
BRYCAN SOIL GROUP - B 35% HYD SOIL GROUP CN = 79

86(.65) + 79(.35) / .65 + .35 = 55.90 + 27.65 / 1 = 83.55 USE 84

* SOIL SURVEY OF CARBON AREA, UTAH - UNITED STATES DEPT. OF AGRICULTURE - SOIL CONSERVATION SERVICE

† APPLIED HYDROLOGY AND SEDIMENTOLOGY FOR DISTURBED AREAS BARFIELD AND HAHN

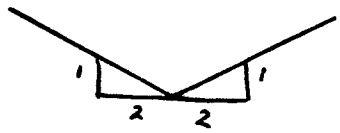
3) % SLOPE = Σ CONTOURS × CONTOUR INTERVALS / AREA

AREA NO.	t_c (4)	PEAK FLOW (CFS) (5) Q_{10-24}	Q_{25-24}	Q_{50-24}	Q_{100-24}
	.077 hr				3.68

4) KENT'S
$t_c = L^{.8} (S+1)^{.7} / 1900\, Y^{.5} / .6$ EQ. = 2.60 PAGE 102
APPLIED HYDROLOGY AND SEDIMENTOLOGY FOR DISTURBED AREAS - BARFIELD AND HAHN

5) SCS UNIT HYDROGRAPH METHOD (NEH - 4, 1972)

DETERMINE DEPTH OF FLOW



$Z = 2$

PEAK FLOW - 3.68 CFS = Q_{100-yr}

USE MANNING FORMULA

$n = .023$ UNIFORM - NOT VEG.
$S = .027$

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

$A = Zd^2$
$R = Zd/2\sqrt{Z^2+1}$

$Q = Zd^2 \times 1.486/n \times (Zd/2\sqrt{Z^2+1})^{2/3} \times S^{1/2}$

$= 2d^2 \times 1.486/.023 \times (2d/2\sqrt{2^2+1})^{2/3} \times (.027)^{1/2}$

$= 2d^2 \times 64.61 \times (.45d)^{2/3} \times .16$

TRY $d = .6$ FT

$Q = 2(.6)^2 \times 64.61 \times (.45(.6))^{2/3} \times .16$

$= 3.10$ CFS

TRY $d = .64$ FT

$Q = 2(.64)^2 \times 64.61 \times (.45(.64))^{2/3} \times .16$

$= 3.68$ CFS

USE $d = .69$ FT.

VELOCITY

$V = 1.486/n \times R^{2/3} \times S^{1/2}$

$= 1.486/.023\,(29)^{2/3} \times (.027)^{1/2}$

$= 4.61$ FPS

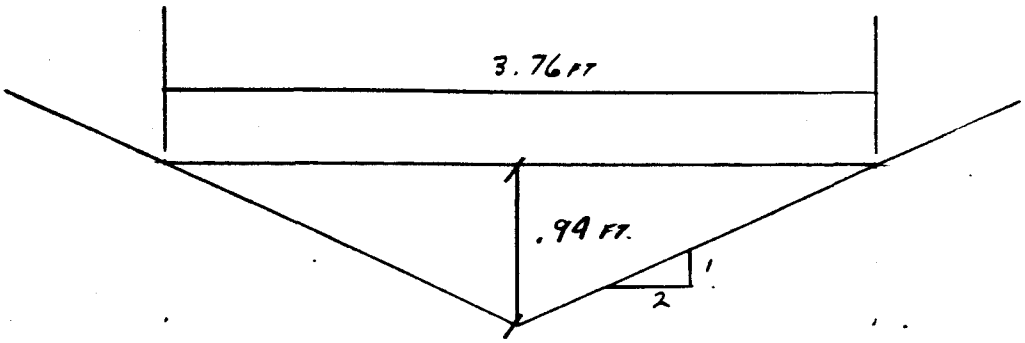
$R = .45(.64) = .29$
$S = .027$
$n = .023$

TOTAL DEPTH = DEPTH OF FLOW + FREE BOARD

$= .64$ FT $+ .3$ FT

$= .94$

DITCH DESIGN



SECTION 16

WASTE ROCK DISPOSAL AREA CAPACITY AND SCHEDULE

REVISED 9-18-89
G. TAYLOR

THE DISPOSAL AREA WAS DESIGNED TO HOLDS 131,000 YD³ OF MATERIAL. AS OF 13 AUGUST 1987, 11,541 YD³ HAD BEEN AT THE DISPOSAL SITE

Section 16

YEAR	VOLUME STORED YD³	
1984		
1987	11,541	119,459
1988	20,000	99,459
1989	10,000	89,459
1990	10,000	79,459
1991	10,000	69,459
1992	10,000	59,459
1993	10,000	49,459
1994	10,000	39,459
1995	10,000	29,459
1996	10,000	19,459
1997	10,000	9,459
1998	8472	987

THE REMAINING 987 YD³ WILL BE USED FOR SEDIMENT STORAGE AND WATER DETENTION.

22-141 50 SHEETS
22-142 100 SHEETS
22-144 200 SHEETS
AMPAD

SECTION 17

RECLAMATION COSTS

17

G. Taylor
6-30-89
Revise Index Page

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See 17

22-141 50 SHEETS
22-142 100 SHEETS
22-144 200 SHEETS
AMPAD

RECLAMATION EQUIPMENT LIST (1)

EQUIPMENT	1) EQUIPMENT RATES MONTHLY (176 HRS)	WEEKLY (40 HRS)	HOURLY	OPERATING RATES
769C OFF HIGHWAY TRUCK	9,465	2935	93.50	22.65
988B WHEEL LOADER	12,535	4265	170.00	42.00
D6 D TRACK TYPE TRACTOR	6,005	2420		11.80
D8L " " "	12,665	4,350		28.50
631 D WHEEL TRACTOR SCRAPER	17,665	6,005		49.60
146 MOTOR GRADER	5,980	2,030		18.65
245 BACKHOE	19,695	6,500		43.85
10 T DUMP TRUCK	3,050	945		12.95
3/4 T 4x4 PICKUP	550	170		2.00
410 B-62 HP TRACTOR	2425	825		6.70
MULCHER		100		

LABOR RATES

FOREMAN	33.65/HR
OPERATOR	30.35/HR
TEAMSTER	24.60/HR
LABORER	23.65/HR

DEMOLITION .. COSTS

CONCRETE	.22/FT^3
STEEL	.16/FT^3
MIX	.17/FT^3
GUARD RAIL	.4.45/FT
FENCE	.1.22/FT
PAVING	1.48/YD^2
DISPOSAL (SITE)	5.10/YD^3
DISPOSAL (OFF-SITE)	8.00/YD^3

1) BLUE BOOK RENTAL RATES

EQUIPMENT REMOVAL

1 DAYS TO REMOVE ANY PIECE OF EQUIPMENT

LABOR

FOREMAN - 1 x 8 HR x $33.65/HR = 269.20
OPERATOR - 1 x 8 HR x $31.00/HR = 248.00
LABORER - 4 x 8 HR x 23.65 HR = 756.00

EQUIPMENT

PICK-UP - 1 x 34 x 8 x 8.9 = 105.20
65 TON CRANE - 1,104 x 8 x 38.00 = 1,408.00
2,787.2

	MONTH	WEEKLY	HR.
P&H 265	16,720	5,520	38.00

2,787.2 ÷ 20 TON = 139.36 USE $190/TON

Reclamation Cost Calculation

Description	Units	Unit Cost	Subtotal
Building and Equipment Removal	Tons		
Equipment Removal			
1,500 × 75%	1,125	$140/ton	157,500
Steel Frame Building Removal	Ft.	$0.17/ft³ of Volume	
Shop - Warehouse	1,856,000		315,520
	113,000		19,210
Administration Building	78,000		13,260
Mine #1 Transfer Tower	96,000		16,320
Mine #2 + 3 Drive House	180,000		30,600
Crusher - Raw Coal	88,000		14,900
Truck Loadout	30,000		5,100
Railcar Loadout	118,000		20,060
Transfer Towers	169,000		28,540
			463,530
Concrete and Blacktop Removal	Ft³ or Yd²		
Upper Terrace			
Conveyor	972 ft³	$.22/ft³	210
Middle Terrace			
Shop Warehouse Foundation	5,130 ft³	$.22/ft³	1,130
Transfer Tower Foundation Mine #1	1,782 ft³	$.22/ft³	390
Conveyor Foundation	1,458 ft³	$.22/ft³	320
Silo	18,360	$.22/ft³	4,040

Parking Area	140 yd²	1.48/yd²	200
Disposal	1,026 yd³	5.10/yd³	5,230

Lower Terrace

Crusher Foundation	2,916 ft³	.22/ft³	640
Mine 2+3 Drive House	3,660 ft³	.22/ft³	800
Conveyor Foundation	2,430 ft³	.22/ft³	530
Truck Loadout Foundation	270 ft³	.22/ft³	60
Road and Storage	14,670 yd²	1.48/yd²	21,700
Disposal	340 yd³	5.10/yd³	1,730

Road

Conveyor - Transfer Tower Foundation	32,400 ft³	.22/ft³	7,130
Disposal	1,200 yd³	5.10/yd³	6,120

Concrete Removal - Loadout

Silo Sides	162,000 ft³	.22/ft³	35,640
Railcar Loadout	6,706 ft³	.22/ft³	1,470
Paving	4,660 yd²	1.48/yd²	6,900
Disposal	6,784 yd³	5.10/yd³	34,600

Backfilling - Portal Area - Section 17, Vol. 5 Page 16

Mine #1	6,940	6,940
Mine #2 + #3	6,940	6,940

MINE SITE
MATERIAL BALANCE

AREA	CUT (YD^3)	FILL (YD^3)
LOWER BENCH (SECTION 17, VOL. 5 PAGES 5+6)	39,719	103,352
MIDDLE BENCH (SECTION 17, VOL. 5 PAGE 7)	159,200	7,360
UPPER BENCH		
WEST FORK (SECTION 17, VOL. 5 PAGE 8)	46,607	48,744
SOUTHWEST FORK (SECTION 17, VOL. 5 PAGE 9)	15,667	85,800
WATER TANK (SECTION 17, VOL. 5 PAGE 10)		1,683
	261,193	246,939

ASSUMPTION

THE CUT AND FILL MATERIAL VOLUMES WILL BALANCE OF THE COMPACTION OF THE FILL

22-141 50 SHEETS
22-142 100 SHEETS
22-144 200 SHEETS
AMPAD

LOWER BENCH

CUT	FILL
SECTION A-A' - MAP 4.4.2-1B	
71 × 40 □' = 2,840 □'	N 66 × 40 □' = 2,640 □'
SECTION B-B' - MAP 4.4.2-1B	
51 × 40 □' = 2,040 □'	N 15 × 40 □' = 600 □' 11 × 40 □' = 440 □' S 65 × 40 □' = 2,600 □'
SECTION C-C' MAP 4.4.2-1B	
19 × 40 □' = 760 □'	N 112 × 40 □' = 4,480 □' S 52 × 40 □' = 2,080 □'

CUT MATERIAL

2,840 SECTION A-A'
2,040 SECTION B-B'
4,880 ÷ 2 = 2,440 □' × 270 FT. = 658,800 CU. FT.

2,040 SECTION B-B'
760 SECTION C-C'
2,800 ÷ 2 = 1,400 □ × 233 FT. = 326,200 CU. FT.

760 □' ÷ 2 = 380 □ × 230 FT = 87,400 CU. FT.

1,072,400 CU. FT. ÷ 27 = 39,719 YD^3

FILL MATERIAL

NORTH SIDE

2,640 SECTION A-A'
1,040 SECTION B-B'
3,680 ÷ 2 = 1,840 □' × 270 FT = 496,800 CU. FT

1,040 SECTION B-B'
4,480 SECTION C-C'
5,520 ÷ 2 = 2,760 □' × 233 FT = 643,080 CU. FT

4,480 □' ÷ 2 = 2,240 □' × 230 FT = 515,200 CU. FT.

1,655,080 CU. FT. ÷ 27 = 61,299 YD³

SOUTH SIDE

2,600 ÷ 2 = 1,300 □' × 270 FT = 351,000 CU. FT

2,600 SECTION B-B'
2,080 SECTION C-C'
4,680 ÷ 2 = 2,340 □' × 233 FT = 545,220 CU. FT.

2,080 ÷ 2 = 1,040 □' × 230 FT = 239,200 CU. FT

1,135,420 CU. FT. ÷ 27 = 42,053 YD³

103,352 YD³

MIDDLE BENCH

CUT FILL

SECTION E-E MAP 4.4.2-1B

144 × 40□' = 5,760□'

SECTION F-F' MAP 4.4.2-1B

55 × 40□' = 2,200□' 24 × 40□' = 960□'

CUT MATERIAL

5,760□' × 540 FT = 3,110,400 CU.FT

2,200□' × 540 FT = 1,188,000 CU.FT

4,298,400 CU.FT. ÷ 27 = 159,200 YD³

FILL MATERIAL

960□' × 207 FT = 198,720 CU.FT ÷ 27 = 7,360 YD³

22-141 50 SHEETS
22-142 100 SHEETS
22-144 200 SHEETS
AMPAD

UPPER BENCH

CUT	FILL

WEST FORK

SECTION G-G' MAP - 4.4.2-1B

73 x 40D' = 2,920 D'

N
121 x 40 D' = 4,840 D'

SECTION H-H' MAP - 4.4.2-1B

30 x 40D = 1,200 D'

N
25 x 40D' = 1,000 D'

S
33 x 40D' = 1,320 D'

CUT MATERIAL

2,920 D' ÷ 2 = 1,460 D' x 455 ft = 664,300 cu.ft

2920
1,200
4,120 ÷ 2 = 2,060 D' x 268 ft = 552,080 cu.ft.

1,200 ÷ 2 = 600 D' x 70 ft = 42,000 cu.ft

1,258,380 cu.ft ÷ 27 = 46,607 yd³

FILL MATERIAL

NORTH SIDE

4,840 D' ÷ 2 = 2,420 D' x 135 ft = 326,700 cu.ft

4890
1000
5,840 ÷ 2 = 2,920 D' x 250 ft = 730,000 cu.ft

1000 ÷ 2 = 500□' × 70 FT = 35,000 CU. FT.

1,091,700 CU. FT ÷ 27 = 40,433 YD³

SOUTH SIDE

1320 ÷ 2 = 660□' × 340 FT = 224,400 CU. FT ÷ 27 = 8,311 YD³

SOUTHWEST FORK

CUT	FILL
25 × 40□' = 1,000□'	198 × 40□' = 7,920□'

CUT MATERIAL

1,000□ ÷ 2 = 500□' × 846 FT = 423,000 CU. FT ÷ 27 = 15,667 YD³

FILL MATERIAL

7,920□' ÷ 2 = 3,960 × 355 FT = 1,405,800 CU. FT

7,920□ ÷ 2 = 3,960 × 230 FT = 910,800 CU. FT

2,316,600 CU. FT ÷ 27 = 85,800 YD³

WATER TANK - MAP 4.4.2-1F

FILL

SECTION A-A'

40 × 60' = 2400'

SECTION B-B'

61 × 60' = 3660'

FILL

240
366
606 ÷2 = 3030' × 150 FT = 45,450 CU FT ÷ 27 = 1,683 YD³

22-141 50 SHEETS
22-142 100 SHEETS
22-144 200 SHEETS
AMPAD

WATER TANK SITE
RECLAMATION

MATERIAL TO BE HAULED

1,683 YD^3 OF FILL MATERIAL

USE 35 TON OFF-HIGHWAY TRUCK

HEAPED CAPACITY - 30.8 YD^3 PAGE 416 CATERPILLAR PERFORMANCE HANDBOOK, EDITION 19

LOAD FACTOR

25% ROCK, 75% EARTH = .80 PAGE 888

LOAD BANK CUBIC YARDS = LCY X. LF
= 30.8 X. 8
= 24.64 BCY

NUMBERS OF LOADS REQUIRED

1,683 YD^3 ÷ 24.64 BCY = 68.3 TRIPS

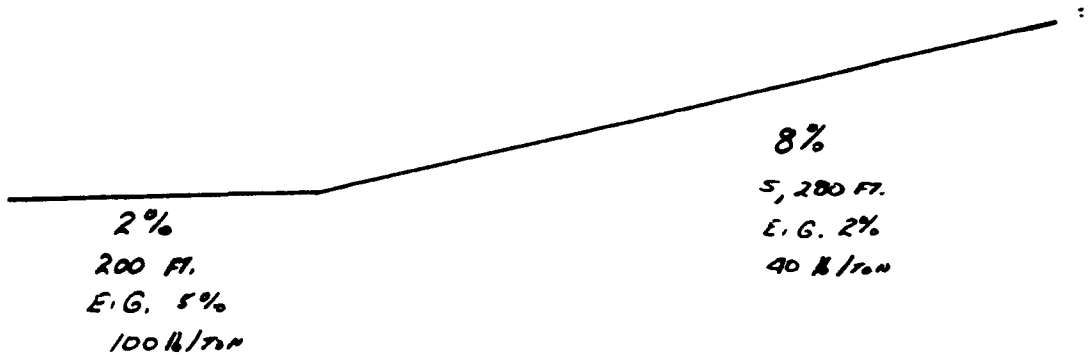
EQUIPMENT NEEDED

3 - 769C OFF HIGWAY TRUCK
1 - 988B WHEEL LOADER
1 - D8L TRACTOR

MATERIAL

DESCRIPTION	- 25% ROCK, 75% EARTH
BANK DENSITY	- 2,840
LOAD FACTOR	- .80
SHRINKAGE FACTOR	- .87
TRACTION FACTOR	- .70
ALTITUDE	- 8,600 - 93% DERATED

JOB LAYOUT - HAUL AND RETURN



SEC 1 - TOTAL EFFECTIVE GRADE = 5% + 2% = 7%
SEC 2 - TOTAL EFFECTIVE GRADE = 2% + 8% = 10%

1. ESTIMATE PAYLOAD
   30.8 yd³ x .8 x 2840 = 69,977.6 lbs USE 70,000 lbs

2. MACHINE WEIGHT

EMPTY	68,000 lbs	OR	34 TON
LOADED	70,000 lbs		35 TON
	138,000 lbs		69 TON

3. USABLE PULL

   LOADED (WEIGHT ON DRIVING WHEELS 66.7%)
   .70 x 138,000 lbs x .667 = 64,432

   EMPTY (WEIGHT ON DRIVING WHEELS 50.4%)
   .70 x 138,000 x .504 = 48,686

4. COMPARE TOTAL RESISTENCE TO TRACTIVE EFFORT ON HAUL

   GRADE RESISTANCE

   SEC. 1 20 lb/TON x 69 TON x 2 = 2,760

   SEC 2 20 lb/TON x 69 TON x 8 = 11,040 lbs

ROLLING RESISTENCE

SEC. 1 100 lb/ton × 69 = 6,900 lbs

SEC 2 40 lb/ton × 69 = 2,760 lbs

TOTAL RESISTENCE

SEC 1 6,900 lbs + 2,760 = 9,660

SEC. 2 11,040 lbs + 2,760 = 13,800 lbs

TRAVEL TIME

SEC. 1 : .31 min
SEC 2 : 6.67 min
6.98

5. COMPARE TOTAL RESISTENCE TO TRACTIVE EFFORT ON RETURN

GRADE ASSISTANCE

SEC. 1 20 lb/ton × 34 ton × 2 = 1,360 lbs

SEC. 2 20 lb/ton × 34 × 8 = 5,440 lbs

ROLLING RESISTENCE

SEC. 1 100 lb × 34 tons = 3400 lbs

SEC 2 40 lbs × 34 ton = 1,360 lbs

TOTAL RESISTENCE

SEC. 1 3,400 lbs − 1,360 = 2040 lbs

SEC 2 1,360 − 5,440 = −4,080 lbs

TRAVEL TIME

SEC. 1 .2 min
SEC 2 3.70 min
3.90 min

6. ESTIMATED CYCLE TIME

TOTAL TRAVEL TIME	=	10.88 MIN.
TRUCK MANEUVER	=	.7 MIN.
DUMP TIME	=	1.2 MIN.
LOADING TIME	=	.55 MIN.
		13.33 MIN.

7. ESTIMATED PRODUCTION

CYCLES/HR = 60 MIN/HR ÷ 13.33 MIN/CY.
= 4.50 CYCLES/HR

HOURLY UNIT PRODUCTION = 24.64 × 4.50
= 110.91 BCY

ADJUSTED PRODUCTION = 110.91 (.83)
= 92.05 BCY

HOURLY FLEET PRODUCTION = 92.05 × 3
= 276.16 yd^3/HR

$1,683 \times 10^3 \div 276.16$ yd^3/HR = 6.09 HRS

COST OF FILL AND GRADING

FILL

769 @	= ($22.65/HR × 6.09 + $95.50/HR × 6.09) × 3	=	2,122.04
988B @	= $42.00/HR × 6.09 HRS × 170,000 yd^3 × 6.09)	=	1,291.08
OPERATOR	= $30.35/HR × 6.09 HRS	=	184.83
TEAMSTER	= $29.60/HR × 6.09 HRS × 3	=	449.43
			4,047.40
	SUPERVISOR		194.05

GRADING

D8L @	= $28.50/HR × 6.09 + 108.75 × 6.09	=	835.85
OPERATOR	= $30.35/HR × 6.09	=	184.83
			1029.68
	SUPERVISOR		40.94
			1,069.62
FOREMAN	= $33.65/HR × 6.09	=	204.93
PICKUP	= $7.0/HR × 6.09 + 4.25 × 6.09	=	38.06
			242.99

WATER TANK TOPSOIL

TOPSOIL NEEDED

150 ft x 90 ft x 2.5 ft = 33,750 ft³ ÷ 27 = 1250 yd³

1- 769 C OFF HIGHWAY TRUCK
1- 988 B WHEEL LOADER
1- D8L TRACTOR

HOURLY UNIT PRODUCTION

24.64 BCY x 4.50 cycle/hr = 110.88 BCY/HR

ADJUSTED PROD.

110.88 BCY/HR x .83 = 92.03 BCY/HR

1250 yd³ ÷ 92.03 BCY/HR = 13.58 HRS

COST

769 C @	- 13.58 HRS x (93.50 + 22.65)	= 1,577.32
988 B @	- 13.58 HRS x (170.00 + 42)	= 2,878.96
D8L @	- 13.58 HRS x (108 + .28 CO)	= 1,853.67
PICK-UP @	- 13.58 HRS x (4.25 + 2.00)	= 84.88
OPERATOR @	- $30.35 HR x 13.58 HR	= 412.15
TEAMSTER	- $24.60/HR x 13.58 HR	= 334.07
FOREMAN	- $33.65/HR x 13.58 HR	= 456.97
		7,598.02

USE = $7,600

RIPPING

TRACTOR @	.3 HR x ($6.70/HR + 20.63)	= 8.20
OPERATOR @	$30.35/HR x .3 HR	= 9.11
LABORER @	$23.65/HR x .3 HR x 3	21.29
HAY	$200/ACRE .3	= 60.00
		98.60 x $100.00

PORTAL BACKFILL

MINE SITE SILO 680 yd^3

RAIL LOADOUT SILOS 6,000 yd^3

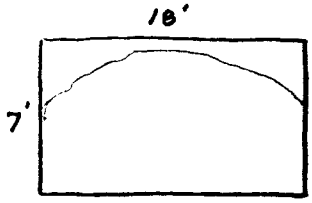
6,680 yd^3

TOTAL ENTRIES TO BACKFILL - 10

6,680 yd^3 ÷ 10 = 668 yd^3 / ENTRY SWELL FACTOR OF 20%

USE 915 LHD TO BACKFILL PORTALS

DESCRIPTION - CONCRETE
LOAD FACTOR - .80



≈ 80% OF THE ENTRY CAN BE FILLED

7' × 18' = 126 ft^2 ÷ 9 ft/yd^2 = 14 yd^3

668 yd^3 × 1.2 = 801.6 yd^3 ÷ 14 yd^2 = 57.26 yd × 3 = 171.77

≈ THE 172 FT OF EACH PORTAL WOULD BE FILLED

NUMBER OF TRIPS

7 yd^3 × .8 = 5.6 yd^3

801.6 ÷ 5.6 = 143.14 TRIPS / ENTRY

TRAVEL TIME

3.5 miles/hr × 5,280 ft/miles × .02 hr/min = 308 ft/min

TOTAL DISTANCE TRAVELED
200 + 280 = 480 ft ÷ 308 ft/min = 1.56 min

TOTAL TRAVEL TIME	=	3.12 min
LOAD	=	.15 min
DUMP	=	.12 min
CARRY POSITION	=	.13 min
		3.52 min.

ESTIMATE PRODUCTION

CYCLES /HR = 60 MIN /HR ÷ 3.52 MIN = 17.03 CYCLES /HR

HOURLY UNIT PRODUCTION

5.6 YD^3 × 17.03 CYCLES /HR = 95.36 YD^3/HR

ADJUSTED PRODUCTION

95.36 × .83 = 79.15 YD^3/HR

HOURLY FLEET PRODUCTION

79.15 YD^3/HR × 2 = 158.30 YD^3/HR

TOTAL HOURS

801.6 YD^3 ÷ 158.30 YD^3/HR = 5.06 HR × 10 = 50.64 HRS

USE 2- 915 E

915 E @ 89.85 /HR × 50.64 HRS × 2 = 9,100
OPERATOR @ 30.35 /HR × 50.64 HRS × 2 = 3,073.85
FORMAN @ 33.65 /HR × 50.64 HRS × 1 = 1,704.04
13,877.89 ÷ 13,800 /2 = 6,900

PRODUCTIVITY FOR SCRAPERS

1. BACKFILL - AND GRADE BENCHES

2. CHARACTERIZATION OF SCRAPER USED

CAT 631 21 YD³ (STRUCK) + 31 YD³ (HEAPED)/2 = 26 YD³ AVG. CAPACITY

A D8L DOZER WILL ASSIST THE SCRAPER IN LOADING

DESCRIPTION OF SCRAPER ROUTE: % GRADE THIS WOULD BE TYPICAL FOR THE MINE SITE

1000 FT. HAUL AT - 4%
1000 FT HAUL AT + 8%

CYCLE TIME

LOAD TIME	.6 MIN
LOADED TRIP TIME	.8 MIN
MANEUVER TIME	.7 MIN
RETURN TRIP TIME	.9 MIN
	3.00 MIN.

CYCLES/HOUR · WORK FACTOR HOURS 50 MIN ÷ 3.00 CYCLE/MIN = 16.67 CYCLES/HR

HOURLY PRODUCTION

26 YD³ × 16.67 CYCLES/HR = 433.33 YD³/HR

PUSHER CYCLE TIME = 140% LOAD TIME + 25 MIN = 1.09 MIN.

NUMBER OF SCRAPERS/PUSHER = 3.00 MIN/1.09 MIN = 2.75 (USE 3)

THEREFORE, THREE SCRAPERS ARE REQUIRED PER PUSHER

ASSUME A SCRAPER FLEET OF 3 AND 1 PUSHER

A. LOWER BENCH

1. PRODUCTION RATE

433.33 YD³/MACHINE HR × 3 = 1,299.99 YD³/HR

103,352 YD³ ÷ 1299.99 = 79.5 HRS

2. FILLING AND GRADING COST

USE THE WEEKLY RATE FOR THE EQUIPMENT

631 @	$6,005/wk × 2 wks × 3 + 49.60 × 79.5 hrs × 3	= 47,859.60
D8 @	4,350/wk × 2 wk + 28.50 × 79.5 hrs × 2	= 21,931.50
OPERATOR	$30.65/hr × 79.5 hrs × 5	= 12,183.38
		81,974.48
FOREMAN	$33.65/hr × 79.5	= 2,675.18
PICK-UP	$170/wk × 2 wks + 2.00 × 79.5	= 499.00
		3,174.18
		85,148.66

DIVIDE 85,148.66 EQUALY BETWEEN BACKFILLING AND GRADING.

B. MIDDLE BENCH

1. PRODUCTION RATE

7,360 YD³ ÷ 1,299.99 YD³/HR = 5.66 HRS

2. FILLING AND GRADING COST

631 @	$150/hr × 5.66 hrs × 3 + 49.60 × 5.66 × 3	= 3,391.33
D8 @	$108.75 × 5.66 hrs × 2 + 28.50 × 5.66 × 2	= 1,553.67
OPERATORS	$30.65/hr × 5.66 hrs × 5	= 867.40
		5,812.40
FOREMAN @	$33.65/hr × 5.66 hrs	= 190.46
PICKUP @	$4.25/hr + $2.00/hr × 5.66	= 35.38
		225.84
		6,038.24

DIVIDE 6,038.24 EQUALY BETWEEN BACKFILLING AND GRADING

C. UPPER BENCH

1. PRODUCTION RATE

134,544 YD³ ÷ 1,299.99 YD³/HR = 103.5 HRS

2, FILLING AND GRADING COST

USE THE WEEKLY RATE FOR THE EQUIPMENT

631 @ $6,005/WK × 2.59 WKS × 3 + 49.60 × 103.5 × 3	= 62,059.65
D8 @ 4,350/WK × 2.57 WKS × 2 + 28.50 × 103.5 × 2	= 28,432.50
OPERATION $30.65/HR × 103.5 HR × 5	= 15,861.38
	$106,353.53
FOREMAN @ $33.65/HR × 103.5	= 3,482.78
PICK-UP @ $170/WK × 2.59 WKS + $2.00 × 103.5	= 697.30
	110,483.61

DIVIDE $110,483.61 EQUALY BETWEEN BACKFILLING AND GRADING.

REFERENCE CATERPILLAR PERFORMANCE HANDBOOK, EDITION 19

TOPSOIL BALANCE
MINE SITE

	YD^3	YD^3
TOPSOIL STOCKPILE		131,742
WATER TANK SITE	1,250	
LOWER BENCH	26,310	
MIDDLE BENCH	29,750	
UPPER BENCH	74,400	
	131,710	
		32

22-141 50 SHEETS
22-142 100 SHEETS
22-144 200 SHEETS
AMPAD

TOPSOIL PRODUCTION

1. AMOUNTS NEEDED ON EACH BENCH

LOWER

NORTH SIDE

700 FT x 270 FT = 189,000 FT² x 2.5 FT = 472,500 CU.FT ÷ 27 = 17,500

SOUTH SIDE

700 FT. x 170 FT = 119,000 FT² x 2.0 FT. = 238,000 CU.FT ÷ 27 = 8,814.81

MIDDLE BENCH

NORTH SIDE

600 FT x 480 FT x 2.5 FT = 720,000 CU.FT. ÷ 27 = 26,666.67

SOUTH SIDE

260 FT x 160 FT x 2 FT = 83,200 CU.FT. ÷ 27 = 3,081.48

UPPER BENCH

NORTH SIDE

1000 FT x 400 FT x 2.5 FT = 1,000,000 CU.FT. ÷ 27 = 37,040

SOUTH SIDE

1300 FT x 300 FT x 2 FT = 1,008,800 CU.FT. ÷ 27 = 37,360

2. SPREAD TOPSOIL

a) USE SCRAPERS

CAT 631 21 YD³ (STRUCK) + 31 YD³ (HEAPED) / 2 = 26 YD³ AVG. CAPACITY

A D8L DOZER WILL ASSIST THE SCRAPERS IN LOADING

DESCRIPTION OF SCRAPER ROUTE % GRADE THIS WOULD BE TYPICAL FOR THE MINE SITE

1,800 FT HAUL AT -10%

1,800 FT HAUL AT +10%

LOAD TIME	.6 MIN
LOADED TRIP TIME	2.7 MIN.
MANEVER TIME	.7 MIN.
RETURN TIME	1.7 MIN
	5.7 MIN,

CYCLES / HOUR WORK FACTOR HOURS 50 MIN ÷ 5.7 MIN = 8.77 CYCLES/HR

HOURLY PRODUCTION

26 YD³ × 8.77 CYCLES/HR = 228.07 YD³/HR

PUSHER CYCLE TIME = 140% (LOAD TIME) + .25 MIN = 1.09 MIN.

NUMBER OF SCRAPER / PUSHER = 5.7 MIN / 1.09 MIN = 5.23 (USE 5)

THEREFORE, FIVE SCRAPERS ARE REQUIRED PER PUSHER

ASSUME A SCRAPER FLEET OF 5 AND 1 PUSHER

3. LOWER BENCH

PRODUCTION RATE

228.07 YD³/HR × 5 = 1,140.35

26,310 YD³ ÷ 1,140.35 YD³/HR = 23.07 HRS

COST

631 @	(150.13 + 49.60) 23.07 × 5	= 23,038.86
D8 @	(108.75 + 28.50) 23.07	= 3,166.36
OPERATOR	30.35 × 23.07 × 6	= 4,201.05
		30,406.27
FOREMAN	- 33.65 × 23.07	= 776.31
PICKUP	- (4.25 + 2) 23.07	= 144.19
		920.50
		31,326.77

RIPPING

14G GRADER

14G @ (50.75 + 18.65) 23.07	=	1601.06
OPERATOR $30.35/HR × 23.07	=	700.17
		2,301.23
TRACTOR @ (20.63 + 6.70) 23.07	=	630.39
OPERATOR 30.35 × 23.07	=	700.17
LABORER 23.65 × 23.07 × 3	=	163.82
MULCHER 2.50 × 23.07	=	57.68
HAY $200/AC × 9.8	=	1960.00
		4,984.69
		7,286.12
		7,290

4. MIDDLE BENCH

PRODUCTION RATE

29,750 YD³ ÷ 1,140.35 YD³/HR = 26.09 HR

COST

631 @ (150.13 + 49.60) 26.09 × 5	=	26,054.78
DB @ (108.75 + 28.50) 26.09	=	3,580.85
OPERATOR 30.35 × 26.09 × 6	=	4,750.99
		34,386.62
FOREMAN 33.65 × 26.09	=	877.93
PICK-UP (4.25 × 2) 26.09	=	163.06
		1040.99
		35,427.61
		35,430

RIPPING

14G @ (50.75 + 18.65) 26.09	=	1,810.65
OPERATOR $30.35/HR 26.09	=	791.83
		2,602.48

Tractor @ (20.63 + 6.70) 26.09	=	713.04
Operator 30.35 × 26.09	=	791.83
Laborer 23.65 × 26.09 × 3	=	1851.09
Mulcher 2.5 × 26.09	=	65.23
Hay $200/ac × 10	=	2000.00
		5,421.19
		8,023.67
		8,020

5 Upper Bench.

Production Rate

74,400 yd³ ÷ 1,140.35 yd³/hr = 65.24 hrs

Cost

Use the weekly rate

631 @ [6,005 × 1.63 + (49.60)(5.24)] 5	=	65,087.65
D8 @ 4,350 × 1.63 + (28.50) 65.24	=	8,949.84
Operator 30.35 × 65.24 × 6	=	11,880.20
		85,917.69
Foreman 33.65 × 65.24	=	2,195.33
Pick-up 170 × 1.63 + 2 × 65.24	=	407.58
		2,602.91
		88,520.60
		88,520

Ripping

MG @ 2,030 × 1.63 + 18.65 × 65.24	=	4,525.63
Operator 30.65 hr × 65.24	=	1,999.61
		6,525.24
Tractor @ 825 × 1.63 + 6.70 × 65.24	=	1,781.86
Operator 30.35 × 65.24	=	1,980.03
Laborer 23.65 × 65.24 × 3	=	4,628.78
Mulcher 100 × 1.63	=	163.00
Hay $200/ac × 11.3	=	2,260.00
		10,813.67
		17,338.91
		17,340

Reference: Caterpillar Preformance Handbook, Edition 19

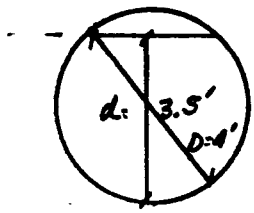
DRAINAGE RECONSTRUCTION

1. UPPER BENCH

A. BACKFILL - 48" Φ CMP

STREAM A - 580
STREAM B - 588 FT
1168 FT

ASSUME PIPE FILLS WITHIN 6 IN. OF THE TOP



CIRCLE > ½ FULL

$$\text{AREA} = D^2/8\,(2\pi - \pi\theta/180 + \sin\theta)$$

$$\theta = 4\cos^{-1}\sqrt{d/D} = 4\cos^{-1}\sqrt{3.5/4} = 82.82$$

$$\text{AREA} = (4)^2/8\,(2\pi - \pi(82.82)/180 + \sin 82.82)$$

$$= 7.69 \text{ SQ. FT.}$$

7.69 D' × 1168 FT = 8,981.92 CU.FT. ÷ 27 = 332.66 YD³

COST

MATERIAL

332.66 YD³ × $26.50/YD³ (DELIVERED) = $8,482.92

PUMP - AQUALIGHT $25.00/HR

PUMP RATE - 30 YD³/HR

332.66 YD³ ÷ 30 YD³/HR ~ 11.09 HRS

11.09 HRS × $25.00/HR = $277.22

LABOR

$23.65/HR × 3 MEN × 11.09 HRS = $786.84

CMP BACKFILL COST

MATERIAL	-	8,482.92
EQUIPMENT	-	277.22
LABOR	-	786.84
		9,546.98
		9,550

B. STREAM CHANNEL COST

1. STREAM A

FILTER BLANKET

34.83 ft² × 850 ft = 29,608.33 cu.ft. ÷ 27 = 1,096.60 yd³

1,096.60 yd³ × $9.50/yd³ = $10,417.75

RIPRAP

39.48 ft³ × 850 ft = 33,558.5 cu.ft. ÷ 27 = 1,242.89 yd³

1,242.89 yd³ × $11.50/yd³ = $14,293.22

MATERIAL TO BE PLACED WITH A 245 EXCAVATORS

BUCKET - 4.25 yd³ FOR FILTER BLANKET
2.87 yd³ FOR ROCK

CYCLE TIME	LOAD BUCKET	.13 min
	SWING LOADED	.07 min
	DUMP BUCKET	1.00 min
	SPREAD MATERIAL	1.50 min
	SWING EMPTY	.07 min
		2.77 min

CATERPILLAR PERFORMANCE HANDBOOK, EDITION 19

FILTER BLANKET - EQUIPMENT HRS

50 min/hr ÷ 2.77 cycle/min = 18.05 cycle/hr

18.05 cycles/hr × 4.25 yd³ = 76.71 yd³/hr

1,096.60 yd³ ÷ 76.71 yd³/hr = 14.29 hrs

RIPRAP - EQUIPMENT HRS

18.05 cycles/hr × 2.87 yd³ = 51.80 yd³/hr

1,242.89 yd³ ÷ 51.80 yd³/hr = 23.99 hr

2. STREAM B

FILTER BLANKET

34.83 ft² × 870 ft = 30,302.10 cu. ft. ÷ 27 = 1,122.30 yd³

1,122.30 yd³ × $9.50/yd³ = $10,661.85

RIPRAP

39.48 ft² × 870 ft = 34,347.60 cu. ft ÷ 27 = 1,272.13 yd³

1,272.13 yd³ × $11.50/yd³ = $14,629.53

FILTER BLANKET

1,122.30 yd³ ÷ 76.71 yd³/hr = 14.63 hrs

RIPRAP

1,272.13 yd³ ÷ 51.80 yd³/hr = 24.56 hrs

3. TOTAL STREAM CHANNEL COST

CMP BACKFILL:

MATERIAL	-	8,482.92	
EQUIPMENT	-	277.22	
LABOR	-	786.84	
		9,546.98	$9,550

STREAM A

MATERIAL	-	24,293.22	$24,290

STREA B

MATERIA	-	25,291.38	$25,290

EQUIPMENT STATION A+B

245 TOTAL HOURS 77.47

USE WEEKLY RATE

6,500/WK × 1.94 WK × 43.95 × 77.47 HRS = 15,993.68 $16,000

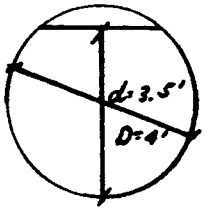
LABOR

OPERATOR $30.35/HR × 77.47 = 2,351.21
LABORER $23.65/HR × 77.47 × 3 = 5,496.50
7,847.71 7,850
82,900

2. MIDDLE BENCH

A. BACK FILL - CMP

48" Φ CMP



CIRCLE > 1/2 FULL

$$\text{AREA} = \frac{D^2}{8}\left(2\pi - \frac{\pi\theta}{180} + \sin\theta\right)$$

$$\theta = 4\cos^{-1}\sqrt{d/D} = 4\cos^{-1}\sqrt{2.5/4} = 82.82$$

$$A = \frac{(4)^2}{8}\left(2\pi - \frac{\pi(82.82)}{180} + \sin 82.82\right)$$
$$= 7.69 \text{ SQ. FT.}$$

7.69 SQ.FT × 410 FT = 3,152.90 CU.FT ÷ 27 = 116.77 YD³

COST

MATERIAL

116.77 YD³ × $25.50 = 2,977.64

PUMP - AQUALIGHT $25.00

PUMP RATE 30 YD³/HR

116.77 YD³ ÷ 30 YD³/HR = 3.89 HR

3.89 HR × $25/HR = 97.31

LABOR

$23.65/HR × 3 × 3.89 = $276.00

B. STREAM CHANNEL COST

1. STREAM C

FILTER BLANKET

34.83 FT² × 720 FT = 25,077.60 FT³ ÷ 27 = 928.8 YD³

928.8 YD³ × $9.50/YD³ = $8,823.60

RIPRAP

39.48 FT² × 720 FT = 28,425.60 FT³ ÷ 27 = 1,052.80 YD³

1,052.80 YD³ × $11.50/YD³ = $12,107.20

FILTER BLANKET - EQUIPMENT HRS

928.8 YD³ ÷ 76.71 YD³/HR = 12.11 HRS

RIPRAP - EQUIPMENT HRS

1052.8 YD³ ÷ 51.80 YD³/HR = 20.32 HRS

2 STREAM D

FILTER BLANKET

116.61 FT² × 540 FT = 62,969.40 FT³ ÷ 27 = 2,332.20 YD³

2,332.20 YD³ × $9.50/YD³ = $22,155.90

RIPRAP

TOTAL SQUARE FT. OF RIPRAP IS 101.40 ONLY 20% OF THE TOTAL WILL HAVE TO BE PURCHASED BECAUSE LARGER SIZE MATERIAL WILL BE FOUND ON THE SITE.

101.40 FT² x .2 = 20.28 FT²

20.28 FT² x 540 = 10,951.20 FT³ ÷ 27 = 405.60 YD³

405.60 YD³ x $11.50 YD³ = $4,664.40

FILTER BLANKET - EQUIPMENT HRS

2,332.20 YD³ ÷ 76.71 YD³/HR = 30.40 HRS

RIPRAP - EQUIPMENT

405.60 YD³ ÷ 51.80 YD³/HR = 7.83 HR

LARGE RIPRAP

101.40 FT² x .3 = 30 FT² x 540 = 16,200 FT³ ÷ 27 = 600 YD³

LOAD BUCKET	.24 MIN.
SWING LOADED	.07 MIN
DUMP BUCKET	1.00 MIN
SPREAD MATERIAL	1.50 MIN.
SWING EMPTY	.07 MIN
	2.88 MIN

50 MIN/HR ÷ 2.88 MIN/CYCLE = 17.36 CYCLES/HR

17.36 CYCLES/HR x 2.87 YD³ = 49.83 YD³/HR

600 YD³ ÷ 49.83 YD³/HR = 12.04 HRS

3. TRANSITION FROM STREAM B TO STREAM D

FILTER BLANKET

93 FT² x 92 FT = 8,556 FT³ ÷ 27 = 316.89 YD³

316.89 YD³ x $9.50/YD³ = $3,010.44

RIPRIP

TOTAL SQUARE FT. OF RIPRAP IS 90 SQ.FT. ONLY 20% OF THE TOTAL WILL HAVE TO BE PURCHASED BECAUSE LARGER SIZE MATERIAL WILL BE FOUND ON THE SITE.

90 SQ.FT × .2 = 18 FT²

18 FT² × .92 FT = 1,656 FT³ ÷ 27 = 61.33 YD³

61.33 YD³ × $11.50 = 705.33

LARGE RIPRAP

90 FT² × .3 = 27 FT² × .92 FT = 2,484 FT³ ÷ 27 = 92 YD³

FILTER BLANKET - EQUIPMENT HRS

613.08 YD³ ÷ 76.71 YD³/HR = 7.99 HRS

RIPRAP

61.33 YD³ ÷ 51.81 YD³ = 1.18 HRS

92 YD³ ÷ 49.83 YD³/HR = 1.85 HRS

3.03 HRS

4 TRANSITION FROM STREAM C TO STREAM D

FILTER BLANKET

57.40 FT² × 35 FT = 2009 FT² ÷ 27 = 74.41 YD³

74.41 YD³ × $9.50/YD³ = 706.87

RIPRAP

TOTAL SQUARE FT. OF RIPRAP IS 46.37 SQ.FT. ONLY 20% OF THE TOTAL WILL HAVE TO BE PURCHASED BECAUSE LAGRER SIZE MATERIAL WILL BE FOUND ON THE SITE.

46.37 SQ.FT × .2 = 9.27 FT²

9.27 FT² × 35 FT = 324.56 FT³ ÷ 27 = 12.02 YD³

12.02 YD³ × $11.50 /YD³ = $138.23

LARGE RIPRAP

46.37 FT² × .3 = 13.91 FT² × 35 FT = 486.89 FT³ ÷ 27 YD³ = 18.03 YD³

FILTER BLANKET - EQUIP. HRS

74.41 YD³ ÷ 76.71 YD³/HR = .97 HRS

RIPRAP

12.02 YD³ ÷ 51.81 YD³/HR = .23 HRS

18.03 YD³ ÷ 49.83 YD³/HR = .36 HRS

.59

C. TOTAL STREAM CHANNEL COST

CMP BACKFILL

MATERIAL	-	2,977.64	
EQUIPMENT	-	97.31	
LABOR	-	276.00	
		3,350.95	3,350

STREAM C

MATERIAL	20,930.80	20,930

STREAM D

MATERIA	26,820.30	26,820

TRANSITION B TO D

MATERIAL	3,715.77	3,720

TRANSITION C TO D

MATERIAL	845.10	850

EQUIPMENT HOURS FOR STREAM C + D, TRANSITIONS B TO D + C TO D

245 TOTAL HOURS 94.31 HRS

USE WEEKLY RATE

6,500 × 2.36 WK + 43.95 × 94.31 = 19,470.30 19,470

LABOR

OPERATOR	$30.35/HR × 94.31/HR	= 2,862.31	
LABORER	23.65 HR × 94.31 HR × 3	= 6,691.29	
		9,553.60	9,550
			84,690

3 LOWER BENCH

A. STREAM CHANNEL COST

1. STREAM E

FILTER BLANKET

81 FT² × 730 FT = 59,130 FT³ ÷ 27 = 2,190 YD³

2,190 YD³ × $9.50/YD³ = $20,805

RIPRAP

TOTAL SQ. FT. OF RIPRAP IS 72 FT² ONLY 20% OF THE TOTAL WILL HAVE TO BE PURCHASED BECAUSE LARGER SIZE MATERIAL WILL BE FOUND ON THE SITE

72 FT² × .2 = 14.40 FT²

14.40 FT² × 730 FT = 10,512 FT² ÷ 27 = 389.33 YD³

389.33 YD³ × $11.50/YD = $4,477.33

LARGE RIPRAP

72 FT² × .3 = 21.60 FT² × 730 FT = 15,769 FT³ ÷ 27 YD³ = 584 YD³

FILTER BLANKET - EQUIPMENT HRS

2,190 YD³ ÷ 76.71 YD³ = 28.55 HRS

RIPRAP

389 33 YD³ ÷ 51.8 YD³/HR = 7.51 HRS

584 YD³ ÷ 49.83 YD³/HR = 11.72 HRS

19.23 HRS

B. TOTAL STREAM CHANNEL COST

STREAM E

MATERIAL 25,282.33 → 25,280

EQUIPMENT HOURS

245 TOTAL HOURS 47.88

USE WEEKLY RATE

$6,500/WK × 1.20 WK + 43.95 × 47.88 = 9,884.83 = 9880

LABOR:

OPERATOR - $30.35/HR × 47.88 = 1,453.16
LABORER - $23.65/HR × 47.88 = 1,132.36
2,585.52 → 2,590

37,750

LOADOUT SITE MATERIAL BALANCE

CUT

SECTION A - A' MAP - 4.4.2-1D

75 x 40 FT² = 3,000 FT²

2,340 FT² x 280 FT = 655,200 FT³ ÷ 27 = 24,267 YD³

SECTION B - B' MAP 4.4.2 - 1D

42 x 40 FT² = 1,680 FT²

2200 FT² x 500 FT = 1,100,000 FT³ ÷ 27 = 40,741 YD³

SECTION C - C' MAP 4.4.2 - 1D

68 x 40 FT² = 2,720 FT²

1660 FT² x 500 FT = 830,000 FT² ÷ 27 = 30,741 YD³

SECTION D - D' MAP 4.4.2 - 1D

15 x 40 FT² = 600 FT²

96,149 YD³

FILL

SECTION C - C' MAP 4.4.2 - 1D

90 x 40 FT² = 3600 FT²

3,060 FT² x 500 = 1,530,000 ÷ 27 = 56,667

SECTION D - D' MAP 4.4.2 - 1D

63 x 40 FT² = 2,520 FT²

$2{,}300\ FT^2 \times 420\ FT = 966{,}000\ FT^3 \div 27 =$ 35,778 YD^3

SECTION E-E' MAP 4.4.2 - 1D

$52 \times 40\ FT^2 = 2{,}080\ FT^2$

SED. POND

$18 \times 40\ FT^2 = 720\ FT^2 \times 150\ FT = 108{,}000\ FT^3 \div 27 =$ 4,000 YD^3

96,445 YD^3

22-141 50 SHEETS
22-142 100 SHEETS
22-144 200 SHEETS
AMPAD

PRODUCTIVITY FOR SCRAPERS

1. BACKFILL AND GRADING

2. CHARACTERIZATION OF SCRAPER USED

CAT 631 $21 yd^3$ (STRUCK) + $31 yd^3$ (HEAPED) / 2 = $26 yd^3$ AVG. CAPACITY

A D8L DOZER WILL ASSIST THE SCRAPER IN LOADING

DESCRIPTION OF SCRAPER ROUTE % GRADE THIS WOULD BE TYPICAL FOR THE LOADOUT SITE

1700 FT @ -4 %
1700 FT @ +9 %

CYCLE TIME

LOAD TIME	-	.6
LOADED TRIP TIME	-	1.20
MANEUVER TIME	-	.7
RETURN TRIP TIME	-	1.10
		3.60 MIN.

CYCLES / HOUR = WORK FACTOR HOURS 50 MIN/HR ÷ 3.60 MIN = 13.89 CYCLES/HR

HOURLY PRODUCTION.

$26 yd^3 \times 13.89$ CYCLES/HR = $361.11 yd^3/HR$

PUSHER CYCLE TIME = 140% LOAD TIME 1.25 MIN = 1.09 MIN

NUMBER OF SCRAPERS / PUSHER = 3.60 / 1.09 = 3.30 (USE 3)

THEREFORE, THREE SCRAPERS ARE REQUIRED PER PUSHER

ASSUME, A SCRAPER FLEET OF 3 AND 1 PUSHER

TOTAL FLEET PRODUCTION RATE

$361.11 yd^3/HR$ / UNIT × 3 UNITS = $1,083.33 yd^3/HR$

$96,149 yd^3 \div 1,083.33 yd^3/HR$ = 88.75 HRS

FILLING AND GRADING COST

USE THE WEEKLY RATE FOR THE EQUIPMENT

631 @ (6,005/hr × 2.22 + 49.60 × 88.75) 3	=	53,199.30
D8 @ 4,350/hr × 2.22 + 28.50 × 88.75 × 2	=	24,372.75
OPERATOR 30.65/HR × 88.75 × 5	=	13,600.94
		91,172.99
FOREMAN - 33.65/HR × 88.75	=	2,986.44
PICK-UP - 170/hr × 2.22 + 2.00 × 8.875	=	554.90
		3,541.34
		94,714.33

DIVIDE 94,710 EQUALLY BETWEEN BACKFILLING AND GRADING

22-141 50 SHEETS
22-142 100 SHEETS
22-144 200 SHEETS
AMPAD

TOPSOIL BALANCE
LOADOUT SITE

	YD^3	
TOPSOIL STOCKPILE		35,589 YD³
WASTE DISPOSAL SITE	3,480	
LOADOUT SITE	32,109	

13,205

22-141 50 SHEETS
22-142 100 SHEETS
22-144 200 SHEETS
AMPAD

TOPSOIL PRODUCTION
LOADOUT SITE

1. CHARACTERIZATION OF SCRAPER USED

CAT 631 21×10^3 (STRUCK) + 31×10^3 (HEAPED) / 2 = 26×10^3 AVG. CAPACITY

A DBL DOWER WILL ASSIST THE SCRAPER IN LOADING

DESCRIPTION OF SCRAPER ROUTE & GRADE THIS WOULD BE TYPICAL FOR THE LOADOUT SITE

1700 FT @ -4%
1700 FT @ +4%

CYCLE TIME

LOAD TIME	- .6 MIN
LOADED TRIP TIME	- 1.2 MIN
MANEUVER TIME	- .7 MIN
RETURN TRIP TIME	1.1 MIN
	3.60 MIN

CYCLES / HOUR = WORK FACTOR HOURS = 50 MIN/HR ÷ 3.60 MIN = 13.89 CYCLES/HR

HOURLY PRODUCTION

$26 \times 10^3 \times 13.89$ CYCLES/HR = 361.11×10^3/HR

PUSHER CYCLE TIME = 140% LOAD TIME = .25 MIN = 1.09 MIN

NUMBER OF SCRAPERS / PUSHER = 3.60/1.09 = 3.30 (USE 3)

THEREFORE, THREE SCRAPERS ARE REQUIRED PER PUSHER

ASSUME, A SCRAPER FLEET OF 3 AND 1 PUSHER

TOTAL FLEET PRODUCTION RATE

361.11×10^3/HR × 3 = $1,083.33 \times 10^3$/HR

$32,109 \times 10^3 \div 1,083.33 \times 10^3$/HR = 29.64 HRS

TOPSOIL ADDITION

631 C	(6,005 × .74 + 49.60 × 29.64) × 3	=	17,741.41
DB	4,350 × .74 + 28.50 × 29.64	=	4,063.74
OPERATORS	$30.35/HR × 29.64 × 4	=	3,598.80
			25,403.95
FOREMAN	$33.65/HR × 29.64	=	997.39
PER-DIEM	170 × .74 + 200 × 29.64	=	185.08
			1182.47
			26,586.92
			USE
			26,590.00

RIPPING

146 GRADER

146 D	5,980 × .75 + 18.65 × 29.64	=	4977.99
OPERATOR	30.35/HR × 29.64	=	899.57
			5,877.56
TRACTOR	= (20.63 + 6.70) 29.64	=	810.06
OPERATOR	= 30.35 × 29.64	=	899.57
LABORERS	= 23.65 × 29.64 × 3	=	2102.96
MULCHER	= 2.50 × 29.64	=	74.10
HAY	= $200/AC × 8.7	=	1740.00
			5,626.69
			11,504.25
			USE
			11,500

22-141 50 SHEETS
22-142 100 SHEETS
22-144 200 SHEETS
AMPAD

SEDIMENTATION POND #1
AT LAYDOWN BACKFILL

1. BACKFILL

USE 245 EXCAVATOR

BUCKET SIZE - 4.24 YD^3

PRODUCTION RATE

LOAD BUCKET	-	.24 MIN
SWING LOADED	-	.12 MIN
DUMP BUCKET	-	.05 MIN
SPREAD MATERIAL	-	1.00 MIN
COMPACT	-	4.00 MIN
SWING EMPTY	-	.10 MIN
		5.51 MIN

50 MIN/HR ÷ 5.51 MIN/CYCLE = 9.07 CYCLES/HR.

9.07 CYCLES/HR × 4.25 YD^3 = 38.57 YD^3/HR

4000 YD^3 ÷ 38.57 YD^3/HR = 103.72 HR

2 COST

USE WEEKLY RATE ON THE 245

245 @	6500 × 2.59 WK × 43.85 × 103.72	= 21,384.40
OPERATOR	30.35 × 103.72	= 3,147.90
LABORER	23.65 × 103.72 × 2	= 4,905.96
FOREMAN	= 33.65 × 103.72	= 3,490.18
PICKUP	= 170 × 2.59 × 2.00 × 103.72	= 647.78
		33,576.22
		USE
		33,580

G. Taylor
Revised
N-17-99

Reclamation Loadout Site
Change out Arch Culvert
for CMP CD-17

Replace arch culvert at the west end of the loadout site with an arch culvert that will pass the 100 yr. - 24 hr. storm event.

Drainage Area - 3,480.76 Acres - Map 3.2.8-3

Hydraulic Length - 18,150. ft. from the culvert to south Eccles Canyon drainage

ΣCI = 46,218,000 Section 12, Vol 5

Slope = 30.40 % Section 12, Vol. 5

CN = 65 Section 12, Vol. 5

Hathway Coeff. = 0.7

		P (in)	Q cfs
Section 2	Soft 10-24	2.43	212.3
	50-24	3.10	524.2
	100-24	3.5	768.5

Determine the size of the arch culvert

Use Manning Formula

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

Try an arch that spans - 8'-7" and has a rise of 5'-11"

$A = 40$ ft.^{2}

$n = .024$

$S = .03$

Surface Mining Water Diversion Design Manual United States Dept. of Interior, Office Surface of Mining.

$$R = \frac{2dT^2}{\frac{1}{2}\sqrt{16d^2+T^2}} + \frac{T^2}{8d}\sinh^{-1}\frac{8d}{T}$$

$$= \frac{40}{\frac{1}{2}\sqrt{16(5.92)+(8.57)^2}} + \frac{(8.57)^2}{8(5.92)}\sinh^{-1}\frac{4(5.92)}{8.57}$$

$$= 2.87$$

$Q = 40 \times 1.486/.024 \times (2.87)^{2/3} \times (.03)^{1/2}$

$= 40 \times 61.92 \times .703 = .17$

$= 854.74$ cfs

USE A 8'-7" SPAN WITH A 5'-11" RISE

DETERMINE GAUGE SIZE

TYPE OF ROAD	-	OFF HIGHWAY
SIZE OF OPENING	-	MULTI-PLATE PIPE ARCH 8'-7" x 5'-11"
DEPTH OF COVER	-	10 FT
LIVE LOAD	-	H-15
TABLE	-	9-10 PAGE 113 HANDBOOK OF DRAINAGE AND CONSTRUCTION PRODUCTS 1958 EDITION
GAGE SELECTED	-	No. 10

USE A STANDARD - 8'-7" x 5'-11" No. 10 PIPE-ARCH

DETERMINE VELOCITY

$V = 1.486/n \times R^{2/3} \times S^{1/2}$

$= 1.486/.024 \times (2.87)^{2/3} \times (.03)^{1/2}$

$= 12.73$ FPS

RIPRAP WILL BE NEEDED

DETERMINE DEPTH OF FLOW

USE MANNING FORMULA

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

$A = 2/3\, dT$

$R = 2/3\, dT / 1/2 \sqrt{16d^2 + T^2} + \frac{T^2}{8d} \sinh^{-1} \frac{4d}{T}$

$n = .017$

$S = .03$

$$Q = \frac{2}{3} dT \times \frac{1.486}{n} \times \left(\frac{2/3\, dT}{1/2 \sqrt{16d^2 + T^2}} + \frac{T^2}{8d} \sinh^{-1} \frac{4d}{T} \right)^{2/3} \times S^{1/2}$$

$$820.58 = \frac{2}{3} dT \times \frac{1.486}{.017} \times \left(\frac{5.71d}{1/2 \sqrt{16d^2 + (18.57)^2}} + \frac{(18.57)^2}{8d} \sinh^{-1} \frac{4d}{18.57} \right)^{2/3} \times .017^{1/2}$$

$$820.58 = 5.71d \times 87.41 \times \left(\frac{5.71d}{1/2 \sqrt{16d^2 + 73.49}} + \frac{73.49}{8d} \sinh^{-1} \frac{4d}{8.57} \right)^{2/3} \times .17$$

$$55.22 = 5.71d \times \left(\underbrace{\frac{5.71d}{1/2 \sqrt{16d^2 + 73.49}}}_{11.81} + \underbrace{\frac{73.49}{8d}}_{2.77} \underbrace{\sinh^{-1} \frac{4d}{8.57}}_{1.69} \right)^{2/3}$$

Trial d

d (ft)	Q (cfs)
5	46.51
5.5	52.47
5.6	53.67

$d = 5.6$ ft.

Determine Velocity at Flow Depth

$$V = \frac{1.486}{n} \times R^{2/3} \times S^{1/2}$$

$$= \frac{1.486}{.017} \times \left(\frac{5.71d}{1/2 \sqrt{16d^2 + 73.49}} + \frac{73.49}{8d} \sinh^{-1} \frac{4d}{8.57} \right)^{2/3} \times (.03)^{1/2}$$

$$= 87.41 \times (2.17)^{2/3} \times (.03)^{1/2}$$

$$= 87.41 \times 1.68 \times .17$$

$$= 24.99$$

Riprap is still needed

Determine Riprap and Filter Blankets Size

a) Riprap Size

The bottom of the arch-pipe will be a triangular channel with 2:1 side slopes

$D_{50} = 2.08$

From Table 5.2 page 5.21 the Design $D_{50} = 2.25$ ft

$D_{max} = 1.25\ D_{50}$

$= 1.25(2.25) = 2.81$ ft.

RIPRAP GRADATION

	Size	%
$1.25\ D_{50}$	2.81	30
D_{50}	2.25	50
$.50_{50}$	1.13	10
$.2D_{50}$	.45	10

FILTER BLANKET DESIGN

ASSUME BASE MATERIAL

$D_{85} = .09$ in

$D_{50} = .024$ in

$D_{15} = .006$ in

RIPRAP PROPERTIES

$D_{85} = 28.66$ in

D_{50} 27 in

D_{15} 5.06 in

FILTER BLANKET WITH RESPECT TO BASE MATERIAL

$D_{50}(\text{FILTER})/D_{50}(\text{BASE}) < 40$

so, $D_{50}(\text{FILTER}) < 40 \times .024 = .96$ in

$D_{15}(\text{FILTER})/D_{15}(\text{BASE}) < 40$

so, $D_{15}(\text{FILTER}) < 40 \times .006 = .24$ in

$D_{15}(\text{FILTER})/D_{85}(\text{BASE}) < 5$

so $D_{15}(\text{FILTER}) < 5 \times .09 = .45$ in

$D_{15}(\text{FILTER})/D_{15}(\text{BASE}) > 5$

so $D_{15}(\text{FILTER}) > 5 \times .006 = .03$ in.

$.03 < D_{15}(\text{FILTER}) < .24$ in.

$D_{50}(\text{FILTER}) < .96$ in.

FILTER BLANKET WITH RESPECT TO THE RIPRAP MATERIAL

D_{50} (RIPRAP) / D_{50} (FILTER) < 40

SO D_{50}(FILTER) > 27/40 = .68 IN

D_{15} (RIPRAP) / D_{15} (FILTER) < 40

SO, D_{15} (FILTER) > 5.06/40 = .13 IN

D_{15} (RIPRAP) / D_{85} (FILTER) < 5

SO D_{85} (FILTER) > 5.06/5 = 1.01 IN

D_{15} (RIPRAP) / D_{15} (FILTER) < 5

SO D_{15} (FILTER) < 5.06/5 = 1.01 IN.

.13 IN < D_{15} (FILTER) < 1.01 IN

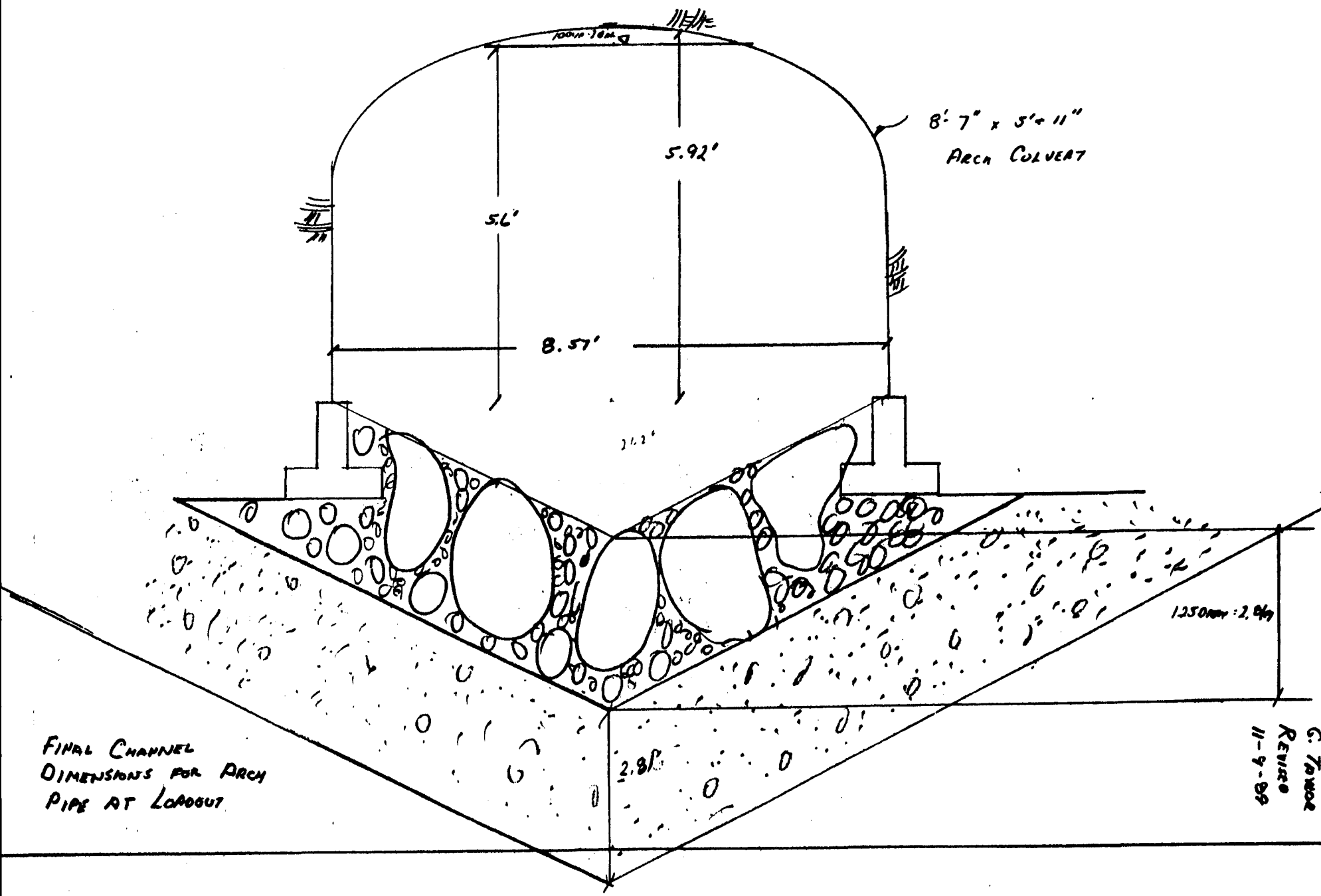
D_{50} (FILTER) > .68 IN

D_{85} (FILTER) > 1.01 IN

THICKNESS OF FILTER BLANKET EQUAL
MAX D_{50} = 2.81 FT.

HYDRAULIC ENGINEERING CIRCULAR
No. 11. U.S. DEPT OF TRANSPORTATION

AMPAD 22-141 50 SHEETS
22-142 100 SHEETS
22-144 200 SHEETS



FINAL CHANNEL DIMENSIONS FOR ARCH PIPE AT LOADOUT

G. TAYLOR
REVISED
11-4-86

RECLAMATION COST

COST OF MATERIALS

FILTER BLANKET

20.14 FT × 2 = 40.28 FT² × 160 FT = 6,449.27 CU.FT ÷ 27 = 238.68 YD³

238.68 YD³ × $9.50 = $2,267.43

RIPRAP

40.28 FT² OF THIS TOTAL ONLY 20% OF WILL HAVE TO BE PURCHASED.

40.28 FT² × .2 = 8.06 FT²

8.06 FT² × 160 FT = 1,288.96 FT³ ÷ 27 = 47.79 YD³

47.79 YD³ × $11.50/YD = $549.00

CONCRETE

2.50 FT² × 160 FT = 400 FT² ÷ 27 = 14.81 YD³

14.81 YD³ × $400/YD = 5,925.93

ARCH - PIPE

160 FT × $30/FT = $4,800

$13,542.36

USE

13,540

EXCAVATION

USE 245

CYCLE TIME

LOAD TIME	.07 MIN
SWING TIME	.12 MIN
DUMP BUCKET	.05 MIN
SWING TIME	.12 MIN
	.36 MIN.

CATERPILLAR PERFORMANCE HANDBOOK, EDITION 19

LOAD FACTOR

4.25 YD³ BUCKET SIZE × .95 = 4.04 YD³

50 min/hr ÷ .36 min/cycle = 138.86 cycle/hr

138.86 cycle/hr × 4.09 yd³ = 561.11 yd³/hr

Amount of Material to Move

10 ft (depth) × 20 ft (width) × 160 ft (long) = 32,000 ft³ ÷ 27 = 1,185.19 yd³

1,185.19 yd³ ÷ 561.11 yd³/hr = 2.11 hrs

Cost of Excavation

245 (162.50 + 43.85) 2.11 = $435.40
Operator $30.35/hr × 2.11 = 64.09
$499.49 use $500

Install Filter Blanket and Riprap

238.68 yd³ ÷ 76.71 yd³/hr = 3.11 hr

47.74 yd³ ÷ 51.81 yd³/hr = .92 hr

190.93 yd³ ÷ 49.83 yd/hr 3.83 hr
7.86 hr

245 (162.50 + 43.85) 7.86 = 1,621.91
Operator $30.35/hr × 7.86 = 238.65
Laborer $23.65/hr × 7.86 × 3 = 552.67
2,412.12 use 2420

Arch Pipe Install + Backfill

30 ft/day

160 ft ÷ 30 ft/day = 5.33 days

5.33 days × 8 hr/day = 42.67 hrs

245 6,500 × 4.57 wks + 43.85 × 62.67 = 12,953.00
Operator 30.35 × 62.67 = 1,902.03
Laborer 23.65 × 62.67 × 4 = 1,482.15
16,337.26 use 16,340

TOTAL COST

MATERIAL COST	13,540
EXCAVATION	500
FILTER BLANKET + RIPRAP	2,420
ARCH PIPE INSTALL + BACKFILL	16,340
	32,800

22-141 50 SHEETS
22-142 100 SHEETS
22-144 200 SHEETS
AMPAD

G. Taylor
7-5-89

Reclamation Sediment Pond Design

Sizing Pond

1. Sediment Volume

0.1 ac-ft/ac for each acre of disturbed area

Vol. = 0.1 Ac-Ft./Ac × 12.56 Acres (Map 3.2.1-3)

= 1.26 ac-ft × 43,560 = 54,711.36

<u>use 54,710 cu.ft</u>

2. Storm Detention

A. Disturbed Area CN Number after Reclamation -

Type	Percent	Hyd. Group	CN
Silas Loam	80	C	86
Brycan	20	B	79

1) Soil Survey of Carbon Area, Utah - United States Department of Agriculture - Soil Conservation Service

2) Table 2.20 page 82 Applied Hydrology and Sedimentology for Disturbed Areas - Barfield and Haan
CN: 86 Range Land Poor Condition CN: 79 Range Land Poor Condition

CN: $86(.80) + 79(.20) / .8 + .2$

= 68.80 + 15.80 //

= 84.60 use <u>85</u>

CN: 85 for 8.46 Acres Section 13, Vol. 5

G. TAYLOR
REVISED 11-9-89

B. UNDISTURBED AREA CN NUMBER

LS-1 MAP 3.2.8-3

CN = 58 SECTION 9, VOL. 5
ACRES = 7.86 SECTION 9, VOL. 5

DA-7 CN = 64 SECTION 13, VOL. 5
ACRES = 3.92 SECTION 13, VOL. 5

C. AVG. CN FOR RECLAMATION

CN = 85	8.46 ACRES	:	719.10
CN = 58	7.86 ACRES	:	455.88
CN = 64	3.92 ACRES	=	250.88
	20.24		

$CN = 719.10 \times 455.88 + 250.88 / 20.24$

$= 70.45$ USE 71

10 YR - 24 HR STORM

P = 2.43 IN. SECTION 2, VOL 5 PAG 5 of 7

$S = 1000/CN - 10$ EQ. 2.39 PAGE 81 APPLIED HYDROLOGY SEDIMENTOLOGY FOR DISTURBED AREAS - BARFIELD AND HAAN

$= 1000/71 - 10$

$= 4.08$

$Q = (P - 0.25)^2 / P + 0.85$ EQ. 2-38 PAGE 81 APPLIED HYDROLOGY SEDIMENTOLOGY FOR DISTURBED AREA - BARFIELD AND HAAN

$(2.43 - .2(4.08))^2 / 2.43 + .8(4.08)$

$= .46$ IN ÷ 12 IN/FT = .04 FT.

20.24 ACRES × 43,560 FT²/AC × .04 FT = 33,612.96 CU.FT

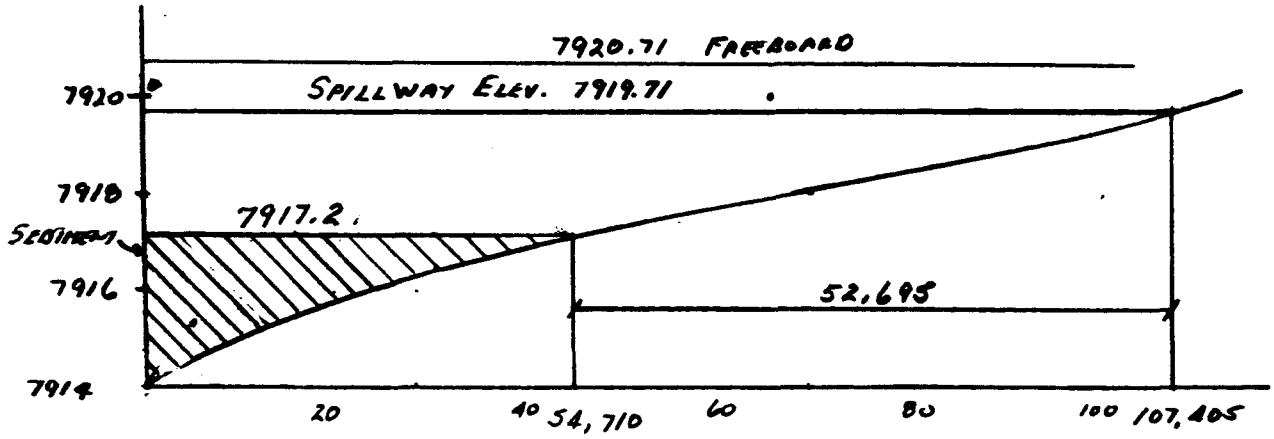
USE 33,610 CU.FT.

THEREFORE THE TOTAL STORAGE / DETENTION CAPACITY OF THE POND SHOULD NOT BE LESS THAN

$$V_T = 54,710 + 33,610 = 88,320 \text{ cu. ft.}$$

3. POND CAPACITY (MAP 4.4.2-1C)

ELEVATION	AREA (FT^2)	AVG. AREA (FT^2)	Δ VOL. (FT^3)	ACC. VOL. (FT^3)
7914	10,776			
		14,205	28,410	28,410
7916	17,634			
		20,178	40,356	68,766
7918	22,722			
		22,596	38,639	107,405
7919.71	22,470			



INTERCEPT DITCH DESIGN FOR PHASE I RECLAMATION AT TRAIN LOADOUT

UDD-3 MAP 3.2.1-3

DU-6 WILL INTERCEPT FROM THE RECLAIM SITE AND LS-1

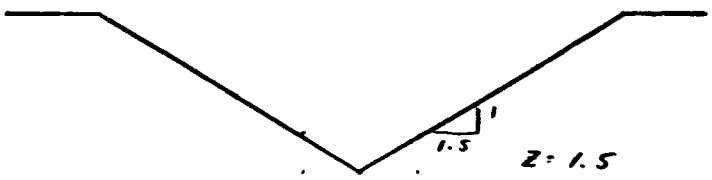
LS-1	Q_{10-24}	=	.23 CFS
LOADOUT	Q_{10-24}	=	18.41 CFS
			18.64 CFS

A. USE MANNING FORMULA TO DETERMINE DEPTH OF FLOW

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

$n = .040$ SMALL DRAINAGE DITCH

$S = .04$



$Z = 1.5$

$A = Zd^2$

$R = Zd/2\sqrt{Z^2+1}$

PAGE 158 APPLIED HYDROLOGY AND SEDIMENTOLOGY FOR DISTURBED AREAS BARFIELD AND HAAN

$Q = 1.486/n \times Zd^2 \times (Zd/2\sqrt{Z^2+1})^{2/3} \times S^{1/2}$

$= 1.486/.04 \times 1.5d^2 \times \left(1.5d/2\sqrt{1.5^2+1}\right)^{2/3} \times (.04)^{1/2}$

$18.64 = 37.15 \times 1.5d^2 \times (.42d)^{2/3} \times .20$

TRY $d = 1.51$ FT.

$18.64 = 37.15 \times 1.5(1.51)^2 \times (.42(1.51))^{2/3} \times .20$

$= 37.15 \times 3.42 \times .79 \times .20$

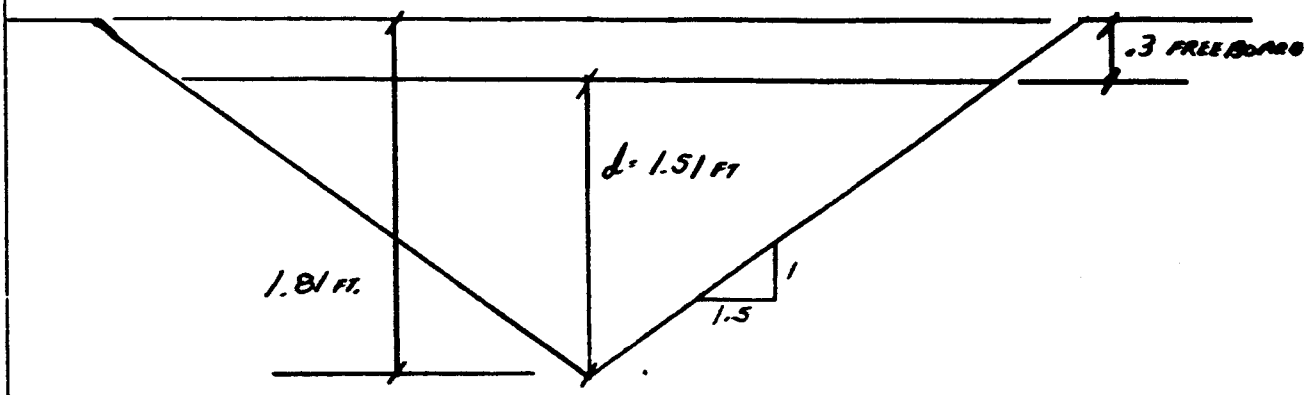
$= 18.73$ CFS

B. DITCH DESIGN

DEPTH OF DITCH = FLOW DEPTH + FREEBOARD

= 1.51 + .3

= 1.81 FT.



C. VELOCITY

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

$$= \frac{1.486}{n} \left(\frac{zd}{2\sqrt{z^2+1}} \right)^{2/3} S^{1/2}$$

$$= \frac{1.486}{.04} \left(\frac{1.5(1.51)}{2\sqrt{1.5^2+1}} \right)^{2/3} (.04)^{1/2}$$

$$= 37.15 \times .73 \times .20$$

$$= 5.42 \text{ FPS}$$

NO ERROSION CONTROL MATERIAL WILL BE NEEDED

WASTE ROCK DISPOSAL SITE

1. GRADING WILL DONE EACH TIME ADDITIONAL MATERIAL IS ADDED

2. TOPSOIL ADDITION

EQUIPMENT

3 - 10 ton DUMP TRUCK
1 - 988B WHEEL LOADER
1 - 14G MOTOR GRADER

ESTIMATED PRODUCTION TIME

CYCLE TIME

TRAVEL TIME	30. min
MANEUVER	.5 min
LOAD	.7 min
MANUVER	.5 min
DUMP	1.2 min
	32.9 min

CYCLE /HR

50 min/hr ÷ 32.9 min = 1.52 cycle/hr

PRODUCTION RATE

8.70 yd³ x .58 = 5.05 yd³

5.05 yd³ x 1.52 cycle /hr = 7.68 yd³/hr/unit

7.68 yd³/hr/unit x 3 units = 23.05 yd³/hr

4,000 yd³ ÷ 23.05 yd³/hr = 173.50 hr

Cost

USE WEEKLY RATES

10T DUMP TRUCK	-($945/wk × 4.34 wk + 12.95 × 173.54)3	= 6,347.23
988B	- $4,265 × 4.34 + 42.00 × 173.54	= 25,798.78
14G	- 2,030 × 4.34 + 18.65 × 173.54	= 12,096.72
OPERATOR	- 30.35 × 173.54 × 2	= 10,533.86
TRAILER	- 24.60 × 173.54 × 3	= 12,807.25
FOREMAN	- 33.65 × 173.54	= 5,839.62
PICK-UP	- 170 × 4.34 × 2 × 173.54	= 1,084.88
		74,450.36
		USE
		74,460

Ripping

14G	- (50.75 + 18.65) 2.3	= 138.90
TRACTOR	- (20.63 + 6.20) 2.3	= 62.85
OPERATOR	- 30.35 × 2.3 × 2	= 139.61
MULCHER	- 2.50 × 2.3	= 5.75
LABORER	- 23.65 × 2.3 × 3	= 163.19
FOREMAN	- 33.65 × 2.3	= 77.40
PICK-UP	- (4.25 + 2) 2.3	= 14.38
HAY	- $200/AC × 2.3	= 460.00
		1,061.58
		US
		1,060

South Fork Breakout

Fill Required

10 x 40 ft² = 400 ft² x 190 ft = 76,000 ft² ÷ 27 = 2,814.81 yd³

Material Remove from the site - 2,840 yd³

Material will balance

Fill and Grading Cost - MAP

Fill from Knob

710 yd³

10 ton Dump Truck

Travel Time	-	15 min
Maneuver	-	.5 min
Load Time	-	.7 min
Maneuver	-	.5 min
Dump	-	1.2 min
		17.90 min

Cycle/hour

50 min/hour ÷ 17.90 min = 2.79 cycle/hr

Production Rate

8.70 yd³ x .58 = 5.05 yd³

5.05 yd³ x 2.79 cy/hr = 14.11 yd³/hr/unit

14.11 yd³/hr/unit x 2 = 28.21 yd³/hr

710 ÷ 28.21 yd³/hr = 25.17 hrs.

245 EXCAVATOR

2,130 YD^3

CYCLE TIME

LOAD BUCKET	-	.12 MIN	CATERPILLAR PERFORMANCE HANDBOOK EDITION 19
SWING LOADED	-	.12 MIN	
DUMP BUCKET	-	.05 MIN	
SWING EMPTY	-	.10 MIN	
		.39 MIN	

50 MIN/HR ÷ .39 MIN = 128.21 CYCLE/HR

PRODUCTION RATE

4.25 YD^3 × .95 LOAD FACTOR = 4.04 YD^3

4.04 YD^3 × 128.21 CYCLE/HR = 517.65 YD^3/HR

2,130 ÷ 517.65 YD^3/HR = 4.11 YD^3

FILLING AND GRADING

10 T TRUCK	(23.63 + 12.95) 25.17 HRS	-	920.72
988B LOADER	(170.00 + 42.00) 25.17 HRS	-	5,336.04
D6D TRACTOR	(60.50 + 11.80) 29.28 HRS	-	2,116.94
245 EXCAVATOR	(162.50 + 18.65) 4.11 HRS	-	749.53
OPERATOR	30.65 × 25.17 ×	-	771.46
OPERATOR	30.65 × 29.28	-	897.43
OPERATOR	30.65 × 4.11	-	125.97
TEAMSTER	24.60 × 25.17 × 2	-	1,238.36
FOREMAN	33.65 × 29.28	-	985.27
PIKE-UP	(4.25 × 2) 29.28	-	183.00
			13,320.02
			USE
			13,320

TOPSOIL ADDITION

988 B WITH 8.25 YD^3

CYCLE TIME

LOAD TIME	-	1.50 MIN
HAUL FULL	-	2.47 MIN
MANUVER	-	.5 MIN
DUMP	-	.5 MIN
MANUVER	-	.5 MIN
HAUL EMPTY	-	2.26 MIN
		7.73 MIN

BUCKET FACTOR

8.25 YD^3 x .90 = 7.43 YD^3/CYCLE

PRODUCTION RATE

50 MIN/HR ÷ 7.73 MIN = 6.73 CYCLE/HR

6.73 CYCLE/HR x 7.43 YD^3/CYCLE = 50.03 YD^3/HR

2990 YD^3 ÷ 50.03 YD^3/HR = 59.76 HRS

988 B LOADER	-	4265 x 1.49 + 42.00 x 59.76	-	8,882.27
D6D TRACTOR	-	2420 x 1.49 + 11.80 x 59.76	-	4,310.97
OPERATOR	-	30.35 x 59.76 x 2	-	3,627.43
FOREMAN	-	33.65 x 59.76	-	2,010.92
PICK-UP	-	170 x 1.49 + 2 x 59.76	-	372.82
				19,204.41
				USE
				19,200

MULCHER	-	2 x 2.56	= 5.00	
LABORER	-	23.65 x 2 x 3	= 141.90	
FOREMAN	-	33.65 x 2	= 67.30	
PICK-UP	-	(4.25 x 2)6	= 12.50	
HAY	-	$200/AC x .96	= 192.00	
			418.70	420
				19,620

RESTORE ROAD

8 FT × 3 FT × 12,000 FT = 288,000 FT³ ÷ 27 = 1,066.67 YD³

CYCLE TIME

LOAD TIME	-	1.00 MIN
SWING TIME	-	.12 MIN
DUMP	-	.05 MIN
COMPACTION	-	1.00 MIN
SWING TIME	-	.05 MIN
		2.22 MIN
TRAVEL TIME		1.00 MIN
		3.22 MIN

PRODUCTION RATE

50 MIN ÷ 3.22 MIN = 15.39 CYCLES/HR

15.39 CYCLE/HR × 4.04 YD³/CYCLE = 61.96 YD³/HR

1,066.67 YD³ ÷ 61.96 YD³/HR = 17.21 HRS

COST

245	(162.50 + 18.65) 17.21	=	3,118.42
OPERATOR	30.65 × 17.21	=	527.63
			3,646.05
			use
			3,650

PORTAL SEAL

9 FT × 20 FT × 2.5 FT = 450 FT³ ÷ 27 = 16.67

16.67 YD³/PORTAL × 3 PORTAL = 50 YD³ × $400/YD = $20,000

SECTION 18

RECLAIMED CHANNEL DESIGNS

G. Taylor
Revised 11-26-

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Transition Stream B to D	61-65
Transition Stream C to D	66-70

See 19

22-141 50 SHEETS
22-142 100 SHEETS
22-144 200 SHEETS
AMPAD

G. Tamor
6-30-89

Reclam Channel Design
Stream A

Elev. 8693'-8669'

Map. 3.2.4-2
Stream Slope = .0284 Map 4.4.2-181

Design Flood Plain for the Q_{100-24} = SB + UD-4 - Surface Flow

148.32 cfs + 1.19 cfs - 38.51 = 111.0 Section 2
Vol. 5, Page 7

Design also for a vegetated channel design - with a grass mixture and bushes.

The channel will be a trapezoid

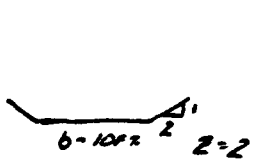
I. Determine permissible velocity

$V = 1.486/n \times R^{2/3} S^{1/2}$

R = Hydraulic Radius
S = Slope
n = .032 Earth Bottom, Rough & Irr
S = .0369 Map 4.4.2-181

a) Determine depth of flow

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



$A = bd + zd^2$
$R = bd + zd^2/b + 2d\sqrt{z^2+1}$
$Q = 111$ cfs

$Q = bd + zd^2 \times 1.486/n \times (bd + zd^2/b + 2d\sqrt{z^2+1})^{2/3} \times S^{1/2}$

$Q = 10d + 2d^2 \times 1.486/.032 \times (10d + 2d^2/10 + 2d\sqrt{(2)^2+1})^{2/3} \times (.0369)^{1/2}$

$Q = 10d + 2d^2 \times 46.44 \times (10d + 2d^2/10 + 4.47d)^{2/3} \times .19$

$111.0 \text{ cfs} = 8.92 \times (10d + 2d^2) \times (10d + 2d^2/10 + 4.47d)^{2/3}$

$12.44 = (10d + 2d^2)(10d + 2d^2/10 + 4.47d)^{2/3}$

Trail d

d	Q
1.1	12.50

d = 1.1

b) DETERMINE VELOCITY

$V = 1.486/n \times R^{2/3} \times S^{1/2}$

$R = (bd + zd^2 / b + 2d\sqrt{z^2+1})$ $\quad d = 1.1$

$= 10d + 2d^2 / 10 + 2d\sqrt{z^2+1})$ $\quad b = 10$ FT

$= (10(1.1) + 2(1.1)^2 / 10 + 2(1.1)\sqrt{2^2+1})$ $\quad z = 2$

$= 13.42 / 14.92$ $\quad S = .0369$

$= .90$

$V = 1.486/.034 \times (.90)^{2/3} \times (.0369)^{1/2}$

$= 46.44 \times .93 \times .19$

$= 8.31$ FPS

THE STREAM WILL NEED TO BE RIPRAPED.

c. DETERMINE RIPRAP SIZE AND FILTER BLANKET

1) RIPRAP SIZE - MILD SLOPE

a. ASSUME $K_m = 6$ IN. $\quad K_m = D_{50}$

$n = 0.0395\ D_{50}^{1/6}$ $\quad$ EQ 4.18 PAGE 4.10

$= 0.0395\ (6/12)^{1/6}$ $\quad$ SURFACE MINING WATER

$= .035$ $\quad$ DIVERSION DESIGN MANUAL

b. CHARTS IN APPENDIX C PAGE C-5 SURFACE MINING WATER DIVERSION DESIGN MANUAL

$Q_n = Q(n)$

$= .111\ (.035)$

$= 3.89$ 3 ON A 4% SLOPE

$V_n = .27$

$V = V_n / n$

$V = .27 / .035 =$

$V = 7.71$ FPS

$d = 1.1$ FT.

THEREFORE

$$R = \frac{10(1.4) + 2(1.4)^2}{10 + 2(1.4\sqrt{(2)^2+1})}$$

$$= .90$$

c $V^2/R^{.33} = (7.71)^2/(.90)^{.3} = 61.55$

FROM TABLE 6.4 PAGE 6.39 REQUIRED RIPRAP IS TYPE L (SURFACE MINING WATER DIVERSION DESIGN MANUAL

FROM TABLE 6.5 PAGE 6.40 TYPE L, $K_m = 9$ IN NOT $K_m = 6$ IN SURFACE MINING WATER DIVERSION DESIGN MANUAL

d. ASSUME $K_m = 9$ IN $K_m = D_{50}$

$n = 0.0395\ D_{50}^{1/6}$ EQ 4.18 PAGE 4.10 SURFACE MINING WATER DIVERSION DESIGN MANUAL

$= 0.0395\ (9/12)^{1/6}$

$= .038$

e. CHARTS IN APPENDIX C PAGE C-5 SURFACE MINING WATER DIVERSION DESIGN MANUAL

$Q_n = Q_n$

$= 149.51\ (.038)$

$= 5.629$ ON A 27. SLOPE

$V_n = .27$

$V = V_n/n$

$= .27/.038$

$= 7.10$ FPS @ $d = 1.1$ FT

f. $V^2/R^{.33} = (7.10)^2/(6.90)^{.3} = 52.19$

FROM TABLE 6.4 PAGE 6.39 REQUIRED RIPRAP IS TYPE L (SURFACE MINING WATER DIVERSION DESIGN MANUAL)

FROM TABLE 6.5 PAGE 6.40 TYPE L, K_b = 9 IN (SURFACE MINING WATER DIVERSION DESIGN MANUAL)

g. CHECK FROUDE NUMBER

$F_R = V/\sqrt{gL}$ $L = 1.18$ EQ 4.6 PAGE 4.15 SURFACE MINING WATER DIVERSION DESIGN MANUAL

$= 7.10/\sqrt{32.2\,(1.18)}$

$= 1.15 < 1$

g) RIPRAP SIZE - STEEP SLOPE
DESIGN - 111 CFS SLOPE - .0284 BOTTOM 10 FT

USE FIG 5.5 PAGE 5.18 SINCE THERE IS NO S=.0369 CURVE USE THE S=.05 CURVE. THIS WILL PROVIDE A CONSERVATIVE DESIGN.

10 FT @ 111 CFS = D_{50} = .75 FT
FROM TABLE 5.2 PAGE 5.21 SURFACE MINING WATER DIVERSION DESIGN MANUAL
D_{50} = .75 FT.

$D_{MAX} = 1.25\,(D_{50}) = 1.25(.75) = .94$ FT

RIPRAP GRADATION

$1.25\,D_{50}$ =	.94 FT	30%
D_{50} =	.75 FT	50%
$.5\,D_{50}$ =	.38 FT	10%
$.2\,D_{50}$ =	.15 FT	10%

2. FILTER BLANKET DESIGN
ASSUME BASE MATERIAL
D_{85} = .09 IN
D_{50} = .029 IN
D_{15} = .006 IN

RIPRAP PROPERTIES

D_{85} = 9.5 IN. D_{15} = 1.7 IN.

D_{50} = 9 IN.

a) EVALUATE THE NEED FOR FILTER BLANKET

D_{15} (RIPRAP)/D_{85} (BASE) < 5

2.7/.09 = 30 < 5

D_{15} (RIPRAP)/D_{15} (BASE) < 40

2.7/.006 = 450 < 40

FILTER CRITERIA ARE EXCEEDED, A FILTER LAYER IS REQUIRED.

b) FILTER BLANKET WITH RESPECT TO BASE MATERIAL

D_{50} (FILTER)/D_{50} (BASE) < 40

SO D_{50} (FILTER) < 40 x .024 = .96 IN

D_{15} (FILTER)/D_{15} (BASE) < 40

SO D_{15} (FILTER) < 40 x .006 = .24 IN

D_{15} (FILTER)/D_{85} (BASE) < 5

EQ 5.2 PAGE 5.12 SURFACE MINING WATER DIVERSION DESIGN MANUAL

SO D_{15} (FILTER) < 5 x .09 = .45 IN.

D_{15} (FILTER)/D_{15} (BASE) > 5

SO D_{15} (FILTER) > 5 x .006 = .03 IN

.03 IN. < D_{15} (FILTER) < .45 IN.

D_{50} (FILTER) < .96 IN.

c) FILTER BLANKET WITH RESPECT TO RIPRAP

D_{50} (RIPRAP)/D_{50} (FILTER) < 40

SO D_{50} (FILTER) > 9/40 = .225 IN.

D_{15} (RIPRAP) / D_{15} (FILTER) < 40

so D_{15} (FILTER) > 1.7/40 = .04 IN

D_{15} (RIPRAP) / D_{85} (FILTER) < 5

so D_{85} > 1.7/5 = .34 IN

Eq 5.2 PAGE 5.12 SURFACE MINING WATER DIVERSION DESIGN MANUAL

D_{15} (RIPRAP) / D_{15} (FILTER) > 5

so D_{15} < 2.7/5 = .34 IN.

.04 IN < D_{15} (FILTER) < .34 IN

D_{50} (FILTER) > .23 IN

D_{85} (FILTER) > .34 IN.

22-141 50 SHEETS
22-142 100 SHEETS
22-144 200 SHEETS
AMPAD

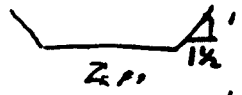
IV Summer Flow Ditch Design

Design Flow Q_{10-24} = SM + UD-4 + SMR

38.17 + .34 + = 38.51 cfs

Section 2, Vol. 5 page 7

A. Determine Flow Depth



$Z = 1\frac{1}{2}$

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

$A = bd + zd^2$

$R = bd + zd^2 / b + 2d\sqrt{z^2+1}$

$n = .032$

$S = .0369$

$$Q = bd + zd^2 \times 1.486/n \times (bd + zd^2/b + 2d\sqrt{z^2+1})^{2/3} \times S^{1/2}$$

$$Q = 2d + 1.5d^2 \times 1.486/.032 \times (2(d) + 1.5d^2/2 + 2d\sqrt{1.5^2+1})^{2/3} \times (.0369)^{1/2}$$

$$38.51 = 2d + 1.5d^2 \times 46.44 \times (2d + 1.5d^2/2 + .361d)^{2/3} \times (.19)$$

$$38.51 = 8.92\,(2d + 1.5d^2) \times (2d + 1.5d^2/2 + 361d)^{2/3}$$

$$4.32 = (2d + 1.5d^2)(2d + 1.5d^2/2 + 361d)^{2/3}$$

Trial d

d	Q
1.31	4.37

B Determine Velocity

$$V = 1.486/n \; R^{2/3} \; S^{1/2}$$

$$V = 1.486/.032 \; (.77)^{2/3} \; (.0369)^{1/2}$$

$$= 46.44 \times .84 \times .19$$

$$= 7.30 \text{ FPS}$$

C. DETERMINE RIPRAP SIZE

1. RIPRAP SIZE - MILD SLOPE

a) ASSUME $K_m = 3$ IN $\quad K_m = D_{50}$

$n = 0.0395\, D_{50}^{1/6}$ EQ 4.18 PAGE 4.10 SURFACE MINING WATER DIVERSION DESIGN MANUAL

$= 0.0395\,(3/12)^{1/6}$

$= .031$

b) CHARTS IN APPENDIX C C-5

$Q_n = Q\,n$

$= 38.51\,(.031)$ SURFACE MINING WATER DIVERSION DESIGN MANUAL

$= 1.207$

$V_n = .13$

$V = V_n/n$

$= .13/.031$

$= 4.194 \quad @ \quad d = 1.3/FT$

c) $V^2/R^{1/3} = (4.194)^2/(.77)^{1/3} = 19.17$

TABLE 6.4 PAGE 6.39 DOES NOT GO BELOW 20 FPS SURFACE MINING WATER DIVERSION DESIGN MANUAL

ASSUME 6 IN WILL WORK

d) CHECK FROUDE NUMBER

$F_R = V/\sqrt{gL}$ L - 1.4 EQ 4.6 PAGE 4.19 SURFACE MINING WATER DIVERSION DESIGN MANUAL -

$= 6.009/1.71$

$= 1.01 : 1$ THIS IS MARGINAL BUT SHOULD WORK.

$D_{50} = 6$ IN

RIPRAP GRADATION

$1.25\,D_{50}$	7.5	30
D_{50}	6 IN	50
$.5\,D_{50}$	3 IN	10
$.2\,D_{50}$	1.2 IN	10

D FILTER BLANKET DESIGN

ASSUME BASE MATERIAL

D_{85} = .09 IN

D_{50} = .024 IN

D_{15} = .006 IN

RIPRAP PROPERTIES

D_{85} = 6.38 IN

D_{50} = 6 IN

D_{15} = 1.13 IN

1. EVALUATE THE NEED FOR A BLANKET

$D_{15}(\text{RIPRAP})/D_{85}(\text{BASE}) < 5$

$1.8/.09 = 20 < 5$

$D_{15}(\text{RIPRAP})/D_{15}(\text{BASE}) < 40$

$1.8/.006 = 300 < 40$

FILTER CRITERIA ARE EXCEEDED, A FILTER LAYER IS REQUIRED.

2. FILTER BLANKET WITH RESPECT TO BASE MATERIAL
EQ 5.1 PAGE 5.12 SURFACE MINING WATER DIVERSION DESIGN MANUAL

$D_{50}(\text{FILTER})/D_{50}(\text{BASE}) < 40$

SO $D_{50}(\text{FILTER}) < 40 \times .024 = .96$ IN

$D_{15}(\text{FILTER})/D_{15}(\text{BASE}) < 40$

SO $D_{15}(\text{FILTER}) < 40 \times .006 = .24$

$D_{15}(\text{FILTER})/D_{85}(\text{BASE}) < 5$

SO $D_{15} < 5 \times .09 = .45$ IN

D_{15} (FILTER) / D_{15} (BASE) > 5

so D_{15} (FILTER) > 5 × .006 = .03 IN

.03 IN < D_{15} (FILTER) < .45 IN

D_{50} (FILTER) < .96 IN

3. FILTER BLANKET WITH RESPECT TO RIPRAP
Eq 5.2 PAGE 5.12 SURFACE MINING WATER DIVERSION DESIGN MANUAL

D_{50} (RIPRAP) / D_{50} (FILTER) < 40

so D_{50} (FILTER) > 6/40 = .15 IN

D_{15} (RIPRAP) / D_{15} (FILTER) < 40

so D_{15} (FILTER) > 1.13 IN/40 = .03 IN.

D_{15} (RIPRAP) / D_{85} (FILTER) < 5

D_{85} (FILTER) > 1.13/5 = .23 IN

D_{15} (RIPRAP) / D_{15} (FILTER) > 5

D_{15} (FILTER) < 1.8/5 = .23 IN

.03 IN < D_{15} (FILTER) < .23 IN

D_{50} (FILTER) > .15 IN

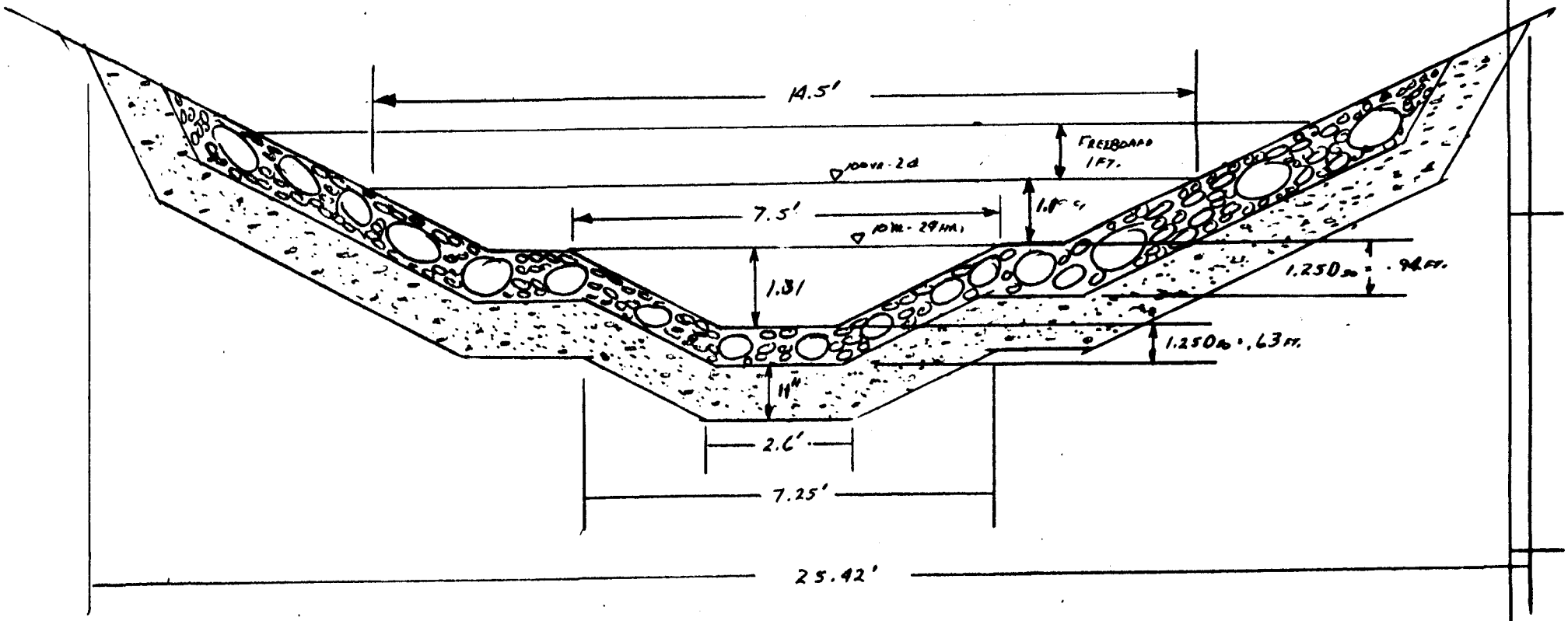
D_{85} (FILTER) > .23 IN

4. THICKNESS OF FILTER BLANKET [2]
THICKNESS = MAX D_{50} = .94 FT.

REFERENCE: 1. SURFACE MINING WATER DIVERSION DESIGN MANUAL, UNITED STATES DEPT. OF THE INTERIOR OFFICE OF SURFACE MINING

2. HYDRAULIC ENGINEERING CIRCULAR No. 11 - U.S. DEPARTMENT OF TRANSPORTATION.

AMPAD 22-141 50 SHEETS
22-142 100 SHEETS
22-144 200 SHEETS



FINAL CHANNEL DIMENSION FOR
STREAM A

RECLAIM CHANNEL DESIGN
STREAM B

MAP 3.2.4-2

INITIAL SLOPE = .0747

DESIGN FLOOD PLAIN FOR THE Q_{100-24} = MB + UDA-2 + UDA-3 - SUMMER FLOW

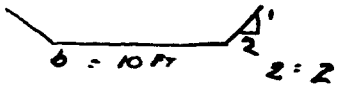
$Q = 125.75 + 3.30 + .85 - 34.64 = 95.26$ cfs
SECTION 2, VOL. 5 PAGE 7

DESIGN CHANNEL TO BE A TRAPEZOID

I DETERMINE DEPTH OF FLOW

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

n = .032 EARTH BOTTOM WITH RUBBLE SIDES
S = .0452 - DESIGN SLOPE MAP 4.4.2-1B1



$A = bd + Zd^2$
$R = bd + Zd^2 / b + 2d\sqrt{Z^2+1}$
$Q = 95.26$ cfs

$Q = bd + 2d^2 \times 1.486/n \times (bd + 2d^2/b + 2d\sqrt{Z^2+1})^{2/3} \times S^{1/2}$
$= 10d + 2d^2 \times 1.486/.032 \times (10d + 2d^2/10 + 2d\sqrt{2^2+1})^{2/3} \times (.0452)^{1/2}$
$= 10d + 2d^2 \times 46.44 \times 10d + 2d^2/10 + d(4.47))^{2/3} \times (.21)$

$95.26 = 9.87 = (10d + 2d^2)(10d + 2d^2/10 \; d(4.47))^{2/3}$

$9.65 = (10d + 2d^2)(10d + 2d^2/10 + d(4.47))^{2/3}$

TRAIL d

d (FT)	Q cfs
.9	8.82
.95	9.68

USE d = .95 FT.

II DETERMINE VELOCITY

$b = 10$ FT
$d = .95$ FT
$n = .032$
$S = .0452$

$$V = 1.486/n \times R^{2/3} \times S^{1/2}$$

$$R = bd + 2d^2/b + 2d\sqrt{z^2+1}$$

$$= 10(.95) + 2(.95)^2/10 + 2(.95)\sqrt{(2)^2+1}$$

$$= 11.31/14.25$$

$$= .79$$

$$V = 1.486/.032 \times (.79)^{2/3} \times (.0452)^{1/2}$$

$$= 46.44 \times .86 \times .21$$

$$= 8.49 \text{ FPS}$$

THE STREAM WILL NEED TO BE RIPRAPPED

III DETERMINE RIPRAP SIZE AND FILTER BLANKET

a) RIPRAP SIZE - MILD SLOPE

1. ASSUME $K_m = 9$ IN $D_{50} = K_m$

$$n = 0.0395\, D_{50}^{1/6}$$
$$= 0.0395\,(9/12)^{1/6}$$
$$= .038$$

EQ 4.18 PAGE 4.10 SURFACE MINING WATER DIVERSION DESIGN MANUAL

2. CHARTS IN APPENDIX C PAGE C-5 SURFACE MINING WATER DIVERSION DESIGN MANUAL.

$$Q_n = Q(n)$$
$$= 95.26\,(.038)$$
$$= 3.62 \text{ CFS ON A } 4\frac{1}{2}\% \text{ SLOPE}$$

$$V_n = .31$$

$$V = V_n/n$$

$$V = .31/.038$$

$$V = 8.16 \text{ FPS}$$

$$d = .95 \text{ FT}$$

3. $V^2/R^{.33} = (8.18)^2/(.74)^{.33} = 34.97$

FROM TABLE 6.4 PAGE 6.39 REQUIRED RIPRAP IS TYPE M SURFACE MINING WATER DIVERSION DESIGN MANUAL.

FROM TABLE 6.5 PAGE 6.40 TYPE M, $K_m = 12$ IN SURFACE MINING WATER DIVERSION DESIGN MANUAL.

4. CHECK FROUDE NUMBER

$F_R = V/\sqrt{gL}$ $L = .95$ EQ 4.6 PAGE 4.19 SURFACE MINING WATER DIVERSION DESIGN MANUAL

$= 8.18/\sqrt{32.2(.95)}$

$= 1.48$ 71

5. RIPRAP SIZE - STEEP SLOPE

DESIGN - 95.26 CFS SLOPE = .0452 BOTTOM 10 FT

USE FIG. 5.5 PAGE 5.18 SINCE THERE IS NO CURVE FOR S = .0452 USE S = .05 CURVE. THIS WILL PROVIDE A CONSERVATIVE DESIGN SURFACE MINING WATER DIVERSION DESIGN MANUAL

10 FT @ 95.26 CFS $D_{50} = .70$

FROM TABLE 5.2 PAGE 5.21 THE DESIGN

$D_{50} = .75$

$D_{MAX} = 1.25\ D_{50} = 1.25(.75) = .94$ FT

RIPRAP GRADATION

$1.25 D_{50}$	- .94 FT	30 %
D_{50}	- .75 FT	50 %
$.5 D_{50}$	= .38 FT	10 %
$.2 D_{50}$	- .15 FT	10 %

6 DESIGN FILTER BLANKET

ASSUME BASE MATERIAL

$D_{85} = .09$ IN

$D_{50} = .024$ IN

$D_{15} = .006$ IN

RIPRAP PROPERTIES

$D_{85} = 9.6$ IN

$D_{50} = 9$ IN

$D_{15} = 1.7$ IN

a) EVALUATE THE NEED FOR FILTER BLANKET

D_{15} (FILTER)/D_{85} BASE <

2.7/.09 = 30 < 5

D_{15} (RIPRAP)/D_{15} (BASE) < 40

1.7/.006 = 283 < 40

FILTER CRITERIA ARE EXCEEDED, A FILTER LAYER IS REQUIRED.

b) FILTER BLANKET WITH RESPECT TO BASE MATERIAL
EQ 5.2 PAGE 5.12 SURFACE MINING WATER DIVERSION DESIGN MANUAL

D_{50} (FILTER)/D_{50} (BASE < 40

SO, D_{50} (FILTER) < 40 x .024 = .96 IN

D_{15} (FILTER)/D_{15} (BASE) < 40

SO, D_{15} (BASE) < 40 x .006 = .24 IN

D_{15} (FILTER)/D_{85} (BASE) < 5

SO, D_{85} (FILTER) < 5 x .09 = .45 IN

D_{15} (FILTER)/D_{15} (BASE) > 5

D_{15} (FILTER) > 5 x .006 = .03 IN

.03 IN < D_{15} (FILTER) < .45 IN

D_{50} < .96 IN.

c) FILTER BLANKET WITH RESPECT TO RIPRAP
EQ 5.2 - PAGE 5.12 - SURFACE MINING WATER DIVERSION DESIGN MANUAL

D_{50} (RIPRAP)/D_{50} (FILTER) < 40

SO, D_{50} (FILTER) > 9/40 = .23 IN

D_{15} (RIPRAP)/D_{15} (FILTER) < 40

SO D_{15} (FILTER) > 1.7/40 = .04 IN

D_{15} (RIPRAP) / D_{85} (FILTER) < 5

so D_{85} (FILTER) < 1.7/5 = .34 in

D_{15} (RIPRAP) / D_{15} (FILTER) > 5

so D_{15} (FILTER) < 27/5 = .39 in

.04 < D_{15} (FILTER) < .39 in

D_{50} (FILTER) > .23 in

D_{85} (FILTER) > .39 in

22-141 50 SHEETS
22-142 100 SHEETS
22-144 200 SHEETS
AMPAD

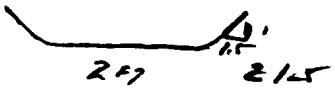
II Summer Flow Ditch Design

Design Flow $Q_{10\text{-}20}$ = MB + VOA-2 + VOA-3 + SMB

$Q = 33.09 + 1.31 + .24$ = 34.64 cfs

Section 2, Vol. 5, page 7

A. Determine depth of flow



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

$S = .025$

$n = .0452$

$A = bd + Zd^2$

$R = bd + Zd^2/b + 2d\sqrt{Z^2+1}$

$Q = bd + Zd^2 \times 1.486/n \times (bd + Zd^2/b + 2d\sqrt{Z^2+1})^{2/3} \times S^{1/2}$

$Q = 2d + 1.5d^2 \times 1.486/.032 \times (2d + 2d^2/2 + 2d\sqrt{2^2+1})^{2/3} \times (.0452)^{1/2}$

$34.64 = 2d + 1.5d^2 \times 46.44 \times (2d + 1.5d^2/2 + 2d\sqrt{(1.5)^2+1})^{2/3} \times .16$

$34.64 = 9.87\,(2d + 1.5d^2)(2d + 1.5d^2/2 + 3.61d)^{2/3}$

$3.51 = (2d + 1.5d^2)(2d + 1.5d^2/2 + 3.61d)^{2/3}$

Trial d

d	Q
1.2	3.66
1.18	3.54

use 1.18 ft.

B. Determine velocity

$V = 1.486/n \times R^{2/3} \times S^{1/2}$

$V = 1.486/.032 \times (.71)^{2/3} \times (.0452)^{1/2}$

$= 46.44 \times .80 \times .21$

$= 7.76$ fps

C DETERMINE RIPRAP SIZE

1. RIPRAP SIZE - MILD SLOPE

a) ASSUME K_n = 6 in $K_n = D_{50}$

$n = .0395\ D_{50}^{1/6}$ EQ 4.18 PAGE 4.10 SURFACE MINING WATER DIVERSION DESIGN MANUAL

$= .0395\ (6/12)^{1/6}$

$= .035$

b) CHARTS IN APPENDIX C C-5 SURFACE MINING WATER DIVERSION DESIGN MANUAL

$Q_n = Q\ n$

$= 34.64\ (.035)$

$= 1.22$ CFS

$V_n = .25$

$V = V_n/n$

$V = .25/.035 = 7.14$ @ d = 1.19 ft

c) $V^2/R^{.33} = (7.14)^2/(.71)^{.33} = 57.13$

TABLE 6.4 PAGE 6.39 DOES NOT GO TO THE 1½:1 SLOPE SURFACE MINING WATER DIVERSION DESIGN MANUAL.

ASSUME 6 IN. WILL WORK

d) CHECK FROUDE NUMBER

$F_R = V/\sqrt{gL}$ L 7.18 EQ 4.6 PAGE 4.14 SURFACE MINING WATER DIVERSION DESIGN MANUAL

$= 7.14/6.16$

$= 1.16 < 1$ THIS IS MARGINAL BUT SHOULD WORK

$D_{50} = 6$ IN.

$D_{MAX} = 1.25\ D_{50} = 1.25\ (6) = 7.5$ IN.

RIPRAP GRADATION

$1.25\ D_{50}$	7.5 IN
D_{50}	6 IN
$.5\ D_{50}$	3 IN
$.2\ D_{50}$	1.2 IN

D. FILTER BLANKET DESIGN

ASSUME BASE MATERIAL

D_{85} = .09 in

D_{50} = .029 in

D_{15} = .006 in

RIPRAP PROPERTIES

D_{85} = 6.38 in.

D_{50} = 6 in.

D_{15} = 1.13 in.

1. EVALUATE THE NEED FOR A BLANKET

D_{15}(RIPRAP)/D_{85} (BASE) < 5

1.13/.09 = 20 < 5

D_{15} (RIPRAP)/D_{15} (BASE) < 40

1.13/.006 = 300 < 40

FILTER CRITERIA ARE EXCEEDED, A FILTER LAYER IS REQUIRED.

2. FILTER BLANKET WITH RESPECT TO BASE MATERIAL
EQ 5.2 PAGE 512 SURFACE MINING WATER DIVERSION DESIGN MANUAL

D_{50} (FILTER)/D_{50} BASE < 40

SO D_{50} (FILTER) < 40 x .029 = .96 in

D_{15} (FILTER)/D_{15} (BASE) < 40

SO D_{15} (FILTER) < 40 x .006 = .24 in

D_{15} (FILTER)/D_{85} (BASE) < 5

SO D_{85}(FILTER) < 5 x .09 = .45 in

D_{15} (Filter) / D_{15} (Base) > 5

so, D_{15} (Filter) > 5 x .006 = .03 in

.03 in < D_{15} (Filter) < .45 in

D_{50} (Filter) < .96 in.

3. Filter Blanket with respect to Riprap
Eq 5.2 page 5.12 Surface Mining Water Diversion Design Manual
D_{50} (Riprap) / D_{50} (Filter) < 40

so D_{50} (Filter) > 6/40 = .15 in

D_{15} (Riprap) / D_{15} (Filter) < 40

so, D_{15} (Filter) > 1.13/40 = .03 in

D_{15} (Riprap) / D_{85} (Filter) < 5

so D_{15} (Filter) > 1.13/5 = .22 in.

D_{15} (Riprap) / D_{15} (Filter) < 5

so D_{15} (Filter) < 1.13/5 = .22 in.

.03 in < D_{15} (Filter) < .22 in

D_{50} (Filter) > .15 in

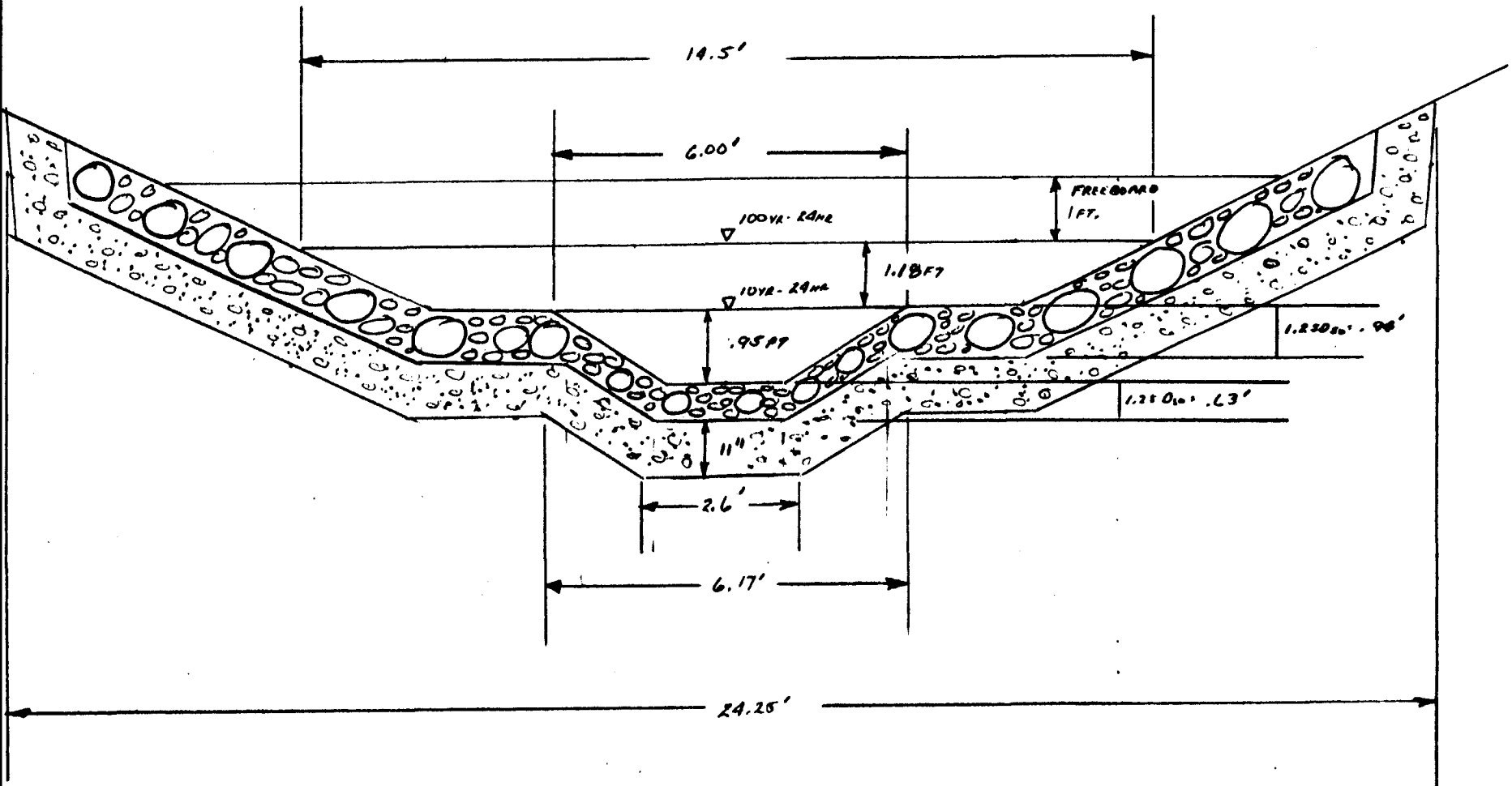
D_{85} (Filter) > .22 in.

4. Thickness of Filter Blanket.[2]
Thickness = Max D_{50} = .94

Reference: 1. Surface Mining Water Diversion Design Manual; United States Dept. of the Interior, Office of Surface Mining.

2. Hydraulic Engineering Circular No. 11 - U.S. Department of Transportation.

AMPAD 22-141 50 SHEETS
22-142 100 SHEETS
22-144 200 SHEETS



FINAL CHANNEL DIMENSIONS FOR STREAM B

RECLAIM CHANNEL DESIGN
STREAM C

REVISED 10-2-89
G. TAYLOR
PAGE 1/10 TO 8/10

MAP 32.4-2
INITIAL SLOPE = .0643

DESIGN FLOOD PLAIN FOR THE Q_{100-24} = NB + UOA-1 - SUPPRESS FLOW

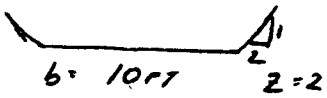
$Q = 127.80 + 12.96 - 52.86 = 87.40$ CFS
SECTION 2, VOL. 5 PAGE 7

DESIGN CHANNEL TO BE A TRAPEZOID

I. DETERMINE DEPTH OF FLOW

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

$n = .032$ EARTH BOTTOM WITH RUBBLE SLOPE
$S = .01$ DESIGN SLOPE MAP 4.4.2-1B1



$A = bd + Zd^2$
$R = bd + Zd^2 / b + 2d\sqrt{Z^2+1}$
$Q = 87.40$

$Q = bd + Zd^2 \times 1.486/n \times (bd + 2d^2/b + 2d\sqrt{Z^2+1})^{2/3} \times S^{1/2}$
$Q_1 = 10d + 2d^2 \times 1.486/.032 \times (10d + 2d^2/10 + 2d\sqrt{2^2+1})^{2/3} \times (.0643)^{1/2}$
$Q = 10d + 2d^2 \times 46.44 \times (10d + 2d^2/10 + 4.47d)^{2/3} \times .25$
$87.4 = 11.70\,(10d + 2d^2)(10d + 2d^2/10 + 4.47d)^{2/3}$

$7.43 = (10d + 2d^2)(10d + 2d^2/10 + 4.47d)^{2/3}$

TRAIL d

d	Q
.8	7.19
.82	7.50

USE $d = .82$ FT.

II Determine Velocity

$V = 1.486/n \; R^{2/3} \; S^{1/2}$

$b = 10$ ft
$d = .82$
$n = .032$
$S = .0643$

$R = bd + 2d^2/b + 2d\sqrt{z^2+1}$
$= 10(.82) + 2(.82)^2/10 + 2(.82)\sqrt{(2)^2+1}$
$= 9.54 / 13.67$
$= .70$

$V = 1.486/.032 \times (.70)^{2/3} \times (.0643)^{1/2}$

$= 46.44 \times (.79) \times .25$

$= 9.26$ fps

Stream will need riprap

III Determine Riprap Size and Filter Blanket

a) Riprap Size - Mild Slope

1 Assume $K_m = 9$ in $K_m = D_{50}$

$n = .0395 \; D_{50}^{1/6}$ Eq 4.18 page 4-10
$= .0395 \; (9/12)^{1/6}$ Surface Mining Water
$= .038$ Diversion Design Manual -

2. Charts in Appendix C page C-5
Surface Mining Water
Diversion Design Manual -

$Q_n = Q_a$
$= (87.40)(.039)$
$= 3.32$

$V_n = .18$

$V = V_n/n$

$= .18/.038$

$= 2.63$ fps

3. $V^2/R^{.33} = (9.26)^2/(.70)^{.33} = 96.46$

FROM TABLE 6.4 PAGE 6.39 REQUIRED RIPRAP IS TYPE M SURFACE MINING WATER DIVERSION DESIGN MANUAL

FROM TABLE 6.5 PAGE 6.40 TYPE L, $K_m = 10$. SURFACE MINING WATER DIVERSION DESIGN MANUAL

4. CHECK FROUDE NUMBER

$Fr = V/\sqrt{gL}$ L = .07 EQ 4.6 PAGE 4.19 SURFACE MINING WATER DIVERSION DESIGN MANUAL

$= 9.26/\sqrt{(32.3)(.07)}$

$= 6.0071$

RIPRAP GRADATION

	SIZE	%
1.25 D_{50}	22.5 IN	30
D_{50}	.18 IN	50
.5 D_{50}	9 IN	10
.2 D_{50}	3.6 IN	10

C) FILTER BANKET DESIGN

ASSUME BASE MATERIAL

D_{85} = .09 IN
D_{50} = .024 IN
D_{15} = .006

RIPRAP PROPERTIES

D_{85} = 19 IN
D_{50} = .18 IN
D_{15} = 3.3 IN.

a) BASED ON PASSED CALCULATIONS A FILTER BLANKET WILL BE NEEDED

b) FILTER BLANKET WITH RESPECT TO BASE MATERIAL
EQ 5.2 PAGE 5.12 SURFACE MINING WATER DIVERSION DESIGN MANUAL

D_{50} (FILTER)/D_{50} (BASE) < 40

SO, D_{50} (FILTER) < 40 × .024 = .96 IN

D_{15} (FILTER)/D_{15} (BASE) < 40

SO, D_{15} (FILTER) < 40 × .006 = .24 IN

D_{15} (FILTER)/D_{85} (BASE) < 5

SO, D_{15} (FILTER) < 5 × .09 = .45 IN.

D_{15} (FILTER)/D_{15} (BASE) > 5

SO, D_{15} (FILTER) > 5 × .006 = .03 IN.

.03 IN < D_{15} (FILTER) < .45 IN

D_{50} (FILTER) < .96 IN.

c) FILTER BLANKET WITH RESPECT TO RIPRAP MATERIAL
EQ 5.2 PAGE 5.12 SURFACE MINING WATER DIVERSION DESIGN MANUAL

D_{50} (RIPRAP)/D_{50} (FILTER) < 40

SO, D_{50} > 18/40 = .45 IN

D_{15} (RIPRAP)/D_{15} (FILTER) < 40

SO, D_{15} (FILTER) > 3.3/40 = .08 IN

D_{15} (RIPRAP)/D_{85} (FILTER) < 5

SO, D_{85} (FILTER) > 3.3/5 = .66 IN

D_{15} (RIPRAP)/D_{15} (FILTER) > 5

D_{15} < 3.3/5 = .66 IN.

.08 < D_{15} (FILTER) < .66 IN

D_{50} (FILTER) > .45 IN

D_{85} > .66 IN.

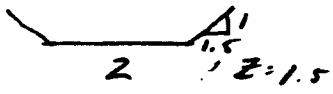
II Summer Flow Ditch Design

Design Flow Q_{10-29} = NB + UDA-1

$Q = 47.98 + 4.88 = 52.86$

Section 2, Vol. 5 page 7

A. Determine depth of flow



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

$A = bd + zd^2$ $\quad S = .0643$

$R = bd + zd^2 / b + 2d\sqrt{z^2+1}$ $\quad n = .032$

$Q = bd + zd^2 \times 1.486/n \times (bd + zd^2/b + 2d\sqrt{z^2+1})^{2/3} \times S^{1/2}$

$Q = 2d + 1.5d^2 \times 1.486/.032 \times (2d + 1.5d^2/2 + 2d\sqrt{1.5^2+1})^{2/3} \times (.0643)^{1/2}$

$52.86 = 2d + 1.5d^2 \times 46.44 \times (2d + 1.5d^2/2 + 3.61d)^{2/3} \times .25$

$52.86 = 11.61 (2d + 1.5d^2)(2d + 1.5d^2/2 + 3.61d)^{2/3}$

$4.55 = (2d + 1.5d^2)(2d + 1.5d^2/2 + 3.61d)^{2/3}$

Trial d

d (ft)	Q
1.33	4.50

B Determine Velocity

$V = 1.486/n \times R^{2/3} \times S^{1/2}$

$= 1.486/.032 \times (.78)^{2/3} \times (.0643)^{1/2}$

$= 46.44 \times .85 \times .25$

$= 9.98$ fps

C. DETERMINE RIPRAP SIZE

1. RIPRAP SIZE - MILD SLOPE

a) ASSUME $K_m = 6$ in $K_m = D_{50}$

$n = .0395\ D_{50}^{1/6}$ EQ 4.18 PAGE 4.10
$= .0395\ (6/12)^{1/6}$ SURFACE MINING WATER
$= .035$ DIVERSION DESIGN MANUAL

b) CHARTS IN APPENDIX C C-1 SURFACE MINING WATER DIVERSION DESIGN MANUAL

$Q_n = Q\ n$
$= (52.86)(.035)$
$= 1.86$ cfs

$V_n = .34$

$V = V_n/n$
$= .34/.035$
$= 9.14$ fps

$C = V^2/R^{.33} = (9.92)^2/(.72)^{.33} = 108.11$

TABLE 6.4 PAGE 6.39 DOES NOT GO THE 1½:1 SLOPE

ASSUME 9 IN. WILL WORK

d) CHECK FROUDE NUMBER

$Fr = V/\sqrt{gL}$ $L = 1.37$ EQ 4.6 PAGE 4.19 SURFACE MINING WATER DIVERSION DESIGN MANUAL

$= 9.92/2.33$

$= 1.58 > 1$

$D_{50} = 6$ in

RIPRAP GRADATION

	SIZE (IN)	%
$1.25\ D_{50}$	11.25 in	30
D_{50}	9 in	50
$.5\ D_{50}$	4.5 in	10
$.2\ D_{50}$	1.8 in	10

D FILTER BLANKET DESIGN

ASSUME BASE MATERIAL

$D_{85} = .09$ IN
$D_{50} = .024$ IN
$D_{15} = .006$ IN

RIPRAP PROPERTIES

$D_{85} = 9.5$ IN
$D_{50} = 9$ IN
$D_{15} = 1.7$ IN

1) BASED ON PASSED CALCULATIONS A FILTER BLANKET WILL BE NEEDED.

2) FILTER BANKET WITH RESPECT TO BASE MATERIAL
EQ 5.2 PAGE 5.12 SURFACE MINING WATER DIVERSION DESIGN MANUAL

D_{50} (FILTER) / D_{50} (BASE) < 40

so, D_{50} (FILTER) < 40 x .024 = .96 IN

D_{15} (FILTER) / D_{15} (BASE) < 40

so, D_{15} (FILTER) < 40 x .006 = .24 IN

D_{15} (FILTER) / D_{85} (BASE) ≥ 5

so, D_{15} (FILTER) < 5 x .09 = .45 IN

D_{15} (FILTER) / D_{15} (BASE) > 5

so, D_{15} (FILTER) > 5 x .006 = .03 IN

.03 < D_{15} (FILTER) < .45 IN

D_{50} (FILTER) < .96 IN.

3) FILTER BLANKET WITH RESPECT TO RIPRAP MATERIAL
EQ 5.1 PAGE 5.12 SURFACE MINING WATER DIVERSION DESIGN MANUAL

D_{50} (RIPRAP) / D_{50} (FILTER) < 40

so, D_{50} (FILTER) > 9/40 = .23 IN

D_{15} (RIPRAP) / D_{15} (FILTER) < 40

so, D_{15} (FILTER) > 1.8/40 = .05 IN.

D_{15} (RIPRAP) / D_{85} (FILTER) < 5

so, D_{85} (FILTER) > 1.8/5 = .36 IN.

D_{15} (RIPRAP) / D_{15} (FILTER) > 5

so D_{15} (FILTER) < 1.8/5 = .36 IN

.05 IN < D_{15} (FILTER) < .36 IN.

D_{50} (FILTER) > .23 IN

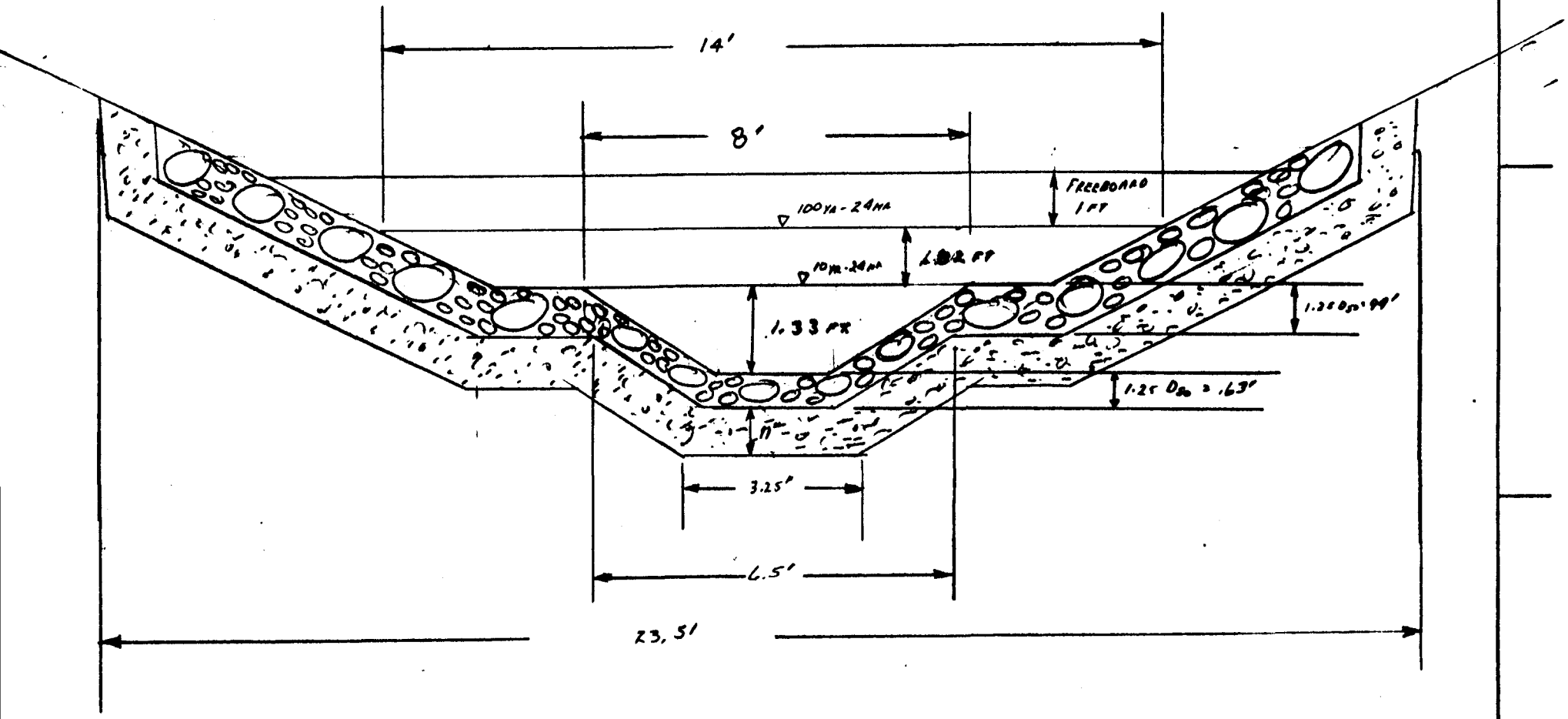
D_{85} > .36 IN.

4 THICKNESS OF FILTER BLANKET.[1]
THICKNESS = MAX D_{50} = .94 FT

REFERENCE: 1) SURFACE MINING WATER DIVERSION DESIGN MANUAL, UNITED STATES DEPT. OF THE INTERIOR, OFFICE OF SURFACE MINING

2) HYDRAULIC ENGINEERING CIRCULAR No 11. - U. S. DEPARTMENT OF TRANSPORTATION.

AMPAD 22-141 50 SHEETS
22-142 100 SHEETS
22-144 200 SHEETS



FINAL CHANNEL DIMENSIONS FOR
STREAM C

MAP 3.2.4.2

INITIAL SLOPE = .1506 THIS WILL ALSO BE THE DESIGN SLOPE

DESIGN FLOOD PLAIN FOR THE $Q_{100\text{-}24}$ = NB + UDAY - SUMMER FLOW

$Q = 127.80 + 12.46 - 52.86 = 87.40$ CFS

DESIGN CHANNEL TO BE A TRAPEZOID

I DETERMINE DEPTH OF FLOW

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

n = .032 EARTH BOTTOM WITH RUBBLE SIDE
S = .1506 MAP 4.4.2-181

$A = bd + zd^2$
$R = bd + zd^2 / b + 2d\sqrt{z^2+1}$ PAGE 158
APPLIED HYDROLOGY AND SEDIMENTOLOGY FOR DISTURBED AREAS - BARFIELD AND HARN

$Q = 87.40$

$Q = bd + zd^2 \times 1.486/n \times (bd + zd^2/b + 2d\sqrt{z^2+1})^{2/3} \times S^{1/2}$
$= 10d + 2d^2 \times 1.486/.032 \times (10d + 2d^2/10 + 2d\sqrt{2^2+1})^{2/3} \times (.1506)^{1/2}$
$87.40 = 10d + 2d^2 \times 46.44 \times (10d + 2d^2/10 + 4.47d)^{2/3} \times .39$

$4.85 = 10d + 2d^2 \times (10d + 2d^2/10 + 4.47d)^{2/3}$

TRAIL d

d	Q
.6	4.39
.64	4.90

USE d = .64

II Determine Velocity

$V = 1.486/n \; R^{2/3} \; S^{1/2}$

$b = 10$ ft
$d = .69$ ft
$n = .032$
$S = .1506$

$R = bd + 2d^2/10 + 2d\sqrt{2^2+1}$
$= 10(.69) + 2(.69)^2/10 + 2(.69)\sqrt{2^2+1}$
$= 7.22 / 12.86$
$= .56$

$V = 1.486/.032 \times (.56)^{2/3} \times (.1506)^{1/2}$

$= 46.44 \times (.56)^{2/3} \times .39$

$= 12.30$ fps

The stream will need riprap.

III Determine Riprap Size and Filter Blanket

a) Ripar Size - Steep Slope

Design - 87.40 cfs

Channel Slope = .1506

10 ft Bottom Width

Use Table 5.5 page 5.18 (Surface Mining Water Diversion Design Manual - United States Department of the Interior - Office of Surface Mining) Since there is no curve for S = .15 use the S = .25 curve. This will provide a slightly conservative design

10 ft @ 87.40 = D_{50} = .68 ft

From Table 5.2 page 5.21 (Surface Mining Water Diversion Design Manual - United States Department of the Interior - Office of Surface Mining)

Design D_{50} = .75 ft

$D_{max} = 1.25 D_{50} = .94$ ft.

Riprap Gradation	Size (ft)	%
$1.25 D_{50}$	.94	30
D_{50}	.75	50
$.5 D_{50}$	.38	10
$.2 D_{50}$	.15	10

b) FILTER BLANKET DESIGN

ASSUME BASE MATERIAL

D_{85} = .09 IN.
D_{50} = .024 IN.
D_{15} = .006 IN.

RIPRAP PROPERTIES

D_{85} = 9.5 IN.
D_{50} = 9 IN.
D_{15} = 4.7 IN.

1. BASED ON PASSED CALCULATIONS A FILTER BLANKET WILL BE NEEDED.

2. FILTER BLANKET WITH RESPECT TO BASE MATERIAL EQ 5.2 PAGE 512 (SURFACE MINING WATER DIVERSION DESIGN MANUAL - U. S. DEPT. OF THE INTERIOR - OFFICE OF SURFACE MINING)

D_{50}(FILTER)/D_{50} (BASE) < 40

SO, D_{50} (FILTER) < 40 × .024 IN = .96 IN

D_{15} (FILTER) / D_{15} (BASE) < 40

SO, D_{15} (FILTER) < 40 × .006 IN = .24 IN.

D_{15} (FILTER) / D_{85} (BASE) < 5

SO, D_{15} (FILTER) < 5 × .09 = .45 IN

D_{15} (FILTER) / D_{15} (BASE) > 5

SO D_{15} (FILTER) > 5 × .006 = .03 IN.

.03 IN. < D_{15} (FILTER) < .45 IN.

D_{50} < .96 IN.

3) FILTER BLANKET WITH RESPECT TO RIPRAP
EQ 5.2 PAGE 5.12 (SURFACE MINING WATER DIVERSION DESIGN MANUAL - U.S. DEPT. OF INTERIOR - OFFICE OF SURFACE MINING)

D_{50} (RIPRAP) / D_{50} (FILTER) < 40

so, D_{50} (FILTER) > 9/40 = .23 in.

D_{15} (RIPRAP) / D_{15} (FILTER) < 40

so, D_{15} (FILTER) > 1.7 in/40 = .04 in

D_{15} (RIPRAP) / D_{85} (FILTER) < 5

so D_{85} (FILTER) > 1.7/5 = .34 in.

D_{15} (RIPRAP) / D_{15} (FILTER) > 5

so D_{15} (FILTER) < 1.7/5 = .34 in

.04 < D_{15} (FILTER) < .34 in

D_{50} (FILTER) > .23 in

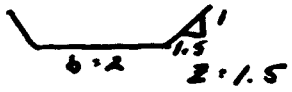
D_{85} (FILTER) > .34 in.

II Summer Flow Ditch Design

Design Flow Q_{10-24} = NB + UDA-1 Section 2, Vol. 5, page 7

$Q = 47.98 + 4.88 = 52.86$

A Determine Depth of Flow



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

$A = bd + zd^2$ Page 158 Applied Hydrology and Sedimentology $n = .032$ Earth Bottom For Disturbed Area - Revegetation with rubble side $S = .1506$

$R = bd + zd^2/b + 2d\sqrt{z^2+1}$

$Q = bd + zd^2 \times 1.486/n \left(bd + zd^2/b + 2d\sqrt{z^2+1}\right)^{2/3} \times S^{1/2}$

$= 2d + 1.5d^2 \times 46.44 \times (2d + 1.5d^2/2 + 3.61d)^{2/3} \times (.1506)^{1/2}$

$52.86 = 18.02\,(2d + 1.5d^2)(2d + 1.5d^2/2 + 3.61d)^{2/3}$

$2.93 = (2d + 1.5d^2)(2d + 1.5d^2/2 + 3.61d)^{2/3}$

Trial d

d	Q
1.0	2.55
1.05	2.81
1.07	2.91

$d = 1.07$ ft.

B Determine Velocity

$V = 1.486/n \times R^{2/3} \times S^{1/2}$

$= 1.486/.032 \times (.66)^{2/3} \times (.1506)^{1/2}$

$= 46.44 \times .76 \times .39$

$= 13.68$ fps

The Stream will need riprap

C. DETERMINE RIPRAP SIZE AND FILTER BLANKET

a) RIPRAP SIZE - STEEP SLOPE

DESIGN = 52.86 CFS

CHANNEL SLOPE .1506

FROM FIG. 2 PAGE 116

USE OF RIPRAP FOR BANK PROTECTION - HYD. ENG. CIR. NO. 11 U.S. DEPT. TRANSPORTATION

D_{50} = 1.75 IN.

D_{MAX} = 1.25 D_{50} = 2.19 FT.

RIPRAP GRADATION

	SIZE (FT)	%
$1.25 D_{50}$	2.19	30
D_{50}	1.75	50
$.5 D_{50}$	.88	10
$.2 D_{50}$	.35	10

b) FILTER BLANKET DESIGN

ASSUME BASED MATERIAL

D_{85} = .09 IN
D_{50} = .629 IN
D_{15} = .006 IN

RIPRAP PROPERTIES

D_{85} = 22.34 IN
D_{50} = 21 IN
D_{15} = 3.94 IN

1) BASED ON PASSED CALCULATIONS A FILTER BLANKET WILL BE NEEDED.

2) FILTER BLANKET WITH RESPECT TO BASE MATERIAL (SURFACE MINING WATER DIVERSION DESIGN MANUAL EQ 5.2 PAGE 5.12)

D_{50} (FILTER) / D_{50} (BASE) < 40

so, D_{50} (FILTER) < 40 x .024 = .96 in

D_{15} (FILTER) / D_{15} (BASE) < 40

so, D_{15} (FILTER) < 40 x .006 = .24 in

D_{15} (FILTER) / D_{85} (BASE) < 5

so, D_{15} (FILTER) < 5 x .09 = .45 in

D_{15} (FILTER) / D_{15} (BASE) > 5

so D_{15} (FILTER) > 5 x .006 = .03 in.

.03 in < D_{15} (FILTER) < .45 in

D_{50} (FILTER) < .96 in

3) FILTER BLANKET WITH RESPECT TO RIPRAP (EQ 5.2 PAGE 5.12 SURFACE MINING WATER DIVERSION DESIGN MANUAL)

D_{50} (RIPRAP) / D_{50} (FILTER) < 40

so D_{50} (FILTER) > 21/40 = .53 in

D_{15} (RIPRAP) / D_{15} (FILTER) < 40

so, D_{15} (FILTER) > 3.99/40 = .10 in

D_{15} (RIPRAP) / D_{85} (FILTER) < 5

so, D_{85} (FILTER) > 3.99/5 = .79 in

D_{15} (RIPRAP) / D_{15} (FILTER) > 5

so D_{15} (FILTER) < 3.99/5 = .79 in

.10 in. < D_{15} (FILTER) < .79 in

D_{50} (FILTER) > .53 in

D_{85} (FILTER) > .79 in.

4) THICKNESS OF FILTER BLANKET
THICKNESS MAX D_{50} = 1.75

REFERENCE

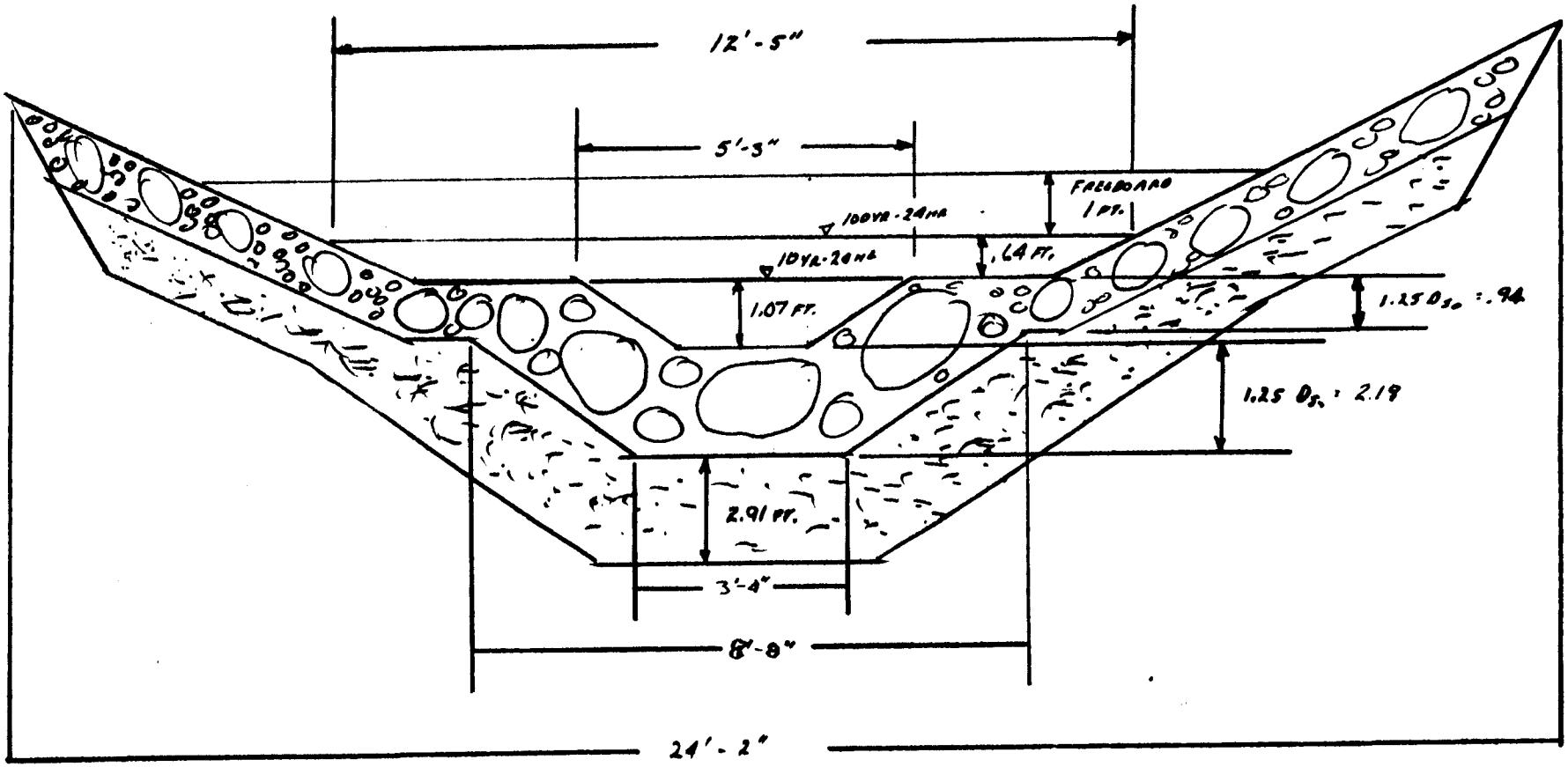
1) SURFACE MINING WATER DIVERSION DESIGN MANUAL
UNITED STATES DEPT. OF THE INTERIOR
OFFICE OF SURFACE MINING

2) HYDRAULIC ENGINEERING CIRCULAR NO. 11
UNITED STATES DEPT. OF TRANSPORTATION

3) BARFIELD, B.J., R.C. WARNER, C.T. HAN. - APPLIED HYDROLOGY AND SEDIMENTOLOGY FOR DISTURBED AREAS - OKLAHOMA TECHNICAL PRESS

22-141 50 SHEETS
22-142 100 SHEETS
22-144 200 SHEETS
AMPAD

AMPAD 22-141 50 SHEETS
22-142 100 SHEETS
22-144 200 SHEETS



FINAL CHANNE DIMENSIONS
FOR STREAM C

G. TAWON
REVISED 11-4-89

RECLAIM CHANNEL DESIGN
STREAM D

INITIAL SLOPE = .1667

I DESIGN FLOOD PLAIN FOR THE Q_{100-24} = NB + MB + SB - Summer Flow

$Q = 149.51 + 129.90 + 140.62 - 126.01 = 294.02$

Q VALUES DETERMINED FROM PREVIOUS CALCULATIONS IN SECTION 18, VOL. 5

DESIGN CHANNEL TO BE A TRAPEZOID

A. DETERMINE DEPTH FLOW

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

$A = bd + zd^2$

$R = bd + zd^2/b + 2d\sqrt{z^2+1}$

$Q = 294.02$ CFS

$n = .032$ EARTH BOTTOM

$S = .1667$ MAP 4.4.2-1B1

$Q = bd + zd^2 \times 1.486/n \times (bd + zd^2/b + 2d\sqrt{z^2+1})^{2/3} \times S^{1/2}$

$Q = 10d + 2d^2 \times 1.486/.032 \times (10d + 2d^2/10 + 2d\sqrt{(2)^2+1})^{2/3} \times (.1667)^{1/2}$

$Q = 10d + 2d^2 \times 46.44 \times (10d + 2d^2/10 + 2d\sqrt{(2)^2+1})^{2/3} \times .41$

$294.02 = 18.96 \times (10d + 2d^2)(10d + 2d^2/10 + 4.47d)^{2/3}$

$15.51 = (10d + 2d^2)(10d + 2d^2/10 + 4.47d)^{2/3}$

TRIAL d

d	Q	
1.2	14.56	.00
1.25	15.65	

USE d = 1.25 FT

B DETERMINE VELOCITY

$n = .032$
$S = .1667$
$b = 10$ FT
$d = 1.25$ FT
$z = 2$

$$V = 1.486/n \times R^{2/3} \times S^{1/2}$$

$$R = bd + zd^2/b + 2d\sqrt{z^2+1}$$
$$= 10(1.25) + 2(1.25)^2/10 + 2(1.25)\sqrt{(2)^2+1}$$
$$= 15.62/15.50$$
$$= 1.00$$

$$V = 1.486/.032 \times (1.00)^{2/3} \times (.1667)^{1/2}$$

$$= 46.44 \times 1.00 \times .41$$

$$= 19.04 \text{ FPS}$$

THE STREAM WILL NEED RIPRAP

C DETERMINE RIPRAP SIZE AND FILTER BLANKET

a) RIPRAP SIZE - STEEP SLOPE (1)

DESIGN - 294.02 CFS

CHANNEL SLOPE - .1667

10 FT BOTTOM WIDTH

USE FIGURE 5.5 PAGE 5.18 SURFACE MINING WATER DIVERSION - DESIGN MANUAL
SINCE THERE IS NOT A CURVE FOR S=.16 USE THE S=.25 CURVE. THIS WILL PROVIDE A SLIGHTLY CONSERVATIVE DESIGN.

10 FT @ 294.02 CFS = D_{50} = 2.7 FT.

FROM TABLE 5.2 PAGE 5-21 THE SURFACE MINING WATER DIVERSION DESIGN MANUAL
DESIGN D_{50} = 2.75

$D_{MAX} = 1.25\ D_{50}$

$D_{MAX} = 1.25\ D_{50} = 1.25(2.75) = 3.44$ FT.

RIPRAP GRADATION

	SIZE (FT)	%
$1.25\ D_{50}$	3.44	300
D_{50}	2.75	50
$.5D_{50}$	1.38	10
$.2D_{50}$	.55	10

b) FILTER BLANKET DESIGN

ASSUME BASE MATERIAL

D_{85} = .09 IN
D_{50} = .024 IN
D_{15} = .006 IN.

RIRAP PROPERTIES

D_{85} = 35 IN
D_{50} = 33 IN
D_{15} = 6 IN

1. BASED ON PASSED CALCULATIONS A FILTER BLANKET WILL BE NEEDED.

2) FILTER BLANKET WITH RESPECT TO BASE MATERIAL
EQ 5-1 PAGE 5.12 SURFACE MINING WATER DIVERSION DESIGN MANUAL

$D_{50}(\text{FILTER})/D_{50}(\text{BASE}) < 40$

SO, $D_{50}(\text{FILTER}) < 40 \times .024 = .96$ IN

$D_{15}(\text{FILTER})/D_{15}(\text{BASE}) < 40$

SO, $D_{15}(\text{FILTER}) < 40 \times .006 = .24$ IN

$D_{15}(\text{FILTER})/D_{85}(\text{BASE}) < 5$

SO, $D_{15}(\text{FILTER}) < 5 \times .09 = .45$ IN

$D_{15}(\text{FILTER})/D_{15}(\text{BASE}) > 5$

SO, $D_{15}(\text{FILTER}) > 5 \times .006 = .03$ IN

$.03 \text{ IN} < D_{15}(\text{FILTER}) < .24 \text{ IN}$

$D_{50}(\text{FILTER}) < .96 \text{ IN}$

3) FILTER BLANKET WITH RESPECT TO RIPRAP

EQ 5.2 PAGE 5-12 SURFACE MINING WATER DIVERSION DESIGN MANUAL

D_{50} (RIPRAP) / D_{50} (FILTER) < 40

SO, D_{50} (FILTER) > 33/40 = .83 IN

D_{15} (RIPRAP) / D_{15} (FILTER) < 40

SO, D_{15} (FILTER) > 6/40 = .15 IN

D_{15} (RIPRAP) / D_{85} (FILTER) < 5

SO, D_{85} (FILTER) > 6/5 = 1.2 IN

D_{15} (RIPRAP) / D_{15} (FILTER) > 5

SO D_{15} (FILTER) < 6/5 = 1.2 IN

.15 IN < D_{15} (FILTER) < 1.2 IN

D_{50} (FILTER) > .83 IN

D_{85} (FILTER) > 1.2 IN.

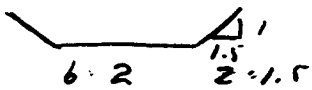
22-141 50 SHEETS
22-142 100 SHEETS
22-144 200 SHEETS
AMPAD

II Summer Flow Ditch Design

Design flow Q_{10-24} : NB + MB + SB

$Q = 34.64 + 38.51 + 52.86 = 126.01$

Q values determined from previous calculations in Section 17, Vol. 5



A. Determine depth of flow

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

$S = .1667$ MN 4.8.2-181

$n = .032$ Earth Bottom

$A = bd + zd^2$

$R = bd + zd^2 / b + 2d\sqrt{z^2+1}$

$Q = bd + zd^2 \times 1.486/n \times (bd + zd^2/b + 2d\sqrt{z^2+1})^{2/3} \times S^{1/2}$

$Q = 2d + 1.5d^2 \times 1.486/.032 \times (2d + 1.5d^2/2 + 2d\sqrt{(1.5)^2+1})^{2/3} \times (.1667)^{1/2}$

$126.01 = 2d + 1.5d^2 \times 46.44 \times (2d + 1.5d^2/2 + 3.61d)^{2/3} \times .41$

$126.01 = 18.96\,(2d + 1.5d^2)\,(2d + 1.5d^2/2 + 3.61d)^{2/3}$

$6.65 = (2d + 1.5d^2)(2d + 1.5d^2/2 + 3.61d)^{2/3}$

Trail d

d	Q
1.6	6.61

$d = 1.6$ ft.

B. Determine Velocity

$V = 1.486/n \; R^{2/3} \; S^{1/2}$

$= 1.486/.032 \times (.91)^{2/3} \times (.1667)^{1/2}$

$= 46.44 \times .94 \times .41$

$= 17.87$ fps

The stream will need riprap

C DETERMINE RIPRAP SIZE AND FILTER BLANKET

a) RIPRAP SIZE - STEEP SLOPE

DESIGN - 126.01 CFS

CHANNEL SLOPE - .1667

FROM FIG. 2 PAGE 11.6 USE OF RIPRAP FOR BANK PROTECTION - HYD. ENG. CIR. No. 11 U.S. DEPT. OF TRANSPORTATION

D_{50} = 2.7 FT.

D_{MAX} = 1.25

D_{MAX} = 1.25 D_{50} = 1.25 (2.7) = 3.38 ft

RIPRAP GRADATION

	SIZE (ft)	%
1.25 D_{50}	3.38	30
D_{50}	2.70	50
.8 D_{50}	1.35	10
.2 D_{50}	.54	10

b) FILTER BLANKET DESIGN

ASSUME BASE MATERIAL

D_{85} = .09 in
D_{50} = .029 in
D_{15} = .006 in

RIPRAP PROPERTIES

D_{85} = 34 in
D_{50} = 32.4 in
D_{15} = 6 in

1) BASED ON PASSED CALCULATION A FILTER BLANKET WILL BE NEEDED.

2) FILTER BLANKET WITH RESPECT TO BASE MATERIAL
EQ 5.1 PAGE 5.12 SURFACE MINING WATER DIVERSION DESIGN MANUAL.

D_{50} (FILTER)/$_{50}$ (BASE) < 40

so, D_{50} (FILTER) < 40 x .024 = .96 IN

D_{15} (FILTER) / D_{15} (BASE) < 40

so D_{15} (FILTER) < 40 x .006 = .24 IN

D_{15} (FILTER) / D_{85} BASE < 5

so, D_{15} (FILTER) < 5 x .09 = .45 IN.

D_{15} (FILTER) / D_{15} (BASE) > 5

so D_{15} (FILTER) > 5 x .006 = .03 IN

.03 IN < D_{15} (FILTER) < .45 IN

D_{50} < .96 IN

3) FILTER BLANKET WITH RESPECT TO RIPRAP
EQ 5.2 PAGE 5.12 SURFACE MINING WATER DIVERSION DESIGN MANUAL

D_{50} (RIPRAP)/D_{50} (FILTER) < 40

so, D_{50} (FILTER) > 32.4/40 = .81 IN.

D_{15} (RIPRAP)/D_{15} (FILTER) < 40

so, D_{15} (FILTER) > 6/40 = .15 IN

D_{15} (RIPRAP)/D_{85} (FILTER) < 5

so D_{85} (FILTER) > 6/5 = 1.20 IN

D_{15} (RIPRAP)/D_{15} (FILTER) < 5

so D_{15} (FILTER) < 6/5 = 1.20 IN.

$.15 \text{ in} < D_{15} \text{ (Filter)} < 1.20$

$D_{50} \text{ (Filter)} > .81 \text{ in}$

$D_{85} \text{ (Filter)} > 1.20 \text{ in}$

4) Thickness of Filter Blanket.[2]

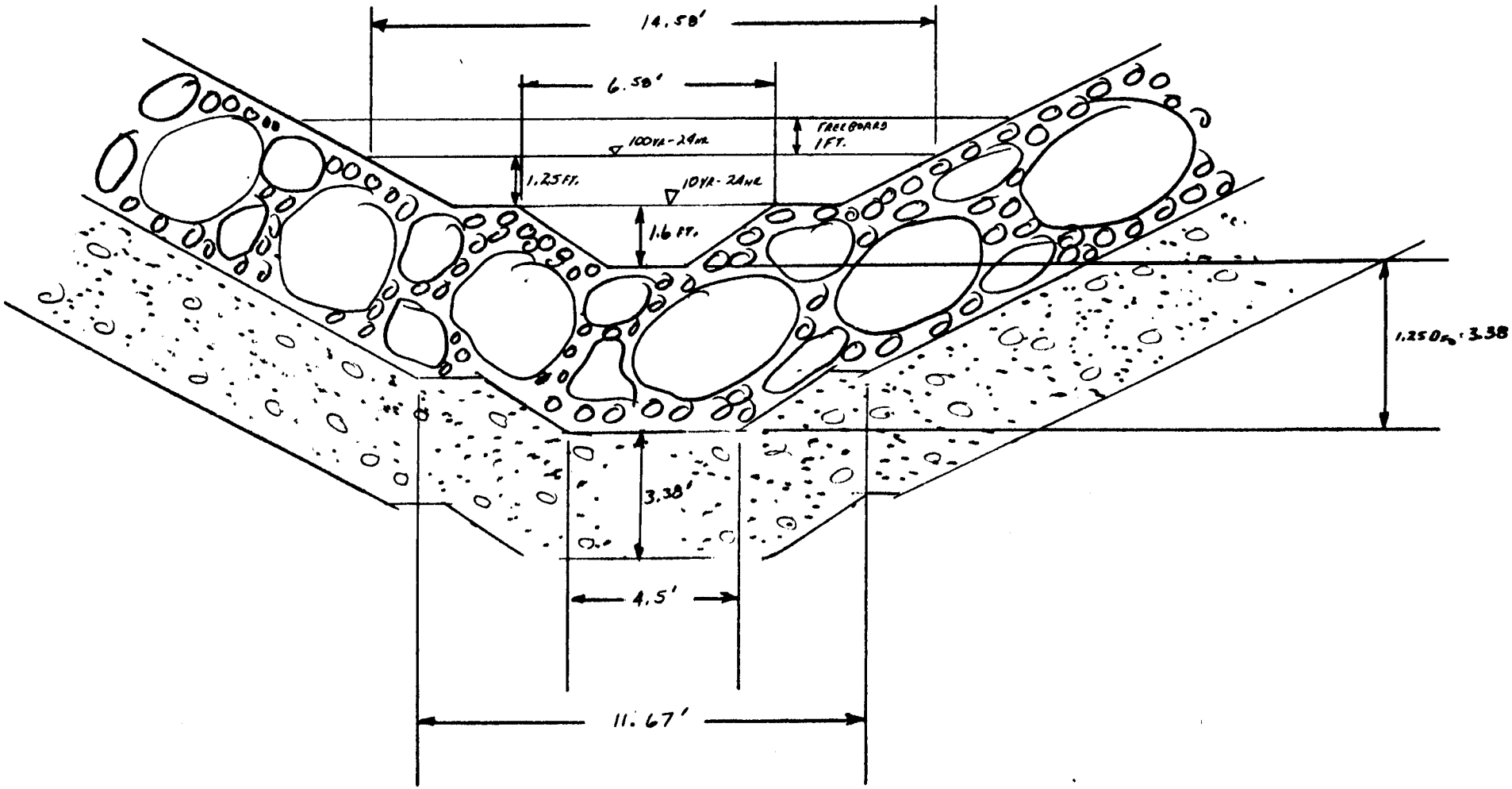
Thickness = Max D_{50} = 3.38 ft

References: 1. Surface Mining Water Diversion Design Manual United States Dept. of the Interior, Office of Surfacing Mining.

2. Use of Riprap for Bank Protection, Hydraulic Engineering Circular No. 11, United States Dept. of Transportation

22-141 50 SHEETS
22-142 100 SHEETS
22-144 200 SHEETS
AMPAD

AMPAD 22-141 50 SHEETS
22-142 100 SHEETS
22-144 200 SHEETS



FINAL CHANNEL DIMENSION FOR STREAM O

RECLAIM CHANNEL DESIGN
STREAM E

INITIAL SLOPE = .0396 (MAP

I. DESIGN FLOOD PLAIN FOR Q_{100-24} = NB + MB + SB

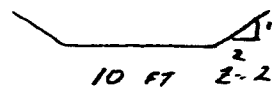
$Q = 149.51 + 129.90 + 140.62 = 420.03$ cfs − 126.01 (SUMMER FLOW)
$= 294.02$

Q VALUES DETERMINED FROM PREVIOUS CALCULATIONS IN THIS SECTION. 1B, VOL. 5

DESIGN CHANNEL TO BE A TRAPEZOID

A. DETERMINE DEPTH OF FLOW

DRAWING NOTE



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

$A = bd + zd^2$ $\qquad n = .032$

$R = bd + zd^2 / b + 2d\sqrt{z^2+1}$ $\qquad S = .0396$ MAP 4A.2-1B1

$$Q = bd + zd^2 \times 1.486/n \times (bd + zd^2/b + 2d\sqrt{z^2+1})^{2/3} \times S^{1/2}$$

$$Q = 10d + 2d^2 \times 1.486/.032 \times (10d + 2d^2/10 + 2d\sqrt{(2)^2+1} \times (.0396)^{1/2}$$

$$294.02 = 10d + 2d^2 \times 46.44 \times (10d + 2d^2/10 + 4.47d)^{2/3} \times .20$$

$$294.02 = 9.24\,(10d + 2d^2)(10d + 2d^2/10 + 4.47d)^{2/3}$$

$$31.82 = (10d + 2d^2)(10d + 2d^2/10 + 4.47d)^{2/3}$$

TRIAL d

d	Q
2	36.41
1.9	33.16
1.8	30.08
1.82	30.64
1.84	31.25
1.86	31.87

USE d = 1.86

B. DETERMINE VELOCITY

$R = 1.39$
$S = .0396$
$n = .032$

$$V = 1.486/n \times R^{2/3} \times S^{1/2}$$

$$= 1.486/.032 \times (1.39)^{2/3} \times (.0396)^{1/2}$$

$$= 46.44 \times 1.247 \times .199$$

$$= 11.52 \text{ FPS}$$

THE STREAM WILL NEED RIPRAP

C. DETERMINE RIPRAP SIZE AND FILTER BLANKET

a) RIPRAP SIZE - MILD SLOPE

1. ASSUME $K_m = 1$ $K_m \cdot D_{50}$

$$n = .0395\ D_{50}^{1/6}$$
$$= .0395\ (1)^{1/6}$$
$$= .0395$$

EQ 4.18 PAGE 4.10 SURFACE MINING WATER DIVERSION DESIGN MANUAL

2. CHARTS IN APPENDIX C PAGE C-5 SURFACE MINING WATER DIVERSION DESIGN MANUAL.

$$Q_n = Q\ n$$
$$= (294.02)(.0395)$$
$$= 11.61 \text{ FOR } 3\% \text{ SLOPE}$$

$$V_n = .38$$

$$V = V_n/n\ (1)$$

$$= .38/.0395$$

$$= 9.62 \text{ FPS} \qquad d = 1.86 \text{ FT}$$

3. $V^2/R^{.33}\ (1) = (9.62)^2/(1.89)^{.33} = 83.02\ R = 1.39$

TABLE 6-9 PAGE 6-39 REQUIRED RIPRAP IS TYPE H (SURFACE MINING WATER DIVERSION DESIGN MANUAL)
FROM TABLE 6-5 PAGE 6-40 K_m FOR A DEPTH OF 2.26 FT AND 3% SLOPE $K_m = 18$ IN
(SURFACE MINING WATER DIVERSION DESIGN MANUAL)
USE A $D_{50} = 18$ IN RIPRAP

4.) CHECK FROUDE NUMBER

$FR = V/\sqrt{gL}$ (1)

$= 10.89/\sqrt{(32.2)(2.26)}$

$= 1.23 > .8$ STEEP SLOPE

$L = 2.26$
EQ 4.6 PAGE 4.19
SURFACE MINING WATER DIVERSION DESIGN MANUAL

B) RIPRAP SIZE - STEEP SLOPE

1) ASSUME $D_{50} = 18$ IN $= 1.5$ FT.

$n = .0395\, D_{50}^{1/6}$
$= .0395\,(1.5)^{1/6}$
$= .042$

2) CHECK FOR STABILITY

$\tau = \gamma d s$

$\gamma = 62.4$
$d = 2.6$
$s = .0396$

$\tau = 62.4\,(1.86)(.0396)$
$= 4.59$ LB/FT^2

$\eta_b = 21\tau/\gamma(S.G.-1)\,D_{50}$ EQ 2.33 PAGE 198 (2)
APPLIED HYDROLOGY AND SEDIMENTOLOGY FOR DISTURBED AREAS BARFIELD AND HAAN

$= 21(4.59)/62.4(2.36-1)\,1.5$
S.G. 2.36

$= .76$

$SF = \cos\theta \tan\phi / \sin\theta + \eta_b \tan\phi$ EQ 3.28 PAGE 186

ϕ ANGLE OF RESPONSE FIGURE 3.14 PAGE 187
RIPRAP ROUND AND ANGULAR APPLIED HYDROLOGY AND SEDIMENTOLOGY FOR DISTURBED AREAS - BARFIELD AND HAAN

$\phi = 38°$

θ = SLOPE IN DEGREES

$\theta = \tan^{-1} .0396$
$= 2.27°$

SAFETY FACTOR = 1.2

$$SF = \cos(2.27)\tan(38) / \sin 2.27 + (.92)\tan 38$$

$$= (.999)(.781) / .04 + (.76)(.781)$$

$$= .781 / .868$$

$$= .90$$

D_{50} (FT)	MANNING n	ANGLE OF REPOSE (DEG)	DEPT OF FLOW	TRACTIVE FORCE τ	STABILITY FACTOR η_b	S.F.
1.5	.042	38	1.86	4.59	.76	1.23

USE 1.5 FT = D_{50}

RIPRAP GRADATION

	SIZE (FT)	%
$2 D_{50}$ =	3.0	30
D_{50} =	1.5	50
$.5 D_{50}$ =	.75	10
$.2 D_{50}$ =	.3	10

C) FILTER BLANKET DESIGN

ASSUME BASE MATERIAL (SCREEN ANALYSIS DONE)

D_{85} = .09 IN

D_{50} = .024 IN

D_{15} = .006 IN

RIPAR PROPERTIES

D_{85}	30.6 IN
D_{50}	18 IN
D_{15}	5.4 IN

a) BASED ON PASSED CALCULATIONS A FILTER BANKLET WILL BE NEEDED.

b) FILTER BLANKET WITH RESPECT TO BASE MATERIAL
EQ 5.1 PAGE 5.12 SURFACE MINING WATER DIVERSION DESIGN MANUAL

D_{50} (FILTER)/D_{50} (BASE) < 40

so, D_{50} < 40 x .024 = .96 IN.

D_{15} (FILTER)/D_{15} (BASE) < 40

so, D_{15} (FILTER) < 40 x .006 = .24 IN

D_{15} (FILTER)/D_{85} (BASE) < 5

so, D_{15} (FILTER) < 5 x .09 = .45 IN

D_{15} (FILTER)/D_{15} (BASE) > 5

so, D_{15} (FILTER) > 5 x .006 = .03 IN

.03 IN < D_{15} (FILTER) < .45 IN

D_{50} (FILTER) < .96 IN

c FILTER BLANKET WITH RESPECT TO RIPRAP MATERIAL
EQ 5.2 PAGE 5.12 SURFACE MINING WATER DIVERSION DESIGN MANUAL

D_{50} (RIPRAP)/D_{50} (FILTER) < 40

so, D_{50} (FILTER) > 18/40 = .45 IN.

D_{15} (RIPRAP)/D_{15} (FILTER) < 40

so, D_{15} (FILTER) > 5.4/40 = .14 IN.

D_{15} (RIPRAP)/D_{85} (FILTER) < 5

so, D_{85} (FILTER) > 5.4/5 = 1.08 IN

D_{15} (RIPRAP)/D_{15} (FILTER) > 5

so, D_{15} (FILTER) < 5.4/5 = 1.08 IN.

.14 IN < D_{15} (FILTER) < 1.08 IN

D_{50} (FILTER) > .45 IN

D_{85} (FILTER) > 1.08 IN.

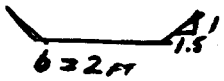
II SUMMER FLOW DITCH DESIGN

DESIGN FLOW Q_{10-24} = NB + MB + SB

$Q = 34.64 + 38.51 + 52.86 = 126.01$ CFS

Q VALUES DETERMINED FROM PREVIOUS CALCULATIONS IN SECTION 18, VOL. 5

A. DETERMINE DEPTH OF FLOW



$n = .032$
$S = .0396$

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

$$A = bd + zd^2$$
$$R = bd + zd^2/b + 2d\sqrt{z^2+1}$$

$$Q = bd + zd^2 \times 1.486/n \times (bd + zd^2/b + 2d\sqrt{z^2+1})^{2/3} \times S^{1/2}$$
$$Q = 2d + 1.5d^2 \times 1.486/.032 \times (2d + 1.5d^2/2 + 2d\sqrt{(1.5)^2+1})^{2/3} \times (.0396)^{1/2}$$
$$126.01 = 2d + 1.5d \times 46.44 \times 2d + 1.5d^2/2 + 3.61d)^{2/3} \times .20$$
$$126.01 = 9.24\,(2d + 1.5d^2)(2d + 1.5d^2/2 + 3.61d)^{2/3}$$

$$13.64 = (2d + 1.5d^2)(2d + 1.5d^2/2 + 3.61d)^{2/3}$$

TRIAL d

d	Q
2.2	12.97
2.3	14.30
2.25	13.63

USE $d = 2.25$ FT.

B. DETERMINE VELOCITY

$$V = 1.486/n \times R^{2/3} \times S^{1/2}$$
$$= 1.486/.032 \times (1.20)^{2/3} \times (.0396)^{1/2}$$
$$= 46.44 \times 1.13 \times .20$$
$$= 10.44 \text{ FPS}$$

$R = 1.20$
$S = .0396$
$n = .032$

C. DETERMINE RIPRAP SIZE AND FILTER BLANKET

1. RIPRAP SIZE - MILD SLOPE

a) ASSUME $K_m = 1$ $K_n = D_{50}$

$n = .0395\, D_{50}^{1/6}$ EQ 4.18 PAGE 4.19
$= .0395\,(1)^{1/6}$ SURFACE MINING WATER
$= .0395$ DIVERSION DESIGN MANUAL

b) CHARTS IN APPENDIX C PAGE C-1

$Q_n = Q\,n$ SURFACE MINING WATER
$= 126.01\,(.0395)$ DIVERSION DESIGN MANUAL
$= 4.98$

$V_n = .30$

$V = V_n/n^{(1)}$

$= .30/.0395$

$= 7.60$ FPS

c) $V^2/R^{.33\,(1)} = (7.60)^2/(1.20)^{.33} = 51.05$ $R = 1.20$

TABLE 6.4 PAGE 6-39 REQUIRED RIPRAP IS TYPE L
(SURFACE MINING WATER DIVERSION DESIGN MANUAL)
FROM TABLE 6.5 PAGE 6-40 K_m FOR A DEPTH OF 2.25 FT AND 3% SLOPE K_m = 9 IN
(SURFACE MINING WATER DIVERSION DESIGN MANUAL)

2) REWORK RIPRAP SIZE FOR K_m = 9 IN.

a) $K_m = 9$ $K_m = D_{50}$

EQ. 4.18 PAGE 4.19
$n = .0395\, D_{50}^{1/6}$ SURFACE MINING WATER
$= .0395\,(9/12)^{1/6}$ DIVERSION DESIGN MANUAL
$= .038$

b) CHARTS IN APPENDIX C PAGE C-1
SURFACE MINING WATER
$Q_n = Q\,n$ DIVERSION DESIGN MANUAL
$= 126.01\,(.038)$
$= 4.79$

$V_n = .30$

$V = V_n / n$

$= .30 / .038$

$= 7.90$ fps

c) $V^2/R^{.33} = (7.90)^2/(1.20)^{.33} = 58.69$

TABLE 6.4 PAGE 6-39 REQUIRED RIPRAP IS TYPE L
(SURFACE MINING WATER DIVERSION DESIGN MANUAL)
FROM TABLE 6.5 PAGE 6.40 K_m FOR A DEPTH
OF 2.25 FT AND 3% SLOPE K_m = 9IN.
SURFACE MINING WATER DIVERSION DESIGN MANUAL
USE 9 IN RIPRAP

d) CHECK FROUDE NUMBER

$F_R = V/\sqrt{gL}$ L = 2.25 EQ 4.6 PAGE 4.19 SURFACE MINING WATER DIVERSION DESIGN MANUAL

$= 7.90/\sqrt{(2.25)(32.2)}$

$= .92 < 1$

$D_{50} = 9$ IN.

RIPRAP GRADATION

	SIZE (IN)	%
$2D_{50}$	= 18.	30
D_{50}	= 9	50
$.5D_{50}$	= 4.5	10
$.2D_{50}$	= 1.8	10

3. FILTER BLANKET DESIGN

ASSUME BASE MATERIAL

$D_{85} = .09$ in

$D_{50} = .024$ in

$D_{15} = .006$ in

RIPRAP PROPERTIES

D_{95} = 15.3 IN.
D_{50} = 9 IN.
D_{15} = 2.7 IN.

a) BASED ON PASSED CALCULATIONS A FILTER BLANKET WILL BE NEEDED.

b) FILTER BLANKET WITH RESPECT TO BASE MATERIAL
EQ 5.1 PAGE 5.12 SURFACE MINING WATER DIVERSION DESIGN MANUAL

D_{50} (FILTER) / D_{50} (BASE) < 40

SO, D_{50} (FILTER) < 40 × .024 = .96 IN

D_{15} (FILTER) / D_{15} (BASE) < 40

SO, D_{15} (FILTER) < 40 × .006 = .24 IN

D_{15} (FILTER) / D_{85} (BASE) < 5

SO, D_{15} (FILTER) < 5 × .09 = .45 IN

D_{15} (FILTER) / D_{15} (BASE) > 5

SO, D_{15} (FILTER) > 5 × .006 = .03 IN

.03 < D_{15} (FILTER) < .24 IN

D_{50} (FILTER) < .96 IN.

c) FILTER BLANKET WITH RESPECT TO RIPRAP
EQ 5.2 PAGE 5.12 SURFACE MINING WATER DIVERSION DESIGN MANUAL

D_{50} (RIPRAP) / D_{50} (FILTER) < 40

SO D_{50} (FILTER) > 9/40 = .23 IN

D_{15} (RIPRAP) / D_{15} (FILTER) < 40

SO, D_{15} (FILTER) > 2.7/40 = .07 IN

D_{15} (RIPRAP) / D_{85} (FILTER) < 5

SO, D_{85} (FILTER) > 2.7/5 = .54 IN

D_{15} (RIPRAP) / D_{15} (FILTER) > 5

so, D_{15} (FILTER) < 2.7/5 = .54 in

.07 in < D_{15} (FILTER) < .54 in

D_{50} (FILTER) > .23 in

D_{85} (FILTER) > .54 in

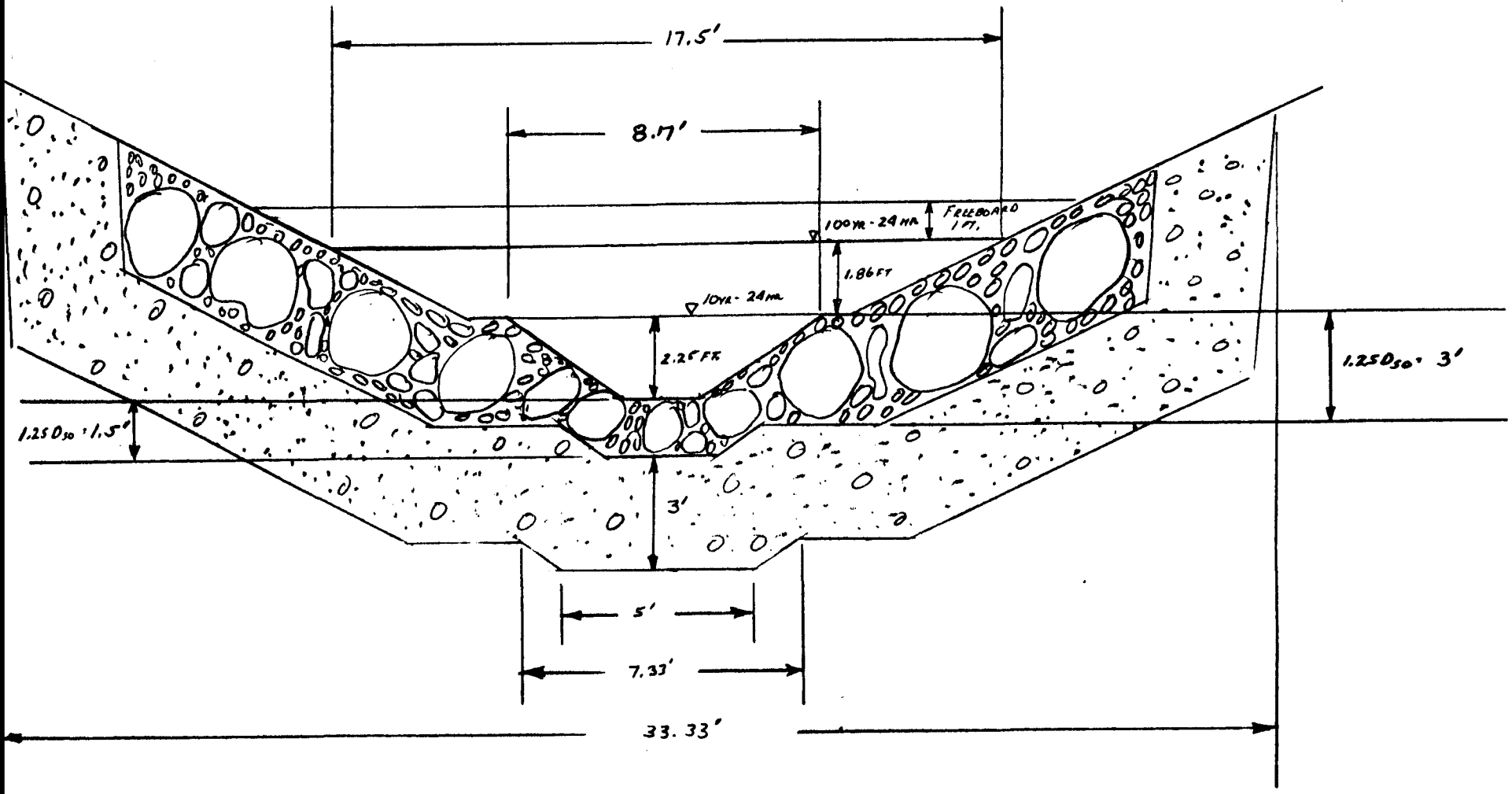
d) THICKNESS OF FILTER BLANKET

THICKNESS = MAX D_{80} = 3 FT.

REFERENCES : 1. SURFACE MINING WATER DIVERSION DESIGN MANUAL, UNITED STATES DEPT. OF INTERIOR, OFFICE OF SURFACE MINING.

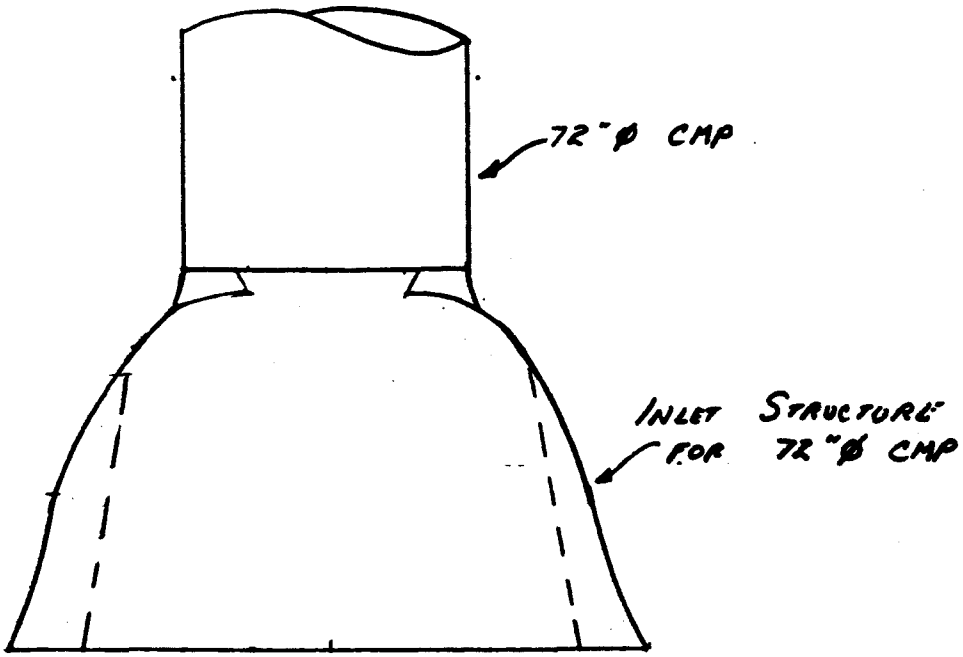
2. BARFIELD, B. J., R.C. WARNER, C.T. HAN, APPLIED HYDROLOGY AND SEDIMENTOLOGY FOR DISTURBED AREAS, OKLAHOMA TECHNICAL PRESS, STILLWATER, OK

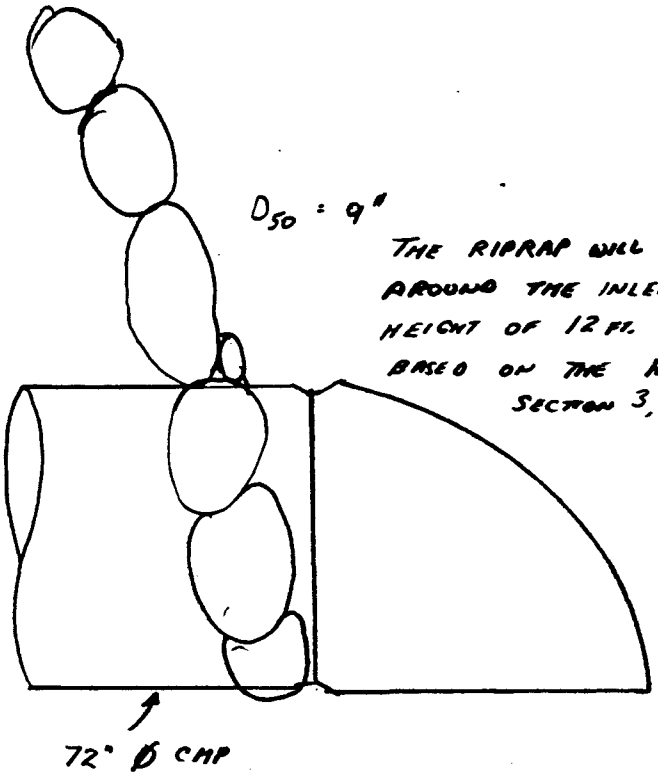
AMPAD 22-141 50 SHEETS
22-142 100 SHEETS
22-144 200 SHEETS



FINAL CHANNEL DIMENSION FOR
STREAM E

72" Ø CMP INLET STRUCTURE





THE RIPRAP WILL PLACED AROUND THE INLET FOR A HEIGHT OF 12 FT. THIS IS BASED ON THE HW IN SECTION 3, VOL. 5 PAGE 4

TRANSITION DESIGN FOR MIDDLE BRANCH TO No. 7 SPRING
(THIS WILL WORK FOR THE SOUTH BRANCH)

UPSTREAM CHANNEL

RIPRAP LINED
D_{50} = .75 FT.
S = .0458 MAP 4.4.2-181
BASE WIDTH = 10 FT.

DOWNSTREAM CHANNEL

RIPRAP LINED
D_{50} = 2.70
S = .1667 MAP 4.4.2-181
BASE WIDTH = 10 FT.

Q = 95.26 CFS

1) EVALUATE UPSTREAM CHANNEL SECTION PROPERTIES

$n = .0395\ D_{50}^{1/6}$
$= .0395\ (.75)^{.17}$
$= .0376$

EQ. 4.18 PAGE 4.10 SURFACE MINING WATER DIVERSION DESIGN MANUAL

$Q_n = Q\ n$
$= 95.26\ (.0376)$
$= 3.58$

FROM THE CHARTS IN APPENDIX C C-5

$V_n = .23$ $d = 1.13$ SURFACE MINING WATER DIVERSION DESIGN MANUAL

$V = V_n/n = .23/.0376 = 6.12$ FPS

2) EVALUATE DOWNSTREAM CHANNEL SECTION PROPERTIES

$n = .0395\ D_{50}^{1/6}$
$= .0395\ (2.7)^{.17}$
$= .0548$

EQ 4.18 PAGE 4.10 SURFACE MINING WATER DIVERSION DESIGN MANUAL

$Q_n = Q\ n$
$= 95.26\ (.0548)$
$= 5.22$

FROM THE CHARTS IN APPENDIX C - C-5

$V_n = .49$ $d = .95$ FT. SURFACE MINING WATER DIVERSION DESIGN MANUAL

$V = V_n/n = .49/.0548 = 8.94$ FPS

3) COMPUTE CHANGE IN WATER SURFACE PROFILE

$\Delta W.S. = 1.15\ \Delta h$

$V_2 = 8.99$ FPS
$V_1 = 1.12$ FPS

$\Delta h = V_2^2/2g - V_1^2/2g$

$= 1.15\left(\frac{(8.99)^2}{2g} - (1.12)^2/2g\right)$

$= 1.15\ (1.29 - .58)$

$= .76$ FT

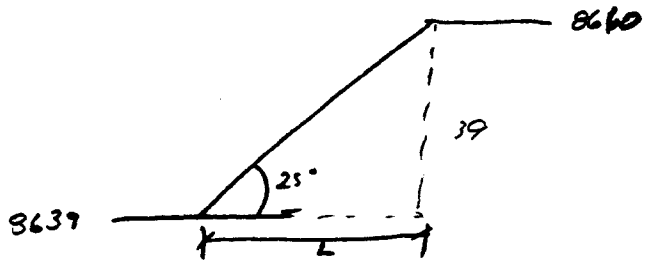
4) COMPUTE NECESSARY CHANGE

$\Delta B.E. = d_1 - d_2 + \Delta W.S$

$= 1.13 - .95 + .76$

$= .94$ FT.

5.) COMPUTE LENGTH OF TRANSITION



$\tan\theta = (8660 - 8639)/L$

$\tan 25° = 21/L$

$= 48.07$ FT

6) DETERMINE RIPRAP SIZE AND FILTER BLANKET

a) DESIGN - 95.26 CFS
CHANNEL SLOPE - .46 BOTTOM WIDTH = 10 FT

USE FIG 5.5 PAGE 5.18
SINCE THERE IS NO CURVE FOR S=.47 USE S=.50 CURVE. THIS WILL PROVIDE A SLIGHTLY CONSERVATIVE DESIGN. SURFACE MINING WATER DIVERSION DESIGN MANUAL

10 FT @ 95.26 CFS = D_{50} 2.3 FT.

FROM TABLE 5.2 PAGE 5.21 THE DESIGN
D_{50} = 2.5 FT.
SURFACE MINING WATER DIVERSION DESIGN MANUAL

$D_{MAX} = 1.25\ D_{50} = 1.25(2.5) = 3.13$ ft

RIPRAP GRADATION

	SIZE (ft)	%
$1.25\ D_{50}$	3.13	30
D_{50}	2.5	50
$.5\ D_{50}$	1.25	10
$.2\ D_{50}$	.5	10

2) DESIGN FILTER BLANKET

ASSUME BASE MATERIAL

$D_{85} = .09$ in
$D_{50} = .024$ in
$D_{15} = .006$ in

RIPRAP PROPERTIES

$D_{85} = 32$ in
$D_{50} = 30$ in
$D_{15} = 5.63$ in

a) FILTER BLANKET WITH RESPECT TO BASE MATERIAL
EQ. 5.2 PAGE 5.12 SURFACE MINING WATER DIVERSION DESIGN MANUAL

$D_{50}(\text{FILTER})/D_{50}(\text{BASE}) < 40$

so, $D_{50}(\text{FILTER}) < 40 \times .024 = .96$ in

$D_{15}(\text{FILTER})/D_{15}(\text{BASE}) < 40$

so $D_{15}(\text{FILTER}) < 40 \times .006 = .24$ in.

$D_{15}(\text{FILTER})/D_{85}(\text{BASE}) < 5$

so $D_{15}(\text{FILTER}) < 5 \times .09 = .45$ in

$D_{15}(\text{FILTER})/D_{5}(\text{BASE}) > 5$

so $D_{15}(\text{FILTER}) > 5 \times .006 = .03$

$.03\text{ in} < D_{15}(\text{FILTER}) < .45$ in.

$D_{50}(\text{FILTER}) < .96$ in

b) FILTER BLANKET WITH RESPECT TO RIPRAP

EQ. 5.2 PAGE 5.12 SURFACE MINING WATER DIVERSION DESIGN MANUAL

D_{50} (RIPRAP) / D_{50} (FILTER) < 40

SO D_{50} (FILTER) > 30/40 = .75 IN

D_{15} (RIPRAP) / D_{15} (FILTER) < 40

SO, D_{15} (FILTER) > 5.6/40 = .14 IN.

D_{15} (RIPRAP) / D_{85} (FILTER) < 5

SO, D_{85} (FILTER) > 5.6/5 = 1.12 IN

D_{15} (RIPRAP) / D_{15} (FILTER) > 5

SO, D_{15} (FILTER) < 5.6/5 = 1.12 IN

.14 IN < D_{15} (FILTER) < 1.12 IN

D_{50} (FILTER) > .75 IN

D_{85} (FILTER) > 1.12 IN.

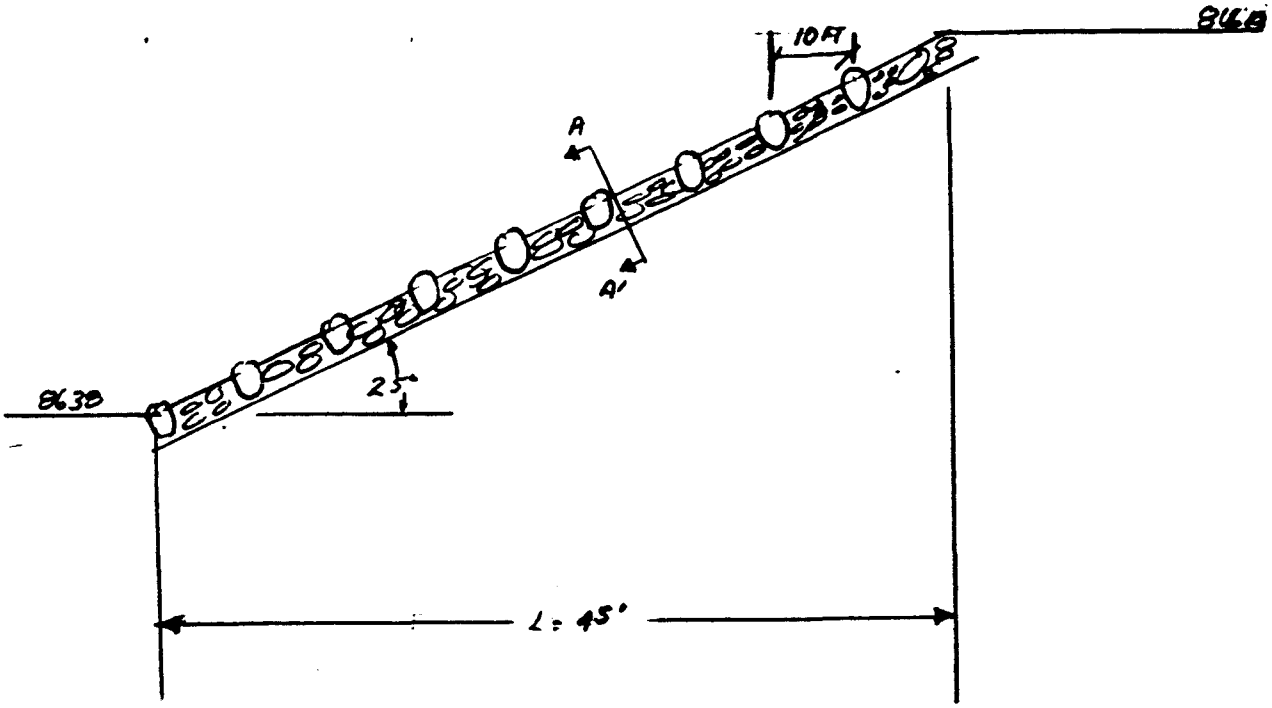
c) THICKNESS OF THE FILTER BLANKET.

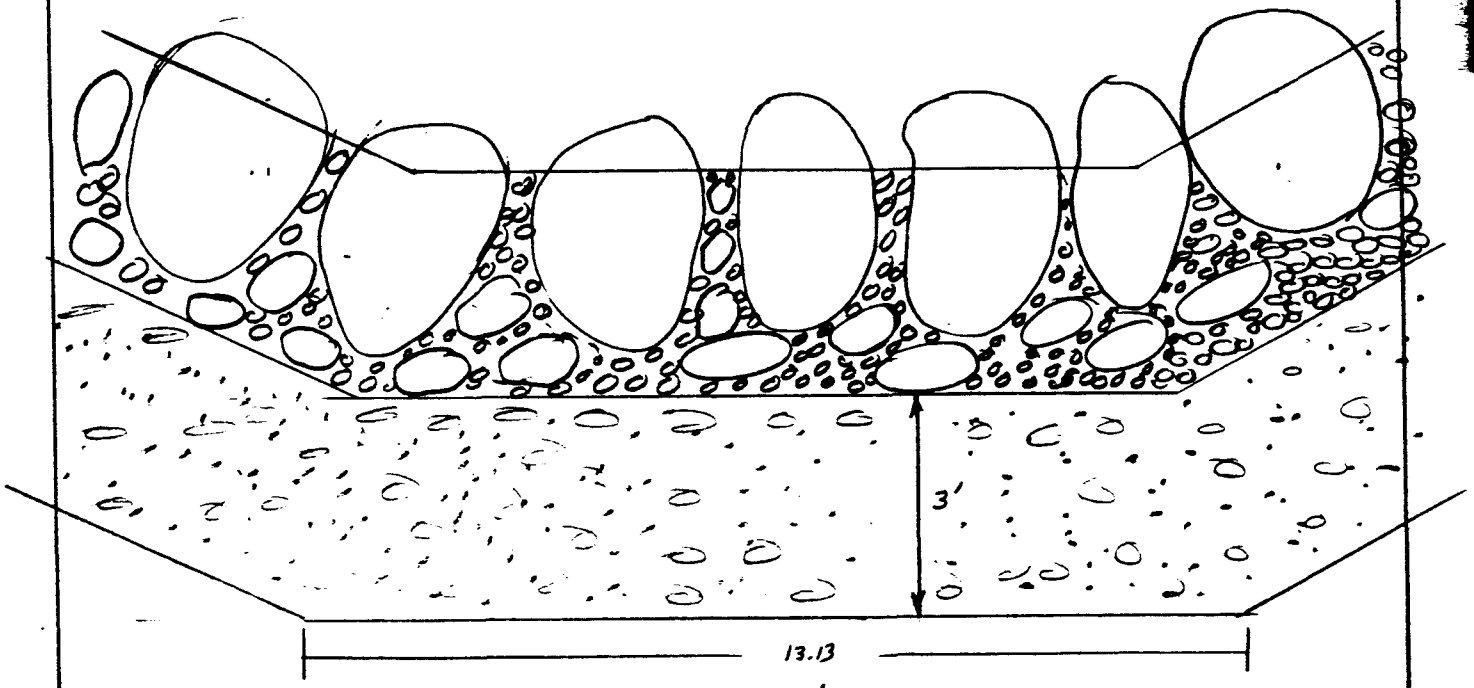
THICKNESS = MAX D_{50} = 3.13'

REFERENCE: SURFACE MINING WATER DIVERSION DESIGN MANUAL UNITED STATES DEPT. OF THE INTERIOR, OFFICE OF SURFACE MINING.

22-141 50 SHEETS
22-142 100 SHEETS
22-144 200 SHEETS
AMPAD

G. Taylor
Revised
11-9-89





Section A-A'

Final Channel Dimensions
For Transition Middle
Branch to Stream D

22-141 50 SHEETS
22-142 100 SHEETS
22-144 200 SHEETS
AMPAD

TRANSITION DESIGN FOR NORTH BRANCH TO MAIN STREAM.

UPSTREAM CHANNEL	DOWNSTREAM CHANNEL
RIPRAP LINED	RIPRAP LINED
$D_{50} = .75$ FT	$D_{50} = 2.7$
$S = .01$ MAP 4.4.2-181	$S = .1667$ MAP 4.4.2-181
BASE WIDTH = 10 FT	BASE WIDTH = 10 FT

$Q = 87.40$ CFS

1) EVALUATE UPSTREAM CHANNEL SECTION PROPERTIES

$n = .0395\ D_{50}^{1/6}$ — EQ 4.18 PAGE 4.10 SURFACE MINING WATER DIVERSION DESIGN MANUAL

$= .0395\ (.75)^{1/6}$

$= .038$

$Q_n = Q\,n$

$= (87.40)(.038)$

$= 3.29$

FROM THE CHARTS IN APPENDIX C C-5

$V_n = .25$ $d = 1.07$ SURFACE MINING WATER DIVERSION DESIGN MANUAL

$V = V_n/n = .25/.038 = 6.58$

2) EVALUATE DOWNSTREAM CHANNEL SECTION PROPERTIES

$n = .0395\ D_{50}^{1/6}$ — EQ 4.18 PAGE 4.10 SURFACE MINING WATER DIVERSION DESIGN MANUAL

$= .0395\ (2.7)^{1/6}$

$= .047$

$Q_n = Q\,n$

$= (87.40)(.047)$

$= 4.09$

FROM THE CHARTS IN APPENDIX C C-5

$V_n = .47$ $d = .85$ FT SURFACE MINING WATER DIVERSION DESIGN MANUAL

$V = V_n/n = .47/.038 = 12.37$

3) COMPUTE CHANGE IN WATER PROFILES

$\Delta S.\omega = 1.15\,\Delta h \qquad \Delta h = V_2^2/2g - V_1^2/2g$

$= 1.15\left(V_2^2/2g - V_1^2/2g\right)$

$= 1.15\left[(12.37)^2/2g - (6.56)^2/2g\right]$

$= 1.15\,(2.38 - .67)$

$= 1.15\,(1.71)$

$= 1.96$ FT.

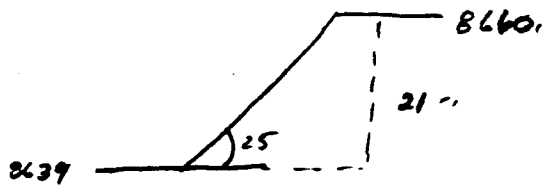
4) COMPUTE NECESSARY CHANGE

Δ B.E. $= d_2 - d_1 + \Delta$ W.S.

$= 1.07 - .85 + 1.96$

$= 2.18$ FT.

5) COMPUTE LENGTH OF TRANSITATION



$\tan\theta = (8660 - 8639)/L$

$\tan 25 = 21/L$

$L = 45$ FT.

6) DESIGN RIPRAP SIZE AND FILTER BLANKET

a) DESIGN = 87.40 CFS BOTTOM WIDTH = 10 FT.
CHANNEL SLOPE = .47

USE FIG. 5.5 PAGE 5-18
SINCE THERE IS NO CURVE FOR S=.47 USE S=.50 CURVE. THIS WILL PROVIDE A SLIGHTLY CONSERVATIVE DESIGN SURFACE MINING WATER DIVERSION DESIGN MANUAL

10 FT @ 87.40 CFS = D_{50} = 2.05 FT

FROM TABLE 5.2 PAGE 5-21 THE DESIGN
D_{50} = 2.25 FT. SURFACE MINING WATER DIVERSION DESIGN MANUAL

$D_{MAX} = 1.25\ D_{50} = (1.25)(2.25) = 2.81$ ft

RIPRAP GRADATION

	Size (ft)	%
$1.25\ D_{50}$	2.81	30
D_{50}	2.25	50
$.5 D_{50}$	1.13	10
$.20 D_{50}$	.45	10

2) DESIGN FILTER BLANKET

ASSUME BASE MATERIAL

D_{85} : .09 in
D_{50} : .024 in
D_{15} : .006 in

RIPRAP PROPERTIES

D_{85} : 28.66 in
D_{50} : 27 in
D_{15} : 5.06 in

a) FILTER BLANKET WITH RESPECT TO BASE MATERIAL
EQ 5.2 PAGE 5.12 SURFACE MINING WATER DIVERSION DESIGN MANUAL

D_{50} (FILTER) / D_{50} (BASE) < 40

so, D_{50} (FILTER) < .40 x .024 = .96 in

D_{15} (FILTER) / D_{15} (BASE) < 40

so, D_{15} (FILTER) < 40 x .006 = .24 in

D_{15} (FILTER) / D_{85} (BASE) < 5

so, D_{15} (FILTER) < 5 x .09 = .45 in.

D_{15} (FILTER) / D_{15} (BASE) > 5

so, D_{15} (FILTER) > 5 x .006 = .03 in.

.03 in < D_{15} (FILTER) < .45 in

D_{50} (FILTER) < .96 in.

b) FILTER BLANKET WITH RESPECT TO RIPRAP
EQ 5.2 PAGE 5.12 SURFACE MINING WATER DIVERSION DESIGN MANUAL

D_{50} (RIPRAP)/D_{50} (FILTER) < 40

so, D_{50} (FILTER) > 27/40 = .68 IN

D_{15} (RIPRAP)/ D_{15} (FILTER) < 40

so, D_{15} (FILTER) > 5.06/40 = .13 IN

D_{15} (RIPRAP)/D_{85} (FILTER) < 5

so, D_{85} (FILTER) > 5.06/5 = 1.01 IN

D_{15} (RIPRAP)/D_{15} (FILTER) > 5

so, D_{15} (FILTER) < 5.06/5 = 1.01 IN

.13 IN < D_{15} (FILTER) < 1.01 IN

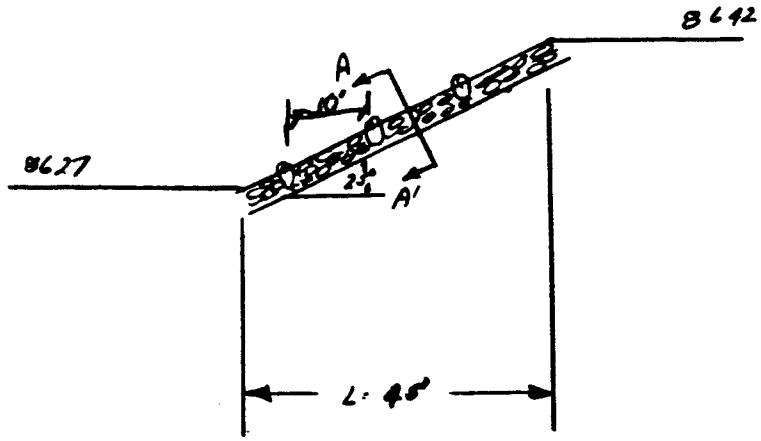
D_{50} (FILTER) > .68 IN

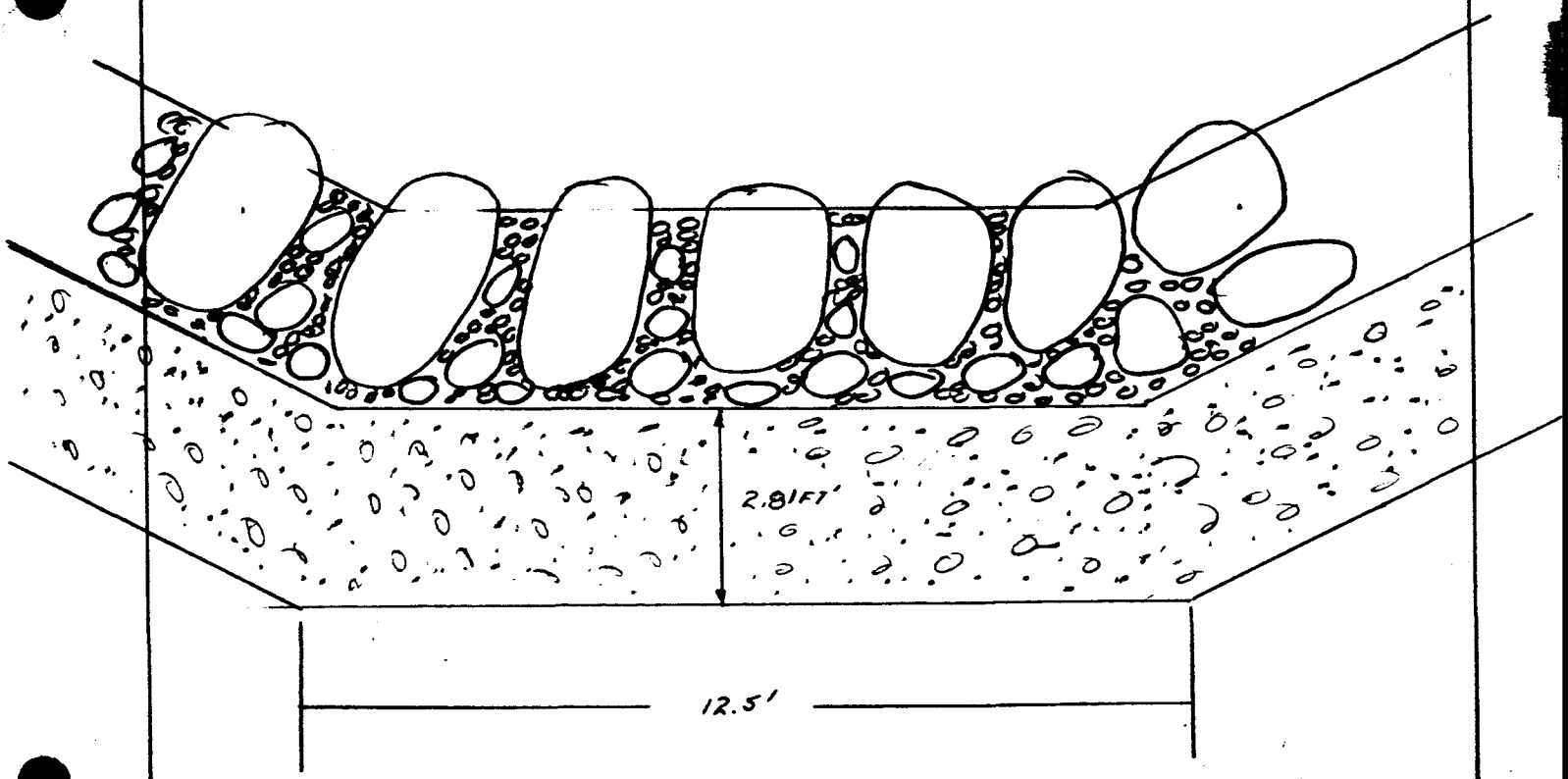
D_{85} (FILTER) > 1.01 IN.

C) THICKNESS OF THE FILTER BLANKET
THICKNESS = MAX D_{50} = 2.81 IN.

REFERENCE: SURFACE MINING WATER DIVERSION DESIGN MANUAL
UNITED STATES DEPT. OF THE INTERIOR, OFFICE OF
SURFACE MINING.

G. TAYLOR
REVISED
11-9-89





SECTION A-A'

FINAL CHANNEL DIMENSIONS
FOR TRANSITION NORTH
BRANCH TO STREAM D

22-141 50 SHEETS
22-142 100 SHEETS
22-144 200 SHEETS
AMPAD

SECTION 19

HYDROLOGY STUDY
SOUTH FORK BREAKOUT
AREA

HYDROLOGY STUDY
SOUTH FORK BREAKOUT
AREA

G. TAYLOR
7-5-89

MAP 3.2.4-2

SOIL TYPES

TYPE	1) PERCENT	1) HYD. GROUP	2) CN
UNITA FAMILY LOAM	50 %	B	55
TOZE FAMILY FINE SANDY LOAM	35 %	B	55
COMODORE BOULDERY LOAM	10 %	D	77
MIDFORK FAMILY BOUL	5%	B	55

1) SOIL SURVEY OF CARBON AREA, UTAH - UNITED STATES DEPARTMENT OF AGRICULTURE - SOIL CONSERVATION SERVICE

2) TABLE 2.20, PAGE 82 APPLIED HYDROLOGY AND SEDIMENTOLOGY FOR DISTURBED AREAS, BARFIELD AND HAAN
CN = 55 - FOREST LAND GOOD COVER CN = 77 FOREST LAND POOR COVER

CN = $.5(55) + .35(55) + .10(77) + .05(55) / .5 + .35 + .10 + .05$

= $27.50 + 19.25 + 7.70 + 2.75 / 1$

= 57.20 USE 57

S = $1000/CN - 10$ EQ. 2.39 PAGE 81 APPLIED HYDROLOGY AND SEDIMENTOLOGY FOR DISTURBED AREA - BARFIELD AND HAAN

= $1000/57 - 10$

= 7.54

AREA OF THE WATER SHED

PLANIMETER READING = 3,228

443 x .0149 in² = 6.60 in² x 22.96 acre/in² = 151.55 ACRES

151.55 ACRES x 43,560 ft²/ACRES = 6,601,608.26 ft²

15 | Ans

TIME PARAMETERS

CONCENTRATION TIME - KIRPICH

$t_c = .0078\, L^{0.77} (L/H)^{0.385}$

EQ 2.58 PAGE 102 APPLIED HYDROLOGY AND SEDIMENTOLOGY FOR DISTURBED AREA - BARFIELD AND HAAN.

$L = 3,850$ FT.

$H = 828$ FT.

$t_c = .0078\,(3,850)^{0.77}\,(3850/828)^{.385}$

$= .0078\,(576.51)\,(1.81)$

$= 8.13$ MIN. USE .14 HRS

LAG TIME

$t_L = L^{0.8}(S+1)^{0.7} / 1900\, Y^{0.5}$

EQ 2.60 PAGE 102 APPLIED HYDROLOGY AND SEDIMENTOLOGY FOR DISTURBED AREAS BARFIELD AND HAAN

$Y = \Sigma c_i \times i$ / AREA IN SQ FT

$i = 80$ FT

$A = 6,601,608.26$ SQ. FT.

ΣC_i		CONTOUR
600	-	8,720
1,400	-	8,800
2,300	-	8,880
2,875	-	8,960
3,400	-	9,040
3,650	-	9,120
3,700	-	9200
3,300	-	9280
3,000	-	9360
2,200	-	9440
450	-	9,520
650	-	9,520
27,525 FT		

$y = 27,525 \text{ FT} \times 80 \text{ FT} / 6,601,608.26$

$= 2,202,000 / 6,601,608.26$

$= 33\%$

$t_L = (3,850)^{.8} (7.48+1)^{.7} / 1900 (33)^{.5}$

$= (738.53)(4.47) / 1900 (5.74)$

$= 3,301.23 / 10,906$

$= .30$

$= 18.16$ MIN. USE 18 MINS.

$t_L = 0.6\, t_c$ EQ. 2.59 PAGE 102 APPLIED HYDROLOGY AND SEDIMENTOLOGY FOR DISTURBED AREAS - BARFIELD AND MAAR

$18. = .6 (t_c)$

$t_c = 0.494$ HRS

PEAK FLOW USING SCS CURVE METHOD

EVENT	PEAK FLOW
2YR - 24 HR	7 CFS
10YR - 24 HR	3.8 CFS
25YR - 24 HR	12.5 CFS
50YR - 24 HR	24.6 CFS
100YR - 24 HR	39.1 CFS

CULVERT SELECTION

USE 100 YR - 24 HR EVENT - 39.1 CFS = Q

SIZE OF CULVERT - FLAT SLOPE

$Q = 2.58\ D^{2.5}$

$D = (Q/2.58)^{1/2.5}$

$= (39.1/2.58)^{.4}$

$= 2.97$ FT $\times 12$ IN/FT

$= 35.6$ IN

USE A 36 IN CULVERT

EFFECT OF SLOPE

$S = 2.04/D^{1/3}$ $\qquad S = .14$

$.14 = 2.04/D^{.33}$

$D^{.33} = 2.04/.14$

$D^{.33} = 14.57$

$= 2.42$ FT $\times 12$ IN/FT

$= 29.05$ IN

USE 30 IN CULVERT

USE A 36 IN CULVERT TO HANDLE PEAK FLOW

22-141 50 SHEETS
22-142 100 SHEETS
22-144 200 SHEETS
AMPAD

DESIGN

GIVEN

PIPE DIA. - 36"
COVER - 15"
LIVE LOAD - 0
WEIGHT OF SOIL - 100 lb/ft³

DETERMINE WALL THICKNESS AND CORRUGATION

1 BACKFILL SOIL DENSITY
90% COMPACTION

2 DESIGN PRESSURE

$P_V = DL + LL$ $\quad DL = H \times \omega$
$= 15 ft \times 100 lb/ft^3 + 0$ $\quad LL$ = NEGLIGIBLE FOR COVER
$= 1500 lb/ft^2$

3 RING COMPRESSION

$C = P_V \times S/2$ $\quad S$ = SPAN IN FT = 3 FT
$= 1,500 lb/ft^2 \times 3/2$
$= 1,500 lb/ft^2 \times 1.5 ft$
$= 2,250 lb/ft$

4 ALLOWABLE WALL STRESS
FIG 3-6 $f_c = 22,500 lb/in^2$ PAGE 105 - HANDBOOK OF STEEL
FOR $2\frac{2}{3} \times \frac{1}{2}$ IN. CORRUGATION DRAINAGE AND HIGHWAY
CONSTRUCTION PRODUCTS

5 WALL CROSS - SECTIONAL AREA

$A = C/f_c$

$= 2,250 lb/ft / 22,500 lb/in^2$

$= .10 in^2/ft$

FROM TABLE 3-2, A SPECIFIED THICKNESS OF 0.064 IN. PROVIDES
AN WALL AREA OF .775 PAGE 107 HANDBOOK OF STEEL
DRAINAGE AND HIGHWAY CONSTRUCTION
PRODUCT

6. $FF = D^2/EI$ = FLEXIBILITY FACTOR = .0433 MAX

D = DIA. = 36 IN
E = 30×10^6 LB/IN^2
I = .00189 IN^2/FT

$$FF = (36)^2 / 30 \times 10^6 \times .00189$$

$$= 1{,}296 / 56{,}700$$

$$= .02286$$

.02286 < .0433 THEREFORE $2\frac{2}{3} \times \frac{1}{2}$ IN. CORRUGATION IS OK

PURCHASE A 36 IN. DIA. PIPE WITH $2\frac{2}{3} \times \frac{1}{2}$ IN CORRUGATIONS.

22-141 50 SHEETS
22-142 100 SHEETS
22-144 200 SHEETS
AMPAD

TEMPORARY CULVERT SELECTION

Q = >1 CFS USE 1 CFS 2 YR - 24 HR

SIZE OF CULVERT - FLAT SLOPE

$Q = 2.58 \; D^{2.5}$

$D = (Q/2.58)^{1/2.5}$

$= (1\,CFS/2.58)^{.4}$

$= .684\,FT \times 12\,IN/FT$

$= 8.21\,IN.$

NEED A 12 IN CULVERT

USE A 18 IN. DIA. CULVERT

22-141 50 SHEETS
22-142 100 SHEETS
22-144 200 SHEETS
AMPAD

CHANNEL RECONSTRUCTION

TRAPEZOIDAL TYPE CHANNEL DESIGN

$Q = 39.1$ CFS

$S = .143$ FT/FT (FIELD SURVEY)

$n = .04$

$b = 9$ FT

$Z = \frac{1.5}{1} = 1.5$

$$Q = VA = \frac{1.49}{n} R^{2/3} A$$

$$= \frac{1.49}{n}\left[\frac{bd + zd^2}{b + 2d\sqrt{z^2+1}}\right]^{2/3} S^{1/2}(bd + zd^2)$$

$$39.1 = \frac{1.49}{.04}\left[\frac{9d + 1.5d^2}{9 + 3.61d}\right]^{2/3}(.143)^{.5}(9d + 1.5d^2)$$

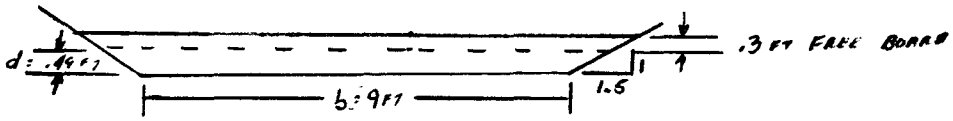
$$2.78 = \left[\frac{9d + 1.5d^2}{9 + 3.61d}\right]^{2/3}(9d + 1.5d^2)$$

4.0 4.4

$b = 9$ FT

TRIAL d FT	Q
.2	.63
.3	.80
.35	1.08
.4	1.98
.42	2.15
.44	2.33
.46	2.51
.48	2.69
.49	2.79

$d = .49$ FT.



DETERMINE RIPRAP D_{50} AND DESIGN FOR SF = 1.20

$V = \frac{1.49}{n} R^{2/3} S^{1/2}$

$n = .04$

$S = .143$ FT/FT

$R = \frac{bd + 2d^2}{b + 2d\sqrt{Z^2+1}} = \frac{9(.49) + 1.5(.49)^2}{9 + (.49)(2)\sqrt{1.5^2+1}} = \frac{4.77}{10.767} = .443$

$V = \frac{1.49}{.04} (.443)^{.66} (.143)^{.5}$

$= (37.25)(.588)(.38)$

$= 8.27$ FT/SEC.

STONE $D_{50} = 7.5$ IN $= .625$ FT.

CHECK n VALUE

$n = .0395 D_{50}^{.17}$ EQ. 3.34 PAGE 188 APPLIED HYDROLOGY AND SEDIMENTOLOGY FOR DISTURBED AREAS BARFIELD AND HAN.

$= .0395 (.625)$

$= .036$

CHECK FOR STABILITY

$d = .49$ FT $S = 14.3$ $\gamma = 62.4$

$\tau = \gamma d s$

$= (62.4)(.49 \text{ ft})(.143) = 4.372$ lb/ft^2

$n_b = \frac{21\tau}{\gamma(SG-1)D_{50}}$ SG - 2.36 EQ 3.33 PAGE 188 APPLIED HYDROLOGY AND SEDIMENTOLOGY FOR DISTURBED AREAS - BARFIELD AND HAN

$n_b = \frac{21(4.372)}{(62.4)(2.36-1)(.63)}$

$= \frac{91.812}{53.464}$

$= 1.72$

SF MUST BE > 1

$\phi = 42°$ ANGULAR RIPRAP

14.3 % SLOPE

$\theta = 8°$

$SF_b = \cos\theta \tan\phi / \sin\theta + n_b \tan\phi$

$= (\cos 8)(\tan 42) / (\sin 8) + (1.72)(\tan 42)$

$= (.990)(.900) / (.139) + 1.549$

$= .891 / 1.682$

$= .521$ UNDER DESIGNED RESIGN STREAM CHANNEL

EQ 3.26 PAGE 186 APPLIED HYDROLOGY AND SEDIMENTOLOGY FOR DISTURBED AREA - BARFIELD AND HAAR.

D_{50} (FT)	MANNING'S n	ANGLE OF REPOSE (DEG)	DEPTH OF CONVEY FLOW	TRACTIVE FORCE	STABILITY FACTOR	SAFETY FACTOR
.63	.036	42°	.49	4.372	1.72	.521
1.26	.041	42°	.49	4.372	.859	.982
1.6	.043	42°	.49	4.372	.676	1.192

$D_{50} = 1.6$ FT.

DETERMINE RIPRAP FOR BANK SF = 1.2

$D_{50} = 1.6$ FT, $n = .043$, $\theta = 8°$, $d = .49$ FT.

ASSUME

$$\tau_{max} = .76 \gamma d s$$

$$= .76 (62.4)(.49)(.043) = 3.323 \text{ lb/FT}^2$$

$$n = (21)(\tau_{max}) / \gamma (SG - 1) D_{50}$$

$$= (21)(3.323) / 62.4 (2.36 - 1) 1.6$$

$$= 69.783 / 135.782$$

$$= .514$$

EQ 3.37 PAGE 190 APPLIED HYDROLOGY AND SEDIMENTOLOGY FOR DISTURBED AREAS - BARFIELD AND HARR

ASSUME UNIFORM FLOW

$$\lambda = \theta = 8°$$

SIDESLOPE

$$\alpha = \tan^{-1} 1/1.5$$

$$= 33.69°$$

$$B = \tan^{-1} \left[\cos\lambda / \frac{2 \sin\alpha}{n \tan\phi} + \sin\lambda \right]$$

$$= \tan^{-1} \left[.990 / 2(.555)/.514(.900) + .139 \right]$$

$$= \tan^{-1} (.390)$$

$$= 21.32°$$

EQ 3.36 PAGE 190 APPLIED HYDROLOGY AND SEDIMENTOLOGY FOR DISTURBED AREAS - BARFIELD AND HARR

$$n' = n \left[\frac{1 + \sin(\lambda + B)}{2} \right]$$

$$= .514 \left[\frac{1 + \sin(8 + 21.32)}{2} \right]$$

$$= .514 \left[1.019/2 \right]$$

$$= .383$$

EQ. 3.38 PAGE 190 APPLIED HYDROLOGY AND SEDIMENTOLOGY FOR DISTURBED AREA - BARFIELD AND HARR

22-141 50 SHEETS
22-142 100 SHEETS
22-144 200 SHEETS
AMPAD

Eq 3.35 PAGE 190
APPLIED HYDROLOGY AND
SEDIMENTOLOGY FOR DISTURBED
AREAS - BARFIELD AND HARPER

$$SF = \cos\alpha \tan\phi / n' \tan\phi + \sin\alpha \cos\beta$$

$$= \cos 33.69 \tan 42 / (.383)(\tan 42) + (\sin 33.69)(\cos 21.32)$$

$$= (.832)(.900) / .345 + (.555)(.932)$$

$$= .749 / .862$$

$$= .869$$

D_{50}	n	β	n'	SF
1.6	.514	21.32°	.383	.869
1.8	.456	19.21	.332	.90
2.0	.411	17.52	.294	.944
2.2	.374	16.09	.263	.979
2.5	.329	14.304	.227	1.009
2.7	.305	13.327	.208	1.03
3.0	.274	12.059	.184	1.06
3.5	.235	10.426	.155	1.09
4.0	.206	9.17	.133	1.12
5.0	.164	7.391	.104	1.17
5.5	.150	6.737	.094	1.18
6.0	.137	6.189	.085	1.19

USE 6 FT D_{50} FOR BOTH CHANNEL BOTTOM AND SIDES

22-141 50 SHEETS
22-142 100 SHEETS
22-144 200 SHEETS
AMPAD

BASED ON THE CALCULATION THE BOTTOM AND SIDESLOPE RIPRAP WILL BE 1.6 FT = D_{50}

RIPRAP GRADATION

	SIZE FT	PERCENT
$2 D_{50}$	3.2	100
$1 D_{50}$	1.6	50
$.5 D_{50}$	.8	20
$.2 D_{50}$	.32	0

22-141 50 SHEETS
22-142 100 SHEETS
22-144 200 SHEETS
AMPAD

UNDERLYING FILTER

BASE MATERIAL

D_{50} = .600 mm

D_{85} = 2.36 mm

D_{15} = .150 mm

RIPRAP

D_{100} = 3.2 ft = 975.36 mm

D_{50} = 1.6 ft = 487.68 mm

D_{85} = 2.9 ft = 883.92 mm

D_{15} = .24 ft = 73.15 mm

D_0 = .10 ft = 30.48 mm

FILTER BLANKET WITH RESPECT TO BASE MATERIAL

(1) D_{50} (Filter) / D_{50} Base < 40

D_{50} (Filter) < 40 × .6 = 24 mm

(2) D_{15} (Filter) / D_{15} (Base) > 5

D_{15} (Filter) > 5 × .150 = .75 mm

PAGE 195 APPLIED HYDROLOGY AND SEDIMENTOLOGY FOR DISTURBED AREAS - BARFIELD AND HAAN

D_{15} (Filter) / D_{15} (Base) < 40

D_{15} (Filter) < 40 × .15 = 6.00 mm

(3) D_{15} (Filter) / D_{85} (Base) < 5

D_{15} (Filter) < 5 × 2.36 = 11.80 mm

ENERGY DISSIPATOR FOR DISCHARGE END OF CULVERT 100YR-24 HR

$Q = VA$

$Q = \frac{1.49}{n} R^{2/3} S^{1/2} A$

$D = TW$ = TAILWATER DEPTH

$n = .024$

$S = .143$ FIELD SURVEY

$39.1 = \frac{1.49}{.024} \left(\frac{.576 D}{1.957 D} \right)^{.66} (.143) \frac{\pi D^2}{4}$

$39.1 = 62.09 (.295 D)^{.66} (.143)(.785 D^2)$

$39.1 = 9.877 (.295 D)^{.66} (.785 D^2)$

$4.404 = (.295 D)^{.66} (.785 D^2)$

D	Q
1 FT	.351
2 FT	2.317
3 FT	6.519
2.5 FT	4.01
2.6 FT	4.45

$D = 2.6$ FT $= TW$

CALCULATE APRON WIDTH

$W_A = D + L_a \quad (TW < .5D)$

$W_A = D + .4 L_a \quad (TW \geq .5 D)$

$TW = 2.6 > .5D = 1.50$

$Q = 39.1$ CFS $\quad D = 3$ FT $\quad d_{50} \approx .33$ FT. $\quad L_A = 10$ FT

$W_A = D + .4 L_A$

$= 3 \text{ FT} + .4 (10)$

$= 3 \text{ FT} + 4 \text{ FT}$

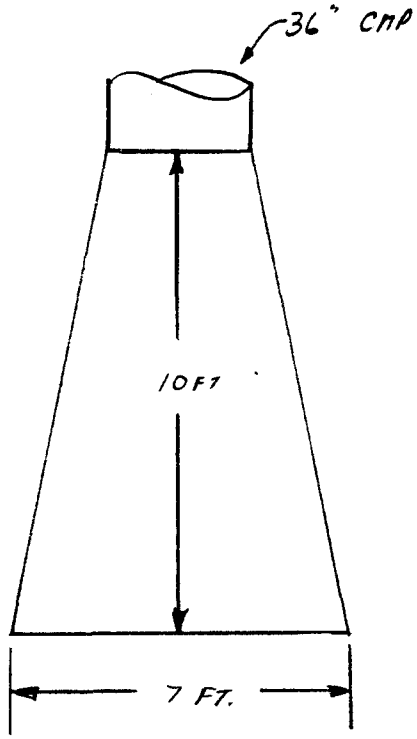
$= 7 \text{ FT}$

$d_{max} = 1.5 \times D_{50}$

$= 1.5 \times .33$

$= .50 \text{ FT} \quad = 6''$

ENERGY DISSIPATION



d_{50} : 4 in.

d_{max} : 6 in.

REFERENCE

1. BARFIELD, B. J., R.C. WARNER AND C. T. HAAN, 1985 APPLIED HYDROLOGY AND SEDIMENTOLOGY FOR DISTURBED AREAS. OKLAHOMA TECHNICAL PRESS, STILLWATER, OKLAHOMA.

2. HANDBOOK OF STEEL DRAINAGE AND HIGHWAY CONSTRUCTION PRODUCTS. AMERICAN IRON AND STEEL INSTITUTE. WASHINGTON D.C. THIRD EDITION

3. HYDRAULIC DESIGN OF STILLING BASINS AND ENERGY DISSIPATORS UNITED STATES DEPARTMENT OF THE INTERIOR, BUREAU OF RECLAMATION.

4. SOIL SURVEY OF CARBON AREA, UTAH, UNITED STATES DEPARTMENT OF AGRICULTURE, SOIL CONSERVATION SERVICE.

22-141 50 SHEETS
22-142 100 SHEETS
22-144 200 SHEETS
AMPAD

CLIMATOLOGICAL DATA SUMMARY

YEAR 1984	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	OCT	NOV	DEC
TEMPERATURE -F												
-MAX							79	78	73	60	52	45
-MIN							40	41	17	2	-5	-10
-AVE HIGH							72.0	70.6	60.8	41.6	36.2	28.6
-AVE LOW							46.0	44.9	33.9	20.8	14.5	9.1
PRECIPITATION												
-TOTAL							1.76	1.60	1.60	5.02	3.14	3.86
-NO DAYS 1 IN +							16	12	10	15	10	14
SNOW COVER												
-MAX DEPTH							0	0	2	14	24	43

YEAR 1985	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	OCT	NOV	DEC
TEMPERATURE -F												
-MAX	43	46	48	63	68	79	85	81	77	63	57	45
-MIN	-24	-26	-13	5	20	29	38	31	19	21	-2	-16
-AVE HIGH	29.6	27.5	35.0	47.9	57.1	67.5	73.3	70.2	57.4	50.0	34.0	33.7
-AVE LOW	5.8	3.8	11.4	23.8	32.7	39.9	49.7	43.5	34.1	27.0	16.5	8.4
PRECIPITATION												
-TOTAL	1.20	1.35	2.85	1.91	1.34	1.27	4.53	0.00	2.55	2.54	5.63	1.82
-NO DAYS 1 IN +	9	12	14	8	8	5	14	0	7	8	16	8
SNOW COVER												
-MAX DEPTH	41	51	57	47	4	0	0	0	0	4	38	888

YEAR 1986	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	OCT	NOV	DEC
TEMPERATURE -F												
-MAX	51	52	57	59	71	81	80	80	74	62	59	44
-MIN	-7	-14	10	6	13	22	39	40	19	12	0	-8
-AVE HIGH	40.4	34.1	44.8	44.3	53.6	72.1	71.8	71.9	59.9	51.2	40.4	35.0
-AVE LOW	13.2	13.9	21.8	23.2	28.1	39.3	43.6	46.7	33.4	25.5	19.3	11.7
PRECIPITATION												
-TOTAL	1.65	8.73	2.88	2.56	2.77	0.15	0.92	1.29	2.38	1.62	1.71	0.32
-NO DAYS 1 IN +	6	15	12	12	9	3	10	6	11	9	11	4
SNOW COVER												
-MAX DEPTH	38	79	57	31	4	0	0	0	5	4	13	6

SUMMARY OF WATER QUALITY ANALYSIS - UTAH FUEL CO.

SITE NAME	CS-1	CS-1	CS-1	CS-1	CS-1	CS-1	CS-1	CS-1	CS-1	CS-1
SAMPLE DATE	05/12/81	06/28/81	07/30/81	08/20/81	09/25/81	11/21/81	06/30/82	07/22/82	08/20/82	09/14/82
LOCATION	UPR S. FORK	UPR S. FORK	UPR S. FORK	UPR S. FORK	UPR S. FORK	UPR S. FORK	UPR S. FORK	UPR S. FORK	UPR S. FORK	UPR S. FORK
LOCATION	ECCLES CR.	ECCLES CR.	ECCLES CR.	ECCLES CR.	ECCLES CR.	ECCLES CR.	ECCLES CR.	ECCLES CR.	ECCLES CR.	ECCLES CR.
PHYSICAL PARAMETERS										
AIR TEMPERATURE (C)	11	21.5	24	14	13	2	15	15	18	6
FLOW (CFS)	0.61	0.34	0.20	0.20	0.15	0.23	2.37	0.75	0.32	0.32
WATER TEMPERATURE (C)	5	11	13	9	7	0	8	8	9	3
SPEC. COND. (UMHOS/CM) FIELD	182	350	360	380	380	450	300	410	395	490
PH FIELD	8.0	7.9	8.3	7.4	7.9	8.0	8.2	8.3	8.4	8.6
TURBIDITY (NTU) FIELD							13	5.9	9.2	16
TOTAL SUSP. SOLIDS							10.0	2.0	10.0	1.0
TOTAL DISS. SOLIDS MEAS.							188	272	326	335
OXYGEN (O) DISS									8.2	
COMMON IONS										
CALCIUM (CA)							53.50	73.60	80.00	82.40
MAGNESIUM (MG)							9.10	13.44	27.36	28.32
SODIUM (NA)							1.9	13.0	2.6	3.0
POTASSIUM (K)							0.62	0.65	1.49	1.87
ACIDITY AS CACO3									4.00	
ALKALINITY AS CACO3 (LAB)								233	250	
BICARBONATE (HCO3) (LAB)							176	284	306	314
SULFATE (SO4)							28.0	30.0	39.0	60.0
CHLORIDE (CL)							0.60	5.10	19.20	5.60
FLUORIDE (F)									0.15	
NUTRIENTS										
NITRATE (NO3-N)									0.09	
AMMONIA (NH3 AS N)							0.23		0.33	
TOTAL PHOSPHATE (PO4)							0.050		0.050	
TRACE ELEMENTS										
BARIUM (BA) TOTAL									0.035	
BORON (B) TOTAL									0.025	
COPPER (CU) TOTAL									0.010	
IRON (FE) TOTAL							0.300	0.070	0.110	0.080
LEAD (PB) TOTAL									0.002	
MANGANESE (MN) TOTAL							0.010	0.005	0.010	0.010
ZINC (ZN) TOTAL									0.005	
ORGANIC PARAMETERS										
ORGANIC CARBON (TOTAL)									11.7	
PHENOLS							0.004		0.004	
OTHER PARAMETERS										
OIL AND GREASE							0.8		1.4	
CYANIDE (CN) TOTAL									0.008	

All quantities in milligrams per liter unless otherwise noted. Blank line indicates parameter not tested.

Output Date: 02-09-1987
HWQ-6/86-R1

SUMMARY OF WATER QUALITY ANALYSIS - UTAH FUEL CO.

SITE NAME	CS-1	CS-1	CS-1	CS-1	CS-1	CS-1	CS-1	CS-1	CS-1	CS-1
SAMPLE DATE	06/30/83	07/20/83	08/25/83	09/29/83	10/27/83	11/11/83	06/28/84	07/30/84	08/27/84	09/18/84
LOCATION	UPR S. FORK	UPR S. FORK	UPR S. FORK	UPR S. FORK	UPR S. FORK	UPR S. FORK	UPR S. FORK	UPR S. FORK	UPR S. FORK	UPR S. FORK
LOCATION	ECCLES CR.	ECCLES CR.	ECCLES CR.	ECCLES CR.	ECCLES CR.	ECCLES CR.	ECCLES CR.	ECCLES CR.	ECCLES CR.	ECCLES CR.
PHYSICAL PARAMETERS										
AIR TEMPERATURE (C)	7	14	14	11	0	3	20	3	21	10
FLOW (CFS)	3.85	1.22	0.47	0.38	0.14	0.18	1.69	0.93	0.42	0.31
WATER TEMPERATURE (C)	4	8	10	5	1	1	8	11	13	7
SPEC. COND. (UMHOS/CM) FIELD	313	440	551	578	559	529	327	572	704	622
PH FIELD	7.7	8.2	8.0	8.1	7.8	7.6	7.5	7.8	8.1	8.0
TURBIDITY (NTU) FIELD	13	8.0	3.3	8.5	11	13	22	24	15	20
TOTAL SUSP. SOLIDS	13.0	7.0	13.0	13.0	11.0	11.0	7.0	14.0	11.0	9.0
TOTAL DISS. SOLIDS MEAS.	204	268	295	290	340	380	360	480	475	422
OXYGEN (O) DISS			7.2						8.0	
COMMON IONS										
CALCIUM (CA)	52.00	66.40	64.00	75.00	76.80	81.60	84.00	83.20	92.00	94.00
MAGNESIUM (MG)	10.08	16.32	21.60	22.56	24.48	25.92	26.40	22.30	22.60	33.60
SODIUM (NA)	16.1	10.0	15.0	2.50	12.00	2.70	2.20	7.50	55.00	2.90
POTASSIUM (K)	0.74	1.1	0.8	1.6	1.2	1.6	1.0	3.00	2.45	2.47
ACIDITY AS CACO3			23.00						4.00	
ALKALINITY AS CACO3 (LAB)			210						250	
BICARBONATE (HCO3) (LAB)	217	254	256	266	271	288	219.6	298.9	305.0	311.1
SULFATE (SO4)	22.0	40	62	60	79	65	134	74	109	106
CHLORIDE (CL)	6.0	6.0	2.0	4.00	6.00	6.00	1.7	0.8	50.0	9.0
FLUORIDE (F)			0.09						0.27	
NUTRIENTS										
NITRATE (NO3-N)			<0.02						0.11	
AMMONIA (NH3 AS N)	<0.1		0.80		0.50		0.22		0.01	
TOTAL PHOSPHATE (PO4)	0.16		0.005		0.06		0.02		0.02	
TRACE ELEMENTS										
BARIUM (BA) TOTAL			0.032						0.04	
BORON (B) TOTAL			0.010						0.107	
COPPER (CU) TOTAL			<0.001						0.018	
IRON (FE) TOTAL	0.350	0.130	0.335	0.060	0.150	0.060	0.31	0.33	0.30	0.20
LEAD (PB) TOTAL			<0.001						<0.001	
MANGANESE (MN) TOTAL	0.013	0.012	0.010	0.010	0.015	0.010	0.02	0.12	0.02	0.01
ZINC (ZN) TOTAL			0.20							
ORGANIC PARAMETERS										
ORGANIC CARBON (TOTAL)			2.50						2.10	
PHENOLS	0.171		<0.001		0.110		<0.001		<0.001	
OTHER PARAMETERS										
OIL AND GREASE	1.4		<0.2		<0.2		0.8		<0.1	
CYANIDE (CN)			<0.001						<0.001	

All quantities in milligrams per liter unless otherwise noted. Blank line indicates parameter not tested.

Output Date: 02-09-1987
HWQ-6/86-R1

SUMMARY OF WATER QUALITY ANALYSIS - UTAH FUEL CO.

SITE NAME	CS-1	CS-1
SAMPLE DATE	10/17/85	06/19/86
LOCATION	UPR S. FORK	UPR S. FORK
LOCATION	ECCLES CR.	ECCLES CR.
PHYSICAL PARAMETERS		
AIR TEMPERATURE (C)	-2	18
FLOW (CFS)	0.27	3.61
WATER TEMPERATURE (C)	0.5	8
SPEC. COND. (UMHOS/CM) FIELD	609	383
PH FIELD	8.3	7.4
TURBIDITY (NTU) FIELD	3.1	4.8
TOTAL SUSP. SOLIDS	7.0	13.0
TOTAL DISS. SOLIDS MEAS.	370	212
COMMON IONS		
CALCIUM (CA)	88.80	56.00
MAGNESIUM (MG)	28.60	13.90
SODIUM (NA)	1.80	3.00
POTASSIUM (K)	2.28	0.66
BICARBONATE (HCO3) (LAB)	298.9	178.1
SULFATE (SO4)	98	24
CHLORIDE (CL)	3.1	1.8
NUTRIENTS		
AMMONIA (NH3 AS N)	<0.01	0.46
TOTAL PHOSPHATE (PO4)	0.06	0.25
TRACE ELEMENTS		
IRON (FE) TOTAL	<0.01	0.29
MANGANESE (MN) TOTAL	<0.01	<0.01
ORGANIC PARAMETERS		
PHENOLS	<0.001	<0.001
OTHER PARAMETERS		
OIL AND GREASE	0.4	1.6

All quantities in milligrams per liter unless otherwise noted. Blank line indicates parameter not tested.

Output Date: 02-09-1987
HWQ-6/86-R1

SUMMARY OF WATER QUALITY ANALYSIS - UTAH FUEL CO.

SITE NAME	CS-2	CS-2	CS-2	CS-2	CS-2	CS-2	CS-2	CS-2	CS-2	CS-2
SAMPLE DATE	01/27/81	03/11/81	04/08/81	05/12/81	06/23/81	07/29/81	08/20/81	09/25/81	10/23/81	11/11/81
LOCATION	ECCLES CR.	ECCLES CR.	ECCLES CR.	ECCLES CR.	ECCLES CR.	ECCLES CR.	ECCLES CR.	ECCLES CR.	ECCLES CR.	ECCLES CR.
LOCATION	USFS BNDRY	USFS BNDRY	USFS BNDRY	USFS BNDRY	USFS BNDRY	USFS BNDRY	USFS BNDRY	USFS BNDRY	USFS BNDRY	USFS BNDRY
PHYSICAL PARAMETERS										
AIR TEMPERATURE (C)	-3	4	5	17	26	21	20	17	3	1
WATER TEMPERATURE (C)	2	2	1	5.2	8.5	9	9	8	5	5
SPEC. COND. (UMHOS/CM) FIELD	275	272	284	320	380	400	480	450	490	490
PH FIELD	7.8	7.7	7.6	8.3	7.8	7.8	7.6	7.9	7.4	7.2
TURBIDITY (NTU) FIELD				6.00			1.00			0.70
TOTAL SUSP. SOLIDS	7.0	52.0	1348	40.0	4.0	1.0	2.0	10.0	11.2	2.0
TOTAL DISS. SOLIDS MEAS.	295	290	290	212	250	265	310	296	320	319
OXYGEN (D) DISS				9.5	10.0	10.6	9.6	9.5	10.8	10.6
COMMON IONS										
TOTAL HARDNESS AS CACO3				188						
CALCIUM (CA)	86.40	74.40	79.20	68.00	71.20	23.20	82.40	78.40	19.20	83.50
MAGNESIUM (MG)	18.24	10.56	15.36	4.32	15.84	31.20	21.12	15.84	22.09	20.50
SODIUM (NA)	5.90	27.00	10.00	9.10	3.00	35.00	3.90	11.00	76.00	6.80
POTASSIUM (K)	1.60	1.38	1.53	1.01	1.29	1.39	1.51	1.30	2.54	2.25
ACIDITY AS CACO3				<0.01			9.00			6.00
ALKALINITY AS CACO3 (LAB)				196			258		289	252
BICARBONATE (HCO3) (LAB)	358.68	334.28	310	237	268	303	315	329	352	308
CARBONATE AS CO3 (LAB)				1.20						
SULFATE (SO4)	6.0	9.0	18.00	9.0	22.0	18.0	24.0	15.0	15.0	44.0
CHLORIDE (CL)	3.92	6.38	12.00	4.50	3.83	5.14	4.97	4.04	5.10	7.30
FLUORIDE (F)				0.19			0.19			0.18
NUTRIENTS										
NITRATE (NO3-N)				0.57			0.48			0.47
NITRITE (NO2-N)				0.01						
AMMONIA (NH3 AS N)	<0.01	<0.01	<0.01	<0.01	<0.01	0.20	<0.01	0.04	0.05	0.55
TOTAL PHOSPHATE (PO4)	0.080	0.060	1.200	0.290		0.150	0.180	0.882	0.830	0.290
TRACE ELEMENTS										
ALUMINUM (AL) TOTAL				<0.001						
ARSENIC (AS) TOTAL				<0.001			<0.001			<0.001
ARSENIC (AS) DISS				<0.001			<0.001			<0.001
BARIUM (BA) TOTAL				0.026			0.050			0.050
BARIUM (BA) DISS				0.20			0.025			0.040
BORON (B) TOTAL				0.013			0.022			0.029
BORON (B) DISS				0.10						0.025
CADMIUM (CD) TOTAL				<0.001			<0.001			<0.001
CADMIUM (CD) DISS				<0.001			<0.001			<0.001
CHROMIUM (CR) TOTAL				<0.001			<0.001			0.002
CHROMIUM (CR) DISS				<0.001			<0.001			<0.001
COPPER (CU) TOTAL				<0.001			0.010			<0.001
COPPER (CU) DISS				<0.001			0.010			<0.001
IRON (FE) TOTAL	0.310	0.190	0.288	0.720	0.130	0.650	0.070	0.069	0.250	0.220

All quantities in milligrams per liter unless otherwise noted. Blank line indicates parameter not tested.

Output Date: 02-09-1987
HWQ-6/86-R1

SUMMARY OF WATER QUALITY ANALYSIS - UTAH FUEL CO.

SITE NAME	CS-2	CS-2	CS-2	CS-2	CS-2	CS-2	CS-2	CS-2	CS-2	CS-2
SAMPLE DATE	01/27/81	03/11/81	04/08/81	05/12/81	06/23/81	07/29/81	08/20/81	09/25/81	10/23/81	11/11/81
TRACE ELEMENTS										
LEAD (PB) TOTAL				0.002			<0.001			0.003
LEAD (PB) DISS				<0.001			<0.001			0.002
MANGANESE (MN) TOTAL	0.095	0.050	0.090	0.110	0.090	0.124	0.030	0.035	0.030	0.060
MERCURY (HG) TOTAL				<0.0002			<0.0002			<0.0002
MOLYBDENUM (MO) TOTAL				<0.001						
NICKEL (NI) TOTAL				<0.001						
SELENIUM (SE) TOTAL				<0.001			<0.001			<0.001
SELENIUM (SE) DISS				<0.001			<0.001			<0.001
SILVER (AG) TOTAL				<0.001			<0.001			<0.001
SILVER (AG) DISS				<0.001			<0.001			<0.001
ZINC (ZN) TOTAL				0.15			0.012			0.010
ZINC (ZN) DISS				0.008			0.006			0.007
BACTERIOLOGICAL PARAMETERS										
FECAL COLIFORM (NO./100ML)							13.0			<2.0
TOTAL COLIFORM (NO./100ML)							330			33.0
5 - DAY BOD							2.4			3.6
ORGANIC PARAMETERS										
ORGANIC CARBON (TOTAL)				2.20			1.00			21.00
PHENOLS	<0.001	0.130	0.004	0.007	0.022	0.003	0.110	<0.001	<0.001	<0.001
OTHER PARAMETERS										
OIL AND GREASE				1.40			9.40			0.20
CYANIDE (CN)				<0.001			0.002			<0.001

All quantities in milligrams per liter unless otherwise noted. Blank line indicates parameter not tested.

Output Date: 02-09-1987
HWQ-6/86-R1

SUMMARY OF WATER QUALITY ANALYSIS - UTAH FUEL CO.

SITE NAME	CS-2	CS-2	CS-2	CS-2	CS-2	CS-2	CS-2	CS-2	CS-2	CS-2
SAMPLE DATE	12/09/81	01/21/82	02/18/82	04/15/82	05/20/82	06/30/82	07/21/82	08/19/82	09/15/82	10/14/82
LOCATION	ECCLES CR.	ECCLES CR.	ECCLES CR.	ECCLES CR.	ECCLES CR.	ECCLES CR.	ECCLES CR.	ECCLES CR.	ECCLES CR.	ECCLES CR.
LOCATION	USFS BNDRY	USFS BNDRY	USFS BNDRY	USFS BNDRY	USFS BNDRY	USFS BNDRY	USFS BNDRY	USFS BNDRY	USFS BNDRY	USFS BNDRY
PHYSICAL PARAMETERS										
AIR TEMPERATURE (C)	7	-6	11	6	13	17	22	18	6	2
FLOW (CFS)								0.62	0.51	0.56
WATER TEMPERATURE (C)	3	1	1	2	3	9	11	11	5	3
SPEC. COND. (UMHOS/CM) FIELD	500	480	500	465	224	390	416	371	367	430
PH FIELD	7.6	8.0	7.5	7.2	7.8	8.0	7.6	8.1	8.1	7.7
TURBIDITY (NTU) FIELD				100+	100+	34	39	4.6	35	54
TOTAL SUSP. SOLIDS	1.0	25.0	25.0	133	378	23.0	27.0	36.0	38.0	119
TOTAL DISS. SOLIDS MEAS.	320	310	320	256	156	236	235	318	295	235
OXYGEN (O) DISS								9.3		
COMMON IONS										
CALCIUM (CA)	89.00	80.10	80.00	60.00	48.00	67.50	62.40	75.20	77.60	77.60
MAGNESIUM (MG)	21.00	20.10	21.50	14.00	8.70	12.30	15.36	16.80	18.24	18.24
SODIUM (NA)	3.95	30.00	7.50	5.80	2.4	38.0	4.5	13.0	5.7	4.0
POTASSIUM (K)	1.95	2.80	1.68	5.40	4.80	0.97	1.10	1.72	1.86	1.70
ACIDITY AS CACO3								<0.01		
ALKALINITY AS CACO3 (LAB)	278	256	263	181	140		204	257		
BICARBONATE (HCO3) (LAB)	338	312	321	221	171	211	249	314	302	291
SULFATE (SO4)	32.0	12.0	38.0	36.0	20.0	9.0	19.0	<3.0	26.0	30.0
CHLORIDE (CL)	5.40	9.23	1.40	7.30	1.80	4.50	2.10	24.70	4.90	7.90
FLUORIDE (F)								0.17		
NUTRIENTS										
NITRATE (NO3-N)								0.59		
AMMONIA (NH3 AS N)	0.52	2.68	0.05			0.28		0.31		0.28
TOTAL PHOSPHATE (PO4)	0.370	0.170	0.220			0.070		0.130		0.010
TRACE ELEMENTS										
BARIUM (BA) TOTAL								0.045		
BORON (B) TOTAL								0.025		
COPPER (CU) TOTAL								0.010		
IRON (FE) TOTAL	0.080	0.550	0.200	1.950	4.750	1.100	0.860	0.980	0.730	0.970
LEAD (PB) TOTAL								0.004		
MANGANESE (MN) TOTAL	0.052	0.009	0.040	0.170	0.113	0.050	0.050	0.090	0.260	0.250
ZINC (ZN) TOTAL								0.012		
ORGANIC PARAMETERS										
ORGANIC CARBON (TOTAL)								10.0		
PHENOLS	0.046	0.033	0.010			0.013		0.025		<0.001
OTHER PARAMETERS										
OIL AND GREASE						1.8		0.8		0.8
CYANIDE (CN)								0.007		

All quantities in milligrams per liter unless otherwise noted. Blank line indicates parameter not tested.

Output Date: 02-09-1987
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SUMMARY OF WATER QUALITY ANALYSIS - UTAH FUEL CO.

SITE NAME	CS-2	CS-2	CS-2	CS-2	CS-2	CS-2	CS-2	CS-2	CS-2	CS-2
SAMPLE DATE	11/09/82	12/14/82	01/19/83	02/15/83	03/31/83	04/21/83	05/25/83	06/30/83	07/20/83	08/25/83
LOCATION	ECCLES CR.	ECCLES CR.	ECCLES CR.	ECCLES CR.	ECCLES CR.	ECCLES CR.	ECCLES CR.	ECCLES CR.	ECCLES CR.	ECCLES CR.
LOCATION	USFS BNDRY	USFS BNDRY	USFS BNDRY	USFS BNDRY	USFS BNDRY	USFS BNDRY	USFS BNDRY	USFS BNDRY	USFS BNDRY	USFS BNDRY
PHYSICAL PARAMETERS										
AIR TEMPERATURE (C)	0	-8	3	-2	4	7	17	13	15	13
FLOW (CFS)							10.3	3.62	1.08	0.80
WATER TEMPERATURE (C)	2	0.5	1	1	3	3	4	6	11	10
SPEC. COND. (UMHOS/CM) FIELD	550	457	554	562	560	634	324	353	364	565
PH FIELD	7.7	7.0	7.6	8.1	7.7	7.2	7.7	8.1	7.6	7.6
TURBIDITY (NTU) FIELD	66	16	7.2	18.5	89	100+	100+	24	33	13
TOTAL SUSP. SOLIDS	100	7.0	<0.1	6.0	72.0	72.0	924	13.0	8.0	31.0
TOTAL DISS. SOLIDS MEAS.	295	298	320	344	351	322	198	228	300	318
TOTAL SETTLEABLE SOLIDS							0.5			
OXYGEN (O) DISS										7.9
COMMON IONS										
CALCIUM (CA)	79.20	79.20	80.80	75.20	68.80	71.20	48.80	57.60	75.20	80.00
MAGNESIUM (MG)	16.32	19.68	20.64	23.04	16.32	15.84	11.52	10.56	13.44	19.20
SODIUM (NA)	4.8	5.1	6.0	21.0	28.0	23.0	4.8	7.5	19.0	14.0
POTASSIUM (K)	1.67	1.73	1.99	1.76	1.97	1.85	1.41	1.06	1.6	1.1
ACIDITY AS CACO3										33.00
ALKALINITY AS CACO3 (LAB)										270
BICARBONATE (HCO3) (LAB)	302	312	333	336	297	273	193	220	295	329
SULFATE (SO4)	21.0	26.0	15.0	30.0	38.0	36.0	21.0	18.0	36	37
CHLORIDE (CL)	4.90	4.20	8.50	20.40	19.20	27.60	4.00	2.0	8.0	4.0
FLUORIDE (F)										0.15
NUTRIENTS										
NITRATE (NO3-N)										<0.02
AMMONIA (NH3 AS N)								<0.1		<0.01
TOTAL PHOSPHATE (PO4)								0.18		0.10
TRACE ELEMENTS										
BARIUM (BA) TOTAL										0.042
BORON (B) TOTAL										0.012
COPPER (CU) TOTAL										0.010
IRON (FE) TOTAL	1.150	0.950	0.370	0.350	1.480	3.270	11.000	0.600	0.180	0.580
LEAD (PB) TOTAL										<0.001
MANGANESE (MN) TOTAL	0.200	0.300	0.350	0.300	0.140	0.175	0.315	0.082	0.190	0.385
ZINC (ZN) TOTAL										0.015
ORGANIC PARAMETERS										
ORGANIC CARBON (TOTAL)										1.80
PHENOLS								<0.001		<0.001
OTHER PARAMETERS										
OIL AND GREASE								1.4		<0.2
CYANIDE (CN)										<0.001

All quantities in milligrams per liter unless otherwise noted. Blank line indicates parameter not tested.

Output Date: 02-09-1987
HWQ-6/86-R1

SUMMARY OF WATER QUALITY ANALYSIS - UTAH FUEL CO.

SITE NAME	CS-2	CS-2	CS-2	CS-2	CS-2	CS-2	CS-2	CS-2	CS-2	CS-2
SAMPLE DATE	09/28/83	10/26/83	11/11/83	01/18/84	02/22/84	03/22/84	04/26/84	05/17/84	06/28/84	07/27/84
LOCATION	ECCLES CR.	ECCLES CR.	ECCLES CR.	ECCLES CR.	ECCLES CR.	ECCLES CR.	ECCLES CR.	ECCLES CR.	ECCLES CR.	ECCLES CR.
LOCATION	USFS BNDRY	USFS BNDRY	USFS BNDRY	USFS BNDRY	USFS BNDRY	USFS BNDRY	USFS BNDRY	USFS BNDRY	USFS BNDRY	USFS BNDRY
PHYSICAL PARAMETERS										
AIR TEMPERATURE (C)	11	9	3	-25	-11	-4	-5	11	18	16
FLOW (CFS)	0.45	0.28	0.42					23.9	6.02	0.91
WATER TEMPERATURE (C)	9	6	4	2	1	2	2	6	14	9
SPEC. COND. (UMHOS/CM) FIELD	320	542	479	578	600	546	436	315	396	475
PH FIELD	7.7	7.5	7.7	7.1	7.6	7.5	7.7	7.3	7.7	7.5
TURBIDITY (NTU) FIELD	37	18	30	5.7	8.8	16	46	100+	37	35
TOTAL SUSP. SOLIDS	21.0	30.0	29.0	15.0	5.0	11.0	65	1828	9.0	13.0
TOTAL DISS. SOLIDS MEAS.	286	320	320	328	360	400	376	440	295	490
COMMON IONS										
CALCIUM (CA)	88.80	80.00	79.20	86.40	96.80	94.80	92.40	80.00	72.00	88.00
MAGNESIUM (MG)	14.88	21.12	24.48	22.56	22.80	18.00	28.56	48.00	24.00	11.30
SODIUM (NA)	4.70	12.00	4.60	7.70	30.00	9.70	3.90	3.10	3.80	4.10
POTASSIUM (K)	1.8	1.2	1.7	1.8	2.1	1.8	1.3	3.2	1.6	1.37
BICARBONATE (HCO3) (LAB)	295	310	320	329	329	336	308.6	122.0	256.2	284.3
SULFATE (SO4)	40	79	34	47	72	37	82	286	68	34
CHLORIDE (CL)	6.00	8.00	8.00	8.0	50.0	19.0	9.0	3.6	3.3	3.3
NUTRIENTS										
AMMONIA (NH3 AS N)		<0.01							0.10	
TOTAL PHOSPHATE (PO4)		0.06							<0.01	
TRACE ELEMENTS										
IRON (FE) TOTAL	0.860	0.176	0.540	0.55	0.34	0.30	0.85	31.20	0.40	0.65
MANGANESE (MN) TOTAL	0.252	0.160	0.220	0.64	0.42	0.49	0.18	1.13	24.00	0.21
ORGANIC PARAMETERS										
PHENOLS		0.110							<0.001	
OTHER PARAMETERS										
OIL AND GREASE		<0.2							0.6	

All quantities in milligrams per liter unless otherwise noted. Blank line indicates parameter not tested.

Output Date: 02-09-1987
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SUMMARY OF WATER QUALITY ANALYSIS - UTAH FUEL CO.

SITE NAME	CS-2	CS-2	CS-2	CS-2	CS-2	CS-2
SAMPLE DATE	08/24/84	09/18/84	10/16/85	04/17/86	05/28/86	06/25/86
LOCATION	ECCLES CR.	ECCLES CR.	ECCLES CR.	ECCLES CR.	ECCLES CR.	ECCLES CR.
LOCATION	USFS BNDRY	USFS BNDRY	USFS BNDRY	USFS BNDRY	USFS BNDRY	USFS BNDRY
PHYSICAL PARAMETERS						
AIR TEMPERATURE (C)	16	13	8	-4	18	15
FLOW (CFS)	0.78	1.07	1.16		16.6	3.33
WATER TEMPERATURE (C)	9	10	6	3	5	9
SPEC. COND. (UMHOS/CM) FIELD	610	499	577	509	245	468
PH FIELD	7.9	7.7	7.3	7.9	7.5	7.7
TURBIDITY (NTU) FIELD	21	48	16	19	62	7.58
TOTAL SUSP. SOLIDS	11.0	53.0	14.0	27.0	142	27.0
TOTAL DISS. SOLIDS MEAS.	310	344	356	330	172	260
OXYGEN (O) DISS	7.8					
COMMON IONS						
CALCIUM (CA)	66.00	80.00	93.60	84.40	44.40	71.20
MAGNESIUM (MG)	32.40	30.00	21.60	17.50	8.40	15.40
SODIUM (NA)	16.00	6.30	7.70	5.30	5.67	5.01
POTASSIUM (K)	1.89	3.45	3.29	1.82	0.79	1.83
ACIDITY AS CACO3	6.00					
ALKALINITY AS CACO3 (LAB)	270					
BICARBONATE (HCO3) (LAB)	329.4	366.0	309.9	256.0	148.0	214.7
SULFATE (SO4)	26	29	78	7	29	65
CHLORIDE (CL)	12.0	11.0	8.1	50.0	2.1	3.2
FLUORIDE (F)	0.23					
NUTRIENTS						
NITRATE (NO3-N)	0.29					
AMMONIA (NH3 AS N)	0.03		<0.01			0.13
TOTAL PHOSPHATE (PO4)	<0.01		0.02			0.02
TRACE ELEMENTS						
BARIUM (BA) TOTAL	0.05					
BORON (B) TOTAL	0.061					
COPPER (CU) TOTAL	0.020					
IRON (FE) TOTAL	0.68	0.79	0.21	0.16	1.15	1.18
LEAD (PB) TOTAL	<0.001					
MANGANESE (MN) TOTAL	0.20	0.14	0.10	0.09	0.10	0.08
ORGANIC PARAMETERS						
ORGANIC CARBON (TOTAL)	11.80					
PHENOLS	<0.001		<0.001			<0.001
OTHER PARAMETERS						
OIL AND GREASE	<0.1		0.2			0.6
CYANIDE (CN)	<0.001					

All quantities in milligrams per liter unless otherwise noted. Blank line indicates parameter not tested.

Output Date: 02-09-1987
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SUMMARY OF WATER QUALITY ANALYSIS - UTAH FUEL CO.

SITE NAME	CS-3	CS-3	CS-3	CS-3	CS-3	CS-3	CS-3	CS-3	CS-3	CS-3
SAMPLE DATE	05/12/81	06/23/81	07/29/81	08/20/81	09/25/81	10/22/81	11/11/81	12/09/81	05/20/82	06/30/82
LOCATION	ECCLES CR.	ECCLES CR.	ECCLES CR.	ECCLES CR.	ECCLES CR.	ECCLES CR.	ECCLES CR.	ECCLES CR.	ECCLES CR.	ECCLES CR.
LOCATION	UPR MID FRK	UPR MID FRK	UPR MID FRK	UPR MID FRK	UPR MID FRK	UPR MID FRK	UPR MID FRK	UPR MID FRK	UPR MID FRK	UPR MID FRK
PHYSICAL PARAMETERS										
AIR TEMPERATURE (C)	16	26	22	18	15	15	0	1	13	18
FLOW (CFS)	2.2	0.4	0.1	0.07	0.03	0.04	0.04		2.74	0.82
WATER TEMPERATURE (C)	6.9	16	14	14	8	1	0	0	2	7
SPEC. COND. (UMHOS/CM) FIELD	285	340	300	380	360	450	430	450	198	280
PH FIELD	8.4	8.3	8.2	8.0	8.0	7.2	7.4	8.0	7.9	8.3
TURBIDITY (NTU) FIELD	0.62			0.26			0.30		16	3.6
TOTAL SUSP. SOLIDS	6.0	3.0	1.0	2.0	33.0	26.0	4.0	1.0	6.40	1.0
TOTAL DISS. SOLIDS MEAS.	186	220	198	245	236	300	278	289	130	184
OXYGEN (O) DISS	10.6	9.2	8.3	9.6	9.8	10.4	12.1			
COMMON IONS										
TOTAL HARDNESS AS CACO3	174									
CALCIUM (CA)	60.00	63.2	40.00	72.00	67.20	30.40	76.80	82.50	44.00	60.50
MAGNESIUM (MG)	5.76	11.52	24.00	12.00	12.48	23.04	16.50	16.50	5.80	9.20
SODIUM (NA)	2.50	2.50	2.90	3.20	3.40	55.00	3.30	3.40	1.6	2.6
POTASSIUM (K)	0.96	1.07	1.14	1.25	1.20	4.20	1.25	1.35	6.10	0.81
ACIDITY AS CACO3	<0.01			<0.01			<0.01			
ALKALINITY AS CACO3 (LAB)	158			206		289	255	261	129	
BICARBONATE (HCO3) (LAB)	193	215	229	242	259	352	292	319	157	208
CARBONATE AS CO3 (LAB)	0.60									
SULFATE (SO4)	13.0	29.0	9.0	30.0	15.0	6.0	20.0	18.0	12.0	20.0
CHLORIDE (CL)	3.50	2.68	3.95	3.48	2.81	3.70	3.60	3.20	0.80	1.20
FLUORIDE (F)	0.17			0.20			0.15			
NUTRIENTS										
NITRATE (NO3-N)	0.96			0.50			0.53			
NITRITE (NO2-N)	0.01									
AMMONIA (NH3 AS N)	<0.01	<0.01	<0.01	<0.01	0.08	0.02	0.39	0.13		0.12
TOTAL PHOSPHATE (PO4)	0.150		1.150	0.160	0.710	0.665	0.320	0.390		0.050
TRACE ELEMENTS										
ALUMINUM (AL) TOTAL	0.010									
ARSENIC (AS) TOTAL	<0.001			<0.001			<0.001			
ARSENIC (AS) DISS	<0.001			<0.001			<0.001			
BARIUM (BA) TOTAL	0.019			0.028			0.030			
BARIUM (BA) DISS	0.010			0.025			0.020			
BORON (B) TOTAL	0.018			0.022			0.028			
BORON (B) DISS	0.010			0.020			0.020			
CADMIUM (CD) TOTAL	<0.001			<0.001			<0.001			
CADMIUM (CD) DISS	<0.001			<0.001			<0.001			
CHROMIUM (CR) TOTAL	<0.001			<0.001			<0.001			
CHROMIUM (CR) DISS	<0.001			<0.001			<0.001			
COPPER (CU) TOTAL	0.010			0.013			<0.001			
COPPER (CU) DISS	<0.001			<0.001			<0.001			

All quantities in milligrams per liter unless otherwise noted. Blank line indicates parameter not tested.

Output Date: 02-09-1987
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SUMMARY OF WATER QUALITY ANALYSIS - UTAH FUEL CO.

SITE NAME	CS-3	CS-3	CS-3	CS-3	CS-3	CS-3	CS-3	CS-3	CS-3	CS-3
SAMPLE DATE	05/12/81	06/23/81	07/29/81	08/20/81	09/25/81	10/22/81	11/11/81	12/09/81	05/20/82	06/30/82
TRACE ELEMENTS										
IRON (FE) TOTAL	0.010	0.080	0.200	0.080	0.095	0.089	0.150	0.100	0.350	0.050
IRON (FE) TOTAL	0.190									
LEAD (PB) TOTAL	0.003			<0.001			<0.001			
LEAD (PB) DISS	<0.001			<0.001			<0.001			
MANGANESE (MN) TOTAL	0.010	0.10	0.016	0.010	0.014	0.015	0.020	0.018	0.120	0.005
MERCURY (HG) TOTAL	<0.0002			<0.0002			<0.0002			
MOLYBDENUM (MO) TOTAL	<0.001									
NICKEL (NI) TOTAL	<0.001									
SELENIUM (SE) TOTAL	<0.001			<0.001			<0.001			
SELENIUM (SE) DISS	<0.001			<0.001			<0.001			
SILVER (AG) TOTAL	<0.001			<0.001			<0.001			
SILVER (AG) DISS	<0.001			<0.001			<0.001			
ZINC (ZN) TOTAL	0.020			0.010			0.010			
ZINC (ZN) DISS	0.007			0.008			0.005			
BACTERIOLOGICAL PARAMETERS										
FECAL COLIFORM (NO./100ML)				33.0			5.0			
TOTAL COLIFORM (NO./100ML)				1400			33.0			
5 - DAY BOD				1.9			4.1			
ORGANIC PARAMETERS										
ORGANIC CARBON (TOTAL)	3.10			5.00			12.20			
PHENOLS	0.003	<0.001	0.005	<0.001	<0.001	<0.001	<0.001	0.080		<0.001
OTHER PARAMETERS										
OIL AND GREASE	3.80			1.2			0.20			0.4
CYANIDE (CN)	<0.001			<0.001			<0.001			

All quantities in milligrams per liter unless otherwise noted. Blank line indicates parameter not tested.

Output Date: 02-09-1987
HWQ-6/86-R1

SUMMARY OF WATER QUALITY ANALYSIS - UTAH FUEL CO.

SITE NAME	CS-3	CS-3	CS-3	CS-3	CS-3	CS-3	CS-3	CS-3	CS-3	CS-3
SAMPLE DATE	07/21/82	08/19/82	09/15/82	10/14/82	11/09/82	06/29/83	07/20/83	08/25/83	09/28/83	10/26/83
LOCATION	ECCLES CR.	ECCLES CR.	ECCLES CR.	ECCLES CR.	ECCLES CR.	ECCLES CR.	ECCLES CR.	ECCLES CR.	ECCLES CR.	ECCLES CR.
LOCATION	UPR MID FRK	UPR MID FRK	UPR MID FRK	UPR MID FK	UPR MID FK	UPR MID FK	UPR MID FK	UPR MID FK	UPR MID FK	UPR MID FK
PHYSICAL PARAMETERS										
AIR TEMPERATURE (C)	19	24	6	0	0	17	15	11	11	7
FLOW (CFS)	0.09	0.11	0.11			1.49	0.44	0.27	0.18	0.14
WATER TEMPERATURE (C)	11	11	5	1	0	6	8	9	8	3
SPEC. COND. (UMHOS/CM) FIELD	356	356	345	320	540	330	369	492	506	497
PH FIELD	8.1	8.4	8.4	7.7	7.9	8.2	7.8	7.8	7.7	7.7
TURBIDITY (NTU) FIELD	3.4	5.7	62	2.8	2.5	14	20	6.8	11	12
TOTAL SUSP. SOLIDS	3.0	5.0	1.0	31.0	27.0	5.0	6.0	16.0	14.0	16.0
TOTAL DISS. SOLIDS MEAS.	255	289	245	304	260	212	286	282	248	285
OXYGEN (O) DISS		8.3						6.2		
COMMON IONS										
CALCIUM (CA)	68.00	74.40	73.60	82.40	76.00	56.00	74.40	72.80	83.20	79.20
MAGNESIUM (MG)	9.12	12.96	15.36	8.64	13.44	10.08	10.08	14.88	11.52	14.88
SODIUM (NA)	17.0	14.0	2.8	23.3	2.7	4.4	18.0	14.1	2.80	7.0
POTASSIUM (K)	0.90	1.14	1.25	1.20	1.20	0.85	1.2	0.9	1.4	1.3
ACIDITY AS CACO3		<0.01						30.00		
ALKALINITY AS CACO3 (LAB)	243	248						252		
BICARBONATE (HCO3) (LAB)	297	303	297	333	299	220	288	307	281	288
SULFATE (SO4)	3.0	<3.0	<0.1	18.0	2.0	6.0	28	24	25	30
CHLORIDE (CL)	2.20	18.60	5.10	2.20	2.90	6.0	6.0	2.0	2.00	4.00
FLUORIDE (F)		0.17						0.14		
NUTRIENTS										
NITRATE (NO3-N)		0.85						<0.02		
AMMONIA (NH3 AS N)		0.37		0.27		<0.1		<0.10		<0.01
TOTAL PHOSPHATE (PO4)		0.080		0.030		0.10		0.02		0.04
TRACE ELEMENTS										
BARIUM (BA) TOTAL		0.025						0.20		
BORON (B) TOTAL		0.020						0.011		
COPPER (CU) TOTAL		0.010						0.002		
IRON (FE) TOTAL	0.080	0.090	0.090	0.050	0.050	0.290	0.220	0.300	0.830	0.250
LEAD (PB) TOTAL		0.002						0.003		
MANGANESE (MN) TOTAL	0.015	0.140	0.008	0.010	0.007	0.026	0.125	0.200	0.171	0.130
ZINC (ZN) TOTAL		0.005						0.018		
ORGANIC PARAMETERS										
ORGANIC CARBON (TOTAL)		10.20						2.10		
PHENOLS		0.021		<0.001		0.008		<0.001		<0.001
OTHER PARAMETERS										
OIL AND GREASE		0.6		<0.1		<0.2		<0.2		<0.2
CYANIDE (CN)		<0.001						0.016		

All quantities in milligrams per liter unless otherwise noted. Blank line indicates parameter not tested.

Output Date: 02-09-1987
HWQ-6/86-R1

SUMMARY OF WATER QUALITY ANALYSIS - UTAH FUEL CO.

SITE NAME	CS-3	CS-3	CS-3	CS-3	CS-3	CS-3	CS-3	CS-3	CS-3	CS-3
SAMPLE DATE	11/11/83	02/22/84	03/22/84	04/25/84	05/17/84	06/27/84	07/26/84	08/28/84	09/17/84	10/16/85
LOCATION	ECCLES CR.	ECCLES CR.	ECCLES CR.	ECCLES CR.	ECCLES CR.	ECCLES CR.	ECCLES CR.	ECCLES CR.	ECCLES CR.	ECCLES CR.
LOCATION	UPR MID FK	UPR MID FK	UPR MID FK	UPR MID FK	UPR MID FK	UPR MID FK	UPR MID FK	UPR MID FK	UPR MID FK	UPR MID FK
PHYSICAL PARAMETERS										
AIR TEMPERATURE (C)	3	-8	-5	-5	10	22	18	13	17	4
FLOW (CFS)	0.13				7.33	0.44	0.21	0.30	0.16	0.13
WATER TEMPERATURE (C)	2	0.5	0.5	1	5	10	13	10	12	1
SPEC. COND. (UMHOS/CM) FIELD	440	456	437	364	264	536	431	530	440	438
PH FIELD	7.8	8.0	7.9	7.6	7.4	7.7	7.6	8.1	8.0	7.7
TURBIDITY (NTU) FIELD	19	100+	15	53	90	17	22	12	12	4.3
TOTAL SUSP. SOLIDS	19.0	9.0	2.0	79	233	2.0	3.0	11.0	8.0	4.0
TOTAL DISS. SOLIDS MEAS.	285	240	320	470	460	330	200	288	292	254
OXYGEN (O) DISS								9.0		
COMMON IONS										
CALCIUM (CA)	76.80	88.00	81.60	88.00	80.00	80.00	81.60	76.00	80.00	90.40
MAGNESIUM (MG)	16.32	18.00	17.52	50.40	60.00	9.60	10.80	9.60	20.40	7.40
SODIUM (NA)	2.90	2.70	2.70	2.40	1.90	33.00	2.80	36.00	3.00	1.90
POTASSIUM (K)	1.2	1.2	1.2	1.0	1.0	1.3	1.10	1.12	1.28	1.30
ACIDITY AS CACO3								8.00		
ALKALINITY AS CACO3 (LAB)								260		
BICARBONATE (HCO3) (LAB)	295	301	322	278.2	122.0	353.8	278.2	317.2	298.9	301.3
SULFATE (SO4)	15	34	14	182	310	20	20	18	28	16
CHLORIDE (CL)	4.00	9.0	9.0	5.0	16.9	5.6	1.8	1.0	10.0	3.1
FLUORIDE (F)								0.24		
NUTRIENTS										
NITRATE (NO3-N)								0.70		
AMMONIA (NH3 AS N)						0.15		0.04		<0.01
TOTAL PHOSPHATE (PO4)						0.03		0.03		0.06
TRACE ELEMENTS										
BARIUM (BA) TOTAL								0.02		
BORON (B) TOTAL								0.035		
COPPER (CU) TOTAL								0.013		
IRON (FE) TOTAL	0.260	2.01	0.39	1.03	2.77	0.33	0.30	0.33	0.26	0.08
LEAD (PB) TOTAL								0.003		
MANGANESE (MN) TOTAL	0.110	0.28	0.12	0.10	0.15	0.18	0.05	0.07	0.06	0.03
ORGANIC PARAMETERS										
ORGANIC CARBON (TOTAL)								0.20		
PHENOLS						<0.001		<0.001		<0.001
OTHER PARAMETERS										
OIL AND GREASE						<0.01		<0.01		<0.1
CYANIDE (CN)								<0.001		

All quantities in milligrams per liter unless otherwise noted. Blank line indicates parameter not tested.

Output Date: 02-09-1987
HWQ-6/86-R1

SUMMARY OF WATER QUALITY ANALYSIS - UTAH FUEL CO.

SITE NAME	CS-3	CS-3
SAMPLE DATE	05/28/86	06/25/86
LOCATION	ECCLES CR.	ECCLES CR.
LOCATION	UPR MID FK	UPR MID FK
PHYSICAL PARAMETERS		
AIR TEMPERATURE (C)	10	18
FLOW (CFS)	5.22	0.78
WATER TEMPERATURE (C)	4	7
SPEC. COND. (UMHOS/CM) FIELD	221	367
PH FIELD	7.6	7.7
TURBIDITY (NTU) FIELD	23	1.77
TOTAL SUSP. SOLIDS	44.0	1.0
TOTAL DISS. SOLIDS MEAS.	150	210
COMMON IONS		
CALCIUM (CA)	41.20	62.40
MAGNESIUM (MG)	1.00	9.10
SODIUM (NA)	5.90	2.40
POTASSIUM (K)	<0.01	0.86
BICARBONATE (HCO3) (LAB)	139.0	222.0
SULFATE (SO4)	7	9
CHLORIDE (CL)	1.7	2.0
NUTRIENTS		
AMMONIA (NH3 AS N)		0.11
TOTAL PHOSPHATE (PO4)		<0.01
TRACE ELEMENTS		
IRON (FE) TOTAL	0.46	0.60
MANGANESE (MN) TOTAL	0.03	0.02
ORGANIC PARAMETERS		
PHENOLS		<0.001
OTHER PARAMETERS		
OIL AND GREASE		1.4

All quantities in milligrams per liter unless otherwise noted. Blank line indicates parameter not tested.

Output Date: 02-09-1987
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SUMMARY OF WATER QUALITY ANALYSIS - UTAH FUEL CO.

SITE NAME	CS-4	CS-4	CS-4	CS-4	CS-4	CS-4	CS-4	CS-4	CS-4	CS-4
SAMPLE DATE	05/12/81	06/23/81	07/29/81	08/20/81	09/25/81	10/22/81	11/11/81	12/08/81	06/29/82	07/21/82
LOCATION	ECCLES CR.	ECCLES CR.	ECCLES CR.	ECCLES CR.	ECCLES CR.	ECCLES CR.	ECCLES CR.	ECCLES CR.	ECCLES CR.	ECCLES CR.
LOCATION	UPR L FRK	UPR L FRK	UPR L FRK	UPR L FRK	UPR L FRK	UPR L FRK	UPR L FRK	UPR L FRK	UPR L FRK	UPR L FRK
PHYSICAL PARAMETERS										
AIR TEMPERATURE (C)	16	22	27	19	15	14	8	0	19	21
FLOW (CFS)		0.25	0.03	0.02			0.01		0.57	0.19
WATER TEMPERATURE (C)	3.6	12.5	15.5	13	9	2	0	0	7	10
SPEC. COND. (UMHOS/CM) FIELD	225	260	360	380	360	430	380	450	295	301
PH FIELD	8.3	8.2	8.5	8.2	8.4	7.2	7.7	7.9	8.1	7.8
TURBIDITY (NTU) FIELD	0.53			0.42			0.28		5.4	100+
TOTAL SUSP. SOLIDS	60.0	6.0	1.0	4.0	7.0	5.5	12.0	103	4.0	747
TOTAL DISS. SOLIDS MEAS.	235	169	215	245	233	280	245	286	195	189
OXYGEN (O) DISS	11.0	10.4		9.4	10.8	9.7	10.2			
COMMON IONS										
TOTAL HARDNESS AS CACO3	132									
CALCIUM (CA)	43.2	55.2	61.6	75.20	71.20	72.00	73.60	82.50	58.50	52.80
MAGNESIUM (MG)	5.76	7.20	13.44	10.56	12.48	10.56	12.00	12.50	5.90	7.68
SODIUM (NA)	9.80	1.80	2.10	2.40	2.50	21.00	2.40	2.90	2.0	9.0
POTASSIUM (K)	1.68	0.62	0.69	0.71	0.90	0.95	0.92	1.10	0.56	0.50
ACIDITY AS CACO3	<0.01			<0.01			<0.01			
ALKALINITY AS CACO3 (LAB)	144			206		262	215	224		184
BICARBONATE (HCO3) (LAB)	176	193		237	264	320	237	224	149	224
CARBONATE AS CO3 (LAB)	0.60									
SULFATE (SO4)	13.5	9.0	29.0	36.0	13.0	6.0	37.0	70.0	49.0	3.0
CHLORIDE (CL)	2.80	2.25	2.46	2.70	2.22	3.70	3.20	3.00	0.30	0.30
FLUORIDE (F)	0.14			0.15			0.12			
NUTRIENTS										
NITRATE (NO3-N)	0.05			<0.01			0.13			
NITRITE (NO2-N)	<0.01									
AMMONIA (NH3 AS N)	<0.01	<0.01	<0.01	<0.01	0.04	0.02	0.49	0.06	0.22	
TOTAL PHOSPHATE (PO4)	0.200		0.300	0.110	0.620	1.522	0.280	0.590	0.060	
TRACE ELEMENTS										
ALUMINUM (AL) TOTAL	0.020									
ARSENIC (AS) TOTAL	<0.001			<0.001			<0.001			
ARSENIC (AS) DISS	<0.001			<0.001			<0.001			
BARIUM (BA) TOTAL	0.020			0.027			0.025			
BARIUM (BA) DISS	0.010			0.015			0.015			
BORON (B) TOTAL	0.005			0.018			0.016			
BORON (B) DISS	<0.001			0.011			0.010			
CADMIUM (CD) TOTAL	<0.001			<0.001			<0.001			
CADMIUM (CD) DISS	<0.001			<0.001			<0.001			
CHROMIUM (CR) TOTAL	<0.001			<0.001			<0.001			
CHROMIUM (CR) DISS	<0.001			<0.001			<0.001			
COPPER (CU) TOTAL	<0.001			0.010			<0.001			
COPPER (CU) DISS	<0.001			<0.001			<0.001			

All quantities in milligrams per liter unless otherwise noted. Blank line indicates parameter not tested.

Output Date: 02-09-1987
HWQ-6/86-R1

SUMMARY OF WATER QUALITY ANALYSIS - UTAH FUEL CO.

SITE NAME	CS-4	CS-4	CS-4	CS-4	CS-4	CS-4	CS-4	CS-4	CS-4	CS-4
SAMPLE DATE	05/12/81	06/23/81	07/29/81	08/20/81	09/25/81	10/22/81	11/11/81	12/08/81	06/29/82	07/21/82
TRACE ELEMENTS										
IRON (FE) TOTAL	0.010	0.070	0.125	0.150	0.350	0.335	0.280	0.250	0.100	13.500
IRON (FE) TOTAL	0.120									
LEAD (PB) TOTAL	0.002			<0.001			<0.001			
LEAD (PB) DISS	<0.001			<0.001			<0.001			
MANGANESE (MN) TOTAL	<0.001	<0.001	0.002	0.020	0.035	0.037	0.010	0.015	0.008	0.245
MERCURY (HG) TOTAL	<0.0002			<0.0002			<0.0002			
MOLYBDENUM (MO) TOTAL	<0.001									
NICKEL (NI) TOTAL	<0.001									
SELENIUM (SE) TOTAL	<0.001			<0.001			<0.001			
SELENIUM (SE) DISS	<0.001			<0.001			<0.001			
SILVER (AG) TOTAL	<0.001			<0.001			<0.001			
SILVER (AG) DISS	<0.001			<0.001			<0.001			
ZINC (ZN) TOTAL	0.007			0.025			0.007			
ZINC (ZN) DISS	0.007			0.020			0.005			
BACTERIOLOGICAL PARAMETERS										
FECAL COLIFORM (NO./100ML)				23.0			<2.0			
TOTAL COLIFORM (NO./100ML)				790			23.0			
5 - DAY BOD				1.1			4.6			
ORGANIC PARAMETERS										
ORGANIC CARBON (TOTAL)	2.60			2.50			11.30			
PHENOLS	<0.001	<0.001	0.009	<0.001	<0.001	<0.001	0.007	0.026	<0.001	
OTHER PARAMETERS										
OIL AND GREASE	6.60			4.0			0.20		1.6	
CYANIDE (CN)	<0.001			<0.001			0.006			

All quantities in milligrams per liter unless otherwise noted. Blank line indicates parameter not tested.

Output Date: 02-09-1987
HWQ-6/86-R1

SUMMARY OF WATER QUALITY ANALYSIS - UTAH FUEL CO.

SITE NAME	CS-4	CS-4	CS-4	CS-4	CS-4	CS-4	CS-4	CS-4	CS-4	CS-4
SAMPLE DATE	08/19/82	09/14/82	10/14/82	06/29/83	07/20/83	08/24/83	09/28/83	10/26/83	11/11/83	05/24/84
LOCATION	ECCLES CR.	ECCLES CR.	ECCLES CR.	ECCLES CR.	ECCLES CR.	ECCLES CR.	ECCLES CR.	ECCLES CR.	ECCLES CR.	ECCLES CR.
LOCATION	UPR L FRK	UPR L FRK	UPR L FRK	UPR L FRK	UPR L FRK	UPR L FRK	UPR L FRK	UPR L FRK	UPR L FRK	UPR L FRK
PHYSICAL PARAMETERS										
AIR TEMPERATURE (C)	24	5	-2	17	16	17	14	14	2	17
FLOW (CFS)	0.10	0.08	0.05	0.72	0.27	0.09	0.06	0.05	0.04	7.12
WATER TEMPERATURE (C)	10	3	1	8	8	9	8	6	1	6
SPEC. COND. (UMHOS/CM) FIELD	310	360	305	237	331	399	408	403	358	219
PH FIELD	8.3	8.5	7.5	8.0	7.6	7.8	8.1	7.8	7.8	7.4
TURBIDITY (NTU) FIELD	100+	91	50	9.2	25	71	41	8.9	35	39
TOTAL SUSP. SOLIDS	300	28.0	115	3.0	6.0	131	10.0	14.0	53.0	44.0
TOTAL DISS. SOLIDS MEAS.	239	225	269	154	198	245	10.0	240	230	140
OXYGEN (O) DISS	6.4					5.8				
COMMON IONS										
CALCIUM (CA)	68.80	68.00	75.20	40.80	55.20	64.00	68.80	69.60	68.00	24.00
MAGNESIUM (MG)	8.16	9.60	7.68	7.20	6.24	11.04	10.56	10.08	12.00	21.60
SODIUM (NA)	14.0	2.2	17.0	3.2	12.0	13.0	2.0	11.00	2.00	1.10
POTASSIUM (K)	0.90	0.84	0.95	0.61	0.6	0.7	0.9	0.8	0.8	0.6
ACIDITY AS CACO3	<0.01					26.00				
ALKALINITY AS CACO3 (LAB)	211					216				
BICARBONATE (HCO3) (LAB)	257	256	271	156	205	264	244	251	254	176.9
SULFATE (SO4)	<3.0	<0.1	30.0	4.0	22	20	15	25	10	7
CHLORIDE (CL)	21.30	2.70	3.70	8.0	2.0	<0.1	4.00	6.00	2.00	<0.1
FLUORIDE (F)	0.16					0.10				
NUTRIENTS										
NITRATE (NO3-N)	0.11					<0.02				
AMMONIA (NH3 AS N)	0.35		0.34	0.1		<0.10		<0.01		
TOTAL PHOSPHATE (PO4)	0.510		0.080	0.10		0.07		0.05		
TRACE ELEMENTS										
BARIUM (BA) TOTAL	0.040					0.020				
BORON (B) TOTAL	0.010					0.014				
COPPER (CU) TOTAL	0.010					0.020				
IRON (FE) TOTAL	6.700	5.000	0.800	0.140	0.180	0.150	0.410	0.160	0.420	0.92
LEAD (PB) TOTAL	0.003					0.003				
MANGANESE (MN) TOTAL	0.160	0.075	0.070	0.010	0.012	0.060	0.040	0.018	0.050	0.04
ZINC (ZN) TOTAL	0.075					0.020				
ORGANIC PARAMETERS										
ORGANIC CARBON (TOTAL)	11.00					2.20				
PHENOLS	<0.001		<0.001	0.008		<0.001		<0.001		
OTHER PARAMETERS										
OIL AND GREASE	0.2		<0.1	<0.2		<0.2		<0.2		
CYANIDE (CN)	0.007					<0.001				

All quantities in milligrams per liter unless otherwise noted. Blank line indicates parameter not tested.

Output Date: 02-09-1987
HWQ-6/86-R1

SUMMARY OF WATER QUALITY ANALYSIS - UTAH FUEL CO.

SITE NAME	CS-4	CS-4	CS-4	CS-4	CS-4	CS-4	CS-4
SAMPLE DATE	06/27/84	07/26/84	08/27/84	09/17/84	10/16/85	05/28/86	06/25/86
LOCATION	ECCLES CR.	ECCLES CR.	ECCLES CR.	ECCLES CR.	ECCLES CR.	ECCLES CR.	ECCLES CR.
LOCATION	UPR L FRK	UPR L FRK	UPR L FRK	UPR L FRK	UPR L FRK	UPR L FRK	UPR L FRK
PHYSICAL PARAMETERS							
AIR TEMPERATURE (C)	24	19	21	17	1	10	11
FLOW (CFS)	0.64	0.02	0.07	0.05	0.04	2.89	0.40
WATER TEMPERATURE (C)	7	10	11	9	1.5	3	6
SPEC. COND. (UMHOS/CM) FIELD	312	316	431	361	371	166	273
PH FIELD	7.3	7.5	8.0	7.8	7.6	7.6	7.8
TURBIDITY (NTU) FIELD	7.7	21	32	11	4.4	17	2.58
TOTAL SUSP. SOLIDS	1.0	11.0	3.0	12.0	4.0	40.0	1.0
TOTAL DISS. SOLIDS MEAS.	185	199	346	238	204	130	150
OXYGEN (O) DISS			8.2				
COMMON IONS							
CALCIUM (CA)	48.00	57.60	66.0	70.00	69.60	35.20	45.60
MAGNESIUM (MG)	9.60	10.10	39.60	16.80	10.00	3.80	5.30
SODIUM (NA)	1.70	1.70	5.00	2.20	6.50	5.36	1.59
POTASSIUM (K)	0.6	0.59	0.69	0.80	1.09	0.08	0.68
ACIDITY AS CACO3			4.00				
ALKALINITY AS CACO3 (LAB)			205				
BICARBONATE (HCO3) (LAB)	170.8	194.0	253.8	268.4	270.8	113.0	161.0
SULFATE (SO4)	18	24	114	16	8	17	5
CHLORIDE (CL)	1.1	0.8	<1.0	7.0	2.0	1.3	1.2
FLUORIDE (F)			0.21				
NUTRIENTS							
NITRATE (NO3-N)			0.11				
AMMONIA (NH3 AS N)	0.22		<0.01		<0.01		0.56
TOTAL PHOSPHATE (PO4)	0.05		0.04		<0.01		0.03
TRACE ELEMENTS							
BARIUM (BA) TOTAL			0.02				
BORON (B) TOTAL			0.040				
COPPER (CU) TOTAL			0.019				
IRON (FE) TOTAL	0.14	0.24	0.20	0.20	<0.01	0.49	0.44
LEAD (PB) TOTAL			<0.001				
MANGANESE (MN) TOTAL	0.01	0.01	0.02	0.01	<0.01	0.03	0.03
ORGANIC PARAMETERS							
ORGANIC CARBON (TOTAL)			0.50				
PHENOLS	<0.001		<0.001		<0.001		<0.001
OTHER PARAMETERS							
OIL AND GREASE	<0.1		<0.1		0.6		0.8
CYANIDE (CN)			<0.001				

All quantities in milligrams per liter unless otherwise noted. Blank line indicates parameter not tested.

Output Date: 02-09-1987
HWQ-6/86-R1

SUMMARY OF WATER QUALITY ANALYSIS - UTAH FUEL CO.

SITE NAME	CS-6	CS-6	CS-6	CS-6	CS-6	CS-6	CS-6	CS-6	CS-6	CS-6
SAMPLE DATE	01/27/81	02/25/81	03/11/81	04/08/81	05/12/81	06/23/81	07/29/81	08/20/81	09/24/81	10/23/81
LOCATION	ECCLES CR.	ECCLES CR.	ECCLES CR.	ECCLES CR.	ECCLES CR.	ECCLES CR.	ECCLES CR.	ECCLES CR.	ECCLES CR.	ECCLES CR.
LOCATION	GAGING STA.	GAGING STA.	GAGING STA.	GAGING STA.	GAGING STA.	GAGING STA.	GAGING STA.	GAGING STA.	GAGING STA.	GAGING STA.
PHYSICAL PARAMETERS										
AIR TEMPERATURE (C)	-1	10	0	4	17	27	28	10	22	3
FLOW (CFS)	2.8		2.4	3						
WATER TEMPERATURE (C)	1	3	3	5	10.5	12.5	15	8	12	2
SPEC. COND. (UMHOS/CM) FIELD	279	410	280	325	360	390	490	500	430	650
PH FIELD	7.8	8.1	7.9	8.1	8.3	8.1	8.1	8.0	8.4	7.3
TURBIDITY (NTU) FIELD					0.64			4.40		
TOTAL SUSP. SOLIDS	7.0	41.0	23.0	150	60	34	50	12	10.0	4.0
TOTAL DISS. SOLIDS MEAS.	294	270	558	300	235	250	315	328	283	420
OXYGEN (O) DISS					9.8	9.1	10.9	9.9	8.9	11.0
COMMON IONS										
TOTAL HARDNESS AS CACO3					214					316
CALCIUM (CA)	76.80	43.60	72.00	72.80	63.20	42.40	64.00	73.68	60.00	64.00
MAGNESIUM (MG)	24.00	37.80	22.08	24.96	13.44	33.12	26.88	30.24	28.32	24.00
SODIUM (NA)	6.00	6.40	123	7.30	9.80	3.60	4.40	4.90	5.00	41.00
POTASSIUM (K)	1.50	2.27	2.15	1.46	1.68	2.08	2.23	2.30	1.30	1.40
ACIDITY AS CACO3					<0.01			<0.01		
ALKALINITY AS CACO3 (LAB)					212			250		
BICARBONATE (HCO3) (LAB)	339.16	263.52	641.72	283.04	259	249	144	300	307	386
CARBONATE AS CO3 (LAB)					0.60					
SULFATE (SO4)	18.0	44.0	12.0	43.0	13.5	35.0	145	58.0	24.0	27.0
CHLORIDE (CL)	5.87	12.00	8.51	16.00	8.80	6.85	7.77	8.20	4.96	6.00
FLUORIDE (F)					0.19			0.21		
NUTRIENTS										
NITRATE (NO3-N)					0.05			<0.01		
NITRITE (NO2-N)					<0.01					
AMMONIA (NH3 AS N)	<0.01	<0.01	<0.01	0.15	<0.01	<0.01	0.15	<0.01	0.15	<0.01
TOTAL PHOSPHATE (PO4)	0.120	0.030	0.080	0.020	0.200		0.220	0.300	0.520	0.520
TRACE ELEMENTS										
ALUMINUM (AL) TOTAL					0.020					
ARSENIC (AS) TOTAL					<0.001			<0.001		
ARSENIC (AS) DISS					<0.001			<0.001		
BARIUM (BA) TOTAL					0.050			0.050		
BARIUM (BA) DISS					0.040			0.045		
BORON (B) TOTAL					0.016			0.035		
BORON (B) DISS					0.010			0.030		
CADMIUM (CD) TOTAL					<0.001			<0.001		
CADMIUM (CD) DISS					<0.001			<0.001		
CHROMIUM (CR) TOTAL					<0.001			<0.001		
CHROMIUM (CR) DISS					<0.001			<0.001		
COPPER (CU) TOTAL					0.010			0.012		
COPPER (CU) DISS					<0.001			<0.001		

All quantities in milligrams per liter unless otherwise noted. Blank line indicates parameter not tested.

Output Date: 02-09-1987
HWD-6/86-R1

SUMMARY OF WATER QUALITY ANALYSIS - UTAH FUEL CO.

SITE NAME	CS-6	CS-6	CS-6	CS-6	CS-6	CS-6	CS-6	CS-6	CS-6	CS-6
SAMPLE DATE	01/27/81	02/25/81	03/11/81	04/08/81	05/12/81	06/23/81	07/29/81	08/20/81	09/24/81	10/23/81
TRACE ELEMENTS										
IRON (FE) TOTAL	1.110	1.370	0.740	1.420	0.960	0.500	0.860	1.530	1.835	1.635
LEAD (PB) TOTAL					0.003			<0.001		
LEAD (PB) DISS					<0.001			<0.001		
MANGANESE (MN) TOTAL	0.090	0.110	0.100	0.086	0.060	0.060	0.050	0.160	0.210	0.200
MERCURY (HG) TOTAL					<0.0002			<0.0002		
MOLYBDENUM (MO) TOTAL					<0.001					
NICKEL (NI) TOTAL					<0.001					
SELENIUM (SE) TOTAL					<0.001			<0.001		
SELENIUM (SE) DISS					<0.001			<0.001		
SILVER (AG) TOTAL					<0.001			<0.001		
SILVER (AG) DISS					<0.001			<0.001		
ZINC (ZN) TOTAL					0.020			0.018		
ZINC (ZN) DISS					0.008			0.012		
BACTERIOLOGICAL PARAMETERS										
FECAL COLIFORM (NO./100ML)								49		
TOTAL COLIFORM (NO./100ML)								1300		
5 - DAY BOD								2.0		
ORGANIC PARAMETERS										
ORGANIC CARBON (TOTAL)					1.80			7.10		
PHENOLS	0.144	0.012	<0.001	<0.001	<0.001	<0.001	0.009	<0.001	<0.001	<0.001
OTHER PARAMETERS										
OIL AND GREASE					6.60			0.80		
CYANIDE (CN)					<0.001			<0.001		

All quantities in milligrams per liter unless otherwise noted. Blank line indicates parameter not tested.

Output Date: 02-09-1987
HWQ-6/86-R1

SUMMARY OF WATER QUALITY ANALYSIS - UTAH FUEL CO.

SITE NAME	CS-6	CS-6	CS-6	CS-6	CS-6	CS-6	CS-6	CS-6	CS-6	CS-6
SAMPLE DATE	11/11/81	12/09/81	01/21/82	02/18/82	03/31/82	04/15/82	05/20/82	06/30/82	07/22/82	08/19/82
LOCATION	ECCLES CR.	ECCLES CR.	ECCLES CR.	ECCLES CR.	ECCLES CR.	ECCLES CR.	ECCLES CR.	ECCLES CR.	ECCLES CR.	ECCLES CR.
LOCATION	GAGING STA.	GAGING STA.	GAGING STA.	GAGING STA.	GAGING STA.	GAGING STA.	GAGING STA.	GAGING STA.	GAGING STA.	GAGING STA.
PHYSICAL PARAMETERS										
AIR TEMPERATURE (C)	8	8	-6	11	0	5	14	18	14	25
FLOW (CFS)								7.87	2.85	2.44
WATER TEMPERATURE (C)	4	3	2	3	2	5	7	11	9	12
SPEC. COND. (UMHOS/CM) FIELD	500	540	460	700	628	602	324	400	420	420
PH FIELD	8.0	7.9	8.2	8.1	7.4	7.7	8.0	8.3	8.3	8.0
TURBIDITY (NTU) FIELD	0.54				45	100+	100+	55	11	78
TOTAL SUSP. SOLIDS	16.0	23.0	166	33.0	44.0	347	331	38.0	76.0	168
TOTAL DISS. SOLIDS MEAS.	350	349	299	450	405	338	198	258	275	321
OXYGEN (O) DISS	10.4									9.9
COMMON IONS										
CALCIUM (CA)		79.50	72.50	90.00	87.50	80.00	53.60	66.00	50.40	72.00
MAGNESIUM (MG)	29.00	28.00	22.80	27.00	27.50	23.00	12.80	16.50	25.92	24.96
SODIUM (NA)	5.10	4.40	7.80	6.54	15.0	4.9	1.5	4.3	20.0	9.0
POTASSIUM (K)	2.50	2.50	2.10	2.09	2.25	4.85	5.20	1.69	1.30	2.54
ACIDITY AS CACO3	<0.01									<0.01
ALKALINITY AS CACO3 (LAB)	278	275	262	258	247	239	178		275	262
BICARBONATE (HCO3) (LAB)	320	287	320	315	301	292	218	218	236	319
CARBONATE AS CO3 (LAB)	9.60									
SULFATE (SO4)	21.0	79.0	21.0	73.0	102	36.0	12.0	56.0	3.0	<3.0
CHLORIDE (CL)	5.90	5.20	9.81	10.20	13.00	24.40	3.90	3.20	3.20	33.40
FLUORIDE (F)	0.18									0.21
NUTRIENTS										
NITRATE (NO3-N)	0.05									0.18
AMMONIA (NH3 AS N)	3.50	0.51	2.65	<0.02				0.06		0.36
TOTAL PHOSPHATE (PO4)	0.260	0.360	0.760	0.210				0.110		0.290
TRACE ELEMENTS										
ARSENIC (AS) TOTAL	<0.001									
ARSENIC (AS) DISS	<0.001									
BARIUM (BA) TOTAL	0.175									0.065
BARIUM (BA) DISS	0.145									
BORON (B) TOTAL	0.065									0.035
BORON (B) DISS	0.025									
CADMIUM (CD) TOTAL	<0.001									
CADMIUM (CD) DISS	<0.001									
CHROMIUM (CR) TOTAL	<0.001									
CHROMIUM (CR) DISS	<0.001									
COPPER (CU) TOTAL	0.011									0.010
COPPER (CU) DISS	0.010									
IRON (FE) TOTAL	0.350	0.760	0.140	0.990	2.000	4.600	3.600	1.400	0.520	2.430
IRON (FE) TOTAL	1.975									
LEAD (PB) TOTAL	<0.001									0.003

All quantities in milligrams per liter unless otherwise noted. Blank line indicates parameter not tested.

Output Date: 02-09-1987
HWQ-6/86-R1

SUMMARY OF WATER QUALITY ANALYSIS - UTAH FUEL CO.

SITE NAME	CS-6	CS-6	CS-6	CS-6	CS-6	CS-6	CS-6	CS-6	CS-6	CS-6
SAMPLE DATE	11/11/81	12/09/81	01/21/82	02/18/82	03/31/82	04/15/82	05/20/82	06/30/82	07/22/82	08/19/82
TRACE ELEMENTS										
LEAD (PB) DISS	<0.001									
MANGANESE (MN) TOTAL	0.180	0.128	0.134	0.110	0.190	0.230	0.115	0.065	0.075	0.125
MERCURY (HG) TOTAL	<0.0002									
SELENIUM (SE) TOTAL	<0.001									
SELENIUM (SE) DISS	<0.001									
SILVER (AG) TOTAL	<0.001									
SILVER (AG) DISS	<0.001									
ZINC (ZN) TOTAL	0.020									0.015
ZINC (ZN) DISS	0.015									
BACTERIOLOGICAL PARAMETERS										
FECAL COLIFORM (NO./100ML)	<2.0									
TOTAL COLIFORM (NO./100ML)	700									
5 - DAY BOD	4.0									
ORGANIC PARAMETERS										
ORGANIC CARBON (TOTAL)	4.70									8.80
PHENOLS	0.002	0.036	0.093	0.010				<0.001		<0.001
OTHER PARAMETERS										
OIL AND GREASE	0.20							0.4		0.8
CYANIDE (CN)	0.044									<0.001

All quantities in milligrams per liter unless otherwise noted. Blank line indicates parameter not tested.

Output Date: 02-09-1987
HWQ-6/86-R1

SUMMARY OF WATER QUALITY ANALYSIS - UTAH FUEL CO.

SITE NAME	CS-6	CS-6	CS-6	CS-6	CS-6	CS-6	CS-6	CS-6	CS-6	CS-6
SAMPLE DATE	09/14/82	10/14/82	11/10/82	12/14/82	01/19/83	02/15/83	03/31/83	04/21/83	05/25/83	06/30/83
LOCATION	ECCLES CR.	ECCLES CR.	ECCLES CR.	ECCLES CR.	ECCLES CR.	ECCLES CR.	ECCLES CR.	ECCLES CR.	ECCLES CR.	ECCLES CR.
LOCATION	GAGING STA.	GAGING STA.	GAGING STA.	GAGING STA.	GAGING STA.	GAGING STA.	GAGING STA.	GAGING STA.	GAGING STA.	GAGING STA.
PHYSICAL PARAMETERS										
AIR TEMPERATURE (C)	7	13	-1	-8	-5	-1	0	8	18	11
FLOW (CFS)		2.57	1.33						20.1	11.75
WATER TEMPERATURE (C)	6	4	1	0	1.5	0.5	3	5	7	8
SPEC. COND. (UMHOS/CM) FIELD	395	540	643	420	583	570	642	781	342	405
PH FIELD	8.5	8.6	7.9	7.5	7.8	8.1	7.9	7.7	8.1	8.0
TURBIDITY (NTU) FIELD	87	62	35	23	28	44	81	100+	100+	30
TOTAL SUSP. SOLIDS	97	161	50.0	9.0	13.0	41.0	427	688	3190	22.0
TOTAL DISS. SOLIDS MEAS.	313	318	322	320	338	378	404	414	234	256
TOTAL SETTLEABLE SOLIDS									1.2	
COMMON IONS										
CALCIUM (CA)	73.60	77.60	80.00	69.60	77.60	79.20	74.40	80.00	51.20	59.20
MAGNESIUM (MG)	25.44	27.36	23.52	30.72	27.84	19.20	24.96	24.00	11.04	15.84
SODIUM (NA)	4.8	1.2	4.5	7.5	9.1	35.0	31.0	20.0	6.0	6.0
POTASSIUM (K)	2.19	2.20	2.04	2.20	2.38	2.19	2.48	2.95	1.64	1.45
BICARBONATE (HCO3) (LAB)	309	317	315	326	329	326	312	281	190	229
SULFATE (SO4)	30.0	42.0	37.0	37.0	37.0	60.0	64.0	60.0	28.0	32.0
CHLORIDE (CL)	10.30	7.00	7.10	7.40	15.00	21.50	31.90	43.40	4.00	6.0
NUTRIENTS										
AMMONIA (NH3 AS N)		0.30								<0.1
TOTAL PHOSPHATE (PO4)		0.060								0.24
TRACE ELEMENTS										
IRON (FE) TOTAL	2.250	1.350	1.050	2.550	1.220	1.030	2.400	9.800	24.500	0.700
MANGANESE (MN) TOTAL	0.140	0.145	0.130	0.165	0.135	0.140	0.175	0.495	0.740	0.060
ORGANIC PARAMETERS										
PHENOLS		<0.001								0.004
OTHER PARAMETERS										
OIL AND GREASE		<0.1								<0.2

All quantities in milligrams per liter unless otherwise noted. Blank line indicates parameter not tested.

Output Date: 02-09-1987
HWQ-6/86-R1

SUMMARY OF WATER QUALITY ANALYSIS - UTAH FUEL CO.

SITE NAME	CS-6	CS-6	CS-6	CS-6	CS-6	CS-6	CS-6	CS-6	CS-6	CS-6
SAMPLE DATE	07/20/83	08/25/83	09/29/83	10/26/83	11/11/83	01/18/84	02/22/84	03/22/84	04/26/84	05/17/84
LOCATION	ECCLES CR.	ECCLES CR.	ECCLES CR.	ECCLES CR.	ECCLES CR.	ECCLES CR.	ECCLES CR.	ECCLES CR.	ECCLES CR.	ECCLES CR.
LOCATION	GAGING STA.	GAGING STA.	GAGING STA.	GAGING STA.	GAGING STA.	GAGING STA.	GAGING STA.	GAGING STA.	GAGING STA.	GAGING STA.
PHYSICAL PARAMETERS										
AIR TEMPERATURE (C)	15	17	11	16	1	-23	-4	-3	-5	16
FLOW (CFS)	5.64	3.10	3.50	1.87	2.22					71.2
WATER TEMPERATURE (C)	11	13	9	5	2	0	0.5	1	3	9
SPEC. COND. (UMHOS/CM) FIELD	528	580	300	576	522	606	617	634	1786	367
PH FIELD	8.0	7.6	7.7	7.7	7.2	7.9	8.0	8.0	8.2	7.7
TURBIDITY (NTU) FIELD	25	7.9	34	16	23	13	22	27	100+	100+
TOTAL SUSP. SOLIDS	28.0	43.0	12.0	16.0	23.0	20.0	5.0	17.0	237	1102
TOTAL DISS. SOLIDS MEAS.	284	320	330	350	330	395	380	420	1000	275
OXYGEN (O) DISS		5.4								
COMMON IONS										
CALCIUM (CA)	69.60	68.00	76.00	79.20	73.60	40.80	86.00	82.00	72.80	88.00
MAGNESIUM (MG)	21.60	24.00	23.52	25.92	28.32	25.44	28.80	33.12	30.72	<0.10
SODIUM (NA)	4.7	15.0	6.30	3.50	8.30	56.0	14.40	21.60	262	4.30
POTASSIUM (K)	2.3	1.5	2.8	2.5	2.6	2.2	2.4	2.3	2.4	2.6
ACIDITY AS CACO3		27.00								
ALKALINITY AS CACO3 (LAB)		236								
BICARBONATE (HCO3) (LAB)	290	288	256	285	300	315	306	320	328.2	207.4
SULFATE (SO4)	26	62	68	58	53	57	64	52	5	45
CHLORIDE (CL)	10.0	6.0	14.00	12.00	12.00	18.0	38.0	51.0	428	6.8
FLUORIDE (F)		0.14								
NUTRIENTS										
NITRATE (NO3-N)		<0.02								
AMMONIA (NH3 AS N)		<0.10		<0.01						
TOTAL PHOSPHATE (PO4)		0.03		0.04						
TRACE ELEMENTS										
BARIUM (BA) TOTAL		0.050								
BORON (B) TOTAL		0.015								
COPPER (CU) TOTAL		0.020								
IRON (FE) TOTAL	0.340	0.650	0.630	0.350	0.540	0.62	0.67	0.78	3.53	19.20
LEAD (PB) TOTAL		0.002								
MANGANESE (MN) TOTAL	0.097	0.120	0.113	0.100	0.120	0.18	0.17	0.19	0.23	0.70
ZINC (ZN) TOTAL		0.025								
ORGANIC PARAMETERS										
ORGANIC CARBON (TOTAL)		2.50								
PHENOLS		<0.001		<0.001						
OTHER PARAMETERS										
OIL AND GREASE		<0.2		<0.2						
CYANIDE (CN)		<0.001								

All quantities in milligrams per liter unless otherwise noted. Blank line indicates parameter not tested.

Output Date: 02-09-1987
HWQ-6/86-R1

SUMMARY OF WATER QUALITY ANALYSIS - UTAH FUEL CO.

SITE NAME	CS-6	CS-6	CS-6	CS-6	CS-6	CS-6	CS-6	CS-6	CS-6
SAMPLE DATE	06/29/84	07/27/84	08/28/84	09/18/84	10/16/85	03/20/86	04/17/86	05/28/86	06/25/86
LOCATION	ECCLES CR.	ECCLES CR.	ECCLES CR.	ECCLES CR.	ECCLES CR.	ECCLES CR.	ECCLES CR.	ECCLES CR.	ECCLES CR.
LOCATION	GAGING STA.	GAGING STA.	GAGING STA.	GAGING STA.	GAGING STA.	GAGING STA.	GAGING STA.	GAGING STA.	GAGING STA.
PHYSICAL PARAMETERS									
AIR TEMPERATURE (C)	22	14	15	11	10	5	-2	21	16
FLOW (CFS)	13.9	6.08	3.12	2.78	2.86			46.5	9.11
WATER TEMPERATURE (C)	9	11	11	8	4	2	3	9	13
SPEC. COND. (UMHOS/CM) FIELD	501	558	660	535	606	719	2240	286	516
PH FIELD	8.3	7.8	8.1	7.9	8.0	7.9	8.0	7.8	7.7
TURBIDITY (NTU) FIELD	25	42	22	35	6.5	7.8	93	83	43.55
TOTAL SUSP. SOLIDS	8.0	63.0	11.0	38.0	12.0	39.0	238	385	71.0
TOTAL DISS. SOLIDS MEAS.	280	380	320	348	368	426	1282	208	302
OXYGEN (O) DISS			8.8						
COMMON IONS									
CALCIUM (CA)	72.00	59.20		76.00	82.80	91.60	86.00	48.40	60.00
MAGNESIUM (MG)	22.80	37.00	28.80	31.20	24.70	28.10	22.10	10.30	21.60
SODIUM (NA)	4.70	5.50	12.00	6.20	8.80	25.60	358.00	6.68	5.70
POTASSIUM (K)	1.8	2.12	2.48	2.84	2.46	2.71	2.35	0.92	2.33
ACIDITY AS CACO3			5.00						
ALKALINITY AS CACO3 (LAB)			225						
BICARBONATE (HCO3) (LAB)	298.9	287.9	274.5	260.0	268.0	303.0	265.0	170.0	205.0
SULFATE (SO4)	33	60	81	95	82	38	60	28	69
CHLORIDE (CL)	6.3	9.11		12.0	14.9	82.3	58.4	4.1	7.7
FLUORIDE (F)			1.17						
NUTRIENTS									
NITRATE (NO3-N)			0.04						
AMMONIA (NH3 AS N)	0.16		0.12		<0.01				0.11
TOTAL PHOSPHATE (PO4)	0.02		<0.01		<0.01				0.04
TRACE ELEMENTS									
BARIUM (BA) TOTAL			0.06						
BORON (B) TOTAL			0.026						
COPPER (CU) TOTAL			0.026						
IRON (FE) TOTAL	0.45	1.13	1.20	0.86	0.34	0.50	2.39	2.22	2.50
LEAD (PB) TOTAL			<0.001						
MANGANESE (MN) TOTAL	0.08	0.12	0.09	0.11	0.09	0.10	0.27	0.18	0.25
ORGANIC PARAMETERS									
ORGANIC CARBON (TOTAL)			0.40						
PHENOLS	0.015		<0.001		<0.001				<0.001
OTHER PARAMETERS									
OIL AND GREASE	<0.1		<0.1		0.4				0.8
CYANIDE (CN)			<0.001						

All quantities in milligrams per liter unless otherwise noted. Blank line indicates parameter not tested.

Output Date: 02-09-1987
HWQ-6/86-R1

SUMMARY OF WATER QUALITY ANALYSIS - UTAH FUEL CO.

SITE NAME	CS-7	CS-7	CS-7	CS-7	CS-7	CS-7	CS-7	CS-7	CS-7	CS-7
SAMPLE DATE	05/13/81	06/23/81	07/30/81	08/21/81	09/25/81	10/22/81	11/10/81	12/08/81	06/28/82	07/21/82
LOCATION	BURNOUT CR.	BURNOUT CR.	BURNOUT CR.	BURNOUT CR.	BURNOUT CR.	BURNOUT CR.	BURNOUT CR.	BURNOUT CR.	BURNOUT CR.	BURNOUT CR.
LOCATION	ABV HUNT CR	ABV HUNT CR	ABV HUNT CR	ABV HUNT CR	ABV HUNT CR	ABV HUNT CR	ABV HUNT CR	ABV HUNT CR	ABV HUNT CR	ABV HUNT CR
PHYSICAL PARAMETERS										
AIR TEMPERATURE (C)	11	20	23	14	15	9	6	10	23	21
FLOW (CFS)	0.59	0.39	0.29	0.28	0.11	0.30	0.28		4.69	1.28
WATER TEMPERATURE (C)	11	19	9.5	10	6	0	0	0	12	12
SPEC. COND. (UMHOS/CM) FIELD	270	270	320	340	300	450	440	310	475	307
PH FIELD	8.5	8.3	8.2	8.0	8.1	7.1	7.9	8.0	8.3	8.2
TURBIDITY (NTU) FIELD	0.65			0.80			0.66		5.5	6.0
TOTAL SUSP. SOLIDS	11.0	6.0	4.0	2.0	7.0	6.5	1.0	5.0		
TOTAL DISS. SOLIDS MEAS.	176	177	210	220	198	300	298	200		
OXYGEN (O) DISS	10.0			9.9			13.0			
COMMON IONS										
TOTAL HARDNESS AS CACO3	172									
CALCIUM (CA)	60.00	50.40	60.00	60.00	49.60	70.40	63.50	70.50		
MAGNESIUM (MG)	5.28	10.56	11.52	15.84	15.84	9.60	10.50	11.00		
SODIUM (NA)	2.20	2.10	2.20	2.30	2.50	36.00	31.00	2.50		
POTASSIUM (K)	0.74	0.75	0.70	0.78	0.60	0.55	0.46	0.90		
ACIDITY AS CACO3	<0.01			<0.01			<0.01			
ALKALINITY AS CACO3 (LAB)	170			194		283	192	213		
BICARBONATE (HCO3) (LAB)	198	185	210	232	227	345	220	211		
CARBONATE AS CO3 (LAB)	4.80									
SULFATE (SO4)	4.5	16.0	24.0	22.0	6.0	9.0	79.0	46.0		
CHLORIDE (CL)	3.40	2.80	3.00	3.13	2.28	3.90	3.00	2.60		
FLUORIDE (F)	0.16			0.15			0.12			
NUTRIENTS										
NITRATE (NO3-N)	0.36	<0.01	0.10	0.48	0.02	0.05	0.40	1.35		
NITRITE (NO2-N)	0.01									
AMMONIA (NH3 AS N)	<0.01	<0.001	0.002	<0.01	<0.001	<0.001	2.70	0.023		
TOTAL PHOSPHATE (PO4)	0.140		0.130	0.280	9.000	4.450	0.300	0.380		
TRACE ELEMENTS										
ALUMINUM (AL) TOTAL	<0.001									
ARSENIC (AS) TOTAL	<0.001			<0.001			<0.001			
ARSENIC (AS) DISS	<0.001			<0.001			<0.001			
BARIUM (BA) TOTAL	0.030			0.030			0.040			
BARIUM (BA) DISS	0.015			0.025			0.020			
BORON (B) TOTAL	0.004			0.012			0.019			
BORON (B) DISS	<0.001			0.010			0.010			
CADMIUM (CD) TOTAL	<0.001			<0.001			<0.001			
CADMIUM (CD) DISS	<0.001			<0.001			<0.001			
CHROMIUM (CR) TOTAL	<0.001			<0.001			<0.001			
CHROMIUM (CR) DISS	<0.001			<0.001			<0.001			
COPPER (CU) TOTAL	0.010			0.010			<0.001			
COPPER (CU) DISS	<0.001			<0.001			<0.001			

All quantities in milligrams per liter unless otherwise noted. Blank line indicates parameter not tested.

Output Date: 02-09-1987
HWQ-6/86-R1

SUMMARY OF WATER QUALITY ANALYSIS - UTAH FUEL CO.

SITE NAME	CS-7	CS-7	CS-7	CS-7	CS-7	CS-7	CS-7	CS-7	CS-7	CS-7
SAMPLE DATE	05/13/81	06/23/81	07/30/81	08/21/81	09/25/81	10/22/81	11/10/81	12/08/81	06/28/82	07/21/82
TRACE ELEMENTS										
IRON (FE) TOTAL	0.010	0.180	0.190	0.250	0.288	0.235	0.230	0.330		
IRON (FE) TOTAL	0.160									
LEAD (PB) TOTAL	0.003			<0.001			<0.001			
LEAD (PB) DISS	<0.001			<0.001			<0.001			
MANGANESE (MN) TOTAL	0.010	0.010	0.013	0.020	0.019	0.015	0.016	0.014		
MERCURY (HG) TOTAL	<0.0002			<0.0002			<0.0002			
MOLYBDENUM (MO) TOTAL	<0.001									
NICKEL (NI) TOTAL	<0.001									
SELENIUM (SE) TOTAL	<0.001			<0.001			<0.001			
SELENIUM (SE) DISS	<0.001			<0.001			<0.001			
SILVER (AG) TOTAL	<0.001			<0.001			<0.001			
SILVER (AG) DISS	<0.001			<0.001			<0.001			
ZINC (ZN) TOTAL	0.005			0.020			0.021			
ZINC (ZN) DISS	0.003			0.010			0.011			
BACTERIOLOGICAL PARAMETERS										
FECAL COLIFORM (NO./100ML)				130			8.0			
TOTAL COLIFORM (NO./100ML)				330			110			
5 - DAY BOD				1.5						
ORGANIC PARAMETERS										
ORGANIC CARBON (TOTAL)	4.10			24.00			11.80			
PHENOLS	0.006			<0.001			11.800			
OTHER PARAMETERS										
OIL AND GREASE	<0.01	9.2	8.9	15.00	9.8	11.6	0.20			
CYANIDE (CN)	<0.001			<0.001			0.011			

All quantities in milligrams per liter unless otherwise noted. Blank line indicates parameter not tested.

Output Date: 02-09-1987
HWQ-6/86-R1

SUMMARY OF WATER QUALITY ANALYSIS - UTAH FUEL CO.

SITE NAME	CS-7	CS-7	CS-7	CS-7	CS-7	CS-7	CS-7	CS-7	CS-7	CS-7
SAMPLE DATE	08/17/82	09/15/82	10/12/82	06/28/83	07/19/83	08/24/83	09/27/83	10/20/83	06/28/84	07/31/84
LOCATION	BURNOUT CR.	BURNOUT CR.	BURNOUT CR.	BURNOUT CR.	BURNOUT CR.	BURNOUT CR.	BURNOUT CR.	BURNOUT CR.	BURNOUT CR.	BURNOUT CR.
LOCATION	ABV HUNT CR	ABV HUNT CR	ABV HUNT CR	ABV HUNT CR	ABV HUNT CR	ABV HUNT CR	ABV HUNT CR	ABV HUNT CR	ABV HUNT CR	ABV HUNT CR
PHYSICAL PARAMETERS										
AIR TEMPERATURE (C)	20	10	11	16	19	16	13	9	18	16
FLOW (CFS)	0.58	0.57	0.49	10.24	1.79	0.65	0.56	0.48	9.1	2.24
WATER TEMPERATURE (C)	12	7	3	10	14	9	9	4	11	10
SPEC. COND. (UMHOS/CM) FIELD	368	302	347	263	332	394	369	378	284	379
PH FIELD	8.6	8.4	6.6	8.1	7.8	8.0	7.4	7.7	7.6	7.6
TURBIDITY (NTU) FIELD	5.0	8.4	3.0	13	8	2.1	4.3	7.2	19	8.1
TOTAL SUSP. SOLIDS	20.0					17.0				
TOTAL DISS. SOLIDS MEAS.	228					210				
OXYGEN (O) DISS	8.4					5.0				
COMMON IONS										
CALCIUM (CA)	55.26					60.40				
MAGNESIUM (MG)	14.88					10.08				
SODIUM (NA)	8.0					9.0				
POTASSIUM (K)	0.71					4.5				
ACIDITY AS CACO3	<0.01					22.00				
ALKALINITY AS CACO3 (LAB)	193					208				
BICARBONATE (HCO3) (LAB)	235					254				
SULFATE (SO4)	<3.0					<3				
CHLORIDE (CL)	20.10					2.0				
FLUORIDE (F)	0.15					0.11				
NUTRIENTS										
NITRATE (NO3-N)	0.62					<0.02				
AMMONIA (NH3 AS N)	0.64					0.30				
TOTAL PHOSPHATE (PO4)	0.070					0.02				
TRACE ELEMENTS										
BARIUM (BA) TOTAL	0.020					0.021				
BORON (B) TOTAL	0.010					0.020				
COPPER (CU) TOTAL	0.010					<0.001				
IRON (FE) TOTAL	0.200					0.510				
LEAD (PB) TOTAL	0.002					<0.001				
MANGANESE (MN) TOTAL	0.025					0.017				
ZINC (ZN) TOTAL	0.002					0.035				
ORGANIC PARAMETERS										
ORGANIC CARBON (TOTAL)	11.30					2.60				
PHENOLS	<0.001					<0.001				
OTHER PARAMETERS										
OIL AND GREASE	<0.1					<0.2				
CYANIDE (CN)	<0.001					<0.001				

All quantities in milligrams per liter unless otherwise noted. Blank line indicates parameter not tested.

Output Date: 02-09-1987
HWQ-6/86-R1

SUMMARY OF WATER QUALITY ANALYSIS - UTAH FUEL CO.

SITE NAME	CS-7	CS-7	CS-7	CS-7
SAMPLE DATE	08/24/84	09/26/84	10/15/85	06/24/86
LOCATION	BURNOUT CR.	BURNOUT CR.	BURNOUT CR.	BURNOUT CR.
LOCATION	ABV HUNT CR	ABV HUNT CR	ABV HUNT CR	ABV HUNT CR
PHYSICAL PARAMETERS				
AIR TEMPERATURE (C)	14	10	10	22
FLOW (CFS)	1.22	0.68	0.40	0.30
WATER TEMPERATURE (C)	8	6	6	11
SPEC. COND. (UMHOS/CM) FIELD	434	371	361	323
PH FIELD	7.9	7.9	7.8	7.4
TURBIDITY (NTU) FIELD	11	4.5	4.8	
TOTAL SUSP. SOLIDS	10.0			
TOTAL DISS. SOLIDS MEAS.	266			
OXYGEN (O) DISS	8.8			
COMMON IONS				
CALCIUM (CA)	68.00			
MAGNESIUM (MG)	9.60			
SODIUM (NA)	26.00			
POTASSIUM (K)	0.67			
ACIDITY AS CACO3	7.50			
ALKALINITY AS CACO3 (LAB)	215			
BICARBONATE (HCO3) (LAB)	262.3			
SULFATE (SO4)	12			
CHLORIDE (CL)	10.0			
FLUORIDE (F)	0.09			
NUTRIENTS				
NITRATE (NO3-N)	0.47			
AMMONIA (NH3 AS N)	0.07			
TOTAL PHOSPHATE (PO4)	<0.01			
TRACE ELEMENTS				
BARIUM (BA) TOTAL	0.02			
BORON (B) TOTAL	0.020			
COPPER (CU) TOTAL	0.016			
IRON (FE) TOTAL	0.70			
LEAD (PB) TOTAL	0.002			
MANGANESE (MN) TOTAL	0.02			
ZINC (ZN) TOTAL	0.036			
ORGANIC PARAMETERS				
ORGANIC CARBON (TOTAL)	<0.01			
PHENOLS	<0.001			
OTHER PARAMETERS				
OIL AND GREASE	<0.1			
CYANIDE (CN)	<0.001			

All quantities in milligrams per liter unless otherwise noted. Blank line indicates parameter not tested.

Output Date: 02-09-1987
HWQ-6/86-R1

SUMMARY OF WATER QUALITY ANALYSIS - UTAH FUEL CO.

SITE NAME	CS-8	CS-8	CS-8	CS-8	CS-8	CS-8	CS-8	CS-8	CS-8	CS-8
SAMPLE DATE	05/13/81	06/23/81	07/30/81	08/21/81	09/24/81	10/22/81	11/10/81	12/08/81	06/28/82	07/21/82
LOCATION	HNT CR R FK	HNT CR R FK	HNT CR R FK	HNT CR R FK	HNT CR R FK	HNT CR R FK	HNT CR R FK	HNT CR R FK	HNT CR R FK	HNT CR R FK
LOCATION	ABV L FK	ABV L FK	ABV L FK	ABV L FK	ABV L FK	ABV L FK	ABV L FK	ABV L FK	ABV L FK	ABV L FK
PHYSICAL PARAMETERS										
AIR TEMPERATURE (C)	17	27	21	11	20	4	8	10	28	22
FLOW (CFS)	2.02	0.48	0.32	0.32	0.29	0.38	0.60	0.40	1.79	0.48
WATER TEMPERATURE (C)	10	13	9.5	8	10	1	4	1	9	9
SPEC. COND. (UMHOS/CM) FIELD	115	170	290	325	320	300	340	285	302	281
PH FIELD	8.2	8.2	8.4	8.1	8.3	7.4	7.9	8.0	7.2	7.9
TURBIDITY (NTU) FIELD	5.60			1.00			0.48		9.9	6.9
TOTAL SUSP. SOLIDS	4.0	6.0	1.0	4.0	3.0	2.6	2.0	1.0		
TOTAL DISS. SOLIDS MEAS.	75	110	189	211	210	198	220	185		
OXYGEN (O) DISS	9.5	10.2	10.8	10.4	10.0	11.0	12.5			
COMMON IONS										
TOTAL HARDNESS AS CACO3	60									
CALCIUM (CA)	20.0	32.0	56.80	64.00	52.00	52.00	52.00	51.50		
MAGNESIUM (MG)	2.40	5.28	10.08	8.64	16.80	5.76	8.50	9.00		
SODIUM (NA)	5.9	2.0	2.20	2.40	2.50	20.00	19.60	2.45		
POTASSIUM (K)	0.50	0.56	0.69	0.74	0.50	0.50	0.55	0.85		
ACIDITY AS CACO3	3.64			<0.01			6.00			
ALKALINITY AS CACO3 (LAB)	60			162		184	146	150		
BICARBONATE (HCO3) (LAB)	73.2	102	188	193	207	225	178	183		
CARBONATE AS CO3 (LAB)	<0.01									
SULFATE (SO4)	9.0	16.0	27.0	35.0	28.0	9.0	50.0	18.0		
CHLORIDE (CL)	4.00	2.58	2.74	2.56	2.24	3.70	3.00	2.70		
FLUORIDE (F)	0.09			0.14			0.10			
NUTRIENTS										
NITRATE (NO3-N)	0.20			0.48			0.17			
NITRITE (NO2-N)	0.01									
AMMONIA (NH3 AS N)	<0.01	<0.01	0.10	<0.01	0.02	0.05	<0.01	0.52		
TOTAL PHOSPHATE (PO4)	0.130		0.100	0.270	6.300	3.880	0.330	0.310		
TRACE ELEMENTS										
ALUMINUM (AL) TOTAL	0.080									
ARSENIC (AS) TOTAL	<0.001			<0.001			<0.001			
ARSENIC (AS) DISS	<0.001			<0.001			<0.001			
BARIUM (BA) TOTAL	0.018			0.029			0.025			
BARIUM (BA) DISS	0.010			0.025			0.025			
BORON (B) TOTAL	<0.001			0.016			0.017			
BORON (B) DISS	<0.001			0.010			0.010			
CADMIUM (CD) TOTAL	<0.001			<0.001			<0.001			
CADMIUM (CD) DISS	<0.001			<0.001			<0.001			
CHROMIUM (CR) TOTAL	<0.001			<0.001			<0.001			
CHROMIUM (CR) DISS	<0.001			<0.001			<0.001			
COPPER (CU) TOTAL	<0.001			0.009			<0.001			
COPPER (CU) DISS	<0.001			<0.001			<0.001			

All quantities in milligrams per liter unless otherwise noted. Blank line indicates parameter not tested.

Output Date: 02-09-1987
HWQ-6/86-R1

SUMMARY OF WATER QUALITY ANALYSIS - UTAH FUEL CO.

SITE NAME	CS-8	CS-8	CS-8	CS-8	CS-8	CS-8	CS-8	CS-8	CS-8	CS-8
SAMPLE DATE	05/13/81	06/23/81	07/30/81	08/21/81	09/24/81	10/22/81	11/10/81	12/08/81	06/28/82	07/21/82
TRACE ELEMENTS										
IRON (FE) TOTAL	0.080	0.220	0.365	0.210	0.200	0.160	0.225	0.240		
IRON (FE) TOTAL	0.380									
LEAD (PB) TOTAL	0.003			<0.001			<0.001			
LEAD (PB) DISS	<0.001			<0.001			<0.001			
MANGANESE (MN) TOTAL	0.010	0.010	0.012	0.020	0.026	0.018	0.019	0.015		
MERCURY (HG) TOTAL	<0.0002			<0.0002			<0.0002			
MOLYBDENUM (MO) TOTAL	<0.001									
NICKEL (NI) TOTAL	<0.001									
SELENIUM (SE) TOTAL	<0.001			<0.001			<0.001			
SELENIUM (SE) DISS	<0.001			<0.001			<0.001			
SILVER (AG) TOTAL	<0.001			<0.001			<0.001			
SILVER (AG) DISS	<0.001			<0.001			<0.001			
ZINC (ZN) TOTAL	0.010						0.014			
ZINC (ZN) DISS	0.008			0.005			0.003			
BACTERIOLOGICAL PARAMETERS										
FECAL COLIFORM (NO./100ML)				5.0			2.0			
TOTAL COLIFORM (NO./100ML)				700			130			
5 - DAY BOD				1.2						
ORGANIC PARAMETERS										
ORGANIC CARBON (TOTAL)	2.90			4.00			8.80			
PHENOLS	0.019	<0.001	0.011	<0.001	<0.001	<0.001	11.80	0.013		
OTHER PARAMETERS										
OIL AND GREASE	4.00			1.20			<0.001			
CYANIDE (CN)	<0.001			<0.001			0.002			
SULFIDE	1.80			0.010						

All quantities in milligrams per liter unless otherwise noted. Blank line indicates parameter not tested.

Output Date: 02-09-1987
HWQ-6/86-R1

SUMMARY OF WATER QUALITY ANALYSIS - UTAH FUEL CO.

SITE NAME	CS-8	CS-8	CS-8	CS-8	CS-8	CS-8	CS-8	CS-8	CS-8	CS-8
SAMPLE DATE	08/18/82	09/15/82	10/15/82	06/28/83	07/19/83	08/24/83	09/27/83	10/20/83	05/24/84	06/26/84
LOCATION	HNT CR R FK	HNT CR R FK	HNT CR R FK	HNT CR R FK	HNT CR R FK	HNT CR R FK	HNT CR R FK	HNT CR R FK	HNT CR R FK	HNT CR R FK
LOCATION	ABV L FK	ABV L FK	ABV L FK	ABV L FK	ABV L FK	ABV L FK	ABV L FK	ABV L FK	ABV L FK	ABV L FK
PHYSICAL PARAMETERS										
AIR TEMPERATURE (C)	21	11	8	16	22	14	11	9	13	14
FLOW (CFS)	0.25	0.27	0.62	4.80	1.11	0.63	0.18	0.33	60.7	3.16
WATER TEMPERATURE (C)	9	6	3	13	13	7	9	6	8	4
SPEC. COND. (UMHOS/CM) FIELD	202	234	225	122	205	293	270	284	109	169
PH FIELD	8.4	7.9	7.7	7.6	7.5	7.4	6.0	7.3	7.2	6.4
TURBIDITY (NTU) FIELD	13	50	9	18	21	76	53	29	45	26
TOTAL SUSP. SOLIDS	10.0					87.0				
TOTAL DISS. SOLIDS MEAS.	195					152				
OXYGEN (O) DISS	8.2					7.6				
COMMON IONS										
CALCIUM (CA)	48.00					43.20				
MAGNESIUM (MG)	11.04					9.60				
SODIUM (NA)	7.5					4.5				
POTASSIUM (K)	0.69					3.6				
ACIDITY AS CACO3	0.50					16.00				
ALKALINITY AS CACO3 (LAB)	161					146				
BICARBONATE (HCO3) (LAB)	196					178				
SULFATE (SO4)	<3.0					15				
CHLORIDE (CL)	17.30					<0.10				
FLUORIDE (F)	0.12					0.08				
NUTRIENTS										
NITRATE (NO3-N)	0.42					<0.02				
AMMONIA (NH3 AS N)	0.35					0.45				
TOTAL PHOSPHATE (PO4)	0.070					0.10				
TRACE ELEMENTS										
BARIUM (BA) TOTAL	0.013					0.020				
BORON (B) TOTAL	0.010					0.055				
COPPER (CU) TOTAL	<0.001					0.020				
IRON (FE) TOTAL	0.300					0.465				
LEAD (PB) TOTAL	0.004					0.003				
MANGANESE (MN) TOTAL	0.020					0.135				
ZINC (ZN) TOTAL	0.003					0.030				
ORGANIC PARAMETERS										
ORGANIC CARBON (TOTAL)	7.70					1.90				
PHENOLS	0.008					<0.001				
OTHER PARAMETERS										
OIL AND GREASE	<0.1					<0.2				
CYANIDE (CN)	<0.001					<0.001				

All quantities in milligrams per liter unless otherwise noted. Blank line indicates parameter not tested.

Output Date: 02-09-1987
HWQ-6/86-R1

SUMMARY OF WATER QUALITY ANALYSIS - UTAH FUEL CO.

SITE NAME	CS-8	CS-8	CS-8	CS-8	CS-8	CS-8
SAMPLE DATE	07/31/84	08/24/84	09/27/84	10/15/85	05/27/86	06/19/86
LOCATION	HNT CR R FK	HNT CR R FK	HNT CR R FK	HNT CR R FK	HNT CR R FK	HNT CR R FK
LOCATION	ABV L FK	ABV L FK	ABV L FK	ABV L FK	ABV L FK	ABV L FK
PHYSICAL PARAMETERS						
AIR TEMPERATURE (C)	20	9	6	11	15	19
FLOW (CFS)	0.65	0.36	0.21	0.34	20.7	3.11
WATER TEMPERATURE (C)	10	7	4	8	6	12
SPEC. COND. (UMHOS/CM) FIELD	243	328	305	292	68	149
PH FIELD	7.2	7.3	7.6	7.3	7.0	7.5
TURBIDITY (NTU) FIELD	25	15	8.1	9.3	33	
TOTAL SUSP. SOLIDS		4.0				
TOTAL DISS. SOLIDS MEAS.		200				
OXYGEN (O) DISS		8.2				
COMMON IONS						
CALCIUM (CA)		52.00				
MAGNESIUM (MG)		8.40				
SODIUM (NA)		17.00				
POTASSIUM (K)		0.72				
ACIDITY AS CACO3		5.20				
ALKALINITY AS CACO3 (LAB)		150				
BICARBONATE (HCO3) (LAB)		183.0				
SULFATE (SO4)		<10				
CHLORIDE (CL)		20.0				
FLUORIDE (F)		0.16				
NUTRIENTS						
NITRATE (NO3-N)		0.18				
AMMONIA (NH3 AS N)		0.08				
TOTAL PHOSPHATE (PO4)		0.02				
TRACE ELEMENTS						
BARIUM (BA) TOTAL		0.02				
BORON (B) TOTAL		0.035				
COPPER (CU) TOTAL		0.013				
IRON (FE) TOTAL		6.20				
LEAD (PB) TOTAL		0.007				
MANGANESE (MN) TOTAL		0.07				
ZINC (ZN) TOTAL		0.041				
ORGANIC PARAMETERS						
ORGANIC CARBON (TOTAL)		<0.01				
PHENOLS		<0.001				
OTHER PARAMETERS						
OIL AND GREASE		<0.10				
CYANIDE (CN)		<0.001				

All quantities in milligrams per liter unless otherwise noted. Blank line indicates parameter not tested.

Output Date: 02-09-1987
HWD-6/86-R1

SUMMARY OF WATER QUALITY ANALYSIS - UTAH FUEL CO.

SITE NAME	CS-9	CS-9	CS-9	CS-9	CS-9	CS-9	CS-9	CS-9	CS-9	CS-9
SAMPLE DATE	01/27/81	04/08/81	05/12/81	06/23/81	07/29/81	08/20/81	09/25/81	10/23/81	11/10/81	12/09/81
LOCATION	RIGHT FORK	RIGHT FORK	RIGHT FORK	RIGHT FORK	RIGHT FORK	RIGHT FORK	RIGHT FORK	RIGHT FORK	RIGHT FORK	RIGHT FORK
LOCATION	ECCLES CR.	ECCLES CR.	ECCLES CR.	ECCLES CR.	ECCLES CR.	ECCLES CR.	ECCLES CR.	ECCLES CR.	ECCLES CR.	ECCLES CR.
PHYSICAL PARAMETERS										
AIR TEMPERATURE (C)	-2	5	16	26	22	24	13	2	2	9
FLOW (CFS)			0.05	0.01	0.01	0.003	0.01	0.01	0.01	0.19
WATER TEMPERATURE (C)	1	3	9	16	17	13	9	1	0	2
SPEC. COND. (UMHOS/CM) FIELD	283	202	440	410	380	500	450	520	500	500
PH FIELD	7.8	8.0	8.4	8.3	8.4	8.1	8.1	7.6	8.0	8.1
TURBIDITY (NTU) FIELD			0.34			0.28			0.28	
TOTAL SUSP. SOLIDS	11.0	6.0	11.0	11.0	1.0	2.0	16.0	15.0	10.0	5.0
TOTAL DISS. SOLIDS MEAS.	302	300	285	270	250	325	288	340	330	335
OXYGEN (O) DISS			10.0	9.0	7.9	8.8	9.2	10.2	10.5	
COMMON IONS										
TOTAL HARDNESS AS CACO3			170							
CALCIUM (CA)	89.60	83.20	60.00	44.80	68.80	80.80	74.40	48.00	86.40	88.50
MAGNESIUM (MG)	17.76	18.72	4.80	14.88	13.44	24.00	10.08	27.36	20.50	20.00
SODIUM (NA)	5.20	5.20	47.00	36.00	8.00	5.20	17.00	49.00	5.40	5.50
POTASSIUM (K)	1.30	1.33	1.48	1.93	1.32	1.28	1.35	1.84	1.35	1.35
ACIDITY AS CACO3			<0.01			<0.01			<0.01	
ALKALINITY AS CACO3 (LAB)			236			242		314	261	270
BICARBONATE (HCO3) (LAB)	336.72	295.24	273	268	254	276	293	383	294	290
CARBONATE AS CO3 (LAB)			7.20							
SULFATE (SO4)	19.0	41.0	16.5	30.0	27.0	68.0	21.0	21.0	59.0	67.0
CHLORIDE (CL)	8.01	8.00	15.20	7.47	9.02	8.31	6.43	5.50	5.80	5.20
FLUORIDE (F)			0.23			0.22			0.19	
NUTRIENTS										
NITRATE (NO3-N)			1.90			1.80			1.75	
NITRITE (NO2-N)			0.02							
AMMONIA (NH3 AS N)		0.20	<0.01	<0.01	0.10	<0.01	0.01	0.02	0.91	0.64
TOTAL PHOSPHATE (PO4)	0.090	<0.001	0.150		0.200	0.160	7.500	3.500	0.340	0.510
TRACE ELEMENTS										
ALUMINUM (AL) TOTAL			<0.001							
ARSENIC (AS) TOTAL			<0.001			<0.001			<0.001	
ARSENIC (AS) DISS			<0.001			<0.001			<0.001	
BARIUM (BA) TOTAL			0.020			0.030			0.018	
BARIUM (BA) DISS			0.015			0.020			0.015	
BORON (B) TOTAL			0.016			0.025			0.025	
BORON (B) DISS			0.010			0.020			0.020	
CADMIUM (CD) TOTAL			<0.001			<0.001			<0.001	
CADMIUM (CD) DISS			<0.001			<0.001			<0.001	
CHROMIUM (CR) TOTAL			<0.001			<0.001			<0.001	
CHROMIUM (CR) DISS			<0.001			<0.001			<0.001	
COPPER (CU) TOTAL			0.140			0.011			<0.001	
COPPER (CU) DISS			<0.001			<0.001			<0.001	

All quantities in milligrams per liter unless otherwise noted. Blank line indicates parameter not tested.

Output Date: 02-09-1987
HWQ-6/86-R1

SUMMARY OF WATER QUALITY ANALYSIS - UTAH FUEL CO.

SITE NAME	CS-9	CS-9	CS-9	CS-9	CS-9	CS-9	CS-9	CS-9	CS-9	CS-9
SAMPLE DATE	01/27/81	04/08/81	05/12/81	06/23/81	07/29/81	08/20/81	09/25/81	10/23/81	11/10/81	12/09/81
TRACE ELEMENTS										
IRON (FE) TOTAL	0.250	0.260	0.070	0.120	0.085	0.080	0.076	0.220	0.120	0.140
LEAD (PB) TOTAL			<0.001			<0.001			<0.001	
LEAD (PB) DISS			<0.001			<0.001			<0.001	
MANGANESE (MN) TOTAL	0.015	0.010	<0.001	0.010	0.002	0.020	0.010	0.019	0.020	0.018
MERCURY (HG) TOTAL			<0.0002			<0.0002			<0.0002	
MOLYBDENUM (MO) TOTAL			<0.001							
NICKEL (NI) TOTAL			<0.001							
SELENIUM (SE) TOTAL			<0.001			<0.001			<0.001	
SELENIUM (SE) DISS			<0.001			<0.001			<0.001	
SILVER (AG) TOTAL			<0.001			<0.001			<0.001	
SILVER (AG) DISS			<0.001			<0.001			<0.001	
ZINC (ZN) TOTAL			0.007			0.012			0.010	
ZINC (ZN) DISS			0.007			0.010			0.010	
BACTERIOLOGICAL PARAMETERS										
FECAL COLIFORM (NO./100ML)						23.0			7.0	
TOTAL COLIFORM (NO./100ML)						1300			94.0	
5 - DAY BOD						1.9			4.0	
ORGANIC PARAMETERS										
ORGANIC CARBON (TOTAL)			3.40			4.60			4.30	
PHENOLS		0.007	0.017	<0.001	0.004	<0.001	<0.001	<0.001	0.003	0.013
OTHER PARAMETERS										
OIL AND GREASE			0.60			1.00			0.20	
CYANIDE (CN)			<0.001			<0.001			<0.001	

All quantities in milligrams per liter unless otherwise noted. Blank line indicates parameter not tested.

Output Date: 02-09-1987
HWQ-6/86-R1

SUMMARY OF WATER QUALITY ANALYSIS - UTAH FUEL CO.

SITE NAME	CS-9	CS-9	CS-9	CS-9	CS-9	CS-9	CS-9	CS-9	CS-9	CS-9
SAMPLE DATE	05/20/82	06/30/82	07/21/82	08/19/82	09/15/82	10/14/82	11/09/82	06/30/83	07/20/83	08/25/83
LOCATION	RIGHT FORK	RIGHT FORK	RIGHT FORK	RIGHT FORK	RIGHT FORK	RIGHT FORK	RIGHT FORK	RIGHT FORK	RIGHT FORK	RIGHT FORK
LOCATION	ECCLES CR.	ECCLES CR.	ECCLES CR.	ECCLES CR.	ECCLES CR.	ECCLES CR.	ECCLES CR.	ECCLES CR.	ECCLES CR.	ECCLES CR.
PHYSICAL PARAMETERS										
AIR TEMPERATURE (C)	13	15	23	26	7	5	0	16	16	12
FLOW (CFS)	0.94	0.19	0.17	0.15	0.15	0.12	0.17	0.29	0.08	0.06
WATER TEMPERATURE (C)	5	10	11	13	5	4	1	10	9	10
SPEC. COND. (UMHOS/CM) FIELD	321	500	470	413	394	472	560	472	514	572
PH FIELD	7.8	8.3	7.7	7.4	8.3	8.0	8.1	8.2	7.9	8.0
TURBIDITY (NTU) FIELD	5.7		3.4	20	11	6.2	10.6	14	12	6.6
TOTAL SUSP. SOLIDS	40.0	1.0	26.0	1.0	11.0	30.0	16.0	10.0	1.0	19.0
TOTAL DISS. SOLIDS MEAS.	218	310	269	310	325	322	325	294	318	332
OXYGEN (O) DISS				9.3						5.8
COMMON IONS										
CALCIUM (CA)	64.80	92.50	74.40	78.40	90.40	88.00	91.20	77.60	83.20	88.00
MAGNESIUM (MG)	9.50	13.00	15.36	20.16	18.24	15.36	14.40	11.52	12.96	16.80
SODIUM (NA)	2.0	4.7	8.5	9.0	5.2	11.9	5.4	8.0	28.0	7.5
POTASSIUM (K)	4.20	1.22	1.18	1.46	1.79	1.80	1.47	16.00	1.2	12.5
ACIDITY AS CACO3				3.0						33.00
ALKALINITY AS CACO3 (LAB)	189		261	265						264
BICARBONATE (HCO3) (LAB)	231	257	318	324	317	329	316	273	342	322
SULFATE (SO4)	18.0	70.0	3.0	<3.0	41.0	30.0	29.0	36.0	36	45
CHLORIDE (CL)	3.00	6.60	6.10	26.20	6.70	7.60	6.50	10.0	8.0	6.0
FLUORIDE (F)				0.21						0.17
NUTRIENTS										
NITRATE (NO3-N)				2.45						<0.02
AMMONIA (NH3 AS N)		0.25		0.05		0.32		<0.1		<0.10
TOTAL PHOSPHATE (PO4)		0.070		0.070		0.080		0.44		0.05
TRACE ELEMENTS										
BARIUM (BA) TOTAL				0.020						0.016
BORON (B) TOTAL				0.025						0.014
COPPER (CU) TOTAL				0.010						<0.001
IRON (FE) TOTAL	0.750	0.170	0.070	0.080	0.300	0.080	0.140	0.450	0.090	0.750
LEAD (PB) TOTAL				0.001						<0.001
MANGANESE (MN) TOTAL	0.085	0.030	0.007	0.010	0.027	0.025	0.012	0.150	0.015	0.030
ZINC (ZN) TOTAL				0.002						0.025
ORGANIC PARAMETERS										
ORGANIC CARBON (TOTAL)				8.20						2.30
PHENOLS		<0.001		<0.001		<0.001		<0.001		<0.001
OTHER PARAMETERS										
OIL AND GREASE		0.4		0.6		0.8		<0.2		<0.2
CYANIDE (CN)				<0.001						<0.001

All quantities in milligrams per liter unless otherwise noted. Blank line indicates parameter not tested.

Output Date: 02-09-1987
HWQ-6/86-R1

SUMMARY OF WATER QUALITY ANALYSIS - UTAH FUEL CO.

SITE NAME	CS-9	CS-9	CS-9	CS-9	CS-9	CS-9	CS-9	CS-9	CS-9	CS-9
SAMPLE DATE	09/28/83	10/26/83	11/11/83	04/25/84	05/17/84	06/27/84	07/26/84	08/28/84	09/17/84	10/16/85
LOCATION	RIGHT FORK	RIGHT FORK	RIGHT FORK	RIGHT FORK	RIGHT FORK	RIGHT FORK	RIGHT FORK	RIGHT FORK	RIGHT FORK	RIGHT FORK
LOCATION	ECCLES CR.	ECCLES CR.	ECCLES CR.	ECCLES CR.	ECCLES CR.	ECCLES CR.	ECCLES CR.	ECCLES CR.	ECCLES CR.	ECCLES CR.
PHYSICAL PARAMETERS										
AIR TEMPERATURE (C)	13	13	3	-6	6	23	14	15	16	6
FLOW (CFS)	0.04	0.03	0.03		8.8	2.7	0.14	0.07	0.06	0.08
WATER TEMPERATURE (C)	9	7	2	0.5	5	11	13	8	15	5
SPEC. COND. (UMHOS/CM) FIELD	570	565	488	441	371	443	528	629	517	545
PH FIELD	7.4	7.6	7.4	7.7	7.7	7.9	7.7	8.0	7.7	7.5
TURBIDITY (NTU) FIELD	13	14	32	39	100+	17	22	20	20	8.5
TOTAL SUSP. SOLIDS	8.0	14.0	25.0	83	3580	8.0	8.0	22.0	15.0	25.0
TOTAL DISS. SOLIDS MEAS.	304	320	320	260	220	298	310	339	336	276
OXYGEN (O) DISS								7.8		
COMMON IONS										
CALCIUM (CA)	83.20	90.40	85.60	36.00	80.00	80.00	79.20	82.00	90.00	88.4
MAGNESIUM (MG)	17.76	17.28	18.72	40.80	<0.10	14.40	19.20	25.00	19.20	14.60
SODIUM (NA)	5.40	5.50	5.10	4.20	4.10	2.60	5.00	16.00	6.40	20.00
POTASSIUM (K)	1.3	1.1	1.2	1.2	4.4	1.0	1.48	1.34	1.56	0.85
ACIDITY AS CACO3								8.0		
ALKALINITY AS CACO3 (LAB)								265		
BICARBONATE (HCO3) (LAB)	285	307	305	297.7	231.8	231.8	300.1	323.3	317.2	348.9
SULFATE (SO4)	47	39	38	4	10	54	30	42	35	32
CHLORIDE (CL)	6.00	10.00	8.00	13.0	6.2	9.8	6.6	4.0	14.0	7.3
FLUORIDE (F)								0.34		
NUTRIENTS										
NITRATE (NO3-N)								2.38		
AMMONIA (NH3 AS N)		<0.01				0.12		0.03		<0.01
TOTAL PHOSPHATE (PO4)		0.10				0.04		0.05		0.12
TRACE ELEMENTS										
BARIUM (BA) TOTAL								0.02		
BORON (B) TOTAL								0.033		
COPPER (CU) TOTAL								0.017		
IRON (FE) TOTAL	0.240	0.095	0.270	0.80	45.10	0.36	0.46	0.50	0.65	0.12
LEAD (PB) TOTAL								<0.001		
MANGANESE (MN) TOTAL	0.027	0.017	0.030	0.08	2.00	0.04	0.50	0.62	0.46	0.16
ORGANIC PARAMETERS										
ORGANIC CARBON (TOTAL)								0.25		
PHENOLS		<0.001				<0.001		<0.001		<0.001
OTHER PARAMETERS										
OIL AND GREASE		<0.2				<0.1		<0.1		0.6
CYANIDE (CN)								<0.001		

All quantities in milligrams per liter unless otherwise noted. Blank line indicates parameter not tested.

Output Date: 02-09-1987
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SUMMARY OF WATER QUALITY ANALYSIS - UTAH FUEL CO.

SITE NAME	CS-9	CS-9
SAMPLE DATE	05/28/86	06/24/86
LOCATION	RIGHT FORK	RIGHT FORK
LOCATION	ECCLES CR.	ECCLES CR.
PHYSICAL PARAMETERS		
AIR TEMPERATURE (C)	18	20
FLOW (CFS)	1.78	0.21
WATER TEMPERATURE (C)	8	10.5
SPEC. COND. (UMHOS/CM) FIELD	365	480
PH FIELD	7.7	7.6
TURBIDITY (NTU) FIELD	34	1.77
TOTAL SUSP. SOLIDS	142	13.6
TOTAL DISS. SOLIDS MEAS.	232	270
COMMON IONS		
CALCIUM (CA)	60.40	73.60
MAGNESIUM (MG)	7.90	13.00
SODIUM (NA)	6.69	5.05
POTASSIUM (K)	1.15	1.15
BICARBONATE (HCO3) (LAB)	194.0	251.3
SULFATE (SO4)	29	30
CHLORIDE (CL)	4.3	6.2
NUTRIENTS		
AMMONIA (NH3 AS N)		0.19
TOTAL PHOSPHATE (PO4)		0.05
TRACE ELEMENTS		
IRON (FE) TOTAL	1.09	1.10
MANGANESE (MN) TOTAL	0.08	0.10
ORGANIC PARAMETERS		
PHENOLS		<0.001
OTHER PARAMETERS		
OIL AND GREASE		<0.01

All quantities in milligrams per liter unless otherwise noted. Blank line indicates parameter not tested.

Output Date: 02-09-1987
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SUMMARY OF WATER QUALITY ANALYSIS - UTAH FUEL CO.

SITE NAME	CS-10	CS-10	CS-10	CS-10	CS-10	CS-10	CS-10	CS-10	CS-10	CS-10
SAMPLE DATE	05/13/81	06/23/81	07/30/81	08/21/81	09/24/81	10/22/81	11/10/81	12/08/81	06/30/82	07/21/82
LOCATION	HUNT.CR.L.	HUNT.CR.L.	HUNT.CR.L.	HUNT.CR.L.	HUNT.CR.L.	HUNT.CR.L.	HUNT.CR.L.	HUNT.CR.L.	HUNT.CR.L.	HUNT.CR.L.
LOCATION	FK ABV R FK	FK ABV R FK	FK ABV R FK	FK ABV R FK	FK ABV R FK	FK ABV R FK	FK ABV R FK	FK ABV R FK	FK ABV R FK	FK ABV R FK
PHYSICAL PARAMETERS										
AIR TEMPERATURE (C)	17	27	21	10	21	4	9	10	27	21
FLOW (CFS)	4.9	1.13	0.41	0.41	0.40	0.68	0.60		7.9	2.2
WATER TEMPERATURE (C)	11	15	12	10	13	1	2	0	10	9
SPEC. COND. (UMHOS/CM) FIELD	115	170	225	240	330	240	200	230	273	267
PH FIELD	8.2	8.2	8.1	8.1	8.3	7.2	7.9	8.0	7.4	7.7
TURBIDITY (NTU) FIELD	5.60			4.40			4.00		10.5	9.0
TOTAL SUSP. SOLIDS	15.0	<0.1	1.0	6.0	10.0	6.5	1.0	3.0		
TOTAL DISS. SOLIDS MEAS.	75			160			135			
TDS MEAS. @ 180 DEG. C		112	145		213	155		150		
OXYGEN (O) DISS	9.8	10.0	8.8	9.9	10.2	11.5	13.2			
COMMON IONS										
TOTAL HARDNESS AS CACO3	66									
CALCIUM (CA)	21.60	32.80	44.80	45.60	44.00	40.00	40.50	43.00		
MAGNESIUM (MG)	2.88	3.84	5.76	8.16	8.16	4.80	4.50	5.00		
SODIUM (NA)	1.90	3.10	1.80	2.00	1.90	13.00	1.80	1.60		
POTASSIUM (K)	0.51	0.50	0.74	0.86	0.80	1.20	0.85	0.95		
ACIDITY AS CACO3	2.73			3.60			4.00			
ALKALINITY AS CACO3 (LAB)	54			134		126	92	94		
BICARBONATE (HCO3) (LAB)	66	107	132	163	134	154	112	115		
CARBONATE AS CO3 (LAB)	<0.01									
SULFATE (SO4)	9.5	15.0	24.0	13.5	32.0	18.0	25.8	31.0		
CHLORIDE (CL)	4.00	2.11	3.29	2.65	2.26	3.60	3.00	2.60		
FLUORIDE (F)	0.08			0.12			0.07			
NUTRIENTS										
NITRATE (NO3-N)	0.20			0.03			0.10			
NITRITE (NO2-N)	0.02									
AMMONIA (NH3 AS N)	<0.01	<0.01	0.10	<0.01	0.02	<0.01	0.20	0.65		
TOTAL PHOSPHATE (PO4)	0.130		0.180	0.180	6.200	2.500	0.330	1.400		
TRACE ELEMENTS										
ALUMINUM (AL) TOTAL	0.020									
ARSENIC (AS) TOTAL	<0.001			<0.001			<0.001			
ARSENIC (AS) DISS	<0.001			<0.001			<0.001			
BARIUM (BA) TOTAL	0.024			0.050			0.030			
BARIUM (BA) DISS	0.020			0.030			0.025			
BORON (B) TOTAL	0.005			0.19			0.015			
BORON (B) DISS	<0.001			0.010			0.010			
CADMIUM (CD) TOTAL	<0.001			<0.001			<0.001			
CADMIUM (CD) DISS	<0.001			<0.001			<0.001			
CHROMIUM (CR) TOTAL	<0.001			<0.001			<0.001			
CHROMIUM (CR) DISS	<0.001			<0.001			<0.001			
COPPER (CU) TOTAL	<0.001			0.15			<0.001			

All quantities in milligrams per liter unless otherwise noted. Blank line indicates parameter not tested.

Output Date: 02-09-1987
HWQ-6/86-R1

SUMMARY OF WATER QUALITY ANALYSIS - UTAH FUEL CO.

SITE NAME	CS-10	CS-10	CS-10	CS-10	CS-10	CS-10	CS-10	CS-10	CS-10	CS-10
SAMPLE DATE	05/13/81	06/23/81	07/30/81	08/21/81	09/24/81	10/22/81	11/10/81	12/08/81	06/30/82	07/21/82
TRACE ELEMENTS										
COPPER (CU) DISS	<0.001			<0.001			<0.001			
IRON (FE) TOTAL	0.140	0.530	0.850	0.900	0.840	0.920	0.860	0.520		
IRON (FE) TOTAL	0.790									
LEAD (PB) TOTAL	0.001			<0.001			<0.001			
LEAD (PB) DISS	<0.001			<0.001			<0.001			
MANGANESE (MN) TOTAL	0.030	0.020	0.026	0.050	0.046	0.063	0.060	0.049		
MERCURY (HG) TOTAL	<0.0002			<0.0002			<0.0002			
MOLYBDENUM (MO) TOTAL	<0.001									
NICKEL (NI) TOTAL	<0.001									
SELENIUM (SE) TOTAL	<0.001			<0.001			<0.001			
SELENIUM (SE) DISS	<0.001			<0.001			<0.001			
SILVER (AG) TOTAL	<0.001			<0.001			<0.001			
SILVER (AG) DISS	<0.001			<0.001			<0.001			
ZINC (ZN) TOTAL	0.010			0.014			0.020			
ZINC (ZN) DISS	0.005			0.011			0.020			
BACTERIOLOGICAL PARAMETERS										
FECAL COLIFORM (NO./100ML)				17.0			<2.0			
TOTAL COLIFORM (NO./100ML)				330			130			
5 - DAY BOD				1.2						
ORGANIC PARAMETERS										
ORGANIC CARBON (TOTAL)	2.90			1.00			6.50			
PHENOLS	0.002	<0.001	0.005	<0.001	<0.001	<0.001	<0.001	0.023		
OTHER PARAMETERS										
OIL AND GREASE	<0.01			2.40			0.40			
CYANIDE (CN)	<0.001			<0.001			<0.001			
SULFIDE	<0.01									

All quantities in milligrams per liter unless otherwise noted. Blank line indicates parameter not tested.

Output Date: 02-09-1987
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SUMMARY OF WATER QUALITY ANALYSIS - UTAH FUEL CO.

SITE NAME	CS-10	CS-10	CS-10	CS-10	CS-10	CS-10	CS-10	CS-10	CS-10	CS-10
SAMPLE DATE	08/18/82	09/15/82	10/15/82	06/28/83	07/19/83	08/24/83	09/27/83	10/20/83	05/24/84	06/26/84
LOCATION	HUNT.CR.L.	HUNT.CR.L.	HUNT.CR.L.	HUNT.CR.L.	HUNT.CR.L.	HUNT.CR.L.	HUNT.CR.L.	HUNT.CR.L.	HUNT.CR.L.	HUNT.CR.L.
LOCATION	FK ABV R FK	FK ABV R FK	FK ABV R FK	FK ABV R FK	FK ABV R FK	FK ABV R FK	FK ABV R FK	FK ABV R FK	FK ABV R FK	FK ABV R FK
PHYSICAL PARAMETERS										
AIR TEMPERATURE (C)	21	10	8	16	21	11	15	9	13	14
FLOW (CFS)	0.82	1.10	3.70	13.67	5.25	1.31	2.43	1.00		7.4
WATER TEMPERATURE (C)	11	6	2	12	15	9	9	5	7	10
SPEC. COND. (UMHOS/CM) FIELD	213	210	198	125	152	250	224	232	111	170
PH FIELD	8.3	8.6	8.0	7.8	7.6	6.8	6.4	7.2	7.1	6.3
TURBIDITY (NTU) FIELD	18	11	19	30	18	18	72	19	100+	22
TOTAL SUSP. SOLIDS	5.0					16.0				
TOTAL DISS. SOLIDS MEAS.	160					136				
OXYGEN (O) DISS	8.2									
COMMON IONS										
CALCIUM (CA)	41.60				39.20					
MAGNESIUM (MG)	8.64				5.28					
SODIUM (NA)	1.8				1.6					
POTASSIUM (K)	0.61				1.5					
ACIDITY AS CACO3	2.0				16.00					
ALKALINITY AS CACO3 (LAB)	107					114				
BICARBONATE (HCO3) (LAB)	130					139				
SULFATE (SO4)	14.0					10				
CHLORIDE (CL)	14.70				2.0					
FLUORIDE (F)	0.09				0.06					
NUTRIENTS										
NITRATE (NO3-N)	0.11					<0.02				
AMMONIA (NH3 AS N)	0.14					<0.10				
TOTAL PHOSPHATE (PO4)	0.050					0.04				
TRACE ELEMENTS										
BARIUM (BA) TOTAL	0.030				0.021					
BORON (B) TOTAL	0.010				0.013					
COPPER (CU) TOTAL	0.010				0.010					
IRON (FE) TOTAL	1.050				0.855					
LEAD (PB) TOTAL	0.003				0.002					
MANGANESE (MN) TOTAL	0.050				0.085					
ZINC (ZN) TOTAL	0.005				0.020					
ORGANIC PARAMETERS										
ORGANIC CARBON (TOTAL)	8.10					1.80				
PHENOLS	0.008					<0.001				
OTHER PARAMETERS										
OIL AND GREASE	0.6					<0.2				
CYANIDE (CN)	<0.001				<0.001					

All quantities in milligrams per liter unless otherwise noted. Blank line indicates parameter not tested.

Output Date: 02-09-1987
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SUMMARY OF WATER QUALITY ANALYSIS - UTAH FUEL CO.

SITE NAME	CS-10	CS-10	CS-10	CS-10	CS-10	CS-10
SAMPLE DATE	07/31/84	08/24/84	09/27/84	10/15/85	05/27/86	06/19/86
LOCATION	HUNT.CR.L.	HUNT.CR.L.	HUNT.CR.L.	HUNT.CR.L.	HUNT.CR.L.	HUNT.CR.L.
LOCATION	FK ABV R FK	FK ABV R FK	FK ABV R FK	FK ABV R FK	FK ABV R FK	FK ABV R FK
PHYSICAL PARAMETERS						
AIR TEMPERATURE (C)	20	9	6	11	15	19
FLOW (CFS)	2.13	1.11	1.05	0.77		9.23
WATER TEMPERATURE (C)	12	9	9	6	7	13
SPEC. COND. (UMHOS/CM) FIELD	221	117	245	232	74	147
PH FIELD	6.9	6.8	7.2	7.1	6.9	7.6
TURBIDITY (NTU) FIELD	36	23	12.0	8.8	36	
TOTAL SUSP. SOLIDS		13.0				
TOTAL DISS. SOLIDS MEAS.		190				
OXYGEN (O) DISS		8.4				
COMMON IONS						
CALCIUM (CA)		48.00				
MAGNESIUM (MG)		8.40				
SODIUM (NA)		24.00				
POTASSIUM (K)		0.61				
ACIDITY AS CACO3		6.70				
ALKALINITY AS CACO3 (LAB)		150				
BICARBONATE (HCO3) (LAB)		183.0				
SULFATE (SO4)		<10				
CHLORIDE (CL)		20.0				
FLUORIDE (F)		0.13				
NUTRIENTS						
NITRATE (NO3-N)		0.06				
AMMONIA (NH3 AS N)		0.04				
TOTAL PHOSPHATE (PO4)		<0.01				
TRACE ELEMENTS						
BARIUM (BA) TOTAL		0.03				
BORON (B) TOTAL		0.028				
COPPER (CU) TOTAL		0.017				
IRON (FE) TOTAL		2.50				
LEAD (PB) TOTAL		0.041				
MANGANESE (MN) TOTAL		0.11				
ZINC (ZN) TOTAL		0.033				
ORGANIC PARAMETERS						
ORGANIC CARBON (TOTAL)		<0.01				
PHENOLS		<0.001				
OTHER PARAMETERS						
OIL AND GREASE		<0.1				
CYANIDE (CN)		<0.001				

All quantities in milligrams per liter unless otherwise noted. Blank line indicates parameter not tested.

Output Date: 02-09-1987
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SUMMARY OF WATER QUALITY ANALYSIS - UTAH FUEL CO.

SITE NAME	CS-11	CS-11	CS-11	CS-11	CS-11	CS-11	CS-11	CS-11	CS-11	CS-11
SAMPLE DATE	05/12/81	06/23/81	07/29/81	08/20/81	09/25/81	10/22/81	11/11/81	05/20/82	06/30/82	07/21/82
LOCATION	ECCLES CR.	ECCLES CR.	ECCLES CR.	ECCLES CR.	ECCLES CR.	ECCLES CR.	ECCLES CR.	ECCLES CR.	ECCLES CR.	ECCLES CR.
LOCATION	ABV MINE	ABV MINE	ABV MINE	ABV MINE	ABV MINE	ABV MINE	ABV MINE	ABV MINE	ABV MINE	ABV MINE
PHYSICAL PARAMETERS										
AIR TEMPERATURE (C)	15	22	25	17	15	15	0	13	17	22
FLOW (CFS)									1.20	0.11
WATER TEMPERATURE (C)	2.5	11	13	12	9	0	0	2	7	10
SPEC. COND. (UMHOS/CM) FIELD	250	290	300	370	350	450	470	205	270	296
PH FIELD	8.4	8.5	8.5	8.2	8.3	7.6	8.1	7.7	8.2	7.9
TURBIDITY (NTU) FIELD	0.82			4.0			8.50	100+	4.0	58
TOTAL SUSP. SOLIDS	7.0	10.0	4.0	4.0	41.0	30.0	91.0	380	1.0	51.0
TOTAL DISS. SOLIDS MEAS.	165	190	197	240	230	280	304	150	179	235
OXYGEN (O) DISS	11.5	9.6	8.7	9.4		11.0	11.5			
COMMON IONS										
TOTAL HARDNESS AS CACO3	166									
CALCIUM (CA)	51.20	47.20	60.80	65.60	69.60	36.80	73.00	42.40	52.50	56.00
MAGNESIUM (MG)	9.12	16.32	9.60	14.88	12.48	6.72	15.50	6.50	8.20	16.32
SODIUM (NA)	2.30	2.20	2.40	2.80	2.30	67.00	2.50	1.6	2.5	14.0
POTASSIUM (K)	0.72	0.74	0.91	0.96	0.58	3.69	3.80	6.30	0.60	0.70
ACIDITY AS CACO3	<0.01			<0.01			<0.01			
ALKALINITY AS CACO3 (LAB)	154			198		267	229	123		235
BICARBONATE (HCO3) (LAB)	178	265	207	224	251	325	255	150	177	287
CARBONATE AS CO3 (LAB)	4.80									
SULFATE (SO4)	7.5	19.5	20.0	38.0	18.0	3.0	38.9	17.0	20.0	3.0
CHLORIDE (CL)	6.00	3.00	3.77	3.56	2.87	3.60	3.60	1.20	0.80	2.80
FLUORIDE (F)	0.13			0.17			0.12			
NUTRIENTS										
NITRATE (NO3-N)	0.23			<0.01			0.14			
NITRITE (NO2-N)	0.02									
AMMONIA (NH3 AS N)	<0.01	<0.01	<0.01	<0.01		0.04	0.10		0.25	
TOTAL PHOSPHATE (PO4)	0.110		0.210	0.170	0.540	0.420	0.660		0.080	
TRACE ELEMENTS										
ALUMINUM (AL) TOTAL	<0.001									
ARSENIC (AS) TOTAL	<0.001			<0.001			<0.001			
ARSENIC (AS) DISS	<0.001			<0.001			<0.001			
BARIUM (BA) TOTAL	0.030			0.025			0.28			
BARIUM (BA) DISS	0.015			0.020			0.015			
BORON (B) TOTAL	0.015			0.015			0.020			
BORON (B) DISS	0.010			0.010			0.015			
CADMIUM (CD) TOTAL	<0.001			<0.001			<0.001			
CADMIUM (CD) DISS	<0.001			<0.001			<0.001			
CHROMIUM (CR) TOTAL	<0.001			<0.001			<0.001			
CHROMIUM (CR) DISS	<0.001			<0.001			<0.001			
COPPER (CU) TOTAL	0.010			0.017			<0.001			
COPPER (CU) DISS	0.010			<0.001			<0.001			

All quantities in milligrams per liter unless otherwise noted. Blank line indicates parameter not tested.

Output Date: 02-09-1987
HWQ-6/86-R1

SUMMARY OF WATER QUALITY ANALYSIS - UTAH FUEL CO.

SITE NAME	CS-11	CS-11	CS-11	CS-11	CS-11	CS-11	CS-11	CS-11	CS-11	CS-11
SAMPLE DATE	05/12/81	06/23/81	07/29/81	08/20/81	09/25/81	10/22/81	11/11/81	05/20/82	06/30/82	07/21/82
TRACE ELEMENTS										
IRON (FE) TOTAL	0.020	0.150	0.115	0.330	0.159	0.133	0.165	5.150	0.100	1.280
IRON (FE) TOTAL	0.110									
LEAD (PB) TOTAL	0.002			<0.001			<0.001			
LEAD (PB) DISS	<0.001			<0.001			<0.001			
MANGANESE (MN) TOTAL	0.010	0.010	0.015	0.030	0.021	0.020	0.025	0.077	0.002	0.020
MERCURY (HG) TOTAL	<0.0002			<0.0002			<0.0002			
MOLYBDENUM (MO) TOTAL	<0.001									
NICKEL (NI) TOTAL	<0.001									
SELENIUM (SE) TOTAL	<0.001			<0.001			<0.001			
SELENIUM (SE) DISS	<0.001			<0.001			<0.001			
SILVER (AG) TOTAL	<0.001			<0.001			<0.001			
SILVER (AG) DISS	<0.001			<0.001			<0.001			
ZINC (ZN) TOTAL	0.007			0.014			0.024			
ZINC (ZN) DISS	0.007			0.010			0.016			
BACTERIOLOGICAL PARAMETERS										
FECAL COLIFORM (NO./100ML)				79.0			<2.0			
TOTAL COLIFORM (NO./100ML)				220			330			
5 - DAY BOD				1.4						
ORGANIC PARAMETERS										
ORGANIC CARBON (TOTAL)	2.40			9.70			11.50			
PHENOLS	0.010	<0.001	0.009	0.164		0.028	10.220		<0.001	
OTHER PARAMETERS										
OIL AND GREASE	<0.01			1.20			<0.01		0.2	
CYANIDE (CN)	<0.001			<0.001			0.002			
SULFIDE	0.92									

All quantities in milligrams per liter unless otherwise noted. Blank line indicates parameter not tested.

Output Date: 02-09-1987
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SUMMARY OF WATER QUALITY ANALYSIS - UTAH FUEL CO.

SITE NAME	CS-11	CS-11	CS-11	CS-11	CS-11	CS-11	CS-11	CS-11	CS-11	CS-11
SAMPLE DATE	08/19/82	09/15/82	10/14/82	11/09/82	06/29/83	07/20/83	08/25/83	09/28/83	10/26/83	11/11/83
LOCATION	ECCLES CR.	ECCLES CR.	ECCLES CR.	ECCLES CR.	ECCLES CR.	ECCLES CR.	ECCLES CR.	ECCLES CR.	ECCLES CR.	ECCLES CR.
LOCATION	ABV MINE	ABV MINE	ABV MINE	ABV MINE	ABV MINE	ABV MINE	ABV MINE	ABV MINE	ABV MINE	ABV MINE
PHYSICAL PARAMETERS										
AIR TEMPERATURE (C)	22	6	-2	0	16	16	8	14	7	2
FLOW (CFS)	0.04	0.15	0.14		2.03	0.52	0.38	0.14	0.11	0.11
WATER TEMPERATURE (C)	10	3	1	0	9	8	7	7	3	1
SPEC. COND. (UMHOS/CM) FIELD	380	320	309	478	282	375	454	459	443	403
PH FIELD	8.5	8.4	7.8	8.0	8.1	7.9	8.0	7.9	7.9	7.9
TURBIDITY (NTU) FIELD	100+	56	84	69	61	22	23	42	11	42
TOTAL SUSP. SOLIDS	297	84.0	218	137	55.0	1.0	27.0	22.0	29.0	26.0
TOTAL DISS. SOLIDS MEAS.	268	245	250	270	184	240	248	230	300	260
OXYGEN (O) DISS	10.7						5.0			
COMMON IONS										
CALCIUM (CA)	69.60	72.00	74.40	75.20	48.80	62.40	70.40	72.00	73.60	73.60
MAGNESIUM (MG)	14.88	11.04	12.48	14.40	6.72	8.16	12.00	13.92	14.40	15.84
SODIUM (NA)	13.0	3.5	4.0	2.9	11.0	20.0	7.5	2.50	21.00	2.50
POTASSIUM (K)	1.00	1.27	1.30	1.13	0.64	0.8	0.6	1.1	0.9	0.9
ACIDITY AS CACO3	<0.01						33.00			
ALKALINITY AS CACO3 (LAB)	239						230			
BICARBONATE (HCO3) (LAB)	292	279	277	269	185	249	281	256	268	281
SULFATE (SO4)	<3.0	<0.1	18.0	27.0	12.0	28	10	27	58	16
CHLORIDE (CL)	19.80	5.90	2.50	3.00	8.0	4.0	2.0	2.00	4.00	4.00
FLUORIDE (F)	0.17						0.10			
NUTRIENTS										
NITRATE (NO3-N)	0.20						<0.02			
AMMONIA (NH3 AS N)	0.17		0.30		<0.1		1.5		<0.01	
TOTAL PHOSPHATE (PO4)	0.270		0.150		0.30		0.10		0.05	
TRACE ELEMENTS										
BARIUM (BA) TOTAL	0.030						0.011			
BORON (B) TOTAL	0.015						0.011			
COPPER (CU) TOTAL	<0.001						0.010			
IRON (FE) TOTAL	3.330	1.550	1.870	1.520	0.900	0.210	0.850	1.070	0.230	0.480
LEAD (PB) TOTAL	0.004						0.003			
MANGANESE (MN) TOTAL	0.125	0.095	0.090	0.100	0.022	0.025	0.060	0.088	0.029	0.070
ZINC (ZN) TOTAL	0.055						0.016			
ORGANIC PARAMETERS										
ORGANIC CARBON (TOTAL)	21.00						1.70			
PHENOLS	<0.001		<0.001		<0.001		<0.001		<0.001	
OTHER PARAMETERS										
OIL AND GREASE	0.6		<0.1		<0.2		<0.1		<0.2	
CYANIDE (CN)	<0.001						<0.001			

All quantities in milligrams per liter unless otherwise noted. Blank line indicates parameter not tested.

Output Date: 02-09-1987
HWQ-6/86-R1

SUMMARY OF WATER QUALITY ANALYSIS - UTAH FUEL CO.

SITE NAME	CS-11	CS-11	CS-11	CS-11	CS-11	CS-11	CS-11	CS-11
SAMPLE DATE	05/24/84	06/27/84	07/26/84	08/28/84	09/17/84	10/16/85	05/28/86	06/25/86
LOCATION	ECCLES CR.	ECCLES CR.	ECCLES CR.	ECCLES CR.	ECCLES CR.	ECCLES CR.	ECCLES CR.	ECCLES CR.
LOCATION	ABV MINE	ABV MINE	ABV MINE	ABV MINE	ABV MINE	ABV MINE	ABV MINE	ABV MINE
PHYSICAL PARAMETERS								
AIR TEMPERATURE (C)	17	24	18	13	17	0	8	14
FLOW (CFS)		2.2	0.40	0.37	0.07			0.97
WATER TEMPERATURE (C)	6	11	13	8	11	1	3	7
SPEC. COND. (UMHOS/CM) FIELD	250	340	362	504	401	417	194	335
PH FIELD	7.4	7.5	7.6	8.2	8.2	7.6	7.6	7.6
TURBIDITY (NTU) FIELD	100+	38	100+	30	24	15	47	2.90
TOTAL SUSP. SOLIDS	201	18.0	236	19.0	20.0	15.0	142	2.0
TOTAL DISS. SOLIDS MEAS.	160	280	230	310	262	250	128	172
OXYGEN (O) DISS				8.0				
COMMON IONS								
CALCIUM (CA)	24.00	76.00	85.60	74.00	78.00	97.60	39.60	53.60
MAGNESIUM (MG)	25.20	14.50	<0.01	20.40	13.20	4.80	5.50	7.20
SODIUM (NA)	1.50	2.10	2.50	11.00	8.10	1.70	5.36	1.98
POTASSIUM (K)	0.7	0.7	1.28	0.81	1.00	0.86	0.35	0.68
ACIDITY AS CACO3				6.00				
ALKALINITY AS CACO3 (LAB)				240				
BICARBONATE (HCO3) (LAB)	170.8	146.4	230.6	292.3	298.9	298.9	133.0	185.4
SULFATE (SO4)	24	118	24	26	21	16	0.18	12
CHLORIDE (CL)	<0.1	1.9	1.5	4.0	4.0	2.8	1.9	1.7
FLUORIDE (F)				0.27				
NUTRIENTS								
NITRATE (NO3-N)				0.18				
ORTHO-PHOSPHATE (PO4-P)				26				
AMMONIA (NH3 AS N)		0.21		0.03		<0.01		0.30
TOTAL PHOSPHATE (PO4)		0.05		0.02		0.08		<0.01
TRACE ELEMENTS								
BARIUM (BA) TOTAL				0.03				
BORON (B) TOTAL				0.041				
COPPER (CU) TOTAL				0.021				
IRON (FE) TOTAL	3.52	0.69	8.50	9.10	0.40	0.10	0.99	1.05
LEAD (PB) TOTAL				0.002				
MANGANESE (MN) TOTAL	0.12	0.03	0.27	0.06	0.05	0.04	0.07	0.05
ORGANIC PARAMETERS								
ORGANIC CARBON (TOTAL)				0.30				
PHENOLS		<0.001		<0.001		<0.001		<0.001
OTHER PARAMETERS								
OIL AND GREASE		<0.1		<0.1		0.8		<0.1
CYANIDE (CN)				<0.001				

All quantities in milligrams per liter unless otherwise noted. Blank line indicates parameter not tested.

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SUMMARY OF WATER QUALITY ANALYSIS - UTAH FUEL CO.

SITE NAME	CS-12	CS-12	CS-12	CS-12	CS-12	CS-12	CS-12	CS-12	CS-12	CS-12
SAMPLE DATE	11/30/83	12/20/83	01/18/84	02/21/84	03/22/84	04/25/84	05/17/84	06/28/84	07/27/84	08/24/84
LOCATION	DISCHARGE	DISCHARGE	DISCHARGE	DISCHARGE	DISCHARGE	DISCHARGE	DISCHARGE	DISCHARGE	DISCHARGE	DISCHARGE
LOCATION	MINE NO.3	MINE NO.3	MINE NO.3	MINE NO.3	MINE NO.3	MINE NO.3	MINE NO.3	MINE NO.3	MINE NO.3	MINE NO.3
PHYSICAL PARAMETERS										
AIR TEMPERATURE (C)	1	-10	-23	2	-5	3	11	19	17	19
FLOW (CFS)						0.18	0.45	0.35		
WATER TEMPERATURE (C)	8	7	8	4	9	11	11	13	12	15
SPEC. COND. (UMHOS/CM) FIELD	594	530	754	1015	892	570	550	712	708	614
PH FIELD	7.2	6.9	7.4	6.9	7.1	7.6	7.7	7.2	7.3	7.5
TURBIDITY (NTU) FIELD	18	38	100+	42	100+	100+	100+	100+	48	82
TOTAL SUSP. SOLIDS	10.0	5.0	11.5	105	81.0	220	167	4750	31.0	60.0
TOTAL DISS. SOLIDS MEAS.	345	420	456	700	860	339	490	550	358	390
TOTAL SETTLEABLE SOLIDS			0.1							
OXYGEN (O) DISS										5.6
TOTAL SOLIDS						0.59	0.89	0.77	0.51	0.64
COMMON IONS										
CALCIUM (CA)	53.00	58.40	100.0	152.00	145.60	66.00	160.00	116.00	66.40	48.00
MAGNESIUM (MG)	21.00	26.40	35.50	37.20	40.80	34.80	<0.10	40.40	46.60	43.20
SODIUM (NA)	46.00	8.60	8.70	18.10	11.30	8.10	8.90	10.50	12.00	40.00
POTASSIUM (K)	3.5	8.2	5.7	5.1	5.8	5.7	6.7	6.7	5.95	5.61
ACIDITY AS CACO3	12.00									10.50
ALKALINITY AS CACO3 (LAB)	248									250
BICARBONATE (HCO3) (LAB)	302.5	253.8	248.9	230.6	225.7	302.6	256.2	274.5	207.4	305.0
SULFATE (SO4)	44	58	205	320	54	66	188	237	197	74
CHLORIDE (CL)	24.00	8.00	8.0	32.0	20.0	7.0	9.5	7.3	15.3	20.0
FLUORIDE (F)	0.10									0.28
NUTRIENTS										
NITRATE (NO3-N)	<0.01									0.02
AMMONIA (NH3 AS N)	1.80							0.26		0.28
TOTAL PHOSPHATE (PO4)	0.05							0.02		<0.01
TRACE ELEMENTS										
BARIUM (BA) TOTAL	0.086									0.11
BORON (B) TOTAL	0.200									0.141
COPPER (CU) TOTAL	0.010									0.023
IRON (FE) TOTAL	0.160	0.020	0.18	0.83	3.04	1.23	2.31	32.40	0.71	2.40
LEAD (PB) TOTAL	<0.001									0.009
MANGANESE (MN) TOTAL	0.020	0.036	0.03	0.06	0.04	0.03	0.13	0.33	0.04	0.02
ZINC (ZN) TOTAL	0.003									0.062
ORGANIC PARAMETERS										
ORGANIC CARBON (TOTAL)	2.50									<0.01
PHENOLS	<0.001							<0.001		<0.001
OTHER PARAMETERS										
OIL AND GREASE	<0.2							2.0		<0.1

All quantities in milligrams per liter unless otherwise noted. Blank line indicates parameter not tested.

Output Date: 02-09-1987
HWQ-6/86-R1

SUMMARY OF WATER QUALITY ANALYSIS - UTAH FUEL CO.

SITE NAME	CS-12	CS-12	CS-12	CS-12	CS-12	CS-12	CS-12	CS-12	CS-12	CS-12
SAMPLE DATE	11/30/83	12/20/83	01/18/84	02/21/84	03/22/84	04/25/84	05/17/84	06/28/84	07/27/84	08/24/84
OTHER PARAMETERS										
CYANIDE (CN)	<0.001									<0.001

All quantities in milligrams per liter unless otherwise noted. Blank line indicates parameter not tested.

Output Date: 02-09-1987
HWQ-6/86-R1

SUMMARY OF WATER QUALITY ANALYSIS - UTAH FUEL CO.

SITE NAME	CS-12	CS-12	CS-12	CS-12	CS-12	CS-12	CS-12	CS-12	CS-12	CS-12
SAMPLE DATE	09/27/84	10/16/85	11/15/85	12/11/85	01/22/86	03/06/86	03/26/86	04/17/86	05/28/86	06/24/86
LOCATION	DISCHARGE	DISCHARGE	DISCHARGE	DISCHARGE	DISCHARGE	DISCHARGE	DISCHARGE	DISCHARGE	DISCHARGE	DISCHARGE
LOCATION	MINE NO.3	MINE NO.3	MINE NO.3	MINE NO.3	MINE NO.3	MINE NO.3	MINE NO.3	MINE NO.3	MINE NO.3	MINE NO.3
PHYSICAL PARAMETERS										
AIR TEMPERATURE (C)	5	9	1	-12	4		10	-3	18	19
FLOW (CFS)		0.36	0.34	0.53	0.60	0.53	0.53	0.58	0.53	0.63
WATER TEMPERATURE (C)	13.5	12	11	12	16.5	12.5	11	11	11.5	12
SPEC. COND. (UMHOS/CM) FIELD	498	589	770	593	698	698	736	789	620	728
PH FIELD	7.3	7.1	7.2	7.4	7.0	7.3	7.0	7.5	7.3	7.1
TURBIDITY (NTU) FIELD	61	27	20	36	14	23	16	17	58	25.81
TOTAL SUSP. SOLIDS	65.0	23.0	9.0	26.0	7.0	50.0	26.0	22.0	219	14.0
TOTAL DISS. SOLIDS MEAS.	310	364	512	406	502	486	520	542	400	496
TOTAL SETTLEABLE SOLIDS			<0.1				<0.1	<0.1	0.5	
TOTAL SOLIDS	0.62									
COMMON IONS										
CALCIUM (CA)	42.00	81.60	110.40	65.20	91.60		111.60	98.40	79.20	90.10
MAGNESIUM (MG)	42.60	27.10	31.90	30.20	<0.10		31.90	33.10	28.80	27.80
SODIUM (NA)	7.50	9.80	11.00	17.60	58.00		11.20	12.40	12.92	15.13
POTASSIUM (K)	5.35	4.48	5.34	4.68	4.88		4.43	5.64	4.97	6.98
BICARBONATE (HCO3) (LAB)	224.5	231.8	216.0	220.0	206.0		206.0	176.0	189.0	175.7
SULFATE (SO4)	102	144	239	141	180		205	235	180	213
CHLORIDE (CL)	5.0	4.2	6.6	8.2	10.8		35.0	14.0	3.4	3.9
NUTRIENTS										
AMMONIA (NH3 AS N)		<0.01								0.16
TOTAL PHOSPHATE (PO4)		0.06								0.04
TRACE ELEMENTS										
IRON (FE) TOTAL	0.43	0.15	0.15	0.17	0.51	0.18	0.20	0.18	0.58	0.20
MANGANESE (MN) TOTAL	0.01	<0.01	0.04	0.02	0.05		0.02	0.02	0.06	0.05
ORGANIC PARAMETERS										
PHENOLS		<0.001								<0.001
OTHER PARAMETERS										
OIL AND GREASE		<0.1	<0.1	1.6	1.0	<0.1	1.6	1.0	1.4	<0.1

All quantities in milligrams per liter unless otherwise noted. Blank line indicates parameter not tested.

Output Date: 02-09-1987
HWQ-6/86-R1

SUMMARY OF WATER QUALITY ANALYSIS - UTAH FUEL CO.

SITE NAME	CS-13	CS-13	CS-13	CS-13	CS-13	CS-13	CS-13	CS-13	CS-13	CS-13
SAMPLE DATE	11/10/83	11/11/83	02/22/84	03/22/84	04/25/84	05/17/84	06/29/84	07/27/84	08/24/84	09/18/84
LOCATION	FRENCH DR.	FRENCH DR.	FRENCH DR.	FRENCH DR.	FRENCH DR.	FRENCH DR.	FRENCH DR.	FRENCH DR.	FRENCH DR.	FRENCH DR.
LOCATION	N.LOADOUT	N.LOADOUT	N.LOADOUT	N.LOADOUT	N.LOADOUT	N.LOADOUT	N.LOADOUT	N.LOADOUT	N.LOADOUT	N.LOADOUT
PHYSICAL PARAMETERS										
AIR TEMPERATURE (C)	2	1	-4	-3	3	16	22	14	15	14
FLOW (CFS)	0.01	0.02	0.02	0.02	0.08	0.08	0.04	0.04	0.02	0.02
WATER TEMPERATURE (C)	6	4	2	4	3	9	8	11	10	9
SPEC. COND. (UMHOS/CM) FIELD	626	599	651	656	874	803	686	670	742	634
PH FIELD	7.2	6.7	7.3	7.4	7.2	7.2	7.5	7.0	7.3	7.1
TURBIDITY (NTU) FIELD	13	13	10	3.4	12.5	5.2	17	23	40	24
TOTAL SUSP. SOLIDS	24.0	24.0	4.0	5.0	12	6.0	7.0	5.0	71.0	39.0
TOTAL DISS. SOLIDS MEAS.	390	420	440	480	485	665	455	360	480	450
OXYGEN (O) DISS									9.8	
COMMON IONS										
CALCIUM (CA)	98.40	97.60	84.00	107.20	142.00	220.00	100.00	104.00	104.00	110.00
MAGNESIUM (MG)	27.36	27.84	44.40	30.48	14.40	12.00	33.60	25.90	36.00	30.00
SODIUM (NA)	8.10	8.10	8.60	10.50	15.10	13.50	10.20	9.80	40.00	9.30
POTASSIUM (K)	2.3	2.2	2.3	2.4	3.2	2.5	2.4	2.34	2.24	2.30
ACIDITY AS CACO3									20.20	
ALKALINITY AS CACO3 (LAB)									340	
BICARBONATE (HCO3) (LAB)	368	368	363	379	403.8	390.4	366.0	380.0	414.8	378.2
SULFATE (SO4)	51	53	66	56	74	180	85	60	54	76
CHLORIDE (CL)	14.00	14.00	24.0	31.0	26.00	80.7	15.4	15.1	20.0	18.0
FLUORIDE (F)									0.17	
NUTRIENTS										
NITRATE (NO3-N)									0.8	
AMMONIA (NH3 AS N)	0.50						0.19		0.08	
TOTAL PHOSPHATE (PO4)	0.02						0.03		0.03	
TRACE ELEMENTS										
BARIUM (BA) TOTAL									0.06	
BORON (B) TOTAL									0.041	
COPPER (CU) TOTAL									0.022	
IRON (FE) TOTAL	0.150	0.200	0.25	0.05	0.30	0.25	0.23	0.22	0.50	0.54
LEAD (PB) TOTAL									0.013	
MANGANESE (MN) TOTAL	0.019	0.060	0.04	0.05	0.10	0.11	0.05	0.04	0.09	0.06
ZINC (ZN) TOTAL									0.056	
ORGANIC PARAMETERS										
ORGANIC CARBON (TOTAL)									<0.01	
PHENOLS	<0.001						0.001		<0.001	
OTHER PARAMETERS										
OIL AND GREASE	<0.02						0.6		<0.1	
CYANIDE (CN)									<0.001	

All quantities in milligrams per liter unless otherwise noted. Blank line indicates parameter not tested.

Output Date: 02-09-1987
HWQ-6/86-R1

SUMMARY OF WATER QUALITY ANALYSIS - UTAH FUEL CO.

SITE NAME	CS-13	CS-13	CS-13	CS-13
SAMPLE DATE	10/16/85	04/17/86	05/28/86	06/25/86
LOCATION	FRENCH DR.	FRENCH DR.	FRENCH DR.	FRENCH DR.
LOCATION	N.LOADOUT	N.LOADOUT	N.LOADOUT	N.LOADOUT
PHYSICAL PARAMETERS				
AIR TEMPERATURE (C)	10	-2	22	18
FLOW (CFS)	0.05	0.06	0.08	0.03
WATER TEMPERATURE (C)	7	5	9.5	10
SPEC. COND. (UMHOS/CM) FIELD	708	850	699	697
PH FIELD	7.2	7.3	7.1	7.1
TURBIDITY (NTU) FIELD	4.4	8.7	3.7	0.07
TOTAL SUSP. SOLIDS	10.0	227	16.0	<0.1
TOTAL DISS. SOLIDS MEAS.	424	535	486	426
COMMON IONS				
CALCIUM (CA)	110.40	128.40	109.60	82.40
MAGNESIUM (MG)	26.60	33.60	30.20	26.40
SODIUM (NA)	11.0	16.30	11.40	12.45
POTASSIUM (K)	2.10	2.28	1.54	2.14
BICARBONATE (HCO3) (LAB)	240.3	378.0	375.0	297.7
SULFATE (SO4)	170	126	83	68
CHLORIDE (CL)	19.7	34.7	23.9	20.0
NUTRIENTS				
AMMONIA (NH3 AS N)	<0.01			0.36
TOTAL PHOSPHATE (PO4)	<0.01			<0.01
TRACE ELEMENTS				
IRON (FE) TOTAL	0.05	0.09	0.05	0.10
MANGANESE (MN) TOTAL	0.04	0.04	0.02	0.03
ORGANIC PARAMETERS				
PHENOLS	<0.001			<0.001
OTHER PARAMETERS				
OIL AND GREASE	0.2			<0.1

All quantities in milligrams per liter unless otherwise noted. Blank line indicates parameter not tested.

Output Date: 02-09-1987
HWQ-6/86-R1

SUMMARY OF WATER QUALITY ANALYSIS - UTAH FUEL CO.

SITE NAME	UPL-3	UPL-3	UPL-3	UPL-3	UPL-3	UPL-3	UPL-3	UPL-3	UPL-3	UPL-3
SAMPLE DATE	05/13/81	06/23/81	07/30/81	08/20/81	09/25/81	10/22/81	11/10/81	12/08/81	05/20/82	06/30/82
LOCATION	HUNT.CR BLW	HUNT.CR.BLW	HUNT.CR.BLW	HUNT.CR.BLW	HUNT.CR.BLW	HUNT.CR.BLW	HUNT.CR.BLW	HUNT.CR.BLW	HUNT.CR.BLW	HUNT.CR.BLW
LOCATION	ELECTRIC LK	ELECTRIC LK	ELECTRIC LK	ELECTRIC LK	ELECTRIC LK	ELECTRIC LK	ELECTRIC LK	ELECTRIC LK	ELECTRIC LK	ELECTRIC LK
PHYSICAL PARAMETERS										
AIR TEMPERATURE (C)	13	20	21	25	5	16	-2	3	9	20
WATER TEMPERATURE (C)	7	9	9	9	9	8	5	3	3	10
SPEC. COND. (UMHOS/CM) FIELD	220	220	210	240	230	270	280	280	362	270
PH FIELD	8.1	7.9	8.0	8.2	8.1	6.6	7.9	7.9	7.2	8.0
TURBIDITY (NTU) FIELD	0.48			0.64			0.50		2.3	
TOTAL SUSP. SOLIDS	10	3.0	3.0	1.5	13.0	4.8	1.0	1.0	1.0	
TOTAL DISS. SOLIDS MEAS.	144	142	140	155	150	185	179	185	158	
OXYGEN (O) DISS	10.3	11.1	9.6	9.8	11.2	9.8	8.5			
COMMON IONS										
TOTAL HARDNESS AS CACO3	136									
CALCIUM (CA)	45.60	40.80	40.80	44.80	41.60	45.60	44.50	46.00	46.40	
MAGNESIUM (MG)	5.28	8.16	7.20	6.72	5.28	7.68	8.50	8.50	8.80	
SODIUM (NA)	2.00	2.50	1.80	1.90	1.85	11.80	12.10	10.90	1.7	
POTASSIUM (K)	0.90	0.82	0.81	0.86	0.75	0.81	0.85	0.66	3.90	
ACIDITY AS CACO3	<0.01			3.60			6.00			
ALKALINITY AS CACO3 (LAB)	120			120		159	137	138	144	
BICARBONATE (HCO3) (LAB)	146	134	139	146	146	193	168	169	176	
CARBONATE AS CO3 (LAB)	<0.01									
SULFATE (SO4)	13.0	24.0	15.0	18.0	9.0	9.0	27.9	29.0	15.0	
CHLORIDE (CL)	3.30	3.24	3.05	2.85	2.07	4.80	2.90	2.70	1.50	
FLUORIDE (F)	0.13			0.11			0.09			
NUTRIENTS										
NITRATE (NO3-N)	0.24			0.20			0.13			
NITRITE (NO2-N)	0.01									
AMMONIA (NH3 AS N)	<0.01	<0.01	<0.01	<0.01	0.01	<0.01	<0.01	0.62		
TOTAL PHOSPHATE (PO4)	0.150		0.120	0.120	1.500	0.166	0.440	0.430		
TRACE ELEMENTS										
ALUMINUM (AL) TOTAL	<0.001									
ARSENIC (AS) TOTAL	<0.001			<0.001			<0.001			
ARSENIC (AS) DISS	<0.001			<0.001			<0.001			
BARIUM (BA) TOTAL	0.035			0.025			0.032			
BARIUM (BA) DISS	0.025			0.015			0.025			
BORON (B) TOTAL	0.008			0.010			0.030			
BORON (B) DISS	<0.001			0.005			0.015			
CADMIUM (CD) TOTAL	<0.001			<0.001			<0.001			
CADMIUM (CD) DISS	<0.001			<0.001			<0.001			
CHROMIUM (CR) TOTAL	<0.001			<0.001			<0.001			
CHROMIUM (CR) DISS	<0.001			<0.001			<0.001			
COPPER (CU) TOTAL	0.010			0.040			<0.001			
COPPER (CU) DISS	<0.001			<0.001			<0.001			
IRON (FE) TOTAL	0.010	0.040	0.052	0.120	0.065	0.144	0.150	0.070	0.050	

All quantities in milligrams per liter unless otherwise noted. Blank line indicates parameter not tested.

Output Date: 02-09-1987
HWQ-6/86-R1

SUMMARY OF WATER QUALITY ANALYSIS - UTAH FUEL CO.

SITE NAME	UPL-3	UPL-3	UPL-3	UPL-3	UPL-3	UPL-3	UPL-3	UPL-3	UPL-3	UPL-3
SAMPLE DATE	05/13/81	06/23/81	07/30/81	08/20/81	09/25/81	10/22/81	11/10/81	12/08/81	05/20/82	06/30/82
TRACE ELEMENTS										
IRON (FE) TOTAL	0.060									
LEAD (PB) TOTAL	0.001			<0.001			<0.001			
LEAD (PB) DISS	<0.001			<0.001			<0.001			
MANGANESE (MN) TOTAL	0.030	0.020	0.015	0.020	0.018	0.019	0.020	0.015	0.012	
MERCURY (HG) TOTAL	<0.0002			<0.0002			<0.0002			
MOLYBDENUM (MO) TOTAL	<0.001									
NICKEL (NI) TOTAL	<0.001									
SELENIUM (SE) TOTAL	<0.001			<0.001			<0.001			
SELENIUM (SE) DISS	<0.001			<0.001			<0.001			
SILVER (AG) TOTAL	<0.001			<0.001			<0.001			
SILVER (AG) DISS	<0.001			<0.001			<0.001			
ZINC (ZN) TOTAL	0.005			0.070			0.060			
ZINC (ZN) DISS	0.005			0.005			0.010			
BACTERIOLOGICAL PARAMETERS										
FECAL COLIFORM (NO./100ML)				<2.0			<2.0			
TOTAL COLIFORM (NO./100ML)				8.0			2.0			
5 - DAY BOD				1.4						
ORGANIC PARAMETERS										
ORGANIC CARBON (TOTAL)	2.10			12.00			4.00			
PHENOLS	0.014	0.494	<0.001	<0.001	<0.001	<0.001	<0.001	0.068		
OTHER PARAMETERS										
OIL AND GREASE	0.40			2.60			2.40			
CYANIDE (CN)	<0.001			0.002			0.006			

All quantities in milligrams per liter unless otherwise noted. Blank line indicates parameter not tested.

Output Date: 02-09-1987
HWQ-6/86-R1

SUMMARY OF WATER QUALITY ANALYSIS - UTAH FUEL CO.

SITE NAME	UPL-3	UPL-3	UPL-3	UPL-3	UPL-3	UPL-3	UPL-3	UPL-3	UPL-3	UPL-3
SAMPLE DATE	07/22/82	08/20/82	09/15/82	10/15/82	06/30/83	07/21/83	08/26/83	09/29/83	10/27/83	06/29/84
LOCATION	HUNT.CR.BLW	HUNT.CR.BLW	HUNT.CR.BLW	HUNT.CR.BLW	HUNT.CR.BLW	HUNT.CR.BLW	HUNT.CR.BLW	HUNT.CR.BLW	HUNT.CR.BLW	HUNT.CR.BLW
LOCATION	ELECTRIC LK	ELECTRIC LK	ELECTRIC LK	ELECTRIC LK	ELECTRIC LK	ELECTRIC LK	ELECTRIC LK	ELECTRIC LK	ELECTRIC LK	ELECTRIC LK
PHYSICAL PARAMETERS										
AIR TEMPERATURE (C)	21	27	9	18	13	18	16	16	16	18
WATER TEMPERATURE (C)	6	7	5	7	4	6	9	8	9	12
SPEC. COND. (UMHOS/CM) FIELD	138	238	220	288	210	258	162	272	282	254
PH FIELD	7.5	8.4	8.1	8.6	7.3	7.2	7.7	7.2	7.4	8.4
TURBIDITY (NTU) FIELD	11	7.3	3.5	3	28	10.1	7.1	5.2	7.6	23
TOTAL SUSP. SOLIDS		13.0					13.0			
TOTAL DISS. SOLIDS MEAS.		195					136			
OXYGEN (O) DISS		8.0					6.0			
COMMON IONS										
CALCIUM (CA)		40.80					36.80			
MAGNESIUM (MG)		9.60					6.72			
SODIUM (NA)		1.8					4.0			
POTASSIUM (K)		0.79					0.7			
ACIDITY AS CACO3		3.0					12.00			
ALKALINITY AS CACO3 (LAB)		127					116			
BICARBONATE (HCO3) (LAB)		155					142			
SULFATE (SO4)		<3.0					11			
CHLORIDE (CL)		15.30					<0.1			
FLUORIDE (F)		0.09					0.06			
NUTRIENTS										
NITRATE (NO3-N)		0.44					<0.02			
AMMONIA (NH3 AS N)		0.16					0.55			
TOTAL PHOSPHATE (PO4)		0.090					0.02			
TRACE ELEMENTS										
BARIUM (BA) TOTAL		0.068					0.020			
BORON (B) TOTAL		0.013					0.040			
COPPER (CU) TOTAL		<0.001					0.020			
IRON (FE) TOTAL		0.080					0.210			
LEAD (PB) TOTAL		<0.001					0.007			
MANGANESE (MN) TOTAL		0.080					0.025			
ZINC (ZN) TOTAL		0.002					0.037			
ORGANIC PARAMETERS										
ORGANIC CARBON (TOTAL)		7.80					0.50			
PHENOLS		0.008					<0.001			
OTHER PARAMETERS										
OIL AND GREASE		0.2					<0.2			
CYANIDE (CN)		0.004					<0.001			

All quantities in milligrams per liter unless otherwise noted. Blank line indicates parameter not tested.

Output Date: 02-09-1987
HWQ-6/86-R1

SUMMARY OF WATER QUALITY ANALYSIS - UTAH FUEL CO.

SITE NAME	UPL-3	UPL-3	UPL-3	UPL-3	UPL-3	UPL-3
SAMPLE DATE	07/31/84	08/24/84	09/26/84	10/15/85	05/27/86	06/19/86
LOCATION	HUNT.CR.BLW	HUNT.CR.BLW	HUNT.CR.BLW	HUNT.CR.BLW	HUNT.CR.BLW	HUNT.CR.BLW
LOCATION	ELECTRIC LK	ELECTRIC LK	ELECTRIC LK	ELECTRIC LK	ELECTRIC LK	ELECTRIC LK
PHYSICAL PARAMETERS						
AIR TEMPERATURE (C)	17	15	15	12	22	19
WATER TEMPERATURE (C)	9	6	9	6	3	14
SPEC. COND. (UMHOS/CM) FIELD	245	352	256	250	222	208
PH FIELD	7.2	7.7	7.3	7.2	6.7	7.7
TURBIDITY (NTU) FIELD	22	13	5.9	3.6	2.8	
TOTAL SUSP. SOLIDS		3.0				
TOTAL DISS. SOLIDS MEAS.		210				
OXYGEN (O) DISS		8.4				
COMMON IONS						
CALCIUM (CA)		48.00				
MAGNESIUM (MG)		14.40				
SODIUM (NA)		29.00				
POTASSIUM (K)		0.75				
ACIDITY AS CACO3		15.70				
ALKALINITY AS CACO3 (LAB)		150				
BICARBONATE (HCO3) (LAB)		183.0				
SULFATE (SO4)		12				
CHLORIDE (CL)		15.0				
FLUORIDE (F)		0.14				
NUTRIENTS						
NITRATE (NO3-N)		0.31				
AMMONIA (NH3 AS N)		0.03				
TOTAL PHOSPHATE (PO4)		.0.01				
TRACE ELEMENTS						
BARIUM (BA) TOTAL		0.03				
BORON (B) TOTAL		0.013				
COPPER (CU) TOTAL		0.016				
IRON (FE) TOTAL		1.40				
LEAD (PB) TOTAL		0.011				
MANGANESE (MN) TOTAL		0.03				
ZINC (ZN) TOTAL		0.031				
ORGANIC PARAMETERS						
ORGANIC CARBON (TOTAL)		<0.01				
PHENOLS		<0.001				
OTHER PARAMETERS						
OIL AND GREASE		<0.1				
CYANIDE (CN)		<0.001				

All quantities in milligrams per liter unless otherwise noted. Blank line indicates parameter not tested.

Output Date: 02-09-1987
HWQ-6/86-R1

SUMMARY OF WATER QUALITY ANALYSIS - UTAH FUEL CO.

SITE NAME	UPL-10	UPL-10	UPL-10	UPL-10	UPL-10	UPL-10	UPL-10	UPL-10	UPL-10	UPL-10
SAMPLE DATE	05/13/81	06/23/81	07/30/81	08/21/81	09/24/81	10/22/81	11/10/81	12/08/81	06/28/82	07/21/82
LOCATION	HUNT.CR.ABV	HUNT.CR.ABV	HUNT.CR.ABV	HUNT.CR.ABV	HUNT.CR.ABV	HUNT.CR.ABV	HUNT.CR.ABV	HUNT.CR.ABV	HUNT.CR.ABV	HUNT.CR.ABV
LOCATION	ELECTRIC LK	ELECTRIC LK	ELECTRIC LK	ELECTRIC LK	ELECTRIC LK	ELECTRIC LK	ELECTRIC LK	ELECTRIC LK	ELECTRIC LK	ELECTRIC LK
PHYSICAL PARAMETERS										
AIR TEMPERATURE (C)	11	20	23	14	16	9	4	10	20	21
FLOW (CFS)	7.45	2.4					1.10		12.9	6.05
WATER TEMPERATURE (C)	11	17.5	13	11	15	0	3	0	13	13
SPEC. COND. (UMHOS/CM) FIELD	170	200	250	280	260	290	300	330	332	231
PH FIELD	8.2	8.4	8.2	8.2	8.5	6.8	8.0	8.2	8.2	7.9
TURBIDITY (NTU) FIELD	3.60			2.00			2.00		10.5	8.3
TOTAL SUSP. SOLIDS	10	7.0	1.0	2.0	11.0	3.1	4.0	2.0		
TOTAL DISS. SOLIDS MEAS.	115	131	167	179	177	195	196	212		
OXYGEN (O) DISS	9.5	9.8	9.9	10.8	9.6	10.2	12.8			
COMMON IONS										
TOTAL HARDNESS AS CACO3	92									
CALCIUM (CA)	29.60	40.00	48.80	57.06	48.00	53.60	48.50	54.50		
MAGNESIUM (MG)	4.32	5.76	9.12	6.24	9.12	6.24	7.00	8.00		
SODIUM (NA)	6.80	1.70	2.10	2.40	2.20	13.50	12.90	11.80		
POTASSIUM (K)	0.54	0.57	0.73	0.82	0.69	0.92	0.90	0.80		
ACIDITY AS CACO3	2.00			<0.01			<0.01			
ALKALINITY AS CACO3 (LAB)	84			158		181	145	155		
BICARBONATE (HCO3) (LAB)	102	127	171	190	161	221	162	189		
CARBONATE AS CO3 (LAB)	<0.01									
SULFATE (SO4)	19.5	18.0	18.0	12.0	24.0	6.0	38.0	33.0		
CHLORIDE (CL)	2.80	2.48	2.81	2.85	2.61	3.80	3.00	2.70		
FLUORIDE (F)	0.10			0.14			0.09			
NUTRIENTS										
NITRATE (NO3-N)	0.23			<0.01			0.11			
NITRITE (NO2-N)	0.02									
AMMONIA (NH3 AS N)	<0.01	<0.01	<0.01	<0.01	0.17	<0.01	0.30	0.65		
TOTAL PHOSPHATE (PO4)	0.090		0.350	0.190	6.000	0.200	0.360	0.800		
TRACE ELEMENTS										
ALUMINUM (AL) TOTAL	0.040									
ARSENIC (AS) TOTAL	<0.001			<0.001			<0.001			
ARSENIC (AS) DISS	<0.001			<0.001			<0.001			
BARIUM (BA) TOTAL	0.029			0.035			0.035			
BARIUM (BA) DISS	0.020			0.028			0.025			
BORON (B) TOTAL	0.004			0.016			0.015			
BORON (B) DISS	<0.001			0.011			0.010			
CADMIUM (CD) TOTAL	<0.001			<0.001			<0.001			
CADMIUM (CD) DISS	<0.001			<0.001			<0.001			
CHROMIUM (CR) TOTAL	<0.001			<0.001			<0.001			
CHROMIUM (CR) DISS	<0.001			<0.001			<0.001			
COPPER (CU) TOTAL	<0.001			0.010			<0.001			
COPPER (CU) DISS	<0.001			<0.001			<0.001			

All quantities in milligrams per liter unless otherwise noted. Blank line indicates parameter not tested.

Output Date: 02-09-1987
HWQ-6/86-R1

SUMMARY OF WATER QUALITY ANALYSIS - UTAH FUEL CO.

SITE NAME	UPL-10	UPL-10	UPL-10	UPL-10	UPL-10	UPL-10	UPL-10	UPL-10	UPL-10	UPL-10
SAMPLE DATE	05/13/81	06/23/81	07/30/81	08/21/81	09/24/81	10/22/81	11/10/81	12/08/81	06/28/82	07/21/82
TRACE ELEMENTS										
IRON (FE) TOTAL	0.080	0.300	0.277	0.520	0.310	0.550	0.580	0.370		
IRON (FE) TOTAL	0.480									
LEAD (PB) TOTAL	0.002			0.004			<0.001			
LEAD (PB) DISS	<0.001			0.002			<0.001			
MANGANESE (MN) TOTAL	0.020	0.020	0.019	0.040	0.021	0.045	0.048	0.040		
MERCURY (HG) TOTAL	<0.0002			<0.0002			<0.0002			
MOLYBDENUM (MO) TOTAL	<0.001									
NICKEL (NI) TOTAL	<0.001									
SELENIUM (SE) TOTAL	<0.001			<0.001			<0.001			
SELENIUM (SE) DISS	<0.001			<0.001			<0.001			
SILVER (AG) TOTAL	<0.001			<0.001			<0.001			
SILVER (AG) DISS	<0.001			<0.001			<0.001			
ZINC (ZN) TOTAL	0.008			0.017			0.019			
ZINC (ZN) DISS	0.005			0.010			0.012			
BACTERIOLOGICAL PARAMETERS										
FECAL COLIFORM (NO./100ML)				170			2.0			
TOTAL COLIFORM (NO./100ML)				2200			110			
5 - DAY BOD				1.5						
ORGANIC PARAMETERS										
ORGANIC CARBON (TOTAL)	4.10			21.70			11.30			
PHENOLS	0.025	<0.001	<0.001	<0.001	<0.001	<0.001	28.000	0.026		
OTHER PARAMETERS										
OIL AND GREASE	<0.01			2.40			23.80			
CYANIDE (CN)	<0.001			0.003			<0.001			

All quantities in milligrams per liter unless otherwise noted. Blank line indicates parameter not tested.

Output Date: 02-09-1987
HWQ-6/86-R1

SUMMARY OF WATER QUALITY ANALYSIS - UTAH FUEL CO.

SITE NAME	UPL-10	UPL-10	UPL-10	UPL-10	UPL-10	UPL-10	UPL-10	UPL-10	UPL-10	UPL-10
SAMPLE DATE	08/17/82	09/15/82	10/15/82	06/28/83	07/19/83	08/24/83	09/27/83	10/20/83	05/24/84	06/26/84
LOCATION	HUNT.CR.ABV	HUNT.CR.ABV	HUNT.CR.ABV	HUNT.CR.ABV	HUNT.CR.ABV	HUNT.CR.ABV	HUNT.CR.ABV	HUNT.CR.ABV	HUNT.CR.ABV	HUNT.CR.ABV
LOCATION	ELECTRIC LK	ELECTRIC LK	ELECTRIC LK	ELECTRIC LK	ELECTRIC LK	ELECTRIC LK	ELECTRIC LK	ELECTRIC LK	ELECTRIC LK	ELECTRIC LK
PHYSICAL PARAMETERS										
AIR TEMPERATURE (C)	20	10	11	17	23	16	13	9	13	14
FLOW (CFS)	2.58	3.20	3.60	63.1	11.35	5.31	7.75	5.10	*	31.2
WATER TEMPERATURE (C)	14	8	4	13	12	9	10	6	8	11
SPEC. COND. (UMHOS/CM) FIELD	246	320	247	126	270	315	263	283	142	227
PH FIELD	8.2	8.0	8.6	8.0	8.0	7.6	6.6	7.7	7.3	6.8
TURBIDITY (NTU) FIELD	11.0	50	15	24	22	16	100+	15	100+	22
TOTAL SUSP. SOLIDS	17.0					41.0				
TOTAL DISS. SOLIDS MEAS.	187					176				
OXYGEN (O) DISS	8.6					7.4				
COMMON IONS										
CALCIUM (CA)	50.40					49.60				
MAGNESIUM (MG)	6.72					8.64				
SODIUM (NA)	13.0					2.3				
POTASSIUM (K)	0.64					0.7				
ACIDITY AS CACO3	<0.01					16.00				
ALKALINITY AS CACO3 (LAB)	171					154				
BICARBONATE (HCO3) (LAB)	208					188				
SULFATE (SO4)	<3.0					13				
CHLORIDE (CL)	11.20					<0.1				
FLUORIDE (F)	0.11					0.07				
NUTRIENTS										
NITRATE (NO3-N)	0.23					<0.02				
AMMONIA (NH3 AS N)	0.29					0.90				
TOTAL PHOSPHATE (PO4)	0.100					0.03				
TRACE ELEMENTS										
BARIUM (BA) TOTAL	0.060					0.021				
BORON (B) TOTAL	0.015					0.025				
COPPER (CU) TOTAL	0.010					0.010				
IRON (FE) TOTAL	0.630					0.720				
LEAD (PB) TOTAL	0.005					0.002				
MANGANESE (MN) TOTAL	0.040					0.050				
ZINC (ZN) TOTAL	0.003					0.020				
ORGANIC PARAMETERS										
ORGANIC CARBON (TOTAL)	7.90					1.60				
PHENOLS	0.004					<0.001				
OTHER PARAMETERS										
OIL AND GREASE	0.4					<0.2				
CYANIDE (CN)	0.005					<0.001				

All quantities in milligrams per liter unless otherwise noted. Blank line indicates parameter not tested.

Output Date: 02-09-1987
HWQ-6/86-R1

SUMMARY OF WATER QUALITY ANALYSIS - UTAH FUEL CO.

SITE NAME	UPL-10	UPL-10	UPL-10	UPL-10	UPL-10	UPL-10
SAMPLE DATE	07/31/84	08/24/84	09/27/84	10/15/85	05/27/86	06/19/86
LOCATION	HUNT.CR.ABV	HUNT.CR.ABV	HUNT.CR.ABV	HUNT.CR.ABV	HUNT.CR.ABV	HUNT.CR.ABV
LOCATION	ELECTRIC LK	ELECTRIC LK	ELECTRIC LK	ELECTRIC LK	ELECTRIC LK	ELECTRIC LK
PHYSICAL PARAMETERS						
AIR TEMPERATURE (C)	15	14	9	10	15	21
FLOW (CFS)	5.35	3.10	2.88	2.15		31.2
WATER TEMPERATURE (C)	12	10	3.5	6	7	14
SPEC. COND. (UMHOS/CM) FIELD	291	35.3	311	290	120	191
PH FIELD	7.5	7.7	7.6	7.7	7.3	7.8
TURBIDITY (NTU) FIELD	33	29	14	7.4	32.5	
TOTAL SUSP. SOLIDS		17.0				
TOTAL DISS. SOLIDS MEAS.		225				
OXYGEN (O) DISS		9.4				
COMMON IONS						
CALCIUM (CA)		60.00				
MAGNESIUM (MG)		21.60				
SODIUM (NA)		9.50				
POTASSIUM (K)		0.63				
ACIDITY AS CACO3		11.20				
ALKALINITY AS CACO3 (LAB)		180				
BICARBONATE (HCO3) (LAB)		219.6				
SULFATE (SO4)		<10				
CHLORIDE (CL)		20.0				
FLUORIDE (F)		0.13				
NUTRIENTS						
NITRATE (NO3-N)		0.13				
AMMONIA (NH3 AS N)		0.02				
TOTAL PHOSPHATE (PO4)		0.02				
TRACE ELEMENTS						
BARIUM (BA) TOTAL		0.03				
BORON (B) TOTAL		0.021				
COPPER (CU) TOTAL		0.020				
IRON (FE) TOTAL		0.16				
LEAD (PB) TOTAL		0.007				
MANGANESE (MN) TOTAL		0.07				
ZINC (ZN) TOTAL		0.044				
ORGANIC PARAMETERS						
ORGANIC CARBON (TOTAL)		<0.01				
PHENOLS		<0.001				
OTHER PARAMETERS						
OIL AND GREASE		<0.01				
CYANIDE (CN)		<0.001				

All quantities in milligrams per liter unless otherwise noted. Blank line indicates parameter not tested.

Output Date: 02-09-1987
HWQ-6/86-R1

SUMMARY OF WATER QUALITY ANALYSIS - UTAH FUEL CO.

SITE NAME	VC-6	VC-6	VC-6	VC-6	VC-6	VC-6	VC-6	VC-6	VC-6	VC-6
SAMPLE DATE	01/27/81	03/11/81	04/08/81	05/12/81	06/23/81	07/29/81	08/20/81	09/24/81	10/23/81	11/11/81
LOCATION	ECCLES CR.	ECCLES CR.	ECCLES CR.	ECCLES CR.	ECCLES CR.	ECCLES CR.	ECCLES CR.	ECCLES CR.	ECCLES CR.	ECCLES CR.
LOCATION	ABV S. FK	ABV S. FK	ABV S. FK	ABV S. FK.	ABV S. FK	ABV S. FK	ABV S. FK	ABV S. FK	ABV S. FK	ABV S. FK
PHYSICAL PARAMETERS										
AIR TEMPERATURE (C)	-2	4	7	17	22	24	15	18	2	4
FLOW (CFS)			0.9	0.56						
WATER TEMPERATURE (C)	0	1	2	6	12	14.5	10	11	2	1
SPEC. COND. (UMHOS/CM) FIELD	265	258	248	300	320	380	440	590	520	420
PH FIELD	7.8	7.9	8.1	8.4	8.1	8.3	8.3	8.2	7.8	7.8
TURBIDITY (NTU) FIELD				18.00			3.20			0.70
TOTAL SUSP. SOLIDS	7.0	11.0	534	52.0	25.0	35.0	1.0	19.0	12.0	12.0
TOTAL DISS. SOLIDS MEAS.	295	265	290	201	210	250	285	385	338	278
OXYGEN (O) DISS				9.5	9.5	10.5	6.6	9.2	11.0	11.4
COMMON IONS										
TOTAL HARDNESS AS CACO3				188						
CALCIUM (CA)	87.20	78.40	83.20	56.00	29.60	20.80	88.00	46.40	35.20	45.60
MAGNESIUM (MG)	16.80	17.28	16.32	11.52	12.48	51.84	9.60	8.16	11.52	20.50
SODIUM (NA)	7.50	3.30	5.10	6.50	35.40	3.80	4.00	50.00	86.00	29.00
POTASSIUM (K)	1.90	1.39	1.95	1.05	1.29	1.71	1.69	1.50	1.30	2.23
ACIDITY AS CACO3				<0.01			<0.01			<0.01
ALKALINITY AS CACO3 (LAB)				186			250		294	255
BICARBONATE (HCO3) (LAB)	356.24	314.76	285.48	212	229	283	281	298	359	297
CARBONATE AS CO3 (LAB)				7.20						
SULFATE (SO4)	6.0	7.2	44.0	9.0	15.0	30.0	29.0	15.0	24.0	15.0
CHLORIDE (CL)	4.67	6.38	6.00	6.00	4.33	6.07	5.75	5.76	5.20	7.30
FLUORIDE (F)				0.16			0.20			0.18
NUTRIENTS										
NITRATE (NO3-N)				0.29			0.32			0.54
NITRITE (NO2-N)				0.03						
AMMONIA (NH3 AS N)	<0.01	<0.01	0.15	<0.01	<0.01	<0.01	<0.01	0.03	<0.01	0.37
TOTAL PHOSPHATE (PO4)	0.050	0.080	1.280	0.170		0.320	0.180	0.710	0.730	0.380
TRACE ELEMENTS										
ALUMINUM (AL) TOTAL				<0.001						
ARSENIC (AS) TOTAL				<0.001			<0.001			<0.001
ARSENIC (AS) DISS				<0.001			<0.001			<0.001
BARIUM (BA) TOTAL				0.045			0.055			0.050
BARIUM (BA) DISS				0.030			0.045			0.018
BORON (B) TOTAL				0.012			0.030			0.026
BORON (B) DISS				0.010			0.020			0.020
CADMIUM (CD) TOTAL				<0.001			<0.001			<0.001
CADMIUM (CD) DISS				<0.001			<0.001			<0.001
CHROMIUM (CR) TOTAL				<0.001			<0.001			<0.001
CHROMIUM (CR) DISS				<0.001			<0.001			<0.001
COPPER (CU) TOTAL				0.010			0.013			<0.001
COPPER (CU) DISS				<0.001			<0.001			<0.001

All quantities in milligrams per liter unless otherwise noted. Blank line indicates parameter not tested.

Output Date: 02-09-1987
HWQ-6/86-R1

SUMMARY OF WATER QUALITY ANALYSIS - UTAH FUEL CO.

SITE NAME	VC-6	VC-6	VC-6	VC-6	VC-6	VC-6	VC-6	VC-6	VC-6	VC-6
SAMPLE DATE	01/27/81	03/11/81	04/08/81	05/12/81	06/23/81	07/29/81	08/20/81	09/24/81	10/23/81	11/11/81
TRACE ELEMENTS										
IRON (FE) TOTAL	0.330	0.120	0.310	1.240	0.140	0.136	0.200	0.150	0.144	0.380
LEAD (PB) TOTAL				0.004			<0.001			<0.001
LEAD (PB) DISS				<0.001			<0.001			<0.001
MANGANESE (MN) TOTAL	0.031	0.020	0.028	0.030	0.020	0.016	0.060	0.012	0.010	0.060
MERCURY (HG) TOTAL				<0.0002			<0.0002			<0.0002
MOLYBDENUM (MO) TOTAL				<0.001						
NICKEL (NI) TOTAL				<0.001						
SELENIUM (SE) TOTAL				<0.001			<0.001			<0.001
SELENIUM (SE) DISS				<0.001			<0.001			<0.001
SILVER (AG) TOTAL				<0.001			<0.001			<0.001
SILVER (AG) DISS				<0.001			<0.001			<0.001
ZINC (ZN) TOTAL				0.025			0.028			0.015
ZINC (ZN) DISS				0.007			0.020			0.010
BACTERIOLOGICAL PARAMETERS										
FECAL COLIFORM (NO./100ML)							23.0			2.0
TOTAL COLIFORM (NO./100ML)							1300			200
5 - DAY BOD							2.3			2.6
ORGANIC PARAMETERS										
ORGANIC CARBON (TOTAL)				2.80			1.00			3.80
PHENOLS	0.014	<0.001	0.266	<0.001	<0.001	0.017	<0.001	<0.001		0.002
OTHER PARAMETERS										
OIL AND GREASE				<0.01			1.60			<0.01
CYANIDE (CN)				<0.001			0.002			<0.001
SULFIDE				1.20						

All quantities in milligrams per liter unless otherwise noted. Blank line indicates parameter not tested.

Output Date: 02-09-1987
HWQ-6/86-R1

SUMMARY OF WATER QUALITY ANALYSIS - UTAH FUEL CO.

SITE NAME	VC-6	VC-6	VC-6	VC-6	VC-6	VC-6	VC-6	VC-6	VC-6	VC-6
SAMPLE DATE	12/09/81	05/20/82	06/30/82	07/21/82	08/19/82	09/14/82	10/14/82	11/09/82	12/14/82	01/19/83
LOCATION	ECCLES CR.	ECCLES CR.	ECCLES CR.	ECCLES CR.	ECCLES CR.	ECCLES CR.	ECCLES CR.	ECCLES CR.	ECCLES CR.	ECCLES CR.
LOCATION	ABV S. FK	ABV S. FK	ABV S. FK	ABV S. FK	ABV S. FK	ABV S. FK	ABV S. FK	ABV S. FK	ABV S. FK	ABV S. FK
PHYSICAL PARAMETERS										
AIR TEMPERATURE (C)	7	14	16	22	26	7	5	-1	-5	-3
FLOW (CFS)			1.00	1.00	0.78	0.55	0.56	0.50		0.50
WATER TEMPERATURE (C)	1	4	9	12	12	6	4	1	1	2.5
SPEC. COND. (UMHOS/CM) FIELD	510	248	350	418	370	405	460	535	470	535
PH FIELD	8.0	7.9	8.2	8.0	8.4	8.6	8.5	7.7	7.7	8.0
TURBIDITY (NTU) FIELD		100+	44	41	5.4	100+	103	71	23	12
TOTAL SUSP. SOLIDS	4.0	460	15.0	62.0	75.0	376	407	329	51.0	25.0
TOTAL DISS. SOLIDS MEAS.	333	179	238	266	258	288	300	310	316	335
COMMON IONS										
CALCIUM (CA)	90.00	48.80	66.00	40.00	69.60	76.80	74.40	76.00	78.00	86.40
MAGNESIUM (MG)	21.50	9.40	11.80	15.84	18.24	15.84	19.20	17.28	24.00	18.72
SODIUM (NA)	4.10	2.4	3.1	45.0	5.7	6.4	11.8	4.7	5.5	10.0
POTASSIUM (K)	1.80	4.40	1.03	1.10	1.74	2.16	2.20	1.74	2.05	1.95
ACIDITY AS CACO3					2.00					
ALKALINITY AS CACO3 (LAB)	284	143		263	237					
BICARBONATE (HCO3) (LAB)	337	174	215	321	289	296	307	309	322	344
SULFATE (SO4)	38.0	22.0	39.0	3.0	<3.0	20.0	30.0	10.0	36.0	27.0
CHLORIDE (CL)	5.00	1.90	1.70	0.60	18.70	6.00	8.10	5.40	3.50	6.60
FLUORIDE (F)					0.15					
NUTRIENTS										
NITRATE (NO3-N)					0.48					
AMMONIA (NH3 AS N)	0.62		0.33		0.38		0.27			
TOTAL PHOSPHATE (PO4)	0.490		0.460		0.210		0.120			
TRACE ELEMENTS										
BARIUM (BA) TOTAL					0.030					
BORON (B) TOTAL					0.018					
COPPER (CU) TOTAL					0.010					
IRON (FE) TOTAL	0.270	7.100		1.000	1.150	10.500	2.030	1.850	0.900	0.380
LEAD (PB) TOTAL					0.002					
MANGANESE (MN) TOTAL	0.55	0.065		0.050	0.075	0.425	0.417	0.210	0.235	0.305
ZINC (ZN) TOTAL					0.012					
ORGANIC PARAMETERS										
ORGANIC CARBON (TOTAL)					11.90					
PHENOLS	0.020				0.013		<0.001			
OTHER PARAMETERS										
OIL AND GREASE					1.0		2.8			
CYANIDE (CN)					<0.001					

All quantities in milligrams per liter unless otherwise noted. Blank line indicates parameter not tested.

Output Date: 02-09-1987
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SUMMARY OF WATER QUALITY ANALYSIS - UTAH FUEL CO.

SITE NAME	VC-6	VC-6	VC-6	VC-6	VC-6	VC-6	VC-6	VC-6	VC-6	VC-6
SAMPLE DATE	02/15/83	03/31/83	04/21/83	05/25/83	06/30/83	07/20/83	08/25/83	09/29/83	10/26/83	11/11/83
LOCATION	ECCLES CR.	ECCLES CR.	ECCLES CR.	ECCLES CR.	ECCLES CR.	ECCLES CR.	ECCLES CR.	ECCLES CR.	ECCLES CR.	ECCLES CR.
LOCATION	ABV S. FK	ABV S. FK	ABV S. FK	ABV S. FK	ABV S. FK	ABV S. FK	ABV S. FK	ABV S. FK	ABV S. FK	ABV S. FK
PHYSICAL PARAMETERS										
AIR TEMPERATURE (C)	-2	2	7	17	7	15	15	10	9	1
FLOW (CFS)	0.50	0.55	0.55	11.9	3.72	1.22	0.81	0.81	0.56	0.59
WATER TEMPERATURE (C)	0.5	2	3	7	6	10	11	7	6	3
SPEC. COND. (UMHOS/CM) FIELD	562	565	658	311	359	471	341	573	542	476
PH FIELD	8.2	8.1	7.8	7.7	7.9	8.0	7.9	7.8	7.9	7.4
TURBIDITY (NTU) FIELD	36	65	100+	100+	27	23	17	34	21	24
TOTAL SUSP. SOLIDS	17.0	67.0	150	19.50	26.0	2.0	149	28.0	36.0	33.0
TOTAL DISS. SOLIDS MEAS.	370	359	320	216	232	290	280	290	335	320
TOTAL SETTLEABLE SOLIDS				0.4						
OXYGEN (O) DISS							6.0			
COMMON IONS										
CALCIUM (CA)	79.20	72.00	71.20	47.20	61.60	76.00	68.00	72.00	75.20	71.20
MAGNESIUM (MG)	20.64	21.60	17.76	9.60	9.12	14.40	21.60	21.12	20.16	23.52
SODIUM (NA)	28.0	19.0	18.3	6.0	6.0	18.0	9.0	5.30	20.00	5.70
POTASSIUM (K)	1.77	1.91	2.00	1.35	1.11	1.6	1.9	1.9	1.4	1.8
ACIDITY AS CACO3							27.00			
ALKALINITY AS CACO3 (LAB)							250			
BICARBONATE (HCO3) (LAB)	333	299	261	178	225	303	305	283	281	299
SULFATE (SO4)	54.0	42.0	40.0	21.0	12.0	36	25	35	65	34
CHLORIDE (CL)	17.10	20.10	29.60	4.00	8.0	6.0		6.00	10.00	8.00
NUTRIENTS										
AMMONIA (NH3 AS N)					<0.1				<0.01	
TOTAL PHOSPHATE (PO4)					0.16				0.03	
TRACE ELEMENTS										
IRON (FE) TOTAL	0.710	1.070	4.900	16.100	0.500	0.230		0.770		0.410
MANGANESE (MN) TOTAL	0.265	0.115	0.200			0.170		0.211		0.180

All quantities in milligrams per liter unless otherwise noted. Blank line indicates parameter not tested.

Output Date: 02-09-1987
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SUMMARY OF WATER QUALITY ANALYSIS - UTAH FUEL CO.

SITE NAME	VC-6	VC-6	VC-6	VC-6	VC-6	VC-6	VC-6	VC-6	VC-6	VC-6
SAMPLE DATE	12/14/83	01/18/84	02/22/84	03/22/84	04/26/84	05/17/84	06/28/84	07/27/84	08/28/84	09/18/84
LOCATION	ECCLES CR.	ECCLES CR.	ECCLES CR.	ECCLES CR.	ECCLES CR.	ECCLES CR.	ECCLES CR.	ECCLES CR.	ECCLES CR.	ECCLES CR.
LOCATION	ABV S. FK	ABV S. FK	ABV S. FK	ABV S. FK	ABV S. FK	ABV S. FK	ABV S. FK	ABV S. FK	ABV S. FK	ABV S. FK
PHYSICAL PARAMETERS										
AIR TEMPERATURE (C)	-3	-24	-9	-4	-5	14	18	14	14	6
FLOW (CFS)						25.4	6.4	2.9	0.88	1.11
WATER TEMPERATURE (C)	1	0	0.5	1	2	8	13	11	12	10
SPEC. COND. (UMHOS/CM) FIELD	602	577	569	560	461	328	410	483	600	504
PH FIELD	8.0	7.7	8.1	7.8	8.3	7.3	7.9	7.7	8.1	7.8
TURBIDITY (NTU) FIELD	48	7.9	10.1	19	49	100+	37	36	23	60
TOTAL SUSP. SOLIDS	11.0	14.0	6.0	29.0	59	1868	4.0	17.0	21.0	112
TOTAL DISS. SOLIDS MEAS.	380	344	400	460	350	620	256	270	286	346
OXYGEN (O) DISS									8.6	
COMMON IONS										
CALCIUM (CA)	79.20	84.00	90.00	83.20	76.00	160.00	76.00	77.60	74.00	82.00
MAGNESIUM (MG)	22.08	2.16	34.80	23.52	33.60	36.00	7.20	14.60	26.40	25.20
SODIUM (NA)	25.70	45.00	9.50	12.90	6.20	3.30	20.00	4.80	21.00	6.70
POTASSIUM (K)	2.3	1.8	2.1	1.9	1.3	2.9	1.7	1.49	2.17	3.05
ACIDITY AS CACO3									10.00	
ALKALINITY AS CACO3 (LAB)									210	
BICARBONATE (HCO3) (LAB)	295	307.4	306.2	316.0	267.2	201.3	287.9	296.5	256.2	305.0
SULFATE (SO4)	52	50	80	25	95	319	30	20	80	64
CHLORIDE (CL)	34.00	14.0	18.0	31.0	12.0	37.5	3.3	4.9	7.0	10.0
FLUORIDE (F)									0.26	
NUTRIENTS										
NITRATE (NO3-N)									0.24	
AMMONIA (NH3 AS N)							0.16		<0.01	
TOTAL PHOSPHATE (PO4)							0.05		0.03	
TRACE ELEMENTS										
BARIUM (BA) TOTAL									0.05	
BORON (B) TOTAL									0.028	
COPPER (CU) TOTAL									0.018	
IRON (FE) TOTAL	0.610	0.40	0.30	0.68	1.15	28.00	0.44	0.75	0.56	1.42
LEAD (PB) TOTAL									<0.001	
MANGANESE (MN) TOTAL	0.220	0.50	0.36	0.39	0.16	1.03	0.10	0.18	0.14	0.21
ORGANIC PARAMETERS										
ORGANIC CARBON (TOTAL)									0.40	
PHENOLS							<0.001		<0.001	
OTHER PARAMETERS										
OIL AND GREASE							0.8		<0.1	
CYANIDE (CN)									<0.001	

All quantities in milligrams per liter unless otherwise noted. Blank line indicates parameter not tested.

Output Date: 02-09-1987
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SUMMARY OF WATER QUALITY ANALYSIS - UTAH FUEL CO.

SITE NAME	VC-6	VC-6	VC-6	VC-6	VC-6	VC-6	VC-6	VC-6
SAMPLE DATE	10/16/85	11/19/85	12/11/85	01/24/86	03/20/86	04/17/86	05/28/86	06/25/86
LOCATION	ECCLES CR.	ECCLES CR.	ECCLES CR.	ECCLES CR.	ECCLES CR.	ECCLES CR.	ECCLES CR.	ECCLES CR.
LOCATION	ABV S. FK	ABV S. FK	ABV S. FK	ABV S. FK	ABV S. FK	ABV S. FK	ABV S. FK	ABV S. FK
PHYSICAL PARAMETERS								
AIR TEMPERATURE (C)	9	-10	-18	4	4	-4	21	17
FLOW (CFS)	1.12						18.9	3.17
WATER TEMPERATURE (C)	6	0.5	0.5	2	3	3	6	10
SPEC. COND. (UMHOS/CM) FIELD	556	625	546	584	601	507	261	472
PH FIELD	8.0	8.2	8.2	8.1	8.0	8.0	7.8	7.8
TURBIDITY (NTU) FIELD	17	5.3	13	1.1	6.6	18	95	8.06
TOTAL SUSP. SOLIDS	17.0	9.0	15.0	1.0	20.0	40.0	284	17.0
TOTAL DISS. SOLIDS MEAS.	342	400	408	412	412	320	210	296
COMMON IONS								
CALCIUM (CA)	86.40	83.60	78.80	82.00	90.80	83.60	47.60	71.20
MAGNESIUM (MG)	21.60	26.60	26.20	26.20	23.00	17.50	7.20	14.90
SODIUM (NA)	23.00	10.30	24.00	8.83	14.00	5.80	5.86	5.51
POTASSIUM (K)	4.03	3.35	2.97	2.63	2.33	2.12	0.55	2.01
BICARBONATE (HCO3) (LAB)	309.9	253.0	268.0	268.0	296.0	242.0	15.00	217.2
SULFATE (SO4)	97	120	111	100	95	80	138	65
CHLORIDE (CL)	6.7	8.0	24.2	12.0	14.6	7.0	2.5	3.9
NUTRIENTS								
AMMONIA (NH3 AS N)	<0.01							0.48
TOTAL PHOSPHATE (PO4)	0.02							0.02
TRACE ELEMENTS								
IRON (FE) TOTAL	0.23	0.21	0.12	0.04	0.25	0.17	1.40	0.05
MANGANESE (MN) TOTAL	0.09	0.10	0.06	0.09	0.15	0.08	0.12	0.08
ORGANIC PARAMETERS								
PHENOLS	<0.001							<0.001
OTHER PARAMETERS								
OIL AND GREASE	1.8		0.4					<0.1

All quantities in milligrams per liter unless otherwise noted. Blank line indicates parameter not tested.

Output Date: 02-09-1987
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SUMMARY OF WATER QUALITY ANALYSIS - UTAH FUEL CO.

SITE NAME	VC-9	VC-9	VC-9	VC-9	VC-9	VC-9	VC-9	VC-9	VC-9	VC-9
SAMPLE DATE	01/27/81	02/25/81	03/11/81	04/08/81	05/12/81	06/23/81	07/29/81	08/20/81	09/24/81	10/23/81
LOCATION	ECCLES CR.	ECCLES CR.	ECCLES CR.	ECCLES CR.	ECCLES CR.	ECCLES CR.	ECCLES CR.	ECCLES CR.	ECCLES CR.	ECCLES CR.
LOCATION	ABV MUD. CR.	ABV MUD CR.	ABV MUD CR.	ABV MUD CR.	ABV MUD CR.	ABV MUD CR.	ABV MUD CR.	ABV MUD CR.	ABV MUD CR.	ABV MUD CR.
PHYSICAL PARAMETERS										
AIR TEMPERATURE (C)	0	10	2	8	17	27	28	11	22	3
FLOW (CFS)	2.7	3.8	2.4	2.3						
WATER TEMPERATURE (C)	1	5	3	6	11.5	12.5	15	8	12	2
SPEC. COND. (UMHOS/CM) FIELD	265	380	275	332	370	380	410	470	450	540
PH FIELD	7.8	8.1	7.9	8.1	8.3	8.1	8.2	8.1	8.1	7.6
TURBIDITY (NTU) FIELD					1.60			5.00		
TOTAL SUSP. SOLIDS	20.0	30.0	17.0	115	64	42	23	1.0	2.0	1.3
TOTAL DISS. SOLIDS MEAS.	285	246	265	290	245	248	268	312	280	350
OXYGEN (O) DISS					9.8	9.1	10.9	9.9	8.9	10.8
COMMON IONS										
TOTAL HARDNESS AS CACO3					228					
CALCIUM (CA)	73.60	20.20	67.20	79.20	83.20	26.40	48.80	68.80	48.00	61.60
MAGNESIUM (MG)	23.04	49.90	21.60	15.84	4.80	24.00	33.60	27.84	27.36	20.64
SODIUM (NA)	5.20	4.60	4.30	6.80	4.00	32.00	4.10	8.00	18.00	47.00
POTASSIUM (K)	2.00	2.34	2.15	2.40	1.70	2.06	2.28	2.31	2.00	2.40
ACIDITY AS CACO3					<0.01			<0.01		
ALKALINITY AS CACO3 (LAB)					200			258		319
BICARBONATE (HCO3) (LAB)	331.84	280.60	280.60	278	239	244	259	312	298	389
CARBONATE AS CO3 (LAB)					2.40					
SULFATE (SO4)	15.0	21.0	20.0	26.0	22.6	33.0	45.0	39.0	27.0	21.0
CHLORIDE (CL)	5.00	10.00	10.64	16.00	9.70	6.72	7.65	8.12	5.18	5.20
FLUORIDE (F)					0.20			0.21		
NUTRIENTS										
NITRATE (NO3-N)					0.06			<0.01		
NITRITE (NO2-N)					0.01					
AMMONIA (NH3 AS N)	<0.01	<0.01	<0.01	0.15	<0.1	<0.01	<0.01	<0.01	0.12	<0.01
TOTAL PHOSPHATE (PO4)	0.030	<0.001	0.070	0.020	0.150		0.240	0.300	0.800	0.850
TRACE ELEMENTS										
ALUMINUM (AL) TOTAL					0.200					
ARSENIC (AS) TOTAL					<0.001			0.002		
ARSENIC (AS) DISS					<0.001			<0.001		
BARIUM (BA) TOTAL					0.080			0.055		
BARIUM (BA) DISS					0.050			0.020		
BORON (B) TOTAL					0.025			0.030		
BORON (B) DISS					0.020			0.006		
CADMIUM (CD) TOTAL					<0.001			<0.001		
CADMIUM (CD) DISS					<0.001			<0.001		
CHROMIUM (CR) TOTAL					<0.001			<0.001		
CHROMIUM (CR) DISS					<0.001			<0.001		
COPPER (CU) TOTAL					0.010			0.040		
COPPER (CU) DISS					<0.001			<0.001		

All quantities in milligrams per liter unless otherwise noted. Blank line indicates parameter not tested.

Output Date: 02-09-1987
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SUMMARY OF WATER QUALITY ANALYSIS - UTAH FUEL CO.

SITE NAME	VC-9	VC-9	VC-9	VC-9	VC-9	VC-9	VC-9	VC-9	VC-9	VC-9
SAMPLE DATE	01/27/81	02/25/81	03/11/81	04/08/81	05/12/81	06/23/81	07/29/81	08/20/81	09/24/81	10/23/81
TRACE ELEMENTS										
IRON (FE) TOTAL	1.200	0.740	0.360	0.750	0.820	0.440	0.380	0.460	0.410	0.440
LEAD (PB) TOTAL					0.004			<0.001		
LEAD (PB) DISS					<0.001			<0.001		
MANGANESE (MN) TOTAL	0.095	0.080	0.070	0.090	0.080	0.050	0.043	0.120	0.048	0.130
MERCURY (HG) TOTAL					<0.0002			<0.0002		
MOLYBDENUM (MO) TOTAL					<0.001					
NICKEL (NI) TOTAL					<0.001					
SELENIUM (SE) TOTAL					0.002			<0.001		
SELENIUM (SE) DISS					<0.001			<0.001		
SILVER (AG) TOTAL					<0.001			<0.001		
SILVER (AG) DISS					<0.001			<0.001		
ZINC (ZN) TOTAL					0.010			0.025		
ZINC (ZN) DISS					0.005			0.010		
BACTERIOLOGICAL PARAMETERS										
FECAL COLIFORM (NO./100ML)								23.0		
TOTAL COLIFORM (NO./100ML)								3300		
5 - DAY BOD								1.2		
ORGANIC PARAMETERS										
ORGANIC CARBON (TOTAL)					19			8.30		
PHENOLS	<0.001	0.003	<0.001	0.003	0.74	<0.001	<0.001	<0.001	<0.001	<0.001
OTHER PARAMETERS										
OIL AND GREASE					1.00			1.40		
CYANIDE (CN)					<0.001			0.001		

All quantities in milligrams per liter unless otherwise noted. Blank line indicates parameter not tested.

Output Date: 02-09-1987
HWQ-6/86-R1

SUMMARY OF WATER QUALITY ANALYSIS - UTAH FUEL CO.

SITE NAME	VC-9	VC-9	VC-9	VC-9	VC-9	VC-9	VC-9	VC-9	VC-9	VC-9
SAMPLE DATE	11/11/81	12/09/81	01/21/82	02/18/82	03/31/82	04/15/82	05/20/82	06/30/82	07/22/82	08/19/82
LOCATION	ECCLES CR.	ECCLES CR.	ECCLES CR.	ECCLES CR.	ECCLES CR.	ECCLES CR.	ECCLES CR.	ECCLES CR.	ECCLES CR.	ECCLES CR.
LOCATION	ABV MUD CR.	ABV MUD CR.	ABV MUD CR.	ABV MUD CR.	ABV MUD CR.	ABV MUD CR.	ABV MUD CR.	ABV MUD CR.	ABV MUD CR.	ABV MUD CR.
PHYSICAL PARAMETERS										
AIR TEMPERATURE (C)	9	10	-6	12	-1	3	11	18	13	26
WATER TEMPERATURE (C)	4	3	2	3	2	4	8	11	9	12
SPEC. COND. (UMHOS/CM) FIELD	450	510	450	550	612	567	322	400	443	392
PH FIELD	7.6	8.0	8.4	7.9	7.9	7.7	8.0	8.4	8.4	8.1
TURBIDITY (NTU) FIELD	0.44				40	98	100+	54	21	103
TOTAL SUSP. SOLIDS	8.0	3.0	128	31.0	113	328	339	40.0	40.0	193
TOTAL DISS. SOLIDS MEAS.	300	330	291	355	324	370	235	253	226	289
OXYGEN (O) DISS	10.2									10.3
COMMON IONS										
CALCIUM (CA)	62.40	77.50	60.90	80.00	90.50	90.00	56.00	64.00	38.40	69.60
MAGNESIUM (MG)	29.00	27.50	24.80	27.50	28.50	27.00	13.30	16.40	24.91	23.52
SODIUM (NA)	4.60	4.80	12.00	6.80	8.70	2.4	9.2	4.4	14.0	6.1
POTASSIUM (K)	2.40	2.20	2.10	2.10	2.25	6.80	6.90	1.70	1.80	2.54
ACIDITY AS CACO3	<0.01									2.00
ALKALINITY AS CACO3 (LAB)	246	255	257	255	266	237	178		226	232
BICARBONATE (HCO3) (LAB)	286	311	313	312	202	289	217	211	276	283
SULFATE (SO4)	41.0	52.0	18.0	60.0	75.0	70.0	36.0	55.0	4.0	8.0
CHLORIDE (CL)	6.10	5.30	8.10	11.10		24.40	4.10	4.30	3.30	31.80
FLUORIDE (F)	0.15									0.19
NUTRIENTS										
NITRATE (NO3-N)	0.04									0.16
AMMONIA (NH3 AS N)	1.38	0.63	2.46	<0.02				0.20		0.33
TOTAL PHOSPHATE (PO4)	0.260	0.440	0.460	0.080				0.090		0.170
TRACE ELEMENTS										
ARSENIC (AS) TOTAL	<0.001									
ARSENIC (AS) DISS	<0.001									
BARIUM (BA) TOTAL	0.065									0.070
BARIUM (BA) DISS	0.050									
BORON (B) TOTAL	0.035									0.014
BORON (B) DISS	0.030									
CADMIUM (CD) TOTAL	<0.001									
CADMIUM (CD) DISS	<0.001									
CHROMIUM (CR) TOTAL	<0.001									
CHROMIUM (CR) DISS	<0.010									
COPPER (CU) TOTAL	0.012									0.010
COPPER (CU) DISS	0.010									
IRON (FE) TOTAL	0.010	0.370	3.340	0.960	1.650	5.450	4.500	1.250	0.800	2.600
IRON (FE) TOTAL	0.490									
LEAD (PB) TOTAL	<0.001									0.004
LEAD (PB) DISS	<0.001									
MANGANESE (MN) TOTAL	0.100	0.080	0.135	0.080	0.170	0.250	0.125	0.115	0.070	0.115

All quantities in milligrams per liter unless otherwise noted. Blank line indicates parameter not tested.

Output Date: 02-09-1987
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SUMMARY OF WATER QUALITY ANALYSIS - UTAH FUEL CO.

SITE NAME	VC-9	VC-9	VC-9	VC-9	VC-9	VC-9	VC-9	VC-9	VC-9	VC-9
SAMPLE DATE	11/11/81	12/09/81	01/21/82	02/18/82	03/31/82	04/15/82	05/20/82	06/30/82	07/22/82	08/19/82
TRACE ELEMENTS										
MERCURY (HG) TOTAL	<0.0002						<0.0002			
SELENIUM (SE) TOTAL	<0.001									
SELENIUM (SE) DISS	<0.001									
SILVER (AG) TOTAL	<0.001									
SILVER (AG) DISS	<0.001									
ZINC (ZN) TOTAL	0.010									0.015
ZINC (ZN) DISS	0.010									
BACTERIOLOGICAL PARAMETERS										
FECAL COLIFORM (NO./100ML)	<2.0									
TOTAL COLIFORM (NO./100ML)	2300									
5 - DAY BOD	3.0									
ORGANIC PARAMETERS										
ORGANIC CARBON (TOTAL)	11.40									10.00
PHENOLS	<0.001	0.020	0.023	0.010				<0.001		0.004
OTHER PARAMETERS										
OIL AND GREASE	0.20							16.0		0.2
CYANIDE (CN)	0.026									<0.001

All quantities in milligrams per liter unless otherwise noted. Blank line indicates parameter not tested.

Output Date: 02-09-1987
HWQ-6/86-R1

SUMMARY OF WATER QUALITY ANALYSIS - UTAH FUEL CO.

SITE NAME	VC-9	VC-9	VC-9	VC-9	VC-9	VC-9	VC-9	VC-9	VC-9	VC-9
SAMPLE DATE	09/14/82	10/14/82	11/10/82	12/14/82	01/19/83	02/15/83	03/31/83	04/21/83	05/25/83	06/30/83
LOCATION	ECCLES CR.	ECCLES CR.	ECCLES CR.	ECCLES CR.	ECCLES CR.	ECCLES CR.	ECCLES CR.	ECCLES CR.	ECCLES CR.	ECCLES CR.
LOCATION	ABV MUD CR.	ABV MUD CR.	ABV MUD CR.	ABV MUD CR.	ABV MUD CR.	ABV MUD CR.	ABV MUD CR.	ABV MUD CR.	ABV MUD CR.	ABV MUD CR.
PHYSICAL PARAMETERS										
AIR TEMPERATURE (C)	7	13	-1	-5	-5	-1	-1	8	17	12
WATER TEMPERATURE (C)	6	6	0	0	1.3	1	3	4	6	8
SPEC. COND. (UMHOS/CM) FIELD	410	530	520	407	574	566	624	793	356	397
PH FIELD	8.4	8.4	7.9	7.8	7.8	8.0	8.0	7.7	7.8	7.9
TURBIDITY (NTU) FIELD	32	52	20	20	19	45	78	100+	100+	31
TOTAL SUSP. SOLIDS	90.0	159	45.0	31.0	34.0	65.0	297	984	4166	25.0
TOTAL DISS. SOLIDS MEAS.	335	312	295	315	368	365	394	388	288	262
TOTAL SETTLEABLE SOLIDS									0.6	
COMMON IONS										
CALCIUM (CA)	72.80	78.40	74.40	68.00	77.60	73.60	71.20	80.00	49.60	59.20
MAGNESIUM (MG)	32.16	22.56	21.60	28.80	28.80	21.12	23.52	23.04	14.88	15.84
SODIUM (NA)	4.8	4.9	4.6	8.6	8.9	32.0	34.0	20.0	5.5	10.5
POTASSIUM (K)	2.19	2.35	2.00	2.25	2.31	2.24	2.34	3.10	1.59	1.45
BICARBONATE (HCO3) (LAB)	303	310	310	321	320	327	311	266	200	237
SULFATE (SO4)	58.0	39.0	20.0	31.0	42.0	48.0	58.0	65.0	28.0	32.0
CHLORIDE (CL)	10.50	6.10	6.80	9.00	18.80	21.50	31.20	39.40	8.00	10.0
NUTRIENTS										
AMMONIA (NH3 AS N)		0.37								<0.1
TOTAL PHOSPHATE (PO4)		0.060								0.20
TRACE ELEMENTS										
IRON (FE) TOTAL	1.550	1.170	0.710	1.350	0.710	0.970	2.000	15.400	36.200	0.760
MANGANESE (MN) TOTAL	0.120	0.130	0.115	0.125	0.125	0.135	0.145	0.505	1.000	0.065
ORGANIC PARAMETERS										
PHENOLS		<0.001								0.006
OTHER PARAMETERS										
OIL AND GREASE		<0.1								<0.2

All quantities in milligrams per liter unless otherwise noted. Blank line indicates parameter not tested.

Output Date: 02-09-1987
HWQ-6/86-R1

SUMMARY OF WATER QUALITY ANALYSIS - UTAH FUEL CO.

SITE NAME	VC-9	VC-9	VC-9	VC-9	VC-9	VC-9	VC-9	VC-9	VC-9	VC-9
SAMPLE DATE	07/20/83	08/25/83	09/29/83	10/26/83	11/10/83	12/14/83	01/18/84	02/22/84	03/22/84	04/26/84
LOCATION	ECCLES CR.	ECCLES CR.	ECCLES CR.	ECCLES CR.	ECCLES CR.	ECCLES CR.	ECCLES CR.	ECCLES CR.	ECCLES CR.	ECCLES CR.
LOCATION	ABV MUD CR.	ABV MUD CR.	ABV MUD CR.	ABV MUD CR.	ABV MUD CR.	ABV MUD CR.	ABV MUD CR.	ABV MUD CR.	ABV MUD CR.	ABV MUD CR.
PHYSICAL PARAMETERS										
AIR TEMPERATURE (C)	17	17	11	9	0	-2	-22	-4	-8	-5
WATER TEMPERATURE (C)	11	13	8	6	4	1	0	0.5	1	3
SPEC. COND. (UMHOS/CM) FIELD	527	575	597	574	516	652	593	575	625	1604
PH FIELD	8.0	7.7	7.8	7.9	7.9	8.0	7.9	8.3	7.9	8.4
TURBIDITY (NTU) FIELD	15	9.1	27	12	37	47	9.9	13	23	100+
TOTAL SUSP. SOLIDS	4.0	81.0	12.0	14.0	32.0	20.0	10.0	2.0	26.0	339
TOTAL DISS. SOLIDS MEAS.	320	295	316	360	340	450	338	380	460	850
OXYGEN (O) DISS		3.4								
COMMON IONS										
CALCIUM (CA)	66.40	63.20	72.00	67.20	70.40	80.00	78.40	78.00	80.00	96.00
MAGNESIUM (MG)	21.60	25.44	24.96	27.36	27.36	27.84	25.90	34.80	28.80	20.40
SODIUM (NA)	23.0	9.8	6.40	24.00	8.80	38.10	9.50	13.50	21.50	224
POTASSIUM (K)	2.3	0.8	2.8	2.5	2.6	3.1	2.2	2.4	2.3	2.5
ACIDITY AS CACO3		16.00								
ALKALINITY AS CACO3 (LAB)		226								
BICARBONATE (HCO3) (LAB)	286	276	249	268	283	290	298.9	303.8	312.3	314.8
SULFATE (SO4)	62	46	70	92	59	75	55	73	31	6
CHLORIDE (CL)	10.0	10.0	14.00	12.00	14.00	58.00	16.0	28.0	54.0	392
FLUORIDE (F)		0.16								
NUTRIENTS										
NITRATE (NO3-N)		<0.02								
AMMONIA (NH3 AS N)		0.30		<0.01						
TOTAL PHOSPHATE (PO4)		<0.01		0.02						
TRACE ELEMENTS										
BARIUM (BA) TOTAL		0.040								
BORON (B) TOTAL		0.044								
COPPER (CU) TOTAL		0.020								
IRON (FE) TOTAL	0.400	0.450	0.580	0.410	0.620	0.500	0.65	0.47	0.67	4.99
LEAD (PB) TOTAL		0.003								
MANGANESE (MN) TOTAL	0.095	0.100	0.098	0.110	0.120	0.140	0.18	0.16	0.17	0.28
ZINC (ZN) TOTAL		0.030								
ORGANIC PARAMETERS										
ORGANIC CARBON (TOTAL)		1.40								
PHENOLS		<0.2		<0.001						
OTHER PARAMETERS										
OIL AND GREASE		<0.2		<0.2						
CYANIDE (CN)		<0.001								

All quantities in milligrams per liter unless otherwise noted. Blank line indicates parameter not tested.

Output Date: 02-09-1987
HWQ-6/86-R1

SUMMARY OF WATER QUALITY ANALYSIS - UTAH FUEL CO.

SITE NAME	VC-9	VC-9	VC-9	VC-9	VC-9	VC-9	VC-9	VC-9	VC-9	VC-9
SAMPLE DATE	05/17/84	06/29/84	07/27/84	08/28/84	09/18/84	10/16/85	11/19/85	12/11/85	01/23/86	02/20/86
LOCATION	ECCLES CR.	ECCLES CR.	ECCLES CR.	ECCLES CR.	ECCLES CR.	ECCLES CR.	ECCLES CR.	ECCLES CR.	ECCLES CR.	ECCLES CR.
LOCATION	ABV MUD CR.	ABV MUD CR.	ABV MUD CR.	ABV MUD CR.	ABV MUD CR.	ABV MUD CR.	ABV MUD CR.	ABV MUD CR.	ABV MUD CR.	ABV MUD CR.
PHYSICAL PARAMETERS										
AIR TEMPERATURE (C)	16	21	17	15	14	10	-10	-18	4	-2
WATER TEMPERATURE (C)	8	9	12	11	9	6	0.5	0.5	3	1
SPEC. COND. (UMHOS/CM) FIELD	363	491	560	661	531	576	970	664	682	744
PH FIELD	7.9	8.4	7.8	8.2	8.0	7.9	8.2	7.9	7.8	7.9
TURBIDITY (NTU) FIELD	100+	24	49	23	35	5.9	11.0	12.0	1.5	9.6
TOTAL SUSP. SOLIDS	1424	9.0	80.0	26.0	25.0	9.0	9.0	24.0	3.0	4.0
TOTAL DISS. SOLIDS MEAS.	750	198	280	380	362	390	586	420	402	490
OXYGEN (O) DISS				9.0						
COMMON IONS										
CALCIUM (CA)	140.00	74.00	77.40	70.00	80.00	107.20	80.00	80.40	71.60	78.00
MAGNESIUM (MG)	72.00	27.60	28.60	39.60	24.00	8.88	30.70	30.50	29.50	25.40
SODIUM (NA)	4.50	4.70	57.00	14.00	14.00	23.00	92.00	18.00	17.02	65.00
POTASSIUM (K)	2.5	1.8	2.17	2.45	2.84	4.12	2.89	2.43	2.58	2.56
ACIDITY AS CACO3				4.00						
ALKALINITY AS CACO3 (LAB)				275						
BICARBONATE (HCO3) (LAB)	231.8	283.0	290.4	335.5	305.0	309.9	287.0	298.0	272.0	278.0
SULFATE (SO4)	426	64	170	62	69	85	88	90	66	88
CHLORIDE (CL)	8.9	6.5	9.2	14.0	12.0	17.2	144	25.7	28.2	86.0
FLUORIDE (F)				0.26						
NUTRIENTS										
NITRATE (NO3-N)				0.04						
AMMONIA (NH3 AS N)		0.26		0.01		<0.01				
TOTAL PHOSPHATE (PO4)		0.06		0.03		<0.01				
TRACE ELEMENTS										
BARIUM (BA) TOTAL				0.06						
BORON (B) TOTAL				0.030						
COPPER (CU) TOTAL				0.017						
IRON (FE) TOTAL	20.20	0.39	1.43	1.50	0.73	0.21	0.40	0.39	0.23	0.67
LEAD (PB) TOTAL				<0.001						
MANGANESE (MN) TOTAL	0.74	0.07	0.13	0.08	0.10	0.07	0.10	0.08	0.08	0.08
ORGANIC PARAMETERS										
ORGANIC CARBON (TOTAL)				0.23						
PHENOLS		<0.001		<0.001		<0.001				
OTHER PARAMETERS										
OIL AND GREASE		0.8		<0.1		0.2		1.8		
CYANIDE (CN)				<0.001						

All quantities in milligrams per liter unless otherwise noted. Blank line indicates parameter not tested.

Output Date: 02-09-1987
HWQ-6/86-R1

SUMMARY OF WATER QUALITY ANALYSIS - UTAH FUEL CO.

SITE NAME	VC-9	VC-9	VC-9	VC-9
SAMPLE DATE	03/20/86	04/17/86	05/28/86	06/25/86
LOCATION	ECCLES CR.	ECCLES CR.	ECCLES CR.	ECCLES CR.
LOCATION	ABV MUD CR.	ABV MUD CR.	ABV MUD CR.	ABV MUD CR.
PHYSICAL PARAMETERS				
AIR TEMPERATURE (C)	5	-2	22	20
WATER TEMPERATURE (C)	3	3	9	13
SPEC. COND. (UMHOS/CM) FIELD	763	2280	296	526
PH FIELD	8.0	8.1	7.7	7.6
TURBIDITY (NTU) FIELD	5.2	9.3	87	40.32
TOTAL SUSP. SOLIDS	28.0	242	486	81.0
TOTAL DISS. SOLIDS MEAS.	432	1320	204	292
COMMON IONS				
CALCIUM (CA)	88.80	87.60	48.80	63.20
MAGNESIUM (MG)	27.40	20.90	10.60	22.10
SODIUM (NA)	24.20	394.00	12.00	6.03
POTASSIUM (K)	2.78	2.50	0.78	2.36
BICARBONATE (HCO3) (LAB)	303.0	261.0	168.0	219.6
SULFATE (SO4)	72	104	51	67
CHLORIDE (CL)	52.3	59.0	4.6	7.9
NUTRIENTS				
TOTAL PHOSPHATE (PO4)				0.02
TRACE ELEMENTS				
IRON (FE) TOTAL	0.28	2.85	2.54	0.28
MANGANESE (MN) TOTAL	0.12	0.27	0.19	0.10

All quantities in milligrams per liter unless otherwise noted. Blank line indicates parameter not tested.

Output Date: 02-09-1987
HWQ-6/86-R1

SUMMARY OF WATER QUALITY ANALYSIS - UTAH FUEL CO.

SITE NAME	VC-10	VC-10	VC-10	VC-10	VC-10	VC-10	VC-10	VC-10	VC-10	VC-10
SAMPLE DATE	05/12/81	06/23/81	07/29/81	08/20/81	09/24/81	10/23/81	11/11/81	12/09/81	05/20/82	06/30/82
LOCATION	ECCLES CR.	ECCLES CR.	ECCLES CR.	ECCLES CR.	ECCLES CR.	ECCLES CR.	ECCLES CR.	ECCLES CR.	ECCLES CR.	ECCLES CR.
LOCATION	ABV CONFLU	ABV CONFLU	ABV CONFLU	ABV CONFLU	ABV CONFLU	ABV CONFLU	ABV CONFLU	ABV CONFLU	ABV CONFLU	ABV CONFLU
PHYSICAL PARAMETERS										
AIR TEMPERATURE (C)	17	22	24	10	18	2	6	7	14	16
FLOW (CFS)	0.70								5.05	2.49
WATER TEMPERATURE (C)	7.5	11	14	10	10	0	0	1	4	9
SPEC. COND. (UMHOS/CM) FIELD	280	220	340	350	310	440	380	400	241	300
PH FIELD	8.5	8.3	8.3	8.2	8.3	7.8	7.8	8.2	7.9	8.3
TURBIDITY (NTU) FIELD	0.70			0.60			0.38		33	15
TOTAL SUSP. SOLIDS	11.0	18.0	2.0	2.0	21.0	1.5	34.0	3.0	76	5.0
TOTAL DISS. SOLIDS MEAS.	184	144	210	223	214	288	249	265	188	185
OXYGEN (O) DISS	10.5	9.1	10.8	9.0	9.6					
COMMON IONS										
TOTAL HARDNESS AS CACO3	170									
CALCIUM (CA)	50.40	43.20	53.60	60.00	46.40	56.00	65.60	68.50	50.40	52.00
MAGNESIUM (MG)	10.56	14.88	17.76	16.80	19.68	21.12	18.50	17.50	9.80	9.50
SODIUM (NA)	3.50	9.50	2.20	2.60	4.10	26.00	2.40	6.00	2.0	1.9
POTASSIUM (K)	0.77	0.82	1.06	1.15	1.10	1.10	1.01	1.10	5.50	0.68
ACIDITY AS CACO3	<0.01			<0.01			<0.01			
ALKALINITY AS CACO3 (LAB)	166			204		274	229	239	166	
BICARBONATE (HCO3) (LAB)	193	217	222	239	244	335	260	292	202	176
CARBONATE AS CO3 (LAB)	4.80									
SULFATE (SO4)	6.0	10.5	24.0	21.0	6.0	9.0	25.0	15.0	8.2	21.0
CHLORIDE (CL)	6.00	2.52	3.13	3.32	2.59	3.70	3.20	2.60	1.00	3.00
FLUORIDE (F)	0.16			0.19			0.15			
NUTRIENTS										
NITRATE (NO3-N)	0.04			0.03			0.09			
NITRITE (NO2-N)	0.02									
AMMONIA (NH3 AS N)	<0.01	<0.01	<0.01	<0.01	0.08	<0.01	0.52	0.53		0.24
TOTAL PHOSPHATE (PO4)	0.140		0.140	0.130	0.910	1.100	0.390	0.380		0.080
TRACE ELEMENTS										
ALUMINUM (AL) TOTAL	<0.001									
ARSENIC (AS) TOTAL	<0.001			<0.001			<0.001			
ARSENIC (AS) DISS	<0.001			<0.001			<0.001			
BARIUM (BA) TOTAL	0.050			0.025			0.030			
BARIUM (BA) DISS	0.045			0.020			0.025			
BORON (B) TOTAL	<0.001			0.020			0.020			
BORON (B) DISS	<0.001			0.010			0.015			
CADMIUM (CD) TOTAL	<0.001			<0.001			<0.001			
CADMIUM (CD) DISS	<0.001			<0.001			<0.001			
CHROMIUM (CR) TOTAL	<0.001			<0.001			<0.001			
CHROMIUM (CR) DISS	<0.001			<0.001			<0.001			
COPPER (CU) TOTAL	0.010			0.020			0.001			
COPPER (CU) DISS	<0.001			<0.001			<0.001			

All quantities in milligrams per liter unless otherwise noted. Blank line indicates parameter not tested.

Output Date: 02-09-1987
HWQ-6/86-R1

SUMMARY OF WATER QUALITY ANALYSIS - UTAH FUEL CO.

SITE NAME	VC-10	VC-10	VC-10	VC-10	VC-10	VC-10	VC-10	VC-10	VC-10	VC-10
SAMPLE DATE	05/12/81	06/23/81	07/29/81	08/20/81	09/24/81	10/23/81	11/11/81	12/09/81	05/20/82	06/30/82
TRACE ELEMENTS										
IRON (FE) TOTAL	0.030	0.240	0.250	0.370	0.230	0.360	0.800	0.470	1.100	0.400
IRON (FE) TOTAL	0.230									
LEAD (PB) TOTAL	0.001			0.005			<0.001			
LEAD (PB) DISS	<0.001			0.002			<0.001			
MANGANESE (MN) TOTAL	0.020	0.030	0.025	0.060	0.030	0.055	0.090	0.083	0.060	0.025
MERCURY (HG) TOTAL	<0.0002			<0.0002			<0.0002			
MOLYBDENUM (MO) TOTAL	<0.001									
NICKEL (NI) TOTAL	<0.001									
SELENIUM (SE) TOTAL	<0.001			<0.001			<0.001			
SELENIUM (SE) DISS	<0.001			<0.001			<0.001			
SILVER (AG) TOTAL	<0.001			0.02			<0.001			
SILVER (AG) DISS	<0.001			<0.001			<0.001			
ZINC (ZN) TOTAL	0.010			0.045			0.035			
ZINC (ZN) DISS	0.005			0.035			0.005			
BACTERIOLOGICAL PARAMETERS										
FECAL COLIFORM (NO./100ML)				70.0			5.0			
TOTAL COLIFORM (NO./100ML)				330			11.0			
5 - DAY BOD				1.0			5.1			
ORGANIC PARAMETERS										
ORGANIC CARBON (TOTAL)	3.30			<0.01			5.60			
PHENOLS	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	0.003	0.036		0.008
OTHER PARAMETERS										
OIL AND GREASE	<0.01			1.20			1.60			<0.1
CYANIDE (CN)	<0.001			<0.001			<0.001			
SULFIDE	1.20									

All quantities in milligrams per liter unless otherwise noted. Blank line indicates parameter not tested.

Output Date: 02-09-1987
HWQ-6/86-R1

SUMMARY OF WATER QUALITY ANALYSIS - UTAH FUEL CO.

SITE NAME	VC-10	VC-10	VC-10	VC-10	VC-10	VC-10	VC-10	VC-10	VC-10	VC-10
SAMPLE DATE	07/22/82	08/20/82	09/14/82	10/14/82	11/09/82	12/14/82	01/19/83	02/15/83	03/31/83	04/21/83
LOCATION	ECCLES CR.	ECCLES CR.	ECCLES CR.	ECCLES CR.	ECCLES CR.	ECCLES CR.	ECCLES CR.	ECCLES CR.	ECCLES CR.	ECCLES CR.
LOCATION	ABV CONFLU	ABV CONFLU	ABV CONFLU	ABV CONFLU	ABV CONFLU	ABV CONFLU	ABV CONFLU	ABV CONFLU	ABV CONFLU	ABV CONFLU
PHYSICAL PARAMETERS										
AIR TEMPERATURE (C)	14	17	7	5	-1	-8	-2	-2	2	9
FLOW (CFS)	0.98	0.55	0.55	0.62	0.30					
WATER TEMPERATURE (C)	8	10	3	1	0	0	2	0	0.5	0
SPEC. COND. (UMHOS/CM) FIELD	387	403	470	523	575	410	594	576	560	654
PH FIELD	8.4	8.6	8.4	8.4	7.8	7.9	7.9	7.8	7.9	7.7
TURBIDITY (NTU) FIELD	3.8	9.1	15	4.2	7.3	10	5.9	18	4.0	8.7
TOTAL SUSP. SOLIDS	10.0	17.0	1.0	25.0	21.0	8.0	2.0	9.0	30.0	9.0
TOTAL DISS. SOLIDS MEAS.	244	305	328	350	355	342	356	380	365	326
COMMON IONS										
CALCIUM (CA)	53.60	76.00	78.40	85.60	86.40	87.20	88.00	82.40	84.80	77.60
MAGNESIUM (MG)	20.64	22.56	25.92	27.84	24.96	25.44	25.44	21.12	18.24	23.52
SODIUM (NA)	14.0	2.7	2.5	0.9	2.5	2.8	2.7	24.0	21.0	2.6
POTASSIUM (K)	0.65	1.36	1.58	1.65	1.59	1.70	1.63	1.57	1.40	1.38
ACIDITY AS CACO3		3.00								
ALKALINITY AS CACO3 (LAB)	246	222								
BICARBONATE (HCO3) (LAB)	300	271	262	303	289	318	303	310	310	266
SULFATE (SO4)	3.0	47.0	83.0	78.0	75.0	62.0	74.0	87.0	80.0	74.0
CHLORIDE (CL)	2.90	12.40	4.50	3.20	3.50	2.50	3.40	4.70	1.60	5.90
FLUORIDE (F)		0.15								
NUTRIENTS										
NITRATE (NO3-N)		0.16								
AMMONIA (NH3 AS N)		0.34		0.37						
TOTAL PHOSPHATE (PO4)		0.100		0.020						
TRACE ELEMENTS										
BARIUM (BA) TOTAL		0.065								
BORON (B) TOTAL		0.021								
COPPER (CU) TOTAL		<0.001								
IRON (FE) TOTAL	0.110	0.150	0.190	0.140	0.280	0.330	0.390	0.300	0.290	0.400
LEAD (PB) TOTAL		<0.001								
MANGANESE (MN) TOTAL	0.18	0.030	0.030	0.035	0.030	0.030	0.035	0.038	0.030	0.030
ZINC (ZN) TOTAL		0.003								
ORGANIC PARAMETERS										
ORGANIC CARBON (TOTAL)		5.80								
PHENOLS		0.004		<0.001						
OTHER PARAMETERS										
OIL AND GREASE		0.6		1.2						
CYANIDE (CN)		0.005								

All quantities in milligrams per liter unless otherwise noted. Blank line indicates parameter not tested.

Output Date: 02-09-1987
HWQ-6/86-R1

SUMMARY OF WATER QUALITY ANALYSIS - UTAH FUEL CO.

SITE NAME	VC-10	VC-10	VC-10	VC-10	VC-10	VC-10	VC-10	VC-10	VC-10	VC-10
SAMPLE DATE	05/25/83	06/30/83	07/20/83	08/25/83	09/29/83	10/26/83	11/11/83	12/14/83	02/22/84	03/22/84
LOCATION	ECCLES CR.	ECCLES CR.	ECCLES CR.	ECCLES CR.	ECCLES CR.	ECCLES CR.	ECCLES CR.	ECCLES CR.	ECCLES CR.	ECCLES CR.
LOCATION	ABV CONFLU	ABV CONFLU	ABV CONFLU	ABV CONFLU	ABV CONFLU	ABV CONFLU	ABV CONFLU	ABV CONFLU	ABV CONFLU	ABV CONFLU
PHYSICAL PARAMETERS										
AIR TEMPERATURE (C)	18	7	15	16	10	9	1	-3	-8	-4
FLOW (CFS)	9.2	4.39	1.47	0.57	0.35	0.32	0.22			
WATER TEMPERATURE (C)	3	4	9	9	5	2	5	0	0	1
SPEC. COND. (UMHOS/CM) FIELD	330	282	434	544	538	510	482	501	527	535
PH FIELD	7.7	7.9	8.1	7.9	7.8	7.9	7.5	8.2	8.1	7.8
TURBIDITY (NTU) FIELD	100+	16	15	6.6	17	10.2	15	19	7.6	9.4
TOTAL SUSP. SOLIDS	244	8.0	1.0	23.0	9.0	15.0	4.0	9.0	3.0	4.0
TOTAL DISS. SOLIDS MEAS.	228	212	270	291	300	326	360	440	340	360
TOTAL SETTLEABLE SOLIDS	0.2									
OXYGEN (D) DISS				5.6						
COMMON IONS										
CALCIUM (CA)	51.20	55.20	66.00	67.20	75.20	72.00	80.00	85.60	112.00	86.80
MAGNESIUM (MG)	12.48	11.04	14.64	20.16	23.04	23.52	23.52	24.00	30.00	26.64
SODIUM (NA)	3.8	5.4	17.0	13.0	2.50	15.00	2.70	2.40	2.60	4.60
POTASSIUM (K)	1.28	0.75	1.1	1.3	1.5	1.0	1.4	1.5	1.6	1.7
ACIDITY AS CACO3				20.00						
ALKALINITY AS CACO3 (LAB)				238						
BICARBONATE (HCO3) (LAB)	198	203	259	290	261	251	284	278	299	305
SULFATE (SO4)	21.0	22.0	40	40	67	88	64	77	133	60
CHLORIDE (CL)	2.00	6.00	6.0	4.0	2.0	6.00	6.00	6.00	13.0	16.0
FLUORIDE (F)				0.13						
NUTRIENTS										
NITRATE (NO3-N)				<0.02						
AMMONIA (NH3 AS N)		<0.1		0.30		<0.01				
TOTAL PHOSPHATE (PO4)		0.16		<0.01		<0.01				
TRACE ELEMENTS										
BARIUM (BA) TOTAL				0.030						
BORON (B) TOTAL				0.036						
COPPER (CU) TOTAL				<0.001						
IRON (FE) TOTAL	3.510	0.390	0.200	0.120	0.360	0.190	0.250	0.260	0.26	0.33
LEAD (PB) TOTAL				<0.001						
MANGANESE (MN) TOTAL	0.130	0.007	0.020	0.030	0.055	0.025	0.050	0.050	0.05	0.11
ZINC (ZN) TOTAL				0.006						
ORGANIC PARAMETERS										
ORGANIC CARBON (TOTAL)				0.85						
PHENOLS		0.004		<0.001		<0.001				
OTHER PARAMETERS										
OIL AND GREASE		<0.2		<0.2		<0.2				
CYANIDE (CN)				<0.001						

All quantities in milligrams per liter unless otherwise noted. Blank line indicates parameter not tested.

Output Date: 02-09-1987
HWQ-6/86-R1

SUMMARY OF WATER QUALITY ANALYSIS - UTAH FUEL CO.

SITE NAME	VC-10	VC-10	VC-10	VC-10	VC-10	VC-10	VC-10	VC-10	VC-10	VC-10
SAMPLE DATE	04/26/84	05/17/84	06/28/84	07/27/84	08/28/84	09/17/84	10/16/85	04/17/86	05/28/86	06/25/86
LOCATION	ECCLES CR.	ECCLES CR.	ECCLES CR.	ECCLES CR.	ECCLES CR.	ECCLES CR.	ECCLES CR.	ECCLES CR.	ECCLES CR.	ECCLES CR.
LOCATION	ABV CONFLU	ABV CONFLU	ABV CONFLU	ABV CONFLU	ABV CONFLU	ABV CONFLU	ABV CONFLU	ABV CONFLU	ABV CONFLU	ABV CONFLU
PHYSICAL PARAMETERS										
AIR TEMPERATURE (C)	-5	14	18	14	15	16	9	-4	21	17
FLOW (CFS)		12.5	4.3	1.38	0.58	0.36	0.34		14.43	2.27
WATER TEMPERATURE (C)	1	6	12	9	11	11	1	1	6	7
SPEC. COND. (UMHOS/CM) FIELD	453	320	373	542	626	505	552	490	252	439
PH FIELD	8.2	8.0	8.1	7.7	8.3	8.1	8.2	8.2	7.7	7.9
TURBIDITY (NTU) FIELD	18	100+	25	25	13	9.6	5.1	3.7	46	1.45
TOTAL SUSP. SOLIDS	38	173	3.0	2.0	11.0		9.0	10.0	165	12.0
TOTAL DISS. SOLIDS MEAS.	275	320	200	320	340		365	276	170	256
OXYGEN (O) DISS					9.0					
COMMON IONS										
CALCIUM (CA)	70.40	120.00	70.00	79.20	76.00		93.20	77.20	45.60	61.60
MAGNESIUM (MG)	21.36	<0.10	12.00	23.30	30.00		30.96	14.00	9.10	16.30
SODIUM (NA)	11.0	1.60	9.00	2.90	10.00		2.40	7.00	5.14	2.17
POTASSIUM (K)	1.2	1.0	1.1	1.77	1.93		3.32	1.23	0.22	1.42
ACIDITY AS CACO3					5.00					
ALKALINITY AS CACO3 (LAB)					220					
BICARBONATE (HCO3) (LAB)	329.4	195.2	253.8	273.8	268.4		296.5	283.0	165.0	219.6
SULFATE (SO4)	9	120	33	65	90		93	28	19	39
CHLORIDE (CL)	8.0	7.9	1.6	2.0	5.0		18.0	6.8	3.7	2.0
FLUORIDE (F)					0.22					
NUTRIENTS										
NITRATE (NO3-N)					0.08					
AMMONIA (NH3 AS N)			0.12		0.04		0.60			0.66
TOTAL PHOSPHATE (PO4)			0.02		0.04		0.18			0.03
TRACE ELEMENTS										
BARIUM (BA) TOTAL					0.04					
BORON (B) TOTAL					0.055					
COPPER (CU) TOTAL					0.012					
IRON (FE) TOTAL	0.50	3.50	0.36	0.38	0.38		0.10	0.10	0.90	0.16
LEAD (PB) TOTAL					0.060					
MANGANESE (MN) TOTAL	0.03	0.17	0.03	0.03	0.02		0.02	<0.01	0.09	0.07
ORGANIC PARAMETERS										
ORGANIC CARBON (TOTAL)					0.45					
PHENOLS			<0.001		<0.001		<0.001			<0.001
OTHER PARAMETERS										
OIL AND GREASE			0.4		<0.01		<0.1			<0.1
CYANIDE (CN)					<0.001					

All quantities in milligrams per liter unless otherwise noted. Blank line indicates parameter not tested.

Output Date: 02-09-1987
HWQ-6/86-R1

SUMMARY OF WATER QUALITY ANALYSIS - UTAH FUEL CO.

SITE NAME	VC-10
SAMPLE DATE	07/23/86
LOCATION	ECCLES CR.
LOCATION	ABV CONFLU
PHYSICAL PARAMETERS	
AIR TEMPERATURE (C)	11
FLOW (CFS)	0.87
WATER TEMPERATURE (C)	8
SPEC. COND. (UMHOS/CM) FIELD	519
PH FIELD	7.8
TURBIDITY (NTU) FIELD	0.72
TOTAL SUSP. SOLIDS	3.0
TOTAL DISS. SOLIDS MEAS.	284
COMMON IONS	
CALCIUM (CA)	65.60
MAGNESIUM (MG)	24.00
SODIUM (NA)	2.84
POTASSIUM (K)	1.82
BICARBONATE (HCO3) (LAB)	246.4
SULFATE (SO4)	59
CHLORIDE (CL)	3.3
TRACE ELEMENTS	
IRON (FE) TOTAL	0.03
MANGANESE (MN) TOTAL	<0.01

All quantities in milligrams per liter unless otherwise noted. Blank line indicates parameter not tested.

Output Date: 02-09-1987
HWQ-6/86-R1

SUMMARY OF WATER QUALITY ANALYSIS - UTAH FUEL CO.

SITE NAME	S10-1	S10-1	S10-1	S10-1	S10-1	S10-1	S10-1	S10-1	S10-1	S10-1
SAMPLE DATE	06/29/81	08/18/81	09/25/81	06/29/82	07/20/82	08/18/82	09/22/82	10/12/82	06/29/83	07/19/83
LOCATION	SPRING	SPRING	SPRING	SPRING	SPRING	SPRING	SPRING	SPRING	SPRING	SPRING
PHYSICAL PARAMETERS										
AIR TEMPERATURE (C)	27	22	13	22	25	10	12	7	11	19
FLOW (CFS)	.01	0.001	0.0001	0.003	0.01	0.002	0.001	0.001	0.07	0.01
WATER TEMPERATURE (C)	8	10	10	6	7	16	7	3	3	5
SPEC. COND. (UMHOS/CM) FIELD	85	105	190	187	165	120	147	137	77	140
PH FIELD	7.6	7.5		7.3	7.1	8.5	7.6	8.4	7.3	6.5
TURBIDITY (NTU) FIELD	9.3	0.26		14	8.6	17	9.7	16	25	19
TOTAL SUSP. SOLIDS	<0.1	3.0		1.0		39.0		21.0	6.0	
TOTAL DISS. SOLIDS MEAS.	5	68.0		66		78		98.0	64.0	
OXYGEN (O) DISS		8.3				8.5				
COMMON IONS										
TOTAL HARDNESS AS CACO3	46									
CALCIUM (CA)	12.00	17.60		13.50		16.80		14.40	12.00	
MAGNESIUM (MG)	3.84	3.84		3.20		4.32		2.88	2.88	
SODIUM (NA)	1.50	1.80		2.0		1.7		1.5	10.3	
POTASSIUM (K)	0.33	0.40		0.41		0.36		0.58	0.60	
CALCIUM (CA) TOTAL	12.50									
MAGNESIUM (MG) TOTAL	3.84									
SODIUM (NA) TOTAL	1.75									
POTASSIUM (K) TOTAL	0.38									
ACIDITY AS CACO3	<0.01	1.60				1.00				
ALKALINITY AS CACO3 (LAB)	28	52.0				27.3				
BICARBONATE (HCO3) (LAB)	34.2	63.4		20.7		33.3		3.90	58.6	
CARBONATE AS CO3 (LAB)	<0.01									
SULFATE (SO4)	15.4	8.0		32.0		14.0		44.5	12.0	
CHLORIDE (CL)	2.51	1.53		0.60		14.90		1.00	4.0	
FLUORIDE (F)	0.05	0.08				0.05				
CHLORIDE (CL) TOTAL	2.60									
FLUORIDE (F) TOTAL	0.05									
NUTRIENTS										
NITRATE (NO3-N)	1.43					0.51				
NITRITE (NO2-N)	0.04									
AMMONIA (NH3 AS N)	<0.01	<0.01		0.27		0.13		0.30	0.3	
TOTAL PHOSPHATE (PO4)	0.240	0.190		0.060		0.080		0.030	0.14	
TRACE ELEMENTS										
ALUMINUM (AL) TOTAL	0.030									
ALUMINUM (AL) DISS	0.070									
ARSENIC (AS) TOTAL	<0.001	0.003								
ARSENIC (AS) DISS	<0.001	<0.001								
BARIUM (BA) TOTAL	0.015	0.015				0.010				
BARIUM (BA) DISS	0.010	0.010								
BORON (B) TOTAL	0.028	<0.001				0.009				
BORON (B) DISS	0.020	<0.001								

All quantities in milligrams per liter unless otherwise noted. Blank line indicates parameter not tested.

Output Date: 02-09-1987
HWQ-6/86-R1

SUMMARY OF WATER QUALITY ANALYSIS - UTAH FUEL CO.

SITE NAME	S10-1	S10-1	S10-1	S10-1	S10-1	S10-1	S10-1	S10-1	S10-1	S10-1
SAMPLE DATE	06/29/81	08/18/81	09/25/81	06/29/82	07/20/82	08/18/82	09/22/82	10/12/82	06/29/83	07/19/83
TRACE ELEMENTS										
CADMIUM (CD) TOTAL	<0.001	<0.001								
CADMIUM (CD) DISS	<0.001	<0.001								
CHROMIUM (CR) TOTAL	<0.001	<0.001								
CHROMIUM (CR) DISS	<0.001	<0.001								
COPPER (CU) TOTAL	0.010	0.010				<0.001				
COPPER (CU) DISS	<0.001	<0.001								
IRON (FE) TOTAL	0.030	0.140		0.420		0.260		0.270	0.370	
IRON (FE) TOTAL	0.160									
LEAD (PB) TOTAL	<0.001	<0.001				0.002				
LEAD (PB) DISS	0.002	<0.001								
MANGANESE (MN) TOTAL	0.005	0.010		0.002		0.002		0.003	0.004	
MANGANESE (MN) TOTAL	0.012									
MERCURY (HG) TOTAL	<0.0002	<0.0002								
MERCURY (HG) DISS	<0.0002									
MOLYBDENUM (MO) TOTAL	<0.001									
MOLYBDENUM (MO) DISS	<0.001									
NICKEL (NI) TOTAL	<0.001									
NICKEL (NI) DISS	<0.001									
SELENIUM (SE) TOTAL	<0.001	<0.001								
SELENIUM (SE) DISS	<0.001		<0.001							
SELENIUM (SE) DISS	<0.001									
SILVER (AG) TOTAL	<0.001	<0.001								
SILVER (AG) DISS	<0.001		<0.001							
ZINC (ZN) TOTAL	0.020	0.030				0.002				
ZINC (ZN) DISS	0.015		0.007							
BACTERIOLOGICAL PARAMETERS										
FECAL COLIFORM (NO./100ML)		17.0								
TOTAL COLIFORM (NO./100ML)		700								
ORGANIC PARAMETERS										
ORGANIC CARBON (TOTAL)	20.60	7.50				6.90				
PHENOLS	0.008	0.055		<0.001		0.004		<0.001	<0.001	
OTHER PARAMETERS										
OIL AND GREASE	1.60	1.00				0.8				
CYANIDE (CN)	<0.001	<0.001				<0.001				
SULFIDE	0.16									

All quantities in milligrams per liter unless otherwise noted. Blank line indicates parameter not tested.

Output Date: 02-09-1987
HWQ-6/86-R1

SUMMARY OF WATER QUALITY ANALYSIS - UTAH FUEL CO.

SITE NAME	S10-1	S10-1	S10-1	S10-1	S10-1	S10-1	S10-1	S10-1	S10-1
SAMPLE DATE	08/22/83	09/27/83	10/19/83	06/26/84	07/30/84	08/22/84	09/26/84	10/15/85	06/18/86
LOCATION	SPRING	SPRING	SPRING	SPRING	SPRING	SPRING	SPRING	SPRING	SPRING
PHYSICAL PARAMETERS									
AIR TEMPERATURE (C)	22	12	6	16	15	15	12	5	23
FLOW (CFS)	0.004	0.003	0.002	0.04	0.01	0.003	0.002	0.002	0.04
WATER TEMPERATURE (C)	8	8	4	4	7	5	7	3	45
SPEC. COND. (UMHOS/CM) FIELD	157	152	129	101	128	161	131	127	99
PH FIELD	6.6	6.6	7.1	6.1	6.5	6.9	6.7	6.8	6.4
TURBIDITY (NTU) FIELD	18	11	11	26	33	20	17	5.9	22
TOTAL SUSP. SOLIDS	41.0		18.0	1.0		4.0		11.0	7.0
TOTAL DISS. SOLIDS MEAS.	82.0		95.0	112		119		94.0	68.0
OXYGEN (O) DISS	7.8					7.7			
COMMON IONS									
CALCIUM (CA)	19.20		18.40	28.00		24.00		32.00	12.80
MAGNESIUM (MG)	9.12		3.84	6.00		13.20		7.20	2.40
SODIUM (NA)	7.0		10.00	1.40		1.50		0.50	1.70
POTASSIUM (K)	0.4		1.5	0.5		0.67		1.12	0.04
ACIDITY AS CACO3	6.00					1.50			
ALKALINITY AS CACO3 (LAB)	70.0					60.0			
BICARBONATE (HCO3) (LAB)	85.4		61.0	63.4		73.20		112.2	46.4
SULFATE (SO4)	28		22	40		21		6	4
CHLORIDE (CL)	<0.1		8.00	1.3		20.0		8.0	1.8
FLUORIDE (F)	0.04					0.02			
NUTRIENTS									
NITRATE (NO3-N)	<0.02					0.29			
AMMONIA (NH3 AS N)	0.10		<0.01	0.23		0.11		<0.01	<0.01
TOTAL PHOSPHATE (PO4)	0.02		0.05	0.10		0.18		0.06	0.06
TRACE ELEMENTS									
BARIUM (BA) TOTAL	0.020					0.02			
BORON (B) TOTAL	0.057					0.035			
COPPER (CU) TOTAL	0.020					0.013			
IRON (FE) TOTAL	0.320		0.190	0.46		0.36		0.10	0.21
LEAD (PB) TOTAL	0.006					0.007			
MANGANESE (MN) TOTAL	0.010		0.020	0.02		0.01		0.02	<0.01
ZINC (ZN) TOTAL	0.023					0.041			
ORGANIC PARAMETERS									
ORGANIC CARBON (TOTAL)	0.78					1.30			
PHENOLS	<0.001		<0.001	<0.001		<0.001		<0.001	<0.001
OTHER PARAMETERS									
OIL AND GREASE	<0.2					<0.1			
CYANIDE (CN)	<0.001					<0.001			

All quantities in milligrams per liter unless otherwise noted. Blank line indicates parameter not tested.

Output Date: 02-09-1987
HWQ-6/86-R1

SUMMARY OF WATER QUALITY ANALYSIS - UTAH FUEL CO.

SITE NAME	S12-1	S12-1	S12-1	S12-1	S12-1	S12-1	S12-1	S12-1	S12-1	S12-1
SAMPLE DATE	06/29/81	06/29/82	07/20/82	08/18/82	10/16/82	06/29/83	07/19/83	08/22/83	09/27/83	10/19/83
LOCATION	SPRING	SPRING	SPRING	SPRING	SPRING	SPRING	SPRING	SPRING	SPRING	SPRING
PHYSICAL PARAMETERS										
AIR TEMPERATURE (C)	24	23	23	14	9	11	19	19	9	6
FLOW (CFS)	0.001	0.18	0.01	0.0007	0.0004	0.17	0.01	0.001	0.003	0.0004
WATER TEMPERATURE (C)	19	16	21	14	1	5	19	8	9	4
SPEC. COND. (UMHOS/CM) FIELD	130	128	160	155	148	86	168	233	241	201
PH FIELD	7.6	7.6	7.5	7.9	7.5	6.6	8.9	7.2	8.0	7.2
TURBIDITY (NTU) FIELD	1.10	9.9	18	21	19	9.8	5.0	12	24	38
TOTAL SUSP. SOLIDS	6	3.0		14.0	105	3.0		17.0		58.0
TOTAL DISS. SOLIDS MEAS.	84	56		132	125	58.0		124		100
OXYGEN (O) DISS				7.6				5.0		
COMMON IONS										
TOTAL HARDNESS AS CACO3	70									
CALCIUM (CA)	24.80	14.50		29.60	27.20	16.80		34.40		32.80
MAGNESIUM (MG)	1.92	1.40		3.84	2.88	1.92		3.36		3.36
SODIUM (NA)		1.6		16.2	17.0	4.2		7.0		4.00
POTASSIUM (K)	0.32	0.27		4.04	0.94	0.31		1.0		0.8
CALCIUM (CA) TOTAL	24.90									
MAGNESIUM (MG) TOTAL	1.95									
SODIUM (NA) TOTAL	2.55									
POTASSIUM (K) TOTAL	0.41									
ACIDITY AS CACO3	1.70			3.00				8.0		
ALKALINITY AS CACO3 (LAB)	62			111.7				100		
BICARBONATE (HCO3) (LAB)	80.5	47		136	120	56.1		122		102
CARBONATE AS CO3 (LAB)	<0.01									
SULFATE (SO4)	7.9	3.0		<3.0	15.0	5.0		10		8
CHLORIDE (CL)	2.86	2.90		15.00	2.90	8.0		6.0		8.00
FLUORIDE (F)	0.12			0.09				0.07		
CHLORIDE (CL) TOTAL	3.50									
FLUORIDE (F) TOTAL	0.12									
NUTRIENTS										
NITRATE (NO3-N)	0.22			0.23				<0.02		
NITRITE (NO2-N)	0.01									
AMMONIA (NH3 AS N)	0.25	0.25		0.59	0.26	<0.1		0.25		<0.01
TOTAL PHOSPHATE (PO4)	0.850	0.060		0.130	0.060	0.18		0.01		0.10
TRACE ELEMENTS										
ALUMINUM (AL) TOTAL	0.045									
ALUMINUM (AL) DISS	0.090									
ARSENIC (AS) TOTAL	<0.001									
ARSENIC (AS) DISS	<0.001									
BARIUM (BA) TOTAL	0.012			0.035				0.080		
BARIUM (BA) DISS	0.005									
BORON (B) TOTAL	0.030			0.017				0.028		
BORON (B) DISS	0.020									

All quantities in milligrams per liter unless otherwise noted. Blank line indicates parameter not tested.

Output Date: 02-09-1987
HWQ-6/86-R1

SUMMARY OF WATER QUALITY ANALYSIS - UTAH FUEL CO.

SITE NAME	S12-1	S12-1	S12-1	S12-1	S12-1	S12-1	S12-1	S12-1	S12-1	S12-1
SAMPLE DATE	06/29/81	06/29/82	07/20/82	08/18/82	10/16/82	06/29/83	07/19/83	08/22/83	09/27/83	10/19/83
TRACE ELEMENTS										
CADMIUM (CD) TOTAL	<0.001									
CADMIUM (CD) DISS	<0.001									
CHROMIUM (CR) TOTAL	<0.001									
CHROMIUM (CR) DISS	<0.001									
COPPER (CU) TOTAL	0.070			<0.001				0.020		
COPPER (CU) DISS	<0.001									
IRON (FE) TOTAL	0.030	0.210		0.65	0.220	0.050		0.320		0.620
IRON (FE) TOTAL	0.210									
LEAD (PB) TOTAL	<0.001			0.001				<0.001		
LEAD (PB) DISS	<0.001									
MANGANESE (MN) TOTAL	0.010	0.010		0.315	0.310	0.007		0.760		0.390
MANGANESE (MN) TOTAL	0.100									
MERCURY (HG) TOTAL	<0.0002									
MERCURY (HG) DISS	<0.0002									
MOLYBDENUM (MO) TOTAL	<0.001									
MOLYBDENUM (MO) DISS	<0.001									
NICKEL (NI) TOTAL	<0.001									
NICKEL (NI) DISS	<0.001									
NICKEL (NI) DISS	<0.001									
SELENIUM (SE) TOTAL	<0.001									
SELENIUM (SE) DISS	<0.001									
SILVER (AG) TOTAL	<0.001									
SILVER (AG) DISS	<0.001									
ZINC (ZN) TOTAL	0.005			0.002				0.015		
ZINC (ZN) DISS	0.005									
ORGANIC PARAMETERS										
ORGANIC CARBON (TOTAL)	34.90			12.50				0.95		
PHENOLS	0.525	<0.001		0.13	<0.001	<0.001		<0.001		<0.001
OTHER PARAMETERS										
OIL AND GREASE	0.80			0.8				<0.2		
CYANIDE (CN)	<0.001			0.005				<0.001		
SULFIDE	<0.01									

All quantities in milligrams per liter unless otherwise noted. Blank line indicates parameter not tested.

Output Date: 02-09-1987
HWQ-6/86-R1

SUMMARY OF WATER QUALITY ANALYSIS - UTAH FUEL CO.

SITE NAME	S12-1	S12-1	S12-1	S12-1	S12-1
SAMPLE DATE	06/26/84	07/31/84	08/22/84	09/26/84	06/18/86
LOCATION	SPRING	SPRING	SPRING	SPRING	SPRING
PHYSICAL PARAMETERS					
AIR TEMPERATURE (C)	20	13	13	7	14
FLOW (CFS)	0.06	0.002	0.0008	0.0002	0.19
WATER TEMPERATURE (C)	3	12	13	3	10
SPEC. COND. (UMHOS/CM) FIELD	135	199	236	260	96
PH FIELD	6.4	7.9	7.1	7.3	6.7
TURBIDITY (NTU) FIELD	11	34	21	15	8.9
TOTAL SUSP. SOLIDS	1.0		6.0		10.0
TOTAL DISS. SOLIDS MEAS.	105		170		54.0
OXYGEN (O) DISS			7.7		
COMMON IONS					
CALCIUM (CA)	30.00		36.00		13.60
MAGNESIUM (MG)	4.08		6.00		1.40
SODIUM (NA)	1.00		21.00		2.10
POTASSIUM (K)	0.4		0.76		0.03
ACIDITY AS CACO3			2.60		
ALKALINITY AS CACO3 (LAB)			100		
BICARBONATE (HCO3) (LAB)	97.6		122.0		46.4
SULFATE (SO4)	11		10		3
CHLORIDE (CL)	1.0		30.0		1.7
FLUORIDE (F)			0.06		
NUTRIENTS					
NITRATE (NO3-N)			0.08		
AMMONIA (NH3 AS N)	0.15		0.11		<0.01
TOTAL PHOSPHATE (PO4)	0.02		0.19		0.14
TRACE ELEMENTS					
BARIUM (BA) TOTAL			0.02		
BORON (B) TOTAL			0.044		
COPPER (CU) TOTAL			0.017		
IRON (FE) TOTAL	0.31		0.33		0.18
LEAD (PB) TOTAL			0.002		
MANGANESE (MN) TOTAL	0.02		0.12		<0.01
ZINC (ZN) TOTAL			0.048		
ORGANIC PARAMETERS					
ORGANIC CARBON (TOTAL)			2.80		
PHENOLS	<0.001		<0.001		<0.001
OTHER PARAMETERS					
OIL AND GREASE			<0.1		
CYANIDE (CN)			<0.001		

All quantities in milligrams per liter unless otherwise noted. Blank line indicates parameter not tested.

Output Date: 02-09-1987
HWQ-6/86-R1

SUMMARY OF WATER QUALITY ANALYSIS - UTAH FUEL CO.

SITE NAME	S13-2	S13-2	S13-2	S13-2	S13-2	S13-2	S13-2	S13-2	S13-2	S13-2
SAMPLE DATE	05/14/81	08/20/81	09/25/81	10/23/81	11/12/81	12/09/81	05/20/82	06/30/82	07/21/82	08/19/82
LOCATION	SPRING	SPRING	SPRING	SPRING	SPRING	SPRING	SPRING	SPRING	SPRING	SPRING
PHYSICAL PARAMETERS										
AIR TEMPERATURE (C)	18	22	13	2	2	9	13	16	23	26
FLOW (CFS)	0.001	0.001	0.001	0.001	0.001	0.001	0.002	0.002	0.001	0.001
WATER TEMPERATURE (C)	9	14	10	1	1	3	8	5	15	12
SPEC. COND. (UMHOS/CM) FIELD	430	490	540	540	570	540	416	538	473	411
PH FIELD	7.85	8.0			7.1	8.0	7.4	8.1	7.6	7.9
TURBIDITY (NTU) FIELD	0.48	0.30			0.70		7.4	4.3	9.1	4.5
TOTAL SUSP. SOLIDS	17.0	2.0			16.0	92.0		6.0		30.0
TOTAL DISS. SOLIDS MEAS.	279	327			369	350		345		310
OXYGEN (O) DISS		9.1			11.2					9.8
COMMON IONS										
TOTAL HARDNESS AS CACO3	170									
CALCIUM (CA)	25.60	80.00			91.00	91.50		93.40		76.80
MAGNESIUM (MG)	24.00	21.60			24.50	23.00		22.20		25.92
SODIUM (NA)	6.00	5.90			6.50	5.90		5.2		5.2
POTASSIUM (K)		1.39			1.50	1.25		1.10		1.26
CALCIUM (CA) TOTAL	26.40									
MAGNESIUM (MG) TOTAL	24.96									
SODIUM (NA) TOTAL	45.00									
POTASSIUM (K) TOTAL	1.50									
ACIDITY AS CACO3	<0.01	5.40			4.00					8.00
ALKALINITY AS CACO3 (LAB)	212	230			213	263				276
BICARBONATE (HCO3) (LAB)	254	281			260	320		356		337
CARBONATE AS CO3 (LAB)	2.40									
SULFATE (SO4)	45.0	57.0			113	62.0		38.0		7.0
CHLORIDE (CL)	7.8	8.14			6.10	5.20		2.80		18.70
FLUORIDE (F)	0.26	0.21			0.20					0.21
CHLORIDE (CL) TOTAL	8.00									
FLUORIDE (F) TOTAL	0.26									
NUTRIENTS										
NITRATE (NO3-N)	1.61	1.34			0.74					0.68
NITRITE (NO2-N)	0.02									
AMMONIA (NH3 AS N)	<0.01	<0.01			0.30	0.60				0.12
TOTAL PHOSPHATE (PO4)	0.140	0.160			0.420	0.680		0.075		0.090
TRACE ELEMENTS										
ALUMINUM (AL) TOTAL	0.010									
ALUMINUM (AL) DISS	<0.001									
ARSENIC (AS) TOTAL	<0.001	<0.001			<0.001					
ARSENIC (AS) DISS	<0.001	<0.001			<0.001					
BARIUM (BA) TOTAL	0.025	0.020			0.020					0.044
BARIUM (BA) DISS	0.020	0.016			0.015					
BORON (B) TOTAL	0.038	0.030			0.033					0.015
BORON (B) DISS	0.030	0.007			0.025					

All quantities in milligrams per liter unless otherwise noted. Blank line indicates parameter not tested.

Output Date: 02-09-1987
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SUMMARY OF WATER QUALITY ANALYSIS - UTAH FUEL CO.

SITE NAME	S13-2	S13-2	S13-2	S13-2	S13-2	S13-2	S13-2	S13-2	S13-2	S13-2
SAMPLE DATE	05/14/81	08/20/81	09/25/81	10/23/81	11/12/81	12/09/81	05/20/82	06/30/82	07/21/82	08/19/82
TRACE ELEMENTS										
CADMIUM (CD) TOTAL	<0.001	<0.001			<0.001					
CADMIUM (CD) DISS	<0.001	<0.001			<0.001					
CHROMIUM (CR) TOTAL	<0.001	<0.001			<0.001					
CHROMIUM (CR) DISS	<0.001	<0.001			<0.001					
COPPER (CU) TOTAL	<0.001	0.020			0.012					0.010
COPPER (CU) DISS	<0.001	<0.001			0.010					
IRON (FE) TOTAL	0.010	0.220			0.250	0.910		0.260		0.170
IRON (FE) TOTAL	0.290									
LEAD (PB) TOTAL	0.002	0.006			<0.001					0.005
LEAD (PB) DISS	<0.001	0.002			0.003					
MANGANESE (MN) TOTAL	0.010	<0.001			0.006	0.010		0.012		0.007
MANGANESE (MN) TOTAL	0.020									
MERCURY (HG) TOTAL	<0.0002	<0.0002			<0.0002					
MERCURY (HG) DISS	<0.0002									
MOLYBDENUM (MO) TOTAL	<0.001									
MOLYBDENUM (MO) DISS	<0.001									
NICKEL (NI) TOTAL	<0.001									
NICKEL (NI) DISS	<0.001									
SELENIUM (SE) TOTAL	<0.001	<0.001			<0.001					
SELENIUM (SE) DISS	<0.001	<0.001			<0.001					
SILVER (AG) TOTAL	<0.001	<0.001			<0.001					
SILVER (AG) DISS	<0.001	<0.001			<0.001					
ZINC (ZN) TOTAL	0.005	0.038			0.035					0.002
ZINC (ZN) DISS	0.005	0.030			0.027					
BACTERIOLOGICAL PARAMETERS										
FECAL COLIFORM (NO./100ML)		4.0			<2.0					
TOTAL COLIFORM (NO./100ML)		1100			790					
5 - DAY BOD		1.7								
ORGANIC PARAMETERS										
ORGANIC CARBON (TOTAL)	5.20	11.00			13.10					10.30
PHENOLS	0.405	<0.001			<0.001	0.039				0.017
OTHER PARAMETERS										
OIL AND GREASE	0.20	2.60			0.20					<0.1
CYANIDE (CN)	<0.001	0.002			0.004					<0.001
SULFIDE	1.50									

All quantities in milligrams per liter unless otherwise noted. Blank line indicates parameter not tested.

Output Date: 02-09-1987
HWQ-6/86-R1

SUMMARY OF WATER QUALITY ANALYSIS - UTAH FUEL CO.

SITE NAME	S13-2	S13-2	S13-2	S13-2	S13-2	S13-2	S13-2	S13-2	S13-2	S13-2
SAMPLE DATE	09/15/82	10/14/82	11/09/82	06/30/83	07/20/83	08/25/83	09/28/83	10/26/83	11/11/83	06/27/84
LOCATION	SPRING	SPRING	SPRING	SPRING	SPRING	SPRING	SPRING	SPRING	SPRING	SPRING
PHYSICAL PARAMETERS										
AIR TEMPERATURE (C)	7	5	0	16	16	12	13	13	3	22
FLOW (CFS)	0.002	0.001	0.001	0.003	0.002	0.0006	0.0007	0.0007	0.002	0.003
WATER TEMPERATURE (C)	6.5	3	1	10	8	8	9	10	4.5	8
SPEC. COND. (UMHOS/CM) FIELD	398	440	615	551	520	613	574	581	536	576
PH FIELD	8.3	7.7	7.8	7.9	7.4	7.2	7.6	7.4	7.3	7.6
TURBIDITY (NTU) FIELD	39	19	26	27	45	23	7.8	29	21	60
TOTAL SUSP. SOLIDS		83.0		18.0		240		117		5.0
TOTAL DISS. SOLIDS MEAS.		338		334		355		340		340
OXYGEN (O) DISS						6.8				
COMMON IONS										
CALCIUM (CA)		87.20		80.00		81.60		87.20		88.00
MAGNESIUM (MG)		20.16		20.64		21.12		23.52		24.00
SODIUM (NA)		12.0		16.0		18.0		5.50		4.70
POTASSIUM (K)		1.37		1.22		1.0		0.5		1.0
ACIDITY AS CACO3						31.00				
ALKALINITY AS CACO3 (LAB)						280				
BICARBONATE (HCO3) (LAB)		346		329		342		312		348.9
SULFATE (SO4)		39.0		40.0		44		48		44
CHLORIDE (CL)		4.40		10.0		6.0		12.00		3.4
FLUORIDE (F)						0.17				
NUTRIENTS										
NITRATE (NO3-N)						<0.02				
AMMONIA (NH3 AS N)		0.36		<0.1		0.45		0.30		0.39
TOTAL PHOSPHATE (PO4)		0.050		0.14		0.05		0.04		0.04
TRACE ELEMENTS										
BARIUM (BA) TOTAL						0.019				
BORON (B) TOTAL						0.015				
COPPER (CU) TOTAL						0.021				
IRON (FE) TOTAL		0.380		0.690		0.120		0.125		0.15
LEAD (PB) TOTAL						0.003				
MANGANESE (MN) TOTAL		0.010		0.010		0.010		0.013		0.02
ZINC (ZN) TOTAL						0.010				
ORGANIC PARAMETERS										
ORGANIC CARBON (TOTAL)						1.40				
PHENOLS		<0.001		0.008		<0.001		<0.001		<0.001
OTHER PARAMETERS										
OIL AND GREASE						<0.2				
CYANIDE (CN)						<0.001				

All quantities in milligrams per liter unless otherwise noted. Blank line indicates parameter not tested.

Output Date: 02-09-1987
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SUMMARY OF WATER QUALITY ANALYSIS - UTAH FUEL CO.

SITE NAME	S13-2	S13-2	S13-2	S13-2	S13-2	S13-2
SAMPLE DATE	07/26/84	08/28/84	09/17/84	10/16/85	05/28/86	06/24/86
LOCATION	SPRING	SPRING	SPRING	SPRING	SPRING	SPRING
PHYSICAL PARAMETERS						
AIR TEMPERATURE (C)	14	15	16	6	18	20
FLOW (CFS)	0.002	0.002	0.002	0.003	0.01	0.01
WATER TEMPERATURE (C)	10	8	13	7	9	8
SPEC. COND. (UMHOS/CM) FIELD	541	640	541	587	467	547
PH FIELD	7.7	7.7	7.5	6.5	7.0	6.9
TURBIDITY (NTU) FIELD	18	14	26	3.2	1.8	0.22
TOTAL SUSP. SOLIDS		10.0		12.0		17.0
TOTAL DISS. SOLIDS MEAS.		360		382		290
OXYGEN (O) DISS		8.6				
COMMON IONS						
CALCIUM (CA)		88.00		98.40		74.40
MAGNESIUM (MG)		21.60		20.20		19.76
SODIUM (NA)		20.00		5.40		4.93
POTASSIUM (K)		1.05		1.66		0.76
ACIDITY AS CACO3		10.00				
ALKALINITY AS CACO3 (LAB)		270				
BICARBONATE (HCO3) (LAB)		229.4		342.8		280.6
SULFATE (SO4)		89		57		39
CHLORIDE (CL)		25.0		6.2		3.7
FLUORIDE (F)		0.19				
NUTRIENTS						
NITRATE (NO3-N)		0.39				
AMMONIA (NH3 AS N)		<0.01		<0.01		1.08
TOTAL PHOSPHATE (PO4)		0.05		<0.01		0.02
TRACE ELEMENTS						
BARIUM (BA) TOTAL		0.02				
BORON (B) TOTAL		0.022				
COPPER (CU) TOTAL		0.024				
IRON (FE) TOTAL		0.12		0.05		0.07
LEAD (PB) TOTAL		<0.001				
MANGANESE (MN) TOTAL		0.01		<0.01		<0.01
ORGANIC PARAMETERS						
ORGANIC CARBON (TOTAL)		<0.01				
PHENOLS		<0.001		<0.001		<0.001
OTHER PARAMETERS						
OIL AND GREASE		<0.1				
CYANIDE (CN)		<0.001				

All quantities in milligrams per liter unless otherwise noted. Blank line indicates parameter not tested.

Output Date: 02-09-1987
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SUMMARY OF WATER QUALITY ANALYSIS - UTAH FUEL CO.

SITE NAME	S13-7	S13-7	S13-7	S13-7	S13-7	S13-7	S13-7	S13-7	S13-7	S13-7
SAMPLE DATE	06/29/81	06/29/82	07/20/82	08/18/82	06/29/83	07/19/83	08/22/83	06/26/84	07/31/84	08/22/84
LOCATION	SPRING	SPRING	SPRING	SPRING	SPRING	SPRING	SPRING	SPRING	SPRING	SPRING
PHYSICAL PARAMETERS										
AIR TEMPERATURE (C)	26	23	23	26	13	18	22	13	15	11
FLOW (CFS)	0.0005	0.09	0.01	0.004	0.09	0.01	0.002	0.08	0.004	0.002
WATER TEMPERATURE (C)	8	3	4	17	3	4	5	8	5	6
SPEC. COND. (UMHOS/CM) FIELD	200	217	257	235	111	261	369	125	337	361
PH FIELD	8.1	7.6	7.5	8.4	6.5	7.2	6.9	6.6	7.1	7.4
TURBIDITY (NTU) FIELD	1.40	9.6	5.5	16	8.0	4.1	3.7	13	8.7	16
TOTAL SUSP. SOLIDS	48	<1.0		10.0	2.0		36.0	1.0		1.0
TOTAL DISS. SOLIDS MEAS.	133	64		165	110		210	107		240
OXYGEN (O) DISS				10.2			8.0			7.6
COMMON IONS										
TOTAL HARDNESS AS CACO3	126									
CALCIUM (CA)	44.80	19.50	51.20		30.40		56.00	28.00		68.00
MAGNESIUM (MG)	3.36	2.10	7.68		3.36		10.56	4.80		14.40
SODIUM (NA)		1.0	3.5		5.8		4.0	1.90		1.20
POTASSIUM (K)	0.42	0.29	0.54		0.35		0.6	0.4		0.58
CALCIUM (CA) TOTAL	45.10									
MAGNESIUM (MG) TOTAL	3.84									
SODIUM (NA) TOTAL	1.50									
POTASSIUM (K) TOTAL	0.45									
TOTAL ALKALINITY AS CACO3						170				
ACIDITY AS CACO3	1.70			3.00			17.00			4.00
ALKALINITY AS CACO3 (LAB)	118			146						205
BICARBONATE (HCO3) (LAB)	144.5	52.3		178	107	207		75.6		205.0
CARBONATE AS CO3 (LAB)	<0.01									
SULFATE (SO4)	6.5	15.0		<3.0	4.0		12	25		19
CHLORIDE (CL)	2.90	<0.01	16.20		8.0		4.0	2.3		24.0
FLUORIDE (F)	0.13		0.14				0.11			0.09
CHLORIDE (CL) TOTAL	3.00									
FLUORIDE (F) TOTAL	0.14									
NUTRIENTS										
NITRATE (NO3-N)	0.70			1.91			<0.02			2.60
NITRITE (NO2-N)	0.06									
AMMONIA (NH3 AS N)	0.10	0.24		0.30	0.1		0.50	0.10		0.07
TOTAL PHOSPHATE (PO4)	0.970	0.080		0.100	0.20		0.02	0.05		0.16
TRACE ELEMENTS										
ALUMINUM (AL) TOTAL	<0.001									
ALUMINUM (AL) DISS	<0.001									
ARSENIC (AS) TOTAL	<0.001									
ARSENIC (AS) DISS	<0.001									
BARIUM (BA) TOTAL	0.018		0.050				0.021			0.02
BARIUM (BA) DISS	0.010									
BORON (B) TOTAL	0.015		0.013				0.010			0.047

All quantities in milligrams per liter unless otherwise noted. Blank line indicates parameter not tested.

Output Date: 02-09-1987
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SUMMARY OF WATER QUALITY ANALYSIS - UTAH FUEL CO.

SITE NAME	S13-7	S13-7	S13-7	S13-7	S13-7	S13-7	S13-7	S13-7	S13-7	S13-7
SAMPLE DATE	06/29/81	06/29/82	07/20/82	08/18/82	06/29/83	07/19/83	08/22/83	06/26/84	07/31/84	08/22/84
TRACE ELEMENTS										
BORON (B) DISS	0.010									
CADMIUM (CD) TOTAL	<0.001									
CADMIUM (CD) DISS	<0.001									
CHROMIUM (CR) TOTAL	<0.001									
CHROMIUM (CR) DISS	<0.001									
COPPER (CU) TOTAL	0.010		<0.001				0.010			0.016
COPPER (CU) DISS	<0.001									
IRON (FE) TOTAL	0.010	1.200	0.060		0.190		0.130	0.32		0.13
IRON (FE) TOTAL	0.200									
LEAD (PB) TOTAL	<0.001		0.001				0.003			<0.001
LEAD (PB) DISS	<0.001									
MANGANESE (MN) TOTAL	0.003	0.010	0.002		0.002		0.010	0.04		0.01
MANGANESE (MN) TOTAL	0.014									
MERCURY (HG) TOTAL	<0.0002									
MERCURY (HG) DISS	<0.0002									
MOLYBDENUM (MO) TOTAL	<0.001									
MOLYBDENUM (MO) DISS	<0.001									
NICKEL (NI) TOTAL	<0.001									
NICKEL (NI) DISS	<0.001									
NICKEL (NI) DISS	<0.001									
SELENIUM (SE) TOTAL	<0.001									
SELENIUM (SE) DISS	<0.001									
SILVER (AG) TOTAL	<0.001									
SILVER (AG) DISS	<0.001									
ZINC (ZN) TOTAL	0.010		0.002				0.015			0.058
ZINC (ZN) DISS	0.010									
ORGANIC PARAMETERS										
ORGANIC CARBON (TOTAL)	27.40			5.60			0.65			<0.01
PHENOLS	0.512	0.004		0.013	0.004		<0.001	<0.001		<0.001
OTHER PARAMETERS										
OIL AND GREASE	0.60			<0.1			<0.2			<0.1
CYANIDE (CN)	<0.001		0.007				<0.001			<0.001
SULFIDE	<0.01									

All quantities in milligrams per liter unless otherwise noted. Blank line indicates parameter not tested.

Output Date: 02-09-1987
HWQ-6/86-R1

SUMMARY OF WATER QUALITY ANALYSIS - UTAH FUEL CO.

SITE NAME	S13-7
SAMPLE DATE	06/18/86
LOCATION	SPRING
PHYSICAL PARAMETERS	
AIR TEMPERATURE (C)	18
FLOW (CFS)	0.08
WATER TEMPERATURE (C)	3
SPEC. COND. (UMHOS/CM) FIELD	121
PH FIELD	6.5
TURBIDITY (NTU) FIELD	7.6
TOTAL SUSP. SOLIDS	3.0
TOTAL DISS. SOLIDS MEAS.	54
COMMON IONS	
CALCIUM (CA)	18.40
MAGNESIUM (MG)	1.40
SODIUM (NA)	1.40
POTASSIUM (K)	0.10
BICARBONATE (HCO3) (LAB)	58.60
SULFATE (SO4)	2
CHLORIDE (CL)	2.6
NUTRIENTS	
AMMONIA (NH3 AS N)	<0.01
TOTAL PHOSPHATE (PO4)	0.48
TRACE ELEMENTS	
IRON (FE) TOTAL	0.14
MANGANESE (MN) TOTAL	<0.01
ORGANIC PARAMETERS	
PHENOLS	<0.001

All quantities in milligrams per liter unless otherwise noted. Blank line indicates parameter not tested.

Output Date: 02-09-1987
HWQ-6/86-R1

SUMMARY OF WATER QUALITY ANALYSIS - UTAH FUEL CO.

SITE NAME	S14-4	S14-4	S14-4	S14-4	S14-4	S14-4	S14-4	S14-4	S14-4	S14-4
SAMPLE DATE	06/29/81	08/18/81	09/24/81	11/11/81	06/29/82	07/20/82	08/18/82	09/22/82	06/29/83	07/19/83
LOCATION	SPRING	SPRING	SPRING	SPRING	SPRING	SPRING	SPRING	SPRING	SPRING	SPRING
PHYSICAL PARAMETERS										
AIR TEMPERATURE (C)	20	22	15	-4	20	20	18	13	10	17
FLOW (CFS)	0.01	0.002	0.001	0.001	0.03	0.01	0.004	0.002	0.03	0.01
WATER TEMPERATURE (C)	5	7	7	2	4	4	8	6	3	4
SPEC. COND. (UMHOS/CM) FIELD	300	350	400	410	298	345	300	435	144	333
PH FIELD	7.6	7.1			7.7	7.6	8.2	8.2	6.5	7.4
TURBIDITY (NTU) FIELD	0.89	0.48			7.7	6.5	8	5	9.2	3.3
TOTAL SUSP. SOLIDS	4.0	1.0			<1.0				1.0	
TOTAL DISS. SOLIDS MEAS.	190	233			136				98.0	
OXYGEN (O) DISS		8.5								
COMMON IONS										
TOTAL HARDNESS AS CACO3	170									
CALCIUM (CA)	59.20	74.40			37.50				24.80	
MAGNESIUM (MG)	5.28	6.72			3.80				4.32	
SODIUM (NA)	2.60	3.10			2.5				3.3	
POTASSIUM (K)	1.05	1.13			0.80				0.76	
CALCIUM (CA) TOTAL	59.70									
MAGNESIUM (MG) TOTAL	5.50									
SODIUM (NA) TOTAL	4.00									
POTASSIUM (K) TOTAL	1.16									
ACIDITY AS CACO3	5.10	6.40								
ALKALINITY AS CACO3 (LAB)	154	198								
BICARBONATE (HCO3) (LAB)	190	242			75.4				92.7	
CARBONATE AS CO3 (LAB)	<0.01									
SULFATE (SO4)	17.3	14.0			45.0				6.0	
CHLORIDE (CL)	5.89	5.28			2.90				6.0	
FLUORIDE (F)	0.14	0.16								
CHLORIDE (CL) TOTAL	5.90									
FLUORIDE (F) TOTAL	0.14									
NUTRIENTS										
NITRATE (NO3-N)	1.95									
NITRITE (NO2-N)	0.07									
AMMONIA (NH3 AS N)	<0.01	<0.01			0.13				0.1	
AMMONIA (NH3 AS N)	<0.01									
TOTAL PHOSPHATE (PO4)	0.460	0.200			0.070				0.20	
TRACE ELEMENTS										
ALUMINUM (AL) TOTAL	<0.001									
ALUMINUM (AL) DISS	<0.001									
ARSENIC (AS) TOTAL	<0.001	0.003								
ARSENIC (AS) DISS	<0.001	<0.001								
BARIUM (BA) TOTAL	0.020	0.015								
BARIUM (BA) DISS	0.010	0.012								
BORON (B) TOTAL	0.018	0.010								

All quantities in milligrams per liter unless otherwise noted. Blank line indicates parameter not tested.

Output Date: 02-09-1987
HWQ-6/86-R1

SUMMARY OF WATER QUALITY ANALYSIS - UTAH FUEL CO.

SITE NAME	S14-4	S14-4	S14-4	S14-4	S14-4	S14-4	S14-4	S14-4	S14-4	S14-4
SAMPLE DATE	06/29/81	08/18/81	09/24/81	11/11/81	06/29/82	07/20/82	08/18/82	09/22/82	06/29/83	07/19/83
TRACE ELEMENTS										
BORON (B) DISS	0.010	0.005								
CADMIUM (CD) TOTAL	<0.001	<0.001								
CADMIUM (CD) DISS	<0.001	<0.001								
CHROMIUM (CR) TOTAL	<0.001	<0.001								
CHROMIUM (CR) DISS	<0.001	<0.001								
COPPER (CU) TOTAL	0.010	0.010								
COPPER (CU) DISS	<0.001	<0.001								
IRON (FE) TOTAL	0.020	0.165			0.100				0.230	
IRON (FE) TOTAL	0.040									
LEAD (PB) TOTAL	<0.001	<0.001								
LEAD (PB) DISS	<0.001	<0.001								
MANGANESE (MN) TOTAL	0.002	<0.001			0.003				0.003	
MANGANESE (MN) TOTAL	0.013									
MERCURY (HG) TOTAL	<0.0002	<0.0002								
MERCURY (HG) DISS	<0.0002									
MOLYBDENUM (MO) TOTAL	<0.001									
MOLYBDENUM (MO) DISS	<0.001									
NICKEL (NI) TOTAL	<0.001									
NICKEL (NI) DISS	<0.001									
SELENIUM (SE) TOTAL	<0.001	<0.001								
SELENIUM (SE) DISS	<0.001	<0.001								
SILVER (AG) TOTAL	<0.001	<0.001								
SILVER (AG) DISS	<0.001	<0.001								
ZINC (ZN) TOTAL	0.010	0.050								
ZINC (ZN) DISS	0.007	0.007								
BACTERIOLOGICAL PARAMETERS										
FECAL COLIFORM (NO./100ML)		<2.0								
TOTAL COLIFORM (NO./100ML)		<2.0								
ORGANIC PARAMETERS										
ORGANIC CARBON (TOTAL)	36.00	2.60								
PHENOLS	0.285	0.025			<0.001				<0.001	
PHENOLS	0.285									
OTHER PARAMETERS										
OIL AND GREASE	2.40	2.60								
CYANIDE (CN)	<0.001	<0.001								
SULFIDE	<0.01									

All quantities in milligrams per liter unless otherwise noted. Blank line indicates parameter not tested.

Output Date: 02-09-1987
HWQ-6/86-R1

SUMMARY OF WATER QUALITY ANALYSIS - UTAH FUEL CO.

SITE NAME	S14-4	S14-4	S14-4	S14-4	S14-4	S14-4	S14-4	S14-4	S14-4	S14-4
SAMPLE DATE	08/22/83	09/27/83	10/19/83	06/26/84	07/30/84	08/22/84	09/26/84	10/16/85	05/27/86	06/18/86
LOCATION	SPRING	SPRING	SPRING	SPRING	SPRING	SPRING	SPRING	SPRING	SPRING	SPRING
PHYSICAL PARAMETERS										
AIR TEMPERATURE (C)	18	11	9	12	14	16	7	6	14	14
FLOW (CFS)	0.01	0.003	0.004	0.03	0.01	0.01	0.003	0.0002	0.05	0.04
WATER TEMPERATURE (C)	6	9	4	3	5	6	4	3	2.5	3
SPEC. COND. (UMHOS/CM) FIELD	387	414	405	197	364	421	419	420	116	251
PH FIELD	6.7	6.3	6.7	6.2	6.4	6.5	6.8	6.5	6.3	6.6
TURBIDITY (NTU) FIELD	1.3	2.2	6.5	9.0	5.7	12	3.7	3.0	2.1	6.8
TOTAL SUSP. SOLIDS	6.0		7.0	1.0		2.0		5.0		6.0
TOTAL DISS. SOLIDS MEAS.	204		220	140		250		278		106
OXYGEN (O) DISS	6.0					7.4				
COMMON IONS										
CALCIUM (CA)	64.80		70.40	46.00		52.00		80.4		29.60
MAGNESIUM (MG)	8.16		8.64	3.60		19.20		8.20		1.90
SODIUM (NA)	6.1		2.90	2.40		18.00		2.00		1.80
POTASSIUM (K)	1.3		0.6	0.8		1.10		1.54		0.34
ACIDITY AS CACO3	23.00					3.50				
ALKALINITY AS CACO3 (LAB)	196					195				
BICARBONATE (HCO3) (LAB)	239		224	125.7		237.8		252.5		87.80
SULFATE (SO4)	10		20	26		11		13		5
CHLORIDE (CL)	4.0		8.00	2.0		26.00		13.0		4.9
FLUORIDE (F)	0.10					0.08				
NUTRIENTS										
NITRATE (NO3-N)	<0.02					1.70				
AMMONIA (NH3 AS N)	0.30		<0.01	0.14		0.09		<0.01		<0.01
TOTAL PHOSPHATE (PO4)	<0.01		0.02	0.03		0.16		0.02		0.08
TRACE ELEMENTS										
BARIUM (BA) TOTAL	0.011					0.02				
BORON (B) TOTAL	0.012					0.054				
COPPER (CU) TOTAL	<0.001					0.014				
IRON (FE) TOTAL	0.010		0.080	0.27		0.10		<0.01		0.09
LEAD (PB) TOTAL	<0.001					0.017				
MANGANESE (MN) TOTAL	0.002		0.020	0.01		0.01		<0.01		<0.01
ZINC (ZN) TOTAL	0.005					0.048				
ORGANIC PARAMETERS										
ORGANIC CARBON (TOTAL)	1.20					<0.01				
PHENOLS	<0.001		<0.001	<0.001		<0.001		<0.001		<0.001
OTHER PARAMETERS										
OIL AND GREASE	<0.2					<0.1				
CYANIDE (CN)	<0.001					<0.001				

All quantities in milligrams per liter unless otherwise noted. Blank line indicates parameter not tested.

Output Date: 02-09-1987
HWQ-6/86-R1

SUMMARY OF WATER QUALITY ANALYSIS - UTAH FUEL CO.

SITE NAME	S15-3	S15-3	S15-3	S15-3	S15-3	S15-3	S15-3	S15-3	S15-3	S15-3
SAMPLE DATE	05/14/81	08/18/81	09/24/81	10/22/81	11/10/81	12/08/81	06/28/82	07/21/82	08/18/82	09/15/82
LOCATION	SPRING	SPRING	SPRING	SPRING	SPRING	SPRING	SPRING	SPRING	SPRING	SPRING
PHYSICAL PARAMETERS										
AIR TEMPERATURE (C)	17	11	20	4	8	10	28	22	21	10
FLOW (CFS)	0.65	0.02	0.01	0.01	0.01	0.01	0.36	0.11	0.08	0.05
WATER TEMPERATURE (C)	3	5	12	5	5	5	4	4	5	4
SPEC. COND. (UMHOS/CM) FIELD	160	320	370	300	400	320	293	290	226	287
PH FIELD	7.9	7.4			7.4	8.2	7.4	8.0	8.2	7.8
TURBIDITY (NTU) FIELD	1.00	0.65			0.49		10.5	6.3	8.4	4.7
TOTAL SUSP. SOLIDS	3.0	1.0			3.0	10.0	<1.0		8.0	
TOTAL DISS. SOLIDS MEAS.	105	210			258	210	88		198	
OXYGEN (O) DISS		10.3			10.3				11.1	
COMMON IONS										
TOTAL HARDNESS AS CACO3	760									
CALCIUM (CA)	23.28	64.00			71.00	59.00	28.00		53.60	
MAGNESIUM (MG)	3.80	8.16			11.00	10.50	3.60		8.64	
SODIUM (NA)	1.70	2.40			6.80	6.20	1.8		12.0	
POTASSIUM (K)	0.420	0.79			1.85	1.60	0.44		0.72	
CALCIUM (CA) TOTAL	24.00									
MAGNESIUM (MG) TOTAL	3.84									
SODIUM (NA) TOTAL	6.50									
POTASSIUM (K) TOTAL	2.30									
ACIDITY AS CACO3	1.82	4.80			4.00				3.00	
ALKALINITY AS CACO3 (LAB)	76.0	176			184	184			178	
BICARBONATE (HCO3) (LAB)	92.7	215			225	225	96.1		217	
CARBONATE AS CO3 (LAB)	<0.01									
SULFATE (SO4)	16.0	18.0			46.0	15.0	8.0		<3.0	
CHLORIDE (CL)	2.00	2.13			2.90	2.70	0.60		14.30	
FLUORIDE (F)	0.09	0.15			0.12				0.12	
CHLORIDE (CL) TOTAL	2.00									
FLUORIDE (F) TOTAL	0.09									
NUTRIENTS										
NITRATE (NO3-N)	0.24				0.16				0.19	
NITRITE (NO2-N)	0.03									
AMMONIA (NH3 AS N)	<0.01	<0.01			<0.01	0.65	0.25		0.26	
TOTAL PHOSPHATE (PO4)	0.120	0.200			0.220	0.340	0.060		0.110	
TRACE ELEMENTS										
ALUMINUM (AL) TOTAL	0.250									
ALUMINUM (AL) DISS	0.200									
ARSENIC (AS) TOTAL	<0.001	0.002			<0.001					
ARSENIC (AS) DISS	<0.001	<0.001			<0.001					
BARIUM (BA) TOTAL	0.010	0.015			0.090				0.020	
BARIUM (BA) DISS	0.005	0.010			0.075					
BORON (B) TOTAL	0.015	0.010			0.010				0.010	
BORON (B) DISS	0.010	0.005			0.005					

All quantities in milligrams per liter unless otherwise noted. Blank line indicates parameter not tested.

Output Date: 02-09-1987
HWQ-6/86-R1

SUMMARY OF WATER QUALITY ANALYSIS - UTAH FUEL CO.

SITE NAME	S15-3	S15-3	S15-3	S15-3	S15-3	S15-3	S15-3	S15-3	S15-3	S15-3
SAMPLE DATE	05/14/81	08/18/81	09/24/81	10/22/81	11/10/81	12/08/81	06/28/82	07/21/82	08/18/82	09/15/82
TRACE ELEMENTS										
CADMIUM (CD) TOTAL	<0.001	<0.001			<0.001					
CADMIUM (CD) DISS	<0.001	<0.001			<0.001					
CHROMIUM (CR) TOTAL	<0.001	<0.001			<0.001					
CHROMIUM (CR) DISS	<0.001	<0.001			<0.001					
COPPER (CU) TOTAL	<0.001	0.010			0.011				0.010	
COPPER (CU) DISS	<0.001	<0.001			<0.001					
IRON (FE) TOTAL	0.050	0.130			0.165	0.030	0.290		0.020	
IRON (FE) TOTAL	0.190									
LEAD (PB) TOTAL	0.002	<0.001			<0.001				0.002	
LEAD (PB) DISS	<0.001	<0.001			<0.001					
MANGANESE (MN) TOTAL	<0.001	<0.001			0.015	0.011	0.002		0.002	
MANGANESE (MN) TOTAL	0.010									
MERCURY (HG) TOTAL	<0.0002	<0.0002			<0.0002					
MERCURY (HG) DISS	<0.0002									
MOLYBDENUM (MO) TOTAL	<0.001									
MOLYBDENUM (MO) DISS	<0.001									
NICKEL (NI) TOTAL	<0.001									
NICKEL (NI) DISS	<0.001									
SELENIUM (SE) TOTAL	<0.001	<0.001			<0.001					
SELENIUM (SE) DISS	<0.001	<0.001			<0.001					
SILVER (AG) TOTAL	<0.001	<0.001			<0.001					
SILVER (AG) DISS	<0.001	<0.001			<0.001					
ZINC (ZN) TOTAL	0.005	0.008			0.010				0.002	
ZINC (ZN) DISS	0.005	0.055			0.002					
BACTERIOLOGICAL PARAMETERS										
FECAL COLIFORM (NO./100ML)		2.0			<2.0					
TOTAL COLIFORM (NO./100ML)		13.0			8.0					
ORGANIC PARAMETERS										
ORGANIC CARBON (TOTAL)	4.20	14.80			10.10				6.20	
PHENOLS	0.017	0.059			0.010	0.020	0.008		0.008	
OTHER PARAMETERS										
OIL AND GREASE	0.20	1.20			<0.01				<0.1	
CYANIDE (CN)	<0.001	<0.001			0.004				<0.001	
SULFIDE	1.80									

All quantities in milligrams per liter unless otherwise noted. Blank line indicates parameter not tested.

Output Date: 02-09-1987
HWQ-6/86-R1

SUMMARY OF WATER QUALITY ANALYSIS - UTAH FUEL CO.

SITE NAME	S15-3	S15-3	S15-3	S15-3	S15-3	S15-3	S15-3	S15-3	S15-3	S15-3
SAMPLE DATE	10/15/82	06/28/83	07/19/83	08/24/83	09/27/83	10/20/83	04/12/84	05/24/84	06/26/84	07/31/84
LOCATION	SPRING	SPRING	SPRING	SPRING	SPRING	SPRING	SPRING	SPRING	SPRING	SPRING
PHYSICAL PARAMETERS										
AIR TEMPERATURE (C)	8	16	22	14	11	9	7	13	14	20
FLOW (CFS)	0.08	0.98	0.13	0.07	0.05	0.06		2.30	0.31	0.19
WATER TEMPERATURE (C)	5	5	4	6	6	6	3	8	3	8
SPEC. COND. (UMHOS/CM) FIELD	268	143	225	317	329	313	312	140	176	281
PH FIELD	7.7	8.3	7.6	7.2	6.8	7.3	7.5	7.1	6.8	6.8
TURBIDITY (NTU) FIELD	4	16	13	2.4	4.1	7.1	4.3	28	14	7.8
TOTAL SUSP. SOLIDS	18.00	<0.1		4.0		3.0			1.0	
TOTAL DISS. SOLIDS MEAS.	169	90.0		180		200			112	
OXYGEN (O) DISS				7.8						
COMMON IONS										
CALCIUM (CA)	46.40	24.00		52.00		52.80			18.00	
MAGNESIUM (MG)	9.12	3.36		6.24		8.16			10.80	
SODIUM (NA)	3.9	8.6		9.0		8.80			8.50	
POTASSIUM (K)	0.65	0.42		0.8		1.2			0.5	
ACIDITY AS CACO3				15.00						
ALKALINITY AS CACO3 (LAB)				160						
BICARBONATE (HCO3) (LAB)	171	100		195		176			113.5	
SULFATE (SO4)	21.00	4.0		16		35			18	
CHLORIDE (CL)	2.00	6.0		<0.1		2.00			0.9	
FLUORIDE (F)				0.08						
NUTRIENTS										
NITRATE (NO3-N)				<0.02						
AMMONIA (NH3 AS N)	0.33	<0.1		0.30		0.70			0.13	
TOTAL PHOSPHATE (PO4)	0.060	0.44		0.02		0.01			0.02	
TRACE ELEMENTS										
BARIUM (BA) TOTAL				0.013						
BORON (B) TOTAL				0.033						
COPPER (CU) TOTAL				<0.001						
IRON (FE) TOTAL	0.070	0.390		0.020		0.060			0.36	
LEAD (PB) TOTAL				<0.001						
MANGANESE (MN) TOTAL	0.002	0.003		<0.001		0.010			0.01	
ZINC (ZN) TOTAL				0.003						
ORGANIC PARAMETERS										
ORGANIC CARBON (TOTAL)				0.80						
PHENOLS	<0.001	<0.001		<0.001		<0.001			<0.001	
OTHER PARAMETERS										
OIL AND GREASE				<0.2						
CYANIDE (CN)				<0.001						

All quantities in milligrams per liter unless otherwise noted. Blank line indicates parameter not tested.

Output Date: 02-09-1987
HWQ-6/86-R1

SUMMARY OF WATER QUALITY ANALYSIS - UTAH FUEL CO.

SITE NAME	S15-3	S15-3	S15-3	S15-3	S15-3
SAMPLE DATE	08/24/84	09/27/84	10/15/85	05/27/86	06/19/86
LOCATION	SPRING	SPRING	SPRING	SPRING	SPRING
PHYSICAL PARAMETERS					
AIR TEMPERATURE (C)	8	3	11	15	19
FLOW (CFS)	0.07	0.05	0.06	3.00	0.33
WATER TEMPERATURE (C)	4	4	5	3	4
SPEC. COND. (UMHOS/CM) FIELD	349	335	330	97	179
PH FIELD	7.1	7.2	7.2		
TURBIDITY (NTU) FIELD	13	5.9	5.0	26	
TOTAL SUSP. SOLIDS	3.0		4.0		6.0
TOTAL DISS. SOLIDS MEAS.	250		216		162
OXYGEN (O) DISS	8.4				
COMMON IONS					
CALCIUM (CA)	60.00		58.4		25.60
MAGNESIUM (MG)	8.40		6.20		3.40
SODIUM (NA)	37.00		1.00		2.20
POTASSIUM (K)	0.67		1.25		0.07
ACIDITY AS CACO3	12.00				
ALKALINITY AS CACO3 (LAB)	175				
BICARBONATE (HCO3) (LAB)	213.5		199.0		85.4
SULFATE (SO4)	<10		14		4
CHLORIDE (CL)	25.0		1.8		5.1
FLUORIDE (F)	0.14				
NUTRIENTS					
NITRATE (NO3-N)	0.11				
AMMONIA (NH3 AS N)	0.09		<0.01		<0.01
TOTAL PHOSPHATE (PO4)	<0.01		<0.01		0.09
TRACE ELEMENTS					
BARIUM (BA) TOTAL	0.02				
BORON (B) TOTAL	0.054				
COPPER (CU) TOTAL	0.023				
IRON (FE) TOTAL	1.80		0.06		0.19
LEAD (PB) TOTAL	0.016				
MANGANESE (MN) TOTAL	0.01		<0.01		<0.01
ZINC (ZN) TOTAL	0.034				
ORGANIC PARAMETERS					
ORGANIC CARBON (TOTAL)	<0.01				
PHENOLS	<0.001		<0.001		<0.001
OTHER PARAMETERS					
OIL AND GREASE	<0.1				
CYANIDE (CN)	<0.001				

All quantities in milligrams per liter unless otherwise noted. Blank line indicates parameter not tested.

Output Date: 02-09-1987
HWQ-6/86-R1

SUMMARY OF WATER QUALITY ANALYSIS - UTAH FUEL CO.

SITE NAME	S17-2	S17-2	S17-2	S17-2	S17-2	S17-2	S17-2	S17-2	S17-2	S17-2
SAMPLE DATE	01/27/81	02/25/81	03/11/81	04/08/81	05/14/81	08/20/81	09/24/81	10/23/81	11/11/81	12/09/81
LOCATION	SPRING	SPRING	SPRING	SPRING	SPRING	SPRING	SPRING	SPRING	SPRING	SPRING
PHYSICAL PARAMETERS										
AIR TEMPERATURE (C)	-3	10	2	5	16	15	22	3	2	7
FLOW (CFS)		0.17	0.04	0.04	0.05	0.2	0.03	0.2	0.31	0.29
WATER TEMPERATURE (C)	9	10	10	8	8	9	12	9	8	9
SPEC. COND. (UMHOS/CM) FIELD	342	460	340	361	480	500	540	500	540	510
PH FIELD	7.1	7.9	7.5	7.2	7.8	7.8			6.8	7.8
TURBIDITY (NTU) FIELD					0.64	4.00			2.30	
TOTAL SUSP. SOLIDS		5.0			4.0	<0.1			3.0	2.0
TOTAL DISS. SOLIDS MEAS.		460			315	330			348	336
OXYGEN (O) DISS						8.5				
COMMON IONS										
TOTAL HARDNESS AS CACO3					302					
CALCIUM (CA)		74.30			77.60	75.20			76.00	77.00
MAGNESIUM (MG)		26.70			25.92	30.24			32.50	30.50
SODIUM (NA)		3.30			4.00	3.80			3.90	3.10
POTASSIUM (K)		2.44			2.42	2.40			2.35	2.10
ACIDITY AS CACO3						9.00			8.00	
ALKALINITY AS CACO3 (LAB)					262	250			266	279
BICARBONATE (HCO3) (LAB)		305			320	305			324	341
CARBONATE AS CO3 (LAB)					<0.01					
SULFATE (SO4)		42.0			40.5	61.0			58.0	45.0
CHLORIDE (CL)		6.0			6.00	5.38			4.20	3.90
FLUORIDE (F)					0.18	0.17			0.17	
NUTRIENTS										
NITRATE (NO3-N)					<0.01	0.03			0.01	
NITRITE (NO2-N)					<0.01					
AMMONIA (NH3 AS N)			<0.01		<0.01	<0.01			<0.01	0.62
TOTAL PHOSPHATE (PO4)		0.028			0.080	0.170			0.260	0.330
TRACE ELEMENTS										
ALUMINUM (AL) TOTAL					<0.001					
ARSENIC (AS) TOTAL					<0.001	<0.001			<0.001	
ARSENIC (AS) DISS					<0.001	<0.001			<0.001	
BARIUM (BA) TOTAL					0.075	0.065			0.075	
BARIUM (BA) DISS					0.060	0.050			0.065	
BORON (B) TOTAL					0.030	0.020			0.025	
BORON (B) DISS					0.020	0.010			0.020	
CADMIUM (CD) TOTAL					<0.001	<0.001			<0.001	
CADMIUM (CD) DISS					<0.001	<0.001			<0.001	
CHROMIUM (CR) TOTAL					<0.001	<0.001			<0.001	
CHROMIUM (CR) DISS					<0.001	<0.001			<0.001	
COPPER (CU) TOTAL					0.010	0.010			<0.001	
COPPER (CU) DISS					<0.001	<0.001			<0.001	
IRON (FE) TOTAL		0.920			1.160	0.460			0.510	1.000

All quantities in milligrams per liter unless otherwise noted. Blank line indicates parameter not tested.

Output Date: 02-09-1987
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SUMMARY OF WATER QUALITY ANALYSIS - UTAH FUEL CO.

SITE NAME	S17-2	S17-2	S17-2	S17-2	S17-2	S17-2	S17-2	S17-2	S17-2	S17-2
SAMPLE DATE	01/27/81	02/25/81	03/11/81	04/08/81	05/14/81	08/20/81	09/24/81	10/23/81	11/11/81	12/09/81
TRACE ELEMENTS										
LEAD (PB) TOTAL					<0.001	0.003			<0.001	
LEAD (PB) DISS					<0.001	0.002			<0.001	
MANGANESE (MN) TOTAL		0.060			0.070	0.060			0.034	0.030
MERCURY (HG) TOTAL					<0.0002	<0.0002			<0.0002	
MOLYBDENUM (MO) TOTAL					<0.001					
NICKEL (NI) TOTAL					<0.001					
SELENIUM (SE) TOTAL					<0.001	<0.001			<0.001	
SELENIUM (SE) DISS					<0.001	<0.001			<0.001	
SILVER (AG) TOTAL					<0.001	<0.001			<0.001	
SILVER (AG) DISS					<0.001	<0.001			<0.001	
ZINC (ZN) TOTAL					0.005	0.010			0.020	
ZINC (ZN) DISS					0.005	0.005			0.006	
BACTERIOLOGICAL PARAMETERS										
FECAL COLIFORM (NO./100ML)						<2.0			<2.0	
TOTAL COLIFORM (NO./100ML)						<2.0			2.0	
5 - DAY BOD						1.4				
ORGANIC PARAMETERS										
ORGANIC CARBON (TOTAL)					2.80	6.10			9.60	
PHENOLS		<0.002			0.160	<0.001			0.014	0.020
OTHER PARAMETERS										
OIL AND GREASE					<0.01	0.60			<0.01	
CYANIDE (CN)					<0.001	0.002			<0.001	

All quantities in milligrams per liter unless otherwise noted. Blank line indicates parameter not tested.

Output Date: 02-09-1987
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SUMMARY OF WATER QUALITY ANALYSIS - UTAH FUEL CO.

SITE NAME	S17-2	S17-2	S17-2	S17-2	S17-2	S17-2	S17-2	S17-2	S17-2	S17-2
SAMPLE DATE	01/21/82	03/31/82	04/15/82	05/20/82	06/29/82	07/21/82	08/19/82	09/14/82	10/14/82	11/10/82
LOCATION	SPRING	SPRING	SPRING	SPRING	SPRING	SPRING	SPRING	SPRING	SPRING	SPRING
PHYSICAL PARAMETERS										
AIR TEMPERATURE (C)	-6	1	5	14	17	21	25	7	11	-1
FLOW (CFS)	0.22	0.22	0.25	0.22	0.26	0.22	0.24	0.22	0.20	0.22
WATER TEMPERATURE (C)	9	8	9	10	9	14	9	9	9	9
SPEC. COND. (UMHOS/CM) FIELD	500	602	630	504	523	524	425	415	527	582
PH FIELD	7.7	6.6	6.7	6.9	7.4	7.4	7.7	7.8	7.4	7.2
TURBIDITY (NTU) FIELD			13	1.5	2.1	2.6	8.8	9	2.1	6.8
TOTAL SUSP. SOLIDS	11.0				6.0		7.0		23.0	
TOTAL DISS. SOLIDS MEAS.	329				344		318		329	
OXYGEN (O) DISS							7.5			
COMMON IONS										
CALCIUM (CA)	74.50				78.00		74.40		72.00	
MAGNESIUM (MG)	30.80				30.80		30.24		28.32	
SODIUM (NA)	3.55				3.9		3.7		12.0	
POTASSIUM (K)	2.50				2.45		2.41		2.38	
ACIDITY AS CACO3							8.00			
ALKALINITY AS CACO3 (LAB)	272						280			
BICARBONATE (HCO3) (LAB)	332				319		341		338	
SULFATE (SO4)	42.00				59.0		16.0		45.0	
CHLORIDE (CL)	3.55				5.60		16.70		3.10	
FLUORIDE (F)							0.17			
NUTRIENTS										
NITRATE (NO3-N)							<0.01			
AMMONIA (NH3 AS N)	2.48				0.25		0.28		0.27	
TOTAL PHOSPHATE (PO4)	0.100				0.070		0.080		0.060	
TRACE ELEMENTS										
BARIUM (BA) TOTAL							0.036			
BORON (B) TOTAL							0.015			
COPPER (CU) TOTAL							<0.001			
IRON (FE) TOTAL	0.990				0.860		0.920		0.860	
LEAD (PB) TOTAL							0.001			
MANGANESE (MN) TOTAL	0.030				0.065		0.065		0.058	
ZINC (ZN) TOTAL							0.001			
ORGANIC PARAMETERS										
ORGANIC CARBON (TOTAL)							10.00			
PHENOLS	<0.001				0.008		0.004		<0.001	
OTHER PARAMETERS										
OIL AND GREASE							0.2			
CYANIDE (CN)							<0.001			

All quantities in milligrams per liter unless otherwise noted. Blank line indicates parameter not tested.

Output Date: 02-09-1987
HWQ-6/86-R1

SUMMARY OF WATER QUALITY ANALYSIS - UTAH FUEL CO.

SITE NAME	S17-2	S17-2	S17-2	S17-2	S17-2	S17-2	S17-2	S17-2	S17-2	S17-2
SAMPLE DATE	12/14/82	01/19/83	02/15/83	03/31/83	04/21/83	05/25/83	06/30/83	07/20/83	08/25/83	09/29/83
LOCATION	SPRING	SPRING	SPRING	SPRING	SPRING	SPRING	SPRING	SPRING	SPRING	SPRING
PHYSICAL PARAMETERS										
AIR TEMPERATURE (C)	-8	-5	-1	-1	8	17	12	17	16	11
FLOW (CFS)	0.25	0.21	0.22	0.22	0.22	0.24	0.25	0.25	0.29	0.25
WATER TEMPERATURE (C)	6	7.4	8.0	8.0	8	10	9	9	10	9
SPEC. COND. (UMHOS/CM) FIELD	335	576	558	597	696	631	600	599	625	614
PH FIELD	6.8	7.0	7.0	7.0	6.8	7.0	6.9	7.2	7.0	6.9
TURBIDITY (NTU) FIELD	7.0	6.5	12	1.7	1.6	2.0	2.5	5.5	1.3	1.3
TOTAL SUSP. SOLIDS							<0.1		8.0	
TOTAL DISS. SOLIDS MEAS.							373		354	
OXYGEN (O) DISS									4.2	
COMMON IONS										
CALCIUM (CA)							72.80		74.40	
MAGNESIUM (MG)							31.20		29.28	
SODIUM (NA)							14.0		11.0	
POTASSIUM (K)							2.50		2.5	
ACIDITY AS CACO3									29.00	
ALKALINITY AS CACO3 (LAB)									266	
BICARBONATE (HCO3) (LAB)							315		325	
SULFATE (SO4)							68.0		59	
CHLORIDE (CL)							14.0		6.0	
FLUORIDE (F)									0.14	
NUTRIENTS										
NITRATE (NO3-N)									<0.02	
AMMONIA (NH3 AS N)							<0.1		0.25	
TOTAL PHOSPHATE (PO4)							0.22		<0.01	
TRACE ELEMENTS										
BARIUM (BA) TOTAL									0.093	
BORON (B) TOTAL									0.035	
COPPER (CU) TOTAL									<0.001	
IRON (FE) TOTAL							0.770		0.860	
LEAD (PB) TOTAL									<0.001	
MANGANESE (MN) TOTAL							0.047		0.052	
ZINC (ZN) TOTAL									0.004	
ORGANIC PARAMETERS										
ORGANIC CARBON (TOTAL)									1.10	
PHENOLS							0.003		<0.001	
OTHER PARAMETERS										
OIL AND GREASE									<0.2	
CYANIDE (CN)									<0.001	

All quantities in milligrams per liter unless otherwise noted. Blank line indicates parameter not tested.

Output Date: 02-09-1987
HWQ-6/86-R1

SUMMARY OF WATER QUALITY ANALYSIS - UTAH FUEL CO.

SITE NAME	S17-2	S17-2	S17-2	S17-2	S17-2	S17-2	S17-2	S17-2	S17-2	S17-2
SAMPLE DATE	10/26/83	11/10/83	12/20/83	01/18/84	02/22/84	03/22/84	04/25/84	05/17/84	06/29/84	07/27/84
LOCATION	SPRING	SPRING	SPRING	SPRING	SPRING	SPRING	SPRING	SPRING	SPRING	SPRING
PHYSICAL PARAMETERS										
AIR TEMPERATURE (C)	9	0	-7	-23	-4	-3	3	13	22	16
FLOW (CFS)	0.25	0.25	0.24	0.21	0.22	0.21	0.26	0.25	0.26	0.29
WATER TEMPERATURE (C)	9	8	7	7	8	8	8	10.5	9	10
SPEC. COND. (UMHOS/CM) FIELD	595	496	596	562	535	528	581	590	597	590
PH FIELD	7.0	6.7	7.0	7.1	7.1	6.7	7.1	7.1	7.3	6.9
TURBIDITY (NTU) FIELD	4.7	7.8	1.3	2.8	1.4	1.9	3.4	4.9	5.5	9.4
TOTAL SUSP. SOLIDS	11.0								1.0	
TOTAL DISS. SOLIDS MEAS.	350								360	
COMMON IONS										
CALCIUM (CA)	74.40								86.00	
MAGNESIUM (MG)	30.72								27.60	
SODIUM (NA)	4.10								10.00	
POTASSIUM (K)	2.3								2.4	
BICARBONATE (HCO3) (LAB)	303								342.8	
SULFATE (SO4)	59								66	
CHLORIDE (CL)	8.00								5.3	
NUTRIENTS										
AMMONIA (NH3 AS N)	0.20								0.12	
TOTAL PHOSPHATE (PO4)	<0.01								0.11	
TRACE ELEMENTS										
IRON (FE) TOTAL	0.850								0.78	
MANGANESE (MN) TOTAL	0.050								0.05	
ORGANIC PARAMETERS										
PHENOLS	<0.001								<0.001	

All quantities in milligrams per liter unless otherwise noted. Blank line indicates parameter not tested.

Output Date: 02-09-1987
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SUMMARY OF WATER QUALITY ANALYSIS - UTAH FUEL CO.

SITE NAME	S17-2	S17-2	S17-2	S17-2	S17-2	S17-2	S17-2
SAMPLE DATE	08/24/84	09/18/84	10/16/85	03/27/86	04/17/86	05/28/86	06/25/86
LOCATION	SPRING	SPRING	SPRING	SPRING	SPRING	SPRING	SPRING
PHYSICAL PARAMETERS							
AIR TEMPERATURE (C)	15	9	10	8	-2	21	21
FLOW (CFS)	0.24	0.22	0.33	0.27	0.29	0.32	0.32
WATER TEMPERATURE (C)	10	9	9	9	9	9	9
SPEC. COND. (UMHOS/CM) FIELD	648	544	560	618	634	543	598
PH FIELD	7.2	6.9	6.7	6.7	7.0	6.9	7.0
TURBIDITY (NTU) FIELD	8.5	14	3.9	0.3	0.3	0.42	6.13
TOTAL SUSP. SOLIDS	20.0		5.0				10.0
TOTAL DISS. SOLIDS MEAS.	460		362				420
OXYGEN (O) DISS	6.2						
COMMON IONS							
CALCIUM (CA)	80.00		84.00				67.2
MAGNESIUM (MG)	45.60		34.10				31.70
SODIUM (NA)	46.00		2.90				45.00
POTASSIUM (K)	2.23		2.45				2.51
ACIDITY AS CACO3	19.50						
ALKALINITY AS CACO3 (LAB)	300						
BICARBONATE (HCO3) (LAB)	366.0		357.0				405.0
SULFATE (SO4)	51		61				62
CHLORIDE (CL)	45.0		5.3				6.2
FLUORIDE (F)	0.21						
NUTRIENTS							
NITRATE (NO3-N)	0.06						
AMMONIA (NH3 AS N)	0.10		<0.01				0.13
TOTAL PHOSPHATE (PO4)	0.02		0.07				0.04
TRACE ELEMENTS							
BARIUM (BA) TOTAL	0.07						
BORON (B) TOTAL	0.035						
COPPER (CU) TOTAL	0.015						
IRON (FE) TOTAL	1.30		0.78				0.80
LEAD (PB) TOTAL	0.005						
MANGANESE (MN) TOTAL	0.05		0.04				0.04
ZINC (ZN) TOTAL	0.033						
ORGANIC PARAMETERS							
ORGANIC CARBON (TOTAL)	<0.01						
PHENOLS	<0.001		<0.001				<0.001
OTHER PARAMETERS							
OIL AND GREASE	<0.1						
CYANIDE (CN)	<0.001						

All quantities in milligrams per liter unless otherwise noted. Blank line indicates parameter not tested.

Output Date: 02-09-1987
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SUMMARY OF WATER QUALITY ANALYSIS - UTAH FUEL CO.

SITE NAME	S22-5	S22-5	S22-5	S22-5	S22-5	S22-5	S22-5	S22-5	S22-5	S22-5
SAMPLE DATE	05/14/81	08/18/81	09/24/81	10/22/81	11/10/81	12/08/81	06/29/82	07/20/82	08/18/82	09/15/82
LOCATION	SPRING	SPRING	SPRING	SPRING	SPRING	SPRING	SPRING	SPRING	SPRING	SPRING
PHYSICAL PARAMETERS										
AIR TEMPERATURE (C)	14	11	21	3	9	10	17	26	18	9
FLOW (CFS)	0.03	0.01	0.005	0.0004	0.01		0.13	0.04	0.01	0.02
WATER TEMPERATURE (C)	3	5	7	4	5	3	4	4	14	5
SPEC. COND. (UMHOS/CM) FIELD	270	330	380	340	350	350	312	376	290	315
PH FIELD	7.85	7.4			7.6	8.1	7.4	7.9	8.2	8.4
TURBIDITY (NTU) FIELD	7.80	0.52			0.30		3.4	9.1	239	8.6
TOTAL SUSP. SOLIDS	1.0	6.0			1.0	1.0	1.0		6.0	
TOTAL DISS. SOLIDS MEAS.	175	212			225	229	178		215	
OXYGEN (O) DISS		11.4			9.9				8.8	
COMMON IONS										
TOTAL HARDNESS AS CACO3	166									
CALCIUM (CA)	56.96	68.00			67.00	69.50	58.00		65.60	
MAGNESIUM (MG)	5.20	8.16			10.50	10.00	6.50		9.60	
SODIUM (NA)	2.50	3.00			4.50	4.10	2.4		4.0	
POTASSIUM (K)	0.560	0.73			0.98	0.70	0.57		0.69	
CALCIUM (CA) TOTAL	57.60									
MAGNESIUM (MG) TOTAL	5.28									
SODIUM (NA) TOTAL	3.60									
POTASSIUM (K) TOTAL	1.65									
ACIDITY AS CACO3	<0.01	6.40			6.00				5.00	
ALKALINITY AS CACO3 (LAB)	154	186			218	200			196	
BICARBONATE (HCO3) (LAB)	183	227			266	244	199		239	
CARBONATE AS CO3 (LAB)	2.40									
SULFATE (SO4)	12.5	17.6			3.0	15.0	9.0		<3.0	
CHLORIDE (CL)	3.8	2.76			3.40	2.90	1.60		14.30	
FLUORIDE (F)	0.14	0.17			0.14				0.15	
CHLORIDE (CL) TOTAL	4.00									
FLUORIDE (F) TOTAL	0.14									
NUTRIENTS										
NITRATE (NO3-N)	1.63				1.08				0.29	
NITRITE (NO2-N)	0.03									
AMMONIA (NH3 AS N)	<0.01	<0.01			0.10	0.63	0.25		0.28	
TOTAL PHOSPHATE (PO4)	0.140	0.170			0.230	0.820	0.060		0.120	
TRACE ELEMENTS										
ALUMINUM (AL) TOTAL	0.065									
ALUMINUM (AL) DISS	0.020									
ARSENIC (AS) TOTAL	<0.001	0.002			<0.001					
ARSENIC (AS) DISS	<0.001	<0.001			<0.001					
BARIUM (BA) TOTAL	0.018	0.020			0.025				0.030	
BARIUM (BA) DISS	0.015	0.013			0.020					
BORON (B) TOTAL	<0.001	0.018			0.013				0.015	
BORON (B) DISS	<0.001	0.010			0.005					

All quantities in milligrams per liter unless otherwise noted. Blank line indicates parameter not tested.

Output Date: 02-09-1987
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SUMMARY OF WATER QUALITY ANALYSIS - UTAH FUEL CO.

SITE NAME	S22-5	S22-5	S22-5	S22-5	S22-5	S22-5	S22-5	S22-5	S22-5	S22-5
SAMPLE DATE	05/14/81	08/18/81	09/24/81	10/22/81	11/10/81	12/08/81	06/29/82	07/20/82	08/18/82	09/15/82
TRACE ELEMENTS										
CADMIUM (CD) TOTAL	<0.001	<0.001			<0.001					
CADMIUM (CD) DISS	<0.001	<0.001			<0.001					
CHROMIUM (CR) TOTAL	<0.001	<0.001			<0.001					
CHROMIUM (CR) DISS	<0.001	<0.001			<0.001					
COPPER (CU) TOTAL	0.010	0.010			0.011				<0.001	
COPPER (CU) DISS	0.010	<0.001			0.010					
IRON (FE) TOTAL	0.020	0.098			0.110	1.450	0.050		0.010	
IRON (FE) TOTAL	0.050									
LEAD (PB) TOTAL	0.002	0.005			<0.001				0.001	
LEAD (PB) DISS	<0.001	<0.001			<0.001					
MANGANESE (MN) TOTAL	<0.001	<0.001			0.002	0.005	0.003		0.002	
MANGANESE (MN) TOTAL	0.010									
MERCURY (HG) TOTAL	<0.0002	<0.0002			<0.0002					
MERCURY (HG) DISS	<0.0002									
MOLYBDENUM (MO) TOTAL	<0.001									
MOLYBDENUM (MO) DISS	<0.001									
NICKEL (NI) TOTAL	<0.001									
NICKEL (NI) DISS	<0.001									
SELENIUM (SE) TOTAL	<0.001	<0.001			<0.001					
SELENIUM (SE) DISS	<0.001	<0.001			<0.001					
SILVER (AG) TOTAL	<0.001	<0.001			<0.001					
SILVER (AG) DISS	<0.001	<0.001			<0.001					
ZINC (ZN) TOTAL	0.010	0.059			0.060				0.001	
ZINC (ZN) DISS	0.003	0.055			0.040					
BACTERIOLOGICAL PARAMETERS										
FECAL COLIFORM (NO./100ML)		<2.0			<2.0					
TOTAL COLIFORM (NO./100ML)		2.0			130					
ORGANIC PARAMETERS										
ORGANIC CARBON (TOTAL)	3.90	5.30			4.90				4.50	
PHENOLS	0.482	<0.001			0.001	0.020	0.013		<0.001	
OTHER PARAMETERS										
OIL AND GREASE	0.20	0.80			20.60				0.4	
CYANIDE (CN)	<0.001	<0.001			<0.001				<0.001	
SULFIDE	2.20									

All quantities in milligrams per liter unless otherwise noted. Blank line indicates parameter not tested.

Output Date: 02-09-1987
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SUMMARY OF WATER QUALITY ANALYSIS - UTAH FUEL CO.

SITE NAME	S22-5	S22-5	S22-5	S22-5	S22-5	S22-5	S22-5	S22-5	S22-5	S22-5
SAMPLE DATE	10/15/82	06/28/83	07/19/83	08/24/83	09/27/83	10/20/83	06/26/84	07/31/84	08/23/84	09/27/84
LOCATION	SPRING	SPRING	SPRING	SPRING	SPRING	SPRING	SPRING	SPRING	SPRING	SPRING
PHYSICAL PARAMETERS										
AIR TEMPERATURE (C)	7	16	21	17	14	9	14	21	13	8
FLOW (CFS)	0.01	0.16	0.07	0.04	0.02	0.02	0.13	0.05	0.04	0.02
WATER TEMPERATURE (C)	5	3	3	5	6	6	3	6	4	4.5
SPEC. COND. (UMHOS/CM) FIELD	359	277	378	408	390	373	337	388	413	384
PH FIELD	7.9	7.6	7.6	7.3	6.1	6.9	6.7	7.0	7.3	7.3
TURBIDITY (NTU) FIELD	4	7.4	2.5	1.2	3.4	7.0	9.9	8.9	8.3	6.2
TOTAL SUSP. SOLIDS	16.0	<0.1		2.0		7.0	3.0		2.0	
TOTAL DISS. SOLIDS MEAS.	269	186		225		240	300		330	
OXYGEN (O) DISS				2.2					9.6	
COMMON IONS										
CALCIUM (CA)	68.00	47.20		64.00		65.60	54.00		72.00	
MAGNESIUM (MG)	7.68	6.24		8.64		9.60	13.20		8.40	
SODIUM (NA)	26.0	9.6		6.8		6.00	7.50		46.00	
POTASSIUM (K)	0.69	0.54		0.6		0.4	0.5		0.59	
ACIDITY AS CACO3				22.0					2.80	
ALKALINITY AS CACO3 (LAB)				192					290	
BICARBONATE (HCO3) (LAB)	289	166		234		222	228.1		353.8	
SULFATE (SO4)	21.0	22.0		13		25	20		<10	
CHLORIDE (CL)	2.20	6.0		4.0		4.00	1.7		10.0	
FLUORIDE (F)				0.12					0.08	
NUTRIENTS										
NITRATE (NO3-N)				<0.02					1.50	
AMMONIA (NH3 AS N)	0.27	<0.1		0.10		0.35	0.16		0.07	
TOTAL PHOSPHATE (PO4)	0.060	0.22		<0.01		<0.01	0.02		0.12	
TRACE ELEMENTS										
BARIUM (BA) TOTAL				0.020					0.02	
BORON (B) TOTAL				0.021					0.057	
COPPER (CU) TOTAL				0.020					0.014	
IRON (FE) TOTAL	0.010	0.050		0.060		0.090	0.15		0.11	
LEAD (PB) TOTAL				<0.001					0.004	
MANGANESE (MN) TOTAL	0.002	0.003		0.008		0.020	0.01		0.01	
ZINC (ZN) TOTAL				0.013					0.028	
ORGANIC PARAMETERS										
ORGANIC CARBON (TOTAL)				0.65					<0.01	
PHENOLS	<0.001	0.013		<0.001		<0.001	<0.001		<0.001	
OTHER PARAMETERS										
OIL AND GREASE				<0.2					<0.1	
CYANIDE (CN)				<0.001					<0.001	

All quantities in milligrams per liter unless otherwise noted. Blank line indicates parameter not tested.

Output Date: 02-09-1987
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SUMMARY OF WATER QUALITY ANALYSIS - UTAH FUEL CO.

SITE NAME	S22-5	S22-5
SAMPLE DATE	10/15/85	06/19/86
LOCATION	SPRING	SPRING
PHYSICAL PARAMETERS		
AIR TEMPERATURE (C)	8	19
FLOW (CFS)	0.017	0.10
WATER TEMPERATURE (C)	5	4
SPEC. COND. (UMHOS/CM) FIELD	385	305
PH FIELD	7.1	7.1
TURBIDITY (NTU) FIELD	2.8	
TOTAL SUSP. SOLIDS	3.0	4.0
TOTAL DISS. SOLIDS MEAS.	252	184
COMMON IONS		
CALCIUM (CA)	88.40	52.80
MAGNESIUM (MG)	<0.10	5.30
SODIUM (NA)	1.20	2.00
POTASSIUM (K)	1.23	0.28
BICARBONATE (HCO3) (LAB)	245.2	170.8
SULFATE (SO4)	13	6
CHLORIDE (CL)	5.5	7.5
NUTRIENTS		
AMMONIA (NH3 AS N)	<0.01	<0.01
TOTAL PHOSPHATE (PO4)	<0.01	0.18
TRACE ELEMENTS		
IRON (FE) TOTAL	<0.01	0.04
MANGANESE (MN) TOTAL	<0.01	<0.01
ORGANIC PARAMETERS		
PHENOLS	<0.001	<0.001

All quantities in milligrams per liter unless otherwise noted. Blank line indicates parameter not tested.

Output Date: 02-09-1987
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SUMMARY OF WATER QUALITY ANALYSIS - UTAH FUEL CO.

SITE NAME	S22-11	S22-11	S22-11	S22-11	S22-11	S22-11	S22-11	S22-11	S22-11	S22-11
SAMPLE DATE	06/29/81	08/18/81	09/24/81	11/11/81	06/29/82	07/26/82	08/18/82	09/15/82	10/15/82	06/28/83
LOCATION	SPRING	SPRING	SPRING	SPRING	SPRING	SPRING	SPRING	SPRING	SPRING	SPRING
PHYSICAL PARAMETERS										
AIR TEMPERATURE (C)	18	12	18	-1	20	21	22	10	1	11
FLOW (CFS)	0.02	0.01	0.01	0.001	0.08	0.05	0.05	0.03	0.03	0.10
WATER TEMPERATURE (C)	4	4	4	2	4	3	4	4	4	3
SPEC. COND. (UMHOS/CM) FIELD	310	290	380	345	328	362	335	298	390	354
PH FIELD	7.9	7.5		7.6	7.5	7.8	8.1	8.3	8.5	7.3
TURBIDITY (NTU) FIELD	0.46	0.27		0.36	2.3	5.9	10.0	12	5	5.8
TOTAL SUSP. SOLIDS	1.0	12.0		4.0	<1.0		5.0		9.0	2.0
TOTAL DISS. SOLIDS MEAS.	208	190		225	218		233		220	226
OXYGEN (O) DISS		9.8		10.2			13.0			
COMMON IONS										
TOTAL HARDNESS AS CACO3	186									
CALCIUM (CA)	62.40	63.20		67.00	64.00		65.60		63.20	60.80
MAGNESIUM (MG)	7.20	7.68		10.00	9.50		9.12		8.64	9.12
SODIUM (NA)	2.20	2.50		3.40	2.4		8.0		6.0	8.0
POTASSIUM (K)	0.790	0.86		1.10	0.80		0.82		0.80	0.82
CALCIUM (CA) TOTAL	63.80									
MAGNESIUM (MG) TOTAL	8.65									
SODIUM (NA) TOTAL	3.50									
POTASSIUM (K) TOTAL	0.99									
ACIDITY AS CACO3	6.80	6.40		12.00			5.00			
ALKALINITY AS CACO3 (LAB)	184	188		194			202			
BICARBONATE (HCO3) (LAB)	224.8	229		237	239		246		244	225
CARBONATE AS CO3 (LAB)	<0.01									
SULFATE (SO4)	14.0	4.5		18.0	6.0		<3.0		6.0	12.0
CHLORIDE (CL)	4.27	2.98		3.20	1.30		12.30		1.60	10.0
FLUORIDE (F)	0.16	0.17		0.13			0.18			
CHLORIDE (CL) TOTAL	4.40									
FLUORIDE (F) TOTAL	0.16									
NUTRIENTS										
NITRATE (NO3-N)	0.99			0.46			4.10			
NITRITE (NO2-N)	0.04									
AMMONIA (NH3 AS N)	0.10	<0.01		0.30	0.28		0.33		0.25	<0.1
TOTAL PHOSPHATE (PO4)	0.690	0.130		0.340	0.070		0.470		0.050	0.30
TRACE ELEMENTS										
ALUMINUM (AL) TOTAL	<0.001									
ALUMINUM (AL) DISS	<0.001									
ARSENIC (AS) TOTAL	<0.001	0.002		<0.001						
ARSENIC (AS) DISS	<0.001	<0.001		<0.001						
BARIUM (BA) TOTAL	0.025	0.020		0.018			0.038			
BARIUM (BA) DISS	0.015	0.014		0.015						
BORON (B) TOTAL	0.030	0.020		0.010			0.012			
BORON (B) DISS	0.020	0.015		0.005						

All quantities in milligrams per liter unless otherwise noted. Blank line indicates parameter not tested.

Output Date: 02-09-1987
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SUMMARY OF WATER QUALITY ANALYSIS - UTAH FUEL CO.

SITE NAME	S22-11	S22-11	S22-11	S22-11	S22-11	S22-11	S22-11	S22-11	S22-11	S22-11
SAMPLE DATE	06/29/81	08/18/81	09/24/81	11/11/81	06/29/82	07/26/82	08/18/82	09/15/82	10/15/82	06/28/83
TRACE ELEMENTS										
CADMIUM (CD) TOTAL	<0.001	<0.001		<0.001						
CADMIUM (CD) DISS	<0.001	<0.001		<0.001						
CHROMIUM (CR) TOTAL	<0.001	<0.001		<0.001						
CHROMIUM (CR) DISS	<0.001	<0.001		<0.001						
COPPER (CU) TOTAL	0.010	0.020		0.015			<0.001			
COPPER (CU) DISS	<0.001	<0.001		0.010						
IRON (FE) TOTAL	0.020	0.099		0.055	0.010		0.030		0.010	0.020
IRON (FE) TOTAL	0.040									
LEAD (PB) TOTAL	<0.001	<0.001		0.001			<0.001			
LEAD (PB) DISS	<0.001	0.004		<0.001						
MANGANESE (MN) TOTAL	0.001	0.020		0.003	<0.001		0.005		0.006	0.004
MANGANESE (MN) TOTAL	0.010									
MERCURY (HG) TOTAL	<0.0002	<0.0002		<0.0002						
MERCURY (HG) DISS	<0.0002									
MOLYBDENUM (MO) TOTAL	<0.001									
MOLYBDENUM (MO) DISS	<0.001									
NICKEL (NI) TOTAL	<0.001									
NICKEL (NI) DISS	<0.001									
SELENIUM (SE) TOTAL	<0.001	<0.001		<0.001						
SELENIUM (SE) DISS	<0.001	<0.001		<0.001						
SILVER (AG) TOTAL	<0.001	<0.001		0.001						
SILVER (AG) DISS	<0.001	<0.001		<0.001						
ZINC (ZN) TOTAL	0.010	0.185		0.015			0.002			
ZINC (ZN) DISS	0.005	0.040		0.008						
BACTERIOLOGICAL PARAMETERS										
FECAL COLIFORM (NO./100ML)		<2.0		<2.0						
TOTAL COLIFORM (NO./100ML)		17.0		2.0						
ORGANIC PARAMETERS										
ORGANIC CARBON (TOTAL)	26.40	9.50		1.90			6.70			
PHENOLS	<0.001	0.050		0.002	<0.001		0.013		<0.001	<0.001
OTHER PARAMETERS										
OIL AND GREASE	1.40	0.60		0.20			0.4			
CYANIDE (CN)	<0.001	<0.001		0.011			<0.001			
SULFIDE	<0.01									

All quantities in milligrams per liter unless otherwise noted. Blank line indicates parameter not tested.

Output Date: 02-09-1987
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SUMMARY OF WATER QUALITY ANALYSIS - UTAH FUEL CO.

SITE NAME	S22-11	S22-11	S22-11	S22-11	S22-11	S22-11	S22-11	S22-11	S22-11	S22-11
SAMPLE DATE	07/19/83	08/24/83	09/28/83	10/26/83	06/27/84	07/31/84	08/23/84	09/26/84	10/30/85	06/19/86
LOCATION	SPRING	SPRING	SPRING	SPRING	SPRING	SPRING	SPRING	SPRING	SPRING	SPRING
PHYSICAL PARAMETERS										
AIR TEMPERATURE (C)	20	13	4	5	10	15	12	10	7	15
FLOW (CFS)	0.04	0.05	0.04	0.04	0.09	0.05	0.05	0.05	0.01	0.14
WATER TEMPERATURE (C)	3	4	4	5	3	4	4	3	4	3
SPEC. COND. (UMHOS/CM) FIELD	384	394	359	345	378	377	383	371	341	355
PH FIELD	7.5	7.3	6.0	6.8	6.9	7.0	7.2	7.2	6.8	7.0
TURBIDITY (NTU) FIELD	11	1.1	1.6	6.6	8.6	7.3	9.5	2.9	0.8	
TOTAL SUSP. SOLIDS		2.0		4.0	2.0		1.0		1.0	6.0
TOTAL DISS. SOLIDS MEAS.		221		228	240		240		186	228
OXYGEN (O) DISS		4.6					9.0			
COMMON IONS										
CALCIUM (CA)		60.00	60.00		68.00		60.00		62.80	62.40
MAGNESIUM (MG)		8.64	10.56		8.40		15.60		8.60	7.70
SODIUM (NA)		12.0	11.00		13.30		15.00		4.60	2.40
POTASSIUM (K)		0.8	0.7		0.7		0.68		0.91	2.11
ACIDITY AS CACO3		20.00					2.70			
ALKALINITY AS CACO3 (LAB)		196					210			
BICARBONATE (HCO3) (LAB)		239		210	266.0		256.4		222.0	219.6
SULFATE (SO4)		13		36	16		<10		14	6
CHLORIDE (CL)		4.0	4.00		2.3		20.0		2.8	5.3
FLUORIDE (F)		0.11					0.09			
NUTRIENTS										
NITRATE (NO3-N)		<0.02					0.25			
AMMONIA (NH3 AS N)		0.65		0.35	0.31		0.08		<0.01	<0.01
TOTAL PHOSPHATE (PO4)		<0.01		0.03	0.05		0.12		0.04	0.85
TRACE ELEMENTS										
BARIUM (BA) TOTAL		0.016					0.01			
BORON (B) TOTAL		0.028					0.032			
COPPER (CU) TOTAL							0.015			
IRON (FE) TOTAL		0.010	0.070		0.08		0.10		0.03	<0.01
LEAD (PB) TOTAL		<0.001					0.003			
MANGANESE (MN) TOTAL		0.002	0.020		0.01		0.01		<0.01	<0.01
ZINC (ZN) TOTAL		0.004					0.040			
ORGANIC PARAMETERS										
ORGANIC CARBON (TOTAL)		0.75					<0.01			
PHENOLS		<0.001		<0.001	<0.001		<0.001		<0.001	<0.001
OTHER PARAMETERS										
OIL AND GREASE		<0.2					<0.1			
CYANIDE (CN)		<0.001					<0.001			

All quantities in milligrams per liter unless otherwise noted. Blank line indicates parameter not tested.

Output Date: 02-09-1987
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SUMMARY OF WATER QUALITY ANALYSIS - UTAH FUEL CO.

SITE NAME	S23-4	S23-4	S23-4	S23-4	S23-4	S23-4	S23-4	S23-4	S23-4	S23-4
SAMPLE DATE	06/29/81	08/20/81	09/24/81	06/29/82	07/20/82	08/19/82	09/22/82	06/29/83	07/19/83	08/22/83
LOCATION	SPRING	SPRING	SPRING	SPRING	SPRING	SPRING	SPRING	SPRING	SPRING	SPRING
PHYSICAL PARAMETERS										
AIR TEMPERATURE (C)	24	24	14	24	23	23	19	10	21	15
WATER TEMPERATURE (C)	25	14	12	17	18	9	10	5	9	12
SPEC. COND. (UMHOS/CM) FIELD	390	390	430	361	458	408	478	354	514	512
PH FIELD	8.0	7.8		7.2	7.3	7.3	7.3	6.6	7.4	6.8
TURBIDITY (NTU) FIELD	1.00	2.40		8.5		7.0	6.9	9.7	83	10
TOTAL SUSP. SOLIDS	14.0	2.3		260		416		71.0		719
TOTAL DISS. SOLIDS MEAS.	255	250		263		289		222		295
OXYGEN (O) DISS		9.1				3.0				
COMMON IONS										
TOTAL HARDNESS AS CACO3	216									
CALCIUM (CA)	48.00	80.80		77.50		78.40		58.40		79.20
MAGNESIUM (MG)	23.04	8.64		14.60		16.80		10.56		17.28
SODIUM (NA)	2.00	2.10		2.5		10.0		9.5		8.9
POTASSIUM (K)	1.100	1.11		1.20		1.43		0.58		1.3
CALCIUM (CA) TOTAL	48.50									
MAGNESIUM (MG) TOTAL	24.20									
SODIUM (NA) TOTAL	17.00									
POTASSIUM (K) TOTAL	0.45									
ACIDITY AS CACO3	8.50	7.20				8.0				19.00
ALKALINITY AS CACO3 (LAB)	240	238				274				
BICARBONATE (HCO3) (LAB)	292.85	290		309		334		227		
CARBONATE AS CO3 (LAB)	<0.01									
SULFATE (SO4)	16.3	3.0		9.0		<3.0		12.0		13
CHLORIDE (CL)	3.41	2.60		1.20		13.50		10.0		2.0
FLUORIDE (F)	0.22	0.23				0.15				0.14
CHLORIDE (CL) TOTAL	3.40									
FLUORIDE (F) TOTAL	0.22									
NUTRIENTS										
NITRATE (NO3-N)	0.66	0.33				0.16				<0.02
NITRITE (NO2-N)	0.04									
AMMONIA (NH3 AS N)	0.10	<0.01		0.32		0.17		<0.1		0.40
TOTAL PHOSPHATE (PO4)	0.180	0.250		0.080		0.210		0.70		0.03
TRACE ELEMENTS										
ALUMINUM (AL) TOTAL	0.050									
ALUMINUM (AL) DISS	0.040									
ARSENIC (AS) TOTAL	<0.001	<0.001								
ARSENIC (AS) DISS	<0.001	<0.001								
BARIUM (BA) TOTAL	0.035	0.030				0.040				0.070
BARIUM (BA) DISS	0.025	0.025								
BORON (B) TOTAL	0.036	0.030				0.010				0.030
BORON (B) DISS	0.030	0.012								
CADMIUM (CD) TOTAL	<0.001	<0.001								

All quantities in milligrams per liter unless otherwise noted. Blank line indicates parameter not tested.

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SUMMARY OF WATER QUALITY ANALYSIS - UTAH FUEL CO.

SITE NAME	S23-4	S23-4	S23-4	S23-4	S23-4	S23-4	S23-4	S23-4	S23-4	S23-4
SAMPLE DATE	06/29/81	08/20/81	09/24/81	06/29/82	07/20/82	08/19/82	09/22/82	06/29/83	07/19/83	08/22/83
TRACE ELEMENTS										
CADMIUM (CD) DISS	<0.001	<0.001								
CHROMIUM (CR) TOTAL	<0.001	<0.001								
CHROMIUM (CR) DISS	<0.001	<0.001								
COPPER (CU) TOTAL	<0.001	0.020				0.010				0.030
COPPER (CU) DISS	<0.001	<0.001								
IRON (FE) TOTAL	0.020	1.300		1.550		3.310		0.540		7.500
IRON (FE) TOTAL	0.240									
LEAD (PB) TOTAL	<0.001	<0.001				0.004				0.009
LEAD (PB) DISS	<0.001	<0.001								
MANGANESE (MN) TOTAL	0.010	0.020		0.080		0.150		0.022		0.150
MANGANESE (MN) TOTAL	0.020									
MERCURY (HG) TOTAL	<0.0002	<0.0002								
MERCURY (HG) DISS	<0.0002									
MOLYBDENUM (MO) TOTAL	<0.001									
MOLYBDENUM (MO) DISS	<0.001									
NICKEL (NI) TOTAL	<0.001									
NICKEL (NI)	<0.001									
SELENIUM (SE) TOTAL	<0.001	<0.001								
SELENIUM (SE) DISS	<0.001	<0.001								
SILVER (AG) TOTAL	<0.001	<0.001								
SILVER (AG) DISS	<0.001	<0.001								
ZINC (ZN) TOTAL	0.010	0.012				0.010				0.055
ZINC (ZN) DISS	0.005	0.005								
BACTERIOLOGICAL PARAMETERS										
FECAL COLIFORM (NO./100ML)		23.0								
TOTAL COLIFORM (NO./100ML)		2300								
5 - DAY BOD		1.9								
ORGANIC PARAMETERS										
ORGANIC CARBON (TOTAL)	19.70	7.60				19.80				0.88
PHENOLS	0.269	<0.001		<0.001		0.008		<0.001		<0.001
OTHER PARAMETERS										
OIL AND GREASE	0.20	1.20				0.4				<0.2
CYANIDE (CN)	<0.001	0.002				0.009				<0.001
SULFIDE	<0.01									

All quantities in milligrams per liter unless otherwise noted. Blank line indicates parameter not tested.

Output Date: 02-09-1987
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SUMMARY OF WATER QUALITY ANALYSIS - UTAH FUEL CO.

SITE NAME	S23-4	S23-4	S23-4	S23-4	S23-4	S23-4	S23-4
SAMPLE DATE	09/28/83	10/19/83	06/26/84	07/30/84	08/22/84	09/18/84	06/19/86
LOCATION	SPRING	SPRING	SPRING	SPRING	SPRING	SPRING	SPRING
PHYSICAL PARAMETERS							
AIR TEMPERATURE (C)	8	8	12	12	16	16	9
WATER TEMPERATURE (C)	6	6	8	10	15	15	5
SPEC. COND. (UMHOS/CM) FIELD	469	448	358	479	516	462	345
PH FIELD	6.8	6.7	6.5	6.7	7.0	7.0	6.6
TURBIDITY (NTU) FIELD	80	28	10	23	59	30	
TOTAL SUSP. SOLIDS		124	1406		18.0		18.0
TOTAL DISS. SOLIDS MEAS.		275	238		310		234
OXYGEN (O) DISS					7.2		
COMMON IONS							
CALCIUM (CA)		73.60	76.00		84.00		64.00
MAGNESIUM (MG)		15.84	8.40		19.20		12.50
SODIUM (NA)		9.00	6.80		8.50		2.50
POTASSIUM (K)		0.5	0.6		1.12		0.32
ACIDITY AS CACO3					1.60		
ALKALINITY AS CACO3 (LAB)	274				285		
BICARBONATE (HCO3) (LAB)	334	281	278.2		347.7		244.0
SULFATE (SO4)		30	10		12		5
CHLORIDE (CL)		4.00	2.5		5.0		6.9
FLUORIDE (F)					0.12		
NUTRIENTS							
NITRATE (NO3-N)					0.28		
AMMONIA (NH3 AS N)		<0.01	0.32		0.18		<0.01
TOTAL PHOSPHATE (PO4)		0.02	0.04		0.26		0.10
TRACE ELEMENTS							
BARIUM (BA) TOTAL					0.04		
BORON (B) TOTAL					0.059		
COPPER (CU) TOTAL					0.015		
IRON (FE) TOTAL		2.810	0.93		0.58		0.31
LEAD (PB) TOTAL					0.003		
MANGANESE (MN) TOTAL		0.070	0.04		0.04		<0.01
ZINC (ZN) TOTAL					0.039		
ORGANIC PARAMETERS							
ORGANIC CARBON (TOTAL)					3.00		
PHENOLS		<0.001	<0.001		<0.001		<0.001
OTHER PARAMETERS							
OIL AND GREASE					<0.1		
CYANIDE (CN)					<0.001		

All quantities in milligrams per liter unless otherwise noted. Blank line indicates parameter not tested.

Output Date: 02-09-1987
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SUMMARY OF WATER QUALITY ANALYSIS - UTAH FUEL CO.

SITE NAME	S24-12	S24-12	S24-12	S24-12	S24-12	S24-12	S24-12	S24-12	S24-12	S24-12
SAMPLE DATE	05/14/81	08/20/81	09/25/81	11/12/81	06/30/82	07/22/82	08/20/82	09/14/82	06/30/83	07/19/83
LOCATION	SPRING	SPRING	SPRING	SPRING	SPRING	SPRING	SPRING	SPRING	SPRING	SPRING
PHYSICAL PARAMETERS										
AIR TEMPERATURE (C)	17.5	15	15	2	16	15	18	6	5	15
FLOW (CFS)	0.003	0.001	0.0015	0.001	0.004	0.002	0.002	0.002	0.003	0.003
WATER TEMPERATURE (C)	7	7	7	3	6	6	6	6	4	13
SPEC. COND. (UMHOS/CM) FIELD	480	500	540	610	440	483	402	460	530	571
PH FIELD	7.7	8.0		7.7	7.6	7.4	8.1	8.0	7.5	7.8
TURBIDITY (NTU) FIELD	4.00	0.40		0.34	3.4	8.3	6.4	6.0	42	7.5
TOTAL SUSP. SOLIDS	66	<0.1		11.0	<1.0		13.0		56.0	
TOTAL DISS. SOLIDS MEAS.	310	333		398	296		340		334	
OXYGEN (O) DISS		10.0		9.0			7.4			
COMMON IONS										
TOTAL HARDNESS AS CACO3	218									
CALCIUM (CA)	46.80	79.20		81.00	78.00		79.20		75.20	
MAGNESIUM (MG)	23.80	31.68		29.50	26.40		34.08		25.44	
SODIUM (NA)	3.10	2.90		25.60	2.7		2.6		13.0	
POTASSIUM (K)	1.68	1.82		1.85	1.34		1.58		1.48	
CALCIUM (CA) TOTAL	47.20									
MAGNESIUM (MG) TOTAL	24.00									
SODIUM (NA) TOTAL	38.00									
POTASSIUM (K) TOTAL	1.70									
ACIDITY AS CACO3	<0.01	<0.01		10.00			7.00			
ALKALINITY AS CACO3 (LAB)	280	310		297			296			
BICARBONATE (HCO3) (LAB)	317.2	373		363	359		361		334	
CARBONATE AS CO3 (LAB)	12.00									
SULFATE (SO4)	20.0	29.0		73.0	12.0		25.0		36.0	
CHLORIDE (CL)	4.00	2.72		3.50	0.60		15.30		10.0	
FLUORIDE (F)	0.16	0.24		0.17			0.17			
CHLORIDE (CL) TOTAL	4.00									
FLUORIDE (F) TOTAL	0.18									
NUTRIENTS										
NITRATE (NO3-N)	0.02	<0.01		0.05			0.11			
NITRITE (NO2-N)	0.02									
AMMONIA (NH3 AS N)	<0.01	<0.01		<0.01	0.26		0.35		<0.1	
TOTAL PHOSPHATE (PO4)	0.110	0.150		0.280	0.050		0.060		0.22	
TRACE ELEMENTS										
ALUMINUM (AL) TOTAL	<0.001									
ALUMINUM (AL) DISS	<0.001									
ARSENIC (AS) TOTAL	<0.001	<0.001		<0.001						
ARSENIC (AS) DISS	<0.001	<0.001		<0.001						
BARIUM (BA) TOTAL	0.065	0.060		0.066			0.065			
BARIUM (BA) DISS	0.050	0.040		0.055						
BORON (B) TOTAL	0.040	0.040		0.040			0.012			
BORON (B) DISS	0.030	0.006		0.035						

All quantities in milligrams per liter unless otherwise noted. Blank line indicates parameter not tested.

Output Date: 02-09-1987
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SUMMARY OF WATER QUALITY ANALYSIS - UTAH FUEL CO.

SITE NAME	S24-12	S24-12	S24-12	S24-12	S24-12	S24-12	S24-12	S24-12	S24-12	S24-12
SAMPLE DATE	05/14/81	08/20/81	09/25/81	11/12/81	06/30/82	07/22/82	08/20/82	09/14/82	06/30/83	07/19/83
TRACE ELEMENTS										
CADMIUM (CD) TOTAL	<0.001	<0.001		<0.001						
CADMIUM (CD) DISS	<0.001	<0.001		<0.001						
CHROMIUM (CR) TOTAL	<0.001	<0.001		<0.001						
CHROMIUM (CR) DISS	<0.001	<0.001		<0.001						
COPPER (CU) TOTAL	0.010	0.020		0.012			0.010			
COPPER (CU) DISS	0.010	<0.001		0.011						
IRON (FE) TOTAL	0.010	0.090		0.450	0.010		0.050		0.850	
IRON (FE) TOTAL	0.420									
LEAD (PB) TOTAL	0.001	0.006		<0.001			0.004			
LEAD (PB) DISS	<0.001	0.002		<0.001						
MANGANESE (MN) TOTAL	0.010	0.010		0.010	0.005		0.015		0.030	
MANGANESE (MN) TOTAL	0.030									
MERCURY (HG) TOTAL	<0.0002	<0.0002		<0.0002						
MERCURY (HG) DISS	<0.0002									
MOLYBDENUM (MO) TOTAL	<0.001									
MOLYBDENUM (MO) DISS	<0.001									
NICKEL (NI) TOTAL	<0.001									
NICKEL (NI)	<0.001									
SELENIUM (SE) TOTAL	<0.001	<0.001		<0.001						
SELENIUM (SE) DISS	<0.001	<0.001		<0.001						
SILVER (AG) TOTAL	<0.001	<0.001		<0.001						
SILVER (AG) DISS	<0.001	<0.001		<0.001						
ZINC (ZN) TOTAL	0.010	0.015		0.020			0.001			
ZINC (ZN) DISS	0.010	0.010		0.012						
BACTERIOLOGICAL PARAMETERS										
FECAL COLIFORM (NO./100ML)		<2.0		<2.0						
TOTAL COLIFORM (NO./100ML)		14.0		7.0						
5 - DAY BOD		2.0								
ORGANIC PARAMETERS										
ORGANIC CARBON (TOTAL)	6.80	4.10		<0.01			12.20			
PHENOLS	0.007	<0.001		<0.001	<0.001		0.008		<0.001	
OTHER PARAMETERS										
OIL AND GREASE	0.80	1.80		<0.01			0.2			
CYANIDE (CN)	<0.001	0.001		0.015			0.004			
SULFIDE	2.20									

All quantities in milligrams per liter unless otherwise noted. Blank line indicates parameter not tested.

Output Date: 02-09-1987
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SUMMARY OF WATER QUALITY ANALYSIS - UTAH FUEL CO.

SITE NAME	S24-12	S24-12	S24-12	S24-12	S24-12	S24-12	S24-12	S24-12	S24-12	S24-12
SAMPLE DATE	08/25/83	09/23/83	10/27/83	11/11/83	06/28/84	07/30/84	08/27/84	09/18/84	10/17/85	06/19/86
LOCATION	SPRING	SPRING	SPRING	SPRING	SPRING	SPRING	SPRING	SPRING	SPRING	SPRING
PHYSICAL PARAMETERS										
AIR TEMPERATURE (C)	13	9	-1	3	18	13	21	11	1	17
FLOW (CFS)	0.002	0.001	0.002	0.002	0.005	0.003	0.003	0.002	0.002	0.004
WATER TEMPERATURE (C)	9	6	3	3.5	5	7	12	8	3	9
SPEC. COND. (UMHOS/CM) FIELD	1.38	636	598	559	477	623	728	598	677	434
PH FIELD	7.5	7.7	7.4	7.5	7.2	7.3	7.7	7.7	7.8	7.4
TURBIDITY (NTU) FIELD	4.5	5.7	4.0	4.3	12	65	15	22	20	2.1
TOTAL SUSP. SOLIDS	14.0		83.0		1.0		7.0		22.0	14.0
TOTAL DISS. SOLIDS MEAS.	334		355		350		419		438	362
OXYGEN (O) DISS	4.4						8.4			
COMMON IONS										
CALCIUM (CA)	76.80		88.00		88.00		88.00		71.20	68.80
MAGNESIUM (MG)	31.20		28.80		21.60		40.80		47.30	28.80
SODIUM (NA)	2.7		2.80		11.60		13.00		2.00	2.20
POTASSIUM (K)	1.8		1.5		0.5		1.86		2.04	1.75
ACIDITY AS CACO3	21.00						8.00			
ALKALINITY AS CACO3 (LAB)	280						274			
BICARBONATE (HCO3) (LAB)	342		342		344.0		334.3		353.8	287.9
SULFATE (SO4)	47		55		50		70		80	38
CHLORIDE (CL)	2.0		4.00		1.9		30.0		2.9	12.6
FLUORIDE (F)	0.14						0.15			
NUTRIENTS										
NITRATE (NO3-N)	<0.02						0.02			
AMMONIA (NH3 AS N)	0.35		0.60		0.16		0.04		<0.01	<0.01
TOTAL PHOSPHATE (PO4)	<0.01		<0.01		0.02		0.04		<0.01	0.14
TRACE ELEMENTS										
BARIUM (BA) TOTAL	0.053						0.06			
BORON (B) TOTAL	0.031						0.018			
COPPER (CU) TOTAL	<0.001						0.016			
IRON (FE) TOTAL	0.020		0.024		0.09		0.10		0.32	<0.01
LEAD (PB) TOTAL	<0.001						<0.001			
MANGANESE (MN) TOTAL	0.009		0.010		0.02		0.01		<0.01	<0.01
ZINC (ZN) TOTAL	0.002									
ORGANIC PARAMETERS										
ORGANIC CARBON (TOTAL)	1.20						<0.01			
PHENOLS	<0.001		<0.001		<0.001		<0.001		<0.001	<0.001
OTHER PARAMETERS										
OIL AND GREASE	<0.2						2.0			
CYANIDE (CN)	<0.001						<0.001			

All quantities in milligrams per liter unless otherwise noted. Blank line indicates parameter not tested.

Output Date: 02-09-1987
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SUMMARY OF WATER QUALITY ANALYSIS - UTAH FUEL CO.

SITE NAME	S26-13	S26-13	S26-13	S26-13	S26-13	S26-13	S26-13	S26-13	S26-13	S26-13
SAMPLE DATE	06/29/81	08/18/81	09/24/81	10/22/81	06/29/82	07/20/82	08/18/82	09/22/82	06/29/83	07/19/83
LOCATION	SPRING	SPRING	SPRING	SPRING	SPRING	SPRING	SPRING	SPRING	SPRING	SPRING
PHYSICAL PARAMETERS										
AIR TEMPERATURE (C)	18	22	18	3	20	21	21	13	16	19
FLOW (CFS)	0.002	0.001	0.001	0.0005	0.01	0.004	0.003	0.002	0.02	0.004
WATER TEMPERATURE (C)	6.5	8	14	2	4	5	6	6	.3	4
SPEC. COND. (UMHOS/CM) FIELD	300	340	400	350	257	221	360	411	194	338
PH FIELD	7.4	7.2			7.7	7.8	8.0	7.3	6.7	7.2
TURBIDITY (NTU) FIELD	1.0	0.50			4.3	7.5	7.0	3.3	10.0	3.0
TOTAL SUSP. SOLIDS	1.0	3.0			1.0		9.0		11.0	
TOTAL DISS. SOLIDS MEAS.	195	225			165		262		115	
OXYGEN (O) DISS		6.7					6.4			
COMMON IONS										
TOTAL HARDNESS AS CACO3	174									
CALCIUM (CA)	60.00	72.00			43.50		68.80		32.80	
MAGNESIUM (MG)	5.76	6.24			5.30		10.56		1.92	
SODIUM (NA)	2.50	3.30			2.9		20.0		2.5	
POTASSIUM (K)	2.70	1.64			4.45		2.14		4.50	
CALCIUM (CA) TOTAL	61.00									
MAGNESIUM (MG) TOTAL	7.10									
SODIUM (NA) TOTAL	2.70									
POTASSIUM (K) TOTAL	0.35									
ACIDITY AS CACO3	10.20	8.00					9.00			
ALKALINITY AS CACO3 (LAB)	158	190					237			
BICARBONATE (HCO3) (LAB)	194.5	232			119		289		105	
CARBONATE AS CO3 (LAB)	<0.01									
SULFATE (SO4)	13.5	16.0			38.0		<3.0		4.0	
CHLORIDE (CL)	5.86	3.59			2.40		18.50		8.0	
FLUORIDE (F)	0.17	0.18					0.15			
CHLORIDE (CL) TOTAL	5.90									
FLUORIDE (F) TOTAL	0.17									
NUTRIENTS										
NITRATE (NO3-N)	2.90						1.75			
NITRITE (NO2-N)	0.06									
AMMONIA (NH3 AS N)	<0.01	<0.01			0.13		0.29		<0.1	
TOTAL PHOSPHATE (PO4)	0.420	0.170			0.110		0.110		0.32	
TRACE ELEMENTS										
ALUMINUM (AL) TOTAL	<0.001									
ALUMINUM (AL) DISS	<0.001									
ARSENIC (AS) TOTAL	<0.001	0.002								
ARSENIC (AS) DISS	<0.001	<0.001								
BARIUM (BA) TOTAL	0.028	0.035					0.040			
BARIUM (BA) DISS	0.025	0.025								
BORON (B) TOTAL	0.015	0.016					0.014			
BORON (B) DISS	0.010	0.010								

All quantities in milligrams per liter unless otherwise noted. Blank line indicates parameter not tested.

Output Date: 02-09-1987
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SUMMARY OF WATER QUALITY ANALYSIS - UTAH FUEL CO.

SITE NAME	S26-13	S26-13	S26-13	S26-13	S26-13	S26-13	S26-13	S26-13	S26-13	S26-13
SAMPLE DATE	06/29/81	08/18/81	09/24/81	10/22/81	06/29/82	07/20/82	08/18/82	09/22/82	06/29/83	07/19/83
TRACE ELEMENTS										
CADMIUM (CD) TOTAL	<0.001	<0.001								
CADMIUM (CD) DISS	<0.001	<0.001								
CHROMIUM (CR) TOTAL	<0.001	<0.001								
CHROMIUM (CR) DISS	<0.001	<0.001								
COPPER (CU) TOTAL	0.010	0.010					<0.001			
COPPER (CU) DISS	<0.001	<0.001								
IRON (FE) TOTAL	0.010	0.059			0.120		0.020		0.270	
IRON (FE) TOTAL	0.060									
LEAD (PB) TOTAL	<0.001	0.023					<0.001			
LEAD (PB) DISS	<0.001	<0.001								
MANGANESE (MN) TOTAL	0.002	0.010			0.002		0.007		0.002	
MANGANESE (MN) TOTAL	0.018									
MERCURY (HG) TOTAL	<0.0002	<0.0002								
MERCURY (HG) DISS	<0.0002									
MOLYBDENUM (MO) TOTAL	<0.001									
MOLYBDENUM (MO) DISS	<0.001									
NICKEL (NI) TOTAL	<0.001									
NICKEL (NI)	<0.001									
SELENIUM (SE) TOTAL	<0.001	<0.001								
SELENIUM (SE) DISS	<0.001	<0.001								
SILVER (AG) TOTAL	<0.001	<0.001								
SILVER (AG) DISS	<0.001	<0.001								
ZINC (ZN) TOTAL	0.005	0.010					0.003			
ZINC (ZN) DISS	0.005	0.007								
BACTERIOLOGICAL PARAMETERS										
FECAL COLIFORM (NO./100ML)		17.0								
TOTAL COLIFORM (NO./100ML)		70.0								
ORGANIC PARAMETERS										
ORGANIC CARBON (TOTAL)	38.20	6.00					7.50			
PHENOLS	<0.001	0.042			<0.001		0.008		<0.001	
OTHER PARAMETERS										
OIL AND GREASE	1.60	1.60					0.6			
CYANIDE (CN)	<0.001	<0.001					0.004			
SULFIDE	<0.01									

All quantities in milligrams per liter unless otherwise noted. Blank line indicates parameter not tested.

Output Date: 02-09-1987
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SUMMARY OF WATER QUALITY ANALYSIS - UTAH FUEL CO.

SITE NAME	S26-13	S26-13	S26-13	S26-13	S26-13	S26-13	S26-13	S26-13	S26-13
SAMPLE DATE	08/24/83	09/28/83	10/19/83	06/26/84	07/30/84	08/22/84	09/18/84	10/30/85	06/19/86
LOCATION	SPRING	SPRING	SPRING	SPRING	SPRING	SPRING	SPRING	SPRING	SPRING
PHYSICAL PARAMETERS									
AIR TEMPERATURE (C)	16	9	9	14	12	19	13	14	16
FLOW (CFS)	0.005	0.002	0.002	0.01	0.004	0.003	0.002	0.0005	0.02
WATER TEMPERATURE (C)	6	6	6	3	5	6	6	6	3
SPEC. COND. (UMHOS/CM) FIELD	415	400	408	249	388	418	390	379	230
PH FIELD	6.5	6.4	6.3	6.0	6.4	6.6	6.9	6.3	6.2
TURBIDITY (NTU) FIELD	1.8	0.3	6.8	8.1	8.3	11.5	6.4	1.2	4.2
TOTAL SUSP. SOLIDS	3.0		3.0	5.0		3.0		1.0	5.0
TOTAL DISS. SOLIDS MEAS.	222		226	265		275		212	174
OXYGEN (O) DISS	1.9					5.6			
COMMON IONS									
CALCIUM (CA)	65.60		69.60	46.00		72.00		73.20	36.00
MAGNESIUM (MG)	11.52		9.60	28.80		10.80		7.70	3.40
SODIUM (NA)	2.5		2.50	2.70		22.00		4.90	2.40
POTASSIUM (K)	2.3		0.8	4.4		1.98		1.04	3.67
ACIDITY AS CACO3	20.00					2.80			
ALKALINITY AS CACO3 (LAB)	194					225			
BICARBONATE (HCO3) (LAB)	237		234	146.4		274.5		251.0	112.2
SULFATE (SO4)	18		19	114		15		12	7
CHLORIDE (CL)	4.0		6.00	2.3		20.0		2.9	8.9
FLUORIDE (F)	0.13					0.12			
NUTRIENTS									
NITRATE (NO3-N)	<0.02					1.29			
AMMONIA (NH3 AS N)	0.15		<0.01	0.35		0.10		0.10	<0.01
TOTAL PHOSPHATE (PO4)	<0.01		0.10	0.03		0.19		0.10	0.19
TRACE ELEMENTS									
BARIUM (BA) TOTAL	0.025					0.03			
BORON (B) TOTAL	0.040					0.025			
COPPER (CU) TOTAL	<0.001					0.019			
IRON (FE) TOTAL	0.010		0.070	0.22		0.13		0.11	0.10
LEAD (PB) TOTAL	<0.001					<0.001			
MANGANESE (MN) TOTAL	0.001		0.020	0.01		0.01		<0.01	<0.01
ZINC (ZN) TOTAL	0.002					0.031			
ORGANIC PARAMETERS									
ORGANIC CARBON (TOTAL)	0.80					<0.01			
PHENOLS	<0.001		<0.001	<0.001		<0.001		<0.001	<0.001
OTHER PARAMETERS									
OIL AND GREASE	<0.2					<0.1			
CYANIDE (CN)	<0.001					<0.001			

All quantities in milligrams per liter unless otherwise noted. Blank line indicates parameter not tested.

Output Date: 02-09-1987
HWQ-6/86-R1

SUMMARY OF WATER QUALITY ANALYSIS - UTAH FUEL CO.

SITE NAME	S34-12	S34-12	S34-12	S34-12
SAMPLE DATE	05/14/81	08/21/81	09/25/81	11/10/81
LOCATION	SPRING	SPRING	SPRING	SPRING
PHYSICAL PARAMETERS				
AIR TEMPERATURE (C)	14	16	12	6
FLOW (CFS)	0.02	0.03	0.01	0.01
WATER TEMPERATURE (C)	5	4	6	5
SPEC. COND. (UMHOS/CM) FIELD	330	360	400	370
PH FIELD	8.0	7.9		7.7
TURBIDITY (NTU) FIELD	0.44	0.16		0.27
TOTAL SUSP. SOLIDS	13.0	2.0		5.0
TOTAL DISS. SOLIDS MEAS.	215	244		235
OXYGEN (O) DISS		9.6		10.0
COMMON IONS				
TOTAL HARDNESS AS CACO3	200			
CALCIUM (CA)	59.20	64.00		67.00
MAGNESIUM (MG)	11.80	16.32		13.00
SODIUM (NA)	2.50	2.60		4.50
CALCIUM (CA) TOTAL	60.00			
MAGNESIUM (MG) TOTAL	12.00			
SODIUM (NA) TOTAL	4.90			
POTASSIUM (K) TOTAL	1.49	0.80		1.50
ACIDITY AS CACO3	<0.01	5.40		8.00
ALKALINITY AS CACO3 (LAB)	194	198		209
BICARBONATE (HCO3) (LAB)	226.92	242		255
CARBONATE AS CO3 (LAB)	4.80			
SULFATE (SO4)	12.5	27.0		18.0
CHLORIDE (CL)	3.00	2.99		3.10
FLUORIDE (F)	0.15	0.19		0.13
CHLORIDE (CL) TOTAL	4.00			
FLUORIDE (F) TOTAL	0.15			
NUTRIENTS				
NITRATE (NO3-N)	1.97	1.56		1.22
NITRITE (NO2-N)	0.02			
AMMONIA (NH3 AS N)	<0.01	<0.01		28.30
TOTAL PHOSPHATE (PO4)	0.120	0.210		0.440
TRACE ELEMENTS				
ALUMINUM (AL) TOTAL	0.050			
ALUMINUM (AL) DISS	0.030			
ARSENIC (AS) TOTAL	<0.001	<0.001		<0.001
ARSENIC (AS) DISS	<0.001	<0.001		<0.001
BARIUM (BA) TOTAL	0.030	0.020		0.025
BARIUM (BA) DISS	0.020	0.015		0.020
BORON (B) TOTAL	0.015	0.020		0.020
BORON (B) DISS	0.010	0.002		0.010
CADMIUM (CD) TOTAL	<0.001	<0.001		<0.001

All quantities in milligrams per liter unless otherwise noted. Blank line indicates parameter not tested.

Output Date: 02-09-1987
HWQ-6/86-R1

SUMMARY OF WATER QUALITY ANALYSIS - UTAH FUEL CO.

SITE NAME	S34-12	S34-12	S34-12	S34-12
SAMPLE DATE	05/14/81	08/21/81	09/25/81	11/10/81
TRACE ELEMENTS				
CADMIUM (CD) DISS	<0.001	<0.001		<0.001
CHROMIUM (CR) TOTAL	<0.001	0.002		<0.001
CHROMIUM (CR) DISS	<0.001	<0.001		<0.001
COPPER (CU) TOTAL	0.020	0.030		0.013
COPPER (CU) DISS	<0.001	0.010		0.010
IRON (FE) TOTAL	<0.001	0.070		0.022
IRON (FE) TOTAL	0.020			
LEAD (PB) TOTAL	0.002	0.007		<0.001
LEAD (PB) DISS	<0.001	0.005		<0.001
MANGANESE (MN) TOTAL	0.010	<0.001		0.006
MANGANESE (MN) TOTAL	0.070			
MERCURY (HG) TOTAL	<0.0002	<0.0002		<0.0002
MERCURY (HG) DISS	<0.0002			
MOLYBDENUM (MO) TOTAL	<0.001			
MOLYBDENUM (MO) DISS	<0.001			
NICKEL (NI) TOTAL	<0.001			
NICKEL (NI) DISS	<0.001			
SELENIUM (SE) TOTAL	<0.001	<0.001		<0.001
SELENIUM (SE) DISS	<0.001	<0.001		<0.001
SILVER (AG) TOTAL	<0.001	<0.001		<0.001
SILVER (AG) DISS	<0.001	<0.001		<0.001
ZINC (ZN) TOTAL	0.090	0.065		0.065
ZINC (ZN) DISS	0.005	0.040		0.004
BACTERIOLOGICAL PARAMETERS				
FECAL COLIFORM (NO./100ML)		<2.0		<2.0
TOTAL COLIFORM (NO./100ML)		5.0		<2.0
5 - DAY BOD		1.6		
ORGANIC PARAMETERS				
ORGANIC CARBON (TOTAL)	8.10	2.00		5.20
PHENOLS	0.482	<0.001		0.005
OTHER PARAMETERS				
OIL AND GREASE	1.40	1.20		0.20
CYANIDE (CN)		0.001		0.002
SULFIDE	1.80			

All quantities in milligrams per liter unless otherwise noted. Blank line indicates parameter not tested.

Output Date: 02-09-1987
HWQ-6/86-R1

SUMMARY OF WATER QUALITY ANALYSIS - UTAH FUEL CO.

SITE NAME	S35-8	S35-8	S35-8	S35-8	S35-8	S35-8	S35-8	S35-8	S35-8	S35-8
SAMPLE DATE	05/14/81	08/21/81	09/25/81	11/11/81	06/28/82	07/26/82	08/17/82	09/15/82	10/15/82	06/28/83
LOCATION	SPRING	SPRING	SPRING	SPRING	SPRING	SPRING	SPRING	SPRING	SPRING	SPRING
PHYSICAL PARAMETERS										
AIR TEMPERATURE (C)	10	13	12	2	21	21	20	9	12	16
FLOW (CFS)	0.01	0.01	0.01	0.01	0.23	0.06	0.03	0.22	0.01	0.27
WATER TEMPERATURE (C)	3	4	4	2	3	3	4	7	.3	4
SPEC. COND. (UMHOS/CM) FIELD	350	370	420	385	356	369	375	340	369	275
PH FIELD	8.1	8.0		7.7	7.5	7.5	7.6	8.0	8.1	7.8
TURBIDITY (NTU) FIELD	0.30	0.16		0.29	4.3	7.7	5.1	4.7	6	9.3
TOTAL SUSP. SOLIDS	4.0	1.3		5.0	<1.0		8.0		13.0	8.0
TOTAL DISS. SOLIDS MEAS.	224	235		255	192		250		253	178
OXYGEN (O) DISS		13.0		13.2			10.6			
COMMON IONS										
TOTAL HARDNESS AS CACO3	210									
CALCIUM (CA)	63.44	75.20		72.50	58.00		69.60		68.80	47.20
MAGNESIUM (MG)	11.90	7.68		14.50	8.50		13.44		12.48	5.28
SODIUM (NA)	2.80	3.50		3.50	2.4		8.0		9.0	11.5
POTASSIUM (K)	0.920	0.98		1.35	0.69		0.84		0.88	0.69
CALCIUM (CA) TOTAL	64.00									
MAGNESIUM (MG) TOTAL	12.00									
SODIUM (NA) TOTAL	10.50									
POTASSIUM (K) TOTAL	1.33									
ACIDITY AS CACO3	<0.01	5.40		6.00			5.0			
ALKALINITY AS CACO3 (LAB)	210	222		225			227			
BICARBONATE (HCO3) (LAB)	236.68	271		275	212		276		288	176
CARBONATE AS CO3 (LAB)	9.60									
SULFATE (SO4)	19.6	6.0		20.0	9.0		<3.0		6.0	12.0
CHLORIDE (CL)	4.80	3.33		3.00	0.20		17.30		3.00	8.0
FLUORIDE (F)	0.14	0.19		0.12			0.12			
CHLORIDE (CL) TOTAL	5.00									
FLUORIDE (F) TOTAL	0.14									
NUTRIENTS										
NITRATE (NO3-N)	0.06	<0.01		0.11			0.05			
NITRITE (NO2-N)	0.01									
AMMONIA (NH3 AS N)	<0.01	<0.01		0.10	0.17		0.33		0.19	<0.1
TOTAL PHOSPHATE (PO4)	0.120	0.130		0.240	0.060		0.170		0.050	0.16
TRACE ELEMENTS										
ALUMINUM (AL) TOTAL	<0.001									
ALUMINUM (AL) DISS	0.020									
ARSENIC (AS) TOTAL	<0.001	<0.001		<0.001						
ARSENIC (AS) DISS	<0.001	<0.001		<0.001						
BARIUM (BA) TOTAL	0.030	0.030		0.034			0.038			
BARIUM (BA) DISS	0.020	0.015		0.025						
BORON (B) TOTAL	0.016	0.016		0.021			0.020			
BORON (B) DISS	0.010	0.010		0.015						

All quantities in milligrams per liter unless otherwise noted. Blank line indicates parameter not tested.

Output Date: 02-09-1987
HWQ-6/86-R1

SUMMARY OF WATER QUALITY ANALYSIS - UTAH FUEL CO.

SITE NAME	S35-8	S35-8	S35-8	S35-8	S35-8	S35-8	S35-8	S35-8	S35-8	S35-8
SAMPLE DATE	05/14/81	08/21/81	09/25/81	11/11/81	06/28/82	07/26/82	08/17/82	09/15/82	10/15/82	06/28/83
TRACE ELEMENTS										
CADMIUM (CD) TOTAL	<0.001	<0.001		<0.001						
CADMIUM (CD) DISS	<0.001	<0.001		<0.001						
CHROMIUM (CR) TOTAL	<0.001	<0.001		<0.001						
CHROMIUM (CR) DISS	<0.001	<0.001		<0.001						
COPPER (CU) TOTAL	0.010	0.050		<0.001			<0.001			
COPPER (CU) DISS	0.010	<0.001		<0.001						
IRON (FE) TOTAL	0.010	0.070		0.078	0.030		0.020		0.070	0.030
IRON (FE) TOTAL	0.090									
LEAD (PB) TOTAL	<0.001	0.002		<0.001			0.001			
LEAD (PB) DISS	<0.001	0.002		<0.001						
MANGANESE (MN) TOTAL	<0.001	<0.001		0.002	<0.001		<0.001		<0.001	0.001
MANGANESE (MN) TOTAL	<0.001									
MERCURY (HG) TOTAL	<0.0002	<0.0002		<0.0002						
MERCURY (HG) DISS	<0.0002									
MOLYBDENUM (MO) TOTAL	<0.001									
MOLYBDENUM (MO) DISS	<0.001									
NICKEL (NI) TOTAL	<0.001									
NICKEL (NI)	<0.001									
SELENIUM (SE) TOTAL	<0.001	<0.001		<0.001						
SELENIUM (SE) DISS	<0.001	<0.001		<0.001						
SILVER (AG) TOTAL	<0.001	<0.001		<0.001						
SILVER (AG) DISS	<0.001	<0.001		<0.001						
ZINC (ZN) TOTAL	0.010	0.020		0.035			0.001			
ZINC (ZN) DISS	0.010	0.010		0.010						
BACTERIOLOGICAL PARAMETERS										
FECAL COLIFORM (NO./100ML)		8.0		<2.0						
TOTAL COLIFORM (NO./100ML)		8.0		2.0						
5 - DAY BOD		1.0								
ORGANIC PARAMETERS										
ORGANIC CARBON (TOTAL)	3.40	5.40		3.10			6.90			
PHENOLS	0.016	<0.001		<0.001	<0.001		0.013		<0.001	<0.001
OTHER PARAMETERS										
OIL AND GREASE	1.00	0.80		0.20			1.0			
CYANIDE (CN)	<0.001	0.001		0.046			0.004			
SULFIDE	1.80									

All quantities in milligrams per liter unless otherwise noted. Blank line indicates parameter not tested.

Output Date: 02-09-1987
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FLOW (CFS)	0.0[illegible]	4	4	412	296	4[illegible]	7.3	7.3	[illegible]	0.64
WAT[illegible]EMPERATURE (C)	5	425	470	7.[illegible]	7.4	7.2	11	3.5	1.3	0.1
SPEC. COND[illegible]UMHOS/CM) FIELD	221	7.2	6.9	8.[illegible]	6.4	7.2	2.0		1.0	[illegible]
PH FIELD	7.5	1.2	1.4	13.0	1.0		285		220	180
TURBIDITY (NTU) FIELD	10	3.0		250	212		8.6			
TOTAL SUSP. SOLIDS		228								
TOTAL DISS. SOLIDS MEAS.		7.6							72.40	53.60
OXYGEN (O) DISS							74.00		13.00	7.20
COMMON IONS				69.60	64.00		15.60		5.40	2.67
CALCIUM (CA)		64.80		12.48	9.60		16.00		0.40	0.69
MAGNESIUM (MG)		12.96		8.50	2.40		0.75			
SODIUM (NA)		5.5		0.4	0.7		2.70			
POTASSIUM (K)		0.8					240		271.0	190.3
ACIDITY AS CACO3		15.00					292.8		16	8
ALKALINITY AS CACO3 (LAB)		216		256	218.4		17		2.4	2.1
BICARBONATE (HCO3) (LAB)		264		30	20		15.0			
SULFATE (SO4)		10		4.0	1.7		0.08			
CHLORIDE (CL)		4.0								
FLUORIDE (F)		0.10								
NUTRIENTS							0.01		<0.01	0.50
NITRATE (NO3-N)		<0.02		<0.01	0.20		0.39		0.04	0.02
AMMONIA (NH3 AS N)		0.30		0.05	0.05		0.11			
TOTAL PHOSPHATE (PO4)		<0.01								
TRACE ELEMENTS							0.03			
BARIUM (BA) TOTAL		0.021					0.035			
BORON (B) TOTAL		0.020					0.020		0.07	0.03
COPPER (CU) TOTAL		<0.001		0.090	0.11		0.12			
IRON (FE) TOTAL		0.009					0.002		<0.01	<0.01
LEAD (PB) TOTAL		<0.001		0.020	0.01		0.01			
MANGANESE (MN) TOTAL		0.0002					0.039			
ZINC (ZN) TOTAL		0.002								
ORGANIC PARAMETERS							<0.01		<0.001	<0.001
ORGANIC CARBON (TOTAL)		0.71		<0.001	<0.001		<0.001			
PHENOLS		<0.001								
OTHER PARAMETERS							<0.1			
OIL AND GREASE		<0.2					<0.001			
CYANIDE (CN)		<0.001								

All quantities in milligrams per liter unless otherwise noted. Blank line indicates parameter not tested.

Output Date: 02-09-1987
HWQ-6/86-R1

SUMMARY OF WATER QUALITY ANALYSIS - UTAH FUEL CO.

SITE NAME	S36-12	S36-12	S36-12	S36-12	S36-12	S36-12	S36-12	S36-12	S36-12	S36-12
SAMPLE DATE	05/15/81	08/18/81	09/24/81	10/22/81	11/11/81	06/29/82	07/20/82	08/18/82	09/22/82	10/12/82
LOCATION	SPRING	SPRING	SPRING	SPRING	SPRING	SPRING	SPRING	SPRING	SPRING	SPRING
PHYSICAL PARAMETERS										
AIR TEMPERATURE (C)	4	19	15	0	-3	18	16	19	18	13
FLOW (CFS)	0.01	0.01	0.01	0.01	0.01	0.02	0.01	0.01	0.01	0.01
WATER TEMPERATURE (C)	3	4	5	4	4	3	4	4	5	4
SPEC. COND. (UMHOS/CM) FIELD	270	340	400	350	370	342	411	365	415	302
PH FIELD	7.9	7.2			7.0	7.6	7.8	8.1	7.6	7.4
TURBIDITY (NTU) FIELD	1.00	0.76			0.58	2.9	6.0	7.8	2.5	2.8
TOTAL SUSP. SOLIDS	4.0	5.0			2.0	<1.0		5.0		9.0
TOTAL DISS. SOLIDS MEAS.	179	223			245	190		250		252
OXYGEN (O) DISS		7.5			6.6			10.2		
COMMON IONS										
TOTAL HARDNESS AS CACO3	172									
CALCIUM (CA)	56.40	72.00			77.50	60.50		68.00		76.00
MAGNESIUM (MG)	7.20	9.12			9.00	7.30		11.04		5.76
SODIUM (NA)	2.00	2.10			2.50	2.0		9.0		10.0
POTASSIUM (K)	0.450	0.40			0.50	0.48		0.42		0.45
CALCIUM (CA) TOTAL	64.00									
MAGNESIUM (MG) TOTAL	7.20									
SODIUM (NA) TOTAL	2.85									
POTASSIUM (K) TOTAL	1.60									
ACIDITY AS CACO3	2.73	8.00			18.00			7.00		
ALKALINITY AS CACO3 (LAB)	168	218			221			221		
BICARBONATE (HCO3) (LAB)	204.96	266				199		269		276
CARBONATE AS CO3 (LAB)	<0.01									
SULFATE (SO4)	10.2	3.0			9.0	18.0		<3.0		6.0
CHLORIDE (CL)	2.00	1.83			2.80	0.60		12.70		4.00
FLUORIDE (F)	0.12	0.15			0.12			0.12		
CHLORIDE (CL) TOTAL	2.00									
FLUORIDE (F) TOTAL	0.12									
NUTRIENTS										
NITRATE (NO3-N)	0.38				0.25			0.44		
NITRITE (NO2-N)	0.04									
AMMONIA (NH3 AS N)	<0.01	<0.01			0.30	0.22		0.30		0.19
TOTAL PHOSPHATE (PO4)	0.120	0.150			0.180	0.050		0.090		0.060
TRACE ELEMENTS										
ALUMINUM (AL) TOTAL	<0.001									
ALUMINUM (AL) DISS	<0.001									
ARSENIC (AS) TOTAL	<0.001	0.002			<0.001					
ARSENIC (AS) DISS	<0.001	<0.001			<0.001					
BARIUM (BA) TOTAL	0.015	0.010			0.017			0.029		
BARIUM (BA) DISS	0.010	0.005			0.010					
BORON (B) TOTAL	0.016	0.021			0.009			0.016		
BORON (B) DISS	<0.001	0.011			0.005					

All quantities in milligrams per liter unless otherwise noted. Blank line indicates parameter not tested.

Output Date: 02-09-1987
HWQ-6/86-R1

SUMMARY OF WATER QUALITY ANALYSIS - UTAH FUEL CO.

SITE NAME	S36-12	S36-12	S36-12	S36-12	S36-12	S36-12	S36-12	S36-12	S36-12	S36-12
SAMPLE DATE	05/15/81	08/18/81	09/24/81	10/22/81	11/11/81	06/29/82	07/20/82	08/18/82	09/22/82	10/12/82
TRACE ELEMENTS										
CADMIUM (CD) TOTAL	<0.001	<0.001			<0.001					
CADMIUM (CD) DISS	<0.001	<0.001			<0.001					
CHROMIUM (CR) TOTAL	<0.001	<0.001			<0.001					
CHROMIUM (CR) DISS	<0.001	<0.001			<0.001					
COPPER (CU) TOTAL	0.010	0.010			<0.001			<0.001		
COPPER (CU) DISS	0.010	<0.001			<0.001					
IRON (FE) TOTAL	0.010	0.90			0.100	0.050		0.030		0.030
IRON (FE) TOTAL	0.050									
LEAD (PB) TOTAL	0.001	<0.001			<0.001			0.003		
LEAD (PB) DISS	<0.001	<0.001			<0.001					
MANGANESE (MN) TOTAL	<0.001	<0.001			0.005	0.002		0.005		0.003
MANGANESE (MN) TOTAL	<0.001									
MERCURY (HG) TOTAL	0.0004	<0.0002			<0.0002					
MERCURY (HG) DISS	<0.0002									
MOLYBDENUM (MO) TOTAL	<0.001									
MOLYBDENUM (MO) DISS	<0.001									
NICKEL (NI) TOTAL	<0.001									
NICKEL (NI)	<0.001									
SELENIUM (SE) TOTAL	<0.001	<0.001			<0.001					
SELENIUM (SE) DISS	<0.001	<0.001			<0.001					
SILVER (AG) TOTAL	<0.001	<0.001			<0.001					
SILVER (AG) DISS	<0.001	<0.001			<0.001					
ZINC (ZN) TOTAL	0.010	0.055			0.052			0.002		
ZINC (ZN) DISS	0.010	0.010			0.005					
BACTERIOLOGICAL PARAMETERS										
FECAL COLIFORM (NO./100ML)		<2.0			<2.0					
TOTAL COLIFORM (NO./100ML)		<2.0			<2.0					
ORGANIC PARAMETERS										
ORGANIC CARBON (TOTAL)	4.50	5.60			24.00			14.00		
PHENOLS	0.11	0.025			0.007	0.004		0.008		<0.001
OTHER PARAMETERS										
OIL AND GREASE	<0.01	1.60			66.80			0.6		
CYANIDE (CN)	<0.001	<0.001			<0.001			0.008		
SULFIDE	0.92									

All quantities in milligrams per liter unless otherwise noted. Blank line indicates parameter not tested.

Output Date: 02-09-1987
HWQ-6/86-R1

SUMMARY OF WATER QUALITY ANALYSIS - UTAH FUEL CO.

SITE NAME	S36-12	S36-12	S36-12	S36-12	S36-12	S36-12	S36-12	S36-12	S36-12	S36-12
SAMPLE DATE	06/29/83	07/19/83	08/24/83	09/28/83	10/19/83	06/26/84	07/30/84	08/22/84	09/18/84	10/15/85
LOCATION	SPRING	SPRING	SPRING	SPRING	SPRING	SPRING	SPRING	SPRING	SPRING	SPRING
PHYSICAL PARAMETERS										
AIR TEMPERATURE (C)	13	17	13	12	7	13	13	14	15	8
FLOW (CFS)	0.02	0.01	0.01	0.01	0.01	0.02	0.01	0.01	0.01	0.01
WATER TEMPERATURE (C)	3	4	5	6	5	3	4	4	.5	4
SPEC. COND. (UMHOS/CM) FIELD	269	384	423	392	395	318	365	388	370	402
PH FIELD	7.1	7.5	7.1	6.4	6.8	6.4	6.7	6.8	7.1	6.6
TURBIDITY (NTU) FIELD	8.4	4.5	1.5	2.6	6.5	6.2	6.3	12.5	4.9	3.0
TOTAL SUSP. SOLIDS	<0.1		15.0		4.0	1.0		1.0		5.0
TOTAL DISS. SOLIDS MEAS.	177		238		250	290		280		244
OXYGEN (O) DISS			5.4					6.6		
COMMON IONS										
CALCIUM (CA)	47.20		66.40		69.20	56.00		78.00		76.80
MAGNESIUM (MG)	5.28		8.64		9.12	34.80		2.40		13.70
SODIUM (NA)	8.5		14.0		12.00	1.80		35.00		0.90
POTASSIUM (K)	0.47		0.5		1.1	0.5		0.39		0.80
ACIDITY AS CACO3			18.00					4.50		
ALKALINITY AS CACO3 (LAB)			220					225		
BICARBONATE (HCO3) (LAB)	183		268		249	213.5		274.5		285.5
SULFATE (SO4)	3.0		10		28	102		13		13
CHLORIDE (CL)	6.0		2.0		2.00	1.0		20.0		1.2
FLUORIDE (F)			0.10					0.07		
NUTRIENTS										
NITRATE (NO3-N)			<0.02					0.24		
AMMONIA (NH3 AS N)	0.7		1.75		<0.01	0.21		0.21		<0.01
TOTAL PHOSPHATE (PO4)	0.16		<0.01		<0.01	0.02		0.12		<0.01
TRACE ELEMENTS										
BARIUM (BA) TOTAL			0.009					0.02		
BORON (B) TOTAL			0.025					0.038		
COPPER (CU) TOTAL			0.010					0.019		
IRON (FE) TOTAL	0.020		0.010		0.070	0.12		0.15		0.04
LEAD (PB) TOTAL			<0.001					0.004		
MANGANESE (MN) TOTAL	0.003		0.001		0.010	0.01		0.01		<0.01
ZINC (ZN) TOTAL			0.002					0.067		
ORGANIC PARAMETERS										
ORGANIC CARBON (TOTAL)			0.64					<0.01		
PHENOLS	<0.001		<0.001		<0.001	<0.001		<0.001		<0.001
OTHER PARAMETERS										
OIL AND GREASE			<0.2					<0.1		
CYANIDE (CN)			<0.001					<0.001		

All quantities in milligrams per liter unless otherwise noted. Blank line indicates parameter not tested.

Output Date: 02-09-1987
HWQ-6/86-R1

SUMMARY OF WATER QUALITY ANALYSIS - UTAH FUEL CO.

SITE NAME	S36-12
SAMPLE DATE	06/19/86
LOCATION	SPRING
PHYSICAL PARAMETERS	
AIR TEMPERATURE (C)	12
FLOW (CFS)	0.02
WATER TEMPERATURE (C)	3.5
SPEC. COND. (UMHOS/CM) FIELD	302
PH FIELD	6.6
TURBIDITY (NTU) FIELD	1.4
TOTAL SUSP. SOLIDS	3.0
TOTAL DISS. SOLIDS MEAS.	164
COMMON IONS	
CALCIUM (CA)	50.40
MAGNESIUM (MG)	5.80
SODIUM (NA)	1.46
POTASSIUM (K)	0.45
BICARBONATE (HCO3) (LAB)	173.2
SULFATE (SO4)	7
CHLORIDE (CL)	1.7
NUTRIENTS	
AMMONIA (NH3 AS N)	0.24
TOTAL PHOSPHATE (PO4)	0.18
TRACE ELEMENTS	
IRON (FE) TOTAL	<0.01
MANGANESE (MN) TOTAL	<0.01
ORGANIC PARAMETERS	
PHENOLS	<0.001

All quantities in milligrams per liter unless otherwise noted. Blank line indicates parameter not tested.

Output Date: 02-09-1987
HWQ-6/86-R1

HYDROMETRICS

DATE: 10-03-1986

WATER QUALITY DATA VALIDATION TEST
UTAH FUEL CO.

SAMPLE NUMBER	DATE SAMPLED	SITE	CATION SUM (MEQ/L)	ANION SUM (MEQ/L)	DEVIATION (SIGMA)	PERCENT DIFFERENCE	LAB. SPECIFIC CONDUCTANCE (UMHOS/CM)	CALCULATED ION SUM MINIMUM (MEQ/L)	CALCULATED ION SUM MAXIMUM (MEQ/L)	TOTAL DISSOLVED SOLIDS CALCULATED (MG/L)	TOTAL DISSOLVED SOLIDS MEASURED AT 180 C (MG/L)	PERCENT DIFFERENCE
	06/30/82	CS-1	3.52	3.48	-.2	.5	300	3.03	3.35	180	188	2.1
	07/22/82	CS-1	5.36	5.42	.33	.6	410	4.16	4.6	275	272	.6
	08/20/82	CS-1	6.39	6.38	-.09	.1	395	4.01	4.43	320	326	.9
	09/14/82	CS-1	6.62	6.55	-.32	.5	490	4.98	5.51	336	335	.1
	06/30/83	CS-1	4.14	4.18	.24	.5	313	3.16	3.5	214	204	2.3
	07/20/83	CS-1	5.12	5.17	.25	.4	440	4.47	4.94	265	268	.6
	08/25/83	CS-1	5.64	5.55	-.5	.9	551	5.55	6.13	291	295	.6
	09/29/83	CS-1	5.75	5.72	-.14	.2	578	5.83	6.45	296	290	1.1
	10/27/83	CS-1	6.4	6.26	-.7	1.1	559	5.63	6.22	333	340	1.1
	11/11/83	CS-1	6.36	6.24	-.59	1	529	5.32	5.88	324	380	7.9
	06/28/84	CS-1	6.49	6.44	-.23	.4	327	3.22	3.56	357	360	.4
	07/30/84	CS-1	6.39	6.46	.35	.6	572	5.77	6.38	338	480	17.4
	08/27/84	CS-1	8.91	8.69	-.88	1.2	704	7.16	7.92	481	475	.7
	09/18/84	CS-1	7.64	7.56	-.38	.6	622	6.3	6.96	401	422	2.6
	10/17/85	CS-1	6.92	7.03	.49	.8	609	6.16	6.81	370	370	.1
	06/19/86	CS-1	4.09	3.47	-3.73	8.2	383	3.88	4.29	187	212	6.3
	01/27/81	CS-2	6.11	6.11	.02	0	275	2.77	3.07	298	295	.6
	03/11/81	CS-2	5.79	5.85	.28	.5	272	2.74	3.03	293	290	.5
	04/08/81	CS-2	5.69	5.79	.53	.9	284	2.87	3.17	289	290	.3
	05/12/81	CS-2	4.17	4.25	.46	.9	320	3.23	3.58	214	212	.4
	06/23/81	CS-2	5.02	4.96	-.33	.6	380	3.85	4.26	249	250	.2
	07/29/81	CS-2	5.28	5.49	1.07	1.9	400	4.06	4.48	263	265	.4
	08/20/81	CS-2	6.06	5.81	-1.24	2.1	480	4.88	5.4	293	310	2.8
	09/25/81	CS-2	5.73	5.82	.47	.8	450	4.57	5.05	287	296	1.5
	10/23/81	CS-2	6.15	6.23	.39	.6	490	4.98	5.51	313	320	1.1
	11/11/81	CS-2	6.21	6.18	-.13	.2	490	4.98	5.51	316	319	.5
	12/09/81	CS-2	6.39	6.36	-.16	.3	500	5.09	5.62	319	320	.1
	01/21/82	CS-2	7.03	5.62	-6.86	11.1	480	4.88	5.4	308	310	.4
	02/18/82	CS-2	6.13	6.09	-.19	.3	500	5.09	5.62	308	320	1.9
	04/15/82	CS-2	4.54	4.58	.23	.5	465	4.73	5.22	237	256	3.8
	05/20/82	CS-2	3.34	3.27	-.43	1	224	2.25	2.49	170	156	4.2
	06/30/82	CS-2	6.06	3.77	-9.99	23.2	390	3.95	4.37	236	236	0
	07/21/82	CS-2	4.6	4.54	-.37	.7	416	4.22	4.67	227	235	1.8
	08/19/82	CS-2	5.74	5.91	.86	1.5	371	3.76	4.15	289	318	4.8
	09/15/82	CS-2	5.67	5.63	-.2	.3	367	3.72	4.11	283	295	2.1
	10/14/82	CS-2	5.59	5.62	.14	.2	430	4.37	4.83	283	235	9.2
	11/09/82	CS-2	5.55	5.53	-.11	.2	550	5.6	6.19	276	295	3.3
	12/14/82	CS-2	5.84	5.77	-.33	.6	457	4.64	5.13	289	298	1.5
	01/19/83	CS-2	6.04	6.01	-.16	.3	554	5.65	6.24	297	320	3.8
	02/15/83	CS-2	6.61	6.71	.48	.8	562	5.73	6.33	337	344	1.1
	03/31/83	CS-2	6.04	6.2	.78	1.3	560	5.71	6.31	318	351	4.9
	04/21/83	CS-2	5.9	6	.5	.8	634	6.42	7.1	310	322	1.9
	05/25/83	CS-2	3.63	3.71	.52	1.2	324	3.28	3.62	186	198	3
	06/30/83	CS-2	4.1	4.04	-.35	.7	353	3.57	3.95	205	228	5.3

Calculated ion sum from Hydro regression.

HYDROMETRICS

DATE: 10-03-1986

WATER QUALITY DATA VALIDATION TEST
UTAH FUEL CO.

SAMPLE NUMBER	DATE SAMPLED	SITE	CATION SUM (MEQ/L)	ANION SUM (MEQ/L)	DEVIATION (SIGMA)	PERCENT DIFFERENCE	LAB. SPECIFIC CONDUCTANCE (UMHOS/CM)	CALCULATED ION SUM MINIMUM (MEQ/L)	CALCULATED ION SUM MAXIMUM (MEQ/L)	TOTAL DISSOLVED SOLIDS CALCULATED (MG/L)	TOTAL DISSOLVED SOLIDS MEASURED AT 180 C (MG/L)	PERCENT DIFFERENCE
	07/20/83	CS-2	5.73	5.81	.43	.7	364	3.69	4.07	298	300	.3
	08/25/83	CS-2	6.21	6.28	.37	.6	565	5.76	6.37	317	318	.1
	09/28/83	CS-2	5.91	5.84	-.35	.6	320	3.23	3.58	301	286	2.6
	10/26/83	CS-2	6.28	6.95	3.2	5.1	542	5.45	6.03	354	320*	5
	11/11/83	CS-2	6.21	6.18	-.16	.3	479	4.87	5.38	309	320	1.7
	01/18/84	CS-2	6.55	6.6	.23	.4	578	5.89	6.51	335	328	1.1
	02/22/84	CS-2	8.07	8.3	1.01	1.4	600	6.06	6.7	435	360	9.5
	03/22/84	CS-2	6.68	6.81	.63	1	546	5.56	6.15	346	400	7.3
	04/26/84	CS-2	7.16	7.02	-.67	1	436	4.35	4.8	369	376	1
	05/17/84	CS-2	8.16	8.06	-.44	.6	315	2.9	3.2	484	440	4.8
	06/28/84	CS-2	5.77	5.71	-.34	.6	396	3.93	4.34	299	295	.6
	07/27/84	CS-2	5.53	5.46	-.38	.7	475	4.83	5.34	282	490	27
	08/24/84	CS-2	6.7	6.29	-1.99	3.2	610	6.23	6.88	316	310	1
	09/18/84	CS-2	6.82	6.91	.42	.7	499	5.08	5.61	340	344	.6
	10/16/85	CS-2	6.87	6.93	.3	.5	577	5.82	6.43	365	356	1.2
	04/17/86	CS-2	5.93	5.75	-.9	1.5	509	5.11	5.64	292	330	6.1
	05/28/86	CS-2	3.17	3.09	-.55	1.4	245	2.47	2.72	163	172	2.6
	06/25/86	CS-2	5.08	4.96	-.66	1.2	468	4.68	5.17	267	260	1.4
	05/12/81	CS-3	3.6	3.56	-.24	.6	285	2.88	3.18	181	186	1.3
	06/23/81	CS-3	4.24	4.2	-.2	.4	340	3.44	3.8	216	220	1
	07/29/81	CS-3	4.13	4.05	-.44	.9	300	3.03	3.35	194	198	1.1
	08/20/81	CS-3	4.75	4.7	-.29	.5	380	3.85	4.26	241	245	.8
	09/25/81	CS-3	4.56	4.64	.44	.8	360	3.65	4.03	229	236	1.4
	10/22/81	CS-3	5.91	6	.43	.7	450	4.57	5.05	295	300	.8
	11/11/81	CS-3	5.37	5.31	-.28	.5	430	4.37	4.83	265	278	2.4
	12/09/81	CS-3	5.66	5.69	.19	.3	450	4.57	5.05	282	289	1.3
	05/20/82	CS-3	2.9	2.85	-.35	.9	198	1.99	2.2	147	130	6.3
	06/30/82	CS-3	3.91	3.86	-.3	.6	280	2.82	3.12	197	184	3.3
	07/21/82	CS-3	4.91	4.99	.47	.9	356	3.6	3.98	246	255	1.7
	08/19/82	CS-3	5.42	5.56	.76	1.3	356	3.6	3.98	273	289	2.8
	09/15/82	CS-3	5.09	5.01	-.41	.8	345	3.49	3.86	244	245	.2
	10/14/82	CS-3	5.87	5.89	.14	.2	320	3.23	3.58	299	304	.7
	11/09/82	CS-3	5.05	5.02	-.12	.2	540	5.5	6.08	245	260	2.9
	06/29/83	CS-3	3.84	3.9	.38	.8	330	3.34	3.69	192	212	5.1
	07/20/83	CS-3	5.36	5.47	.61	1.1	369	3.74	4.13	279	286	1.2
	08/25/83	CS-3	5.49	5.6	.53	.9	492	5.01	5.53	280	282	.4
	09/28/83	CS-3	5.26	5.18	-.4	.7	506	5.15	5.69	264	248	3.1
	10/26/83	CS-3	5.51	5.46	-.3	.5	497	5.06	5.59	278	285	1.2
	11/11/83	CS-3	5.33	5.26	-.38	.7	440	4.47	4.94	261	285	4.3
	02/22/84	CS-3	6.02	5.9	-.63	1.1	456	4.63	5.12	301	240	11.3
	03/22/84	CS-3	5.66	5.82	.82	1.4	437	4.44	4.91	264	320	5.9
	04/25/84	CS-3	8.67	8.49	-.75	1	364	3.41	3.76	466	470	.5
	05/17/84	CS-3	9.04	8.93	-.44	.6	264	2.38	2.63	530	460	7.1
	06/27/84	CS-3	6.25	6.37	.6	1	536	5.46	6.03	323	330	1

Calculated ion sum from Hydro regression.

HYDROMETRICS

DATE: 10-03-1986

WATER QUALITY DATA VALIDATION TEST
UTAH FUEL CO.

SAMPLE NUMBER	DATE SAMPLED	SITE	CATION SUM (MEQ/L)	ANION SUM (MEQ/L)	DEVIATION (SIGMA)	PERCENT DIFFERENCE	LAB. SPECIFIC CONDUCTANCE (UMHOS/CM)	CALCULATED ION SUM MINIMUM (MEQ/L)	CALCULATED ION SUM MAXIMUM (MEQ/L)	TOTAL DISSOLVED SOLIDS CALCULATED (MG/L)	TOTAL DISSOLVED SOLIDS MEASURED AT 180 C (MG/L)	PERCENT DIFFERENCE
	07/26/84	CS-3	5.11	5.03	-.45	.8	431	4.38	4.84	255	200	12.1
	08/28/84	CS-3	6.18	5.61	-2.84	4.8	530	5.4	5.97	298	288	1.7
	09/17/84	CS-3	5.83	5.76	-.36	.6	440	4.47	4.94	290	292	.4
	10/16/85	CS-3	5.24	5.36	.65	1.2	438	4.45	4.92	268	254	2.7
	05/28/86	CS-3	2.4	2.47	.53	1.6	221	2.22	2.46	125	150	9
	06/25/86	CS-3	3.99	3.88	-.64	1.4	367	3.72	4.11	195	210	3.7
	05/12/81	CS-4	3.1	3.27	1.11	2.7	225	2.26	2.5	164	235	17.8
	06/23/81	CS-4	3.44	3.41	-.17	.4	260	2.62	2.9	171	169	.6
	08/20/81	CS-4	4.74	4.72	-.14	.3	380	3.85	4.26	322	245	13.6
	09/25/81	CS-4	4.71	4.66	-.29	.5	360	3.65	4.03	232	233	.2
	10/22/81	CS-4	5.4	5.47	.39	.7	430	4.37	4.83	272	280	1.5
	11/11/81	CS-4	4.79	4.75	-.2	.4	380	3.85	4.26	246	245	.2
	12/08/81	CS-4	5.3	5.21	-.46	.8	450	4.49	4.96	282	286	.7
	06/29/82	CS-4	3.51	3.47	-.22	.5	295	2.89	3.19	190	195	1.4
	07/21/82	CS-4	3.67	3.74	.43	1	301	3.04	3.36	183	189	1.5
	08/19/82	CS-4	4.74	4.88	.81	1.5	310	3.13	3.46	243	239	.8
	09/14/82	CS-4	4.3	4.27	-.15	.3	360	3.65	4.03	209	225	3.6
	10/14/82	CS-4	5.15	5.17	.12	.2	305	3.08	3.41	268	269	.2
	06/29/83	CS-4	2.78	2.87	.55	1.5	237	2.39	2.64	141	154	4.6
	07/20/83	CS-4	3.81	3.87	.42	.9	331	3.35	3.7	199	198	.2
	08/24/83	CS-4	4.69	4.75	.37	.7	399	4.05	4.47	239	245	1.3
	09/28/83	CS-4	4.41	4.42	.07	.1	408	4.14	4.57	221	10.0	91.4
	10/26/83	CS-4	4.8	4.8	.01	0	403	4.09	4.52	246	240	1.2
	11/11/83	CS-4	4.49	4.43	-.34	.7	358	3.62	4.01	220	230	2.3
	05/24/84	CS-4	3.04	3.05	.06	.2	219	2.2	2.43	141	140	.5
	06/27/84	CS-4	3.27	3.21	-.44	1.1	312	3.15	3.48	163	185	6.3
	07/26/84	CS-4	3.79	3.7	-.56	1.2	316	3.19	3.53	190	199	2.3
	08/27/84	CS-4	6.79	6.57	-1.02	1.6	431	4.29	4.75	351	346	.8
	09/17/84	CS-4	4.99	4.93	-.34	.6	361	3.66	4.04	245	238	1.4
	10/16/85	CS-4	4.61	4.66	.31	.6	371	3.76	4.15	230	204	6.1
	05/28/86	CS-4	2.3	2.24	-.44	1.4	166	1.66	1.84	118	130	4.7
	06/25/86	CS-4	2.8	2.78	-.14	.4	273	2.75	3.04	139	150	4
	01/27/81	CS-6	6.11	6.1	-.04	.1	279	2.81	3.11	299	294	.8
	02/25/81	CS-6	5.62	5.57	-.25	.4	410	4.16	4.6	276	270	1
	03/11/81	CS-6	10.82	11.01	.7	.9	280	2.82	3.12	555	558	.2
	04/08/81	CS-6	6.04	5.99	-.28	.5	325	3.29	3.63	305	300	.8
	05/12/81	CS-6	4.73	4.8	.42	.8	360	3.65	4.03	239	235	.8
	06/23/81	CS-6	5.05	5	-.26	.5	390	3.95	4.37	245	250	.9
	07/29/81	CS-6	5.65	5.6	-.29	.5	490	4.74	5.24	321	315	1
	08/20/81	CS-6	6.44	6.36	-.39	.6	500	5.01	5.54	325	328	.5
	09/24/81	CS-6	5.58	5.67	.5	.9	430	4.37	4.83	275	283	1.5
	10/23/81	CS-6	6.99	7.06	.33	.5	650	6.64	7.34	353	420	8.6
	12/09/81	CS-6	6.53	6.5	-.15	.2	540	5.43	6	340	349	1.3

Calculated ion sum from Hydro regression.

HYDROMETRICS

DATE: 10-03-1986

WATER QUALITY DATA VALIDATION TEST
UTAH FUEL CO.

SAMPLE NUMBER	DATE SAMPLED	SITE	CATION SUM (MEQ/L)	ANION SUM (MEQ/L)	DEVIATION (SIGMA)	PERCENT DIFFERENCE	LAB. SPECIFIC CONDUCTANCE (UMHOS/CM)	CALCULATED ION SUM MINIMUM (MEQ/L)	CALCULATED ION SUM MAXIMUM (MEQ/L)	TOTAL DISSOLVED SOLIDS CALCULATED (MG/L)	TOTAL DISSOLVED SOLIDS MEASURED AT 180 C (MG/L)	PERCENT DIFFERENCE
	01/21/82	CS-6	5.89	5.96	.36	.6	460	4.68	5.17	293	299	1
	02/18/82	CS-6	7.05	6.97	-.37	.6	700	7.12	7.87	364	450	10.6
	03/31/82	CS-6	7.34	7.42	.38	.6	628	6.36	7.03	395	405	1.2
	04/15/82	CS-6	6.22	6.22	.01	0	602	6.08	6.73	317	338	3.2
	05/20/82	CS-6	3.93	3.93	.04	.1	324	3.28	3.62	196	198	.5
	06/30/82	CS-6	4.88	4.83	-.29	.5	400	3.97	4.39	255	258	.6
	07/22/82	CS-6	5.55	4.02	-8.47	16	420	4.26	4.71	220	275	11.1
	08/19/82	CS-6	6.1	6.24	.7	1.1	420	4.26	4.71	302	321	3.1
	09/14/82	CS-6	6.03	5.98	-.26	.4	395	4.01	4.43	298	313	2.4
	10/14/82	CS-6	6.23	6.27	.17	.3	540	5.5	6.08	313	318	.8
	11/10/82	CS-6	6.18	6.13	-.21	.3	643	6.57	7.26	309	322	2.1
	12/14/82	CS-6	6.38	6.32	-.3	.5	420	4.26	4.71	315	320	.8
	01/19/83	CS-6	6.62	6.59	-.16	.3	583	5.95	6.57	331	338	1.1
	02/15/83	CS-6	7.11	7.2	.41	.6	570	5.75	6.35	377	378	.1
	03/31/83	CS-6	7.18	7.35	.77	1.2	642	6.51	7.19	382	404	2.8
	04/21/83	CS-6	6.91	7.08	.78	1.2	781	7.98	8.82	369	414	5.8
	05/25/83	CS-6	3.77	3.81	.26	.6	342	3.46	3.82	195	234	9
	06/30/83	CS-6	4.56	4.59	.19	.4	405	4.11	4.54	233	256	4.7
	07/20/83	CS-6	5.51	5.58	.33	.6	528	5.38	5.94	277	284	1.3
	08/25/83	CS-6	6.06	6.19	.64	1.1	580	5.85	6.47	318	320	.3
	09/29/83	CS-6	6.07	6.01	-.33	.6	300	2.94	3.25	316	330	2.1
	10/26/83	CS-6	6.3	6.22	-.41	.7	576	5.81	6.42	321	350	4.3
	11/11/83	CS-6	6.43	6.36	-.35	.6	522	5.24	5.8	325	330	.7
	01/18/84	CS-6	6.62	6.86	1.12	1.7	606	6.13	6.77	354	395	5.4
	02/22/84	CS-6	7.35	7.42	.32	.5	617	6.24	6.9	384	380	.5
	03/22/84	CS-6	7.82	7.77	-.22	.3	634	6.42	7.1	399	420	2.5
	04/26/84	CS-6	17.62	17.56	-.16	.2	1786	20.8	22.99	962	1000	1.9
	05/17/84	CS-6	4.65	4.53	-.7	1.4	367	3.63	4.01	249	275	5
	06/29/84	CS-6	5.72	5.76	.23	.4	501	5.1	5.63	288	280	1.3
	07/27/84	CS-6	6.29	6.22	-.33	.5	558	5.62	6.21	314	380	9.4
	09/18/84	CS-6	6.7	6.58	-.59	.9	535	5.38	5.95	351	348	.4
	10/16/85	CS-6	6.61	6.52	-.43	.7	606	6.13	6.77	347	368	2.9
	03/20/86	CS-6	8.07	8.08	.06	.1	719	7.32	8.09	417	426	1
	04/17/86	CS-6	21.74	7.24	-9.99	50	2240	27.4	30.28	717	1282	28.3
	05/28/86	CS-6	3.58	3.48	-.57	1.3	286	2.89	3.19	182	208	6.7
	06/25/86	CS-6	5.08	5.01	-.35	.6	516	5.18	5.73	267	302	6.1
	05/13/81	CS-7	3.54	3.6	.37	.8	270	2.72	3.01	178	176	.7
	06/23/81	CS-7	3.49	3.44	-.31	.7	270	2.72	3.01	174	177	1
	07/30/81	CS-7	4.06	4.03	-.17	.4	320	3.23	3.58	205	210	1.3
	08/21/81	CS-7	4.42	4.36	-.35	.7	340	3.44	3.8	218	220	.4
	09/25/81	CS-7	3.9	3.91	.04	.1	300	3.03	3.35	188	198	2.5
	10/22/81	CS-7	5.88	5.95	.35	.6	450	4.57	5.05	299	300	.2
	11/10/81	CS-7	5.39	5.34	-.27	.5	440	4.39	4.85	296	298	.4
	12/08/81	CS-7	4.55	4.49	-.37	.7	310	3.04	3.36	237	200	8.5

Calculated ion sum from Hydro regression.

HYDROMETRICS

DATE: 10-03-1986

WATER QUALITY DATA VALIDATION TEST
UTAH FUEL CO.

SAMPLE NUMBER	DATE SAMPLED	SITE	CATION SUM (MEQ/L)	ANION SUM (MEQ/L)	DEVIATION (SIGMA)	PERCENT DIFFERENCE	LAB. SPECIFIC CONDUCTANCE (UMHOS/CM)	CALCULATED ION SUM MINIMUM (MEQ/L)	CALCULATED ION SUM MAXIMUM (MEQ/L)	TOTAL DISSOLVED SOLIDS CALCULATED (MG/L)	TOTAL DISSOLVED SOLIDS MEASURED AT 180 C (MG/L)	PERCENT DIFFERENCE
	08/17/82	CS-7	4.35	4.49	.81	1.6	368	3.73	4.12	218	228	2.3
	08/24/83	CS-7	4.35	4.29	-.36	.7	394	4	4.42	214	210	.9
	08/24/84	CS-7	5.33	4.84	-2.67	4.9	434	4.41	4.87	255	266	2
	05/13/81	CS-8	1.46	1.51	.31	1.4	115	1.14	1.27	78	75	1.9
	06/23/81	CS-8	2.13	2.08	-.39	1.3	170	1.7	1.88	109	110	.7
	07/30/81	CS-8	3.78	3.72	-.34	.8	290	2.93	3.24	192	189	.8
	08/21/81	CS-8	4.03	3.97	-.33	.7	325	3.29	3.63	208	211	.6
	09/24/81	CS-8	4.1	4.04	-.35	.7	320	3.23	3.58	204	210	1.5
	10/22/81	CS-8	3.95	3.98	.17	.4	300	3.03	3.35	202	198	.9
	11/10/81	CS-8	4.16	4.05	-.66	1.4	340	3.35	3.7	221	220	.3
	12/08/81	CS-8	3.44	3.45	.07	.2	285	2.88	3.18	174	185	2.9
	08/18/82	CS-8	3.65	3.77	.74	1.6	202	2.03	2.24	184	195	2.9
	08/24/83	CS-8	3.23	3.24	.02	.1	293	2.96	3.27	164	152	3.7
	08/24/84	CS-8	4.04	3.78	-1.58	3.4	328	3.32	3.67	198	200	.4
	01/27/81	CS-9	6.19	6.14	-.26	.4	283	2.86	3.16	306	302	.7
	04/08/81	CS-9	5.95	5.92	-.17	.3	202	2.03	2.24	303	300	.4
	05/12/81	CS-9	5.47	5.5	.14	.3	440	4.47	4.94	287	285	.3
	06/23/81	CS-9	5.08	5.23	.82	1.5	410	4.16	4.6	267	270	.6
	07/29/81	CS-9	4.92	4.98	.32	.6	380	3.85	4.26	252	250	.5
	08/20/81	CS-9	6.27	6.19	-.4	.6	500	5.01	5.54	324	325	.2
	09/25/81	CS-9	5.32	5.42	.55	1	450	4.57	5.05	274	288	2.4
	10/23/81	CS-9	6.83	6.87	.21	.3	520	5.29	5.85	341	340	.1
	11/10/81	CS-9	6.27	6.22	-.23	.4	500	5.09	5.62	323	330	1
	12/09/81	CS-9	6.34	6.29	-.2	.3	500	5.01	5.54	330	335	.7
	05/20/82	CS-9	4.21	4.25	.21	.4	321	3.25	3.59	215	218	.7
	06/30/82	CS-9	5.92	5.86	-.33	.6	500	5.01	5.54	314	310	.7
	07/21/82	CS-9	5.38	5.45	.37	.6	470	4.78	5.28	265	269	.8
	08/19/82	CS-9	6	6.12	.61	1	413	4.19	4.63	298	310	2
	09/15/82	CS-9	6.28	6.24	-.22	.4	394	4	4.42	319	325	.9
	10/14/82	CS-9	6.22	6.23	.06	.1	472	4.8	5.3	316	322	.9
	11/09/82	CS-9	6.01	5.97	-.21	.4	560	5.71	6.31	303	325	3.4
	06/30/83	CS-9	5.58	5.51	-.37	.6	472	4.8	5.3	293	294	.1
	07/20/83	CS-9	6.47	6.58	.55	.9	514	5.23	5.78	338	318	3
	08/25/83	CS-9	6.42	6.39	-.13	.2	572	5.83	6.45	334	332	.3
	09/28/83	CS-9	5.88	5.82	-.32	.5	570	5.81	6.42	301	304	.5
	10/26/83	CS-9	6.2	6.13	-.37	.6	565	5.76	6.37	314	320	.9
	11/11/83	CS-9	6.06	6.02	-.24	.4	488	4.96	5.49	307	320	2.1
	04/25/84	CS-9	5.37	5.33	-.2	.4	441	4.48	4.95	246	260	2.9
	05/17/84	CS-9	4.29	4.18	-.63	1.3	371	3.76	4.15	219	220	.3
	06/27/84	CS-9	5.32	5.2	-.62	1.1	443	4.42	4.88	276	298	3.9
	07/26/84	CS-9	5.79	5.73	-.3	.5	528	5.38	5.94	289	310	3.5
	08/28/84	CS-9	6.88	6.3	-2.76	4.4	629	6.42	7.1	330	339	1.4
	09/17/84	CS-9	6.39	6.32	-.33	.5	517	5.26	5.82	322	336	2.1
	10/16/85	CS-9	6.5	6.59	.42	.7	545	5.55	6.14	335	276	9.6

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WATER QUALITY DATA VALIDATION TEST
UTAH FUEL CO.

SAMPLE NUMBER	DATE SAMPLED	SITE	CATION SUM (MEQ/L)	ANION SUM (MEQ/L)	DEVIATION (SIGMA)	PERCENT DIFFERENCE	LAB. SPECIFIC CONDUCTANCE (UMHOS/CM)	CALCULATED ION SUM MINIMUM (MEQ/L)	CALCULATED ION SUM MAXIMUM (MEQ/L)	TOTAL DISSOLVED SOLIDS CALCULATED (MG/L)	TOTAL DISSOLVED SOLIDS MEASURED AT 180 C (MG/L)	PERCENT DIFFERENCE
	05/28/86	CS-9	3.98	3.9	-.48	1	365	3.7	4.09	205	232	6.2
	06/24/86	CS-9	4.99	4.92	-.4	.7	480	4.88	5.4	253	270	3.3
	05/12/81	CS-11	3.42	3.41	-.09	.2	250	2.52	2.78	169	165	1.3
	06/23/81	CS-11	3.81	4.83	5.88	11.8	290	2.93	3.24	219	190	7.1
	07/29/81	CS-11	3.95	3.92	-.22	.5	300	3.03	3.35	199	197	.6
	08/20/81	CS-11	4.64	4.57	-.41	.8	370	3.75	4.14	236	240	.8
	09/25/81	CS-11	4.61	4.57	-.25	.5	350	3.54	3.92	229	230	.2
	10/27/81	CS-11	5.4	5.49	.49	.9	450	4.57	5.05	281	280	.1
	11/11/81	CS-11	5.12	5.1	-.14	.3	470	4.78	5.28	263	304	7.3
	05/20/82	CS-11	2.88	2.85	-.23	.6	205	2.06	2.28	149	150	.4
	06/30/82	CS-11	3.42	3.34	-.49	1.2	270	2.72	3.01	172	179	2.1
	07/21/82	CS-11	4.76	4.85	.45	.8	296	2.99	3.3	234	235	.2
	08/19/82	CS-11	5.29	5.42	.67	1.2	380	3.85	4.26	265	268	.6
	09/15/82	CS-11	4.69	4.74	.31	.6	320	3.23	3.58	231	245	2.9
	10/14/82	CS-11	4.95	4.99	.21	.4	309	3.12	3.45	249	250	.2
	11/09/82	CS-11	5.09	5.06	-.2	.4	478	4.86	5.37	256	270	2.7
	06/29/83	CS-11	3.48	3.51	.15	.4	282	2.85	3.14	178	184	1.6
	07/20/83	CS-11	4.68	4.78	.56	1.1	375	3.8	4.2	246	240	1.2
	08/25/83	CS-11	4.84	4.88	.18	.3	454	4.61	5.1	241	248	1.5
	09/28/83	CS-11	4.88	4.81	-.33	.6	459	4.66	5.16	244	230	3
	10/26/83	CS-11	5.79	5.71	-.42	.7	443	4.42	4.88	304	300	.6
	11/11/83	CS-11	5.11	5.05	-.3	.6	403	4.09	4.52	251	260	1.8
	05/24/84	CS-11	3.35	3.3	-.33	.8	250	2.52	2.78	159	160	.2
	06/27/84	CS-11	5.09	4.91	-1.01	1.8	340	3.16	3.49	285	280	.9
	07/26/84	CS-11	4.41	4.32	-.53	1.1	362	3.67	4.05	228	230	.4
	08/28/84	CS-11	5.87	5.46	-2.12	3.6	504	5.13	5.67	280	310	5
	09/17/84	CS-11	5.36	5.45	.49	.9	401	4.07	4.5	272	262	1.9
	10/16/85	CS-11	5.36	5.31	-.26	.5	417	4.23	4.68	271	250	4
	05/28/86	CS-11	2.67	2.24	-3	8.8	194	1.95	2.15	118	128	3.9
	06/25/86	CS-11	3.37	3.34	-.22	.5	335	3.39	3.75	168	172	1.1
	11/30/83	CS-12	6.46	6.56	.45	.7	594	6	6.63	340	345	.7
	12/20/83	CS-12	5.67	5.59	-.4	.7	530	5.33	5.89	292	420	17.9
	01/18/84	CS-12	8.44	8.57	.58	.8	754	7.67	8.47	485	456	3.1
	02/21/84	CS-12	11.56	11.34	-.77	1	1015	9.59	10.6	678	700	1.6
	03/22/84	CS-12	11.26	5.39	-9.99	35.3	892	9.17	10.14	388	860	37.8
	04/25/84	CS-12	6.66	6.53	-.59	.9	570	5.75	6.35	336	339	.4
	05/17/84	CS-12	8.55	8.38	-.71	1	550	5.39	5.96	499	490	.9
	06/28/84	CS-12	9.74	9.64	-.4	.5	712	7.19	7.95	553	550	.3
	07/27/84	CS-12	7.82	7.93	.48	.7	708	7.15	7.9	445	358	10.9
	08/24/84	CS-12	7.83	7.12	-3.22	4.8	614	6.21	6.87	381	390	1.2
	09/27/84	CS-12	6.06	5.94	-.6	1	498	4.99	5.52	315	310	.8
	10/16/85	CS-12	6.84	6.92	.34	.5	589	5.95	6.57	385	364	2.8
	11/15/85	CS-12	8.75	8.7	-.19	.3	770	7.85	8.67	510	512	.2
	12/11/85	CS-12	6.62	6.77	.71	1.1	593	5.87	6.48	375	406	4

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UTAH FUEL CO.

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	01/22/86	CS-12	7.23	7.43	.92	1.4	698	7.03	7.78	447	502	5.8
	03/26/86	CS-12	8.79	8.63	-.67	.9	736	7.46	8.25	500	520	1.9
	04/17/86	CS-12	8.32	8.17	-.62	.9	789	8.06	8.91	485	542	5.5
	05/28/86	CS-12	7.01	6.94	-.33	.5	620	6.16	6.81	402	400	.3
	06/24/86	CS-12	7.62	7.42	-.88	1.3	728	7.37	8.15	443	496	5.6
	11/10/83	CS-13	7.57	7.49	-.38	.6	626	6.39	7.06	382	390	1
	11/11/83	CS-13	7.57	7.53	-.18	.3	599	6.11	6.76	384	420	4.5
	02/22/84	CS-13	8.28	8	-1.19	1.7	651	6.6	7.3	408	440	3.8
	03/22/84	CS-13	8.38	8.25	-.52	.7	656	6.66	7.36	424	480	6.2
	04/25/84	CS-13	9.01	8.89	-.48	.7	874	8.98	9.92	473	485	1.2
	05/17/84	CS-13	12.62	12.42	-.64	.8	803	8.22	9.09	701	665	2.6
	06/29/84	CS-13	8.26	8.2	-.24	.3	686	6.97	7.71	427	455	3.2
	07/27/84	CS-13	7.81	7.9	.42	.6	670	6.85	7.57	404	360	5.8
	08/24/84	CS-13	9.95	8.5	-5.83	7.9	742	7.59	8.39	460	480	2.1
	09/18/84	CS-13	8.42	8.29	-.56	.8	634	6.42	7.1	432	450	2.1
	10/16/85	CS-13	8.23	8.03	-.84	1.2	708	7.15	7.9	458	424	3.9
	04/17/86	CS-13	9.94	9.8	-.55	.7	850	8.72	9.64	527	535	.7
	05/28/86	CS-13	8.49	8.55	.25	.3	699	7.11	7.86	444	486	4.5
	06/25/86	CS-13	6.88	6.86	-.1	.2	697	7.09	7.84	358	426	8.7
	01/27/81	VC-9	5.85	5.89	.23	.4	265	2.67	2.95	287	285	.4
	02/25/81	VC-9	5.37	5.32	-.29	.5	380	3.85	4.26	246	246	0
	03/11/81	VC-9	5.37	5.32	-.3	.5	275	2.77	3.07	264	265	.2
	04/08/81	VC-9	5.61	5.55	-.33	.6	332	3.36	3.71	283	290	1.2
	05/12/81	VC-9	4.76	4.75	-.07	.1	370	3.75	4.14	246	245	.2
	06/23/81	VC-9	4.74	4.88	.77	1.4	380	3.85	4.26	244	248	.8
	07/29/81	VC-9	5.44	5.4	-.2	.4	410	4.16	4.6	269	268	.1
	08/20/81	VC-9	6.13	6.17	.17	.3	470	4.78	5.28	308	312	.7
	09/24/81	VC-9	5.48	5.59	.58	1	450	4.57	5.05	274	280	1.1
	10/23/81	VC-9	6.88	6.96	.38	.6	540	5.5	6.08	349	350	.1
	11/11/81	VC-9	5.76	5.72	-.21	.4	450	4.57	5.05	286	300	2.3
	12/09/81	VC-9	6.4	6.33	-.32	.5	510	5.19	5.74	322	330	1.2
	01/21/82	VC-9	5.66	5.73	.4	.7	450	4.57	5.05	280	291	2
	02/18/82	VC-9	6.6	6.68	.34	.5	550	5.54	6.12	341	355	2
	04/15/82	VC-9	6.99	6.88	-.51	.8	567	5.72	6.32	667	370	28.6
	05/20/82	VC-9	4.47	4.42	-.25	.5	322	3.26	3.6	232	235	.6
	06/30/82	VC-9	4.78	4.72	-.3	.6	400	3.97	4.39	250	253	.7
	07/22/82	VC-9	4.62	4.7	.44	.8	443	4.5	4.97	222	226	.9
	08/19/82	VC-9	5.74	5.71	-.14	.2	392	3.97	4.39	281	289	1.4
	09/14/82	VC-9	6.54	6.47	-.36	.6	410	4.08	4.5	329	335	.8
	10/14/82	VC-9	6.04	6.06	.12	.2	530	5.4	5.97	306	312	1
	11/10/82	VC-9	5.74	5.69	-.27	.5	520	5.29	5.85	282	295	2.3
	12/14/82	VC-9	6.19	6.16	-.17	.3	407	4.13	4.56	305	315	1.5
	01/19/83	VC-9	6.69	6.65	-.18	.3	574	5.85	6.47	336	368	4.6

Calculated ion sum from Hydro regression.

HYDROMETRICS

DATE: 10-03-1986

WATER QUALITY DATA VALIDATION TEST
UTAH FUEL CO.

SAMPLE NUMBER	DATE SAMPLED	SITE	CATION SUM (MEQ/L)	ANION SUM (MEQ/L)	DEVIATION (SIGMA)	PERCENT DIFFERENCE	LAB. SPECIFIC CONDUCTANCE (UMHOS/CM)	CALCULATED ION SUM MINIMUM (MEQ/L)	CALCULATED ION SUM MAXIMUM (MEQ/L)	TOTAL DISSOLVED SOLIDS CALCULATED (MG/L)	TOTAL DISSOLVED SOLIDS MEASURED AT 180 C (MG/L)	PERCENT DIFFERENCE
	02/15/83	VC-9	6.86	6.97	.49	.8	566	5.71	6.31	359	365	.8
	03/31/83	VC-9	7.03	7.19	.73	1.1	624	6.32	6.98	373	394	2.7
	04/21/83	VC-9	6.84	6.82	-.06	.1	793	8.11	8.97	361	388	3.6
	05/25/83	VC-9	3.98	4.09	.63	1.3	356	3.6	3.98	206	288	16.6
	06/30/83	VC-9	4.75	4.83	.45	.8	397	4.03	4.45	246	262	3.2
	07/20/83	VC-9	6.15	6.26	.54	.9	527	5.3	5.85	326	320	.9
	08/25/83	VC-9	5.69	5.77	.4	.7	573	5.86	6.48	291	295	.7
	09/29/83	VC-9	6	5.93	-.32	.5	597	6.03	6.67	313	316	.5
	10/26/83	VC-9	6.71	6.65	-.32	.5	574	5.79	6.4	357	360	.4
	11/10/83	VC-9	6.21	6.26	.24	.4	516	5.18	5.73	321	340	2.8
	12/14/83	VC-9	8.02	7.95	-.3	.4	652	6.61	7.31	425	450	2.9
	01/18/84	VC-9	6.51	6.5	-.08	.1	593	5.99	6.62	334	338	.6
	02/22/84	VC-9	7.4	7.29	-.52	.8	575	5.8	6.41	379	380	.1
	03/22/84	VC-9	7.36	7.29	-.31	.5	625	6.33	6.99	371	460	10.7
	04/26/84	VC-9	16.28	16.34	.18	.2	1604	18.16	20.07	896	850	2.6
	05/17/84	VC-9	13.17	12.92	-.81	1	363	3.4	3.75	768	750	1.2
	06/29/84	VC-9	6.21	6.15	-.3	.5	491	4.92	5.44	318	198	23.2
	07/27/84	VC-9	8.75	8.56	-.8	1.1	560	5.64	6.24	487	280	27
	08/28/84	VC-9	7.42	7.2	-1.02	1.5	661	6.71	7.41	367	380	1.7
	09/18/84	VC-9	6.65	6.77	.6	.9	531	5.34	5.9	352	362	1.4
	10/16/85	VC-9	7.19	7.33	.68	1	576	5.81	6.42	398	390	1
	11/19/85	VC-9	10.59	10.6	.02	0	970	10.15	11.22	579	586	.6
	12/11/85	VC-9	7.37	7.48	.52	.8	664	6.74	7.45	394	420	3.3
	01/23/86	VC-9	6.81	6.63	-.85	1.3	682	6.93	7.66	349	402	7.1
	02/20/86	VC-9	8.88	8.81	-.25	.3	744	7.55	8.35	482	490	.9
	03/20/86	VC-9	7.81	7.94	.57	.8	763	7.79	8.61	416	432	1.8
	04/17/86	VC-9	23.29	8.11	-9.99	48.4	2280	27.98	30.93	796	1320	24.7
	05/28/86	VC-9	3.85	3.95	.57	1.2	296	2.9	3.21	210	204	1.5
	06/25/86	VC-9	5.29	5.22	-.41	.7	526	5.29	5.84	277	292	2.7
	05/12/81	VC-10	3.56	3.63	.43	1	280	2.82	3.12	177	184	1.9
	06/23/81	VC-10	3.81	3.85	.19	.4	220	2.21	2.44	188	144	13.3
	07/29/81	VC-10	4.26	4.23	-.19	.4	340	3.44	3.8	211	210	.2
	08/20/81	VC-10	4.52	4.46	-.35	.7	350	3.54	3.92	223	223	.1
	09/24/81	VC-10	4.14	4.2	.33	.7	310	3.13	3.46	200	214	3.4
	10/23/81	VC-10	5.69	5.78	.47	.8	440	4.47	4.94	282	288	1.1
	11/11/81	VC-10	4.93	4.88	-.25	.5	380	3.85	4.26	244	249	1.1
	12/09/81	VC-10	5.15	5.17	.13	.2	400	4.06	4.48	254	265	2.1
	05/20/82	VC-10	3.55	3.51	-.24	.6	241	2.43	2.68	176	188	3.2
	06/30/82	VC-10	3.48	3.41	-.44	1	300	3.03	3.35	175	185	2.9
	07/22/82	VC-10	5	5.06	.34	.6	387	3.92	4.34	242	244	.3
	08/20/82	VC-10	5.8	5.78	-.12	.2	403	4	4.42	295	305	1.6
	09/14/82	VC-10	6.19	6.15	-.22	.4	470	4.7	5.19	325	328	.5
	10/14/82	VC-10	6.64	6.68	.17	.3	523	5.25	5.81	346	350	.5
	11/09/82	VC-10	6.51	6.4	-.57	.9	575	5.8	6.41	336	355	2.7

Calculated ion sum from Hydro regression.

HYDROMETRICS

DATE: 10-03-1984

WATER QUALITY DATA VALIDATION TEST
UTAH FUEL CO.

SAMPLE NUMBER	DATE SAMPLED	SITE	CATION SUM (MEQ/L)	ANION SUM (MEQ/L)	DEVIATION (SIGMA)	PERCENT DIFFERENCE	LAB. SPECIFIC CONDUCTANCE (UMHOS/CM)	CALCULATED ION SUM MINIMUM (MEQ/L)	CALCULATED ION SUM MAXIMUM (MEQ/L)	TOTAL DISSOLVED SOLIDS CALCULATED (MG/L)	TOTAL DISSOLVED SOLIDS MEASURED AT 180 C (MG/L)	PERCENT DIFFERENCE
	12/14/82	VC-10	6.61	6.57	-.18	.3	410	4.16	4.6	338	342	.6
	01/19/83	VC-10	6.64	6.6	-.2	.3	594	6	6.63	344	356	1.7
	02/15/83	VC-10	6.93	7.02	.42	.7	576	5.81	6.42	373	380	.9
	03/31/83	VC-10	6.68	6.79	.52	.8	560	5.64	6.24	359	365	.8
	04/21/83	VC-10	5.96	6.07	.55	.9	654	6.63	7.33	316	326	1.6
	05/25/83	VC-10	3.78	3.74	-.25	.5	330	3.34	3.69	189	228	9.3
	06/30/83	VC-10	3.92	3.95	.22	.5	282	2.85	3.14	200	212	2.9
	07/20/83	VC-10	5.27	5.25	-.1	.2	434	4.41	4.87	272	270	.4
	08/25/83	VC-10	5.61	5.71	.49	.8	544	5.54	6.13	288	291	.5
	09/29/83	VC-10	5.8	5.73	-.34	.6	538	5.41	5.98	300	300	.1
	10/26/83	VC-10	6.21	6.12	-.45	.7	510	5.12	5.66	329	326	.4
	11/11/83	VC-10	6.08	6.16	.38	.6	482	4.82	5.33	317	360	6.3
	12/14/83	VC-10	6.39	6.33	-.29	.5	501	5.02	5.55	333	440	13.8
	02/22/84	VC-10	8.21	8.04	-.75	1.1	527	5.3	5.85	439	340	12.7
	03/22/84	VC-10	6.77	6.7	-.32	.5	535	5.38	5.95	346	360	2
	04/26/84	VC-10	5.78	5.81	.16	.3	453	4.6	5.09	283	275	1.4
	05/17/84	VC-10	6.09	5.92	-.86	1.4	320	3.15	3.48	347	320	4
	06/28/84	VC-10	4.9	4.89	-.04	.1	373	3.78	4.18	251	200	11.4
	07/27/84	VC-10	6.04	5.9	-.72	1.2	542	5.45	6.03	309	320	1.8
	08/28/84	VC-10	6.75	6.43	-1.53	2.4	626	6.34	7.01	345	340	.7
	10/16/85	VC-10	7.39	7.3	-.38	.6	552	5.56	6.14	387	365	2.9
	04/17/86	VC-10	5.34	5.41	.38	.7	490	4.98	5.51	273	276	.5
	05/28/86	VC-10	3.25	3.2	-.31	.8	252	2.54	2.81	164	170	1.8
	06/25/86	VC-10	4.55	4.47	-.44	.9	439	4.46	4.93	230	256	5.2
	07/23/86	VC-10	5.42	5.36	-.31	.5	519	5.21	5.76	278	284	1.1

Calculated ion sum from Hydro regression.

STATISTICAL SUMMARY OF WATER QUALITY ANALYSIS
FOR SITE VC-6 FOR THE PERIOD 01/27/81 TO 06/25/8

	RANGE	MEAN	STANDARD DEVIATION	NUMBER OF SAMPLES
AIR TEMPERATURE (C)	-24-26	6.75	10.85	48
PHYSICAL PARAMETERS				
FLOW (CFS)	.5-25.4	3.24	6.03	27
WATER TEMPERATURE (C)	0-14.5	5.35	4.38	48
SPEC. COND. (UMHOS/CM) FIELD	248-658	462	116	48
PH FIELD	7.3-8.6	7.98	.26	48
TURBIDITY (NTU) FIELD	.70-103	38.06	33.43	40
TOTAL SUSP. SOLIDS	1-1868	116	289	48
TOTAL DISS. SOLIDS MEAS.	179-620	316	76.84	48
TOTAL SETTLEABLE SOLIDS	.4	.4	0	1
OXYGEN (O) DISS	6-11.4	9.14	1.85	9
COMMON IONS				
TOTAL HARDNESS AS CACO3	188	188	0	1
CALCIUM (CA)	20.8-160	72.42	21.23	48
MAGNESIUM (MG)	2.16-51.84	19.09	8.71	48
SODIUM (NA)	2.4-86	14.94	15.82	48
POTASSIUM (K)	.55-4.4	1.95	.725	48
ACIDITY AS CACO3	<.01-27	6.5	10.76	6
ALKALINITY AS CACO3 (LAB)	143-294	237	45.9	10
BICARBONATE (HCO3) (LAB)	15-359	277	57.62	48
CARBONATE AS CO3 (LAB)	7.2	7.2	0	1
SULFATE (SO4)	<3-319	50.12	51.87	48
CHLORIDE (CL)	.6-37.5	10.09	8.72	47
FLUORIDE (F)	.15-.26	.19	.044	5
NUTRIENTS				
NITRATE (NO3-N)	.24-.54	.374	.129	5
NITRITE (NO2-N)	.03	.03	0	1
AMMONIA (NH3 AS N)	<.01-.62	.145	.194	20
TOTAL PHOSPHATE (PO4)	.02-1.28	.289	.329	19
TRACE ELEMENTS				
ALUMINUM (AL) TOTAL	<.001	<.001	0	1
ARSENIC (AS) TOTAL	<.001	<.001	0	3
ARSENIC (AS) DISS	<.001	<.001	0	3
BARIUM (BA) TOTAL	.03-.055	.046	.0096	5
BARIUM (BA) DISS	.018-.045	.031	.014	3
BORON (B) TOTAL	.012-.03	.023	.0076	5
BORON (B) DISS	.01-.02	.017	.0058	3
CADMIUM (CD) TOTAL	<.001	<.001	0	3
CADMIUM (CD) DISS	<.001	<.001	0	3
CHROMIUM (CR) TOTAL	<.001	<.001	0	3
CHROMIUM (CR) DISS	<.001	<.001	0	3

ALL QUANTITIES IN MILLIGRAMS PER LITER UNLESS OTHERWISE NOTED.
FOR VALUES BELOW THE DETECTION LIMIT, ONE HALF THE DETECTION LIMIT WAS USED IN THE STATISTICAL ANALYSIS.
IF THE RESULTING MEAN WAS BELOW THE RANGE THEN THE LOW RANGE VALUE WAS USED FOR THE MEAN.
OUTPUT DATE: 02-10-1987 HWQ-6/86-R.ST.1

STATISTICAL SUMMARY OF WATER QUALITY ANALYSIS
FOR SITE VC-6 FOR THE PERIOD 01/27/81 TO 06/25/86

	RANGE	MEAN	STANDARD DEVIATION	NUMBER OF SAMPLES
TRACE ELEMENTS				
COPPER (CU) TOTAL	<.001-.018	.01	.0064	5
COPPER (CU) DISS	<.001	<.001	0	3
IRON (FE) TOTAL	.01-28	1.87	4.8	48
LEAD (PB) TOTAL	<.001-.004	.0015	.0015	5
LEAD (PB) DISS	<.001	<.001	0	3
MANGANESE (MN) TOTAL	.01-1.05	.182	.193	43
MERCURY (HG) TOTAL	<.0002	<.0002	0	3
MOLYBDENUM (MO) TOTAL	<.001	<.001	0	1
NICKEL (NI) TOTAL	<.001	<.001	0	1
SELENIUM (SE) TOTAL	<.001	<.001	0	3
SELENIUM (SE) DISS	<.001	<.001	0	3
SILVER (AG) TOTAL	<.001	<.001	0	3
SILVER (AG) DISS	<.001	<.001	0	3
ZINC (ZN) TOTAL	.012-.028	.02	.0077	4
ZINC (ZN) DISS	.007-.02	.012	.0068	3
BACTERIOLOGICAL PARAMETERS				
FECAL COLIFORM (NO./100ML)	2-23	12.5	14.85	2
TOTAL COLIFORM (NO./100ML)	200-1300	750	778	2
5 - DAY BOD	2.3-2.6	2.45	.212	2
ORGANIC PARAMETERS				
ORGANIC CARBON (TOTAL)	.4-11.9	3.98	4.63	5
PHENOLS	<.001-.266	.021	.066	16
OTHER PARAMETERS				
OIL AND GREASE	<.01-2.8	.851	.955	10
CYANIDE (CN)	<.001-.002	<.001	.0007	5
SULFIDE	1.2	1.2	0	1

ALL QUANTITIES IN MILLIGRAMS PER LITER UNLESS OTHERWISE NOTED.
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IF THE RESULTING MEAN WAS BELOW THE RANGE THEN THE LOW RANGE VALUE WAS USED FOR THE MEAN.
OUTPUT DATE: 02-10-1987 HWQ-6/86-R.ST.1

STATISTICAL SUMMARY OF WATER QUALITY ANALYSIS
FOR SITE VC-6 FOR THE PERIOD 01/27/81 TO 06/25/86

	RANGE	MEAN	STANDARD DEVIATION	NUMBER OF SAMPLES
PHYSICAL PARAMETERS				
AIR TEMPERATURE (C)	-24-26	6.75	10.85	48
FLOW (CFS)	.5-25.4	3.24	6.03	27
WATER TEMPERATURE (C)	0-14.5	5.35	4.38	48
SPEC. COND. (UMHOS/CM) FIELD	248-658	462	116	48
PH FIELD	7.3-8.6	7.98	.26	48
TURBIDITY (NTU) FIELD	.70-103	38.06	33.43	40
TOTAL SUSP. SOLIDS	1-1868	116	289	48
TOTAL DISS. SOLIDS MEAS.	179-620	316	76.84	48
TOTAL SETTLEABLE SOLIDS	.4	.4	0	1
OXYGEN (O) DISS	6-11.4	9.14	1.85	9
COMMON IONS				
TOTAL HARDNESS AS CACO3	188	188	0	1
CALCIUM (CA)	20.8-160	72.42	21.23	48
MAGNESIUM (MG)	2.16-51.84	19.09	8.71	48
SODIUM (NA)	2.4-86	14.94	15.82	48
POTASSIUM (K)	.55-4.4	1.95	.725	48
ACIDITY AS CACO3	<.01-27	6.5	10.76	6
ALKALINITY AS CACO3 (LAB)	143-294	237	45.9	10
BICARBONATE (HCO3) (LAB)	15-359	277	57.62	48
CARBONATE AS CO3 (LAB)	7.2	7.2	0	1
SULFATE (SO4)	<3-319	50.12	51.87	48
CHLORIDE (CL)	.6-37.5	10.09	8.72	47
FLUORIDE (F)	.15-.26	.19	.044	5
NUTRIENTS				
NITRATE (NO3-N)	.24-.54	.374	.129	5
NITRITE (NO2-N)	.03	.03	0	1
AMMONIA (NH3 AS N)	<.01-.62	.145	.194	20
TOTAL PHOSPHATE (PO4)	.02-1.28	.289	.329	19
TRACE ELEMENTS				
ALUMINUM (AL) TOTAL	<.001	<.001	0	1
ARSENIC (AS) TOTAL	<.001	<.001	0	3
ARSENIC (AS) DISS	<.001	<.001	0	3
BARIUM (BA) TOTAL	.03-.055	.046	.0096	5
BARIUM (BA) DISS	.018-.045	.031	.014	3
BORON (B) TOTAL	.012-.03	.023	.0076	5
BORON (B) DISS	.01-.02	.017	.0058	3
CADMIUM (CD) TOTAL	<.001	<.001	0	3
CADMIUM (CD) DISS	<.001	<.001	0	3
CHROMIUM (CR) TOTAL	<.001	<.001	0	3
CHROMIUM (CR) DISS	<.001	<.001	0	3

ALL QUANTITIES IN MILLIGRAMS PER LITER UNLESS OTHERWISE NOTED.
FOR VALUES BELOW THE DETECTION LIMIT, ONE HALF THE DETECTION LIMIT WAS USED IN THE STATISTICAL ANALYSIS.
IF THE RESULTING MEAN WAS BELOW THE RANGE THEN THE LOW RANGE VALUE WAS USED FOR THE MEAN.
OUTPUT DATE: 02-10-1987 HWQ-6/86-R.ST.1

STATISTICAL SUMMARY OF WATER QUALITY ANALYSIS
FOR SITE VC-6 FOR THE PERIOD 01/27/81 TO 06/25/86

	RANGE	MEAN	STANDARD DEVIATION	NUMBER OF SAMPLES
TRACE ELEMENTS				
COPPER (CU) TOTAL	<.001-.018	.01	.0064	5
COPPER (CU) DISS	<.001	<.001	0	3
IRON (FE) TOTAL	.01-28	1.87	4.8	48
LEAD (PB) TOTAL	<.001-.004	.0015	.0015	5
LEAD (PB) DISS	<.001	<.001	0	3
MANGANESE (MN) TOTAL	.01-1.05	.182	.193	43
MERCURY (HG) TOTAL	<.0002	<.0002	0	3
MOLYBDENUM (MO) TOTAL	<.001	<.001	0	1
NICKEL (NI) TOTAL	<.001	<.001	0	1
SELENIUM (SE) TOTAL	<.001	<.001	0	3
SELENIUM (SE) DISS	<.001	<.001	0	3
SILVER (AG) TOTAL	<.001	<.001	0	3
SILVER (AG) DISS	<.001	<.001	0	3
ZINC (ZN) TOTAL	.012-.028	.02	.0077	4
ZINC (ZN) DISS	.007-.02	.012	.0068	3
BACTERIOLOGICAL PARAMETERS				
FECAL COLIFORM (NO./100ML)	2-23	12.5	14.85	2
TOTAL COLIFORM (NO./100ML)	200-1300	750	778	2
5 - DAY BOD	2.3-2.6	2.45	.212	2
ORGANIC PARAMETERS				
ORGANIC CARBON (TOTAL)	.4-11.9	3.98	4.63	5
PHENOLS	<.001-.266	.021	.066	16
OTHER PARAMETERS				
OIL AND GREASE	<.01-2.8	.851	.955	10
CYANIDE (CN)	<.001-.002	<.001	.0007	5
SULFIDE	1.2	1.2	0	1

ALL QUANTITIES IN MILLIGRAMS PER LITER UNLESS OTHERWISE NOTED.
FOR VALUES BELOW THE DETECTION LIMIT, ONE HALF THE DETECTION LIMIT WAS USED IN THE STATISTICAL ANALYSIS.
IF THE RESULTING MEAN WAS BELOW THE RANGE THEN THE LOW RANGE VALUE WAS USED FOR THE MEAN.
OUTPUT DATE: 02-10-1987 HWQ-6/86-R.ST.1

STATISTICAL SUMMARY OF WATER QUALITY ANALYSIS
FOR SITE VC-9 FOR THE PERIOD 01/27/81 TO 06/25/86

	RANGE	MEAN	STANDARD DEVIATION	NUMBER OF SAMPLES
PHYSICAL PARAMETERS				
AIR TEMPERATURE (C)	-22-28	7.35	10.88	54
FLOW (CFS)	2.3-3.8	2.8	.688	4
WATER TEMPERATURE (C)	0-15	5.64	4.27	54
SPEC. COND. (UMHOS/CM) FIELD	265-2280	568	312	54
PH FIELD	7.6-8.4	7.99	.227	54
TURBIDITY (NTU) FIELD	.44-103	37.81	33.69	43
TOTAL SUSP. SOLIDS	1-4166	193	602	54
TOTAL DISS. SOLIDS MEAS.	198-1320	365	176	54
TOTAL SETTLEABLE SOLIDS	.6	.6	0	1
OXYGEN (O) DISS	3.4-10.9	9.23	2.17	10
COMMON IONS				
TOTAL HARDNESS AS CACO3	228	228	0	1
CALCIUM (CA)	20.2-140	71.66	18.24	54
MAGNESIUM (MG)	4.8-72	25.66	9.68	54
SODIUM (NA)	2.4-394	27.13	60.63	54
POTASSIUM (K)	.78-6.9	2.45	1.01	54
ACIDITY AS CACO3	<.01-16	3.67	6.25	6
ALKALINITY AS CACO3 (LAB)	178-319	245	33.74	14
BICARBONATE (HCO3) (LAB)	168-389	282	39.65	54
CARBONATE AS CO3 (LAB)	2.4	2.4	0	1
SULFATE (SO4)	4-426	58.9	58.73	54
CHLORIDE (CL)	3.3-392	26.93	56.59	53
FLUORIDE (F)	.15-.26	.195	.039	6
NUTRIENTS				
NITRATE (NO3-N)	<.01-.16	.052	.057	6
NITRITE (NO2-N)	.01	.01	0	1
AMMONIA (NH3 AS N)	<.01-2.46	.277	.567	23
TOTAL PHOSPHATE (PO4)	<.001-.85	.19	.241	23
TRACE ELEMENTS				
ALUMINUM (AL) TOTAL	.2	.2	0	1
ARSENIC (AS) TOTAL	<.001-.002	.001	.0009	3
ARSENIC (AS) DISS	<.001	<.001	0	3
BARIUM (BA) TOTAL	.04-.08	.062	.014	6
BARIUM (BA) DISS	.02-.05	.04	.017	3
BORON (B) TOTAL	.014-.044	.03	.01	6
BORON (B) DISS	.006-.03	.019	.012	3
CADMIUM (CD) TOTAL	<.001	<.001	0	3
CADMIUM (CD) DISS	<.001	<.001	0	3
CHROMIUM (CR) TOTAL	<.001	<.001	0	3
CHROMIUM (CR) DISS	<.001-<.01	.002	.0026	3

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IF THE RESULTING MEAN WAS BELOW THE RANGE THEN THE LOW RANGE VALUE WAS USED FOR THE MEAN.
OUTPUT DATE: 02-10-1987 HWQ-6/86-R.ST.1

STATISTICAL SUMMARY OF WATER QUALITY ANALYSIS
FOR SITE VC-9 FOR THE PERIOD 01/27/81 TO 06/25/86

	RANGE	MEAN	STANDARD DEVIATION	NUMBER OF SAMPLES
TRACE ELEMENTS				
COPPER (CU) TOTAL	.01-.04	.018	.011	6
COPPER (CU) DISS	<.001-.01	.0037	.0055	3
IRON (FE) TOTAL	.01-36.2	2.29	5.66	57
LEAD (PB) TOTAL	<.001-.004	.0021	.0018	6
LEAD (PB) DISS	<.001	<.001	0	3
MANGANESE (MN) TOTAL	.043-1	.151	.162	54
MERCURY (HG) TOTAL	<.0002	<.0002	0	4
MOLYBDENUM (MO) TOTAL	<.001	<.001	0	1
NICKEL (NI) TOTAL	<.001	<.001	0	1
SELENIUM (SE) TOTAL	<.001-.002	.001	.0009	3
SELENIUM (SE) DISS	<.001	<.001	0	3
SILVER (AG) TOTAL	<.001	<.001	0	3
SILVER (AG) DISS	<.001	<.001	0	3
ZINC (ZN) TOTAL	.01-.03	.018	.0091	5
ZINC (ZN) DISS	.005-.01	.0083	.0029	3
BACTERIOLOGICAL PARAMETERS				
FECAL COLIFORM (NO./100ML)	<2-23	12	15.56	2
TOTAL COLIFORM (NO./100ML)	2300-3300	2800	707	2
5 - DAY BOD	1.2-3	2.1	1.27	2
ORGANIC PARAMETERS				
ORGANIC CARBON (TOTAL)	.23-19	8.39	6.92	6
PHENOLS	<.001-.74	.04	.154	23
OTHER PARAMETERS				
OIL AND GREASE	<.1-16	1.69	4.34	13
CYANIDE (CN)	<.001-.026	.0048	.01	6

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OUTPUT DATE: 02-10-1987 HWQ-6/86-R.ST.1

STATISTICAL SUMMARY OF WATER QUALITY ANALYSIS
FOR SITE VC-10 FOR THE PERIOD 05/12/81 TO 07/23/86

	RANGE	MEAN	STANDARD DEVIATION	NUMBER OF SAMPLES
PHYSICAL PARAMETERS				
AIR TEMPERATURE (C)	-9-24	8.85	8.84	41
FLOW (CFS)	.22-14.43	2.7	3.94	24
WATER TEMPERATURE (C)	0-14	4.93	4.33	41
SPEC. COND. (UMHOS/CM) FIELD	220-654	443	114	41
PH FIELD	7.5-8.6	8.04	.261	41
TURBIDITY (NTU) FIELD	.38-100	16.64	22.63	36
TOTAL SUSP. SOLIDS	1-244	26.29	51.25	40
TOTAL DISS. SOLIDS MEAS.	144-440	286	69.16	40
TOTAL SETTLEABLE SOLIDS	.2	.2	0	1
OXYGEN (O) DISS	5.6-10.8	9.09	1.7	7
COMMON IONS				
TOTAL HARDNESS AS CACO3	170	170	0	1
CALCIUM (CA)	43.2-120	71.4	17.34	40
MAGNESIUM (MG)	<.1-30.96	19.55	6.77	40
SODIUM (NA)	.90-26	6.38	6.39	41
POTASSIUM (K)	.22-5.5	1.42	.822	40
ACIDITY AS CACO3	<.01-20	4.67	7.79	6
ALKALINITY AS CACO3 (LAB)	166-274	220	34.07	10
BICARBONATE (HCO3) (LAB)	165-335	262	43.74	40
CARBONATE AS CO3 (LAB)	4.8	4.8	0	1
SULFATE (SO4)	3-133	49.39	33.97	40
CHLORIDE (CL)	1-18	5.02	3.82	40
FLUORIDE (F)	.13-.22	.167	.033	6
NUTRIENTS				
NITRATE (NO3-N)	<.02-.16	.068	.054	6
NITRITE (NO2-N)	.02	.02	0	1
AMMONIA (NH3 AS N)	<.01-.66	.216	.235	18
TOTAL PHOSPHATE (PO4)	<.01-1.1	.225	.317	17
TRACE ELEMENTS				
ALUMINUM (AL) TOTAL	<.001	<.001	0	1
ARSENIC (AS) TOTAL	<.001	<.001	0	3
ARSENIC (AS) DISS	<.001	<.001	0	3
BARIUM (BA) TOTAL	.025-.065	.04	.015	6
BARIUM (BA) DISS	.02-.045	.03	.013	3
BORON (B) TOTAL	<.001-.055	.025	.018	6
BORON (B) DISS	<.001-.015	.0085	.0074	3
CADMIUM (CD) TOTAL	<.001	<.001	0	3
CADMIUM (CD) DISS	<.001	<.001	0	3
CHROMIUM (CR) TOTAL	<.001	<.001	0	3
CHROMIUM (CR) DISS	<.001	<.001	0	3

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OUTPUT DATE: 02-10-1987 HWQ-6/86-R.ST.1

STATISTICAL SUMMARY OF WATER QUALITY ANALYSIS
FOR SITE VC-10 FOR THE PERIOD 05/12/81 TO 07/23/86

	RANGE	MEAN	STANDARD DEVIATION	NUMBER OF SAMPLES
TRACE ELEMENTS				
COPPER (CU) TOTAL	<.001-.02	.0073	.008	6
COPPER (CU) DISS	<.001	<.001	0	3
IRON (FE) TOTAL	.03-3.51	.457	.713	43
LEAD (PB) TOTAL	<.001-.06	.011	.024	6
LEAD (PB) DISS	<.001-.002	.001	.0009	3
MANGANESE (MN) TOTAL	.007-.18	.049	.04	40
MERCURY (HG) TOTAL	<.0002	<.0002	0	3
MOLYBDENUM (MO) TOTAL	<.001	<.001	0	1
NICKEL (NI) TOTAL	<.001	<.001	0	1
SELENIUM (SE) TOTAL	<.001	<.001	0	3
SELENIUM (SE) DISS	<.001	<.001	0	3
SILVER (AG) TOTAL	<.001-.02	.007	.011	3
SILVER (AG) DISS	<.001	<.001	0	3
ZINC (ZN) TOTAL	.003-.045	.02	.019	5
ZINC (ZN) DISS	.005-.035	.015	.017	3
BACTERIOLOGICAL PARAMETERS				
FECAL COLIFORM (NO./100ML)	5-70	37.5	45.96	2
TOTAL COLIFORM (NO./100ML)	11-330	171	226	2
5 - DAY BOD	1-5.1	3.05	2.9	2
ORGANIC PARAMETERS				
ORGANIC CARBON (TOTAL)	<.01-5.8	2.67	2.61	6
PHENOLS	<.001-.036	.0034	.0084	18
OTHER PARAMETERS				
OIL AND GREASE	<.01-1.6	.42	.556	13
CYANIDE (CN)	<.001-.005	.0013	.0018	6
SULFIDE	1.2	1.2	0	1

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OUTPUT DATE: 02-10-1987 HWQ-6/86-R.ST.1

STATISTICAL SUMMARY OF WATER QUALITY ANALYSIS
FOR SITE CS-1 FOR THE PERIOD 05/12/81 TO 06/19/86

	RANGE	MEAN	STANDARD DEVIATION	NUMBER OF SAMPLES
PHYSICAL PARAMETERS				
AIR TEMPERATURE (C)	-2-24	11.75	7.4	22
FLOW (CFS)	.14-3.85	.862	1.08	22
WATER TEMPERATURE (C)	0-13	6.8	3.91	22
SPEC. COND. (UMHOS/CM) FIELD	182-704	449	128	22
PH FIELD	7.4-8.6	7.98	.324	22
TURBIDITY (NTU) FIELD	3.1-24	11.86	6.41	16
TOTAL SUSP. SOLIDS	1-14	9.5	3.86	16
TOTAL DISS. SOLIDS MEAS.	188-480	326	88.27	16
OXYGEN (O) DISS	7.2-8.2	7.8	.529	3
COMMON IONS				
CALCIUM (CA)	52-94	75.21	13.33	16
MAGNESIUM (MG)	9.1-33.6	21.66	7.15	16
SODIUM (NA)	1.8-55	9.45	13.19	16
POTASSIUM (K)	.62-3	1.47	.758	16
ACIDITY AS CACO3	4-23	10.33	10.97	3
ALKALINITY AS CACO3 (LAB)	210-250	236	18.95	4
BICARBONATE (HCO3) (LAB)	176-314	265	45.51	16
SULFATE (SO4)	22-134	64.38	33.88	16
CHLORIDE (CL)	.6-50	7.93	12.06	16
FLUORIDE (F)	.09-.27	.17	.092	3
NUTRIENTS				
NITRATE (NO3-N)	<.02-.11	.075	.044	4
AMMONIA (NH3 AS N)	<.01-.8	.289	.265	9
TOTAL PHOSPHATE (PO4)	.005-.25	.075	.079	9
TRACE ELEMENTS				
BARIUM (BA) TOTAL	.032-.04	.036	.004	3
BORON (B) TOTAL	.01-.107	.047	.052	3
COPPER (CU) TOTAL	<.001-.018	.0095	.0088	3
IRON (FE) TOTAL	<.01-.35	.192	.121	16
LEAD (PB) TOTAL	<.001-.002	.001	.0009	3
MANGANESE (MN) TOTAL	.005-.12	.018	.028	16
ZINC (ZN) TOTAL	.005-.2	.102	.138	2
ORGANIC PARAMETERS				
ORGANIC CARBON (TOTAL)	2.1-11.7	5.43	5.43	3
PHENOLS	<.001-.171	.032	.063	9
OTHER PARAMETERS				
OIL AND GREASE	<.1-1.6	.739	.615	9
CYANIDE (CN) TOTAL	.008	.008	0	1

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OUTPUT DATE: 02-10-1987 HWQ-6/86-R.ST.1

STATISTICAL SUMMARY OF WATER QUALITY ANALYSIS
FOR SITE CS-1 FOR THE PERIOD 05/12/81 TO 06/19/86

	RANGE	MEAN	STANDARD DEVIATION	NUMBER OF SAMPLES
OTHER PARAMETERS				
CYANIDE (CN)	<.001	<.001	0	2

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STATISTICAL SUMMARY OF WATER QUALITY ANALYSIS
FOR SITE CS-3 FOR THE PERIOD 05/12/81 TO 06/25/86

	RANGE	MEAN	STANDARD DEVIATION	NUMBER OF SAMPLES
PHYSICAL PARAMETERS				
AIR TEMPERATURE (C)	-8-26	10.97	9.05	32
FLOW (CFS)	.03-7.33	.922	1.74	26
WATER TEMPERATURE (C)	0-16	6.15	4.86	32
SPEC. COND. (UMHOS/CM) FIELD	198-540	391	90.44	32
PH FIELD	7.2-8.4	7.89	.306	32
TURBIDITY (NTU) FIELD	.26-100	19.63	26.15	27
TOTAL SUSP. SOLIDS	1-233	19.45	42.27	32
TOTAL DISS. SOLIDS MEAS.	130-470	263	71.33	32
OXYGEN (O) DISS	6.2-12.1	9.35	1.59	10
COMMON IONS				
TOTAL HARDNESS AS CACO3	174	174	0	1
CALCIUM (CA)	30.4-90.4	70.71	14.91	32
MAGNESIUM (MG)	1-60	15.25	11.65	32
SODIUM (NA)	1.6-55	8.88	12.31	32
POTASSIUM (K)	<.01-6.1	1.35	1.06	32
ACIDITY AS CACO3	<.01-30	6.34	12.03	6
ALKALINITY AS CACO3 (LAB)	129-289	230	50.45	10
BICARBONATE (HCO3) (LAB)	122-353.8	269	58.64	32
CARBONATE AS CO3 (LAB)	.6	.6	0	1
SULFATE (SO4)	<.1-310	30.7	59.49	32
CHLORIDE (CL)	.8-18.6	4.66	4.12	32
FLUORIDE (F)	.14-.24	.178	.037	6
NUTRIENTS				
NITRATE (NO3-N)	<.02-.96	.592	.336	6
NITRITE (NO2-N)	.01	.01	0	1
AMMONIA (NH3 AS N)	<.01-.39	.101	.124	18
TOTAL PHOSPHATE (PO4)	<.01-1.15	.235	.322	17
TRACE ELEMENTS				
ALUMINUM (AL) TOTAL	.01	.01	0	1
ARSENIC (AS) TOTAL	<.001	<.001	0	3
ARSENIC (AS) DISS	<.001	<.001	0	3
BARIUM (BA) TOTAL	.019-.2	.054	.072	6
BARIUM (BA) DISS	.01-.025	.018	.0076	3
BORON (B) TOTAL	.011-.035	.022	.0083	6
BORON (B) DISS	.01-.02	.017	.0058	3
CADMIUM (CD) TOTAL	<.001	<.001	0	3
CADMIUM (CD) DISS	<.001	<.001	0	3
CHROMIUM (CR) TOTAL	<.001	<.001	0	3
CHROMIUM (CR) DISS	<.001	<.001	0	3
COPPER (CU) TOTAL	<.001-.013	.0081	.0055	6

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STATISTICAL SUMMARY OF WATER QUALITY ANALYSIS
FOR SITE CS-3 FOR THE PERIOD 05/12/81 TO 06/25/86

	RANGE	MEAN	STANDARD DEVIATION	NUMBER OF SAMPLES
TRACE ELEMENTS				
COPPER (CU) DISS	<.001	<.001	0	3
IRON (FE) TOTAL	.01-2.77	.357	.562	35
LEAD (PB) TOTAL	<.001-.003	.002	.0012	6
LEAD (PB) DISS	<.001	<.001	0	3
MANGANESE (MN) TOTAL	.005-.28	.074	.071	32
MERCURY (HG) TOTAL	<.0002	<.0002	0	3
MOLYBDENUM (MO) TOTAL	<.001	<.001	0	1
NICKEL (NI) TOTAL	<.001	<.001	0	1
SELENIUM (SE) TOTAL	<.001	<.001	0	3
SELENIUM (SE) DISS	<.001	<.001	0	3
SILVER (AG) TOTAL	<.001	<.001	0	3
SILVER (AG) DISS	<.001	<.001	0	3
ZINC (ZN) TOTAL	.005-.02	.013	.0062	5
ZINC (ZN) DISS	.005-.008	.0067	.0015	3
BACTERIOLOGICAL PARAMETERS				
FECAL COLIFORM (NO./100ML)	5-33	19	19.8	2
TOTAL COLIFORM (NO./100ML)	33-1400	717	967	2
5 - DAY BOD	1.9-4.1	3	1.56	2
ORGANIC PARAMETERS				
ORGANIC CARBON (TOTAL)	.2-12.2	5.47	4.75	6
PHENOLS	<.001-.08	.0069	.019	18
OTHER PARAMETERS				
OIL AND GREASE	<.01-3.8	.616	1.06	13
CYANIDE (CN)	<.001-.016	.0031	.0063	6

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OUTPUT DATE: 02-10-1987 HWQ-6/86-R.ST.1

STATISTICAL SUMMARY OF WATER QUALITY ANALYSIS
FOR SITE CS-4 FOR THE PERIOD 05/12/81 TO 06/25/86

	RANGE	MEAN	STANDARD DEVIATION	NUMBER OF SAMPLES
PHYSICAL PARAMETERS				
AIR TEMPERATURE (C)	-2-27	14.37	7.73	27
FLOW (CFS)	.01-7.12	.598	1.54	23
WATER TEMPERATURE (C)	0-15.5	6.67	4.23	27
SPEC. COND. (UMHOS/CM) FIELD	166-450	333	71.32	27
PH FIELD	7.2-8.5	7.88	.359	27
TURBIDITY (NTU) FIELD	.28-100	30.56	32.72	22
TOTAL SUSP. SOLIDS	1-747	63.91	151	27
TOTAL DISS. SOLIDS MEAS.	10-346	211	62.62	27
OXYGEN (O) DISS	5.8-11	9.1	1.9	9
COMMON IONS				
TOTAL HARDNESS AS CACO3	132	132	0	1
CALCIUM (CA)	24-82.5	60.75	13.93	27
MAGNESIUM (MG)	3.8-39.6	11.02	6.8	27
SODIUM (NA)	1.1-21	5.83	5.51	27
POTASSIUM (K)	.08-1.68	.773	.276	27
ACIDITY AS CACO3	<.01-26	5	10.41	6
ALKALINITY AS CACO3 (LAB)	144-262	207	31.58	9
BICARBONATE (HCO3) (LAB)	113-320	223	49.08	26
CARBONATE AS CO3 (LAB)	.6	.6	0	1
SULFATE (SO4)	<.1-114	22.3	24.17	27
CHLORIDE (CL)	<.1-21.3	3.21	4.13	27
FLUORIDE (F)	.1-.21	.147	.038	6
NUTRIENTS				
NITRATE (NO3-N)	<.01-.13	.069	.055	6
NITRITE (NO2-N)	<.01	<.01	0	1
AMMONIA (NH3 AS N)	<.01-.56	.138	.182	18
TOTAL PHOSPHATE (PO4)	<.01-1.522	.272	.38	17
TRACE ELEMENTS				
ALUMINUM (AL) TOTAL	.02	.02	0	1
ARSENIC (AS) TOTAL	<.001	<.001	0	3
ARSENIC (AS) DISS	<.001	<.001	0	3
BARIUM (BA) TOTAL	.02-.04	.025	.0078	6
BARIUM (BA) DISS	.01-.015	.013	.0029	3
BORON (B) TOTAL	.005-.04	.017	.012	6
BORON (B) DISS	<.001-.011	.0072	.0058	3
CADMIUM (CD) TOTAL	<.001	<.001	0	3
CADMIUM (CD) DISS	<.001	<.001	0	3
CHROMIUM (CR) TOTAL	<.001	<.001	0	3
CHROMIUM (CR) DISS	<.001	<.001	0	3
COPPER (CU) TOTAL	<.001-.02	.01	.0085	6

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OUTPUT DATE: 02-10-1987 HWQ-6/86-R.ST.1

STATISTICAL SUMMARY OF WATER QUALITY ANALYSIS
FOR SITE CS-4 FOR THE PERIOD 05/12/81 TO 06/25/86

	RANGE	MEAN	STANDARD DEVIATION	NUMBER OF SAMPLES
TRACE ELEMENTS				
COPPER (CU) DISS	<.001	<.001	0	3
IRON (FE) TOTAL	0-13.5	1.06	2.76	30
LEAD (PB) TOTAL	<.001-.003	.0016	.0012	6
LEAD (PB) DISS	<.001	<.001	0	3
MANGANESE (MN) TOTAL	<.001-.245	.038	.053	27
MERCURY (HG) TOTAL	<.0002	<.0002	0	3
MOLYBDENUM (MO) TOTAL	<.001	<.001	0	1
NICKEL (NI) TOTAL	<.001	<.001	0	1
SELENIUM (SE) TOTAL	<.001	<.001	0	3
SELENIUM (SE) DISS	<.001	<.001	0	3
SILVER (AG) TOTAL	<.001	<.001	0	3
SILVER (AG) DISS	<.001	<.001	0	3
ZINC (ZN) TOTAL	.007-.075	.027	.028	5
ZINC (ZN) DISS	.005-.02	.011	.0081	3
BACTERIOLOGICAL PARAMETERS				
FECAL COLIFORM (NO./100ML)	<2-23	12	15.56	2
TOTAL COLIFORM (NO./100ML)	23-790	407	542	2
5 - DAY BOD	1.1-4.6	2.85	2.47	2
ORGANIC PARAMETERS				
ORGANIC CARBON (TOTAL)	.5-11.3	5.02	4.81	6
PHENOLS	<.001-.026	.0032	.0064	18
OTHER PARAMETERS				
OIL AND GREASE	<.1-6.6	1.11	1.98	13
CYANIDE (CN)	<.001-.007	.0025	.0031	6

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OUTPUT DATE: 02-10-1987 HWQ-6/86-R.ST.1

STATISTICAL SUMMARY OF WATER QUALITY ANALYSIS
FOR SITE CS-6 FOR THE PERIOD 01/27/81 TO 06/25/86

	RANGE	MEAN	STANDARD DEVIATION	NUMBER OF SAMPLES
PHYSICAL PARAMETERS				
AIR TEMPERATURE (C)	-23-28	8.41	10.3	49
FLOW (CFS)	1.33-71.2	10.3	16.82	23
WATER TEMPERATURE (C)	0-15	5.91	4.23	49
SPEC. COND. (UMHOS/CM) FIELD	279-2240	563	330	49
PH FIELD	7.2-8.6	7.95	.283	49
TURBIDITY (NTU) FIELD	.54-100	45.01	34.21	38
TOTAL SUSP. SOLIDS	4-3190	178	482	49
TOTAL DISS. SOLIDS MEAS.	198-1282	363	178	49
TOTAL SETTLEABLE SOLIDS	1.2	1.2	0	1
OXYGEN (O) DISS	5.4-11	9.41	1.6	10
COMMON IONS				
TOTAL HARDNESS AS CACO3	214-316	265	72.12	2
CALCIUM (CA)	40.8-91.6	70.6	12.8	47
MAGNESIUM (MG)	<.1-37.8	24.5	6.83	49
SODIUM (NA)	1.2-358	25.39	63.13	49
POTASSIUM (K)	.92-5.2	2.26	.731	49
ACIDITY AS CACO3	<.01-27	5.34	10.8	6
ALKALINITY AS CACO3 (LAB)	178-278	246	28.5	13
BICARBONATE (HCO3) (LAB)	144-641.72	289	69.62	49
CARBONATE AS CO3 (LAB)	.6-9.6	5.1	6.36	2
SULFATE (SO4)	<3-145	46.67	27.74	49
CHLORIDE (CL)	3.2-428	23.78	61.67	48
FLUORIDE (F)	0-1.17	.315	.426	6
NUTRIENTS				
NITRATE (NO3-N)	<.01-.18	.056	.064	6
NITRITE (NO2-N)	<.01	<.01	0	1
AMMONIA (NH3 AS N)	<.01-3.5	.349	.859	24
TOTAL PHOSPHATE (PO4)	<.01-.76	.193	.198	23
TRACE ELEMENTS				
ALUMINUM (AL) TOTAL	.02	.02	0	1
ARSENIC (AS) TOTAL	<.001	<.001	0	3
ARSENIC (AS) DISS	<.001	<.001	0	3
BARIUM (BA) TOTAL	.05-.175	.075	.049	6
BARIUM (BA) DISS	.04-.145	.077	.059	3
BORON (B) TOTAL	.015-.065	.032	.018	6
BORON (B) DISS	.01-.03	.022	.01	3
CADMIUM (CD) TOTAL	<.001	<.001	0	3
CADMIUM (CD) DISS	<.001	<.001	0	3
CHROMIUM (CR) TOTAL	<.001	<.001	0	3
CHROMIUM (CR) DISS	<.001	<.001	0	3

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OUTPUT DATE: 02-10-1987 HWQ-6/86-R.ST.1

STATISTICAL SUMMARY OF WATER QUALITY ANALYSIS
FOR SITE CS-6 FOR THE PERIOD 01/27/81 TO 06/25/86

	RANGE	MEAN	STANDARD DEVIATION	NUMBER OF SAMPLES
TRACE ELEMENTS				
COPPER (CU) TOTAL	.01-.026	.015	.0066	6
COPPER (CU) DISS	<.001-.01	.0037	.0055	3
IRON (FE) TOTAL	.008-24.5	2.24	4.27	52
LEAD (PB) TOTAL	<.001-.003	.0016	.0012	6
LEAD (PB) DISS	<.001	<.001	0	3
MANGANESE (MN) TOTAL	.05-.74	.166	.137	49
MERCURY (HG) TOTAL	<.0002	<.0002	0	3
MOLYBDENUM (MO) TOTAL	<.001	<.001	0	1
NICKEL (NI) TOTAL	<.001	<.001	0	1
SELENIUM (SE) TOTAL	<.001	<.001	0	3
SELENIUM (SE) DISS	<.001	<.001	0	3
SILVER (AG) TOTAL	<.001	<.001	0	3
SILVER (AG) DISS	<.001	<.001	0	3
ZINC (ZN) TOTAL	.015-.025	.02	.0036	5
ZINC (ZN) DISS	.008-.015	.012	.0035	3
BACTERIOLOGICAL PARAMETERS				
FECAL COLIFORM (NO./100ML)	<2-49	25	33.94	2
TOTAL COLIFORM (NO./100ML)	700-1300	1000	424	2
5 - DAY BOD	2-4	3	1.41	2
ORGANIC PARAMETERS				
ORGANIC CARBON (TOTAL)	.4-8.8	4.22	3.25	6
PHENOLS	<.001-.144	.014	.034	24
OTHER PARAMETERS				
OIL AND GREASE	<.1-6.6	.804	1.77	13
CYANIDE (CN)	<.001-.044	.0078	.018	6

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OUTPUT DATE: 02-10-1987 HWQ-6/86-R.ST.1

STATISTICAL SUMMARY OF WATER QUALITY ANALYSIS
FOR SITE CS-7 FOR THE PERIOD 05/13/81 TO 06/24/86

	RANGE	MEAN	STANDARD DEVIATION	NUMBER OF SAMPLES
PHYSICAL PARAMETERS				
AIR TEMPERATURE (C)	6-23	14.83	5.03	24
FLOW (CFS)	.11-10.24	1.63	2.72	23
WATER TEMPERATURE (C)	0-19	8.31	4.62	24
SPEC. COND. (UMHOS/CM) FIELD	263-475	349	59.21	24
PH FIELD	6.6-8.6	7.89	.456	24
TURBIDITY (NTU) FIELD	.65-19	6.22	4.69	18
TOTAL SUSP. SOLIDS	1-20	8.14	5.96	11
TOTAL DISS. SOLIDS MEAS.	176-300	226	43.79	11
OXYGEN (O) DISS	5-13	9.18	2.61	6
COMMON IONS				
TOTAL HARDNESS AS CACO3	172	172	0	1
CALCIUM (CA)	49.6-70.5	60.73	7.15	11
MAGNESIUM (MG)	5.28-15.84	11.34	3.14	11
SODIUM (NA)	2.1-36	11.25	13.1	11
POTASSIUM (K)	.46-4.5	1.03	1.16	11
ACIDITY AS CACO3	<.01-22	4.92	8.89	6
ALKALINITY AS CACO3 (LAB)	170-283	209	33.42	8
BICARBONATE (HCO3) (LAB)	185-345	234	43.09	11
CARBONATE AS CO3 (LAB)	4.8	4.8	0	1
SULFATE (SO4)	<3-79	20.14	23.45	11
CHLORIDE (CL)	2-20.1	5.11	5.43	11
FLUORIDE (F)	.09-.16	.13	.028	6
NUTRIENTS				
NITRATE (NO3-N)	<.01-1.35	.351	.4	11
NITRITE (NO2-N)	.01	.01	0	1
AMMONIA (NH3 AS N)	<.001-2.7	.341	.807	11
TOTAL PHOSPHATE (PO4)	<.01-9	1.48	2.97	10
TRACE ELEMENTS				
ALUMINUM (AL) TOTAL	<.001	<.001	0	1
ARSENIC (AS) TOTAL	<.001	<.001	0	3
ARSENIC (AS) DISS	<.001	<.001	0	3
BARIUM (BA) TOTAL	.02-.04	.027	.008	6
BARIUM (BA) DISS	.015-.025	.02	.005	3
BORON (B) TOTAL	.004-.02	.014	.0066	6
BORON (B) DISS	<.001-.01	.0068	.0055	3
CADMIUM (CD) TOTAL	<.001	<.001	0	3
CADMIUM (CD) DISS	<.001	<.001	0	3
CHROMIUM (CR) TOTAL	<.001	<.001	0	3
CHROMIUM (CR) DISS	<.001	<.001	0	3
COPPER (CU) TOTAL	<.001-.016	.0078	.0061	6

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OUTPUT DATE: 02-10-1987 HWQ-6/86-R.ST.1

STATISTICAL SUMMARY OF WATER QUALITY ANALYSIS
FOR SITE CS-7 FOR THE PERIOD 05/13/81 TO 06/24/86

	RANGE	MEAN	STANDARD DEVIATION	NUMBER OF SAMPLES
TRACE ELEMENTS				
COPPER (CU) DISS	<.001	<.001	0	3
IRON (FE) TOTAL	.01-.70	.242	.182	14
LEAD (PB) TOTAL	<.001-.003	.0014	.0011	6
LEAD (PB) DISS	<.001	<.001	0	3
MANGANESE (MN) TOTAL	.01-.025	.016	.0046	11
MERCURY (HG) TOTAL	<.0002	<.0002	0	3
MOLYBDENUM (MO) TOTAL	<.001	<.001	0	1
NICKEL (NI) TOTAL	<.001	<.001	0	1
SELENIUM (SE) TOTAL	<.001	<.001	0	3
SELENIUM (SE) DISS	<.001	<.001	0	3
SILVER (AG) TOTAL	<.001	<.001	0	3
SILVER (AG) DISS	<.001	<.001	0	3
ZINC (ZN) TOTAL	.002-.036	.02	.014	6
ZINC (ZN) DISS	.003-.011	.008	.0044	3
BACTERIOLOGICAL PARAMETERS				
FECAL COLIFORM (NO./100ML)	8-130	69	86.27	2
TOTAL COLIFORM (NO./100ML)	110-330	220	156	2
5 - DAY BOD	1.5	1.5	0	1
ORGANIC PARAMETERS				
ORGANIC CARBON (TOTAL)	<.01-24	8.97	8.76	6
PHENOLS	<.001-11.8	1.97	4.82	6
OTHER PARAMETERS				
OIL AND GREASE	<.01-15	5.49	5.94	10
CYANIDE (CN)	<.001-.011	.0023	.0043	6

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STATISTICAL SUMMARY OF WATER QUALITY ANALYSIS
FOR SITE CS-8 FOR THE PERIOD 05/13/81 TO 06/19/86

	RANGE	MEAN	STANDARD DEVIATION	NUMBER OF SAMPLES
PHYSICAL PARAMETERS				
AIR TEMPERATURE (C)	4-28	14.88	6.39	26
FLOW (CFS)	.18-60.7	4.02	12.24	26
WATER TEMPERATURE (C)	1-13	7.67	3.41	26
SPEC. COND. (UMHOS/CM) FIELD	68-340	239	78.75	26
PH FIELD	6-8.4	7.57	.579	26
TURBIDITY (NTU) FIELD	.48-76	22.71	19.99	20
TOTAL SUSP. SOLIDS	1-87	11.33	25.23	11
TOTAL DISS. SOLIDS MEAS.	75-220	177	45.95	11
OXYGEN (O) DISS	7.6-12.5	9.84	1.5	10
COMMON IONS				
TOTAL HARDNESS AS CACO3	60	60	0	1
CALCIUM (CA)	20-64	47.59	12.13	11
MAGNESIUM (MG)	2.4-16.8	8.68	3.66	11
SODIUM (NA)	2-20	7.82	7.34	11
POTASSIUM (K)	.5-3.6	.90	.903	11
ACIDITY AS CACO3	<.01-16	5.22	5.81	6
ALKALINITY AS CACO3 (LAB)	60-184	145	36.53	8
BICARBONATE (HCO3) (LAB)	73.2-225	173	45.02	11
CARBONATE AS CO3 (LAB)	<.01	<.01	0	1
SULFATE (SO4)	<3-50	19.41	14.45	11
CHLORIDE (CL)	<.1-20	5.53	6.59	11
FLUORIDE (F)	.08-.16	.115	.031	6
NUTRIENTS				
NITRATE (NO3-N)	<.02-.48	.243	.175	6
NITRITE (NO2-N)	.01	.01	0	1
AMMONIA (NH3 AS N)	<.01-.52	.145	.196	11
TOTAL PHOSPHATE (PO4)	.02-6.3	1.15	2.16	10
TRACE ELEMENTS				
ALUMINUM (AL) TOTAL	.08	.08	0	1
ARSENIC (AS) TOTAL	<.001	<.001	0	3
ARSENIC (AS) DISS	<.001	<.001	0	3
BARIUM (BA) TOTAL	.013-.029	.021	.0056	6
BARIUM (BA) DISS	.01-.025	.02	.0087	3
BORON (B) TOTAL	<.001-.055	.022	.02	6
BORON (B) DISS	<.001-.01	.0068	.0055	3
CADMIUM (CD) TOTAL	<.001	<.001	0	3
CADMIUM (CD) DISS	<.001	<.001	0	3
CHROMIUM (CR) TOTAL	<.001	<.001	0	3
CHROMIUM (CR) DISS	<.001	<.001	0	3
COPPER (CU) TOTAL	<.001-.02	.0072	.0082	6

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OUTPUT DATE: 02-10-1987 HWQ-6/86-R.ST.1

STATISTICAL SUMMARY OF WATER QUALITY ANALYSIS
FOR SITE CS-8 FOR THE PERIOD 05/13/81 TO 06/19/86

	RANGE	MEAN	STANDARD DEVIATION	NUMBER OF SAMPLES
TRACE ELEMENTS				
COPPER (CU) DISS	<.001	<.001	0	3
IRON (FE) TOTAL	.08-6.2	.664	1.6	14
LEAD (PB) TOTAL	<.001-.007	.003	.0024	6
LEAD (PB) DISS	<.001	<.001	0	3
MANGANESE (MN) TOTAL	.01-.135	.032	.038	11
MERCURY (HG) TOTAL	<.0002	<.0002	0	3
MOLYBDENUM (MO) TOTAL	<.001	<.001	0	1
NICKEL (NI) TOTAL	<.001	<.001	0	1
SELENIUM (SE) TOTAL	<.001	<.001	0	3
SELENIUM (SE) DISS	<.001	<.001	0	3
SILVER (AG) TOTAL	<.001	<.001	0	3
SILVER (AG) DISS	<.001	<.001	0	3
ZINC (ZN) TOTAL	.003-.041	.02	.016	5
ZINC (ZN) DISS	.003-.008	.0053	.0025	3
BACTERIOLOGICAL PARAMETERS				
FECAL COLIFORM (NO./100ML)	2-5	3.5	2.12	2
TOTAL COLIFORM (NO./100ML)	130-700	415	403	2
5 - DAY BOD	1.2	1.2	0	1
ORGANIC PARAMETERS				
ORGANIC CARBON (TOTAL)	<.01-8.8	4.22	3.41	6
PHENOLS	<.001-11.8	1.08	3.56	11
OTHER PARAMETERS				
OIL AND GREASE	<.001-4	.90	1.59	6
CYANIDE (CN)	<.001-.002	<.001	.0006	6
SULFIDE	.01-1.8	.905	1.27	2

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STATISTICAL SUMMARY OF WATER QUALITY ANALYSIS
FOR SITE CS-9 FOR THE PERIOD 01/27/81 TO 06/24/86

	RANGE	MEAN	STANDARD DEVIATION	NUMBER OF SAMPLES
PHYSICAL PARAMETERS				
AIR TEMPERATURE (C)	-6-26	12.22	8.45	32
FLOW (CFS)	.003-8.8	.571	1.69	29
WATER TEMPERATURE (C)	0-17	7.59	4.82	32
SPEC. COND. (UMHOS/CM) FIELD	202-629	463	90.57	32
PH FIELD	7.4-8.4	7.89	.296	32
TURBIDITY (NTU) FIELD	.28-100	17.15	20.59	24
TOTAL SUSP. SOLIDS	1-3580	131	630	32
TOTAL DISS. SOLIDS MEAS.	218-340	298	34.46	32
OXYGEN (O) DISS	5.8-10.5	8.85	1.4	10
COMMON IONS				
TOTAL HARDNESS AS CACO3	170	170	0	1
CALCIUM (CA)	36-92.5	77.56	14.29	32
MAGNESIUM (MG)	<.1-40.8	16.46	7.12	32
SODIUM (NA)	2-49	11.24	12.12	32
POTASSIUM (K)	.85-16	2.35	3.24	32
ACIDITY AS CACO3	<.01-33	7.34	12.95	6
ALKALINITY AS CACO3 (LAB)	189-314	257	31.48	10
BICARBONATE (HCO3) (LAB)	194-383	293	40.07	32
CARBONATE AS CO3 (LAB)	7.2	7.2	0	1
SULFATE (SO4)	<3-70	33.41	17.82	32
CHLORIDE (CL)	3-26.2	8.16	4.25	32
FLUORIDE (F)	.17-.34	.227	.06	6
NUTRIENTS				
NITRATE (NO3-N)	<.02-2.45	1.72	.887	6
NITRITE (NO2-N)	.02	.02	0	1
AMMONIA (NH3 AS N)	<.01-.91	.156	.241	19
TOTAL PHOSPHATE (PO4)	<.001-7.5	.712	1.82	19
TRACE ELEMENTS				
ALUMINUM (AL) TOTAL	<.001	<.001	0	1
ARSENIC (AS) TOTAL	<.001	<.001	0	3
ARSENIC (AS) DISS	<.001	<.001	0	3
BARIUM (BA) TOTAL	.016-.03	.021	.0048	6
BARIUM (BA) DISS	.015-.02	.017	.0029	3
BORON (B) TOTAL	.014-.033	.023	.007	6
BORON (B) DISS	.01-.02	.017	.0058	3
CADMIUM (CD) TOTAL	<.001	<.001	0	3
CADMIUM (CD) DISS	<.001	<.001	0	3
CHROMIUM (CR) TOTAL	<.001	<.001	0	3
CHROMIUM (CR) DISS	<.001	<.001	0	3
COPPER (CU) TOTAL	<.001-.14	.03	.054	6

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OUTPUT DATE: 02-10-1987 HWQ-6/86-R.ST.1

STATISTICAL SUMMARY OF WATER QUALITY ANALYSIS
FOR SITE CS-9 FOR THE PERIOD 01/27/81 TO 06/24/86

	RANGE	MEAN	STANDARD DEVIATION	NUMBER OF SAMPLES
TRACE ELEMENTS				
COPPER (CU) DISS	<.001	<.001	0	3
IRON (FE) TOTAL	.01-45.1	1.58	7.58	35
LEAD (PB) TOTAL	<.001	<.001	.0002	6
LEAD (PB) DISS	<.001	<.001	0	3
MANGANESE (MN) TOTAL	<.001-2	.145	.371	32
MERCURY (HG) TOTAL	<.0002	<.0002	0	3
MOLYBDENUM (MO) TOTAL	<.001	<.001	0	1
NICKEL (NI) TOTAL	<.001	<.001	0	1
SELENIUM (SE) TOTAL	<.001	<.001	0	3
SELENIUM (SE) DISS	<.001	<.001	0	3
SILVER (AG) TOTAL	<.001	<.001	0	3
SILVER (AG) DISS	<.001	<.001	0	3
ZINC (ZN) TOTAL	.002-.025	.011	.0086	5
ZINC (ZN) DISS	.007-.01	.009	.0017	3
BACTERIOLOGICAL PARAMETERS				
FECAL COLIFORM (NO./100ML)	7-23	15	11.31	2
TOTAL COLIFORM (NO./100ML)	94-1300	697	853	2
5 - DAY BOD	1.9-4	2.95	1.48	2
ORGANIC PARAMETERS				
ORGANIC CARBON (TOTAL)	.25-8.2	3.84	2.66	6
PHENOLS	<.001-.017	.0027	.0047	19
OTHER PARAMETERS				
OIL AND GREASE	<.01-1	.354	.332	13
CYANIDE (CN)	<.001	<.001	0	6

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STATISTICAL SUMMARY OF WATER QUALITY ANALYSIS
FOR SITE CS-10 FOR THE PERIOD 05/13/81 TO 06/19/86

	RANGE	MEAN	STANDARD DEVIATION	NUMBER OF SAMPLES
PHYSICAL PARAMETERS				
AIR TEMPERATURE (C)	4-27	14.81	6.27	26
FLOW (CFS)	.4-13.67	3.03	3.5	23
WATER TEMPERATURE (C)	0-15	8.65	4.12	26
SPEC. COND. (UMHOS/CM) FIELD	74-330	200	59.92	26
PH FIELD	6.3-8.6	7.53	.63	26
TURBIDITY (NTU) FIELD	4-100	23.81	23.66	20
TOTAL SUSP. SOLIDS	<.1-16	6.96	5.76	11
TOTAL DISS. SOLIDS MEAS.	75-190	143	38.79	6
TDS MEAS. @ 180 DEG. C	112-213	155	36.53	5
OXYGEN (O) DISS	8.2-13.2	10	1.57	9
COMMON IONS				
TOTAL HARDNESS AS CACO3	66	66	0	1
CALCIUM (CA)	21.6-48	40.1	7.33	11
MAGNESIUM (MG)	2.88-8.64	5.95	2.04	11
SODIUM (NA)	1.6-24	4.95	7.15	11
POTASSIUM (K)	.5-1.5	.83	.303	11
ACIDITY AS CACO3	2-16	5.84	5.23	6
ALKALINITY AS CACO3 (LAB)	54-150	109	29.67	8
BICARBONATE (HCO3) (LAB)	66-183	130	31.22	11
CARBONATE AS CO3 (LAB)	<.01	<.01	0	1
SULFATE (SO4)	9.5-32	17.98	9.01	11
CHLORIDE (CL)	2-20	5.47	6.02	11
FLUORIDE (F)	.06-.13	.092	.028	6
NUTRIENTS				
NITRATE (NO3-N)	<.02-.2	.085	.068	6
NITRITE (NO2-N)	.02	.02	0	1
AMMONIA (NH3 AS N)	<.01-.65	.111	.19	11
TOTAL PHOSPHATE (PO4)	<.01-6.2	1.1	1.96	10
TRACE ELEMENTS				
ALUMINUM (AL) TOTAL	.02	.02	0	1
ARSENIC (AS) TOTAL	<.001	<.001	0	3
ARSENIC (AS) DISS	<.001	<.001	0	3
BARIUM (BA) TOTAL	.021-.05	.031	.01	6
BARIUM (BA) DISS	.02-.03	.025	.005	3
BORON (B) TOTAL	.005-.19	.044	.072	6
BORON (B) DISS	<.001-.01	.0068	.0055	3
CADMIUM (CD) TOTAL	<.001	<.001	0	3
CADMIUM (CD) DISS	<.001	<.001	0	3
CHROMIUM (CR) TOTAL	<.001	<.001	0	3
CHROMIUM (CR) DISS	<.001	<.001	0	3

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STATISTICAL SUMMARY OF WATER QUALITY ANALYSIS
FOR SITE CS-10 FOR THE PERIOD 05/13/81 TO 06/19/86

	RANGE	MEAN	STANDARD DEVIATION	NUMBER OF SAMPLES
TRACE ELEMENTS				
COPPER (CU) TOTAL	<.001-.15	.031	.058	6
COPPER (CU) DISS	<.001	<.001	0	3
IRON (FE) TOTAL	.08-2.5	.784	.59	14
LEAD (PB) TOTAL	<.001-.041	.008	.016	6
LEAD (PB) DISS	<.001	<.001	0	3
MANGANESE (MN) TOTAL	.02-.11	.054	.026	11
MERCURY (HG) TOTAL	<.0002	<.0002	0	3
MOLYBDENUM (MO) TOTAL	<.001	<.001	0	1
NICKEL (NI) TOTAL	<.001	<.001	0	1
SELENIUM (SE) TOTAL	<.001	<.001	0	3
SELENIUM (SE) DISS	<.001	<.001	0	3
SILVER (AG) TOTAL	<.001	<.001	0	3
SILVER (AG) DISS	<.001	<.001	0	3
ZINC (ZN) TOTAL	.005-.033	.017	.0098	6
ZINC (ZN) DISS	.005-.02	.012	.0075	3
BACTERIOLOGICAL PARAMETERS				
FECAL COLIFORM (NO./100ML)	<2-17	9	11.31	2
TOTAL COLIFORM (NO./100ML)	130-330	230	141	2
5 - DAY BOD	1.2	1.2	0	1
ORGANIC PARAMETERS				
ORGANIC CARBON (TOTAL)	<.01-8.1	3.38	3.22	6
PHENOLS	<.001-.023	.0038	.0068	11
OTHER PARAMETERS				
OIL AND GREASE	<.01-2.4	.593	.915	6
CYANIDE (CN)	<.001	<.001	0	6
SULFIDE	<.01	<.01	0	1

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OUTPUT DATE: 02-10-1987 HWQ-6/86-R.ST.1

STATISTICAL SUMMARY OF WATER QUALITY ANALYSIS
FOR SITE CS-11 FOR THE PERIOD 05/12/81 TO 06/25/86

	RANGE	MEAN	STANDARD DEVIATION	NUMBER OF SAMPLES
PHYSICAL PARAMETERS				
AIR TEMPERATURE (C)	-2-25	12.89	7.74	28
FLOW (CFS)	.04-2.2	.559	.691	16
WATER TEMPERATURE (C)	0-13	6.27	4.33	28
SPEC. COND. (UMHOS/CM) FIELD	194-504	356	85.04	28
PH FIELD	7.4-8.5	7.98	.329	28
TURBIDITY (NTU) FIELD	.82-100	43.43	34.2	24
TOTAL SUSP. SOLIDS	1-380	77.43	101	28
TOTAL DISS. SOLIDS MEAS.	128-310	231	49.07	28
OXYGEN (O) DISS	5-11.5	9.49	2.09	9
COMMON IONS				
TOTAL HARDNESS AS CACO3	166	166	0	1
CALCIUM (CA)	24-97.6	63.41	16.28	28
MAGNESIUM (MG)	<.01-25.2	11.8	5.23	28
SODIUM (NA)	1.5-67	7.92	12.83	28
POTASSIUM (K)	.35-6.3	1.25	1.27	28
ACIDITY AS CACO3	<.01-33	6.5	13.2	6
ALKALINITY AS CACO3 (LAB)	123-267	213	46.31	9
BICARBONATE (HCO3) (LAB)	133-325	240	54.21	28
CARBONATE AS CO3 (LAB)	4.8	4.8	0	1
SULFATE (SO4)	<.1-118	22.27	22.74	28
CHLORIDE (CL)	<.1-19.8	3.72	3.56	28
FLUORIDE (F)	.1-.27	.16	.061	6
NUTRIENTS				
NITRATE (NO3-N)	<.01-.23	.127	.097	6
NITRITE (NO2-N)	.02	.02	0	1
ORTHO-PHOSPHATE (PO4-P)	26	26	0	1
AMMONIA (NH3 AS N)	<.01-1.5	.186	.367	16
TOTAL PHOSPHATE (PO4)	<.01-.66	.201	.193	16
TRACE ELEMENTS				
ALUMINUM (AL) TOTAL	<.001	<.001	0	1
ARSENIC (AS) TOTAL	<.001	<.001	0	3
ARSENIC (AS) DISS	<.001	<.001	0	3
BARIUM (BA) TOTAL	.011-.28	.068	.104	6
BARIUM (BA) DISS	.015-.02	.017	.0029	3
BORON (B) TOTAL	.011-.041	.02	.011	6
BORON (B) DISS	.01-.015	.012	.0029	3
CADMIUM (CD) TOTAL	<.001	<.001	0	3
CADMIUM (CD) DISS	<.001	<.001	0	3
CHROMIUM (CR) TOTAL	<.001	<.001	0	3
CHROMIUM (CR) DISS	<.001	<.001	0	3

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OUTPUT DATE: 02-10-1987 HWQ-6/86-R.ST.1

STATISTICAL SUMMARY OF WATER QUALITY ANALYSIS
FOR SITE CS-11 FOR THE PERIOD 05/12/81 TO 06/25/86

	RANGE	MEAN	STANDARD DEVIATION	NUMBER OF SAMPLES
TRACE ELEMENTS				
COPPER (CU) TOTAL	<.001-.021	.0098	.0084	6
COPPER (CU) DISS	<.001-.01	.0037	.0055	3
IRON (FE) TOTAL	.01-9.1	1.42	2.3	31
LEAD (PB) TOTAL	<.001-.004	.002	.0014	6
LEAD (PB) DISS	<.001	<.001	0	3
MANGANESE (MN) TOTAL	.002-.27	.058	.054	28
MERCURY (HG) TOTAL	<.0002	<.0002	0	3
MOLYBDENUM (MO) TOTAL	<.001	<.001	0	1
NICKEL (NI) TOTAL	<.001	<.001	0	1
SELENIUM (SE) TOTAL	<.001	<.001	0	3
SELENIUM (SE) DISS	<.001	<.001	0	3
SILVER (AG) TOTAL	<.001	<.001	0	3
SILVER (AG) DISS	<.001	<.001	0	3
ZINC (ZN) TOTAL	.007-.055	.023	.019	5
ZINC (ZN) DISS	.007-.016	.011	.0046	3
BACTERIOLOGICAL PARAMETERS				
FECAL COLIFORM (NO./100ML)	<2-79	40	55.15	2
TOTAL COLIFORM (NO./100ML)	220-330	275	77.78	2
5 - DAY BOD	1.4	1.4	0	1
ORGANIC PARAMETERS				
ORGANIC CARBON (TOTAL)	.3-21	7.77	7.93	6
PHENOLS	<.001-10.22	.652	2.55	16
OTHER PARAMETERS				
OIL AND GREASE	<.01-1.2	.251	.376	13
CYANIDE (CN)	<.001-.002	<.001	.0006	6
SULFIDE	.92	.92	0	1

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STATISTICAL SUMMARY OF WATER QUALITY ANALYSIS
FOR SITE CS-12 FOR THE PERIOD 11/30/83 TO 06/24/8.

	RANGE	MEAN	STANDARD DEVIATION	NUMBER OF SAMPLES
PHYSICAL PARAMETERS				
AIR TEMPERATURE (C)	-23-19	4.47	11.74	19
FLOW (CFS)	.18-.63	.467	.134	12
WATER TEMPERATURE (C)	4-16.5	11.05	2.81	20
SPEC. COND. (UMHOS/CM) FIELD	498-1015	683	127	20
PH FIELD	6.9-7.7	7.25	.224	20
TURBIDITY (NTU) FIELD	14-100	51.29	33.55	20
TOTAL SUSP. SOLIDS	5-4750	295	1051	20
TOTAL DISS. SOLIDS MEAS.	310-860	472	130	20
TOTAL SETTLEABLE SOLIDS	<.1-.5	.15	.197	5
OXYGEN (O) DISS	5.6	5.6	0	1
TOTAL SOLIDS	.51-.89	.67	.137	6
COMMON IONS				
CALCIUM (CA)	42-160	91.34	34.88	19
MAGNESIUM (MG)	<.1-46.6	30.49	12.59	19
SODIUM (NA)	7.5-58	17.25	14.31	19
POTASSIUM (K)	3.5-8.2	5.56	1.07	19
ACIDITY AS CACO3	10.5-12	11.25	1.06	2
ALKALINITY AS CACO3 (LAB)	248-250	249	1.41	2
BICARBONATE (HCO3) (LAB)	175.7-305	234	40.1	19
SULFATE (SO4)	44-320	162	77.61	19
CHLORIDE (CL)	3.4-35	12.75	9.38	19
FLUORIDE (F)	.1-.28	.19	.127	2
NUTRIENTS				
NITRATE (NO3-N)	<.01-.02	.012	.011	2
AMMONIA (NH3 AS N)	<.01-1.8	.501	.734	5
TOTAL PHOSPHATE (PO4)	<.01-.06	.035	.022	5
TRACE ELEMENTS				
BARIUM (BA) TOTAL	.086-.11	.098	.017	2
BORON (B) TOTAL	.141-.2	.171	.042	2
COPPER (CU) TOTAL	.01-.023	.016	.0092	2
IRON (FE) TOTAL	.02-32.4	2.3	7.14	20
LEAD (PB) TOTAL	<.001-.009	.0047	.006	2
MANGANESE (MN) TOTAL	<.01-.33	.053	.072	19
ZINC (ZN) TOTAL	.003-.062	.032	.042	2
ORGANIC PARAMETERS				
ORGANIC CARBON (TOTAL)	<.01-2.5	1.25	1.76	2
PHENOLS	<.001	<.001	0	5
OTHER PARAMETERS				
OIL AND GREASE	<.1-2	.746	.764	12

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STATISTICAL SUMMARY OF WATER QUALITY ANALYSIS
FOR SITE CS-12 FOR THE PERIOD 11/30/83 TO 06/24/86

	RANGE	MEAN	STANDARD DEVIATION	NUMBER OF SAMPLES
OTHER PARAMETERS				
CYANIDE (CN)	<.001	<.001	0	2

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STATISTICAL SUMMARY OF WATER QUALITY ANALYSIS
FOR SITE CS-13 FOR THE PERIOD 11/10/83 TO 06/25/86

	RANGE	MEAN	STANDARD DEVIATION	NUMBER OF SAMPLES
PHYSICAL PARAMETERS				
AIR TEMPERATURE (C)	-4-22	9.14	9.36	14
FLOW (CFS)	.01-.08	.041	.025	14
WATER TEMPERATURE (C)	2-11	6.96	2.95	14
SPEC. COND. (UMHOS/CM) FIELD	599-874	707	83.23	14
PH FIELD	6.7-7.5	7.19	.192	14
TURBIDITY (NTU) FIELD	.07-40	12.71	10.65	14
TOTAL SUSP. SOLIDS	<.1-227	32.15	59.11	14
TOTAL DISS. SOLIDS MEAS.	360-665	464	72.86	14
OXYGEN (O) DISS	9.8	9.8	0	1
COMMON IONS				
CALCIUM (CA)	82.4-220	114	34.11	14
MAGNESIUM (MG)	12-44.4	28.48	8.12	14
SODIUM (NA)	8.1-40	13.17	8.12	14
POTASSIUM (K)	1.54-3.2	2.3	.343	14
ACIDITY AS CACO3	20.2	20.2	0	1
ALKALINITY AS CACO3 (LAB)	340	340	0	1
BICARBONATE (HCO3) (LAB)	240.3-414.8	364	44.37	14
SULFATE (SO4)	51-180	85.86	42.41	14
CHLORIDE (CL)	14-80.7	25.46	17.08	14
FLUORIDE (F)	.17	.17	0	1
NUTRIENTS				
NITRATE (NO3-N)	.8	.8	0	1
AMMONIA (NH3 AS N)	<.01-.5	.227	.203	5
TOTAL PHOSPHATE (PO4)	<.01-.03	.018	.013	5
TRACE ELEMENTS				
BARIUM (BA) TOTAL	.06	.06	0	1
BORON (B) TOTAL	.041	.041	0	1
COPPER (CU) TOTAL	.022	.022	0	1
IRON (FE) TOTAL	.05-.54	.213	.155	14
LEAD (PB) TOTAL	.013	.013	0	1
MANGANESE (MN) TOTAL	.019-.11	.054	.028	14
ZINC (ZN) TOTAL	.056	.056	0	1
ORGANIC PARAMETERS				
ORGANIC CARBON (TOTAL)	<.01	<.01	0	1
PHENOLS	<.001	<.001	.0002	5
OTHER PARAMETERS				
OIL AND GREASE	<.02-.6	.182	.245	5
CYANIDE (CN)	<.001	<.001	0	1

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STATISTICAL SUMMARY OF WATER QUALITY ANALYSIS
FOR SITE UPL-3 FOR THE PERIOD 05/13/81 TO 06/19/86

	RANGE	MEAN	STANDARD DEVIATION	NUMBER OF SAMPLES
PHYSICAL PARAMETERS				
AIR TEMPERATURE (C)	-2-27	15.46	6.58	26
WATER TEMPERATURE (C)	3-14	7.38	2.7	26
SPEC. COND. (UMHOS/CM) FIELD	138-362	248	48.11	26
PH FIELD	6.6-8.6	7.67	.518	26
TURBIDITY (NTU) FIELD	.48-28	8.26	8.04	19
TOTAL SUSP. SOLIDS	1-13	5.61	5.09	12
TOTAL DISS. SOLIDS MEAS.	136-210	165	24.74	12
OXYGEN (O) DISS	6-11.2	9.27	1.58	10
COMMON IONS				
TOTAL HARDNESS AS CACO3	136	136	0	1
CALCIUM (CA)	36.8-48	43.47	3.26	12
MAGNESIUM (MG)	5.28-14.4	8.07	2.4	12
SODIUM (NA)	1.7-29	6.78	8.18	12
POTASSIUM (K)	.66-3.9	1.05	.90	12
ACIDITY AS CACO3	<.01-15.7	6.72	5.96	6
ALKALINITY AS CACO3 (LAB)	116-159	135	14.87	9
BICARBONATE (HCO3) (LAB)	134-193	158	19.14	12
CARBONATE AS CO3 (LAB)	<.01	<.01	0	1
SULFATE (SO4)	<3-29	15.37	8.17	12
CHLORIDE (CL)	<.1-15.3	4.73	5	12
FLUORIDE (F)	.06-.14	.103	.029	6
NUTRIENTS				
NITRATE (NO3-N)	<.02-.44	.222	.148	6
NITRITE (NO2-N)	.01	.01	0	1
AMMONIA (NH3 AS N)	<.01-.62	.127	.231	11
TOTAL PHOSPHATE (PO4)	.01-1.5	.305	.446	10
TRACE ELEMENTS				
ALUMINUM (AL) TOTAL	<.001	<.001	0	1
ARSENIC (AS) TOTAL	<.001	<.001	0	3
ARSENIC (AS) DISS	<.001	<.001	0	3
BARIUM (BA) TOTAL	.02-.068	.035	.017	6
BARIUM (BA) DISS	.015-.025	.022	.0058	3
BORON (B) TOTAL	.008-.04	.019	.013	6
BORON (B) DISS	<.001-.015	.0068	.0074	3
CADMIUM (CD) TOTAL	<.001	<.001	0	3
CADMIUM (CD) DISS	<.001	<.001	0	3
CHROMIUM (CR) TOTAL	<.001	<.001	0	3
CHROMIUM (CR) DISS	<.001	<.001	0	3
COPPER (CU) TOTAL	<.001-.04	.014	.015	6
COPPER (CU) DISS	<.001	<.001	0	3

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STATISTICAL SUMMARY OF WATER QUALITY ANALYSIS
FOR SITE UPL-3 FOR THE PERIOD 05/13/81 TO 06/19/86

	RANGE	MEAN	STANDARD DEVIATION	NUMBER OF SAMPLES
TRACE ELEMENTS				
IRON (FE) TOTAL	.01-1.4	.174	.343	15
LEAD (PB) TOTAL	<.001-.011	.0034	.0045	6
LEAD (PB) DISS	<.001	<.001	0	3
MANGANESE (MN) TOTAL	.012-.08	.025	.018	12
MERCURY (HG) TOTAL	<.0002	<.0002	0	3
MOLYBDENUM (MO) TOTAL	<.001	<.001	0	1
NICKEL (NI) TOTAL	<.001	<.001	0	1
SELENIUM (SE) TOTAL	<.001	<.001	0	3
SELENIUM (SE) DISS	<.001	<.001	0	3
SILVER (AG) TOTAL	<.001	<.001	0	3
SILVER (AG) DISS	<.001	<.001	0	3
ZINC (ZN) TOTAL	.002-.07	.034	.028	6
ZINC (ZN) DISS	.005-.01	.0067	.0029	3
BACTERIOLOGICAL PARAMETERS				
FECAL COLIFORM (NO./100ML)	<2	<2	0	2
TOTAL COLIFORM (NO./100ML)	2-8	5	4.24	2
5 - DAY BOD	1.4	1.4	0	1
ORGANIC PARAMETERS				
ORGANIC CARBON (TOTAL)	<.01-12	4.4	4.68	6
PHENOLS	<.001-.494	.053	.147	11
OTHER PARAMETERS				
OIL AND GREASE	<.1-2.6	.958	1.2	6
CYANIDE (CN)	<.001-.006	.0023	.0023	6

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STATISTICAL SUMMARY OF WATER QUALITY ANALYSIS
FOR SITE UFL-10 FOR THE PERIOD 05/13/81 TO 06/19/86

	RANGE	MEAN	STANDARD DEVIATION	NUMBER OF SAMPLES
PHYSICAL PARAMETERS				
AIR TEMPERATURE (C)	4-23	14.54	4.99	26
FLOW (CFS)	1.1-63.1	10.94	15.36	19
WATER TEMPERATURE (C)	0-17.5	9.38	4.59	26
SPEC. COND. (UMHOS/CM) FIELD	35.3-332	243	74.32	26
PH FIELD	6.6-8.6	7.81	.52	26
TURBIDITY (NTU) FIELD	2-100	25.86	28.03	20
TOTAL SUSP. SOLIDS	1-41	10.46	11.66	11
TOTAL DISS. SOLIDS MEAS.	115-225	178	32.19	11
OXYGEN (O) DISS	7.4-12.8	9.8	1.4	10
COMMON IONS				
TOTAL HARDNESS AS CACO3	92	92	0	1
CALCIUM (CA)	29.6-60	49.1	8.36	11
MAGNESIUM (MG)	4.32-21.6	8.43	4.62	11
SODIUM (NA)	1.7-13.5	7.11	5.11	11
POTASSIUM (K)	.54-.92	.722	.126	11
ACIDITY AS CACO3	<.01-16	4.87	6.97	6
ALKALINITY AS CACO3 (LAB)	84-181	154	30.91	8
BICARBONATE (HCO3) (LAB)	102-221	176	37.12	11
CARBONATE AS CO3 (LAB)	<.01	<.01	0	1
SULFATE (SO4)	<3-38	17.09	11.4	11
CHLORIDE (CL)	<.1-20	4.94	5.7	11
FLUORIDE (F)	.07-.14	.107	.026	6
NUTRIENTS				
NITRATE (NO3-N)	<.01-.23	.119	.1	6
NITRITE (NO2-N)	.02	.02	0	1
AMMONIA (NH3 AS N)	<.01-.90	.214	.305	11
TOTAL PHOSPHATE (PO4)	.02-6	.814	1.84	10
TRACE ELEMENTS				
ALUMINUM (AL) TOTAL	.04	.04	0	1
ARSENIC (AS) TOTAL	<.001	<.001	0	3
ARSENIC (AS) DISS	<.001	<.001	0	3
BARIUM (BA) TOTAL	.021-.06	.035	.013	6
BARIUM (BA) DISS	.02-.028	.024	.004	3
BORON (B) TOTAL	.004-.025	.016	.0071	6
BORON (B) DISS	<.001-.011	.0072	.0058	3
CADMIUM (CD) TOTAL	<.001	<.001	0	3
CADMIUM (CD) DISS	<.001	<.001	0	3
CHROMIUM (CR) TOTAL	<.001	<.001	0	3
CHROMIUM (CR) DISS	<.001	<.001	0	3
COPPER (CU) TOTAL	<.001-.02	.0085	.0073	6

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STATISTICAL SUMMARY OF WATER QUALITY ANALYSIS
FOR SITE UPL-10 FOR THE PERIOD 05/13/81 TO 06/19/86

	RANGE	MEAN	STANDARD DEVIATION	NUMBER OF SAMPLES
TRACE ELEMENTS				
COPPER (CU) DISS	<.001	<.001	0	3
IRON (FE) TOTAL	.08-.72	.378	.203	14
LEAD (PB) TOTAL	<.001-.007	.0034	.0024	6
LEAD (PB) DISS	<.001-.002	.001	.0009	3
MANGANESE (MN) TOTAL	.019-.07	.038	.016	11
MERCURY (HG) TOTAL	<.0002	<.0002	0	3
MOLYBDENUM (MO) TOTAL	<.001	<.001	0	1
NICKEL (NI) TOTAL	<.001	<.001	0	1
SELENIUM (SE) TOTAL	<.001	<.001	0	3
SELENIUM (SE) DISS	<.001	<.001	0	3
SILVER (AG) TOTAL	<.001	<.001	0	3
SILVER (AG) DISS	<.001	<.001	0	3
ZINC (ZN) TOTAL	.003-.044	.019	.014	6
ZINC (ZN) DISS	.005-.012	.009	.0036	3
BACTERIOLOGICAL PARAMETERS				
FECAL COLIFORM (NO./100ML)	2-170	86	119	2
TOTAL COLIFORM (NO./100ML)	110-2200	1155	1478	2
5 - DAY BOD	1.5	1.5	0	1
ORGANIC PARAMETERS				
ORGANIC CARBON (TOTAL)	<.01-21.7	7.77	7.98	6
PHENOLS	<.001-28	2.55	8.44	11
OTHER PARAMETERS				
OIL AND GREASE	<.01-23.8	4.45	9.52	6
CYANIDE (CN)	<.001-.005	.0017	.0019	6

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OUTPUT DATE: 02-10-1987 HWQ-6/86-R.ST.1

STATISTICAL SUMMARY OF WATER QUALITY ANALYSIS
FOR SITE S10-1 FOR THE PERIOD 06/29/81 TO 06/18/86

	RANGE	MEAN	STANDARD DEVIATION	NUMBER OF SAMPLES
PHYSICAL PARAMETERS				
AIR TEMPERATURE (C)	5-27	15.47	6.6	19
FLOW (CFS)	.0001-.07	.011	.018	19
WATER TEMPERATURE (C)	3-45	8.74	9.32	19
SPEC. COND. (UMHOS/CM) FIELD	77-190	134	31.46	19
PH FIELD	6.1-8.5	7.08	.659	18
TURBIDITY (NTU) FIELD	.26-33	15.71	7.97	18
TOTAL SUSP. SOLIDS	<.1-41	12.67	14.38	12
TOTAL DISS. SOLIDS MEAS.	5-119	79.08	29.62	12
OXYGEN (O) DISS	7.7-8.5	8.07	.386	4
COMMON IONS				
TOTAL HARDNESS AS CACO3	46	46	0	1
CALCIUM (CA)	12-32	18.39	6.51	12
MAGNESIUM (MG)	2.4-13.2	5.23	3.2	12
SODIUM (NA)	.5-10.3	3.41	3.54	12
POTASSIUM (K)	.04-1.5	.576	.387	12
CALCIUM (CA) TOTAL	12.5	12.5	0	1
MAGNESIUM (MG) TOTAL	3.84	3.84	0	1
SODIUM (NA) TOTAL	1.75	1.75	0	1
POTASSIUM (K) TOTAL	.38	.38	0	1
ACIDITY AS CACO3	<.01-6	2.02	2.31	5
ALKALINITY AS CACO3 (LAB)	27.3-70	47.46	19.18	5
BICARBONATE (HCO3) (LAB)	3.9-112.2	54.64	29.36	12
CARBONATE AS CO3 (LAB)	<.01	<.01	0	1
SULFATE (SO4)	4-44.5	20.57	13.23	12
CHLORIDE (CL)	<.1-20	5.31	6.35	12
FLUORIDE (F)	.02-.08	.048	.022	5
CHLORIDE (CL) TOTAL	2.6	2.6	0	1
FLUORIDE (F) TOTAL	.05	.05	0	1
NUTRIENTS				
NITRATE (NO3-N)	<.02-1.43	.56	.615	4
NITRITE (NO2-N)	.04	.04	0	1
AMMONIA (NH3 AS N)	<.01-.3	.122	.123	12
TOTAL PHOSPHATE (PO4)	.02-.24	.101	.071	12
TRACE ELEMENTS				
ALUMINUM (AL) TOTAL	.03	.03	0	1
ALUMINUM (AL) DISS	.07	.07	0	1
ARSENIC (AS) TOTAL	<.001-.003	.0018	.0018	2
ARSENIC (AS) DISS	<.001	<.001	0	2
BARIUM (BA) TOTAL	.01-.02	.016	.0042	5
BARIUM (BA) DISS	.01	.01	0	2

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FOR VALUES BELOW THE DETECTION LIMIT, ONE HALF THE DETECTION LIMIT WAS USED IN THE STATISTICAL ANALYSIS.
IF THE RESULTING MEAN WAS BELOW THE RANGE THEN THE LOW RANGE VALUE WAS USED FOR THE MEAN.
OUTPUT DATE: 02-10-1987 HWQ-6/86-R.ST.1

STATISTICAL SUMMARY OF WATER QUALITY ANALYSIS
FOR SITE S10-1 FOR THE PERIOD 06/29/81 TO 06/18/86

	RANGE	MEAN	STANDARD DEVIATION	NUMBER OF SAMPLES
TRACE ELEMENTS				
BORON (B) TOTAL	<.001-.057	.026	.022	5
BORON (B) DISS	<.001-.02	.01	.014	2
CADMIUM (CD) TOTAL	<.001	<.001	0	2
CADMIUM (CD) DISS	<.001	<.001	0	2
CHROMIUM (CR) TOTAL	<.001	<.001	0	2
CHROMIUM (CR) DISS	<.001	<.001	0	2
COPPER (CU) TOTAL	<.001-.02	.011	.007	5
COPPER (CU) DISS	<.001	<.001	0	2
IRON (FE) TOTAL	.03-.46	.239	.135	14
LEAD (PB) TOTAL	<.001-.007	.0032	.0031	5
LEAD (PB) DISS	<.001-.002	.0013	.0011	2
MANGANESE (MN) TOTAL	.002-.02	.0095	.0069	13
MERCURY (HG) TOTAL	<.0002	<.0002	0	2
MERCURY (HG) DISS	<.0002	<.0002	0	1
MOLYBDENUM (MO) TOTAL	<.001	<.001	0	1
MOLYBDENUM (MO) DISS	<.001	<.001	0	1
NICKEL (NI) TOTAL	<.001	<.001	0	1
NICKEL (NI) DISS	<.001	<.001	0	1
SELENIUM (SE) TOTAL	<.001	<.001	0	2
SELENIUM (SE) DISS	<.001	<.001	0	3
SILVER (AG) TOTAL	<.001	<.001	0	2
SILVER (AG) DISS	<.001	<.001	0	2
ZINC (ZN) TOTAL	.002-.041	.023	.014	5
ZINC (ZN) DISS	.007-.015	.011	.0057	2
BACTERIOLOGICAL PARAMETERS				
FECAL COLIFORM (NO./100ML)	17	17	0	1
TOTAL COLIFORM (NO./100ML)	700	700	0	1
ORGANIC PARAMETERS				
ORGANIC CARBON (TOTAL)	.78-20.6	7.42	7.99	5
PHENOLS	<.001-.055	.006	.016	12
OTHER PARAMETERS				
OIL AND GREASE	<.1-1.6	.71	.65	5
CYANIDE (CN)	<.001	<.001	0	5
SULFIDE	.16	.16	0	1

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OUTPUT DATE: 02-10-1987 HWQ-6/86-R.ST.1

STATISTICAL SUMMARY OF WATER QUALITY ANALYSIS
FOR SITE S12-1 FOR THE PERIOD 06/29/81 TO 06/18/86

	RANGE	MEAN	STANDARD DEVIATION	NUMBER OF SAMPLES
PHYSICAL PARAMETERS				
AIR TEMPERATURE (C)	6-24	14.93	6.03	15
FLOW (CFS)	.0002-.19	.042	.073	15
WATER TEMPERATURE (C)	1-21	10.47	6.49	15
SPEC. COND. (UMHOS/CM) FIELD	86-260	172	54.22	15
PH FIELD	6.4-8.9	7.43	.627	15
TURBIDITY (NTU) FIELD	1.1-38	16.51	10.15	15
TOTAL SUSP. SOLIDS	1-105	22.3	33.49	10
TOTAL DISS. SOLIDS MEAS.	54-170	101	38.32	10
OXYGEN (O) DISS	5-7.7	6.77	1.53	3
COMMON IONS				
TOTAL HARDNESS AS CACO3	70	70	0	1
CALCIUM (CA)	13.6-36	25.97	8.3	10
MAGNESIUM (MG)	1.4-6	3.02	1.44	10
SODIUM (NA)	1-21	8.23	7.69	9
POTASSIUM (K)	.03-4.04	.887	1.15	10
CALCIUM (CA) TOTAL	24.9	24.9	0	1
MAGNESIUM (MG) TOTAL	1.95	1.95	0	1
SODIUM (NA) TOTAL	2.55	2.55	0	1
POTASSIUM (K) TOTAL	.41	.41	0	1
ACIDITY AS CACO3	1.7-8	3.82	2.84	4
ALKALINITY AS CACO3 (LAB)	62-111.7	93.43	21.66	4
BICARBONATE (HCO3) (LAB)	46.4-136	92.96	33.61	10
CARBONATE AS CO3 (LAB)	<.01	<.01	0	1
SULFATE (SO4)	3-15	7.44	4.27	10
CHLORIDE (CL)	1-30	7.84	8.84	10
FLUORIDE (F)	.06-.12	.085	.026	4
CHLORIDE (CL) TOTAL	3.5	3.5	0	1
FLUORIDE (F) TOTAL	.12	.12	0	1
NUTRIENTS				
NITRATE (NO3-N)	<.02-.23	.135	.108	4
NITRITE (NO2-N)	.01	.01	0	1
AMMONIA (NH3 AS N)	<.01-.59	.192	.174	10
TOTAL PHOSPHATE (PO4)	.01-.85	.174	.246	10
TRACE ELEMENTS				
ALUMINUM (AL) TOTAL	.045	.045	0	1
ALUMINUM (AL) DISS	.09	.09	0	1
ARSENIC (AS) TOTAL	<.001	<.001	0	1
ARSENIC (AS) DISS	<.001	<.001	0	1
BARIUM (BA) TOTAL	.012-.08	.037	.03	4
BARIUM (BA) DISS	.005	.005	0	1

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OUTPUT DATE: 02-10-1987 HWQ-6/86-R.ST.1

STATISTICAL SUMMARY OF WATER QUALITY ANALYSIS
FOR SITE S12-1 FOR THE PERIOD 06/29/81 TO 06/18/86

	RANGE	MEAN	STANDARD DEVIATION	NUMBER OF SAMPLES
TRACE ELEMENTS				
BORON (B) TOTAL	.017-.044	.03	.011	4
BORON (B) DISS	.02	.02	0	1
CADMIUM (CD) TOTAL	<.001	<.001	0	1
CADMIUM (CD) DISS	<.001	<.001	0	1
CHROMIUM (CR) TOTAL	<.001	<.001	0	1
CHROMIUM (CR) DISS	<.001	<.001	0	1
COPPER (CU) TOTAL	<.001-.07	.027	.03	4
COPPER (CU) DISS	<.001	<.001	0	1
IRON (FE) TOTAL	.03-.65	.285	.199	11
LEAD (PB) TOTAL	<.001-.002	.001	.0007	4
LEAD (PB) DISS	<.001	<.001	0	1
MANGANESE (MN) TOTAL	.007-.76	.186	.239	11
MERCURY (HG) TOTAL	<.0002	<.0002	0	1
MERCURY (HG) DISS	<.0002	<.0002	0	1
MOLYBDENUM (MO) TOTAL	<.001	<.001	0	1
MOLYBDENUM (MO) DISS	<.001	<.001	0	1
NICKEL (NI) TOTAL	<.001	<.001	0	1
NICKEL (NI) DISS	<.001	<.001	0	2
SELENIUM (SE) TOTAL	<.001	<.001	0	1
SELENIUM (SE) DISS	<.001	<.001	0	1
SILVER (AG) TOTAL	<.001	<.001	0	1
SILVER (AG) DISS	<.001	<.001	0	1
ZINC (ZN) TOTAL	.002-.048	.018	.021	4
ZINC (ZN) DISS	.005	.005	0	1
ORGANIC PARAMETERS				
ORGANIC CARBON (TOTAL)	.95-34.9	12.79	15.59	4
PHENOLS	<.001-.525	.066	.166	10
OTHER PARAMETERS				
OIL AND GREASE	<.1-.8	.438	.419	4
CYANIDE (CN)	<.001-.005	.0016	.0022	4
SULFIDE	<.01	<.01	0	1

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OUTPUT DATE: 02-10-1987 HWQ-6/86-R.ST.1

STATISTICAL SUMMARY OF WATER QUALITY ANALYSIS
FOR SITE S13-2 FOR THE PERIOD 05/14/81 TO 06/24/86

	RANGE	MEAN	STANDARD DEVIATION	NUMBER OF SAMPLES
PHYSICAL PARAMETERS				
AIR TEMPERATURE (C)	0-26	13.08	7.06	26
FLOW (CFS)	.0006-.01	.0022	.0024	26
WATER TEMPERATURE (C)	1-15	7.73	3.82	26
SPEC. COND. (UMHOS/CM) FIELD	398-640	526	66.41	26
PH FIELD	6.5-8.3	7.56	.418	24
TURBIDITY (NTU) FIELD	.22-60	16.82	16.05	23
TOTAL SUSP. SOLIDS	2-240	47.5	66.46	14
TOTAL DISS. SOLIDS MEAS.	279-382	337	28.51	14
OXYGEN (O) DISS	6.8-11.2	9.1	1.62	5
COMMON IONS				
TOTAL HARDNESS AS CACO3	170	170	0	1
CALCIUM (CA)	25.6-98.4	81.65	17.47	14
MAGNESIUM (MG)	19.76-25.92	22.3	1.89	14
SODIUM (NA)	4.7-20	8.66	5.42	14
POTASSIUM (K)	.5-1.66	1.16	.309	13
CALCIUM (CA) TOTAL	26.4	26.4	0	1
MAGNESIUM (MG) TOTAL	24.96	24.96	0	1
SODIUM (NA) TOTAL	45	45	0	1
POTASSIUM (K) TOTAL	1.5	1.5	0	1
ACIDITY AS CACO3	<.01-31	9.73	10.97	6
ALKALINITY AS CACO3 (LAB)	212-280	249	29.87	7
BICARBONATE (HCO3) (LAB)	229.4-356	310	41.19	14
CARBONATE AS CO3 (LAB)	2.4	2.4	0	1
SULFATE (SO4)	7-113	51.57	25.01	14
CHLORIDE (CL)	2.8-25	8.53	6.31	14
FLUORIDE (F)	.17-.26	.207	.03	6
CHLORIDE (CL) TOTAL	8	8	0	1
FLUORIDE (F) TOTAL	.26	.26	0	1
NUTRIENTS				
NITRATE (NO3-N)	<.02-1.61	.795	.593	6
NITRITE (NO2-N)	.02	.02	0	1
AMMONIA (NH3 AS N)	<.01-1.08	.282	.312	13
TOTAL PHOSPHATE (PO4)	<.01-.68	.14	.187	14
TRACE ELEMENTS				
ALUMINUM (AL) TOTAL	.01	.01	0	1
ALUMINUM (AL) DISS	<.001	<.001	0	1
ARSENIC (AS) TOTAL	<.001	<.001	0	3
ARSENIC (AS) DISS	<.001	<.001	0	3
BARIUM (BA) TOTAL	.019-.044	.025	.0097	6
BARIUM (BA) DISS	.015-.02	.017	.0026	3

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OUTPUT DATE: 02-10-1987 HWQ-6/86-R.ST.1

STATISTICAL SUMMARY OF WATER QUALITY ANALYSIS
FOR SITE S13-2 FOR THE PERIOD 05/14/81 TO 06/24/86

	RANGE	MEAN	STANDARD DEVIATION	NUMBER OF SAMPLES
TRACE ELEMENTS				
BORON (B) TOTAL	.015-.038	.025	.0096	6
BORON (B) DISS	.007-.03	.021	.012	3
CADMIUM (CD) TOTAL	<.001	<.001	0	3
CADMIUM (CD) DISS	<.001	<.001	0	3
CHROMIUM (CR) TOTAL	<.001	<.001	0	3
CHROMIUM (CR) DISS	<.001	<.001	0	3
COPPER (CU) TOTAL	<.001-.024	.015	.0088	6
COPPER (CU) DISS	<.001-.01	.0037	.0055	3
IRON (FE) TOTAL	.01-.91	.236	.235	17
LEAD (PB) TOTAL	<.001-.006	.0028	.0023	6
LEAD (PB) DISS	<.001-.003	.0018	.0013	3
MANGANESE (MN) TOTAL	<.001-.02	.0099	.0052	15
MERCURY (HG) TOTAL	<.0002	<.0002	0	3
MERCURY (HG) DISS	<.0002	<.0002	0	1
MOLYBDENUM (MO) TOTAL	<.001	<.001	0	1
MOLYBDENUM (MO) DISS	<.001	<.001	0	1
NICKEL (NI) TOTAL	<.001	<.001	0	1
NICKEL (NI) DISS	<.001	<.001	0	1
SELENIUM (SE) TOTAL	<.001	<.001	0	3
SELENIUM (SE) DISS	<.001	<.001	0	3
SILVER (AG) TOTAL	<.001	<.001	0	3
SILVER (AG) DISS	<.001	<.001	0	3
ZINC (ZN) TOTAL	.002-.038	.018	.017	5
ZINC (ZN) DISS	.005-.03	.021	.014	3
BACTERIOLOGICAL PARAMETERS				
FECAL COLIFORM (NO./100ML)	<2-4	2.5	2.12	2
TOTAL COLIFORM (NO./100ML)	790-1100	945	219	2
5 - DAY BOD	1.7	1.7	0	1
ORGANIC PARAMETERS				
ORGANIC CARBON (TOTAL)	<.01-13.1	6.83	5.43	6
PHENOLS	<.001-.405	.036	.111	13
OTHER PARAMETERS				
OIL AND GREASE	<.1-2.6	.533	1.01	6
CYANIDE (CN)	<.001-.004	.0013	.0014	6
SULFIDE	1.5	1.5	0	1

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OUTPUT DATE: 02-10-1987 HWQ-6/86-R.ST.1

STATISTICAL SUMMARY OF WATER QUALITY ANALYSIS
FOR SITE S13-7 FOR THE PERIOD 06/29/81 TO 06/18/86

	RANGE	MEAN	STANDARD DEVIATION	NUMBER OF SAMPLES
PHYSICAL PARAMETERS				
AIR TEMPERATURE (C)	11-26	18.91	5.41	11
FLOW (CFS)	.0005-.09	.034	.041	11
WATER TEMPERATURE (C)	3-17	6	4.07	11
SPEC. COND. (UMHOS/CM) FIELD	111-369	236	93.49	11
PH FIELD	6.5-8.4	7.25	.628	11
TURBIDITY (NTU) FIELD	1.4-16	8.51	4.87	11
TOTAL SUSP. SOLIDS	1-48	12.69	18.62	8
TOTAL DISS. SOLIDS MEAS.	54-240	135	66.08	8
OXYGEN (O) DISS	7.6-10.2	8.6	1.4	3
COMMON IONS				
TOTAL HARDNESS AS CACO3	126	126	0	1
CALCIUM (CA)	18.4-68	39.54	18.16	8
MAGNESIUM (MG)	1.4-14.4	5.96	4.57	8
SODIUM (NA)	1-5.8	2.69	1.8	7
POTASSIUM (K)	.1-.6	.41	.167	8
CALCIUM (CA) TOTAL	45.1	45.1	0	1
MAGNESIUM (MG) TOTAL	3.84	3.84	0	1
SODIUM (NA) TOTAL	1.5	1.5	0	1
POTASSIUM (K) TOTAL	.45	.45	0	1
TOTAL ALKALINITY AS CACO3	170	170	0	1
ACIDITY AS CACO3	1.7-17	6.43	7.11	4
ALKALINITY AS CACO3 (LAB)	118-205	156	44.41	3
BICARBONATE (HCO3) (LAB)	52.3-207	129	64	8
CARBONATE AS CO3 (LAB)	<.01	<.01	0	1
SULFATE (SO4)	2-25	10.63	8.59	8
CHLORIDE (CL)	<.01-24	7.5	8.36	8
FLUORIDE (F)	.09-.14	.117	.022	4
CHLORIDE (CL) TOTAL	3	3	0	1
FLUORIDE (F) TOTAL	.14	.14	0	1
NUTRIENTS				
NITRATE (NO3-N)	<.02-2.6	1.3	1.17	4
NITRITE (NO2-N)	.06	.06	0	1
AMMONIA (NH3 AS N)	<.01-.5	.177	.161	8
TOTAL PHOSPHATE (PO4)	.02-.97	.257	.322	8
TRACE ELEMENTS				
ALUMINUM (AL) TOTAL	<.001	<.001	0	1
ALUMINUM (AL) DISS	<.001	<.001	0	1
ARSENIC (AS) TOTAL	<.001	<.001	0	1
ARSENIC (AS) DISS	<.001	<.001	0	1
BARIUM (BA) TOTAL	.018-.05	.027	.015	4

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OUTPUT DATE: 02-10-1987 HWQ-6/86-R.ST.1

STATISTICAL SUMMARY OF WATER QUALITY ANALYSIS
FOR SITE S13-7 FOR THE PERIOD 06/29/81 TO 06/18/86

	RANGE	MEAN	STANDARD DEVIATION	NUMBER OF SAMPLES
TRACE ELEMENTS				
BARIUM (BA) DISS	.01	.01	0	1
BORON (B) TOTAL	.01-.047	.021	.017	4
BORON (B) DISS	.01	.01	0	1
CADMIUM (CD) TOTAL	<.001	<.001	0	1
CADMIUM (CD) DISS	<.001	<.001	0	1
CHROMIUM (CR) TOTAL	<.001	<.001	0	1
CHROMIUM (CR) DISS	<.001	<.001	0	1
COPPER (CU) TOTAL	<.001-.016	.0091	.0064	4
COPPER (CU) DISS	<.001	<.001	0	1
IRON (FE) TOTAL	.01-1.2	.264	.362	9
LEAD (PB) TOTAL	<.001-.003	.0012	.0012	4
LEAD (PB) DISS	<.001	<.001	0	1
MANGANESE (MN) TOTAL	.002-.04	.011	.012	9
MERCURY (HG) TOTAL	<.0002	<.0002	0	1
MERCURY (HG) DISS	<.0002	<.0002	0	1
MOLYBDENUM (MO) TOTAL	<.001	<.001	0	1
MOLYBDENUM (MO) DISS	<.001	<.001	0	1
NICKEL (NI) TOTAL	<.001	<.001	0	1
NICKEL (NI) DISS	<.001	<.001	0	2
SELENIUM (SE) TOTAL	<.001	<.001	0	1
SELENIUM (SE) DISS	<.001	<.001	0	1
SILVER (AG) TOTAL	<.001	<.001	0	1
SILVER (AG) DISS	<.001	<.001	0	1
ZINC (ZN) TOTAL	.002-.058	.021	.025	4
ZINC (ZN) DISS	.01	.01	0	1
ORGANIC PARAMETERS				
ORGANIC CARBON (TOTAL)	<.01-27.4	8.41	12.9	4
PHENOLS	<.001-.512	.067	.18	8
OTHER PARAMETERS				
OIL AND GREASE	<.1-.6	.2	.268	4
CYANIDE (CN)	<.001-.007	.0021	.0032	4
SULFIDE	<.01	<.01	0	1

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OUTPUT DATE: 02-10-1987 HWQ-6/86-R.ST.1

STATISTICAL SUMMARY OF WATER QUALITY ANALYSIS
FOR SITE S14-4 FOR THE PERIOD 06/29/81 TO 06/18/86

	RANGE	MEAN	STANDARD DEVIATION	NUMBER OF SAMPLES
PHYSICAL PARAMETERS				
AIR TEMPERATURE (C)	-4-22	13.6	6.1	20
FLOW (CFS)	.0002-.05	.013	.015	20
WATER TEMPERATURE (C)	2-9	4.78	1.94	20
SPEC. COND. (UMHOS/CM) FIELD	116-435	335	94.84	20
PH FIELD	6.2-8.2	6.96	.657	18
TURBIDITY (NTU) FIELD	.48-12	5.19	3.28	18
TOTAL SUSP. SOLIDS	1-7	3.35	2.52	10
TOTAL DISS. SOLIDS MEAS.	98-278	186	62.38	10
OXYGEN (O) DISS	6-8.5	7.3	1.25	3
COMMON IONS				
TOTAL HARDNESS AS CACO3	170	170	0	1
CALCIUM (CA)	24.8-80.4	53.91	19.19	10
MAGNESIUM (MG)	1.9-19.2	6.98	4.86	10
SODIUM (NA)	1.8-18	4.47	4.9	10
POTASSIUM (K)	.34-1.54	.942	.351	10
CALCIUM (CA) TOTAL	59.7	59.7	0	1
MAGNESIUM (MG) TOTAL	5.5	5.5	0	1
SODIUM (NA) TOTAL	4	4	0	1
POTASSIUM (K) TOTAL	1.16	1.16	0	1
ACIDITY AS CACO3	3.5-23	9.5	9.08	4
ALKALINITY AS CACO3 (LAB)	154-198	186	21.2	4
BICARBONATE (HCO3) (LAB)	75.4-252.5	177	72.92	10
CARBONATE AS CO3 (LAB)	<.01	<.01	0	1
SULFATE (SO4)	5-45	16.73	11.78	10
CHLORIDE (CL)	2-26	7.8	7.09	10
FLUORIDE (F)	.08-.16	.12	.037	4
CHLORIDE (CL) TOTAL	5.9	5.9	0	1
FLUORIDE (F) TOTAL	.14	.14	0	1
NUTRIENTS				
NITRATE (NO3-N)	<.02-1.95	1.22	1.06	3
NITRITE (NO2-N)	.07	.07	0	1
AMMONIA (NH3 AS N)	<.01-.3	.072	.094	11
TOTAL PHOSPHATE (PO4)	<.01-.46	.124	.14	10
TRACE ELEMENTS				
ALUMINUM (AL) TOTAL	<.001	<.001	0	1
ALUMINUM (AL) DISS	<.001	<.001	0	1
ARSENIC (AS) TOTAL	<.001-.003	.0018	.0018	2
ARSENIC (AS) DISS	<.001	<.001	0	2
BARIUM (BA) TOTAL	.011-.02	.016	.0044	4
BARIUM (BA) DISS	.01-.012	.011	.0014	2

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OUTPUT DATE: 02-10-1987 HWQ-6/86-R.ST.1

STATISTICAL SUMMARY OF WATER QUALITY ANALYSIS
FOR SITE S14-4 FOR THE PERIOD 06/29/81 TO 06/18/86

	RANGE	MEAN	STANDARD DEVIATION	NUMBER OF SAMPLES
TRACE ELEMENTS				
BORON (B) TOTAL	.01-.054	.023	.021	4
BORON (B) DISS	.005-.01	.0075	.0035	2
CADMIUM (CD) TOTAL	<.001	<.001	0	2
CADMIUM (CD) DISS	<.001	<.001	0	2
CHROMIUM (CR) TOTAL	<.001	<.001	0	2
CHROMIUM (CR) DISS	<.001	<.001	0	2
COPPER (CU) TOTAL	<.001-.014	.0086	.0057	4
COPPER (CU) DISS	<.001	<.001	0	2
IRON (FE) TOTAL	<.01-.27	.097	.085	12
LEAD (PB) TOTAL	<.001-.017	.0046	.0083	4
LEAD (PB) DISS	<.001	<.001	0	2
MANGANESE (MN) TOTAL	<.001-.02	.0067	.006	11
MERCURY (HG) TOTAL	<.0002	<.0002	0	2
MERCURY (HG) DISS	<.0002	<.0002	0	1
MOLYBDENUM (MO) TOTAL	<.001	<.001	0	1
MOLYBDENUM (MO) DISS	<.001	<.001	0	1
NICKEL (NI) TOTAL	<.001	<.001	0	1
NICKEL (NI) DISS	<.001	<.001	0	1
SELENIUM (SE) TOTAL	<.001	<.001	0	2
SELENIUM (SE) DISS	<.001	<.001	0	2
SILVER (AG) TOTAL	<.001	<.001	0	2
SILVER (AG) DISS	<.001	<.001	0	2
ZINC (ZN) TOTAL	.005-.05	.028	.024	4
ZINC (ZN) DISS	.007	.007	0	2
BACTERIOLOGICAL PARAMETERS				
FECAL COLIFORM (NO./100ML)	<2	<2	0	1
TOTAL COLIFORM (NO./100ML)	<2	<2	0	1
ORGANIC PARAMETERS				
ORGANIC CARBON (TOTAL)	<.01-36	9.95	17.4	4
PHENOLS	<.001-.285	.054	.114	11
OTHER PARAMETERS				
OIL AND GREASE	<.1-2.6	1.29	1.4	4
CYANIDE (CN)	<.001	<.001	0	4
SULFIDE	<.01	<.01	0	1

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OUTPUT DATE: 02-10-1987 HWQ-6/86-R.ST.1

STATISTICAL SUMMARY OF WATER QUALITY ANALYSIS
FOR SITE S15-3 FOR THE PERIOD 05/14/81 TO 06/19/86

	RANGE	MEAN	STANDARD DEVIATION	NUMBER OF SAMPLES
PHYSICAL PARAMETERS				
AIR TEMPERATURE (C)	3-28	13.64	6.27	25
FLOW (CFS)	.01-3	.375	.744	24
WATER TEMPERATURE (C)	3-12	5.04	1.97	25
SPEC. COND. (UMHOS/CM) FIELD	97-400	270	80.01	25
PH FIELD	6.8-8.3	7.47	.463	21
TURBIDITY (NTU) FIELD	.49-28	8.7	7.53	21
TOTAL SUSP. SOLIDS	<.1-18	4.61	4.78	14
TOTAL DISS. SOLIDS MEAS.	88-258	175	56.63	14
OXYGEN (O) DISS	7.8-11.1	9.58	1.41	5
COMMON IONS				
TOTAL HARDNESS AS CACO3	760	760	0	1
CALCIUM (CA)	18-71	45.43	17.82	14
MAGNESIUM (MG)	3.36-11	7.24	2.81	14
SODIUM (NA)	1-37	7.85	9.08	14
POTASSIUM (K)	.07-1.85	.813	.495	14
CALCIUM (CA) TOTAL	24	24	0	1
MAGNESIUM (MG) TOTAL	3.84	3.84	0	1
SODIUM (NA) TOTAL	6.5	6.5	0	1
POTASSIUM (K) TOTAL	2.3	2.3	0	1
ACIDITY AS CACO3	1.82-15	6.77	5.39	6
ALKALINITY AS CACO3 (LAB)	76-184	162	38.71	7
BICARBONATE (HCO3) (LAB)	85.4-225	166	55.57	14
CARBONATE AS CO3 (LAB)	<.01	<.01	0	1
SULFATE (SO4)	<3-46	15.82	12.35	14
CHLORIDE (CL)	<.1-25	4.82	6.81	14
FLUORIDE (F)	.08-.15	.117	.027	6
CHLORIDE (CL) TOTAL	2	2	0	1
FLUORIDE (F) TOTAL	.09	.09	0	1
NUTRIENTS				
NITRATE (NO3-N)	<.02-.24	.142	.088	5
NITRITE (NO2-N)	.03	.03	0	1
AMMONIA (NH3 AS N)	<.01-.70	.199	.235	14
TOTAL PHOSPHATE (PO4)	<.01-.44	.121	.134	14
TRACE ELEMENTS				
ALUMINUM (AL) TOTAL	.25	.25	0	1
ALUMINUM (AL) DISS	.2	.2	0	1
ARSENIC (AS) TOTAL	<.001-.002	.001	.0009	3
ARSENIC (AS) DISS	<.001	<.001	0	3
BARIUM (BA) TOTAL	.01-.09	.028	.031	6
BARIUM (BA) DISS	.005-.075	.03	.039	3

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OUTPUT DATE: 02-10-1987 HWQ-6/86-R.ST.1

STATISTICAL SUMMARY OF WATER QUALITY ANALYSIS
FOR SITE S15-3 FOR THE PERIOD 05/14/81 TO 06/19/86

	RANGE	MEAN	STANDARD DEVIATION	NUMBER OF SAMPLES
TRACE ELEMENTS				
BORON (B) TOTAL	.01-.054	.022	.018	6
BORON (B) DISS	.005-.01	.0067	.0029	3
CADMIUM (CD) TOTAL	<.001	<.001	0	3
CADMIUM (CD) DISS	<.001	<.001	0	3
CHROMIUM (CR) TOTAL	<.001	<.001	0	3
CHROMIUM (CR) DISS	<.001	<.001	0	3
COPPER (CU) TOTAL	<.001-.023	.0092	.0083	6
COPPER (CU) DISS	<.001	<.001	0	3
IRON (FE) TOTAL	.01-1.8	.228	.423	17
LEAD (PB) TOTAL	<.001-.016	.0036	.0061	6
LEAD (PB) DISS	<.001	<.001	0	3
MANGANESE (MN) TOTAL	<.001-.015	.0058	.0048	15
MERCURY (HG) TOTAL	<.0002	<.0002	0	3
MERCURY (HG) DISS	<.0002	<.0002	0	1
MOLYBDENUM (MO) TOTAL	<.001	<.001	0	1
MOLYBDENUM (MO) DISS	<.001	<.001	0	1
NICKEL (NI) TOTAL	<.001	<.001	0	1
NICKEL (NI) DISS	<.001	<.001	0	1
SELENIUM (SE) TOTAL	<.001	<.001	0	3
SELENIUM (SE) DISS	<.001	<.001	0	3
SILVER (AG) TOTAL	<.001	<.001	0	3
SILVER (AG) DISS	<.001	<.001	0	3
ZINC (ZN) TOTAL	.002-.034	.01	.012	6
ZINC (ZN) DISS	.002-.055	.021	.03	3
BACTERIOLOGICAL PARAMETERS				
FECAL COLIFORM (NO./100ML)	<2	<2	.707	2
TOTAL COLIFORM (NO./100ML)	8-13	10.5	3.54	2
ORGANIC PARAMETERS				
ORGANIC CARBON (TOTAL)	<.01-14.8	6.02	5.67	6
PHENOLS	<.001-.059	.009	.016	14
OTHER PARAMETERS				
OIL AND GREASE	<.01-1.2	.268	.462	6
CYANIDE (CN)	<.001-.004	.0011	.0014	6
SULFIDE	1.8	1.8	0	1

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OUTPUT DATE: 02-10-1987 HWQ-6/86-R.ST.1

STATISTICAL SUMMARY OF WATER QUALITY ANALYSIS
FOR SITE S17-2 FOR THE PERIOD 01/27/81 TO 06/25/86

	RANGE	MEAN	STANDARD DEVIATION	NUMBER OF SAMPLES
PHYSICAL PARAMETERS				
AIR TEMPERATURE (C)	-23-25	7.38	10	47
FLOW (CFS)	.03-.33	.227	.068	46
WATER TEMPERATURE (C)	6-14	8.93	1.26	47
SPEC. COND. (UMHOS/CM) FIELD	335-696	542	83.37	47
PH FIELD	6.6-7.9	7.13	.352	45
TURBIDITY (NTU) FIELD	.3-14	4.5	3.69	38
TOTAL SUSP. SOLIDS	<.1-23	7.26	6.62	16
TOTAL DISS. SOLIDS MEAS.	315-460	362	45.79	16
OXYGEN (O) DISS	4.2-8.5	6.6	1.86	4
COMMON IONS				
TOTAL HARDNESS AS CACO3	302	302	0	1
CALCIUM (CA)	67.2-86	76.11	4.51	16
MAGNESIUM (MG)	25.92-45.6	31.01	4.42	16
SODIUM (NA)	2.9-46	10.89	13.99	16
POTASSIUM (K)	2.1-2.51	2.4	.11	16
ACIDITY AS CACO3	8-29	14.7	9.35	5
ALKALINITY AS CACO3 (LAB)	250-300	272	14.89	8
BICARBONATE (HCO3) (LAB)	303-405	334	26.32	16
CARBONATE AS CO3 (LAB)	<.01	<.01	0	1
SULFATE (SO4)	16-68	52.16	13.23	16
CHLORIDE (CL)	3.1-45	9.01	10.27	16
FLUORIDE (F)	.14-.21	.173	.023	6
NUTRIENTS				
NITRATE (NO3-N)	<.01-.06	.02	.022	6
NITRITE (NO2-N)	<.01	<.01	0	1
AMMONIA (NH3 AS N)	<.01-2.48	.298	.604	16
TOTAL PHOSPHATE (PO4)	<.01-.33	.103	.095	16
TRACE ELEMENTS				
ALUMINUM (AL) TOTAL	<.001	<.001	0	1
ARSENIC (AS) TOTAL	<.001	<.001	0	3
ARSENIC (AS) DISS	<.001	<.001	0	3
BARIUM (BA) TOTAL	.036-.093	.069	.019	6
BARIUM (BA) DISS	.05-.065	.058	.0076	3
BORON (B) TOTAL	.015-.035	.027	.0082	6
BORON (B) DISS	.01-.02	.017	.0058	3
CADMIUM (CD) TOTAL	<.001	<.001	0	3
CADMIUM (CD) DISS	<.001	<.001	0	3
CHROMIUM (CR) TOTAL	<.001	<.001	0	3
CHROMIUM (CR) DISS	<.001	<.001	0	3
COPPER (CU) TOTAL	<.001-.015	.0061	.0064	6

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OUTPUT DATE: 02-10-1987 HWQ-6/86-R.ST.1

STATISTICAL SUMMARY OF WATER QUALITY ANALYSIS
FOR SITE S17-2 FOR THE PERIOD 01/27/81 TO 06/25/86

	RANGE	MEAN	STANDARD DEVIATION	NUMBER OF SAMPLES
TRACE ELEMENTS				
COPPER (CU) DISS	<.001	<.001	0	3
IRON (FE) TOTAL	.04-1.3	.774	.319	19
LEAD (PB) TOTAL	<.001-.005	.0018	.0019	6
LEAD (PB) DISS	<.001-.002	.001	.0009	3
MANGANESE (MN) TOTAL	.03-.07	.05	.013	16
MERCURY (HG) TOTAL	<.0002	<.0002	0	3
MOLYBDENUM (MO) TOTAL	<.001	<.001	0	1
NICKEL (NI) TOTAL	<.001	<.001	0	1
SELENIUM (SE) TOTAL	<.001	<.001	0	3
SELENIUM (SE) DISS	<.001	<.001	0	3
SILVER (AG) TOTAL	<.001	<.001	0	3
SILVER (AG) DISS	<.001	<.001	0	3
ZINC (ZN) TOTAL	.001-.033	.012	.012	6
ZINC (ZN) DISS	.005-.006	.0053	.0006	3
BACTERIOLOGICAL PARAMETERS				
FECAL COLIFORM (NO./100ML)	<2	<2	0	2
TOTAL COLIFORM (NO./100ML)	2	2	.707	2
5 - DAY BOD	1.4	1.4	0	1
ORGANIC PARAMETERS				
ORGANIC CARBON (TOTAL)	<.01-10	4.93	4.3	6
PHENOLS	<.001-.16	.013	.04	16
OTHER PARAMETERS				
OIL AND GREASE	<.01-.6	.16	.228	6
CYANIDE (CN)	<.001-.002	<.001	.0006	6

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STATISTICAL SUMMARY OF WATER QUALITY ANALYSIS
FOR SITE S22-5 FOR THE PERIOD 05/14/81 TO 06/19/86

	RANGE	MEAN	STANDARD DEVIATION	NUMBER OF SAMPLES
PHYSICAL PARAMETERS				
AIR TEMPERATURE (C)	3-26	13.86	5.76	22
FLOW (CFS)	.0004-.16	.044	.047	21
WATER TEMPERATURE (C)	3-14	4.93	2.32	22
SPEC. COND. (UMHOS/CM) FIELD	270-413	350	41.64	22
PH FIELD	6.1-8.4	7.44	.549	20
TURBIDITY (NTU) FIELD	.3-239	18.35	55.16	18
TOTAL SUSP. SOLIDS	<.1-16	3.79	4.13	14
TOTAL DISS. SOLIDS MEAS.	175-330	230	45.9	14
OXYGEN (O) DISS	2.2-11.4	8.38	3.58	5
COMMON IONS				
TOTAL HARDNESS AS CACO3	166	166	0	1
CALCIUM (CA)	47.2-88.4	64.08	10.11	14
MAGNESIUM (MG)	<.1-13.2	7.79	3.12	14
SODIUM (NA)	1.2-46	8.97	12.33	14
POTASSIUM (K)	.28-1.23	.647	.234	14
CALCIUM (CA) TOTAL	57.6	57.6	0	1
MAGNESIUM (MG) TOTAL	5.28	5.28	0	1
SODIUM (NA) TOTAL	3.6	3.6	0	1
POTASSIUM (K) TOTAL	1.65	1.65	0	1
ACIDITY AS CACO3	<.01-22	7.03	7.71	6
ALKALINITY AS CACO3 (LAB)	154-290	205	42.09	7
BICARBONATE (HCO3) (LAB)	166-353.8	233	49.08	14
CARBONATE AS CO3 (LAB)	2.4	2.4	0	1
SULFATE (SO4)	<3-25	13.11	7.47	14
CHLORIDE (CL)	1.6-14.3	4.98	3.56	14
FLUORIDE (F)	.08-.17	.133	.031	6
CHLORIDE (CL) TOTAL	4	4	0	1
FLUORIDE (F) TOTAL	.14	.14	0	1
NUTRIENTS				
NITRATE (NO3-N)	<.02-1.63	.902	.723	5
NITRITE (NO2-N)	.03	.03	0	1
AMMONIA (NH3 AS N)	<.01-.63	.163	.179	14
TOTAL PHOSPHATE (PO4)	<.01-.82	.154	.207	14
TRACE ELEMENTS				
ALUMINUM (AL) TOTAL	.065	.065	0	1
ALUMINUM (AL) DISS	.02	.02	0	1
ARSENIC (AS) TOTAL	<.001-.002	.001	.0009	3
ARSENIC (AS) DISS	<.001	<.001	0	3
BARIUM (BA) TOTAL	.018-.03	.022	.0045	6
BARIUM (BA) DISS	.013-.02	.016	.0036	3

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OUTPUT DATE: 02-10-1987 HWQ-6/86-R.ST.1

STATISTICAL SUMMARY OF WATER QUALITY ANALYSIS
FOR SITE S22-5 FOR THE PERIOD 05/14/81 TO 06/19/86

	RANGE	MEAN	STANDARD DEVIATION	NUMBER OF SAMPLES
TRACE ELEMENTS				
BORON (B) TOTAL	<.001-.057	.021	.019	6
BORON (B) DISS	<.001-.01	.0052	.0048	3
CADMIUM (CD) TOTAL	<.001	<.001	0	3
CADMIUM (CD) DISS	<.001	<.001	0	3
CHROMIUM (CR) TOTAL	<.001	<.001	0	3
CHROMIUM (CR) DISS	<.001	<.001	0	3
COPPER (CU) TOTAL	<.001-.02	.011	.0064	6
COPPER (CU) DISS	<.001-.01	.0068	.0055	3
IRON (FE) TOTAL	<.01-1.45	.138	.341	17
LEAD (PB) TOTAL	<.001-.005	.0022	.0019	6
LEAD (PB) DISS	<.001	<.001	0	3
MANGANESE (MN) TOTAL	<.001-.02	.0057	.0052	15
MERCURY (HG) TOTAL	<.0002	<.0002	0	3
MERCURY (HG) DISS	<.0002	<.0002	0	1
MOLYBDENUM (MO) TOTAL	<.001	<.001	0	1
MOLYBDENUM (MO) DISS	<.001	<.001	0	1
NICKEL (NI) TOTAL	<.001	<.001	0	1
NICKEL (NI) DISS	<.001	<.001	0	1
SELENIUM (SE) TOTAL	<.001	<.001	0	3
SELENIUM (SE) DISS	<.001	<.001	0	3
SILVER (AG) TOTAL	<.001	<.001	0	3
SILVER (AG) DISS	<.001	<.001	0	3
ZINC (ZN) TOTAL	.001-.06	.028	.026	6
ZINC (ZN) DISS	.003-.055	.033	.027	3
BACTERIOLOGICAL PARAMETERS				
FECAL COLIFORM (NO./100ML)	<2	<2	0	2
TOTAL COLIFORM (NO./100ML)	2-130	66	90.51	2
ORGANIC PARAMETERS				
ORGANIC CARBON (TOTAL)	<.01-5.3	3.21	2.29	6
PHENOLS	<.001-.482	.038	.128	14
OTHER PARAMETERS				
OIL AND GREASE	<.1-20.6	3.69	8.29	6
CYANIDE (CN)	<.001	<.001	0	6
SULFIDE	2.2	2.2	0	1

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STATISTICAL SUMMARY OF WATER QUALITY ANALYSIS
FOR SITE S22-11 FOR THE PERIOD 06/29/81 TO 06/19/86

	RANGE	MEAN	STANDARD DEVIATION	NUMBER OF SAMPLES
PHYSICAL PARAMETERS				
AIR TEMPERATURE (C)	-1-22	12.15	6.65	20
FLOW (CFS)	.001-.14	.047	.034	20
WATER TEMPERATURE (C)	2-5	3.65	.671	20
SPEC. COND. (UMHOS/CM) FIELD	290-394	354	30.2	20
PH FIELD	6-8.5	7.38	.593	19
TURBIDITY (NTU) FIELD	.27-12	5.08	4.01	18
TOTAL SUSP. SOLIDS	1-12	3.81	3.47	13
TOTAL DISS. SOLIDS MEAS.	186-240	220	16.74	13
OXYGEN (O) DISS	4.6-13	9.32	3.04	5
COMMON IONS				
TOTAL HARDNESS AS CACO3	186	186	0	1
CALCIUM (CA)	60-68	63.03	2.6	13
MAGNESIUM (MG)	7.2-15.6	9.29	2.11	13
SODIUM (NA)	2.2-15	6.98	4.58	13
POTASSIUM (K)	.68-2.11	.915	.375	13
CALCIUM (CA) TOTAL	63.8	63.8	0	1
MAGNESIUM (MG) TOTAL	8.65	8.65	0	1
SODIUM (NA) TOTAL	3.5	3.5	0	1
POTASSIUM (K) TOTAL	.99	.99	0	1
ACIDITY AS CACO3	2.7-20	8.82	6.28	6
ALKALINITY AS CACO3 (LAB)	184-210	196	9.42	6
BICARBONATE (HCO3) (LAB)	210-266	235	15.62	13
CARBONATE AS CO3 (LAB)	<.01	<.01	0	1
SULFATE (SO4)	<3-36	11.69	8.94	13
CHLORIDE (CL)	1.3-20	5.7	5.36	13
FLUORIDE (F)	.09-.18	.14	.036	6
CHLORIDE (CL) TOTAL	4.4	4.4	0	1
FLUORIDE (F) TOTAL	.16	.16	0	1
NUTRIENTS				
NITRATE (NO3-N)	<.02-4.1	1.16	1.68	5
NITRITE (NO2-N)	.04	.04	0	1
AMMONIA (NH3 AS N)	<.01-.65	.209	.19	13
TOTAL PHOSPHATE (PO4)	<.01-.85	.242	.275	13
TRACE ELEMENTS				
ALUMINUM (AL) TOTAL	<.001	<.001	0	1
ALUMINUM (AL) DISS	<.001	<.001	0	1
ARSENIC (AS) TOTAL	<.001-.002	.001	.0009	3
ARSENIC (AS) DISS	<.001	<.001	0	3
BARIUM (BA) TOTAL	.01-.038	.021	.0096	6
BARIUM (BA) DISS	.014-.015	.015	.0006	3

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OUTPUT DATE: 02-10-1987 HWQ-6/86-R.ST.1

STATISTICAL SUMMARY OF WATER QUALITY ANALYSIS
FOR SITE S22-11 FOR THE PERIOD 06/29/81 TO 06/19/86

	RANGE	MEAN	STANDARD DEVIATION	NUMBER OF SAMPLES
TRACE ELEMENTS				
BORON (B) TOTAL	.01-.032	.022	.0095	6
BORON (B) DISS	.005-.02	.013	.0076	3
CADMIUM (CD) TOTAL	<.001	<.001	0	3
CADMIUM (CD) DISS	<.001	<.001	0	3
CHROMIUM (CR) TOTAL	<.001	<.001	0	3
CHROMIUM (CR) DISS	<.001	<.001	0	3
COPPER (CU) TOTAL	<.001-.02	.012	.0074	5
COPPER (CU) DISS	<.001-.01	.0037	.0055	3
IRON (FE) TOTAL	<.01-.1	.04	.032	16
LEAD (PB) TOTAL	<.001-.003	.001	.001	6
LEAD (PB) DISS	<.001-.004	.0017	.002	3
MANGANESE (MN) TOTAL	<.001-.02	.0073	.0062	14
MERCURY (HG) TOTAL	<.0002	<.0002	0	3
MERCURY (HG) DISS	<.0002	<.0002	0	1
MOLYBDENUM (MO) TOTAL	<.001	<.001	0	1
MOLYBDENUM (MO) DISS	<.001	<.001	0	1
NICKEL (NI) TOTAL	<.001	<.001	0	1
NICKEL (NI) DISS	<.001	<.001	0	1
SELENIUM (SE) TOTAL	<.001	<.001	0	3
SELENIUM (SE) DISS	<.001	<.001	0	3
SILVER (AG) TOTAL	.001	.001	.0003	3
SILVER (AG) DISS	<.001	<.001	0	3
ZINC (ZN) TOTAL	.002-.185	.043	.071	6
ZINC (ZN) DISS	.005-.04	.018	.019	3
BACTERIOLOGICAL PARAMETERS				
FECAL COLIFORM (NO./100ML)	<2	<2	0	2
TOTAL COLIFORM (NO./100ML)	2-17	9.5	10.61	2
ORGANIC PARAMETERS				
ORGANIC CARBON (TOTAL)	<.01-26.4	7.54	9.95	6
PHENOLS	<.001-.05	.0054	.014	13
OTHER PARAMETERS				
OIL AND GREASE	<.1-1.4	.458	.504	6
CYANIDE (CN)	<.001-.011	.0023	.0043	6
SULFIDE	<.01	<.01	0	1

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OUTPUT DATE: 02-10-1987 HWQ-6/86-R.ST.1

STATISTICAL SUMMARY OF WATER QUALITY ANALYSIS
FOR SITE S23-4 FOR THE PERIOD 06/29/81 TO 06/19/86

	RANGE	MEAN	STANDARD DEVIATION	NUMBER OF SAMPLES
PHYSICAL PARAMETERS				
AIR TEMPERATURE (C)	8-24	16.35	5.98	17
WATER TEMPERATURE (C)	5-25	11.53	5.36	17
SPEC. COND. (UMHOS/CM) FIELD	345-516	434	59.13	17
PH FIELD	6.5-8	7.06	.438	16
TURBIDITY (NTU) FIELD	1-83	25.61	28.11	14
TOTAL SUSP. SOLIDS	2.3-1406	305	450	10
TOTAL DISS. SOLIDS MEAS.	222-310	263	28.74	10
OXYGEN (O) DISS	3-9.1	6.43	3.12	3
COMMON IONS				
TOTAL HARDNESS AS CACO3	216	216	0	1
CALCIUM (CA)	48-84	71.99	11.49	10
MAGNESIUM (MG)	8.4-23.04	14.69	4.72	10
SODIUM (NA)	2-10	6.18	3.46	10
POTASSIUM (K)	.32-1.43	.926	.387	10
CALCIUM (CA) TOTAL	48.5	48.5	0	1
MAGNESIUM (MG) TOTAL	24.2	24.2	0	1
SODIUM (NA) TOTAL	17	17	0	1
POTASSIUM (K) TOTAL	.45	.45	0	1
ACIDITY AS CACO3	1.6-19	8.86	6.31	5
ALKALINITY AS CACO3 (LAB)	238-285	262	21.66	5
BICARBONATE (HCO3) (LAB)	227-347.7	294	39.06	10
CARBONATE AS CO3 (LAB)	<.01	<.01	0	1
SULFATE (SO4)	<3-30	11.18	8.1	10
CHLORIDE (CL)	1.2-13.5	5.11	3.94	10
FLUORIDE (F)	.12-.23	.172	.05	5
CHLORIDE (CL) TOTAL	3.4	3.4	0	1
FLUORIDE (F) TOTAL	.22	.22	0	1
NUTRIENTS				
NITRATE (NO3-N)	<.02-.66	.288	.242	5
NITRITE (NO2-N)	.04	.04	0	1
AMMONIA (NH3 AS N)	<.01-.4	.156	.148	10
TOTAL PHOSPHATE (PO4)	.02-.70	.187	.202	10
TRACE ELEMENTS				
ALUMINUM (AL) TOTAL	.05	.05	0	1
ALUMINUM (AL) DISS	.04	.04	0	1
ARSENIC (AS) TOTAL	<.001	<.001	0	2
ARSENIC (AS) DISS	<.001	<.001	0	2
BARIUM (BA) TOTAL	.03-.07	.043	.016	5
BARIUM (BA) DISS	.025	.025	0	2
BORON (B) TOTAL	.01-.059	.033	.018	5

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OUTPUT DATE: 02-10-1987 HWQ-6/86-R.ST.1

STATISTICAL SUMMARY OF WATER QUALITY ANALYSIS
FOR SITE S23-4 FOR THE PERIOD 06/29/81 TO 06/19/86

	RANGE	MEAN	STANDARD DEVIATION	NUMBER OF SAMPLES
TRACE ELEMENTS				
BORON (B) DISS	.012-.03	.021	.013	2
CADMIUM (CD) TOTAL	<.001	<.001	0	2
CADMIUM (CD) DISS	<.001	<.001	0	2
CHROMIUM (CR) TOTAL	<.001	<.001	0	2
CHROMIUM (CR) DISS	<.001	<.001	0	2
COPPER (CU) TOTAL	<.001-.03	.015	.011	5
COPPER (CU) DISS	<.001	<.001	0	2
IRON (FE) TOTAL	.02-7.5	1.59	2.14	12
LEAD (PB) TOTAL	<.001-.009	.0034	.0035	5
LEAD (PB) DISS	<.001	<.001	0	2
MANGANESE (MN) TOTAL	<.01-.15	.055	.052	11
MERCURY (HG) TOTAL	<.0002	<.0002	0	2
MERCURY (HG) DISS	<.0002	<.0002	0	1
MOLYBDENUM (MO) TOTAL	<.001	<.001	0	1
MOLYBDENUM (MO) DISS	<.001	<.001	0	1
NICKEL (NI) TOTAL	<.001	<.001	0	1
NICKEL (NI)	<.001	<.001	0	1
SELENIUM (SE) TOTAL	<.001	<.001	0	2
SELENIUM (SE) DISS	<.001	<.001	0	2
SILVER (AG) TOTAL	<.001	<.001	0	2
SILVER (AG) DISS	<.001	<.001	0	2
ZINC (ZN) TOTAL	.01-.055	.025	.021	5
ZINC (ZN) DISS	.005	.005	0	2
BACTERIOLOGICAL PARAMETERS				
FECAL COLIFORM (NO./100ML)	23	23	0	1
TOTAL COLIFORM (NO./100ML)	2300	2300	0	1
5 - DAY BOD	1.9	1.9	0	1
ORGANIC PARAMETERS				
ORGANIC CARBON (TOTAL)	.88-19.8	10.2	9.05	5
PHENOLS	<.001-.269	.028	.085	10
OTHER PARAMETERS				
OIL AND GREASE	<.1-1.2	.39	.472	5
CYANIDE (CN)	<.001-.009	.0025	.0037	5
SULFIDE	<.01	<.01	0	1

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OUTPUT DATE: 02-10-1987 HWQ-6/86-R.ST.1

STATISTICAL SUMMARY OF WATER QUALITY ANALYSIS
FOR SITE S24-12 FOR THE PERIOD 05/14/81 TO 06/19/86

	RANGE	MEAN	STANDARD DEVIATION	NUMBER OF SAMPLES
PHYSICAL PARAMETERS				
AIR TEMPERATURE (C)	-1-21	11.48	6.58	20
FLOW (CFS)	.001-.005	.0024	.0011	20
WATER TEMPERATURE (C)	3-13	6.53	2.75	20
SPEC. COND. (UMHOS/CM) FIELD	1.38-728	517	149	20
PH FIELD	7.2-8.1	7.63	.245	19
TURBIDITY (NTU) FIELD	.34-65	12.26	16.17	19
TOTAL SUSP. SOLIDS	<.1-83	23.96	28.13	12
TOTAL DISS. SOLIDS MEAS.	296-438	356	42.64	12
OXYGEN (O) DISS	4.4-10	7.84	2.14	5
COMMON IONS				
TOTAL HARDNESS AS CACO3	218	218	0	1
CALCIUM (CA)	46.8-88	76.68	11.3	12
MAGNESIUM (MG)	21.6-47.3	30.78	7.23	12
SODIUM (NA)	2-25.6	7.02	7.34	12
POTASSIUM (K)	.5-2.04	1.6	.398	12
CALCIUM (CA) TOTAL	47.2	47.2	0	1
MAGNESIUM (MG) TOTAL	24	24	0	1
SODIUM (NA) TOTAL	38	38	0	1
POTASSIUM (K) TOTAL	1.7	1.7	0	1
ACIDITY AS CACO3	<.01-21	7.67	7.76	6
ALKALINITY AS CACO3 (LAB)	274-310	290	13.71	6
BICARBONATE (HCO3) (LAB)	287.9-373	343	23.07	12
CARBONATE AS CO3 (LAB)	12	12	0	1
SULFATE (SO4)	12-80	44.58	21.87	12
CHLORIDE (CL)	.6-30	7.46	8.49	12
FLUORIDE (F)	.14-.24	.172	.035	6
CHLORIDE (CL) TOTAL	4	4	0	1
FLUORIDE (F) TOTAL	.18	.18	0	1
NUTRIENTS				
NITRATE (NO3-N)	<.01-.11	.036	.04	6
NITRITE (NO2-N)	.02	.02	0	1
AMMONIA (NH3 AS N)	<.01-.6	.153	.196	12
TOTAL PHOSPHATE (PO4)	<.01-.28	.09	.091	12
TRACE ELEMENTS				
ALUMINUM (AL) TOTAL	<.001	<.001	0	1
ALUMINUM (AL) DISS	<.001	<.001	0	1
ARSENIC (AS) TOTAL	<.001	<.001	0	3
ARSENIC (AS) DISS	<.001	<.001	0	3
BARIUM (BA) TOTAL	.053-.066	.061	.0049	6
BARIUM (BA) DISS	.04-.055	.048	.0076	3

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OUTPUT DATE: 02-10-1987 HWQ-6/86-R.ST.1

STATISTICAL SUMMARY OF WATER QUALITY ANALYSIS
FOR SITE S24-12 FOR THE PERIOD 05/14/81 TO 06/19/86

	RANGE	MEAN	STANDARD DEVIATION	NUMBER OF SAMPLES
TRACE ELEMENTS				
BORON (B) TOTAL	.012-.04	.03	.012	6
BORON (B) DISS	.006-.035	.024	.016	3
CADMIUM (CD) TOTAL	<.001	<.001	0	3
CADMIUM (CD) DISS	<.001	<.001	0	3
CHROMIUM (CR) TOTAL	<.001	<.001	0	3
CHROMIUM (CR) DISS	<.001	<.001	0	3
COPPER (CU) TOTAL	<.001-.02	.011	.0066	6
COPPER (CU) DISS	<.001-.011	.0072	.0058	3
IRON (FE) TOTAL	<.01-.85	.165	.243	15
LEAD (PB) TOTAL	<.001-.006	.0021	.0024	6
LEAD (PB) DISS	<.001-.002	.001	.0009	3
MANGANESE (MN) TOTAL	.005-.03	.013	.0086	13
MERCURY (HG) TOTAL	<.0002	<.0002	0	3
MERCURY (HG) DISS	<.0002	<.0002	0	1
MOLYBDENUM (MO) TOTAL	<.001	<.001	0	1
MOLYBDENUM (MO) DISS	<.001	<.001	0	1
NICKEL (NI) TOTAL	<.001	<.001	0	1
NICKEL (NI)	<.001	<.001	0	1
SELENIUM (SE) TOTAL	<.001	<.001	0	3
SELENIUM (SE) DISS	<.001	<.001	0	3
SILVER (AG) TOTAL	<.001	<.001	0	3
SILVER (AG) DISS	<.001	<.001	0	3
ZINC (ZN) TOTAL	.001-.02	.0096	.0082	5
ZINC (ZN) DISS	.01-.012	.011	.0012	3
BACTERIOLOGICAL PARAMETERS				
FECAL COLIFORM (NO./100ML)	<2	<2	0	2
TOTAL COLIFORM (NO./100ML)	7-14	10.5	4.95	2
5 - DAY BOD	2	2	0	1
ORGANIC PARAMETERS				
ORGANIC CARBON (TOTAL)	<.01-12.2	4.05	4.79	6
PHENOLS	<.001-.008	.0017	.0027	12
OTHER PARAMETERS				
OIL AND GREASE	<.01-2	.817	.885	6
CYANIDE (CN)	<.001-.015	.0036	.0058	6
SULFIDE	2.2	2.2	0	1

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OUTPUT DATE: 02-10-1987 HWQ-6/86-R.ST.1

STATISTICAL SUMMARY OF WATER QUALITY ANALYSIS
FOR SITE S26-13 FOR THE PERIOD 06/29/81 TO 06/19/86

	RANGE	MEAN	STANDARD DEVIATION	NUMBER OF SAMPLES
PHYSICAL PARAMETERS				
AIR TEMPERATURE (C)	3-22	15.42	4.89	19
FLOW (CFS)	.0005-.02	.0051	.0059	19
WATER TEMPERATURE (C)	2-14	5.55	2.55	19
SPEC. COND. (UMHOS/CM) FIELD	194-418	339	74.44	19
PH FIELD	6-8	6.88	.615	17
TURBIDITY (NTU) FIELD	.3-11.5	5.01	3.48	17
TOTAL SUSP. SOLIDS	1-11	4.09	3.27	11
TOTAL DISS. SOLIDS MEAS.	115-275	212	48.05	11
OXYGEN (O) DISS	1.9-6.7	5.15	2.22	4
COMMON IONS				
TOTAL HARDNESS AS CACO3	174	174	0	1
CALCIUM (CA)	32.8-73.2	58.14	15.52	11
MAGNESIUM (MG)	1.92-28.8	9.24	7.2	11
SODIUM (NA)	2.4-22	6.2	7.37	11
POTASSIUM (K)	.8-4.5	2.69	1.36	11
CALCIUM (CA) TOTAL	61	61	0	1
MAGNESIUM (MG) TOTAL	7.1	7.1	0	1
SODIUM (NA) TOTAL	2.7	2.7	0	1
POTASSIUM (K) TOTAL	.35	.35	0	1
ACIDITY AS CACO3	2.8-20	10	6.26	5
ALKALINITY AS CACO3 (LAB)	158-237	201	31.19	5
BICARBONATE (HCO3) (LAB)	105-289	200	67.69	11
CARBONATE AS CO3 (LAB)	<.01	<.01	0	1
SULFATE (SO4)	<3-114	23.45	31.54	11
CHLORIDE (CL)	2.3-20	7.5	6.21	11
FLUORIDE (F)	.12-.18	.15	.025	5
CHLORIDE (CL) TOTAL	5.9	5.9	0	1
FLUORIDE (F) TOTAL	.17	.17	0	1
NUTRIENTS				
NITRATE (NO3-N)	<.02-2.9	1.49	1.2	4
NITRITE (NO2-N)	.06	.06	0	1
AMMONIA (NH3 AS N)	<.01-.35	.108	.118	11
TOTAL PHOSPHATE (PO4)	<.01-.42	.159	.122	11
TRACE ELEMENTS				
ALUMINUM (AL) TOTAL	<.001	<.001	0	1
ALUMINUM (AL) DISS	<.001	<.001	0	1
ARSENIC (AS) TOTAL	<.001-.002	.0013	.0011	2
ARSENIC (AS) DISS	<.001	<.001	0	2
BARIUM (BA) TOTAL	.025-.04	.032	.0059	5
BARIUM (BA) DISS	.025	.025	0	2

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STATISTICAL SUMMARY OF WATER QUALITY ANALYSIS
FOR SITE S26-13 FOR THE PERIOD 06/29/81 TO 06/19/86

	RANGE	MEAN	STANDARD DEVIATION	NUMBER OF SAMPLES
TRACE ELEMENTS				
BORON (B) TOTAL	.014-.04	.022	.011	5
BORON (B) DISS	.01	.01	0	2
CADMIUM (CD) TOTAL	<.001	<.001	0	2
CADMIUM (CD) DISS	<.001	<.001	0	2
CHROMIUM (CR) TOTAL	<.001	<.001	0	2
CHROMIUM (CR) DISS	<.001	<.001	0	2
COPPER (CU) TOTAL	<.001-.019	.008	.0078	5
COPPER (CU) DISS	<.001	<.001	0	2
IRON (FE) TOTAL	.01-.27	.091	.081	13
LEAD (PB) TOTAL	<.001-.023	.005	.01	5
LEAD (PB) DISS	<.001	<.001	0	2
MANGANESE (MN) TOTAL	.001-.02	.0077	.0063	12
MERCURY (HG) TOTAL	<.0002	<.0002	0	2
MERCURY (HG) DISS	<.0002	<.0002	0	1
MOLYBDENUM (MO) TOTAL	<.001	<.001	0	1
MOLYBDENUM (MO) DISS	<.001	<.001	0	1
NICKEL (NI) TOTAL	<.001	<.001	0	1
NICKEL (NI)	<.001	<.001	0	1
SELENIUM (SE) TOTAL	<.001	<.001	0	2
SELENIUM (SE) DISS	<.001	<.001	0	2
SILVER (AG) TOTAL	<.001	<.001	0	2
SILVER (AG) DISS	<.001	<.001	0	2
ZINC (ZN) TOTAL	.002-.031	.01	.012	5
ZINC (ZN) DISS	.005-.007	.006	.0014	2
BACTERIOLOGICAL PARAMETERS				
FECAL COLIFORM (NO./100ML)	17	17	0	1
TOTAL COLIFORM (NO./100ML)	70	70	0	1
ORGANIC PARAMETERS				
ORGANIC CARBON (TOTAL)	<.01-38.2	10.5	15.82	5
PHENOLS	<.001-.042	.005	.012	11
OTHER PARAMETERS				
OIL AND GREASE	<.1-1.6	.79	.77	5
CYANIDE (CN)	<.001-.004	.0012	.0016	5
SULFIDE	<.01	<.01	0	1

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OUTPUT DATE: 02-10-1987 HWQ-6/86-R.ST.1

STATISTICAL SUMMARY OF WATER QUALITY ANALYSIS
FOR SITE S34-12 FOR THE PERIOD 05/14/81 TO 11/10/81

	RANGE	MEAN	STANDARD DEVIATION	NUMBER OF SAMPLES
PHYSICAL PARAMETERS				
AIR TEMPERATURE (C)	6-16	12	4.32	4
FLOW (CFS)	.01-.03	.017	.0096	4
WATER TEMPERATURE (C)	4-6	5	.816	4
SPEC. COND. (UMHOS/CM) FIELD	330-400	365	28.87	4
PH FIELD	7.7-8	7.87	.153	3
TURBIDITY (NTU) FIELD	.16-.44	.29	.141	3
TOTAL SUSP. SOLIDS	2-13	6.67	5.69	3
TOTAL DISS. SOLIDS MEAS.	215-244	231	14.84	3
OXYGEN (O) DISS	9.6-10	9.8	.283	2
COMMON IONS				
TOTAL HARDNESS AS CACO3	200	200	0	1
CALCIUM (CA)	59.2-67	63.4	3.93	3
MAGNESIUM (MG)	11.8-16.32	13.71	2.34	3
SODIUM (NA)	2.5-4.5	3.2	1.13	3
CALCIUM (CA) TOTAL	60	60	0	1
MAGNESIUM (MG) TOTAL	12	12	0	1
SODIUM (NA) TOTAL	4.9	4.9	0	1
POTASSIUM (K) TOTAL	.8-1.5	1.26	.401	3
ACIDITY AS CACO3	<.01-8	4.47	4.08	3
ALKALINITY AS CACO3 (LAB)	194-209	200	7.77	3
BICARBONATE (HCO3) (LAB)	226.92-255	241	14.05	3
CARBONATE AS CO3 (LAB)	4.8	4.8	0	1
SULFATE (SO4)	12.5-27	19.17	7.32	3
CHLORIDE (CL)	2.99-3.1	3.03	.061	3
FLUORIDE (F)	.13-.19	.157	.031	3
CHLORIDE (CL) TOTAL	4	4	0	1
FLUORIDE (F) TOTAL	.15	.15	0	1
NUTRIENTS				
NITRATE (NO3-N)	1.22-1.97	1.58	.376	3
NITRITE (NO2-N)	.02	.02	0	1
AMMONIA (NH3 AS N)	<.01-28.3	9.44	16.34	3
TOTAL PHOSPHATE (PO4)	.12-.44	.257	.165	3
TRACE ELEMENTS				
ALUMINUM (AL) TOTAL	.05	.05	0	1
ALUMINUM (AL) DISS	.03	.03	0	1
ARSENIC (AS) TOTAL	<.001	<.001	0	3
ARSENIC (AS) DISS	<.001	<.001	0	3
BARIUM (BA) TOTAL	.02-.03	.025	.005	3
BARIUM (BA) DISS	.015-.02	.018	.0029	3
BORON (B) TOTAL	.015-.02	.018	.0029	3

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OUTPUT DATE: 02-10-1987 HWQ-6/86-R.ST.1

STATISTICAL SUMMARY OF WATER QUALITY ANALYSIS
FOR SITE S34-12 FOR THE PERIOD 05/14/81 TO 11/10/81

	RANGE	MEAN	STANDARD DEVIATION	NUMBER OF SAMPLES
TRACE ELEMENTS				
BORON (B) DISS	.002-.01	.0073	.0046	3
CADMIUM (CD) TOTAL	<.001	<.001	0	3
CADMIUM (CD) DISS	<.001	<.001	0	3
CHROMIUM (CR) TOTAL	<.001-.002	.001	.0009	3
CHROMIUM (CR) DISS	<.001	<.001	0	3
COPPER (CU) TOTAL	.013-.03	.021	.0085	3
COPPER (CU) DISS	<.001-.01	.0068	.0055	3
IRON (FE) TOTAL	<.001-.07	.028	.025	6
LEAD (PB) TOTAL	<.001-.007	.0032	.0034	3
LEAD (PB) DISS	<.001-.005	.002	.0026	3
MANGANESE (MN) TOTAL	<.001-.07	.022	.032	4
MERCURY (HG) TOTAL	<.0002	<.0002	0	3
MERCURY (HG) DISS	<.0002	<.0002	0	1
MOLYBDENUM (MO) TOTAL	<.001	<.001	0	1
MOLYBDENUM (MO) DISS	<.001	<.001	0	1
NICKEL (NI) TOTAL	<.001	<.001	0	1
NICKEL (NI) DISS	<.001	<.001	0	1
SELENIUM (SE) TOTAL	<.001	<.001	0	3
SELENIUM (SE) DISS	<.001	<.001	0	3
SILVER (AG) TOTAL	<.001	<.001	0	3
SILVER (AG) DISS	<.001	<.001	0	3
ZINC (ZN) TOTAL	.065-.09	.073	.014	3
ZINC (ZN) DISS	.004-.04	.016	.021	3
BACTERIOLOGICAL PARAMETERS				
FECAL COLIFORM (NO./100ML)	<2	<2	0	2
TOTAL COLIFORM (NO./100ML)	<2-5	3	2.83	2
5 - DAY BOD	1.6	1.6	0	1
ORGANIC PARAMETERS				
ORGANIC CARBON (TOTAL)	2-8.1	5.1	3.05	3
PHENOLS	<.001-.482	.162	.277	3
OTHER PARAMETERS				
OIL AND GREASE	.2-1.4	.933	.643	3
CYANIDE (CN)	.001-.002	.0015	.0007	2
SULFIDE	1.8	1.8	0	1

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OUTPUT DATE: 02-10-1987 HWQ-6/86-R.ST.1

STATISTICAL SUMMARY OF WATER QUALITY ANALYSIS
FOR SITE S35-8 FOR THE PERIOD 05/14/81 TO 06/24/86

	RANGE	MEAN	STANDARD DEVIATION	NUMBER OF SAMPLES
PHYSICAL PARAMETERS				
AIR TEMPERATURE (C)	2-21	13.05	5.4	20
FLOW (CFS)	.01-.27	.07	.086	20
WATER TEMPERATURE (C)	2-7	3.7	1.03	20
SPEC. COND. (UMHOS/CM) FIELD	221-470	373	59.91	20
PH FIELD	6.9-8.1	7.52	.346	19
TURBIDITY (NTU) FIELD	.16-11	4.66	3.6	19
TOTAL SUSP. SOLIDS	<.1-13	4.6	4.55	13
TOTAL DISS. SOLIDS MEAS.	178-285	228	31.7	13
OXYGEN (O) DISS	7.6-13.2	10.6	2.53	5
COMMON IONS				
TOTAL HARDNESS AS CACO3	210	210	0	1
CALCIUM (CA)	47.2-75.2	65.63	8.4	13
MAGNESIUM (MG)	5.28-15.6	11.12	3.14	13
SODIUM (NA)	2.4-16	6.24	4.17	13
POTASSIUM (K)	.4-1.35	.776	.245	13
CALCIUM (CA) TOTAL	64	64	0	1
MAGNESIUM (MG) TOTAL	12	12	0	1
SODIUM (NA) TOTAL	10.5	10.5	0	1
POTASSIUM (K) TOTAL	1.33	1.33	0	1
ACIDITY AS CACO3	<.01-15	5.68	5.07	6
ALKALINITY AS CACO3 (LAB)	210-240	223	10.27	6
BICARBONATE (HCO3) (LAB)	176-292.8	248	37.98	13
CARBONATE AS CO3 (LAB)	9.6	9.6	0	1
SULFATE (SO4)	<3-30	13.47	7.82	13
CHLORIDE (CL)	.2-17.3	5.29	5.17	13
FLUORIDE (F)	.08-.19	.125	.038	6
CHLORIDE (CL) TOTAL	5	5	0	1
FLUORIDE (F) TOTAL	.14	.14	0	1
NUTRIENTS				
NITRATE (NO3-N)	.01-.11	.041	.041	6
NITRITE (NO2-N)	.01	.01	0	1
AMMONIA (NH3 AS N)	<.01-.5	.173	.166	13
TOTAL PHOSPHATE (PO4)	<.01-.24	.093	.069	13
TRACE ELEMENTS				
ALUMINUM (AL) TOTAL	<.001	<.001	0	1
ALUMINUM (AL) DISS	.02	.02	0	1
ARSENIC (AS) TOTAL	<.001	<.001	0	3
ARSENIC (AS) DISS	<.001	<.001	0	3
BARIUM (BA) TOTAL	.021-.038	.031	.0056	6
BARIUM (BA) DISS	.015-.025	.02	.005	3

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OUTPUT DATE: 02-10-1987 HWQ-6/86-R.ST.1

STATISTICAL SUMMARY OF WATER QUALITY ANALYSIS
FOR SITE S35-8 FOR THE PERIOD 05/14/81 TO 06/24/86

	RANGE	MEAN	STANDARD DEVIATION	NUMBER OF SAMPLES
TRACE ELEMENTS				
BORON (B) TOTAL	.016-.035	.021	.007	6
BORON (B) DISS	.01-.015	.012	.0029	3
CADMIUM (CD) TOTAL	<.001	<.001	0	3
CADMIUM (CD) DISS	<.001	<.001	0	3
CHROMIUM (CR) TOTAL	<.001	<.001	0	3
CHROMIUM (CR) DISS	<.001	<.001	0	3
COPPER (CU) TOTAL	<.001-.05	.014	.019	6
COPPER (CU) DISS	<.001-.01	.0037	.0055	3
IRON (FE) TOTAL	.009-.12	.059	.035	16
LEAD (PB) TOTAL	<.001-.002	.0011	.0007	6
LEAD (PB) DISS	<.001-.002	.001	.0009	3
MANGANESE (MN) TOTAL	.0002-.02	.004	.0058	14
MERCURY (HG) TOTAL	<.0002	<.0002	0	3
MERCURY (HG) DISS	<.0002	<.0002	0	1
MOLYBDENUM (MO) TOTAL	<.001	<.001	0	1
MOLYBDENUM (MO) DISS	<.001	<.001	0	1
NICKEL (NI) TOTAL	<.001	<.001	0	1
NICKEL (NI)	<.001	<.001	0	1
SELENIUM (SE) TOTAL	<.001	<.001	0	3
SELENIUM (SE) DISS	<.001	<.001	0	3
SILVER (AG) TOTAL	<.001	<.001	0	3
SILVER (AG) DISS	<.001	<.001	0	3
ZINC (ZN) TOTAL	.001-.039	.018	.016	6
ZINC (ZN) DISS	.01	.01	0	3
BACTERIOLOGICAL PARAMETERS				
FECAL COLIFORM (NO./100ML)	<2-8	4.5	4.95	2
TOTAL COLIFORM (NO./100ML)	2-8	5	4.24	2
5 - DAY BOD	1	1	0	1
ORGANIC PARAMETERS				
ORGANIC CARBON (TOTAL)	<.01-6.9	3.25	2.64	6
PHENOLS	<.001-.016	.0027	.0053	13
OTHER PARAMETERS				
OIL AND GREASE	<.1-1	.525	.456	6
CYANIDE (CN)	<.001-.046	.0088	.018	6
SULFIDE	1.8	1.8	0	1

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OUTPUT DATE: 02-10-1987 HWQ-6/86-R.ST.1

STATISTICAL SUMMARY OF WATER QUALITY ANALYSIS
FOR SITE S36-12 FOR THE PERIOD 05/15/81 TO 06/19/86

	RANGE	MEAN	STANDARD DEVIATION	NUMBER OF SAMPLES
PHYSICAL PARAMETERS				
AIR TEMPERATURE (C)	-3-19	12.19	5.96	21
FLOW (CFS)	.01-.02	.012	.004	21
WATER TEMPERATURE (C)	3-6	4.12	.805	21
SPEC. COND. (UMHOS/CM) FIELD	269-423	361	46.1	21
PH FIELD	6.4-8.1	7.14	.51	19
TURBIDITY (NTU) FIELD	.58-12.5	4.32	3.14	19
TOTAL SUSP. SOLIDS	<.1-15	4.2	4.08	13
TOTAL DISS. SOLIDS MEAS.	164-290	229	40.08	13
OXYGEN (O) DISS	5.4-10.2	7.26	1.8	5
COMMON IONS				
TOTAL HARDNESS AS CACO3	172	172	0	1
CALCIUM (CA)	47.2-78	65.72	10.65	13
MAGNESIUM (MG)	2.4-34.8	9.94	7.98	13
SODIUM (NA)	.90-35	7.79	9.37	13
POTASSIUM (K)	.39-1.1	.532	.199	13
CALCIUM (CA) TOTAL	64	64	0	1
MAGNESIUM (MG) TOTAL	7.2	7.2	0	1
SODIUM (NA) TOTAL	2.85	2.85	0	1
POTASSIUM (K) TOTAL	1.6	1.6	0	1
ACIDITY AS CACO3	2.73-18	9.7	6.69	6
ALKALINITY AS CACO3 (LAB)	168-225	212	21.76	6
BICARBONATE (HCO3) (LAB)	173.2-285.5	238	40.71	12
CARBONATE AS CO3 (LAB)	<.01	<.01	0	1
SULFATE (SO4)	3-102	17.21	26.44	13
CHLORIDE (CL)	.6-20	4.45	5.66	13
FLUORIDE (F)	.07-.15	.113	.027	6
CHLORIDE (CL) TOTAL	2	2	0	1
FLUORIDE (F) TOTAL	.12	.12	0	1
NUTRIENTS				
NITRATE (NO3-N)	<.02-.44	.264	.166	5
NITRITE (NO2-N)	.04	.04	0	1
AMMONIA (NH3 AS N)	<.01-1.75	.318	.469	13
TOTAL PHOSPHATE (PO4)	<.01-.18	.088	.068	13
TRACE ELEMENTS				
ALUMINUM (AL) TOTAL	<.001	<.001	0	1
ALUMINUM (AL) DISS	<.001	<.001	0	1
ARSENIC (AS) TOTAL	<.001-.002	.001	.0009	3
ARSENIC (AS) DISS	<.001	<.001	0	3
BARIUM (BA) TOTAL	.009-.029	.017	.0073	6
BARIUM (BA) DISS	.005-.01	.0083	.0029	3

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STATISTICAL SUMMARY OF WATER QUALITY ANALYSIS
FOR SITE S36-12 FOR THE PERIOD 05/15/81 TO 06/19/86

	RANGE	MEAN	STANDARD DEVIATION	NUMBER OF SAMPLES
TRACE ELEMENTS				
BORON (B) TOTAL	.009-.038	.021	.01	6
BORON (B) DISS	<.001-.011	.0055	.0053	3
CADMIUM (CD) TOTAL	<.001	<.001	0	3
CADMIUM (CD) DISS	<.001	<.001	0	3
CHROMIUM (CR) TOTAL	<.001	<.001	0	3
CHROMIUM (CR) DISS	<.001	<.001	0	3
COPPER (CU) TOTAL	<.001-.019	.0083	.007	6
COPPER (CU) DISS	<.001-.01	.0037	.0055	3
IRON (FE) TOTAL	<.01-.90	.107	.215	16
LEAD (PB) TOTAL	<.001-.004	.0016	.0015	6
LEAD (PB) DISS	<.001	<.001	0	3
MANGANESE (MN) TOTAL	.001-<.01	.0043	.0035	14
MERCURY (HG) TOTAL	<.0002-.0004	.0002	.0002	3
MERCURY (HG) DISS	<.0002	<.0002	0	1
MOLYBDENUM (MO) TOTAL	<.001	<.001	0	1
MOLYBDENUM (MO) DISS	<.001	<.001	0	1
NICKEL (NI) TOTAL	<.001	<.001	0	1
NICKEL (NI)	<.001	<.001	0	1
SELENIUM (SE) TOTAL	<.001	<.001	0	3
SELENIUM (SE) DISS	<.001	<.001	0	3
SILVER (AG) TOTAL	<.001	<.001	0	3
SILVER (AG) DISS	<.001	<.001	0	3
ZINC (ZN) TOTAL	.002-.067	.031	.03	6
ZINC (ZN) DISS	.005-.01	.0083	.0029	3
BACTERIOLOGICAL PARAMETERS				
FECAL COLIFORM (NO./100ML)	<2	<2	0	2
TOTAL COLIFORM (NO./100ML)	<2	<2	0	2
ORGANIC PARAMETERS				
ORGANIC CARBON (TOTAL)	<.01-24	8.12	9.25	6
PHENOLS	<.001-.11	.012	.03	13
OTHER PARAMETERS				
OIL AND GREASE	<.01-66.8	11.53	27.09	6
CYANIDE (CN)	<.001-.008	.0018	.0031	6
SULFIDE	.92	.92	0	1

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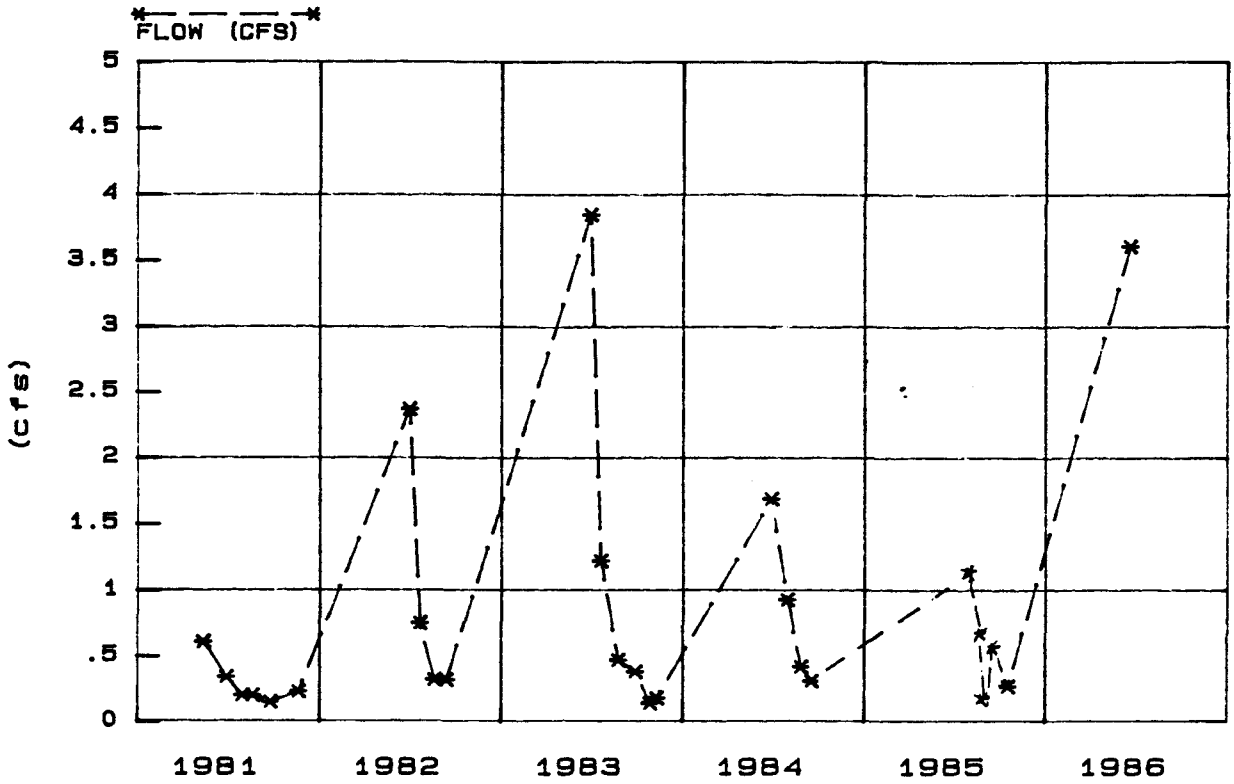
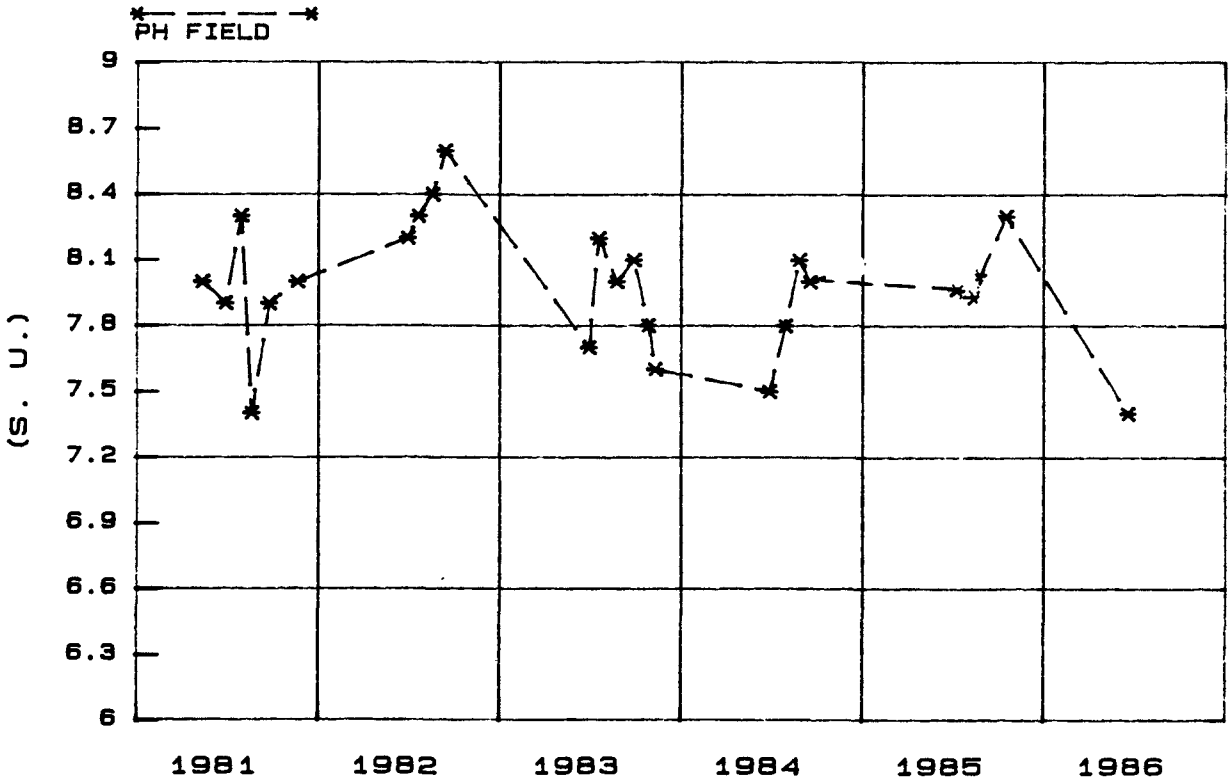
OUTPUT DATE: 02-10-1987 HWQ-6/86-R.ST.1



WATER QUALITY SITE: CS-1 UPR S. FORK ECCLES CR.



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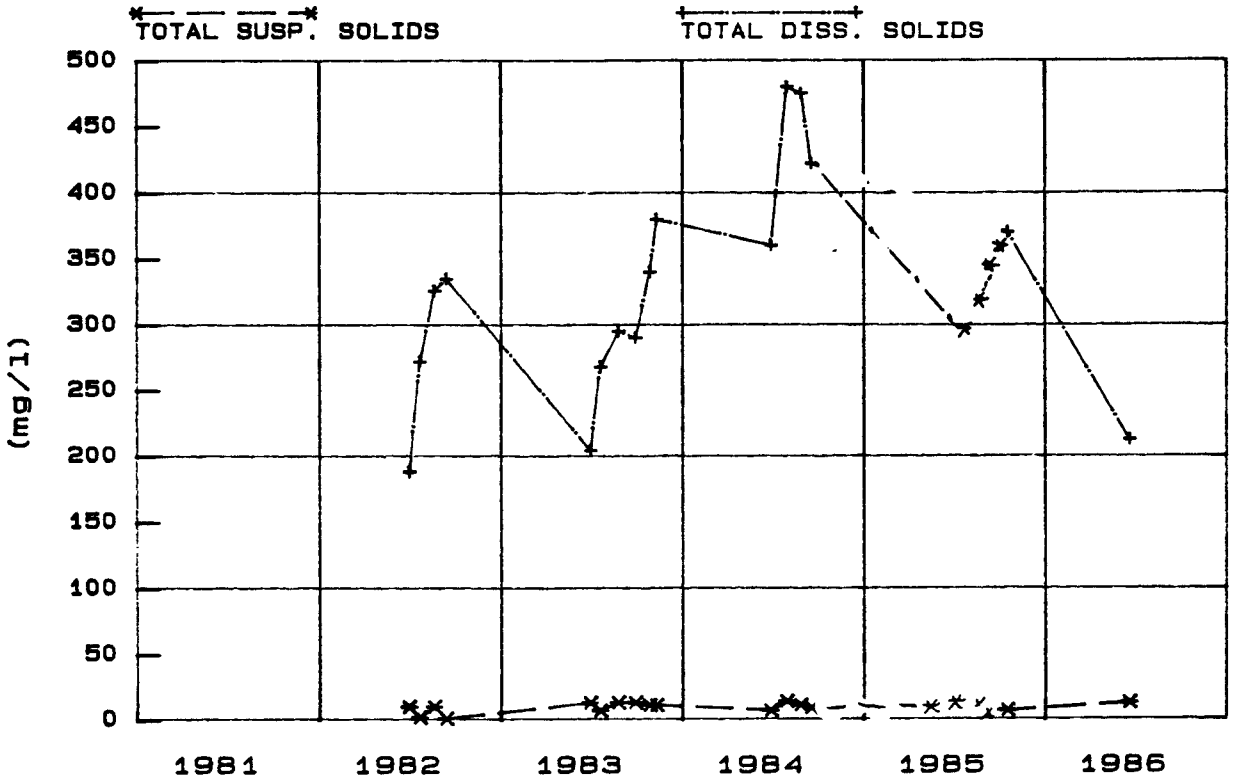

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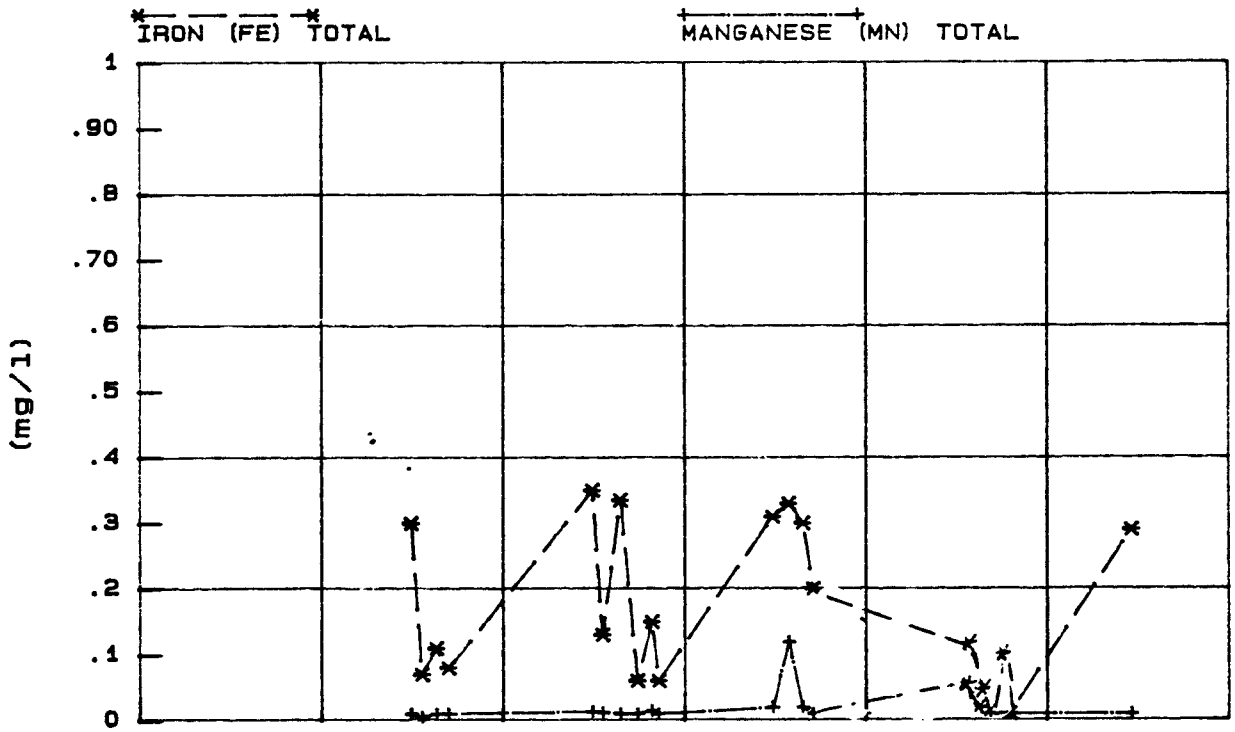

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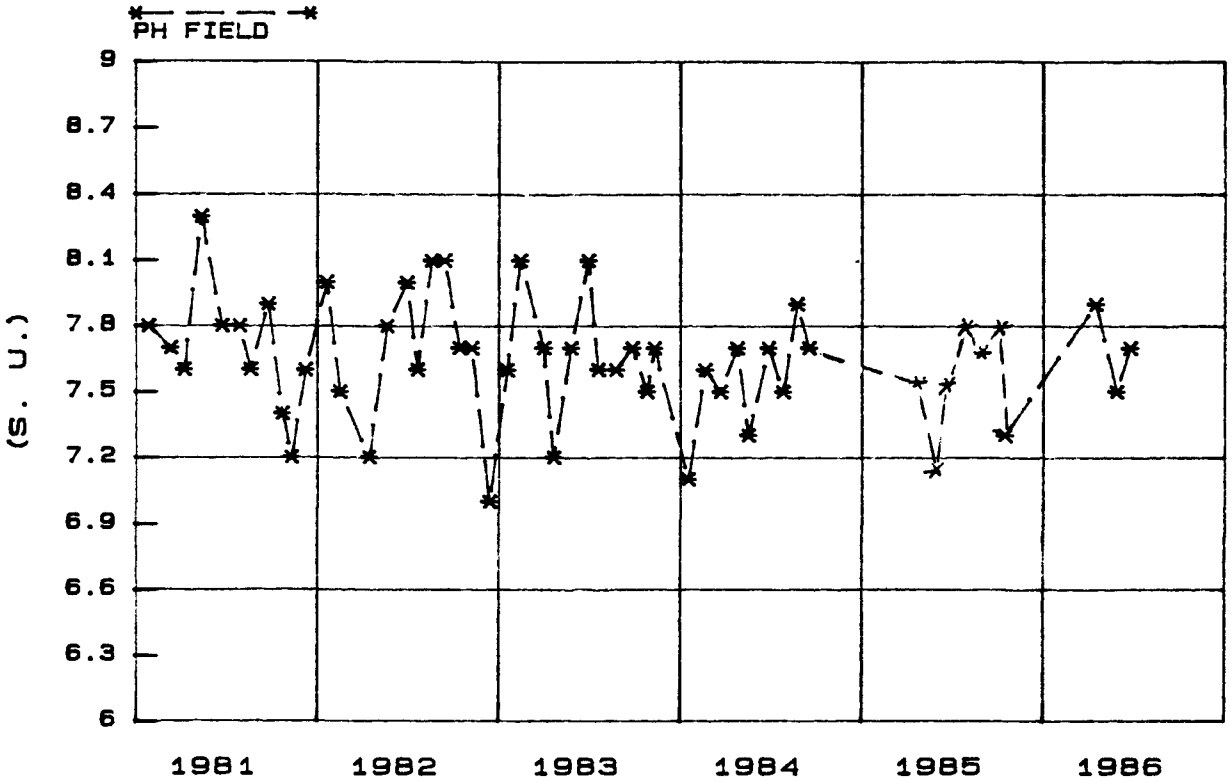

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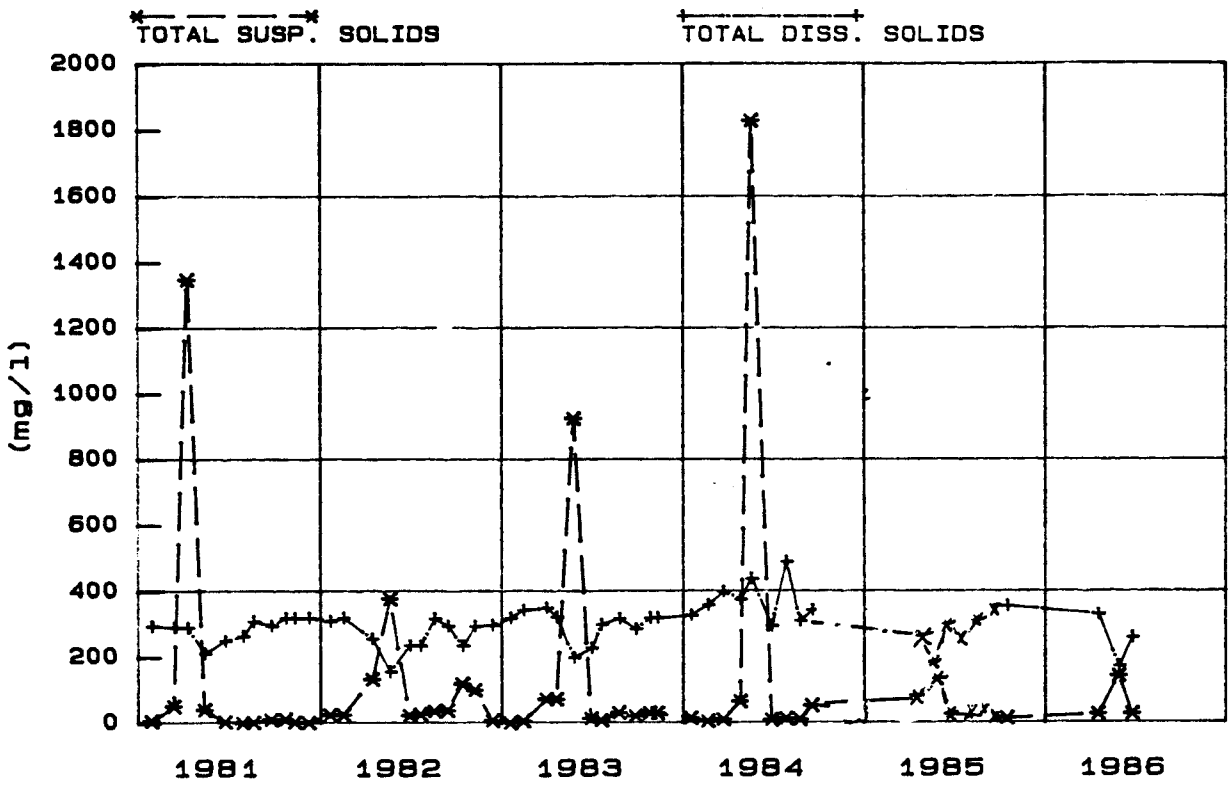

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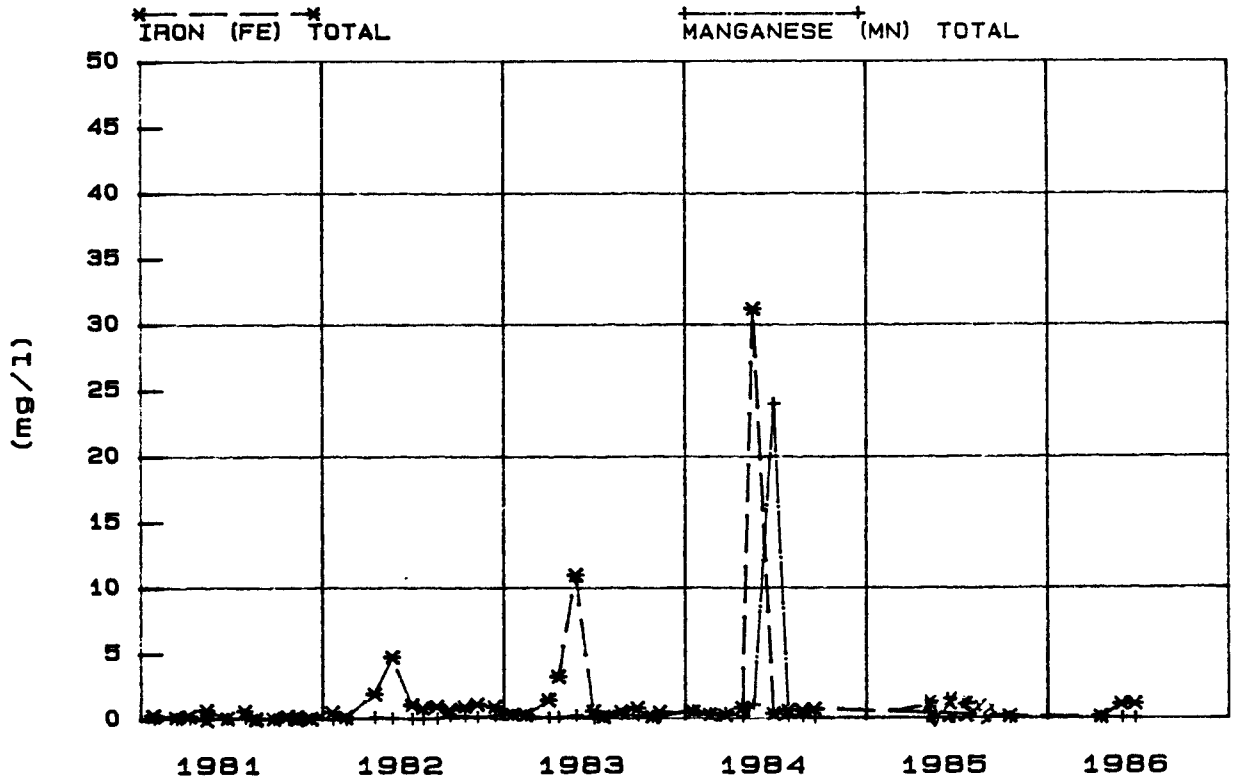

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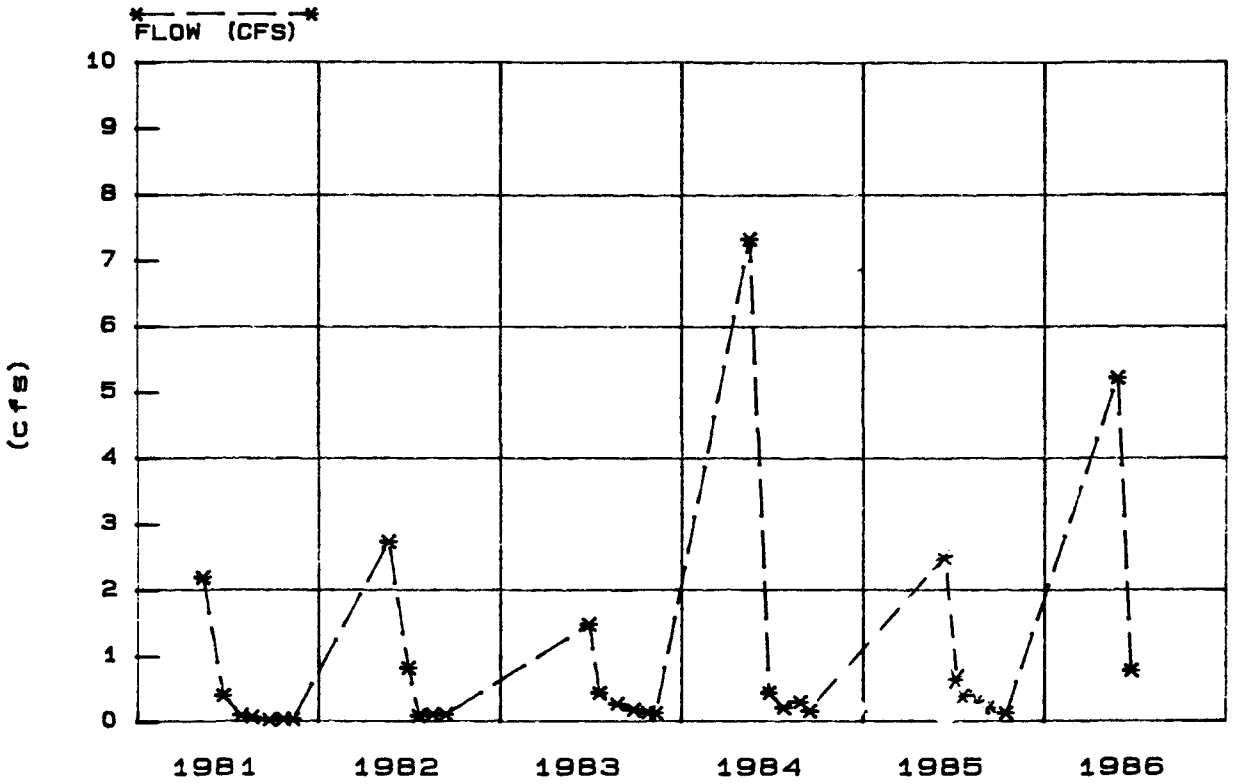

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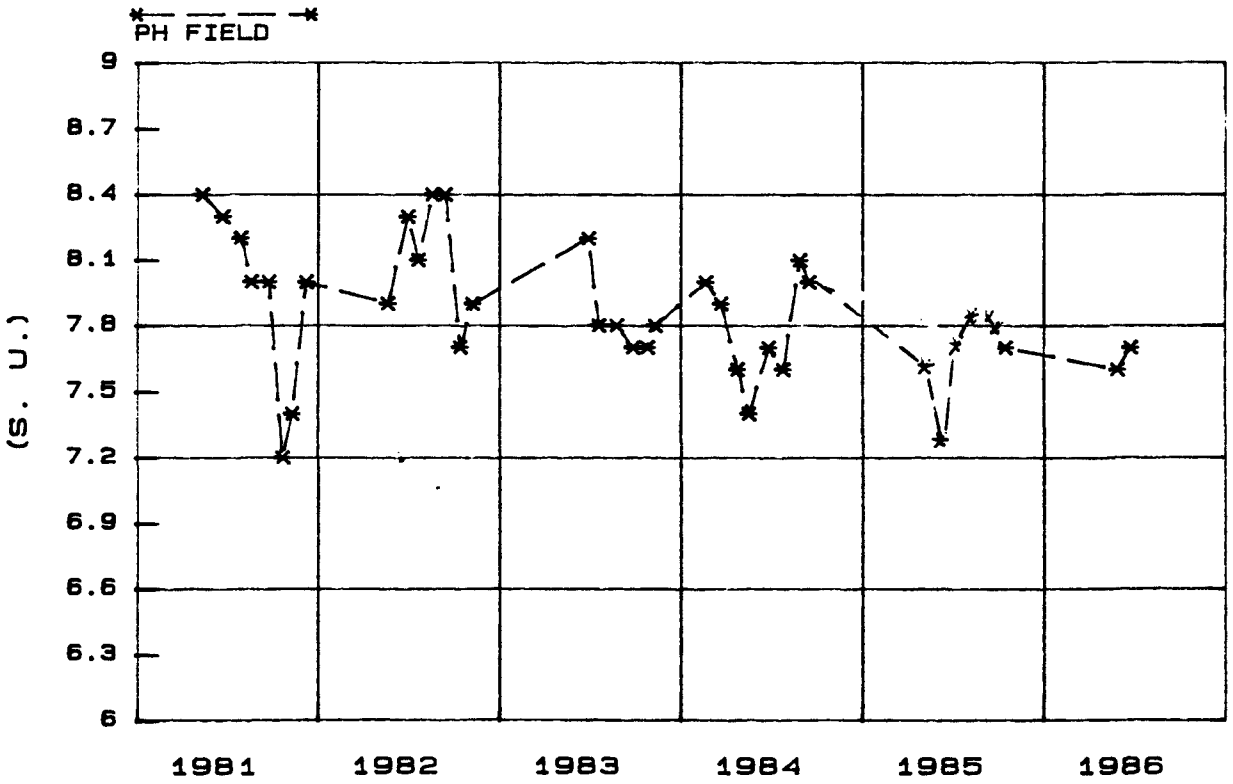

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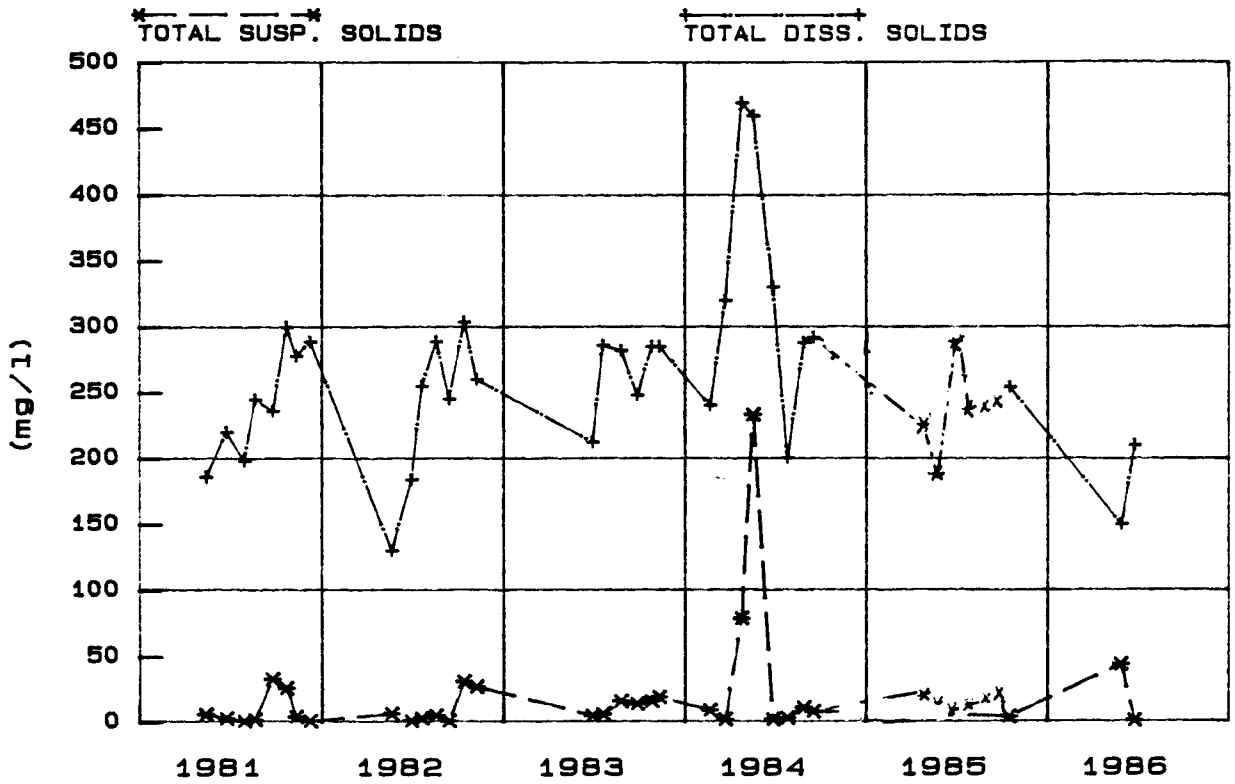

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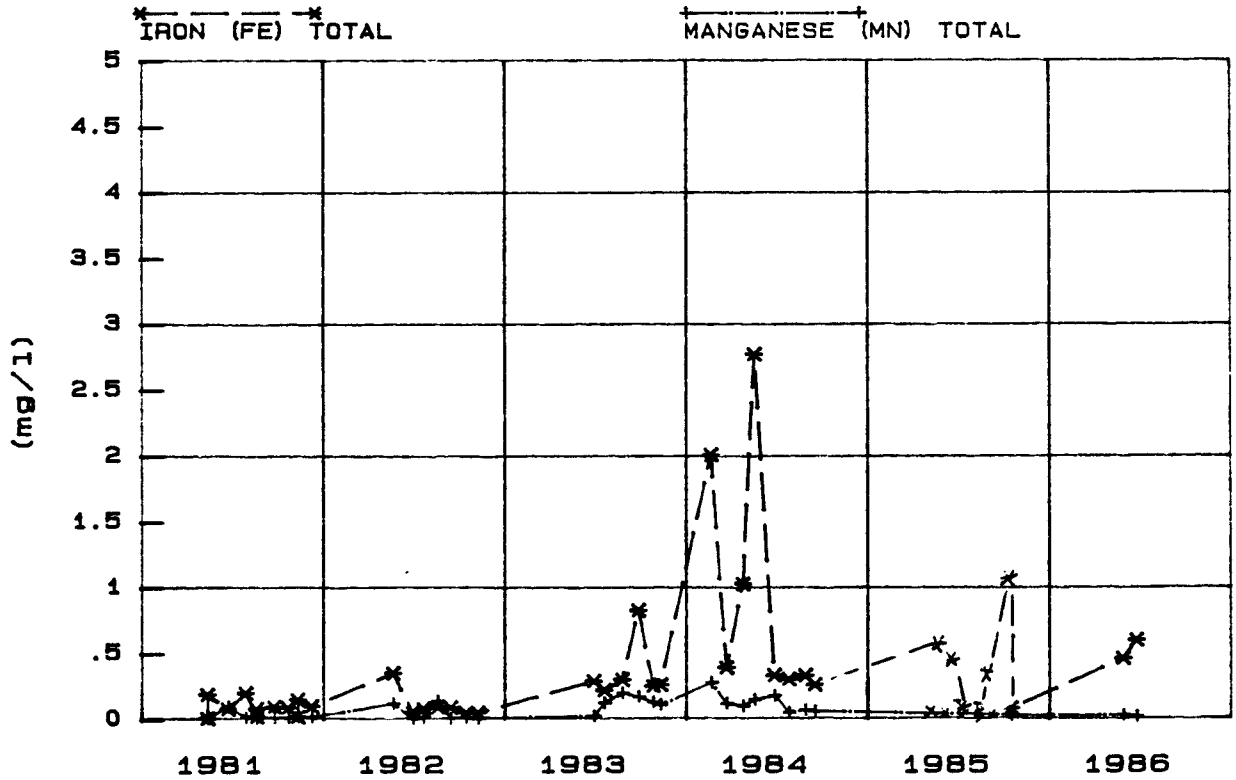

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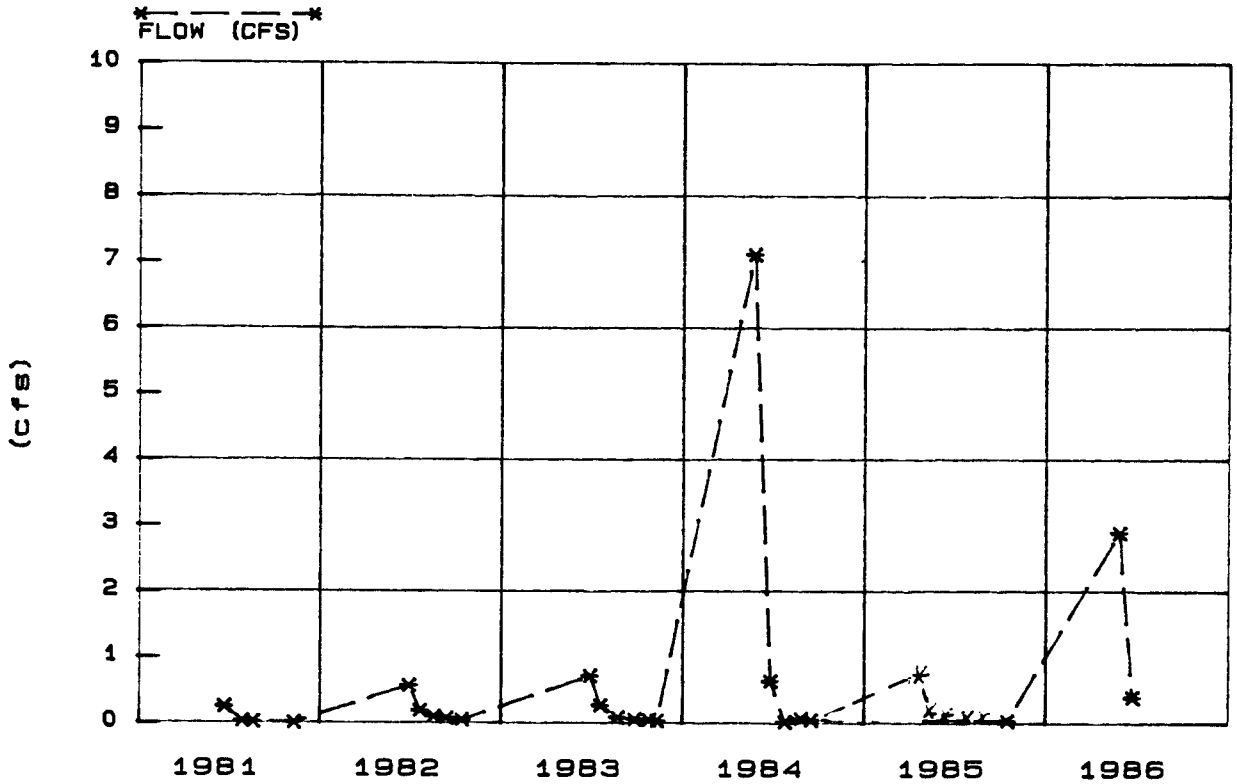

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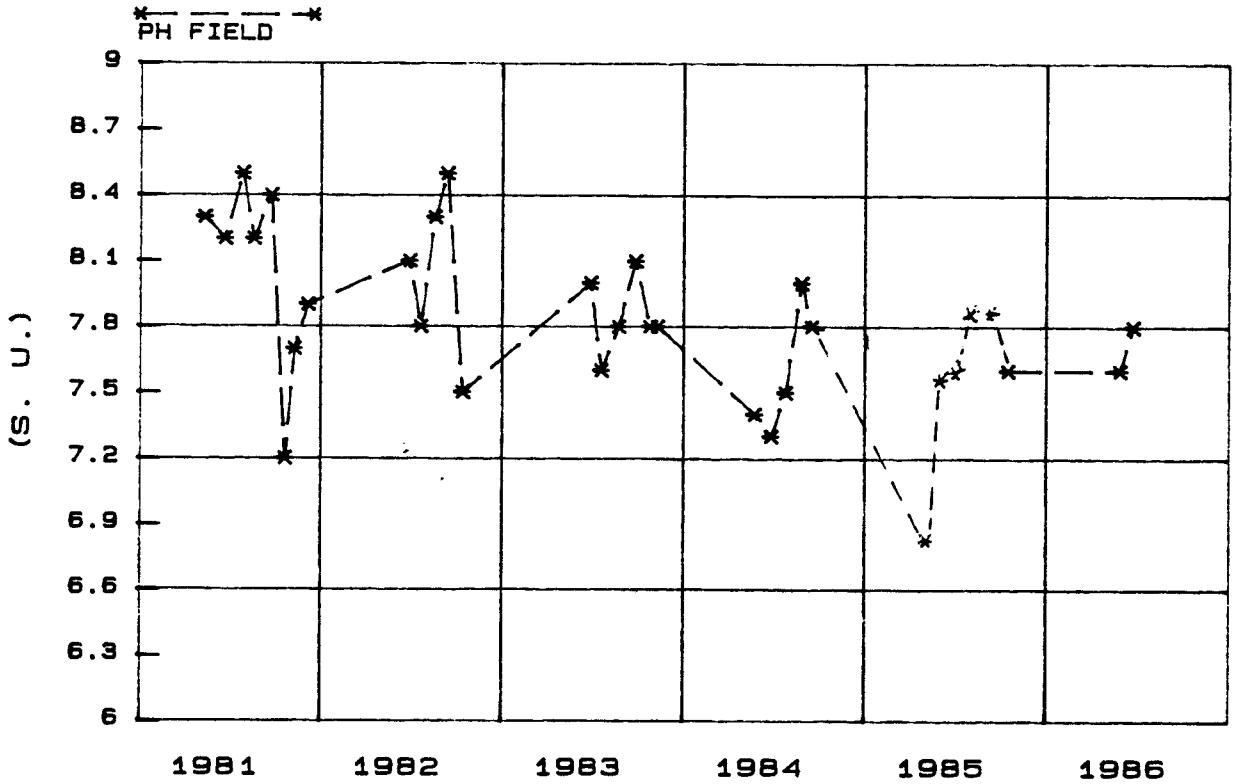

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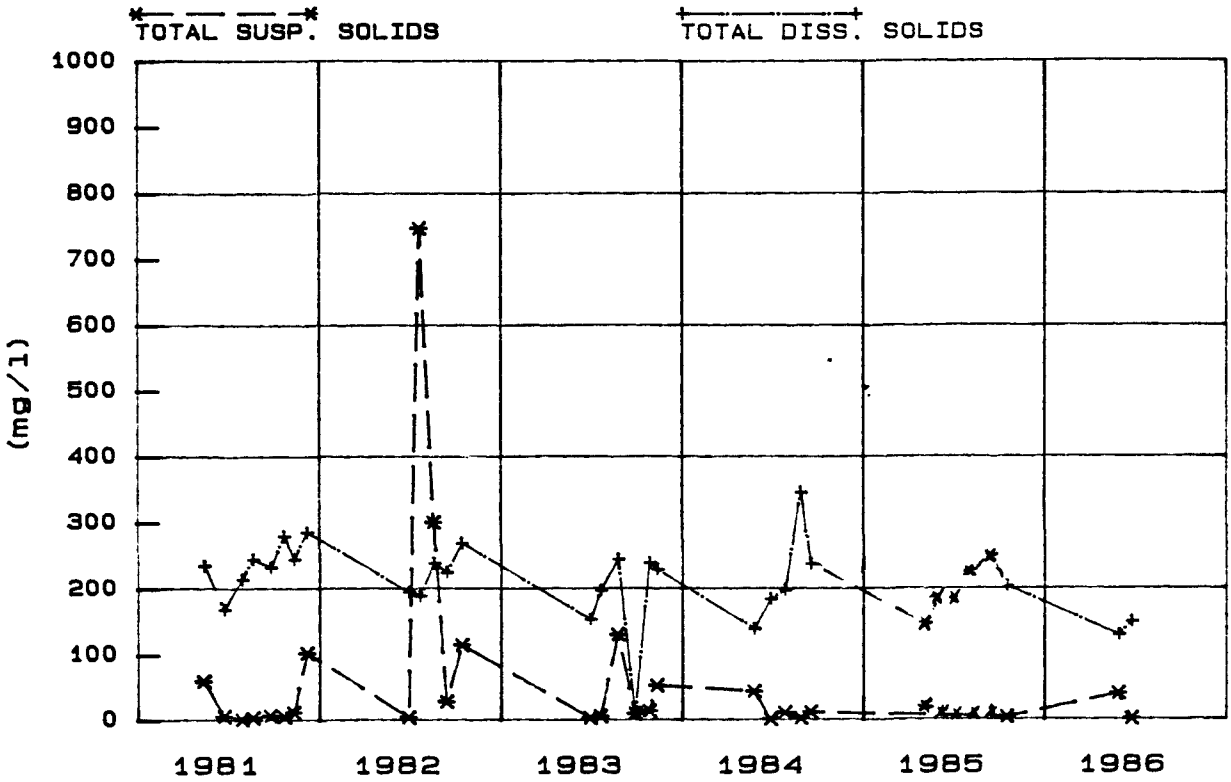

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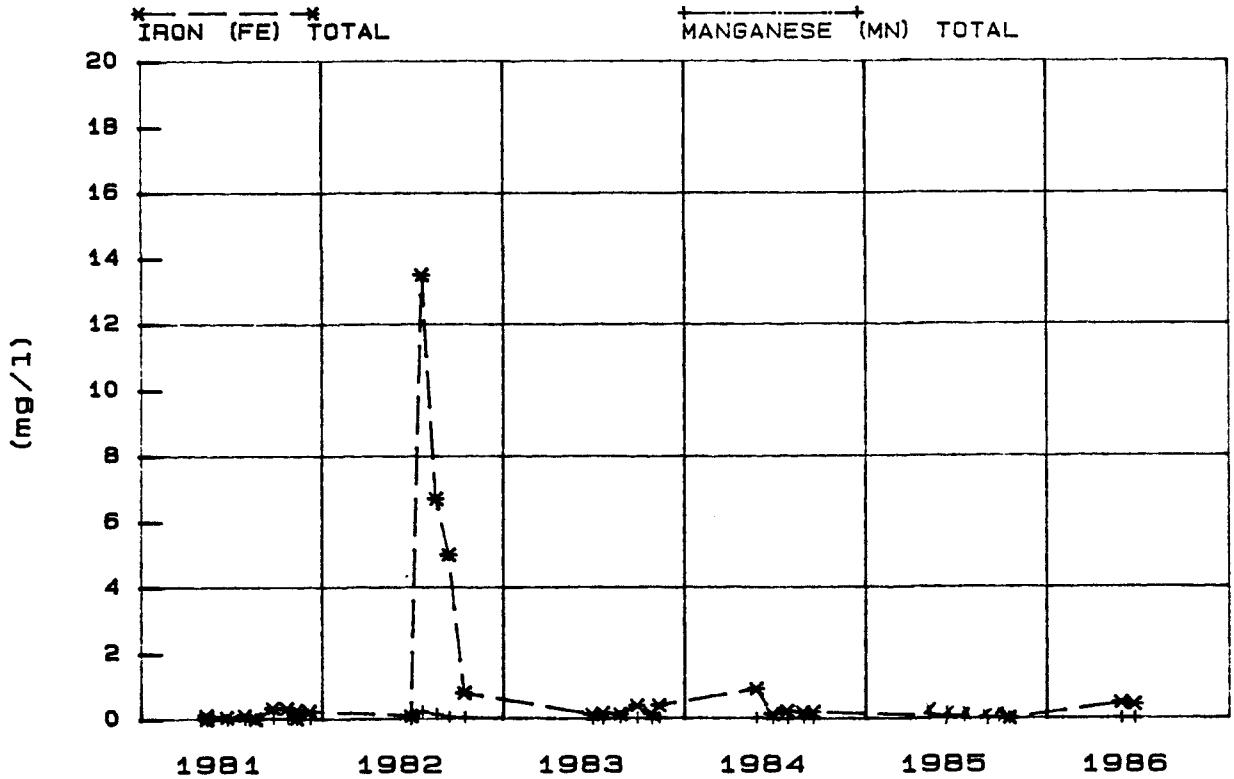

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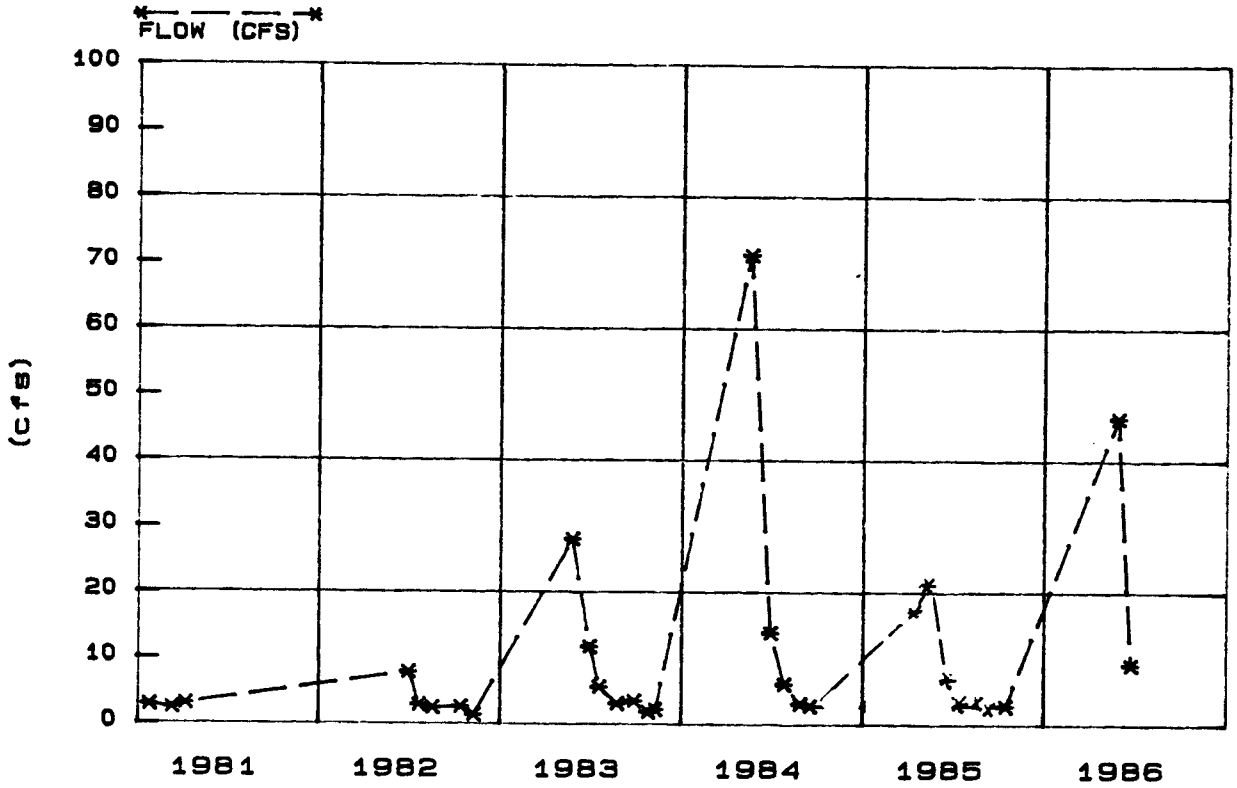
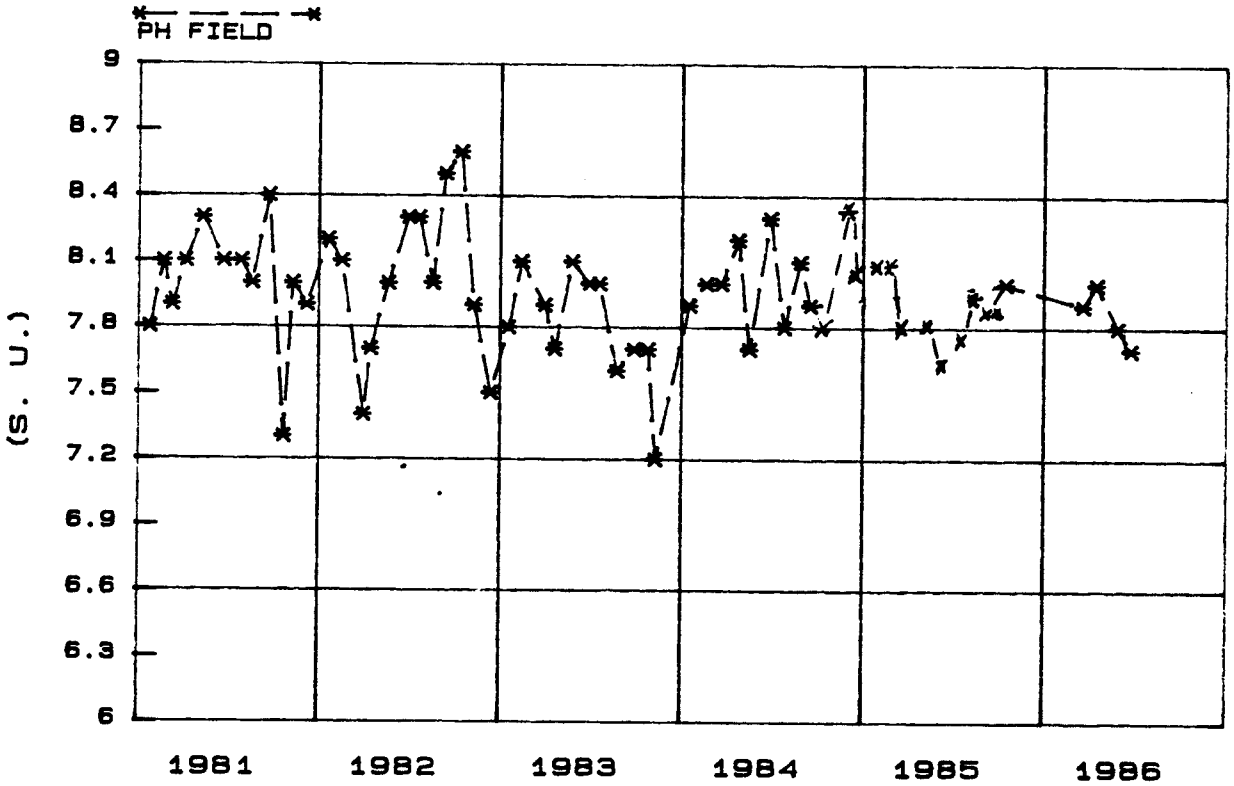


WATER QUALITY SITE: CS-6 ECCLES CR. GAGING STA.



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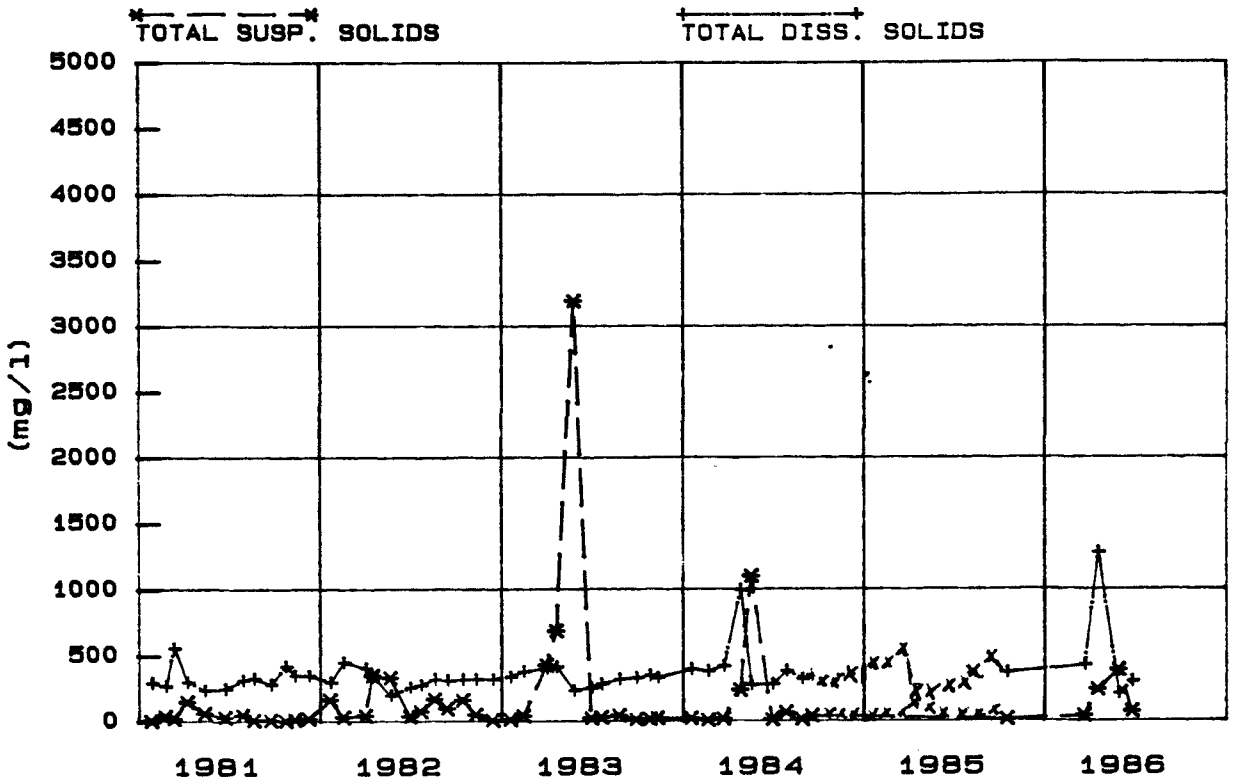
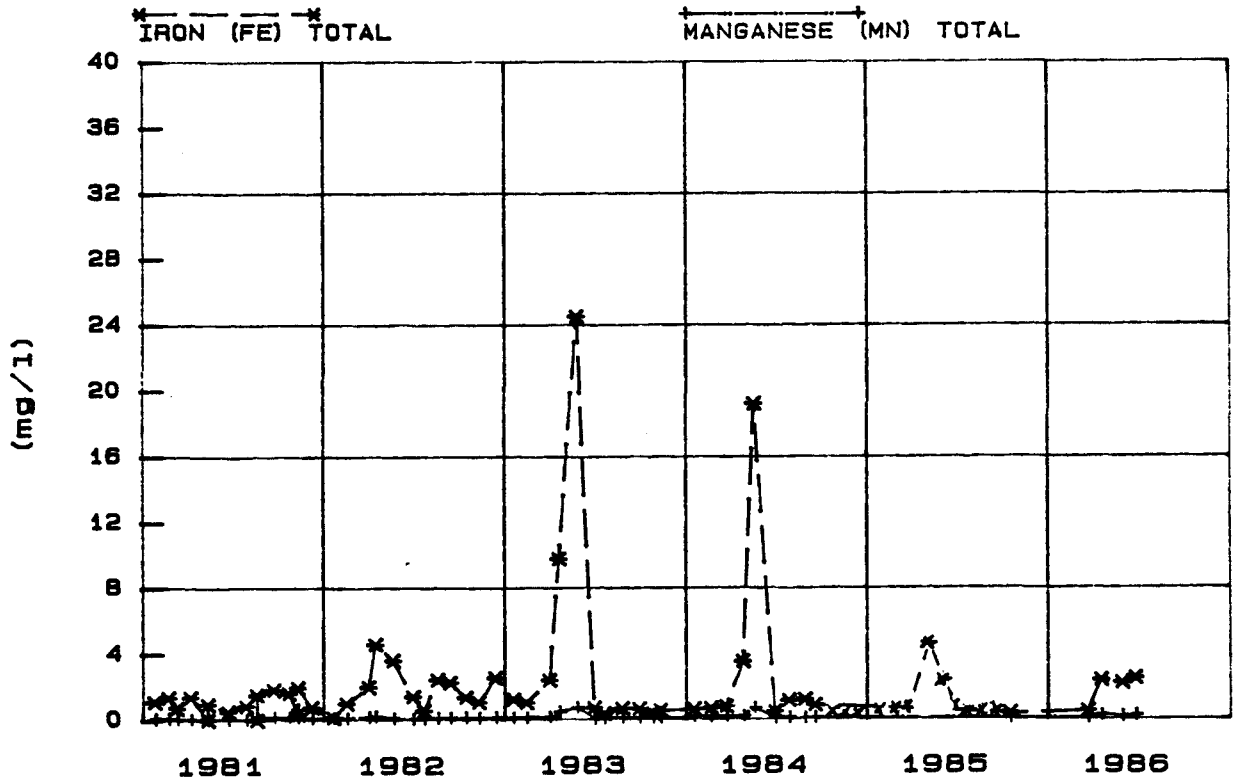
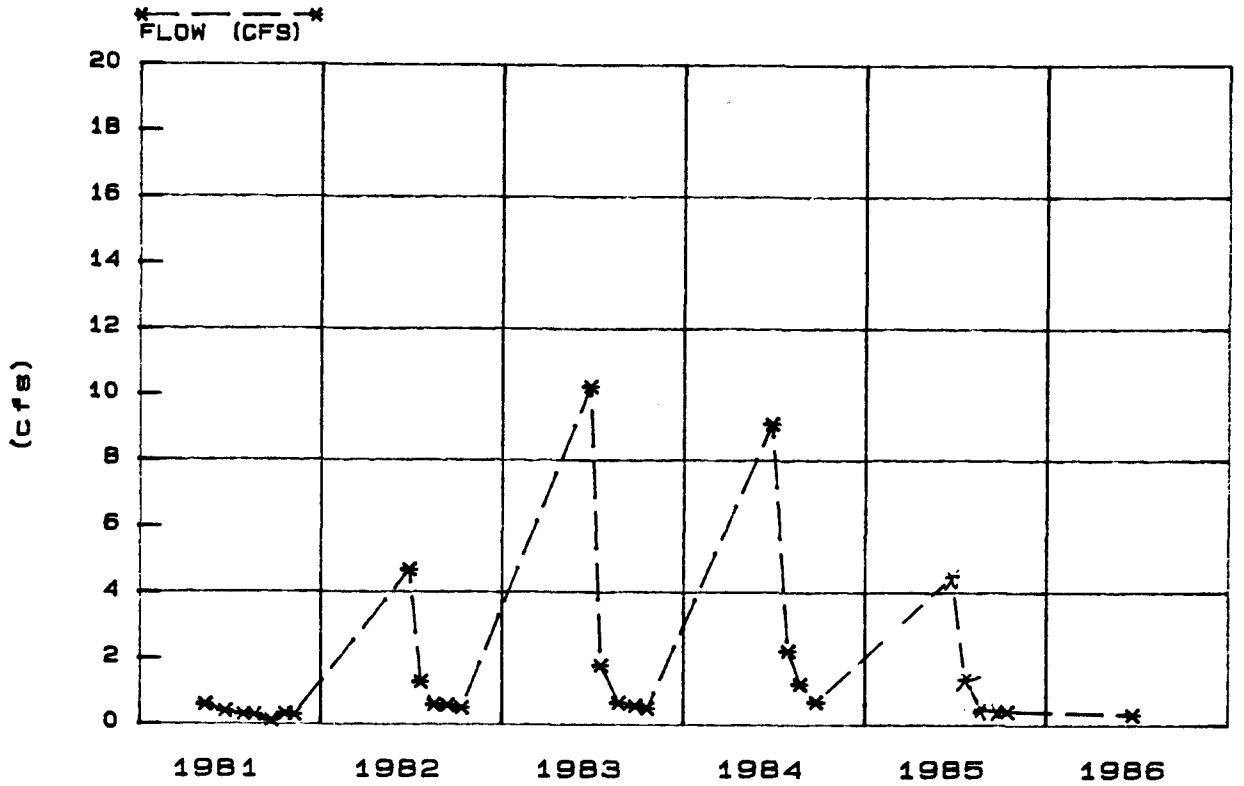


WATER QUALITY SITE: CS-6 ECCLES CR. GAGING STA.



WATER QUALITY SITE: CS-6 ECCLES CR. GAGING STA.



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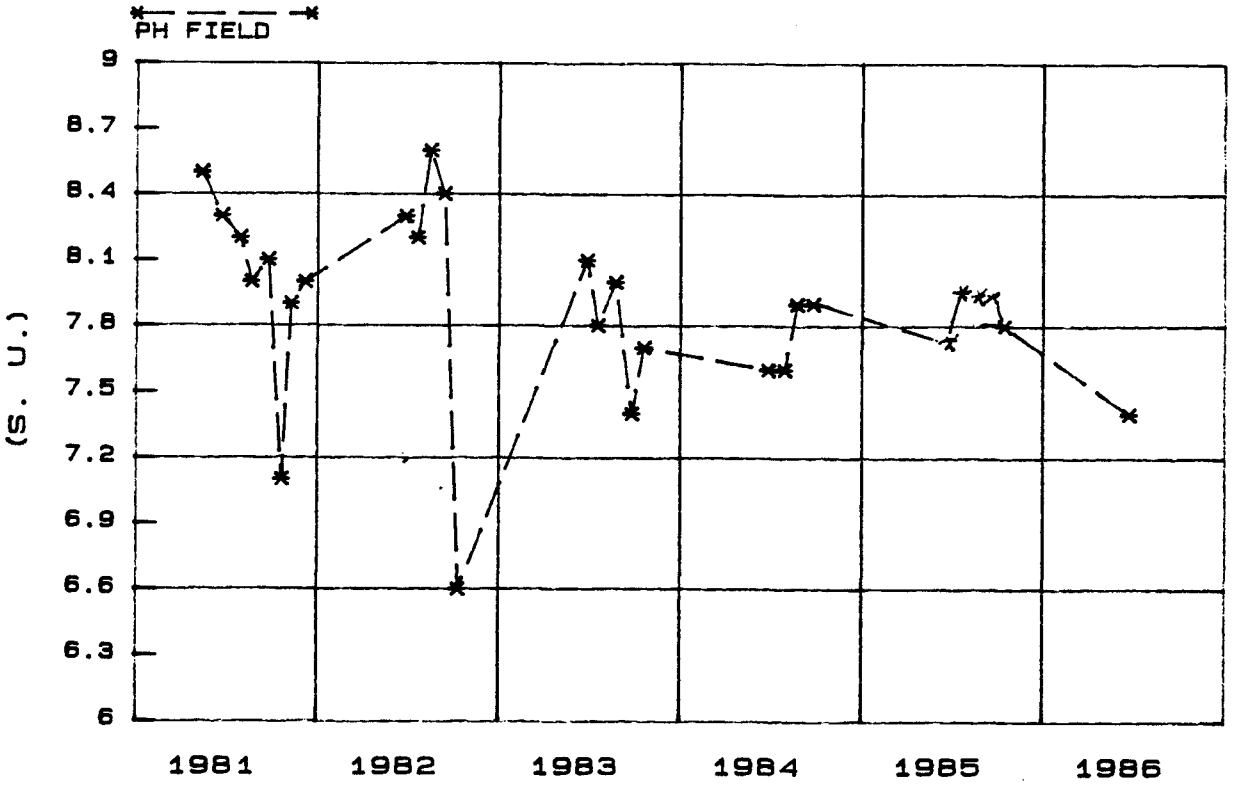

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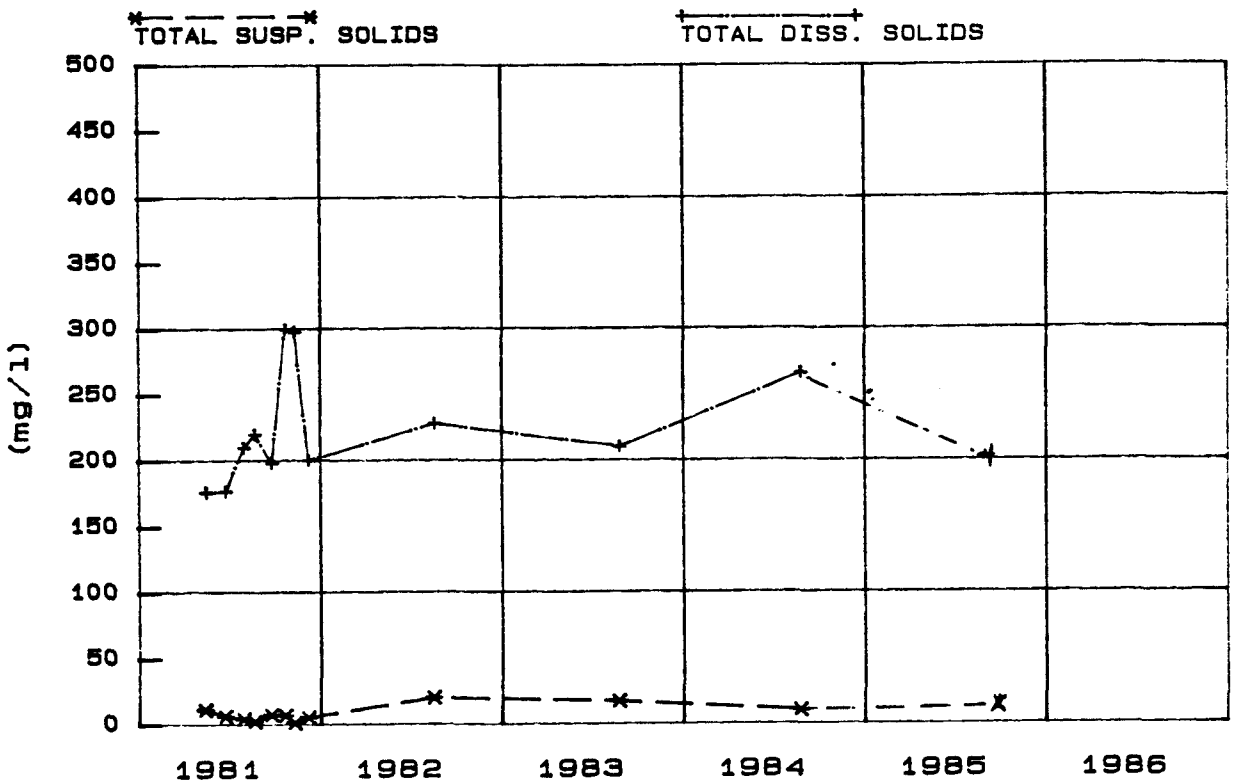

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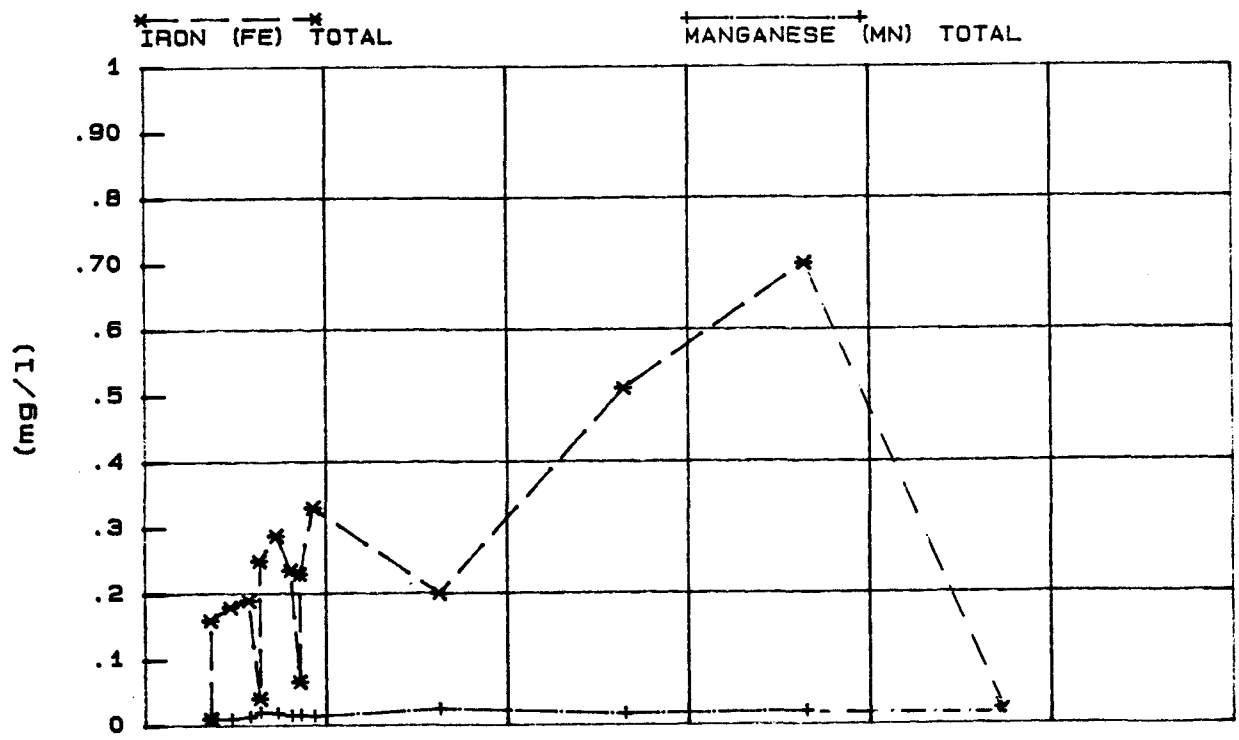

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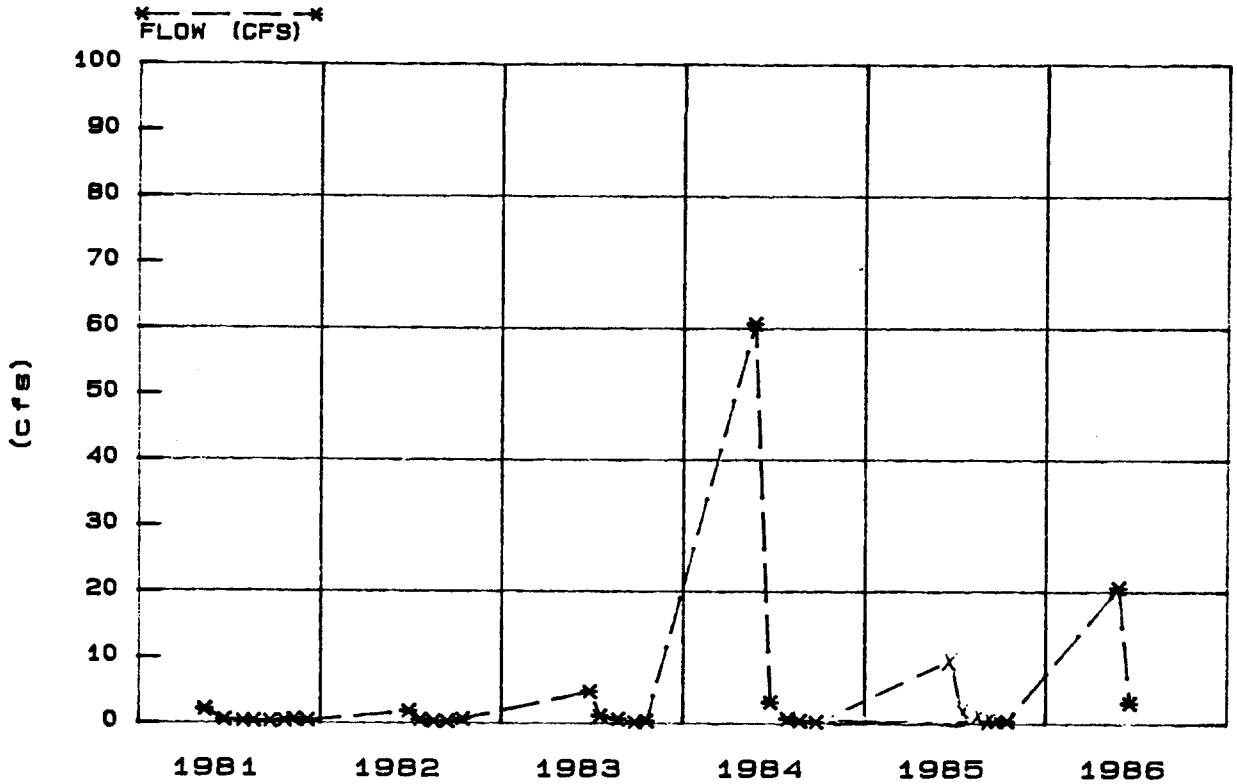

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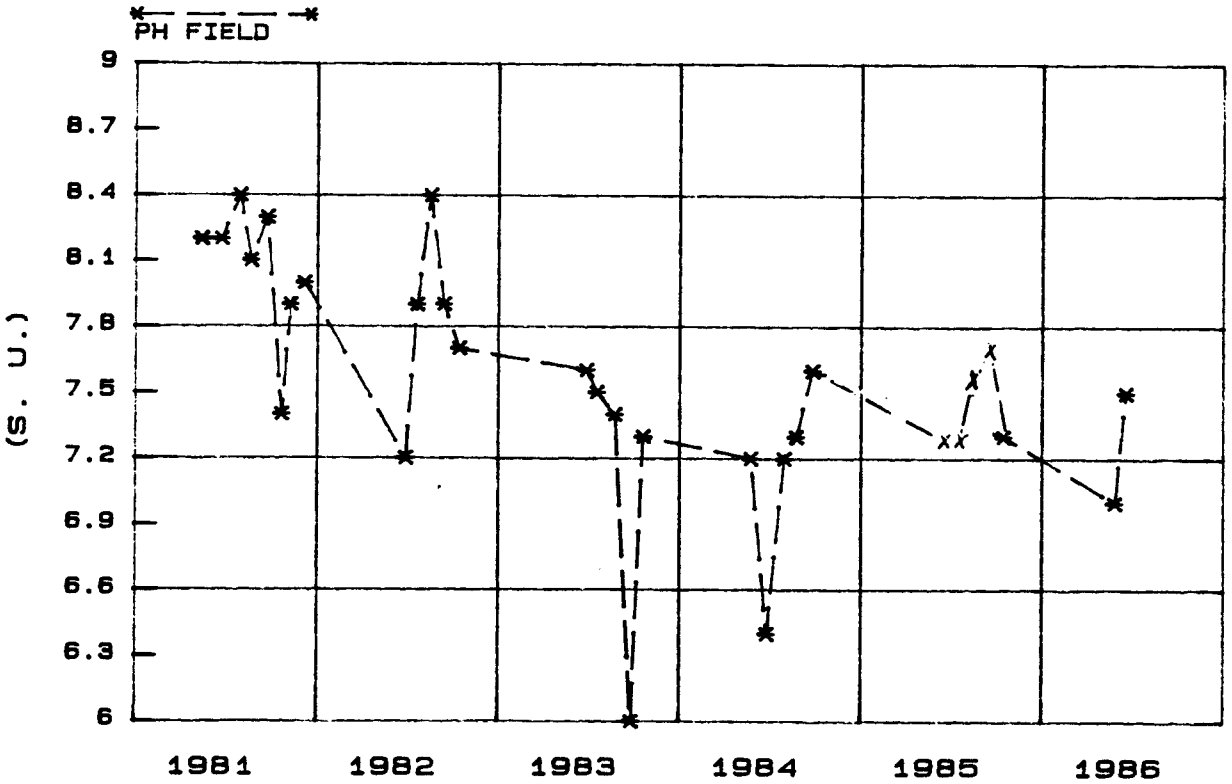

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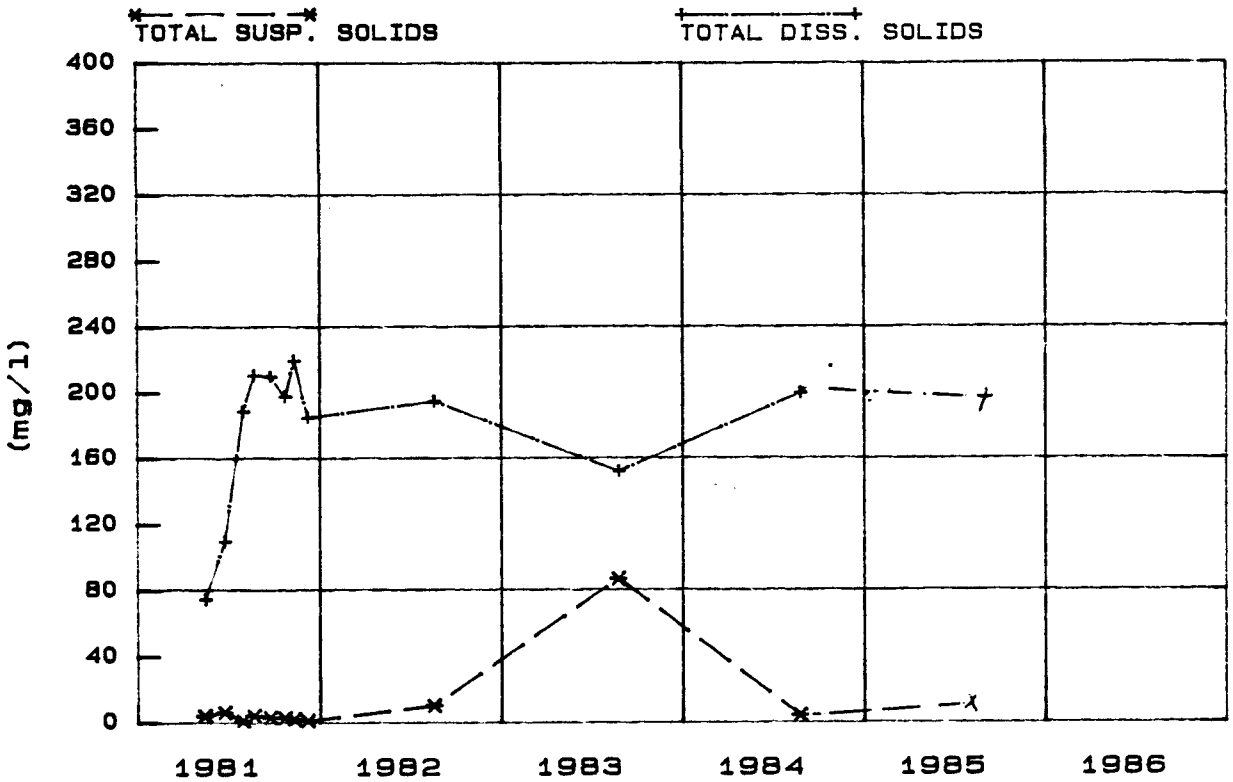

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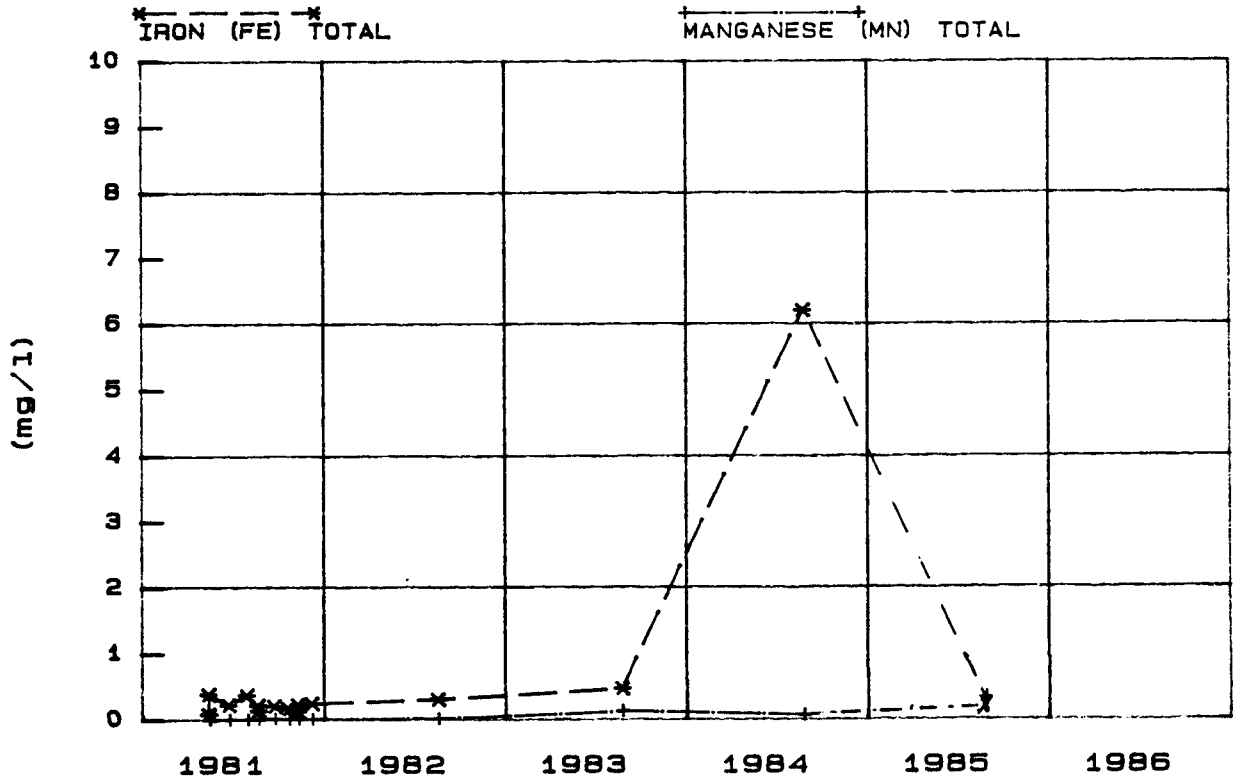

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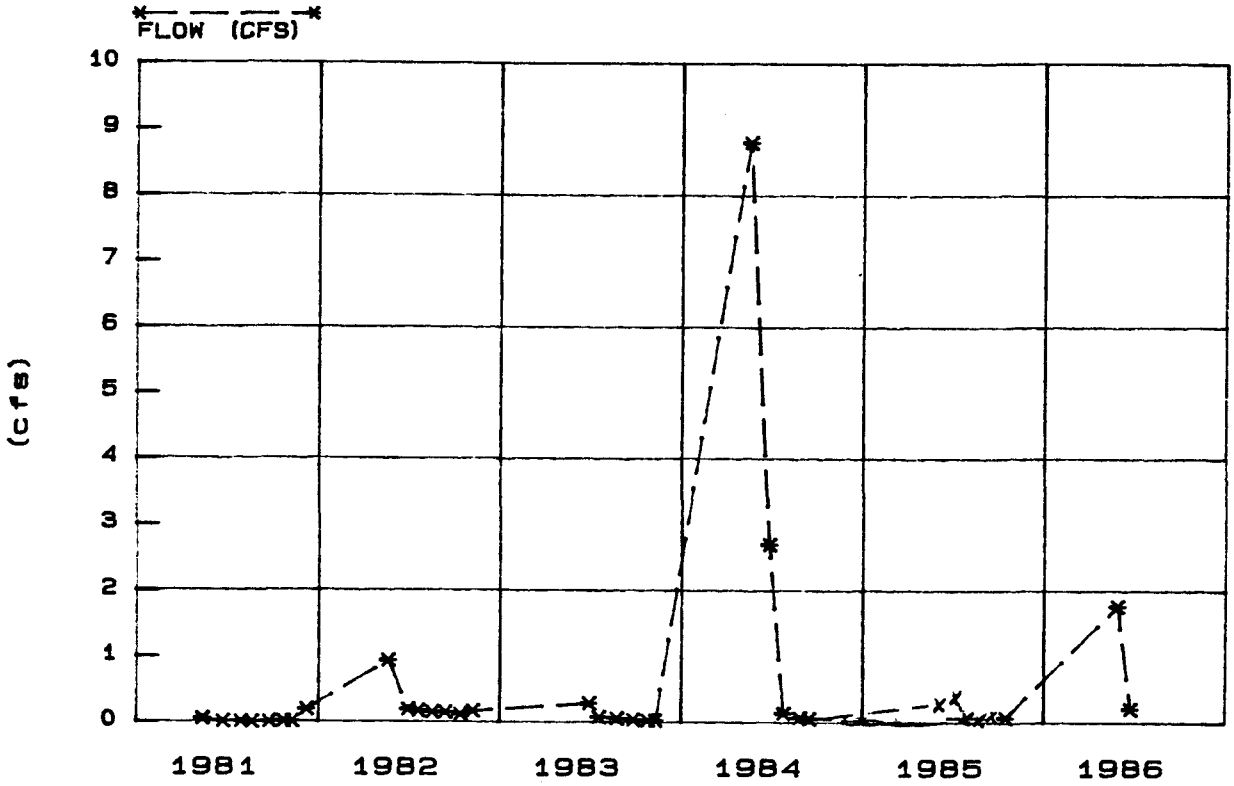
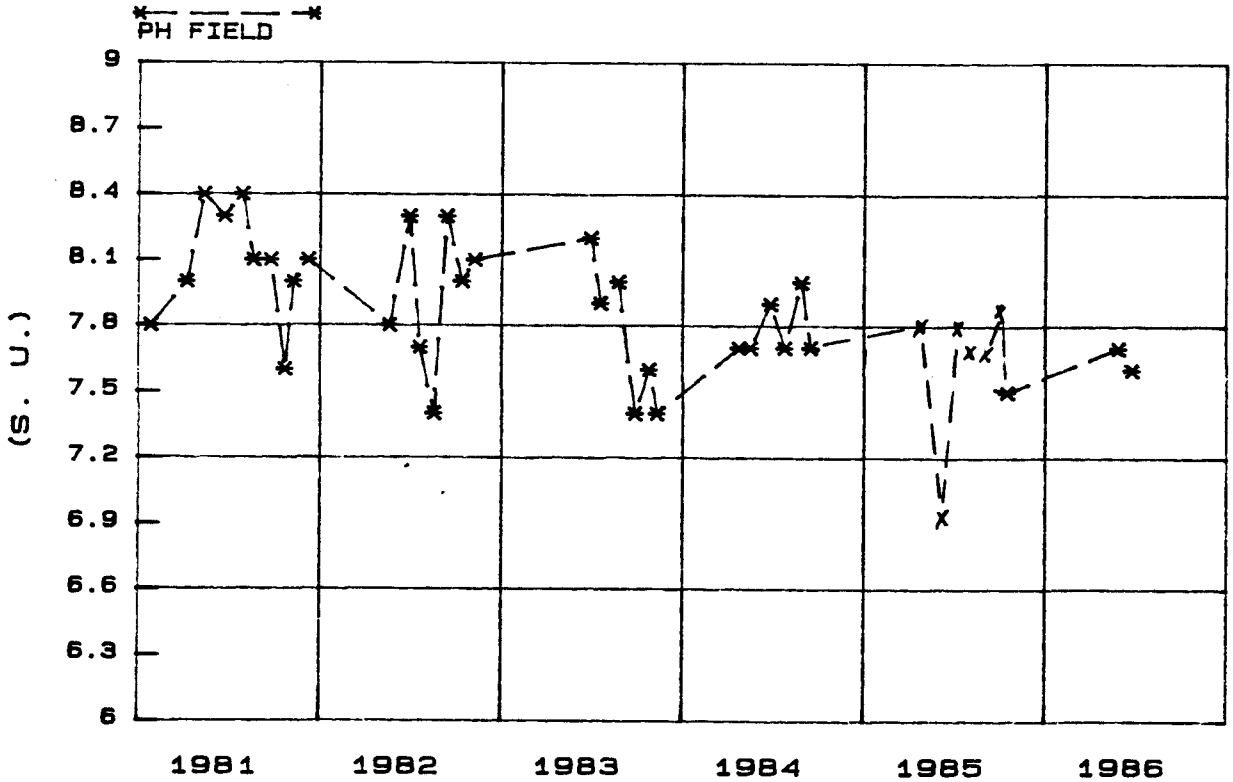


WATER QUALITY SITE: CS-9 RIGHT FORK ECCLES CR.



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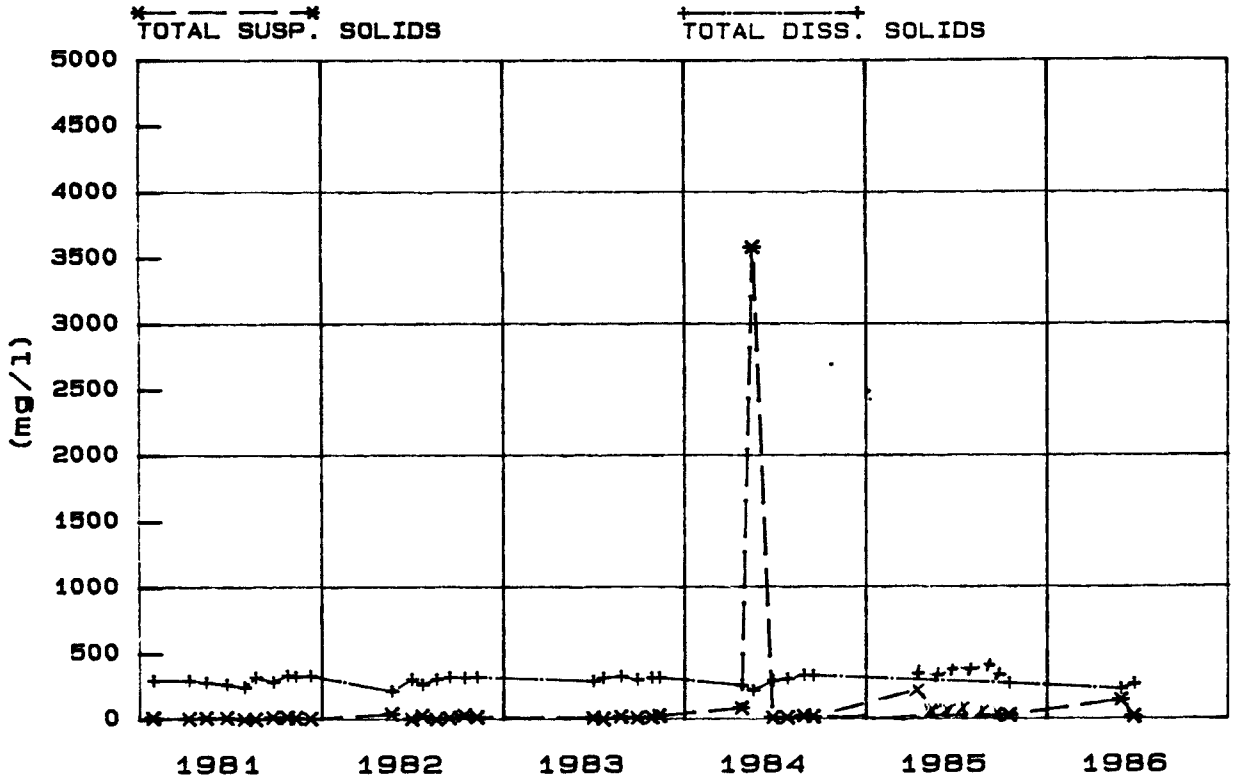

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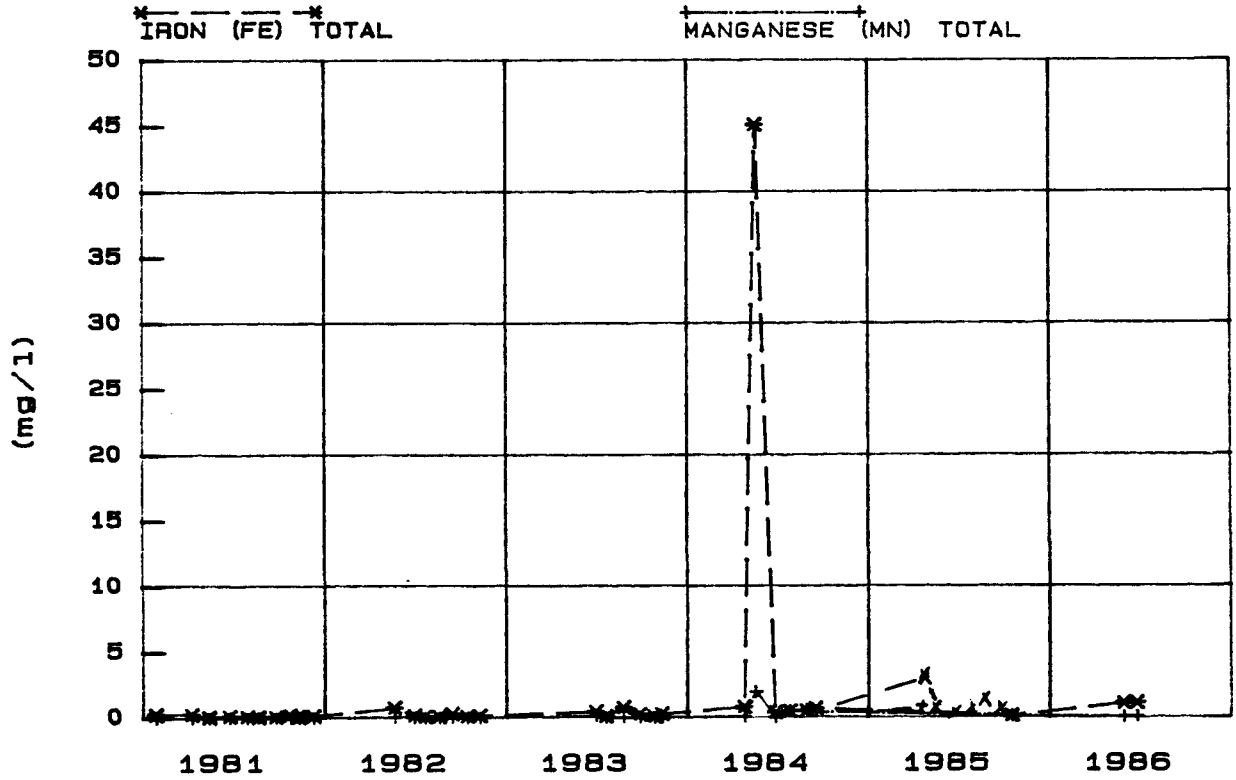

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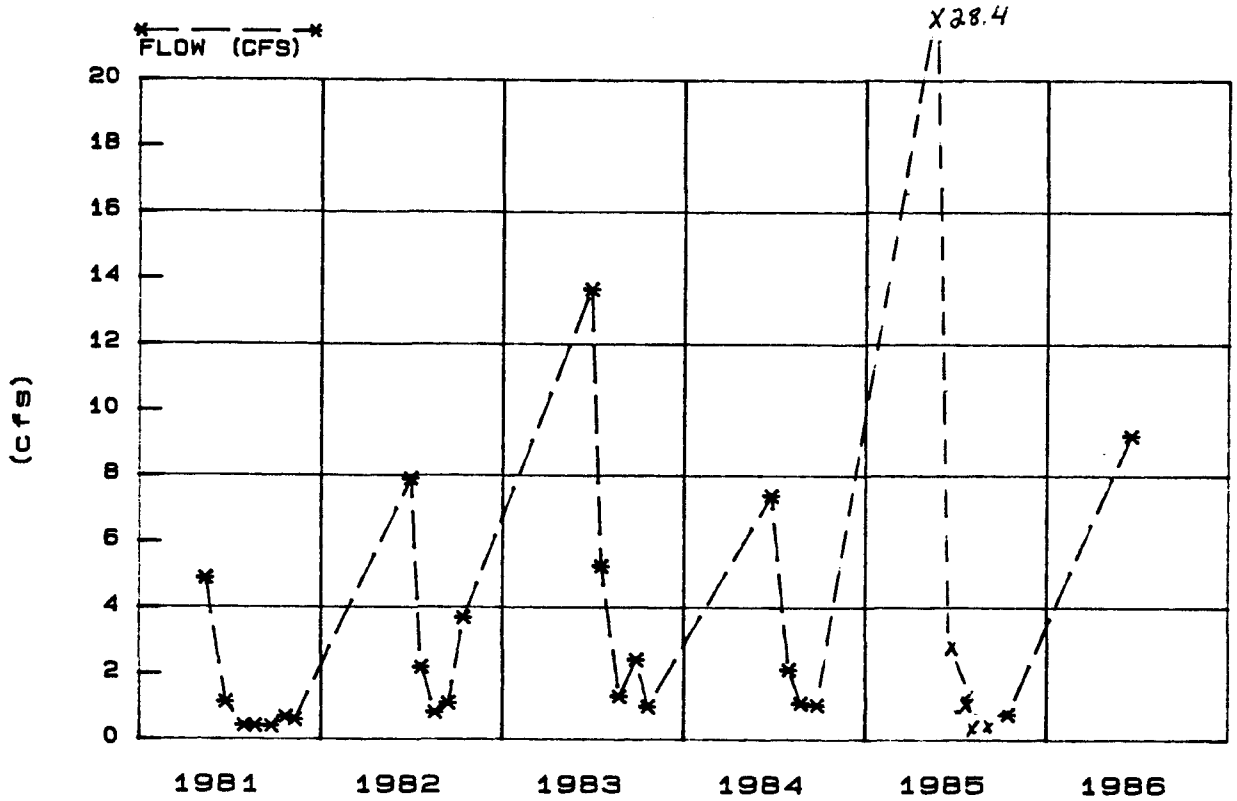
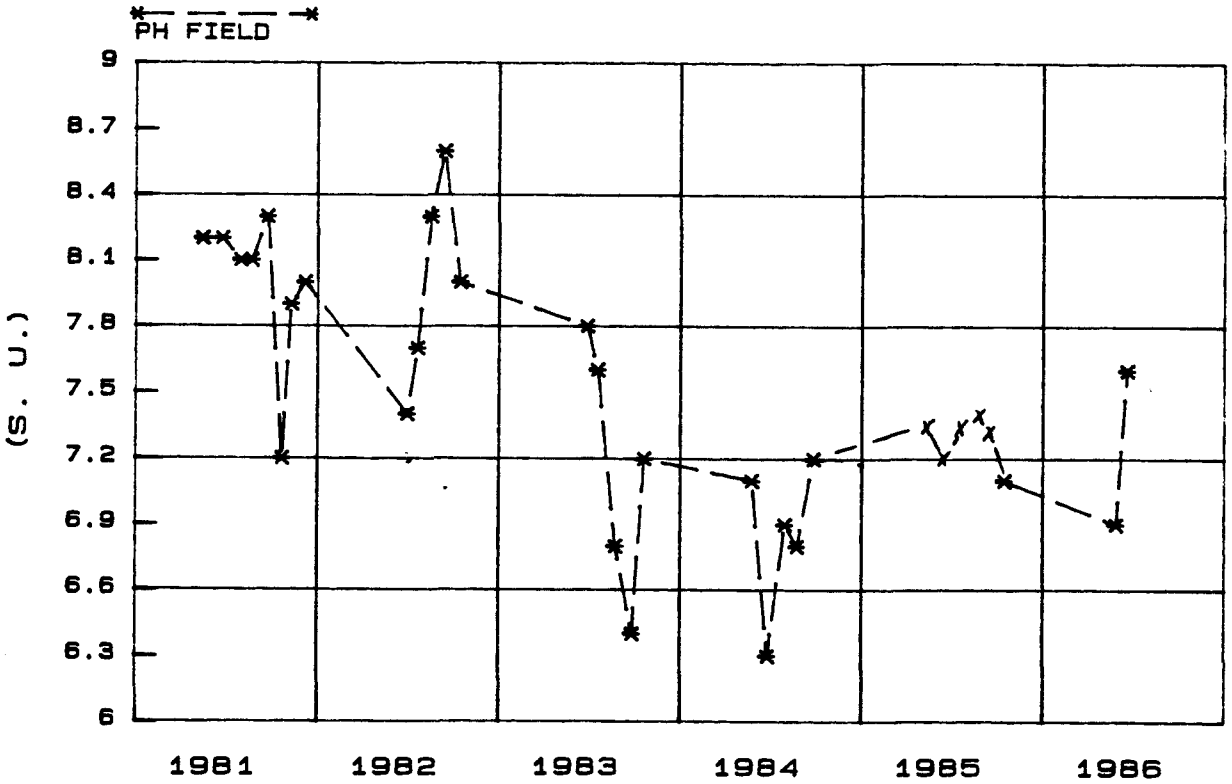


WATER QUALITY SITE: CS-10



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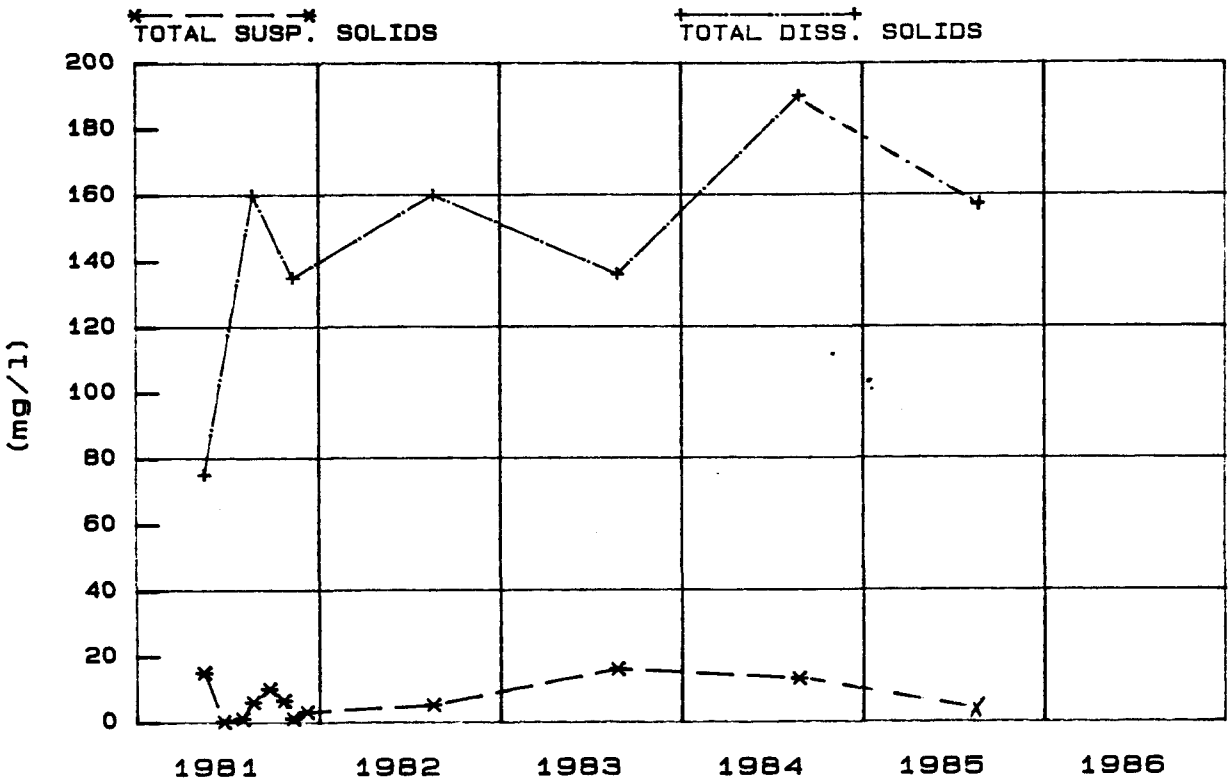

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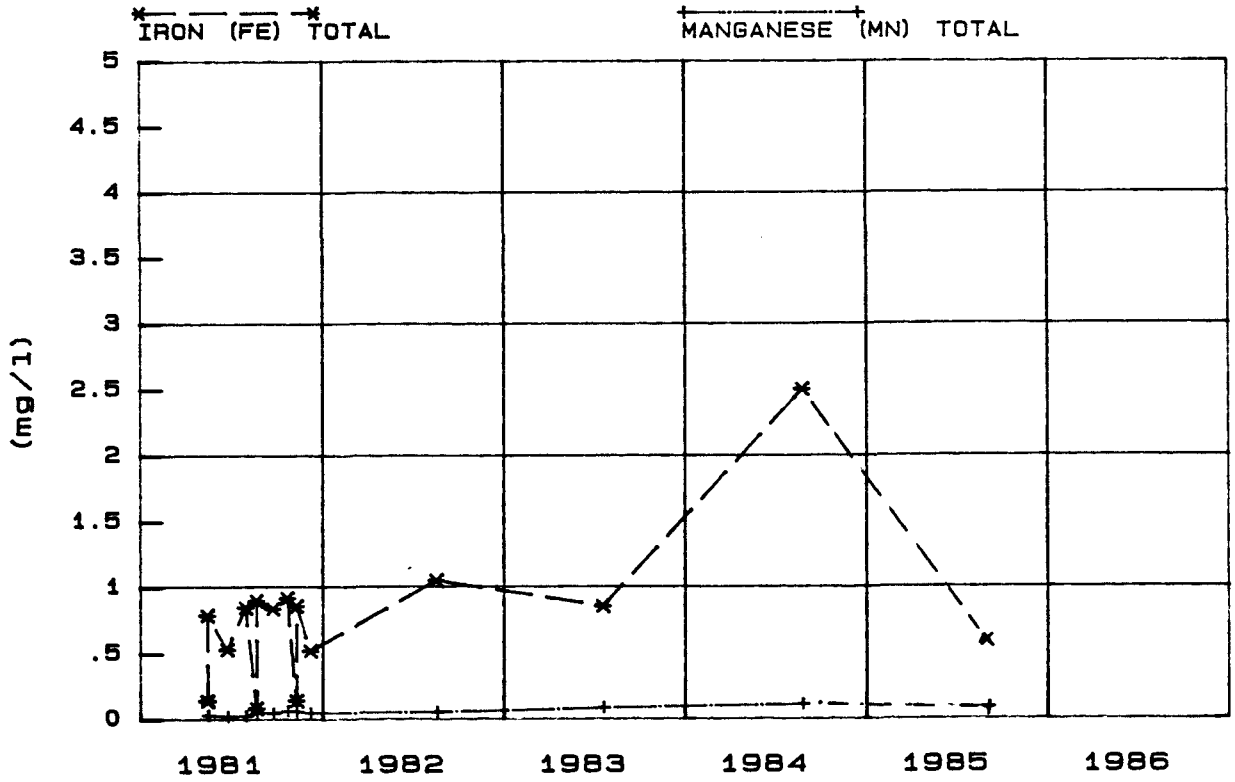

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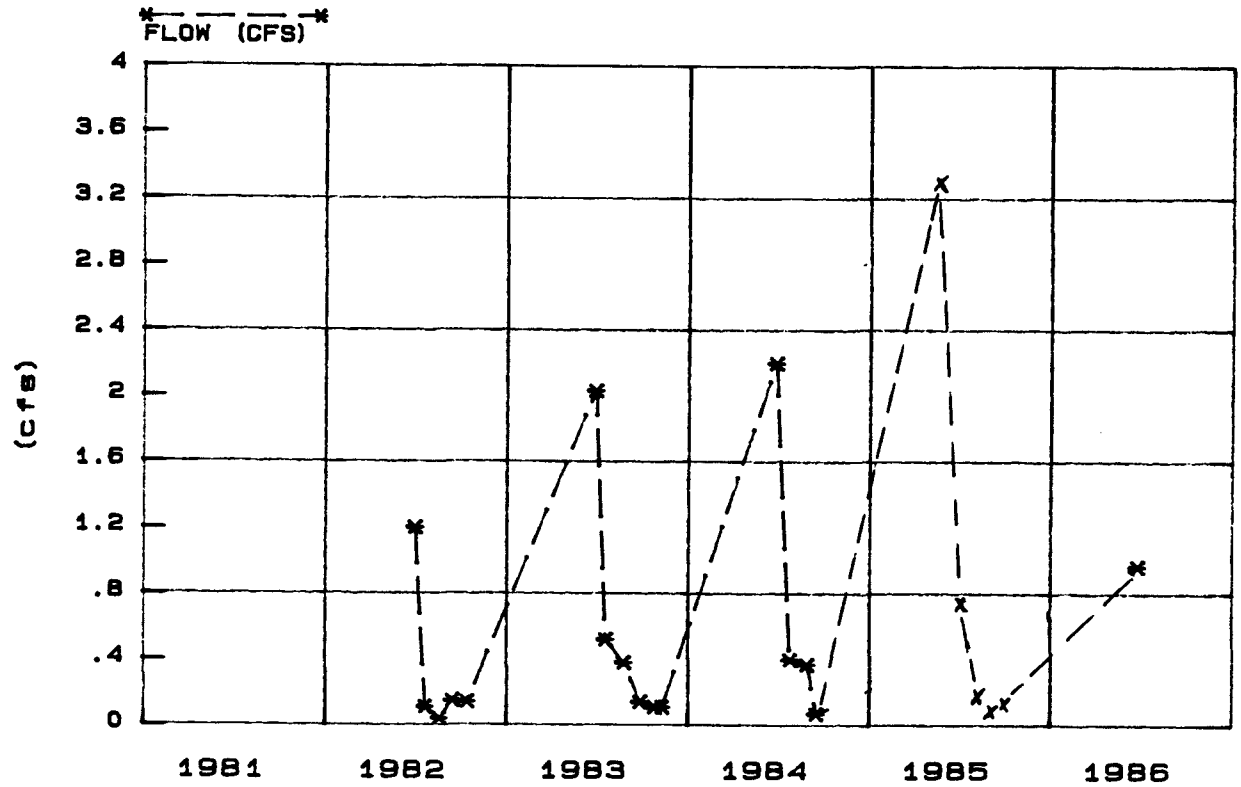
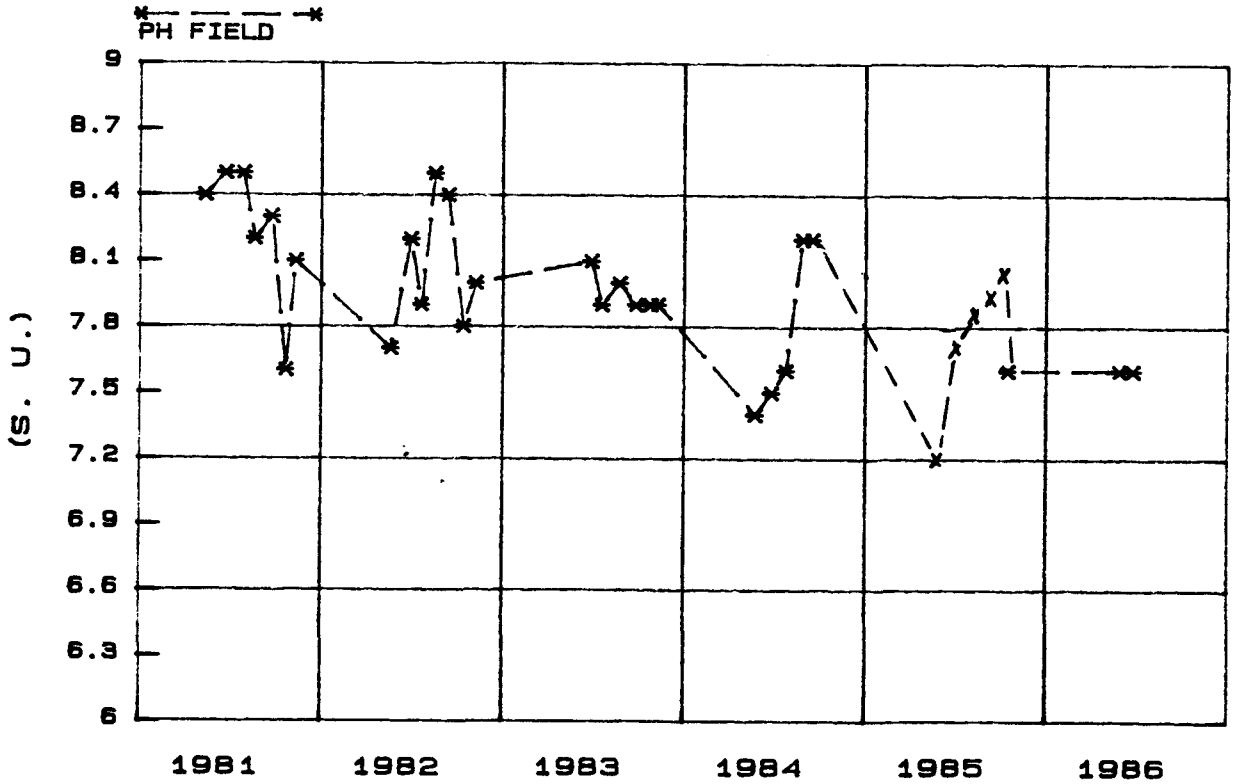


WATER QUALITY SITE: CS-11 ECCLES CR. ABV MINE



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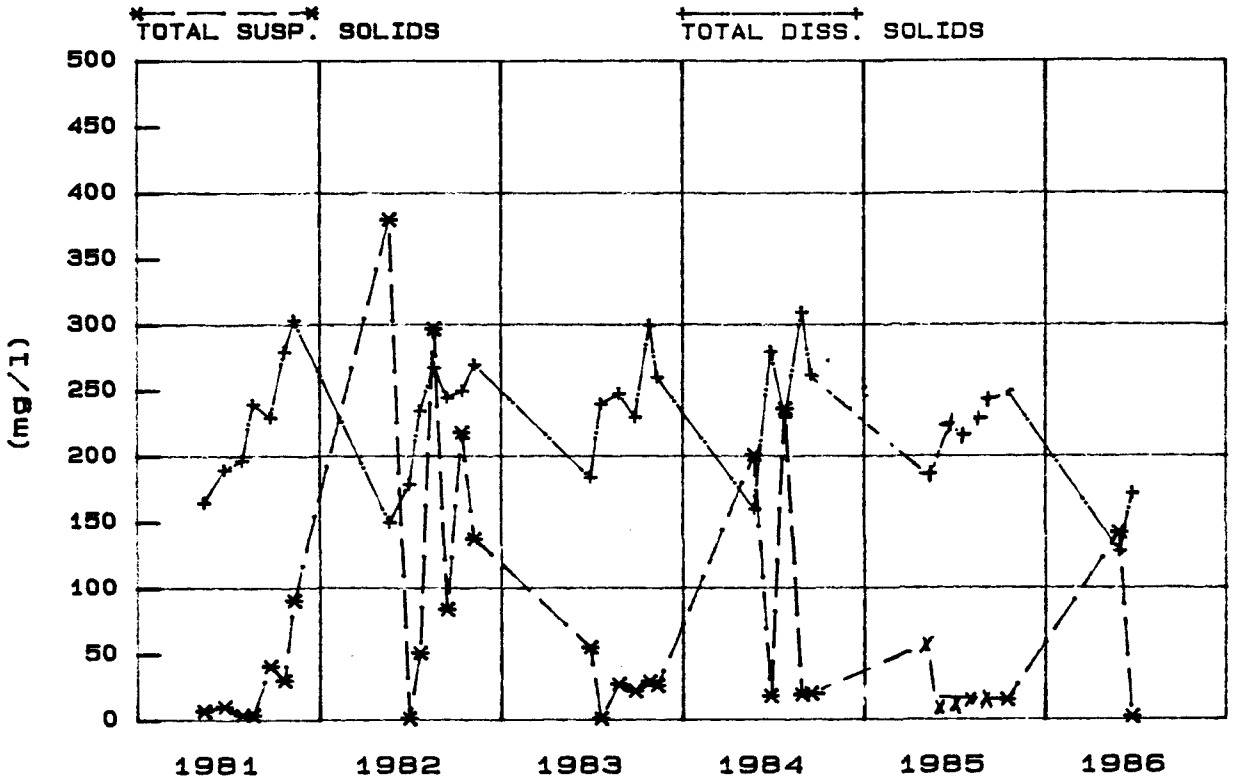

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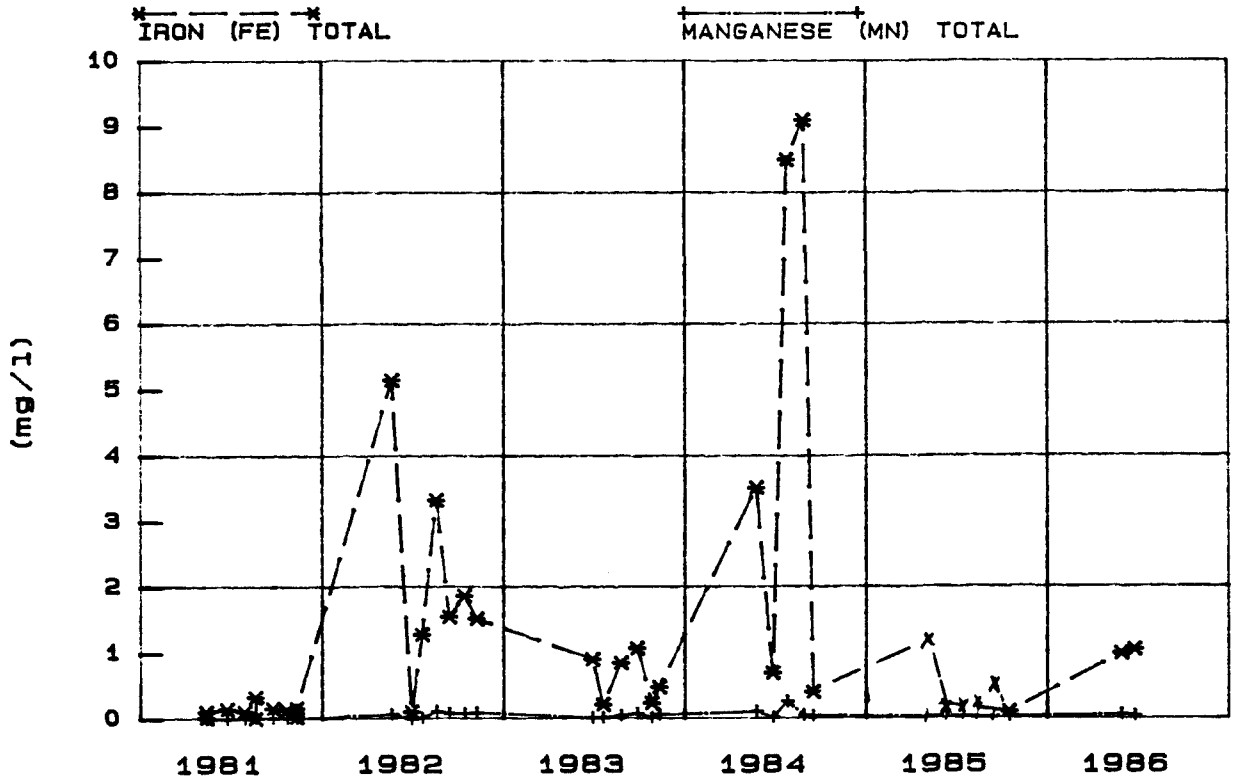

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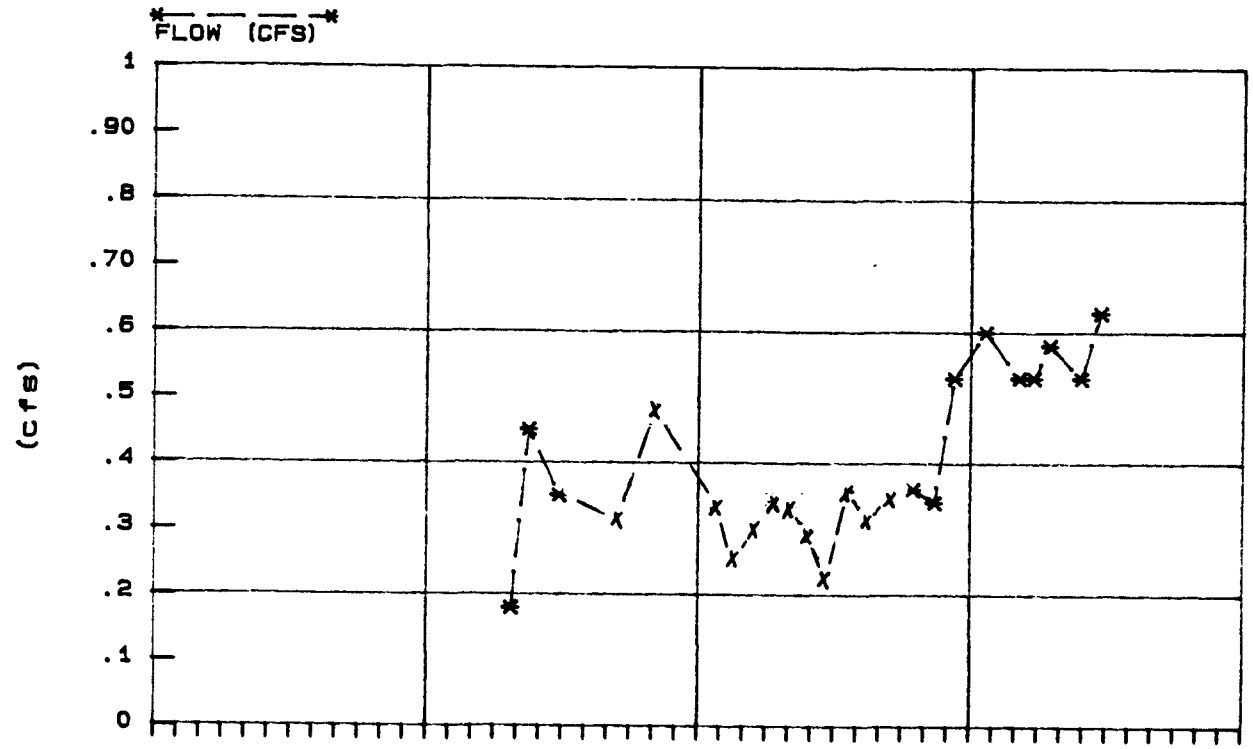
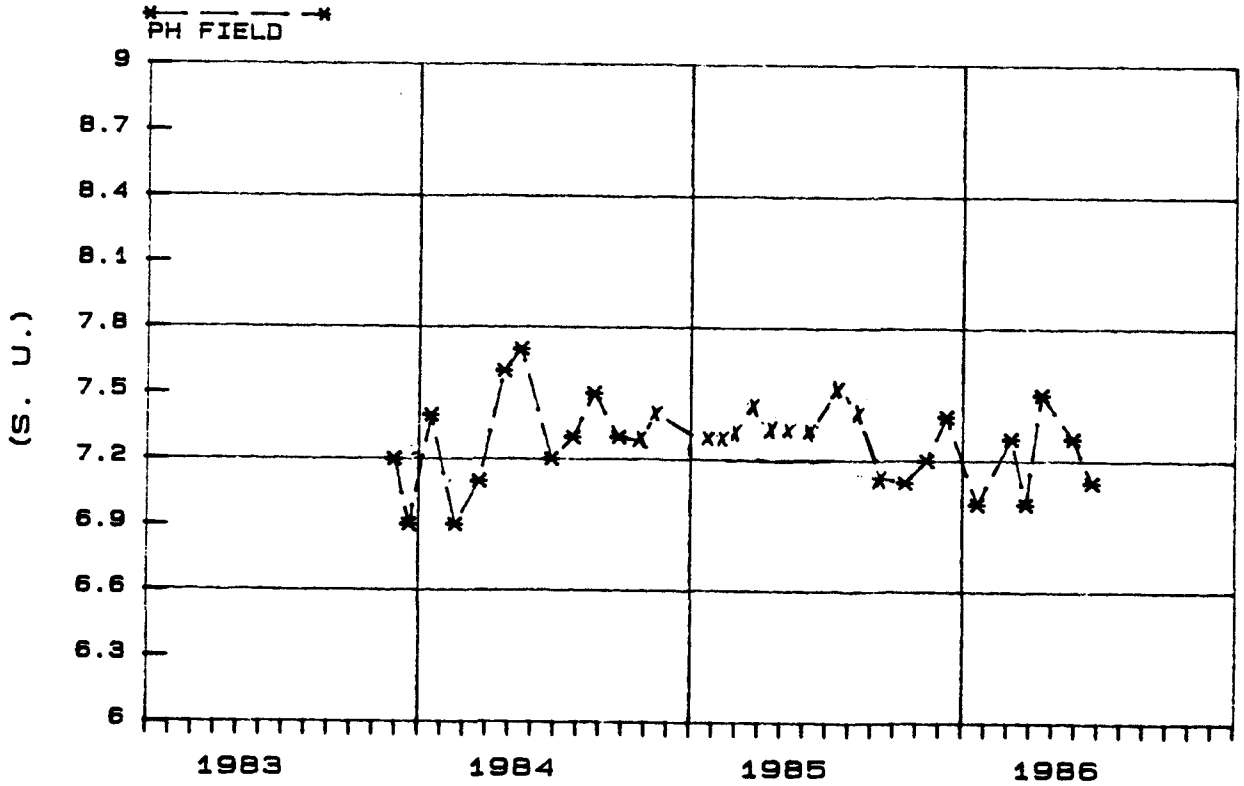


WATER QUALITY SITE: CS-12 DISCHARGE MINE NO.3



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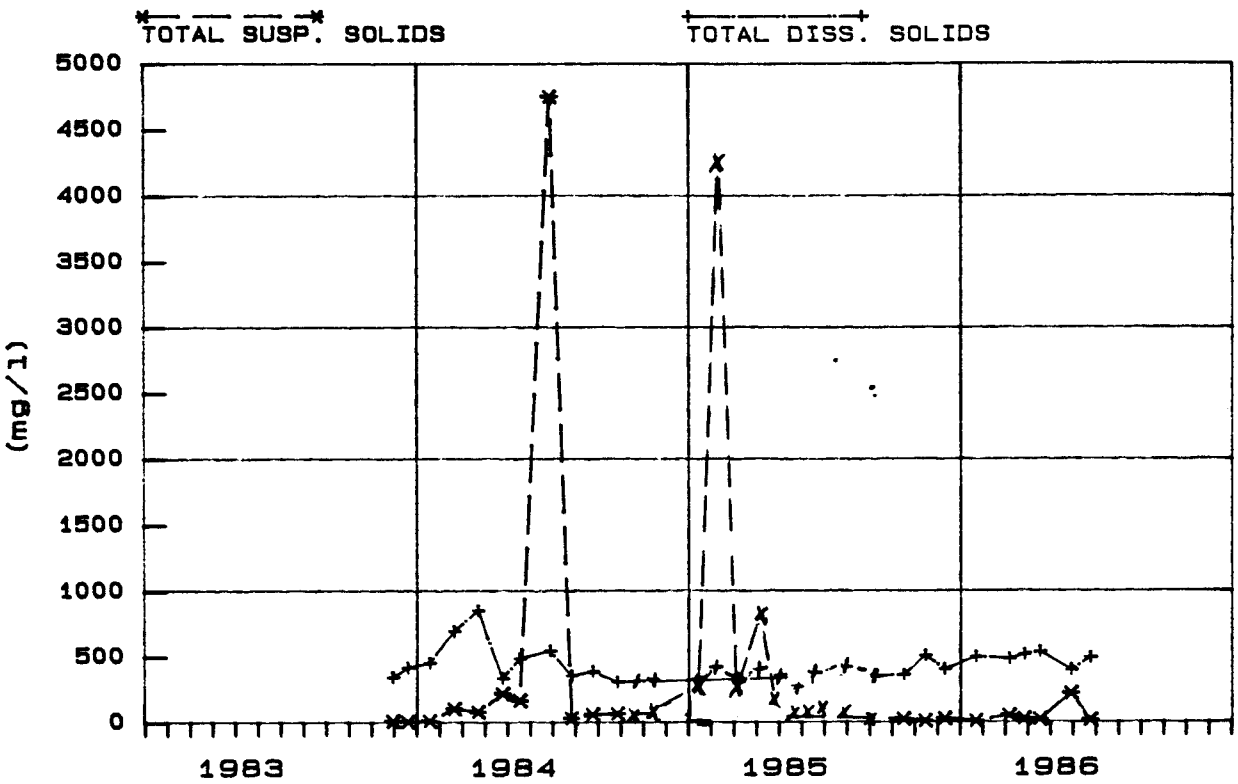

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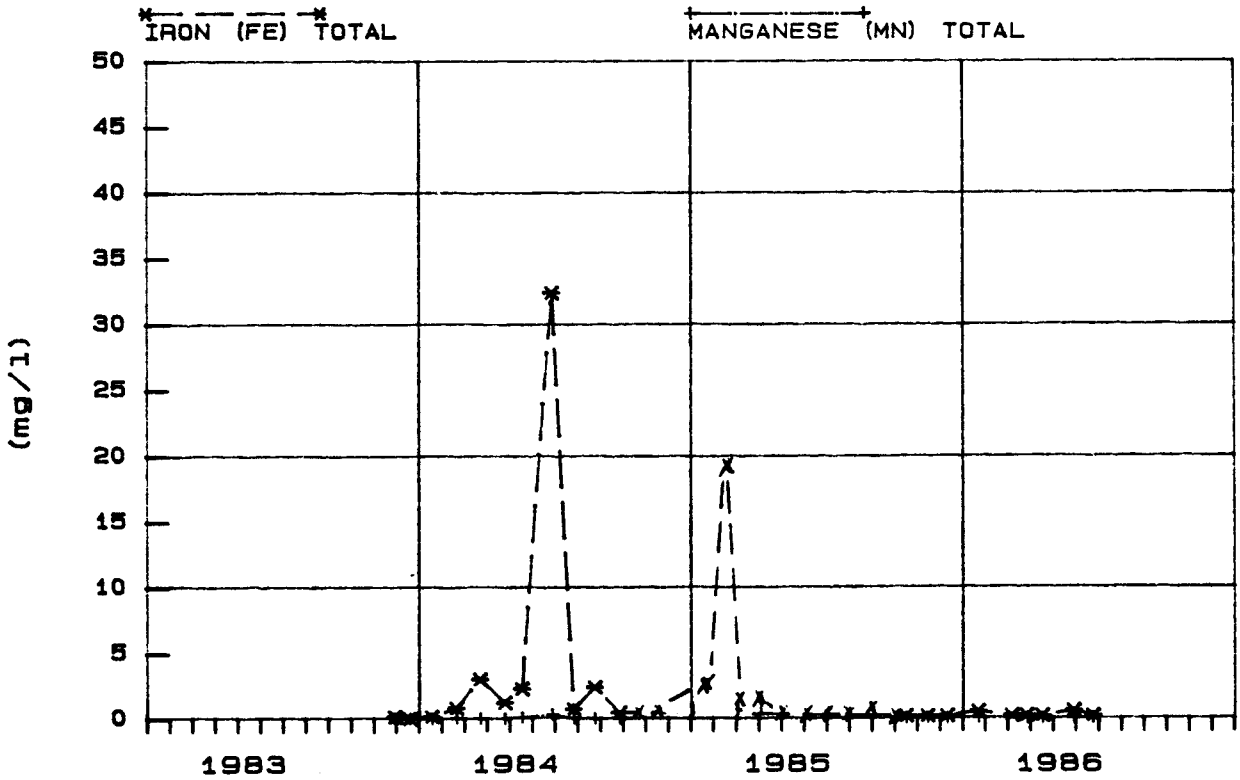

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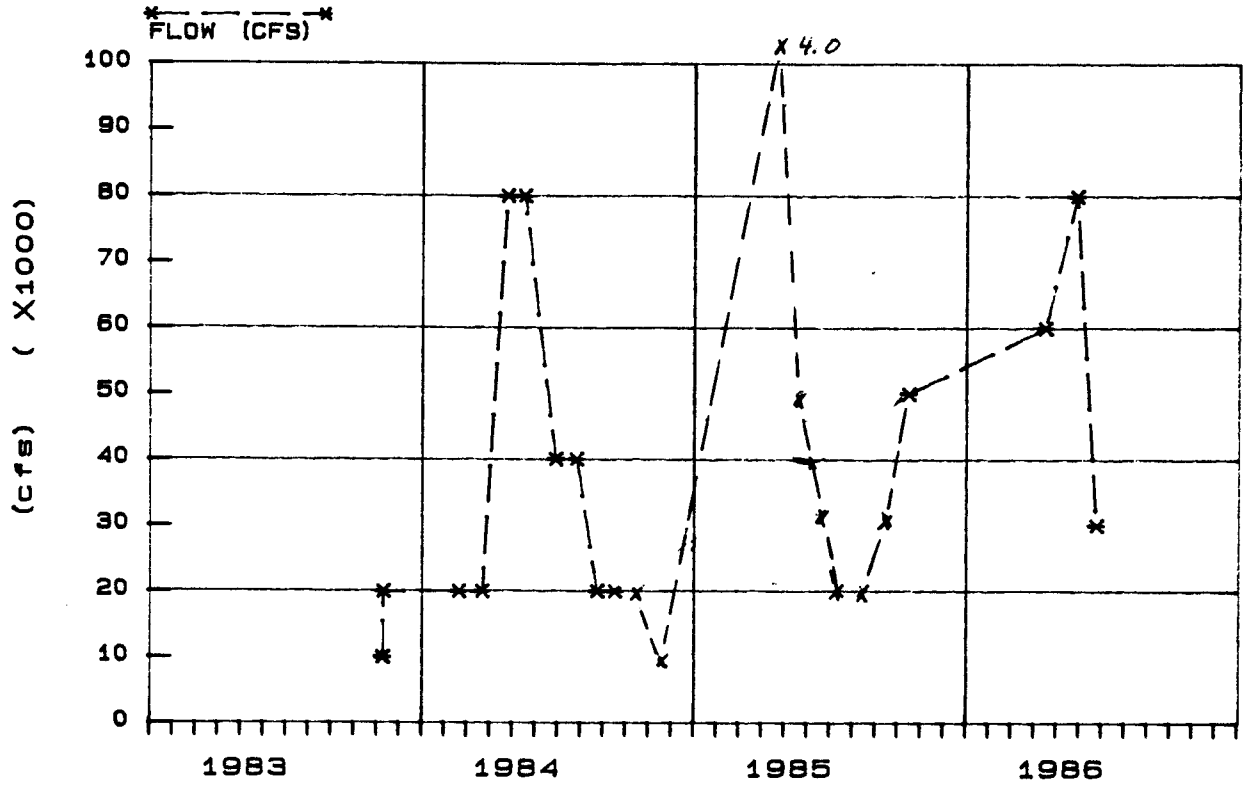
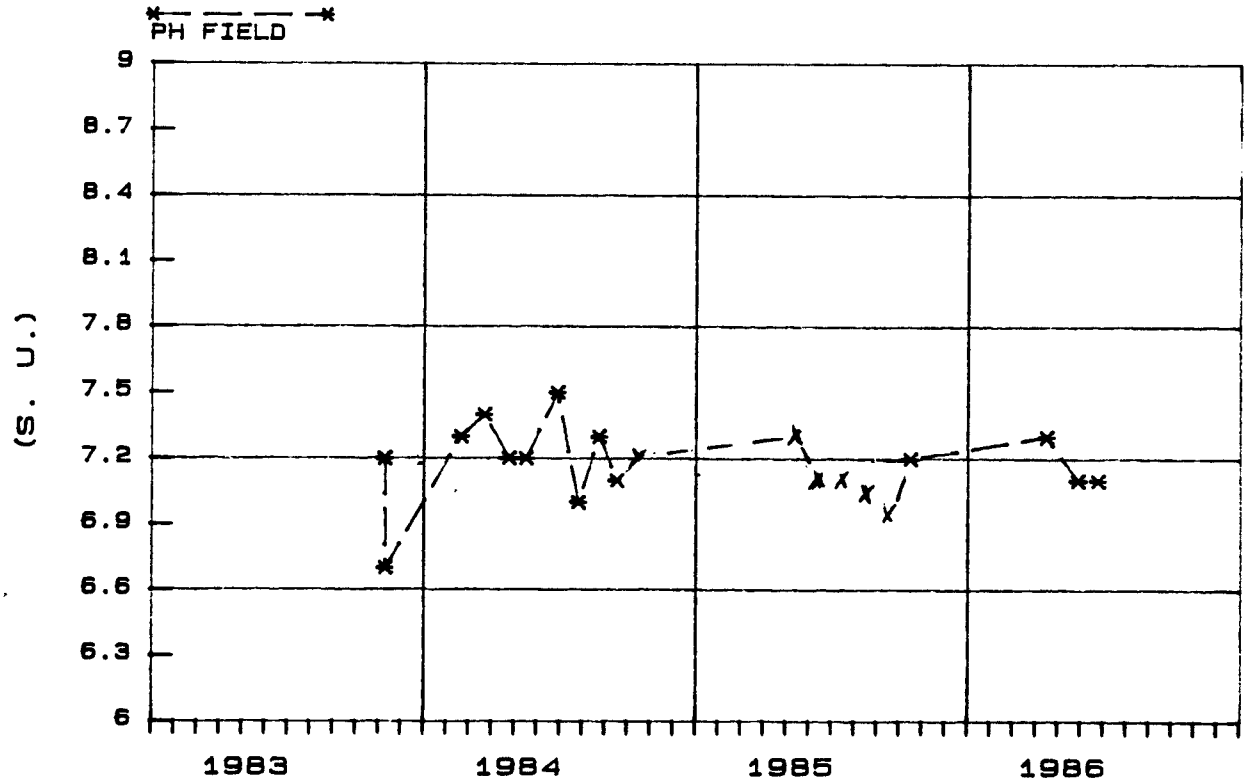


WATER QUALITY SITE: CS-13 FRENCH DR. N.LOADOUT



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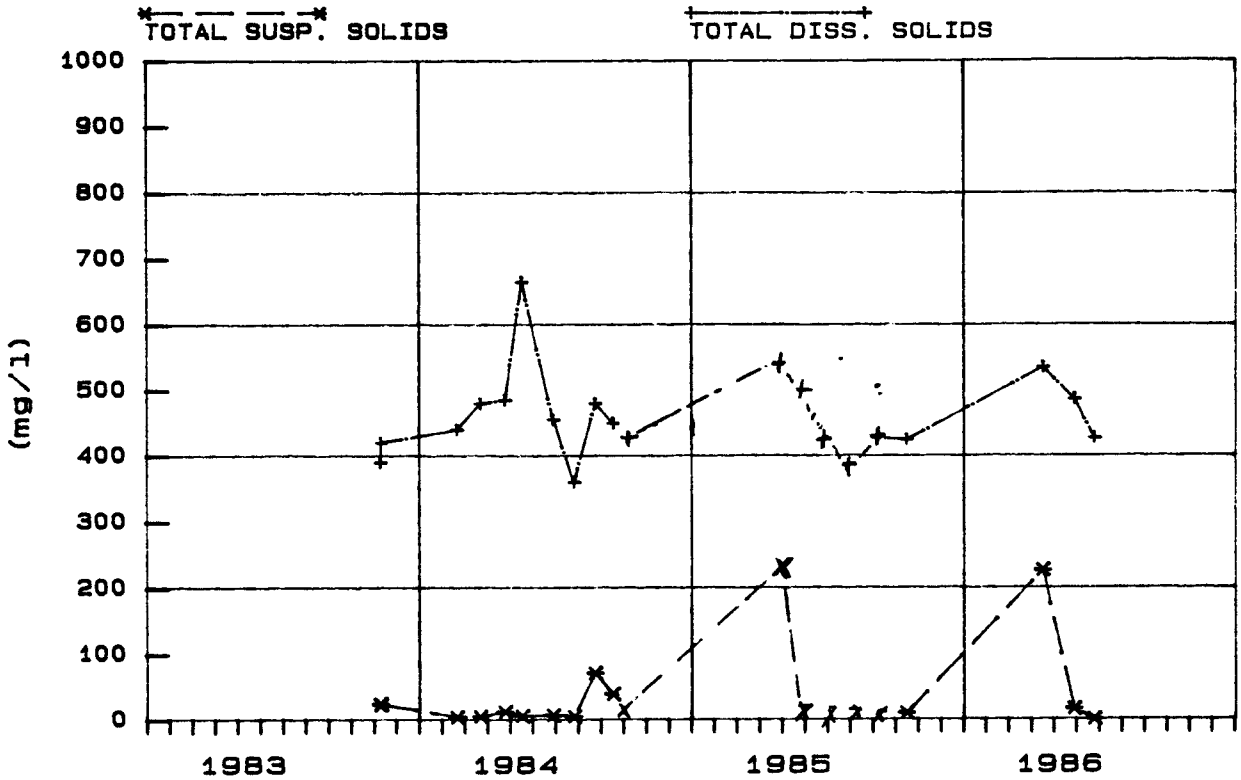

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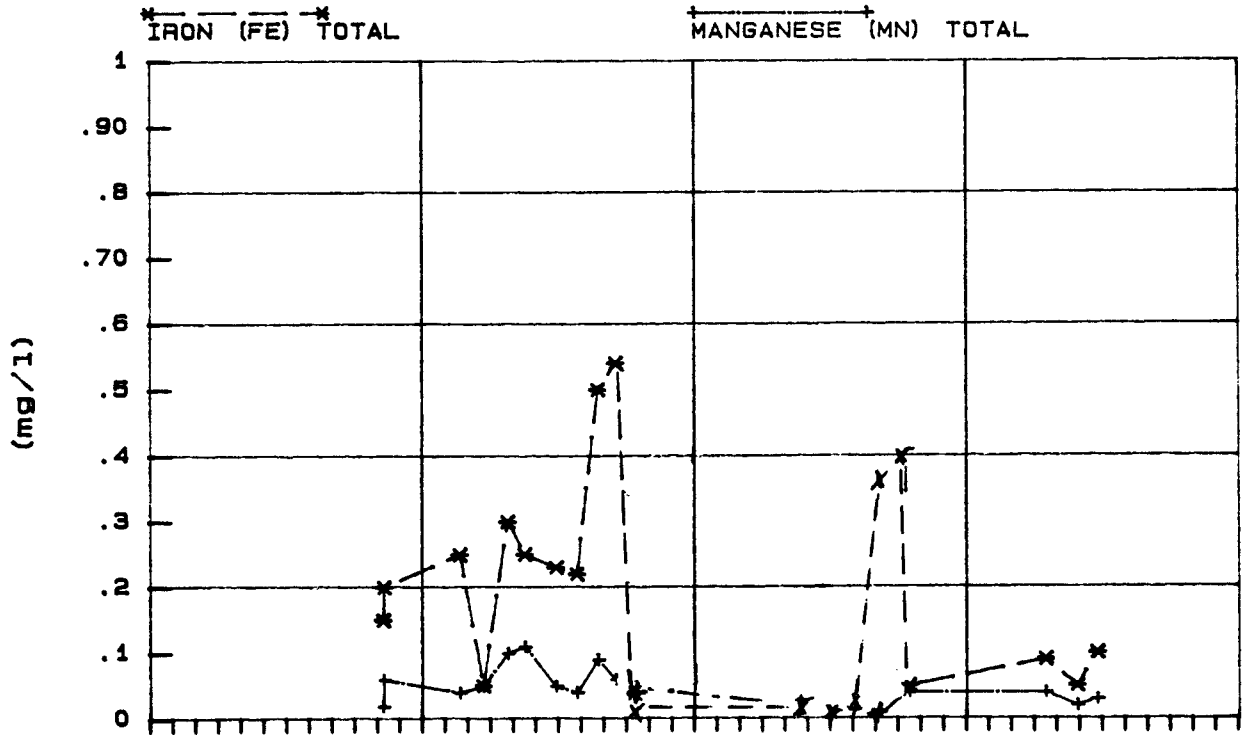

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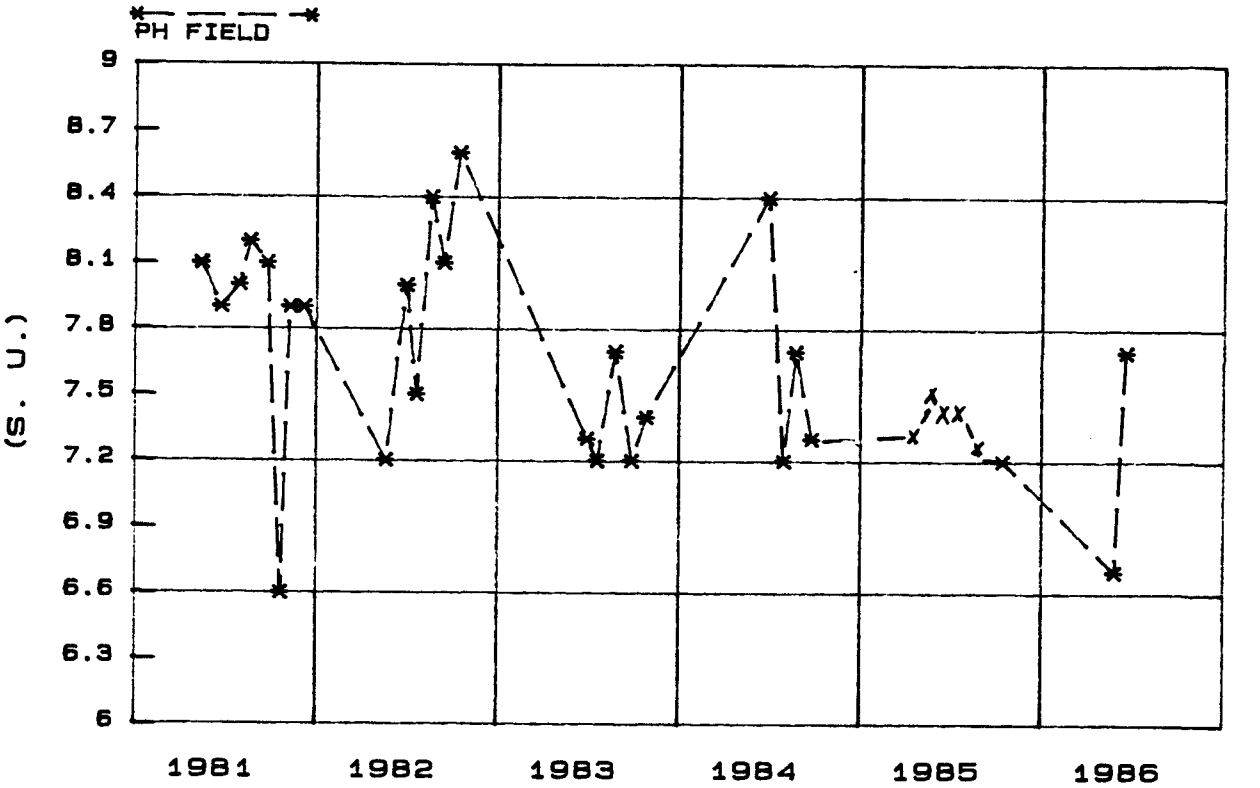
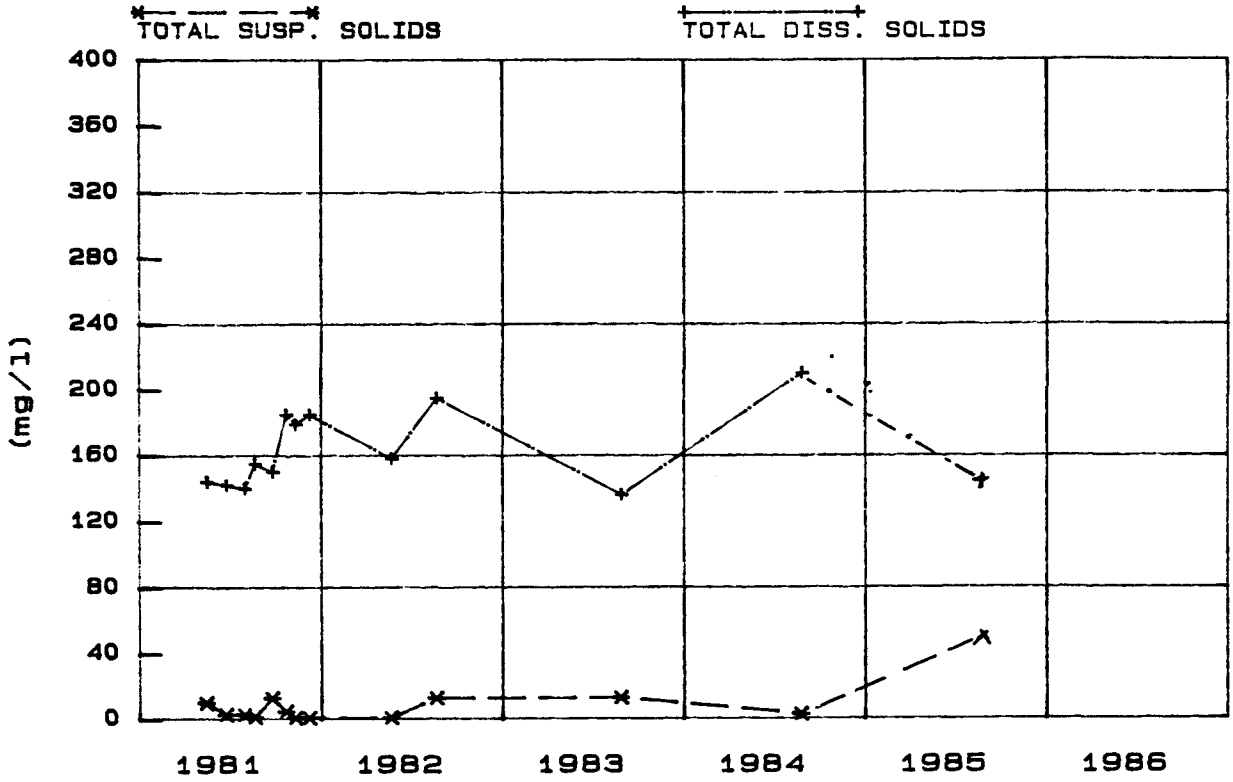


WATER QUALITY SITE: UPL-3 HUNT.CR.BLW ELECTRIC LK



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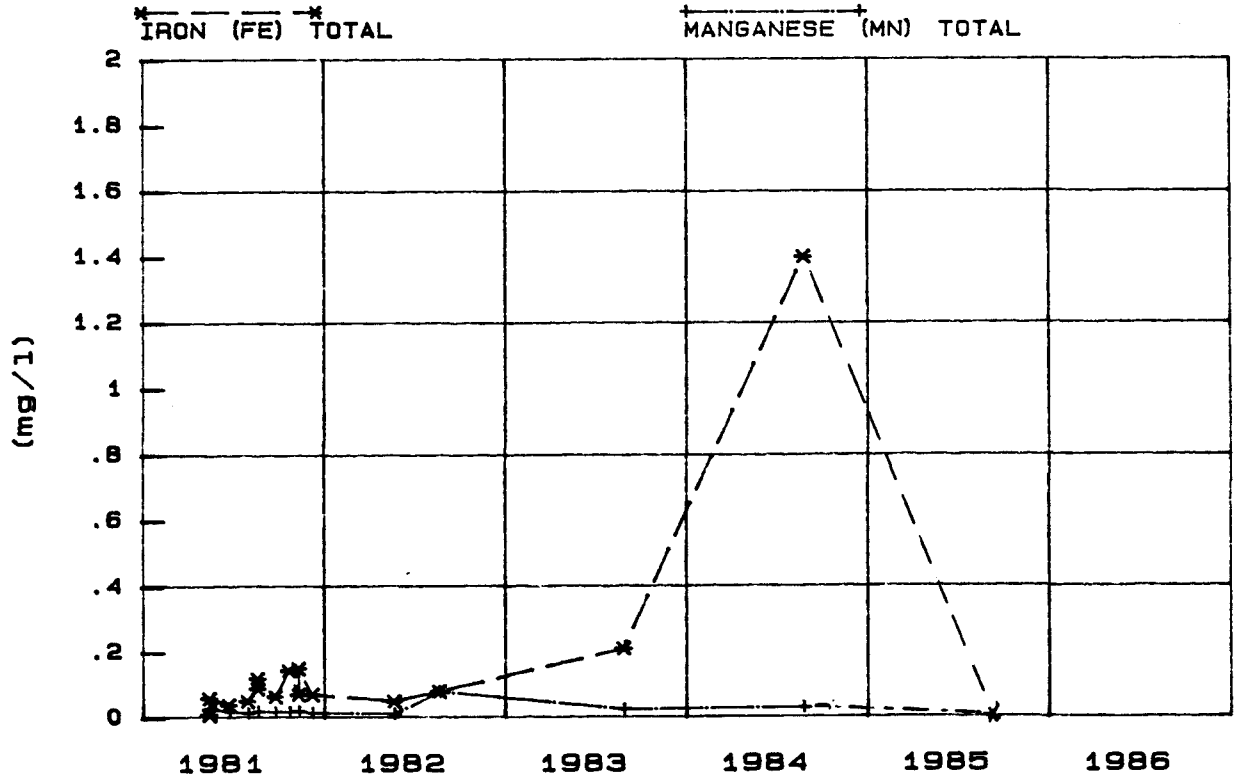

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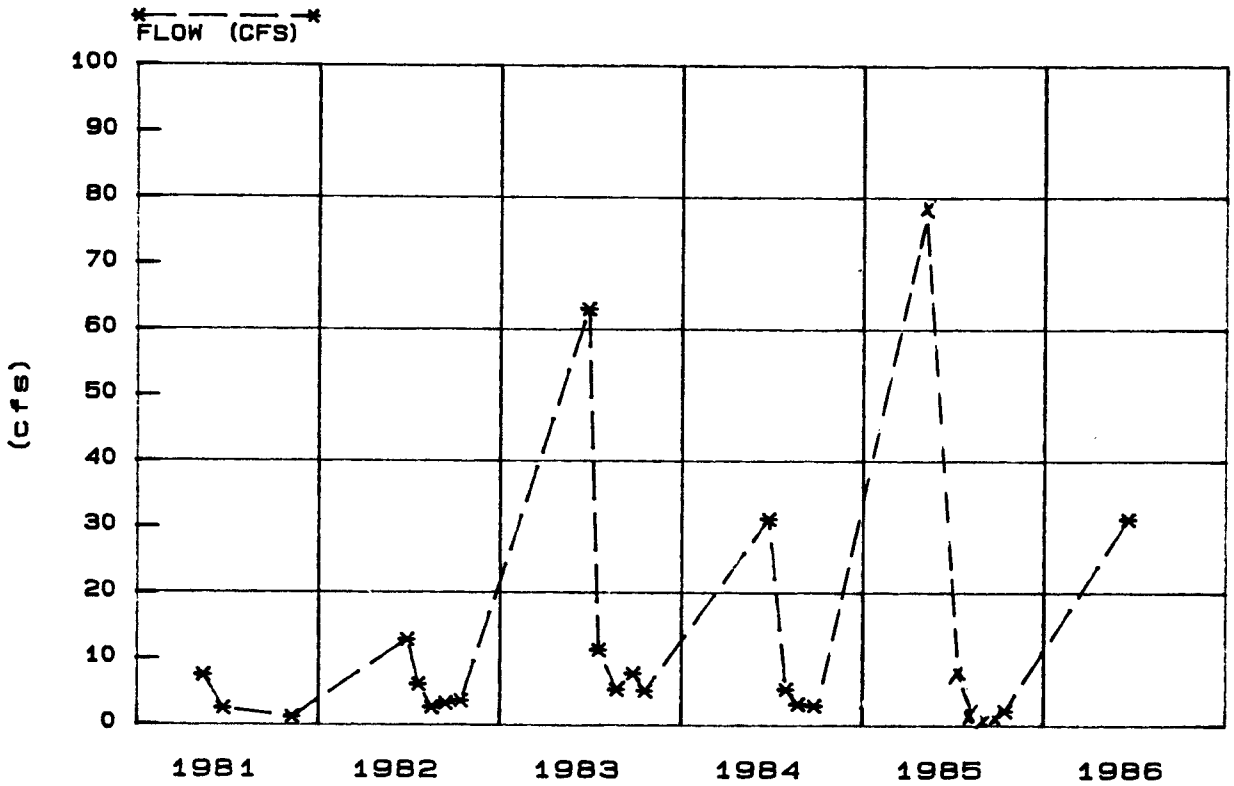

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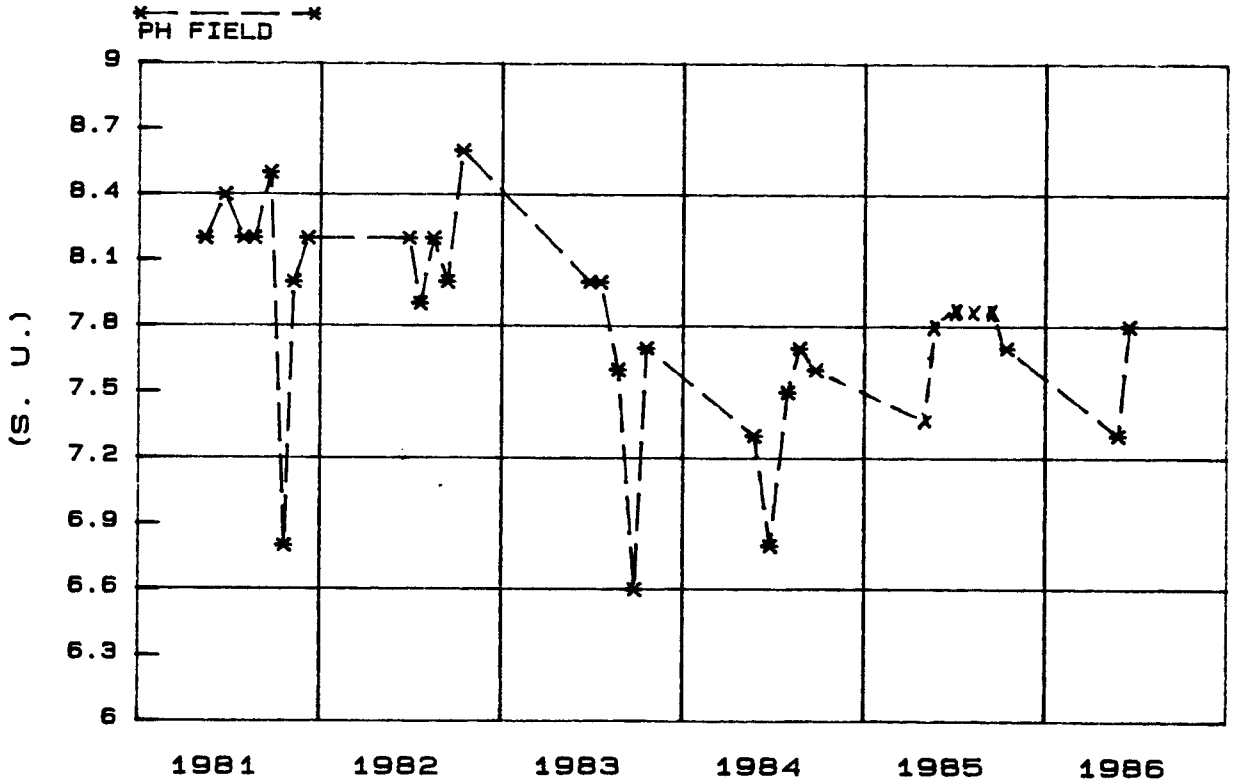

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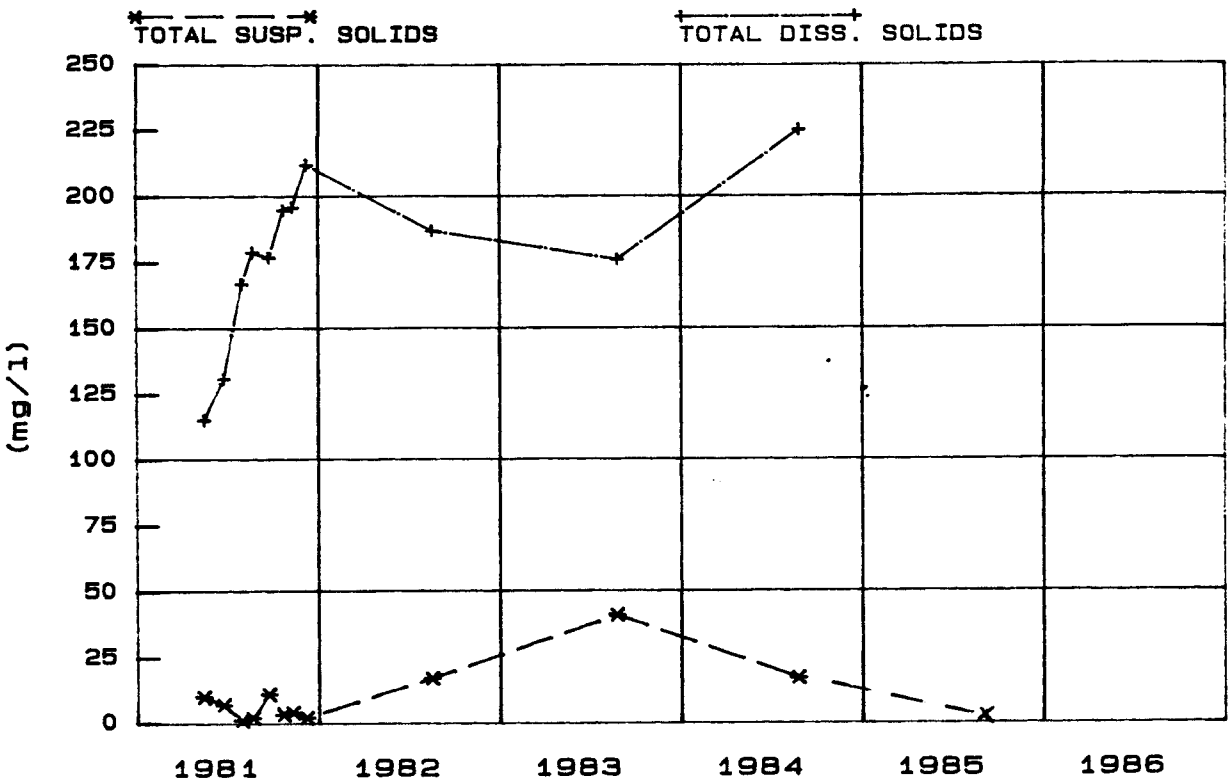

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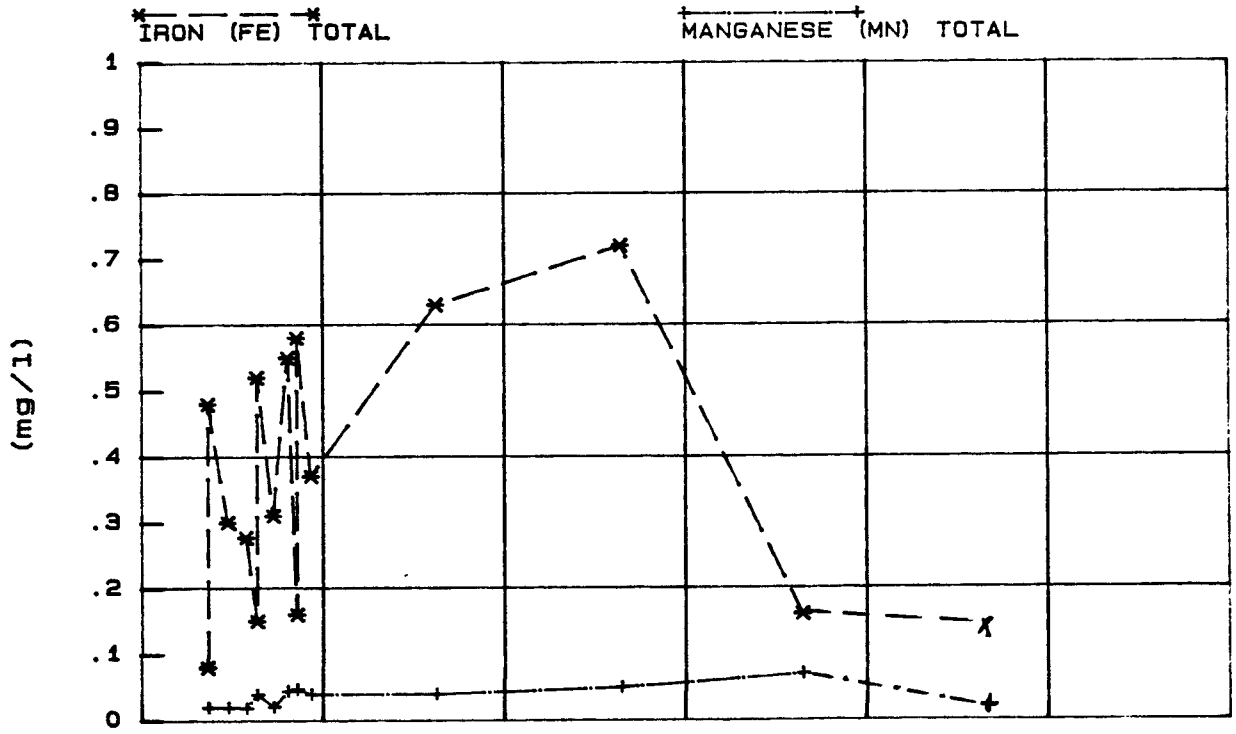

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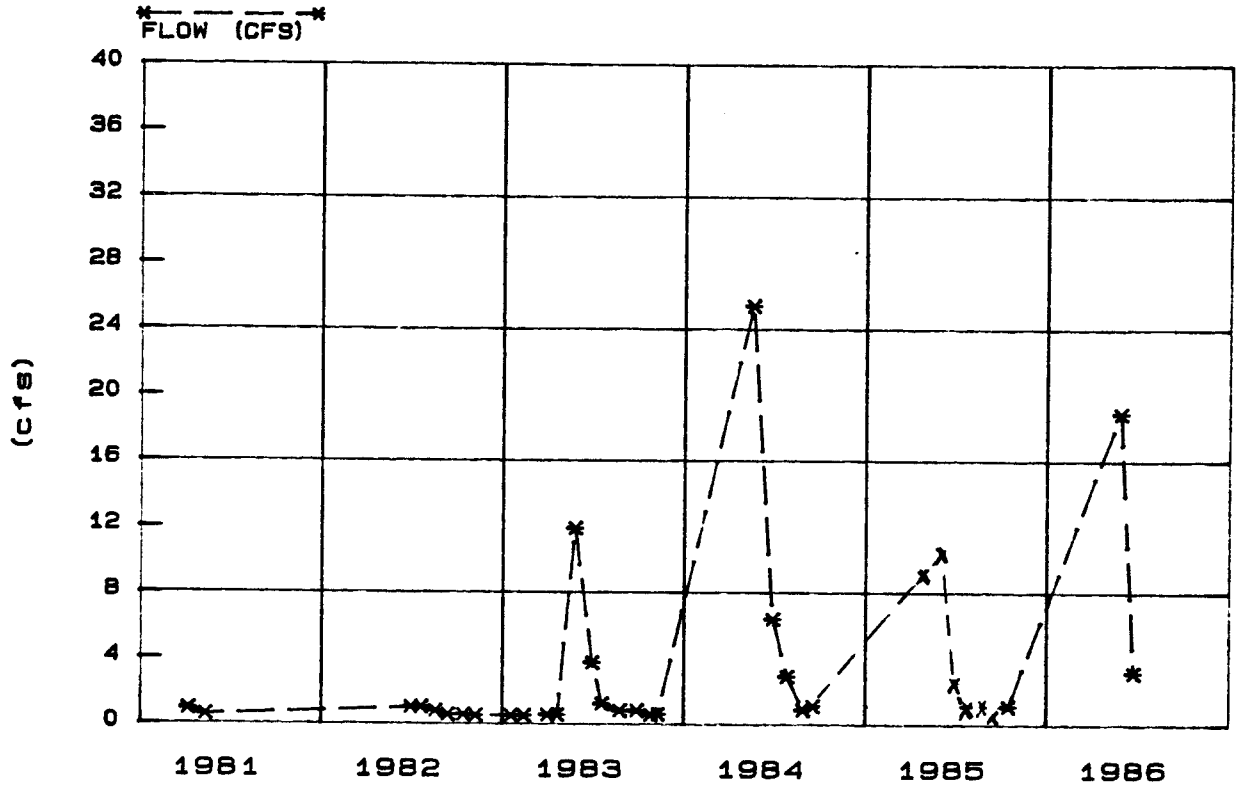
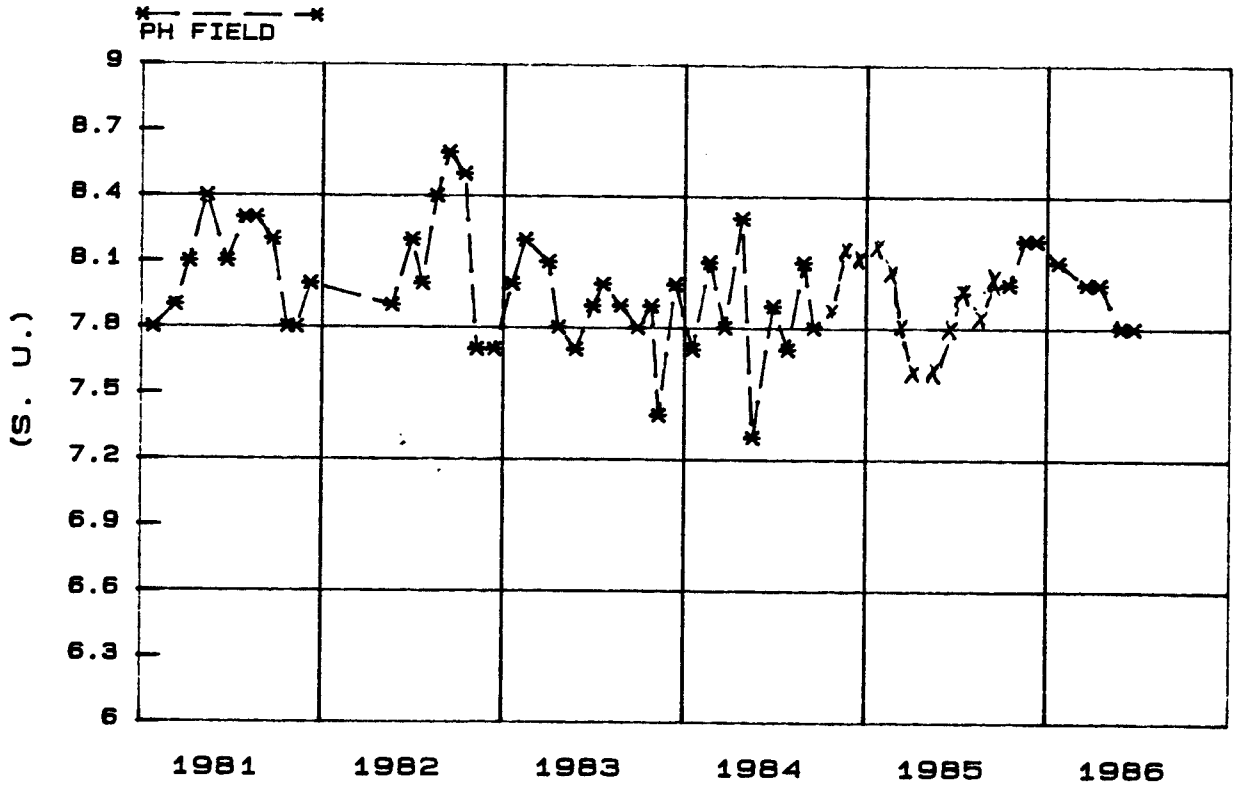
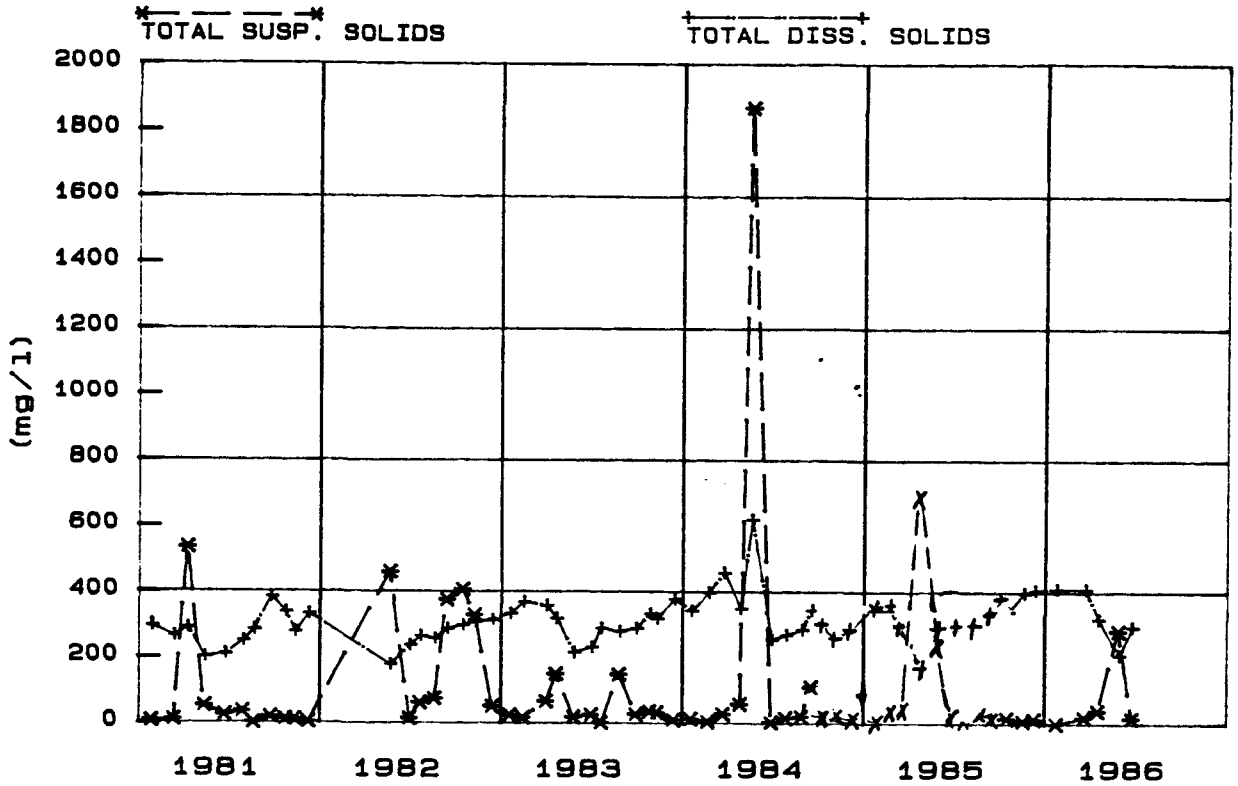


WATER QUALITY SITE: VC-6



WATER QUALITY SITE: VC-6



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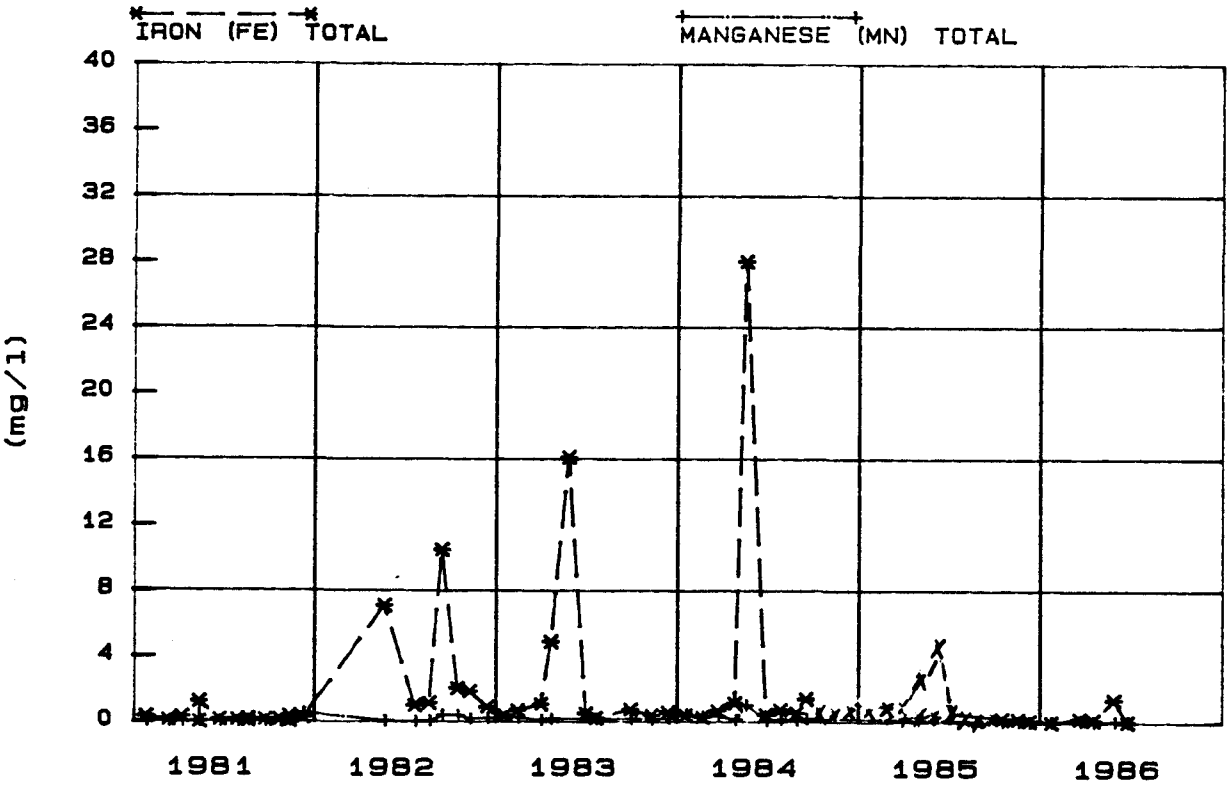
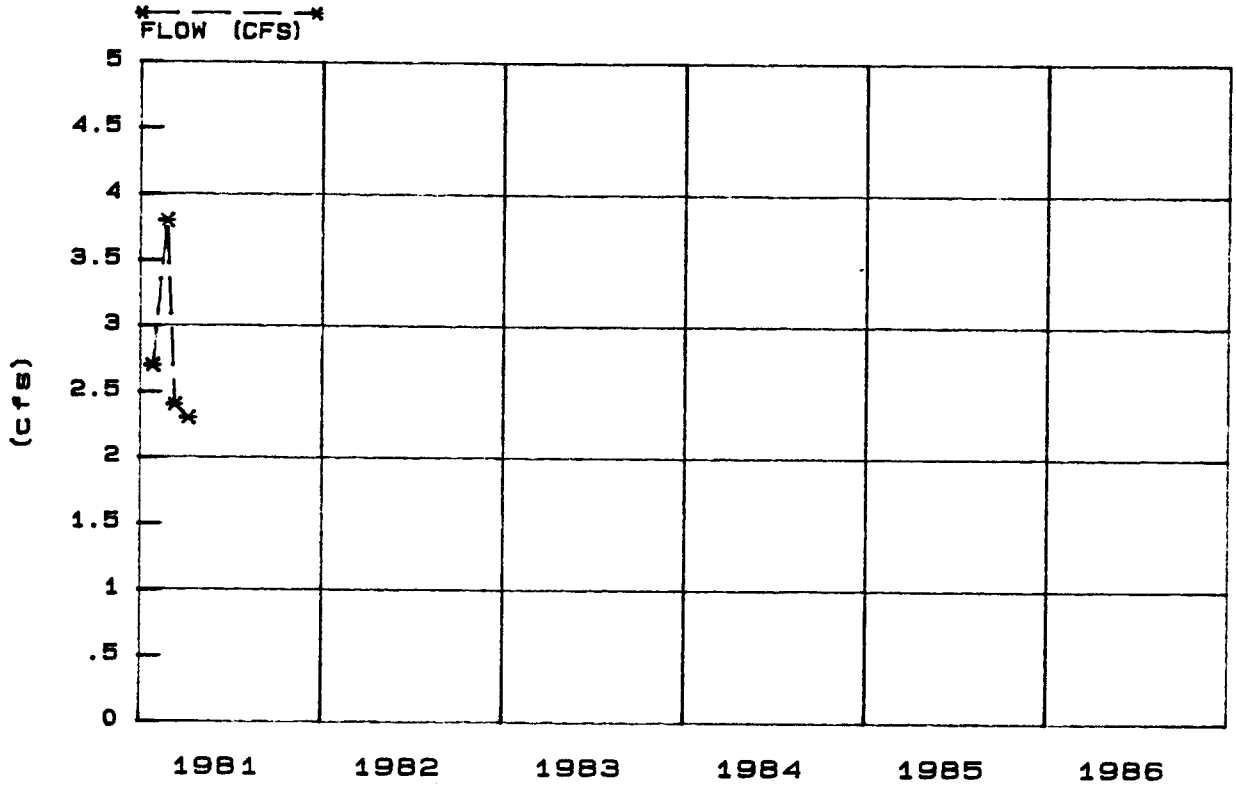
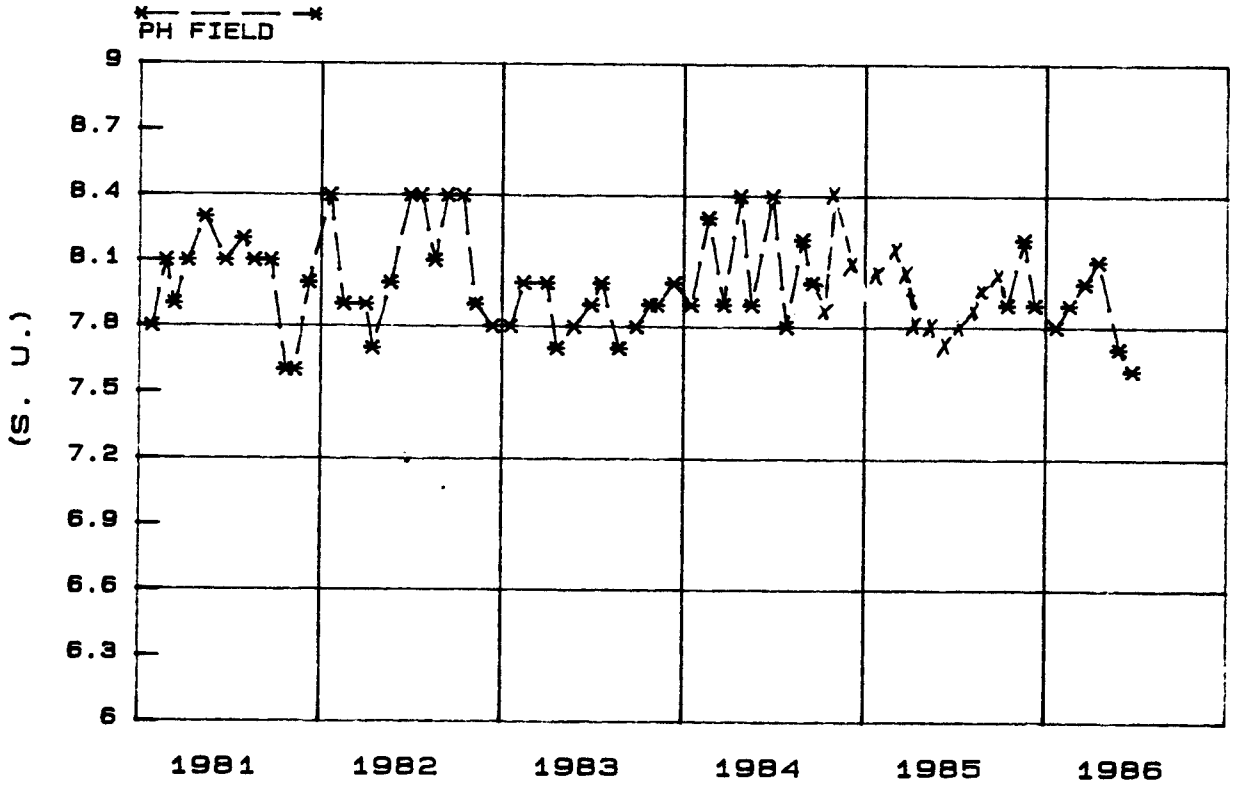


WATER QUALITY SITE: VC-6



WATER QUALITY SITE: VC-9 ECCLES CR. ABV MUD CR.



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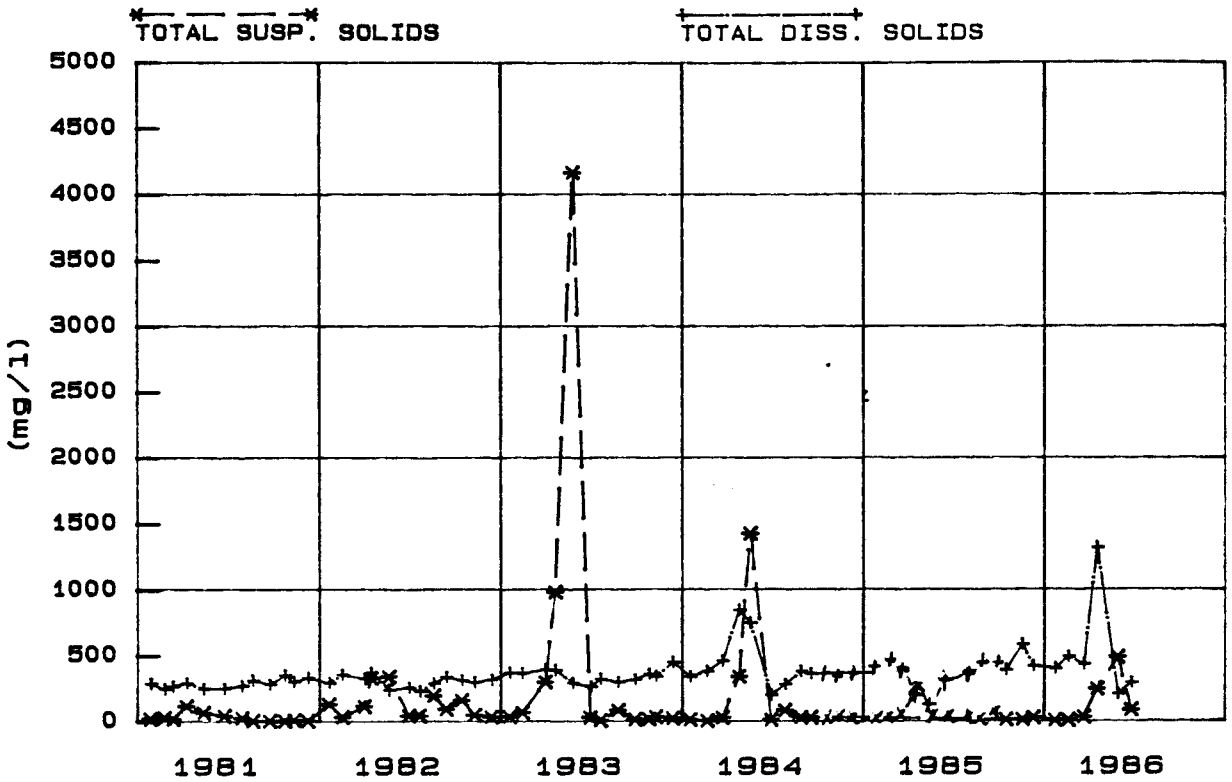

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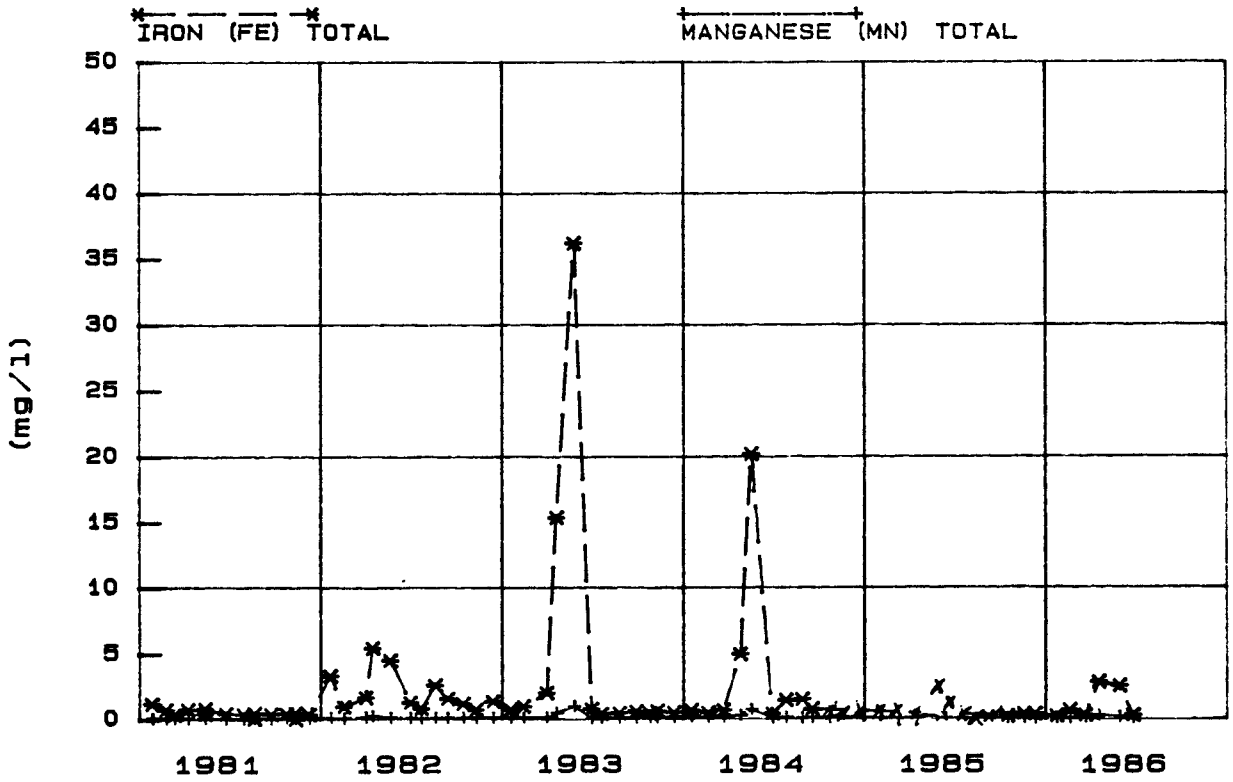

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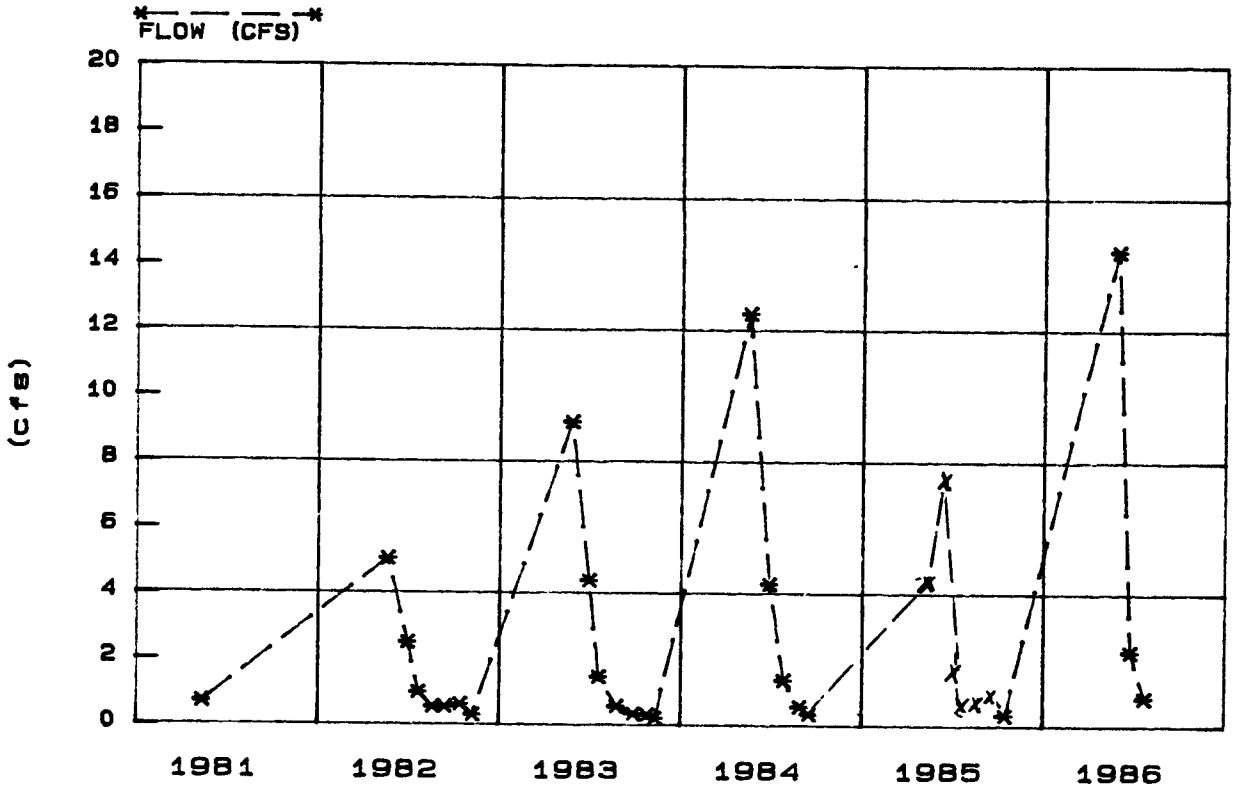
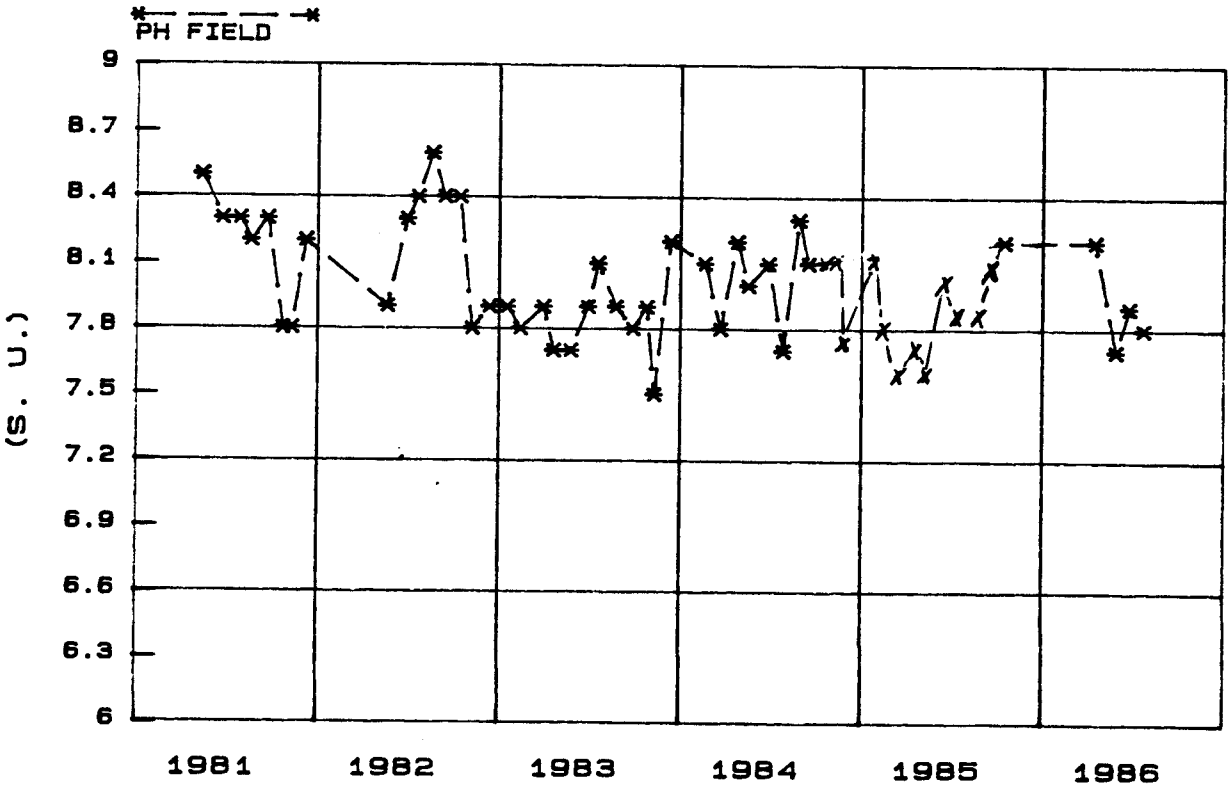


WATER QUALITY SITE: VC-10 ECCLES CR. ABV CONFLU



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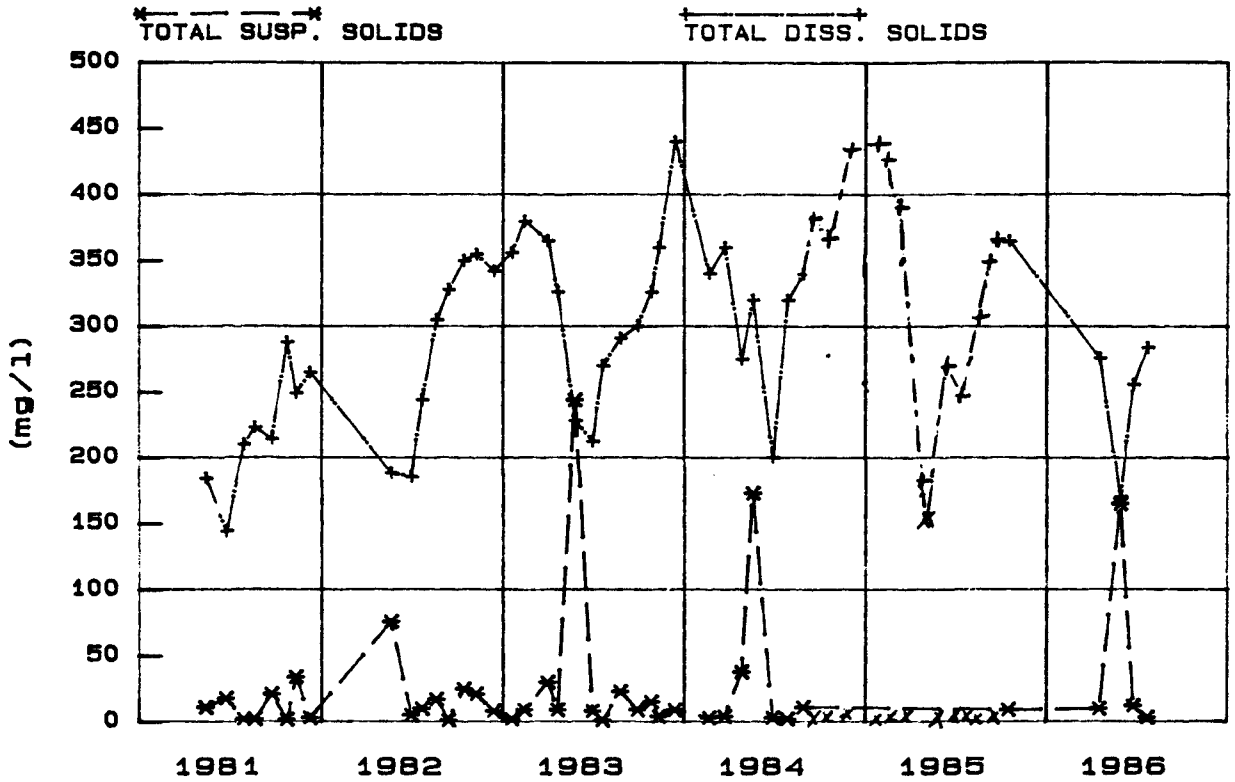

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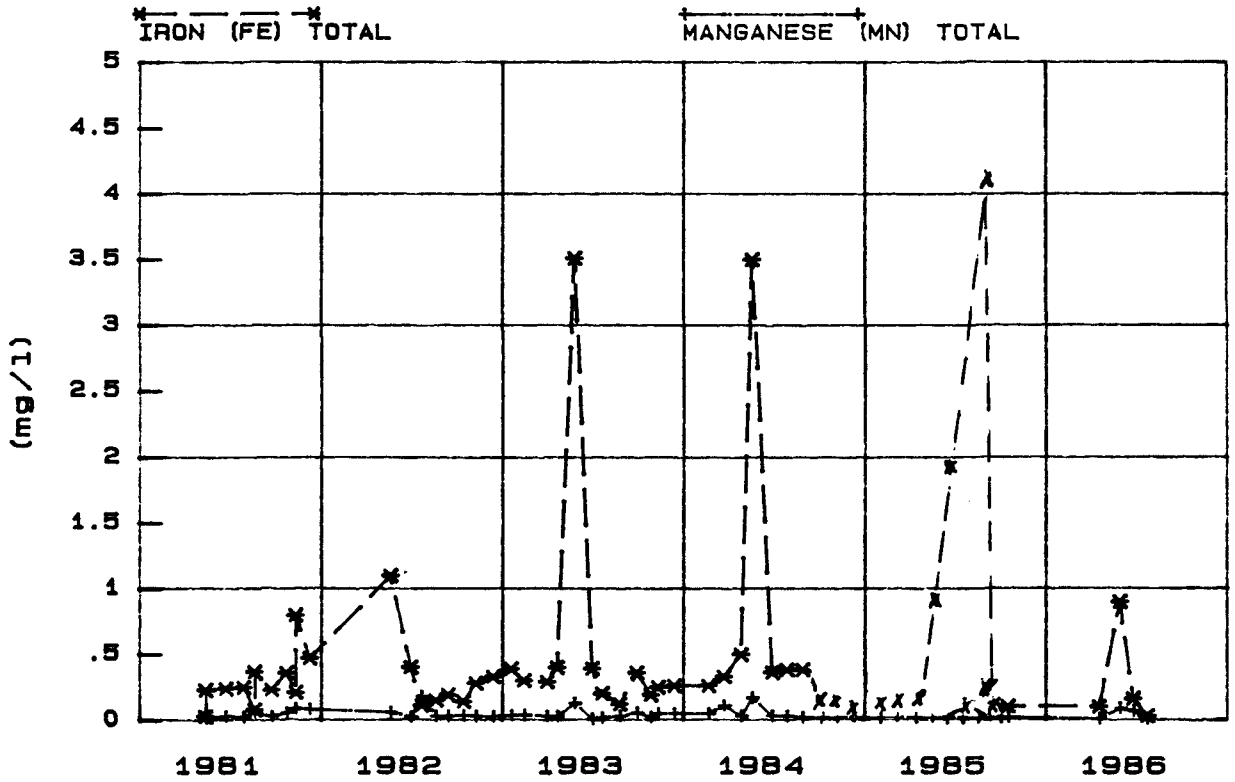

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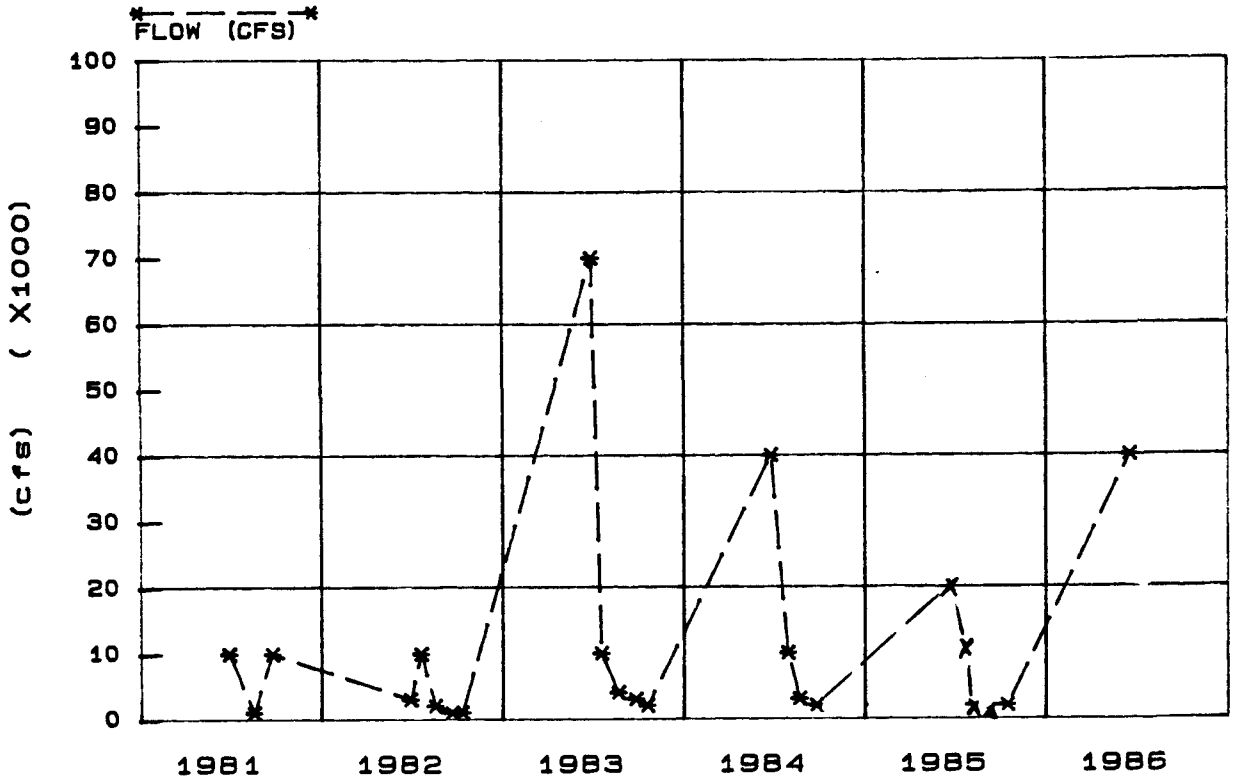
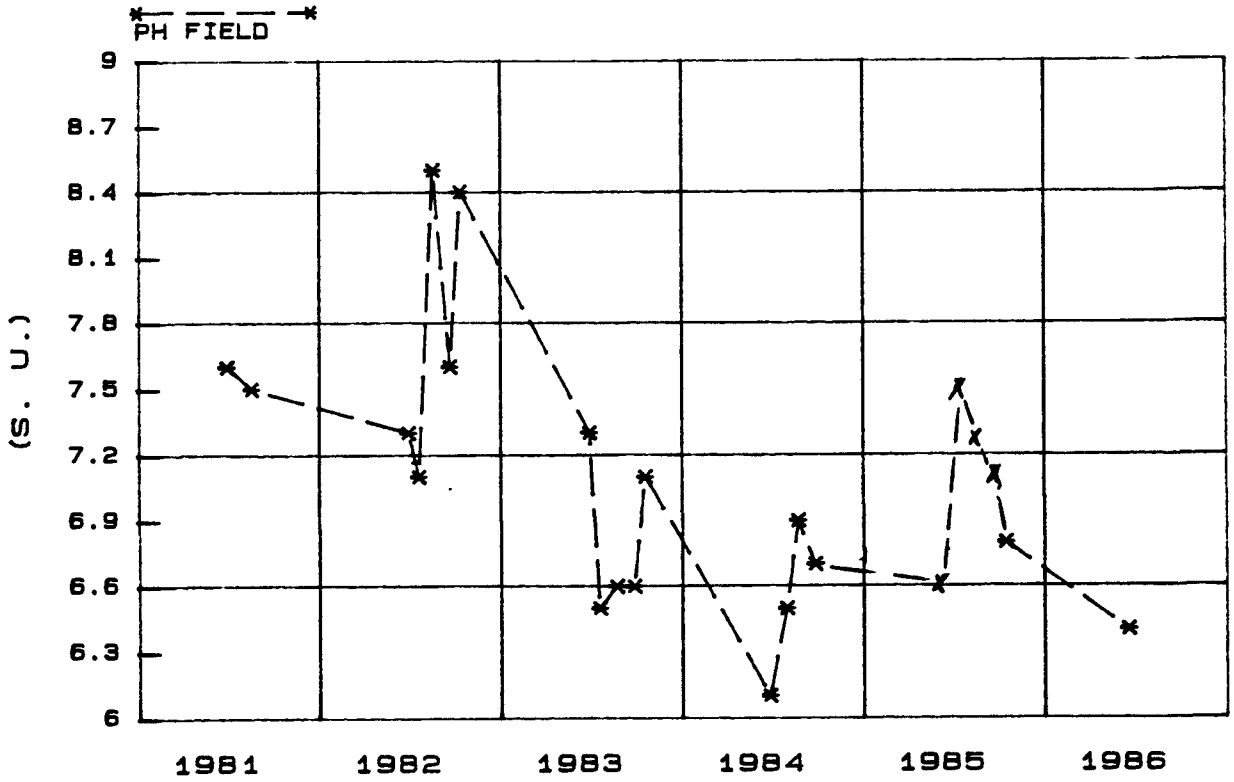


WATER QUALITY SITE: S10-1



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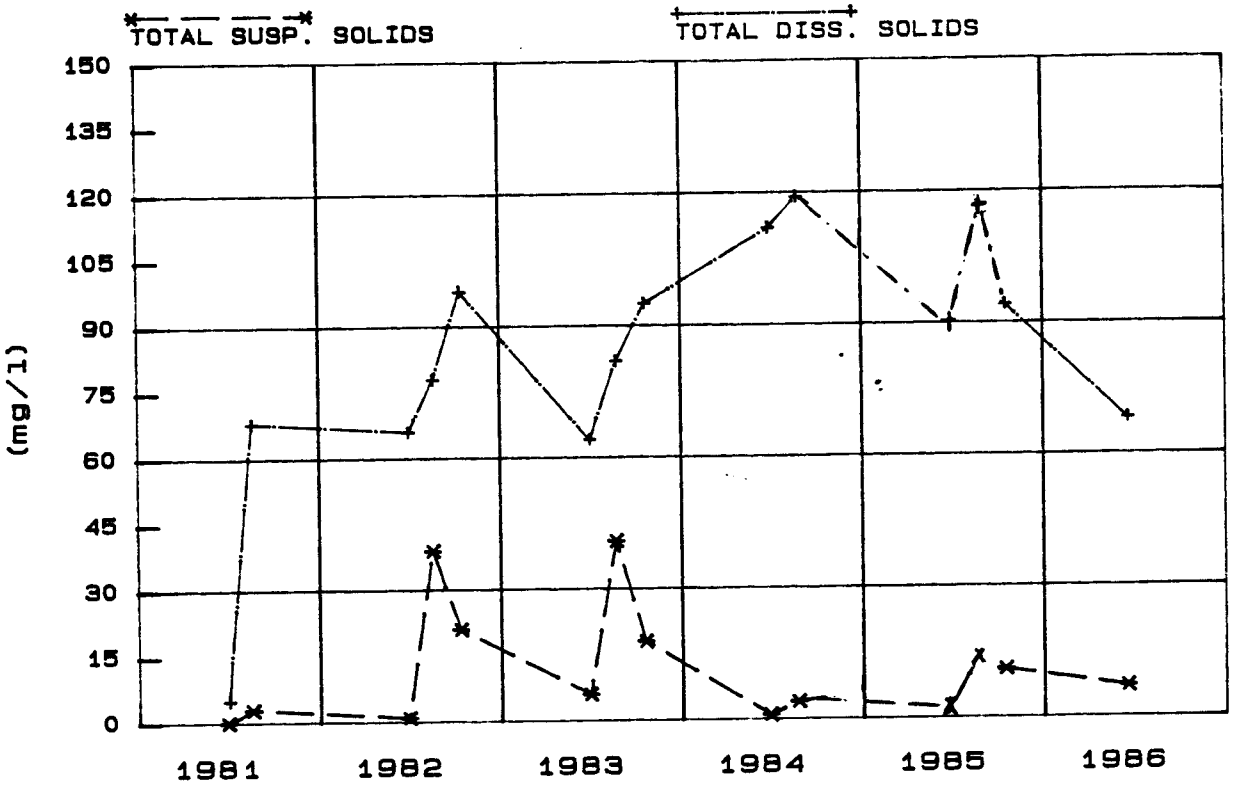

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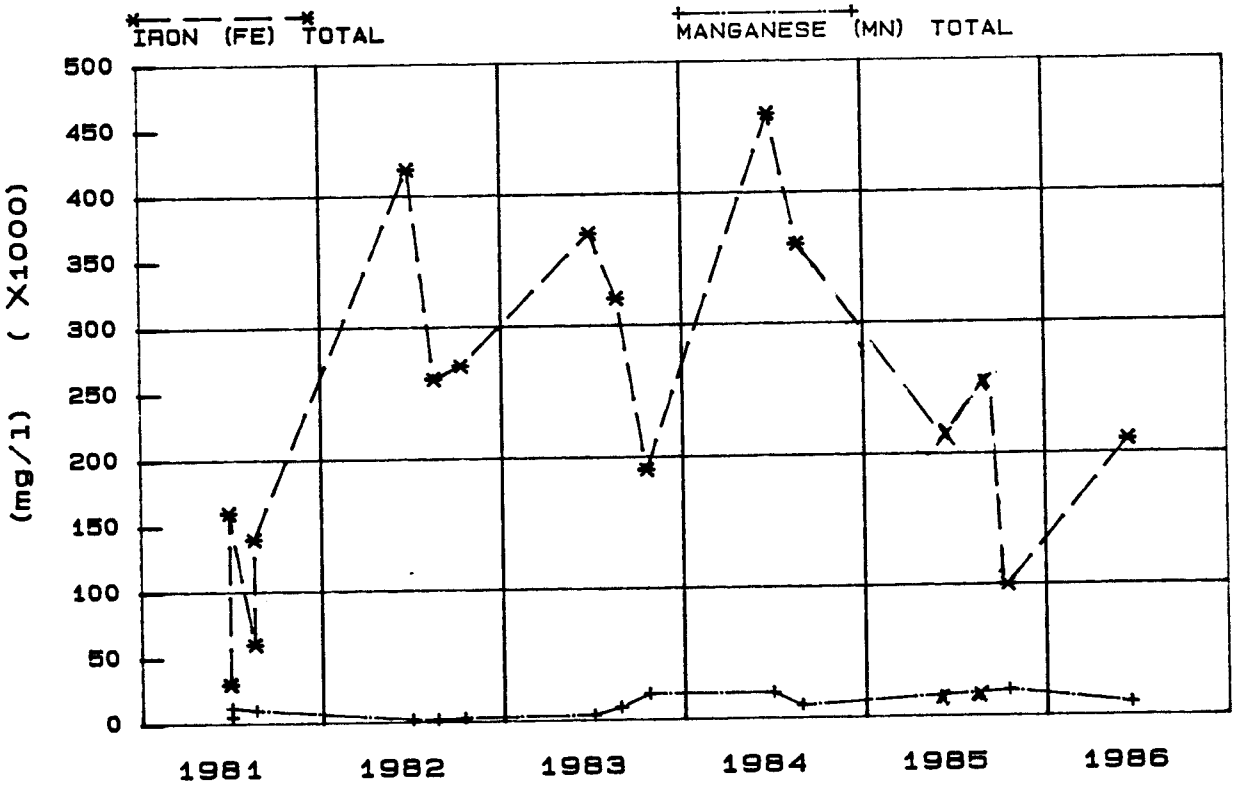

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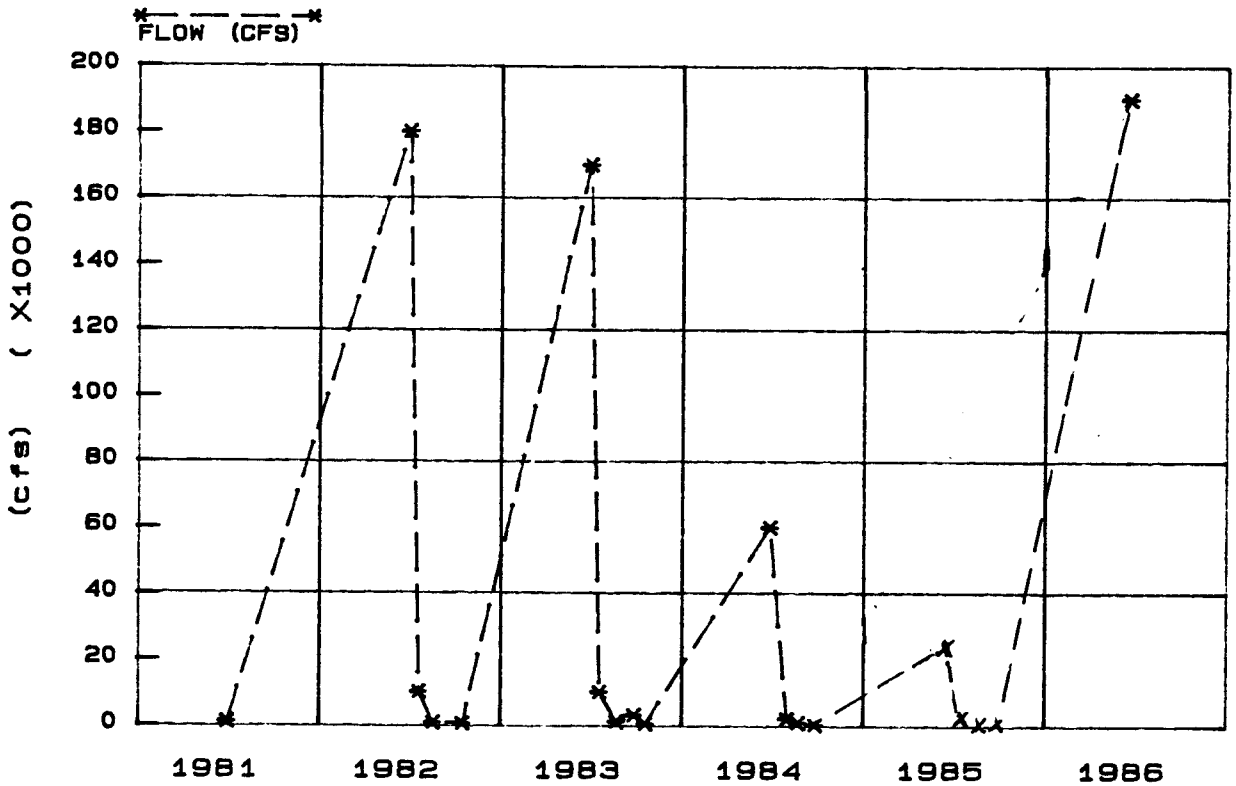

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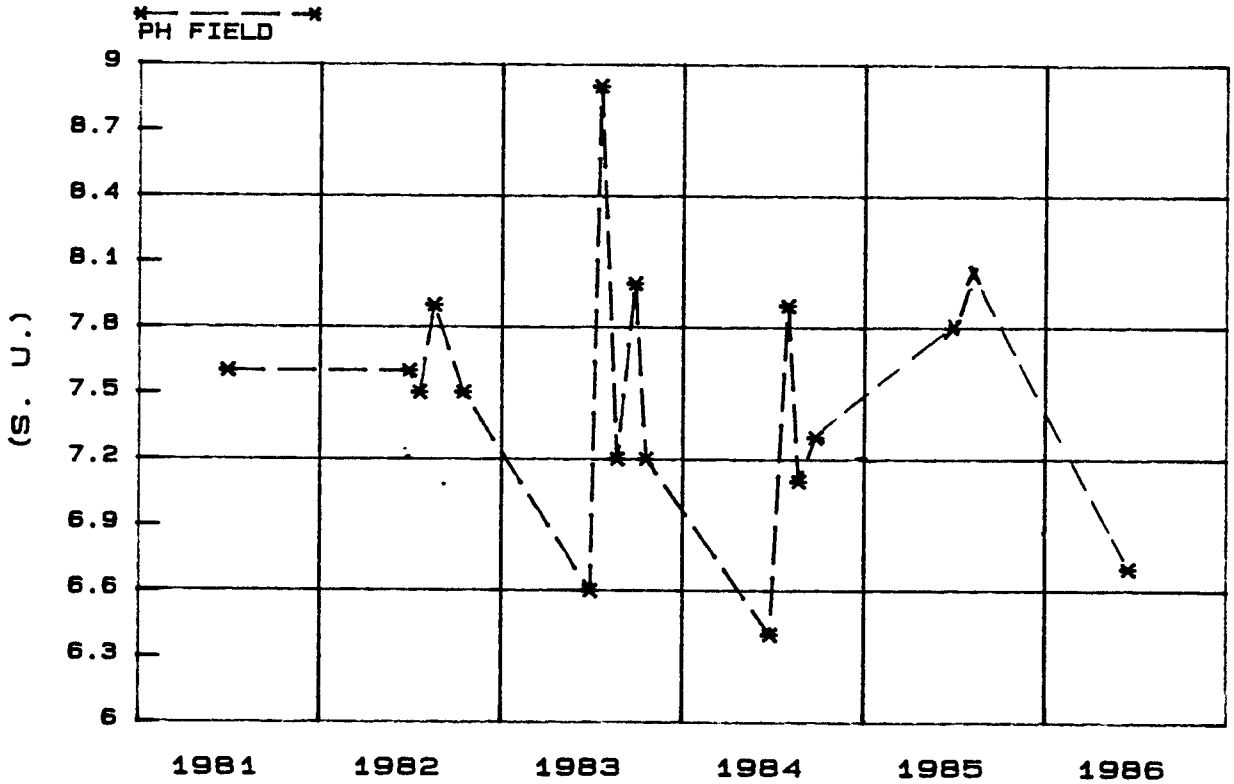
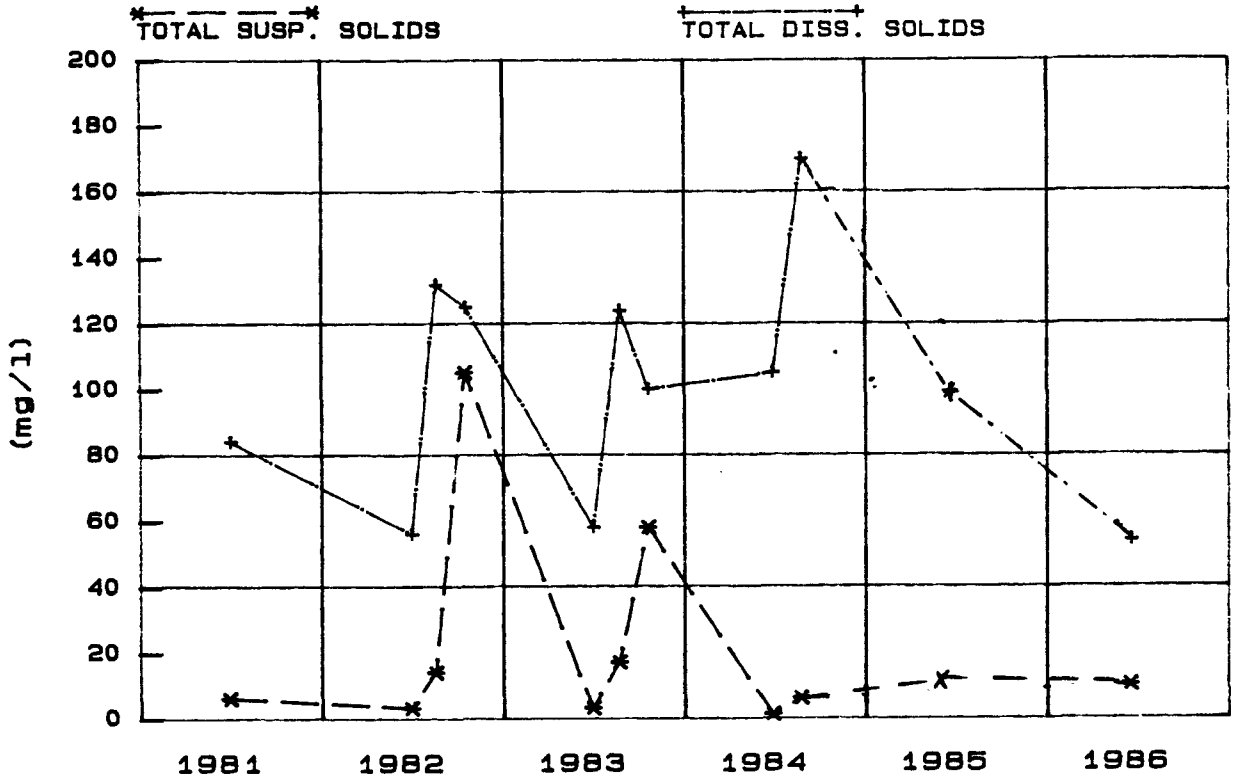
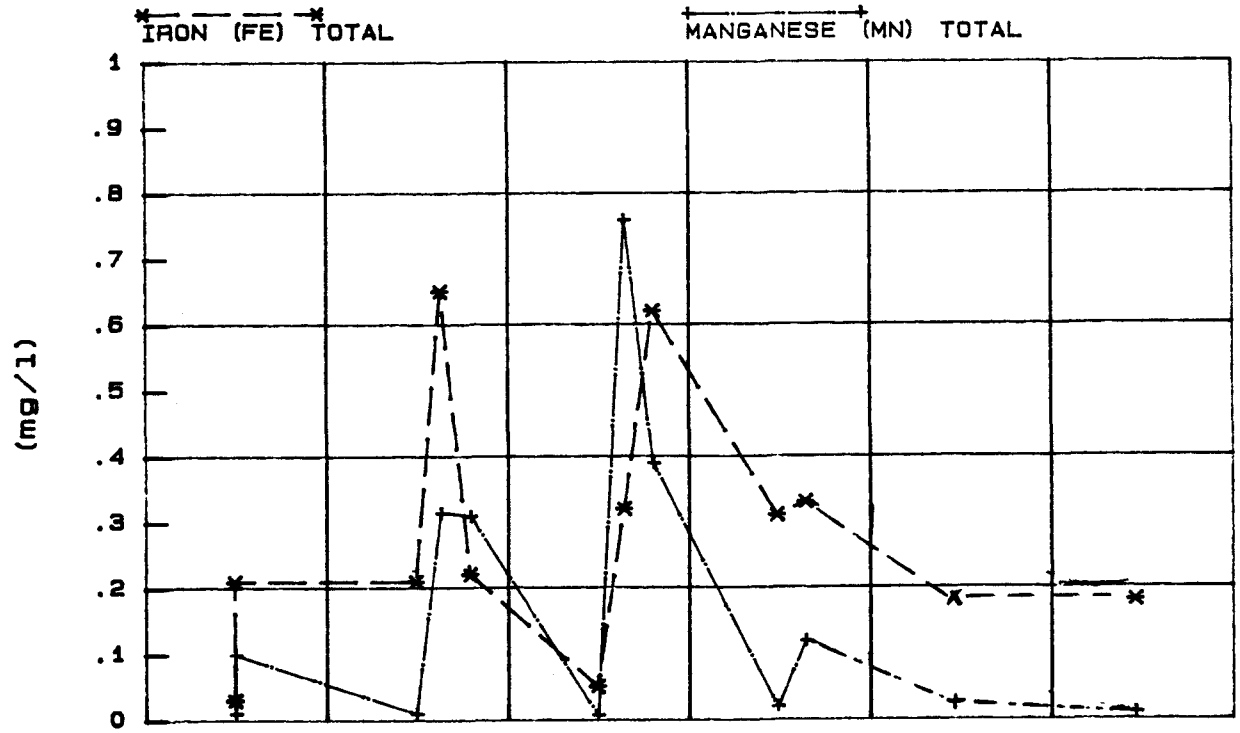


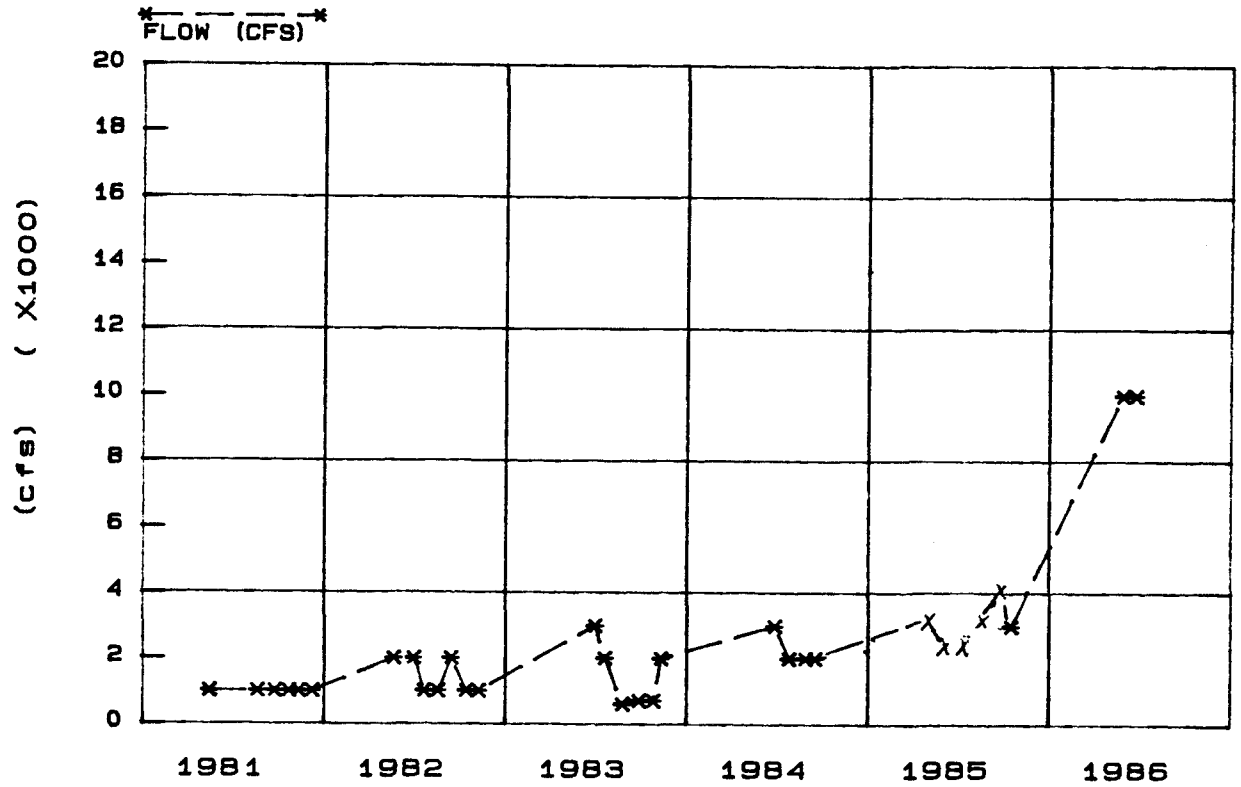
WATER QUALITY SITE: S12-1



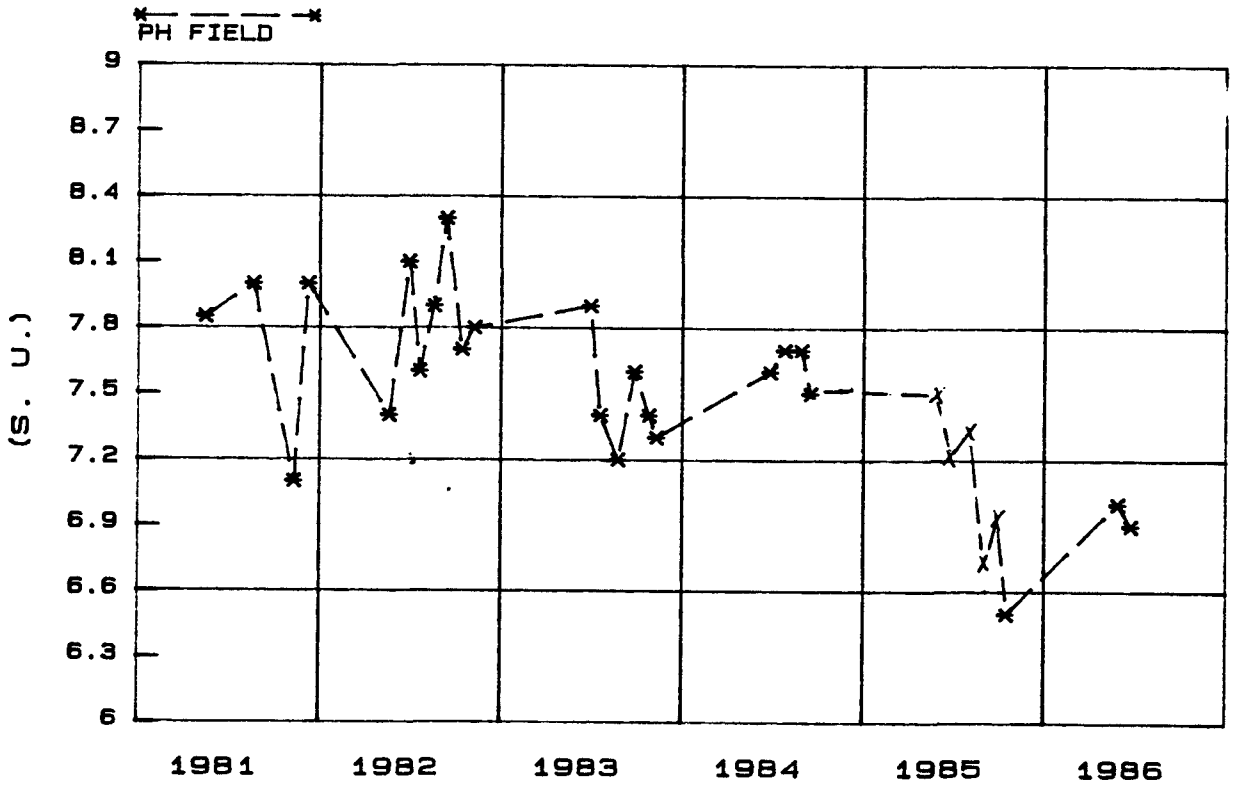
WATER QUALITY SITE: S12-1



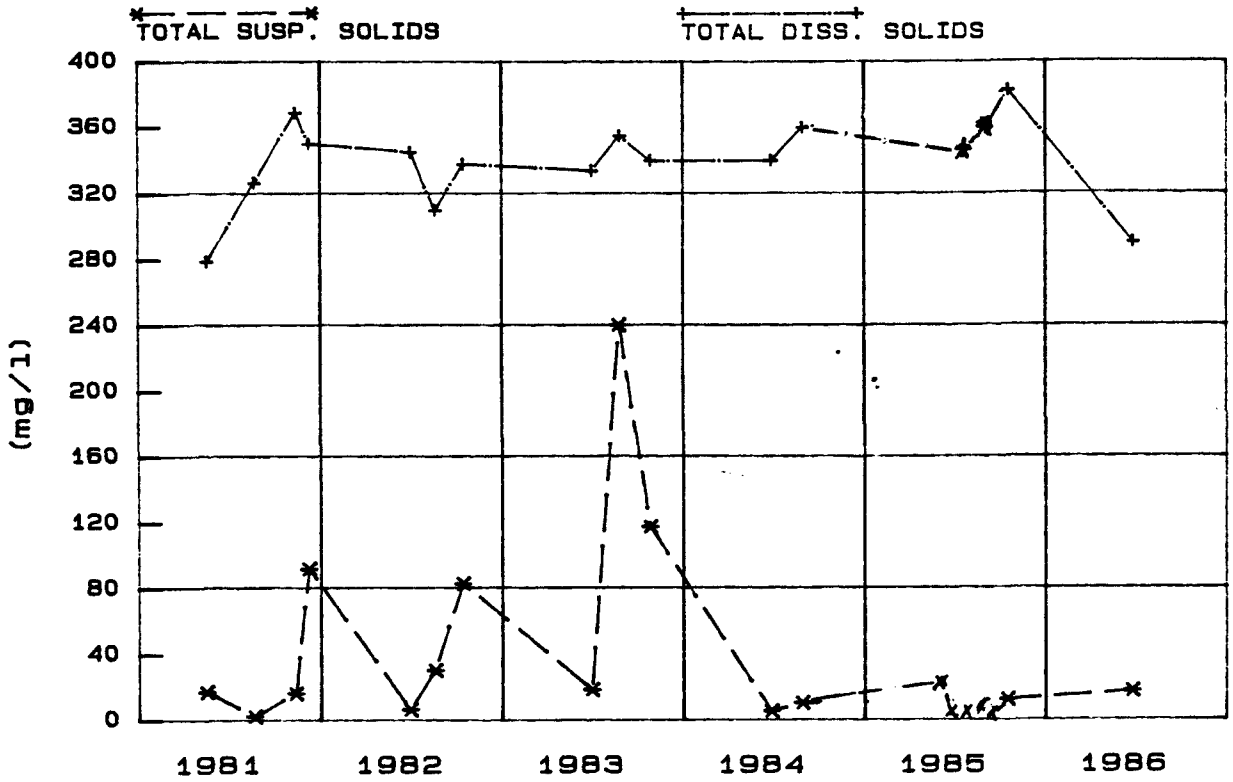
WATER QUALITY SITE: S12-1



WATER QUALITY SITE: S13-2



WATER QUALITY SITE: S13-2



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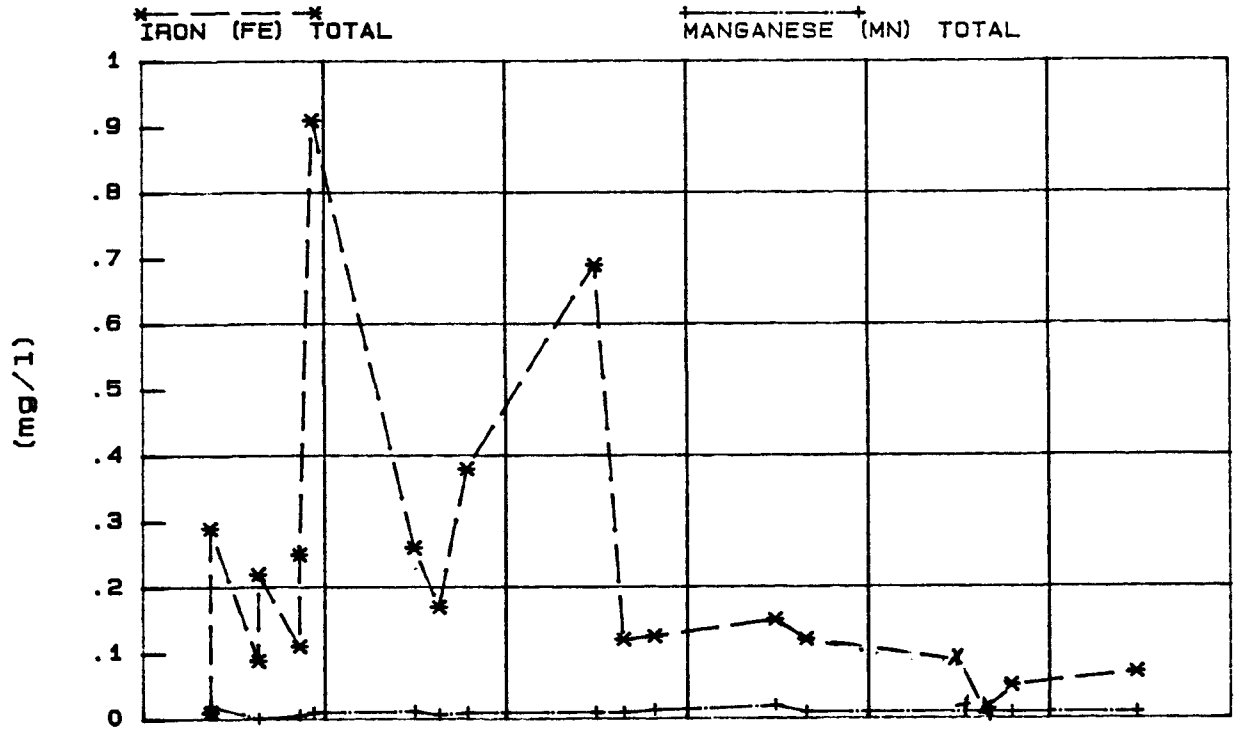

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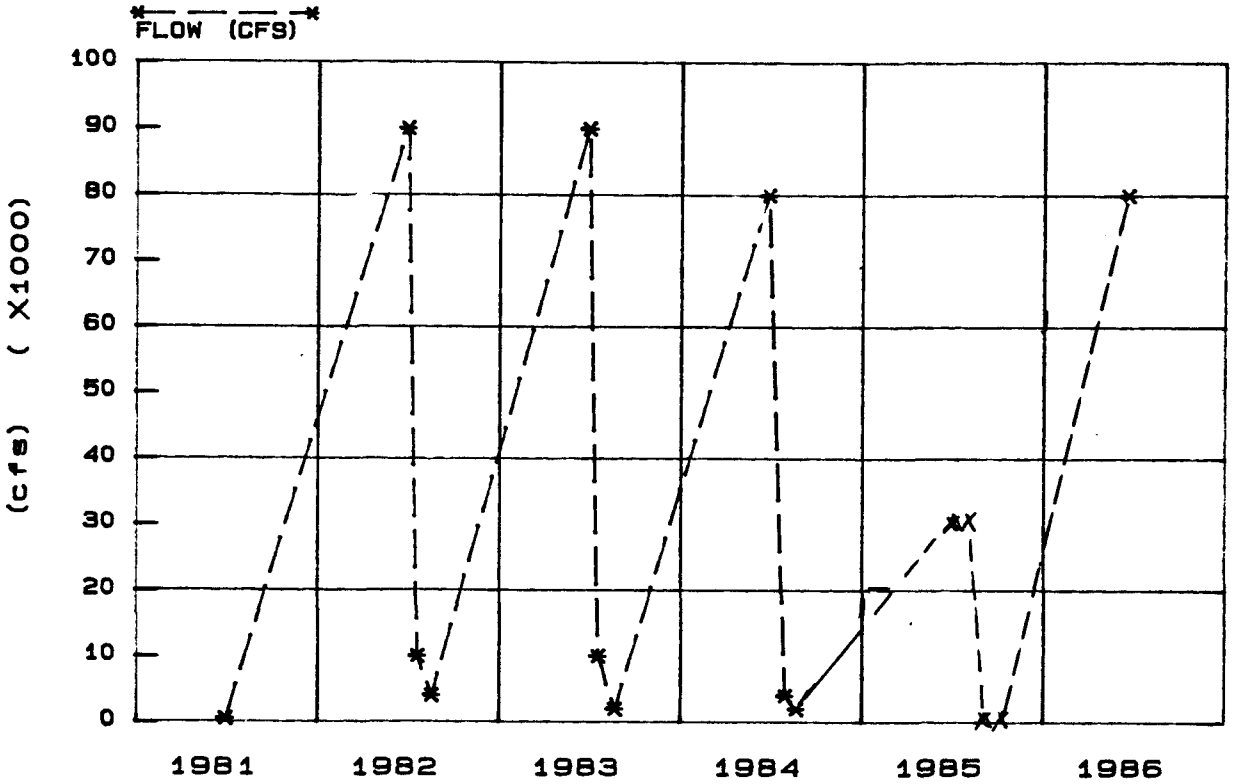
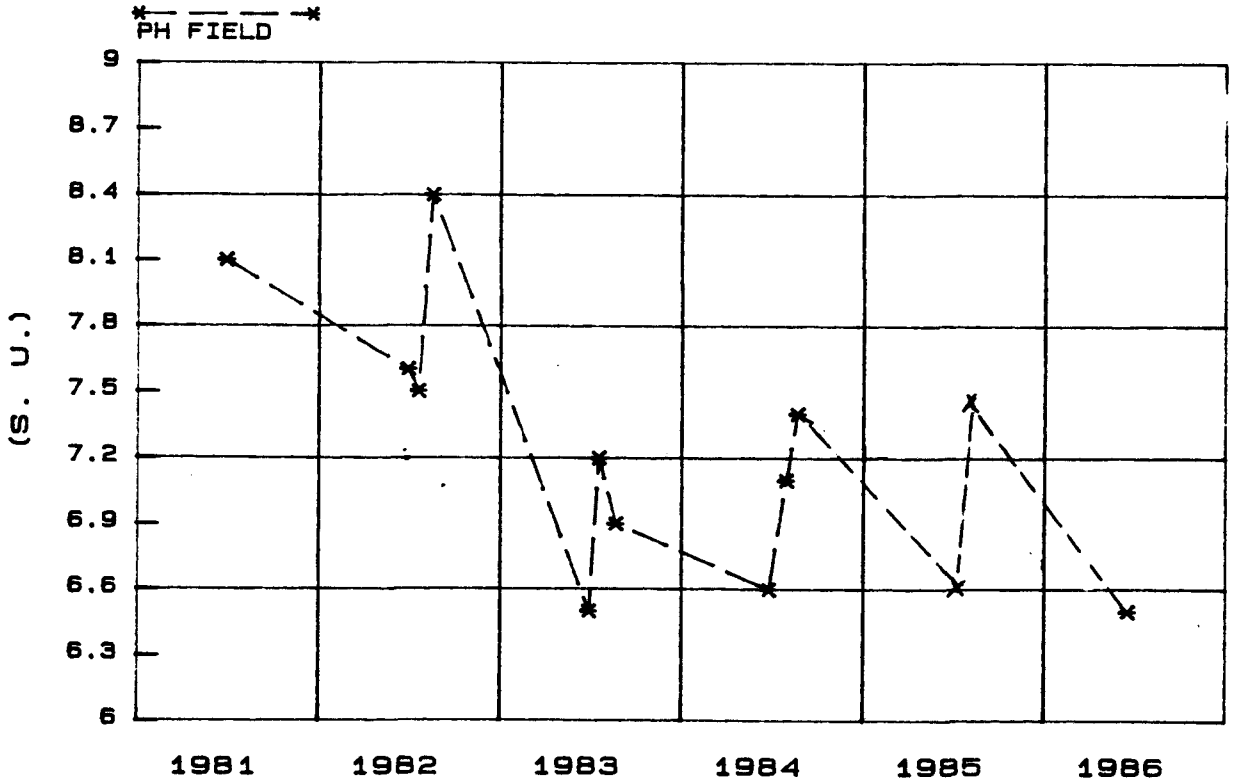


WATER QUALITY SITE: S13-7



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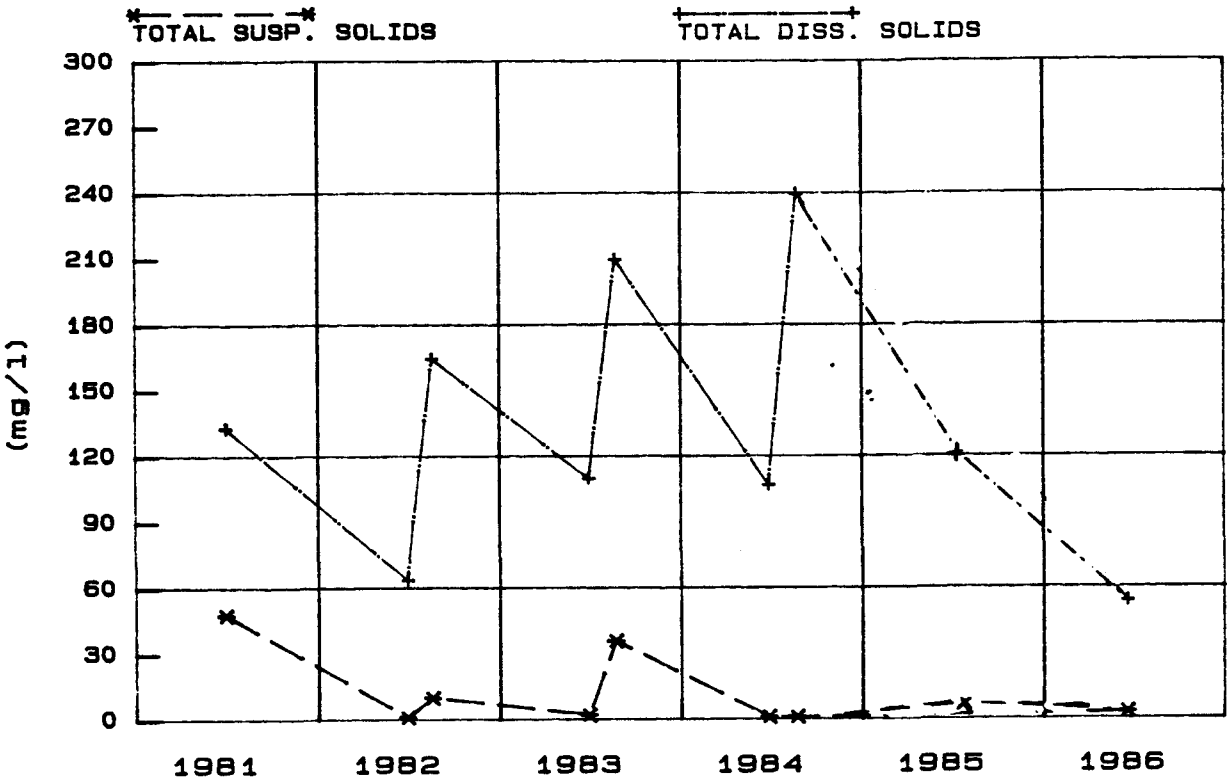

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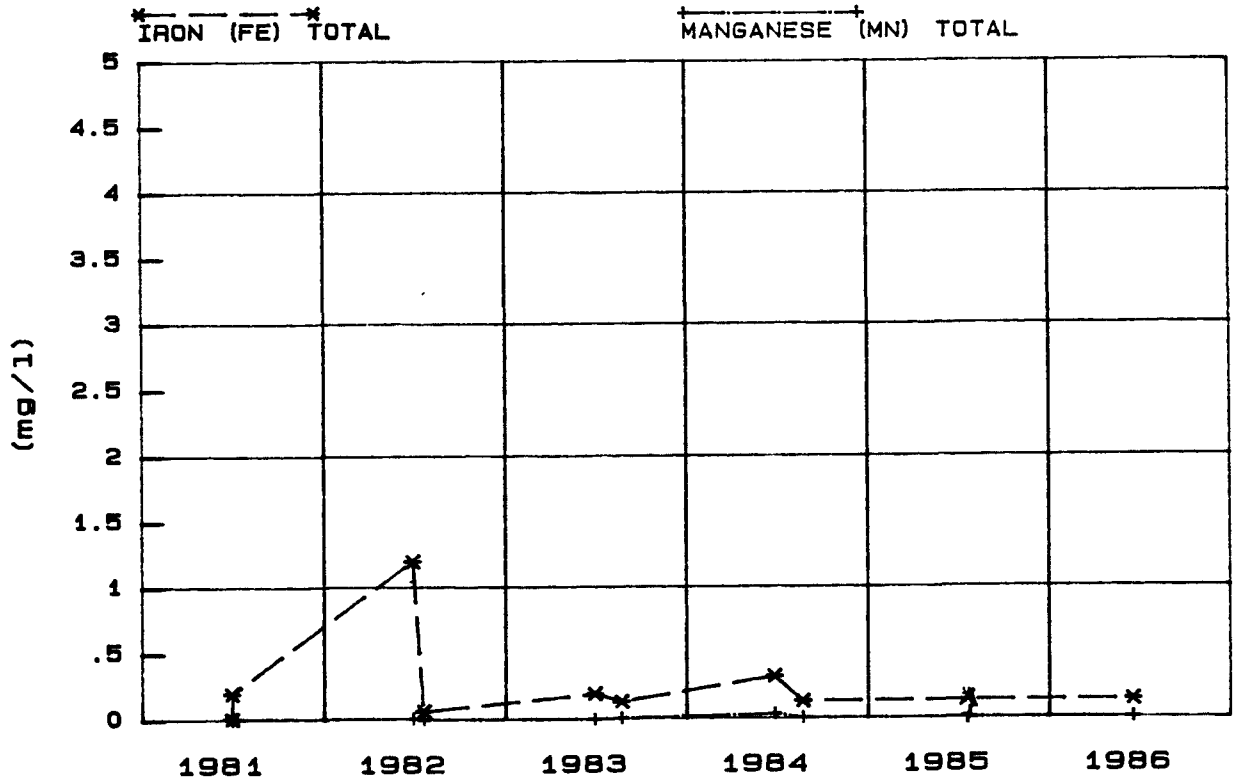
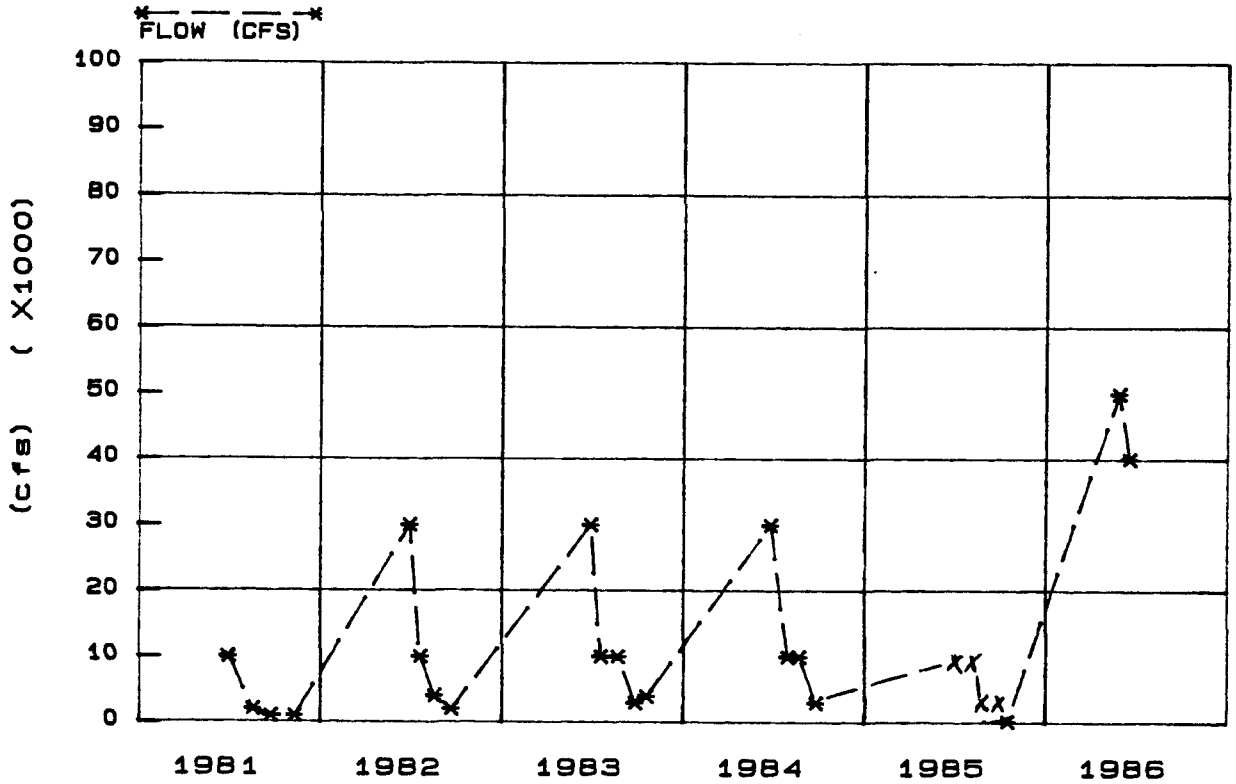
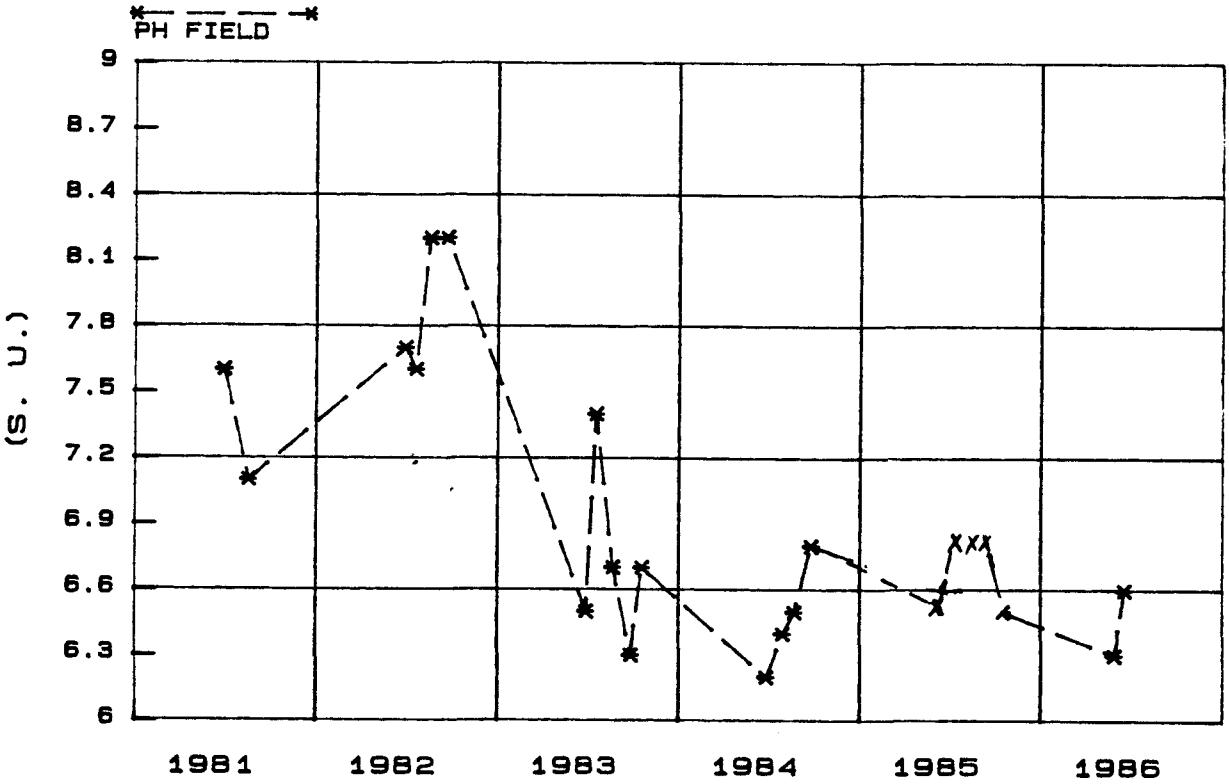


WATER QUALITY SITE: S13-7



WATER QUALITY SITE: S14-4



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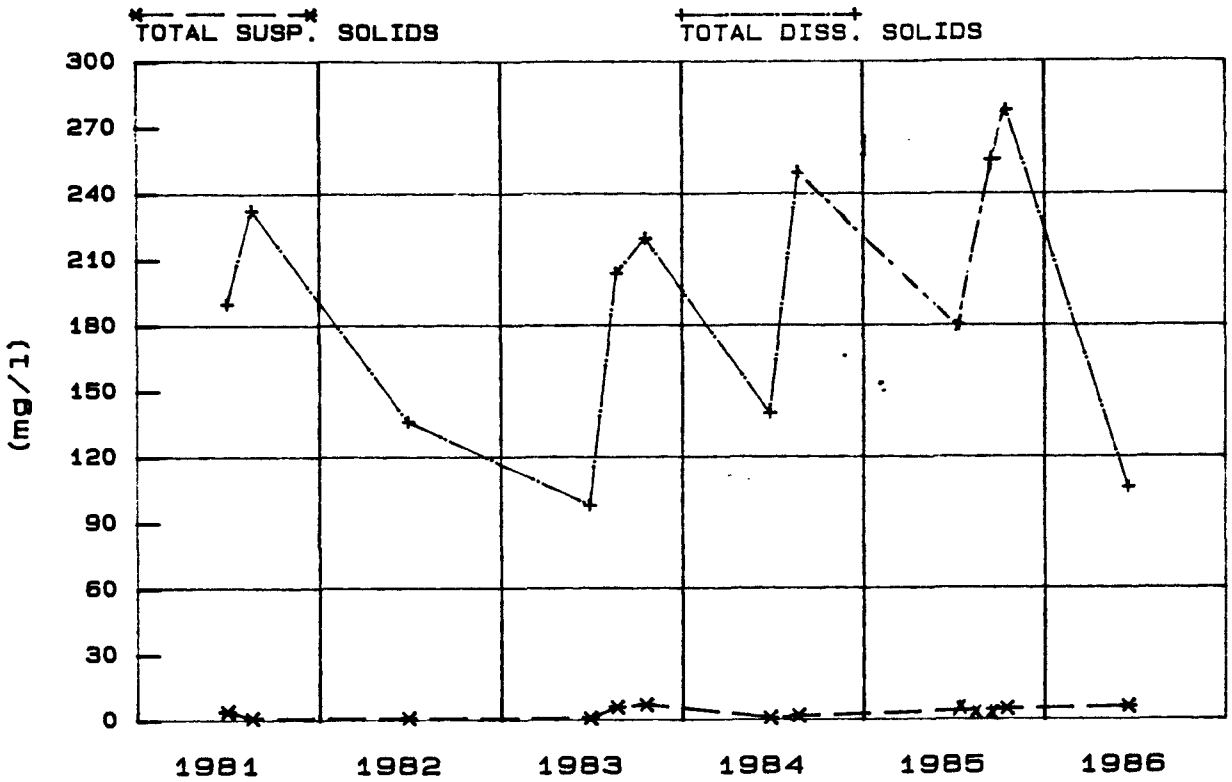
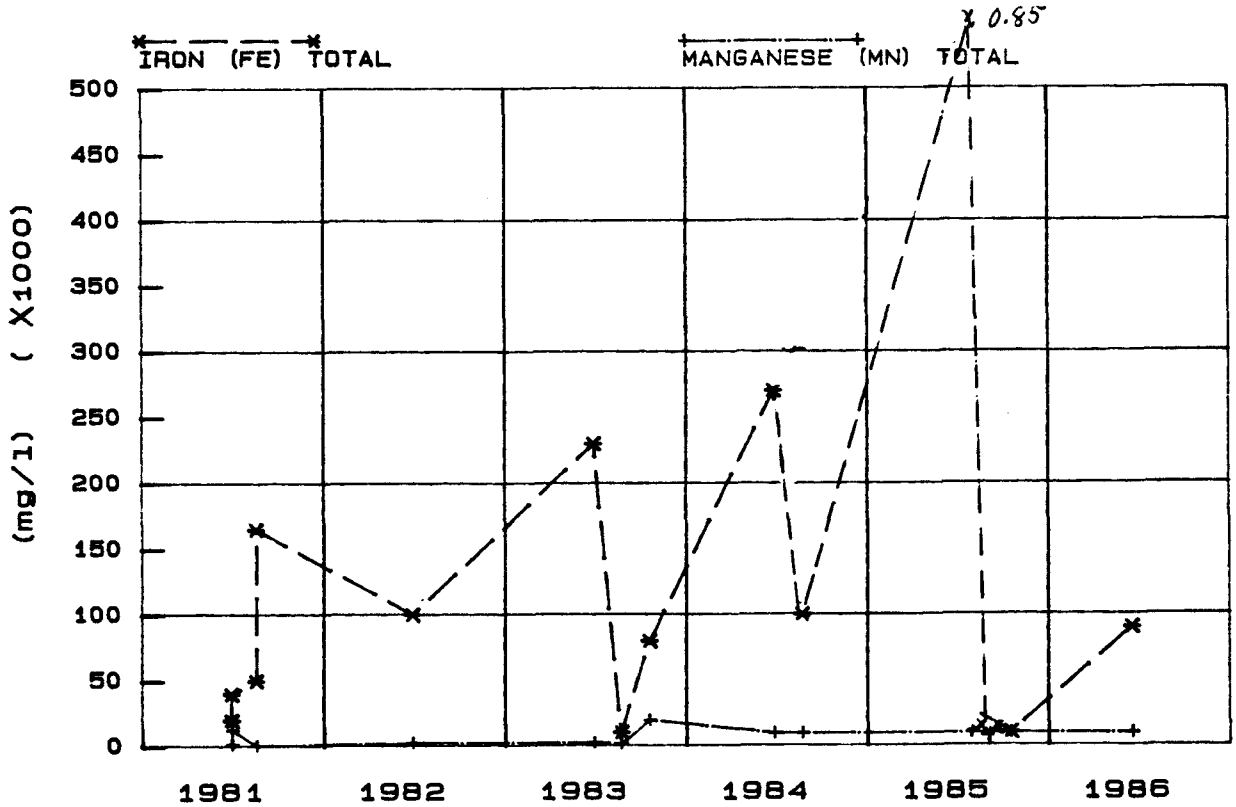


WATER QUALITY SITE: S14-4



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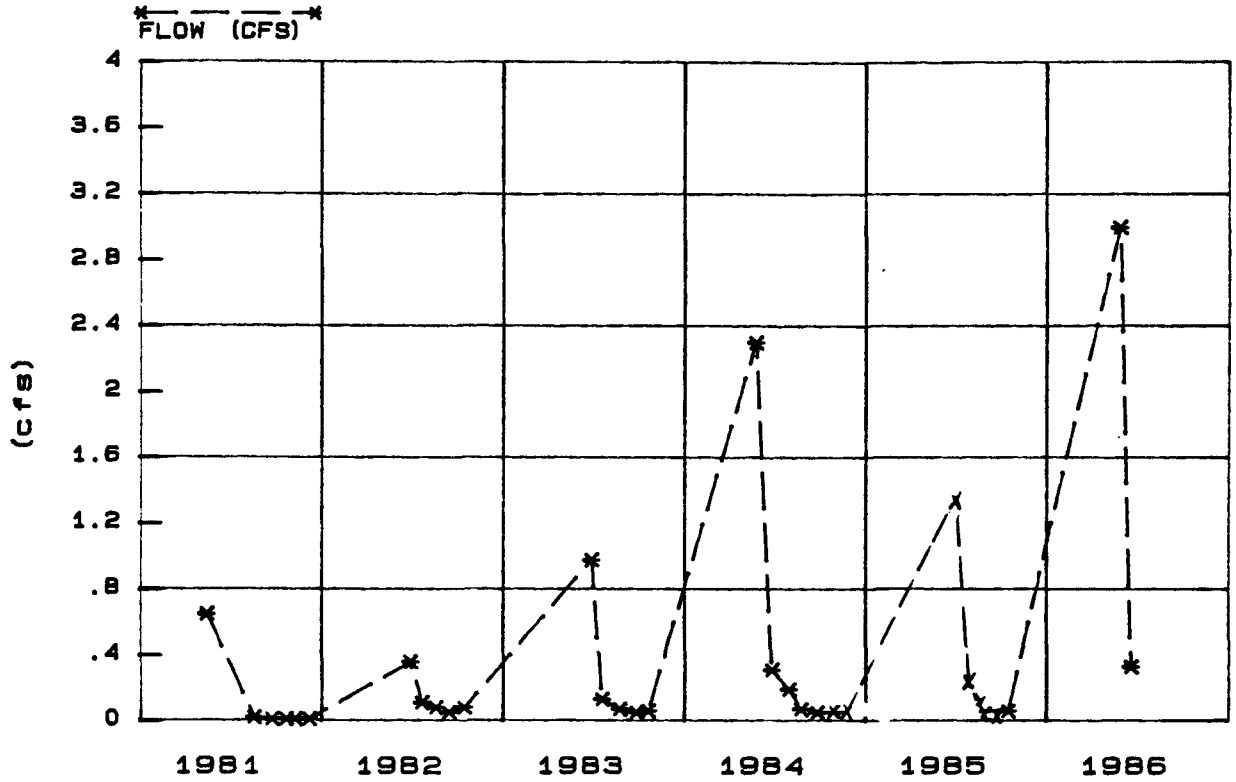
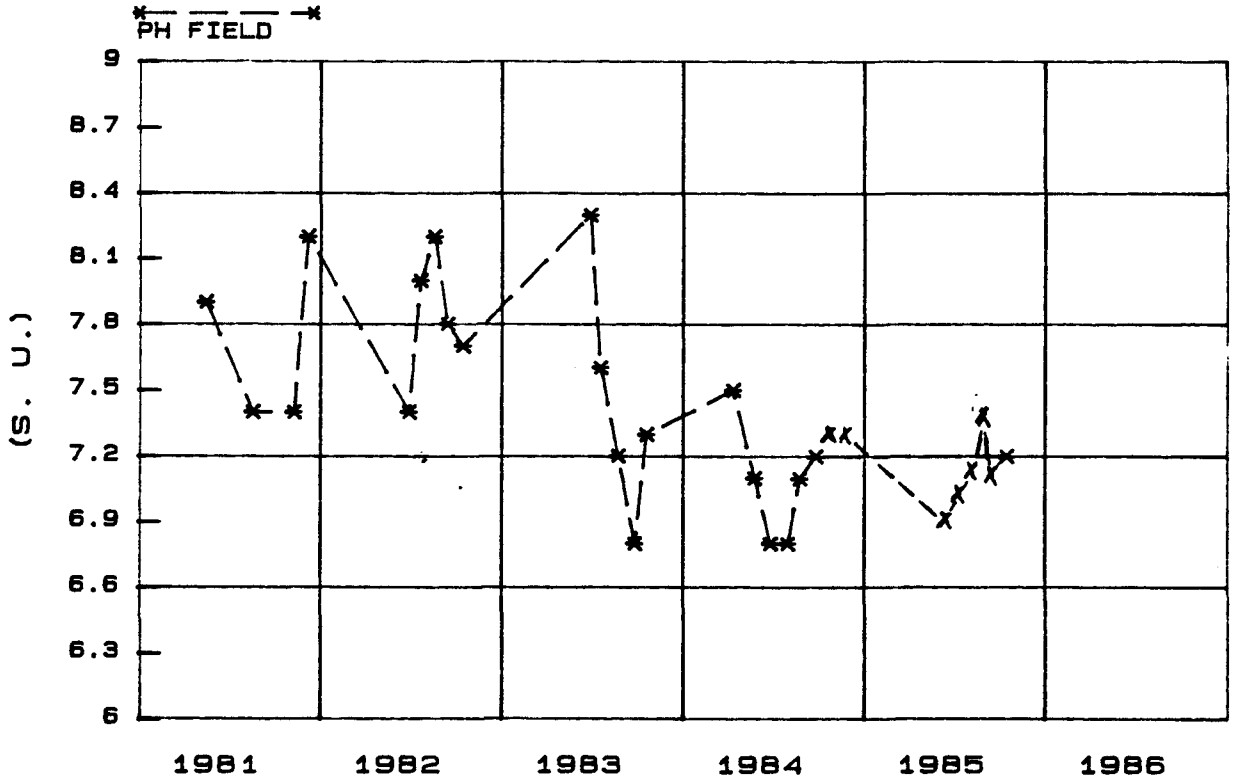


WATER QUALITY SITE: S15-3



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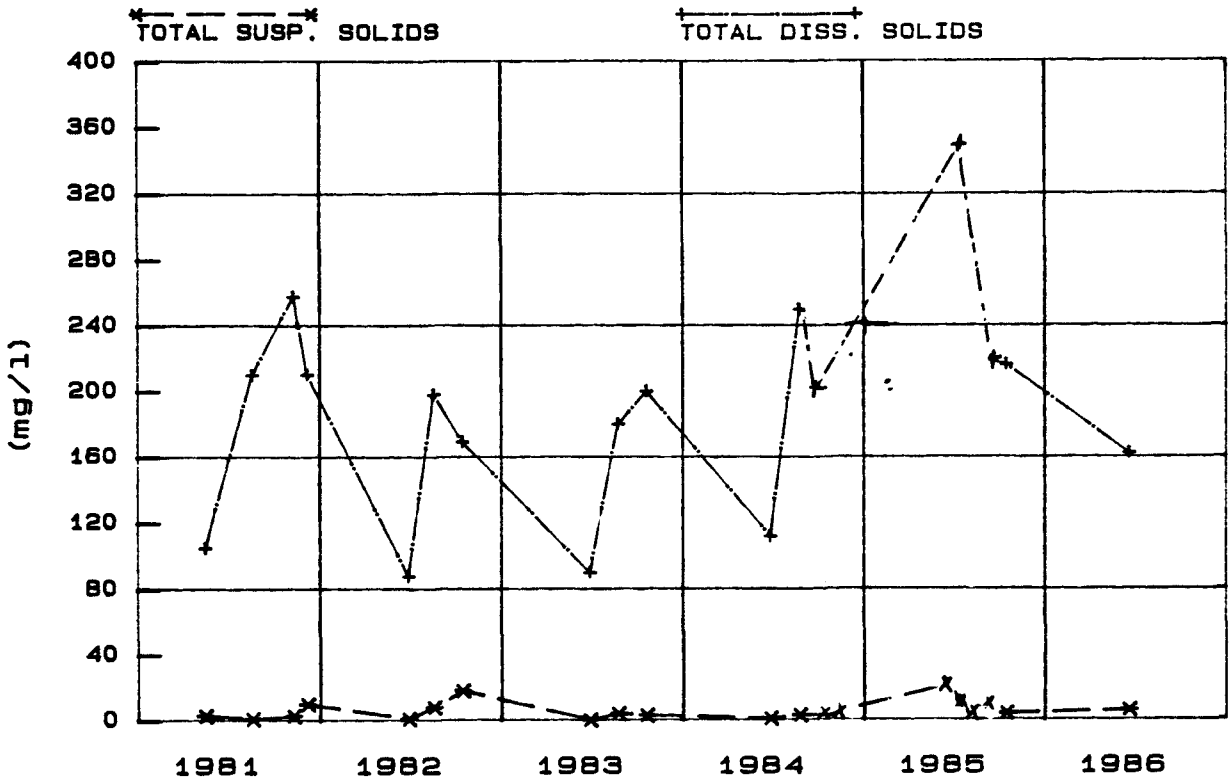
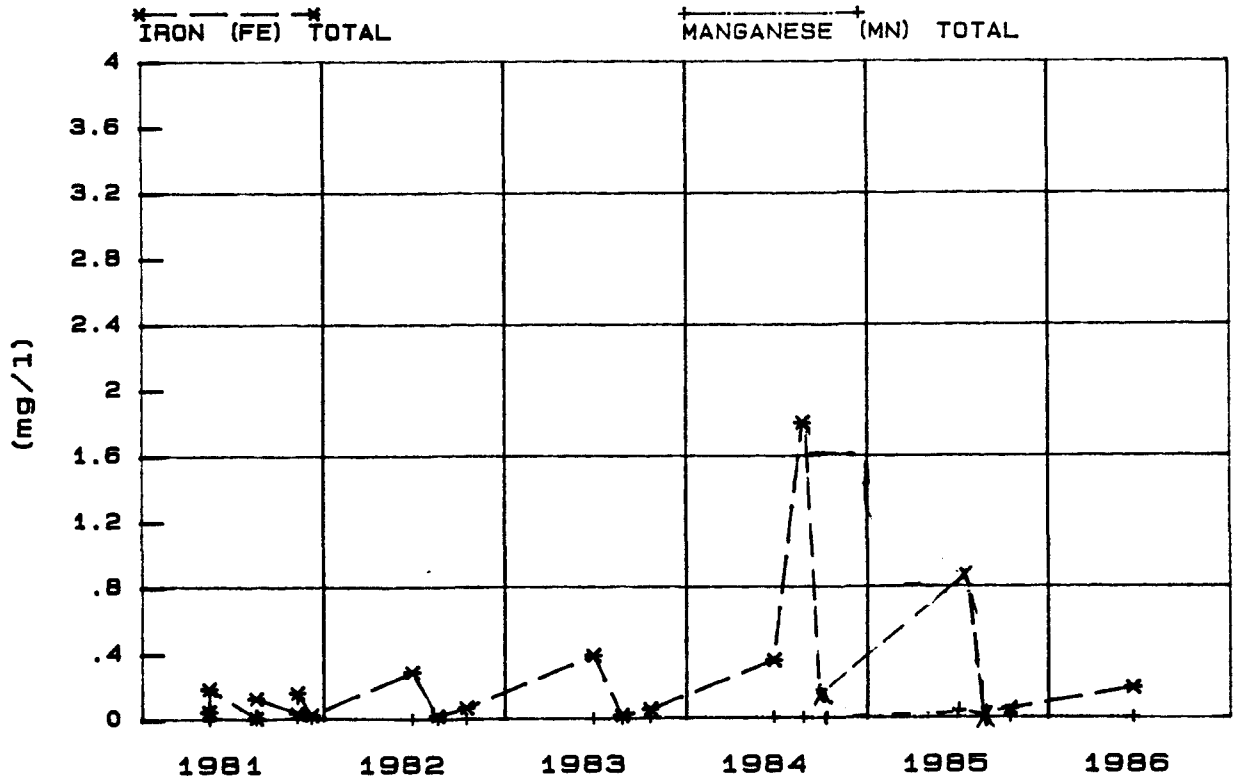
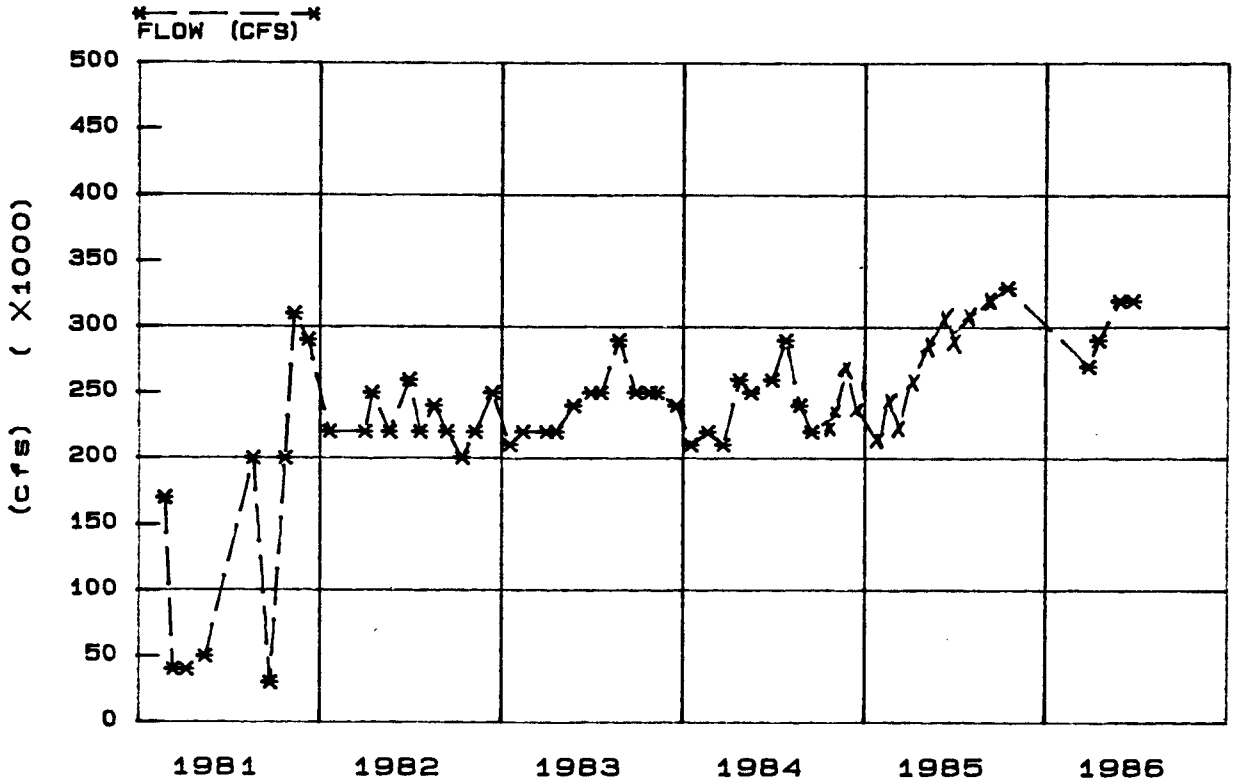


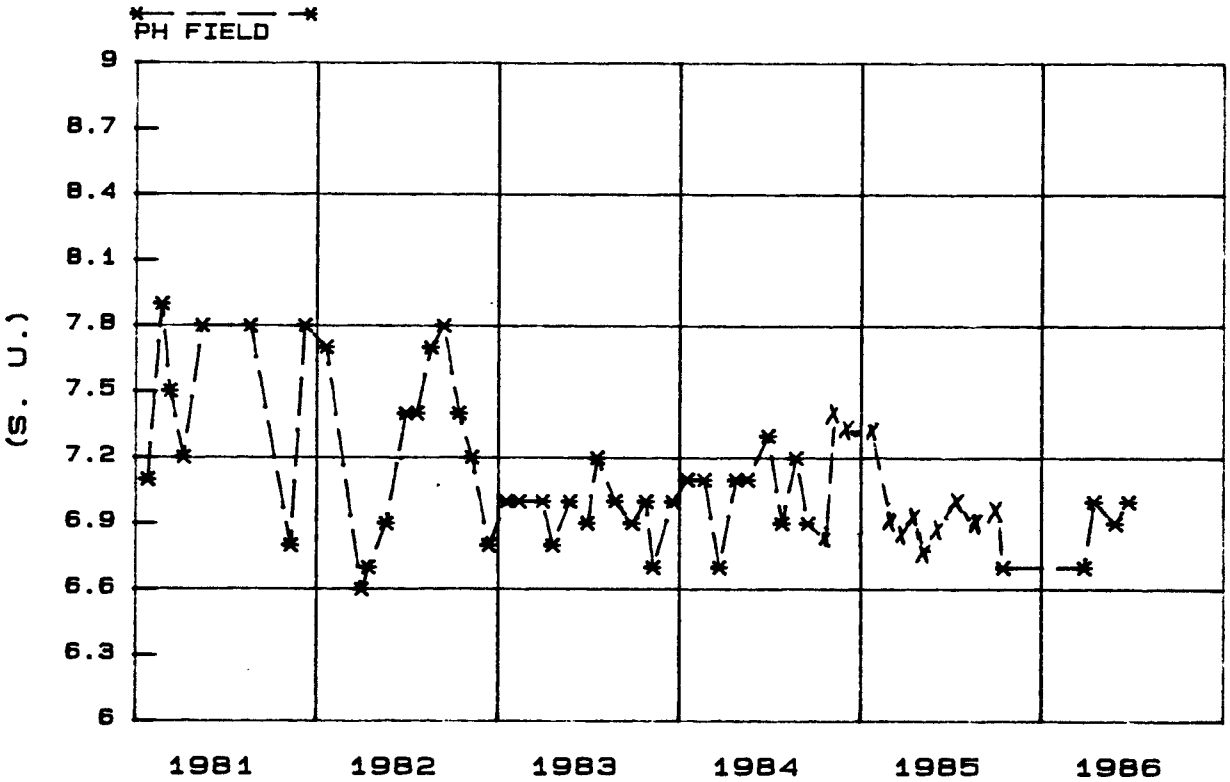
WATER QUALITY SITE: S15-3



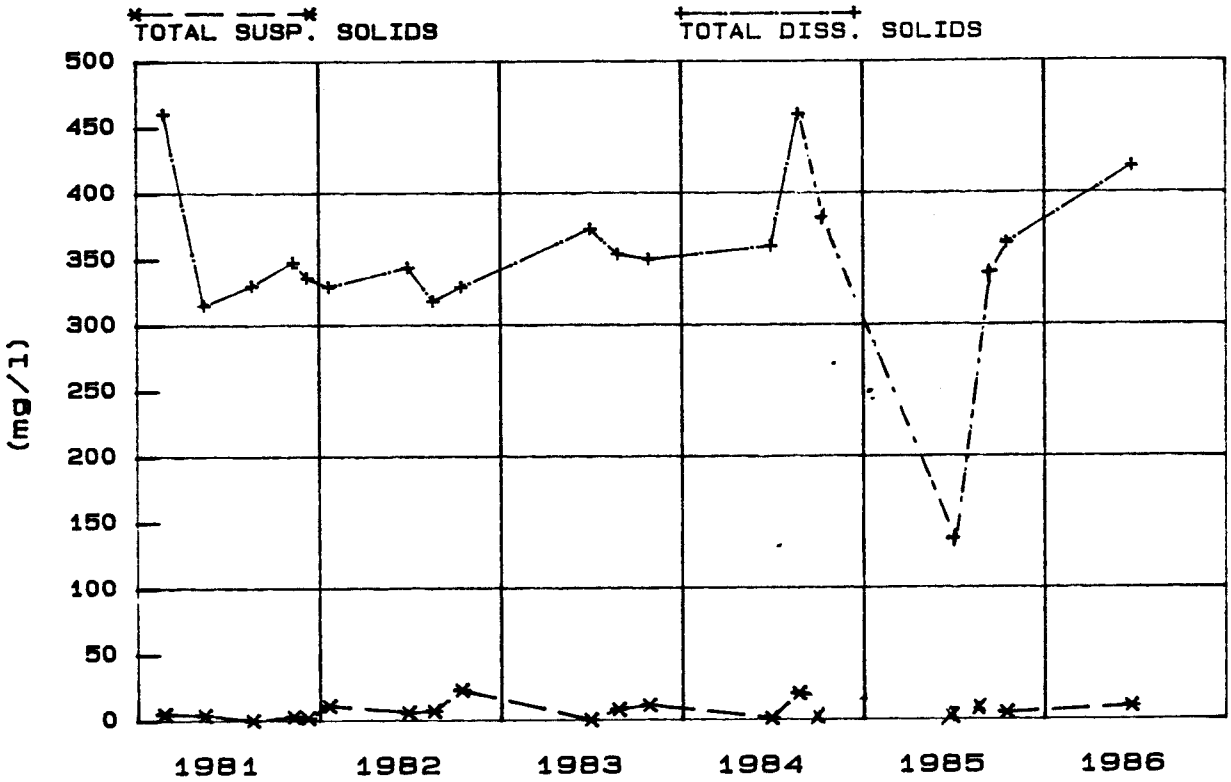
WATER QUALITY SITE: S15-3



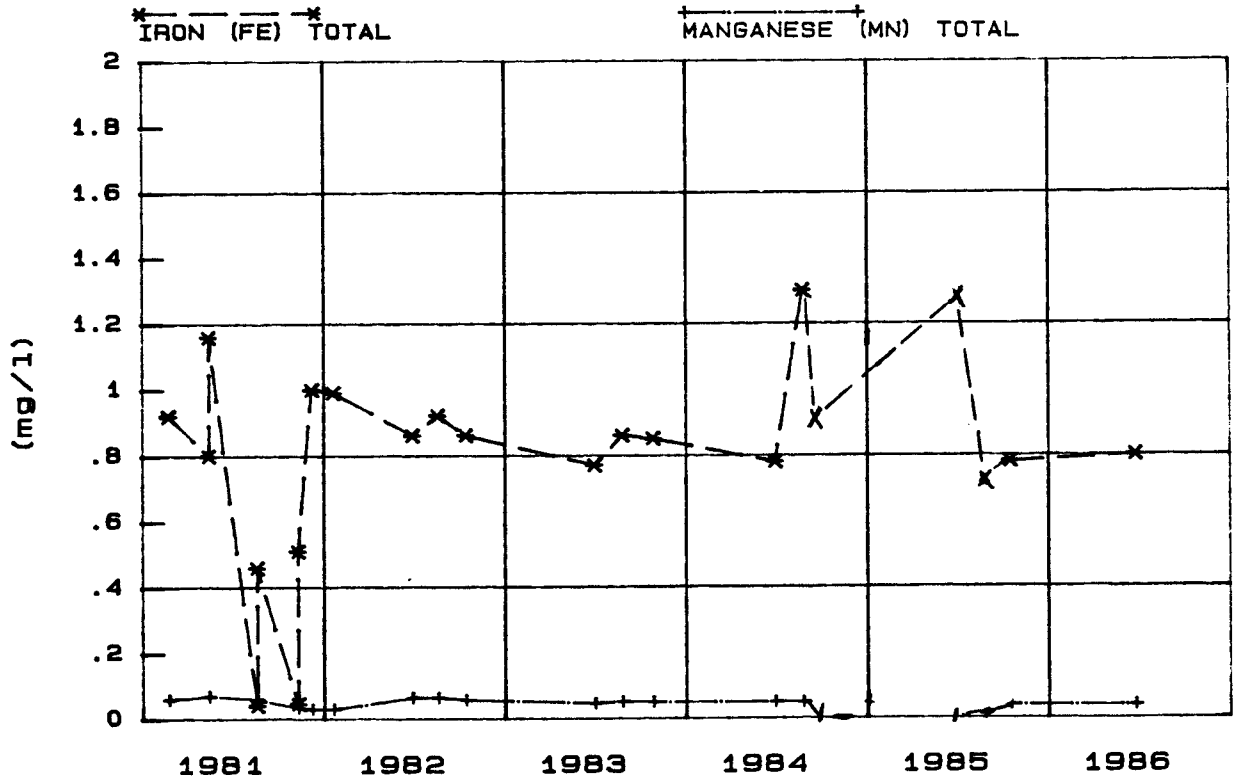
WATER QUALITY SITE: S17-2 SPRING



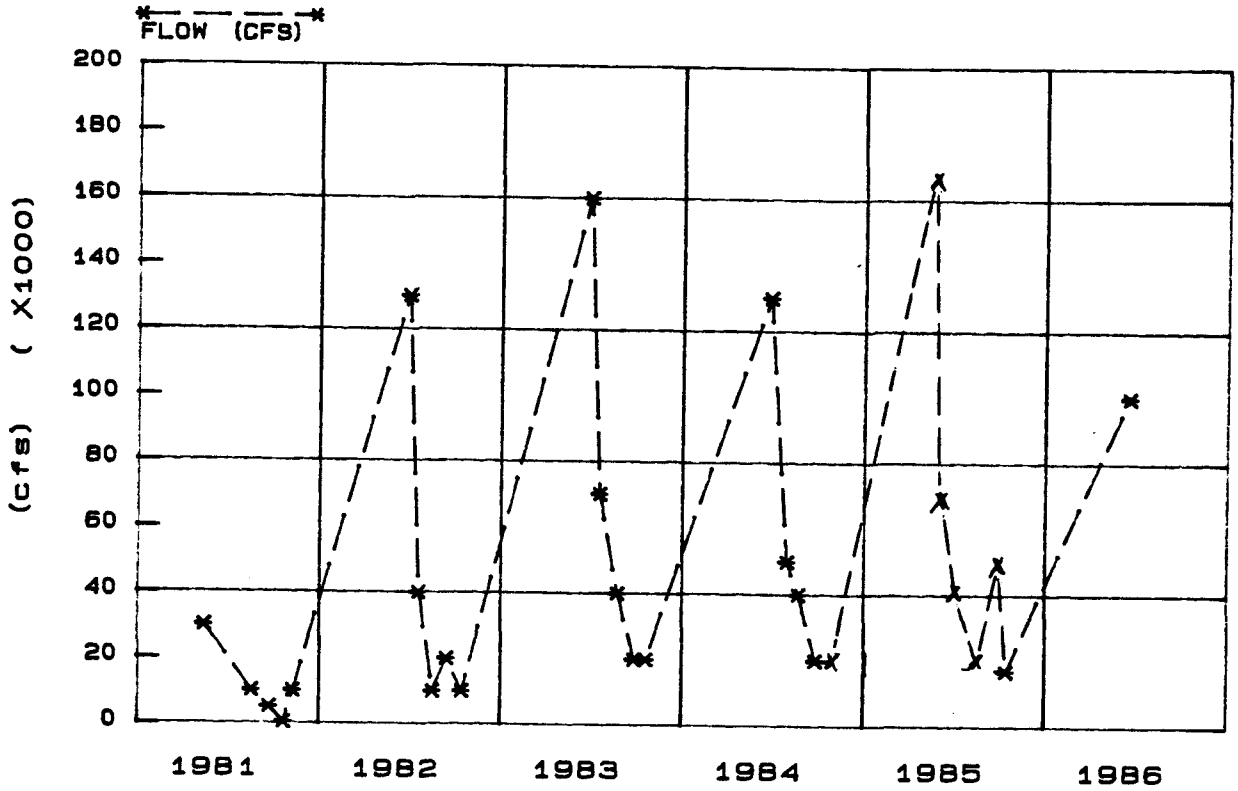
WATER QUALITY SITE: S17-2 SPRING



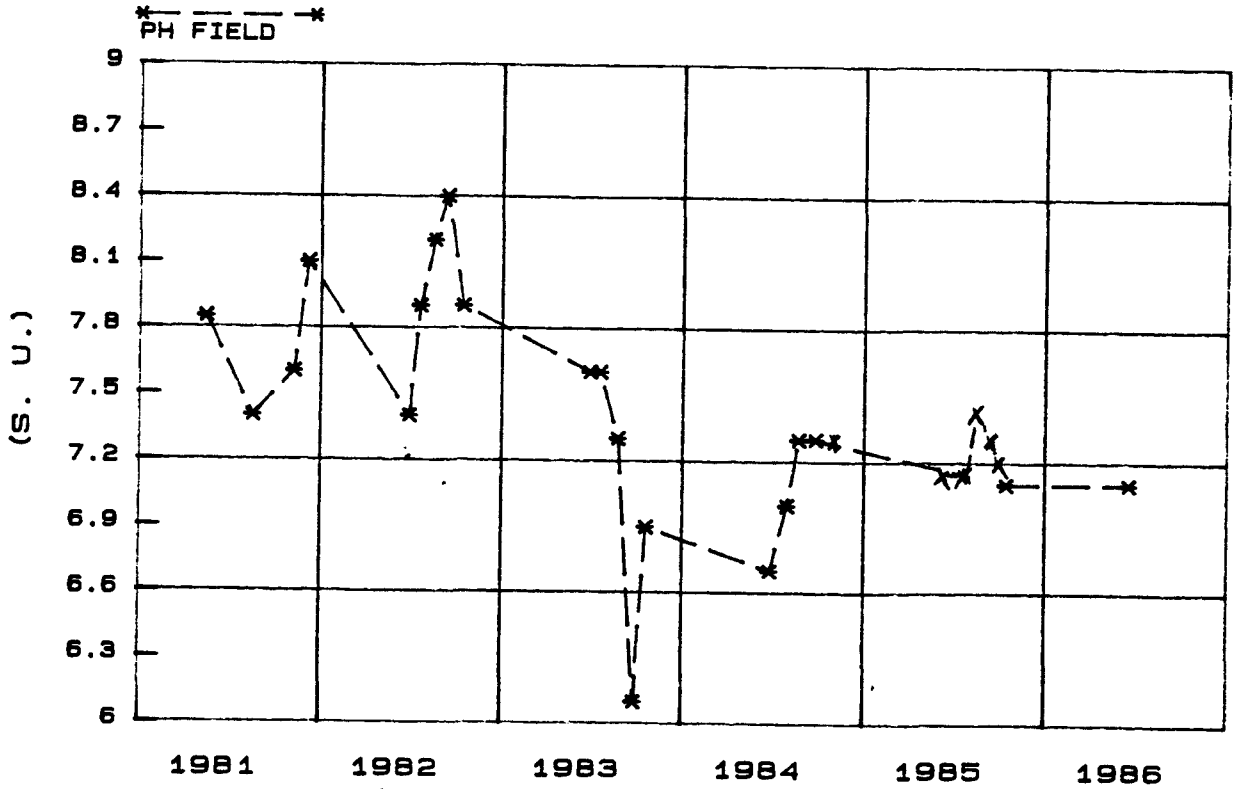
WATER QUALITY SITE: S17-2 SPRING



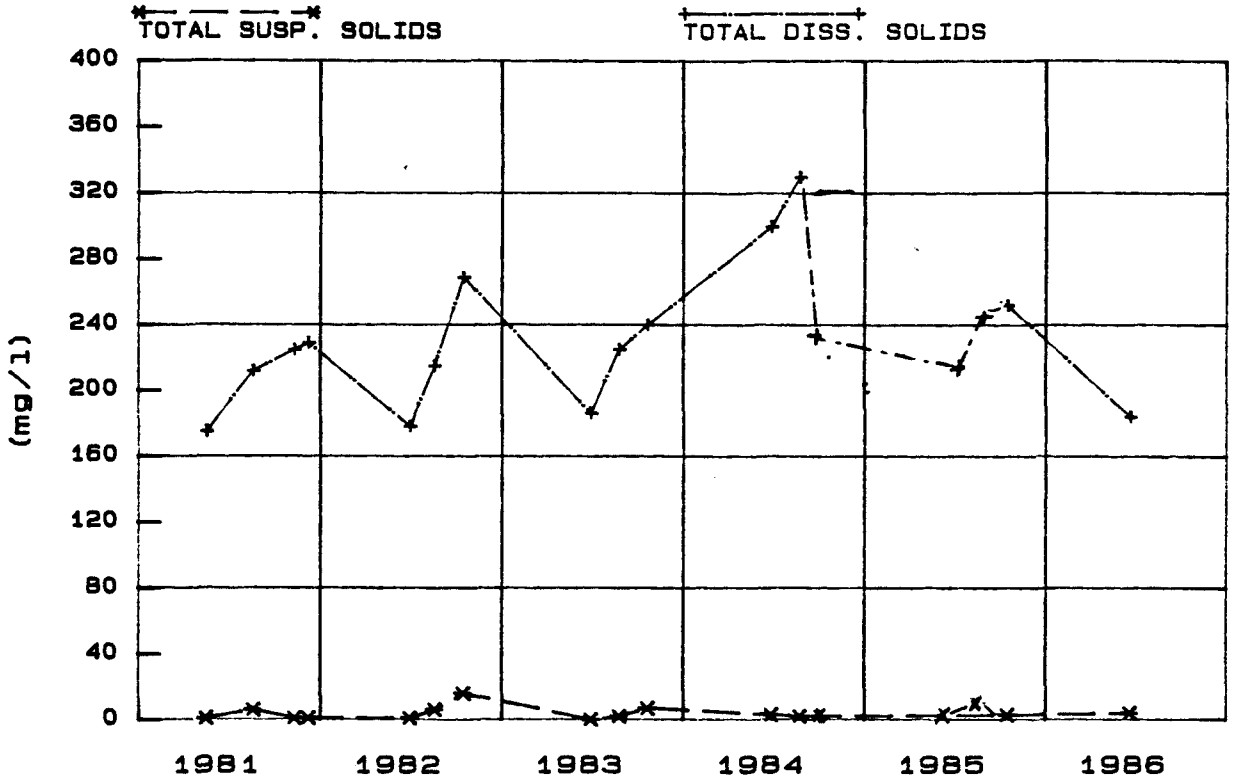
WATER QUALITY SITE: S17-2 SPRING



WATER QUALITY SITE: S22-5 SPRING



WATER QUALITY SITE: S22-5 SPRING



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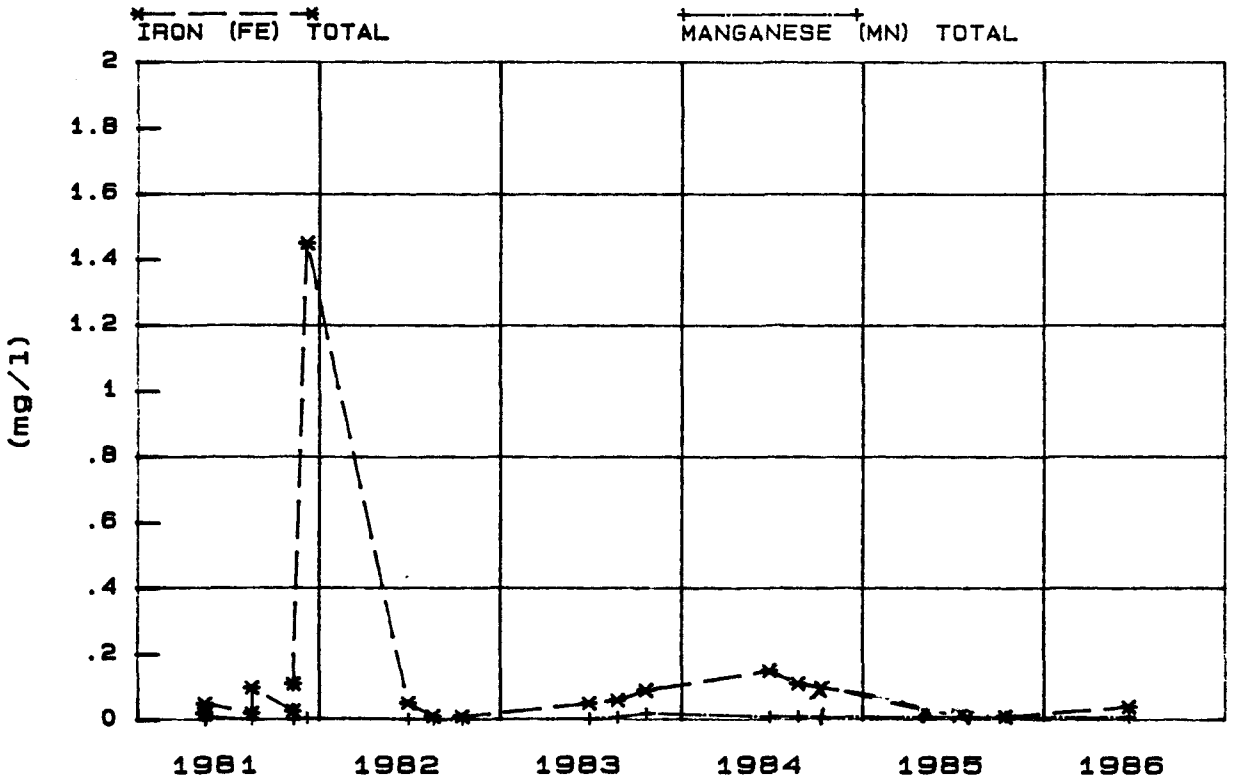
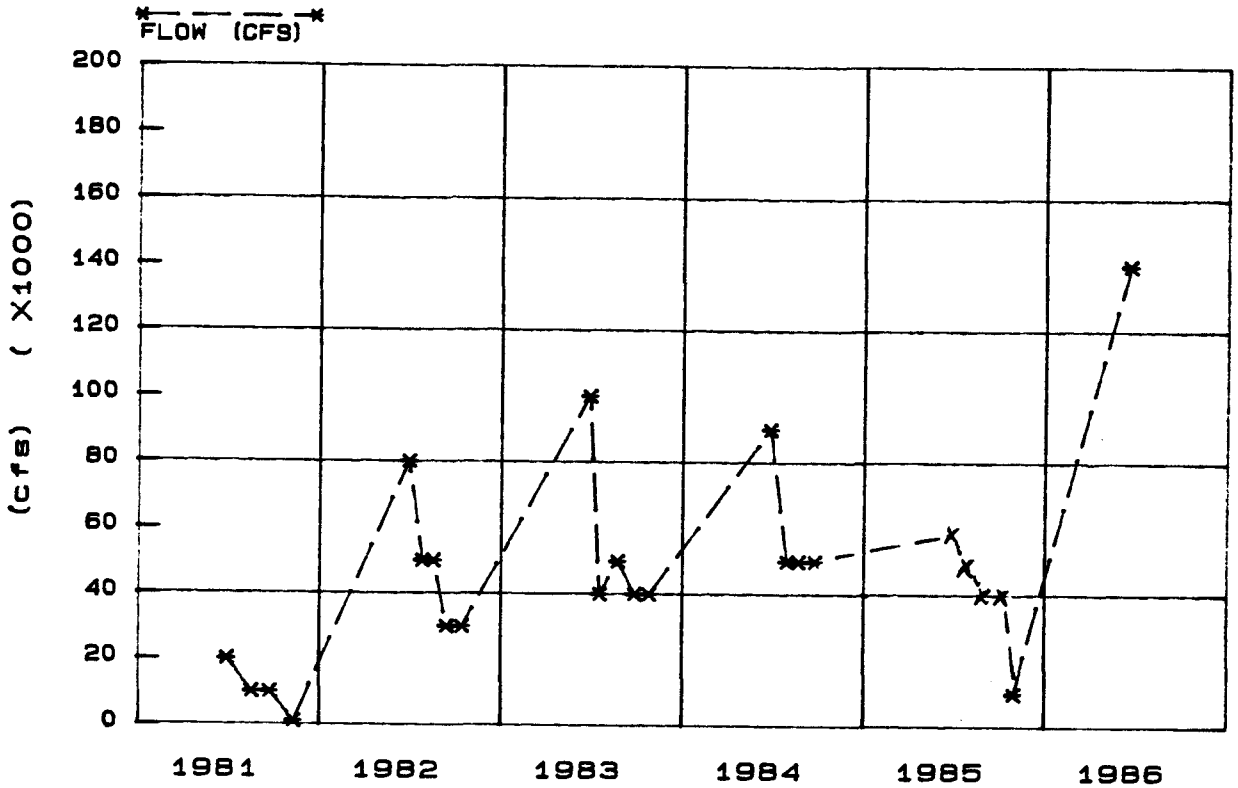
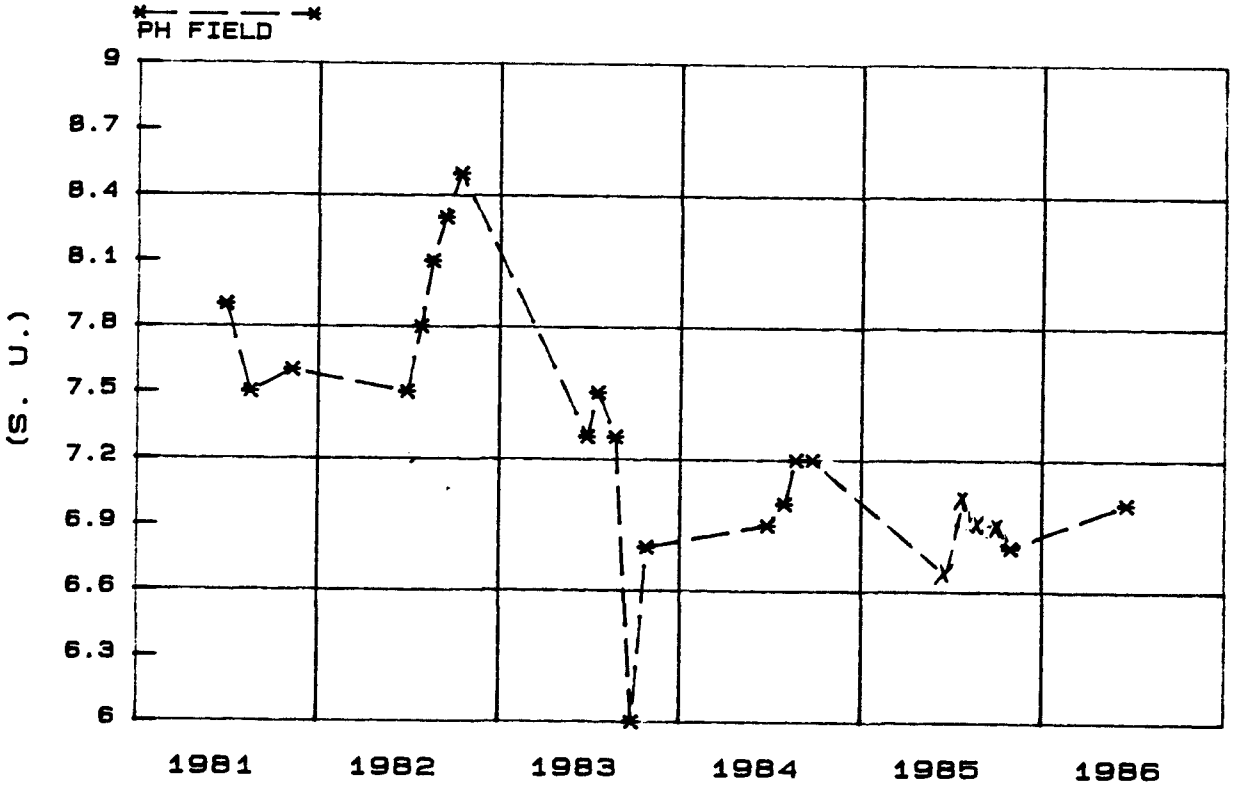


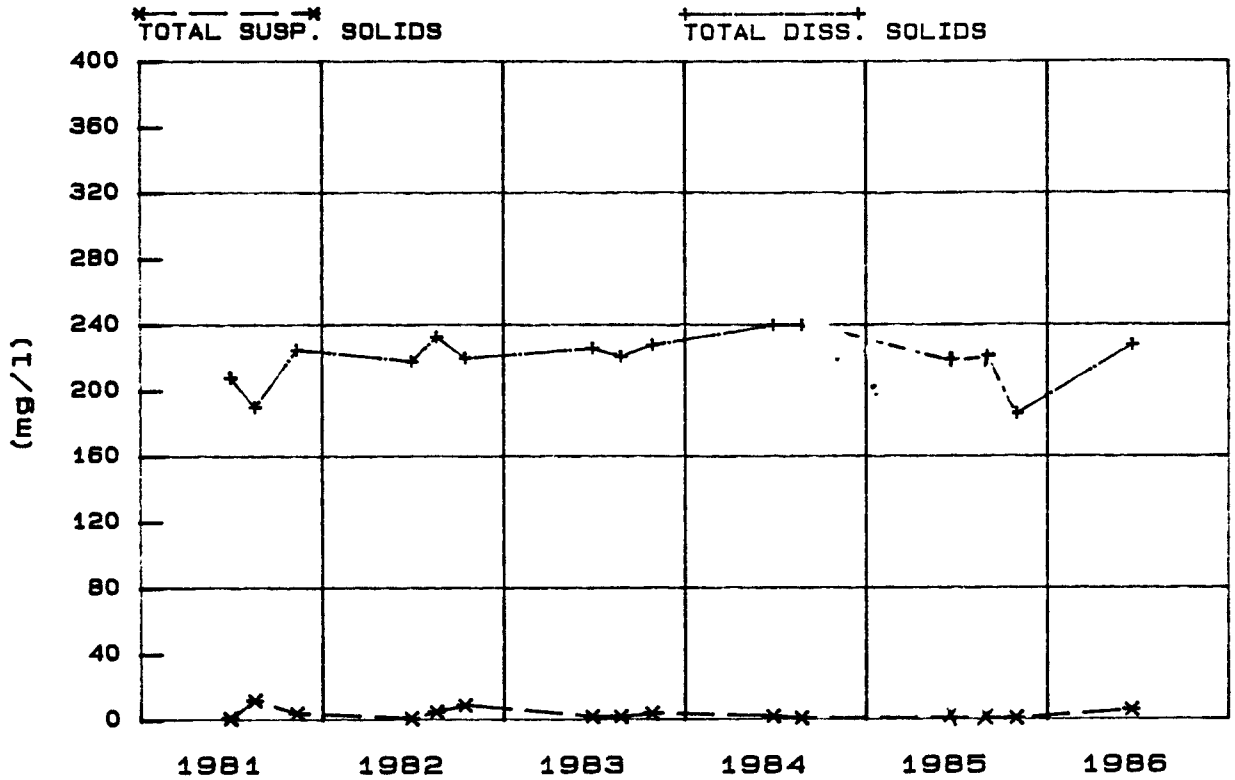
WATER QUALITY SITE: S22-5 SPRING



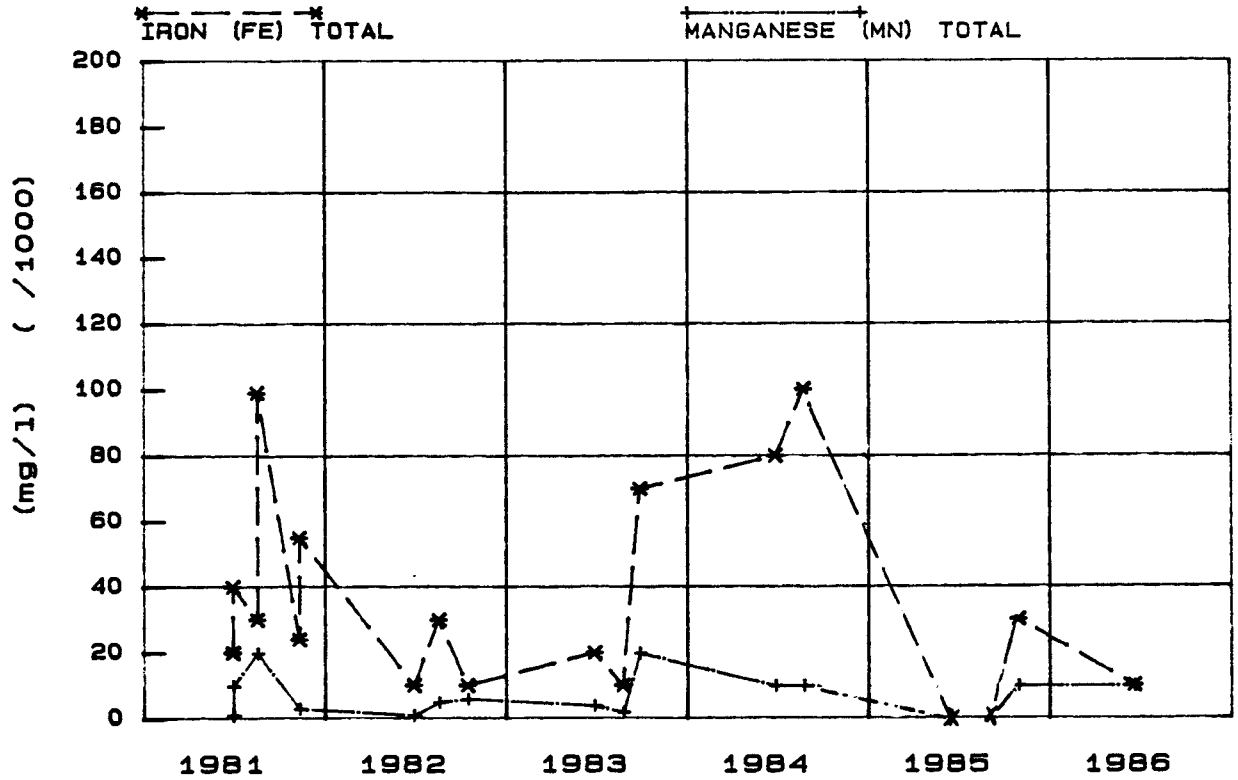
WATER QUALITY SITE: S22-11 SPRING



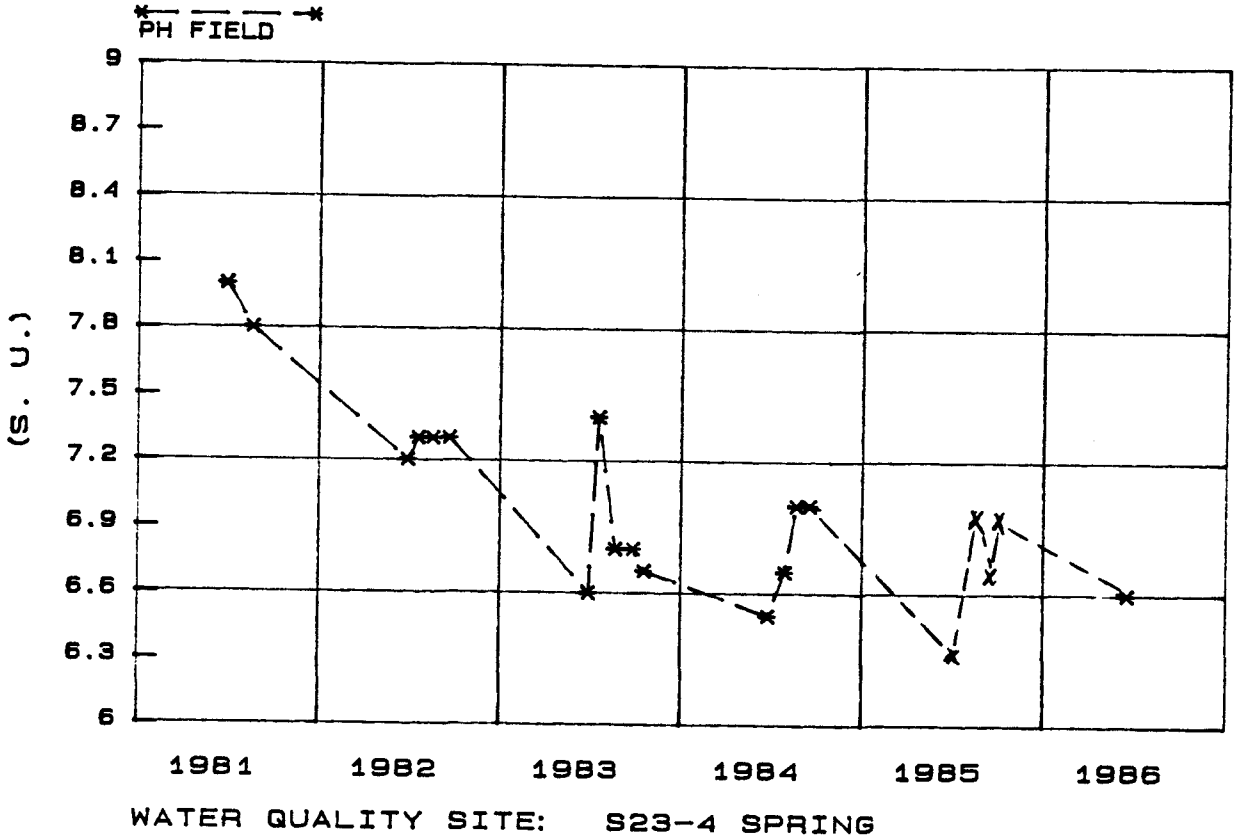
WATER QUALITY SITE: S22-11 SPRING



WATER QUALITY SITE: S22-11 SPRING



WATER QUALITY SITE: S22-11 SPRING


PH FIELD
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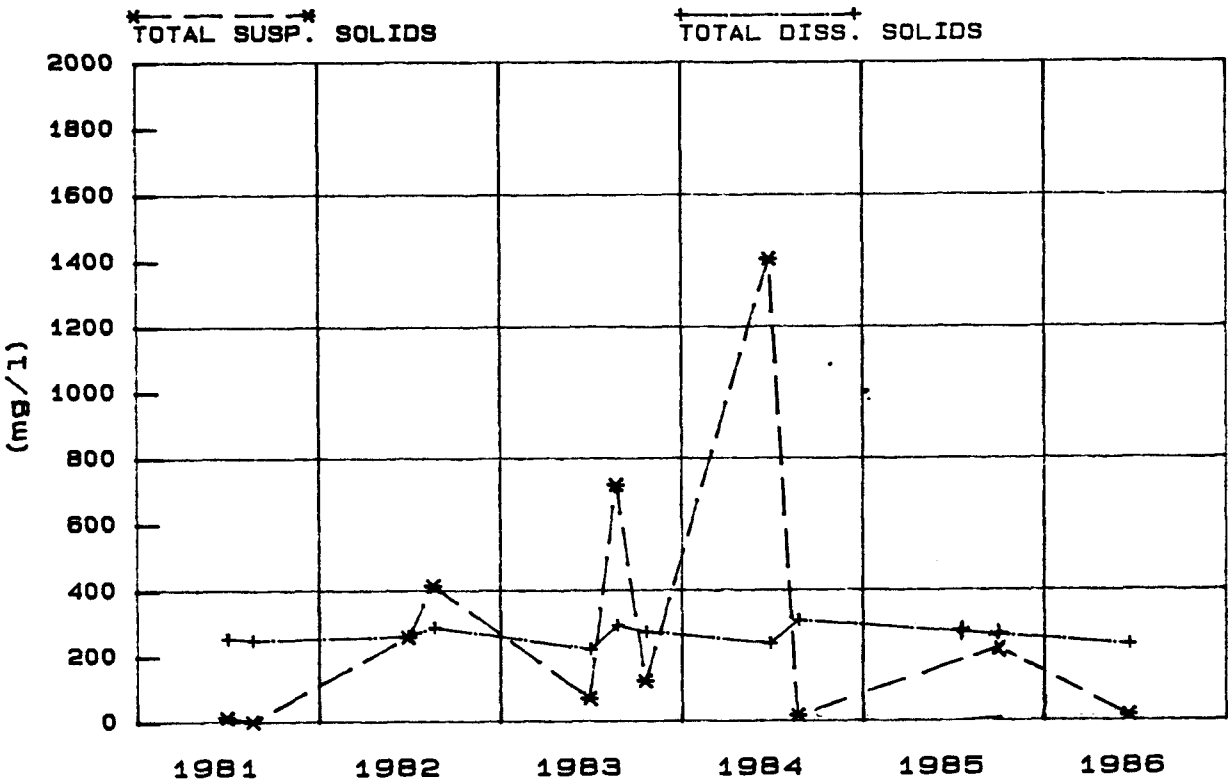
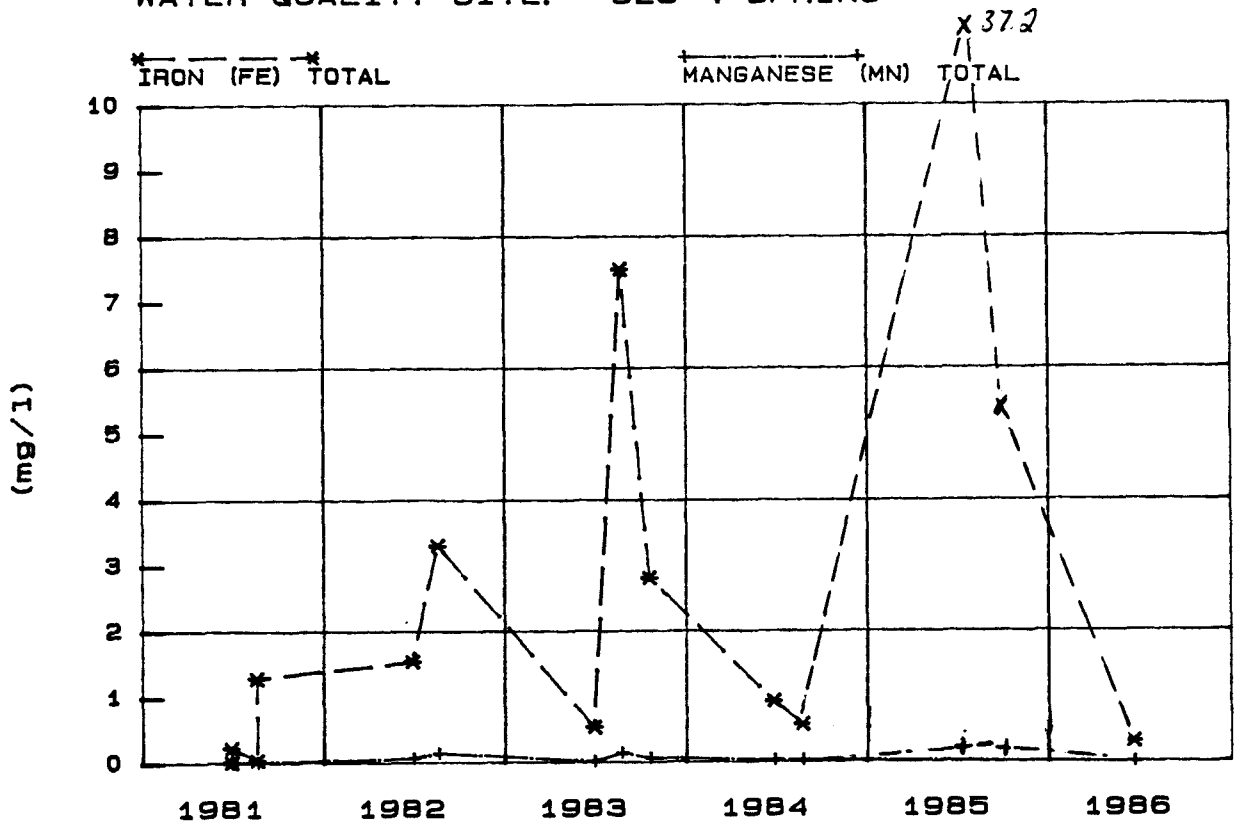
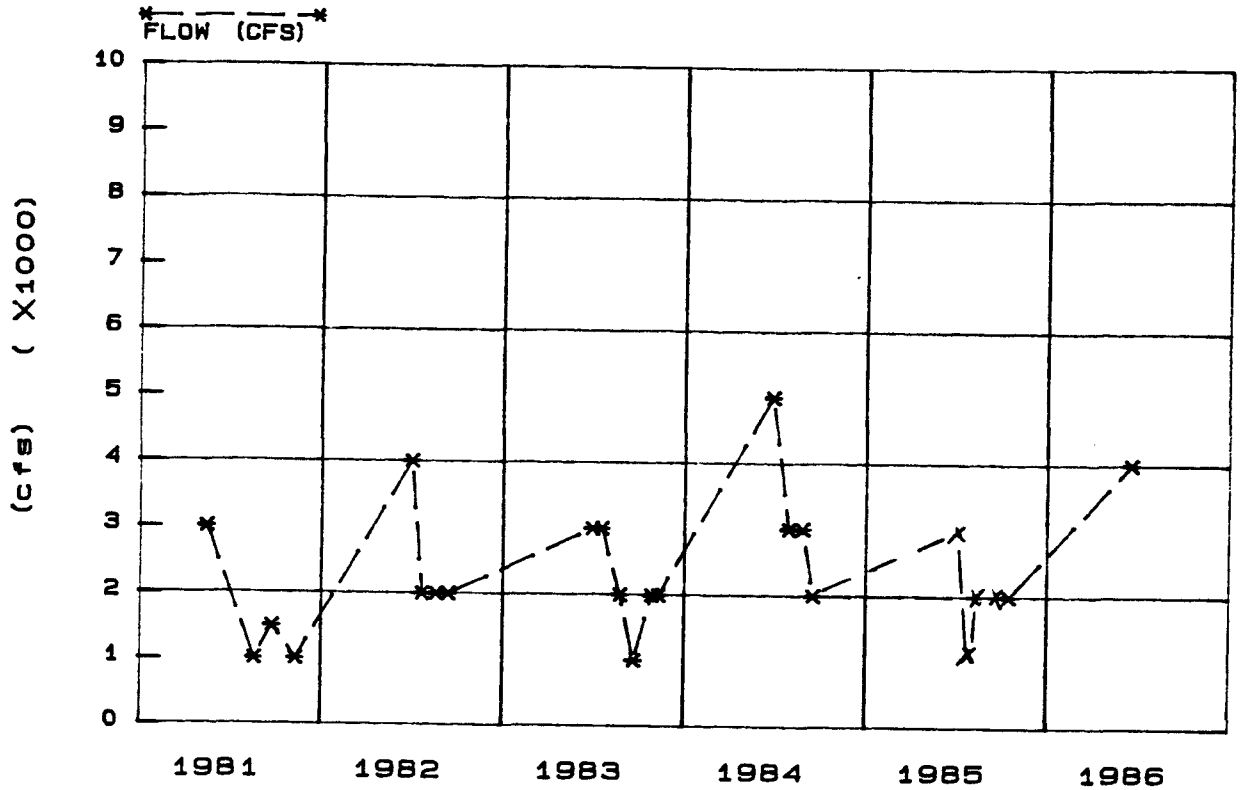
WATER QUALITY SITE: S23-4 SPRING



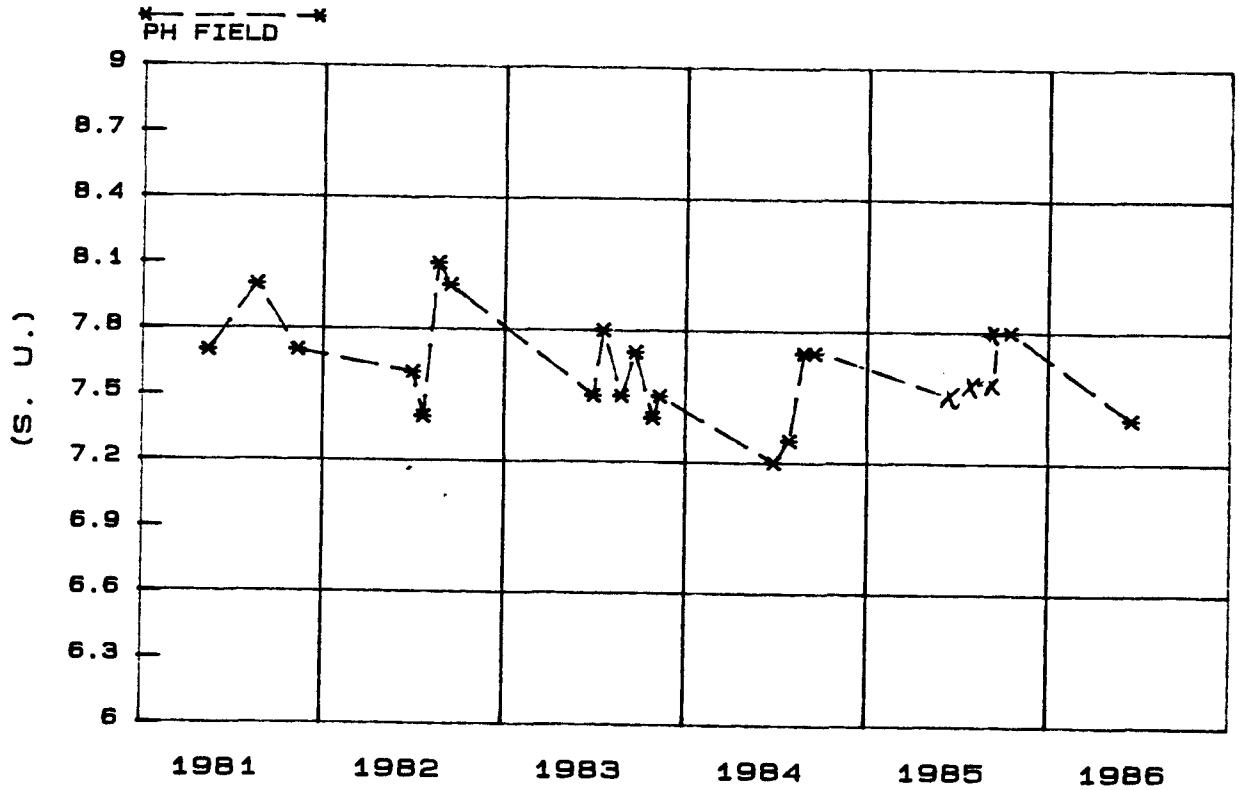
WATER QUALITY SITE: S23-4 SPRING



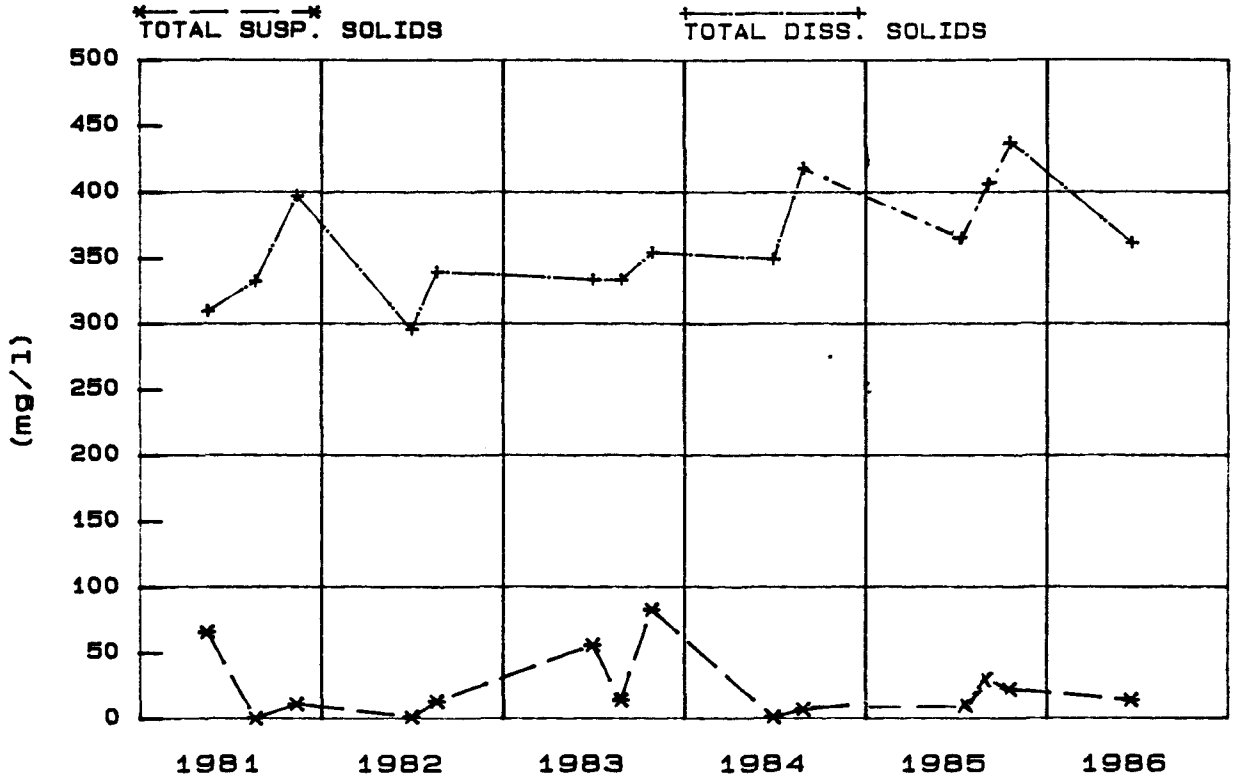
WATER QUALITY SITE: S23-4 SPRING



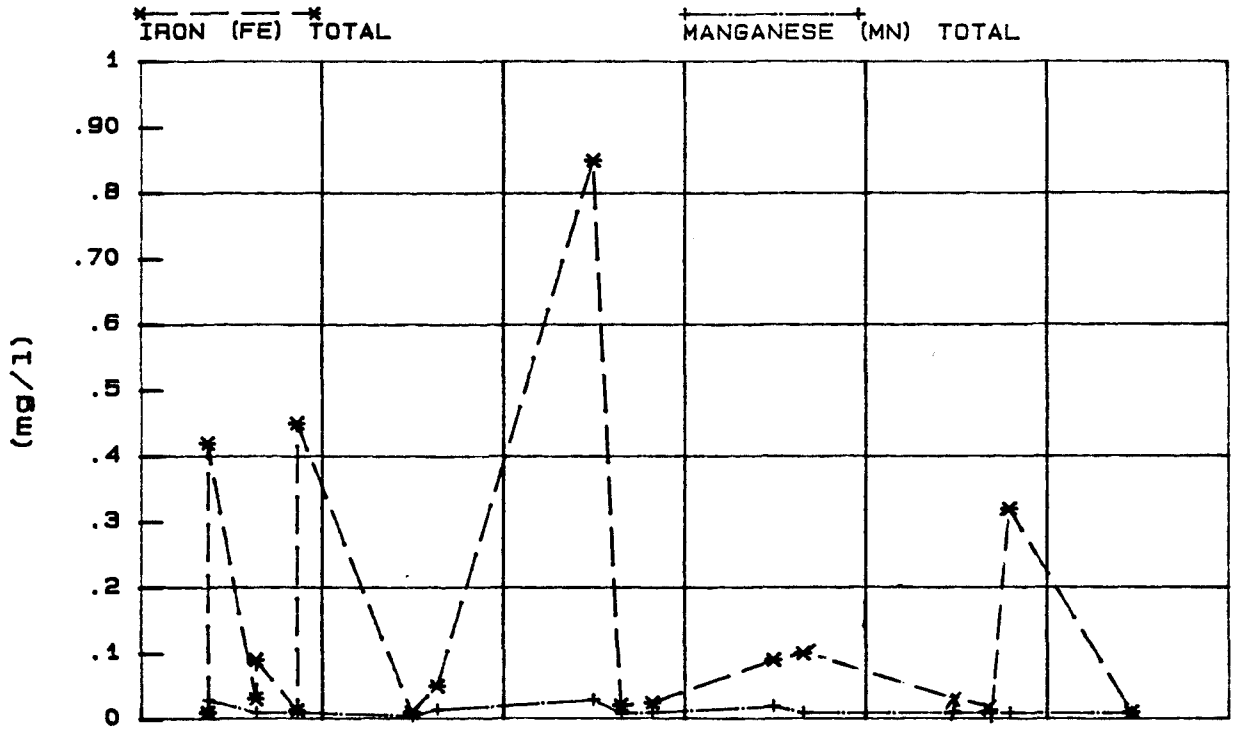
WATER QUALITY SITE: S24-12 SPRING



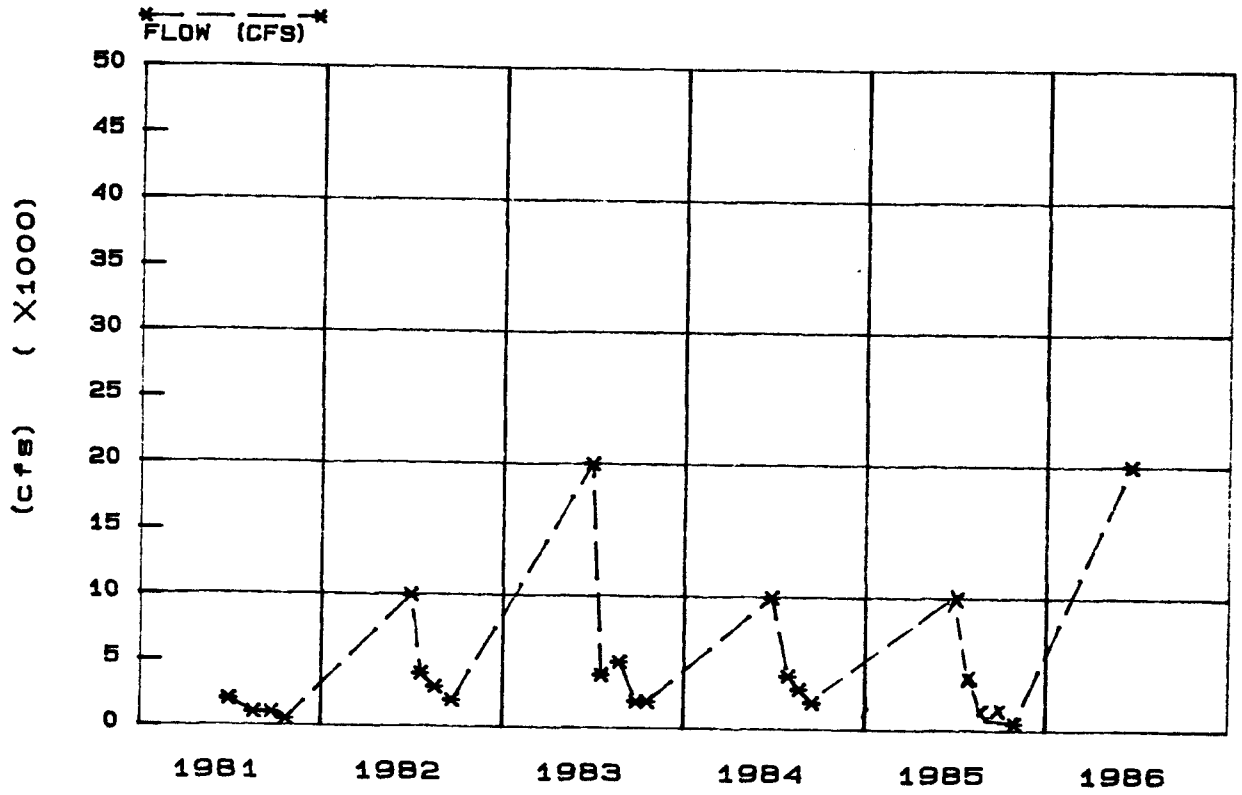
WATER QUALITY SITE: S24-12 SPRING



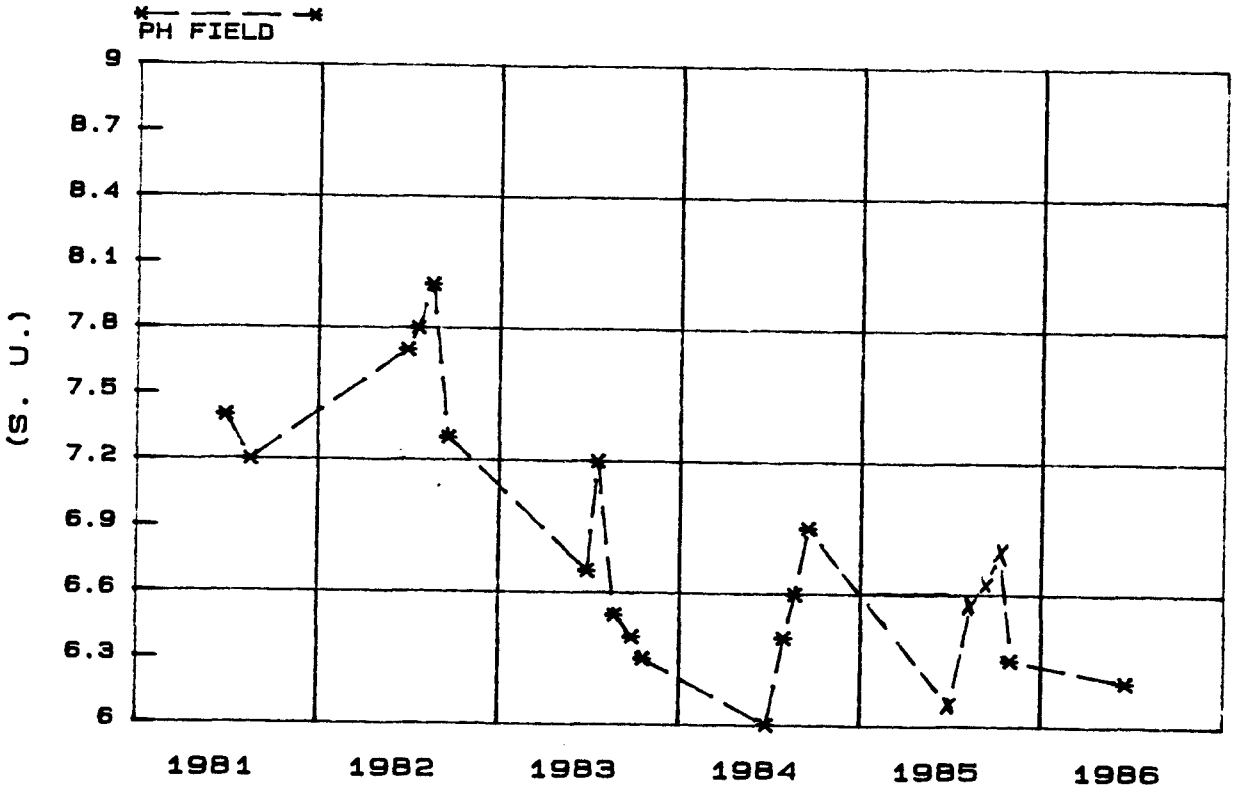
WATER QUALITY SITE: S24-12 SPRING



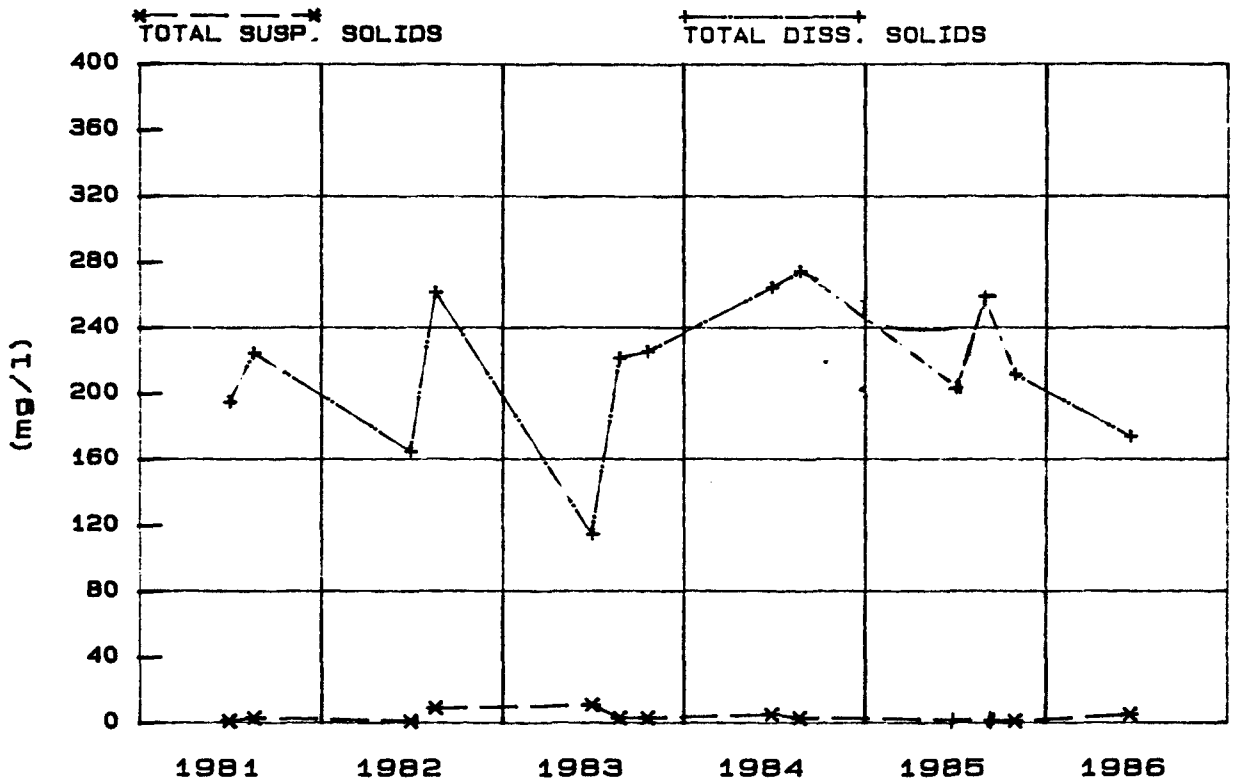
WATER QUALITY SITE: S24-12 SPRING



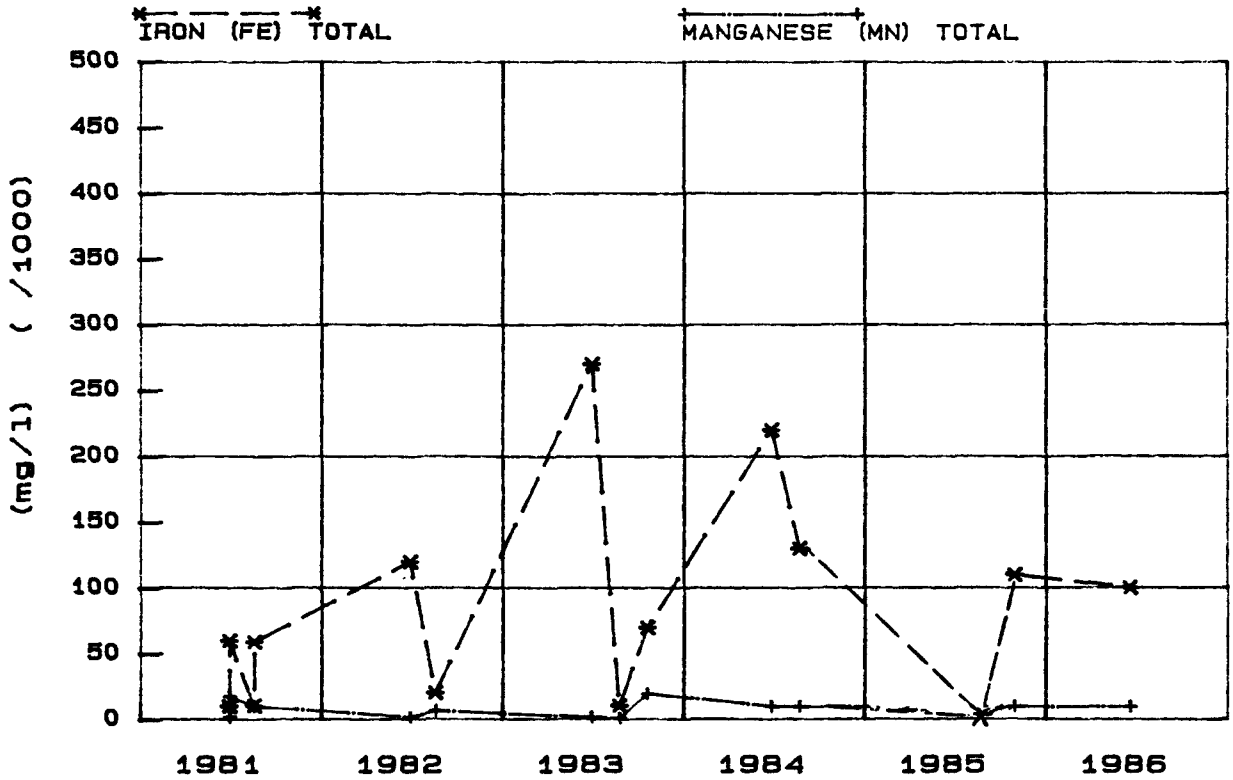
WATER QUALITY SITE: S26-13 SPRING



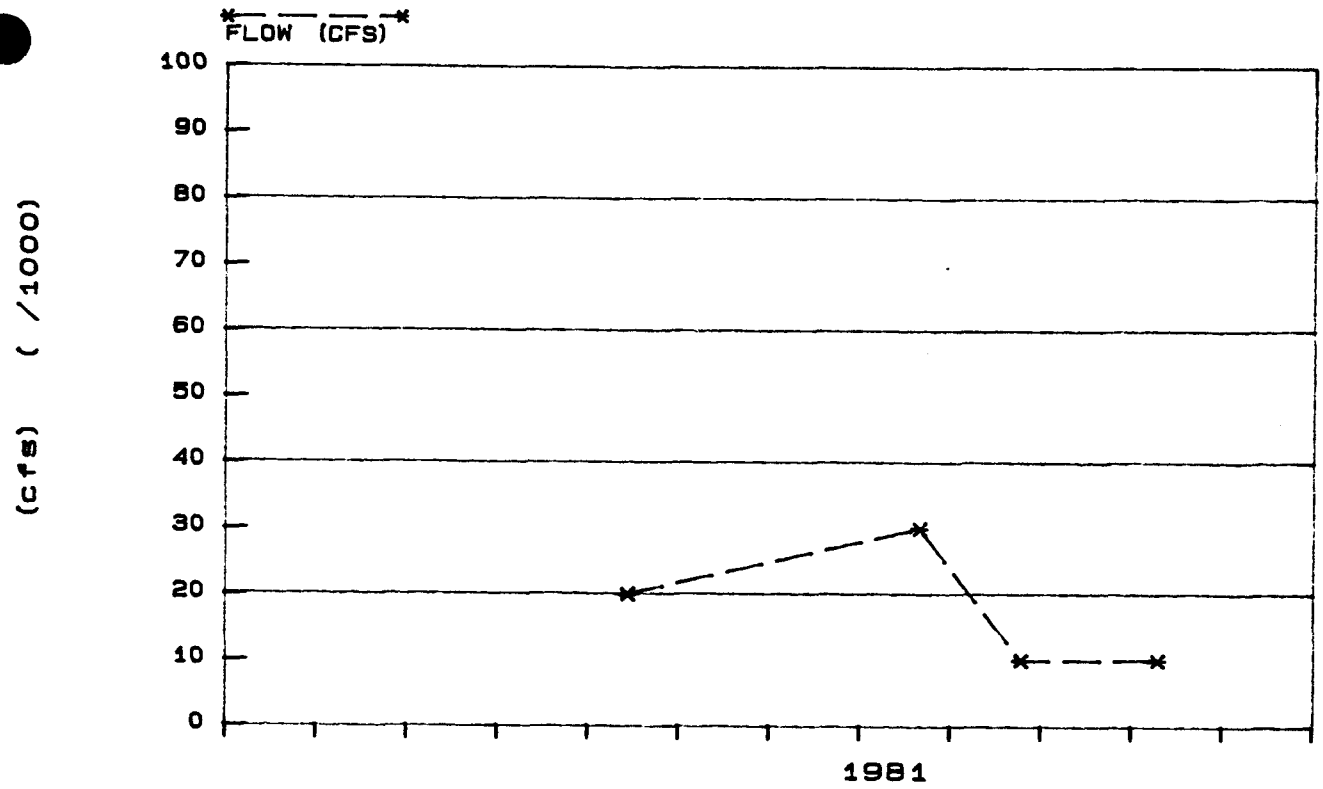
WATER QUALITY SITE: S26-13 SPRING



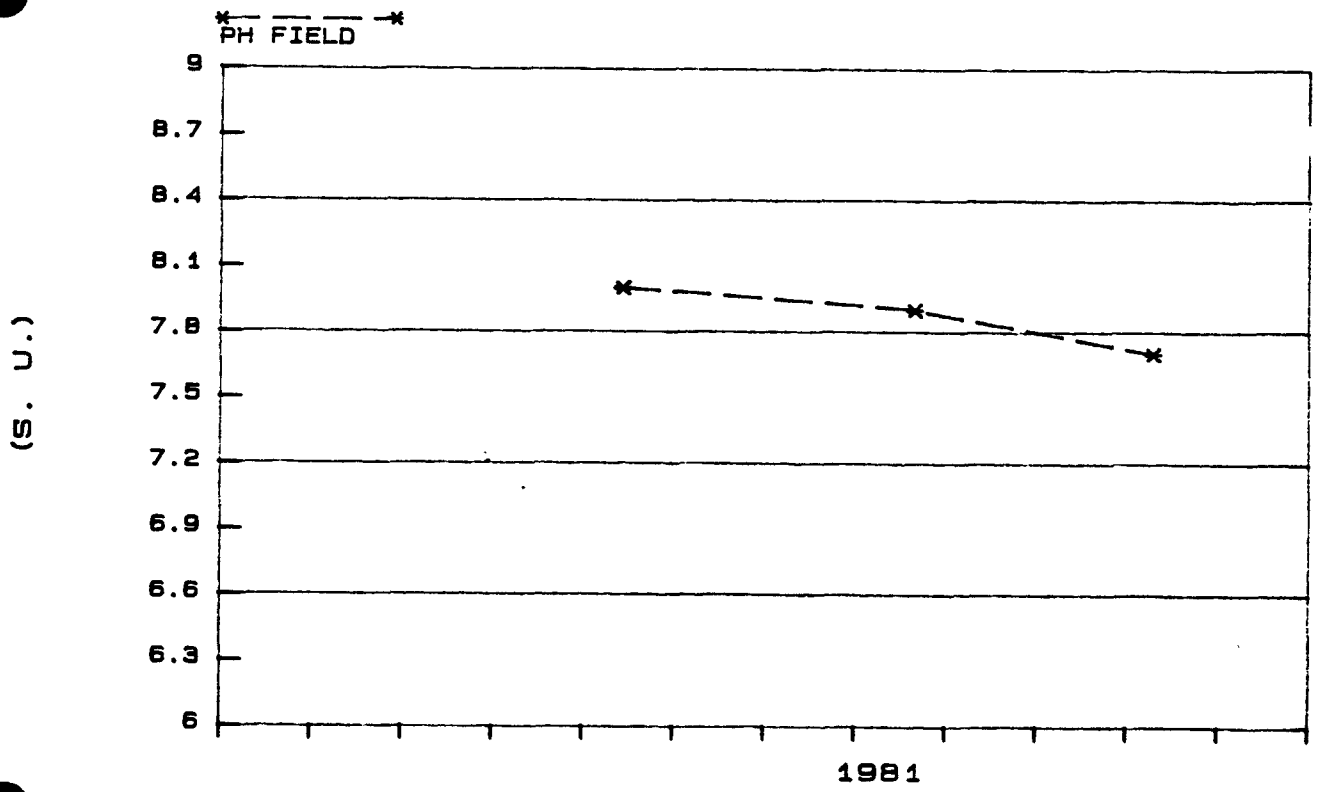
WATER QUALITY SITE: S26-13 SPRING



WATER QUALITY SITE: S26-13 SPRING



WATER QUALITY SITE: S34-12 SPRING



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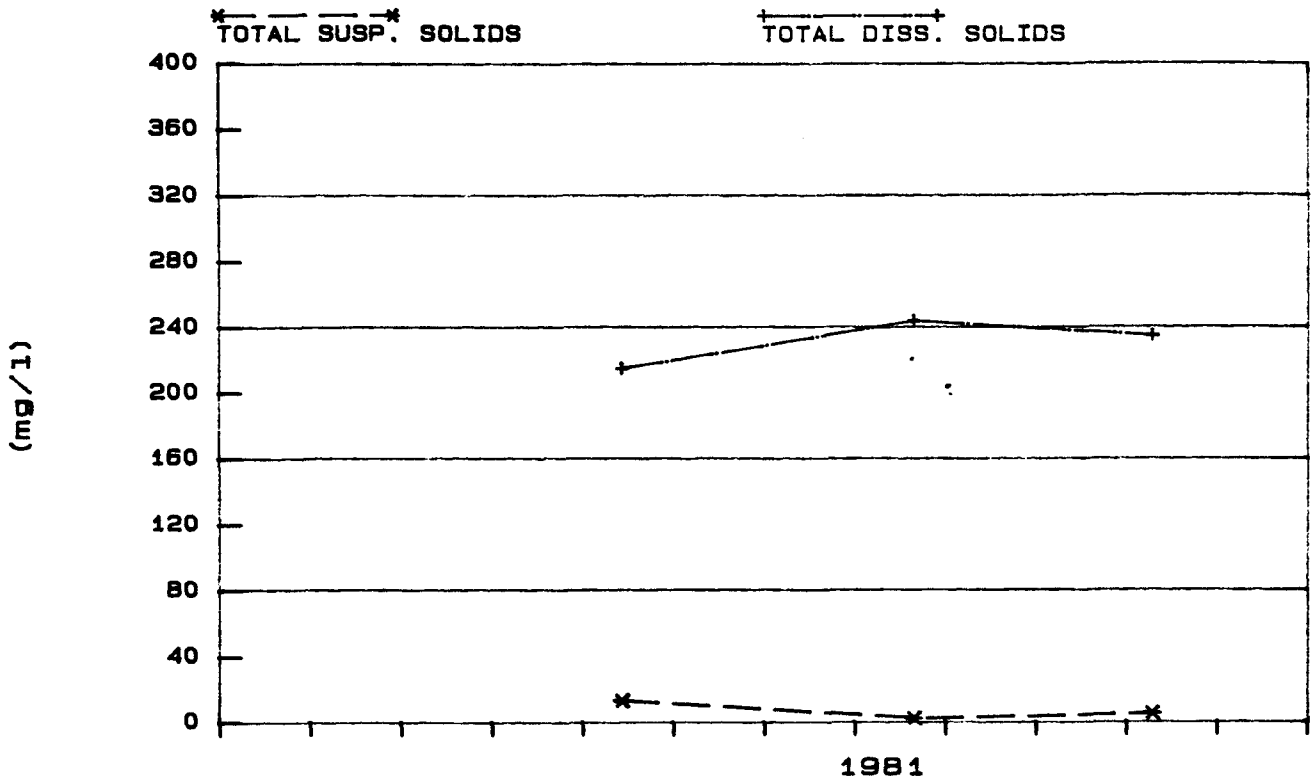
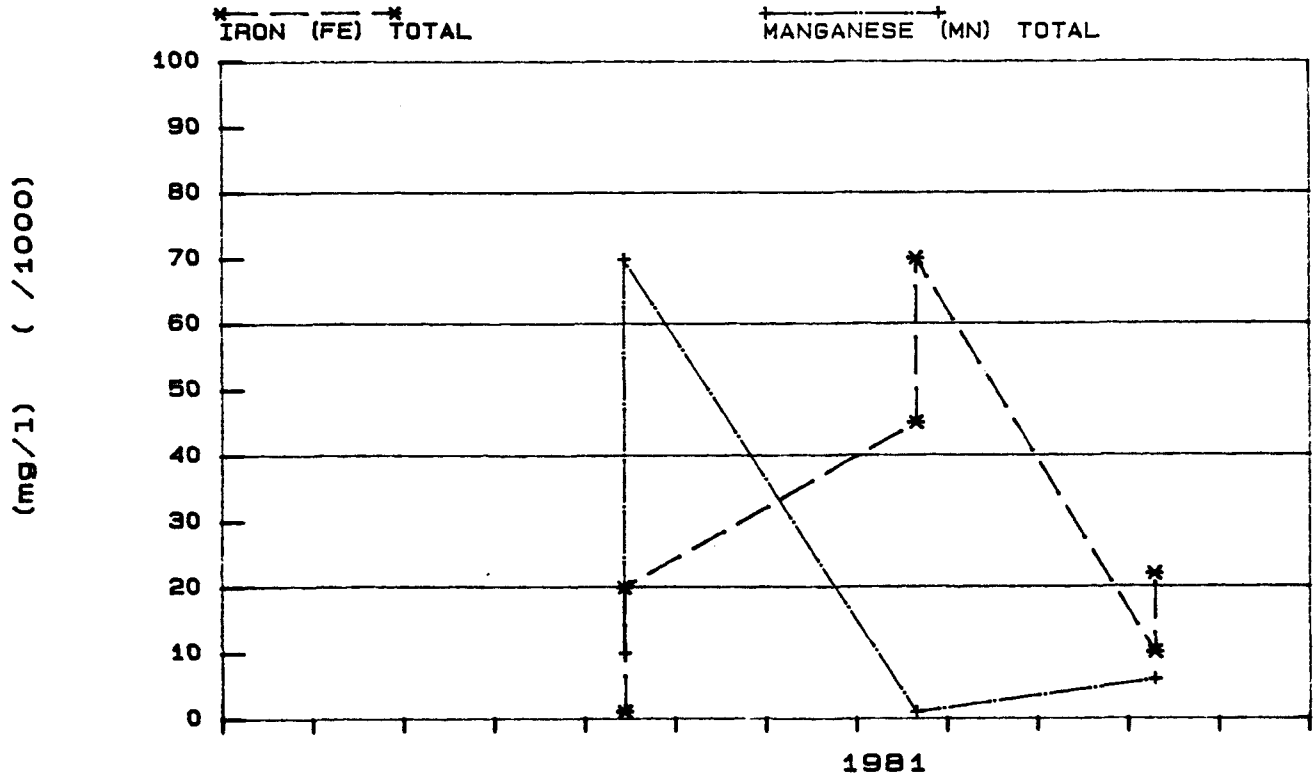
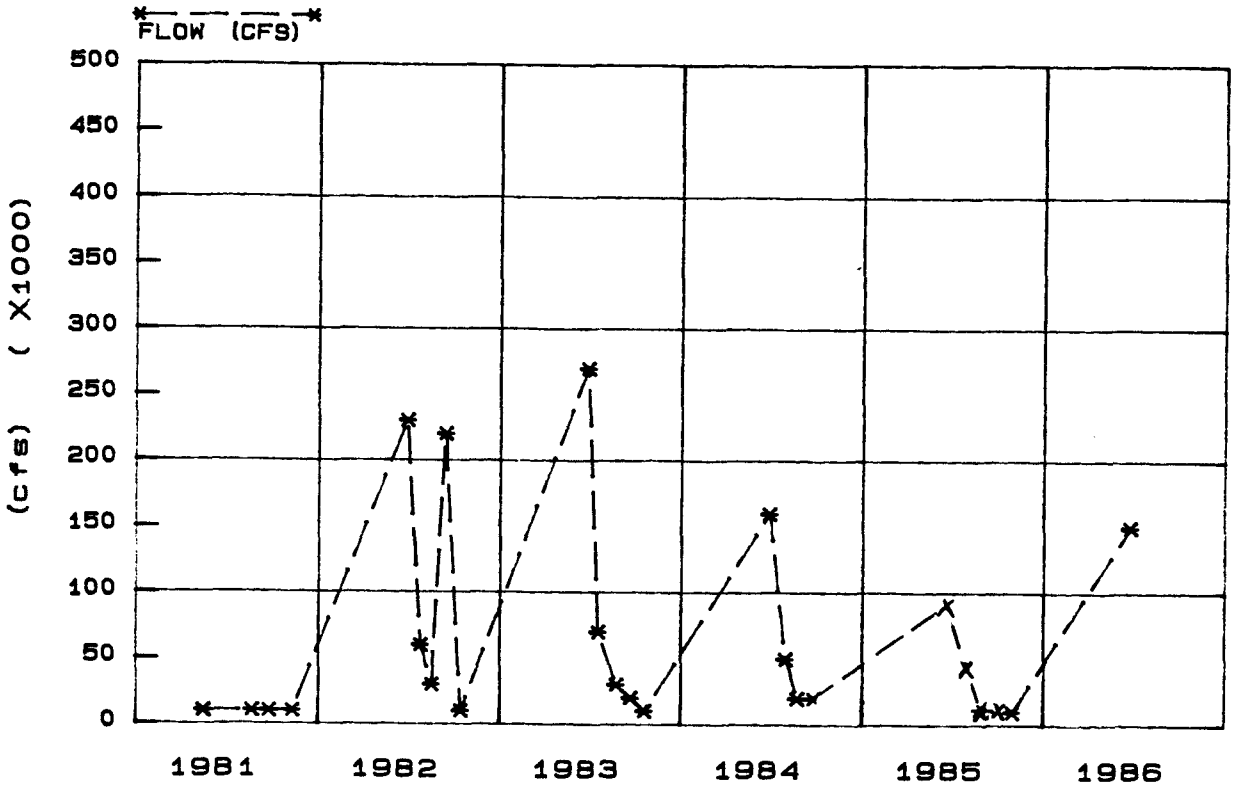


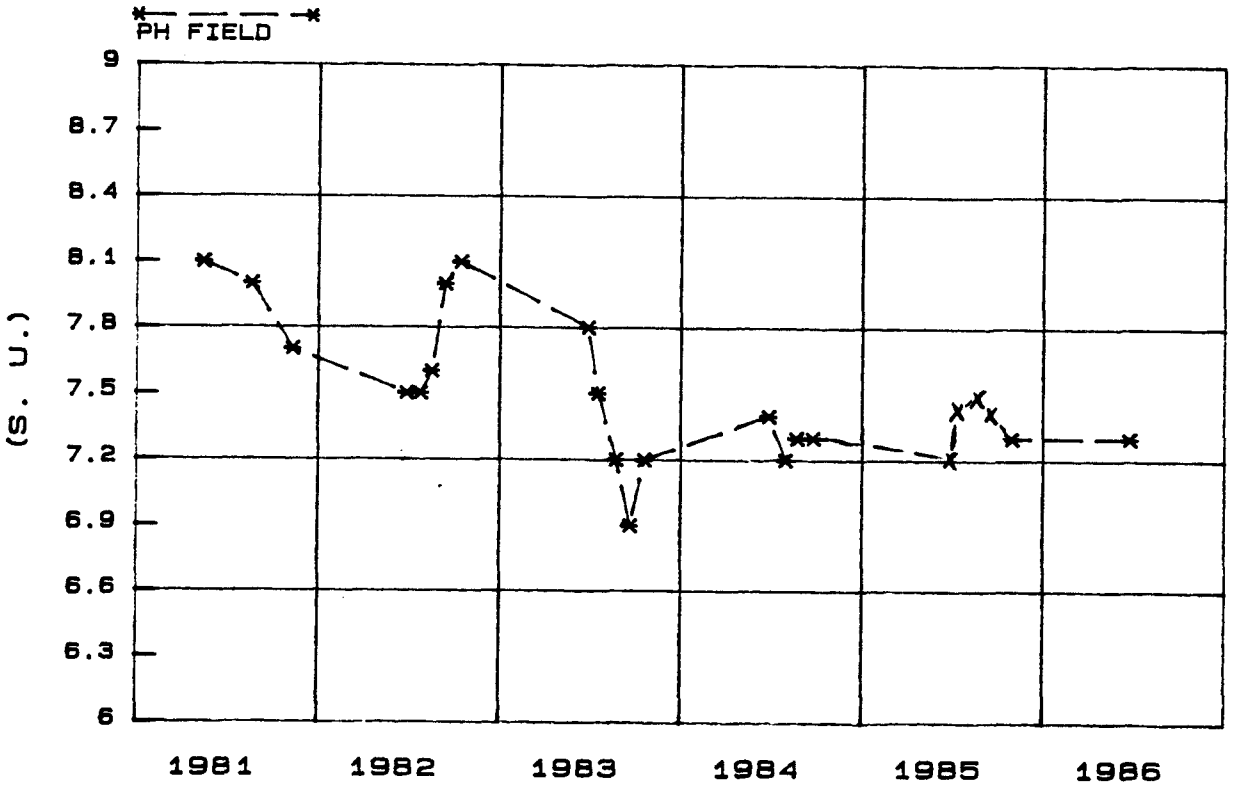
WATER QUALITY SITE: S34-12 SPRING



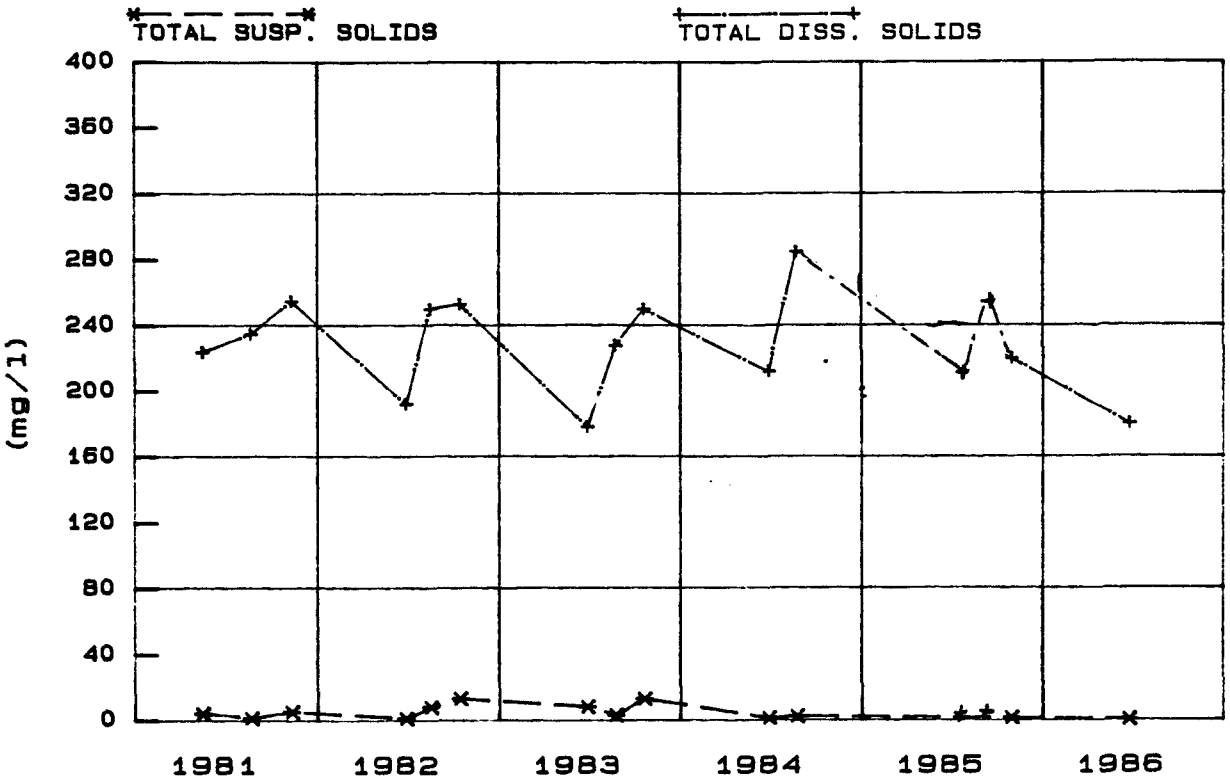
WATER QUALITY SITE: S34-12 SPRING



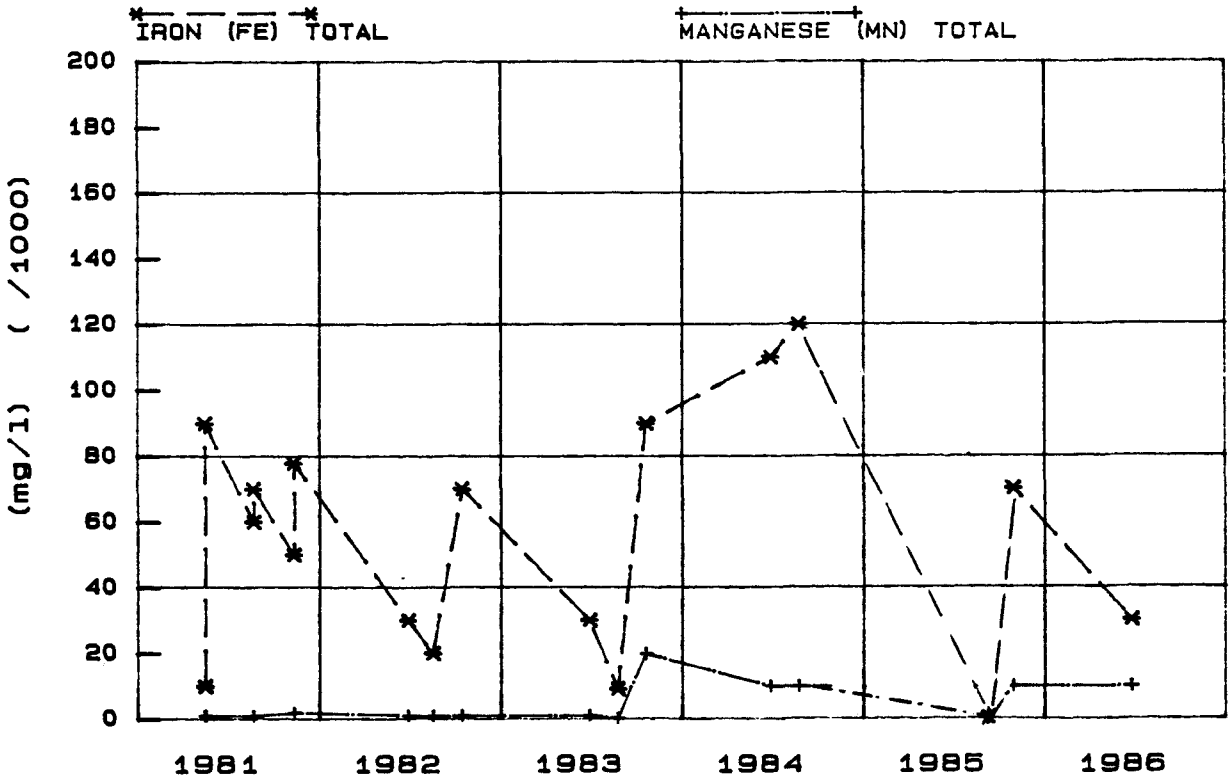
WATER QUALITY SITE: S35-8 SPRING



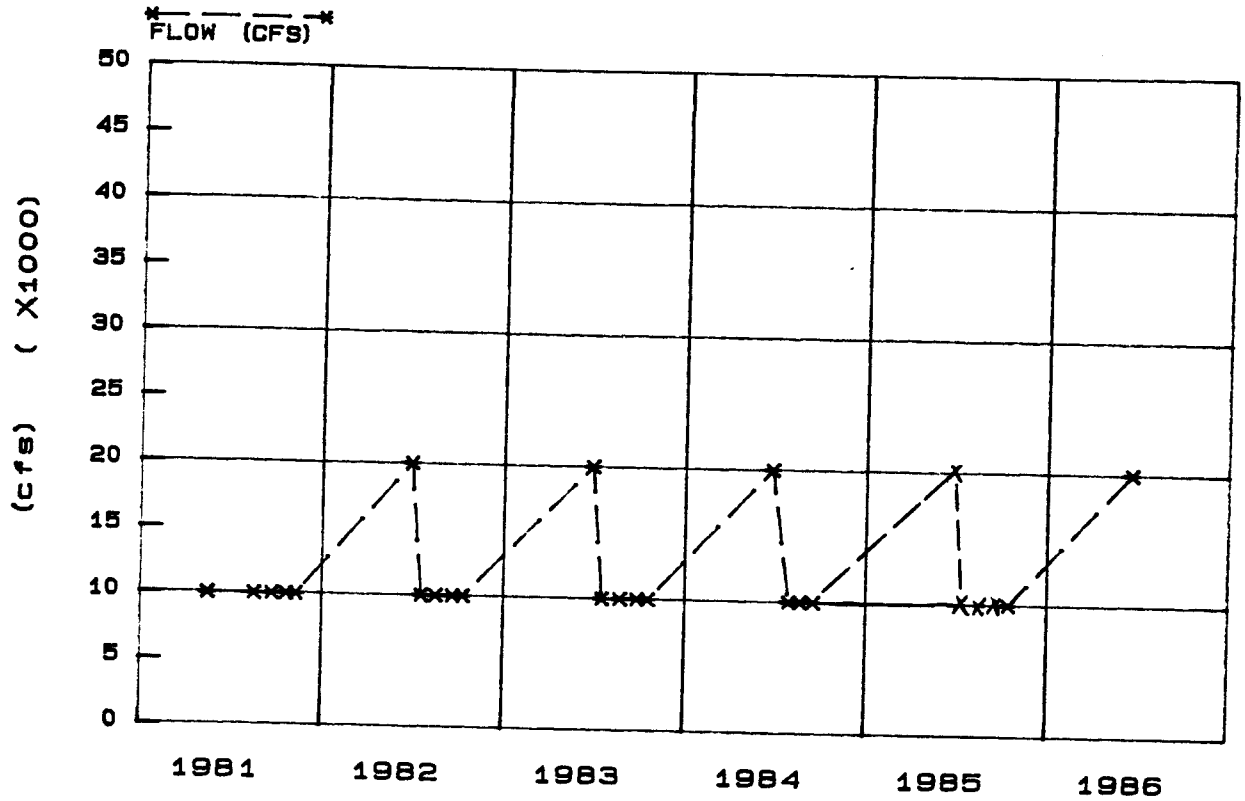
WATER QUALITY SITE: S35-8 SPRING



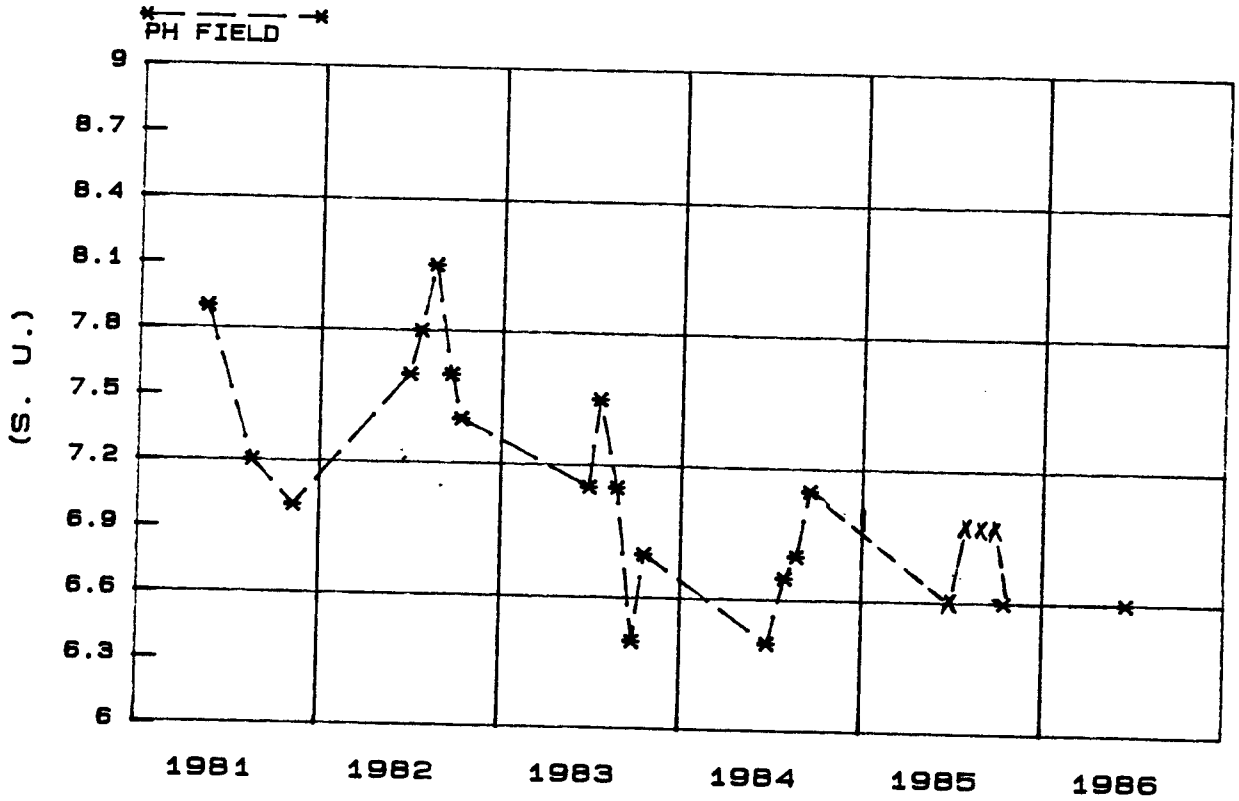
WATER QUALITY SITE: S35-8 SPRING



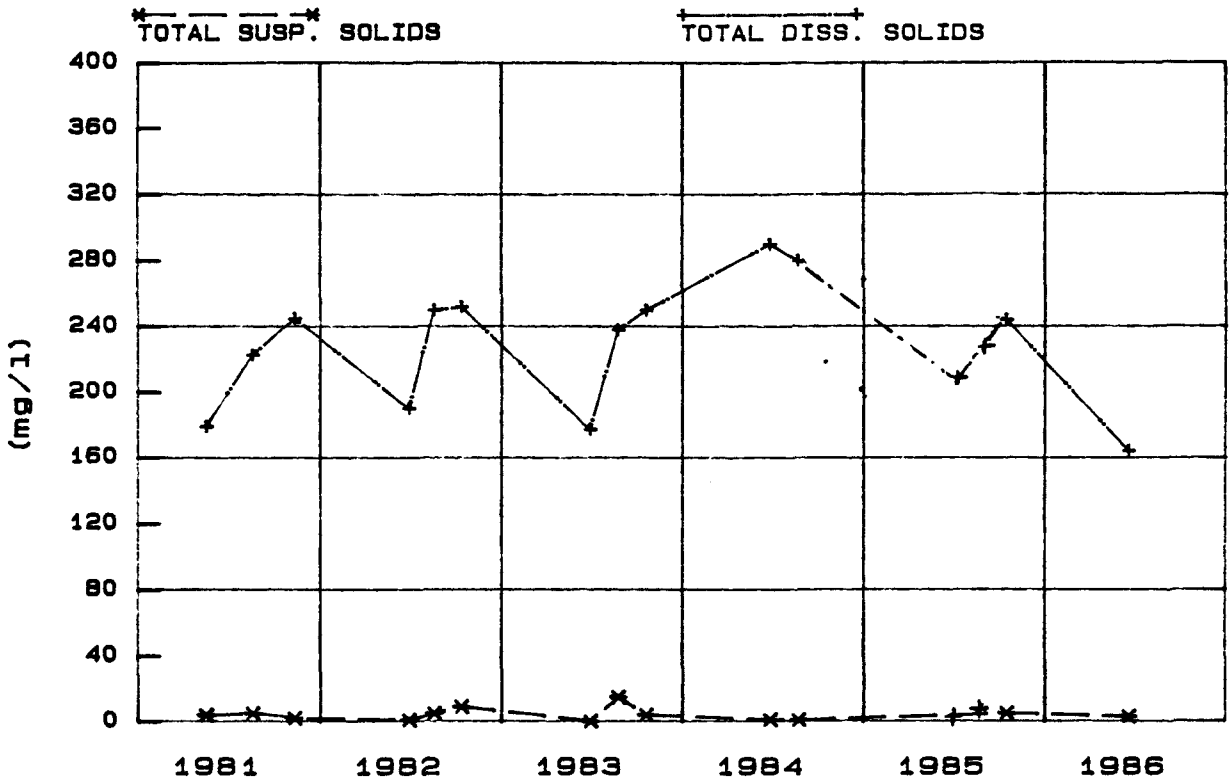
WATER QUALITY SITE: S35-8 SPRING



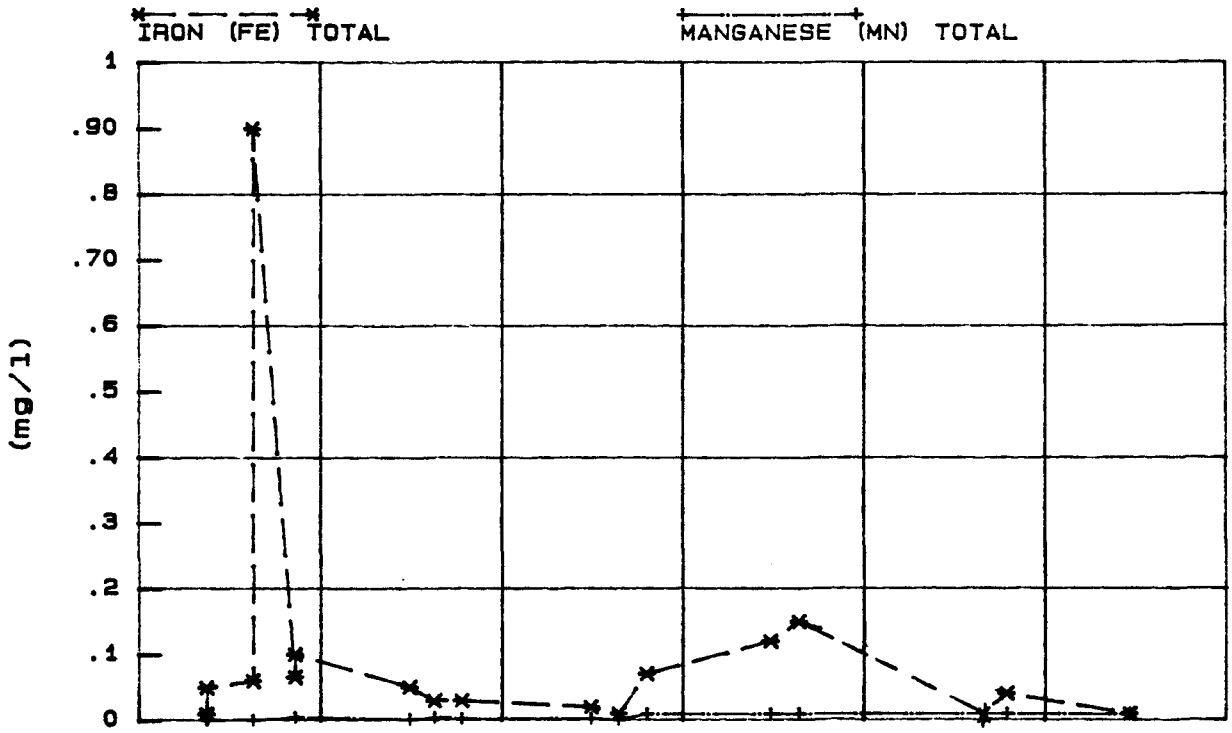
WATER QUALITY SITE: S36-12 SPRING



WATER QUALITY SITE: S36-12 SPRING



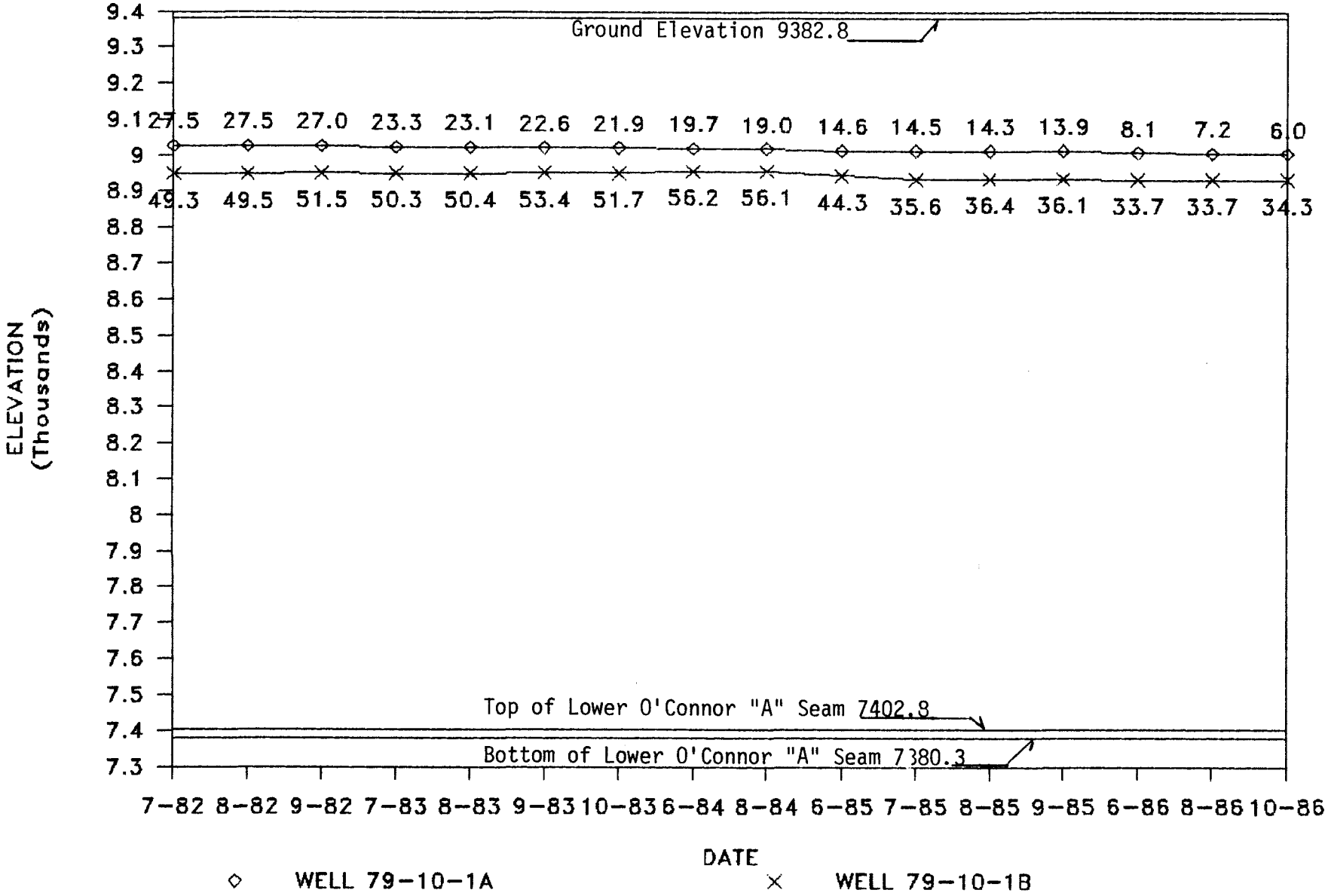
WATER QUALITY SITE: S36-12 SPRING



WATER QUALITY SITE: S36-12 SPRING

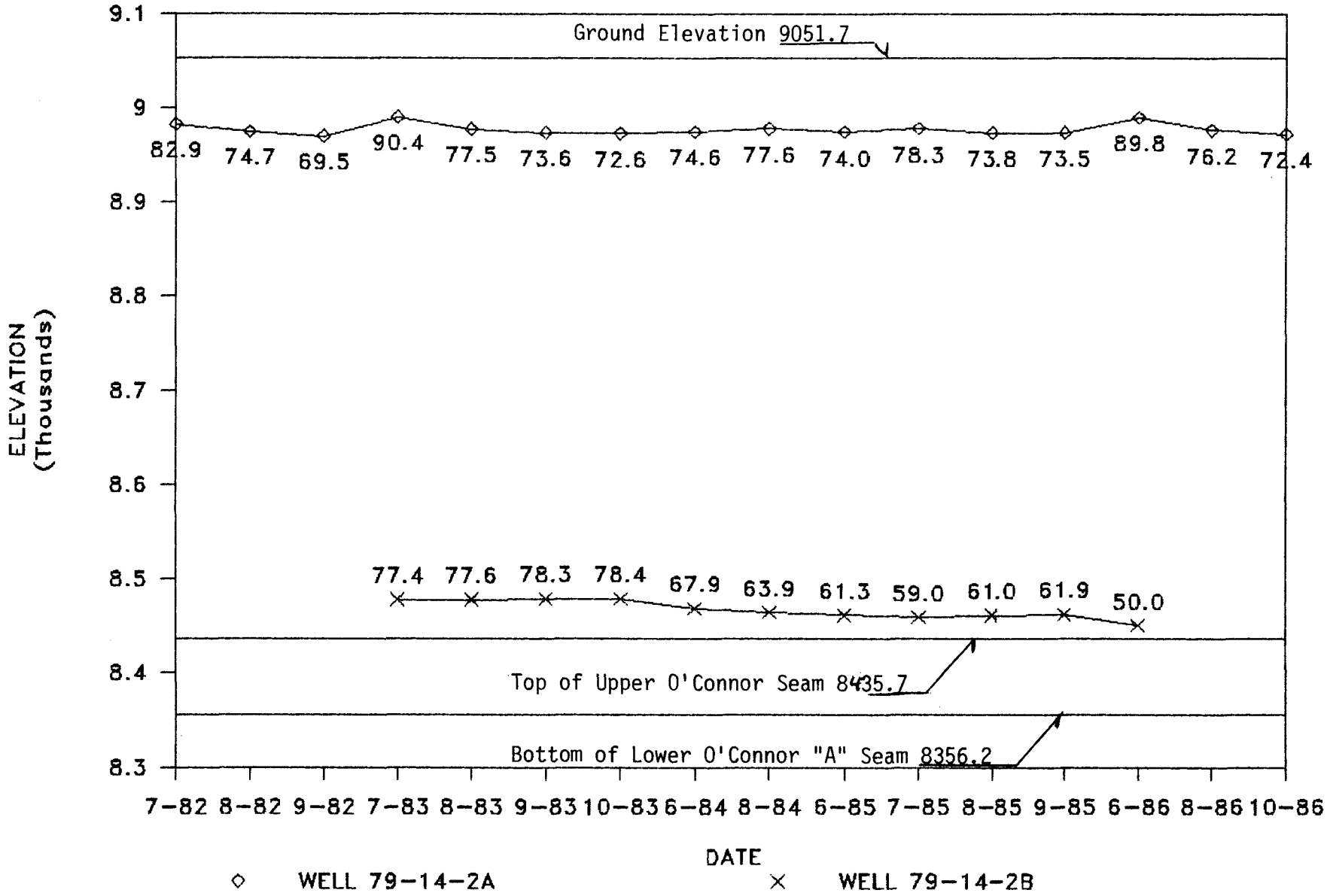
WELL WATER LEVEL

Wells 79-10-1A and 79-10-1B



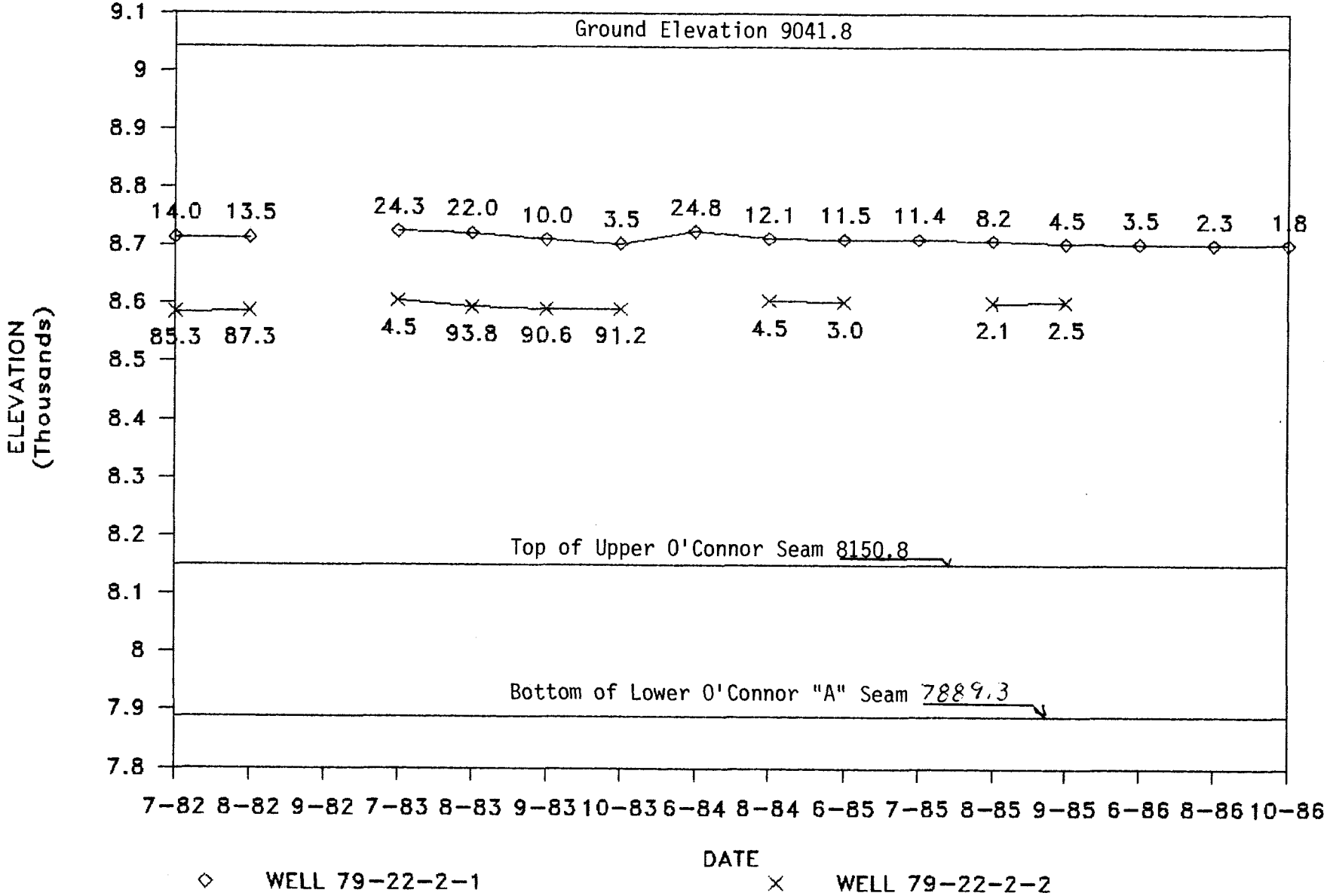
WELL WATER LEVEL

Wells 79-14-2A and 79-14-2B



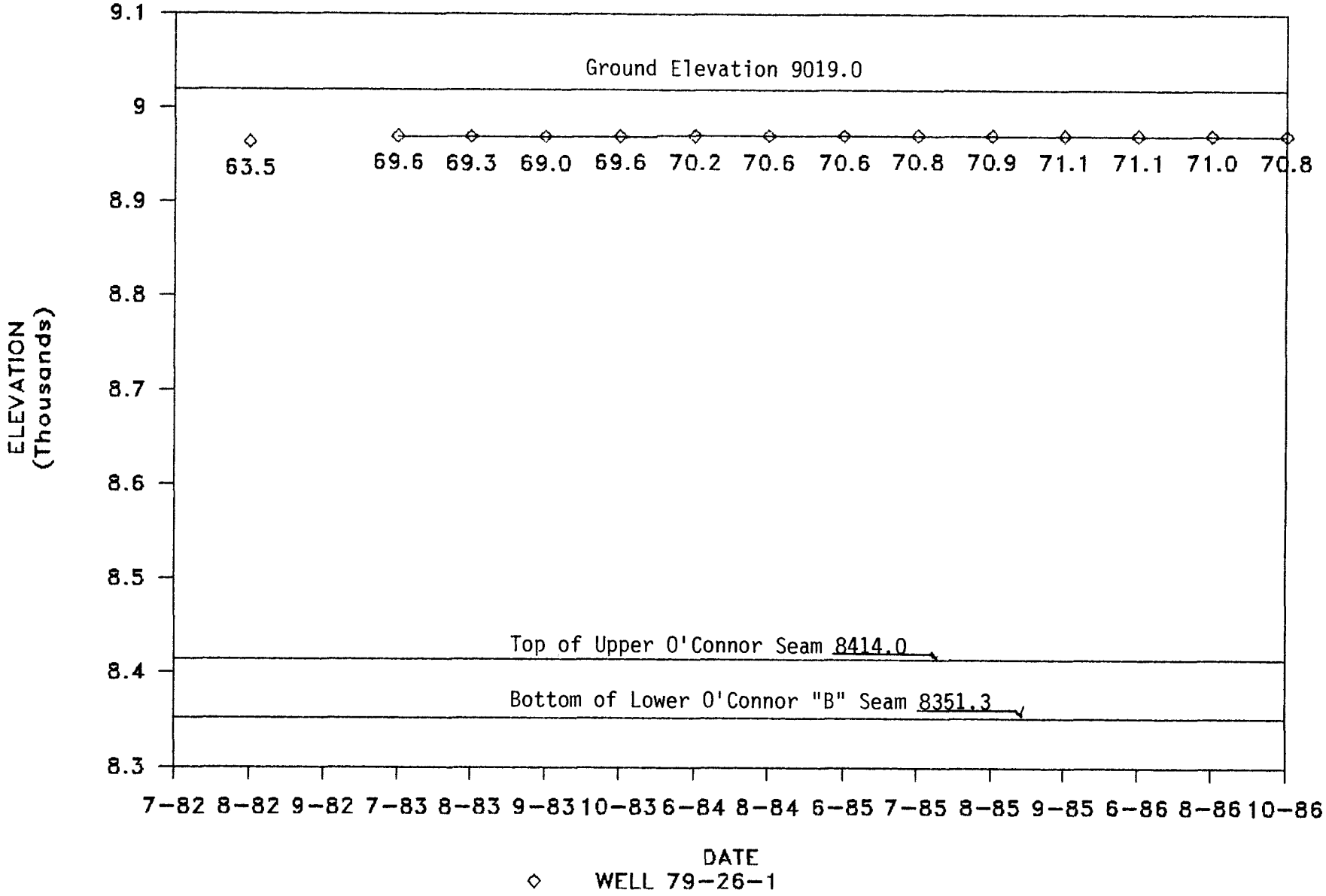
WELL WATER LEVEL

Wells 79-22-2-1 and 79-22-2-2



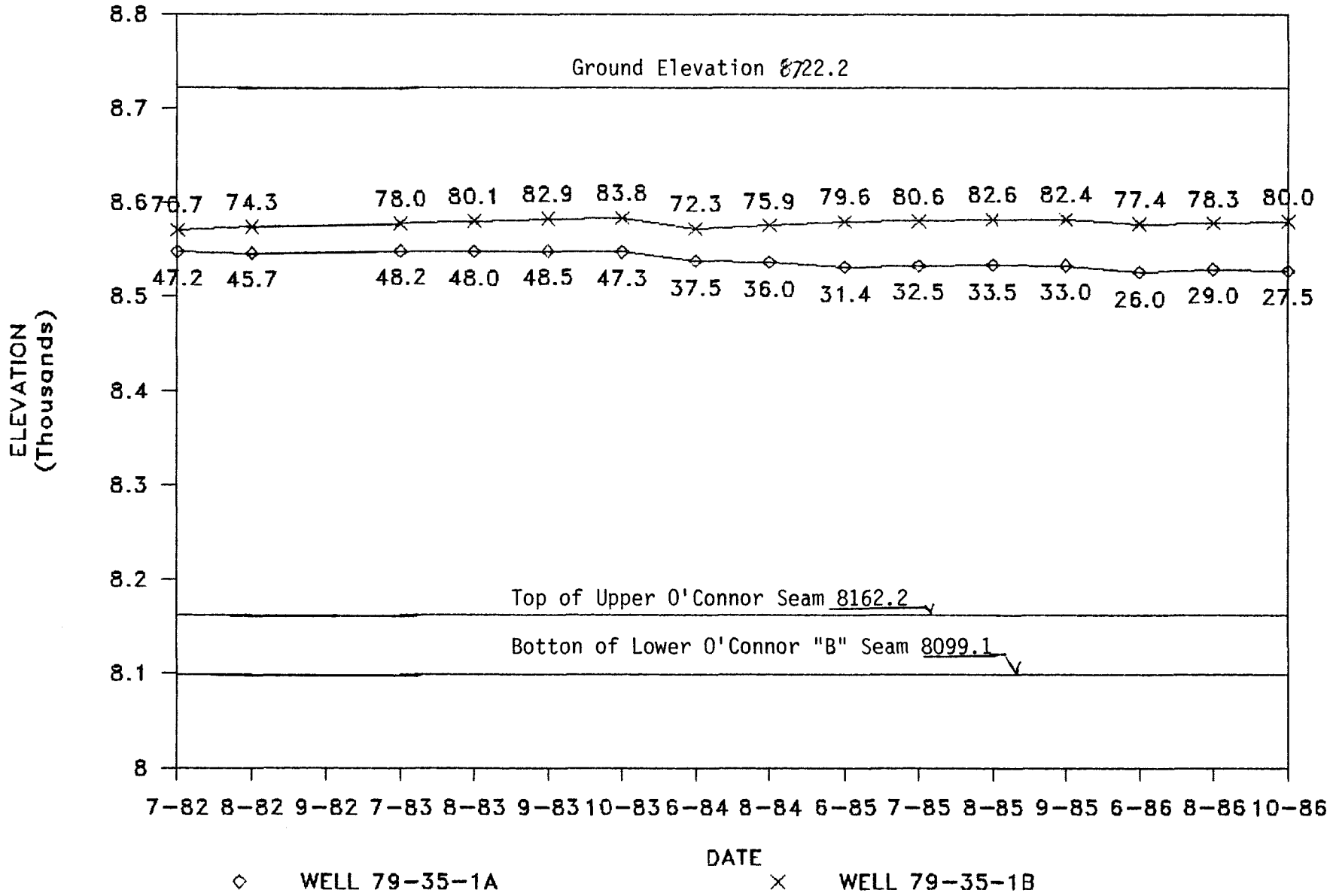
WELL WATER LEVEL

Well 79-26-1



WELL WATER LEVEL

Wells 79-35-1A and 79-35-1B



SURFACE WATER RIGHTS IN THE PRICE RIVER BASIN LOCATED ON AND ADJACENT TO THE SKYLINE PROPERTY

Water Use Claim No.	Owner	Source	Flow (cfs)	Purpose of Use	Period of Use
91-252	Utah Div. of Wildlife Resources	Gooseberry Creek with Storage	5.0	Fish Culture	January 1 to December 31
91-345	Tom Nicolaides Leon Nicolaides Mary Stathis Bessie Daraban	Green Canyon Spring Stream	0.75	Irrigation	March 1 to November 30
91-423	Nick Marakis (½ interest)	Winter Quarters Creek	----	Stockwatering	January 1 to December 31
91-431	Nick Marakis (½ interest)	Stream	----	Stockwatering	January 1 to December 31
91-436	Nick Marakis (½ interest)	Stream	----	Stockwatering	January 1 to December 31
91-437	Nick Marakis (½ interest)	Clear Creek	----	Stockwatering	January 1 to December 31
91-438	Nick Marakis (½ interest)	Clear Creek	----	Stockwatering	January 1 to December 31
91-440	Nick Marakis (½ interest)	Wash with storage	----	Stockwatering	January 1 to December 31
91-441	Nick Marakis (½ interest)	Stream with storage	----	Stockwatering	Janaury 1 to December 31
91-462	John Marakis Estate (½ interest)	Winter Quarters Creek	----	Stockwatering	January 1 to December 31
91-471	John Marakis Estate (½ interest)	Stream	----	Stockwatering	January 1 to December 31
91-476	John Marakis Estate (½ interest)	Stream	----	Stockwatering	January 1 to December 31
91-477	John Marakis Estate (½ interest)	Clear Creek	----	Stockwatering	January 1 to December 31
91-478	John Marakis Estate (½ interest)	Clear Creek	----	Stockwatering	January 1 to December 31

SURFACE WATER RIGHTS IN THE PRICE RIVER BASIN (continued)

Water Use Claim No.	Owner	Source	Flow (cfs)	Purpose of Use	Period of Use
91-1022	U.S. Forest Service	S. Fork Eccles Canyon Cr.	----	Stockwatering	July 1 to September 30
91-1023	U.S. Forest Service	Tributary to South Fork Eccles Canyon Creek	----	Stockwatering	July 1 to September 30
91-1024	U.S. Forest Service	Tributary to South Fork Eccles Canyon Creek	----	Stockwatering	July 1 to September 30
91-1025	U.S. Forest Service	Tributary to Eccles Canyon Cr.	----	Stockwatering	July 1 to September 30
91-1026	U.S. Forest Service	Tributary to Eccles Canyon Cr.	----	Stockwatering	July 1 to September 30
91-1027	U.S. Forest Service	Eccles Canyon Creek	----	Stockwatering	July 1 to September 30
91-1028	U.S. Forest Service	Eccles Canyon Creek	----	Stockwatering	July 1 to September 30
91-1029	U.S. Forest Service	Tributary to Winter Quarters Canyon Creek	----	Stockwatering	July 1 to September 30
91-1030	U.S. Forest Service	Tributary to Winter Quarters Canyon Creek	----	Stockwatering	July 1 to September 30
91-1031	U.S. Forest Service	Tributary to Winter Quarters Canyon Creek	----	Stockwatering	July 1 to September 30
91-1032	U.S. Forest Service	Tributary to Winter Quarters Canyon Creek	----	Stockwatering	July 1 to September 30
91-1033	U.S. Forest Service	Winter Quarters Canyon Creek	----	Stockwatering	July 1 to September 30
91-1034	U.S. Forest Service	Tributary to Winter Quarters Canyon Creek	----	Stockwatering	July 1 to September 30
91-1037	U.S. Forest Service	Tributary to Winter Quarters Canyon Creek	----	Stockwatering	July 1 to September 30
91-1038	U.S. Forest Service	Woods Canyon Creek	----	Stockwatering	July 1 to September 30
91-1040	U.S. Forest Service	East Fork Dairy Creek	----	Stockwatering	July 1 to September 30
91-1041	U.S. Forest Service	Andrew Dairy Creek	----	Stockwatering	July 1 to September 30

SURFACE WATER RIGHTS IN THE PRICE RIVER BASIN (continued)

Water Use Claim No.	Owner	Source	Flow (cfs)	Purpose of Use	Period of Use
91-1148	Leon & Tom Nicolaides Mary Stathis Bessie Daraban	Green Canyon Stream	----	Stockwatering	January 1 to December 31
91-1149	U.S. Forest Service	Gooseberry Creek with Storage	----	Stockwatering	July 1 to October 5
91-1678	Calvin K. Jacob	Stream	----	Stockwatering	May 1 to November 30
91-1713	N.M. Jensen Investment Co.	Spring Stream	----	Stockwatering Domestic	January 1 to December 31
91-2018	Angelo Georgedes	Green Canyon Stream with Storage	----	Stockwatering	May 1 to October 31
91-2019	Angelo Georgedes	Stream with storage	----	Stockwatering	May 1 to October 31
91-2020	Angelo Georgedes	Green Canyon Stream	----	Stockwatering	May 1 to October 31
91-2048	John Jouflas Estate	Pleasant Creek	----	Stockwatering	May 1 to October 31
91-2146	Elrie and Bertha Simonsen	Winter Quarters Creek	----	Stockwatering	June 1 to November 30
91-2495	Elrie & Bertha Simonsen	Woods Canyon Creek	----	Stockwatering	June 1 to November 30
91-2496	Elrie & Bertha Simonsen	Stream with storage	----	Stockwatering	June 1 to November 30
91-2548	John Jouflas Estate (2/3 interest)	Pleasant Creek	----	Stockwatering	May 1 to October 31
91-2549	Lee S. Thomas (1/3 interest)	Pleasant Creek	----	Stockwatering	May 1 to October 31
91-2971	Lee S. Thomas (1/3 interest)	Clear Creek	0.106	Irrigation	March 1 to November 30
91-2972	John Jouflas Estate (2/3 interest)	Clear Creek	0.106	Irrigation	March 1 to November 30
91-2973	John Jouflas Estate	Clear Creek	0.381	Irrigation	March 1 to November 30

SURFACE WATER RIGHTS IN THE PRICE RIVER BASIN (continued)

Water Use Claim No.	Owner	Source	Flow (cfs)	Purpose of Use	Period of Use
91-2997	Alice M. Pannier (4.85/21.70 interest)	Woods Canyon Creek	0.50	Irrigation	March 1 to November 30
91-2998	Boyd W. & Johannah M. Hafen (12.0/21.70 interest)	Woods Canyon Creek	0.50	Irrigation	March 1 to November 30
91-2999	Reed & Leoan M. Gunderson	Woods Canyon Creek	0.136	Irrigation	March 1 to November 30
91-3002	Della L. Madsen	Woods Canyon Creek	0.035	Irrigation	March 1 to November 30
91-3003	Charles J. Jacobsen Evelyn M. Jacobsen Stephen C. Hacobsen Charlyn J. Dalebout (7.9/26.0 interest)	Woods Canyon Creek	0.433	Irrigation	March 1 to November 30
91-3004	Louise M. Watts Helen L. Watts John Andy Watts (18.1/26.0 interest)	Woods Canyon Creek	0.433	Irrigation	March 1 to November 30
91-3007	Elrie M. & Bertha Simonsen	Winter Quarters Creek	0.63	Irrigation	March 1 to November 30
91-3008	S. J. Harkness	Winter Quarters Creek	0.693	Irrigation	March 1 to November 30
91-3009	Elrie M. & Bertha Simonsen	Winter Quarters Creek	0.68	Irrigation	March 1 to November 30
91-3010	S. J. Harkness	Winter Quarters Creek	0.213	Irrigation	March 1 to November 30
91-3011	S. J. Harkness	Winter Quarters Creek	----	Stockwatering	January 1 to December 31
91-3014	Anton Michelog	Snidder Creek	----	Stockwatering	January 1 to December 31
91-3015	Anton Michelog	Mud Creek	----	Stockwatering	January 1 to December 31
91-3040	Tom Nicolaides Leon Nicolaides Mary Stathis Bessie Darsban	Clear Creek	----	Stockwatering	January 1 to December 31
91-3045	Milton A. Oman	Clear Creek	----	Stockwatering	January 1 to December 31

SURFACE WATER RIGHTS IN THE PRICE RIVER BASIN (continued)

Water Use Claim No.	Owner	Source	Flow (cfs)	Purpose of Use	Period of Use
91-3083	Lavern Jensen	Finn Canyon Creek	----	Stockwatering	January 1 to December 31
91-3084	Milton A. Oman	Finn Canyon Creek	----	Stockwatering	January 1 to December 31
91-3086	Anton Michelog	Long Canyon Creek	----	Stockwatering	January 1 to December 31
91-3086	Anton Michelog	Long Canyon Creek	----	Stockwatering	January 1 to December 31
91-3090	Anton Michelog	Stream with storage	----	Stockwatering	January 1 to December 31
91-3405	Elrie & Bertha Simonsen	Woods Canyon Creek	----	Irrigation Stockwatering	March 1 to November 30
91-3440	Calvin R. Jacob	Clear Creek	----	Stockwatering	May 1 to November 30
91-3587	North American Coal Corp.	Boardinghouse Canyon Creek	----	Stockwatering	June 1 to November 30
91-3588	North American Coal Corp.	Finn Canyon Creek	----	Stockwatering	June 1 to November 30
91-3589	North American Coal Corp.	Mud Creek	----	Stockwatering	June 1 to November 30
91-3622	Mae Nicolodemas	Clear Creek	0.016	Irrigation	March 1 to November 30
91-3630	Utah Board of State Lands	Gooseberry Creek	----	Stockwatering	June 1 to November 30
91-3631	D. Euray Allred	Woods Canyon Creek	----	Stockwatering	May 1 to November 30
91-3633	D. Euray Allred	Winter Quarters Creek	----	Stockwatering	May 1 to November 30
91-3635	D. Euray Allred	Stream	----	Stockwatering	May 1 to November 30
91-3641	Pete Frandsen	Stream with storage	----	Stockwatering	June 1 to November 30
91-3644	Justus O. Seely	Clear Creek	----	Stockwatering	June 1 to November 30
91-3645	S. J. Harkness	Clear Creek	----	Stockwatering	June 1 to November 30
91-3648	John B. Jones	Clear Creek	----	Stockwatering	January 1 to December 31
91-3655	John B. Jones	Woods Canyon Creek	----	Stockwatering	January 1 to December 31

SURFACE WATER RIGHTS IN THE SAN RAFAEL RIVER BASIN LOCATED ON AND ADJACENT TO THE SKYLINE PROPERTY

Water Use Claim No.	Owner	Source	Flow (cfs)	Purpose of Use	Period of Use
93-1	U.S. Forest Service	Kitchen Fork of Huntington Cr.	-----	Stockwatering	July 1 to October 10
93-2	U.S. Forest Service	Kitchen Fork of Huntington Cr.	-----	Stockwatering	July 1 to September 30
93-3	U.S. Forest Service	Kitchen Fork of Huntington Cr.	-----	Stockwatering	July 1 to September 30
93-4	Crowther Investment Co.	Kitchen Fork of Huntington Cr.	-----	Stockwatering	July 1 to September 30
93-6	U.S. Forest Service	N. Fork of Huntington Creek	-----	Stockwatering	July 1 to September 30
93-8	U.S. Forest Service	Unnamed for of Huntington Cr.	-----	Stockwatering	July 1 to September 30
93-9	U.S. Forest Service	Huntington Creek	-----	Stockwatering	July 1 to September 30
93-10	L.D.S. Church	Swens Canyon Creek	-----	Stockwatering	----------
93-11	U.S. Forest Service	Swen's Canyon Creek	-----	Stockwatering	July 1 to September 30
93-12	U.S. Forest Service	Huntington Creek	-----	Stockwatering	July 1 to September 30
93-13	U.S. Forest Service	Burnout Canyon Creek	-----	Stockwatering	July 1 to September 30
93-14	U.S. Forest Service	James Canyon Creek	-----	Stockwatering	July 1 to September 30
93-16	U.S. Forest Service	James Canyon Creek	-----	Stockwatering	July 1 to September 30
93-18	U.S. Forest Service	Flat Canyon Creek	-----	Stockwatering	July 1 to September 30
93-19	U.S. Forest Service	Flat Canyon Creek	-----	Stockwatering	July 1 to September 30
93-20	U.S. Forest Service	Boulger Creek	-----	Stockwatering	July 1 to September 30
93-21	U.S. Forest Service	Boulger Creek	-----	Stockwatering	July 1 to September 30
93-32	Lela C. Mower	Jackson Spring #1 Stream	-----	Irrigation Stockwatering	----------
93-33	Clyde K. Cox	Jackson Spring #1 Stream	-----	Irrigation Stockwatering	----------

SURFACE WATER RIGHTS IN THE SAN RAFAEL RIVER BASIN (continued)

Water Use Claim No.	Owner	Source	Flow (cfs)	Purpose of Use	Period of Use
93-77	Utah Power & Light Co.	Bear Canyon Creek	-----	Stockwatering	July 1 to September 30
93-78	U.S. Forest Service	Coal Creek	-----	Stockwatering	July 1 to September 30
93-79	U.S. Forest Service	Coal Creek	-----	Stockwatering	July 1 to September 30
93-80	Reed Neilson	Huntington Creek	-----	Stockwatering	July 1 to September 30
93-81	Bernard Nielsen	Huntington Creek	-----	Stockwatering	July 1 to September 30
93-82	Utah Power and Light Co.	Huntington Creek	-----	Stockwatering	July 1 to September 30
93-83	U.S. Forest Service	Cox Canyon Creek	-----	Stockwatering	July 1 to September 30
93-84	U.S. Forest Service	Valentine Gulch	-----	Stockwatering	July 1 to September 30
93-85	U.S. Forest Service	Valentine Gulch	-----	Stockwatering	July 1 to September 30
93-89	Valenine Gulch Inc.	Valentine Gulch	-----	Stockwatering	July 1 to September 30
93-96	Utah Power and Light Co.	Huntington Creek	-----	Stockwatering	July 1 to September 30
93-265	Utah Power and Light Co.	Coal Creek	-----	Stockwatering	July 1 to September 30
93-290	Utah Power and Light Co.	Coal Creek	-----	Stockwatering	July 1 to September 30
93-338	U.S. Forest Service	Huntington Creek	-----	Stockwatering	July 1 to September 30
93-346	L.D.S. Church	Little Swens Canyon Cr.	-----	Stockwatering Domestic	June 1 to November 30
93-348	U.S. Forest Service	Spring Creek	-----	Stockwatering	June 16 to October 5
93-399	Utah Power and Light Co.	Huntington Creek	-----	Stockwatering	July 1 to September 30
93-434	William R. Whitehead et al	Kitchen Fork of Huntington Cr.	-----	Stockwatering	June 1 to November 30
93-543	Morris S. & Betty A. Cook	Coal Creek	-----	Stockwatering	July 1 to September 30
93-551	Utah Power and Light Co.	Cox Canyon Creek	-----	Stockwatering	July 1 to September 30
93-553	Utah Power and Light Co.	James Canyon Creek	-----	Stockwatering	July 1 to September 30

GROUND WATER RIGHTS IN THE PRICE RIVER BASIN LOCATED ON AND ADJACENT TO THE SKYLINE PROPERTY

Water Use Claim No.	Owner	Source	Flow (cfs)	Purpose of Use	Period of Use
91-119	U.S. Forest Service	Spring	0.03	Domestic, Irrigation	March 1 to November 30
91-136	U.S. Forest Service	Beaver Dam Ridge Spring	0.006	Stockwatering	May 1 to October 31
91-200	Utah Natural Gas Company (½ interest)	Underground Water, well	0.134	Domestic Irrigation	January 1 to December 31
91-201	Earl Thomas	Spring with storage	0.068	Stockwatering	April 15 to November 1
91-288	U.S. Forest Service	Gooseberry Campground Spring	0.098	Domestic	May 1 to October 31
91-408	Calvin K. Jacob	Spring	0.011	Stockwatering	May 1 to November 30
91-424	Nick Marakis (½ interest)	Spring with storage	0.011	Stockwatering	January 1 to December 31
91-425	Nick Marakis (½ interest)	Spring	0.022	Stockwatering	January 1 to December 31
91-432	Nick Marakis (½ interest)	Spring	0.011	Stockwatering	January 1 to December 31
91-433	Nick Marakis (½ interest)	Spring with storage	0.011	Stockwatering	January 1 to December 31
91-434	Nick Marakis (½ interest)	Spring with storage	0.011	Stockwatering	January 1 to December 31
91-435	Nick Marakis (½ interest)	Spring	0.011	Stockwatering	January 1 to December 31
91-455	Robert Radakovich	Spring	0.011	Stockwatering	May 1 to December 15
91-463	John Marakis Estate (½ interest)	Spring with storage	0.011	Stockwatering	January 1 to December 31
91-464	John Marakis Estate (½ interest)	Spring	0.022	Stockwatering	January 1 to December 31
91-472	John Marakis Estate (½ interest)	Spring	0.011	Stockwatering	January 1 to December 31

GROUND WATER RIGHTS IN THE PRICE RIVER BASIN (continued)

Water Use Claim No.	Owner	Source	Flow (cfs)	Purpose of Use	Period of Use
91-1158	N.M. Jensen Investment Co.	Aagard Spring	0.638	Irr.,Stock., Domestic	June 1 to October 31
91-1643	Jack Thomas	Spring with storage	0.011	Stockwatering	January 1 to December 31
91-1644	Lee Thomas (1/3 interest)	Spring	-----	Stockwatering	May 1 to October 31
91-1679	Calvin K. Jacob	Spring	0.011	Stock. and Domestic	May 1 to November 30
91-1680	Calvin K. Jacob	Spring	0.011	Stockwatering	May 1 to November 30
91-1681	Calvin K. Jacob	Spring	0.011	Stockwatering	May 1 to November 30
91-1699	N.M. Jensen Investment Co.	Spring	0.022	Stockwatering	June 1 to October 31
91-1700	N.M. Jensen Investment Co.	Spring	0.022	Stockwatering	June 1 to October 31
91-1701	N.M. Jensen Investment Co.	Spring	0.022	Stockwatering	June 1 to October 31
91-1702	N.M. Jensen Investment Co.	Spring	0.022	Stockwatering	June 1 to October 31
91-1710	N.M. Jensen Investment Co.	Spring	0.022	Stockwatering	June 1 to October 31
91-1711	N.M. Jensen Investment Co.	Spring	0.022	Stockwatering	June 1 to October 31
91-1714	N.M. Jensen Investment Co.	Spring	0.022	Stockwatering	June 1 to October 31
91-1986	Angelo Georgedes	Spring with storage	0.05	Fish Culture	January 1 to December 31
91-2049	John Jouflas Estate (2/3 interest)	Spring	0.011	Stockwatering	May 1 to October 31
91-2144	Elrie and Bertha Simonsen (½ interest)	Simonsen Spring	0.022	Domestic	January 1 to December 31
91-2145	Robert Radakovich (½ interest)	Simonsen Spring	0.022	Domestic	January 1 to December 31
91-2288	Elrie & Bertha Simonsen	Spring	0.011	Stockwatering	June 1 to November 30
91-2494	Elrie & Bertha Simonsen	Mooney Mine Spring	----	Irrigation Stockwatering	March 1 to November 30

GROUND WATER RIGHTS IN THE PRICE RIVER BASIN (continued)

Water Use Claim No.	Owner	Source	Flow (cfs)	Purpose of Use	Period of Use
91-3601	Della L. Madsen	Spring	0.011	Stockwatering	June 1 to November 30
91-3634	D. Euray Allred	Spring	0.011	Stockwatering	May 1 to November 30
91-3638	D. Euray Allred	Spring	0.011	Stockwatering	May 1 to November 30
91-3642	John B. Jones	Spring with storage	0.011	Stockwatering	January 1 to December 31
91-3668	Angelo Georgedes	Spring	0.015	Stockwatering	May 1 to October 31
91-3971	Lionel L. Peterson	Spring	0.022	Stock. & Domestic	May 1 to November 30
91-3973	Lionel L. Peterson	Spring	0.022	Stock. & Domestic	May 1 to November 30
91-3974	Lionel L. Peterson	Spring	0.022	Stock. & Domestic	May 1 to November 30
91-3975	Lionel L. Peterson	Spring	0.022	Stock. & Domestic	May 1 to November 30
91-3976	Lionel L. Peterson	Spring	0.022	Stock. & Domestic	May 1 to November 30
91-3977	Lionel L. Peterson	Spring	0.022	Stock. & Domestic	May 1 to November 30
91-3978	Lionel L. Peterson	Spring	0.022	Stock. & Domestic	May 1 to November 30
91-3979	Lionel L. Peterson	Spring	0.022	Stock. & Domestic	May 1 to November 30
91-3980	Lionel L. Peterson	Spring	0.022	Stock. & Domestic	May 1 to November 30
91-3981	Lionel L. Peterson	Spring	0.022	Stock. & Domestic	May 1 to November 30
91-3982	Lionel L. Peterson	Spring	0.022	Stock. & Domestic	May 1 to November 30
91-3983	Lionel L. Peterson	Spring	0.022	Stock. & Domestic	May 1 to November 30
91-3985	Lionel L. Peterson	Spring	0.022	Stock. & Domestic	May 1 to November 30
P*91-4217	Carol C. Dixon	Collard Spring	9.64	Stock. & Domestic	January 1 to December 31
P*91-4319	Robert Anderson	Robert Anderson Spring	0.035AF	Stock. & Domestic	January 1 to December 31

P* - Pending

GROUND WATER RIGHTS IN THE SAN RAFAEL RIVER BASIN (continued)

Water Use Claim No.	Owner	Source	Flow (cfs)	Purpose of Use	Period of Use
93-59	Clyde K. Cox	Saw Mill Spring	-----	Stockwatering, Irrig.	----------
93-60	Roscoe C. Cox	Stan Spring #1	-----	Stockwatering	----------
93-61	Roscoe C. Cox	Stan Spring #2	-----	Stockwatering	----------
93-62	Stanley Cox	Saw Mill Springs	-----	Stockwatering, Irrig.	----------
93-63	Stanley Cox	Stan Spring #1	-----	Stockwatering, Irrig.	----------
93-64	Roscoe C. Cox	Stan Spring #1	-----	Stockwatering, Irrig.	----------
93-65	Doris R. Cox	Stan Spring #2	-----	Stockwatering, Irrig.	----------
93-66	Donald B. Cox	Stan Spring #2	-----	Stockwatering, Irrig.	----------
93-67	Newel B. Cox	Mineral Spring #2	-----	Stockwatering, Irrig.	----------
93-68	Evan Cox	Stan Spring #2	-----	Stockwatering, Irrig.	
93-69	A. Ira Cox	Stan Spring #2	-----	Stockwatering, Irrig.	----------
93-70	Olea D. Cox	Mineral Spring #2	-----	Stockwatering, Irrig.	----------
93-71	Roscoe C. Cox	Worth Spring Stream	-----	Stockwatering, Irrig.	----------
93-72	Evan Cox	Ross Spring #2	-----	Stockwatering	----------
93-75	Evan Cox	Ross Spring #3	-----	Stockwatering	----------
93-90	L.D.S. Church	Unnamed Spring	0.022	Stockwatering Domestic	June 1 to November 30
93-114	L.D.S. Church	Unnamed Spring	0.022	Stockwatering	June 1 to November 30
93-127	L.D.S. Church	Unnamed Spring	0.022	Stockwatering	June 1 to November 30
93-145	L.D.S. Church	Unnamed Spring	0.022	Stockwatering	June 1 to November 30
93-153	L.D.S. Church	Unnamed Spring	0.022	Stockwatering	June 1 to November 30
93-154	L.D.S. Church	Unnamed Spring	0.022	Stockwatering	June 1 to November 30

GROUND WATER RIGHTS IN THE SAN RAFAEL RIVER BASIN (continued)

Water Use Claim No.	Owner	Source	Flow (cfs)	Purpose of Use	Period of Use
93-404	Russel O. Brown	Unnamed Spring	0.0222	Stockwatering	June 1 to October 15
93-411	M. Dover Hunt	Unnamed Spring	0.0222	Stockwatering	June 1 to October 15
93-429	Don Evans	Unnamed Spring	0.0222	Stockwatering	June 1 to October 15
93-430	Eli Clayson	Unnamed Spring	0.0222	Stockwatering	June 1 to October 15
93-431	Clark T. Thorstensen	Unnamed Spring	0.0222	Stockwatering	June 1 to October 15
93-432	Crowther Investment Company	Brooks Canyon Divide	0.011	Stockwatering	June 1 to October 15
93-433	William R. Whitehead et al	Unnamed Spring	0.011	Stockwatering	June 1 to October 15
93-435	Crowther Investment Company	Unnamed Spring	0.011	Stockwatering	June 1 to October 15
93-449	Crowther Investment Company	Unnamed Spring	0.011	Stockwatering Domestic	June 1 to October 15
93-763	Robert N. Anderson	Unnamed Spring #8	0.018	Stockwatering	June 15 to October 15
93-770	W. Chad Cox	Spring House Spring	-----	Irrigation Stockwatering	----------
93-771	Donald B. Cox	Spring House Spring	-----	Irrigation Stockwatering	----------
93-773	Roscoe C. Cox	Ross Spring #1	-----	Stockwatering	----------
93-774	A. Ira Cox	Ike Spring #1	-----	Stockwatering	----------
93-775	A. Ira Cox	Ike Spring #2	-----	Stockwatering	----------
93-838	L.D.S. Church	Unnamed Spring	0.022	Stockwatering	June 1 to November 30
93-839	L.D.S. Church	Unnamed Spring	0.022	Stockwatering	June 1 to November 30
93-840	N. M. Jensen Investment Company	Unnamed Spring	0.022	Stockwatering	June 1 to November 30
93-841	N. M. Jensen Investment Company	Unnamed Spring	0.022	Stockwatering Domestic	June 1 to November 30

WATER RIGHT EXCHANGES IN THE SKYLINE PROPERTY AREA

Water Use Claim No.	Owner	Source	Flow (cfs)	Purpose of Use	Period of Use
91-164	Louise Gorishek	Well	1.0 A.F.	Domestic	January 1 to December 31
91-452	Robert Radakovich	Well	1.0 A.F.	Stockwatering	March 1 to November 30
91-772	Valley Camp Coal Company	Well	0.446 cfs	Industrial Domestic	January 1 to December 31
91-940	Gooseberry Enterprise Inc	Springs	66.0 A.F.	Domestic	January 1 to December 31
91-1058	Price River Water Users Association	Well	7.7 A.F.	Industrial Domestic	January 1 to December 31
91-1114	Coastal States Energy Co.	Wells	30.0 A.F.	Industrial Domestic	January 1 to December 31
91-1560	Coastal States Energy Co.	Wells	118.0 A.F.	Industrial Domestic	January 1 to December 31
91-1658	Robert Radakovich	Spring	1.0 A.F.	Domestic	January 1 to December 31
91-1669	T.O.E. Investments	Well	3.0 A.F.	Industrial	January 1 to December 31
91-1691	Valley Camp of Utah Inc	Well	7.7 A.F.	Industrial Domestic	January 1 to December 31
91-1906	Coastal States Energy Co.	Wells	118.0 A.F.	Industrial Domestic	January 1 to December 31
91-1912	Jim Nicolodemos	Well	1.0 A.F.	Domestic	January 1 to December 31
91-2188	LDS Church	Well	1.0 A.F.	Domestic	May 1 to October 30
91-2385	Max A. Blackam	Spring	0.5 A.F.	Domestic	January 1 to December 31
91-2475	LDS Church	Well	1.0 A.F.	Domestic	January 1 to December 31

SURFACE WATER RIGHTS IN THE PRICE RIVER BASIN LOCATED ON AND ADJACENT TO THE SKYLINE PROPERTY

Water Use Claim No.	Owner	Source	Flow (cfs)	Purpose of Use	Period of Use
91-252	Utah Div. of Wildlife Resources	Gooseberry Creek with Storage	5.0	Fish Culture	January 1 to December 31
91-345	Tom Nicolaides Leon Nicolaides Mary Stathis Bessie Daraban	Green Canyon Spring Stream	0.75	Irrigation	March 1 to November 30
91-423	Nick Marakis (½ interest)	Winter Quarters Creek	---	Stockwatering	January 1 to December 31
91-431	Nick Marakis (½ interest)	Stream	---	Stockwatering	January 1 to December 31
91-436	Nick Marakis (½ interest)	Stream	---	Stockwatering	January 1 to December 31
91-437	Nick Marakis (½ interest)	Clear Creek	---	Stockwatering	January 1 to December 31
91-438	Nick Marakis (½ interest)	Clear Creek	---	Stockwatering	January 1 to December 31
91-440	Nick Marakis (½ interest)	Wash with storage	---	Stockwatering	January 1 to December 31
91-441	Nick Marakis (½ interest)	Stream with storage	---	Stockwatering	Janaury 1 to December 31
91-462	John Marakis Estate (½ interest)	Winter Quarters Creek	---	Stockwatering	January 1 to December 31
91-471	John Marakis Estate (½ interest)	Stream	---	Stockwatering	January 1 to December 31
91-476	John Marakis Estate (½ interest)	Stream	---	Stockwatering	January 1 to December 31
91-477	John Marakis Estate (½ interest)	Clear Creek	---	Stockwatering	January 1 to December 31
91-478	John Marakis Estate (½ interest)	Clear Creek	---	Stockwatering	January 1 to December 31

SURFACE WATER RIGHTS IN THE PRICE RIVER BASIN (continued)

Water Use Claim No.	Owner	Source	Flow (cfs)	Purpose of Use	Period of Use
91-479	John Marakis Estate (½ interest)	Wash with storage	----	Stockwatering	January 1 to December 31
91-480	John Marakis Estate (½ interest)	Stream with storage	----	Stockwatering	January 1 to December 31
91-482	Robert Radakovich	Stream	----	Stockwatering	May 1 to December 15
91-483	Robert Radakovich	Winter Quarters Creek	0.443	Irrigation Stockwatering	March 1 to December 15
91-592	John Marakis Estate (½ interest)	Mud Creek	----	Stockwatering	January 1 to December 31
91-593	Nick Marakis (½ interest)	Mud Creek	----	Stockwatering	January 1 to December 31
91-1009	U.S. Forest Service	Tributary to Snider Canyon Cr.	----	Stockwatering	July 1 to September 30
91-1010	U.S. Forest Service	Tributary to Mud Creek	----	Stockwatering	July 1 to September 30
91-1011	U.S. Forest Service	Mud Creek	----	Stockwatering	July 1 to September 30
91-1012	U.S. Forest Service	Mud Creek	----	Stockwatering	July 1 to September 30
91-1014	U.S. Forest Service	Tributary to Mud Creek	----	Stockwatering	July 1 to September 30
91-1015	U.S. Forest Service	Tributary to Mud Creek	----	Stockwatering	July 1 to September 30
91-1016	U.S. Forest Service	Long Canyon Creek	----	Stockwatering	July 1 to September 30
91-1017	U.S. Forest Service	Tributary to Long Canyon Cr.	----	Stockwatering	July 1 to September 30
91-1018	U.S. Forest Service	Tributary to Mud Creek	----	Stockwatering	July 1 to September 30
91-1019	U.S. Forest Service	Tributary to Boardinghouse Canyon Creek	----	Stockwatering	July 1 to September 30
91-1020	U.S. Forest Service	Boardinghouse Canyon Creek	----	Stockwatering	July 1 to September 30
91-1021	U.S. Forest Service	Boardinghouse Canyon Creek	----	Stockwatering	July 1 to September 30

SURFACE WATER RIGHTS IN THE PRICE RIVER BASIN (continued)

Water Use Claim No.	Owner	Source	Flow (cfs)	Purpose of Use	Period of Use
91-1022	U.S. Forest Service	S. Fork Eccles Canyon Cr.	----	Stockwatering	July 1 to September 30
91-1023	U.S. Forest Service	Tributary to South Fork Eccles Canyon Creek	----	Stockwatering	July 1 to September 30
91-1024	U.S. Forest Service	Tributary to South Fork Eccles Canyon Creek	----	Stockwatering	July 1 to September 30
91-1025	U.S. Forest Service	Tributary to Eccles Canyon Cr.	----	Stockwatering	July 1 to September 30
91-1026	U.S. Forest Service	Tributary to Eccles Canyon Cr.	----	Stockwatering	July 1 to September 30
91-1027	U.S. Forest Service	Eccles Canyon Creek	----	Stockwatering	July 1 to September 30
91-1028	U.S. Forest Service	Eccles Canyon Creek	----	Stockwatering	July 1 to September 30
91-1029	U.S. Forest Service	Tributary to Winter Quarters Canyon Creek	----	Stockwatering	July 1 to September 30
91-1030	U.S. Forest Service	Tributary to Winter Quarters Canyon Creek	----	Stockwatering	July 1 to September 30
91-1031	U.S. Forest Service	Tributary to Winter Quarters Canyon Creek	----	Stockwatering	July 1 to September 30
91-1032	U.S. Forest Service	Tributary to Winter Quarters Canyon Creek	----	Stockwatering	July 1 to September 30
91-1033	U.S. Forest Service	Winter Quarters Canyon Creek	----	Stockwatering	July 1 to September 30
91-1034	U.S. Forest Service	Tributary to Winter Quarters Canyon Creek	----	Stockwatering	July 1 to September 30
91-1037	U.S. Forest Service	Tributary to Winter Quarters Canyon Creek	----	Stockwatering	July 1 to September 30
91-1038	U.S. Forest Service	Woods Canyon Creek	----	Stockwatering	July 1 to September 30
91-1040	U.S. Forest Service	East Fork Dairy Creek	----	Stockwatering	July 1 to September 30
91-1041	U.S. Forest Service	Andrew Dairy Creek	----	Stockwatering	July 1 to September 30

SURFACE WATER RIGHTS IN THE PRICE RIVER BASIN (continued)

Water Use Claim No.	Owner	Source	Flow (cfs)	Purpose of Use	Period of Use
91-1043	U.S. Forest Service	Wife Creek	----	Stockwatering	July 1 to September 30
91-1044	U.S. Forest Service	Wife Creek	----	Stockwatering	July 1 to September 30
91-1047	U.S. Forest Service	Tributary to French Creek	----	Stockwatering	July 1 to September 30
91-1048	U.S. Forest Service	Tributary to French Creek	----	Stockwatering	July 1 to September 30
91-1049	U.S. Forest Service	French Creek	----	Stockwatering	July 1 to September 30
91-1050	U.S. Forest Service	French Creek	----	Stockwatering	July 1 to September 30
91-1112	U.S. Forest Service	Mill Creek	----	Stockwatering	July 1 to October 10
91-1113	U.S. Forest Service	Mill Creek	----	Stockwatering	July 1 to September 30
91-1114	U.S. Forest Service	Tributary to Mill Creek	----	Stockwatering	July 1 to September 10
91-1115	U.S. Forest Service	Gooseberry Creek	----	Stockwatering	July 1 to October 10
91-1116	U.S. Forest Service	Gooseberry Creek	----	Stockwatering	July 1 to October 10
91-1117	U.S. Forest Service	Gooseberry Creek	----	Stockwatering	July 1 to October 10
91-1118	U.S. Forest Service	Gooseberry Creek	----	Stockwatering	July 1 to October 10
91-1119	U.S. Forest Service	Tributary to Gooseberry Cr.	----	Stockwatering	July 1 to October 10
91-1120	U.S. Forest Service	Tributary to Gooseberry Cr.	----	Stockwatering	July 1 to October 10
91-1121	U.S. Forest Service	Gooseberry Creek	----	Stockwatering	June 6 to October 10
91-1128	U.S. Forest Service	Jap Creek	----	Stockwatering	June 6 to October 10
91-1129	U.S. Forest Service	Jap Creek	----	Stockwatering	July 1 to September 30
91-1142	U.S. Forest Service	Gooseberry Creek	----	Stockwatering	June 6 to October 10
91-1143	U.S. Forest Service	Gooseberry Creek	----	Stockwatering	July 1 to October 5
91-1146	U.S. Forest Service	Gooseberry Creek	----	Stockwatering	July 1 to October 5
91-1147	U.S. Forest Service	Gooseberry Creek	----	Stockwatering	July 1 to September 30

SURFACE WATER RIGHTS IN THE PRICE RIVER BASIN (continued)

Water Use Claim No.	Owner	Source	Flow (cfs)	Purpose of Use	Period of Use
91-1148	Leon & Tom Nicolaides Mary Stathis Bessie Daraban	Green Canyon Stream	----	Stockwatering	January 1 to December 31
91-1149	U.S. Forest Service	Gooseberry Creek with Storage	----	Stockwatering	July 1 to October 5
91-1678	Calvin K. Jacob	Stream	----	Stockwatering	May 1 to November 30
91-1713	N.M. Jensen Investment Co.	Spring Stream	----	Stockwatering Domestic	January 1 to December 31
91-2018	Angelo Georgedes	Green Canyon Stream with Storage	----	Stockwatering	May 1 to October 31
91-2019	Angelo Georgedes	Stream with storage	----	Stockwatering	May 1 to October 31
91-2020	Angelo Georgedes	Green Canyon Stream	----	Stockwatering	May 1 to October 31
91-2048	John Jouflas Estate	Pleasant Creek	----	Stockwatering	May 1 to October 31
91-2146	Elrie and Bertha Simonsen	Winter Quarters Creek	----	Stockwatering	June 1 to November 30
91-2495	Elrie & Bertha Simonsen	Woods Canyon Creek	----	Stockwatering	June 1 to November 30
91-2496	Elrie & Bertha Simonsen	Stream with storage	----	Stockwatering	June 1 to November 30
91-2548	John Jouflas Estate (2/3 interest)	Pleasant Creek	----	Stockwatering	May 1 to October 31
91-2549	Lee S. Thomas (1/3 interest)	Pleasant Creek	----	Stockwatering	May 1 to October 31
91-2971	Lee S. Thomas (1/3 interest)	Clear Creek	0.106	Irrigation	March 1 to November 30
91-2972	John Jouflas Estate (2/3 interest)	Clear Creek	0.106	Irrigation	March 1 to November 30
91-2973	John Jouflas Estate	Clear Creek	0.381	Irrigation	March 1 to November 30

SURFACE WATER RIGHTS IN THE PRICE RIVER BASIN (continued)

Water Use Claim No.	Owner	Source	Flow (cfs)	Purpose of Use	Period of Use
91-2974	Justus O. Seely	Clear Creek	0.170	Irrigation Stockwatering	March 1 to November 30
91-2977	S. J. Harkness	Clear Creek	0.075	Irrigation	March 1 to November 30
91-2978	Justus O. Seely	Clear Creek	0.683	Irrigation Stockwatering	March 1 to November 30
91-2979	S. J. Harkness	Clear Creek	0.453	Irrigation	March 1 to November 30
91-2980	Helen Miller	Clear Creek	0.10	Irrigation	March 1 to November 30
91-2981	Orson Marsing	Clear Creek	0.10	Irrigation	March 1 to November 30
91-2982	Lillie Pearson	Clear Creek	0.10	Irrigation	March 1 to November 30
91-2983	Thomas Biggs, Jr.	Clear Creek	0.10	Irrigation	March 1 to November 30
91-2984	Waino E. Burton	Clear Creek	0.10	Irrigation	March 1 to November 30
91-2985	Phyllis M. Conover	Clear Creek	0.10	Irrigation	March 1 to November 30
91-2986	William & Armeda Sherman	Clear Creek	0.015	Irrigation	March 1 to November 30
91-2987	Leah B. Johnson	Clear Creek	0.10	Irrigation	March 1 to November 30
91-2988	E. D. & Elizabeth Jacobson	Clear Creek	0.10	Irrigation	March 1 to November 30
91-2989	Scofield Town	Clear Creek	0.10	Irrigation	March 1 to November 30
91-2990	Della L. Madsen	Clear Creek	1.166	Irrigation	March 1 to November 30
91-2991	John B. Jones	Clear Creek	4.58	Irrigaion	March 1 to November 30
91-2992	John B. Jones	Clear Creek	4.58	Irrigation	March 1 to November 30
91-2993	John B. Jones	Clear Creek	4.58	Irrigation	March 1 to November 30
91-2994	John B. Jones	Woods Canyon Creek	----	Irrigation	March 1 to November 30
91-2995	John B. Jones	Woods Canyon Creek	----	Irrigation	March 1 to November 30
91-2996	Gladys P. Butler (4.85/21.70 interest)	Woods Canyon Creek	0.50	Irrigation	March 1 to November 30

SURFACE WATER RIGHTS IN THE PRICE RIVER BASIN (continued)

Water Use Claim No.	Owner	Source	Flow (cfs)	Purpose of Use	Period of Use
91-2997	Alice M. Pannier (4.85/21.70 interest)	Woods Canyon Creek	0.50	Irrigation	March 1 to November 30
91-2998	Boyd W. & Johannah M. Hafen (12.0/21.70 interest)	Woods Canyon Creek	0.50	Irrigation	March 1 to November 30
91-2999	Reed & Leoan M. Gunderson	Woods Canyon Creek	0.136	Irrigation	March 1 to November 30
91-3002	Della L. Madsen	Woods Canyon Creek	0.035	Irrigation	March 1 to November 30
91-3003	Charles J. Jacobsen Evelyn M. Jacobsen Stephen C. Hacobsen Charlyn J. Dalebout (7.9/26.0 interest)	Woods Canyon Creek	0.433	Irrigation	March 1 to November 30
91-3004	Louise M. Watts Helen L. Watts John Andy Watts (18.1/26.0 interest)	Woods Canyon Creek	0.433	Irrigation	March 1 to November 30
91-3007	Elrie M. & Bertha Simonsen	Winter Quarters Creek	0.63	Irrigation	March 1 to November 30
91-3008	S. J. Harkness	Winter Quarters Creek	0.693	Irrigation	March 1 to November 30
91-3009	Elrie M. & Bertha Simonsen	Winter Quarters Creek	0.68	Irrigation	March 1 to November 30
91-3010	S. J. Harkness	Winter Quarters Creek	0.213	Irrigation	March 1 to November 30
91-3011	S. J. Harkness	Winter Quarters Creek	----	Stockwatering	January 1 to December 31
91-3014	Anton Michelog	Snider Creek	----	Stockwatering	January 1 to December 31
91-3015	Anton Michelog	Mud Creek	----	Stockwatering	January 1 to December 31
91-3040	Tom Nicolaides Leon Nicolaides Mary Stathis Bessie Darsban	Clear Creek	----	Stockwatering	January 1 to December 31
91-3045	Milton A. Oman	Clear Creek	----	Stockwatering	January 1 to December 31

SURFACE WATER RIGHTS IN THE PRICE RIVER BASIN (continued)

Water Use Claim No.	Owner	Source	Flow (cfs)	Purpose of Use	Period of Use
91-3051	John Marakis Estate (½ interest)	Clear Creek	----	Stockwatering	January 1 to December 31
91-3052	Mick Marakis (½ interest)	Clear Creek	----	Stockwatering	January 1 to December 31
91-3053	Milton A. Oman	Clear Creek	----	Stockwatering	January 1 to December 31
91-3056	Tom Nicolaides Leon Nicolaides Mary Stathis Bessie Daraban	Stream	----	Stockwatering	January 1 to December 31
91-3057	Milton A. Oman	South Fork Eccles Canyon Cr.	----	Stockwatering	January 1 to December 31
91-3059	John Marakis Estate (½ interest)	South Fork Eccles Canyon Cr.	----	Stockwatering	January 1 to December 31
91-3060	Nick Marakis (½ interest)	South Fork Eccles Canyon Cr.	----	Stockwatering	January 1 to December 31
91-3070	John Marakis Estate (½ interest)	Eccles Canyon Creek	----	Stockwatering	January 1 to December 31
91-3071	Nick Marakis (½ interest)	Eccles Canyon Creek	----	Stockwatering	January 1 to December 31
91-3072	Milton A. Oman	Eccles Canyon Creek	----	Stockwatering	January 1 to December 31
91-3074	Milton A. Oman	Eccles Canyon Creek	----	Stockwatering	January 1 to December 31
91-3075	Tom Nicolaides Leon Nicolaides Mary Stathis Bessie Daraban	Eccles Canyon Creek	----	Stockwatering	January 1 to December 31
91-3080	Milton A. Oman	Boardinghouse Canyon Creek	----	Stockwatering	January 1 to December 31
91-3081	Jack Thomas	Boardinghouse Canyon Creek	----	Stockwatering	January 1 to December 31
91-3082	Milton A. Oman	Boardinghouse Canyon Creek	----	Stockwatering	January 1 to December 31

SURFACE WATER RIGHTS IN THE PRICE RIVER BASIN (continued)

Water Use Claim No.	Owner	Source	Flow (cfs)	Purpose of Use	Period of Use
91-3083	Lavern Jensen	Finn Canyon Creek	----	Stockwatering	January 1 to December 31
91-3084	Milton A. Oman	Finn Canyon Creek	----	Stockwatering	January 1 to December 31
91-3086	Anton Michelog	Long Canyon Creek	----	Stockwatering	January 1 to December 31
91-3086	Anton Michelog	Long Canyon Creek	----	Stockwatering	January 1 to December 31
91-3090	Anton Michelog	Stream with storage	----	Stockwatering	January 1 to December 31
91-3405	Elrie & Bertha Simonsen	Woods Canyon Creek	----	Irrigation Stockwatering	March 1 to November 30
91-3440	Calvin K. Jacob	Clear Creek	----	Stockwatering	May 1 to November 30
91-3587	North American Coal Corp.	Boardinghouse Canyon Creek	----	Stockwatering	June 1 to November 30
91-3588	North American Coal Corp.	Finn Canyon Creek	----	Stockwatering	June 1 to November 30
91-3589	North American Coal Corp.	Mud Creek	----	Stockwatering	June 1 to November 30
91-3622	Mae Nicolodemas	Clear Creek	0.016	Irrigation	March 1 to November 30
91-3630	Utah Board of State Lands	Gooseberry Creek	----	Stockwatering	June 1 to November 30
91-3631	D. Euray Allred	Woods Canyon Creek	----	Stockwatering	May 1 to November 30
91-3633	D. Euray Allred	Winter Quarters Creek	----	Stockwatering	May 1 to November 30
91-3635	D. Euray Allred	Stream	----	Stockwatering	May 1 to November 30
91-3641	Pete Frandsen	Stream with storage	----	Stockwatering	June 1 to November 30
91-3644	Justus O. Seely	Clear Creek	----	Stockwatering	June 1 to November 30
91-3645	S. J. Harkness	Clear Creek	----	Stockwatering	June 1 to November 30
91-3648	John B. Jones	Clear Creek	----	Stockwatering	January 1 to December 31
91-3655	John B. Jones	Woods Canyon Creek	----	Stockwatering	January 1 to December 31

SURFACE WATER RIGHTS IN THE PRICE RIVER BASIN (continued)

Water Use Claim No.	Owner	Source	Flow (cfs)	Purpose of Use	Period of Use
91-3658	John B. Jones	Stream with storage	----	Stockwatering	January 1 to December 31
91-3664	Lionel L. Peterson	Gooseberry Creek	----	Stockwatering	May 1 to November 30
91-3665	John Marakis Estate	Clear Creek	----	Stockwatering	January 1 to December 31
91-3666	Nick Marakis (1/2 interest)	Clear Creek	----	Stockwatering	January 1 to December 31
91-3667	Angelo Georgedes	Clear Creek	----	Stockwatering Domestic	January 1 to December 31
91-3910	Reed & Leoan M. Gunderson	Clear Creek (Scofield Res.)	----	Stockwatering	May 1 to November 30
91-3911	Della L & Hilda M. Madsen	Clear Creek (Scofield Res.)	----	Stockwatering	May 1 to November 30
P*91-4254	Robert Radamovich	Pleasant Creek	----	Domestic Commercial	January 1 to December 31

P* - Pending

SURFACE WATER RIGHTS IN THE SAN RAFAEL RIVER BASIN LOCATED ON AND ADJACENT TO THE SKYLINE PROPERTY

Water Use Claim No.	Owner	Source	Flow (cfs)	Purpose of Use	Period of Use
93-1	U.S. Forest Service	Kitchen Fork of Huntington Cr.	-----	Stockwatering	July 1 to October 10
93-2	U.S. Forest Service	Kitchen Fork of Huntington Cr.	-----	Stockwatering	July 1 to September 30
93-3	U.S. Forest Service	Kitchen Fork of Huntington Cr.	-----	Stockwatering	July 1 to September 30
93-4	Crowther Investment Co.	Kitchen Fork of Huntington Cr.	-----	Stockwatering	July 1 to September 30
93-6	U.S. Forest Service	N. Fork of Huntington Creek	-----	Stockwatering	July 1 to September 30
93-8	U.S. Forest Service	Unnamed for of Huntington Cr.	-----	Stockwatering	July 1 to September 30
93-9	U.S. Forest Service	Huntington Creek	-----	Stockwatering	July 1 to September 30
93-10	L.D.S. Church	Swens Canyon Creek	-----	Stockwatering	----------
93-11	U.S. Forest Service	Swen's Canyon Creek	-----	Stockwatering	July 1 to September 30
93-12	U.S. Forest Service	Huntington Creek	-----	Stockwatering	July 1 to September 30
93-13	U.S. Forest Service	Burnout Canyon Creek	-----	Stockwatering	July 1 to September 30
93-14	U.S. Forest Service	James Canyon Creek	-----	Stockwatering	July 1 to September 30
93-16	U.S. Forest Service	James Canyon Creek	-----	Stockwatering	July 1 to September 30
93-18	U.S. Forest Service	Flat Canyon Creek	-----	Stockwatering	July 1 to September 30
93-19	U.S. Forest Service	Flat Canyon Creek	-----	Stockwatering	July 1 to September 30
93-20	U.S. Forest Service	Boulger Creek	-----	Stockwatering	July 1 to September 30
93-21	U.S. Forest Service	Boulger Creek	-----	Stockwatering	July 1 to September 30
93-32	Lela C. Mower	Jackson Spring #1 Stream	-----	Irrigation Stockwatering	----------
93-33	Clyde K. Cox	Jackson Spring #1 Stream	-----	Irrigation Stockwatering	----------

SURFACE WATER RIGHTS IN THE SAN RAFAEL RIVER BASIN (continued)

Water Use Claim No.	Owner	Source	Flow (cfs)	Purpose of Use	Period of Use
93-35	Newel B. Cox	Cabin Hollow Stream	-----	Irrigation Stockwatering	----------
93-36	Newel B. Cox	Cove Spring Stream	-----	Irrigation Stockwatering	----------
93-37	Newel B. Cox	Jackson Spring #1 Stream	-----	Irrigation Stockwatering	----------
93-38	Clyde K. Cox	Cabin Hollow Stream	-----	Irrigation Stockwatering	----------
93-41	Newel B. Cox	Burns Cox Spring Stream	-----	Irrigation Stockwatering	----------
93-48	Stanley Cox	Jackson Hollow Stream	-----	Irrigation Stockwatering	----------
93-49	Clyde K. Cox	Jackson Hollow Stream	-----	Irrigation Stockwatering	----------
93-51	Stanley Cox	West Fork Jackson Hollow Stream	-----	Irrigation Stockwatering	----------
93-55	Stanley Cox	Clyde Spring Stream	-----	Irrigation Stockwatering	----------
93-56	Clyde K. Cox	Clyde Spring Stream	-----	Irrigation Stockwatering	----------
93-57	Clyde K. Cox	Worth Spring Stream	-----	Irrigation Stockwatering	----------
93-58	Stanley Cox	Worth Spring Stream	-----	Irrigation Stockwatering	----------
93-73	A. Ira Cox	Ross Spring Stream	-----	Irrigation Stockwatering	----------
93-74	Evan Cox	Ross Spring Stream	-----	Irrigation Stockwatering	----------

SURFACE WATER RIGHTS IN THE SAN RAFAEL RIVER BASIN (continued)

Water Use Claim No.	Owner	Source	Flow (cfs)	Purpose of Use	Period of Use
93-77	Utah Power & Light Co.	Bear Canyon Creek	-----	Stockwatering	July 1 to September 30
93-78	U.S. Forest Service	Coal Creek	-----	Stockwatering	July 1 to September 30
93-79	U.S. Forest Service	Coal Creek	-----	Stockwatering	July 1 to September 30
93-80	Reed Neilson	Huntington Creek	-----	Stockwatering	July 1 to September 30
93-81	Bernard Nielsen	Huntington Creek	-----	Stockwatering	July 1 to September 30
93-82	Utah Power and Light Co.	Huntington Creek	-----	Stockwatering	July 1 to September 30
93-83	U.S. Forest Service	Cox Canyon Creek	-----	Stockwatering	July 1 to September 30
93-84	U.S. Forest Service	Valentine Gulch	-----	Stockwatering	July 1 to September 30
93-85	U.S. Forest Service	Valentine Gulch	-----	Stockwatering	July 1 to September 30
93-89	Valenine Gulch Inc.	Valentine Gulch	-----	Stockwatering	July 1 to September 30
93-96	Utah Power and Light Co.	Huntington Creek	-----	Stockwatering	July 1 to September 30
93-265	Utah Power and Light Co.	Coal Creek	-----	Stockwatering	July 1 to September 30
93-290	Utah Power and Light Co.	Coal Creek	-----	Stockwatering	July 1 to September 30
93-338	U.S. Forest Service	Huntington Creek	-----	Stockwatering	July 1 to September 30
93-346	L.D.S. Church	Little Swens Canyon Cr.	-----	Stockwatering Domestic	June 1 to November 30
93-348	U.S. Forest Service	Spring Creek	-----	Stockwatering	June 16 to October 5
93-399	Utah Power and Light Co.	Huntington Creek	-----	Stockwatering	July 1 to September 30
93-434	William R. Whitehead et al	Kitchen Fork of Huntington Cr.	-----	Stockwatering	June 1 to November 30
93-543	Morris S. & Betty A. Cook	Coal Creek	-----	Stockwatering	July 1 to September 30
93-551	Utah Power and Light Co.	Cox Canyon Creek	-----	Stockwatering	July 1 to September 30
93-553	Utah Power and Light Co.	James Canyon Creek	-----	Stockwatering	July 1 to September 30

SURFACE WATER RIGHTS IN THE SAN RAFAEL RIVER BASIN (continued)

Water Use Claim No.	Owner	Source	Flow (cfs)	Purpose of Use	Period of Use
93-599	Utah Power & Light	Bear Canyon Creek	----	Stockwatering	July 1 to September 30
93-768	W. Chad Cox	Burns Cox Spring Stream	----	Stockwatering, Irrigation	----------
93-769	Donald B. Cox	Burns Cox Spring Stream	----	Stockwatering, Irrigation	----------
93-772	Donald B. Cox	West Fork Jackson Hollow Stream	----	Stockwatering, Irrigation	----------
93-776	Newel B. Cox	Flat Canyon Creek	----	Stockwatering	----------
93-777	Donald B. Cox	Flat Canyon Creek	----	Stockwatering	----------
93-778	A. Ira Cox	Flat Canyon Creek	----	Stockwatering	----------
93-831	Clark-Montana Realty Co.	Bear Canyon Creek	----	Stockwatering	----------
93-938	Cottonwood Gooseberry Irrigation Company	Boulger Creek	11.9	Irrigation, Domestic	May 15 to September 5
P*93-3170	Utah Power & Light	Huntington Creek Electric Lake	100.0	Industrial	January 1 to December 31

P* - Pending

GROUND WATER RIGHTS IN THE PRICE RIVER BASIN LOCATED ON AND ADJACENT TO THE SKYLINE PROPERTY

Water Use Claim No.	Owner	Source	Flow (cfs)	Purpose of Use	Period of Use
91-119	U.S. Forest Service	Spring	0.03	Domestic, Irrigation	March 1 to November 30
91-136	U.S. Forest Service	Beaver Dam Ridge Spring	0.006	Stockwatering	May 1 to October 31
91-200	Utah Natural Gas Company (½ interest)	Underground Water, well	0.134	Domestic Irrigation	January 1 to December 31
91-201	Earl Thomas	Spring with storage	0.068	Stockwatering	April 15 to November 1
91-288	U.S. Forest Service	Gooseberry Campground Spring	0.098	Domestic	May 1 to October 31
91-408	Calvin K. Jacob	Spring	0.011	Stockwatering	May 1 to November 30
91-424	Nick Marakis (½ interest)	Spring with storage	0.011	Stockwatering	January 1 to December 31
91-425	Nick Marakis (½ interest)	Spring	0.022	Stockwatering	January 1 to December 31
91-432	Nick Marakis (½ interest)	Spring	0.011	Stockwatering	January 1 to December 31
91-433	Nick Marakis (½ interest)	Spring with storage	0.011	Stockwatering	January 1 to December 31
91-434	Nick Marakis (½ interest)	Spring with storage	0.011	Stockwatering	January 1 to December 31
91-435	Nick Marakis (½ interest)	Spring	0.011	Stockwatering	January 1 to December 31
91-455	Robert Radakovich	Spring	0.011	Stockwatering	May 1 to December 15
91-463	John Marakis Estate (½ interest)	Spring with storage	0.011	Stockwatering	January 1 to December 31
91-464	John Marakis Estate (½ interest)	Spring	0.022	Stockwatering	January 1 to December 31
91-472	John Marakis Estate (½ interest)	Spring	0.011	Stockwatering	January 1 to December 31

GROUND WATER RIGHTS IN THE PRICE RIVER BASIN (continued)

Water Use Claim No.	Owner	Source	Flow (cfs)	Purpose of Use	Period of Use
91-473	John Marakis Estate (½ interest)	Spring with storage	0.011	Stockwatering	January 1 to December 31
91-474	John Marakis Estate (½ interest)	Spring with storage	0.011	Stockwatering	January 1 to December 31
91-475	John Marakis Estate (½ interest)	Spring	0.011	Stockwatering	January 1 to December 31
91-481	Robert Radakovich	Spring	0.011	Stockwatering	May 1 to December 15
91-1035	U.S. Forest Service	Spring	0.015	Stockwatering	July 1 to September 30
91-1036	U.S. Forest Service	Spring	0.015	Stockwatering	July 1 to September 30
91-1039	U.S. Forest Service	Spring	0.015	Stockwatering	July 1 to September 30
91-1045	U.S. Forest Service	Spring	0.015	Stockwatering	July 1 to September 30
91-1046	U.S. Forest Service	Spring	0.015	Stockwatering	July 1 to September 30
91-1122	U.S. Forest Service	Spring	0.015	Stockwatering	July 1 to October 10
91-1123	U.S. Forest Service	Spring	0.015	Stockwatering	July 1 to October 5
91-1124	U.S. Forest Service	Spring	0.015	Stockwatering	July 1 to October 5
91-1125	U.S. Forest Service	Spring	0.015	Stockwatering	July 1 to October 5
91-1126	U.S. Forest Service	Spring	0.015	Stockwatering	July 1 to October 5
91-1127	U.S. Forest Service	Spring	0.015	Stockwatering	July 1 to October 5
91-1144	U.S. Forest Service	Gooseberry Campground Spring	0.015	Stockwatering	June 6 to October 10
91-1150	U.S. Forest Service	Spring	0.015	Stockwatering	July 1 to October 5
91-1151	U.S. Forest Service	Spring	0.015	Stockwatering	July 1 to October 5
91-1153	U.S. Forest Service	Summer Home Area Spring	0.015	Stockwatering	June 1 to November 1

GROUND WATER RIGHTS IN THE PRICE RIVER BASIN (continued)

Water Use Claim No.	Owner	Source	Flow (cfs)	Purpose of Use	Period of Use
91-1158	N.M. Jensen Investment Co.	Aagard Spring	0.638	Irr.,Stock., Domestic	June 1 to October 31
91-1643	Jack Thomas	Spring with storage	0.011	Stockwatering	January 1 to December 31
91-1644	Lee Thomas (1/3 interest)	Spring	-----	Stockwatering	May 1 to October 31
91-1679	Calvin K. Jacob	Spring	0.011	Stock. and Domestic	May 1 to November 30
91-1680	Calvin K. Jacob	Spring	0.011	Stockwatering	May 1 to November 30
91-1681	Calvin K. Jacob	Spring	0.011	Stockwatering	May 1 to November 30
91-1699	N.M. Jensen Investment Co.	Spring	0.022	Stockwatering	June 1 to October 31
91-1700	N.M. Jensen Investment Co.	Spring	0.022	Stockwatering	June 1 to October 31
91-1701	N.M. Jensen Investment Co.	Spring	0.022	Stockwatering	June 1 to October 31
91-1702	N.M. Jensen Investment Co.	Spring	0.022	Stockwatering	June 1 to October 31
91-1710	N.M. Jensen Investment Co.	Spring	0.022	Stockwatering	June 1 to October 31
91-1711	N.M. Jensen Investment Co.	Spring	0.022	Stockwatering	June 1 to October 31
91-1714	N.M. Jensen Investment Co.	Spring	0.022	Stockwatering	June 1 to October 31
91-1986	Angelo Georgedes	Spring with storage	0.05	Fish Culture	January 1 to December 31
91-2049	John Jouflas Estate (2/3 interest)	Spring	0.011	Stockwatering	May 1 to October 31
91-2144	Elrie and Bertha Simonsen (½ interest)	Simonsen Spring	0.022	Domestic	January 1 to December 31
91-2145	Robert Radakovich (½ interest)	Simonsen Spring	0.022	Domestic	January 1 to December 31
91-2288	Elrie & Bertha Simonsen	Spring	0.011	Stockwatering	June 1 to November 30
91-2494	Elrie & Bertha Simonsen	Mooney Mine Spring	----	Irrigation Stockwatering	March 1 to November 30

GROUND WATER RIGHTS IN THE PRICE RIVER BASIN (continued)

Water Use Claim No.	Owner	Source	Flow (cfs)	Purpose of Use	Period of Use
91-2669	Della Simonsen	Spring	0.011	Stockwatering	April 1 to November 30
91-2970	Angelo Georgedes	Spring	0.015	Stockwatering	May 1 to October 31
91-2975	Justus O. Seely	Spring	0.011	Irrigation, Stock.	January 1 to December 31
91-2976	Justus O. Seely	Spring	0.011	Irrigation, Stock.	January 1 to December 31
91-3012	Angelo Georgedes	Spring	0.015	Irrigation, Stock.	January 1 to December 31
91-3076	Milton A. Oman	Spring	0.011	Stockwatering	January 1 to December 31
91-3078	Milton A. Oman	Spring	0.011	Stockwatering	January 1 to December 31
91-3087	Anton Michelog	Spring with storage	0.011	Stockwatering	January 1 to December 31
91-3094	Scofield Town	3 Springs	0.033	Municipal	January 1 to December 31
91-3163	Pete Frandsen	Spring	0.011	Stockwatering	June 1 to November 30
91-3401	Waino E. Burton	Underground water, well	0.011	Stock. and Domestic	January 1 to December 31
91-3402	Waino E. Burton	Underground water, well	0.011	Stock. and Domestic	January 1 to December 31
91-3406	Della L. Madsen	Spring	0.011	Stockwatering	April 1 to November 30
91-3460	Mountain Fuel Supply Co. (½ interest)	Underground Water, well	0.134	Domestic, Irr., Misc.	January 1 to December 31
91-3499	Lavern Jensen	Finn Spring	0.011	Stock. and Domestic	January 1 to December 31
91-3500	Lavern Jensen	Spring	0.011	Stock. and Domestic	January 1 to December 31
91-3586	North American Coal Corp.	Clear Creek Spring Area	0.50	Domestic, Stock., Irr., Industrial	January 1 to December 31
91-3590	North American Coal Corp. (Underground Water)	Clear Creek Mine Tunnel No. 3	0.446	Industrial	January 1 to December 31
91-3596	North American Coal Corp. (Underground Water)	O'Connor Mine Tunnel No. 2	0.047	Industrial	January 1 to December 31

GROUND WATER RIGHTS IN THE PRICE RIVER BASIN (continued)

Water Use Claim No.	Owner	Source	Flow (cfs)	Purpose of Use	Period of Use
91-3601	Della L. Madsen	Spring	0.011	Stockwatering	June 1 to November 30
91-3634	D. Euray Allred	Spring	0.011	Stockwatering	May 1 to November 30
91-3638	D. Euray Allred	Spring	0.011	Stockwatering	May 1 to November 30
91-3642	John B. Jones	Spring with storage	0.011	Stockwatering	January 1 to December 31
91-3668	Angelo Georgedes	Spring	0.015	Stockwatering	May 1 to October 31
91-3971	Lionel L. Peterson	Spring	0.022	Stock. & Domestic	May 1 to November 30
91-3973	Lionel L. Peterson	Spring	0.022	Stock. & Domestic	May 1 to November 30
91-3974	Lionel L. Peterson	Spring	0.022	Stock. & Domestic	May 1 to November 30
91-3975	Lionel L. Peterson	Spring	0.022	Stock. & Domestic	May 1 to November 30
91-3976	Lionel L. Peterson	Spring	0.022	Stock. & Domestic	May 1 to November 30
91-3977	Lionel L. Peterson	Spring	0.022	Stock. & Domestic	May 1 to November 30
91-3978	Lionel L. Peterson	Spring	0.022	Stock. & Domestic	May 1 to November 30
91-3979	Lionel L. Peterson	Spring	0.022	Stock. & Domestic	May 1 to November 30
91-3980	Lionel L. Peterson	Spring	0.022	Stock. & Domestic	May 1 to November 30
91-3981	Lionel L. Peterson	Spring	0.022	Stock. & Domestic	May 1 to November 30
91-3982	Lionel L. Peterson	Spring	0.022	Stock. & Domestic	May 1 to November 30
91-3983	Lionel L. Peterson	Spring	0.022	Stock. & Domestic	May 1 to November 30
91-3985	Lionel L. Peterson	Spring	0.022	Stock. & Domestic	May 1 to November 30
P*91-4217	Carol C. Dixon	Collard Spring	9.64	Stock. & Domestic	January 1 to December 31
P*91-4319	Robert Anderson	Robert Anderson Spring	0.035AF	Stock. & Domestic	January 1 to December 31

P* - Pending

GROUND WATER RIGHTS IN THE SAN RAFAEL RIVER BASIN LOCATED ON AND ADJACENT TO THE SKYLINE PROPERTY

Water Use Claim No.	Owner	Source	Flow (cfs)	Purpose of Use	Period of Use
93-5	U.S. Forest Service	North Huntington Spring	0.022	Stockwatering	July 1 to September 30
93-23	U.S. Forest Service	East Boulger Canyon Spring	0.022	Stockwatering	June 16 to October 5
93-24	U.S. Forest Service	West Boulger Canyon Spring	0.022	Stockwatering	June 16 to October 5
93-25	U.S. Forest Service	Fairview Canal Spring Area #1	0.022	Stockwatering	June 16 to October 5
93-26	U.S. Forest Service	Fairview Canal Spring Area #2	0.022	Stockwatering	June 16 to October 5
93-27	U.S. Forest Service	Upper Boulger Spring	0.033	Stockwatering	June 16 to October 5
93-34	Clyde K. Cox	Jackson Spring #2	----	Stockwatering, Irrig.	----------
93-39	Newel B. Cox	Cove Spring #2	----	Stockwatering	----------
93-40	W. Chad Cox	Burns Cox Spring	----	Stockwatering	----------
93-43	Newel B. Cox	Cold Spring	----	Stockwatering, Irrig.	----------
93-44	Newel B. Cox	Milk House Spring	----	Stockwatering, Irrig.	----------
93-45	Newel B. Cox	Spring House Spring	----	Stockwatering, Irrig.	----------
93-46	Robert N. Anderson	Unnamed Spring #2	0.20	Irrigation Stockwatering	May 1 to October 15
93-47	Robert N. Anderson	Unnamed Spring #3	0.1337	Irrigation Stockwatering	May 1 to October 15
93-50	Robert N. Anderson	Unnamed Spring #4	0.011	Irrigation Stockwatering	May 1 to October 15
93-52	Stanley Cox	Worth Spring #1	----	Stockwatering	----------
93-53	Stanley Cox	Worth Spring #2	----	Stockwatering	----------
93-54	Clyde K. Cox	Clyde Spring	----	Stockwatering	----------

GROUND WATER RIGHTS IN THE SAN RAFAEL RIVER BASIN (continued)

Water Use Claim No.	Owner	Source	Flow (cfs)	Purpose of Use	Period of Use
93-59	Clyde K. Cox	Saw Mill Spring	-----	Stockwatering, Irrig.	----------
93-60	Roscoe C. Cox	Stan Spring #1	-----	Stockwatering	----------
93-61	Roscoe C. Cox	Stan Spring #2	-----	Stockwatering	----------
93-62	Stanley Cox	Saw Mill Springs	-----	Stockwatering, Irrig.	----------
93-63	Stanley Cox	Stan Spring #1	-----	Stockwatering, Irrig.	----------
93-64	Roscoe C. Cox	Stan Spring #1	-----	Stockwatering, Irrig.	----------
93-65	Doris R. Cox	Stan Spring #2	-----	Stockwatering, Irrig.	----------
93-66	Donald B. Cox	Stan Spring #2	-----	Stockwatering, Irrig.	----------
93-67	Newel B. Cox	Mineral Spring #2	-----	Stockwatering, Irrig.	----------
93-68	Evan Cox	Stan Spring #2	-----	Stockwatering, Irrig.	
93-69	A. Ira Cox	Stan Spring #2	-----	Stockwatering, Irrig.	----------
93-70	Olea D. Cox	Mineral Spring #2	-----	Stockwatering, Irrig.	----------
93-71	Roscoe C. Cox	Worth Spring Stream	-----	Stockwatering, Irrig.	----------
93-72	Evan Cox	Ross Spring #2	-----	Stockwatering	----------
93-75	Evan Cox	Ross Spring #3	-----	Stockwatering	----------
93-90	L.D.S. Church	Unnamed Spring	0.022	Stockwatering Domestic	June 1 to November 30
93-114	L.D.S. Church	Unnamed Spring	0.022	Stockwatering	June 1 to November 30
93-127	L.D.S. Church	Unnamed Spring	0.022	Stockwatering	June 1 to November 30
93-145	L.D.S. Church	Unnamed Spring	0.022	Stockwatering	June 1 to November 30
93-153	L.D.S. Church	Unnamed Spring	0.022	Stockwatering	June 1 to November 30
93-154	L.D.S. Church	Unnamed Spring	0.022	Stockwatering	June 1 to November 30

GROUND WATER RIGHTS IN THE SAN RAFAEL RIVER BASIN (continued)

Water Use Claim No.	Owner	Source	Flow (cfs)	Purpose of Use	Period of Use
93-172	L.D.S. Church	Unnamed Spring	0.022	Stockwatering	June 1 to November 30
93-186	L.D.S. Church	Unnamed Spring	0.022	Stockwatering	June 1 to Novmeber 30
93-187	L.D.S. Church	Unnamed Spring	0.022	Stockwatering	June 1 to November 30
93-205	L.D.S. Church	Unnamed Spring	0.022	Stockwatering	June 1 to November 30
93-207	L.D.S. Church	Unnamed Spring	0.022	Stockwatering	June 1 to November 30
93-232	Osmond & Idena J. Crother	Brooks Canyon Divide Spring	-----	Stockwatering	July 1 to September 30
93-279	Crowther Investment Company	Unnamed Spring	0.011	Stockwatering Domestic	June 1 to October 15
93-331	David J. Stone	Unnamed Spring	0.02	Stockwatering	June 1 to October 15
93-332	R. Phill Shumway	Unnamed Spring	0.02	Stockwatering	June 1 to October 15
93-333	Richard S. Christensen	Unnamed Spring	0.02	Stockwatering	June 1 to October 15
93-334	Douglas G. Marriott	Unnamed Spring	0.02	Stockwatering	June 1 to October 15
93-343	David J. Stone	Unnamed Spring	0.02	Stockwatering	June 1 to October 15
93-344	R. Phil Shumway	Unnamed Spring	0.02	Stockwatering	June 1 to October 15
93-345	Richard S. Christensen	Unnamed Spring	0.02	Stockwatering	June 1 to October 15
93-365	Douglas Mariott	Unnamed Spring	0.02	Stockwatering	June 1 to October 15
93-379	Russel O. Brown	Unnamed Spring	0.0222	Stockwatering	June 1 to October 15
93-380	M. Dover Hunt	Unnamed Spring	0.0222	Stockwatering	June 1 to October 15
93-381	Don Evans	Unnamed Spring	0.0222	Stockwatering	June 1 to October 15
93-391	Eli Clayson	Unnamed Spring	0.0222	Stockwatering	June 1 to October 15
93-402	Clark T. Thorstensen	Unnamed Spring	0.0222	Stockwatering	June 1 to October 15

GROUND WATER RIGHTS IN THE SAN RAFAEL RIVER BASIN (continued)

Water Use Claim No.	Owner	Source	Flow (cfs)	Purpose of Use	Period of Use
93-404	Russel O. Brown	Unnamed Spring	0.0222	Stockwatering	June 1 to October 15
93-411	M. Dover Hunt	Unnamed Spring	0.0222	Stockwatering	June 1 to October 15
93-429	Don Evans	Unnamed Spring	0.0222	Stockwatering	June 1 to October 15
93-430	Eli Clayson	Unnamed Spring	0.0222	Stockwatering	June 1 to October 15
93-431	Clark T. Thorstensen	Unnamed Spring	0.0222	Stockwatering	June 1 to October 15
93-432	Crowther Investment Company	Brooks Canyon Divide	0.011	Stockwatering	June 1 to October 15
93-433	William R. Whitehead et al	Unnamed Spring	0.011	Stockwatering	June 1 to October 15
93-435	Crowther Investment Company	Unnamed Spring	0.011	Stockwatering	June 1 to October 15
93-449	Crowther Investment Company	Unnamed Spring	0.011	Stockwatering Domestic	June 1 to October 15
93-763	Robert N. Anderson	Unnamed Spring #8	0.018	Stockwatering	June 15 to October 15
93-770	W. Chad Cox	Spring House Spring	-----	Irrigation Stockwatering	----------
93-771	Donald B. Cox	Spring House Spring	-----	Irrigation Stockwatering	----------
93-773	Roscoe C. Cox	Ross Spring #1	-----	Stockwatering	----------
93-774	A. Ira Cox	Ike Spring #1	-----	Stockwatering	----------
93-775	A. Ira Cox	Ike Spring #2	-----	Stockwatering	----------
93-838	L.D.S. Church	Unnamed Spring	0.022	Stockwatering	June 1 to November 30
93-839	L.D.S. Church	Unnamed Spring	0.022	Stockwatering	June 1 to November 30
93-840	N. M. Jensen Investment Company	Unnamed Spring	0.022	Stockwatering	June 1 to November 30
93-841	N. M. Jensen Investment Company	Unnamed Spring	0.022	Stockwatering Domestic	June 1 to November 30

GROUND WATER RIGHTS IN THE SAN RAFAEL RIVER BASIN (continued)

Water Use Claim No.	Owner	Source	Flow (cfs)	Purpose of Use	Period of Use
93-842	N. M. Jensen Investment Company	Unnamed Spring	0.22	Stockwatering	June 1 to November 30
93-843	L.D.S. Church	Unnamed Spring	0.022	Stockwatering	June 1 to November 30
93-844	N. M. Jensen Investment Company	Unnamed Spring	0.022	Stockwatering	June 1 to November 30
93-845	N. M. Jensen Investment Company	Unnamed Spring	0.022	Stockwatering	June 1 to November 30
93-846	N. M. Jensen Investment Company	Cove Spring	0.022	Stockwatering Domestic	June 1 to November 30

WATER RIGHT EXCHANGES IN THE SKYLINE PROPERTY AREA

Water Use Claim No.	Owner	Source	Flow (cfs)	Purpose of Use	Period of Use
91-164	Louise Gorishek	Well	1.0 A.F.	Domestic	January 1 to December 31
91-452	Robert Radakovich	Well	1.0 A.F.	Stockwatering	March 1 to November 30
91-772	Valley Camp Coal Company	Well	0.446 cfs	Industrial Domestic	January 1 to December 31
91-940	Gooseberry Enterprise Inc	Springs	66.0 A.F.	Domestic	January 1 to December 31
91-1058	Price River Water Users Association	Well	7.7 A.F.	Industrial Domestic	January 1 to December 31
91-1114	Coastal States Energy Co.	Wells	30.0 A.F.	Industrial Domestic	January 1 to December 31
91-1560	Coastal States Energy Co.	Wells	118.0 A.F.	Industrial Domestic	January 1 to December 31
91-1658	Robert Radakovich	Spring	1.0 A.F.	Domestic	January 1 to December 31
91-1669	T.O.E. Investments	Well	3.0 A.F.	Industrial	January 1 to December 31
91-1691	Valley Camp of Utah Inc	Well	7.7 A.F.	Industrial Domestic	January 1 to December 31
91-1906	Coastal States Energy Co.	Wells	118.0 A.F.	Industrial Domestic	January 1 to December 31
91-1912	Jim Nicolodemos	Well	1.0 A.F.	Domestic	January 1 to December 31
91-2188	LDS Church	Well	1.0 A.F.	Domestic	May 1 to October 30
91-2385	Max A. Blackam	Spring	0.5 A.F.	Domestic	January 1 to December 31
91-2475	LDS Church	Well	1.0 A.F.	Domestic	January 1 to December 31