ANNUAL HYDROLOGIC MONITORING REPORT
EAST MOONTAIN PROPERTY
1990

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UTAH POWER & LIGHT COMPANY
MINING DIVISION
TECHNICAL SERVICES REPORT

CHARLES A. SEMBORSKI

CENTRAL ENGINEERING

ANNUAL HYDROLOGIC MONITORING REPORT
EAST MOUNTAIN PROPERTY
1990

PACIFICORP FUEL RESOURCES

MAY 1991

PACIFICORP - FUEL RESOURCES
HYDROLOGIC MONITORING PROGRAM
ANNUAL REPORT FOR 1990

MAY 1991

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Prepared and submitted for PacifiCorp by:

Hydrologic Section of the Power Operations Department

and

Electric Operations - Fuel Resources

TABLE OF CONTENTS

List of Figures iv

List of Tables v

List of Appendices vi

List of Maps vi

I. Introduction 1

II. Climatic Observations 3

A. Regional Climatology 3

B. Local Climatology 3

1. Precipitation 3
2. Temperatures 11

III. Drainage Systems 13

A. Huntington Creek Drainage System 13
1. Huntington Creek 13
2. Deer Creek 17
a. Flow and Sampling Schedule 17
(1) Locations 17
(2) Flow 17
(3) Water and Quality Sampling 17
b. Flow Information 17
c. Quality Information 18
3. Meetinghouse Canyon Creek 18
a. Flow and Sampling Schedule 18
(1) Locations 18
(2) Flow 18
(3) Water Quality Sampling 21
b. Flow Information 21
c. Quality Information 21
4. Rilda Canyon Creek 21
a. Flow and Sampling Schedule 21
(1) Locations 21
(2) Flow 23
(3) Water Quality Sampling 23
b. Flow Information 23
c. Quality Information 24

B. Cottonwood Creek Drainage System 24
1. Cottonwood Canyon Creek 24
2. Grimes Wash 26
a. Flow and Sampling Schedule 26
(1) Locations 26
(2) Flow 26
(3) Water Quality Sampling 26
b. Flow Information 27
c. Quality Information 27

IV. East Mountain Springs 31

A. Flow and Sampling Schedule 32
1. Flow 32
2. Quality Samples 32

B. Spring Flow 32

C. Quality 41

V. Mine Hydrology 41

A. Groundwater and
Surface Water Sources in Relation to Mine Workings 41

B. Groundwater Quality and Collection Procedures 45

C. Hydrologic Developments During 1990 48

1. 3rd North Roans Fault Crossing 49
2. Groundwater Inflow
2nd Right off 4th South, Deer Creek Mine 51
3. Rilda Canyon Springs (NEWUA)
Hydrologic Investigation 52

D. Mine Water 68

1. Deer Creek Mine 68
a. In-Mine Water Production 68
b. In-Mine Quality 68
c. Discharge Quantity 70
d. Discharge Quality 77
2. Des-Bee-Dove Mine 77
3. Wilberg/Cottonwood Mine 78
a. In-Mine Water Production 78
b. In-Mine Quality 78
c. Discharge Quantity 78
d. Discharge Quality 78

VI. Piezometric Gradient Information 85

A. Surface 85
1. EM-31 and EM-47 85
2. Rilda Canyon Study Area 85
B. In-Mine 88
1. Deer Creek Mine 88
2. Cottonwood Mine 88

VII. Waste Rock Wells 91

A. Deer Creek Mine - Waste Rock Storage Facility 91

B. Cottonwood/Wilberg Mine - Waste Rock Storage Facility 92

VIII. Effects of Mining and Subsidence on Hydrology 93

IX. Summary 95

LIST OF FIGURES

Figure

1 Location Map 2

2 East Mountain Precipitation 10

3 Spring Discharge vs. Precipitation and Temperature 38

4 Deer Creek Mine with Topography and Overlying Springs 43

5 Wilberg/Cottonwood Mine with Topography and Overlying Springs 44

6 In-Mine Water Quality Cation-Anion Diagrams 46

7 Long-Term Water Sources 47

8 Piezometric Surface with Spring Collection System, Rilda Canyon 53

9 Rilda Canyon Study Area 1986-1990 Piezometric Study 63

10 Swelling Test 67

11 Deer Creek Coal Mine Water Sump Areas 74

12 Deer Creek Mine 1990 Mine Water Discharge 75

13 Deer Creek Mine Discharge, 1/80 Through 12/90 76

14 Wilberg/Cottonwood Mine Water Sump Areas 79

15 Wilberg/Cottonwood Mine Discharge 4/79 Through 12/90 80

16 Wilberg/Cottonwood 1990 Mine Water Discharge 84

17 Monitoring Wells EM-31 and Em-47 Piezometric Study 87

18 Deer Creek Mine Piezometric Study
In-Mine Water Well Elevations 89

19 Cottonwood In-Mine Piezometric Study 90

LIST OF TABLES

1 Precipitation in Emery County, Utah (1990 Water Year) 5
2 Comparison of 1989 and 1990 Precipitation (Inches) 4
3 Hunter Plant Precipitation 6
4 Huntington Plant Precipitation 7
5 Electric Lake Precipitation 8
6 East Mountain Precipitation 9
7 Temperatures in Emery County, Utah (1990 Water Year) 12
8 Comparison of 1989 and 1990 Temperatures 11
9 Huntington Creek Water Flows (1990 Water Year) 14
10 Comparison of 1989 and 1990 Runoff Values 15
11 Huntington Creek Water Quality (1990 Water Year) 16
12 Huntington Creek Water Quality 1989-1990 16
13 Deer Creek Surface Water Quality Above the Mine 19
14 Deer Creek Surface Water Quality Below the Mine 20
15 Meetinghouse Canyon Water Quality 22
16 Rilda Canyon Surface Water Quality 25
17 Grimes Wash Surface Quality Right Fork 28
18 Grimes Wash Surface Quality Left Fork 29
19 Grimes Wash Surface Quality Below Mine 30
20A East Mountain Springs Discharge 33
20B East Mountain Springs Discharge 34
21 Yearly Spring Discharge Variations (GPM) 36
22 Modes of Occurrence - East Mountain Springs 37
23 Temperature Comparison 39
24 East Mountain Regression Study (Flow/Temperature) 40
25 East Mountain Springs Water Quality (Historical to 1989) 42
26 Deer Creek In-Mine Water Quality - 1990 69
27 Deer Creek Mine - Discharge Water Quality 77
28 Wilberg/Cottonwood In-Mine Water Quality - 1990 82
29 Wilberg/Cottonwood Discharge Water Quality 86
30 Waste Rock Storage Facilities - Water Quality - 1990 94

LIST OF APPENDICES

Appendix

A Huntington Creek Stream Flows/Water Quality
B Deer Creek Surface Water Flow and Quality
C Meetinghouse Canyon Creek Water Flow and Quality
D Rilda Canyon Creek Water Flow and Quality
E Grimes Wash Water Flow and Quality
F East Mountain Springs Cation-Anion Diagrams/Flow and Quality
G Deer Creek In-Mine Water Quality
H Deer Creek Mine Discharge Water Quality
I Wilberg Mine In-Mine Water Quality
J Wilberg Mine Discharge-Grimes Wash and Miller Canyon Water Quality
K Waste Rock Wells
L Field Data
M Water Monitoring Plan

LIST OF MAPS
(Located in Map Pockets)

Map No.

HM-1 Water Monitoring Stations
HM-2 Deer Creek Mine - In-Mine Sampling Locations
HM-3 Wilberg Mine - In-Mine Sampling Locations
HM-4 Spring Map
HM-5 Spring Map with 5-Year Mine Plan Overlay and Subsidence Zones

I. INTRODUCTION

The 1990 Hydrologic Monitoring Report is hereby submitted in accordance with the U. S. Department of Interior, Office of Surface Mining requirements and the Utah State Division of Oil, Gas and Mining guidelines for hydrologic monitoring in areas of and adjacent to coal mining operations.

This is the thirteenth annual hydrologic report submitted by PacifiCorp since the report entitled "Monitoring of the Water Resources in the Mining Areas of East Mountain, Emery County, Utah" was submitted to the U. S. Geological Survey and the Utah Division of Oil, Gas and Mining in December 1977. It addresses flow observations and water quality characteristics of the water resources adjacent to PacifiCorp's mining areas in Emery County. (See Figure 1.)

Information was compiled the past year from in-house as well as from state and federal agencies and private sources as follow:

U. S. Geological Survey
U. S. Forest Service
U. S. Department of Commerce, National Weather Service
Utah Division of Oil, Gas and Mining
Utah Division of Environmental Health
Huntington-Cleveland Irrigation Company
Emery Water Conservancy District
Cottonwood Creek Consolidated Irrigation Company

Information from outside agencies will continue to be utilized each year for as long as their data gathering programs continue. As a result, cooperative effort is realized and duplication of effort and expense is substantially reduced.

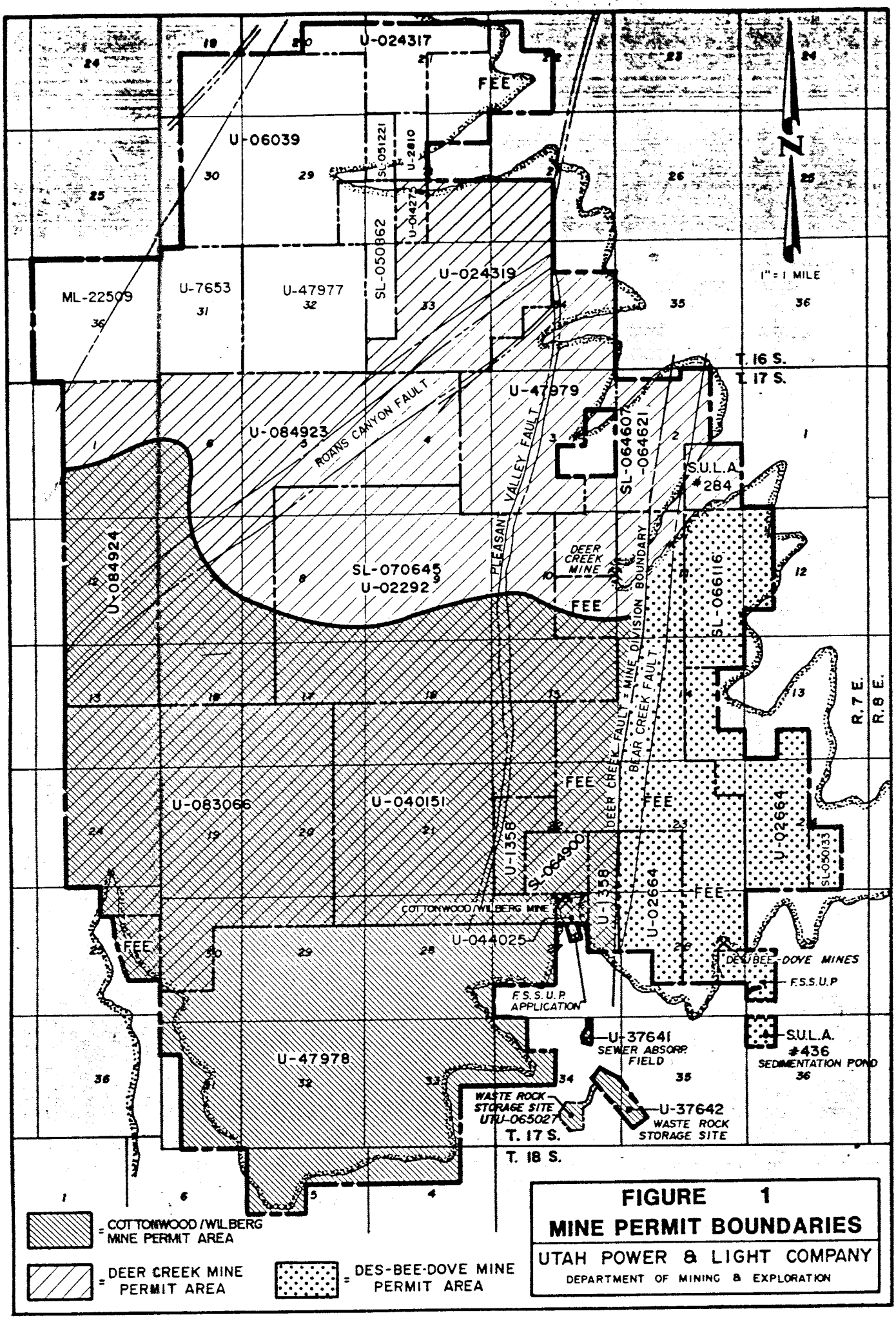


FIGURE 1
MINE PERMIT BOUNDARIES
UTAH POWER & LIGHT COMPANY
DEPARTMENT OF MINING & EXPLORATION

II. CLIMATIC OBSERVATIONS

In general, runoff and subsequent water supplies are a direct function of the climatic conditions in any given area. Furthermore, the significance of the weather affecting the flow characteristics of the East Mountain springs cannot be overemphasized.

Most of the water supply in the Western United States originates in the high mountain ranges as snowfall during winter periods. Snowmelt augmented by spring precipitation produces runoff which is utilized downstream. Fall precipitation influences soil moisture conditions prior to snowpack accumulation and has a bearing upon runoff the following year.

A. Regional Climatology

From 1982 to 1984 the Western United States, especially Utah, experienced an unprecedented wet cycle of precipitation. The pattern changed in 1985 with conditions returning to slightly above normal. During the 1986 water year the extremely wet trend returned, and the upper Colorado River Basin experienced above average precipitation. The 1987 weather pattern changed dramatically with near normal valley precipitation and mountain snowfall much below normal. The resulting 1987 runoff was substantially below normal. The drought continued into 1988, 1989, and 1990 with runoff amounts less in 1990 than in 1989.

B. Local Climatology

1. Precipitation

Valley precipitation in Emery County during 1990 was below average. The mountains in the San Rafael Basin received below normal snowfall during the 1989-90 winter, and precipitation at Electric Lake (20.40") was below normal.

Precipitation amounts recorded at Hunter Plant, Huntington Plant, Electric Lake, and East Mountain for the 1990 water year (October 1989 to September 1990) will be presented since these sites include low elevation, intermediate elevation, and two high elevation observation sites in the immediate vicinity of mining activities. The values are shown in Table 1 on the following page.

A comparison of precipitation for 1989 and 1990 merits consideration in this study. The intent is to develop a correlation between yearly precipitation and spring discharges on East Mountain. Table 2 is a comparison of the 1989-1990 precipitation levels recorded at the four locations.

TABLE 2: COMPARISON OF 1989 AND 1990 PRECIPITATION (Inches)

	1989		1990		1990 As
Station	Amount	% of Normal	Amount	% of Normal	% of 1989
Hunter Plant	6.26	90	4.73	68	76
Huntington Plant	7.38	99	11.76	157	159
Electric Lake	18.79	96	20.40	104	109
East Mountain	10.59	73	10.90	77	103
Average %		89		102	112

Table 2 indicates that 1990 precipitation was higher than 1989 at Huntington, Electric Lake, and East Mountain and lower at Hunter. The overall precipitation at the four stations averaged twelve percent (12%) higher in 1990 than in 1989.

Tables 3, 4, 5, and 6 indicate monthly precipitation values at Hunter, Huntington, Electric Lake, and East Mountain from the beginning of operation at each site. The tables indicate monthly trends as well as the great fluctuation in yearly totals. Figure 2 shows monthly precipitation at the East Mountain site for the 1990 water year.

TABLE 1: PRECIPITATION IN EMERY COUNTY, UTAH (1990 Water Year)

	Hunter Plant (Elev. 5800')		Huntington Plant (Elev. 6500')		Electric Lake (Elev. 8350')		East Mountain (Elev. 8985')	
Month	Precip (in.)	% Of Normal	Precip (in.)	% Of Normal	Precip. (in.)	% Of Normal	Precip. (in.)	% of Normal
1989								
October	0.10	13	0.21	17	1.21	57	0.28	20
November	0.00	0	0.28	47	1.88	101	0.39	31
December	0.03	6	0.42	89	0.70	24	0.16	15
1989								
January	0.31	72	0.51	96	2.00	99	0.74	71
February	0.72	176	1.18	347	4.06	233	2.08	210
March	0.71	169	0.94	152	2.30	120	1.75	107
April	0.51	119	1.30	236	2.00	119	1.03	114
May	0.06	10	1.35	237	0.81	54	0.26	33
June	0.24	52	0.65	159	1.87	231	0.67	126
July	0.56	97	1.30	137	1.08	92	0.88	85
August	0.38	38	1.27	187	0.62	73	1.03	63
September	1.11	139	2.35	443	1.87	178	1.62	60
TOTALS	4.73	68	11.76	157	20.40	104	10.90	113
Mean Monthly	0.39	---	0.98	---	1.70	---	0.91	---

TABLE 3: HUNTER PLANT PRECIPITATION

Elevation - 5,800 Feet

Water Year	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEPT	TOTAL
75-76	0.13	0.25	0.19	0.02	0.40	0.00	0.89	0.84	0.03	0.31	0.08	0.70	3.84
76-77	0.00	0.02	0.00	0.37	0.07	0.00	0.03	1.28	0.07	1.35	0.41	0.50	4.10
77-78	0.01	0.18	0.00	1.28	1.05	1.74	0.34	1.21	0.00	0.69	1.14	0.14	7.78
78-79	0.03	2.22	0.22	1.43	0.53	2.43	0.24	0.47	0.00	0.00	0.79	0.00	8.36
79-80	0.00	0.00	0.41	1.70	1.70	0.67	0.75	1.11	0.00	0.02	0.51	2.06	8.93
80-81	0.66	0.06	0.02	0.00	0.07	1.48	0.16	0.45	0.14	0.20	0.70	2.43	6.37
81-82	0.58	0.27	0.45	0.94	0.45	0.54	0.00	0.02	0.00	0.15	1.06	1.23	5.69
82-83	0.20	1.25	0.45	0.54	0.41	0.84	0.37	0.51	0.00	2.18	1.58	0.88	9.21
83-84	0.53	0.66	1.07	0.03	0.35	0.34	0.34	0.05	1.09	1.80	1.89	2.35	10.50
84-85	1.6	0.06	1.24	0.20	0.95	1.01	0.67	0.64	0.26	1.50	0.03	0.86	9.11
85-86	0.92	1.40	0.42	0.10	0.97	0.40	0.31	0.00	0.31	0.55	1.01	0.57	7.05
86-87	0.92	0.08	0.10	0.32	0.45	0.90	0.12	1.38	1.25	1.65	1.27	0.11	8.55
87-88	1.91	1.02	0.66	0.55	0.00	0.66	1.64	0.59	0.20	0.69	0.44	0.78	9.14
88-89	0.69	0.04	0.48	1.23	0.02	0.23	0.00	0.37	0.14	1.01	1.70	0.35	6.26
89-90	0.20	0.00	0.03	0.31	0.72	0.71	0.51	0.06	0.24	0.56	0.38	1.11	4.73
90-91	0.04	0.00	0.19										

TABLE 4: HUNTINGTON PLANT PRECIPITATION

Elevation - 6,500 Feet

Water Year	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEPT	TOTAL
70-71	---	---	---	---	---	0.08	0.29	0.16	0.11	0.57	0.63	0.43	2.27
71-72	2.26	0.59	1.62	0.04	0.00	0.32	0.28	0.16	0.77	0.40	0.66	1.07	8.17
72-73	4.27	1.28	0.34	0.49	0.80	2.42	0.50	0.17	0.97	1.09	1.94	0.12	14.39
73-74	0.08	0.02	0.37	0.20	0.03	0.01	0.00	0.00	0.00	0.09	0.00	0.07	0.87
74-75	0.68	1.19	1.13	1.01	0.30	0.80	0.03	0.75	1.44	2.62	0.31	0.24	9.50
75-76	0.23	0.95	0.03	0.20	0.23	0.00	2.34	0.86	0.02	0.73	0.19	0.85	6.63
76-77	0.56	0.00	0.00	0.35	0.00	0.00	0.00	1.76	0.00	2.08	0.96	0.70	6.41
77-78	0.66	0.12	0.82	1.45	1.00	1.36	0.94	0.72	0.12	0.05	0.72	0.77	8.73
78-79	0.02	2.65	0.25	1.21	0.52	2.50	0.00	0.84	0.05	0.09	3.32	0.20	11.65
79-80	0.17	0.14	0.15	2.88	3.63	0.68	1.13	1.88	0.65	0.18	0.38	2.22	14.09
80-81	1.20	0.06	0.00	0.00	0.00	0.62	0.08	1.75	0.48	0.00	0.58	1.53	6.30
81-82	1.12	0.25	1.30	1.63	0.20	0.73	0.00	0.17	0.00	0.08	0.71	1.91	8.10
82-83	0.20	0.60	0.67	0.16	0.65	1.87	0.08	0.40	0.00	1.61	0.39	1.15	7.78
83-84	0.76	0.76	2.13	0.10	0.15	1.18	0.72	0.17	1.04	0.74	1.39	0.46	9.60
84-85	2.07	0.34	1.74	0.49	0.27	0.53	0.44	1.08	0.42	3.21	0.04	0.81	11.44
85-86	0.77	1.28	0.64	0.01	0.98	0.28	0.43	0.10	0.17	0.42	0.55	1.08	6.71
86-87	0.38	0.15	0.05	0.81	0.66	0.13	1.22	1.48	1.01	2.14	0.65	0.00	8.68
87-88	1.36	1.35	0.51	1.77	0.00	0.10	1.35	0.94	0.83	0.04	0.13	0.92	9.30
88-89	0.31	0.13	0.83	0.68	0.28	0.21	0.20	0.22	1.28	0.78	1.72	0.74	7.38
89-90	0.21	0.28	0.42	0.51	1.18	0.94	1.30	1.35	0.65	1.30	1.27	2.35	11.76
90-91	0.45	0.03	0.43										

TABLE 5: ELECTRIC LAKE PRECIPITATION

Elevation - 8,350 Feet

Water Year	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEPT	TOTAL
70-71	2.46	2.35	6.41	1.13	1.66	0.36	1.05	0.66	0.47	0.40	2.15	0.78	19.88
71-72	3.49	1.69	4.07	3.35	0.58	0.70	1.02	0.28	1.49	0.70	0.80	2.91	21.08
72-73	4.18	3.43	3.27	0.97	2.09	2.74	3.67	1.42	0.85	0.82	1.23	1.15	25.82
73-74	0.79	1.90	3.52	2.70	1.12	1.52	2.49	0.20	0.13	2.09	0.06	0.09	16.61
74-75	2.27	0.62	1.73	2.10	2.37	3.42	1.23	3.21	1.08	1.93	0.49	0.25	20.70
75-76	1.31	2.57	0.82	1.44	2.23	1.35	1.47	2.00	1.23	1.07	0.54	1.19	17.22
76-77	1.00	0.25	0.14	0.76	1.14	2.00	0.05	3.00	0.90	2.28	1.31	1.26	14.09
77-78	1.47	2.10	3.20	3.68	2.74	3.16	2.46	1.18	0.30	0.10	0.24	0.77	21.40
78-79	0.40	3.18	2.66	2.90	2.18	2.53	0.72	1.67	0.19	0.96	2.29	0.32	20.00
79-80	1.55	2.23	0.37	4.95	6.01	3.34	1.27	3.09	0.12	0.37	0.38	1.80	25.48
10-Year	1.892	2.032	2.619	2.398	2.212	2.112	1.543	1.671	0.666	1.072	0.949	1.052	20.218
80-81	1.45	0.98	0.32	1.30	1.04	3.20	1.45	3.06	0.39	1.61	2.73	1.44	18.97
81-82	4.18	1.44	4.79	5.26	1.66	5.06	1.11	1.40	0.59	1.26	2.29	5.38	34.42
82-83	1.88	3.68	2.76	2.41	4.00	4.30	2.35	2.81	1.35	1.34	1.50	2.88	31.26
83-84	2.15	4.81	7.43	1.27	1.56	2.77	3.23	1.73	3.41	2.55	2.26	1.47	34.64
84-85	2.92	2.63	3.24	1.54	1.09	3.54	1.95	1.19	0.89	3.04	0.03	4.35	26.41
85-86	4.40	6.62	1.99	1.81	8.54	2.48	3.79	1.62	0.26	1.01	1.68	2.73	36.93
86-87	1.86	1.98	0.55	2.14	2.07	2.47	1.03	2.93	0.79	2.12	1.22	0.49	19.65
87-88	1.39	1.68	3.50	3.06	0.72	3.32	2.14	1.60	0.86	1.04	2.23	1.16	22.70
88-89	1.20	2.68	1.91	1.52	1.99	3.55	0.35	0.06	1.54	1.43	1.37	1.19	18.79
89-90	1.21	1.88	0.70	2.00	4.06	2.30	2.00	0.81	1.87	1.08	0.62	1.87	20.40
90-91	1.32	0.90	1.64										

NOTE: Climatic Station was moved from a point one mile above the dam site to a point 500 feet below dam site on November 15, 1973.

October, November, and December 70-71 were estimated by correlation with Clear Creek Weather Station.

TABLE 6: EAST MOUNTAIN PRECIPITATION

Elevation - 8,985 Feet

Water Year	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEPT	TOTAL
80-81	1.28	0.39	0.05	0.29	0.52	2.77	0.64	0.87	0.11	0.57	0.85	2.55	10.90
81-82	1.93	0.53	0.97	3.22	0.14	1.67	0.00	0.45	0.09	1.86	1.10	2.61	14.57
82-83	0.38	2.90	1.39	1.30	1.81	1.98	0.92	0.71	0.61	1.27	4.83	1.62	19.71
83-84	0.76	2.43	2.42	0.27	0.65	1.22	0.50	0.22	1.18	1.90	2.33	0.64	14.53
84-85	3.27	0.97	1.67	0.49	0.59	1.77	1.35	1.73	0.28	2.47	0.12	2.31	17.02
85-86	1.15	2.38	0.87	0.30	2.10	1.43	1.05	0.38	0.53	0.87	2.24	1.63	14.92
86-87	1.57	0.39	0.16	1.37	1.37	1.65	1.16	1.77	0.58	2.49	1.16	0.06	13.73
87-88	2.77	1.91	1.29	1.42	0.00	0.99	2.08	1.03	0.81	0.45	0.96	0.91	14.61
88-89	0.61	0.43	1.56	1.00	0.68	1.03	0.26	0.47	0.43	1.19	2.44	0.49	10.59
89-90	0.28	0.39	0.16	0.74	2.08	1.75	1.03	0.26	0.67	0.88	1.03	1.62	10.90
90-91	0.48	0.26	0.66	0.34	0.39	2.34							

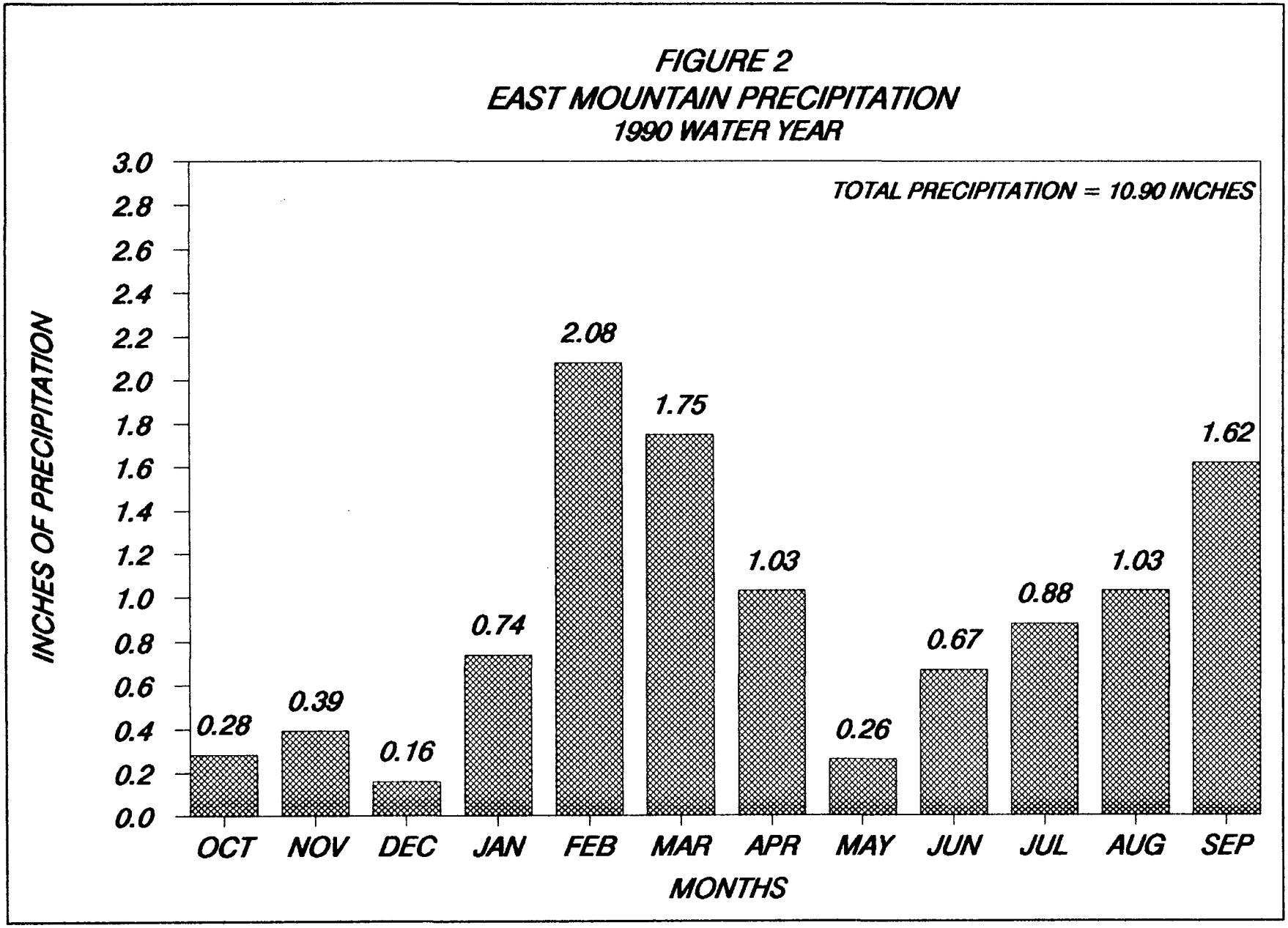


FIGURE 2
EAST MOUNTAIN PRECIPITATION
1990 WATER YEAR
TOTAL PRECIPITATION = 10.90 INCHES
INCHES OF PRECIPITATION
3.0
2.8
2.6
2.4
2.2
2.0
1.8
1.6
1.4
1.2
1.0
0.8
0.6
0.4
0.2
0.0
0.28
0.39
0.16
0.74
2.08
1.75
1.03
0.26
0.67
0.88
1.03
1.62
OCT
NOV
DEC
JAN
FEB
MAR
APR
MAY
JUN
JUL
AUG
SEP
MONTHS

The correlation of precipitation levels with spring discharges will be discussed in the East Mountain Springs section of this report.

2. Temperatures

During the 1990 water year temperatures were above normal for all stations. At the Hunter Plant station temperatures were much above normal for all months. Temperatures at the Huntington Plant station were above normal for all months except February, May, and August. At the East Mountain station temperatures were cooler than normal during January, February, and July, while the rest of the year was above normal. Temperatures at the Electric Lake station were above normal for most of the year. (See Table 7.)

A comparison of 1989 and 1990 temperatures for the four stations is addressed since temperatures also influence water supplies from year to year. Table 8 depicts the variation and compares 1989 to 1990.

TABLE 8: COMPARISON OF 1989 AND 1990 TEMPERATURES*

	1989		1990		1990
Station	Average Temp.	Departure From Normal	Average Temp.	Departure From Normal	Departure From 1989
Hunter Plant	50.0	+4.1	53.2	+7.3	+3.2
Huntington Plant	47.9	+0.3	48.8	+1.2	+0.9
Electric Lake	33.8	-0.1	35.8	+1.8	+2.0
East Mountain	39.6	+0.6	41.5	+2.3	+1.9
Average Departure From Normal		+1.2		+3.2	+2.0

* Temperatures reported in degrees Fahrenheit.

TABLE 7: TEMPERATURES IN EMERY COUNTY, UTAH (1990 Water Year)

Month	Hunter Plant		Huntington Plant		Electric Lake		East Mountain	
	Average Temp.*	Departure From Normal	Average Temp.*	Departure From Normal	Average Temp.*	Departure From Normal	Average Temp.*	Departure From Normal
1989								
October	51.8	+3.4	48.8	+0.6	34.5	-3.0	39.8	+1.6
November	40.9	+5.7	38.9	+2.9	27.1	+1.4	34.3	+6.0
December	30.6	+3.9	30.4	+3.0	16.1	+0.3	23.9	+2.3
1990								
January	27.8	+3.7	24.5	+0.9	13.8	-0.8	19.6	-2.4
February	33.6	+5.2	28.2	-2.0	14.4	-4.9	22.5	-1.1
March	44.5	+8.7	40.3	+2.6	27.8	+7.0	30.5	+1.9
April	55.5	+10.9	49.7	+4.6	35.0	+6.3	38.5	+2.1
May	58.9	+6.8	53.6	-1.3	42.0	+3.0	43.3	+0.8
June	72.3	+10.9	66.8	+1.0	53.4	+4.8	58.4	+3.3
July	78.0	+9.6	72.4	+0.7	57.9	+2.2	60.1	-1.5
August	75.3	+8.9	68.5	-0.9	54.9	+1.1	68.5	+7.5
September	68.9	+10.2	63.5	+3.1	52.2	+4.7	58.7	+7.5
TOTALS	53.2	+7.3	48.8	+1.2	35.8	+1.8	41.5	+2.3

* Temperatures reported in degrees Fahrenheit.

III. DRAINAGE SYSTEMS

The surface drainage system on East Mountain is divided into two major drainages; the southwest portion forms part of the Cottonwood Creek drainage, and the northeast portion contributes to the Huntington Creek drainage. (See Map 1 in pocket.) The drainage boundaries, including minor subdivisions to Cottonwood and Huntington creeks, are designated on the accompanying map. Both Huntington and Cottonwood creeks flow out of the Wasatch Plateau in a southeasterly direction. The creeks merge with Ferron Creek to form the San Rafael River, which is a tributary of the Green River.

A. Huntington Creek Drainage System

Huntington Creek is comprised of many smaller tributary streams that feed the main stream. They include Deer Creek, Meetinghouse, and Rilda canyons. Deer Creek and Meetinghouse Canyon creeks are the only tributaries to Huntington Creek that emanate from within PacifiCorp's coal mine permitted area.

1. Huntington Creek

Flow data are recorded on a continuous basis by Utah Power & Light at two locations; one station is located near the UP&L Huntington Plant, the other about 22 miles upstream from the Huntington Plant. Flow records are maintained by Utah Power & Light Company in order to determine water entitlements and reservoir storage allocation for the various users on the river.

Table 9 shows a summary of actual Huntington Creek flows below Electric Lake and at Huntington Plant, and calculated natural flow at Huntington Plant. The calculated natural flow considers actual flow recorded at the plant, plant diversions, Electric Lake storage change, and lake evaporation. The average daily

discharges for the 1990 water year (October 1989 - September 1990) at the two stations plus the calculated natural flow are found in Appendix A.

TABLE 9: HUNTINGTON CREEK WATER FLOWS (1990 Water Year)

	Huntington Creek Below Electric Lake	Huntington Creek At Plant	Calc. Natural Flow at Plant
Total Yearly Flow (Acre Feet)	11,970	30,820	36,561
% of Normal	*54.9	44.9	52.6
Mean Discharge in Cubic Feet Per Second (CFS)	16.5	42.6	
Maximum Discharge (CFS)	45.0	124	
Date of Maximum Discharge	7/18/90	6/12/90	
Minimum Discharge (CFS)	9.6	8.4	
Date of Minimum Discharge	10/16/90	12/11/90	

*Influenced by upstream storage in Electric Lake.

During the 1990 spring runoff period (April through July) approximately 3,646 acre feet of water were impounded behind Electric Lake Dam. During spring runoff the impoundment reached its highest level on June 18. Total storage on that date amounted to 19,449 acre feet, which is 11,823 acre feet below full. Reservoir releases for fishery, irrigation, and Huntington Plant needs during the water year totaled 11,970 acre feet. The total flow of 30,820 acre feet recorded for Huntington Creek at the Huntington Plant is equal to 45% of normal.

A comparison of runoff values from 1989 and 1990 is presented in Table 10.

TABLE 10: COMPARISON OF 1989 AND 1990 RUNOFF VALUES

	1990		1989		
	Amount	% Of Normal	Amount	% Of Normal	1989 as a % of 1989
Spring Runoff Stored in Electric Lake (Acre Feet)	3,646	36	3,687	37	99
Calculated Natural Flow at Plant (Acre Feet)	36,561	52.6	46,534	67	78.6

The 1990 water quality information on Huntington Creek was compiled on a quarterly basis for all sampling stations. Utah Power & Light's Environmental Department conducted the sampling program and the analyses were performed by Ford Lab, Salt Lake City. The location of water quality sampling stations on Huntington Creek that were considered for this report follow. (Refer to Map No. 1 in pocket.)

a. Below Electric Lake +*

b. Above the Forks +*

c. Below the Power Plant Diversion

d. Below the Power Plant

+ Not listed on map due to scale.

* The sites listed above are not considered part of PacifiCorp's Hydrologic Monitoring Program but will be included in the annual report as long as data is available.

Specific water quality constituents analyzed are shown in Table 11. Values are in milligrams per liter unless otherwise noted. Raw data can be found in Appendix A.

TABLE 11: HUNTINGTON CREEK WATER QUALITY (1989 Water Year)

Parameter	Below Electric Lake Ave.	Max.	Min.	Right Above Left Fork Ave.	Max.	Min.	Above Power Plant* Ave.	Max.	Min.	Below Power Plant* Ave.	Max.	Min.
pH (N.U.)	8.0	8.2	7.8	8.1	8.3	7.9						
Suspended Solids	1.1	1.2	1.0	4.4	4.8	4						
Dissolved Solids	148	146	149	203	207	198						
Spec. Cond. (umhos)	268	268	267	376	396	355						

* Not sampled during 1990.

The values at the station below Electric Lake do not express the actual natural drainage water quality characteristics above Electric Lake because of the lake effect, but it appears that the surface flow in Huntington Canyon is of very high quality in the upper reaches with some natural degradation occurring as the flow proceeds to the canyon mouth.

The comparison of water quality characteristics with the Huntington drainage for 1989 and 1990 is presented in Table 12. The comparison merits consideration in order to evaluate the changes in water quality from year to year. Average values are presented in milligrams per liter unless otherwise noted.

TABLE 12: HUNTINGTON CREEK WATER QUALITY 1989-1990

Parameter	Below Electric Lake 1989	1990	Right Fork Above Left Fork 1989	1990	Above Power Plant* 1989	1990	Below Power Plant* 1989	1990
pH (N.U.)	7.55	8.0	7.9	8.1	7.95		7.95	
Total Susp. Solids	1.0	1.1	18.0	4.4	17.0		16.5	
Total Diss. Solids	177	146	202	203	321		279	

* Not sampled during 1990.

2. Deer Creek

Deer Creek is an ephemeral tributary of Huntington Creek and flows from the same canyon in which the Deer Creek Mine is located. PacifiCorp monitors the characteristics of Deer Creek according to the following flow and sampling schedule (see Hydrologic Monitoring Schedule Appendix M).

a. Flow and Sampling Schedule

(1) Locations:
(a) Above the Mine - DCR01
(b) @ Permit Boundary* - DCR04
(c) Below the Mine - DCR05
(See Map No. 1 in pocket)

(2) Flow: Information is collected during the first or second week of each month.

(3) Water Quality Sampling:
Water samples will be collected and analyzed quarterly (one sample at low flow and high flow) during the first or second week of the quarter. Parameters analyzed are those listed in the DOGM Guidelines for Surface Water Operational Quality. (See Appendix M.) The program was initiated in March 1988 and will continue through 1991; i.e., June, September, and December. Field measurements including pH, specific conductivity, and temperature will be performed monthly in conjunction with quantity measurements.

* Flow and field parameters only

b. Flow Information

As stated above, flow information is collected monthly throughout the year with the use of two Parshall flumes. (See Map No. 1 for flume locations.) A hydrograph showing all the data collected for 1990 and 1984-1989 has been generated for each location. (See Appendix B.) The hydrographs show that the Deer Creek stream did not flow during 1990 at any of the measuring locations. Deer Creek drainage did receive flow below Deer Creek Mine in December as a result of the temporary mine discharge Bypass Agreement granted by the State Department of Health. The quantity and quality of water discharge and impacts to the receiving

streams (Deer Creek and Huntington Creek) will be discussed in the Deer Creek Discharge section of this report. Both locations and schedules for hydrologic monitoring in 1991 have been updated to reflect the Bypass Agreement (see Appendix M).

c. Quality Information

In accordance with the Hydrologic Monitoring Plan baseline quality analysis was performed in 1986. Baseline analysis will be repeated once every five (5) years. No samples were collected in 1990 due to the severe drought. The results of the historical operational quality analysis are listed in Tables 13 and 14. The minimum, maximum, and mean values are given for a five-year period along with the historical results. Values are in milligrams per liter unless otherwise noted. It is apparent from historical information in the tables that the quality of the Deer Creek runoff degradates slightly from the upper to the lower sampling point. The quality of the lower sampling point is thought to be affected by the Mancos Shale which outcrops above the lower sampling location.

3. Meetinghouse Canyon Creek

Meetinghouse Canyon Creek is an ephemeral tributary of Huntington Creek and is monitored according to the following schedule (see Hydrologic Monitoring Schedule in Appendix M).

a. Flow and Sampling Schedule
   (1) Location: South Fork of Meetinghouse Canyon (See Map No. 1 in pocket.)
   (2) Flow: Information is collected during the first or second week of each month.

TABLE 13: DEER CREEK SURFACE WATER QUALITY *
ABOVE THE MINE

1989 SAMPLE DATES	ACIDITY	ALKALINITY BICARBONATE	CALCIUM	CARBONATE	CHLORIDE	CONDUCTIVITY (umhos/cm)	DISSOLVED OXYGEN	HARDNESS	---- IRON ---- DISSOLVED	TOTAL	MAGNESIUM	MANGANESE	OIL & GREASE	pH (units)	POTASSIUM	SODIUM	SULFATE	----- SOLIDS ----- TDS	TSS	SETTLEABLE
No flow during 1989-90																				
1988																				
MIN	<1.0	285	56.8	<1.0	6.0	442	5.8	283	<0.02	<0.02	24.8	<0.01	<1.0	8.2	0.68	13.4	22.0	362	<1.0	<0.05
MAX	51.0	397	107.2	8.0	138.0	1300	8.1	599	0.09	0.13	80.5	<0.01	2.6	8.5	3.30	59.0	185.0	663	19.0	<0.1
MEAN	22.5	336.0	76.7	3.2	51.3	794.0	7.0	372.5	0.06	0.07	46.8	<0.01	1.4	7.5	1.37	34.4	100.7	499	9.3	0.08
1987																				
MIN	0	272	2.2	<1.0	3.5	360	5.3	225	0.02	0.04	27.9	<0.01	0.6	7.0	0.50	16.0	24.0	252		0
MAX	137.0	337	82.0	6.0	176.0	1580	8.4	550	0.05	0.31	83.9	0.06	<1.0	8.4	4.33	111.6	255.0	897		<0.1
MEAN	23.5	298.2	48.0	1.8	34.4	647.5	6.94	311.7	0.05	0.11	42.4	0.02	0.84	7.6	1.48	36.2	93.3	395		0.08
1986																				
MIN	1.0	262	42.0	<1.0	4.5	470	8.2	232	<0.05	<0.05	26.3	<0.01	<0.5	7.3	0.80	13.9	30.0	269	<0.5	<0.1
MAX	1.0	322	62.0	<1.0	10.8	660	10.2	290	<0.05	0.26	40.1	0.03	0.5	7.9	1.12	27.6	90.0	385	130.0	<0.5
MEAN	1.0	299.7	50.7	<1.0	7.29	573.1	9.5	263.9	<0.05	0.08	33.4	0.01	0.5	7.7	1.00	20.0	52.9	318	23.9	0.02
1985																				
MIN						439				<0.05		<0.01		7.4				246	1.0	
MAX						685				0.21		0.08		8.0				378	162.0	
MEAN						573.1				0.07		0.02		7.8				318	24.3	
1984																				
MIN						480				<0.05		<0.01		7.3				231	<0.5	
MAX						700				<0.05		<0.01		8.3				381	41.5	
MEAN						582.5				<0.05		<0.01		7.9				320	11.5	
HISTORICAL 1978-1989																				
MIN	<1.0	262	2.2	0.6	3.5	360	5.3	225	<0.02	0.02	24.8	<0.01	<0.5	7.0	0.50	13.4	10.0	231	<0.5	<0.05
MAX	137.0	337	107.2	8.0	176.0	1580	10.2	599	0.09	40.10	83.9	0.24	2.6	8.5	4.33	111.6	255.0	897	3592.0	1.0
MEAN	15.4	311	59.7	1.7	28.9	602	8.0	321	0.05	0.82	40.5	0.03	0.9	7.9	1.26	29.7	74.3	352	113.6	0.26
NO. OF ANALYSES	19	19	19	19	20	59	20	19	12	60	19	58	20	60	18	19	21	60	60	18

* Quality parameters are reported as mg/l unless otherwise noted.

TABLE 14: DEER CREEK SURFACE WATER QUALITY *

BELOW THE MINE

1989 SAMPLE DATES	ACIDITY	ALKALINITY BICARBONATE	CALCIUM	CARBONATE	CHLORIDE	CONDUCTIVITY (umhos/cm)	DISSOLVED OXYGEN	HARDNESS	---- IRON ---- DISSOLVED	TOTAL	MAGNESIUM	MANGANESE	OIL & GREASE	pH (units)	POTASSIUM	SODIUM	SULFATE	----- SOLIDS ----- TDS	TSS	SETTLEABLE
No flow during 1989-90																				
1988																				
MIN	<1.0	244	88.4	<1.0	75.0	800	7.2	382	0.03	0.04	39.2	<0.01	3.6	8.1	1.70	49.2	130.0	472	<1.0	<0.05
MAX	27.0	442	129.1	11.0	195.0	1450	7.9	700	0.64	0.78	95.1	0.06	9.0	8.4	7.60	145.8	350.0	1164	372.0	1.5
MEAN	15.2	309	113.7	3.5	117.3	1155	7.4	547	0.19	0.27	63.9	0.02	5.6	8.3	5.00	90.9	263.3	832	136.3	0.53
1987																				
MIN	<1.0	255	2.4	<1.0	34.6	620	5.4	285	<0.05	<0.05	40.1	<0.01	<1.0	7.4	1.00	39.0	90.0	429	<4.0	<0.1
MAX	90.0	371	124.0	8.0	420.0	2650	8.2	815	0.07	0.29	122.8	0.02	1.2	8.5	7.31	233.8	500.0	1544	410.0	<1.0
MEAN	15.2	302.3	71.4	2.2	118.9	1303.3	6.8	540.3	0.53	0.10	78.2	0.01	0.8	7.8	4.05	127.3	234.5	806	11.2	0.4
1986																				
MIN	<1.0	260	46.0	<1.0	30.3	698	9.4	284	<0.05	<0.05	34.5	<0.01	<0.5	7.4	1.30	32.6	65.0	358	<0.5	<0.1
MAX	<1.0	359	112.0	<1.0	290	2300	11.0	750	0.06	0.19	114.3	0.03	0.5	7.9	6.61	192.0	450.0	1315	91.0	<0.5
MEAN	<1.0	308.1	73.0	<1.0	135.9	1306.9	10.0	449.9	0.05	0.09	65.0	0.02	0.5	7.7	3.66	104.2	225.0	739	25.7	0.02
1985																				
MIN						630				<0.05		<0.01		7.4				320	4.0	
MAX						2300				0.39		0.08		8.3				1354	258.0	
MEAN						1374.7				0.13		0.02		7.9				690	44.1	
1984																				
MIN						620				0.05		<0.01		7.8				371	0.5	
MAX						2150				0.18		<0.01		8.5				637	141.0	
MEAN						1172.5				0.07		<0.01		8.1				465	29.8	
HISTORICAL 1978-1989																				
MIN	<1.0	244	1.4	<1.0	22.0	420	5.4	284	0.03	0.04	34.5	<0.01	<0.5	6.9	1.0	32.6	65.0	273	<0.5	<0.05
MAX	90.0	442	129.1	11.0	420.0	2300	11.0	815	0.64	170.00	122.8	0.27	9.0	8.6	7.6	233.8	500.0	1544	20,540.0	1.5
MEAN	10.4	306	73.3	2.0	117.8	1146	8.3	495	0.11	3.43	64.8	0.04	1.7	8.0	3.91	106.8	218.8	688	462.3	0.3
NO. OF ANALYSES	17	17	17	17	18	53	18	17	10	54	17	52	18	54	17	17	19	54	53	17

* Quality parameters are reported as mg/l unless otherwise noted.

(3) Water Quality Sampling:
Water samples will be collected and analyzed quarterly (one sample at low flow and high flow) during the first or second week of the quarter. Parameters analyzed will be those stated in the DOGM Guidelines for Surface Water Operational Quality. (See Addendum in Appendix M.) The program was initiated in March 1988 and will continue through 1991, i.e., June, September, and December. Field measurements including pH, specific conductivity, temperature, and dissolved oxygen will be performed monthly in conjunction with quantity measurements.

b. Flow Information

A hydrograph comparing 1990 and 1984-1989 can be found in Appendix C. Flow occurred only during the month of June and measured 40.7 GPM.

c. Quality Information

In accordance with the Hydrologic Monitoring Plan baseline quality analysis was performed in 1986. Baseline analysis will be repeated once every five (5) years. Quality sampling was initiated in 1986. Table 15 lists the minimum, maximum, and mean values for 1986-1990 along with historical results.

4. Rilda Canyon Creek

Rilda Canyon Creek is a tributary of Huntington Creek and is monitored according to the following schedule (see Appendix M). Rilda Canyon Creek is ephemeral from its headwaters to the western border of Section 28, Township 16 South, Range 7 East, and perennial from that point to the confluence of Huntington Creek.

a. Flow and Sampling Schedule

(1) Locations:
(a) Right Fork of Rilda - RCF1
(b) Left Fork of Rilda - RCL1*
(c) Rilda Canyon - RCF2*
(d) Rilda Canyon - RCF3
(e) Rilda Canyon - RCW4 (See Map HM-1.)

TABLE 15: MEETINGHOUSE CANYON WATER QUALITY *

LEFT FORK

1990 SAMPLE DATES	ACIDITY	ALKALINITY BICARBONATE	CALCIUM	CARBONATE	CHLORIDE	CONDUCTIVITY (umhos/cm)	DISSOLVED OXYGEN	HARDNESS	---- IRON ---- DISSOLVED	TOTAL	MAGNESIUM	MANGANESE	OIL & GREASE	pH (units)	POTASSIUM	SODIUM	SULFATE	----- SOLIDS ----- TDS	TSS	SETTLEABLE
6-13	<1.0	229	49.8	6.0	20.0	385	6.3	240	<0.02	<0.02	28.2	0.02	4.2	8.5	0.34	37.5	100.0	201	<1.0	<0.5
1989	NO FLOW																			
1988																				
MIN	<1.0	215	43.2	<1.0	5.0	380	7.1	222	0.04	0.08	22.5	<0.01	<1.0	7.8	0.96	6.9	22.0	268	<1.0	<0.05
MAX	13.0	267	71.1	7.0	15.0	480	7.9	280	0.19	0.27	27.7	<0.01	1.4	8.5	1.50	12.5	100.0	304	26.0	<0.05
MEAN	9.3	241.7	57.3	2.5	6.7	440	7.5	260	0.10	0.15	28.4	<0.01	1.1	8.1	1.32	9.8	69.0	290	15.0	<0.05
1987																				
MIN	0.0	222	2.2	<1.0	3.0	300	5.4	195	0.04	<0.05	24.3	<0.01	<1.0	7.3	0.60	3.8	20.0	190	<1.0	0.1
MAX	49.0	307	55.6	8.0	47.5	420	7.4	267	0.08	0.90	33.0	0.04	10.9	8.6	1.29	10.7	45.0	259	42.0	<1.0
MEAN	10.4	250.2	33.8	3.2	14.1	366	6.4	226	0.10	0.28	29.4	0.02	2.9	7.9	1.02	8.2	30.8	230	15.8	0.5
1986																				
MIN	<1.0	231	38.0	<1.0	3.3	432	8.6	213	<0.05	<0.05	22.6	<0.01	<0.5	7.4	0.9	6.5	25.0	231	<0.5	<0.1
MAX	<1.0	261	52.8	<1.0	7.6	500	10.3	260	<0.05	0.18	36.5	0.02	0.6	8.0	1.6	13.1	85.0	292	74.0	<0.5
MEAN	<1.0	248.7	44.5	<1.0	5.1	450	9.4	233	<0.05	0.10	29.6	0.02	0.5	7.7	1.23	9.5	43.2	253	24.0	0.2
HISTORICAL 1986-89																				
MIN	<1.0	215	2.2	1.0	3.0	300	5.4	195	0.04	<0.05	22.5	<0.01	0.1	7.3	0.60	3.8	20.0	190	0.1	<0.05
MAX	49	307	71.1	8.0	47.5	500	10.3	350	0.30	0.90	36.5	0.04	10.9	8.6	1.62	13.1	100.0	304	74.0	<1.0
MEAN	7.8	247	45.3	2.1	8.7	415	7.9	247	0.11	0.18	28.8	0.02	1.4	7.9	1.18	8.9	42.8	255	20.9	0.16
NO. OF ANALYSES	13	15	15	15	15	15	15	15	9	15	15	14	15	15	15	15	15	15	14	14

* Quality parameters are reported as mg/l unless otherwise noted.

(2) Flow: Information is collected during the first or second week of each month.

(3) Water Quality Sampling:
Water samples will be collected and analyzed quarterly (one sample at low flow and high flow) during the first or second week of the quarter. Parameters analyzed are those listed in the DOGM Guidelines for Surface Water Operational Quality. (See Appendix M.) The program was initiated in June 1989 except for RCL1, which was initiated in 1990. Field measurements, including pH, specific conductivity, temperature, and dissolved oxygen, will be performed at the perennial stream locations, i.e., RCF3 and RCW4, monthly in conjunction with quantity measurements.

* Flow and field parameters only.

b. Flow Information

Flow information is collected monthly throughout the year with the use of three Parshall flumes and one V-notch weir. (See Map No. 1 for locations.) A hydrograph has been generated for each flume-weir location. (See Appendix D.) Springs utilized by North Emery Water Users Association (NEWUA) for culinary purposes are situated between monitoring locations RCF2 and RCF3. Flow above the spring area is ephemeral and below the stream is perennial. For location RCF1 flow occurred during the months of May and June, measuring 192.7 and 380.2 GPM, respectively. For location RCF2 flow only occurred during the month of June, measuring 116.8 GPM. Location RCLF1 remained dry throughout the year. Below the spring area the stream is perennial and increases in flow from RCF3 to RCW4. During 1990 the baseline for RCF3 was approximately 19 GPM and for RCW4, 54 GPM. Data suggest that above the NEWUA spring the stream loses water to the alluvium and below the spring area the alluvium recharges the stream causing the flow to increase.

c. Quality Information

In accordance with the Hydrologic Monitoring Plan baseline quality analysis will be for a two-year period, 1989-90. Thereafter, baseline analysis will be repeated once every five (5) years. Quality sampling was initiated in 1989; results of the samples collected are presented in Table 16. Keeping in mind that this data represents a two-year period, the quality of the water degradates from the upper reaches of Rilda Canyon, i.e., RCF1, to the NEWUA spring area; and from that point to the mouth of the canyon, i.e., RCW4, the water quality is relatively consistent. (See Table 16.)

B. Cottonwood Creek Drainage System

The southern portion of East Mountain is intersected by Cottonwood Creek and its associated tributaries, including Cottonwood Canyon Creek and Grimes Wash. The Cottonwood Creek drainage is about equal in size to the Huntington drainage, with total discharge from each drainage about 70,000 acre feet per year. The major cultural feature on Cottonwood Creek is Joe's Valley Reservoir, located about twelve miles west of the town of Orangeville. The 63,000 acre foot reservoir was constructed by the U. S. Bureau of Reclamation and provides storage water for irrigation, industrial, and municipal needs in the Emery County area.

PacifiCorp monitors two of the tributaries of the Cottonwood Creek drainage system, Cottonwood Canyon Creek and Grimes Wash. (See Map No. 1 in pocket.)

1. Cottonwood Canyon Creek

An extensive baseline study conducted on Cottonwood Canyon Creek to determine water characteristics prior to mining at the proposed Cottonwood Mine began in 1979. A property acquisition in 1981 resulted in mine plan changes; therefore, the baseline study was terminated as of January 1, 1984. As agreed upon

TABLE 16: RILDA CANYON SURFACE WATER QUALITY *

1990 SAMPLE DATES	ACIDITY	ALKALINITY BICARBONATE	CALCIUM	CARBONATE	CHLORIDE	CONDUCTIVITY (umhos/cm)	DISSOLVED OXYGEN	HARDNESS	IRON DISSOLVED	IRON TOTAL	MAGNESIUM	MANGANESE	OIL & GREASE	pH (units)	POTASSIUM	SODIUM	SULFATE	SOLIDS TDS	SOLIDS TSS	SOLIDS SETTLEABLE
RCF1																				
6-13	<1.0	245	76.1	4.0	10.0	360	6.9	287	0.02	0.05	23.5	<0.02	1.1	8.3	2.10	4.3	80.0	277	2.0	<0.05
1989																				
MIN	<1.0	227	49.8	<1.0	10.0	300	7.1	201	0.02	0.02	18.6	<0.01	<1.0	8.2	0.60	5.6	23.0	222	12.0	0.05
MAX	<1.0	227	49.8	<1.0	10.0	300	7.1	201	0.02	0.02	18.6	<0.01	<1.0	8.2	0.60	5.6	23.0	222	12.0	0.05
MEAN	<1.0	227	49.8	<1.0	10.0	300	7.1	201	0.02	0.02	18.6	<0.01	<1.0	8.2	0.60	5.6	23.0	222	12.0	0.05
RCF3																				
6-13	2.0	336	79.9	<1.0	5.0	550	6.8	329	0.33	0.03	31.4	0.02	<1.0	8.1	1.80	7.6	60.0	226	9.0	<0.50
9-6	<1.0	425	99.5	<1.0	10.0	515	4.5	433	0.06	0.03	44.7	0.04	<1.0	7.9	2.02	2.0	110.0	493	31.0	<0.50
12-14	--	421	112.2	<1.0	15.0	720	7.6	499	0.34	0.34	53.2	0.02	1.7	8.0	2.11	2.1	75.0	453	<1.0	2.50
MIN	<1.0	336	79.9	<1.0	5.0	515	4.5	329	0.06	0.03	31.4	0.02	<1.0	7.9	1.80	2.0	60.0	226	<1.0	<0.50
MAX	2.0	425	112.2	<1.0	15.0	720	7.6	499	0.34	0.34	53.2	0.04	1.7	8.1	2.11	7.6	110.0	493	31.0	2.50
MEAN	1.5	394	97.2	<1.0	10.0	595	6.3	420	0.24	0.13	43.1	0.03	1.2	8.0	1.98	3.9	81.7	391	13.7	1.20
NO. OF ANALYSES	2	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3
1989																				
MIN	<1.0	338	81.7	<1.0	10.0	500	7.0	379	<0.02	0.08	42.5	<0.01	<1.0	7.9	1.7	10.4	70.0	372	4.0	<0.05
MAX	5.0	500	104.3	<1.0	15.0	855	7.6	479	0.41	0.51	53.1	0.04	2.8	8.0	2.5	15.9	150.0	513	23.0	<1.0
MEAN	3.3	432	94.9	<1.0	12.5	726	7.4	442	0.16	0.22	49.7	0.02	1.6	8.0	2.2	13.3	111.2	464	14.5	0.29
RCW4																				
6-13	4.0	348	116.6	5.0	20.0	700	6.9	458	<0.02	0.04	40.4	<0.02	<1.0	8.3	0.5	52.0	250.0	300	<1.0	<0.50
9-6	<1.0	404	132.7	<1.0	12.0	600	5.2	545	0.06	0.03	51.9	0.06	<1.0	8.2	2.2	19.1	250.0	538	193.0	<0.50
12-14	<1.0	461	91.3	<1.0	20.0	750	7.2	505	0.03	0.04	67.2	<0.01	2.1	8.3	2.5	32.8	140.0	511	2.0	<0.50
MIN	<1.0	348	91.3	<1.0	12.0	600	5.2	458	<0.02	0.03	40.4	<0.01	<1.0	8.2	0.5	19.1	140.0	300	<1.0	<0.50
MAX	4.0	461	132.7	5.0	20.0	750	7.2	545	0.06	0.04	67.2	0.06	2.1	8.3	2.5	52.0	250.0	538	193.0	<0.50
MEAN	2.0	404.3	113.5	2.3	17.3	683	6.4	503	0.04	0.04	53.2	0.03	1.3	8.2	1.7	34.6	213.3	449	65.3	<0.50
NO. OF ANALYSES	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3
1989																				
MIN	<1.0	320	63.0	<1.0	10.0	450	7.5	336	<0.02	<0.02	43.4	<0.01	<1.0	8.1	1.9	13.9	85.0	413	6.0	<0.05
MAX	<1.0	410	73.2	<1.0	15.0	800	8.7	453	0.10	0.12	65.7	0.02	2.8	8.3	2.8	17.1	150.0	496	7.0	<1.0
MEAN	<1.0	373	69.6	<1.0	13.3	678	7.9	397	0.06	0.05	54.4	0.01	1.8	8.2	2.3	16.0	110.0	462	6.7	0.37

*Quality parameters are reported as mg/l unless otherwise noted.

in both the Deer Creek Mine and Wilberg Mine permit applications, PacifiCorp will continue to monitor the flow and water quality field measurements at the USGS flume location on a monthly basis. Based on data collected PacifiCorp, Cottonwood Canyon Creek is an ephemeral stream from its headwaters to Section 24, Township 17 South, Range 6 East and intermittent from that point to its confluence with Cottonwood Creek. The majority of water moving through Cottonwood Canyon Creek appears to be through the colluvial valley deposits. The stream becomes intermittent where it crosses the Roans Canyon Fault Trace, possibly caused by intersecting an impermeable obstruction. The hydrograph in Appendix E illustrates the flow information collected during 1990 and compares it to the data collected from 1984 through 1989. It shows a peak flow of 406 GPM in March and a baseline flow of approximately 20 GPM in December. It is likely that the flow measurements are high because the flume is installed in such a way that it traps sediment. The degree to which the measurements have been affected by the sediment has not been determined.

2. Grimes Wash

Grimes is an ephemeral tributary of Cottonwood Creek and flows in the same canyon in which the Wilberg/Cottonwood Mine is located. Three permanent runoff sampling sites were established in 1980 and are sampled as listed below (see Hydrologic Monitoring Plan in Appendix M).

a. Flow and Sampling Schedule

(1) Locations: (See Map No. 1 in pocket.)
   (a) Right Fork - GWR01
   (b) Left Fork - GWR02
   (c) Below the Mine - GWR03

(2) Flow: Information is collected during the first or second week of each month.

(3) Water Quality Sampling:
Water samples will be collected and analyzed quarterly (one sample at low flow and high flow) during the first or second week of the quarter. Parameters analyzed will be those stated in the DOGM Guidelines for Surface

Water Operational Quality. (See Appendix M.) The program was initiated in March 1988 and will continue through 1991, i.e., June, September, and December. Field measurements including pH, specific conductivity, and temperature will be performed monthly in conjunction with quantity measurements.

b. Flow Information

As stated above, flow information is collected monthly throughout the year with the use of two Parshall flumes. (See Map No. 1 for flume locations.) A hydrograph comparing 1990 to the data collected from 1984 through 1989 has been generated for each flume location. (See Appendix E.) The hydrographs show that both the Right and the Left forks remained dry throughout 1990. Flow at the Below the Mine location continued throughout the year due to the influence of the springs emanating from the Starpoint Sandstone/Mancos Shale formational contact and Wilberg/Cottonwood Mine discharge. Baseline flow averaged approximately 30 GPM.

c. Quality Information

In accordance with the Hydrologic Monitoring Plan baseline quality analysis was performed in 1986. Baseline analysis will be repeated once every five (5) years. The results of the 1990 operational quality analysis are listed in Tables 16, 17, and 18. The minimum, maximum, and mean values are given for a five-year period along with the historical results. Values are in milligrams per liter unless otherwise noted. Complete raw data can be found in Appendix E.

The Grimes Wash drainage quality is influenced by two factors: 1) Under normal conditions the Right Fork contributes a relatively high amount of suspended solids during spring runoff due to the fact that it is a south facing canyon dominated by argillaceous sediments. 2) Mancos Shale/Starpoint Sandstone interface seeps and springs elevate the TDS at the Below the Mine location.

TABLE 17: GRIMES WASH WATER QUALITY *

RIGHT FORK

1989 SAMPLE DATES	ACIDITY	ALKALINITY BICARBONATE	CALCIUM	CARBONATE	CHLORIDE	CONDUCTIVITY (umhos/cm)	DISSOLVED OXYGEN	HARDNESS	---- IRON ---- DISSOLVED	TOTAL	MAGNESIUM	MANGANESE	OIL & GREASE	pH (units)	POTASSIUM	SODIUM	SULFATE	------ SOLIDS ------ TDS	TSS	SETTLEABLE
No flow during 1989-90																				
1988																				
MIN	39.0	112	43.8	<1.0	26.4	225	9.7	154	0.61	0.78	10.9	0.04	9.0	8.2	5.2	1.9	27.0	196	8.0	<1.0
MAX	39.0	112	43.8	<1.0	26.4	225	9.7	154	0.61	0.78	10.9	0.04	9.0	8.2	5.2	1.9	27.0	196	8.0	<1.0
MEAN	39.0	112	43.8	<1.0	26.4	225	9.7	154	0.61	0.78	10.9	0.04	9.0	8.2	5.2	1.9	27.0	196	8.0	<1.0
1987																				
MIN	<1.0	104	34.4	<1.0	3.0	190	6.8	112	3.31	20.60	6.3	0.05	---	7.2	7.6	2.0	20.0	115	2000.0	3.3
MAX	<1.0	104	34.4	<1.0	3.0	190	6.8	112	3.31	20.60	6.3	0.05	---	7.2	7.6	2.0	20.0	115	2000.0	3.3
MEAN	<1.0	104	34.4	<1.0	3.0	190	6.8	112	3.31	20.60	6.3	0.05	---	7.2	7.6	2.0	20.0	115	2000.0	3.3
1986																				
MIN	<1.0	240	30.0	<1.0	8.3	465	7.6	222	<0.05	<0.05	35.7	<0.01	<0.5	7.5	1.6	3.4	40.0	262	0.5	<0.1
MAX	<1.0	320	52.0	<1.0	11.5	680	9.8	320	<0.05	0.73	46.2	0.05	2.2	8.1	3.3	20.4	120.0	389	257.0	<0.5
MEAN	<1.0	275	41.6	<1.0	10.2	547.6	8.8	268	<0.05	0.24	39.9	0.02	0.74	7.8	2.5	15.7	61.3	316	60.6	0.2
1985																				
MIN						200				<0.05		<0.01		7.4				125	11.0	
MAX						740				2.90		0.08		8.3				430	7116.0	
MEAN						532.3				0.50		0.02		8.0				304	833.8	
1984																				
MIN						470				<0.05		<0.01		7.9				246	7.0	
MAX						750				1.05		0.02		8.7				477	1482.0	
MEAN						593.8				0.26		0.01		8.2				333	207.7	
1983																				
MIN						525				0.08		<0.01		8.1				386	10.5	
MAX						650				2.64		0.18		8.6				280	493.0	
MEAN						610				0.69		0.06		8.3				328	183.3	
HISTORICAL 1979-1989																				
MIN	0.1	104	30.0	<1.0	3.0	190	6.8	112	<0.05	0.01	6.3	<0.01	<0.5	7.2	1.6	1.9	20.0	115	0.5	<0.1
MAX	39.0	320	52.0	<1.0	26.4	750	9.8	320	3.31	20.60	46.2	0.30	9.0	8.7	7.6	20.4	161.7	700	7116.0	3.3
MEAN	5.6	238	41.0	<1.0	11.3	560	8.6	238	0.47	1.36	33.0	0.06	1.9	8.1	3.4	14.1	64.4	342	376.3	0.6
NO. OF ANALYSES	11	9	9	9	11	42	9	9	9	46	9	42	12	46	9	9	13	46	46	9

* Quality parameters are reported as mg/l unless otherwise noted.

TABLE 18: GRIMES WASH WATER QUALITY *

LEFT FORK

1989 SAMPLE DATES	ACIDITY	ALKALINITY BICARBONATE	CALCIUM	CARBONATE	CHLORIDE	CONDUCTIVITY (umhos/cm)	DISSOLVED OXYGEN	HARDNESS	---- IRON ---- DISSOLVED	TOTAL	MAGNESIUM	MANGANESE	OIL & GREASE	pH (units)	POTASSIUM	SODIUM	SULFATE	------ SOLIDS ------ TDS	TSS	SETTLEABLE
No flow during 1989-90																				
1988																				
MIN	34.0	312	71.5	<1.0	10.0	600	7.0	337	<0.02	<0.02	38.5	<0.01	2.0	8.4	1.1	24.2	105.0	428	4.0	<0.05
MAX	34.0	312	71.5	<1.0	10.0	600	7.0	337	<0.02	<0.02	38.5	<0.01	2.0	8.4	1.1	24.2	105.0	428	4.0	<0.05
MEAN	34.0	312	71.5	<1.0	10.0	600	7.0	337	<0.02	<0.02	38.5	<0.01	2.0	8.4	1.1	24.2	105.0	428	4.0	<0.05
1987																				
MIN	<1.0	188	2.3	<1.0	6.0	412	5.0	337	<0.05	<0.05	23.8	<0.01	<0.5	7.6	1.0	11.1	45.0	212	<1.0	0
MAX	<1.0	482	71.1	15.0	156.0	610	7.8	460	0.12	0.62	68.5	0.06	3.5	8.6	2.5	34.0	90.0	382	48.0	0.20
MEAN	<1.0	317	38.1	3.8	56.6	526	7.0	296	0.07	0.17	43.4	0.02	1.7	7.8	1.4	28.5	73.6	307	14.6	0.10
1986																				
MIN	<1.0	281	36.0	<1.0	7.7	410	7.4	252	<0.05	<0.05	37.7	<0.01	<0.5	7.4	1.3	25.2	67.0	293	3.0	<0.10
MAX	<1.0	331	58.0	<1.0	10.9	690	9.6	310	<0.05	0.22	43.8	0.07	0.6	8.0	3.0	34.0	115.0	427	253.0	<0.50
MEAN	<1.0	304	45.5	<1.0	8.8	591	8.6	278	<0.05	0.12	39.9	0.02	0.5	7.7	1.9	29.2	77.9	346	54.1	0.20
1985																				
MIN						473				<0.05		<0.01		7.5				283	<0.5	
MAX						750				0.22		0.08		8.3				438	141.0	
MEAN						628				0.12		0.02		7.9				356	37.1	
1984																				
MIN						600				<0.05		<0.01		7.8				278	<0.5	
MAX						685				0.09		<0.01		8.5				396	76.0	
MEAN						639				0.06		<0.01		8.1				344	17.0	
HISTORICAL 1979-1989																				
MIN	<1.0	188	2.3	<1.0	6.0	410	5.0	196	<0.02	<0.02	23.8	<0.01	0.1	7.3	1.0	11.1	30.4	212	<0.5	<0.05
MAX	34.0	482	71.1	15.0	156.0	790	9.6	460	0.12	0.81	68.5	0.15	3.5	8.7	3.0	34.0	115.0	570	1428.0	<0.50
MEAN	3.4	309	44.6	2.0	19.7	627	7.7	289	0.06	0.15	41.3	0.03	1.1	8.0	1.6	28.5	73.8	363	52.1	0.13
NO. OF ANALYSES	14	14	14	14	14	49	14	14	6	51	14	50	14	51	14	14	15	51	52	13

* Quality parameters are reported as mg/l unless otherwise noted.

TABLE 19: GRIMES WASH WATER QUALITY *

BELOW MINE

SAMPLE DATES	ACIDITY	ALKALINITY BICARBONATE	CALCIUM	CARBONATE	CHLORIDE	CONDUCTIVITY (umhos/cm)	DISSOLVED OXYGEN	HARDNESS	IRON DISSOLVED	IRON TOTAL	MAGNESIUM	MANGANESE	OIL & GREASE	pH (units)	POTASSIUM	SODIUM	SULFATE	SOLIDS TDS	SOLIDS TSS	SOLIDS SETTLEABLE
1990																				
3-6	8.0	366	150.4	<1.0	900	3900	9.0	703	0.07	0.19	79.5	0.04	1.1	8.2	5.6	513.5	250.0	1981	16.0	<0.05
6-6	6.0	371	222.9	<1.0	140	1200	5.5	925	0.03	0.15	89.4	0.04	<1.0	8.2	3.2	95.9	600.0	909	3.0	2.00
9-7	7.0	340	132.8	<1.0	126	1250	5.9	646	<0.02	0.13	76.4	<0.02	<1.0	8.1	1.3	103.6	410.0	1071	<1.0	<0.50
12-17	<1.0	486	272.3	<1.0	1450	3900	6.0	1043	0.13	0.13	88.1	0.06	<1.0	8.2	8.0	780.0	410.0	2827	13.0	--
MIN	<1.0	366	132.8	<1.0	126	1200	5.5	646	<0.02	0.13	76.4	<0.02	<1.0	8.1	1.3	95.9	250.0	909	<1.0	0.50
MAX	8.0	486	222.9	<1.0	1450	3900	9.0	1043	0.13	0.19	89.4	0.06	1.1	8.2	8.0	780.0	600.0	2827	16.0	2.00
MEAN		391	194.6	<1.0	654	2563	6.6	829	0.06	0.15	83.4	0.04	1.0	8.2	4.5	373.3	417.5	1697	8.3	1.00
NO. OF ANALYSES	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	3
1989																				
MIN	<1.0	340	84.9	<1.0	10.0	900	6.3	420	0.09	0.10	50.6	0.01	<1.0	7.7	3.5	19.3	120.0	594	<1.0	<0.05
MAX	6.0	425	184.9	<1.0	515.0	4290	9.5	906	0.33	0.44	115.5	0.90	8.3	8.2	7.1	376.5	580.0	1877	91.0	<0.05
MEAN	3.2	395	146.3	<1.0	202.5	2113	7.5	741	0.16	0.20	91.2	0.26	3.2	7.4	5.4	153.9	450.0	1314	36.2	<0.05
1988																				
MIN	2.0	205	91.5	<1.0	142.0	1200	5.1	356	0.04	0.06	30.9	<0.01	0.6	7.7	0.5	85.1	135.0	673	1.0	<0.05
MAX	114.0	398	274.0	3.0	4531.0	12000	8.9	1165	0.48	0.76	116.8	0.13	27.0	8.3	12.5	3181.0	462.0	7160	36.0	1.00
MEAN	35.8	330	156.9	1.3	1054.1	3783	7.5	702	0.25	0.38	75.3	0.04	8.5	8.0	6.7	717.8	356.2	2375	13.2	0.37
1987																				
MIN	<1.0	117	5.1	<1.0	9.0	295	4.5	146	<0.05	<0.05	10.7	0.04	<0.5	7.1	5.0	9.0	46.0	155	<1.0	<0.10
MAX	127.0	400	191.5	<1.0	154.0	1700	7.8	855	2.25	22.60	102.0	0.17	5.2	8.2	7.8	121.0	593.0	1201	3295.0	4.00
MEAN	22.0	331	99.1	<1.0	67.5	1254	6.5	598	0.43	3.98	75.4	0.10	2.2	7.6	6.6	83.1	340.7	883	552.2	1.05
1986																				
MIN	<1.0	284	72.4	<1.0	36.3	890	7.9	405	<0.05	<0.05	51.1	<0.01	<0.5	7.2	2.6	47.0	150.0	523	<0.5	<0.10
MAX	<1.0	381	150.0	<1.0	141.2	1800	11.4	760	0.13	0.40	87.6	0.08	1.0	8.0	5.8	119.8	320.0	1224	248.0	<0.50
MEAN	<1.0	343	99.0	<1.0	71.4	1239	9.4	545	0.06	0.13	72.2	0.03	0.2	7.6	4.1	68.9	243.3	760	37.1	0.20
1985																				
MIN						220				0.05		0.01		7.4				152	2.0	
MAX						1810				2.70		0.13		8.1				1129	9702.0	
MEAN						1183				0.37		0.04		7.8				733	994.8	
HISTORICAL 1979-1989																				
MIN	<1.0	117	5.1	<1.0	10.0	220	4.5	146	0.04	0.01	10.7	<0.01	<0.5	7.1	0.5	9.0	46.0	152	<0.5	<0.10
MAX	127.0	486	274.0	3.0	4531.0	12000	11.4	1165	2.25	22.60	116.8	0.90	27.0	8.5	12.5	3181.0	600.0	7160	9702.0	4.00
MEAN	12.7	352	131.9	1.1	361.9	1491	7.7	659	0.20	0.90	77.8	0.10	2.9	7.9	5.1	247.6	334.0	895	244.0	0.50
NO. OF ANALYSES	32	28	28	28	30	68	30	28	20	70	28	67	31	72	30	27	31	70	70	24

* Quality parameters are reported as mg/l unless otherwise noted.

IV. EAST MOUNTAIN SPRINGS

Between the time PacifiCorp began monitoring springs on East Mountain and 1986 the number of springs measured increased from less than fifty (50) to nearly eighty (80). PacifiCorp believed that more benefit could be realized by concentrating its monitoring to selective springs in the areas that will be undermined within the next five years. (See Map No. 3 in pocket.) A meeting was held on March 25, 1987 with the U. S. Forest Service and the Utah State Division of Oil, Gas and Mining to determine the most effective plan for PacifiCorp's monitoring. A subsequent meeting was held on April 15, 1987 with the State Division of Oil, Gas and Mining to finalize the monitoring plan revisions.

During the meetings it was resolved that the following springs will be monitored. Eight additional springs (denoted with a plus [+] symbol below) were added in 1989 after the annual field verification process jointly conducted by DOGM and PacifiCorp.

*	Burnt Tree Springs		79-40
*	Elk Spring		80-41
*	Sheba Springs		80-43
	Ted's Tub	*	80-44
	79-2	*	80-46
*	79-10		80-47
	79-15	+	80-48
*	79-23		82-51
	79-24	*	82-52
*	79-26	*	84-56
+	79-28	+	89-60 (Alpine Spring)
*	79-29	+	89-61
	79-32	+	89-65
	79-34	+	89-66
*	79-35	+	89-67
	79-38	+	89-68

Of these springs, twelve will be monitored on a monthly basis, weather permitting, and have been denoted on the above list with asterisks (*).

A. Flow and Sampling Schedule

1. Flow

All springs on the preceding list are measured during the months of July and October. In addition, a minimum of twelve springs are monitored to establish a discharge recession curve. Generally, measurements are made on a monthly basis during the months of July through October if weather and reasonable access permit; but, when historical data indicate that a spring is short-lived, all efforts are made to measure discharge from that spring at least three times, equally spaced, within its flow period.

2. Quality Samples

All springs listed above are sampled for water quality characteristics during the months of July and October. Parameters analyzed are those listed in the DOGM Guidelines for Groundwater Operational Quality. (See Appendix M.) In addition, the twelve discharge recession springs denoted by asterisks in the preceding list will be monitored monthly, access permitting, each year between July and October for the following parameters: 1) discharge quantity, 2) specific conductivity [field], 3) temperature [field], 4) pH [field], 5) total hardness, 6) carbonate, and 7) total manganese. Due to the consistency of the samples collected from 1987-90, the 1991 sampling schedule has been updated to reflect monitoring of the springs for field parameters only, except in July and October when operational parameters will be tested.

B. Spring Flow

Both precipitation and spring discharge rates increased slightly from 1989 to 1990, whereas temperature, a critical factor on spring discharge rates, was 2.3 degrees higher in 1990 than the historical average. Table 20, A and B, is a tabulation of the flow data collected during the 1990 monitoring season. To record the season variation,

TABLE 20A: EAST MOUNTAIN SPRINGS DISCHARGE

Spring	Date Sampled	Flow (GPM)	Temp. °F	Date Sampled	Flow (GPM)	Temp. °F	Seasonal Net Change %
Sheba	07-02-90	8.1	41	10-10-90	1.6	39	-80
Elk Spring	07-02-90	130.8	39	10-10-90	36.8	39	-72
Burnt Tree	07-03-90	4.1	49	10-10-90	3.5	41	-15
Jerk Water							
Pine Springs							
Pine Sp. Trough							
Ted's Tub	07-03-90	13.0	52	10-10-90	dry		
79-1							
79-2	07-03-90	3.0	47	10-10-90	2.3	45	-23
79-3							
79-4							
79-5							
79-6							
79-7							
79-8							
79-9							
79-10	07-02-90	10.2	47	10-10-90	3.0	43	-71
79-11							
79-12	07-03-90	dry		10-10-90	dry		
79-13							
79-14							
79-15	07-02-90	3.9	44	10-10-90	1.7	41	-56
79-16							
79-17							
79-18							
79-19							
79-20							
79-21							
79-22							
79-23	07-03-90	dry		10-10-90	dry		
79-24	07-03-90	dry		10-10-90	dry		
79-25							
79-26	07-03-90	dry		10-10-90	dry		
79-27							
79-28	07-03-90	1.8	47	10-10-90	2.0	43	11
79-29	07-03-90	1.3	47	10-10-90	1.0	40	-23
79-30							
79-31							
79-32	07-03-90	damp		10-10-90	damp		
79-33							
79-34	07-02-90	dry		10-10-90	dry		
79-35	07-02-90	1.9	45	10-10-90	seep		
79-36							
79-37							
79-38	07-03-90	7.8	47	10-10-90	2.6	44	-67
79-39							
79-40	07-03-90	dry		10-10-90	dry		
80-41	07-03-90	dry		10-10-90	dry		

TABLE 20B: EAST MOUNTAIN SPRINGS DISCHARGE

Spring	Date Sampled	Flow (GPM)	Temp. °F	Date Sampled	Flow (GPM)	Temp. °F	Seasonal Net Change %
80-42							
80-43	07-03-90	dry		10-10-90	dry		
80-44	07-03-90	dry		10-10-90	dry		
80-45							
80-46	07-03-90	dry		10-10-90	dry		
80-47	07-03-90	2.0	46	10-10-90	3.3	42	65
80-48	07-02-90	0.1	52	10-10-90	damp		
80-49							
80-50							
82-51	07-03-90	dry		10-10-90	dry		
82-52	07-03-90	1.3	43	10-10-90	1.1	42	-15
84-53	07-03-90	damp		10-10-90	dry		
84-54							
84-55							
84-56	07-02-90	1.0	41	10-10-90	1.0	41	0
85-57							
86-58							
86-59							
89-60	07-03-90	3.2	51	10-10-90	dry		
89-61	07-02-90	60.0	44	10-10-90	24.0	41	-60
89-62							
89-63							
89-64							
89-65	07-02-90	1.0	43	10-10-90	damp		
89-66	07-02-90	damp		10-10-90	dry		
89-67	07-02-90	3.7	39	10-10-90	2.3	39	-38
89-68	07-02-90	damp		10-10-90	dry		
89-69							
89-70							
89-71							
				AVERAGE NET CHANGE			-32

all springs measured in July are measured again in October. The seasonal variation is represented in Table 20, A and B, under the column heading "Seasonal Net Change." The percentage figures represent the amount of change, either positive or negative. The average change reveals a thirty-two percent (32%) decrease from the July to the October measurements.

A nine-year comparison of spring discharge is shown in Table 21. The table includes a year by year comparison of springs identified from each mode of occurrence (Table 22). The springs utilized in the comparison are underlined in Table 22. The flow values for the individual springs represent the July measurements. October measurements were not utilized because winter weather conditions caused some springs to be inaccessible.

Table 21 has been compared to East Mountain climatology to see how closely spring discharge rates follow local annual precipitation. Figure 3 reveals good correlation between spring discharge and precipitation between 1982-84, but starting in 1985 spring discharge rates have declined whereas precipitation has leveled off. Along with precipitation, temperature plays a critical role in yearly discharge variations, especially during the early stages of the runoff period. Listed in Table 23 is a comparison of January through June temperature data from surrounding weather stations for the period 1982-89 versus departure from normal. The comparison is vital in determining mining effects on spring discharge versus general changes in annual precipitation.

TABLE 21: YEARLY SPRING DISCHARGE VARIATIONS (GPM)

JULY FLOW DATA

Spring	1982	1983	1984	1985	1986	1987	1988	1989	1990
Burnt Tree	12.0	30.5	26.6	26.1	17.5	10.2	12.0	6.4	4.1
Elk Spring	546.0	642.3	427.9	390.5	309.7	217.0	217.4	78.5	130.8
Sheba	15.0	22.9	19.7	14.4	8.6	11.4	10.4	1.1	8.1
Ted's Tub	60.0	89.0	48.0	39.1	31.6	69.0	60.0	5.0	13.0
79-2	12.0	9.1	9.7	5.5	2.9	4.0	2.1	2.7	3.0
79-10	32.0	57.1	20.0	33.3	26.1	26.1	25.0	7.0	10.2
79-15	27.5	42.9	26.1	18.2	18.2	14.6	12.7	2.9	3.9
79-23	3.0	20.0	3.6	6.8	0.6	Damp	Damp	Dry	Dry
79-24	6.1*	9.3*	6.1*	5.0	4.3	Damp	0.8	Dry	Dry
79-26	7.5	20.7	20.0	10.9	8.7	1.5	3.3	0.3	Dry
79-29	4.0	10.0	6.2	6.0	4.7	2.5	2.6	1.1	1.3
79-32	2.1	3.3	3.1	2.7	1.3*	1.0	0.6	0.5	Damp
79-34	30.0	56.7	42.9	18.5	16.7	10.5	13.3	Dry	Dry
79-35	7.6	15.0	10.5	10.5	7.8	6.3	2.7	Dry	1.9
79-38	10.0	10.9	9.2	4.7	3.6	8.3	10.0	1.1	7.8
79-40	3.2	15.0	8.3	5.6	4.7	2.0	5.4	Dry	Dry
80-41	1.0	10.9	15.0	5.8	4.1	2.5	3.9	Dry	Dry
80-43	10.0	24.0	20.0	6.6	3.1	0.4	1.8	Dry	Dry
80-44	12.0	24.0	13.1	5.5	2.2	Dry	0.5	Dry	Dry
80-46	12.0	60.0	28.3	18.2	12.0	4.0	6.7	Dry	Dry
80-47	12.0	20.0	15.0	12.5	12.2	7.4	9.9	4.6	2.0
80-51	3.0	10.0	5.9	3.8	2.6	Damp	Damp	Dry	Dry
82-52	16.0	80.0	48.0	32.1	23.3	20.1	21.5	2.6	1.3
84-56	6.3*	9.6*	6.3	4.7	3.7	2.5	2.9	1.6	1.0
TOTALS	844.0	1,293.2	839.5	687.0	530.2	421.3	425.5	115.4	188.4

* No measurement - utilized yearly comparison.

TABLE 22: MODES OF OCCURRENCE - EAST MOUNTAIN SPRINGS

Occurrences

Stratigraphic Location	Permeable fluvial channels that intersect the land surface	Flow along permeable strata underlain by impermeable mudstone which intersects the land surface	Contact of permeable beds and the Roans Canyon Fault zone	Mode of occurrence not identified
Base of Flagstaff Limestone		79-6, 79-7, 79-35, 86-58	Sheba Springs, 79-1	
North Horn Formation	Teds Tub, Burnt Tree, 79-2, 79-3, 79-8, 79-9, 79-11, 79-12, 79-13, 79-14, 79-15, 79-16, 79-17, 79-21, 79-22, 79-26, 79-27, 79-28, 79-29, 79-34, 79-39, 80-42, 80-43, 80-46, 80-47, 80-48, 84-53, 84-56, 86-59, 89-62, 89-63, 89-64, 89-65, 89-66, 89-67, 89-68		Elk Springs, 79-10, 79-18, 79-19, 79-20, 84-54, 89-61	
Base of North Horn Formation		79-23, 79-25, 79-32, 79-36, 79-37, 79-38, 84-55	79-30, 79-31	
Other Stratigraphic Locations	Blackhawk Formation 80-50, 84-57		80-49 (Price River) Bear Canyon Fault Zone 82-51 (Price River)	Flagstaff Limestone 79-4, 79-5, Pine Springs Trough Price River Formation 79-24, 79-33, 79-40, 80-41, 80-44, 80-45, 82-52, Jerk Water, 89-60 (Alpine)

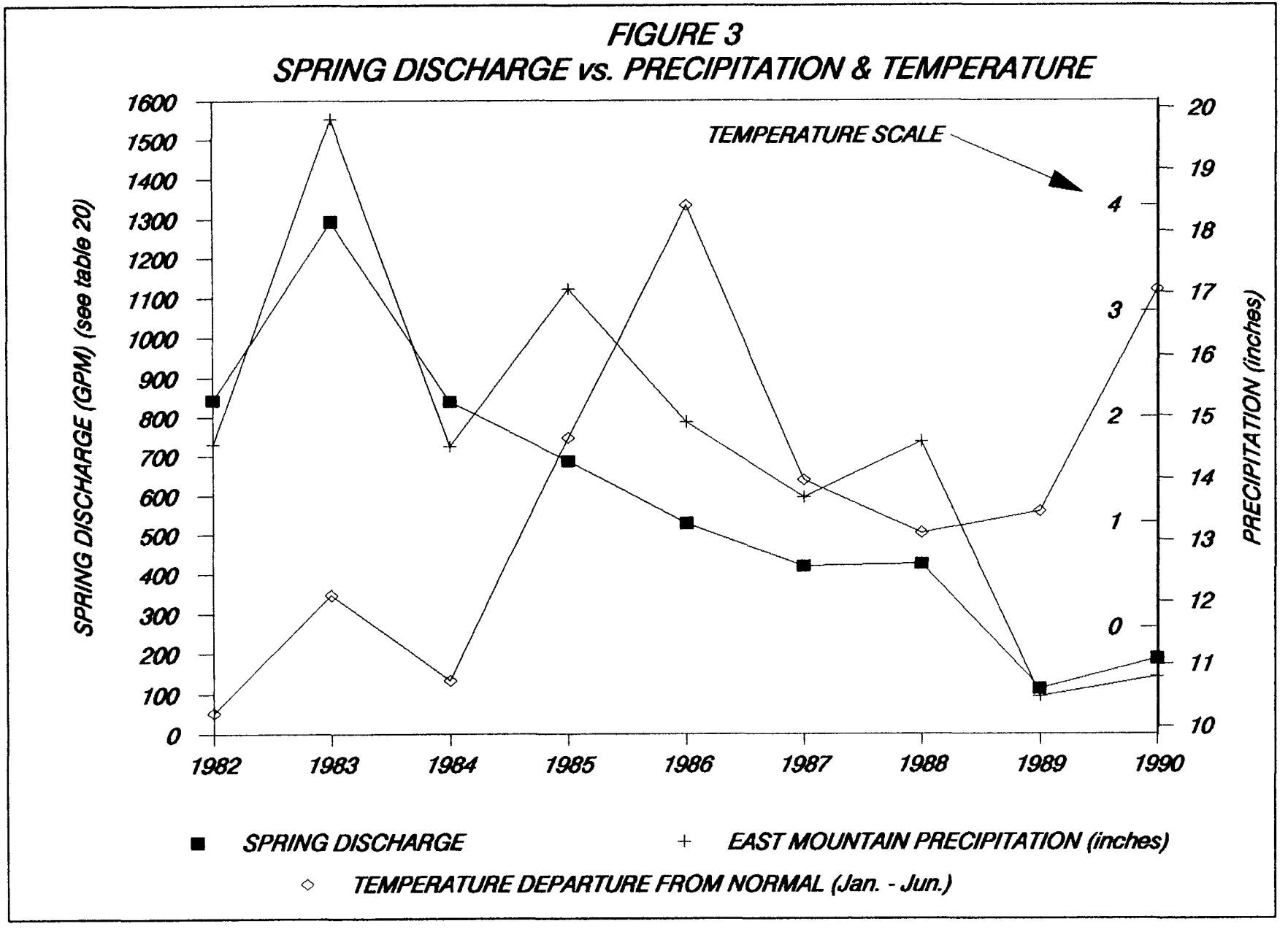


FIGURE 3
SPRING DISCHARGE vs. PRECIPITATION & TEMPERATURE
SPRING DISCHARGE (GPM) (see table 20)
PRECIPITATION (inches)
TEMPERATURE SCALE
1600
1500
1400
1300
1200
1100
1000
900
800
700
600
500
400
300
200
100
0
20
19
18
17
16
15
14
13
12
11
10
4
3
2
1
0
1982
1983
1984
1985
1986
1987
1988
1989
1990
SPRING DISCHARGE
EAST MOUNTAIN PRECIPITATION (inches)
TEMPERATURE DEPARTURE FROM NORMAL (Jan. - Jun.)

TABLE 23: TEMPERATURE COMPARISON

MONTH	EAST MOUNTAIN DEPARTURE FROM NORMAL	ELECTRIC LAKE DEPARTURE FROM NORMAL	HUNTER PLANT DEPARTURE FROM NORMAL	HUNTINGTON PLANT DEPARTURE FROM NORMAL
1982				
JAN		-3.0	-9.6	+1.2
FEB	Insufficient	-6.9	-2.4	-1.5
MAR	Historical	0.0	+2.6	+2.1
APR	Data	-3.0	+0.5	+1.0
MAY		-3.4	+4.0	+2.6
JUN		-1.7	+2.4	+0.7
1983				
JAN		+2.1	+2.7	+6.2
FEB	Insufficient	-2.2	+3.2	+2.1
MAR	Historical	+1.3	+4.5	+2.1
APR	Data	+7.6	-0.8	-3.4
MAY		-6.4	+1.9	+0.2
JUN		-3.5	+3.7	-1.1
1984				
JAN		-3.8	-7.6	+2.8
FEB	Insufficient	-5.4	-7.3	-0.3
MAR	Historical	-1.0	+1.4	-0.1
APR	Data	-4.5	+1.5	-1.8
MAY		+3.1	+11.2	+4.0
JUN		-1.6	+3.9	-3.8
1985				
JAN	-1.4	-5.7	-2.8	+2.1
FEB	-2.5	-8.6	-4.5	-5.5
MAR	+1.0	-1.4	+2.2	-0.4
APR	+7.8	+6.6	+8.0	+6.1
MAY	+6.1	+7.6	+8.4	+2.5
JUN	+7.3	+3.0	+6.8	+0.3
1986				
JAN	+5.1	+4.0	+6.2	+6.5
FEB	+3.1	+0.6	+7.9	+3.8
MAR	+7.6	+9.6	+9.5	+5.9
APR	+2.0	+0.8	+3.0	0.0
MAY	-5.6	0.0	+3.4	-0.1
JUN	+5.0	+5.5	+7.7	+3.3
1987				
JAN	-4.2	-4.8	-2.6	+0.8
FEB	-1.4	-6.3	+3.0	+1.7
MAR	-2.2	-2.7	+0.5	-3.1
APR	+7.3	+5.5	+6.2	+5.1
MAY	+5.4	+3.6	+4.4	+0.3
JUN	+5.3	+2.0	+7.7	+1.8
1988				
JAN	-3.7	-4.2	-7.1	-3.1
FEB	+0.7	-3.0	+3.0	+0.7
MAR	-1.8	-3.4	+2.6	-1.5
APR	+2.6	+4.1	+4.5	+2.2
MAY	+4.2	+1.2	+4.9	+0.9
JUN	+3.2	+4.5	+9.6	+2.4
1989				
JAN	-2.1	-4.3	-7.8	-4.8
FEB	-3.5	-6.6	-1.4	-5.7
MAR	+5.7	+8.1	+9.5	+3.8
APR	+6.0	+6.9	+9.5	+5.7
MAY	+4.4	+4.0	+6.8	+0.7
JUN	-4.5	-6.4	+5.0	-1.8
1990				
JAN	-2.4	-0.8	+3.7	+0.9
FEB	-1.1	-4.9	+5.2	-2.0
MAR	+1.9	+7.0	+8.7	+2.6
APR	+2.1	+6.3	+10.9	+4.6
MAY	+0.8	+3.0	+6.8	-1.3
JUN	+3.3	+4.8	+10.9	+1.0

YEAR	EAST MOUNTAIN	ELECTRIC LAKE	HUNTER PLANT	HUNTINGTON PLANT	TOTAL
1982		-2.8	-0.03	+1.2	-0.8
1983		-2.7	2.5	+1.0	+0.3
1984		-2.2	0.5	0.13	-0.5
1985	3.1	0.3	3.0	0.9	+1.8
1986	2.9	3.4	6.3	3.2	+4.0
1987	1.7	-0.5	3.2	1.1	+1.4
1988	-0.2	-0.1	3.5	0.5	+0.9
1989	0.0	-0.1	4.1	0.3	+1.1
1990	2.3	1.8	7.3	1.2	+3.2

Table 23 clearly demonstrates near average temperatures between 1982 and 1984, but starting in 1985 positive departure from normal has been significant. Comparison between spring discharge rate and general changes in annual precipitation patterns correlated well in the past due to relatively normal temperatures experienced during the early runoff period (January through June). Figure 3 not only includes a comparison of spring discharge rate and precipitation as in the past but also temperature departure due to critical influence temperature has on peak discharge occurrence.

An additional flow information study was initiated during the summer of 1985. The purpose of the program is to establish flow recession curves for the following springs: (1) Burnt Tree, (2) Elk Springs, (3) Sheba, (4) 79-10, (5) 79-23, (6) 79-26, (7) 79-29, (8) 79-35, (9) 80-44, (10) 80-46, (11) 82-52, (12) 84-56. The flow information collected during 1990 is shown in Table 24; corresponding spring recession curves comparing 1990 to 1984-1989 are located in Appendix F.

TABLE 24: EAST MOUNTAIN REGRESSION STUDY(FLOW*/TEMP.**)

		1990		
Spring	July	August	September	October
Burnt Tree	4.1/49	4.0/68	+	3.5/41
Elk Spring	130.8/39	67.1/40	46.2/40	36.8/39
Sheba	81.1/416	2.0/45	0.8/43	1.6/39
79-10	10.2/47	5.7/42	5.0/40	3.0/43
79-23	Dry	Dry	Dry	Dry
79-26	Dry	Dry	Dry	Dry
79-29	1.3/47	1.2/47	1.2/44	1.0/40
79-35	1.9/45	2.0/47	1.5/41	Seep
80-44	Dry	Dry	Dry	Dry
80-46	Dry	Dry	Dry	Dry
82-52	1.3/43	1.5/48	1.0/42	1.1/42
84-56	1.0/41	1.0/43	0.6/43	1.0/41

* All flow given in gallons per minute
** Temperatures reported in degrees Fahrenheit
\+ Pond level above diversion pipe - no sample

C. Quality

To more closely identify springs which are related one with another, water samples were analyzed to determine the percentage of cations and anions in solution. The percentages have been graphically represented as cation-anion diagrams. (See Appendix F.) The purpose of the cation-anion diagrams is to identify groups of related springs by water chemistry. To better visualize the concept, the cation-anion diagrams are presented by the geologic formation in which the spring originates. A general pattern for the Flagstaff and Price River formations can be recognized for each year in which the cations/anions were analyzed. A consistent pattern for the North Horn is less obvious due to the complex geology of the formation itself. One aspect the cation-anion diagrams demonstrate is that, even though the quality varies slightly from individual sites as well as from different formations, seasonal variations do not exist.

The quality of the springs sampled in 1990 reveals an excellent correlation with historical averages. A summary of the water quality analysis for a representative group of East Mountain Springs is presented in Table 25. In the table the mean values for 1990 are compared to the historical results for each respective spring. The raw data regarding all springs sampled is contained in Appendix F.

V. MINE HYDROLOGY

A. Groundwater and Surface Water Sources in Relation to Mine Workings

The relationship of the Deer Creek and Wilberg mine workings with the overlying springs is shown in Figures 4 and 5. Beginning in 1979, PacifiCorp has developed an ambitious spring monitoring program with emphasis to detect changes in the East Mountain hydrologic regime as a result of mining. The data collected

Table 25: East Mountain Springs Water Quality (Historical vs. 1990) *

	Burnt Tree		Elk Spring		Sheba Spring		79-10		79-23		79-26	
PARAMETER	Historical	1990	Historical	1990	Historical	1990	Historical	1990	Historical	1990	Historical	1990
Elevation	9260		9350		9740		9350		9035		9310	
Geologic Formation	TKn		TKn		Tf		Kpr		TKn		TKn	
Bicarbonate	335	272	291	338	290	305	312	343	413	no	336	no
Calcium	65.0	66.1	67.4	75.9	90.4	88.8	73.1	83.7	79.6	flow	71.0	flow
Carbonate	<1	<1	<1	<1	<1	<1	<1	<1	<1	during	<1	during
Chloride	5.1	10.0	4.9	7.5	4.0	12.5	5.4	10.0	11.3	1990	8.2	1990
Cond.(umhos/cm)	503	528	434	412	443	395	472	463	691		520	
Hardness	270	271	241	298	248	262	276	288			286	
Iron	0.21	0.08	0.12	0.03	0.14	0.08	0.12	0.02	0.09		0.20	
Magnesium	26.51	25.83	21.73	26.18	9.87	9.77	22.29	19.15	38.30		26.28	
Mangenese	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01		0.02	
pH(units)	7.50	7.47	7.71	8.13	7.56	7.75	7.62	7.85	7.72		7.94	
Potassium	1.15	0.05	2.44	0.10	1.62	0.05	2.80	0.00	1.54		2.15	
Sodium	13.96	13.24	10.16	6.53	5.90	0.81	5.87	3.51	14.90		16.63	
Sulfate	28.0	65.0	36.0	6.0	35.3	4.5	25.2	40.0	27.2		41.9	
TDS	271	235	257	209	270	240	273	225	364		319	

	79-29		79-35		80-44		80-46		82-52		84-56	
PARAMETER	Historical	1990	Historical	1990	Historical	1990	Historical	1990	Historical	1990	Historical	1990
Elevation	9410		9585		8980		9350		8995		9335	
Geologic Formation	TKn		Tf		Kpr		TKn		Kpr		TKn	
Bicarbonate	317	397	304	355	451	no	365	no	414	495	345	382
Calcium	53.6	49.6	93.7	101.1	101.6	flow	64.1	flow	79.4	81.2	63.3	75.9
Carbonate	<1	<1	<1	<1	<1	during	<1	during	<1	<1	<1	<1
Chloride	17.70	20.00	3.60	10.00	11.10	1990	4.90	1990	9.70	12.50	8.30	12.50
Cond.(umhos/cm)	548	538	466	367	876		561		670	588	556	496
Hardness	245	258	273	318	377		304		318	328	297	326
Iron	0.12	0.14	0.13	0.34	0.12		0.27		0.06	0.18	0.04	0.02
Magnesium	32.53	32.63	13.75	15.83	41.48		28.57		33.57	30.47	32.15	33.08
Mangenese	0.02	0.01	0.01	0.02	0.01		0.01		0.01	0.01	0.01	0.01
pH(units)	7.79	7.83	7.64	7.83	7.79		7.43		7.54	7.80	7.56	7.45
Potassium	3.42	0.46	0.89	0.13	2.76		0.83		1.51	0.15	0.88	0.06
Sodium	30.61	35.29	9.05	2.61	35.17		9.90		23.63	24.42	17.42	19.19
Sulfate	63.1	31.0	46.6	125.0	138.7		19.0		44.4	31.5	28.9	65.0
TDS	343	304	275	259	524		311		373	351	344	259

* quality parameters reported as mg/l unless otherwise noted

to date reveal no indication of any mine-related effects on spring discharge or surface flow rates. As expected, there is a direct relationship between annual precipitation, temperature, and spring discharge rates as previously discussed on pages 32 through 40 and shown in Figure 3.

B. Groundwater Quality and Collection Procedures

PacifiCorp began in-mine quality and quantity measurement in 1977 and has continued the measurement through 1990. With the collection of numerous samples throughout the extent of the mine workings the quality has remained relatively constant. Figure 6 depicts the consistency of the historical versus 1990 groundwater quality for individual locations by the use of cation-anion diagrams.

Collection procedures for groundwater quality consist of two grab samples collected and analyzed per quarter at each of the mines which produces measurable quantities of water. Sampling according to this established plan began in the first quarter of 1982. Parameters analyzed are those listed in the DOGM Guidelines for Groundwater Operational Quality except when new sites are established. In that case baseline information will be collected for two (2) years. (See Appendix M.)

Long-term monitoring locations have been established at each of the mines which produces measurable quantities of water, i.e., Deer Creek and Wilberg mines. (See Maps 3 and 4 in pocket.) Four types of occurrences have been recognized to exist within the current mine workings. (Refer to Figure 7.)

1. Structural rolls with overlying fluvial channels,
2. Fault systems (Pleasant Valley and Roans Canyon),
3. Fractures and joints (lineaments),
4. Roof bolt and in-mine drill holes.

A collection device was installed at each long-term monitoring location. Flow and temperatures collected on a quarterly basis from the long-term sites in both

FIGURE 6

IN-MINE WATER QUALITY CATION-ANION DIAGRAMS

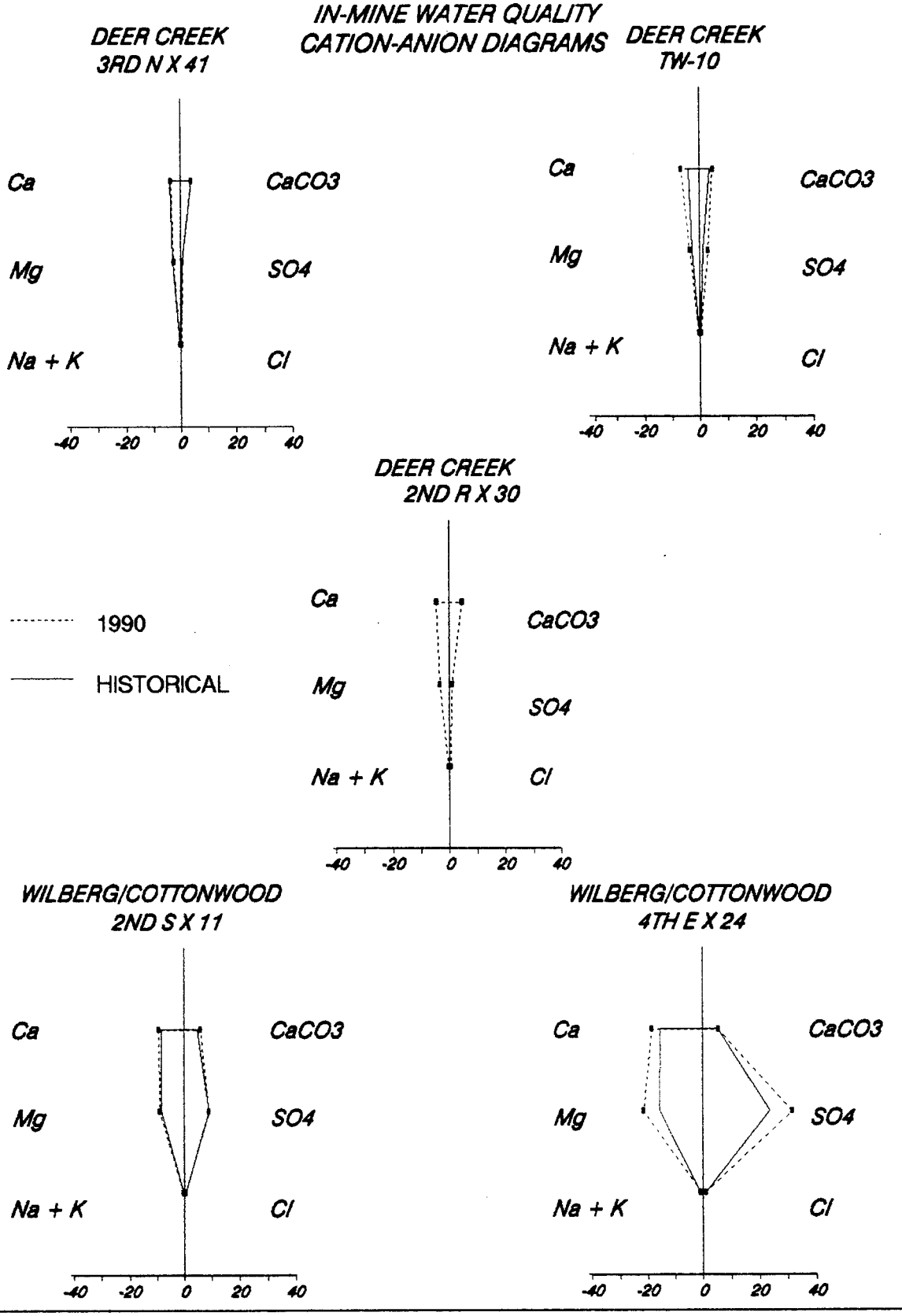
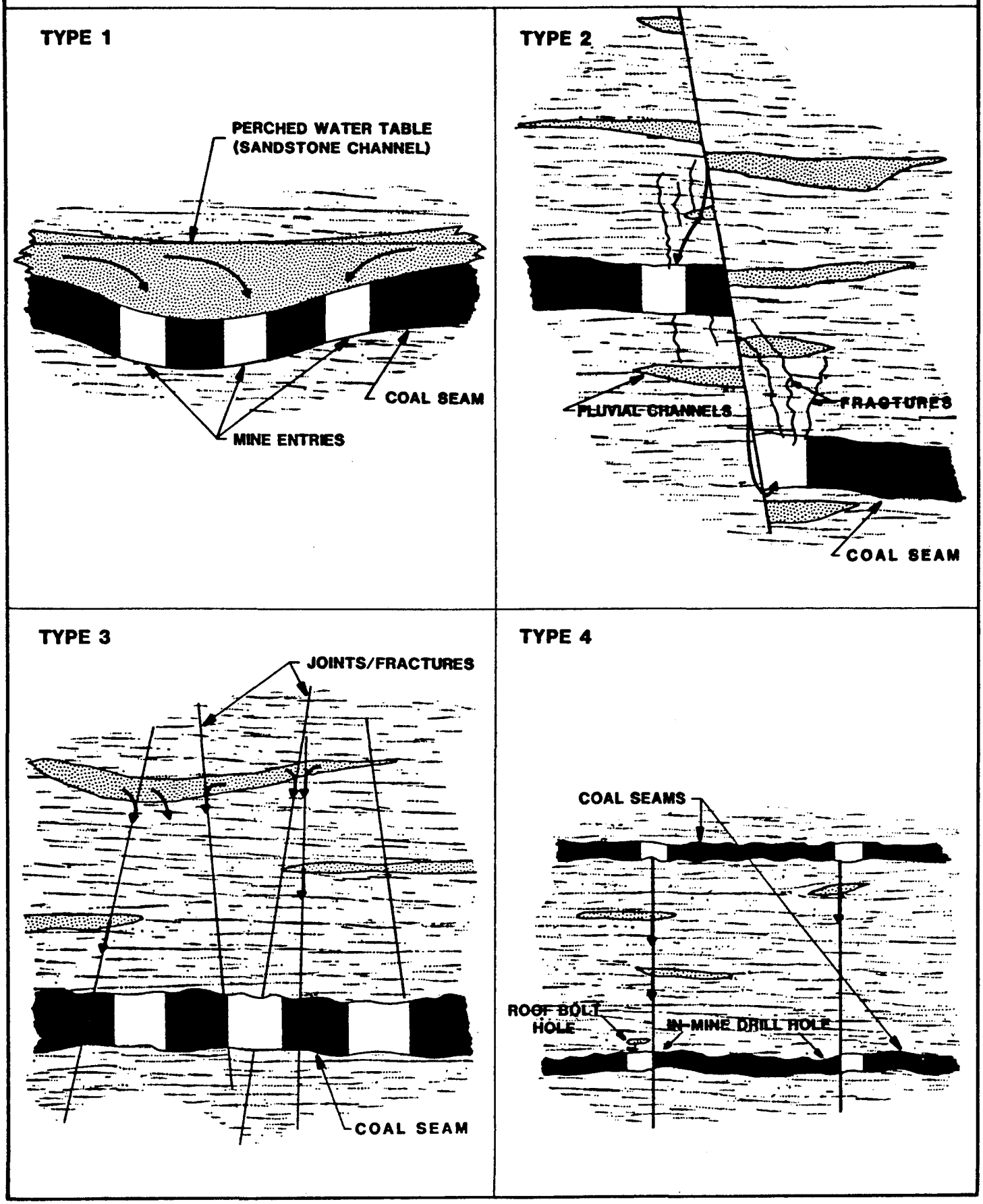


FIGURE 7
LONG TERM WATER SOURCES



mines were fairly consistent. (See appendices G and I for the Deer Creek and Wilberg In-Mine hydrographs.)

Due to the ever-changing conditions experienced in underground mining one long-term monitoring site in the Deer Creek Mine was eliminated and one new site was established in 1990. The description and reasoning for the site which was eliminated and the location of the new site are as follow.

DEER CREEK MINE

1989 ID	Terminated Site Location Description	Reason for Termination
1	3rd North xc-41 2R	Ceased flowing as of 6/90

1990 ID	Additional Site Location Description	Water Source Type
1	2nd Right xc-38	Water producing fracture associated the Roans Canyon Fault System

Additional long-term monitoring sites will be added when areas meeting our long-term criteria are opened by mining, i.e., long-term accessibility and water source is such that consistent sampling can be achieved.

C. Hydrologic Developments During 1990

Four hydrologic related projects-developments occurred during 1990. Three hydrologic developments involved the Deer Creek Mine. They were 1) completion of the 3rd North Roans Canyon fault crossing; 2) interception of significant groundwater in 2nd Right off 4th South, a sympathetic fault associated with the Roans Canyon fault system; and 3) Rilda Canyon Springs hydrologic investigation. The fourth was a project applicable to the entire permit area and involved the verification of the swelling bentonitic-plastic type mudstones of the North Horn Formation.

1. 3rd North Roans Canyon Fault Crossing

As discussed in previous annual Hydrologic Monitoring reports and the Hydrologic Section of the PAP, in order to access coal reserves from the northern third of the property the Deer Creek Mine Plan included a fault crossing to be completed during 1990. The fault system, which is known as the Roans Canyon Graben, trends in a North 60° East direction. The graben is 600 feet in width at the location of the proposed slopes, and the Blind Canyon coal seam is approximately forty (40) feet lower on the north side of the graben than where the current mine workings exist on the south side of the graben. (See Map HM-2). The strata within the graben itself have been downthrown as much as 159 feet in relationship to the adjacent strata.

The graben consists of four major faults. The southernmost fault appears to be the greatest in width, having as much as thirty (30) feet of fault gouge. The two faults in the interior of the graben are very clean and have less than a foot of fault gouge where they were intersected by drill holes. The northern fault has up to five (5) feet of gouge where it has been intersected.

A hydrogeologic investigation of the Roans Canyon Fault Graben was completed during 1988 in order to develop plans for management of groundwater inflow during the construction of three parallel rock tunnels. The fault crossing is located in the section of the Deer Creek Mine called Third North. (See Map HM-2.) In order to conduct the investigation five (5) test wells were constructed. Selected intervals in the boreholes were tested for hydraulic properties with straddle packers. In addition, one long-term and three short-term constant rate flow tests were performed to measure aquifer parameters. The packer test and flow and recovery test data were analyzed to determine static pressures and gradients through the fault system and to

determine transmissivity, hydraulic conductivity, and storage coefficient for each zone tested.

The investigation defined two major hydrogeologic units which are fractured, well-sorted, medium-grained, friable, oxidized channel sandstones. The first sandstone unit is located approximately 350 feet, the second about 650 feet, horizontally from the southern bounding fault. The sandstone units are likely of limited vertical thickness but may have more extensive lateral continuity. The two sandstones are heavily oxidized and iron-stained along fractures, and in places the sandstone is totally oxidized for several feet adjacent to the fracture. The oxidation, at a depth of 2000 feet below land surface, indicates that oxygenated water is infiltrating rapidly from the surface through the fractures, suggesting that there is good hydraulic connection between the channel sandstones at the depth of the rock tunnels and the recharge at the surface, primarily through fractures.

Results from the aquifer test indicated the horizontal flow component is the result of flow in the graben from the west toward the east where the graben intercepts the canyon walls and, presumably, the groundwater system discharges. The vertical flow component is controlled by the Starpoint Sandstone which underlies the entire graben.

The groundwater flow in the graben occurs primarily in the fractures of the two major water-producing zones with lesser flow quantities in the fractured siltstone units. Virtually no flow occurs in the mudstone between the siltstone and sandstone. The south boundary fault of the graben creates a hydrogeologic barrier to flow into the mine area south of the graben. The north boundary fault does not have a thick fault gouge zone like the one associated with the southern fault, but from drilling observations it is also suspected to be a barrier to groundwater flow.

PacifiCorp utilized a pressure grout program to minimize the long-term groundwater inflow from the water-producing zones encountered during slope development. The grouting program consisted of drilling a series of boreholes prior to water-producing zone interception and forcing fast-setting grout material into the fractures. Experience with pressure grouting indicates that as much as ninety to ninety-five percent (90-95%) of the groundwater inflow was effectively stopped. The rock tunnels were completed in November 1990, and development work in the Blind Canyon Seam north of the fault is scheduled to begin in mid-1991. Groundwater inflow into the tunnels after they were completed is approximately 50 gallons per minute.

2. Groundwater Inflow - 2nd Right off 4th South, Deer Creek Mine

Another area associated with the Roans Canyon fault system where groundwater was intercepted is in longwall development entries driven west from 4th South Mains (see Map HM-2, Section 7, Township 17 South, Range 6 East). Development entries intersected an unknown sympathetic fault with approximately 2.5 feet of displacement (2nd Right off 4th South). Initial groundwater inflow rates were estimated at approximately 2000 GPM. At that time development was terminated and a hydrogeologic program was developed to determine the extent and bearing of the fracture system. In-mine horizontal drilling was utilized to project the fracture system as well as to isolate the water zone for aquifer testing. The aquifer test utilized inflatable packers to isolate the zone to flow and pressure characteristics. Test results indicated that the fracture zone had hydrologic properties similar to the Roans Canyon system tested in 3rd North, maximum pressure recorded was 90 psi (indicating a relatively low head differential), and flow rates from the fracture zone diminished over time. A permanent monitoring site was established using a two-foot rectangular weir to measure the intercepted groundwater. Flow from this area has diminished

rapidly from approximately 2000 GPM in April to 125 GPM in March 1991. As a result of significant inflows associated with the fracture system, mine plans were adjusted based on the projection of the fracture so that the potential for additional interception of groundwater would be reduced.

As part of PacifiCorp's hydrologic monitoring program, major springs associated with the Roans Canyon Fault Graben, i.e., Elk Spring, Sheba Springs, and 79-10, are monitored for flow on a monthly basis. Monitoring has not indicated any mining related impacts but confirms climatological effects.

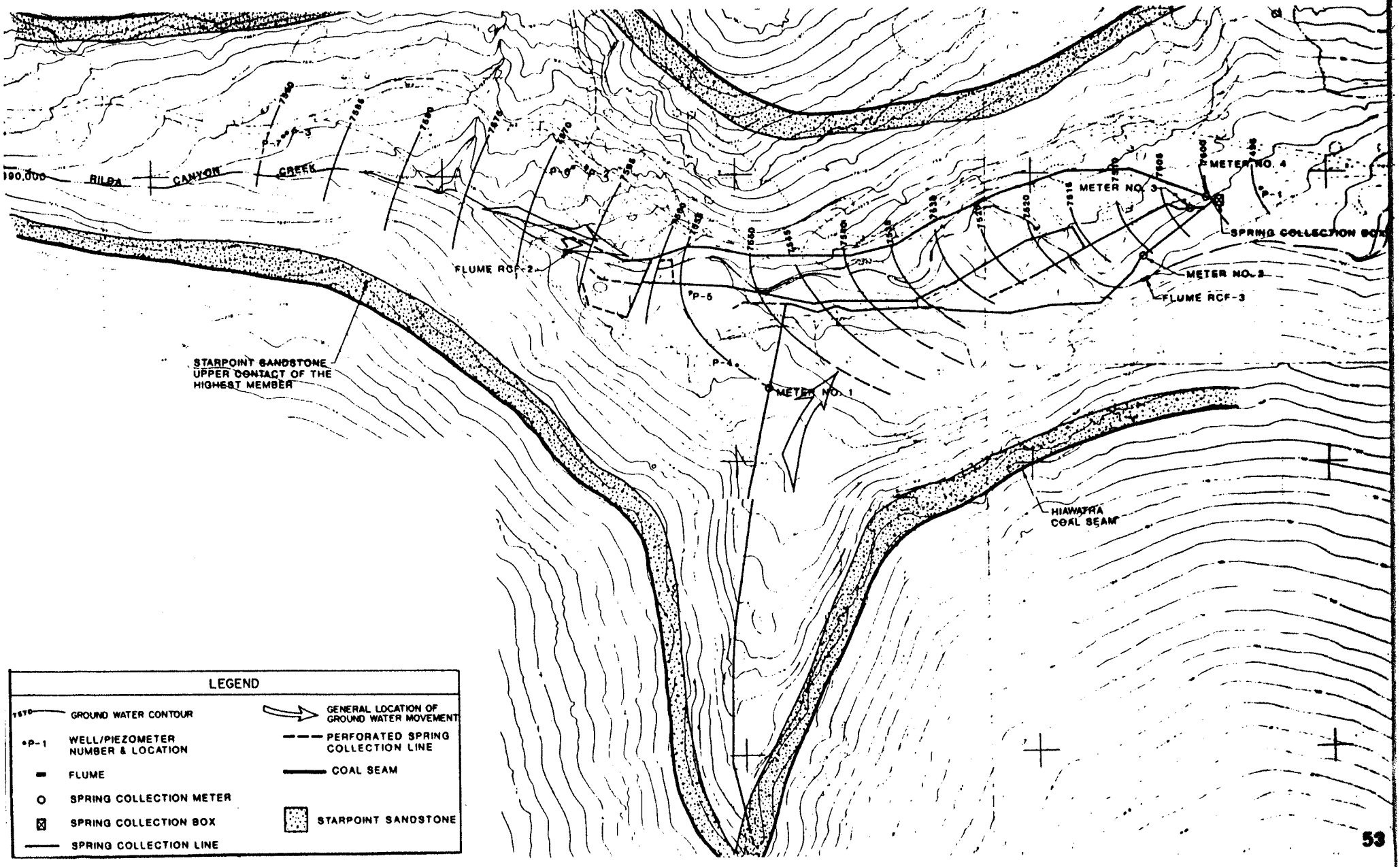
3. Rilda Canyon Springs (NEWUA) Hydrologic Investigation

Of concern to PacifiCorp-Fuel Resources is the proximity of proposed mining activities in Rilda Canyon to the Rilda Canyon springs which serve as a culinary water source for the North Emery Water Users Association (NEWUA), serving some 410 connections. Due to the importance of these springs, PacifiCorp contracted Hansen, Allen & Luce (HA&L) to conduct a hydrologic test in Rilda Canyon. The overall purpose of the hydrologic testing was to determine to the degree possible 1) general hydrologic conditions associated with the NEWUA springs, including the general direction of groundwater movement; 2) the potential origin of waters feeding the NEWUA springs; and 3) a determination of general aquifer characteristics, including transmissivity.

Description of NEWUA Spring Collection System

The NEWUA spring system consists of a series of collection lines extending westward up Rilda Canyon and southward up a small side drainage as shown on Figure 8. The NEWUA spring system is metered at four locations. Meter 1 (Side Canyon Spring) is located at the downstream end of a collection line which enters

FIGURE 8
RILDA CANYON
PIEZOMETRIC SURFACE with SPRING COLLECTION SYSTEM



Rilda Canyon from the south. Meter 2 (Side Canyon Spring plus South Spring) is located near the bottom of the main east-west trending collection line which lies to the south of Rilda Canyon Creek at a point just upstream (west) of the main spring collection box. Meter 2 records combined flows from both the Side Canyon (Meter 1) as well as additional inflows which enter the system below Meter 1 known as South Spring. Meter 3 (North Spring) records flows for the east-west central collection line which was constructed through the central portions of the valley near Rilda Canyon Creek. Meter 4 (North Spring) collects data from the north collection line located on the north side of Rilda Canyon Creek.

In addition to the main spring collection lines there are two flumes in the vicinity which monitor flow rates within Rilda Canyon Creek. The upper flume, RCF2, is located adjacent to the extreme west end of the spring collection system monitored by Meter 4. Flume RCF3 is located in Rilda Canyon Creek adjacent to spring collection Meter 2.

Seven shallow wells have been located in the area surrounding the spring collection system to monitor groundwater level fluctuations through time. The locations of the wells are shown on Map 1. Wells 1 through 5 are relatively shallow wells which were constructed prior to 1990. Wells 6 and 7 are larger wells which were constructed adjacent to Wells P-2 and P-3, respectively, in order to obtain more complete groundwater data through aquifer testing. (See Appendix D.)

Quantity

Through the cooperative efforts of PacifiCorp and NEWUA, flow meters were installed in September 1990 to isolate individual spring areas for quantity and quality (see Figure 8). Listed below are the individual flow rates for Meters 2-4 (flow from Meter 1 is included in Meter 2).

DATE	METER 2	METER 3	METER 4	TOTAL
Sept. 6, 1990	20.0	75.0	120.0	215
Sept. 18, 1990	15.8	78.9	91.0	186
Nov. 7, 1990	13.3	37.5*	20.0	71
Nov. 14, 1990	14.5	67.42	9.3	91
Nov. 19, 1990**	13.59	57.69	6.3	78
Apr. 8, 1991	10.9	56.5	4.7	72

* Flow not stabilized
** Collected during Rilda Canyon Pump Test Project

The seasonal variation of the monthly average flow from all NEWUA's Rilda Canyon Springs is shown in Figure HF-11. With the installation of the flow meters, individual spring contributions to the total flow can be plotted over time.

Earlier reports (April 1983 and March 1984) prepared by Vaughn Hansen Associates identified the source of water from the North Spring to originate from two general sources. The earlier report concluded that the source of water originated from a north-south trending subsurface anomaly (VLF-EM) which may be a strike slip fault located immediately downstream of the main North Spring area. The latter, using additional data collected, concluded that there also appears to be an east-west trending anomaly (VLF-EM) which intersects the north-south anomaly just north of the North Spring. Water collected in the east-west anomaly from surface and/or fault sources located higher in the canyon may issue forth at the North Spring as the water comes in contact with the north-south trending anomaly. It was believed at the onset of the project that the source of water (whether from the north-south trending anomaly or from sources farther up the canyon) could be determined by pumping strategically placed wells near the sources of water.

Upon initiation of the project PacifiCorp and HA&L met to determine the most efficient method of proceeding with the proposed pumping tests. It was mentioned that because of the proximity of Well P-6 to the main spring collection area, pumping Well P-7 might produce clearer test results (see Figure 8). Pumping

P-6 would have an impact upon the main spring collection system; however, any attempts to determine the source of spring water could be masked by the influence of the drawdown cone. That is, by pumping P-6 both sources of recharge to the North Spring would be drawn upon, thereby making the attempt at isolation more difficult.

Soon after initiation of the project it was decided that the most complete data could be obtained by pump testing P-7 because of its location upgradient of the main spring collection area. If P-7 could be pumped sufficiently, the potential source of recharge water feeding the North Spring from the alluvial canyon fill west of the spring could be reduced without affecting water recharging the springs from the north-south trending anomaly or fault system. The level of impact due to pumping P-7 would then be an indicator of the general source of water issuing from the NEWUA springs.

The purpose of the pump test performed on P-7 was to pump the well to its maximum potential for a period of time sufficient to note and record impacts upon the NEWUA springs or other wells located in the vicinity. The amount of pumping and the level of impact on the local systems was used subsequent to the test to help document the source of water discharging into the NEWUA spring collection system. A pump test was run on P-7 continuously from 4:00 p.m. on November 13 through 12:30 p.m. on November 20, 1990. Throughout this period records were kept related to pumping conditions and flow rate discharging P-7, water levels in wells P-1 through P-7, and spring flows recorded at NEWUA spring collection meters 1 through 4. Well P-3 was dry throughout the test.

Aquifer Characteristics

The local groundwater system in the vicinity of the NEWUA springs consists of an unconfined alluvial valley fill aquifer as well as bedrock and fracture

systems. Resistivity data collected in 1989 indicate that the total maximum depth of alluvium ranges from 50 to 73 feet at the three locations where cross sections were taken. The width of the unconfined aquifer varies due to the influence of side drainages which also feed the area.

Water moving throughout Rilda Canyon appears to originate from at least three sources. The first and most obvious source is through the alluvial valley fill, the second is through an east-west trending fault which is believed to lie to the north of the canyon floor, and the third is potentially through a north-south trending fault which bisects the canyon just west of the NEWUA spring collection system. More is mentioned about water quality from these sources later in this document. Springs within Rilda Canyon are believed to indicate and verify the locations of changes in geologic structure.

Examples of local geologic structures and their impact on hydrology have been verified historically through stream and spring flow observations. The canyon drainage west (or above) the interface with the upper contact of the Starpoint Sandstone is generally a discharging stream section. When alluvial waters come in contact with the more impermeable members of the upper Starpoint Sandstone formation, they are often forced to the surface, creating springs. Local NEWUA springs confirm a recharging stream section. When these more impermeable formations are crossed, the stream once more becomes a losing stream until subsurface waters again come in contact with the more impermeable members of the Starpoint Sandstone and underlying Mancos Shale formations. Some sections of the stream within Rilda Canyon gain flow, thereby evidencing the locations where subsurface water is forced to the surface by the tighter formations.

Data collected during and following the pump test of P-7 were used to provide estimates of local valley fill aquifer characteristics. For these analyses data from both pumped Well P-7 and from observation Well P-6 during both the drawdown and recovery portions of the test were used. Well P-6 was used as an observation well over other local wells because 1) it is the closest to the pumped well, 2) it is upgradient from the north-south trending anomaly associated with the spring, 3) it showed the most response to pumping, and 4) the data were more consistent than other data collected.

In order to analyze the data in an acceptable fashion, the data sets were broken into three separate portions. The first data set has been termed the "initial" data set and includes time and drawdown data from P-7 for the beginning period of the test where the flow rate was recorded to be equal to 8.22 gpm. The "intermediate" data set includes data subsequent to that time when the flow rate was increased to an average value over time of 16.4 gpm. The third data set includes data taken during the "recovery" portion of the test after the pump in P-7 was shut off.

Three basic analytical methods--the Cooper-Jacob, Theis, and Neuman methods--were used to estimate aquifer transmissivity. Listed below is a summary of the calculated transmissivities.

SUMMARY OF CALCULATED TRANSMISSIVITIES

Analysis Used	Data Type	Well Data Used	Estimated Transmissivity (gpd/ft)		Credibility of Results		
			Short-Term	Long-Term	High	Medium	Low
Cooper-Jacob	Drawdown	P-7	35,650	17,550-21,000	XXX		
Cooper-Jacob	Drawdown	P-6		23,600	XXX		
Cooper-Jacob	Recovery	P-7	35,900	13,700	XXX	XXX	
Theis	Drawdown	P-7	28,450	17,900	XXX	XXX	
Neuman	Drawdown	P-7	13,150	6,100			XXX

Quality

Initial water quality investigations (sampling consisted of wells P-1 through P-5 and three spring collection areas) conducted by West Appa Coal Company in the fall of 1982 indicated two distinct classes of groundwater (primarily defined by sulfate concentrations). The percent reacting values for major cations and anions for the five piezometers and three spring collection areas as determined from samples collected on September 16, October 15, and December 6, 1982, respectively, can be found in Appendix D. As illustrated on the figures, there are two distinct groupings of data from the various sources with regard to sulfate concentrations and total dissolved solids (TDS) concentrations. In general, the Side Canyon Spring, the South Spring collection zone, and well P-4 contain groundwater higher in TDS and sulfate concentrations than do the North Spring collection zone, wells P-2 and P-5.

Differences in the above-referenced groupings of data reflect differences in the groundwater source or the origin of groundwater for the various springs issuing within the Rilda Springs area. The Side Canyon Spring is located at or near the base of the Blackhawk Formation. The higher sulfate concentrations and TDS concentrations from the spring are characteristic of waters associated with the Blackhawk Formation. The similarity in water quality between the Side Canyon Spring and the South Spring collection area, Meter 2, would indicate that South Spring waters are also primarily of Blackhawk origin. The slightly better quality of South Spring water over the Side Canyon Spring water indicates that some of the South Spring water is derived from waters moving within the fracture zone of the Starpoint Sandstone.

As illustrated by TDS concentrations on cations and anions figures (Appendix D), waters issuing from the North Spring collection area are of a better quality than waters from the Side Canyon and South Spring collection areas. Waters

issuing from the North Spring originate primarily from water moving within the alluvial valley sediments and fracture systems of the Starpoint Sandstone and are not derived from the Blackhawk Formation.

Additional water quality sampling conducted by PacifiCorp during 1990 confirmed the early results obtained by West Appa (see Appendix D). In summary, water quality of the springs does not generally correlate well with waters originating from the south as measured by Meter 1 (Side Canyon) and Meter 2 (South Spring), nor do they correlate well with surface waters monitored within Rilda Canyon. The water appears to be more highly correlated with waters moving toward the NEWUA springs from the west. Water movement from the west is most likely through three source mechanisms. The first and most obvious water source is through the alluvial valley aquifer into which local wells have been drilled. The next sources may be through faulting and fracturing systems within Rilda Canyon or through the north-south anomaly which passes through the west end of the spring collection system, as discussed above. The waters originating through faulting, fracturing, and Rilda Canyon alluvial valley fill appear to have different water quality characteristics than those of the southern springs. Analytical analysis from water collection from the individual springs can be found in Appendix D.

Water Source

In the report originally prepared by Vaughn Hansen Associates in April of 1983 for West Appa Coal Company, it was noted that the water appeared to be originating from the north along a north-south oriented anomaly (VLF-EM) in the vicinity of the main north spring. In a later response to an OSM Completeness Review for West Appa Coal Company in March of 1984 it was noted that additional data seemed to indicate that a portion of the flow may originate from sources to the west

which move into an east-west oriented anomaly or fracture, then intersect the north-south anomaly (VLF-EM) before discharging as spring water.

Piezometric Surface

Water level data collected at each of the wells or piezometers within Rilda Canyon has been compiled to indicate the general orientation and direction of groundwater within the vicinity of the NEWUA springs as shown on Figure 8. Note from the map that the general direction of groundwater continues to be to the east along the axis of Rilda Canyon with flow contributions being received by the drainage entering from the south. Water table gradients for the area are dependent upon the time of year as well as overall groundwater recharge characteristics. For example, from the map it can be found that the average slope of the monitored water table lying between wells P-7 and P-5 was 4.3 percent in November 1990. At the same time the average water table gradient increases downgradient of P-5 where it was found to be 6.4 percent. The fact that the water table gradient increases downstream of P-5 still tends to confirm the presence of the north-south anomaly reported earlier for the area. A check of water table gradients during high flow periods shows larger values than were noted in the latter part of 1990. Analysis of historic data shows that, although flow patterns are relatively unchanged during high flow periods, the water table gradient above P-5 may have been as high as 7.4 percent in 1987.

Groundwater Quantity Based on Pump Test Results

An approximation of the total groundwater flow moving eastward down Rilda Canyon was made using data collected from the resistivity studies completed by PacifiCorp and from data collected at local area wells. The flow approximation was made by applying the general flow equation $Q=VA$. The area of groundwater flow was determined using the inferred cross sectional area identified in the resistivity

study for the canyon adjacent to P-7. The velocity of groundwater movement was determined from the relationship between hydraulic permeability and groundwater gradient, $V = ki$. Permeability was determined from the estimate for short-term transmissivity obtained using the methods discussed earlier. It was felt that under flow conditions uninfluenced by man, the short-term transmissivity is most representative of natural conditions. Using these relationships, the estimated amount of groundwater moving down Rilda Canyon was determined for both high and low flow conditions.

Based on historic data, low flow conditions were found to dominate during the period of the 1990 pump test; however, it has been noted by PacifiCorp employees that a rise in water level occurs within Rilda Canyon wells each year as the groundwater aquifer responds to snow melt runoff. Historical data reproduced in Figure 9 for wells 1 through 5 shows seasonal and annual water level fluctuations. Note the relative change in water level between wells. Little overall variation is noted except for P-3 which shows changes over time totaling approximately thirteen to fourteen (13-14) feet. Changes recorded in P-3 are likely greater than those indicated by Figure 9 because P-3 is only thirty-eight (38) feet deep and water levels have been known to drop below the bottom of the well. A comparison of water level variations between P-3 and adjacent P-7 indicates that the total water level fluctuation may be as much as twenty-two (22) feet.

Low Flow. The first condition analyzed was based upon the relatively low flow condition found in November 1990. Using the relationship $Q = VA$ as discussed above, the total alluvial valley aquifer flow in the area of P-7 was estimated to be approximately 151 gpm. Subtracting an average pumped volume of 16.4 gpm from P-7, an estimated flow of 135 gpm bypassed P-7 and continued downstream toward the NEWUA spring collection system. Impacts noted upon the NEWUA spring system

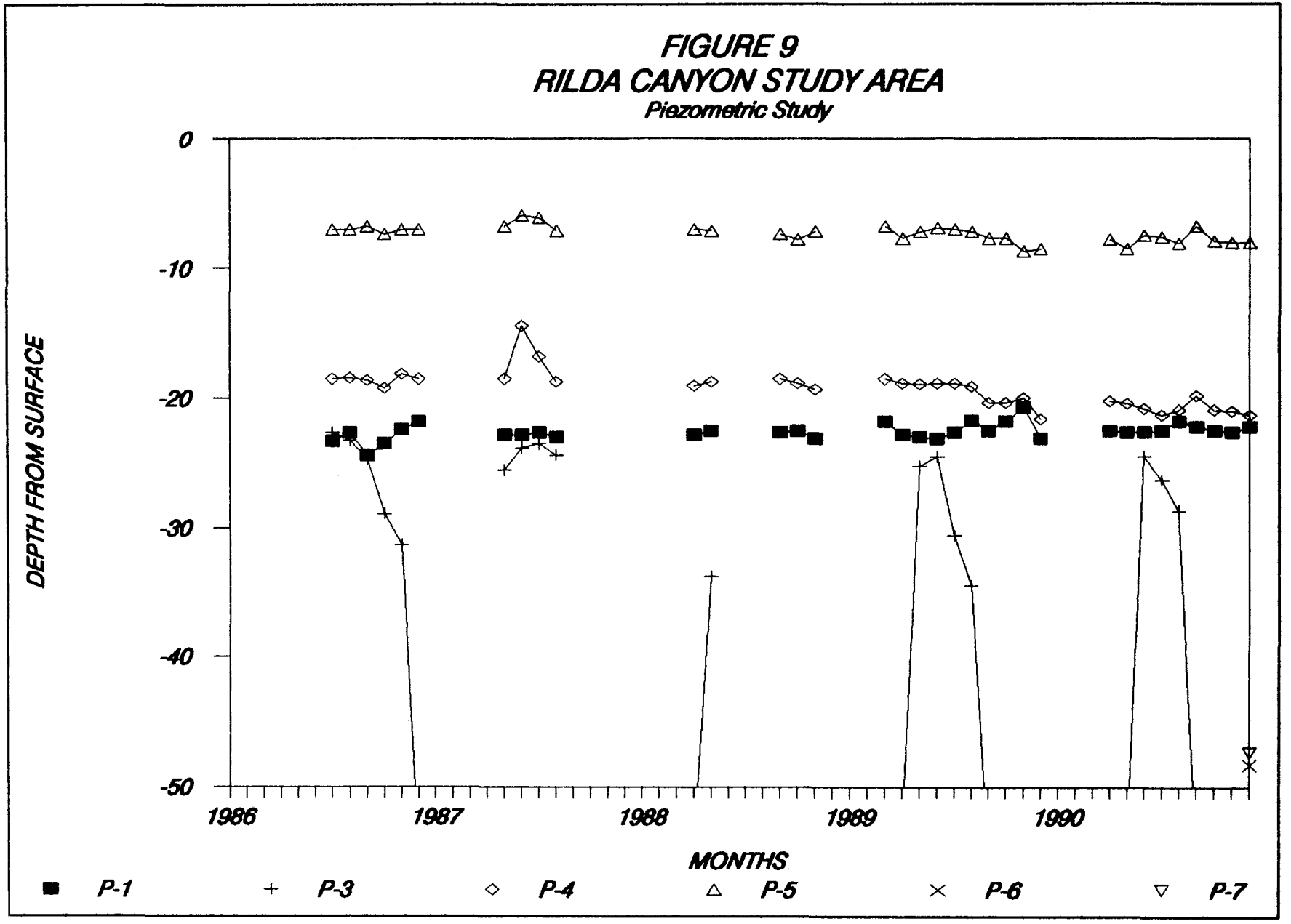


FIGURE 9
RILDA CANYON STUDY AREA
Piezometric Study
DEPTH FROM SURFACE
0
-10
-20
-30
-40
-50
1986
1987
1988
1989
1990
MONTHS
P-1
P-3
P-4
P-5
P-6
P-7

as a result of pumping P-7 appear to be confined to a reduction in flow from the springs on the order of ten percent. Before pumping began, total combined spring flows were approximately 85 gpm. During the later stages of pumping, just prior to termination of the test, spring flows had reduced to approximately 77.5 gpm, indicating a reduction in flow of 7.5 gpm during the pump test. Additional reductions in flow will probably occur as flows continue to stabilize.

High Flow. High flow conditions were estimated by adding to the 151 gpm base flow calculated for the November 1990 period the additional flow which would move down the canyon given a twenty-two (22) foot rise in water level which would occur during a wet year. The additional flow projected to occur during wet years was estimated by 1) measuring the cross sectional area which would result from a twenty-two (22) foot rise in the water table and 2) by applying the flow relationship $Q = kiA$. As indicated earlier, the water table gradient (i) used in this equation was found to be greater in 1987 than during the November 1990 test. Based on these assumptions, increased water levels measured during the high flow period of 1987 resulted in an estimated alluvial valley aquifer flow rate of 372 gpm.

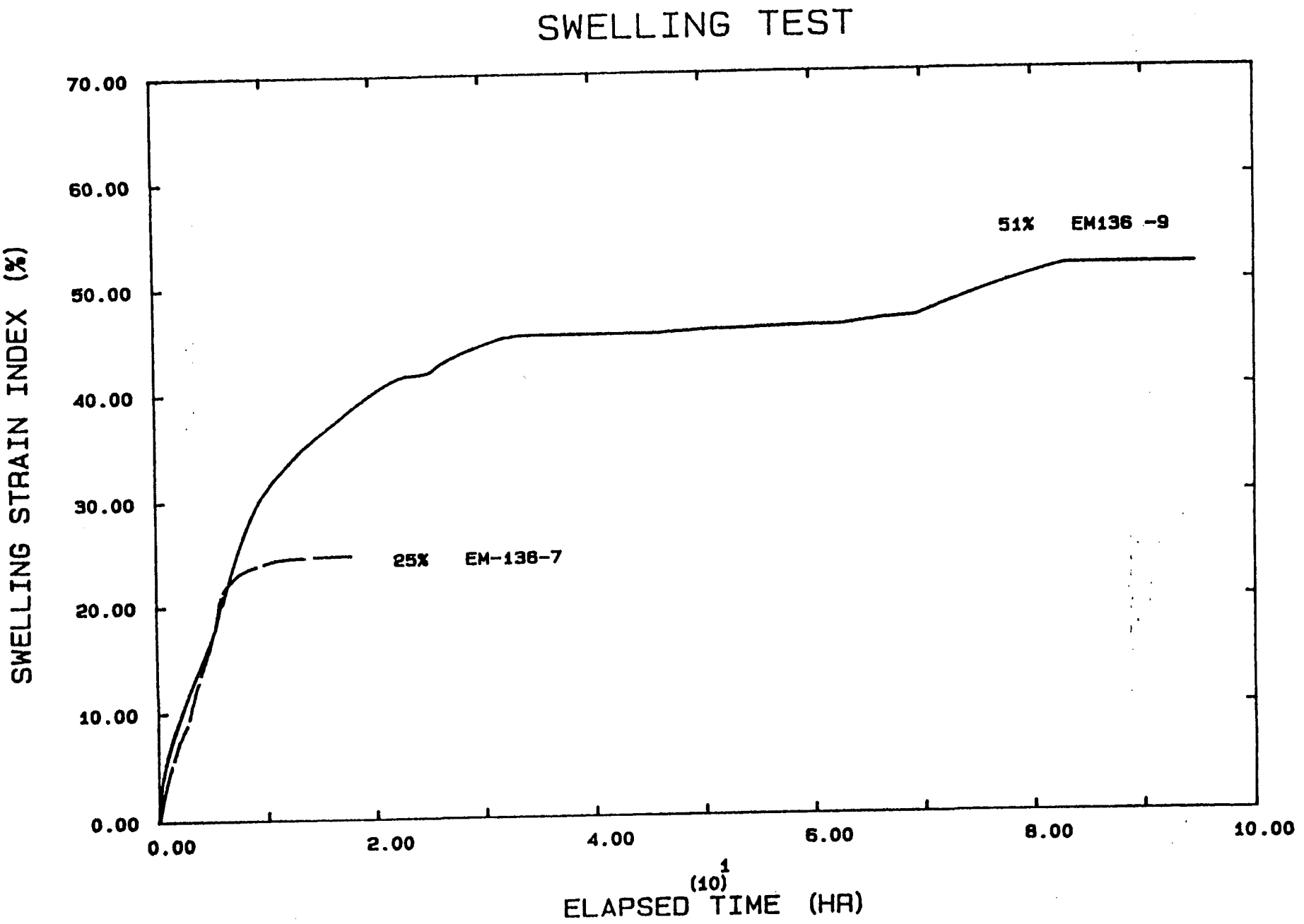
As discussed in the PAP, most of the groundwater in the permit area discharges in the form of seeps and springs. Springs issuing from the perched groundwater in the Flagstaff Limestone and the North Horn and Price River formations will only be impacted by mining activities if fracturing from subsidence reaches upward into these formations and is not sealed by swelling or fracture filling from plastic mudstones. As shown in Table 22, the majority of springs on the East Mountain property are associated with the North Horn Formation. As discussed in the regional groundwater characteristics section, the North Horn Formation is comprised of a variety of rock types which range from highly calcareous sandstone to mudstone. Lenticular

sandstone channels are oftentimes present in the upper and lower portion of the formation. Water which percolates down fractures from the overlying Flagstaff Limestone works its way into the sandstones, forming the perched water tables. The actual lateral extent, or correlation, between the perched water tables has not been identified; and it is not practical to do so because the tables are limited in extent and variable in stratigraphic location. Many springs have been identified where the sandstone channels intersect the land surface.

The lower two-thirds (upper Cretaceous in age) of the formation is generally highly bentonitic mudstone which is impermeable. It is likely that this material is acting as an aquiclude, preventing adequate recharge from reaching the Price River Formation or Castlegate Sandstone below. The mudstones present appear to swell when they come in contact with water; therefore, vertical migration of water along fractures through this material is limited because the fractures are sealed by the swelling clays. To identify and verify the existence of these bentonitic-plastic type mudstones, PacifiCorp conducted a special surface drilling program in 1989 to determine the rock strength and lithologic characteristics of the overburden on the East Mountain property. The entire sequence of the formations which are present on the East Mountain property, from the Flagstaff through the Starpoint Sandstone, was penetrated using two drill holes, identified as EM-136C and EM-137C (see Maps HM-2, 3, and 4). Drill hole EM-136C penetrated the Flagstaff Limestone and the upper 200 feet of the North Horn Formation. Hole EM-137C penetrated the lower portion of the North Horn Formation through the upper Starpoint Sandstone (see Appendix L). Previous East Mountain surface exploration programs have experienced swelling and caving problems associated with plastic mudstone zones located in the upper and lower portions of the North Horn Formation. Regional as well as property

wide drilling, along with limited-accessible outcrop data, has shown that even though projecting the lateral extent of individual lithologic units is not practical, the basic lithologic characteristics of the North Horn Formation are consistent on regional and permit area bases. Drilling of EM-136C and 137C confirmed existence of soft, plastic type mudstones which form an aquiclude, preventing significant recharge to the lithologic units below the North Horn Formation. PacifiCorp contracted TerraTek (a Salt Lake City based geoscience service company) to conduct a test to determine the swelling indices for two representative North Horn mudstone samples from EM-136C. Sample 1, EM-136-7 (96.3-96.9 ft; mudstone, light gray/green/red-brown, soft, plastic), swelled approximately twenty-five percent within the first hour. Sample 2, EM-136-9 (346.4-346.9 ft; mudstone, dark gray, highly fractured, yields to plastic deformation), swelled approximately thirty percent within the first hour and continued to swell until three hours had elapsed where it stabilized at approximately forty-five percent (see Figure 10). Even though the two samples stabilized at different rates, the initial rate of swelling is approximately the same for both. The combination of surface exploration and swelling analysis documents the plastic-swelling nature of the mudstones within the North Horn Formation and provides empirical data on how these lithologic units prevent vertical migration of water. Results of additional tests on these samples for fractured permeability and clay characterization (X-ray diffraction) are pending.

FIGURE 10


SWELLING TEST
SWELLING STRAIN INDEX (%)
70.00
60.00
50.00
40.00
30.00
20.00
10.00
0.00
0.00
2.00
4.00
6.00
8.00
10.00
(10)1
ELAPSED TIME (HR)
51% EM136 -9
25% EM-136-7

D. Mine Water

1. Deer Creek Mine

a. In-Mine Water Production

The best estimate of in-mine water production was arrived at by combining the following values:

Deer Creek Discharge	1,483.4 Million Gallons
Estimated Evaporation*	18.9 Million Gallons
Domestic Usage	8.0 Million Gallons
Total Discharge	1,510.3 Million Gallons

* See 1981 Hydrologic Monitoring Report

b. In-Mine Quality

Eleven samples were collected in the Deer Creek Mine in 1990. (See Map No. 4 in pocket for locations.) Parameters analyzed in 1990 are those listed in the DOGM Guidelines for Groundwater Baseline or Operational Quality. (See Appendix M.) Table 26 lists the characteristics of the samples collected and compares the mean, minimum, and maximum results of 1990 to the historical values for each location. It is apparent from Table 26 that the average quality of the in-mine water has remained relatively constant. The consistency was also depicted in the stiff diagrams presented as Figure 6. The complete chemical analysis of samples collected in 1990 can be found in Appendix G. In addition to water chemistry analyses, two bioassay samples were analyzed in 1990. The tests were performed using the current guidelines, "Methods for Measuring the Acute Toxicity of Effluent to Freshwater and Marine Organisms," EPA-600/4-85-013 (rev. March 1985). Each test included a 48-hour static toxicity test using *Ceriodaphnia sp.* and an acute 96-hour static replacement toxicity test using fathead minnows five (5) days of age. All tests passed in all concentrations of the effluent (see Appendix G).

TABLE 26: DEER CREEK IN-MINE WATER QUALITY* - 1990

LOCATION	SAMPLE DATES	ALKALINITY BICARBONATE	CALCIUM	CARBONATE	CHLORIDE	CONDUCTIVITY (umhos/cm)	HARDNESS	IRON DISSOLVED	MAGNESIUM	MANGANESE	pH (units)	POTASSIUM	SODIUM	SULFATE	TDS
3N xc-65	03-09**	490	165.9	<1.0	10.0	450	732	1.17	77.1	0.31	7.40	5.00	13.00	35.0	381
TW-10	04-03	376	83.1	<1.0	15.0	700	334	0.18	30.8	<0.01	7.80	2.30	17.00	50.0	433
	06-29	418	107.9	<1.0	15.0	599	430	0.30	39.0	<0.01	7.40	0.10	9.81	80.0	359
	09-07**	714	211.0	<1.0	7.0	500	710	1.35	44.4	1.21	7.85	2.49	18.90	180.0	393
	12-19	348	96.2	<1.0	15.0	510	381	0.35	34.1	0.04	7.50	0.00	17.89	35.0	358
** High suspended sediment															
	MIN	348	83.1	<1.0	7.0	500	334	0.18	30.8	<0.01	7.40	0.10	9.81	35.0	358
	MAX	714	211.0	<1.0	15.0	700	732	1.35	77.1	1.21	7.85	2.49	18.90	350.0	433
	MEAN	469	132.8	<1.0	12.4	552	517	0.67	45.1	0.32	7.59	1.98	15.32	139.0	385
HISTORICAL	MIN	292	62.9	<1.0	5.0	530	292	0.01	28.1	<0.01	7.00	1.10	13.50	27.0	362
(1988-89)	MAX	400	91.0	<1.0	30.0	950	371	0.25	38.5	0.02	7.50	2.00	17.10	100.0	439
	MEAN	361	77.8	<1.0	13.3	690	334	0.07	33.8	0.01	7.30	1.45	14.82	60.0	400
2R xc-30***	04-10	414	82.1	<1.0	15.0	520	381	<0.02	42.8	<0.01	7.65	1.80	11.40	70.0	203
	06-29	510	105.8	<1.0	15.0	700	429	0.44	40.1	<0.01	7.30	1.51	13.85	40.0	408
	09-07	375	79.5	<1.0	20.0	575	354	0.13	37.8	<0.01	7.50	0.25	13.41	45.0	402
	12-19	526	92.9	<1.0	10.0	550	414	0.21	44.1	0.02	7.70	0.72	14.22	45.0	362
	MIN	375	79.5	<1.0	15.0	520	354	<0.02	37.8	<0.01	7.30	0.25	11.40	40.0	203
	MAX	526	105.8	<1.0	20.0	700	429	0.44	44.1	0.02	7.70	1.80	14.22	70.0	408
	MEAN	456	90.1	<1.0	17.5	586	395	0.20	41.2	0.01	7.54	1.07	13.22	50.0	344
*** Sample site initiated during 1990.															
3N xc-44****	03-09	381	72.9	<1.0	10.0	420	311	0.92	31.3	<0.01	7.20	1.40	12.90	25.0	342
HISTORICAL	MIN	340	56.6	<1.0	3.9	500	287	0.01	29.1	<0.01	6.80	1.00	12.84	10.0	256
1984-89	MAX	447	89.5	<1.0	10.0	820	371	0.54	38.6	0.03	7.60	2.90	17.00	100.0	446
	MEAN	394	74.2	<1.0	5.4	672	326	0.15	33.9	0.01	7.27	2.12	15.15	42.9	351
**** Site terminated.															
1R xc-22	03-09	512	81.7	<1.0	5.0	650	370	0.44	40.2	<0.01	7.10	2.40	90.00	150.0	491
	03-26	538	110.8	<1.0	5.0	800	467	0.03	46.3	<0.01	7.00	2.10	19.20	80.0	495
Limited access, only two samples collected.															

* Quality parameters are reported as mg/l unless otherwise noted.

c. Discharge Quantity

Excess water not utilized in the mining operation or for domestic use was either pumped to storage areas or discharged from the mine. The locations of the main sump areas within the mine are shown in Figure 11. The largest volume of water is stored in the western part of Main West, which has not been actively mined for several years.

In-line flow meters are utilized to record the amount of water discharged from the mine, after which it passes through underground sedimentation sumps. Prior to December 1990 all of the water discharged from Deer Creek was piped directly to PacifiCorp's Huntington Power Plant. As of November 16, 1990, the State of Utah-Department of Health granted PacifiCorp a temporary discharge permit under a bypass agreement. Based on negotiations with the Department of Health, PacifiCorp conducted investigations to determine the impact to surface waters as the result of discharging mine water to Deer Creek and to the main receiving stream of Huntington Creek. The objectives of this investigation were to:

1. Quantitatively determine the existing geomorphological conditions in Deer Creek downstream of the proposed discharge location.

2. Predict the water quality impact (total suspended solids and total dissolved solids) to Huntington Creek resulting from proposed mining water discharges into Deer Creek.

The following summary represents the conclusions reached as a result of field investigations, computer simulation modeling, and review of historical water quality.

1. Field observations and laboratory data indicate that Deer Creek has an embedded stream bottom which is dominated by large substrate.

2. The large substrate is covered by a layer of fine material (2-6 inches deep).
3. The banks of the stream are similar in character to the stream bottom.
4. Across stream transects showed that the valley type was V-shaped, typical of steep mountain streams.
5. Computer simulations (U.S. Army Corps of Engineers HEC-6 Sediment and Transport Model) using input field data from the site indicated that initial discharges of 7-12 cfs produced sediment concentrations and loads currently experienced by Deer Creek.
6. These sediment loads from Deer Creek into Huntington Creek under worse-case conditions (day 1 at 22 cfs) represent only thirty percent (30%) of the observed maximums in Huntington Creek.
7. Using variable discharge rates (step increase of 1 cfs/3 days) starting at 7 cfs and ending at 22 cfs, the daily loading into Huntington Creek would be only eighteen percent (18%) of the average September transport currently occurring in the stream.
8. Because the loading of sediment from Deer Creek into Huntington Creek resulting from constant 7-12 cfs discharges or the variable discharge rates are substantially lower than current transport rates within Huntington Creek and the similarity of these flows to current storm loadings by Deer Creek, it is believed that discharges of mine waters will not adversely impact the aquatic life in Huntington Creek.

Based on the findings of this investigation and negotiations with State and Federal agencies, the Department of Health granted PacifiCorp a temporary permit based on the stipulations set forth in the bypass agreement. As part of the agreement a comprehensive hydrologic monitoring program was established to

monitor the potential impacts to the receiving streams of Deer Creek and Huntington Creek. The program includes monitoring stream transects, water quality, and macroinvertebrates.

Initial data collected during the time frame December 1990 through March 1991 indicate the major constituents of water discharged from the mine have had only a minor impact on the receiving stream of Huntington Creek (see Appendix H for water quality analysis). Monitoring sites were established along the extent of Deer Creek in addition to sites above and below the confluence of Deer Creek on Huntington Creek. Listed below are the parameters analyzed to determine the potential impact.

Alkalinity (total)	pH
Calcium	Potassium
Chloride	Sodium
Flow	Solids: Settleable/Suspended
Iron (Total)	Sulfate
Magnesium	Temperature
Manganese	Turbidity
Oil & Grease	TDS
Oxygen - Dissolved	

Considering the low flow conditions of Huntington Creek, downstream of the confluence of Deer Creek only the parameters TDS and sulfate increased slightly from background. Turbidity and sediment load (settleable and suspended), a major concern of the government agencies, stabilized quicker than predictive models indicated.

In addition to water chemistry sampling, bioassay tests were conducted using the current guidelines, "Methods for Measuring the Acute Toxicity of Effluent to Freshwater and Marine Organisms," EPA-600/4-85-013 (Rev. March 1985). Each test included a 48-hour static toxicity test using *Ceriodaphnia sp.* and an acute 96-hour static replacement toxicity test using fathead minnows five (5) days

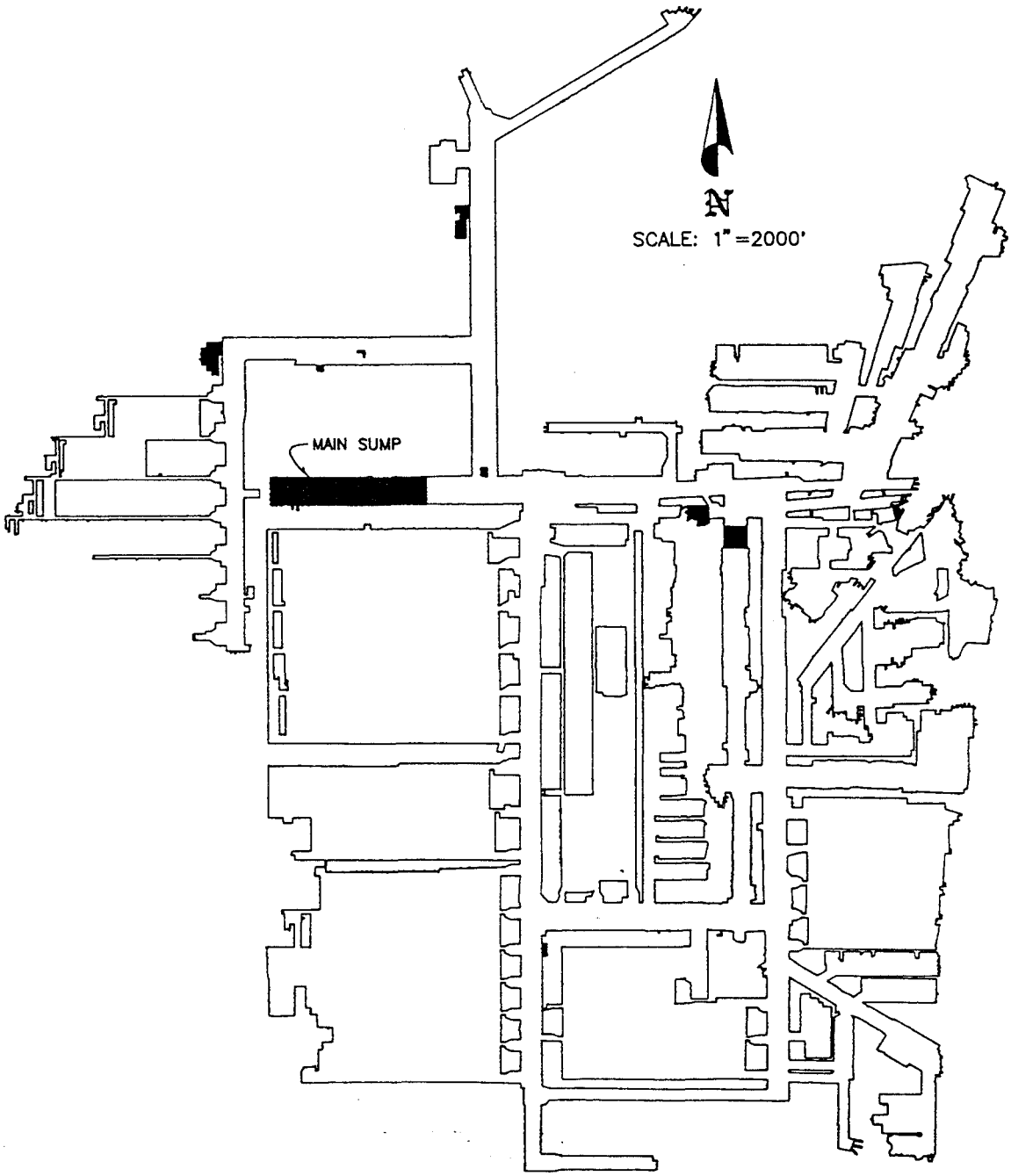
of age. These tests were utilized to determine aquatic characteristics of the intercepted groundwater, mine water discharged, and Deer Creek drainage near the confluence with Huntington Creek (see Appendix H). All of the tests passed the guidelines established by the EPA.

The temporary discharge permit allowed by the State Health Department is for a one-year period. At the end of the one-year period a comprehensive report will be developed by PacifiCorp to determine the overall impacts related to Huntington Creek from the Deer Creek Mine water discharge.

The total water discharged from the Deer Creek Mine during 1990 was estimated at 4552 acre feet, or 1,483.4 million gallons. The recorded flow of 4552 acre feet during 1990 is a one hundred twenty-seven percent (127%) increase from the 1989 discharge of 2008 acre feet. The average monthly discharges are shown in Figure 11. A graph displaying the historical discharge rates is included as Figure 12. The volume of water discharged from the mine has increased at a significant rate over the past several years due to at least five factors. First, in previous years water discharged was measured with a Stevens Recorder installed in a Parshall flume. It was difficult to maintain calibration of the recorder and, in 1985, in-line flow meters (totalizer and instantaneous flow) were installed, allowing for a more accurate measurement of discharge. Second, mining has progressed into areas largely dominated by sandstone roof. The inflow from those areas is greater per acre of exposed area than areas of mudstone top. Third, mining has progressed into the bottom of the Straight Canyon Syncline, the lowest part of the mine, where a significant amount of water has been intersected. Fourth, mining has intersected the Roans Canyon Fault Graben which has released additional water into the mine workings. Last, prior to 1985 water used in mining was pumped directly from the

FIGURE 11

DEER CREEK COAL MINE WATER SUMP AREAS



MINE WORKINGS UPDATED THROUGH APRIL 1, 1991

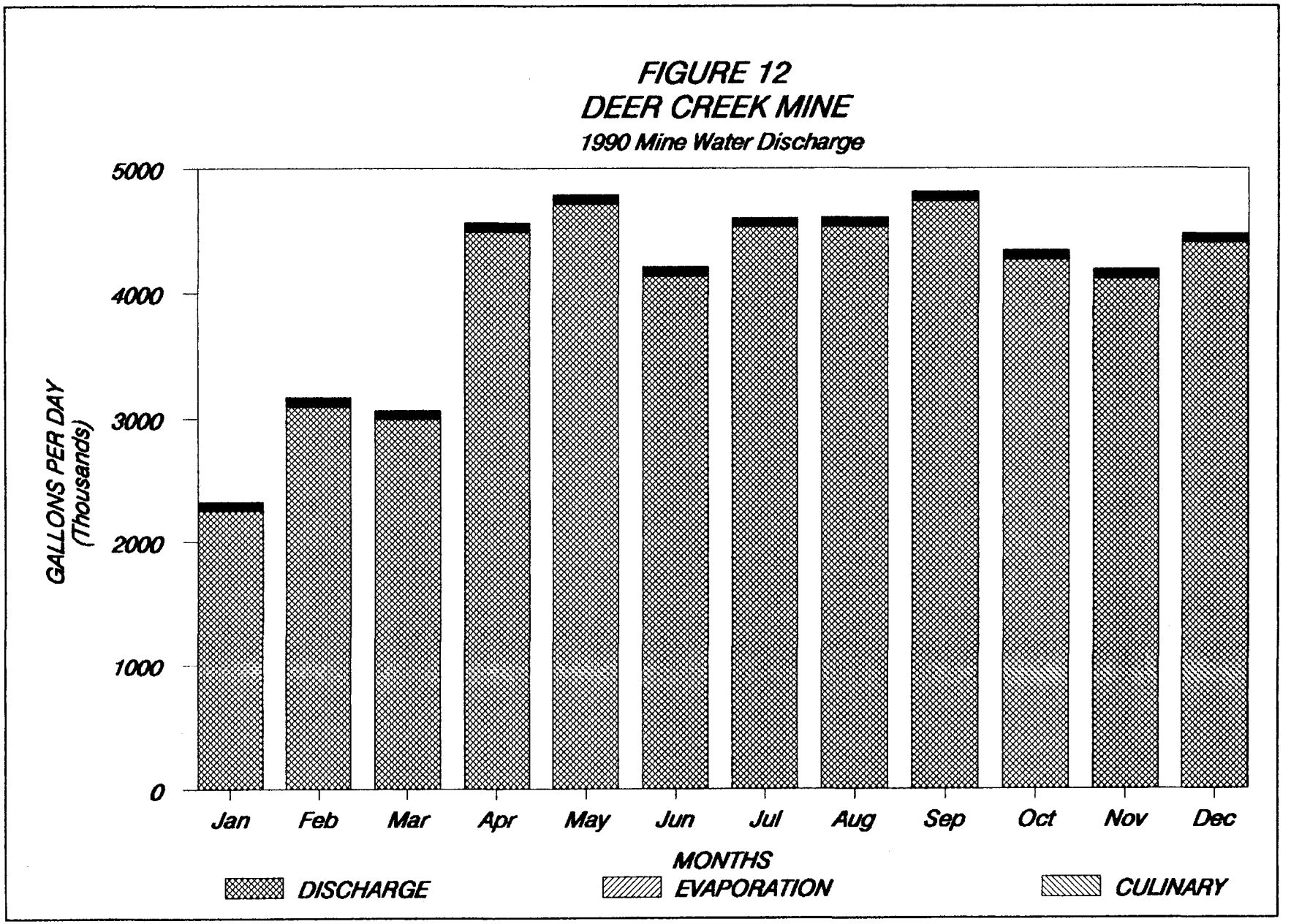


FIGURE 12
DEER CREEK MINE
1990 Mine Water Discharge
GALLONS PER DAY
(Thousands)
5000
4000
3000
2000
1000
0
Jan
Feb
Mar
Apr
May
Jun
Jul
Aug
Sep
Oct
Nov
Dec
MONTHS
DISCHARGE
EVAPORATION
CULINARY

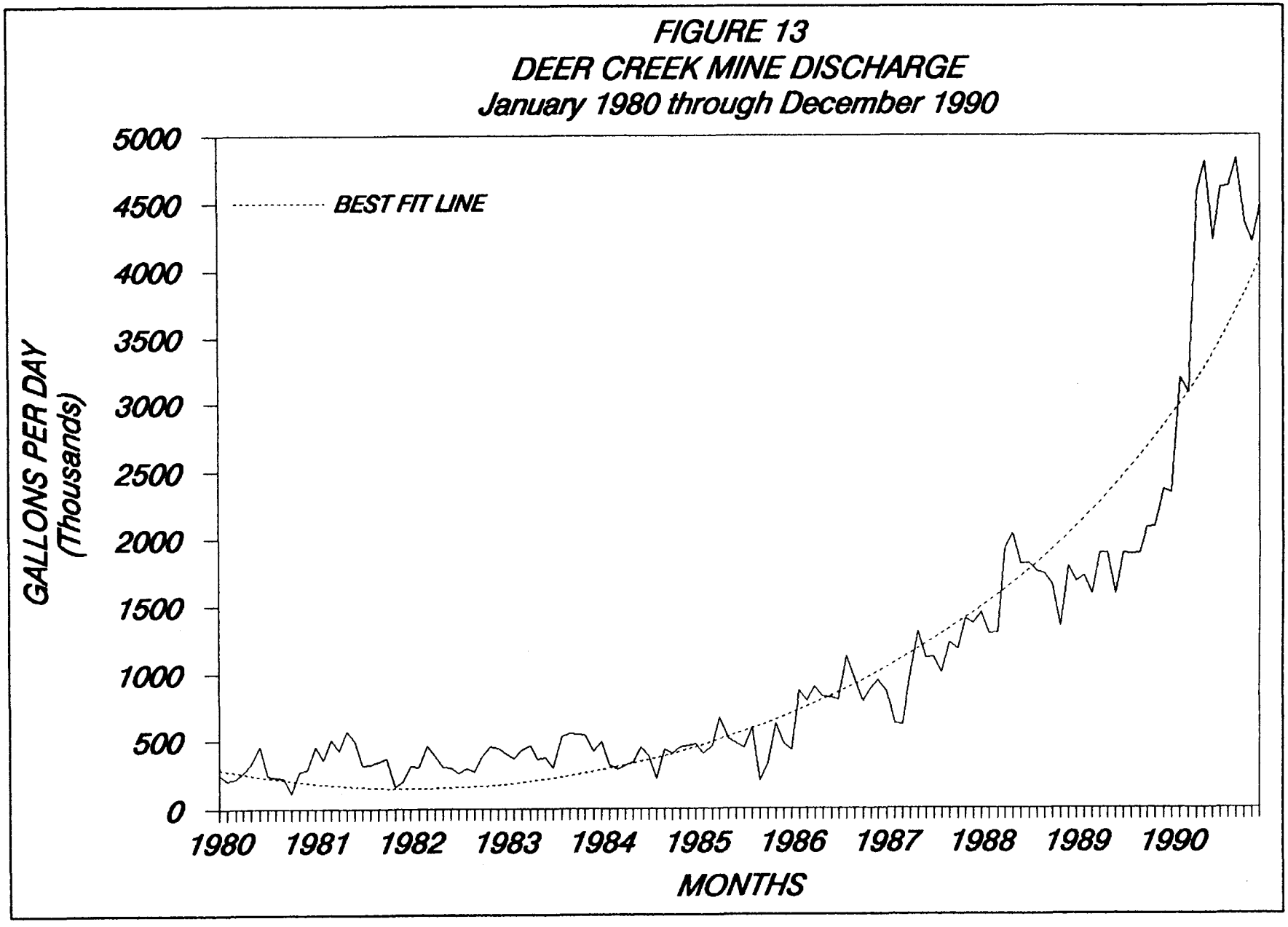


FIGURE 13
DEER CREEK MINE DISCHARGE
January 1980 through December 1990
BEST FIT LINE
GALLONS PER DAY
(Thousands)
5000
4500
4000
3500
3000
2500
2000
1500
1000
500
0
1980
1981
1982
1983
1984
1985
1986
1987
1988
1989
1990
MONTHS

in-mine sumps. Since that time all water has been pumped from the mine through the metering system. Mining water is then pumped back into the mine through a high-pressure steel line to the mining faces where it is utilized.

d. Discharge Quality

Monthly water quality samples were collected for 1990. Table 27 compares the minimum, maximum, and mean values from an historical standpoint to 1990. An examination of Table 27 shows a slight change in chloride between samples collected in 1990 to the historical results. Individual analysis can be found in Appendix H.

TABLE 27: DEER CREEK MINE - DISCHARGE WATER QUALITY*

	1990			Historical - (1976-1989)		
Parameters	Minimum	Maximum	Mean	Minimum	Maximum	Mean
pH (units)	7.3	8.1	7.7	6.8	8.2	7.59
Acidity	1.00	97.00	15.37	0.0	96.0	12.05
Alkalinity	290	459	345	207	459	299.1
Chloride	5.0	60.0	17.04	2.4	60	10.1
Conductivity (umhos/cm)	575	950	731	480	1480	917
Iron (Total)	<0.02	1.26	0.24	0.02	7.53	0.58
Oil & Grease	0.00	16.40	2.09	0.0	48.8	3.92
Sulfate	80.0	300.0	151.8	29.8	497	219.9
TDS	310	683	483	231	938	604
TSS	<1.0	192.0	32.97	0.1	2784	99.28

* Quality parameters reported as mg/l unless otherwise noted.

2. Des-Bee-Dove Mine

Production at the Des-Bee-Dove Mine was terminated indefinitely as of February 14, 1987. The portals were sealed and underground hydrologic monitoring was discontinued.

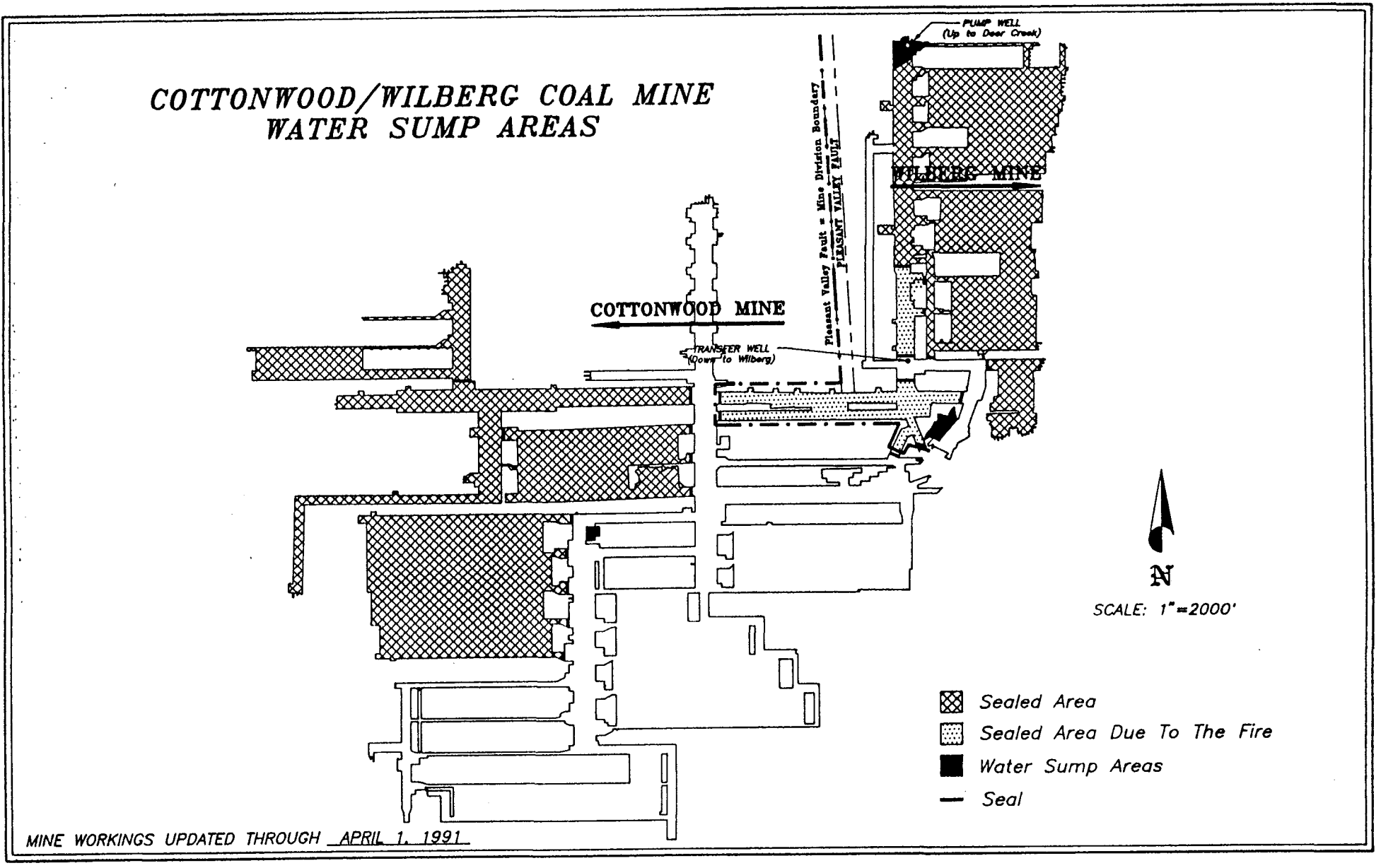
3. Wilberg/Cottonwood Mine

The mine fire which occurred in late 1984 altered normal hydrologic monitoring at the Wilberg Mine. Normal hydrologic monitoring was reinstated in late 1985 and continued through 1990.

a. In-Mine Water Production

In previous reports the in-mine water production was arrived at by combining mine discharge, domestic use, and evaporation. Due to the fire, normal coal production and usage were not experienced. Pre-fire coal production resumed during late 1985. A large part of the mine workings have been sealed since the fire. The locations of the sealed areas and sumps are shown on Figure 14. As reported in the 1984 Annual Report, water discharged from the Wilberg Mine complex (includes the area designated as the Cottonwood Mine) decreased substantially from previous years. (See Figure 15.) The main reason for the large decrease was mining in areas dominated by mudstone roof. Mining in the next two years will be centered in the southern reserves which, from surface and drill hole information, will continue the trend of lower in-mine water production. The small amount of groundwater intercepted by mining in the South Lease area is transported by pipeline to the sealed area in the western portion of the mine. (See Figure 14.) Consistent with previous years, the following table lists the factors involved in estimating in-mine water production.

FIGURE 14


COTTONWOOD/WILBERG COAL MINE
WATER SUMP AREAS
PUMP WELL
(Up to Deer Creek)
Pleasant Valley Fault = Mine Division Boundary
PLEASANT VALLEY FAULT
WILBERG MINE
COTTONWOOD MINE
TRANSFER WELL
(Down to Wilberg)
N
SCALE: 1"=2000'
Sealed Area
Sealed Area Due To The Fire
Water Sump Areas
Seal
MINE WORKINGS UPDATED THROUGH APRIL 1, 1991

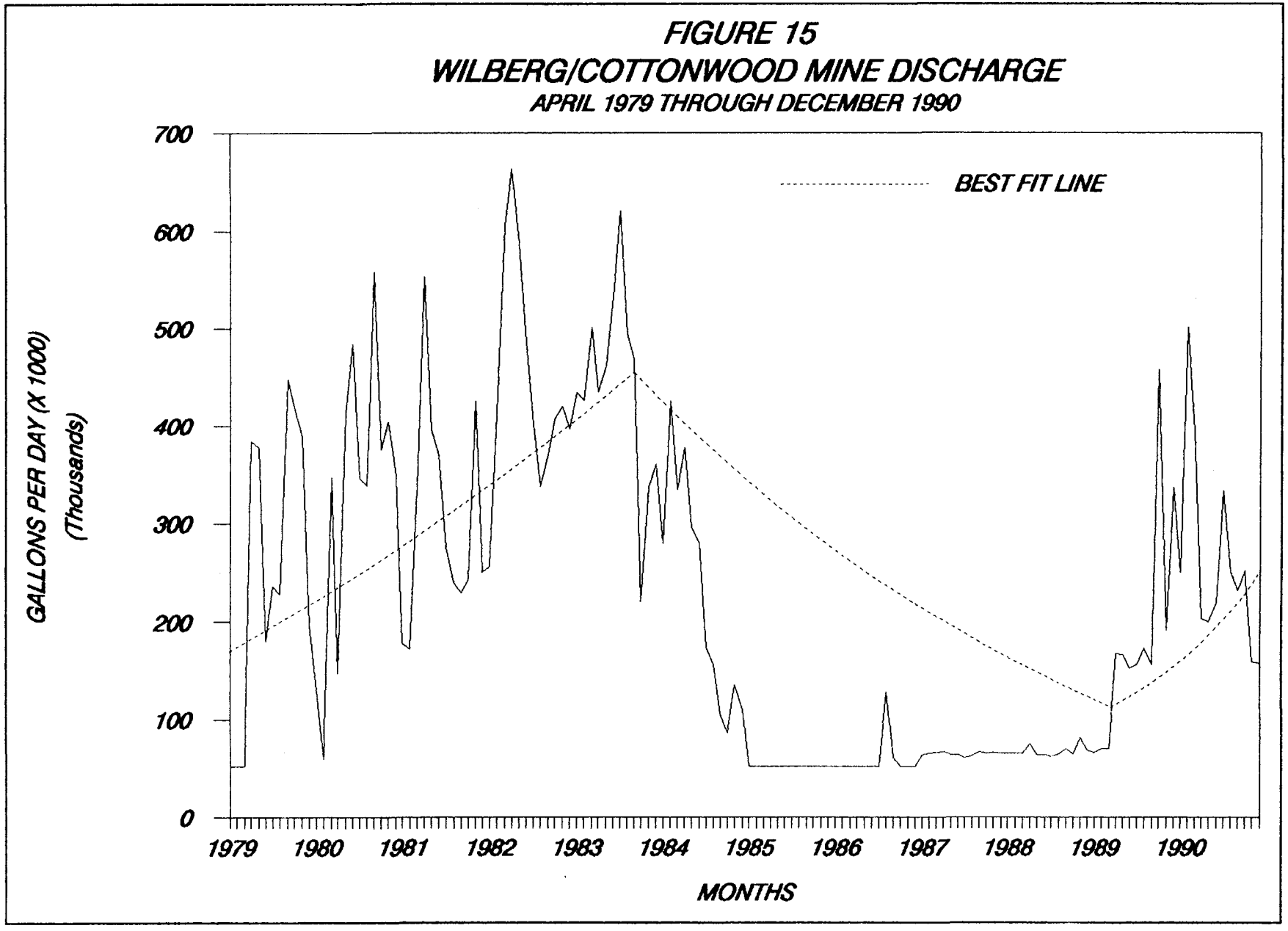


FIGURE 15
WILBERG/COTTONWOOD MINE DISCHARGE
APRIL 1979 THROUGH DECEMBER 1990
BEST FIT LINE
GALLONS PER DAY (X 1000)
(Thousands)
700
600
500
400
300
200
100
0
1979
1980
1981
1982
1983
1984
1985
1986
1987
1988
1989
1990
MONTHS

Wilberg/Cottonwood Discharge

Grimes Wash	56.0 Million Gallons
Miller Canyon*	12.6 Million Gallons
Estimated Evaporation**	19.0 Million Gallons
Domestic Usage	5.4 Million Gallons
Total Discharge	74.0 Million Gallons

* Sealed ventilation breakout which intermittently discharges.
** See 1981 Hydrologic Monitoring Report.

b. In-Mine Quality

Eight samples were collected in the Wilberg/Cottonwood Mine in 1989. (See Map No. 5 in pocket for locations.) Parameters analyzed in 1990 are those listed in the DOGM Guidelines for Groundwater Operational Quality. (See Appendix M.) Table 28 lists the characteristics of the samples collected and compares the mean, minimum, and maximum results of 1990 to the historical values. The average quality by location has remained relatively constant for each individual location. A complete chemical analysis of samples can be found in Appendix I.

The 1986 review performed by DOGM raised questions concerning the elevated mineral levels, specifically sulfate and TDS (DOGM September 28, 1987), found in the 4th East area. PacifiCorp has collected numerous samples throughout the 3rd and 4th East and 2nd South areas (see Map No. 5 in pocket) and all samples have indicated elevated mineral content. Originally, decreasing quality from north to south was believed to depict the groundwater flow direction, and the quality decreased as a function of the time it traveled through the strata. The time travel component is probably an important factor. In 1985 a surface exploration program identified the existence of an area of residual heat from an ancient burn on the outcrop throughout the southern portion of East Mountain. The high temperature was also explored within the mine and a portion of reserves was lost

TABLE 28: WILBERG/COTTONWOOD IN-MINE WATER QUALITY* - 1990

LOCATION	SAMPLE DATES	ALKALINITY BICARBONATE	CALCIUM	CARBONATE	CHLORIDE	CONDUCTIVITY (umhos/cm)	HARDNESS	IRON DISSOLVED	MAGNESIUM	MANGANESE	pH (units)	POTASSIUM	SODIUM	SULFATE	TDS
2S XC-11	03-08	567	182.9	<1.0	25.0	1100	901	0.07	107.8	<0.01	7.3	3.5	18.9	450	1060
	06-28	676	224.9	<1.0	15.0	1500	1022	0.09	111.9	0.04	7.1	2.7	23.5	490	1036
	09-06	593	176.8	<1.0	17.0	1215	917	<0.02	115.5	0.02	7.0	0.3	25.5	450	1065
	12-20	567	161.8	<1.0	15.0	1250	850	0.27	108.3	0.06	7.5	3.4	23.7	340	1071
	MIN	567	161.8	<1.0	15.0	1100	850	<0.02	107.8	<0.01	7.0	0.3	18.9	340	1036
	MAX	676	224.9	<1.0	25.0	1500	1022	0.27	115.5	0.06	7.5	3.5	25.5	490	1071
	MEAN	600	186.6	<1.0	18.0	1266	923	0.11	110.9	0.03	7.2	2.5	22.9	433	1058
HISTORICAL	MIN	403	116.0	<1.0	9.6	1000	725	0.01	5.4	0.01	7.0	2.4	6.4	340	664
(1983-89)	MAX	631	330.0	<1.0	130.0	2600	1013	0.17	134.4	0.08	8.1	7.4	36.9	690	1328
	MEAN	494	167.4	<1.0	23.6	1549	861	0.05	104.0	0.02	7.5	4.5	23.7	434	972
4E XC-24	03-08	532	302.0	<1.0	35.0	2400	1625	0.12	211.5	0.01	7.7	8.5	39.7	1200	2381
	06-28	636	412.4	<1.0	45.0	2500	2384	0.07	328.9	0.06	7.5	7.0	45.7	1800	2263
	09-06	567	372.1	<1.0	34.0	2450	1805	<0.02	212.7	0.02	7.6	4.3	45.3	1350	2341
	12-20	545	389.8	<1.0	45.0	2350	2168	0.07	290.0	0.06	7.1	8.9	46.4	1700	2073
	MIN	532	302.0	<1.0	34.0	2350	1625	<0.02	211.5	0.01	7.1	4.3	39.7	1200	2073
	MAX	636	412.4	<1.0	45.0	2500	2384	0.12	328.9	0.06	7.7	8.9	46.4	1800	2381
	MEAN	570	369.1	<1.0	39.8	2425	1996	0.07	260.8	0.04	7.5	7.2	44.3	1513	2265
HISTORICAL	MIN	450	236.0	<1.0	17.6	1250	1170	0.01	106.0	0.01	7.2	7.5	21.7	800	1314
(1986-89)	MAX	612	416.9	<1.0	85.0	5000	2022	0.17	238.2	0.06	8.0	11.3	59.3	1700	2594
	MEAN	529	310.2	<1.0	35.4	2455	1571	0.05	193.3	0.03	7.5	9.3	45.5	1141	1903

* Quality parameters are reported as mg/l unless otherwise noted.

because of the situation. It is now theorized that the high temperature water dissolved the mineral constituents of the formations, thereby altering the water chemistry. The quality also decreases vertically because of the influence of marine sediments along with the trend of decreasing quality from north to south.

c. Discharge Quantity

Water produced in the Wilberg Mine gravity flows to the northern area of 1st North. At that point it can either be pumped by a vertical turbine located in the Deer Creek Mine which picks up the water and pumps it back to the south and down to the Wilberg Mine main sump or pumped directly to the main sump utilizing submersible pumps. The sump, which functions as a settling basis, effectively removes settleable solids from the water. A portion of the water is redistributed to various areas of the mine to be utilized in the mining operations. Excess water is discharged into the Left Fork of Grimes Wash after it passes through an oil skimmer in accordance with stipulations of the Wilberg Mine Discharge Permit UT-0022896-01. A total of 56.0 million gallons was discharged to Grimes Wash during 1990; and intermittent small quantity discharges did occur at the Miller Canyon breakouts, which were developed for ventilation purposes but sealed in 1987. (See Figure 16.) Intermittent discharges usually occur throughout the year with a flow rate ranging from 10 to 65 GPM. Discharge from Miller Canyon is monitored in accordance with stipulations of the Wilberg Mine Discharge Permit UT-0022896-04. Approximately 12.6 million gallons were discharged during 1990.

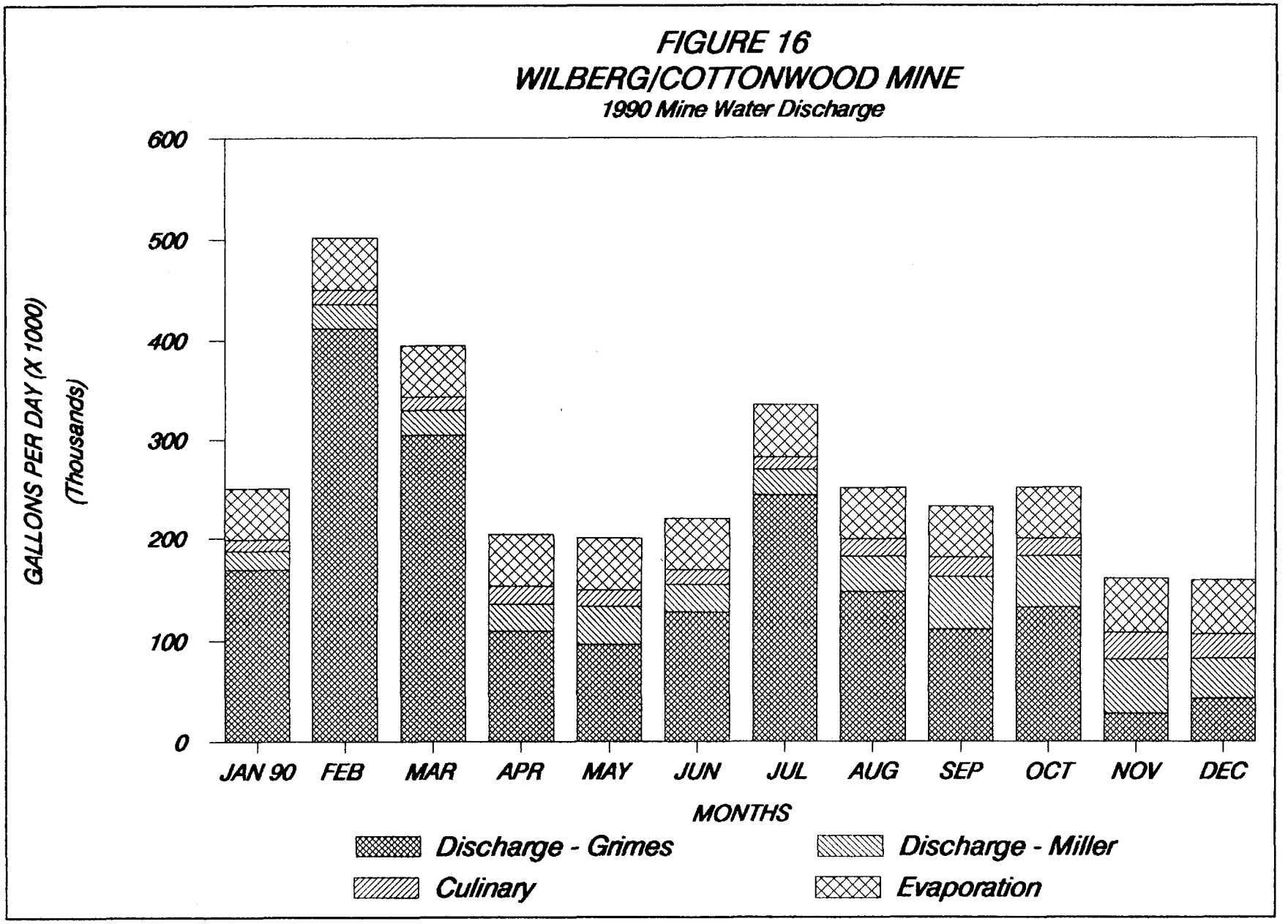


FIGURE 16
WILBERG/COTTONWOOD MINE
1990 Mine Water Discharge
GALLONS PER DAY (X 1000)
(Thousands)
600
500
400
300
200
100
0
JAN 90
FEB
MAR
APR
MAY
JUN
JUL
AUG
SEP
OCT
NOV
DEC
MONTHS
Discharge - Grimes
Discharge - Miller
Culinary
Evaporation

d. Discharge Quality

Samples are collected each month from Grimes Wash and Miller Canyon breakouts whenever discharge occurs. Monthly samples were collected from both the Grimes Wash and Miller Canyon locations during 1990. Table 29 compares the minimum, maximum, and mean values from 1990 to the historical values.

VI. PIEZOMETRIC GRADIENT INFORMATION

A. Surface

1. EM-31 and EM-47

Two surface exploration drill holes which were developed into permanent water monitoring stations in 1978 continued to be monitored on a monthly basis, as access permitted. (See Map HM-1.)

Drill hole EM-31 in Cottonwood Creek Canyon was monitored monthly throughout 1990 except for the month of February when it was inaccessible. (See Map HM-1 in pocket.) The water level in the hole was at its highest point, -46.1 feet, during the months of March and May and at its lowest point, -50.4 feet, during the months of September and November. Drill hole EM-47 in Rilda Canyon was accessible only during the months of April through November. During this time frame the water was at its highest, -204.5 feet, in July and its lowest, -221.5 feet, during the month of April. Hydrographs of 1984-1990 data collected are shown in Figure 17.

2. Rilda Canyon Study Area

Water elevations from five existing piezometers and two monitoring wells completed in November 1991 were collected on a monthly basis throughout the year when accessible. Information collected during 1990 correlated well with historical

TABLE 29: WILBERG/COTTONWOOD - DISCHARGE WATER QUALITY*

GRIMES WASH

Parameters	1990 Minimum	1990 Maximum	1990 Mean	Historical - (1976-1989) Minimum	Historical - (1976-1989) Maximum	Historical - (1976-1989) Mean
pH (units)	7.0	7.9	7.57	6.9	8.2	7.63
Acidity	0.0	30.0	8.42	0.1	62.0	7.24
Alkalinity	278	415	324.3	216	377	273.8
Chloride	5.0	25.0	19.4	2.7	63.3	14.3
Conductivity (umhos/cm)	620	1100	878	710	1390	1009
Iron	<0.02	0.52	0.13	0.01	3.0	0.3
Oil & Grease	<1.0	5.2	1.5	0.2	23.8	2.1
Sulfate	70	300	229.6	29.2	430	217.0
TDS	425	888	606.8	424	1047	575
TSS	<1.0	5.0	2.5	<0.5	222	8.4

MILLER CANYON

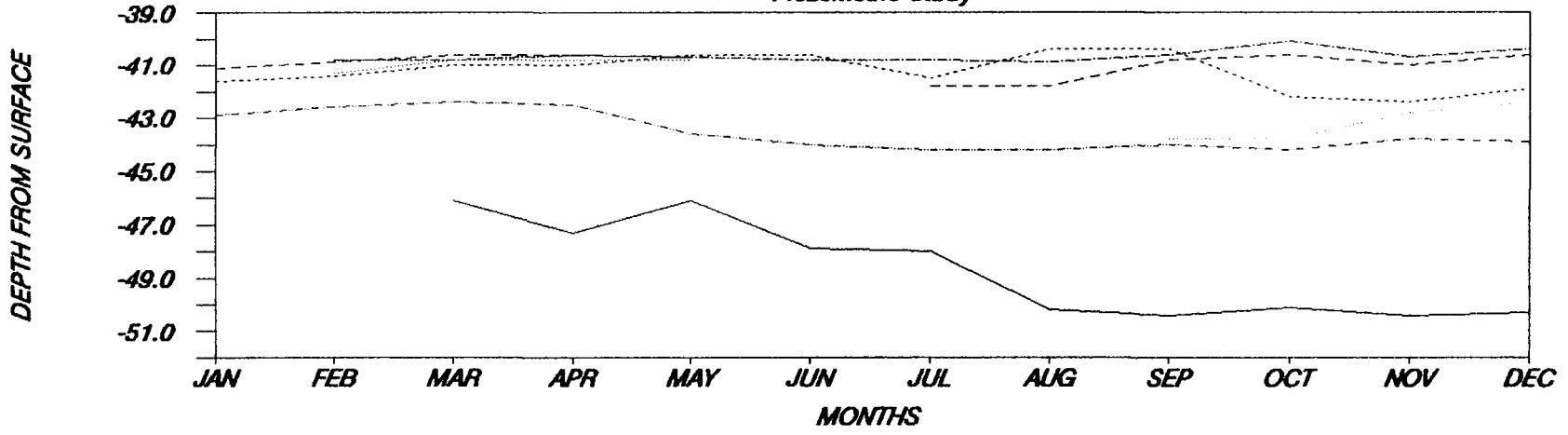
Parameters	1990 Minimum	1990 Maximum	1990 Mean	Historical - (1986-1989) Minimum	Historical - (1986-1989) Maximum	Historical - (1986-1989) Mean
pH (units)	6.7	7.4	7.04	6.9	7.8	7.27
Acidity	16	37	25.8	<1.0	57	24.7
Alkalinity	338	445	379.4	225	393	331.9
Chloride	10	70	27.5	10	25	16.0
Conductivity (umhos/cm)	1000	1500	1193	650	1900	1235
Iron	<0.02	1.38	0.3	0.02	1.18	0.35
Oil & Grease	<1.0	4.6	1.52	<1.0	5.8	1.78
Sulfate	290	650	421.5	250	650	417
TDS	809	930	895	413	1182	920
TSS	<1.0	32.0	4.83	0.1	31	4.2

* Quality parameters reported as mg/l unless otherwise noted.

FIGURE 17

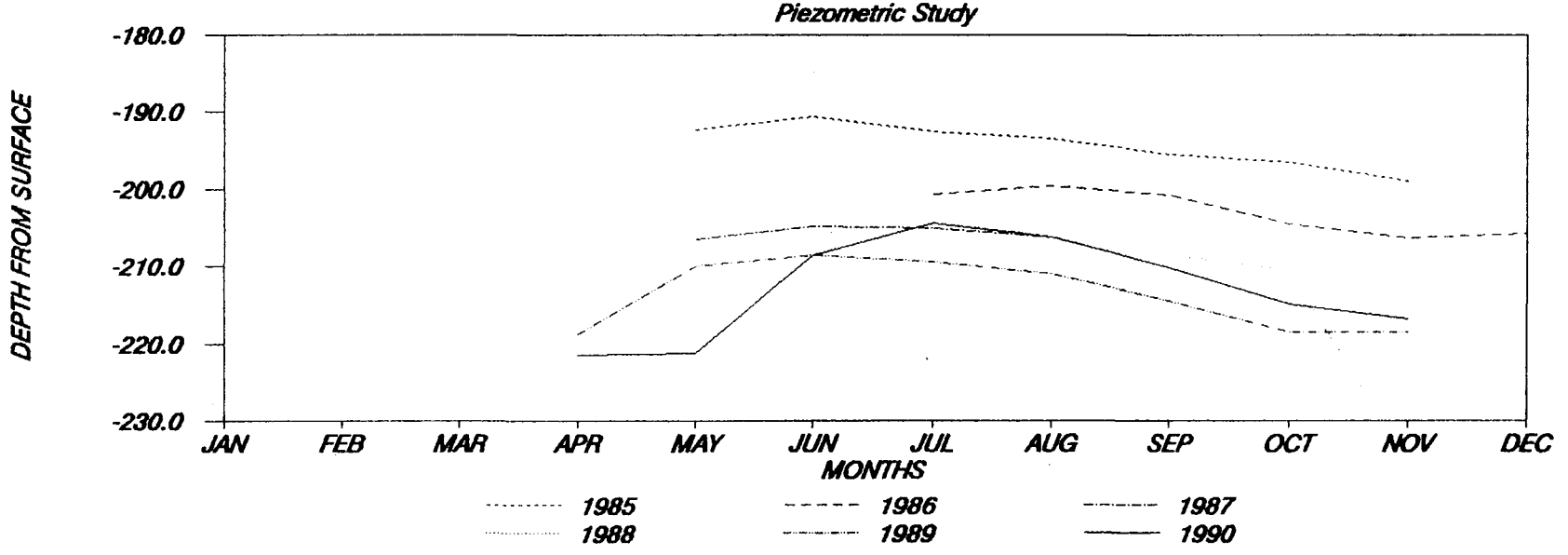
MONITORING WELL EM-31

Piezometric Study



MONITORING WELL EM-47

Piezometric Study



information. (See Figure 9.) For complete detail of the hydrologic investigation conducted in Rilda Canyon, review "Hydrologic Development in 1990" section of this report.

B. In-Mine

1. Deer Creek

Four (4) long-term monitoring wells were completed during 1989, and data collection was initiated in December. (See Map HM-2 for well locations.) As Figure 18 reveals, the water level remained relatively constant during 1990. Following water reports will graphically display groundwater level elevation trends.

2. Cottonwood Mine

During 1989 four holes were drilled in the Cottonwood Mine. Three are considered long-term and one a short-term study well. (See Map HM-3.) Data from the wells are shown in Figure 19. The short-term well was completed in a longwall development entry to study the effect longwall mining has upon the level of groundwater. Monitoring of the groundwater level was collected on a daily basis until the longwall had retreated past the well and access was restricted (October 27, 1989). As Figure 19 reveals, the groundwater elevation in short-term well WCP-4, as well as in the long-term locations, remained constant during extraction of the 9th East longwall panel (September-December 1989). Monitoring of the long-term wells, WCP 1-3, will continue through 1991 as long as access permits.

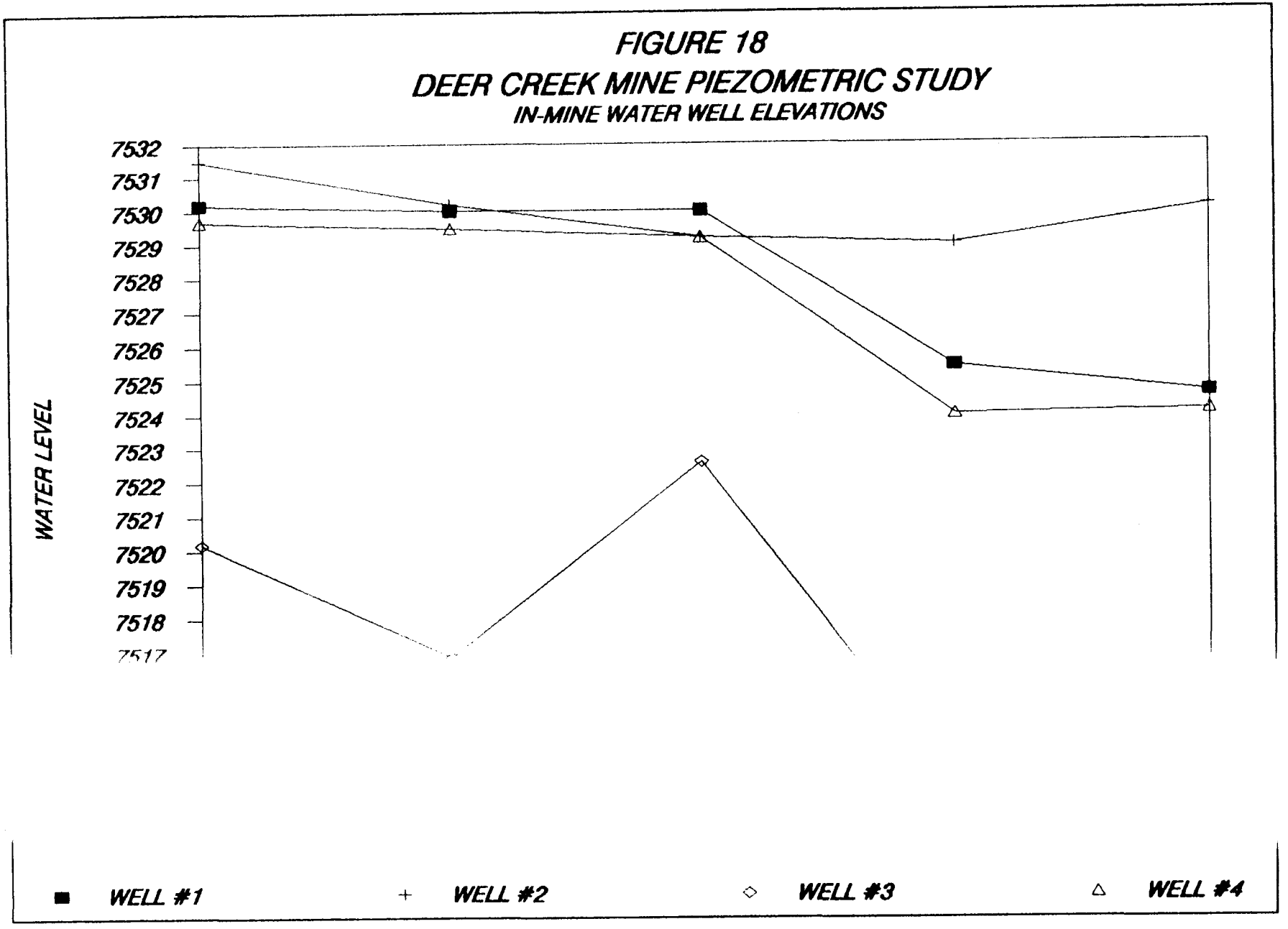


FIGURE 18
DEER CREEK MINE PIEZOMETRIC STUDY
IN-MINE WATER WELL ELEVATIONS
WATER LEVEL
7532
7531
7530
7529
7528
7527
7526
7525
7524
7523
7522
7521
7520
7519
7518
7517
WELL #1
WELL #2
WELL #3
WELL #4

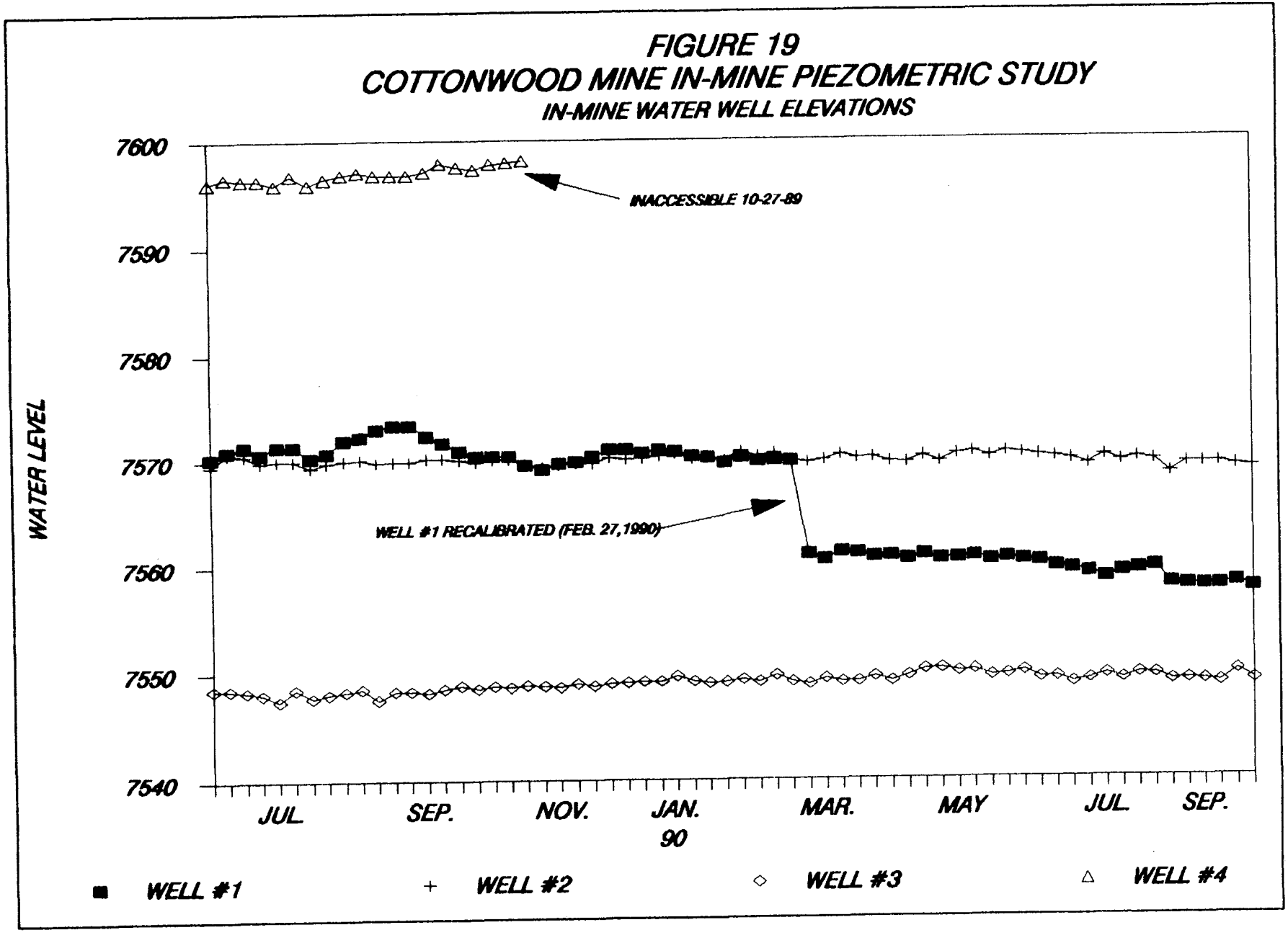


FIGURE 19
COTTONWOOD MINE IN-MINE PIEZOMETRIC STUDY
IN-MINE WATER WELL ELEVATIONS
WATER LEVEL
7600
7590
7580
7570
7560
7550
7540
INACCESSIBLE 10-27-89
WELL #1 RECALIBRATED (FEB. 27,1990)
JUL.
SEP.
NOV.
JAN.
90
MAR.
MAY
JUL.
SEP.
WELL #1
WELL #2
WELL #3
WELL #4

VII. WASTE ROCK WELLS

A. Deer Creek Mine - Waste Rock Storage Facility

The Deer Creek Waste Rock Storage Facility is located on the northeast side of State Highway 31 approximately six (6) miles west of Huntington, Utah.

The geology of the Deer Creek Waste Rock Storage Facility is fairly simple and straightforward. The site is located on the southern flanks of Gentry Mountain in the area just south of Wild Horse Ridge. Rocks exposed in the area are marine-derived mudstones in the lower portion of the Masuk member of the Mancos Shale. The Masuk Shale on the bench which adjoins the proposed site on the east and west is covered by a five- to twenty-foot thick layer of terrace gravel of Quaternary age. North-south trending normal faults have disrupted the strata in the region; however, no faults are known to exist within the area of the proposed Deer Creek Waste Rock Storage Facility.

The test wells completed prior to construction identified the existence of a limited quantity of groundwater locally in the Masuk Shale. The water is most likely flowing along fractures in the strata. The rate of water migration has been shown to be extremely slow (< 100 feet per year); therefore, the proposed operations to be conducted at the waste rock site should not impact the hydrology of the area. The weathered Masuk Shale present on and near the ground surface will act as an effective barrier to prevent the surface waters from migrating to depths and intersecting groundwater.

The groundwater present in the terrace gravels should not be impacted by the waste rock site because it is located at a higher elevation than the proposed site.

In order to identify the groundwater quality characteristics of the waste rock storage facility one of the test wells completed prior to the construction of the site was developed into a long-term water monitoring well. (See Map HM-1 for location.)

Four samples were collected in 1990. The analysis, along with water depth, is listed in Table 30. Values are in milligrams per liter unless otherwise noted. Complete raw data can be found in Appendix K. It is a well known fact that the Mancos Shale typically contains large quantities of soluble minerals such as gypsum; therefore, any water passing through it will be naturally high in dissolved solids. Samples at the waste rock well verify this condition.

B. Cottonwood/Wilberg Mines - Waste Rock Storage Facility

The Cottonwood/Wilberg Waste Rock Storage Facility is located on the west side of the Wilberg Mine road approximately 1.5 miles south of the Wilberg Mine.

The geology of the proposed waste rock site is fairly simple and straightforward. The site is located on the southern flank of East Mountain to the south of Newberry Canyon. Rocks exposed in the area are marine-derived mudstones in the lower portion of the Masuk member of the Mancos Shale. The Masuk Shale on the bench which adjoins the proposed site on the north and east is covered by a five- to twenty-foot thick layer of terrace gravel of Quaternary age. North-south trending normal faults have disrupted the strata in the region; however, no faults are known to exist within the area of the proposed waste rock site.

In order to identify the groundwater quality characteristics of the waste rock storage facility one of the test wells completed prior to the construction of the site was developed into a long-term water monitoring well. (See Map HM-1 for location.)

Four samples were collected in 1990. The analysis, along with water depth, is listed in Table 30. Values are in milligrams per liter unless otherwise noted.

Complete raw data can be found in Appendix K. It is a well known fact that the Mancos Shale typically contains large quantities of soluble minerals such as gypsum; therefore, any water passing through it will be naturally high in dissolved solids. Samples at the waste rock well verify this condition.

VIII. EFFECTS OF MINING AND SUBSIDENCE ON HYDROLOGY

Since the development of the PacifiCorp mining complex on East Mountain, coal has been extracted causing the partial collapse of the immediate overburden strata and, ultimately, surface subsidence. This occurs in areas of retreat mining in room and pillar sections and in areas of longwall mining. All areas with potential for subsidence are monitored annually. (See annual Subsidence Monitoring reports.)

The springs and surface waters above all areas of mine workings are being monitored closely to measure the effects of mining. No mining-related changes to the springs or surface waters have been identified in the data collected. The water flowing into the mine workings, although temporarily diverted or detained, has not had an impact on the surface waters of East Mountain or the surrounding area.

TABLE 30: WASTE ROCK STORAGE FACILITIES - WATER QUALITY* - 1990

SAMPLE DATES	WATER DEPTH	BICARBONATE	CALCIUM	CARBONATE	CHLORIDE	CONDUCTIVITY (umhos/cm)	HARDNESS	IRON DISSOLVED	IRON TOTAL	MAGNESIUM	MANGANESE	pH (units)	POTASSIUM	SODIUM	SULFATE	SOLIDS TDS	SOLIDS TSS
							DEER CREEK - DCWR-1										
03-06	-4.4'	884	194.1	<1.0	980.0	21,000	1127	0.06	0.17	156.1	0.06	8.0	27.2	5590.0	10,500	11,466	24
06-14	-5.2'	731	272.9	<1.0	1115.0	23,000	1493	0.11	0.22	197.0	0.09	8.1	19.2	5641.0	11,000	21,623	125
09-25	-4.0'	772	225.4	<1.0	1140.0	24,500	1741	1.10	2.52	286.0	0.02	7.4	22.5	6440.0	12,800	24,189	227
12-14	-4.9'	935	539.0	<1.0	915.0	18,900	1581	0.61	0.62	57.0	0.08	8.2	30.8	5165.0	10,000	18,954	114
MIN	-4.0'	731	194.1	<1.0	915.0	18,900	1127	0.06	0.17	57.0	0.02	7.4	19.2	5165.0	10,000	11,466	24
MAX	-5.2'	935	539.0	<1.0	1140.0	24,500	1581	1.10	2.52	286.0	0.09	8.2	30.8	6440.0	12,800	24,189	227
MEAN	-4.6'	831	307.9	<1.0	1037.5	21,850	1486	0.47	0.88	174.0	0.06	7.9	24.9	5709.0	11,075	19,058	123
1989																	
MIN	-5.1'	698	142.2	<1.0	645.0	22,000	951	0.08	0.08	144.6	0.02	7.5	22.6	5220.0	10,250	20,492	4
MAX	-5.9'	712	211.5	<1.0	770.0	26,000	1343	0.33	0.33	197.8	0.05	8.4	43.8	7830.0	15,900	21,671	54
MEAN	-5.6'	704	179.2	<1.0	696.3	23,000	1122	0.17	0.19	164.4	0.04	8.0	29.2	6337.5	12,538	21,049	27
							WILBERG/COTTONWOOD - WCWR-1										
01-09	-59.0	534	266.4	<1.0	425.0	16,000	2345	0.19	0.21	408.0	0.15	7.5	23.8	2300.0	5,900	10,170	11064
03-06	-60.0	704	351.4	<1.0	550.0	18,000	2805	0.81	0.97	468.0	0.38	7.8	18.0	2750.0	7,000	12,850	1170
06-06	-59.6	593	498.6	<1.0	700.0	15,000	3477	0.10	0.37	542.0	0.45	7.9	29.4	3794.0	9,600	13,140	2634
09-24	-58.9	638	399.6	<1.0	650.0	15,300	3007	2.16	6.59	588.0	0.02	7.2	31.4	3430.0	9,500	14,798	8428
12-17	-59.2	781	522.0	<1.0	730.0	13,900	5043	1.90	4.20	908.0	1.09	7.7	55.7	4934.0	13,000	13,452	220
MIN	-58.9	534	266.4	<1.0	425.0	13,900	2345	0.10	0.21	408.0	0.02	7.2	18.0	2300.0	5,900	10,170	220
MAX	-60.0	781	522.0	<1.0	730.0	18,000	5043	2.16	6.59	908.0	1.09	7.9	55.7	4934.0	13,000	14,798	11064
MEAN	-59.3	813	407.6	<1.0	611.0	15,640	3335	1.29	3.09	562.8	0.42	7.6	31.7	3442.0	9,000	12,882	5879
1989																	
MIN	-59.5	414	563.0	<1.0	280.0	10,000	3354	9.0	5.01	292.0	0.89	7.7	41.6	851.0	4,300	8,714	8000
MAX	-59.5	798	1135.0	<1.0	815.0	32,000	4037	9.0	11.30	473.0	2.48	7.9	119.1	1905.0	6,200	9,316	15754
MEAN	-59.5	606	858.0	<1.0	548.0	21,000	3696	9.0	8.16	382.5	1.69	7.8	80.4	1378.0	5,250	9,015	11877

IX. SUMMARY

PacifiCorp has been conducting a water monitoring program in the area of its underground coal mines in Emery County, Utah in accordance with federal and state regulations. The program has been in existence since 1977, and this is the thirteenth annual report submitted concerning the hydrology.

From 1982 to 1984 the Western United States, especially Utah, experienced an unprecedented wet cycle of precipitation. The pattern changed in 1985 with conditions returning to slightly above normal. During the 1986 water year the extremely wet trend returned, and the upper Colorado River Basin experienced above average precipitation. The 1987 weather pattern changed dramatically with near normal valley precipitation and mountain snowfall much below normal. The resulting 1987 runoff was substantially below normal. The drought continued into 1988, 1989, and 1990 with runoff amounts less in 1990 than in 1989.

Runoff for drainages surrounding East Mountain were similar to 1989. The combined effect of lower precipitation received by East Mountain and above normal temperatures resulted in greater soil absorption and lower flow levels.

During 1984 an East Mountain Spring Recession Study was initiated. The program continued through 1990 with similar discharge patterns being recorded. Several of the springs show a possible double porosity feature, i.e., the spring's discharge rate drops rapidly due to the snow pack runoff and the flow rate stabilizes at a lower value, which could be considered the formation porosity. Subsequent years of data will help in distinguishing this form.

The data collected in 1990 continued to show the relationship between the variation in surface water quantity and precipitation, but the hydrologic monitoring

completed on East Mountain to date has failed to identify any change in the quantity or quality of ground or surface water which can be attributed to mining present on the East Mountain property.

UTAH POWER & LIGHT COMPANY

STREAM DISCHARGE RECORDS

DAILY DISCHARGE (CFS)

DAY	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	DAY
1	12.00	11.00	20.00	11.00	12.00	12.00	11.00	15.00	17.00	15.00	34.00	33.00	1
2	12.00	12.00	20.00	11.00	12.00	12.00	11.00	15.00	17.00	14.00	34.00	33.00	2
3	12.00	12.00	20.00	11.00	12.00	12.00	12.00	15.00	17.00	14.00	34.00	33.00	3
4	13.00	12.00	20.00	11.00	12.00	13.00	11.00	15.00	17.00	14.00	34.00	33.00	4
5	14.00	12.00	20.00	11.00	12.00	13.00	11.00	15.00	17.00	15.00	34.00	33.00	5
6	13.00	12.00	16.00	11.00	12.00	13.00	11.00	15.00	17.00	16.00	34.00	33.00	6
7	12.00	11.00	12.00	11.00	11.00	12.00	11.00	15.00	17.00	16.00	38.00	33.00	7
8	12.00	11.00	11.00	11.00	11.00	11.00	11.00	15.00	16.00	16.00	41.00	33.00	8
9	12.00	11.00	11.00	11.00	11.00	12.00	11.00	16.00	16.00	16.00	41.00	34.00	9
10	12.00	11.00	11.00	11.00	11.00	12.00	11.00	16.00	15.00	15.00	41.00	34.00	10
11	12.00	11.00	11.00	11.00	11.00	12.00	11.00	16.00	16.00	16.00	41.00	26.00	11
12	12.00	11.00	11.00	11.00	12.00	12.00	11.00	16.00	16.00	16.00	41.00	20.00	12
13	12.00	11.00	11.00	11.00	12.00	12.00	11.00	16.00	17.00	16.00	41.00	19.00	13
14	11.00	11.00	11.00	11.00	12.00	12.00	11.00	16.00	17.00	16.00	41.00	20.00	14
15	11.00	11.00	11.00	11.00	12.00	12.00	11.00	16.00	16.00	16.00	41.00	20.00	15
16	9.60	11.00	11.00	11.00	12.00	12.00	11.00	16.00	15.00	20.00	41.00	20.00	16
17	9.80	11.00	11.00	11.00	12.00	12.00	11.00	16.00	15.00	35.00	41.00	20.00	17
18	10.00	11.00	11.00	10.00	12.00	12.00	11.00	16.00	15.00	45.00	41.00	20.00	18
19	11.00	11.00	11.00	10.00	12.00	12.00	12.00	17.00	15.00	29.00	41.00	20.00	19
20	11.00	11.00	12.00	10.00	12.00	12.00	12.00	17.00	15.00	29.00	41.00	21.00	20
21	11.00	11.00	12.00	10.00	12.00	12.00	12.00	17.00	15.00	29.00	35.00	26.00	21
22	10.00	11.00	12.00	10.00	12.00	12.00	12.00	17.00	15.00	29.00	29.00	34.00	22
23	10.00	11.00	12.00	10.00	12.00	12.00	12.00	17.00	15.00	29.00	31.00	34.00	23
24	10.00	11.00	12.00	11.00	12.00	12.00	11.00	17.00	15.00	29.00	31.00	23.00	24
25	10.00	11.00	12.00	12.00	12.00	12.00	11.00	17.00	16.00	29.00	31.00	14.00	25
26	10.00	11.00	12.00	12.00	12.00	12.00	11.00	17.00	16.00	29.00	29.00	14.00	26
27	10.00	11.00	12.00	12.00	12.00	12.00	11.00	17.00	16.00	28.00	30.00	14.00	27
28	10.00	12.00	12.00	12.00	12.00	12.00	11.00	17.00	16.00	28.00	32.00	14.00	28
29	11.00	16.00	11.00	12.00	0.00	11.00	11.00	17.00	16.00	29.00	32.00	15.00	29
30	11.00	20.00	11.00	12.00	0.00	11.00	14.00	17.00	15.00	29.00	33.00	15.00	30
31	11.00	0.00	11.00	12.00	0.00	11.00	0.00	17.00	0.00	33.00	33.00	0.00	31
MONTHLY													
TOT	347.40	350.00	401.00	342.00	331.00	371.00	339.00	501.00	478.00	710.00	1121.00	741.00	
MEA	11.20	11.70	12.90	11.00	11.80	12.00	11.30	16.20	15.90	22.90	36.20	24.70	
MAX	14.00	20.00	20.00	12.00	12.00	13.00	14.00	17.00	17.00	45.00	41.00	34.00	
MIN	9.60	11.00	11.00	10.00	11.00	11.00	11.00	15.00	15.00	14.00	29.00	14.00	
ACR FT	689.00	694.00	795.00	678.00	657.00	736.00	672.00	994.00	948.00	1410.00	2220.00	1470.00	

OCT89-SEPT90 TOTAL 6032.40 MEAN 16.50 MAX 45.00 MIN 9.60 TOT ACR FT 11970.00

TOTAL MEAN MAX MIN TOT ACR FT

MAX UNIT DISCHARGE 50.00 CFS DATE JUL 18 MIN UNIT DISCHARGE 1.20 CFS DATE SEP 25
(1.75 FT)

REMARKS:

UTAH POWER & LIGHT COMPANY

STREAM DISCHARGE RECORDS

DAILY DISCHARGE (CFS)

AY	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	DAY
	23.00	16.00	15.00	18.00	19.00	19.00	29.00	51.00	78.00	100.00	52.00	48.00	1
	24.00	17.00	12.00	21.00	19.00	19.00	30.00	52.00	76.00	99.00	52.00	53.00	2
	22.00	18.00	15.00	13.00	15.00	19.00	31.00	60.00	76.00	97.00	51.00	51.00	3
	21.00	17.00	11.00	12.00	19.00	19.00	32.00	63.00	81.00	80.00	51.00	54.00	4
	23.00	17.00	14.00	19.00	20.00	19.00	32.00	70.00	84.00	78.00	47.00	87.00	5
	25.00	18.00	27.00	18.00	16.00	19.00	35.00	71.00	80.00	79.00	47.00	66.00	6
	23.00	17.00	20.00	20.00	22.00	19.00	39.00	69.00	79.00	79.00	50.00	60.00	7
	22.00	16.00	17.00	21.00	17.00	18.00	38.00	70.00	81.00	81.00	56.00	59.00	8
	19.00	16.00	20.00	21.00	17.00	19.00	34.00	66.00	81.00	80.00	56.00	58.00	9
	18.00	16.00	16.00	20.00	22.00	19.00	32.00	94.00	84.00	76.00	59.00	57.00	10
	18.00	16.00	8.40	20.00	20.00	19.00	35.00	86.00	119.00	59.00	61.00	56.00	11
	18.00	16.00	10.00	18.00	20.00	17.00	40.00	90.00	124.00	60.00	59.00	55.00	12
	18.00	16.00	13.00	19.00	20.00	17.00	46.00	86.00	95.00	59.00	60.00	52.00	13
	18.00	18.00	19.00	19.00	18.00	18.00	49.00	88.00	84.00	59.00	71.00	45.00	14
	20.00	19.00	22.00	19.00	11.00	19.00	55.00	89.00	78.00	61.00	83.00	44.00	15
	19.00	21.00	19.00	18.00	19.00	18.00	59.00	87.00	79.00	60.00	79.00	47.00	16
	17.00	22.00	18.00	17.00	25.00	22.00	59.00	91.00	80.00	58.00	79.00	45.00	17
	17.00	22.00	18.00	14.00	23.00	24.00	57.00	94.00	82.00	66.00	74.00	60.00	18
	19.00	22.00	13.00	19.00	22.00	25.00	58.00	95.00	80.00	64.00	73.00	66.00	19
	19.00	22.00	14.00	14.00	20.00	26.00	63.00	95.00	67.00	69.00	74.00	63.00	20
	20.00	22.00	17.00	11.00	20.00	27.00	67.00	93.00	63.00	64.00	71.00	61.00	21
	21.00	21.00	18.00	15.00	21.00	28.00	65.00	99.00	62.00	60.00	57.00	65.00	22
	19.00	21.00	16.00	20.00	22.00	29.00	65.00	89.00	65.00	59.00	59.00	65.00	23
	18.00	22.00	17.00	16.00	22.00	28.00	63.00	79.00	66.00	62.00	59.00	80.00	24
	17.00	23.00	13.00	15.00	22.00	29.00	52.00	77.00	72.00	56.00	56.00	69.00	25
	16.00	23.00	15.00	20.00	21.00	30.00	54.00	83.00	78.00	53.00	53.00	58.00	26
	15.00	17.00	20.00	14.00	20.00	30.00	49.00	83.00	107.00	52.00	51.00	42.00	27
	17.00	17.00	23.00	20.00	19.00	30.00	58.00	84.00	103.00	51.00	53.00	48.00	28
	16.00	16.00	16.00	21.00	0.00	29.00	54.00	85.00	101.00	52.00	45.00	48.00	29
	16.00	17.00	20.00	20.00	0.00	28.00	51.00	79.00	101.00	53.00	49.00	46.00	30
	17.00	0.00	17.00	21.00	0.00	28.00	0.00	79.00	0.00	54.00	47.00	0.00	31
ONTHLY													
OT	595.00	561.00	513.40	553.00	551.00	710.00	1431.00	2497.00	2506.00	2080.00	1834.00	1708.00	
EA	19.20	18.70	16.60	17.80	19.70	22.90	47.70	80.50	83.50	67.10	59.20	56.90	
AX	25.00	23.00	27.00	21.00	25.00	30.00	67.00	99.00	124.00	100.00	83.00	87.00	
IN	15.00	16.00	8.40	11.00	11.00	17.00	29.00	51.00	62.00	51.00	45.00	42.00	
CR FT	1180.00	1110.00	1020.00	1100.00	1090.00	1410.00	2840.00	4950.00	4970.00	4130.00	3640.00	3390.00	

CT89-SEPT90 TOTAL 15539.40 MEAN 42.60 MAX 124.00 MIN 8.40 TOT ACR FT 30820.00

TOTAL MEAN MAX MIN TOT ACR FT

MAX UNIT DISCHARGE 283.00 CFS (3.62 FT) DATE AUG 15 MIN UNIT DISCHARGE 3.60 CFS DATE DEC 2

EMARKS:

UTAH POWER & LIGHT COMPANY

INFLOW AND UTILIZATION RECORDS

/	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	DAY
	30.14	24.35	13.97	26.29	30.28	28.40	31.02	71.05	106.51	102.99	30.09	27.35	1
	37.28	24.35	5.13	32.74	28.19	30.99	32.77	75.69	99.39	103.06	34.51	35.29	2
	32.88	24.41	10.64	21.49	22.17	29.60	37.17	89.31	94.65	100.49	34.28	31.75	3
	26.25	26.60	11.22	20.73	25.11	26.76	55.26	98.15	99.82	85.74	32.56	35.51	4
	30.23	26.59	13.83	28.40	25.63	27.06	42.59	108.35	102.69	76.81	28.62	76.17	5
	22.19	25.07	31.99	24.96	23.47	21.28	32.55	117.01	100.37	74.07	28.39	52.47	6
	23.11	18.33	28.74	29.16	34.83	27.61	54.56	125.82	98.66	79.04	30.58	45.80	7
	31.37	16.42	26.01	32.63	29.11	26.42	56.14	127.30	98.76	82.76	32.19	39.29	8
	26.91	15.95	31.02	31.86	23.68	27.38	49.40	112.99	95.18	82.46	30.13	36.47	9
	25.30	21.43	27.13	29.46	28.77	30.16	44.02	128.69	100.76	79.35	29.10	38.27	10
	25.41	22.59	17.01	28.29	27.00	33.29	48.11	118.51	153.63	60.09	33.15	40.87	11
	25.14	24.34	16.36	24.52	29.46	30.90	57.23	124.40	182.75	58.88	32.77	47.75	12
	25.27	23.17	21.85	29.63	31.51	28.26	63.79	122.56	142.59	58.01	34.09	46.72	13
	27.08	19.59	29.98	32.30	23.46	30.42	73.93	132.71	113.58	61.01	43.81	38.73	14
	32.58	20.46	33.07	31.45	18.22	32.64	88.08	133.66	102.38	61.84	56.96	39.07	15
	31.53	27.45	31.02	28.82	27.26	28.96	100.77	124.75	100.01	59.14	55.58	41.36	16
	28.02	29.34	29.54	28.45	36.71	24.57	99.36	124.93	98.85	52.43	57.19	41.96	17
	25.78	25.65	27.34	25.36	38.66	28.31	94.56	132.01	97.99	52.76	49.84	55.53	18
	26.42	23.31	20.47	29.00	38.24	29.29	94.51	133.87	95.65	57.91	44.17	61.03	19
	27.61	23.75	21.89	24.92	30.67	30.21	97.77	133.49	81.84	43.06	43.59	55.51	20
	31.14	29.12	24.62	21.27	24.93	32.65	123.68	133.12	76.75	50.59	45.84	51.38	21
	29.45	27.86	23.82	24.11	27.39	32.34	129.69	141.95	73.02	46.90	38.18	50.55	22
	23.33	28.16	23.79	30.06	29.68	32.75	133.52	136.79	72.03	44.22	42.41	51.66	23
	24.58	33.90	25.05	26.55	29.87	33.23	133.90	125.91	75.82	43.59	41.83	69.87	24
	25.09	37.48	20.49	23.04	30.04	32.60	104.39	119.04	80.78	45.32	37.73	65.73	25
	28.59	40.63	22.95	29.21	28.86	34.42	88.49	115.26	82.77	37.89	35.16	57.51	26
	26.66	32.74	28.89	23.28	27.97	36.13	82.27	112.83	109.52	35.73	34.29	43.45	27
	25.99	25.74	31.29	27.28	26.93	39.80	90.15	114.21	106.09	37.77	39.41	48.31	28
	26.28	19.73	26.49	29.26	0.00	39.67	87.66	115.27	103.08	47.74	26.71	47.75	29
	22.85	17.80	30.16	29.39	0.00	34.95	77.35	108.22	102.05	37.22	27.87	43.09	30
	23.75	0.00	24.67	30.65	0.00	33.64	0.00	107.57	0.00	36.85	28.34	0.00	31
NTHLY													
T	848.22	757.27	731.20	854.53	798.10	954.72	2304.69	3665.43	3048.00	1895.71	1159.37	1416.21	
N	27.36	25.24	23.59	27.57	28.50	30.80	76.82	118.24	101.60	61.15	37.40	47.21	
X	37.28	40.63	33.07	32.74	38.66	39.80	133.90	141.95	182.75	103.06	57.19	76.17	
N	22.19	15.95	5.13	20.73	18.22	21.28	31.02	71.05	72.03	35.73	26.71	27.35	

T89-SEPT90 TOTAL 18433. MEAN 51. MAX 183. MIN 5.

TOTAL MEAN MAX MIN

MARKS:

Electric Lake Water Quality Report

UPL 3: Huntington Creek below Electric Lake

1990			Mar 2							0.24
Coliform (MPN/100ml)										
Total			<2.0							1,000
Fecal			<2.0							1,000
Fecal Strep			<2.0							–
Nitrogen (mg/l)										
Nitrate			0.17							0.25
Nitrite			<.02							<.01
Organic			<.10							–
Ammonia as NH3			–							<.2
Total Sus.Solids mg/l			1							1.2
Total Dis.Solids mg/l			146							149
Spec.Cond. umhos/cm			267							268
Total Phos PO4 mg/l			0.13							<.01
Turbidity NTU			.93							1.1
pH			7.8							8.19

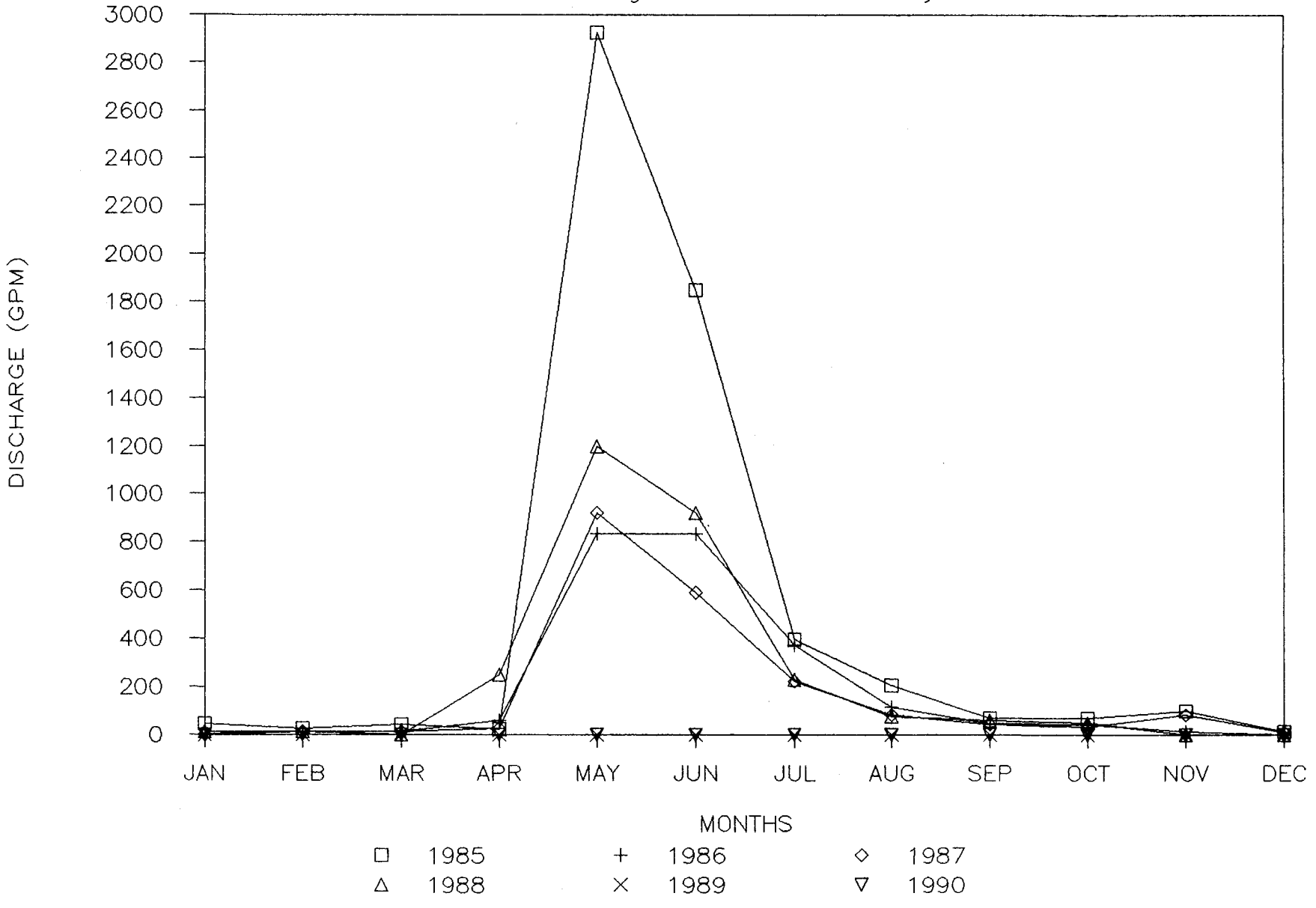
Electric Lake Water Quality Report

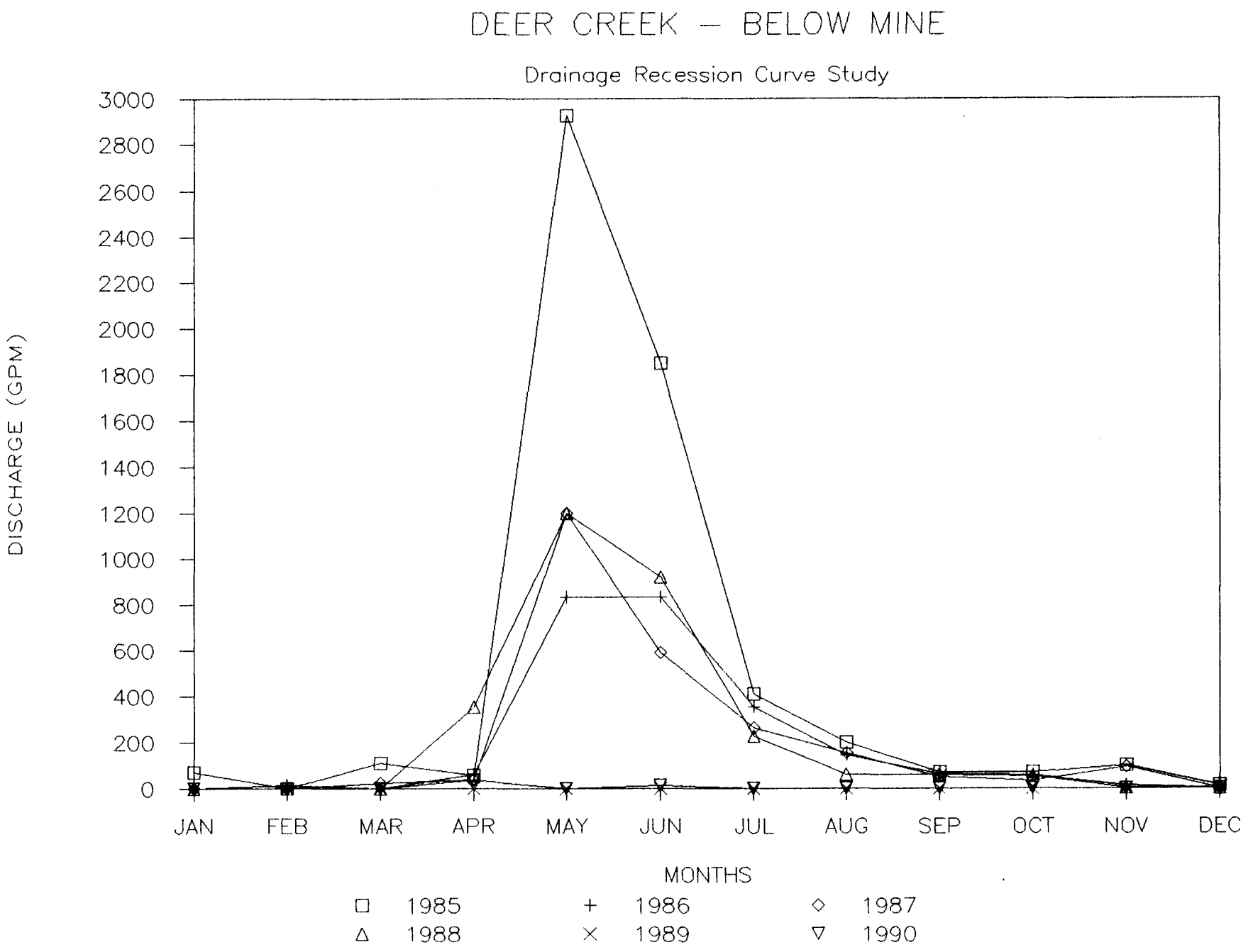
UPL 2: Huntington Creek above confluence with Left Fork of Huntington Creek

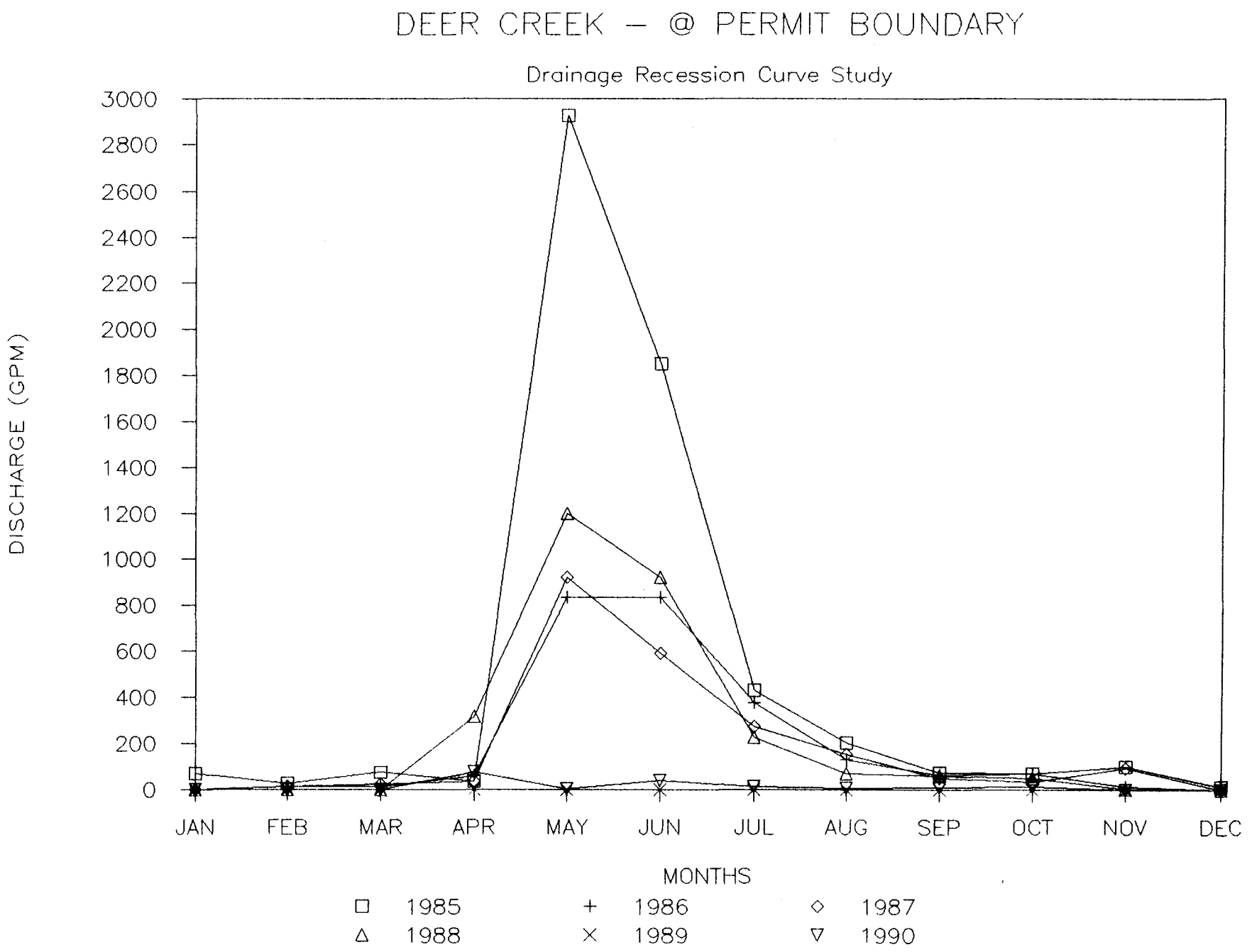
1990			MAR 2							OCT 4
Coliform (MPN/100ml)										
Total			<2.0							30
Fecal			<2.0							30
Fecal Strep			<2.0							—
Nitrogen (mg/l)										
Nitrate			0.10							0.10
Nitrite			<.02							<.01
Organic			2.40							—
Ammonia as NH3			—							0.20
Total Sus.Solids mg/l			4							4.8
Total Dis.Solids mg/l			198							207
Spec.Cond. umhos/cm			355							1,346
Total Phos PO4 mg/l			0.11							<.01
Turbidity NTU			1.3							1.7
pH			7.9							8.31

DEER CREEK – ABOVE MINE

Drainage Recession Curve Study

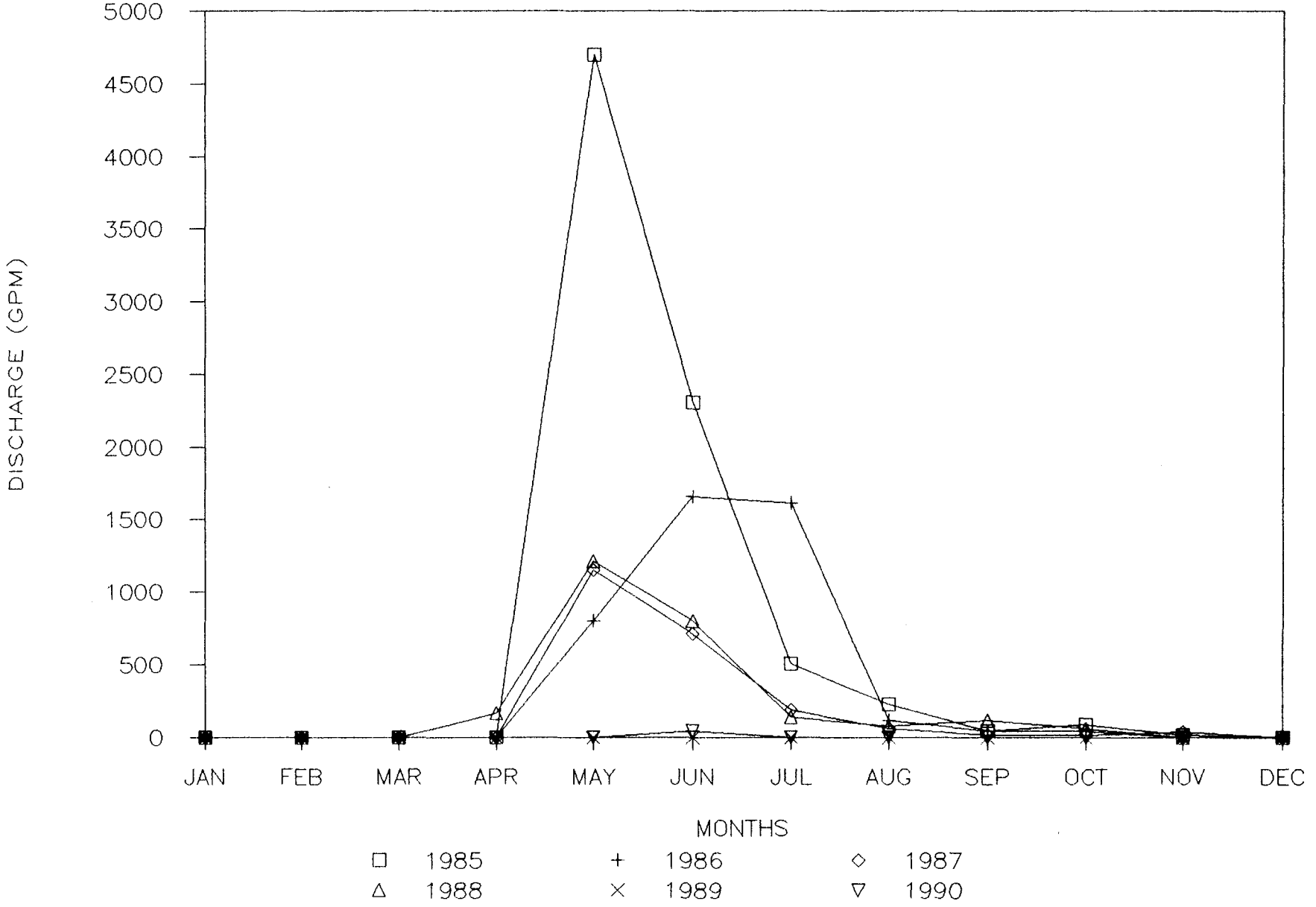



DEER CREEK – BELOW MINE
Drainage Recession Curve Study
DISCHARGE (GPM)
3000
2800
2600
2400
2200
2000
1800
1600
1400
1200
1000
800
600
400
200
0
JAN
FEB
MAR
APR
MAY
JUN
JUL
AUG
SEP
OCT
NOV
DEC
MONTHS
1985
1986
1987
1988
1989
1990


DEER CREEK – @ PERMIT BOUNDARY
Drainage Recession Curve Study
DISCHARGE (GPM)
3000
2800
2600
2400
2200
2000
1800
1600
1400
1200
1000
800
600
400
200
0
JAN
FEB
MAR
APR
MAY
JUN
JUL
AUG
SEP
OCT
NOV
DEC
MONTHS
1985
1986
1987
1988
1989
1990

MEETINGHOUSE CANYON — LEFT FORK

Drainage Recession Curve Study



COMMERCIAL TESTING & ENGINEERING CO.
GENERAL OFFICES: 1919 SOUTH HIGHLAND AVE., SUITE 210-B, LOMBARD, ILLINOIS 60148 • (312) 953-9300
SINCE 1908
Member of the SGS Group (Société Générale de Surveillance)

PLEASE ADDRESS ALL CORRESPONDENCE TO:
P.O. BOX 1020, HUNTINGTON, UT 84528
TELEPHONE: (801) 653-2311

June 28, 1990

Job No.: 59 10445

Date Rec'd: June 14, 1990

Date Sampled: June 13, 1990

Sampled By: UP&L

Utah Power and Light Co.
P.O. Box 1005
Huntington UT 84528

Sample ID: UP&L

MEETINGHOUSE CANYON
Temperature 71 degrees
Flow 0.1/40.7 gpm
Rec'd 1509 hr.
Sampled 0830 hr.
FIELD MEASUREMENTS
pH 8.05
Conductivity 385

WATER ANALYSIS

Acidity	1<	mg/l CaCO3	Iron, Dissolved	0.02<	mg/l
06-27-90	0910 hr.		06-15-90	1430 hr.	
Alk., Bicarbonate	229	mg/l HCO3	Magnesium	28.20	mg/l
06-18-90	1415 hr.		06-15-90	1415 hr.	
Alk., Carbonate	6	mg/l CaCO3	Manganese	0.02	mg/l
06-18-90	1415 hr.		06-15-90	1445 hr.	
Alk., Total	193	mg/l CaCO3	Oil and Grease	4.2	mg/l
06-18-90	1415 hr.		06-20-90	1100 hr.	
Anions, Total	6.42	meq/l	Oxygen, Dissolved	6.3	mg/l
			06-14-90	1330 hr.	
Calcium	49.8	mg/l	pH	8.50	Units
06-15-90	1400 hr.		06-14-90	1120 hr.	
Cations, Total	6.42	meq/l	Potassium	0.34	mg/l
			06-15-90	1515 hr.	
Chloride	20.0	mg/l	Sodium	37.50	mg/l
06-20-90	1620 hr.		06-15-90	1500 hr.	
Conductivity	385	umhos/cm	Solids, Dissolved	201.0	mg/l
06-14-90	1510 hr.		06-15-90	1630 hr.	
Hardness, Total	240	mg/l CaCO3	Solids, Settleable	0.5<	mg/l
			06-14-90	1545 hr.	
Iron	0.02<	mg/l	Solids, Suspended	1.0<	mg/l
06-15-90	1430 hr.		06-15-90	1630 hr.	
			Sulfate	100.0	mg/l
			06-21-90	1315 hr.	

ANALYST: D. Igoe

Respectfully submitted,
COMMERCIAL TESTING & ENGINEERING CO.

Manager, Huntington Laboratory

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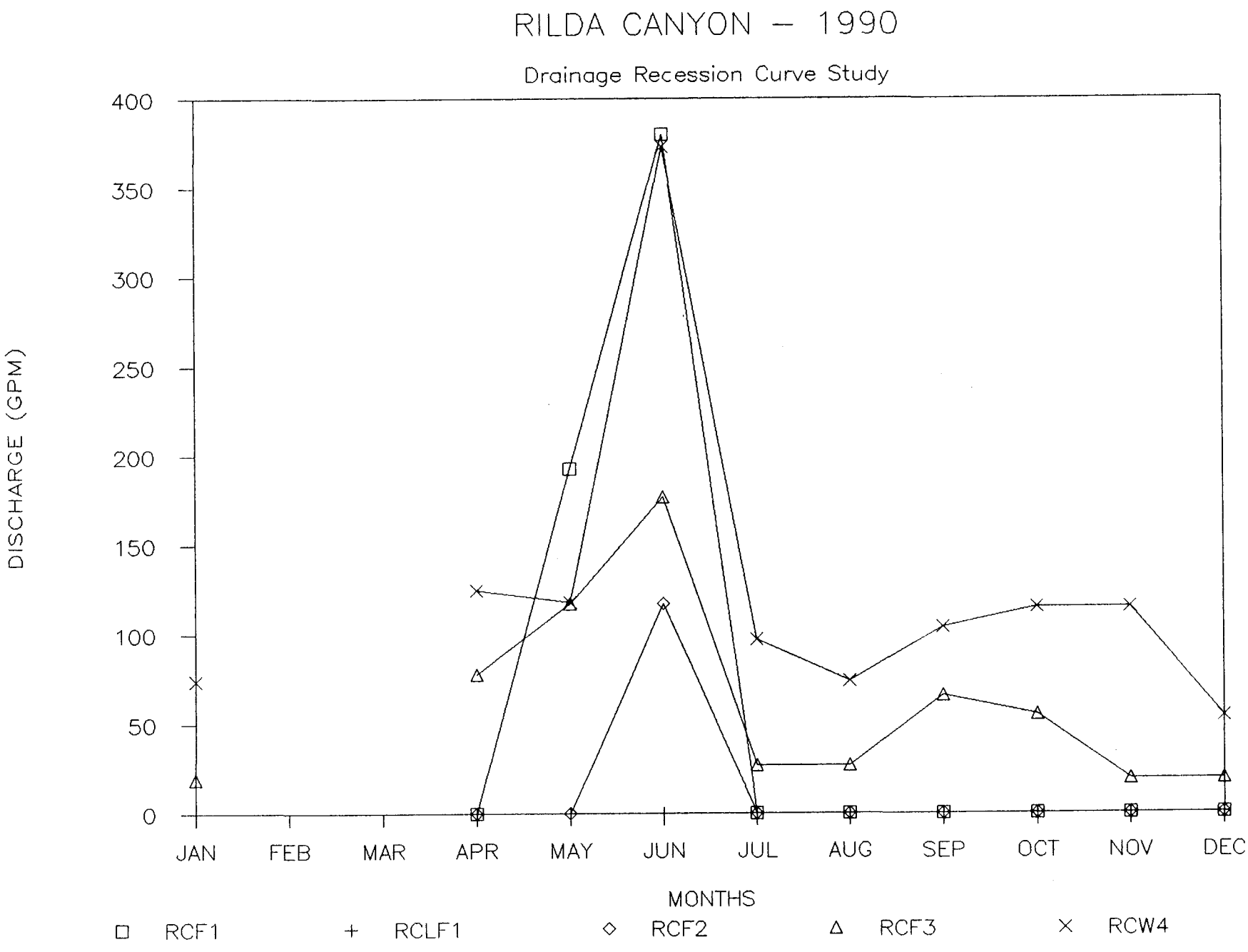
F-465


RILDA CANYON – 1990
Drainage Recession Curve Study
DISCHARGE (GPM)
400
350
300
250
200
150
100
50
0
JAN
FEB
MAR
APR
MAY
JUN
JUL
AUG
SEP
OCT
NOV
DEC
MONTHS
RCF1
RCLF1
RCF2
RCF3
RCW4

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Member of the SGS Group (Société Générale de Surveillance)

PLEASE ADDRESS ALL CORRESPONDENCE TO:
P.O. BOX 1020, HUNTINGTON, UT 84528
TELEPHONE: (801) 653-2311

July 3, 1990

Job No.: 59 10441

Date Rec'd: June 14, 1990

Date Sampled: June 13, 1990

Sampled By: UP&L

Utah Power and Light Co.
P.O. Box 1005
Huntington UT 84528

Sample ID: UP&L

RILDA CANYON RCF #1
Temperature 51 degrees
Flow 0.28/380.2 gpm
Rec'd 0830 hr.
Sampled 1545 hr.
FIELD MEASUREMENTS
pH 8.2
Conductivity 337

WATER ANALYSIS

Acidity	1<	mg/l CaCO3	06-27-90 0910 hr.
Aluminum	0.01<	mg/l	06-21-90 0900 hr.
Alk., Bicarbonate	245	mg/l HCO3	06-18-90 1415 hr.
Alk., Carbonate	4	mg/l CaCO3	06-18-90 1415 hr.
Alk., Total	205	mg/l CaCO3	06-18-90 1415 hr.
Arsenic	0.002<	mg/l	06-25-90 1400 hr.
Anions, Total	5.96	meq/l	
Barium	0.09	mg/l	06-21-90 0900 hr.
Boron	0.08	mg/l	06-20-90 1100 hr.
Cadmium	0.002<	mg/l	06-22-90 1330 hr.
Calcium	76.1	mg/l	06-15-90 1300 hr.
Cations, Total	5.97	meq/l	
Chloride	10.0	mg/l	06-20-90 1620 hr.
Chromium	0.02<	mg/l	06-21-90 0900 hr.
Conductivity	360	umhos/cm	06-14-90 1510 hr.
Copper	0.010<	mg/l	06-22-90 1330 hr.
Fluoride	0.34	mg/l	06-15-90 0845 hr.
Hardness, Total	287	mg/l CaCO3	
Iron	0.05	mg/l	06-15-90 1330 hr.
Iron, Dissolved	0.02	mg/l	06-15-90 1330 hr.
Lead	0.050<	mg/l	06-22-90 1330 hr.
Magnesium	23.50	mg/l	06-15-90 1315 hr.
Manganese	0.02<	mg/l	06-15-90 1345 hr.
Mercury	0.002<	mg/l	06-21-90 1600 hr.

ANALYST: D. Tyson

Respectfully submitted,
COMMERCIAL TESTING & ENGINEERING CO.

Manager, Huntington Laboratory

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OVER 40 BRANCH LABORATORIES STRATEGICALLY LOCATED IN PRINCIPAL COAL MINING AREAS,
TIDEWATER AND GREAT LAKES PORTS, AND RIVER LOADING FACILITIES

COMMERCIAL TESTING & ENGINEERING CO.
GENERAL OFFICES: 1919 SOUTH HIGHLAND AVE., SUITE 210-B, LOMBARD, ILLINOIS 60148 • (312) 953-9300
SINCE 1908
Member of the SGS Group (Société Générale de Surveillance)

PLEASE ADDRESS ALL CORRESPONDENCE TO:
P.O. BOX 1020, HUNTINGTON, UT 84528
TELEPHONE: (801) 653-2311

July 3, 1990

Job No.: 59 10441

Date Rec'd: June 14, 1990

Date Sampled: June 13, 1990

Sampled By: UP&L

Utah Power and Light Co.
P.O. Box 1005
Huntington UT 84528

Sample ID: UP&L

RILDA CANYON RCF #1
Temperature 51 degrees
Flow 0.28/380.2 gpm
Rec'd 0830 hr.
Sampled 1545 hr.
FIELD MEASUREMENTS
pH 8.2
Conductivity 337

WATER ANALYSIS

Molybdenum	0.10<	mg/l	06-21-90 0900 hr.
Nickel	0.08	mg/l	06-22-90 1330 hr.
Nitrogen, Ammonia	0.27	mg/l	06-18-90 1300 hr.
Nitrogen, Nitrate	0.04	mg/l	07-03-90 0830 hr.
Nitrogen, Nitrite	0.01<	mg/l	07-03-90 0830 hr.
Oil and Grease	1.1	mg/l	06-19-90 1100 hr.
Oxygen, Dissolved	6.9	mg/l	06-14-90 1330 hr.
pH	8.30	Units	06-14-90 1120 hr.
Phosphorus, Total	0.04	mg/l	06-19-90 1325 hr.
Potassium	2.10	mg/l	06-15-90 1415 hr.
Selenium	0.002<	mg/l	07-03-90 1100 hr.
Sodium	4.30	mg/l	06-15-90 1400 hr.
Solids, Dissolved	277.0	mg/l	06-19-90 1630 hr.
Solids, Settleable	0.5 <	mg/l	06-14-90 1410 hr.
Solids, Suspended	2.0	mg/l	06-19-90 1630 hr.
Sulfate	80.0	mg/l	06-21-90 1315 hr.
Sulfide	1.00<	mg/l	06-14-90 1615 hr.
Zinc	0.00<	mg/l	06-22-90 1330 hr.

RECEIVED
JUL - 6 1990
MINING DIV.
FIELD OFFICE

ANALYST: D. Tyson

Respectfully submitted,
COMMERCIAL TESTING & ENGINEERING CO.

Manager, Huntington Laboratory

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For Your Protection

OVER 40 BRANCH LABORATORIES STRATEGICALLY LOCATED IN PRINCIPAL COAL MINING AREAS,
TIDEWATER AND GREAT LAKES PORTS, AND RIVER LOADING FACILITIES

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CE 1908
Member of the SGS Group (Société Générale de Surveillance)

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P.O. BOX 1020, HUNTINGTON, UT 84528
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OK

July 3, 1990

Job No.: 59 10442

Date Rec'd: June 14, 1990

Date Sampled: June 13, 1990

Sampled By: UP&L

Utah Power and Light Co.
P.O. Box 1005
Huntington UT 84528

Sample ID: UP&L

RILDA CANYON RCF #3
Temperature 51 degrees
Flow 0.17/176.5 gpm
Rec'd 0830 hr.
Sampled 1630 hr.
FIELD MEASUREMENTS:
pH 7.91
COND 470
DO 8.43

WATER ANALYSIS

Acidity	2	mg/l CaCO3	Chloride	5.0	mg/l
06-27-90	0910 hr.		06-20-90	1620 hr.	
Aluminum	0.01<	mg/l	Chromium	0.02<	mg/l
06-21-90	0900 hr.		06-21-90	0900 hr.	
Alk., Bicarbonate	336	mg/l HCO3	Conductivity	550	umhos/cm
06-18-90	1415 hr.		06-14-90	1510 hr.	
Alk., Carbonate	1<	mg/l CaCO3	Copper	0.020	mg/l
06-18-90	1415 hr.		06-22-90	1330 hr.	
Alk., Total	275	mg/l CaCO3	Fluoride	0.29	mg/l
06-18-90	1415 hr.		06-15-90	0845 hr.	
Arsenic	0.002<	mg/l	Hardness, Total	329	mg/l CaCO3
06-25-90	1400 hr.				
Anions, Total	6.76	meq/l	Iron	0.33	mg/l
			06-15-90	1330 hr.	
Barium	0.08	mg/l	Iron, Dissolved	0.03	mg/l
06-21-90	0900 hr.		06-15-90	1330 hr.	
Boron	0.25	mg/l	Lead	0.050<	mg/l
06-20-90	1100 hr.		06-22-90	1330 hr.	
Cadmium	0.002<	mg/l	Magnesium	31.40	mg/l
06-22-90	1330 hr.		06-15-90	1315 hr.	
Calcium	79.9	mg/l	Manganese	0.02	mg/l
06-15-90	1300 hr.		06-15-90	1345 hr.	
Cations, Total	6.94	meq/l	Mercury	0.002<	mg/l
			06-21-90	1600 hr.	

ANALYST: D. Tyson

Respectfully submitted,
COMMERCIAL TESTING & ENGINEERING CO.

M M
Manager, Huntington Laboratory

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COMMERCIAL TESTING & ENGINEERING CO.
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PLEASE ADDRESS ALL CORRESPONDENCE TO:
P.O. BOX 1020, HUNTINGTON, UT 84528
TELEPHONE: (801) 653-2311

July 3, 1990

Job No.: 59 10442

Date Rec'd: June 14, 1990

Date Sampled: June 13, 1990

Sampled By: UP&L

Sample ID: UP&L

RILDA CANYON RCF #3
Temperature 51 degrees
Flow 0.17/176.5 gpm
Rec'd 0830 hr.
Sampled 1630 hr.

Utah Power and Light Co.
P.O. Box 1005
Huntington UT 84528

WATER ANALYSIS

Molybdenum		0.10<	mg/l	Potassium		1.80	mg/l
06-21-90	0900 hr.			06-15-90	1415 hr.		
Nickel		0.02<	mg/l	Selenium		0.002<	mg/l
06-22-90	1330 hr.			07-03-90	1100 hr.		
Nitrogen, Ammonia		0.27	mg/l	Sodium		7.63	mg/l
06-18-90	1300 hr.			06-15-90	1400 hr.		
Nitrogen, Nitrate		0.01<	mg/l	Solids, Dissolved		226.0	mg/l
07-03-90	0830 hr.			06-19-90	1630 hr.		
Nitrogen, Nitrite		0.01<	mg/l	Solids, Settleable		0.5<	mg/l
07-03-90	0830 hr.			06-14-90	1500 hr.		
Oil and Grease		1.0<	mg/l	Solids, Suspended		9.0	mg/l
06-19-90	1300 hr.			06-19-90	1630 hr.		
Oxygen, Dissolved		6.8	mg/l	Sulfate		60.0	mg/l
06-14-90	1330 hr.			06-21-90	1315 hr.		
pH		8.10	Units	Sulfide		0.00	mg/l
06-14-90	1120 hr.			06-14-90	1615 hr.		
Phosphorus, Total		0.02	mg/l	Zinc		0.00<	mg/l
06-19-90	1325 hr.			06-22-90	1330 hr.		

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ANALYST: D. Tyson

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PLEASE ADDRESS ALL CORRESPONDENCE TO:
P.O. BOX 1020, HUNTINGTON, UT 84528
TELEPHONE: (801) 653-2311

October 3, 1990

Job No.: 59 10579 -

Date Rec'd: September 6, 1990

Date Sampled: September 6, 1990

Sampled By: UP&L

Utah Power and Light Co.
P.O. Box 1005
Huntington UT 84528

Sample ID: UP&L

RILDA CANYON RCF-3
Temperature 56 degrees
Rec'd 1520 hr.
Sampled 1235 hr.
Flow 0.09/66.4 gpm

FIELD MEASUREMENTS

pH	7.62
DO	6.8
Conductivity	684

WATER ANALYSIS

Acidity	1<	mg/l CaCO3	Chloride	10.0	mg/l
09-13-90	0900 hr.		09-12-90	1530 hr.	
Aluminum	1.23	mg/l	Chromium	0.02<	mg/l
10-01-90	1100 hr.		10-01-90	1100 hr.	
Alk., Bicarbonate	425	mg/l HCO3	Conductivity	515	umhos/cm
09-12-90	1100 hr.		09-11-90	1100 hr.	
Alk., Carbonate	1<	mg/l CaCO3	Copper	0.010<	mg/l
09-12-90	1100 hr.		10-01-90	1300 hr.	
Alk., Total	348	mg/l CaCO3	Fluoride	0.12	mg/l
09-12-90	1100 hr.		09-11-90	1530 hr.	
Arsenic	0.002<	mg/l	Hardness, Total	433	mg/l CaCO3
09-19-90	1000 hr.				
Anions, Total	9.38	meq/l	Iron	0.06	mg/l
			09-19-90	1545 hr.	
Barium	0.26	mg/l	Iron, Dissolved	0.03	mg/l
10-01-90	1100 hr.		09-19-90	1545 hr.	
Boron	0.22	mg/l	Lead	0.050<	mg/l
09-20-90	1400 hr.		10-01-90	1300 hr.	
Cadmium	0.002<	mg/l	Magnesium	44.70	mg/l
10-01-90	1300 hr.		09-19-90	1530 hr.	
Calcium	99.5	mg/l	Manganese	0.04	mg/l
09-19-90	1500 hr.		09-19-90	1600 hr.	
Cations, Total	9.36	meq/l	Mercury	0.002<	mg/l
			09-18-90	1330 hr.	

ANALYST: D. Tipon

Respectfully submitted,
COMMERCIAL TESTING & ENGINEERING CO.

OCT 04 1990

Manager, Huntington Laboratory

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PLEASE ADDRESS ALL CORRESPONDENCE TO:
P.O. BOX 1020, HUNTINGTON, UT 84528
TELEPHONE: (801) 653-2311

October 3, 1990

Job No.: 59 10579

Date Rec'd: September 6, 1990

Date Sampled: September 6, 1990

Sampled By: UP&L

Utah Power and Light Co.
P.O. Box 1005
Huntington UT 84528

Sample ID: UP&L

RILDA CANYON RCF-3
Temperature 56 degrees
Rec'd 1520 hr.
Sampled 1235 hr.
Flow 0.09/66.4 gpm

FIELD MEASUREMENTS

pH	7.62
DO	6.8
Conductivity	684

WATER ANALYSIS

Molybdenum	0.10<	mg/l	10-01-90 1100 hr.
Nickel	0.02<	mg/l	10-01-90 1300 hr.
Nitrogen, Ammonia	0.01	mg/l	09-21-90 1500 hr.
Nitrogen, Nitrate	0.01<	mg/l	09-21-90 1500 hr.
Nitrogen, Nitrite	0.01<	mg/l	09-21-90 1500 hr.
Oil and Grease	1.0<	mg/l	09-10-90 1420 hr.
Oxygen, Dissolved	4.5	mg/l	09-06-90 1620 hr.
pH	7.90	Units	09-06-90 1555 hr.
Phosphorus, Total	0.01<	mg/l	09-07-90 1417 hr.
Potassium	2.02	mg/l	09-19-90 1500 hr.
Selenium	0.002<	mg/l	09-18-90 1100 hr.
Sodium	15.60	mg/l	09-19-90 1445 hr.
Solids, Dissolved	493.0	mg/l	09-11-90 1130 hr.
Solids, Settleable	0.5 <	mg/l	09-07-90 1030 hr.
Solids, Suspended	31.0	mg/l	09-11-90 1130 hr.
Sulfate	110.0	mg/l	09-13-90 1600 hr.
Sulfide	4.00	mg/l	09-07-90 1115 hr.
Zinc	0.00<	mg/l	10-01-90 1300 hr.

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PLEASE ADDRESS ALL CORRESPONDENCE TO:
P.O. BOX 1020, HUNTINGTON, UT 84528
TELEPHONE: (801) 653-2311
FAX: (801) 653-2479

January 30, 1991

Job No.: 59 10812

Date Rec'd: December 14, 1990

Date Sampled: December 14, 1990

Sampled By: RILDA CANYON

Utah Power and Light Co.
P.O. Box 1005
Huntington UT 84528

Sample ID:

RILDA CANYON RCF 3
Temp. 39°C
Flow 0.04/19.1
pH 7.64
Cond 648
Time Sampled 11:10 hr.
Time Rec'd 16:00 hr.

WATER ANALYSIS

Aluminum 01-11-91	0.01<	mg/l 1200 hr.	Chromium 01-11-91	0.02<	mg/l 1200 hr.
Alk., Bicarbonate 01-08-91	421	mg/l HCO3 1400 hr.	Conductivity 01-11-91	720	umhos/cm 1200 hr.
Alk., Carbonate 01-08-91	1<	mg/l CaCO3 1400 hr.	Copper 01-11-91	0.010<	mg/l 1200 hr.
Alk., Total 01-08-91	345	mg/l CaCO3 1400 hr.	Fluoride 01-11-91	0.15	mg/l 1200 hr.
Arsenic 01-11-91	0.007	mg/l 1200 hr.	Hardness, Total	499	mg/l CaCO3
Anions, Total	8.72	meq/l	Iron 01-11-91	0.34	mg/l 0930 hr.
Barium 01-11-91	0.06	mg/l 1200 hr.	Iron, Dissolved 01-11-91	0.34	mg/l 0930 hr.
Boron 01-09-91	0.16	mg/l 1300 hr.	Lead 01-11-91	0.050<	mg/l 0930 hr.
Cadmium 01-09-91	0.002<	mg/l 1300 hr.	Magnesium 01-11-91	53.20	mg/l 0930 hr.
Calcium 01-11-91	112.2	mg/l 0930 hr.	Manganese 01-11-91	0.02	mg/l 0930 hr.
Cations, Total	10.73	meq/l	Mercury 01-09-91	0.002<	mg/l 0930 hr.
Chloride 12-31-90	15.0	mg/l 0930 hr.	Molybdenum 01-11-91	0.10<	mg/l 1200 hr.

ANALYST: Rio Stafko

Respectfully submitted,
COMMERCIAL TESTING & ENGINEERING CO.

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P.O. BOX 1020, HUNTINGTON, UT 84528
TELEPHONE: (801) 653-2311
FAX: (801) 653-2479

January 30, 1991

Job No.: 59 10812

Date Rec'd: December 14, 1990

Date Sampled: December 14, 1990

Sampled By: RILDA CANYON

Utah Power and Light Co.
P.O. Box 1005
Huntington UT 84528

Sample ID:

RILDA CANYON RCF 3
Temp. 39°C
Flow 0.04/19.1
pH 7.64
Cond 648
Time Sampled 11:10 hr.
Time Rec'd 16:00 hr.

WATER ANALYSIS

Nickel 01-11-91	0.16	mg/l 1200 hr.	Selenium 01-02-91	0.006	mg/l 0900 hr.
Nitrogen, Ammonia 01-02-91	0.12	mg/l 1100 hr.	Sodium 01-11-91	16.44	mg/l 0930 hr.
Nitrogen, Nitrate 12-17-90	0.01<	mg/l 1000 hr.	Solids, Dissolved 12-18-90	453.0	mg/l 0900 hr.
Nitrogen, Nitrite 12-17-90	0.01<	mg/l 1000 hr.	Solids, Settleable 12-21-90	2.5	mg/l 1545 hr.
Oil and Grease 12-28-90	1.7	mg/l 0900 hr.	Solids, Suspended 12-18-90	1.0<	mg/l 0900 hr.
Oxygen, Dissolved 12-14-90	7.6	mg/l 1620 hr.	Sulfate 01-17-91	75.0	mg/l 1400 hr.
pH 12-14-90	7.95	Units 1615 hr.	Sulfide 01-09-91	93.20	mg/l 1400 hr.
Phosphorus, Total	0.01<	mg/l	Zinc 01-11-91	0.01	mg/l 1400 hr.
Potassium 01-11-91	2.11	mg/l 1320 hr.			

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ANALYST: Rio Stafko

Respectfully submitted,
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Manager, Huntington Laboratory

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PLEASE ADDRESS ALL CORRESPONDENCE TO:
P.O. BOX 1020, HUNTINGTON, UT 84528
TELEPHONE: (801) 653-2311

July 3, 1990

Job No.: 59 10443

Date Rec'd: June 14, 1990

Date Sampled: June 13, 1990

Sampled By: UP&L

Utah Power and Light Co.
P.O. Box 1005
Huntington UT 84528

Sample ID: UP&L

RILDA CANYON RCF #4
Temperature 52 degrees
Flow 0.65/372.7 gpm
Rec'd 0830 hr.
Sampled 1649 hr.
FIELD MEASUREMENTS
pH 7.89
COND 575
DO 9.21

WATER ANALYSIS

Acidity	4	mg/l CaCO3	Chloride	20.0	mg/l
06-27-90	0910 hr.		06-20-90	1620 hr.	
Aluminum	0.01<	mg/l	Chromium	0.02<	mg/l
06-21-90	0900 hr.		06-21-90	0900 hr.	
Alk., Bicarbonate	348	mg/l HCO3	Conductivity	700	umhos/cm
06-18-90	1415 hr.		06-14-90	1510 hr.	
Alk., Carbonate	5	mg/l CaCO3	Copper	0.010<	mg/l
06-18-90	1415 hr.		06-22-90	1330 hr.	
Alk., Total	291	mg/l CaCO3	Fluoride	0.25	mg/l
06-18-90	1415 hr.		06-15-90	0845 hr.	
Arsenic	0.002<	mg/l	Hardness, Total	458	mg/l CaCO3
06-25-90	1400 hr.				
Anions, Total	11.48	meq/l	Iron	0.04	mg/l
			06-15-90	1330 hr.	
Barium	0.03<	mg/l	Iron, Dissolved	0.02<	mg/l
06-21-90	0900 hr.		06-15-90	1330 hr.	
Boron	0.22	mg/l	Lead	0.050<	mg/l
06-20-90	1100 hr.		06-22-90	1330 hr.	
Cadmium	0.002<	mg/l	Magnesium	40.40	mg/l
06-22-90	1330 hr.		06-15-90	1315 hr.	
Calcium	116.6	mg/l	Manganese	0.02<	mg/l
06-15-90	1300 hr.		06-15-90	1345 hr.	
Cations, Total	11.39	meq/l	Mercury	0.002<	mg/l
			06-21-90	1600 hr.	

ANALYST: D. Lyon

Respectfully submitted,
COMMERCIAL TESTING & ENGINEERING CO.

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Manager, Huntington Laboratory

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OVER 40 BRANCH LABORATORIES STRATEGICALLY LOCATED IN PRINCIPAL COAL MINING AREAS,
TIDEWATER AND GREAT LAKES PORTS, AND RIVER LOADING FACILITIES

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PLEASE ADDRESS ALL CORRESPONDENCE TO:
P.O. BOX 1020, HUNTINGTON, UT 84528
TELEPHONE: (801) 653-2311

July 3, 1990

Job No.: 59 10443

Date Rec'd: June 14, 1990

Date Sampled: June 13, 1990

Sampled By: UP&L

Sample ID: UP&L

RILDA CANYON RCF #4
Temperature 52 degrees
Flow 0.65/372.7 gpm
Rec'd 0830 hr.
Sampled 1649 hr.

Utah Power and Light Co.
P.O. Box 1005
Huntington UT 84528

WATER ANALYSIS

Molybdenum	0.10<	mg/l	Potassium	0.50	mg/l
06-21-90 0900 hr.			06-15-90 1415 hr.		
Nickel	0.02<	mg/l	Selenium	0.002<	mg/l
06-22-90 1330 hr.			07-03-90 1100 hr.		
Nitrogen, Ammonia	0.26	mg/l	Sodium	52.00	mg/l
06-18-90 1300 hr.			06-15-90 1400 hr.		
Nitrogen, Nitrate	0.01<	mg/l	Solids, Dissolved	300.0	mg/l
07-03-90 0830 hr.			06-19-90 1630 hr.		
Nitrogen, Nitrite	0.01<	mg/l	Solids, Settleable	0.5<	mg/l
07-03-90 0830 hr.			06-14-90 1500 hr.		
Oil and Grease	1.0<	mg/l	Solids, Suspended	1.0<	mg/l
06-19-90 1330 hr.			06-19-90 1630 hr.		
Oxygen, Dissolved	6.9	mg/l	Sulfate	250.0	mg/l
06-14-90 1330 hr.			06-21-90 1315 hr.		
pH	8.30	Units	Sulfide	1.00<	mg/l
06-14-90 1120 hr.			06-14-90 1615 hr.		
Phosphorus, Total	0.01<	mg/l	Zinc	0.00<	mg/l
06-19-90 1325 hr.			06-22-90 1330 hr.		

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ANALYST: D. Tyson

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COMMERCIAL TESTING & ENGINEERING CO.

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PLEASE ADDRESS ALL CORRESPONDENCE TO:
P.O. BOX 1020, HUNTINGTON, UT 84528
TELEPHONE: (801) 653-2311

October 3, 1990

Job No.: 59 10580

Date Rec'd: September 6, 1990

Date Sampled: September 6, 1990

Sampled By: UP&L

Utah Power and Light Co.
P.O. Box 1005
Huntington UT 84528

Sample ID: UP&L

RILDA CANYON RCW-4
Temperature 58 degrees
Rec'd 1520 hr.
Sampled 1400 hr.
Flow 0.39/104 gpm

FIELD MEASUREMENTS

pH	7.62
DO	6.1
Conductivity	762

WATER ANALYSIS

Acidity	09-13-90 0900 hr.	1<	mg/l CaCO3	Chloride	09-12-90 1530 hr.	12.0	mg/l
Aluminum	10-01-90 1100 hr.	6.25	mg/l	Chromium	10-01-90 1100 hr.	0.02<	mg/l
Alk., Bicarbonate	09-12-90 1100 hr.	404	mg/l HCO3	Conductivity	09-11-90 1100 hr.	600	umhos/cm
Alk., Carbonate	09-12-90 1100 hr.	1<	mg/l CaCO3	Copper	10-01-90 1300 hr.	0.010<	mg/l
Alk., Total	09-12-90 1100 hr.	331	mg/l CaCO3	Fluoride	09-11-90 1530 hr.	0.13	mg/l
Arsenic	09-18-90 1000 hr.	0.002<	mg/l	Hardness, Total		545	mg/l CaCO3
Anions, Total		12.04	meq/l	Iron	09-19-90 1545 hr.	0.06	mg/l
Barium	10-01-90 1100 hr.	0.08	mg/l	Iron, Dissolved	09-19-90 1545 hr.	0.03	mg/l
Boron	09-20-90 1400 hr.	0.08	mg/l	Lead	10-01-90 1300 hr.	0.050<	mg/l
Cadmium	10-01-90 1300 hr.	0.002<	mg/l	Magnesium	09-19-90 1530 hr.	51.90	mg/l
Calcium	09-19-90 1500 hr.	132.7	mg/l	Manganese	09-19-90 1600 hr.	0.06	mg/l
Cations, Total		11.77	meq/l	Mercury	09-19-90 1330 hr.	0.002<	mg/l

ANALYST: D. Tyson

Respectfully submitted,
COMMERCIAL TESTING & ENGINEERING CO.

Manager, Huntington Laboratory

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PLEASE ADDRESS ALL CORRESPONDENCE TO:
P.O. BOX 1020, HUNTINGTON, UT 84528
TELEPHONE: (801) 653-2311

October 3, 1990

Job No.: 59 10580

Date Rec'd: September 6, 1990

Date Sampled: September 6, 1990

Sampled By: UP&L

Utah Power and Light Co.
P.O. Box 1005
Huntington UT 84528

Sample ID: UP&L

RILDA CANYON RCW-4
Temperature 58 degrees
Rec'd 1520 hr.
Sampled 1400 hr.
Flow 0.39/104 gpm

FIELD MEASUREMENTS

pH	7.62
DO	6.1
Conductivity	762

WATER ANALYSIS

Molybdenum	0.10<	mg/l	Potassium	2.16	mg/l
10-01-90	1100 hr.		09-19-90	1500 hr.	
Nickel	0.02<	mg/l	Selenium	0.002<	mg/l
10-01-90	1300 hr.		09-18-90	1100 hr.	
Nitrogen, Ammonia	0.00	mg/l	Sodium	19.08	mg/l
09-21-90	1500 hr.		09-19-90	1445 hr.	
Nitrogen, Nitrate	0.01<	mg/l	Solids, Dissolved	538.0	mg/l
09-21-90	1500 hr.		09-11-90	1130 hr.	
Nitrogen, Nitrite	0.01<	mg/l	Solids, Settleable	0.5 <	mg/l
09-21-90	1500 hr.		09-07-90	1030 hr.	
Oil and Grease	1.0<	mg/l	Solids, Suspended	193.0	mg/l
09-10-90	1420 hr.		09-11-90	1130 hr.	
Oxygen, Dissolved	5.2	mg/l	Sulfate	250.0	mg/l
09-06-90	1620 hr.		09-13-90	1600 hr.	
pH	8.15	Units	Sulfide	10.60	mg/l
09-06-90	1555 hr.		09-07-90	1115 hr.	
Phosphorus, Total	0.01<	mg/l	Zinc	0.01	mg/l
09-07-90	1417 hr.		10-01-90	1300 hr.	

ANALYST: D. Tipon

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Respectfully submitted,
COMMERCIAL TESTING & ENGINEERING CO.

Manager, Huntington Laboratory

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SINCE 1908
Member of the SGS Group (Société Générale de Surveillance)

PLEASE ADDRESS ALL CORRESPONDENCE TO:
P.O. BOX 1020, HUNTINGTON, UT 84528
TELEPHONE: (801) 653-2311
FAX: (801) 653-2479

January 23, 1991

Job No.: 59 10813

Date Rec'd: December 14, 1990

Date Sampled: December 14, 1990

Sampled By: RCW

Utah Power and Light Co.
P.O. Box 1005
Huntington UT 84528

Sample ID:

RCW-4
Temp 34.1°C
Flow 0.3/54
pH 7.78
Cond 688
Time Sampled 11:35 hr.
Time Rec'd 16:00 hr.

WATER ANALYSIS

Aluminum	0.01<	mg/l	Chromium	0.02<	mg/l
01-11-91		12:00 hr.	01-11-91		12:00 hr.
Alk., Bicarbonate	461	mg/l HCO3	Conductivity	750	umhos/cm
01-08-91		14:00 hr.	01-11-91		12:00 hr.
Alk., Carbonate	1<	mg/l CaCO3	Copper	0.010<	mg/l
01-08-91		14:00 hr.	01-11-91		12:00 hr.
Alk., Total	378	mg/l CaCO3	Fluoride	0.16	mg/l
01-08-91		14:00 hr.	01-11-91		12:00 hr.
Arsenic	0.006	mg/l	Hardness, Total	505	mg/l CaCO3
01-11-91		12:00 hr.			
Anions, Total	10.87	meq/l	Iron	0.04	mg/l
			01-11-91		09:30 hr.
Barium	0.04	mg/l	Iron, Dissolved	0.03	mg/l
01-11-91		12:00 hr.	01-11-91		09:30 hr.
Boron	0.16	mg/l	Lead	0.050<	mg/l
01-09-91		13:00 hr.	01-11-91		09:30 hr.
Cadmium	0.002<	mg/l	Magnesium	67.20	mg/l
01-09-91		13:00 hr.	01-11-91		09:30 hr.
Calcium	91.3	mg/l	Manganese	0.01<	mg/l
01-11-91		12:00 hr.	01-11-91		09:30 hr.
Cations, Total	11.55	meq/l	Mercury	0.002<	mg/l
			01-09-91		09:30 hr.
Chloride	20.0	mg/l	Molybdenum	0.10<	mg/l
12-31-90		09:30 hr.	01-11-91		12:00 hr.

ANALYST: Jim Stapley

Respectfully submitted,
COMMERCIAL TESTING & ENGINEERING CO.

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TELEPHONE: (801) 653-2311
FAX: (801) 653-2479

January 23, 1991

Job No.: 59 10813

Date Rec'd: December 14, 1990

Date Sampled: December 14, 1990

Sampled By: RCW

Utah Power and Light Co.
P.O. Box 1005
Huntington UT 84528

Sample ID:

RCW-4
Temp 34.1°C
Flow 0.3/54
pH 7.78
Cond 688
Time Sampled 11:35 hr.
Time Rec'd 16:00 hr.

WATER ANALYSIS

Nickel 01-11-91	0.02<	mg/l 12:00 hr.	Selenium 01-02-91	0.002<	mg/l 09:00 hr.
Nitrogen, Ammonia 01-02-91	0.11	mg/l 11:00 hr.	Sodium 01-11-91	32.81	mg/l 09:30 hr.
Nitrogen, Nitrate 12-17-90	0.01<	mg/l 10:00 hr.	Solids, Dissolved 12-18-90	511.0	mg/l 09:00 hr.
Nitrogen, Nitrite 12-17-90	0.01<	mg/l 10:00 hr.	Solids, Settleable 12-21-90	.5<	mg/l 15:45 hr.
Oil and Grease 12-28-90	2.1	mg/l 09:00 hr.	Solids, Suspended 12-18-90	2.0	mg/l 09:00 hr.
Oxygen, Dissolved 12-14-90	7.2	mg/l 16:20 hr.	Sulfate 01-17-91	140.0	mg/l 10:00 hr.
pH 12-14-90	8.25	Units 16:15 hr.	Sulfide 01-17-91	23.00	mg/l 14:00 hr.
Potassium 01-11-91	2.54	mg/l 09:30 hr.	Zinc 01-11-91	0.01	mg/l 12:00 hr.

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ANALYST: Lew Stafko

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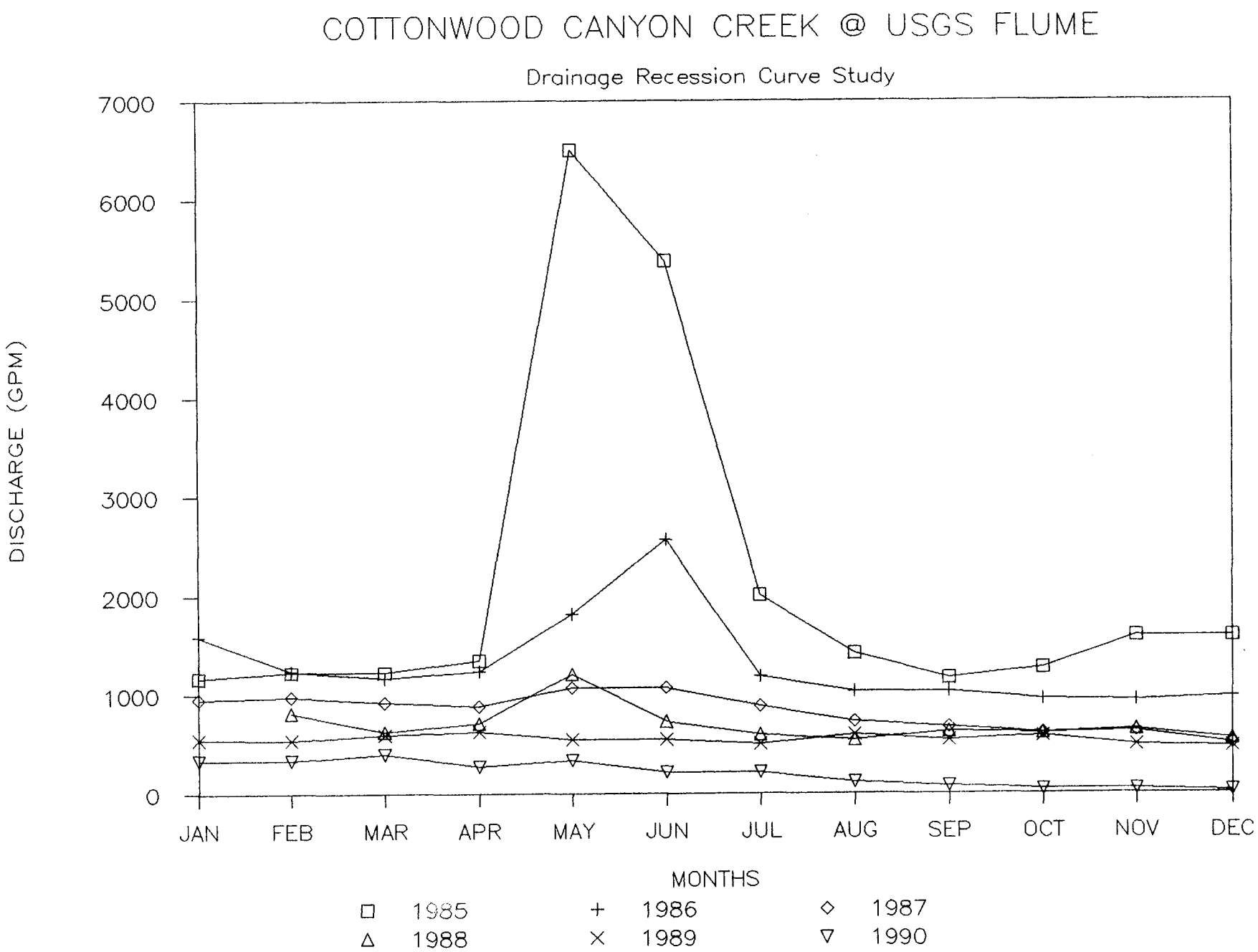
COTTONWOOD CANYON CREEK @ USGS FLUME
Drainage Recession Curve Study
DISCHARGE (GPM)
7000
6000
5000
4000
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2000
1000
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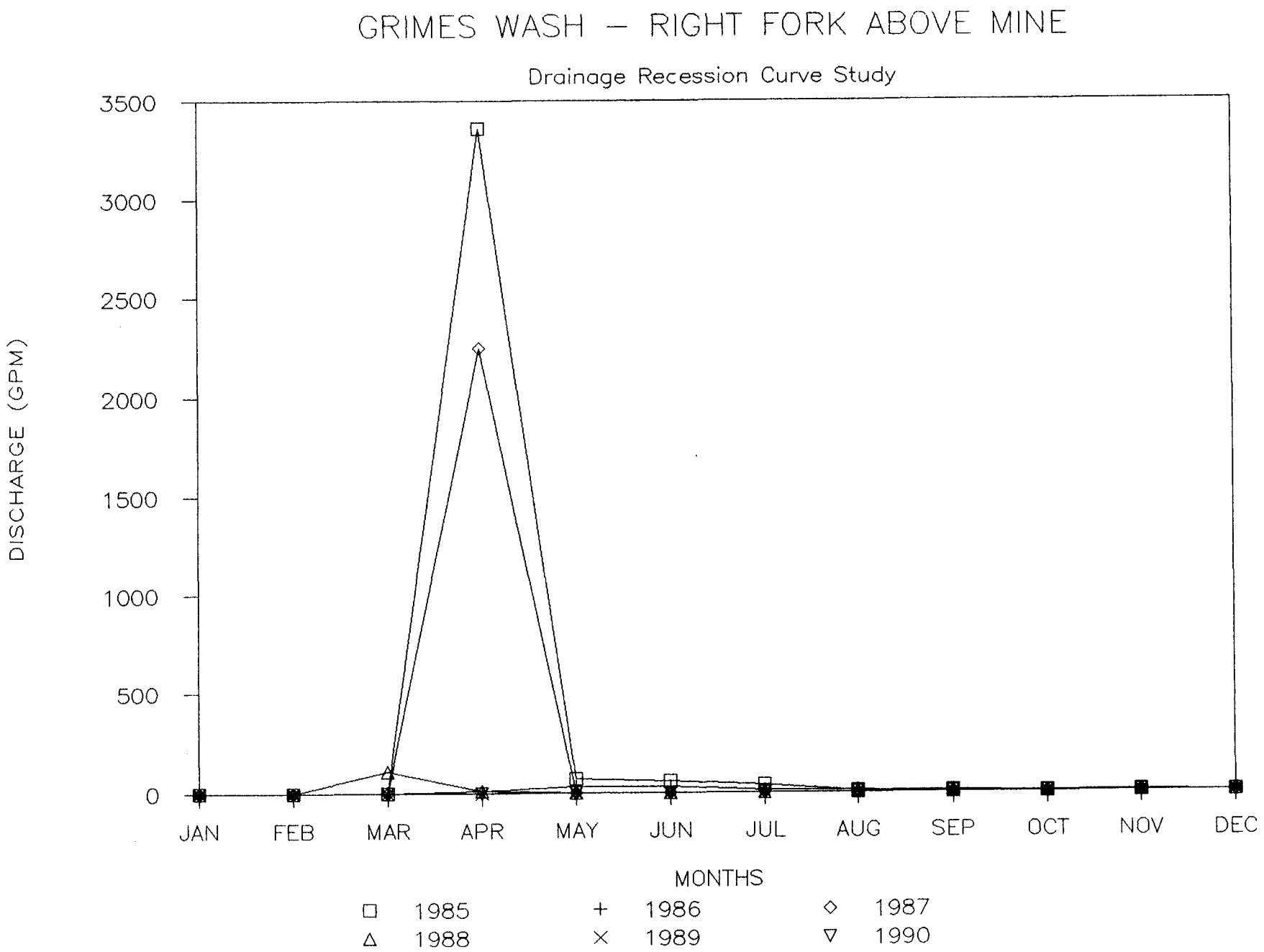
GRIMES WASH – RIGHT FORK ABOVE MINE
Drainage Recession Curve Study
DISCHARGE (GPM)
3500
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1500
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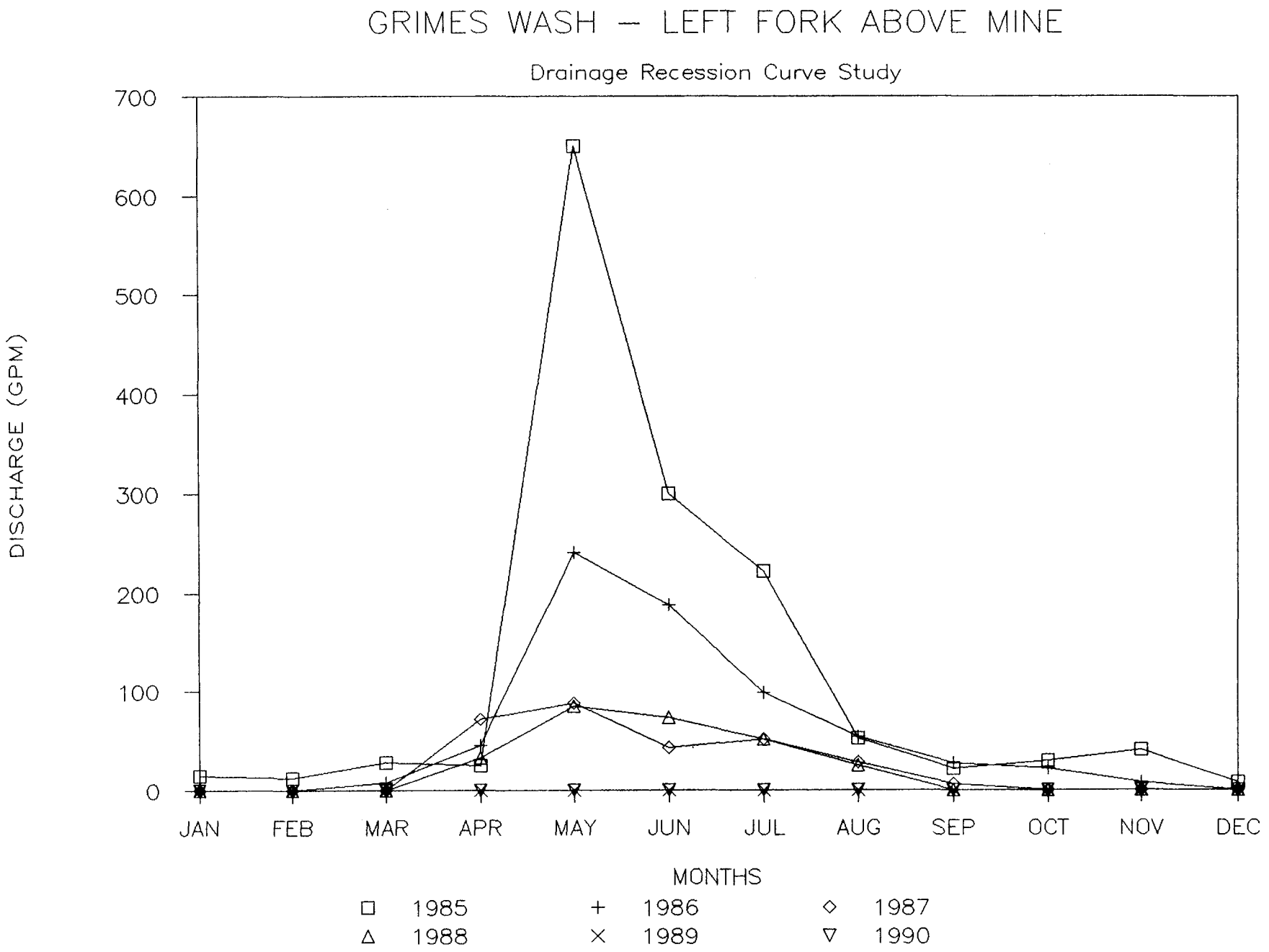
GRIMES WASH – LEFT FORK ABOVE MINE
Drainage Recession Curve Study
DISCHARGE (GPM)
700
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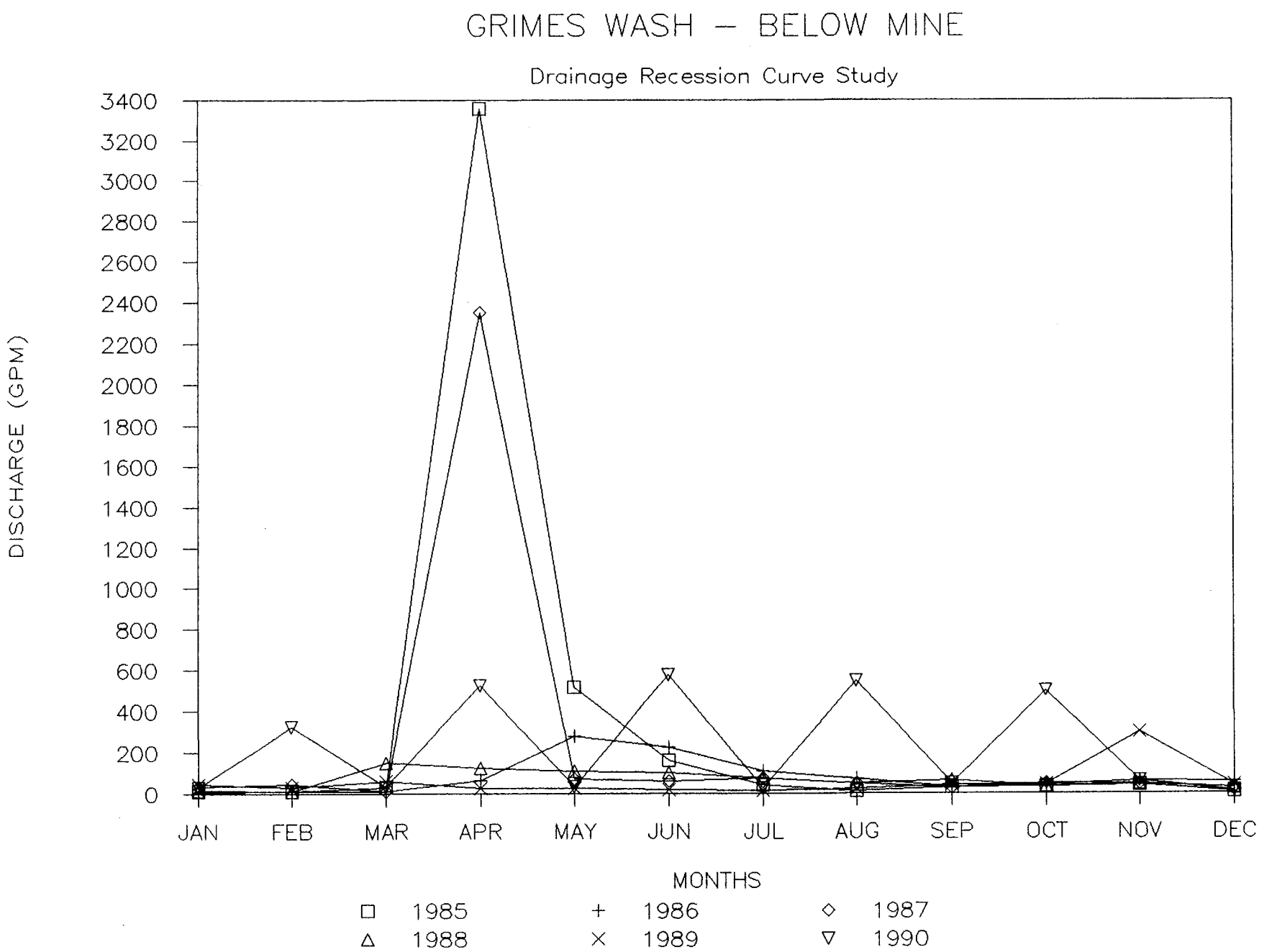
GRIMES WASH – BELOW MINE
Drainage Recession Curve Study
DISCHARGE (GPM)
3400
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2600
2400
2200
2000
1800
1600
1400
1200
1000
800
600
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200
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JAN
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PLEASE ADDRESS ALL CORRESPONDENCE TO:
P.O. BOX 1020, HUNTINGTON, UT 84528
TELEPHONE: (801) 653-2311

March 20, 1990

Job No.: 59 10300

Date Rec'd: March 5, 1990

Date Sampled: March 6, 1990

Sampled By: UP&L

Sample ID: UP&L

GRIMES WASH BELOW THE MINE
Temperature 35 degrees
Flow 65.0 gpm
Rec'd 0900 hr.
Sampled 1520 hr.

Utah Power and Light Co.
P.O. Box 1005
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WATER ANALYSIS

Acidity	8	mg/l CaCO3	Iron, Dissolved	0.07	mg/l
03-08-90 1300 hr.			03-13-90 1400 hr.		
Alk., Bicarbonate	366	mg/l HCO3	Magnesium	79.50	mg/l
03-08-90 1100 hr.			03-13-90 1345 hr.		
Alk., Carbonate	1<	mg/l CaCO3	Manganese	0.04	mg/l
03-08-90 1100 hr.			03-13-90 1415 hr.		
Alk., Total	300	mg/l CaCO3	Oil and Grease	1.1	mg/l
03-08-90 1100 hr.			03-13-90 1330 hr.		
Anions, Total	36.30	meq/l	Oxygen, Dissolved	9.0	mg/l
			03-06-90 1100 hr.		
Calcium	150.4	mg/l	pH	8.15	Units
03-13-90 1330 hr.			03-06-90 1035 hr.		
Cations, Total	36.27	meq/l	Potassium	5.60	mg/l
			03-13-90 1315 hr.		
Chloride	900.0	mg/l	Sodium	513.50	mg/l
03-16-90 1600 hr.			03-13-90 1300 hr.		
Conductivity	3900	umhos/cm	Solids, Dissolved	1981.0	mg/l
03-07-90 0945 hr.			03-08-90 1520 hr.		
Hardness, Total	703	mg/l CaCO3	Solids, Settleable	0.5 <	mg/l
			03-06-90 1000 hr.		
Iron	0.19	mg/l	Solids, Suspended	16.0	mg/l
03-13-90 1400 hr.			03-08-90 1520 hr.		
			Sulfate	250.0	mg/l
			03-08-90 1405 hr.		

ANALYST: D. Tyson

Respectfully submitted,
COMMERCIAL TESTING & ENGINEERING CO.

Manager, Huntington Laboratory

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OVER 40 BRANCH LABORATORIES STRATEGICALLY LOCATED IN PRINCIPAL COAL MINING AREAS,
TIDEWATER AND GREAT LAKES PORTS, AND RIVER LOADING FACILITIES

COMMERCIAL TESTING & ENGINEERING CO.
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PLEASE ADDRESS ALL CORRESPONDENCE TO:
P.O. BOX 1020, HUNTINGTON, UT 84528
TELEPHONE: (801) 653-2311

June 12, 1990

Job No.: 59 10426

Date Rec'd: June 6, 1990

Date Sampled: June 6, 1990

Sampled By: UP&L

Utah Power and Light Co.
P.O. Box 1005
Huntington UT 84528

Sample ID: UP&L

GRIMES WASH BELOW THE MINE
Temperature 57 degrees
Flow 580 gpm
Rec'd 1555 hr.
Sampled 1040 hr.
FIELD MEASUREMENTS
pH 7.79
Conductivity 1150

WATER ANALYSIS

Acidity	6	mg/l CaCO3	Iron, Dissolved	0.03	mg/l
06-11-90	1300 hr.		06-07-90	1430 hr.	
Alk., Bicarbonate	371	mg/l HCO3	Magnesium	89.40	mg/l
06-11-90	1130 hr.		06-07-90	1415 hr.	
Alk., Carbonate	1<	mg/l CaCO3	Manganese	0.04	mg/l
06-11-90	1130 hr.		06-07-90	1500 hr.	
Alk., Total	304	mg/l CaCO3	Oil and Grease	1.0<	mg/l
06-11-90	1130 hr.		06-12-90	1030 hr.	
Anions, Total	22.45	meq/l	Oxygen, Dissolved	5.5	mg/l
			06-06-90	1620 hr.	
Calcium	222.9	mg/l	pH	8.20	Units
06-07-90	1400 hr.		06-06-90	1600 hr.	
Cations, Total	22.68	meq/l	Potassium	3.22	mg/l
			06-07-90	1530 hr.	
Chloride	140.0	mg/l	Sodium	95.90	mg/l
06-11-90	1430 hr.		06-07-90	1515 hr.	
Conductivity	1200	umhos/cm	Solids, Dissolved	909.0	mg/l
06-07-90	1150 hr.		06-11-90	1600 hr.	
Hardness, Total	925	mg/l CaCO3	Solids, Settleable	2.0	mg/l
			06-07-90	1030 hr.	
Iron	0.15	mg/l	Solids, Suspended	3.0	mg/l
06-07-90	1430 hr.		06-11-90	1600 hr.	
			Sulfate	600.0	mg/l
			06-12-90	1100 hr.	

ANALYST: D. Igon

Respectfully submitted,
COMMERCIAL TESTING & ENGINEERING CO.

Manager, Huntington Laboratory

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TIDEWATER AND GREAT LAKES PORTS, AND RIVER LOADING FACILITIES

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PLEASE ADDRESS ALL CORRESPONDENCE TO:
P.O. BOX 1020, HUNTINGTON, UT 84528
TELEPHONE: (801) 653-2311

September 17, 1990

Job No.: 59 10589

Date Rec'd: September 7, 1990

Date Sampled: September 7, 1990

Sampled By: UP&L

Sample ID: UP&L

GRIMES WASH BELOW THE MINE
Temperature 68 degrees
Flow 50.0 gpm
Rec'd 1600 hr.
Sampled 1135 hr.

Utah Power and Light Co.
P.O. Box 1005
Huntington UT 84528

WATER ANALYSIS

Acidity	7	mg/l CaCO3	Iron, Dissolved	0.02<	mg/l
09-13-90 0900 hr.			09-12-90 1045 hr.		
Alk., Bicarbonate	340	mg/l HCO3	Magnesium	76.40	mg/l
09-12-90 1100 hr.			09-12-90 1020 hr.		
Alk., Carbonate	1<	mg/l CaCO3	Manganese	0.02<	mg/l
09-12-90 1100 hr.			09-12-90 1100 hr.		
Alk., Total	279	mg/l CaCO3	Oil and Grease	1.0<	mg/l
09-12-90 1100 hr.			09-10-90 1420 hr.		
Anions, Total	17.58	meq/l	Oxygen, Dissolved	5.9	mg/l
			09-07-90 1715 hr.		
Calcium	132.8	mg/l	pH	8.10	Units
09-12-90 1000 hr.			09-07-90 1700 hr.		
Cations, Total	17.39	meq/l	Potassium	1.26	mg/l
			09-12-90 1145 hr.		
Chloride	126.0	mg/l	Sodium	103.60	mg/l
09-12-90 1530 hr.			09-12-90 1130 hr.		
Conductivity	1250	umhos/cm	Solids, Dissolved	1071.0	mg/l
09-11-90 1100 hr.			09-13-90 1630 hr.		
Hardness, Total	646	mg/l CaCO3	Solids, Settleable	0.50 <	mg/l
			09-07-90 1700 hr.		
Iron	0.13	mg/l	Solids, Suspended	1.0<	mg/l
09-12-90 1045 hr.			09-13-90 1630 hr.		
			Sulfate	410.0	mg/l
			09-13-90 1300 hr.		

ANALYST: D. Tyson

Respectfully submitted,
COMMERCIAL TESTING & ENGINEERING CO.

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P.O. BOX 1020, HUNTINGTON, UT 84528
TELEPHONE: (801) 653-2311
FAX: (801) 653-2479

January 29, 1991

Job No.: 59 10818

Date Rec'd: December 17, 1990

Date Sampled: December 17, 1990

Sampled By: UP&L

Utah Power and Light Co.
P.O. Box 1005
Huntington UT 84528

Sample ID: Utah Power and Light Co.

WILBERG BELOW MINE
WMRO3
FLOW 12 GPM
Temperature 41.9 Degrees
Rec'd 1600 hr.
Sampled 1300 hr.

FIELD MEASUREMENTS

pH	7.45
Conductivity	4084

WATER ANALYSIS

Acidity	1<	mg/l CaCO3	Iron, Dissolved	0.13	mg/l
01-24-91		13:00 hr.	01-11-91		14:00 hr.
Alk., Bicarbonate	486	mg/l HCO3	Magnesium	88.10	mg/l
01-08-91		14:00 hr.	01-11-91		14:00 hr.
Alk., Carbonate	1<	mg/l CaCO3	Manganese	0.06	mg/l
01-08-91		14:00 hr.	01-11-91		14:00 hr.
Alk., Total	399	mg/l CaCO3	Oil and Grease	1.0<	mg/l
01-08-91		14:00 hr.	12-28-90		10:30 hr.
Anions, Total	56.99	meq/l	Oxygen, Dissolved	6.0	mg/l
			12-17-90		16:15 hr.
Calcium	272.3	mg/l	pH	8.20	Units
01-11-91		14:00 hr.	12-17-90		16:20 hr.
Cations, Total	54.59	meq/l	Potassium	8.00	mg/l
			01-11-91		14:00 hr.
Chloride	1450.0	mg/l	Sodium	780.00	mg/l
01-29-91		14:30 hr.	01-11-91		14:00 hr.
Conductivity	3900	umhos/cm	Solids, Dissolved	2827.0	mg/l
01-11-91		13:12 hr.	01-24-91		08:00 hr.
Hardness, Total	1043	mg/l CaCO3	Solids, Suspended	13.0	mg/l
			01-24-91		08:00 hr.
Iron	0.13	mg/l	Sulfate	410.0	mg/l
01-11-91		14:00 hr.	01-24-91		13:30 hr.

ANALYST: Lion Stafko

Respectfully submitted,
COMMERCIAL TESTING & ENGINEERING CO.

Manager, Huntington Laboratory

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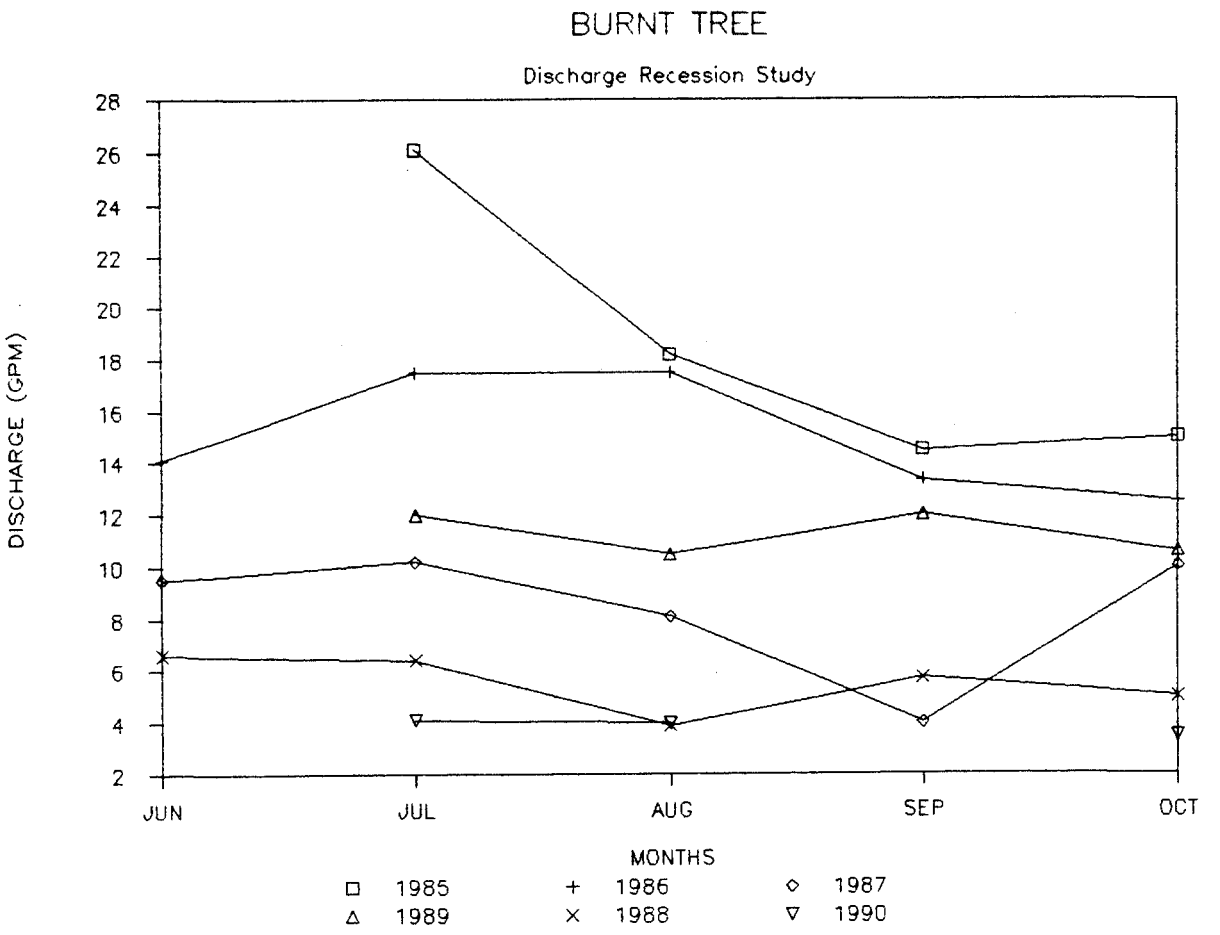
BURNT TREE
Discharge Recession Study
DISCHARGE (GPM)
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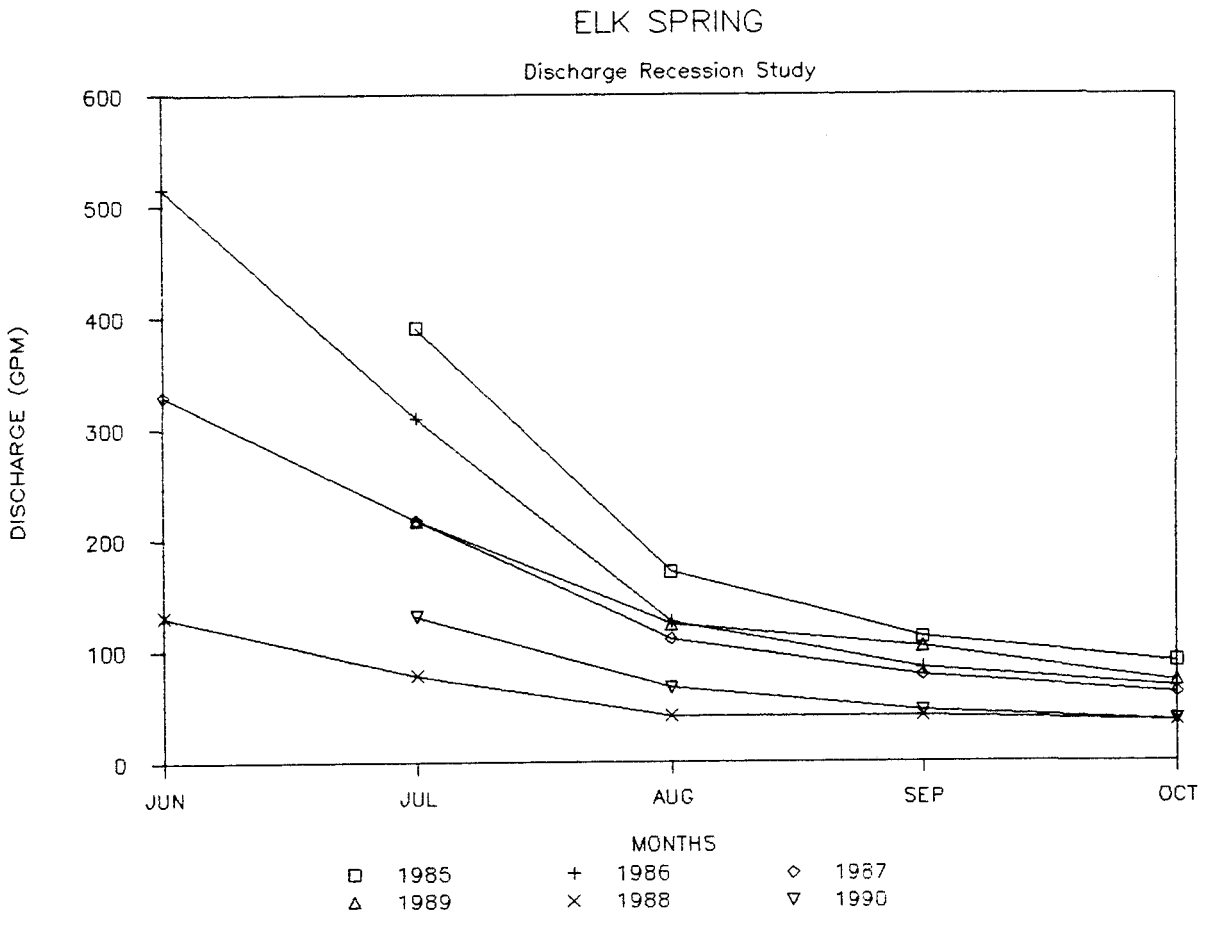
ELK SPRING
Discharge Recession Study
DISCHARGE (GPM)
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1990

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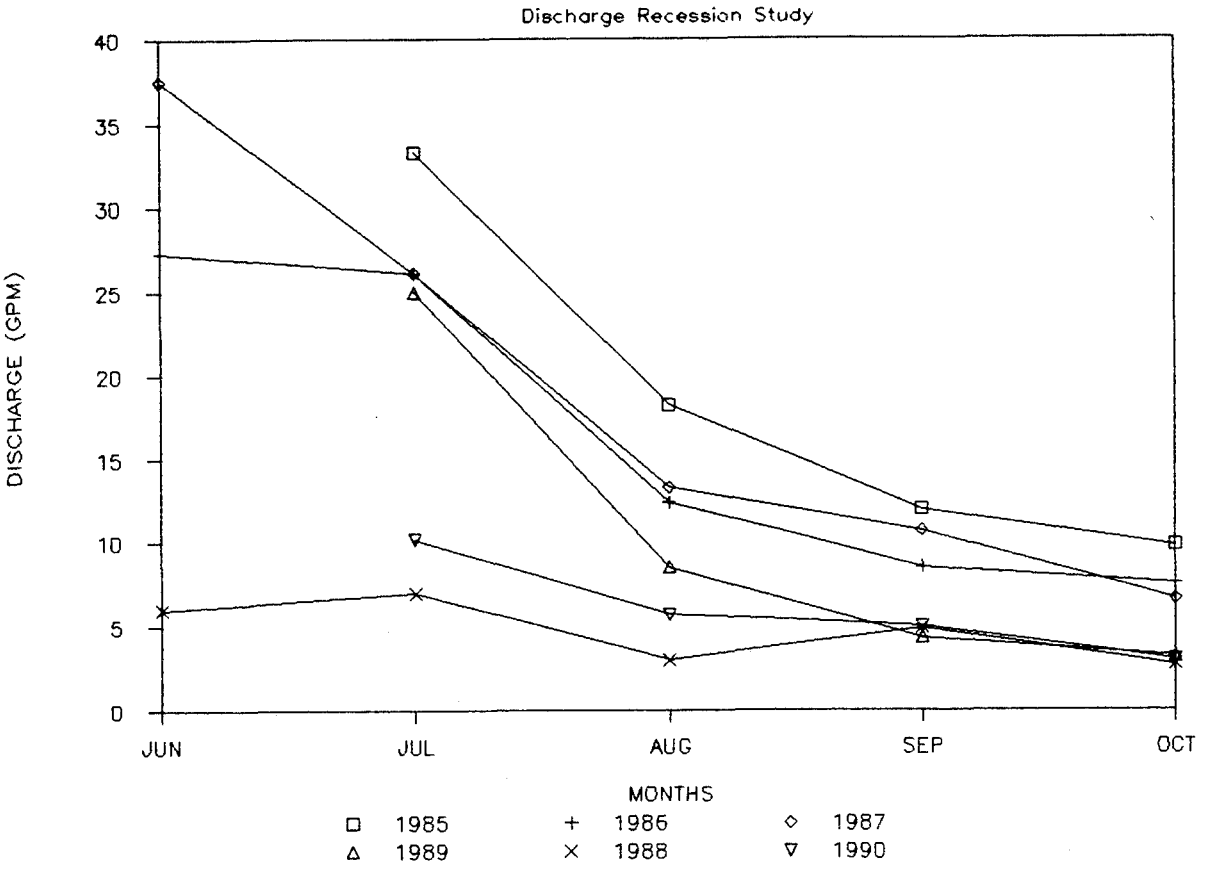
Discharge Recession Study
DISCHARGE (GPM)
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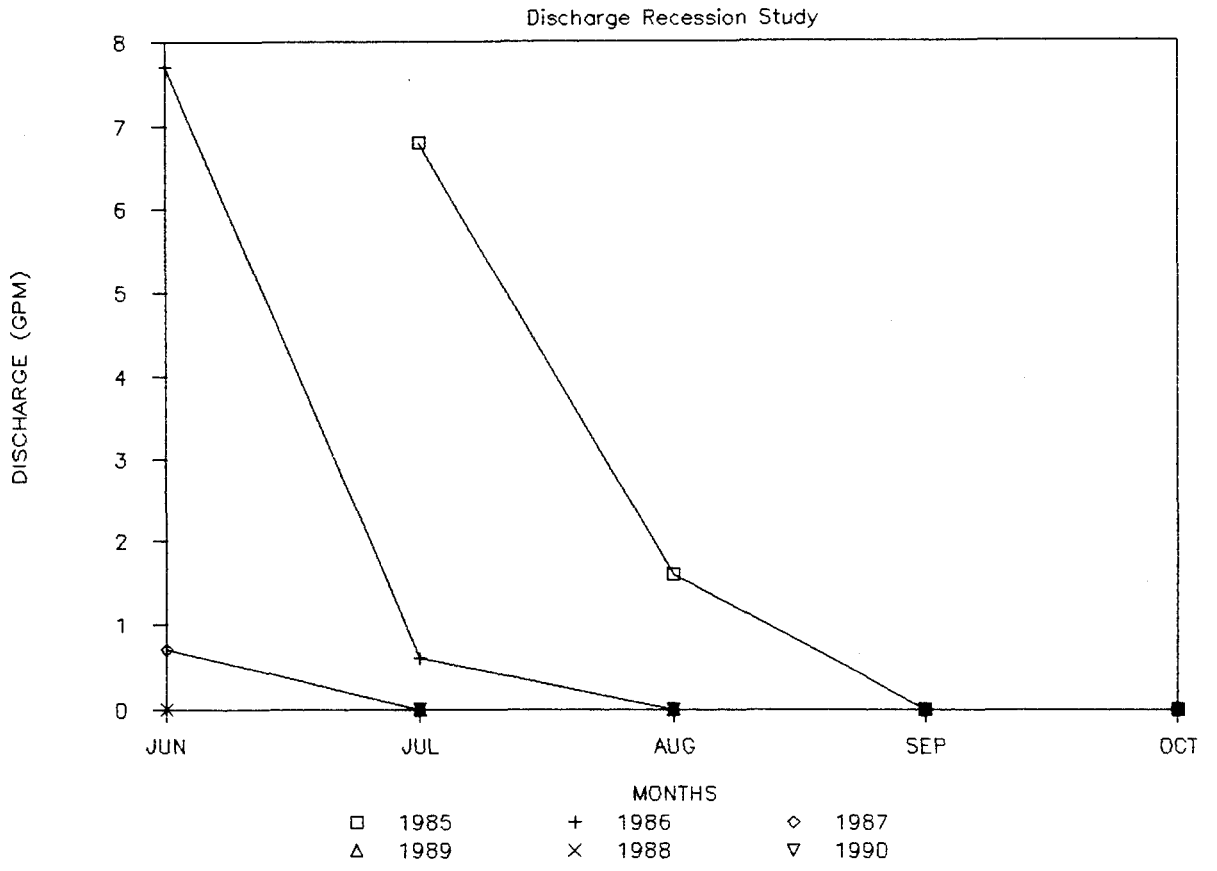
Discharge Recession Study
DISCHARGE (GPM)
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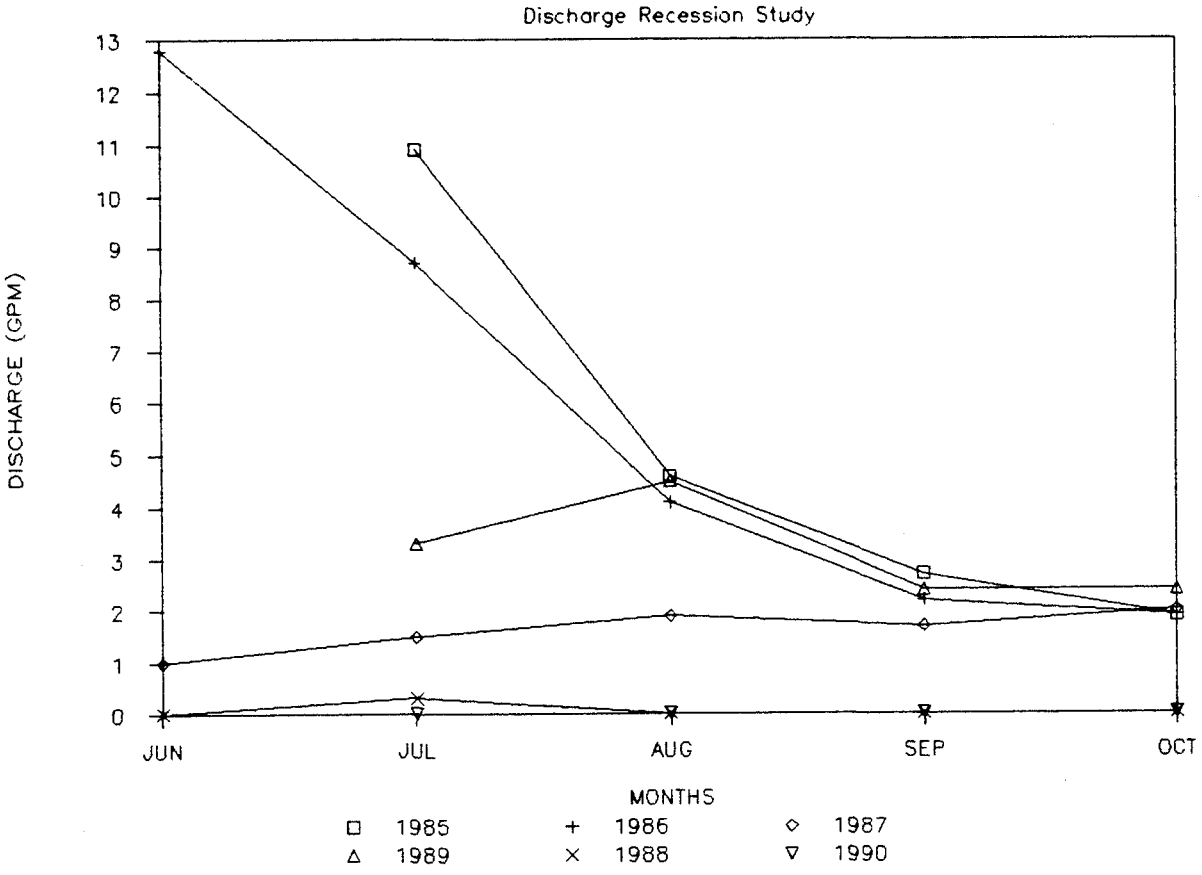
Discharge Recession Study
DISCHARGE (GPM)
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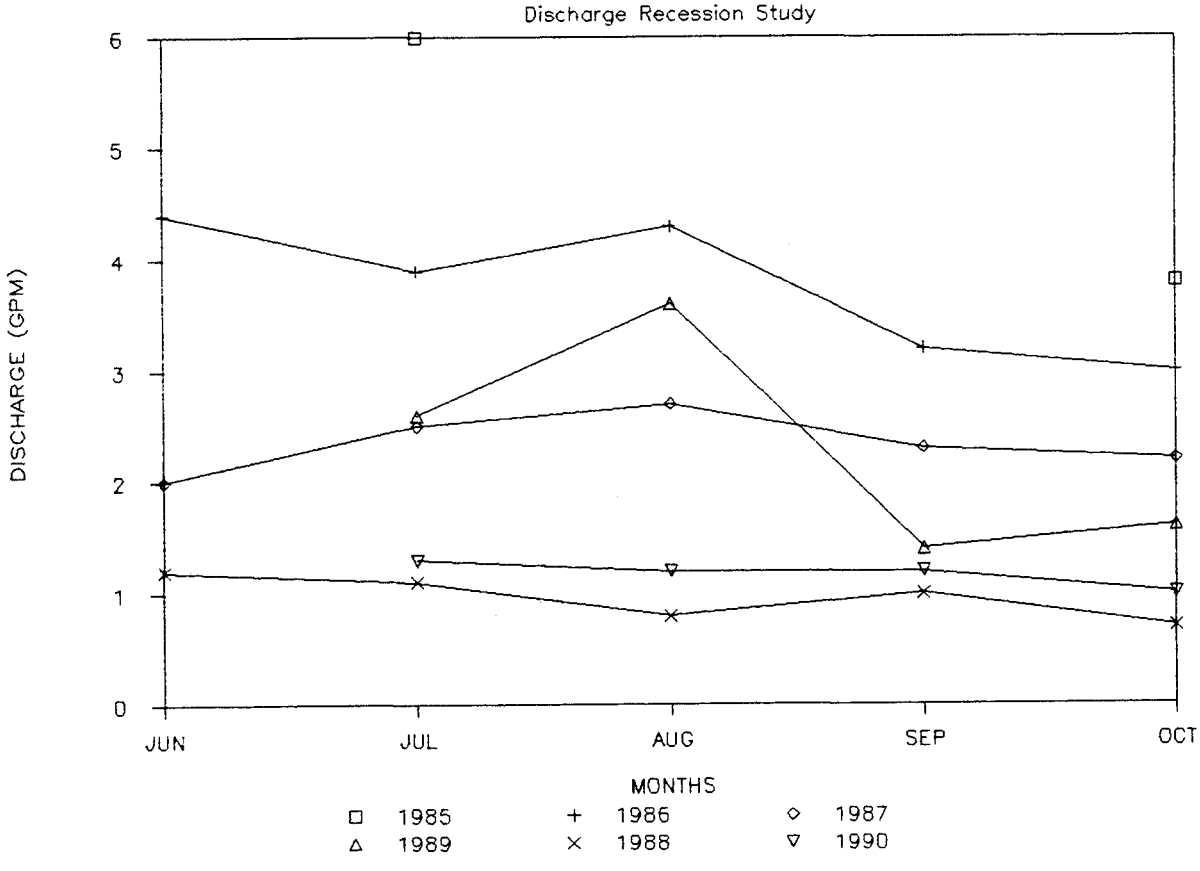
Discharge Recession Study
DISCHARGE (GPM)
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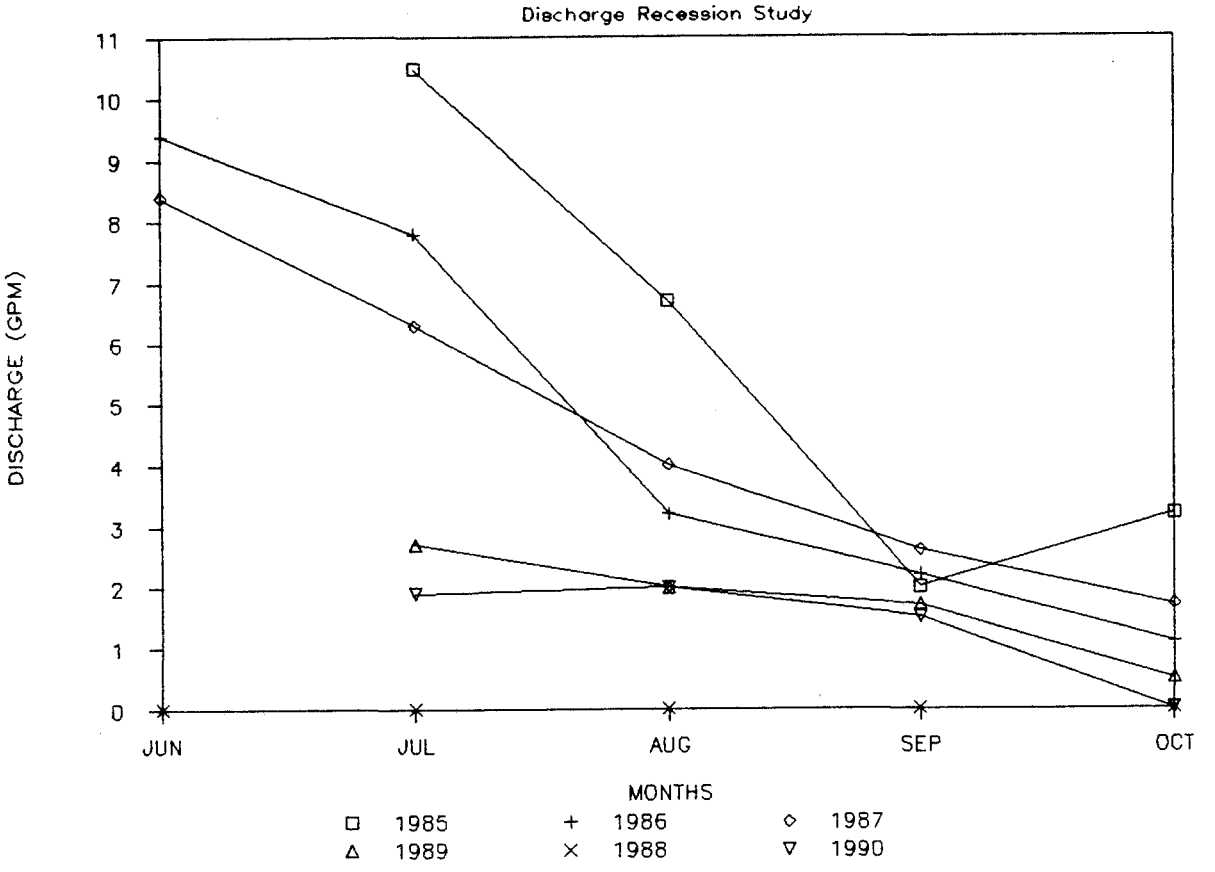
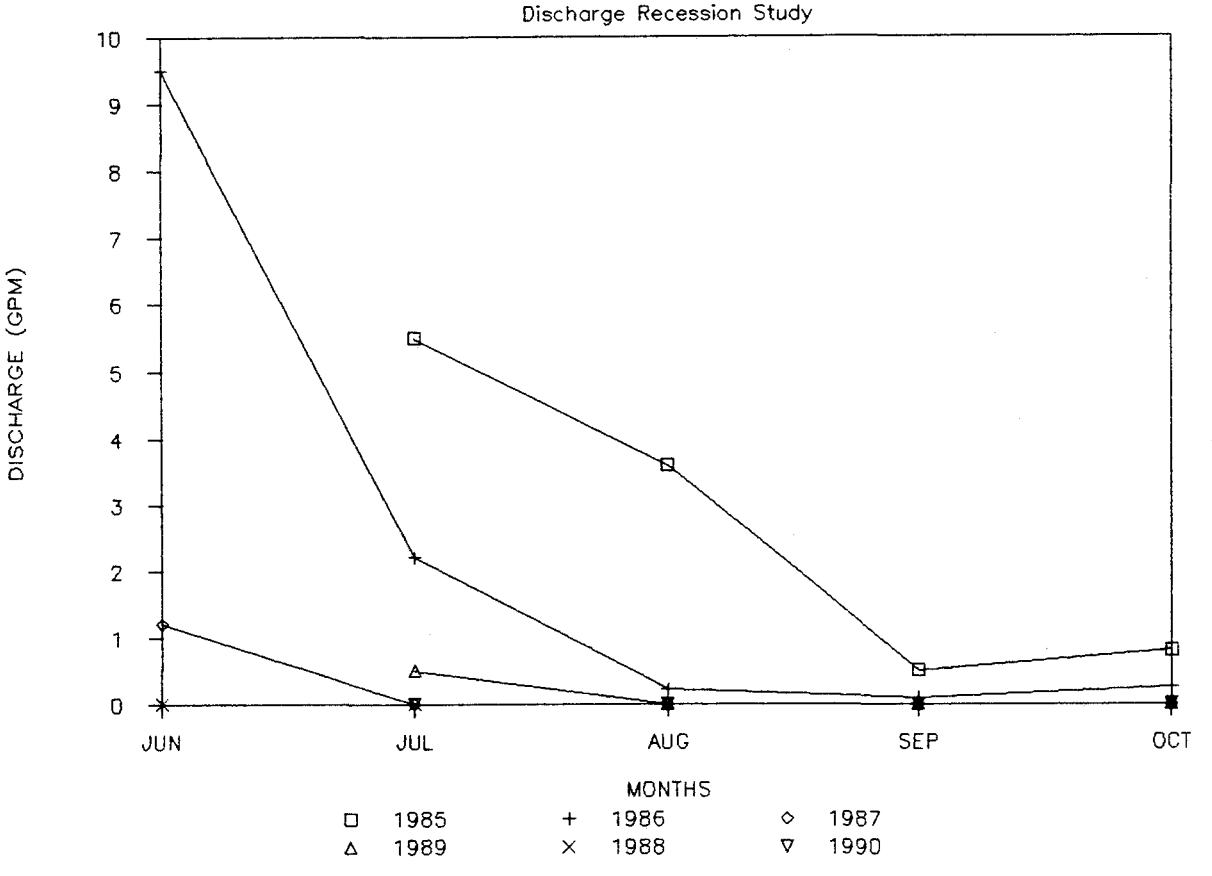
1990

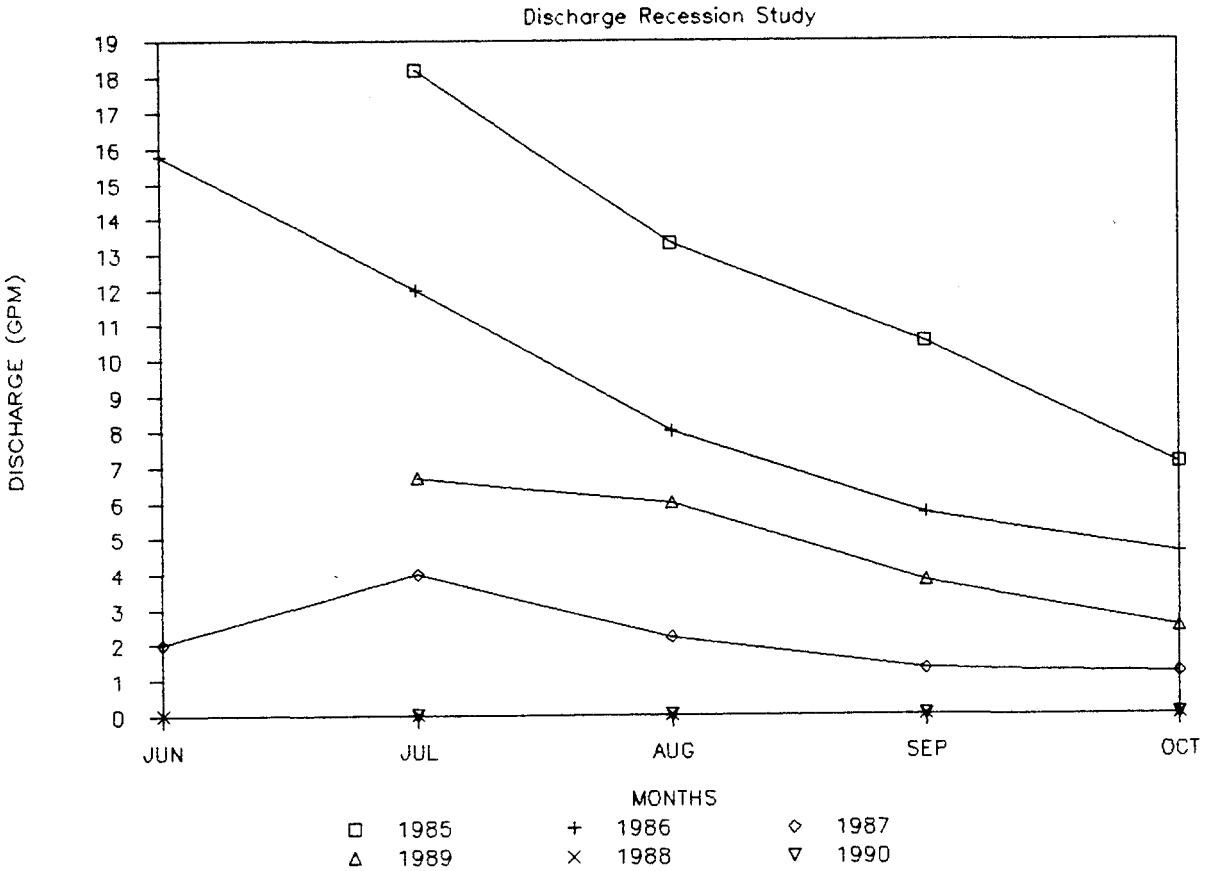
79–35


Discharge Recession Study
DISCHARGE (GPM)
11
10
9
8
7
6
5
4
3
2
1
0
JUN
JUL
AUG
SEP
OCT
MONTHS
1985
1986
1987
1989
1988
1990

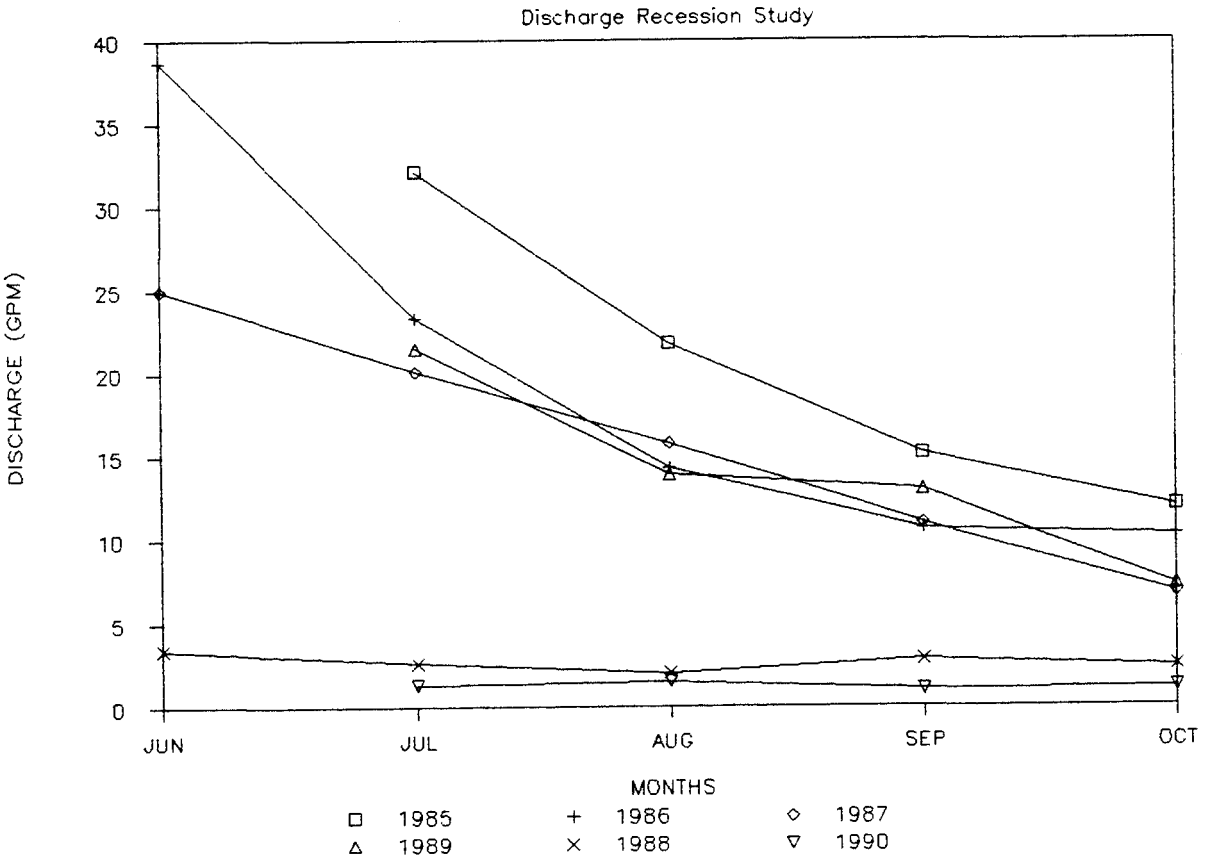
80–44


Discharge Recession Study
DISCHARGE (GPM)
10
9
8
7
6
5
4
3
2
1
0
JUN
JUL
AUG
SEP
OCT
MONTHS
1985
1986
1987
1989
1988
1990

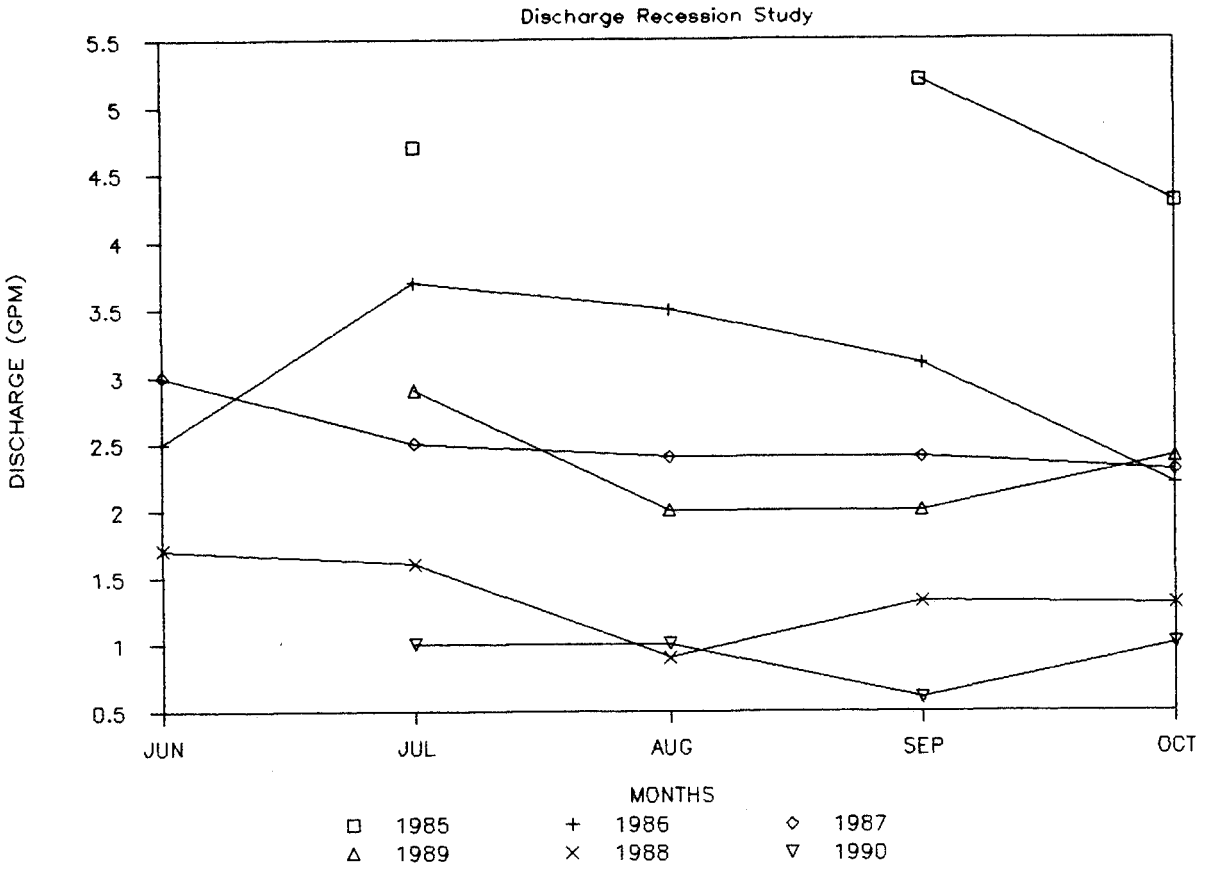
80–46


Discharge Recession Study
DISCHARGE (GPM)
19
18
17
16
15
14
13
12
11
10
9
8
7
6
5
4
3
2
1
0
JUN
JUL
AUG
SEP
OCT
MONTHS
1985
1986
1987
1989
1988
1990

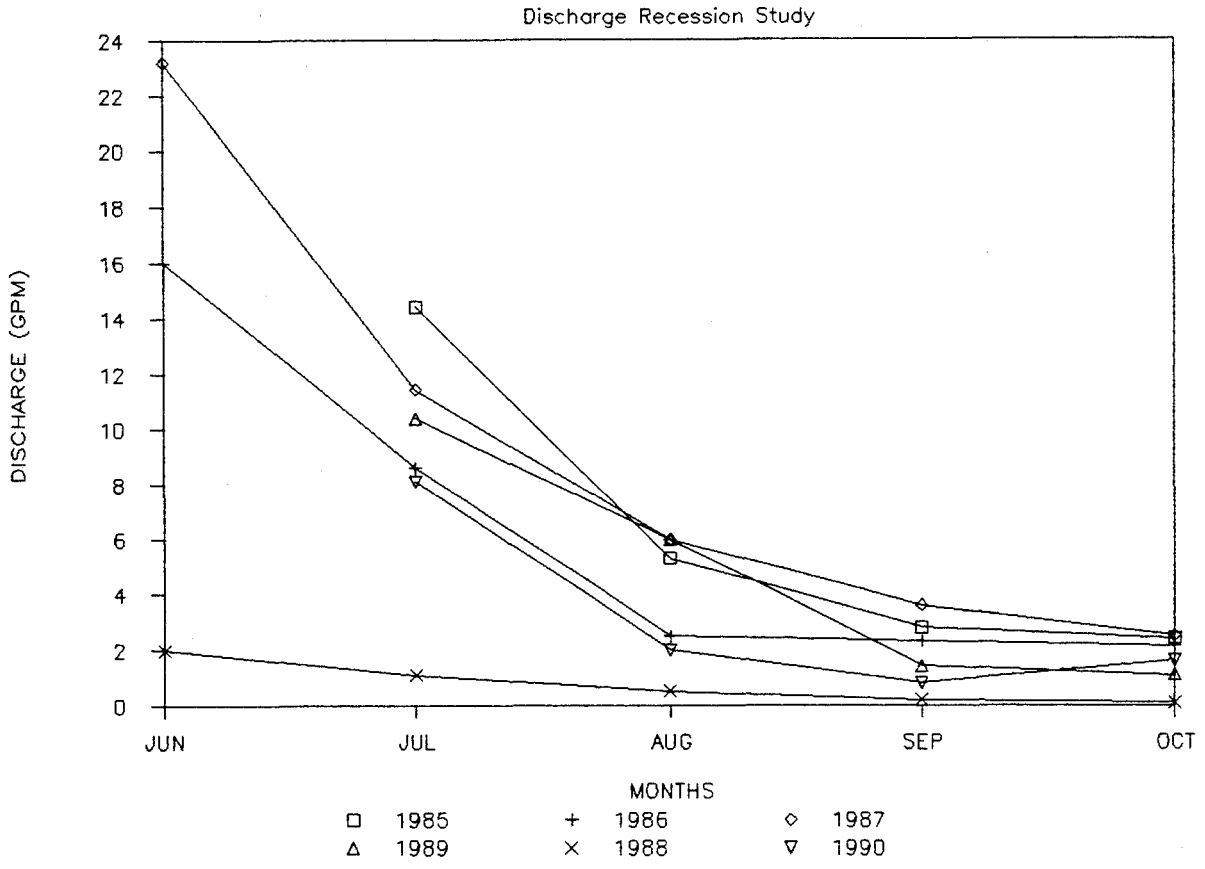
82–52


Discharge Recession Study
DISCHARGE (GPM)
40
35
30
25
20
15
10
5
0
JUN
JUL
AUG
SEP
OCT
MONTHS
1985
1986
1987
1989
1988
1990

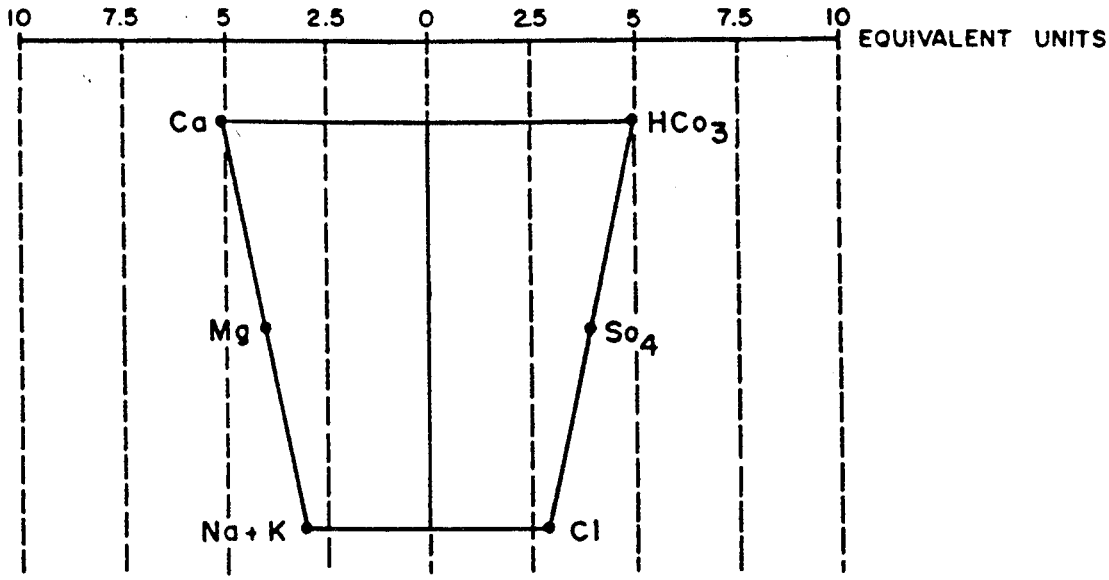
84-56



SHEBA SPRINGS



CATION – ANION DIAGRAMS



$$\frac{\text{P P M}}{\text{Equivalent Weight}} = \text{Equivalent Unit}$$

1" = 5 Equivalent Units

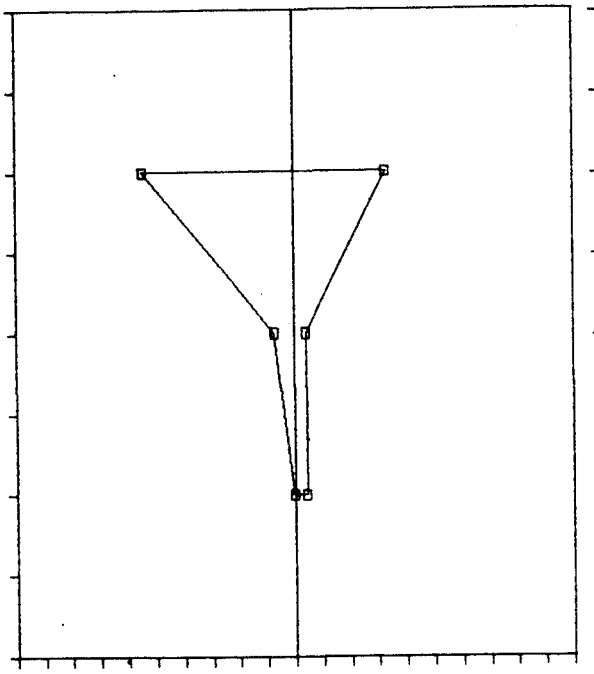
Equivalent Weights

Mg	12.16	(Magnesium)
Ca	20.04	(Calcium)
Na	23.00	(Sodium)
K	39.10	(Potassium)
So_4	48.03	(Sulfate)
$CaCO_3$	100.1	(Total Alkalinity)
Cl	35.46	(Chloride)

FLAGSTAFF LIMESTONE

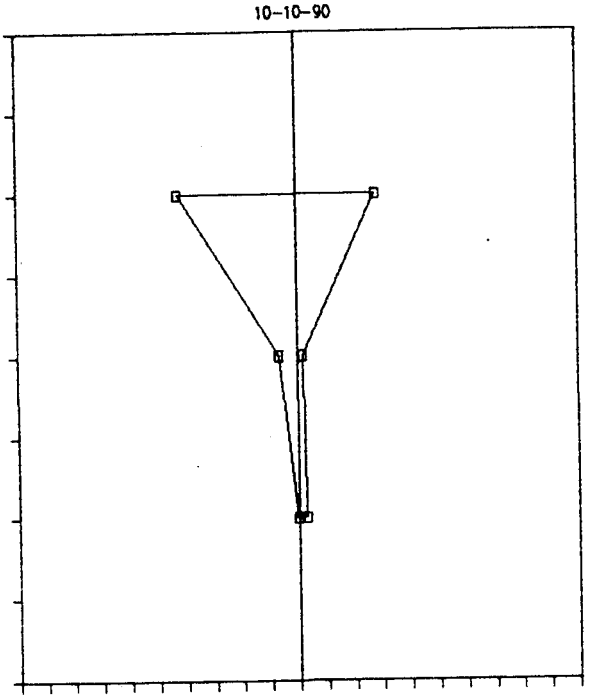
SHEBA SP.

07-02-90



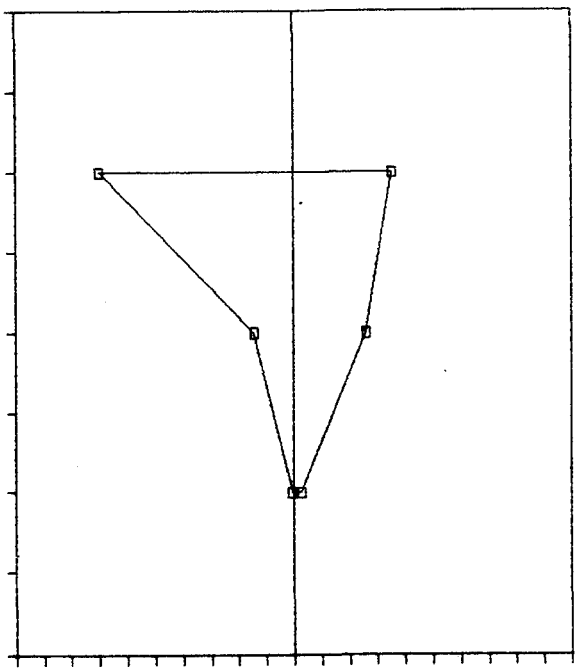
SHEBA SP.

10-10-90



79-35

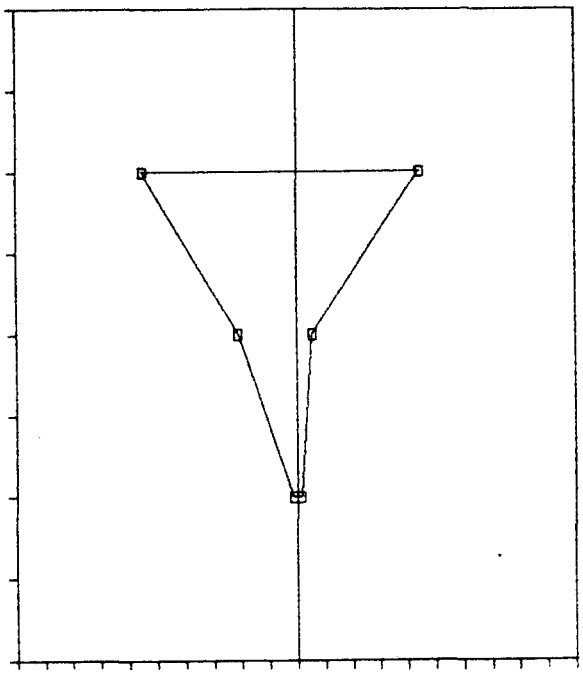
07-02-90



NORTH HORN FORMATION

89-61

07-02-90



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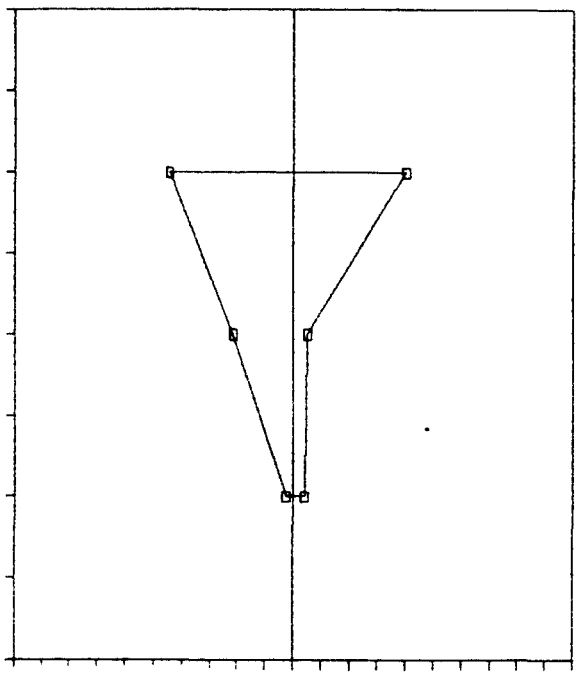
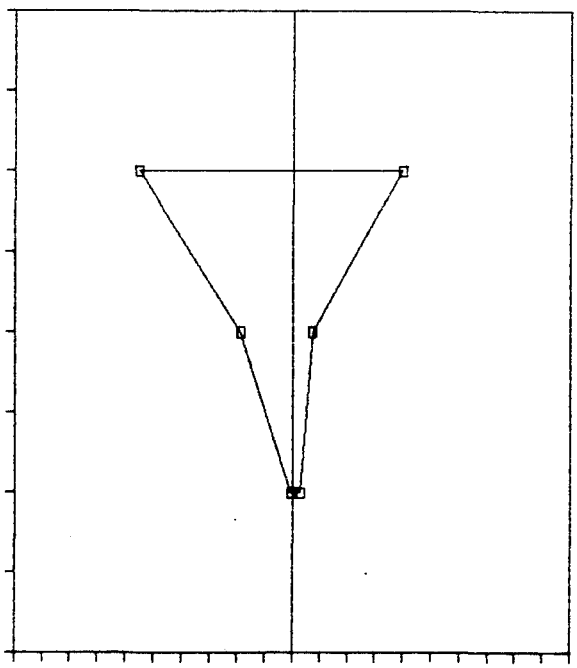
10-10-90



89-66

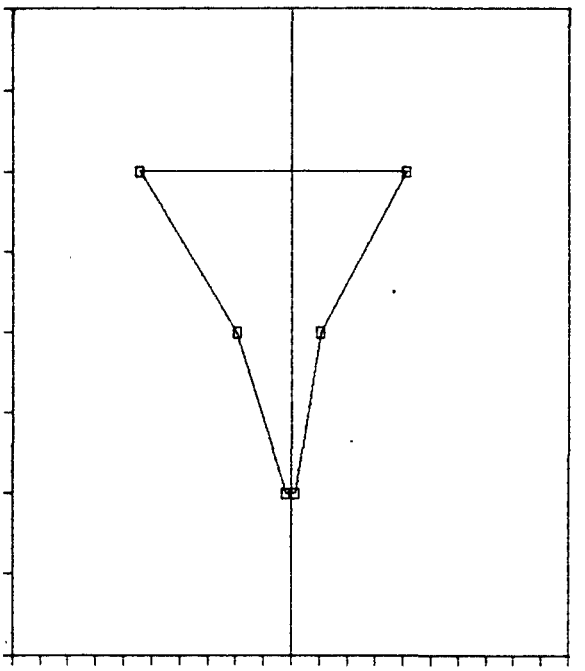
07-02-90



NORTH HORN FORMATION

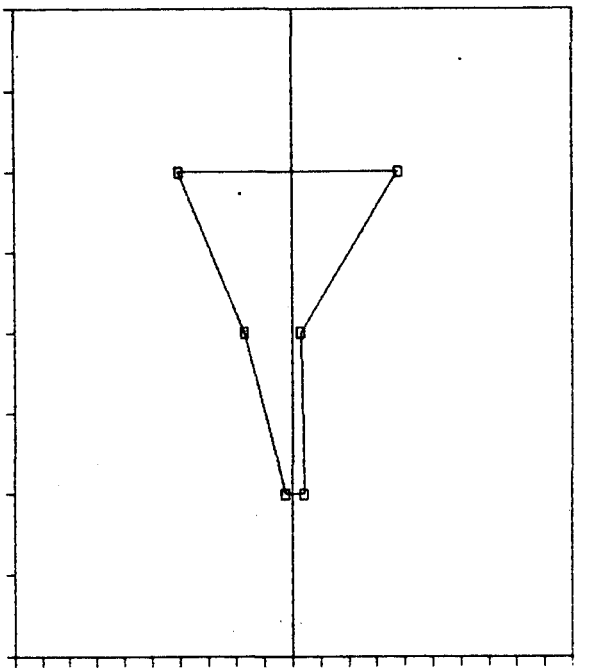
79-2

07-03-90



79-2

10-10-90



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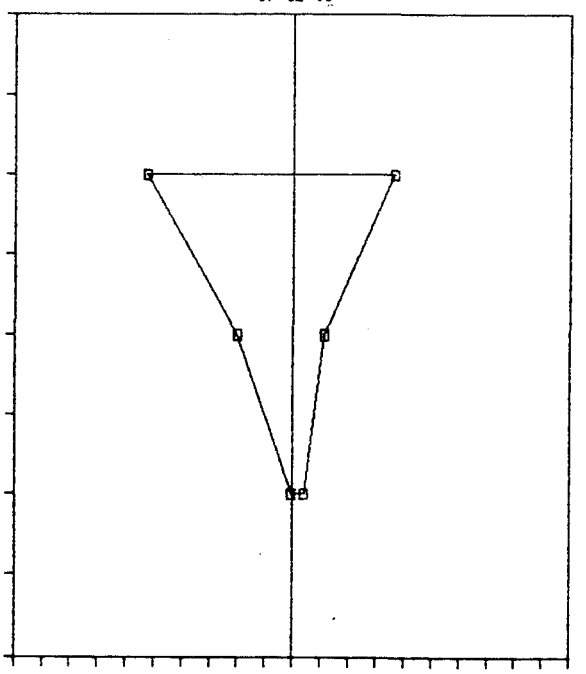

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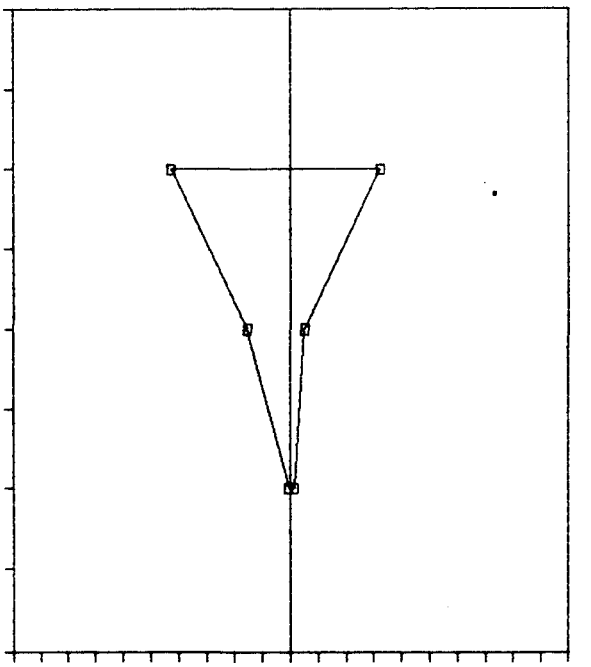
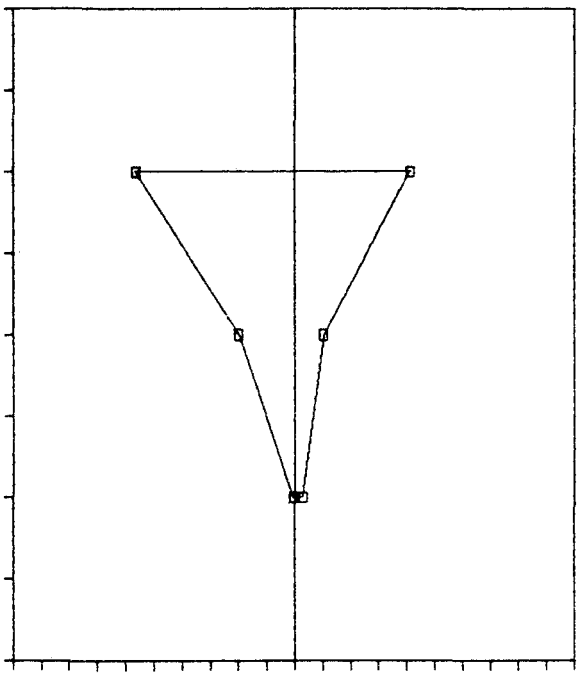
10-10-90



NORTH HORN FORMATION

79-15

07-03-90



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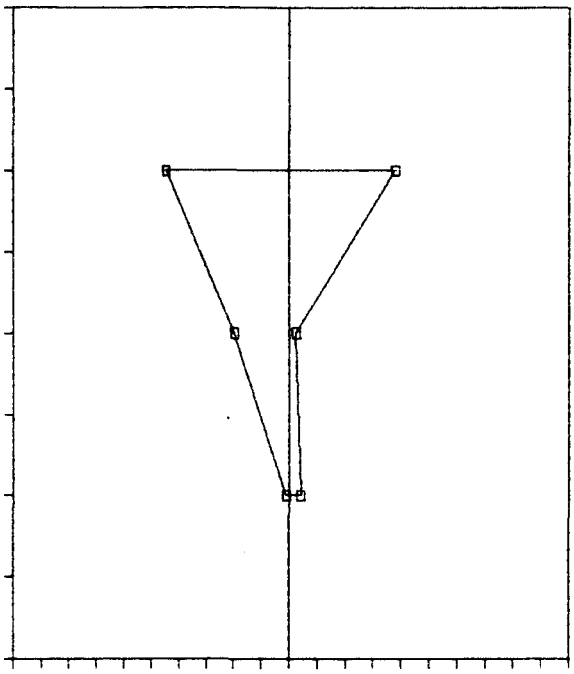

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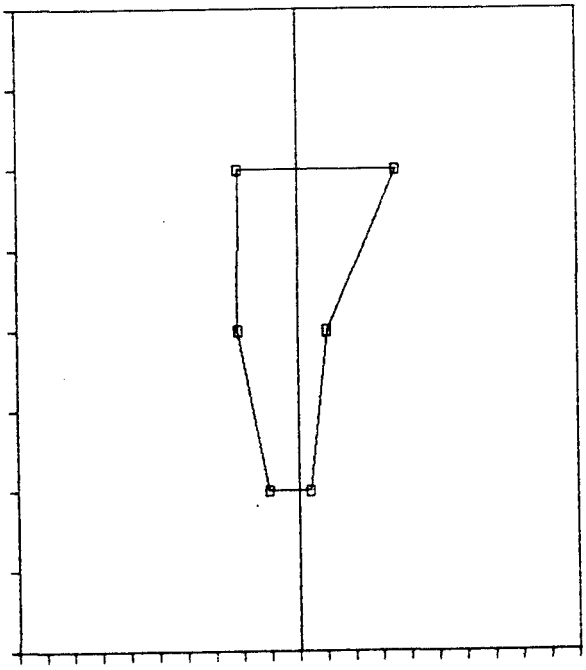

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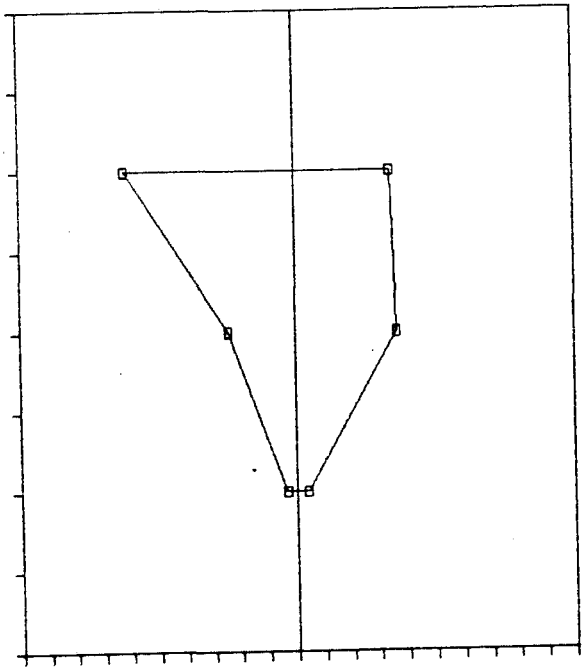
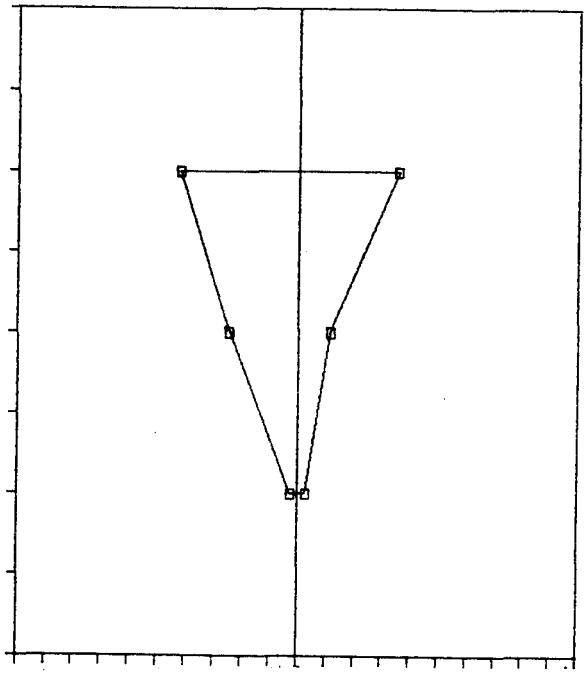


NORTH HORN FORMATION

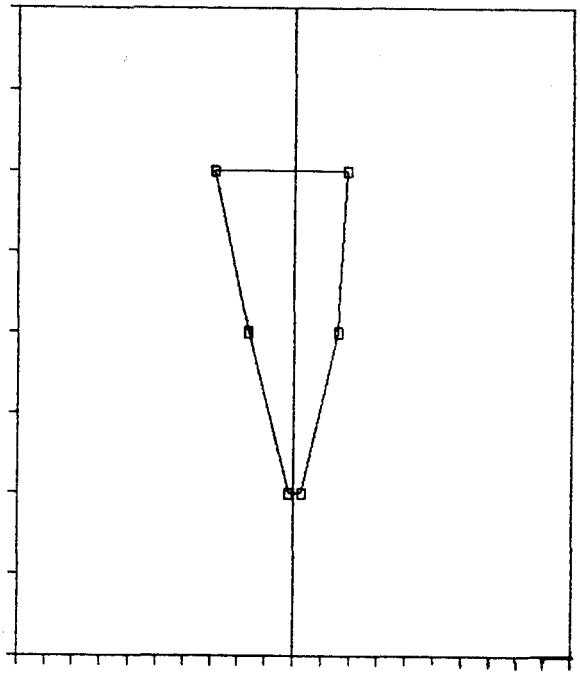
BURNT TREE

07-03-90



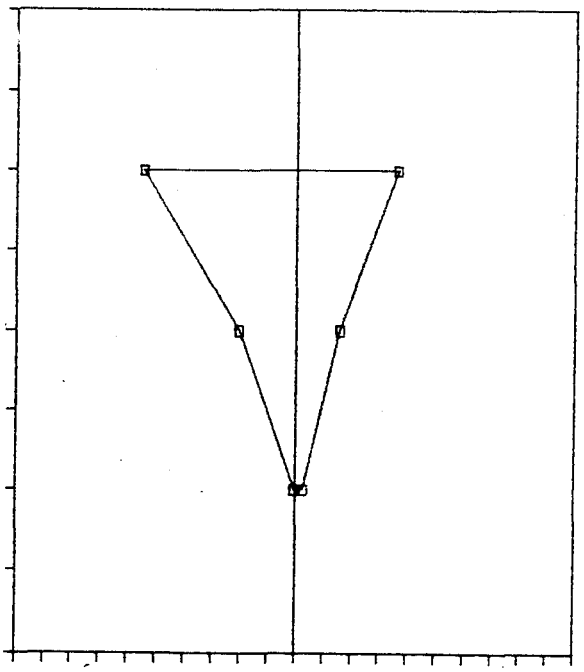
BURNT TREE

10-10-90



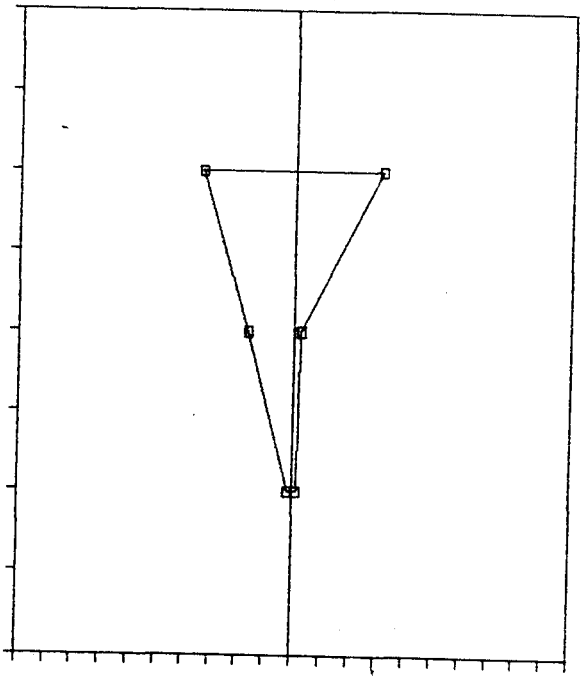
ELK SP.

07-02-90



ELK SP.

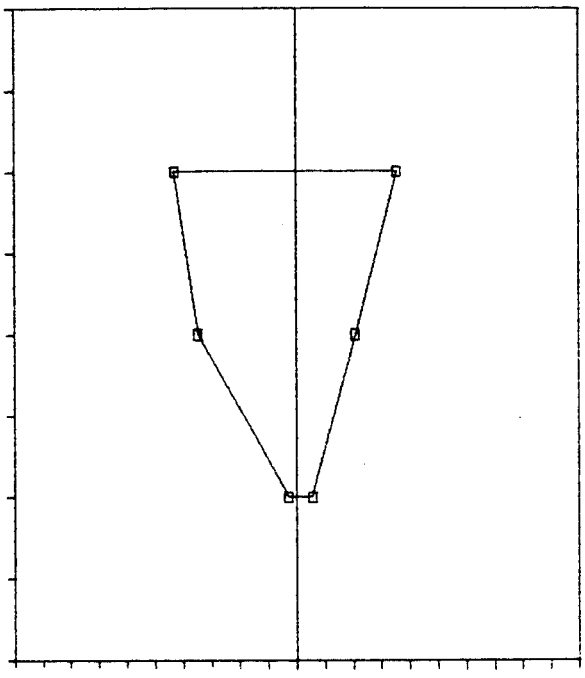
10-10-90



NORTH HORN FORMATION

84-56

07-02-90



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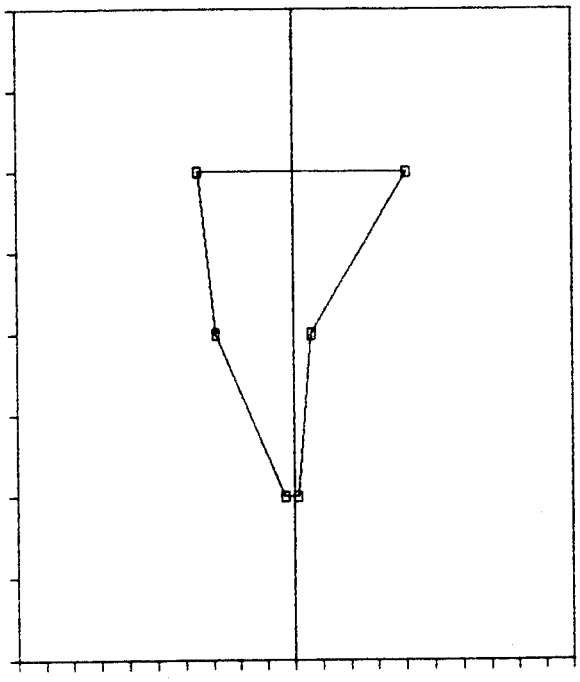

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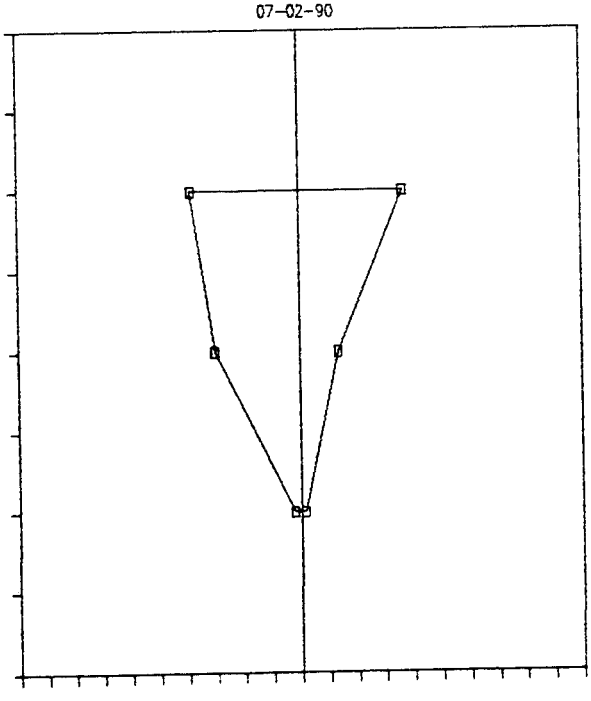

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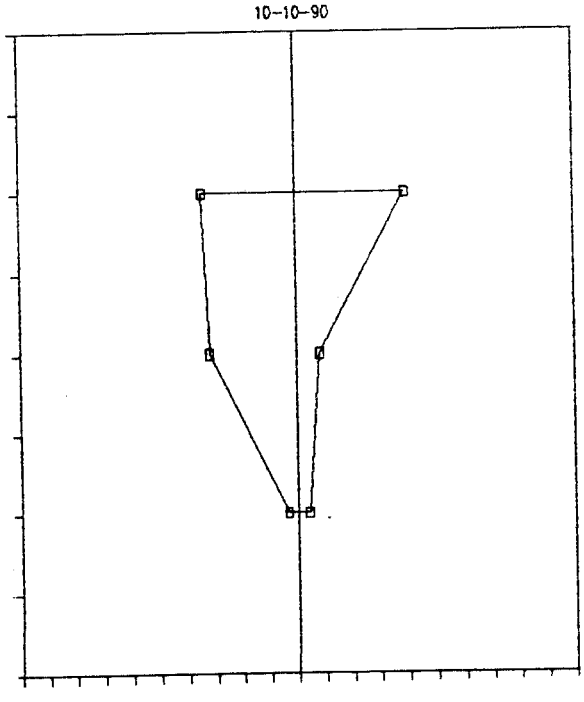
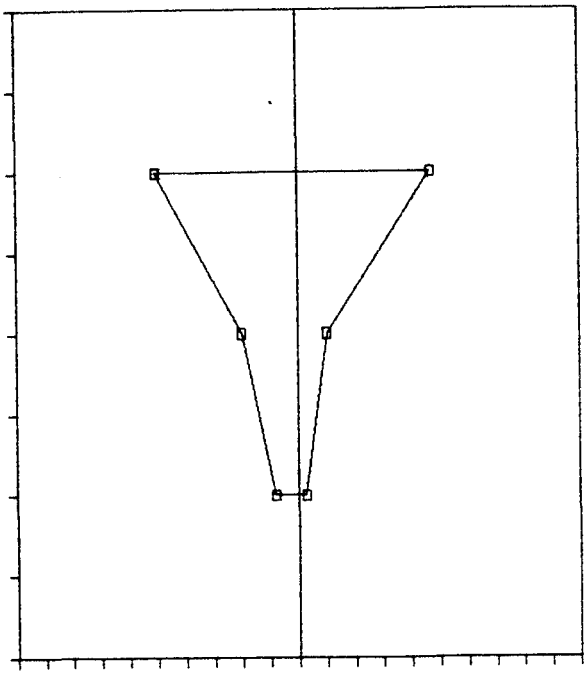
10-10-90



NORTH HORN FORMATION

79-38

07-03-90



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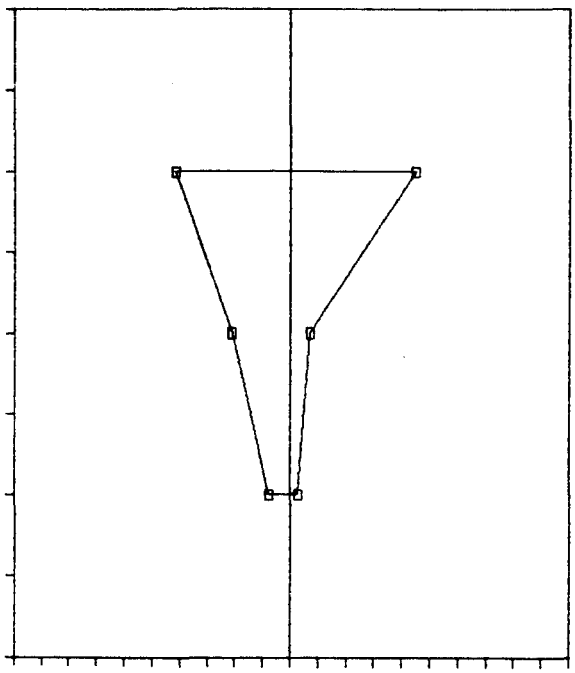

80-47

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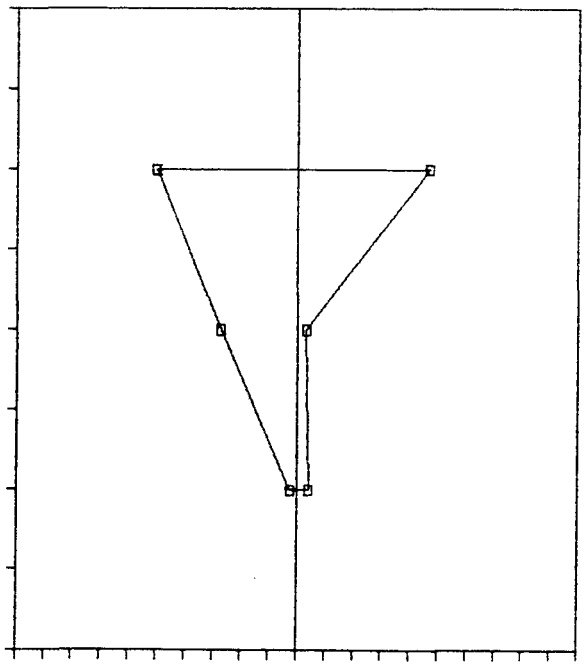

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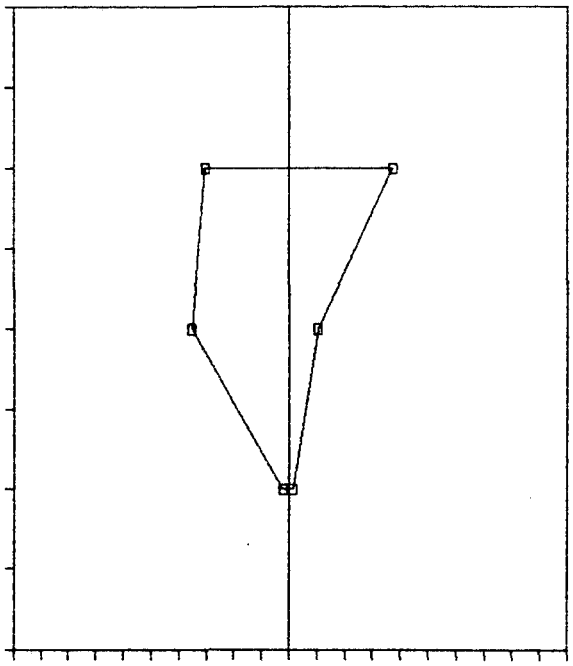

NORTH HORN FORMATION

79-29

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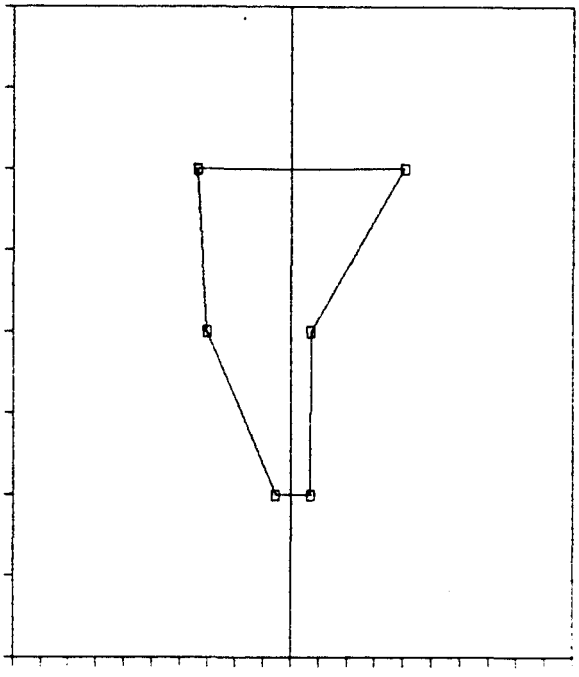

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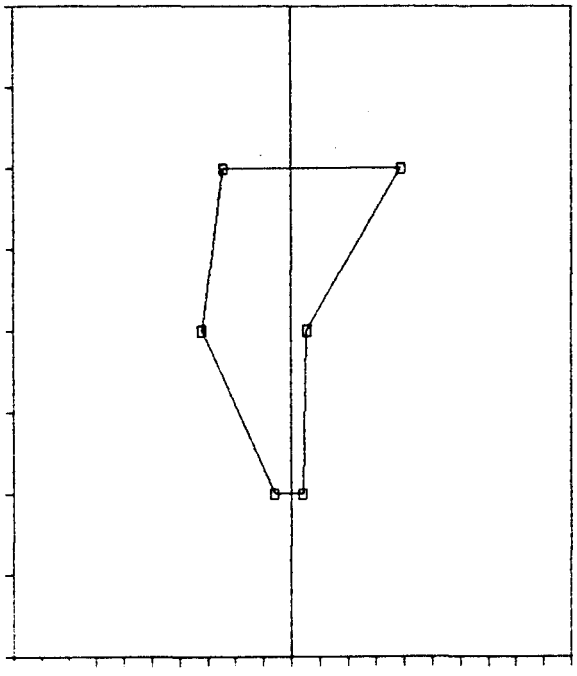

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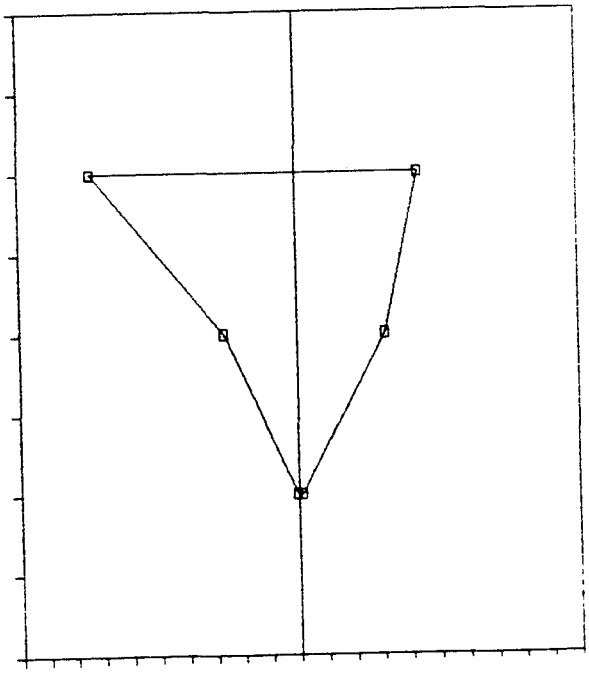
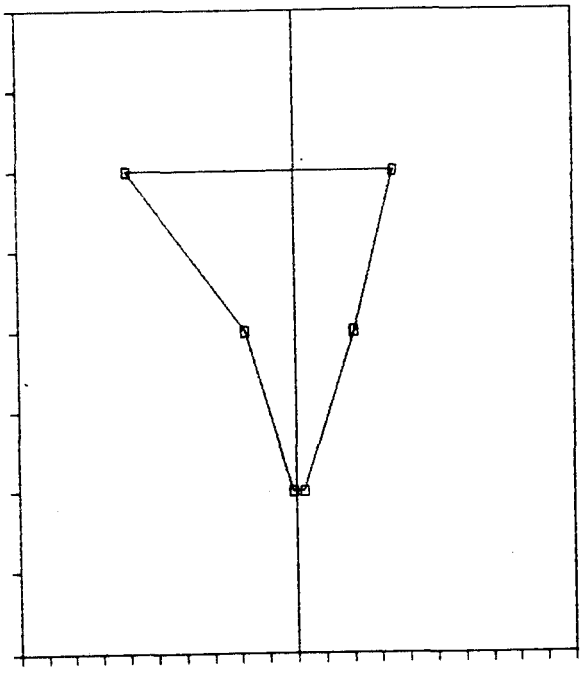


TEDS TUB

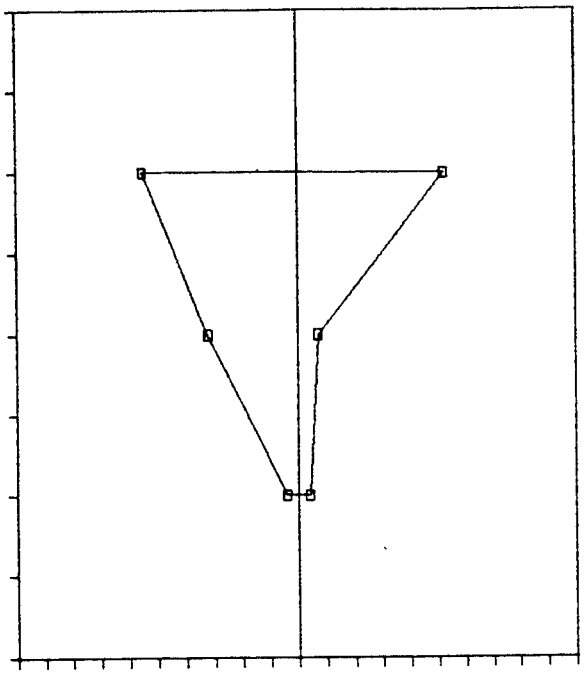
07-03-90



PRICE RIVER FORMATION

82-52

07-03-90



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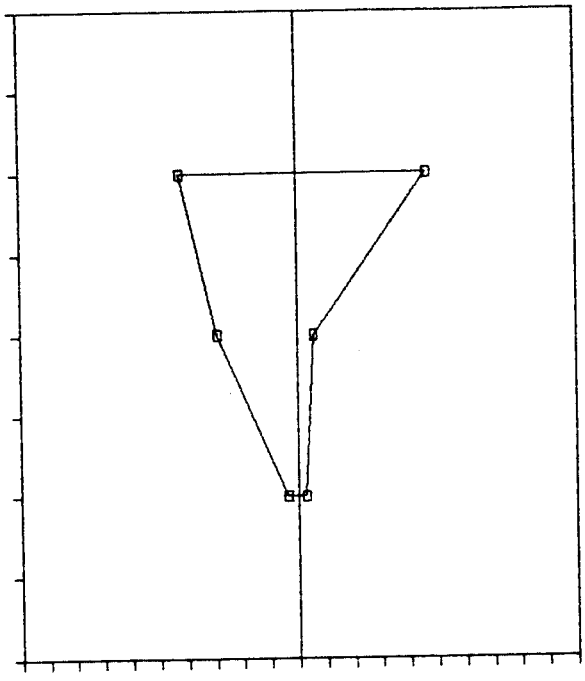

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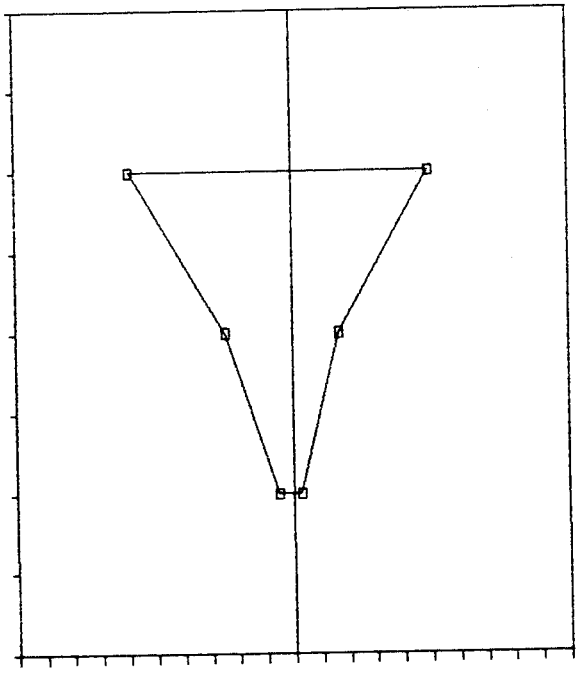

COMMERCIAL TESTING & ENGINEERING CO.
GENERAL OFFICES: 1919 SOUTH HIGHLAND AVE., SUITE 210-B, LOMBARD, ILLINOIS 60148 • (312) 953-9300
SINCE 1908
Member of the SGS Group (Société Générale de Surveillance)

PLEASE ADDRESS ALL CORRESPONDENCE TO:
P.O. BOX 1020, HUNTINGTON, UT 84528
TELEPHONE: (801) 653-2311

July 12, 1990

Job No.: 59 10481

Date Rec'd: July 3, 1990

Date Sampled: July 2, 1990

Sampled By: UF&L

Utah Power and Light Co.
P.O. Box 1005
Huntington UT 84528

Sample ID: UF&L

ELK SPRINGS
Temperature 39 degrees
Flow 130.8 gpm
Rec'd 1000 gpm
Sampled 1305 hr.
FIELD MEASUREMENTS
pH 8.24
Conductivity 337

WATER ANALYSIS

Alk., Bicarbonate 07-10-90	364	mg/l HCO3	Iron 07-12-90	0.03	mg/l
Alk., Carbonate 07-10-90	1<	mg/l CaCO3	Magnesium 07-12-90	25.10	mg/l
Alk., Total 07-10-90	298	mg/l CaCO3	Manganese 07-12-90	0.01<	mg/l
Anions, Total	7.67	meq/l	Oxygen, Dissolved 07-03-90	6.9	mg/l
Calcium 07-12-90	109.2	mg/l	pH 07-03-90	7.80	Units
Cations, Total	7.64	meq/l	Potassium 07-12-90	0.10	mg/l
Chloride 07-10-90	10.0	mg/l	Sodium 07-12-90	2.78	mg/l
Conductivity 07-10-90	475	umhos/cm	Solids, Dissolved 07-11-90	229.0	mg/l
Hardness, Total	376	mg/l CaCO3	Solids, Suspended 07-11-90	1.0<	mg/l
			Sulfate 07-12-90	75.0	mg/l

RECEIVED
JUL 16 1990
MINING DIV.
SALT LAKE OFFICE

ANALYST: June Komar

Respectfully submitted,
COMMERCIAL TESTING & ENGINEERING CO.

Manager, Huntington Laboratory

Original Copy Watermarked
For Your Protection

OVER 40 BRANCH LABORATORIES STRATEGICALLY LOCATED IN PRINCIPAL COAL MINING AREAS,
TIDEWATER AND GREAT LAKES PORTS, AND RIVER LOADING FACILITIES

COMMERCIAL TESTING & ENGINEERING CO.
GENERAL OFFICES: 1919 SOUTH HIGHLAND AVE., SUITE 210-B, LOMBARD, ILLINOIS 60148 • (312) 953-9300
SINCE 1908
Member of the SGS Group (Société Générale de Surveillance)

PLEASE ADDRESS ALL CORRESPONDENCE TO:
P.O. BOX 1020, HUNTINGTON, UT 84528
TELEPHONE: (801) 653-2311

July 12, 1990

Job No.: 59 10482

Date Rec'd: July 3, 1990

Date Sampled: July 2, 1990

Sampled By: UF&L

Utah Power and Light Co.
P.O. Box 1005
Huntington UT 84528

Sample ID: UF&L

SHEBA SPRINGS
Temperature 41 degrees
Flow 8.1 gpm
Rec'd 1000 gpm
Sampled 1010 hr.
FIELD MEASUREMENTS
pH 7.4
Conductivity 308

WATER ANALYSIS

Alk., Bicarbonate 07-10-90	328	mg/l HCO3	Iron 07-12-90	0.13	mg/l
Alk., Carbonate 07-10-90	1<	mg/l CaCO3	Magnesium 07-12-90	8.90	mg/l
Alk., Total 07-10-90	269	mg/l CaCO3	Manganese 07-12-90	0.01<	mg/l
Anions, Total	6.09	meq/l	Oxygen, Dissolved 07-03-90	6.7	mg/l
Calcium 07-12-90	109.2	mg/l	pH 07-03-90	7.30	Units
Cations, Total	6.28	meq/l	Potassium 07-12-90	0.16	mg/l
Chloride 07-10-90	15.0	mg/l	Sodium 07-12-90	2.07	mg/l
Conductivity 07-10-90	410	umhos/cm	Solids, Dissolved 07-11-90	212.0	mg/l
Hardness, Total	309	mg/l CaCO3	Solids, Suspended 07-11-90	6.0	mg/l
			Sulfate 07-12-90	20.0	mg/l

ANALYST: June Koman

JUL 16 1990
G DIV.
FIELD OFFICE

Respectfully submitted,
COMMERCIAL TESTING & ENGINEERING CO.

Manager, Huntington Laboratory

Original Copy Watermarked
For Your Protection

OVER 40 BRANCH LABORATORIES STRATEGICALLY LOCATED IN PRINCIPAL COAL MINING AREAS,
TIDEWATER AND GREAT LAKES PORTS, AND RIVER LOADING FACILITIES

COMMERCIAL TESTING & ENGINEERING CO.
GENERAL OFFICES: 1919 SOUTH HIGHLAND AVE., SUITE 210-B, LOMBARD, ILLINOIS 60148 • (312) 953-9300
SINCE 1908
Member of the SGS Group (Société Générale de Surveillance)

PLEASE ADDRESS ALL CORRESPONDENCE TO:
P.O. BOX 1020, HUNTINGTON, UT 84528
TELEPHONE: (801) 653-2311

July 13, 1990

Job No.: 59 10499

Date Rec'd: July 5, 1990

Date Sampled: July 3, 1990

Sampled By: UP&L

Utah Power and Light Co.
P.O. Box 1005
Huntington UT 84528

Sample ID: UP&L

EMS TED'S
Temperature 52 degrees
Flow 13.0 gpm
Rec'd 0800 hr.
Sampled 1140 hr.
FIELD MEASUREMENTS
pH 7.59
Conductivity 435

WATER ANALYSIS

Alk., Bicarbonate	353	mg/l HCO3	Iron	0.30	mg/l
07-10-90		09:50 hr.	07-09-90		13:15 hr.
Alk., Carbonate	1<	mg/l CaCO3	Magnesium	21.80	mg/l
07-10-90		9:50 hr.	07-09-90		13:15 hr.
Alk., Total	289	mg/l CaCO3	Manganese	0.01<	mg/l
07-10-90		9:50 hr.	07-09-90		13:45 hr.
Anions, Total	8.02	meq/l	Oxygen, Dissolved	7.7	mg/l
			07-05-90		17:00 hr.
Calcium	120.0	mg/l	pH	7.60	Units
07-09-90		13:00 hr.	07-05-90		16:45 hr.
Cations, Total	8.08	meq/l	Potassium	0.00<	mg/l
			07-09-90		14:15 hr.
Chloride	10.0	mg/l	Sodium	6.71	mg/l
07-10-90		15:45 hr.	07-09-90		14:00 hr.
Conductivity	450	umhos/cm	Solids, Dissolved	271.0	mg/l
07-10-90		13:25 hr.	07-12-90		16:30 hr.
Hardness, Total	389	mg/l CaCO3	Solids, Suspended	1.0<	mg/l
			07-12-90		16:30 hr.
			Sulfate	100.0	mg/l
			07-12-90		14:30 hr.

JUL 1 6 1990

ANALYST: June Komar

Respectfully submitted,
COMMERCIAL TESTING & ENGINEERING CO.

FIELD OFFICE

Manager, Huntington Laboratory

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GENERAL OFFICES: 1919 SOUTH HIGHLAND AVE., SUITE 210-B, LOMBARD, ILLINOIS 60148 • (312) 953-9300
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PLEASE ADDRESS ALL CORRESPONDENCE TO:
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TELEPHONE: (801) 653-2311

July 13, 1990

Job No.: 59 10492

Date Rec'd: July 5, 1990

Date Sampled: July 3, 1990

Sampled By: UP&L

Utah Power and Light Co.
P.O. Box 1005
Huntington UT 84528

Sample ID: UP&L

EMS 79-2
Temperature 47 degrees
Flow none
Rec'd 0800 hr.
Sampled 1435 hr.
FIELD MEASUREMENTS
pH 7.5
Conductivity 486

WATER ANALYSIS

Alk., Bicarbonate	409	mg/l HCO3	Iron	0.29	mg/l
07-10-90		09:50 hr.	07-09-90		13:30 hr.
Alk., Carbonate	1<	mg/l CaCO3	Magnesium	23.90	mg/l
07-10-90		09:50 hr.	07-09-90		13:15 hr.
Alk., Total	335	mg/l CaCO3	Manganese	0.01<	mg/l
07-10-90		09:50 hr.	07-09-90		13:45 hr.
Anions, Total	7.72	meq/l	Oxygen, Dissolved	7.0	mg/l
			07-05-90		17:00 hr.
Calcium	109.0	mg/l	pH	7.30	Units
07-09-90		13:00 hr.	07-05-90		16:45 hr.
Cations, Total	7.95	meq/l	Potassium	0.11	mg/l
			07-09-90		14:15 hr.
Chloride	5.0	mg/l	Sodium	12.60	mg/l
07-10-90		15:45 hr.	07-09-90		14:00 hr.
Conductivity	550	umhos/cm	Solids, Dissolved	317.0	mg/l
07-10-90		13:25 hr.	07-12-90		16:30 hr.
Hardness, Total	371	mg/l CaCO3	Solids, Suspended	1.0<	mg/l
			07-12-90		16:30 hr.
			Sulfate	50.0	mg/l
			07-12-90		14:30 hr.

ANALYST: June Koman

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PLEASE ADDRESS ALL CORRESPONDENCE TO:
P.O. BOX 1020, HUNTINGTON, UT 84528
TELEPHONE: (801) 653-2311

July 13, 1990

Job No.: 59 10483

Date Rec'd: July 3, 1990

Date Sampled: July 2, 1990

Sampled By: UP&L

Utah Power and Light Co.
P.O. Box 1005
Huntington UT 84528

Sample ID: UP&L

EMS 70-10
Temperature 46 degrees
Flow 10.2 gpm
Rec'd 1000 gpm
Sampled 0945 hr.
FIELD MEASUREMENTS
pH 8.08
Conductivity 389

WATER ANALYSIS

Alk., Bicarbonate	362	mg/l HCO3	Iron	0.02<	mg/l
07-10-90		09:50 hr.	07-09-90		13:30 hr.
Alk., Carbonate	1<	mg/l CaCO3	Magnesium	24.40	mg/l
07-10-90		09:50 hr.	07-09-90		13:15 hr.
Alk., Total	297	mg/l CaCO3	Manganese	0.01<	mg/l
07-10-90		09:50 hr.	07-09-90		13:45 hr.
Anions, Total	7.37	meq/l	Oxygen, Dissolved	6.9	mg/l
			07-03-90		17:15 hr.
Calcium	105.3	mg/l	pH	7.60	Units
07-09-90		13:00 hr.	07-03-90		16:15 hr.
Cations, Total	7.42	meq/l	Potassium	0.12	mg/l
			07-09-90		14:15 hr.
Chloride	15.0	mg/l	Sodium	3.48	mg/l
07-10-90		15:45 hr.	07-09-90		14:00 hr.
Conductivity	500	umhos/cm	Solids, Dissolved	211.0	mg/l
07-10-90		13:25 hr.	07-12-90		16:30 hr.
Hardness, Total	363	mg/l CaCO3	Solids, Suspended	3.0	mg/l
			07-12-90		16:30 hr.
			Sulfate	55.0	mg/l
			07-12-90		14:30 hr.

ANALYST: June Komar

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PLEASE ADDRESS ALL CORRESPONDENCE TO:
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TELEPHONE: (801) 653-2311

July 13, 1990

Job No.: 59 10484

Date Rec'd: July 3, 1990

Date Sampled: July 2, 1990

Sampled By: UP&L

Utah Power and Light Co.
P.O. Box 1005
Huntington UT 84528

Sample ID: UP&L

EMS 79-15
Temperature 44 degrees
Flow 3.2 gpm
Rec'd 1000 gpm
Sampled 1420 hr.
FIELD MEASUREMENTS
pH 8.24
Conductivity 415

WATER ANALYSIS

Alk., Bicarbonate 07-10-90	412	mg/l HCO3 09:50 hr.	Iron 07-09-90	0.02<	mg/l 13:30 hr.
Alk., Carbonate 07-10-90	1<	mg/l CaCO3 09:50 hr.	Magnesium 07-09-90	24.20	mg/l 13:15 hr.
Alk., Total 07-10-90	338	mg/l CaCO3 09:50 hr.	Manganese 07-09-90	0.01<	mg/l 13:45 hr.
Anions, Total	7.92	meq/l	Oxygen, Dissolved 07-03-90	6.7	mg/l 17:15 hr.
Calcium 07-09-90	113.0	mg/l 13:00 hr.	pH 07-03-90	7.50	Units 16:15 hr.
Cations, Total	7.80	meq/l	Potassium 07-09-90	0.14	mg/l 14:15 hr.
Chloride 07-10-90	10.0	mg/l 15:45 hr.	Sodium 07-09-90	3.75	mg/l 14:00 hr.
Conductivity 07-10-90	505	umhos/cm 13:25 hr.	Solids, Dissolved 07-12-90	276.0	mg/l 16:30 hr.
Hardness, Total	382	mg/l CaCO3	Solids, Suspended 07-12-90	2.0	mg/l 16:30 hr.
			Sulfate 07-12-90	50.0	mg/l 14:30 hr.

ANALYST: June Komar

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MINING DIV
FIELD OFFICE

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PLEASE ADDRESS ALL CORRESPONDENCE TO:
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TELEPHONE: (801) 653-2311

July 13, 1990

Job No.: 59 10495

Date Rec'd: July 5, 1990

Date Sampled: July 3, 1990

Sampled By: UP&L

Utah Power and Light Co.
P.O. Box 1005
Huntington UT 84528

Sample ID: UP&L

EMS 79-28
Temperature 47 degrees
Flow 1.8 gpm
Rec'd 0800 hr.
Sampled 1110 hr.
FIELD MEASUREMENTS
pH 7.31
Conductivity 582

WATER ANALYSIS

Alk., Bicarbonate 07-10-90	345	mg/l HCO3 09:50 hr.	Manganese 07-09-90	0.01<	mg/l 13:45 hr.
Alk., Carbonate 07-10-90	1<	mg/l CaCO3 09:50 hr.	Oxygen, Dissolved 07-05-90	7.2	mg/l 17:00 hr.
Alk., Total 07-10-90	283	mg/l CaCO3 09:50 hr.	pH 07-05-90	7.30	Units 16:45 hr.
Calcium 07-09-90	123.4	mg/l 13:00 hr.	Potassium 07-09-90	1.01	mg/l 14:15 hr.
Cations, Total	9.42	meq/l	Sodium 07-09-90	19.37	mg/l 14:00 hr.
Conductivity 07-10-90	650	umhos/cm 13:25 hr.	Solids, Dissolved 07-12-90	438.0	mg/l 16:30 hr.
Hardness, Total	428	mg/l CaCO3	Solids, Suspended 07-12-90	15.0	mg/l 16:30 hr.
Iron 07-09-90	0.35	mg/l 13:30 hr.	Sulfate 07-12-90	175.0	mg/l 14:30 hr.
Magnesium 07-09-90	29.20	mg/l 13:15 hr.			

ANALYST: June Koman

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PLEASE ADDRESS ALL CORRESPONDENCE TO:
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TELEPHONE: (801) 653-2311

July 13, 1990

Job No.: 59 10498

Date Rec'd: July 5, 1990

Date Sampled: July 3, 1990

Sampled By: UP&L

Utah Power and Light Co.
P.O. Box 1005
Huntington UT 84528

Sample ID: UP&L

EMS 79-29
Temperature 47 degrees
Flow 1.3 gpm
Rec'd 0800 hr.
Sampled 1050 hr.
FIELD MEASUREMENTS
pH 7.72
Conductivity 487

WATER ANALYSIS

Alk., Bicarbonate 07-10-90	405	mg/l HCO3 09:50 hr.	Iron 07-09-90	0.25	mg/l 13:30 hr.
Alk., Carbonate 07-10-90	1<	mg/l CaCO3 09:50 hr.	Magnesium 07-09-90	36.60	mg/l 13:15 hr.
Alk., Total 07-10-90	332	mg/l CaCO3 09:50 hr.	Manganese 07-09-90	0.01<	mg/l 13:45 hr.
Anions, Total	7.91	meq/l	Oxygen, Dissolved 07-05-90	7.1	mg/l 17:00 hr.
Calcium 07-09-90	67.3	mg/l 13:00 hr.	pH 07-05-90	7.40	Units 16:45 hr.
Cations, Total	7.84	meq/l	Potassium 07-09-90	0.00<	mg/l 14:15 hr.
Chloride 07-10-90	25.0	mg/l 15:45 hr.	Sodium 07-09-90	34.30	mg/l 14:00 hr.
Conductivity 07-10-90	600	umhos/cm 13:25 hr.	Solids, Dissolved 07-12-90	334.0	mg/l 16:30 hr.
Hardness, Total	319	mg/l CaCO3	Solids, Suspended 07-12-90	2.0	mg/l 16:30 hr.
			Sulfate 07-12-90	35.0	mg/l 14:30 hr.

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ANALYST: June Komes

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TELEPHONE: (801) 653-2311

July 13, 1990

Job No.: 59 10485

Date Rec'd: July 3, 1990

Date Sampled: July 2, 1990

Sampled By: UP&L

Utah Power and Light Co.
P.O. Box 1005
Huntington UT 84528

Sample ID: UP&L

EMS 79-35
Temperature 45 degrees
Flow 1.9 gpm
Rec'd 1000 gpm
Sampled 1345 hr.
FIELD MEASUREMENTS
pH 8.46
Conductivity 339

WATER ANALYSIS

Alk., Bicarbonate	355	mg/l HCO3	Iron	0.34	mg/l
07-10-90		09:50 hr.	07-09-90		13:30 hr.
Alk., Carbonate	1<	mg/l CaCO3	Magnesium	17.40	mg/l
07-10-90		09:50 hr.	07-09-90		13:15 hr.
Alk., Total	291	mg/l CaCO3	Manganese	0.03	mg/l
07-10-90		09:50 hr.	07-09-90		13:45 hr.
Anions, Total	8.58	meq/l	Oxygen, Dissolved	6.7	mg/l
			07-03-90		17:15 hr.
Calcium	140.0	mg/l	pH	7.70	Units
07-09-90		13:00 hr.	07-03-90		16:15 hr.
Cations, Total	8.54	meq/l	Potassium	0.13	mg/l
			07-09-90		14:15 hr.
Chloride	10.0	mg/l	Sodium	2.61	mg/l
07-10-90		15:45 hr.	07-09-90		14:00 hr.
Conductivity	425	umhos/cm	Solids, Dissolved	259.0	mg/l
07-10-90		13:25 hr.	07-12-90		16:30 hr.
Hardness, Total	421	mg/l CaCO3	Solids, Suspended	4.0	mg/l
			07-12-90		16:30 hr.
			Sulfate	125.0	mg/l
			07-12-90		14:30 hr.

ANALYST: June Komas

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PLEASE ADDRESS ALL CORRESPONDENCE TO:
P.O. BOX 1020, HUNTINGTON, UT 84528
TELEPHONE: (801) 653-2311

July 13, 1990

Job No.: 59 10494

Date Rec'd: July 5, 1990

Date Sampled: July 3, 1990

Sampled By: UP&L

Utah Power and Light Co.
P.O. Box 1005
Huntington UT 84528

Sample ID: UP&L

EMS 79-38
Temperature 47 degrees
Flow 7.8 gpm
Rec'd 0800 hr.
Sampled 1245 hr.
FIELD MEASUREMENTS
pH 7.28
Conductivity 529

WATER ANALYSIS

Alk., Bicarbonate 07-10-90	471	mg/l HCO3 09:50 hr.	Iron 07-09-90	0.34	mg/l 13:30 hr.
Alk., Carbonate 07-10-90	1<	mg/l CaCO3 09:50 hr.	Magnesium 07-09-90	24.10	mg/l 13:15 hr.
Alk., Total 07-10-90	386	mg/l CaCO3 09:50 hr.	Manganese 07-09-90	0.01<	mg/l 13:45 hr.
Anions, Total	8.86	meq/l	Oxygen, Dissolved 07-05-90	7.8	mg/l 17:00 hr.
Calcium 07-09-90	100.7	mg/l 13:00 hr.	pH 07-05-90	7.60	Units 16:45 hr.
Cations, Total	9.12	meq/l	Potassium 07-09-90	0.84	mg/l 14:15 hr.
Chloride 07-10-90	10.0	mg/l 13:25 hr.	Sodium 07-09-90	48.64	mg/l 14:00 hr.
Conductivity 07-10-90	600	umhos/cm 13:25 hr.	Solids, Dissolved 07-12-90	384.0	mg/l 16:30 hr.
Hardness, Total	351	mg/l CaCO3	Solids, Suspended 07-12-90	19.0	mg/l 16:30 hr.
			Sulfate 07-12-90	50.0	mg/l 14:30 hr.

JUL 16 1990

ANALYST: June Komar

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TELEPHONE: (801) 653-2311

July 13, 1990

Job No.: 59 10496

Date Rec'd: July 5, 1990

Date Sampled: July 3, 1990

Sampled By: UP&L

Utah Power and Light Co.
P.O. Box 1005
Huntington UT 84528

Sample ID: UP&L

EMS 80-47
Temperature 46 degrees
Flow 2.0 gpm
Rec'd 0800 hr.
Sampled 1500 hr.
FIELD MEASUREMENTS
pH 7.73
Conductivity 510

WATER ANALYSIS

Alk., Bicarbonate	467	mg/l HCO3	Iron	0.26	mg/l
07-10-90		09:50 hr.	07-09-90		13:30 hr.
Alk., Carbonate	1<	mg/l CaCO3	Magnesium	33.10	mg/l
07-10-90		09:50 hr.	07-09-90		13:45 hr.
Alk., Total	383	mg/l CaCO3	Manganese	0.01<	mg/l
07-10-90		09:50 hr.	07-09-90		13:45 hr.
Anions, Total	8.20	meq/l	Oxygen, Dissolved	7.3	mg/l
			07-05-90		17:00 hr.
Calcium	100.2	mg/l	pH	7.90	Units
07-09-90		13:00 hr.	07-05-90		16:45 hr.
Cations, Total	8.40	meq/l	Potassium	0.72	mg/l
			07-09-90		14:15 hr.
Chloride	15.0	mg/l	Sodium	15.27	mg/l
07-10-90		15:45 hr.	07-09-90		14:00 hr.
Conductivity	530	umhos/cm	Solids, Dissolved	319.0	mg/l
07-10-90		13:25 hr.	07-10-90		16:30 hr.
Hardness, Total	387	mg/l CaCO3	Solids, Suspended	15.0	mg/l
			07-10-90		16:30 hr.
			Sulfate	15.0	mg/l
			07-12-90		14:30 hr.

ANALYST: June Komar

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COMMERCIAL TESTING & ENGINEERING CO.
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PLEASE ADDRESS ALL CORRESPONDENCE TO:
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TELEPHONE: (801) 653-2311

July 13, 1990

Job No.: 59 10486

Date Rec'd: July 3, 1990

Date Sampled: July 2, 1990

Sampled By: UP&L

Utah Power and Light Co.
P.O. Box 1005
Huntington UT 84528

Sample ID: UP&L

EMS 80-48
Temperature 52 degrees
Flow 0.13 gpm
Rec'd 1000 gpm
Sampled 1045 hr.
FIELD MEASUREMENTS
pH 7.68
Conductivity 506

WATER ANALYSIS

Alk., Bicarbonate	437	mg/l HCO3	Iron	2.00	mg/l
07-10-90		09:50 hr.	07-09-90		13:30 hr.
Alk., Carbonate	1<	mg/l CaCO3	Magnesium	32.20	mg/l
07-10-90		09:50 hr.	07-09-90		13:15 hr.
Alk., Total	358	mg/l CaCO3	Manganese	0.50	mg/l
07-10-90		09:50 hr.	07-09-90		13:45 hr.
Anions, Total	10.27	meq/l	Oxygen, Dissolved	6.6	mg/l
			07-03-90		17:15 hr.
Calcium	147.7	mg/l	pH	8.10	Units
07-09-90		13:30 hr.	07-03-90		16:15 hr.
Cations, Total	10.14	meq/l	Potassium	0.00<	mg/l
			07-09-90		14:15 hr.
Chloride	5.0	mg/l	Sodium	2.61	mg/l
07-10-90		15:45 hr.	07-09-90		14:00 hr.
Conductivity	505	umhos/cm	Solids, Dissolved	325.0	mg/l
07-10-90		13:25 hr.	07-12-90		16:30 hr.
Hardness, Total	501	mg/l CaCO3	Solids, Suspended	45.0	mg/l
			07-12-90		16:30 hr.
			Sulfate	150.0	mg/l
			07-12-90		14:30 hr.

ANALYST: June Komar

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PLEASE ADDRESS ALL CORRESPONDENCE TO:
P.O. BOX 1020, HUNTINGTON, UT 84528
TELEPHONE: (801) 653-2311

July 13, 1990

Job No.: 59 10493

Date Rec'd: July 5, 1990

Date Sampled: July 3, 1990

Sampled By: UP&L

Utah Power and Light Co.
P.O. Box 1005
Huntington UT 84528

Sample ID: UP&L

EMS 82-52
Temperature 43 degrees
Flow 1.2 GPM
Rec'd 0800 hr.
Sampled 1315 hr.
FIELD MEASUREMENTS
pH 7.37
Conductivity 543

WATER ANALYSIS

Alk., Bicarbonate	523	mg/l HCO3	Iron	0.33	mg/l
07-10-90		09:50 hr.	07-09-90		13:30 hr.
Alk., Carbonate	1<	mg/l CaCO3	Magnesium	38.90	mg/l
07-10-90		09:50 hr.	07-09-90		13:15 hr.
Alk., Total	429	mg/l CaCO3	Manganese	0.01<	mg/l
07-10-90		09:50 hr.	07-09-90		13:45 hr.
Anions, Total	9.52	meq/l	Oxygen, Dissolved	7.5	mg/l
			07-05-90		17:00 hr.
Calcium	110.3	mg/l	pH	7.60	Units
07-09-90		13:00 hr.	07-05-90		16:45 hr.
Cations, Total	9.80	meq/l	Potassium	0.20	mg/l
			07-09-90		14:15 hr.
Chloride	15.0	mg/l	Sodium	25.37	mg/l
07-10-90		15:45 hr.	07-09-90		14:00 hr.
Conductivity	625	umhos/cm	Solids, Dissolved	406.0	mg/l
07-10-90		13:25 hr.	07-12-90		16:30 hr.
Hardness, Total	436	mg/l CaCO3	Solids, Suspended	2.0	mg/l
			07-12-90		16:30 hr.
			Sulfate	35.0	mg/l
			07-12-90		14:30 hr.

ANALYST: June Koman

JUL 16 1990
MINING DIV
FIELD OFFICE

Respectfully submitted,
COMMERCIAL TESTING & ENGINEERING CO.

M U

Manager, Huntington Laboratory

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OVER 40 BRANCH LABORATORIES STRATEGICALLY LOCATED IN PRINCIPAL COAL MINING AREAS,
TIDEWATER AND GREAT LAKES PORTS, AND RIVER LOADING FACILITIES

COMMERCIAL TESTING & ENGINEERING CO.
GENERAL OFFICES: 1919 SOUTH HIGHLAND AVE., SUITE 210-B, LOMBARD, ILLINOIS 60148 • (312) 953-9300
SINCE 1908
Member of the SGS Group (Société Générale de Surveillance)

PLEASE ADDRESS ALL CORRESPONDENCE TO:
P.O. BOX 1020, HUNTINGTON, UT 84528
TELEPHONE: (801) 653-2311

July 17, 1990

Job No.: 59 10487

Date Rec'd: July 3, 1990

Date Sampled: July 2, 1990

Sampled By: UP&L

Utah Power and Light Co.
P.O. Box 1005
Huntington UT 84528

Sample ID: UP&L

EMS 84-56
Temperature 41 degrees
Flow 1.0 gpm
Rec'd 1000 gpm
Sampled 1555 hr.
FIELD MEASUREMENTS
pH 8.41
Conductivity 412

WATER ANALYSIS

Alk., Bicarbonate 07-10-90	357	mg/l HCO3 09:50 hr.	Iron 07-09-90	0.02<	mg/l 13:30 hr.
Alk., Carbonate 07-10-90	1<	mg/l CaCO3 09:50 hr.	Magnesium 07-09-90	42.00	mg/l 13:15 hr.
Alk., Total 07-10-90	293	mg/l CaCO3 09:50 hr.	Manganese 07-09-90	0.01<	mg/l 13:45 hr.
Anions, Total	8.37	meq/l 09:50 hr.	Oxygen, Dissolved 07-03-90	6.9	mg/l 17:15 hr.
Calcium 07-09-90	85.9	mg/l 13:00 hr.	pH 07-03-90	7.30	Units 16:15 hr.
Cations, Total	8.50	meq/l	Potassium 07-09-90	0.03	mg/l 14:15 hr.
Chloride 07-10-90	20.0	mg/l 15:45 hr.	Sodium 07-09-90	17.57	mg/l 14:00 hr.
Conductivity 07-10-90	590	umhos/cm 13:25 hr.	Solids, Dissolved 07-12-90	339.0	mg/l 16:30 hr.
Hardness, Total	387	mg/l CaCO3	Solids, Suspended 07-12-90	3.0	mg/l 16:30 hr.
			Sulfate 07-12-90	100.0	mg/l 14:30 hr.

JUL 18 1990

ANALYST: June Koman

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COMMERCIAL TESTING & ENGINEERING CO.
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PLEASE ADDRESS ALL CORRESPONDENCE TO:
P.O. BOX 1020, HUNTINGTON, UT 84528
TELEPHONE: (801) 653-2311

July 25, 1990

Job No.: 59 10500

Date Rec'd: July 5, 1990

Date Sampled: July 3, 1990

Sampled By: UP&L

Utah Power and Light Co.
P.O. Box 1005
Huntington UT 84528

Sample ID: UP&L

EMS 89-60
Temperature 51 degrees
Flow 3.20 gpm
Rec'd 0800 hr.
Sampled 1235 hr.
FIELD MEASUREMENTS
pH 7.36
Conductivity 589

WATER ANALYSIS

Aluminum	0.34	mg/l	Chromium	0.02<	mg/l
07-24-90	1400 hr.		07-24-90	1400 hr.	
Alk., Bicarbonate	498	mg/l HCO3	Conductivity	690	umhos/cm
07-10-90	0950 hr.		07-10-90	1325 hr.	
Alk., Carbonate	1<	mg/l CaCO3	Copper	0.010<	mg/l
07-10-90	0950 hr.		07-24-90	1030 hr.	
Alk., Total	408	mg/l CaCO3	Fluoride	0.31	mg/l
07-10-90	0950 hr.		07-10-90	1530 hr.	
Arsenic	0.002<	mg/l	Hardness, Total	417	mg/l CaCO3
07-20-90	0900 hr.				
Anions, Total	9.92	meq/l	Iron	0.07	mg/l
			07-12-90	1415 hr.	
Barium	0.33	mg/l	Lead	0.050<	mg/l
07-24-90	1400 hr.		07-24-90	1030 hr.	
Boron	0.14	mg/l	Magnesium	29.60	mg/l
07-18-90	0930 hr.		07-12-90	1350 hr.	
Cadmium	0.002<	mg/l	Manganese	0.01<	mg/l
07-24-90	1030 hr.		07-12-90	1400 hr.	
Calcium	118.3	mg/l	Mercury	0.002<	mg/l
07-12-90	1330 hr.		07-19-90	1400 hr.	
Cations, Total	9.76	meq/l	Molybdenum	0.10<	mg/l
			07-24-90	1400 hr.	
Chloride	10.0	mg/l	Nickel	0.02<	mg/l
07-10-90	0930 hr.		07-24-90	1030 hr.	

ANALYST: D. Tipon

Respectfully submitted,
COMMERCIAL TESTING & ENGINEERING CO.

Manager, Huntington Laboratory

JUL 26 1990
MINING DIV.
FIELD OFFICE

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OVER 40 BRANCH LABORATORIES STRATEGICALLY LOCATED IN PRINCIPAL COAL MINING AREAS,
TIDEWATER AND GREAT LAKES PORTS, AND RIVER LOADING FACILITIES

COMMERCIAL TESTING & ENGINEERING CO.
GENERAL OFFICES: 1919 SOUTH HIGHLAND AVE., SUITE 210-B, LOMBARD, ILLINOIS 60148 • (312) 953-9300
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PLEASE ADDRESS ALL CORRESPONDENCE TO:
P.O. BOX 1020, HUNTINGTON, UT 84528
TELEPHONE: (801) 653-2311

July 25, 1990

Job No.: 59 10500

Date Rec'd: July 5, 1990

Date Sampled: July 3, 1990

Sampled By: UP&L

Utah Power and Light Co.
P.O. Box 1005
Huntington UT 84528

Sample ID: UP&L

EMS 89-60
Temperature 51 degrees
Flow 3.20 gpm
Rec'd 0800 hr.
Sampled 1235 hr.
FIELD MEASUREMENTS
pH 7.36
Conductivity 589

WATER ANALYSIS

Nitrogen, Ammonia	0.00	mg/l	Selenium	0.002<	mg/l
07-12-90	1530 hr.		07-20-90	1000 hr.	
Nitrogen, Nitrate	0.05	mg/l	Sodium	33.03	mg/l
07-13-90	1230 hr.		07-12-90	1430 hr.	
Nitrogen, Nitrite	0.01<	mg/l	Solids, Dissolved	408.0	mg/l
07-13-90	1230 hr.		07-12-90	1630 hr.	
Oxygen, Dissolved	6.5	mg/l	Solids, Suspended	6.0	mg/l
07-05-90	1700 hr.		07-12-90	1630 hr.	
pH	7.50	Units	Sulfate	80.0	mg/l
07-05-90	1645 hr.		07-12-90	1430 hr.	
Phosphorus, Total	0.03	mg/l	Zinc	0.00<	mg/l
07-06-90	1430 hr.		07-24-90	1030 hr.	
Potassium	0.00<	mg/l	Sulfide	1.00<	mg/l
07-12-90	1445 hr.		07-12-90	0830 hr.	

JUL 30 1990
MINING DIV.
OFFICE

ANALYST: D. Lyon

Respectfully submitted,
COMMERCIAL TESTING & ENGINEERING CO.

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PLEASE ADDRESS ALL CORRESPONDENCE TO
P.O. BOX 1020, HUNTINGTON, UT 84528
TELEPHONE: (801) 653-2311

July 25, 1990

Job No.: 59 10488

Date Rec'd: July 3, 1990

Date Sampled: July 2, 1990

Sampled By: UP&L

Utah Power and Light Co.
P.O. Box 1005
Huntington UT 84528

Sample ID: UP&L

EMS 89-61
Temperature 44 degrees
Flow none
Rec'd 1000 hr.
Sampled 1210 hr.
FIELD MEASUREMENTS
pH 7.85
Conductivity 380

WATER ANALYSIS

Aluminum	0.01<	mg/l	Chromium	0.02<	mg/l
07-24-90	1400 hr.		07-24-90	1400 hr.	
Alk., Bicarbonate	443	mg/l HCO3	Conductivity	485	umhos/cm
07-10-90	0950 hr.		07-10-90	1325 hr.	
Alk., Carbonate	1<	mg/l CaCO3	Copper	0.010<	mg/l
07-10-90	0950 hr.		07-24-90	1030 hr.	
Alk., Total	363	mg/l CaCO3	Fluoride	0.19	mg/l
07-10-90	0950 hr.		07-10-90	1500 hr.	
Arsenic	0.002<	mg/l	Hardness, Total	380	mg/l CaCO3
07-20-90	0900 hr.				
Anions, Total	7.79	meq/l	Iron	0.19	mg/l
			07-12-90	1415 hr.	
Barium	0.03<	mg/l	Lead	0.050<	mg/l
07-24-90	1400 hr.		07-24-90	1030 hr.	
Boron	0.04	mg/l	Magnesium	25.60	mg/l
07-18-90	0930 hr.		07-12-90	1350 hr.	
Cadmium	0.002<	mg/l	Manganese	0.01<	mg/l
07-24-90	1030 hr.		07-12-90	1400 hr.	
Calcium	110.1	mg/l	Mercury	0.002<	mg/l
07-12-90	1330 hr.		07-19-90	1400 hr.	
Cations, Total	7.99	meq/l	Molybdenum	0.10<	mg/l
			07-24-90	1400 hr.	
Chloride	5.0	mg/l	Nickel	0.02<	mg/l
07-10-90	0930 hr.		07-24-90	1030 hr.	

ANALYST: D. Tyson

Respectfully submitted,
COMMERCIAL TESTING & ENGINEERING CO.

Manager, Huntington Laboratory

JUL 30 1990
MINING DIV
FIELD OFFICE

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OVER 40 BRANCH LABORATORIES STRATEGICALLY LOCATED IN PRINCIPAL COAL MINING AREAS,
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COMMERCIAL TESTING & ENGINEERING CO.
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PLEASE ADDRESS ALL CORRESPONDENCE TO:
P.O. BOX 1020, HUNTINGTON, UT 84528
TELEPHONE: (801) 653-2311

July 25, 1990

Job No.: 59 10488

Date Rec'd: July 3, 1990

Date Sampled: July 2, 1990

Sampled By: UP&L

Utah Power and Light Co.
P.O. Box 1005
Huntington UT 84528

Sample ID: UP&L

EMS 89-61
Temperature 44 degrees
Flow none
Rec'd 1000 hr.
Sampled 1210 hr.
FIELD MEASUREMENTS
pH 7.85
Conductivity 380

WATER ANALYSIS

Nitrogen, Ammonia	0.01	mg/l	Selenium	0.002<	mg/l
07-12-90	1530 hr.		07-20-90	1000 hr.	
Nitrogen, Nitrate	0.05	mg/l	Sodium	8.33	mg/l
07-13-90	1230 hr.		07-12-90	1430 hr.	
Nitrogen, Nitrite	0.01<	mg/l	Solids, Dissolved	294.0	mg/l
07-13-90	1230 hr.		07-10-90	1630 hr.	
Oxygen, Dissolved	6.7	mg/l	Solids, Suspended	1.0<	mg/l
07-03-90	1715 hr.		07-10-90	1630 hr.	
pH	8.00	Units	Sulfate	27.0	mg/l
07-03-90	1615 hr.		07-12-90	1430 hr.	
Phosphorus, Total	0.05	mg/l	Sulfide	1.00<	mg/l
07-06-90	1430 hr.		07-12-90	0830 hr.	
Potassium	0.90	mg/l	Zinc	0.00<	mg/l
07-12-90	1445 hr.		07-24-90	1030 hr.	

ANALYST: D. Tyson

JUL 30 1990
MINING DIV
FIELD OFFICE

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OVER 40 BRANCH LABORATORIES STRATEGICALLY LOCATED IN PRINCIPAL COAL MINING AREAS,
TIDEWATER AND GREAT LAKES PORTS, AND RIVER LOADING FACILITIES

COMMERCIAL TESTING & ENGINEERING CO.
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PLEASE ADDRESS ALL CORRESPONDENCE TO
P.O. BOX 1020, HUNTINGTON, UT 84528
TELEPHONE: (801) 653-2311

July 25, 1990

Job No.: 59 10489

Date Rec'd: July 3, 1990

Date Sampled: July 2, 1990

Sampled By: UP&L

Utah Power and Light Co.
P.O. Box 1005
Huntington UT 84528

Sample ID: UP&L

EMS 89-66
Temperature 43 degrees
Flow 1.05 gpm
Rec'd 1000 hr.
Sampled 1135 hr.
FIELD MEASUREMENTS
pH 7.91
Conductivity 440

WATER ANALYSIS

Aluminum	0.01<	mg/l	Chromium	0.02<	mg/l
07-24-90	1400 hr.		07-24-90	1400 hr.	
Alk., Bicarbonate	397	mg/l HCO3	Conductivity	525	umhos/cm
07-10-90	0950 hr.		07-10-90	1325 hr.	
Alk., Carbonate	1<	mg/l CaCO3	Copper	0.010<	mg/l
07-10-90	0950 hr.		07-24-90	1030 hr.	
Alk., Total	325	mg/l CaCO3	Fluoride	0.17	mg/l
07-10-90	0950 hr.		07-10-90	1500 hr.	
Arsenic	0.002<	mg/l	Hardness, Total	370	mg/l CaCO3
07-20-90	0900 hr.				
Anions, Total	7.35	meq/l	Iron	0.28	mg/l
			07-09-90	1415 hr.	
Barium	3.45	mg/l	Lead	0.050<	mg/l
07-24-90	1400 hr.		07-24-90	1030 hr.	
Boron	0.08	mg/l	Magnesium	23.00	mg/l
07-18-90	0930 hr.		07-09-90	1350 hr.	
Cadmium	0.002<	mg/l	Manganese	0.01<	mg/l
07-24-90	1030 hr.		07-09-90	1400 hr.	
Calcium	110.4	mg/l	Mercury	0.002<	mg/l
07-09-90	1330 hr.		07-19-90	1400 hr.	
Cations, Total	7.58	meq/l	Molybdenum	0.10<	mg/l
			07-24-90	1400 hr.	
Chloride	10.0	mg/l	Nickel	0.02<	mg/l
07-10-90	0930 hr.		07-24-90	1030 hr.	

ANALYST: D. Tipon

Respectfully submitted,
COMMERCIAL TESTING & ENGINEERING CO.

Manager, Huntington Laboratory

JUL 30 1990
MINING DIV
FIELD OFFICE

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OVER 40 BRANCH LABORATORIES STRATEGICALLY LOCATED IN PRINCIPAL COAL MINING AREAS,
TIDEWATER AND GREAT LAKES PORTS, AND RIVER LOADING FACILITIES

COMMERCIAL TESTING & ENGINEERING CO.
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PLEASE ADDRESS ALL CORRESPONDENCE TO:
P.O. BOX 1020, HUNTINGTON, UT 84528
TELEPHONE: (801) 653-2311

July 25, 1990

Job No.: 59 10489

Date Rec'd: July 3, 1990

Date Sampled: July 2, 1990

Sampled By: UP&L

Utah Power and Light Co.
P.O. Box 1005
Huntington UT 84528

Sample ID: UP&L

EMS 89-66
Temperature 43 degrees
Flow 1.05 gpm
Rec'd 1000 hr.
Sampled 1135 hr.
FIELD MEASUREMENTS
pH 7.91
Conductivity 440

WATER ANALYSIS

Nitrogen, Ammonia	0.01	mg/l	Selenium	0.002<	mg/l
07-12-90	1530 hr.		07-20-90	1000 hr.	
Nitrogen, Nitrate	0.01<	mg/l	Sodium	3.56	mg/l
07-13-90	1230 hr.		07-09-90	1430 hr.	
Nitrogen, Nitrite	0.01<	mg/l	Solids, Dissolved	294.0	mg/l
07-13-90	1230 hr.		07-10-90	1630 hr.	
Oxygen, Dissolved	6.7	mg/l	Solids, Suspended	1.0<	mg/l
07-03-90	1715 hr.		07-10-90	1630 hr.	
pH	7.30	Units	Sulfate	35.0	mg/l
07-03-90	1615 hr.		07-12-90	1430 hr.	
Phosphorus, Total	0.01<	mg/l	Sulfide	1.00<	mg/l
07-06-90	1430 hr.		07-12-90	0830 hr.	
Potassium	0.94	mg/l	Zinc	0.01	mg/l
07-09-90	1445 hr.		07-24-90	1030 hr.	

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ANALYST: D. Tipon

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COMMERCIAL TESTING & ENGINEERING CO.

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OVER 40 BRANCH LABORATORIES STRATEGICALLY LOCATED IN PRINCIPAL COAL MINING AREAS,
TIDEWATER AND GREAT LAKES PORTS, AND RIVER LOADING FACILITIES

COMMERCIAL TESTING & ENGINEERING CO.
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PLEASE ADDRESS ALL CORRESPONDENCE TO:
P.O. BOX 1020, HUNTINGTON, UT 84528
TELEPHONE: (801) 653-2311

July 25, 1990

Job No.: 59 10490

Date Rec'd: July 3, 1990

Date Sampled: July 2, 1990

Sampled By: UP&L

Utah Power and Light Co.
P.O. Box 1005
Huntington UT 84528

Sample ID: UP&L

EMS 89-67
Temperature 39 degrees
Flow 3.7 gpm
Rec'd 1000 hr.
Sampled 1115 hr.
FIELD MEASUREMENTS
pH 7.65
Conductivity 377

WATER ANALYSIS

Aluminum	0.23	mg/l	Chromium	0.02<	mg/l
07-24-90	1400 hr.		07-24-90	1400 hr.	
Alk., Bicarbonate	368	mg/l HCO3	Conductivity	525	umhos/cm
07-10-90	0950 hr.		07-10-90	1325 hr.	
Alk., Carbonate	1<	mg/l CaCO3	Copper	0.010<	mg/l
07-10-90	0950 hr.		07-24-90	1030 hr.	
Alk., Total	302	mg/l CaCO3	Fluoride	0.20	mg/l
07-10-90	0950 hr.		07-10-90	1500 hr.	
Arsenic	0.002<	mg/l	Hardness, Total	342	mg/l CaCO3
07-20-90	0900 hr.				
Anions, Total	7.39	meq/l	Iron	0.13	mg/l
			07-12-90	1415 hr.	
Barium	0.50	mg/l	Lead	0.050<	mg/l
07-24-90	1400 hr.		07-24-90	1030 hr.	
Boron	0.11	mg/l	Magnesium	36.50	mg/l
07-18-90	0930 hr.		07-12-90	1350 hr.	
Cadmium	0.002<	mg/l	Manganese	0.01<	mg/l
07-24-90	1030 hr.		07-12-90	1400 hr.	
Calcium	76.8	mg/l	Mercury	0.002<	mg/l
07-12-90	1330 hr.		07-19-90	1400 hr.	
Cations, Total	7.43	meq/l	Molybdenum	0.10<	mg/l
			07-24-90	1400 hr.	
Chloride	5.0	mg/l	Nickel	0.02<	mg/l
07-10-90	0930 hr.		07-24-90	1030 hr.	

ANALYST: D. Tupon

Respectfully submitted,
COMMERCIAL TESTING & ENGINEERING CO.

Manager, Huntington Laboratory

JUL 30 1990
MINING DIV
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TIDEWATER AND GREAT LAKES PORTS, AND RIVER LOADING FACILITIES

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PLEASE ADDRESS ALL CORRESPONDENCE TO
P.O. BOX 1020, HUNTINGTON, UT 84528
TELEPHONE: (801) 653-2311

July 25, 1990

Job No.: 59 10490

Date Rec'd: July 3, 1990

Date Sampled: July 2, 1990

Sampled By: UP&L

Utah Power and Light Co.
P.O. Box 1005
Huntington UT 84528

Sample ID: UP&L

EMS 89-67
Temperature 39 degrees
Flow 3.7 gpm
Rec'd 1000 hr.
Sampled 1115 hr.
FIELD MEASUREMENTS
pH 7.65
Conductivity 377

WATER ANALYSIS

Nitrogen, Ammonia	0.00	mg/l	Selenium	0.002<	mg/l
07-12-90	1530 hr.		07-20-90	1000 hr.	
Nitrogen, Nitrate	0.05	mg/l	Sodium	13.60	mg/l
07-13-90	1230 hr.		07-12-90	1430 hr.	
Nitrogen, Nitrite	0.01<	mg/l	Solids, Dissolved	304.0	mg/l
07-13-90	1230 hr.		07-10-90	1630 hr.	
Oxygen, Dissolved	6.7	mg/l	Solids, Suspended	2.0	mg/l
07-03-90	1715 hr.		07-10-90	1630 hr.	
pH	8.00	Units	Sulfate	65.0	mg/l
07-03-90	1615 hr.		07-12-90	1430 hr.	
Phosphorus, Total	0.01<	mg/l	Sulfide	1.00<	mg/l
07-06-90	1430 hr.		07-12-90	0830 hr.	
Potassium	0.54	mg/l	Zinc	0.00<	mg/l
07-12-90	1445 hr.		07-24-90	1030 hr.	

ANALYST: D. Tipon

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COMMERCIAL TESTING & ENGINEERING CO.

Manager, Huntington Laboratory

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OVER 40 BRANCH LABORATORIES STRATEGICALLY LOCATED IN PRINCIPAL COAL MINING AREAS,
TIDEWATER AND GREAT LAKES PORTS, AND RIVER LOADING FACILITIES

COMMERCIAL TESTING & ENGINEERING CO.
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PLEASE ADDRESS ALL CORRESPONDENCE TO:
P.O. BOX 1020, HUNTINGTON, UT 84528
TELEPHONE: (801) 653-2311

August 13, 1990

Job No.: 59 10546

Date Rec'd: August 9, 1990

Date Sampled: August 8, 1990

Sampled By: UF&L

Utah Power and Light Co.
P.O. Box 1005
Huntington UT 84528

Sample ID: UF&L

EMS BURNT TREE
Temperature 68 degrees F.
Flow 4.0 gpm
Rec'd 0830 hr.
Sampled 1425 hr.
FIELD MEASUREMENTS
pH 7.61
Conductivity 491

WATER ANALYSIS

Alk., Carbonate 08-09-90 1300 hr.	1<	mg/l CaCO3	Magnesium 08-09-90 1100 hr.	27.80	mg/l
Calcium 08-09-90 1030 hr.	55.8	mg/l	Manganese 08-09-90 1115 hr.	0.01<	mg/l
Conductivity 08-09-90 1110 hr.	475	umhos/cm	Oxygen, Dissolved 08-09-90 1100 hr.	7.4	mg/l
Hardness, Total	254	mg/l CaCO3	pH 08-09-90 1000 hr.	7.80	Units

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AUG 15 1990
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ANALYST: D. Igou

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Dave Councilman

Manager, Huntington Laboratory

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PLEASE ADDRESS ALL CORRESPONDENCE TO:
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TELEPHONE: (801) 653-2311

August 13, 1990

Job No.: 59 10542

Date Rec'd: August 9, 1990

Date Sampled: August 8, 1990

Sampled By: UP&L

Utah Power and Light Co.
P.O. Box 1005
Huntington UT 84528

Sample ID: UP&L

EMS ELK SPRINGS
Temperature 40 degrees F.
Flow .19/67.1 gpm
Rec'd 0830 hr.
Sampled 1140 hr.
FIELD MEASUREMENTS
pH 7.28
Conductivity 380

WATER ANALYSIS

Alk., Carbonate	1<	mg/l CaCO3	Magnesium	35.70	mg/l
08-09-90 1300 hr.			08-09-90 1100 hr.		
Calcium	62.0	mg/l	Manganese	0.01<	mg/l
08-09-90 1030 hr.			08-09-90 1115 hr.		
Conductivity	385	umhos/cm	Oxygen, Dissolved	7.4	mg/l
08-09-90 1110 hr.			08-09-90 1100 hr.		
Hardness, Total	302	mg/l CaCO3	pH	7.90	Units
			08-09-90 1000 hr.		

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ANALYST: D. Tyson

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PLEASE ADDRESS ALL CORRESPONDENCE TO:
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TELEPHONE: (801) 653-2311

August 13, 1990

Job No.: 59 10545

Date Rec'd: August 9, 1990

Date Sampled: August 8, 1990

Sampled By: UP&L

Utah Power and Light Co.
P.O. Box 1005
Huntington UT 84528

Sample ID: UP&L

EMS SHEBA SPRINGS
Temperature 45 degrees
Flow 2.0 gpm
Rec'd 0830 hr.
Sampled 1125 hr.
FIELD MEASUREMENTS
pH 7.38
conductivity 310

WATER ANALYSIS

Alk., Carbonate	1<	mg/l CaCO3	Magnesium	10.70	mg/l
08-09-90	1300 hr.		08-09-90	1100 hr.	
Calcium	91.0	mg/l	Manganese	0.01<	mg/l
08-09-90	1030 hr.		08-09-90	1115 hr.	
Conductivity	360	umhos/cm	Oxygen, Dissolved	7.9	mg/l
08-09-90	1110 hr.		08-09-90	1100 hr.	
Hardness, Total	271	mg/l CaCO3	pH	7.40	Units
			08-09-90	1000 hr.	

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ANALYST: D. Tyson

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TELEPHONE: (801) 653-2311

August 13, 1990

Job No.: 59 10547

Date Rec'd: August 9, 1990

Date Sampled: August 8, 1990

Sampled By: UP&L

Utah Power and Light Co.
P.O. Box 1005
Huntington UT 84528

Sample ID: UP&L

EMS 79-10
Temperature 42 degrees F.
Flow 5.7 gpm
Rec'd 0830 hr.
Sampled 1100 hr.
FIELD MEASUREMENTS
pH 7.79
Conductivity 345

WATER ANALYSIS

Alk., Carbonate	1<	mg/l CaCO3	Magnesium	20.80	mg/l
08-09-90 1300 hr.			08-09-90 1100 hr.		
Calcium	73.4	mg/l	Manganese	0.01<	mg/l
08-09-90 1030 hr.			08-09-90 1115 hr.		
Conductivity	375	umhos/cm	Oxygen, Dissolved	8.4	mg/l
08-09-90 1110 hr.			08-09-90 1100 hr.		
Hardness, Total	269	mg/l CaCO3	pH	7.70	Units
			08-09-90 1000 hr.		

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ANALYST: D. Tepson

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PLEASE ADDRESS ALL CORRESPONDENCE TO:
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TELEPHONE: (801) 653-2311

August 13, 1990

Job No.: 59 10548

Date Rec'd: August 9, 1990

Date Sampled: August 8, 1990

Sampled By: UP&L

Utah Power and Light Co.
P.O. Box 1005
Huntington UT 84528

Sample ID: UP&L

EMS 79-29
Temperature 47 degrees F.
Flow 1.2 gpm
Rec'd 0830 hr.
Sampled 1315 hr.
FIELD MEASUREMENTS
pH 7.52
Conductivity 390

WATER ANALYSIS

Alk., Carbonate		1<	mg/l CaCO3	Magnesium		32.10	mg/l
08-09-90	1300 hr.			08-09-90	1100 hr.		
Calcium		39.7	mg/l	Manganese		0.01<	mg/l
08-09-90	1030 hr.			08-09-90	1115 hr.		
Conductivity		475	umhos/cm	Oxygen, Dissolved		7.3	mg/l
08-09-90	1110 hr.			08-09-90	1100 hr.		
Hardness, Total		231	mg/l CaCO3	pH		7.60	Units
				08-09-90	1000 hr.		

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ANALYST: D. Tipon

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P.O. BOX 1020, HUNTINGTON, UT 84528
TELEPHONE: (801) 653-2311

August 13, 1990

Job No.: 59 10544

Sample ID: UP&L

Date Rec'd: August 9, 1990

EMS 79-35
Temperature 47 degrees F.
Flow 2.0 gpm
Rec'd 0830 hr.
Sampled 1745 hr.

Date Sampled: August 8, 1990

Sampled By: UP&L

FIELD MEASUREMENTS
pH 7.40
Conductivity 315

Utah Power and Light Co.
P.O. Box 1005
Huntington UT 84528

WATER ANALYSIS

Alk., Carbonate	1<	mg/l CaCO3	Magnesium	14.80	mg/l
08-09-90	1300 hr.		08-09-90	1100 hr.	
Calcium	84.6	mg/l	Manganese	0.01<	mg/l
08-09-90	1030 hr.		08-09-90	1115 hr.	
Conductivity	355	umhos/cm	Oxygen, Dissolved	7.9	mg/l
08-09-90	1110 hr.		08-09-90	1100 hr.	
Hardness, Total	272	mg/l CaCO3	pH	7.80	Units
			08-09-90	1000 hr.	

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ANALYST: R. Tipon

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August 13, 1990

Job No.: 59 10543

Sample ID: UF&L

Date Rec'd: August 9, 1990

Date Sampled: August 8, 1990

Sampled By: UF&L

EMS 82-52
Temperature 48 degrees F.
Flow 1.5 gpm
Rec'd 0830 hr.
Sampled 1440 hr.

FIELD MEASUREMENTS
pH 7.56
Conductivity 454

Utah Power and Light Co.
P.O. Box 1005
Huntington UT 84528

WATER ANALYSIS

Alk., Carbonate	1<	mg/l $CaCO_3$	Magnesium	33.40	mg/l
08-09-90	1300 hr.		08-09-90	1100 hr.	
Calcium	76.8	mg/l	Manganese	0.01<	mg/l
08-09-90	1030 hr.		08-09-90	1115 hr.	
Conductivity	525	umhos/cm	Oxygen, Dissolved	7.4	mg/l
08-09-90	1110 hr.		08-09-90	1100 hr.	
Hardness, Total	329	mg/l $CaCO_3$	pH	7.80	Units
			08-09-90	1000 hr.	

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ANALYST: D. Lyon

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PLEASE ADDRESS ALL CORRESPONDENCE TO:
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TELEPHONE: (801) 653-2311

August 13, 1990

Job No.: 59 10541

Date Rec'd: August 9, 1990

Date Sampled: August 8, 1990

Sampled By: UP&L

Utah Power and Light Co.
P.O. Box 1005
Huntington UT 84528

Sample ID: UP&L

EMS 84-56
Temperature 43 degrees F.
Flow .19/67.1 gpm
Rec'd 0830 hr.
Sampled 1400 hr.

FIELD MEASUREMENTS
pH 7.28
Conductivity 380

WATER ANALYSIS

Alk., Carbonate	1<	mg/l $CaCO_3$	Magnesium	35.70	mg/l
08-09-90 1300 hr.			08-09-90 1100 hr.		
Calcium	75.6	mg/l	Manganese	0.01<	mg/l
08-09-90 1030 hr.			08-09-90 1115 hr.		
Conductivity	370	umhos/cm	Oxygen, Dissolved	6.5	mg/l
08-09-90 1110 hr.			08-09-90 1100 hr.		
Hardness, Total	336	mg/l $CaCO_3$	pH	7.30	Units
			08-09-90 1000 hr.		

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ANALYST: D. Tipon

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PLEASE ADDRESS ALL CORRESPONDENCE TO:
P.O. BOX 1020, HUNTINGTON, UT 84528
TELEPHONE: (801) 653-2311

September 24, 1990

Job No.: 59 10598

Date Rec'd: September 10, 1990

Date Sampled: September 7, 1990

Sampled By: UP&L

Utah Power and Light Co.
P.O. Box 1005
Huntington UT 84528

Sample ID: UP&L

EMS ELK SPRINGS
Temperature 40 degrees
Flow 0.15/46.2 GPM
Rec'd 0800 hr.
Sampled 1440 hr.

FIELD MEASUREMENTS

pH	7.24
Conductivity	370

WATER ANALYSIS

Alk., Carbonate	09-12-90	0930 hr.	1< mg/l CaCO3	Magnesium	09-12-90	1245 hr.	23.80 mg/l
Calcium	09-12-90	1230 hr.	65.1 mg/l	Manganese	09-12-90	1315 hr.	0.02 mg/l
Conductivity	09-11-90	1100 hr.	288 umhos/cm	Oxygen, Dissolved	09-10-90	1340 hr.	7.4 mg/l
Hardness, Total			261 mg/l CaCO3	pH	09-10-90	1320 hr.	8.30 Units

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ANALYST: D. Tyson

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PLEASE ADDRESS ALL CORRESPONDENCE TO:
P.O. BOX 1020, HUNTINGTON, UT 84528
TELEPHONE: (801) 653-2311

September 26, 1990

Job No.: 59 10599

Date Rec'd: September 10, 1990

Date Sampled: September 7, 1990

Sampled By: UP&L

Utah Power and Light Co.
P.O. Box 1005
Huntington UT 84528

Sample ID: UP&L

EMS SHEBA SPRINGS
Temperature 43 degrees
Flow 0.83 GPM
Rec'd 0800 hr.
Sampled 1430 hr.

FIELD MEASUREMENTS

pH	7.87
Conductivity	354

WATER ANALYSIS

Alk., Carbonate	1<	mg/l CaCO3	Magnesium	11.36	mg/l
09-12-90 0930 hr.			09-12-90 1245 hr.		
Calcium	70.2	mg/l	Manganese	0.02	mg/l
09-12-90 1230 hr.			09-12-90 1315 hr.		
Conductivity	325	umhos/cm	Oxygen, Dissolved	8.5	mg/l
09-11-90 1100 hr.			09-10-90 1340 hr.		
Hardness, Total	222	mg/l CaCO3	pH	7.90	Units
			09-10-90 1320 hr.		

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ANALYST: D. Lyon

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Manager, Huntington Laboratory

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PLEASE ADDRESS ALL CORRESPONDENCE TO:
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TELEPHONE: (801) 653-2311

September 24, 1990

Job No.: 59 10600

Date Rec'd: September 10, 1990

Date Sampled: September 7, 1990

Sampled By: UP&L

Utah Power and Light Co.
P.O. Box 1005
Huntington UT 84528

Sample ID: UP&L

EMS 79-10
Temperature 40 degrees
Flow 5.0 GPM
Rec'd 0800 hr.
Sampled 1420 hr.

FIELD MEASUREMENTS

pH	7.83
Conductivity	409

WATER ANALYSIS

Alk., Carbonate	1<	mg/l CaCO3	Magnesium	12.60	mg/l
09-12-90	0930 hr.		09-12-90	1245 hr.	
Calcium	71.2	mg/l	Manganese	0.02	mg/l
09-12-90	1230 hr.		09-12-90	1315 hr.	
Conductivity	375	umhos/cm	Oxygen, Dissolved	8.5	mg/l
09-11-90	1100 hr.		09-10-90	1340 hr.	
Hardness, Total	230	mg/l CaCO3	pH	8.00	Units
			09-10-90	1320 hr.	

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ANALYST: D. Tipon

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Dave Councilley

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PLEASE ADDRESS ALL CORRESPONDENCE TO:
P.O. BOX 1020, HUNTINGTON, UT 84528
TELEPHONE: (801) 653-2311

September 25, 1990

Job No.: 59 10597

Date Rec'd: September 10, 1990

Date Sampled: September 7, 1990

Sampled By: UP&L

Utah Power and Light Co.
P.O. Box 1005
Huntington UT 84528

Sample ID: UP&L

EMS 79-29
Temperature 44 degrees
Flow 1.2 GPM
Rec'd 0800 hr.
Sampled 1525 hr.

FIELD MEASUREMENTS

pH	7.99
Conductivity	476

WATER ANALYSIS

Alk., Carbonate	1<	mg/l CaCO3	Magnesium	23.00	mg/l
09-12-90	0930 hr.		09-12-90	1245 hr.	
Calcium	42.8	mg/l	Manganese	0.02	mg/l
09-12-90	1230 hr.		09-12-90	1315 hr.	
Conductivity	475	umhos/cm	Oxygen, Dissolved	6.1	mg/l
09-11-90	1100 hr.		09-10-90	1340 hr.	
Hardness, Total	202	mg/l CaCO3	pH	8.00	Units
			09-10-90	1320 hr.	

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ANALYST: D. Tyson

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Dave Councell by Dr

Manager, Huntington Laboratory

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PLEASE ADDRESS ALL CORRESPONDENCE TO:
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TELEPHONE: (801) 653-2311

September 25, 1990

Job No.: 59 10596

Date Rec'd: September 10, 1990

Date Sampled: September 7, 1990

Sampled By: UP&L

Utah Power and Light Co.
P.O. Box 1005
Huntington UT 84528

Sample ID: UP&L

EMS 79-35
Temperature 41 degrees
Flow 1.5 GPM
Rec'd 0800 hr.
Sampled 1500 hr.

FIELD MEASUREMENTS

pH	7.67
Conductivity	369

WATER ANALYSIS

Alk., Carbonate	1<	mg/l CaCO3	Magnesium	15.30	mg/l
09-12-90	0930 hr.		09-12-90	1245 hr.	
Calcium	78.7	mg/l	Manganese	0.02	mg/l
09-12-90	1230 hr.		09-12-90	1315 hr.	
Conductivity	320	umhos/cm	Oxygen, Dissolved	8.1	mg/l
09-11-90	1100 hr.		09-10-90	1340 hr.	
Hardness, Total	260	mg/l CaCO3	pH	8.00	Units
			09-10-90	1320 hr.	

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ANALYST: D. Tipton

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TELEPHONE: (801) 653-2311

September 26, 1990

Job No.: 59 10595

Date Rec'd: September 10, 1990

Date Sampled: September 7, 1990

Sampled By: UP&L

Utah Power and Light Co.
P.O. Box 1005
Huntington UT 84528

Sample ID: UP&L

EMS 82-52
Temperature 42 degrees
Flow 1.0 GPM
Rec'd 0800 hr.
Sampled 1620 hr.

FIELD MEASUREMENTS

pH	7.87
Conductivity	587

WATER ANALYSIS

Alk., Carbonate	1<	mg/l CaCO3	Magnesium	14.30	mg/l
09-12-90 0930 hr.			09-12-90 1245 hr.		
Calcium	53.2	mg/l	Manganese	0.02	mg/l
09-12-90 1230 hr.			09-12-90 1315 hr.		
Conductivity	500	umhos/cm	Oxygen, Dissolved	7.8	mg/l
09-11-90 1100 hr.			09-10-90 1340 hr.		
Hardness, Total	192	mg/l CaCO3	pH	8.00	Units
			09-10-90 1320 hr.		

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ANALYST: D. Lyon

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PLEASE ADDRESS ALL CORRESPONDENCE TO:
P.O. BOX 1020, HUNTINGTON, UT 84528
TELEPHONE: (801) 653-2311

September 24, 1990

Job No.: 59 10601

Date Rec'd: September 10, 1990

Date Sampled: September 7, 1990

Sampled By: UP&L

Utah Power and Light Co.
P.O. Box 1005
Huntington UT 84528

Sample ID: UP&L

EMS 84-56
Temperature 43 degrees
Flow 0.6 GPM
Rec'd 0800 hr.
Sampled 1550 hr.

FIELD MEASUREMENTS

pH	8.01
Conductivity	494

WATER ANALYSIS

Alk., Carbonate	1<	mg/l CaCO3	Magnesium	19.80	mg/l
09-12-90	0930 hr.		09-12-90	1245 hr.	
Calcium	71.8	mg/l	Manganese	0.02	mg/l
09-12-90	1230 hr.		09-12-90	1315 hr.	
Conductivity	425	umhos/cm	Oxygen, Dissolved	7.2	mg/l
09-11-90	1100 hr.		09-10-90	1340 hr.	
Hardness, Total	261	mg/l CaCO3	pH	7.80	Units
			09-10-90	1320 hr.	

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ANALYST: D. Tipson

Respectfully submitted,
COMMERCIAL TESTING & ENGINEERING CO.

Dave Cornell by DT

Manager, Huntington Laboratory

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COMMERCIAL TESTING & ENGINEERING CO.
GENERAL OFFICES: 1919 SOUTH HIGHLAND AVE., SUITE 210-B, LOMBARD, ILLINOIS 60148 • (312) 953-9300
SINCE 1908
Member of the SGS Group (Société Générale de Surveillance)

PLEASE ADDRESS ALL CORRESPONDENCE TO:
P.O. BOX 1020, HUNTINGTON, UT 84528
TELEPHONE: (801) 653-2311

October 30, 1990

Job No.: 59 10647

Sample ID:

Date Rec'd: October 10, 1990

Date Sampled: October 10, 1990

Sampled By: UP&L

BURNT TREE SPRINGS
Rec'd 16:30 hr.
Sampled 13:10 hr.
Temp 41°
Flow 3.5 GPM
Cond. 409
pH 7.83

Utah Power and Light Co.
P.O. Box 1005
Huntington UT 84528

WATER ANALYSIS

Alk., Bicarbonate	188	mg/l HCO3	Iron	0.02<	mg/l
10-18-90 1000 hr.			10-16-90 1500 hr.		
Alk., Carbonate	1<	mg/l CaCO3	Magnesium	20.00	mg/l
10-18-90 1000 hr.			10-16-90 1425 hr.		
Alk., Total	154	mg/l CaCO3	Manganese	0.01<	mg/l
10-18-90 1000 hr.			10-16-90 1425 hr.		
Anions, Total	4.86	meq/l	Oxygen, Dissolved	5.2	mg/l
			10-11-90 1100 hr.		
Calcium	57.9	mg/l	pH	7.10	Units
10-16-90 1410 hr.			10-11-90 1140 hr.		
Cations, Total	4.99	meq/l	Potassium	0.02	mg/l
			10-16-90 1430 hr.		
Chloride	10.0	mg/l	Sodium	10.50	mg/l
10-17-90 1030 hr.			10-16-90 1430 hr.		
Conductivity	600	umhos/cm	Solids, Dissolved	164.0	mg/l
10-15-90 1000 hr.			10-24-90 0930 hr.		
Hardness, Total	227	mg/l CaCO3	Solids, Suspended	19.0	mg/l
			10-24-90 0930 hr.		
			Sulfate	75.0	mg/l
			10-18-90 1300 hr.		

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ANALYST: D. Tipon

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PLEASE ADDRESS ALL CORRESPONDENCE TO:
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TELEPHONE: (801) 653-2311

October 30, 1990

Job No.: 59 10657

Date Rec'd: October 10, 1990

Date Sampled: October 10, 1990

Sampled By: UP&L

Utah Power and Light Co.
P.O. Box 1005
Huntington UT 84528

Sample ID:

EAST MOUNTAIN SPRINGS-(ELK SPRING)
Rec'd 16:30 hr.
Sampled 10:35 a.m. hr.
Temp 39°
Flow 0.13/36.8 GPM
Cond. 3 77
pH 7.88

WATER ANALYSIS

Alk., Bicarbonate	312	mg/l HCO3	Iron	0.02<	mg/l
10-18-90 1000 hr.			10-15-90 1500 hr.		
Alk., Carbonate	1<	mg/l CaCO3	Magnesium	20.10	mg/l
10-18-90 1000 hr.			10-15-90 1425 hr.		
Alk., Total	256	mg/l CaCO3	Manganese	0.01<	mg/l
10-18-90 1000 hr.			10-15-90 1425 hr.		
Anions, Total	5.38	meq/l	Oxygen, Dissolved	6.3	mg/l
			10-11-90 1100 hr.		
Calcium	67.4	mg/l	pH	8.50	Units
10-15-90 1410 hr.			10-11-90 1140 hr.		
Cations, Total	5.46	meq/l	Potassium	0.00<	mg/l
			10-15-90 1430 hr.		
Chloride	5.0	mg/l	Sodium	10.28	mg/l
10-17-90 1030 hr.			10-15-90 1430 hr.		
Conductivity	500	umhos/cm	Solids, Dissolved	189.0	mg/l
10-15-90 1000 hr.			10-24-90 0930 hr.		
Hardness, Total	251	mg/l CaCO3	Solids, Suspended	3.0	mg/l
			10-24-90 0930 hr.		
			Sulfate	12.0	mg/l
			10-18-90 1300 hr.		

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ANALYST: D. Tyson

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PLEASE ADDRESS ALL CORRESPONDENCE TO:
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TELEPHONE: (801) 653-2311

October 30, 1990

Job No.: 59 10650

Sample ID:

Date Rec'd: October 10, 1990

Date Sampled: October 10, 1990

Sampled By: UP&L

EAST MOUNTAIN SPRING (SHERA SPRING)
Rec'd 16:30 hr.
Sampled 11:05 a.m. hrs.
Temp 39°
Flow 1.66 GPM
Cond. 4 12
pH 7.85

Utah Power and Light Co.
P.O. Box 1005
Huntington UT 84528

WATER ANALYSIS

Alk., Bicarbonate	281	mg/l HCO3	Iron	0.02<	mg/l
10-18-90 **1000 hr.**			10-16-90 **1500 hr.**		
Alk., Carbonate	1<	mg/l CaCO3	Magnesium	8.10	mg/l
10-18-90 **1000 hr.**			10-16-90 **1425 hr.**		
Alk., Total	230	mg/l CaCO3	Manganese	0.01<	mg/l
10-18-90 1000 hr.			10-16-90 1425 hr.		
Anions, Total	4.95	meq/l	Oxygen, Dissolved	6.9	mg/l
			10-11-90 1100 hr.		
Calcium	84.9	mg/l	pH	8.40	Units
10-16-90 1410 hr.			10-11-90 1140 hr.		
Cations, Total	4.98	meq/l	Potassium	0.09	mg/l
			10-16-90 1430 hr.		
Chloride	10.0	mg/l	Sodium	1.61	mg/l
10-17-90 1030 hr.			10-16-90 1430 hr.		
Conductivity	500	umhos/cm	Solids, Dissolved	267.0	mg/l
10-15-90 1000 hr.			10-24-90 0930 hr.		
Hardness, Total	245	mg/l CaCO3	Solids, Suspended	1.0<	mg/l
			10-24-90 0930 hr.		
			Sulfate	9.0	mg/l
			10-18-90 1300 hr.		

ANALYST: D. Igon

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PLEASE ADDRESS ALL CORRESPONDENCE TO:
P.O. BOX 1020, HUNTINGTON, UT 84528
TELEPHONE: (801) 653-2311

October 30, 1990

Job No.: 59 10653

Sample ID:

Date Rec'd: October 10, 1990

Date Sampled: October 10, 1990

Sampled By: UP&L

Utah Power and Light Co.
P.O. Box 1005
Huntington UT 84528

EAST MOUNTAIN SPRINGS
79-2
Rec'd 16:30 hr.
Sampled 13:20 hr.
Temp 42°
Flow 2.3 GPM
Cond. 4 55
pH 7.78

WATER ANALYSIS

Alk., Bicarbonate	378	mg/l HCO3	Iron	0.02<	mg/l
10-18-90 1000 hr.			10-15-90 1500 hr.		
Alk., Carbonate	1<	mg/l CaCO3	Magnesium	20.70	mg/l
10-18-90 1000 hr.			10-15-90 1425 hr.		
Alk., Total	310	mg/l CaCO3	Manganese	0.01<	mg/l
10-18-90 1000 hr.			10-15-90 1425 hr.		
Anions, Total	6.76	meq/l	Oxygen, Dissolved	6.7	mg/l
			10-11-90 1100 hr.		
Calcium	80.4	mg/l	pH	8.10	Units
10-15-90 1410 hr.			10-11-90 1140 hr.		
Cations, Total	6.39	meq/l	Potassium	0.08	mg/l
			10-15-90 1430 hr.		
Chloride	15.0	mg/l	Sodium	15.57	mg/l
10-17-90 1030 hr.			10-15-90 1430 hr.		
Conductivity	600	umhos/cm	Solids, Dissolved	265.0	mg/l
10-15-90 1000 hr.			10-24-90 0930 hr.		
Hardness, Total	286	mg/l CaCO3	Solids, Suspended	1.0<	mg/l
			10-24-90 0930 hr.		
			Sulfate	14.0	mg/l
			10-18-90 1300 hr.		

ANALYST: D. Tyson

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PLEASE ADDRESS ALL CORRESPONDENCE TO:
P.O. BOX 1020, HUNTINGTON, UT 84528
TELEPHONE: (801) 653-2311

October 30, 1990

Job No.: 59 10658

Date Rec'd: October 10, 1990

Date Sampled: October 10, 1990

Sampled By: UP&L

Utah Power and Light Co.
P.O. Box 1005
Huntington UT 84528

Sample ID:

EAST MOUNTAIN SPRINGS
EMS 79-10
Rec'd 16:30 hr.
Sampled 10:55 a.m. hr.
Temp 42°
Flow 3.0 GPM
Cond. 4 38
pH 7.68

WATER ANALYSIS

Alk., Bicarbonate	323	mg/l HCO3	Iron	0.02<	mg/l
10-18-90 1000 hr.			10-15-90 1500 hr.		
Alk., Carbonate	1<	mg/l CaCO3	Magnesium	18.80	mg/l
10-18-90 1000 hr.			10-15-90 1425 hr.		
Alk., Total	265	mg/l CaCO3	Manganese	0.01<	mg/l
10-18-90 1000 hr.			10-15-90 1425 hr.		
Anions, Total	5.83	meq/l	Oxygen, Dissolved	6.4	mg/l
			10-11-90 1100 hr.		
Calcium	85.0	mg/l	pH	8.10	Units
10-15-90 1410 hr.			10-11-90 1140 hr.		
Cations, Total	5.94	meq/l	Potassium	0.00<	mg/l
			10-15-90 1430 hr.		
Chloride	5.0	mg/l	Sodium	3.54	mg/l
10-17-90 1030 hr.			10-15-90 1430 hr.		
Conductivity	600	umhos/cm	Solids, Dissolved	239.0	mg/l
10-15-90 1000 hr.			10-24-90 0930 hr.		
Hardness, Total	290	mg/l CaCO3	Solids, Suspended	3.0	mg/l
			10-24-90 0930 hr.		
			Sulfate	25.0	mg/l
			10-18-90 1300 hr.		

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ANALYST: D. Tyson

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PLEASE ADDRESS ALL CORRESPONDENCE TO:
P.O. BOX 1020, HUNTINGTON, UT 84528
TELEPHONE: (801) 653-2311

November 1, 1990

Job No.: 59 10654

Date Rec'd: October 10, 1990

Date Sampled: October 10, 1990

Sampled By: UP&L

Utah Power and Light Co.
P.O. Box 1005
Huntington UT 84528

Sample ID:

EMS 79-15
EAST MOUNTAIN SPRINGS
Rec'd 16:30 hr.
Sampled 11:30 a.m. hr.
Temp 41°
Flow 1.7 GPM
Cond. 4 22
pH 7.75

WATER ANALYSIS

Alk., Bicarbonate 10-18-90	382	mg/l HCO3	Iron 10-15-90	0.02<	mg/l
Alk., Carbonate 10-18-90	1<	mg/l CaCO3	Magnesium 10-15-90	24.00	mg/l
Alk., Total 10-18-90	313	mg/l CaCO3	Manganese 10-15-90	0.01<	mg/l
Anions, Total	6.78	meq/l	Oxygen, Dissolved 10-11-90	6.9	mg/l
Calcium 10-15-90	89.3	mg/l	pH 10-11-90	8.00	Units
Cations, Total	6.73	meq/l	Potassium 10-15-90	0.09	mg/l
Chloride 10-17-90	15.0	mg/l	Sodium 10-15-90	6.80	mg/l
Conductivity 10-15-90	500	umhos/cm	Solids, Dissolved 10-24-90	265.0	mg/l
Hardness, Total	322	mg/l CaCO3	Solids, Suspended 10-24-90	1.0<	mg/l
			Sulfate 10-18-90	12.0	mg/l

ANALYST: _____

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Manager, Huntington Laboratory

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PLEASE ADDRESS ALL CORRESPONDENCE TO:
P.O. BOX 1020, HUNTINGTON, UT 84528
TELEPHONE: (801) 653-2311

October 30, 1990

Job No.: 59 10656

Date Rec'd: October 10, 1990

Date Sampled: October 10, 1990

Sampled By: UP&L

Utah Power and Light Co.
P.O. Box 1005
Huntington UT 84528

Sample ID:

EAST MOUNTAIN SPRINGS
79-29
Rec'd 16:30 hr.
Sampled 14:25 hr.
Temp 41°
Flow 1 GPM
Cond. 4 65
pH 7.61

WATER ANALYSIS

Alk., Bicarbonate	389	mg/l HCO3	Iron	0.02<	mg/l
10-18-90	1000 hr.		10-15-90	1500 hr.	
Alk., Carbonate	1<	mg/l CaCO3	Magnesium	38.80	mg/l
10-18-90	1000 hr.		10-15-90	1425 hr.	
Alk., Total	319	mg/l CaCO3	Manganese	0.01<	mg/l
10-18-90	1000 hr.		10-15-90	1425 hr.	
Anions, Total	7.21	meq/l	Oxygen, Dissolved	6.4	mg/l
			10-11-90	1100 hr.	
Calcium	48.6	mg/l	pH	8.30	Units
10-15-90	1410 hr.		10-11-90	1140 hr.	
Cations, Total	7.18	meq/l	Potassium	0.46	mg/l
			10-15-90	1430 hr.	
Chloride	15.0	mg/l	Sodium	36.27	mg/l
10-17-90	1030 hr.		10-15-90	1430 hr.	
Conductivity	600	umhos/cm	Solids, Dissolved	273.0	mg/l
10-15-90	1000 hr.		10-24-90	0930 hr.	
Hardness, Total	281	mg/l CaCO3	Solids, Suspended	6.0	mg/l
			10-24-90	0930 hr.	
			Sulfate	27.0	mg/l
			10-18-90	1300 hr.	

ANALYST: D. Lyson

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PLEASE ADDRESS ALL CORRESPONDENCE TO:
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TELEPHONE: (801) 653-2311

November 5, 1990

Job No.: 59 10655

Date Rec'd: October 10, 1990

Date Sampled: October 10, 1990

Sampled By: UP&L

Utah Power and Light Co.
P.O. Box 1005
Huntington UT 84528

Sample ID:-

EAST MOUNTAIN SPRINGS
79-28
Rec'd 16:30 hr.
Sampled 14:10 hr.
Temp 43°
Flow 2 GPM
Cond. 5 85
pH 7.58

WATER ANALYSIS

Alk., Bicarbonate	352	mg/l HCO3	Iron	0.02<	mg/l
10-18-90 1000 hr.			10-15-90 1500 hr.		
Alk., Carbonate	1<	mg/l CaCO3	Magnesium	26.30	mg/l
10-18-90 1000 hr.			10-15-90 1425 hr.		
Alk., Total	308	mg/l CaCO3	Manganese	0.01<	mg/l
10-18-90 1000 hr.			10-15-90 1425 hr.		
Anions, Total	7.48	meq/l	Oxygen, Dissolved	5.4	mg/l
			10-11-90 1100 hr.		
Calcium	42.9	mg/l	pH	7.80	Units
10-15-90 1410 hr.			10-11-90 1140 hr.		
Cations, Total	7.19	meq/l	Potassium	0.04	mg/l
			10-15-90 1430 hr.		
Chloride	15.0	mg/l	Sodium	67.16	mg/l
10-17-90 1030 hr.			10-15-90 1430 hr.		
Conductivity	700	umhos/cm	Solids, Dissolved	387.0	mg/l
10-15-90 1000 hr.			10-24-90 0930 hr.		
Hardness, Total	215	mg/l CaCO3	Solids, Suspended	1.0<	mg/l
			10-24-90 0930 hr.		
			Sulfate	50.0	mg/l
			10-18-90 1300 hr.		

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ANALYST: D. Tyson

Respectfully submitted,
COMMERCIAL TESTING & ENGINEERING CO.
FIELD OFFICE
Dave Cornell Hydes
Manager, Huntington Laboratory

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PLEASE ADDRESS ALL CORRESPONDENCE TO:
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TELEPHONE: (801) 653-2311

November 1, 1990

Job No.: 59 10651

Date Rec'd: October 10, 1990

Date Sampled: October 10, 1990

Sampled By: UP&L

Utah Power and Light Co.
P.O. Box 1005
Huntington UT 84528

Sample ID:

EMS 79-38
EAST MOUNTAIN SPRINGS
Rec'd 16:30 hr.
Sampled 12:20 p.m. hrs.
Temp 44°
Flow 2.6 GPM
Cond. 5 06
pH 7.37

WATER ANALYSIS

Alk., Bicarbonate 10-18-90	450	mg/l HCO3	Iron 10-16-90	0.83	mg/l
Alk., Carbonate 10-18-90	1<	mg/l CaCO3	Magnesium 10-16-90	25.60	mg/l
Alk., Total 10-18-90	369	mg/l CaCO3	Manganese 10-16-90	0.01<	mg/l
Anions, Total	8.19	meq/l	Oxygen, Dissolved 10-11-90	6.7	mg/l
Calcium 10-16-90	83.8	mg/l	pH 10-11-90	8.30	Units
Cations, Total	8.32	meq/l	Potassium 10-16-90	0.04	mg/l
Chloride 10-17-90	10.0	mg/l	Sodium 10-16-90	47.30	mg/l
Conductivity 10-15-90	700	umhos/cm	Solids, Dissolved 10-24-90	331.0	mg/l
Hardness, Total	315	mg/l CaCO3	Solids, Suspended 10-24-90	12.0	mg/l
			Sulfate 10-18-90	34.0	mg/l

ANALYST: _____

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PLEASE ADDRESS ALL CORRESPONDENCE
P.O. BOX 1020, HUNTINGTON, UT 8
TELEPHONE: (801) 653-2311
FAX: (801) 653-2479

May 8, 1991

Job. No.: 59-10652

Date Rec'd: October 10, 1990

Date Sampled: October 10, 1990

Sampled By: UP&L

PacifiCorp Field Office
P.O.Box 1005
Huntington UT 84528

Sample ID:

EAST MOUNTAIN SPRINGS
80-47
Temperature 42.0 Degrees
Rec'd 16:30 hr.
Sampled 13:35 hr.

(REPRINTED ANALYSIS)

WATER ANALYSIS

Alkalinity, bicarbonate	373 mg/l HCO_3	10/18/90	1000 hr.
Alkalinity, carbonate	1< mg/l $CaCO_3$	10/18/90	1000 hr.
Alkalinity, total	306 mg/l $CaCO_3$	10/18/90	1000 hr.
Anions, total	7.16 meq/l		
Calcium	61.1 mg/l	10/15/90	1600 hr.
Cations, total	7.16 meq/l		
Chloride	5.0 mg/l	10/17/90	1030 hr.
Conductivity	600 umhos/cm	10/15/90	1000 hr.
Hardness, total	329 mg/l $CaCO_3$	10/15/90	1600 hr.
Iron, total	0.09 mg/l	10/15/90	1635 hr.
Magnesium	42.90 mg/l	10/15/90	1615 hr.
Manganese	0.01 mg/l	10/15/90	1545 hr.
Oxygen, dissolved	6.5 mg/l	10/11/90	1100 hr.
pH	8.40 units	10/11/90	1100 hr.
Potassium	0.06 mg/l	10/15/90	1700 hr.
Sodium	13.60 mg/l	10/15/90	1650 hr.
Solids, dissolved	283.0 mg/l	10/24/90	1400 hr.
Solids, suspended	1.0 mg/l	10/24/90	1400 hr.
Sulfate	50.0 mg/l	10/18/90	1300 hr.

ANALYST: M M

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M M

Manager, Huntington Laboratory

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PLEASE ADDRESS ALL CORRESPONDENCE TO:
P.O. BOX 1020, HUNTINGTON, UT 84528
TELEPHONE: (801) 653-2311

October 30, 1990

Job No.: 59 10649

Sample ID:

Date Rec'd: October 10, 1990

Date Sampled: October 10, 1990

Sampled By: UP&L

EAST MOUNTAIN SPRING
82-52
Rec'd 16:30 hr.
Sampled 12:45 p.m. hr.
Temp 42°
Flow 1.19 GPM
Cond. 5 60
pH 7.39

Utah Power and Light Co.
P.O. Box 1005
Huntington UT 84528

WATER ANALYSIS

Alk., Bicarbonate	466	mg/l HCO3	Iron	0.02<	mg/l
10-18-90	1000 hr.		10-16-90	1500 hr.	
Alk., Carbonate	1<	mg/l CaCO3	Magnesium	35.30	mg/l
10-18-90	1000 hr.		10-16-90	1425 hr.	
Alk., Total	382	mg/l CaCO3	Manganese	0.01<	mg/l
10-18-90	1000 hr.		10-16-90	1425 hr.	
Anions, Total	8.32	meq/l	Oxygen, Dissolved	4.2	mg/l
			10-11-90	1100 hr.	
Calcium	84.4	mg/l	pH	7.80	Units
10-16-90	1410 hr.		10-11-90	1140 hr.	
Cations, Total	8.13	meq/l	Potassium	0.09	mg/l
			10-16-90	1430 hr.	
Chloride	10.0	mg/l	Sodium	23.47	mg/l
10-17-90	1030 hr.		10-16-90	1430 hr.	
Conductivity	700	umhos/cm	Solids, Dissolved	295.0	mg/l
10-15-90	1000 hr.		10-24-90	0930 hr.	
Hardness, Total	356	mg/l CaCO3	Solids, Suspended	1.0<	mg/l
			10-24-90	0930 hr.	
			Sulfate	28.0	mg/l
			10-18-90	1300 hr.	

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ANALYST: D. Tipon

Respectfully submitted,
COMMERCIAL TESTING & ENGINEERING CO.

Manager, Huntington Laboratory

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GENERAL OFFICES: 1919 SOUTH HIGHLAND AVE., SUITE 210-B, LOMBARD, ILLINOIS 60148 • (312) 953-9300
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Member of the SGS Group (Societe' Generale de Surveillance)

PLEASE ADDRESS ALL CORRESPONDENCE TO:
P.O. BOX 1020, HUNTINGTON, UT 84528
TELEPHONE: (801) 653-2311

November 5, 1990

Job No.: 59 10648

Date Rec'd: October 10, 1990

Date Sampled: October 10, 1990

Sampled By: UP&L

Utah Power and Light Co.
P.O. Box 1005
Huntington UT 84528

Sample ID:

EAST MOUNTAIN SPRING 84-56
Rec'd 16:30 hr.
Sampled 13:50 hr.
Temp 41°
Flow 1 GPM
Cond. 480
pH 7.65

WATER ANALYSIS

Alk., Bicarbonate	406	mg/l HCO3	Iron	0.02<	mg/l
10-18-90	1000 hr.		10-16-90	1500 hr.	
Alk., Carbonate	1<	mg/l CaCO3	Magnesium	34.80	mg/l
10-18-90	1000 hr.		10-16-90	1425 hr.	
Alk., Total	333	mg/l CaCO3	Manganese	0.01<	mg/l
10-18-90	1000 hr.		10-16-90	1425 hr.	
Anions, Total	7.26	meq/l	Oxygen, Dissolved	4.9	mg/l
			10-11-90	1100 hr.	
Calcium	70.2	mg/l	pH	7.40	Units
10-16-90	1410 hr.		10-11-90	1140 hr.	
Cations, Total	7.26	meq/l	Potassium	0.09	mg/l
			10-16-90	1430 hr.	
Chloride	5.0	mg/l	Sodium	20.80	mg/l
10-31-90	0930 hr.		10-16-90	1430 hr.	
Conductivity	600	umhos/cm	Solids, Dissolved	179.0	mg/l
10-15-90	1000 hr.		10-24-90	0930 hr.	
Hardness, Total	319	mg/l CaCO3	Solids, Suspended	8.0	mg/l
			10-24-90	1400 hr.	
			Sulfate	30.0	mg/l
			11-01-90		

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PLEASE ADDRESS ALL CORRESPONDENCE TO:
P.O. BOX 1020, HUNTINGTON, UT 84528
TELEPHONE: (801) 653-2311

October 30, 1990

Job No.: 59 10660

Sample ID:

Date Rec'd: October 10, 1990

Date Sampled: October 10, 1990

Sampled By: UP&L

EAST MOUNTAIN SPRINGS
EMS 89-61
Flow 24.0 GPM
Temp 41°
Cond. 4 80
pH 7.79
Rec'd 16:30 hr.
Sampled 10:05 a.m. hr.

Utah Power and Light Co.
P.O. Box 1005
Huntington UT 84528

WATER ANALYSIS

Aluminum	0.01<	mg/l	Chromium	0.02<	mg/l
10-25-90 1600 hr.			10-25-90 1600 hr.		
Alk., Bicarbonate	400	mg/l HCO3	Conductivity	500	umhos/cm
10-18-90 1000 hr.			10-15-90 1000 hr.		
Alk., Carbonate	1<	mg/l CaCO3	Copper	0.010<	mg/l
10-18-90 1000 hr.			10-25-90 1300 hr.		
Alk., Total	328	mg/l CaCO3	Fluoride	0.34	mg/l
10-18-90 1000 hr.			10-22-90 1400 hr.		
Arsenic	0.002	mg/l	Hardness, Total	331	mg/l CaCO3
10-19-90 1300 hr.					
Anions, Total	7.34	meq/l	Iron	0.02<	mg/l
			10-16-90 1500 hr.		
Barium	0.03<	mg/l	Lead	0.050<	mg/l
10-25-90 1600 hr.			10-25-90 1300 hr.		
Boron	0.53	mg/l	Magnesium	26.30	mg/l
10-16-90 1100 hr.			10-16-90 1425 hr.		
Cadmium	0.002<	mg/l	Manganese	0.01<	mg/l
10-25-90 1300 hr.			10-16-90 1425 hr.		
Calcium	89.3	mg/l	Mercury	0.002<	mg/l
10-16-90 1410 hr.			10-23-90 1600 hr.		
Cations, Total	7.26	meq/l	Molybdenum	0.10<	mg/l
			10-25-90 1600 hr.		
Chloride	15.0	mg/l	Nickel	0.02<	mg/l
10-15-90 1600 hr.			10-25-90 1300 hr.		

ANALYST: D. Igon

Respectfully submitted,
COMMERCIAL TESTING & ENGINEERING CO.

Manager, Huntington Laboratory

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PLEASE ADDRESS ALL CORRESPONDENCE TO:
P.O. BOX 1020, HUNTINGTON, UT 84528
TELEPHONE: (801) 653-2311

October 30, 1990

Job No.: 59 10660

Sample ID:

Date Rec'd: October 10, 1990

Date Sampled: October 10, 1990

Sampled By: UF&L

Utah Power and Light Co.
P.O. Box 1005
Huntington UT 84528

EAST MOUNTAIN SPRINGS
EMS 89-61
Flow 24.0 GPM
Temp 41°
Cond. 4 80
pH 7.79
Rec'd 16:30 hr.
Sampled 10:05 a.m. hr.

WATER ANALYSIS

Nitrogen, Ammonia	0.00	mg/l	Selenium	0.002<	mg/l
10-11-90 0815 hr.			10-19-90 1300 hr.		
Nitrogen, Nitrate	0.15	mg/l	Sodium	14.72	mg/l
10-16-90 1600 hr.			10-16-90 1430 hr.		
Nitrogen, Nitrite	0.02	mg/l	Solids, Dissolved	272.0	mg/l
10-16-90 1600 hr.			10-24-90 0930 hr.		
Oxygen, Dissolved	6.3	mg/l	Solids, Suspended	13.0	mg/l
10-11-90 1100 hr.			10-24-90 0930 hr.		
pH	7.80	Units	Sulfate	25.0	mg/l
10-11-90 1140 hr.			10-18-90 1300 hr.		
Phosphorus, Total	0.01<	mg/l	Sulfide	20.80	mg/l
10-16-90 0815 hr.			10-12-90 1300 hr.		
Potassium	0.06	mg/l	Zinc	0.01<	mg/l
10-16-90 1445 hr.			10-25-90 1300 hr.		

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PLEASE ADDRESS ALL CORRESPONDENCE TO:
P.O. BOX 1020, HUNTINGTON, UT 84528
TELEPHONE: (801) 653-2311

November 5, 1990

Job No.: 59 10659

Sample ID:

Date Rec'd: October 10, 1990

Date Sampled: October 10, 1990

Sampled By: UP&L

EAST MOUNTAIN SPRINGS
EMS 89-67
Flow 2.3 GPM
Temp 39°
Cond. 439
pH 7.88

Utah Power and Light Co.
P.O. Box 1005
Huntington UT 84528

WATER ANALYSIS

Aluminum	0.32	mg/l	Chromium	0.02<	mg/l
10-25-90	1600 hr.		10-25-90	1600 hr.	
Alk., Bicarbonate	392	mg/l HCO3	Conductivity	600	umhos/cm
10-18-90	1000 hr.		10-15-90	1000 hr.	
Alk., Carbonate	1<	mg/l CaCO3	Copper	0.010<	mg/l
10-18-90	1000 hr.		10-25-90	1300 hr.	
Alk., Total	321	mg/l CaCO3	Fluoride	0.37	mg/l
10-18-90	1000 hr.		10-22-90	1400 hr.	
Arsenic	0.003	mg/l	Hardness, Total	331	mg/l CaCO3
10-19-90	1300 hr.				
Anions, Total	7.52	meq/l	Iron	0.08	mg/l
			10-16-90	1500 hr.	
Barium	0.03<	mg/l	Lead	0.050<	mg/l
10-25-90	1600 hr.		10-25-90	1300 hr.	
Boron	0.18	mg/l	Magnesium	38.60	mg/l
10-16-90	1100 hr.		10-16-90	1425 hr.	
Cadmium	0.002<	mg/l	Manganese	0.02	mg/l
10-25-90	1300 hr.		10-16-90	1425 hr.	
Calcium	68.8	mg/l	Mercury	0.002<	mg/l
10-16-90	1410 hr.		10-23-90	1600 hr.	
Cations, Total	7.50	meq/l	Molybdenum	0.10<	mg/l
			10-25-90	1600 hr.	
Chloride	15.0	mg/l	Nickel	0.02<	mg/l
10-15-90	1600 hr.		10-25-90	1300 hr.	

ANALYST: D. Tepon

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PLEASE ADDRESS ALL CORRESPONDENCE TO:
P.O. BOX 1020, HUNTINGTON, UT 84528
TELEPHONE: (801) 653-2311

November 5, 1990

Job No.: 59 10659

Sample ID:

Date Rec'd: October 10, 1990

Date Sampled: October 10, 1990

Sampled By: UP&L

EAST MOUNTAIN SPRINGS
EMS 89-67
Flow 2.3 GPM
Temp 39°
Cond. 439
pH 7.88

Utah Power and Light Co.
P.O. Box 1005
Huntington UT 84528

WATER ANALYSIS

Nitrogen, Ammonia	0.00	mg/l	Selenium	0.002<	mg/l
10-11-90	0815 hr.		10-19-90	1300 hr.	
Nitrogen, Nitrate	0.16	mg/l	Sodium	19.70	mg/l
10-16-90	1600 hr.		10-16-90	1430 hr.	
Nitrogen, Nitrite	0.03	mg/l	Solids, Dissolved	235.0	mg/l
10-16-90	1600 hr.		10-24-90	0930 hr.	
Oxygen, Dissolved	5.8	mg/l	Solids, Suspended	26.0	mg/l
10-11-90	1100 hr.		10-24-90	0930 hr.	
pH	7.70	Units	Sulfate	40.0	mg/l
10-11-90	1140 hr.		10-18-90	1300 hr.	
Phosphorus, Total	0.01<	mg/l	Sulfide	0.00	mg/l
10-16-90	0815 hr.		10-12-90	1300 hr.	
Potassium	1.88	mg/l	Zinc	0.01	mg/l
10-16-90	1445 hr.		10-25-90	1300 hr.	

ANALYST: D. Tyson

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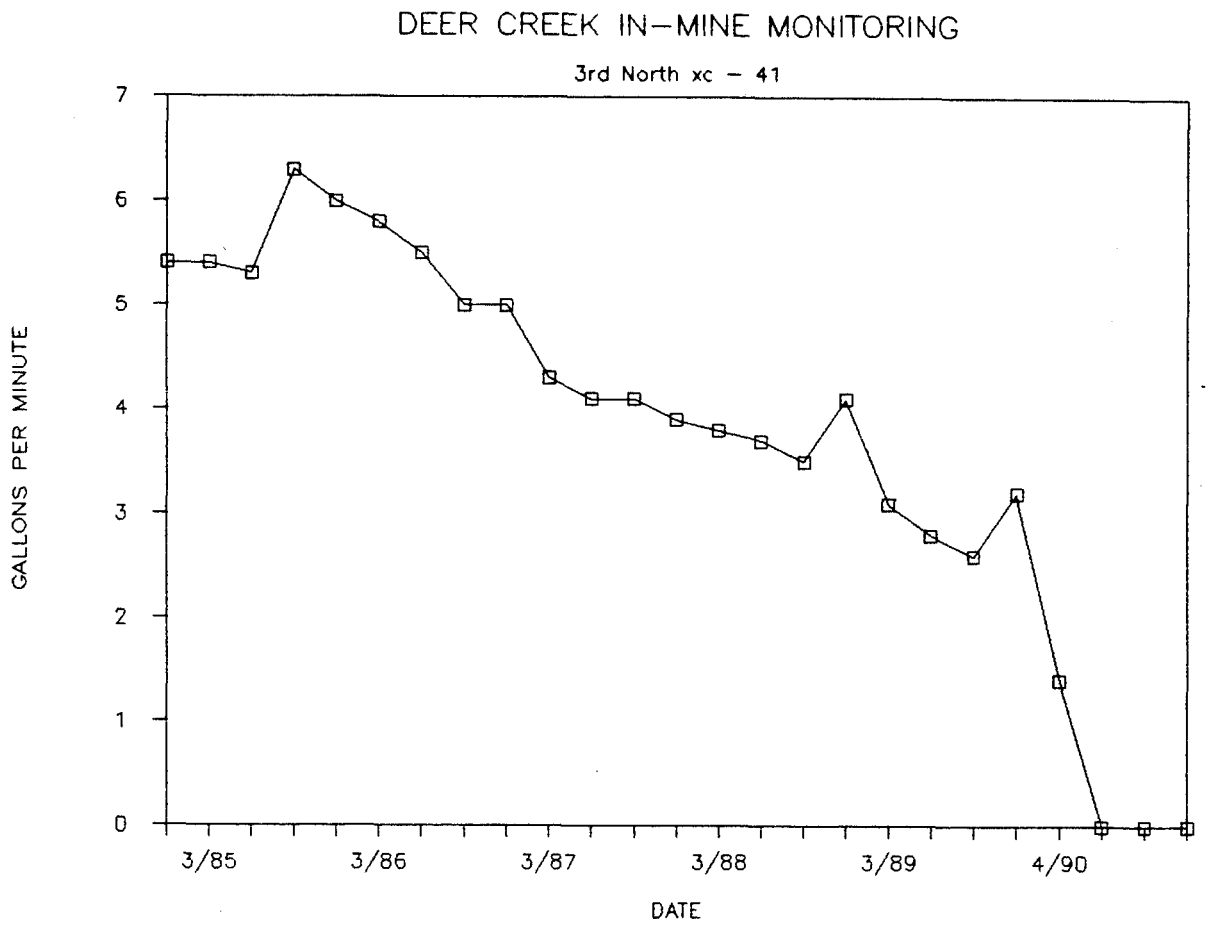
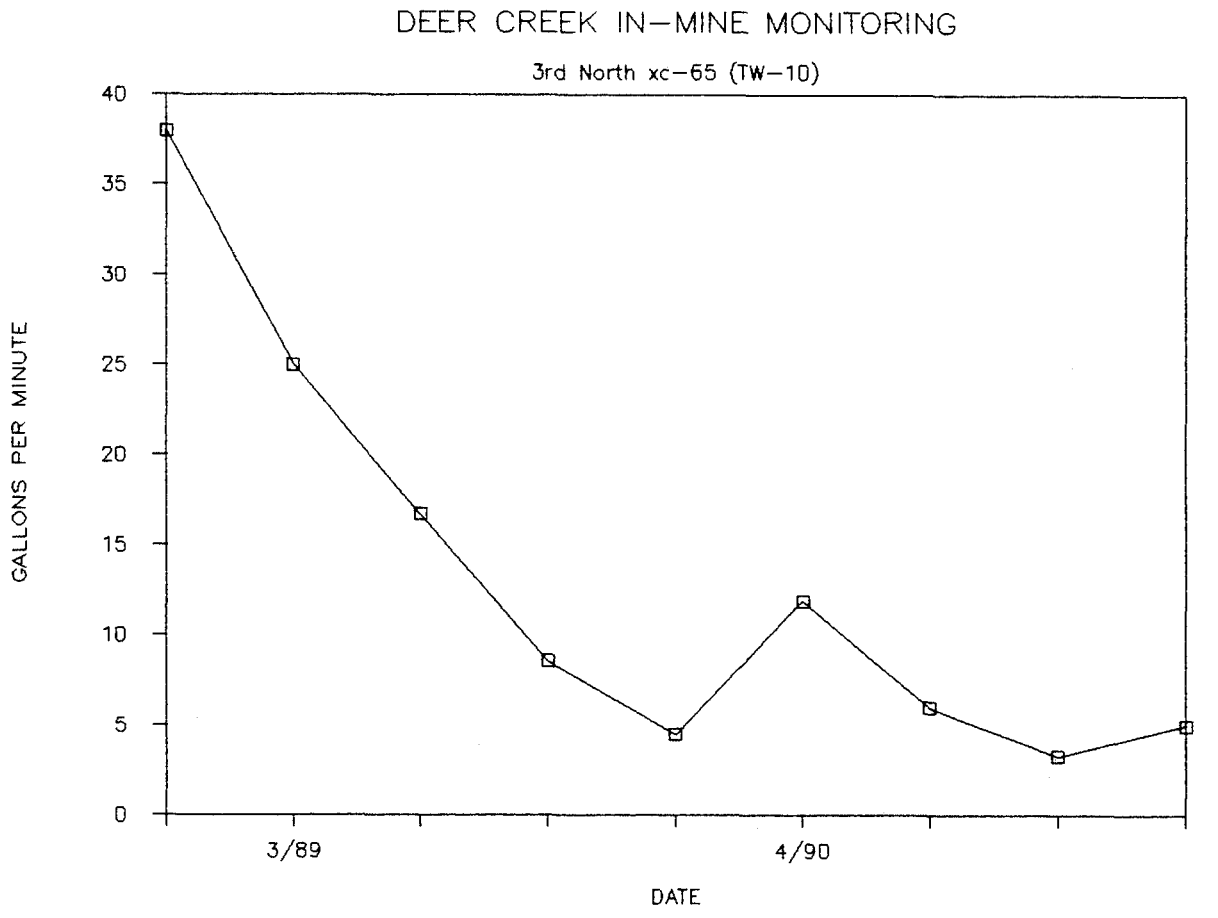
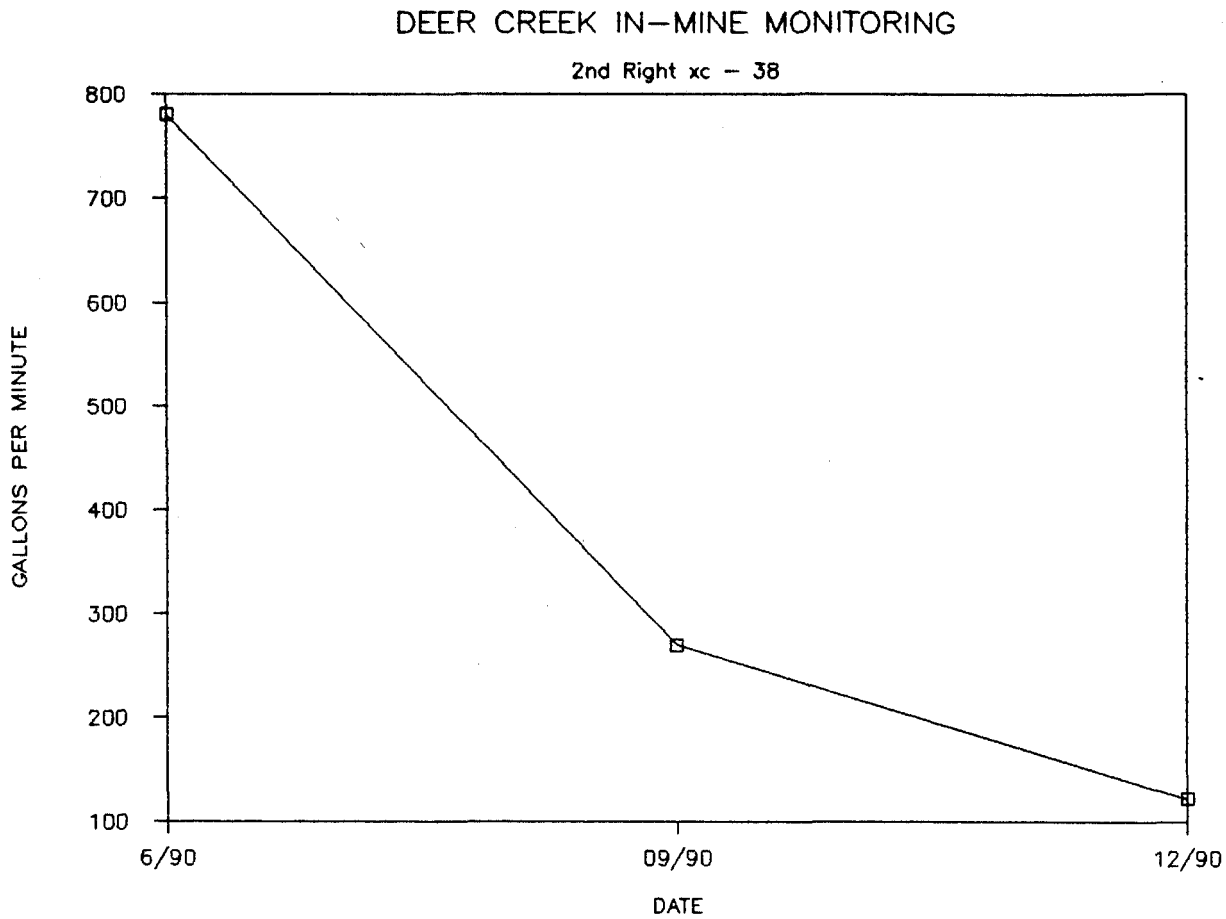

DEER CREEK IN-MINE MONITORING
3rd North xc - 41
GALLONS PER MINUTE
0
1
2
3
4
5
6
7
3/85
3/86
3/87
3/88
3/89
4/90
DATE


DEER CREEK IN-MINE MONITORING
3rd North xc-65 (TW-10)
GALLONS PER MINUTE
0
5
10
15
20
25
30
35
40
3/89
4/90
DATE


DEER CREEK IN-MINE MONITORING
2nd Right xc - 38
GALLONS PER MINUTE
800
700
600
500
400
300
200
100
6/90
09/90
12/90
DATE

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TELEPHONE: (801) 653-2311

Dup

March 21, 1990

Job No.: 59 10310

Date Rec'd: March 9, 1990

Date Sampled: March 9, 1990

Sampled By: UP&L

Sample ID: UP&L

DEER CREEK-IN-MINE
TW-10
Temperature 48 degrees
Flow 11.9 gpm
Rec'd 1300 hr.
Sampled 1110 hr.

Utah Power and Light Co.
P.O. Box 1005
Huntington UT 84528

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WATER ANALYSIS

Alk., Bicarbonate	490	mg/l HCO3	Iron	1.17	mg/l
03-14-90	1345 hr.		03-13-90	1400 hr.	
Alk., Carbonate	1<	mg/l CaCO3	Magnesium	77.10	mg/l
03-14-90	1345 hr.		03-13-90	1345 hr.	
Alk., Total	402	mg/l CaCO3	Manganese	0.31	mg/l
03-14-90	1345 hr.		03-13-90	1415 hr.	
Anions, Total	15.47	meq/l	Oxygen, Dissolved	5.7	mg/l
			03-09-90	1525 hr.	
Calcium	165.9	mg/l	pH	7.40	Units
03-12-90	1330 hr.		03-09-90	1515 hr.	
Cations, Total	15.31	meq/l	Potassium	5.00	mg/l
			03-13-90	1315 hr.	
Chloride	10.0	mg/l	Sodium	13.00	mg/l
03-12-90	1445 hr.		03-13-90	1300 hr.	
Conductivity	450	umhos/cm	Solids, Dissolved	381.0	mg/l
03-12-90	1430 hr.		03-20-90	1530 hr.	
Hardness, Total	732	mg/l CaCO3	Solids, Suspended	1828.0	mg/l
			03-20-90	1530 hr.	
			Sulfate	350.0	mg/l
			03-16-90	1200 hr.	

ANALYST: D Tyson

Respectfully submitted,
COMMERCIAL TESTING & ENGINEERING CO.

Dave Cornwell Lab Dir

Manager, Huntington Laboratory

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PLEASE ADDRESS ALL CORRESPONDENCE TO:
P.O. BOX 1020, HUNTINGTON, UT 84528
TELEPHONE: (801) 653-2311

March 21, 1990

Job No.: 59 10309

Date Rec'd: March 9, 1990

Date Sampled: March 9, 1990

Sampled By: UP&L

Sample ID: UP&L

DEER CREEK-IN-MINE
3rd NO. XC-41
Temperature 55 degrees
Flow 1.40 gpm
Rec'd 1300 hr.
Sampled 1120 hr.

Utah Power and Light Co.
P.O. Box 1005
Huntington UT 84528

WATER ANALYSIS

Alk., Bicarbonate	381	mg/l HCO3	Iron	0.92	mg/l
03-14-90	1345 hr.		03-13-90	1400 hr.	
Alk., Carbonate	1<	mg/l CaCO3	Magnesium	31.30	mg/l
03-14-90	1345 hr.		03-13-90	1345 hr.	
Alk., Total	312	mg/l CaCO3	Manganese	0.01<	mg/l
03-14-90	1345 hr.		03-13-90	1415 hr.	
Anions, Total	6.89	meq/l	Oxygen, Dissolved	3.0	mg/l
			03-09-90	1510 hr.	
Calcium	72.9	mg/l	pH	7.20	Units
03-13-90	1330 hr.		03-09-90	1450 hr.	
Cations, Total	6.80	meq/l	Potassium	1.40	mg/l
			03-13-90	1315 hr.	
Chloride	10.0	mg/l	Sodium	12.90	mg/l
03-12-90	1445 hr.		03-13-90	1300 hr.	
Conductivity	420	umhos/cm	Solids, Dissolved	342.0	mg/l
03-12-90	1430 hr.		03-20-90	1530 hr.	
Hardness, Total	311	mg/l CaCO3	Solids, Suspended	1.0<	mg/l
			03-20-90	1530 hr.	
			Sulfate	25.0	mg/l
			03-16-90	1200 hr.	

ANALYST: D Tyson

Respectfully submitted,
COMMERCIAL TESTING & ENGINEERING CO.

Dave Councilleyder

Manager, Huntington Laboratory

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P.O. BOX 1020, HUNTINGTON, UT 84528
TELEPHONE: (801) 653-2311

Dup

March 21, 1990

Job No.: 59 10311

Date Rec'd: March 9, 1990

Date Sampled: March 9, 1990

Sampled By: UP&L

Sample ID: UP&L

DEER CREEK-IN-MINE
1st Right XC-22
Temperature 52 degrees
Flow (NO FLOW)
Rec'd 1300 hr.
Sampled 0950 hr.

Utah Power and Light Co.
P.O. Box 1005
Huntington UT 84528

WATER ANALYSIS

Alk., Bicarbonate	512	mg/l HCO3	Iron	0.44	mg/l
03-14-90	1345 hr.		03-13-90	1400 hr.	
Alk., Carbonate	1<	mg/l CaCO3	Magnesium	40.20	mg/l
03-14-90	1345 hr.		03-13-90	1345 hr.	
Alk., Total	420	mg/l CaCO3	Manganese	0.01<	mg/l
03-14-90	1345 hr.		03-13-90	1415 hr.	
Anions, Total	11.48	meq/l	Oxygen, Dissolved	4.3	mg/l
			03-09-90	1525 hr.	
Calcium	81.7	mg/l	pH	7.10	Units
03-13-90	1315 hr.		03-09-90	1515 hr.	
Cations, Total	11.31	meq/l	Potassium	2.40	mg/l
			03-13-90	1315 hr.	
Chloride	5.0	mg/l	Sodium	90.00	mg/l
03-12-90	1445 hr.		03-13-90	1300 hr.	
Conductivity	650	umhos/cm	Solids, Dissolved	491.0	mg/l
03-12-90	1355 hr.		03-20-90	1630 hr.	
Hardness, Total	370	mg/l CaCO3	Solids, Suspended	1.0<	mg/l
			03-20-90	1630 hr.	
			Sulfate	150.0	mg/l
			03-16-90	1200 hr.	

ANALYST: D. Tipon

Respectfully submitted,
COMMERCIAL TESTING & ENGINEERING CO.

Dave Cunnell Light

Manager, Huntington Laboratory

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PLEASE ADDRESS ALL CORRESPONDENCE TO:
P.O. BOX 1020, HUNTINGTON, UT 84528
TELEPHONE: (801) 653-2311

April 10, 1990

Job No.: 59 10328

Date Rec'd: March 26, 1990

Date Sampled: March 26, 1990

Sampled By: UF&L

Sample ID: UF&L

DEER CREEK-MINE
1st Right Fault Zone
Temperature 46 degrees
Rec'd 1100 hr.
Sampled 0855 hr.

Utah Power and Light Co.
P.O. Box 1005
Huntington UT 84528

WATER ANALYSIS

Alk., Bicarbonate	538	mg/l HCO3	Magnesium	46.30	mg/l
03-26-90	1300 hr.		03-28-90	1345 hr.	
Alk., Carbonate	1<	mg/l CaCO3	Manganese	0.01<	mg/l
03-26-90	1300 hr.		03-28-90	1400 hr.	
Alk., Total	441	mg/l CaCO3	Oil and Grease	1.1	mg/l
03-26-90	1300 hr.		03-28-90	1420 hr.	
Anions, Total	10.42	meq/l	Oxygen, Dissolved	3.0	mg/l
			03-26-90	1645 hr.	
Calcium	110.8	mg/l	pH	7.00	Units
03-28-90	1330 hr.		03-26-90	1605 hr.	
Cations, Total	10.22	meq/l	Potassium	2.10	mg/l
			03-28-90	1315 hr.	
Chloride	5.0	mg/l	Sodium	19.20	mg/l
03-27-90	1445 hr.		03-28-90	1300 hr.	
Conductivity	800	umhos/cm	Solids, Dissolved	495.0	mg/l
03-26-90	1055 hr.		03-27-90	1545 hr.	
Hardness, Total	467	mg/l CaCO3	Solids, Settleable	0.5 <	mg/l
			03-27-90	1330 hr.	
Iron	0.20	mg/l	Solids, Suspended	79.0	mg/l
03-28-90	1400 hr.		03-27-90	1545 hr.	
Iron, Dissolved	0.03	mg/l	Sulfate	80.0	mg/l
03-28-90	1400 hr.		03-29-90	0930 hr.	

ANALYST: D. Tipton

RECEIVED
APR 10 1990
PRODUCTION DIV
FIELD OFFICE

Respectfully submitted,
COMMERCIAL TESTING & ENGINEERING CO.

Manager, Huntington Laboratory

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COMMERCIAL TESTING & ENGINEERING CO.
GENERAL OFFICES: 1919 SOUTH HIGHLAND AVE., SUITE 210-B, LOMBARD, ILLINOIS 60148 • (312) 953-9300
SINCE 1908
Member of the SGS Group (Société Générale de Surveillance)

Biomonitoring
1[illegible]8

DEER CREEK MINE
1st Right Fault Zone

PLEASE ADDRESS ALL CORRESPONDENCE TO:
P.O. BOX 1020, HUNTINGTON, UT 84528
TELEPHONE: (801) 653-2311

REGION VIII GUIDANCE FOR ACUTE WHOLE EFFLUENT REPORTING

PERMITTEE NAME UTAH POWER & LIGHT CO. NPDES No _____

20% MORTALITY TEST: X pass ___ fail LC50 N/A % OUTFALL NO _____

TEST ANIMAL & AGE Fathead 4d SAMPLE TIME & DATE 08:55 3-26-90

Analysis Time & Date: Begin 3-27-90 13:00 End 3-31-90 13:00

Receiving Water Hardness 173 Reconstituted Water Hardness (if used) ____

Measurements	Dilutions (% Effluent)*						
	0%	6%	12.5%	25%	50%	75%	100%
No @ Start of Test	20		20	20	20	20	20
No live after 24 hrs	20		20	20	19	20	19
No live after 48 hrs	20		20	20	18	20	19
No live after 72 hrs	20		20	20	18	20	19
No live after 96 hrs	20		20	19	18	20	19
Initial DO: mg/l	8.1		7.3	7.1	6.5	5.6	4.2
DO; 24 hrs: old/new	6.6/7.1	/	6.3/7.0	6.2/6.9	5.8/6.4	6.5/6.1	/5.4
DO; 48 hrs: old/new	5.8/7.8	/	5.7/7.0	5.7/6.9	5.9/6.7	5.8/6.3	5.5/5.6
DO; 72 hrs: old/new	5.7/6.6	/	6.0/6.6	6.1/6.5	6.1/6.2	6.1/6.1	6.1/5.8
DO; 96 hrs:	6.8		6.7	6.6	6.6	6.5	6.2
Initial temp: °C	20		20	20	20	20	20
Temp; 24 hrs: old/new	21/21	/	21/21	21/21	21/21	21/21	21/21
Temp; 48 hrs: old/new	20/20	/	20/20	20/20	20/20	20/20	20/20
Temp; 72 hrs: old/new	20/20	/	20/20	20/20	20/20	20/20	20/20
Temp; 96 hrs:	20		20	20	20	20	20

Initial alkal. 0% 225 100% 441 Initial Effluent Hardness 467

Initial NH_3 as N 0% 0.60 100% 0.47 Initial pH 0% 8.10 100% 7.00

Final pH 0% 8.3 100% 8.2 ANALYST'S NAME David Councill

LABORATORY CTE-HUNTINGTON SIGNATURE/DATE [signature] 4-9-90

* normally, a minimum of five plus control (0%)

APR - 9 1990

6/28/88

COMMERCIAL TESTING & ENGINEERING CO.
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Biomonitoring
10328

DEER CREEK MINE
1st Right Fault Zone

PLEASE ADDRESS ALL CORRESPONDENCE TO:
P.O. BOX 1020, HUNTINGTON, UT 84528
TELEPHONE: (801) 653-2311

REGION VIII GUIDANCE FOR ACUTE WHOLE EFFLUENT REPORTING

PERMITTEE NAME UTAH POWER & LIGHT CO. **NPDES No** _____

20% MORTALITY TEST: X **pass** ___ **fail** **LC50** N/A % **OUTFALL NO** _____

TEST ANIMAL & AGE Ceriodaphnia 24hr **SAMPLE TIME & DATE** 08:55 3/26/90

Analysis Time & Date: Begin 3/28/90 10:00 End 3/30/90 10:00

Receiving Water Hardness 173 Reconstituted Water Hardness (if used) ____

Measurements	Dilutions (% Effluent)*						
	0%	6%	12.5%	25%	50%	75%	100%
No @ Start of Test	20		20	20	20	20	20
No live after 24 hrs	20		20	20	20	20	20
No live after 48 hrs	20		20	20	20	20	20
No live after 72 hrs							
No live after 96 hrs							
Initial DO: mg/l	7.1		7.0	6.9	6.4	6.1	5.4
DO; 24 hrs: old/new	6.8/7.8	/	6.8/7.0	6.5/6.9	6.2/6.7	6.1/6.3	6.0/5.6
DO; 48 hrs: old/new	6.2/	/	6.4/	6.5/	6.3/	6.1/	6.6/
DO; 72 hrs: old/new	/	/	/	/	/	/	/
DO; 96 hrs:							
Initial temp: °C	21		21	21	21	21	21
Temp; 24 hrs: old/new	20/20	/	20/20	20/20	20/20	20/20	20/20
Temp; 48 hrs: old/new	20/	/	20/	20/	20/	20/	20/
Temp; 72 hrs: old/new	/	/	/	/	/	/	/
Temp; 96 hrs:							

Initial alkal. 0% 225 100% 441 Initial Effluent Hardness 467

Initial NH_3 as N 0% 0.60 100% 0.47 Initial pH 0% 8.1 100% 7.0

Final pH 0% 8.4 100% 8.4 **ANALYST'S NAME** Donna Tyson

LABORATORY CTE-HUNTINGTON **SIGNATURE/DATE** [signature] ~~4/9/90~~

* normally, a minimum of five plus control (0%) 6/28/88

COMMERCIAL TESTING & ENGINEERING CO.
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PLEASE ADDRESS ALL CORRESPONDENCE TO
P.O. BOX 1020, HUNTINGTON, UT 84528
TELEPHONE: (801) 653-2311

April 12, 1990

Job No.: 59 10335

Date Rec'd: April 3, 1990

Date Sampled: April 3, 1990

Sampled By: UP&L

Utah Power and Light Co.
P.O. Box 1005
Huntington UT 84528

Sample ID: UP&L

DEER CREEK-MINE
3rd North XC-65
#3 Slope
Temperature 46 degrees
Flow 15 gpm
Rec'd 1030 hr.
Sampled 0915 hr.

WATER ANALYSIS

Alk., Bicarbonate	376	mg/l HCO3	Magnesium	30.80	mg/l
04-09-90	1315 hr.		04-08-90	1345 hr.	
Alk., Carbonate	1<	mg/l CaCO3	Manganese	0.01<	mg/l
04-09-90	1315 hr.		04-08-90	1400 hr.	
Alk., Total	308	mg/l CaCO3	Oil and Grease	1.0<	mg/l
04-09-90	1315 hr.		04-08-90	1400 hr.	
Anions, Total	7.48	meq/l	Oxygen, Dissolved	7.8	mg/l
			04-03-90	1345 hr.	
Calcium	83.1	mg/l	pH	7.80	Units
04-08-90	1330 hr.		04-03-90	1330 hr.	
Cations, Total	7.47	meq/l	Potassium	2.30	mg/l
			04-08-90	1315 hr.	
Chloride	15.0	mg/l	Sodium	17.00	mg/l
04-03-90	1400 hr.		04-08-90	1300 hr.	
Conductivity	700	umhos/cm	Solids, Dissolved	433.0	mg/l
04-09-90	0930 hr.		04-06-90	1600 hr.	
Hardness, Total	334	mg/l CaCO3	Solids, Suspended	1.0<	mg/l
			04-06-90	1600 hr.	
Iron	0.18	mg/l	Sulfate	50.0	mg/l
04-08-90	1415 hr.		04-10-90	1607 hr.	
Iron, Dissolved	0.02<	mg/l			
04-08-90	1415 hr.				

ANALYST: D. Tyson

Respectfully submitted,
COMMERCIAL TESTING & ENGINEERING CO.

Manager, Huntington Laboratory

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10335
Biomonitoring

DEER CREEK MINE
3rd North XC-65
#3 Slope

PLEASE ADDRESS ALL CORRESPONDENCE TO
P.O. BOX 1020, HUNTINGTON, UT 84528
TELEPHONE: (801) 653-2311

REGION VIII GUIDANCE FOR ACUTE WHOLE EFFLUENT REPORTING

PERMITTEE NAME UTAH POWER & LIGHT CO. **NPDES No** _____

20% MORTALITY TEST: X **pass** ___ **fail** **LC50** N/A % **OUTFALL NO** _____

TEST ANIMAL & AGE Ceriodaphnia<24hr **SAMPLE TIME & DATE** 09:15 4/3/90

Analysis Time & Date: Begin 4/4/90 10:00 **End** 4/6/90 10:00

Receiving Water Hardness 223 **Reconstituted Water Hardness (if used)** ____

Measurements	Dilutions (% Effluent)*						
	0%	6%	12.5%	25%	50%	75%	100%
No @ Start of Test	20		20	20	20	20	20
No live after 24 hrs	20		20	20	20	20	20
No live after 48 hrs	20		20	20	20	20	20
No live after 72 hrs							
No live after 96 hrs							
Initial DO: mg/l	8.0		7.9	7.8	7.9	8.0	7.8
DO; 24 hrs: old/new	7.2/7.2	/	7.0/7.1	6.9/7.1	7.0/7.1	7.2/7.2	7.2/7.1
DO; 48 hrs: old/new	7.2/	/	7.1/	7.0/	7.0/	7.2/	7.0/
DO; 72 hrs: old/new	/	/	/	/	/	/	/
DO; 96 hrs:							
Initial temp: °C	20		20	20	20	20	20
Temp; 24 hrs: old/new	20/20	/	20/20	20/20	20/20	20/20	20/20
Temp; 48 hrs: old/new	20/	/	20/	20/	20/	20/	20/
Temp; 72 hrs: old/new	/	/	/	/	/	/	/
Temp; 96 hrs:							

Initial alkal. 0% 198 100% 308 **Initial Effluent Hardness** 334

Initial NH_3 as N 0% 0.37 100% 0.41 **Initial pH** 0% 8.3 100% 7.8

Final pH 0% 8.3 100% 8.4 **ANALYST'S NAME** David Councill

LABORATORY CTE-HUNTINGTON **SIGNATURE/DATE** [signature] 4/11/90

* normally, a minimum of five plus control (0%)

6/28/88

COMMERCIAL TESTING & ENGINEERING CO.
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335
Biomonitoring

DEER CREEK MINE
3rd North XC-65
#3 Slope

PLEASE ADDRESS ALL CORRESPONDENCE TO:
P.O. BOX 1020, HUNTINGTON, UT 84528
TELEPHONE: (801) 653-2311

REGION VIII GUIDANCE FOR ACUTE WHOLE EFFLUENT REPORTING

PERMITTEE NAME UTAH POWER & LIGHT CO. NPDES No _____

20% MORTALITY TEST: X pass ___ fail LC50 N/A % OUTFALL NO _____

TEST ANIMAL & AGE Pimephales 4d SAMPLE TIME & DATE 09:15 4/3/90

Analysis Time & Date: Begin 4/3/90 13:00 End 4/7/90 13:00

Receiving Water Hardness 223 Reconstituted Water Hardness (if used) ____

Measurements	Dilutions (% Effluent)*						
	0%	6%	12.5%	25%	50%	75%	100%
No @ Start of Test	20		20	20	20	20	20
No live after 24 hrs	20		20	20	20	19	19
No live after 48 hrs	19		20	20	20	19	19
No live after 72 hrs	19		20	20	20	19	19
No live after 96 hrs	19		20	20	20	19	19
Initial DO: mg/l	7.9		7.9	7.8	7.8	7.4	7.5
DO; 24 hrs: old/new	5.9/8.0	/	5.7/7.9	5.6/7.8	5.4/7.9	5.4/8.0	5.1/7.8
DO; 48 hrs: old/new	6.1/7.2	/	6.3/7.1	6.5/7.1	6.4/7.1	6.3/7.2	6.4/7.1
DO; 72 hrs: old/new	6.7/7.1	/	/7.2	6.3/7.4	6.5/7.2	6.6/7.3	6.6/6.9
DO; 96 hrs:	6.3		6.2	6.2	6.0	6.0	5.6
Initial temp: °C	21		21	21	21	21	20
Temp; 24 hrs: old/new	20/20	/	20/20	20/20	20/20	20/20	20/20
Temp; 48 hrs: old/new	20/20	/	20/20	20/20	20/20	20/20	20/20
Temp; 72 hrs: old/new	20/20	/	20/20	20/20	20/20	20/20	20/20
Temp; 96 hrs:	20		20	20	20	20	20

Initial alkal. 0% 198 100% 308 Initial Effluent Hardness 334

Initial NH_3 as N 0% 0.37 100% 0.41 Initial pH 0% 8.3 100% 7.8

Final pH 0% 8.20 100% 8.25 ANALYST'S NAME David Councill

LABORATORY CTE-HUNTINGTON SIGNATURE/DATE [signature] 4/11/90

* normally, a minimum of five plus control (0%)

APR 16/28/88

MINING DIV
OFFICE

COMMERCIAL TESTING & ENGINEERING CO.
GENERAL OFFICES 1919 SOUTH HIGHLAND AVE., SUITE 210-B, LOMBARD, ILLINOIS 60148 • (312) 953-9300
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PLEASE ADDRESS ALL CORRESPONDENCE TO:
P.O. BOX 1020, HUNTINGTON, UT 84528
TELEPHONE: (801) 653-2311

April 23, 1990

Job No.: 59 10347

Sample ID: UF&L

Date Rec'd: April 10, 1990

DEER CREEK MINE
2nd Right XC-17
Temperature 50 degrees
Rec'd 1155 hr.
Sampled 1000 hr.

Date Sampled: April 10, 1990

Sampled By: UF&L

Utah Power and Light Co.
P.O. Box 1005
Huntington UT 84528

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MINING DIV.
FIELD OFFICE

WATER ANALYSIS

Alk., Bicarbonate	414	mg/l HCO3	Magnesium	42.80	mg/l
04-13-90	1300 hr.		04-13-90	1445 hr.	
Alk., Carbonate	1<	mg/l CaCO3	Manganese	0.01<	mg/l
04-13-90	1300 hr.		04-23-90	1500 hr.	
Alk., Total	339	mg/l CaCO3	Oil and Grease	1.0<	mg/l
04-13-90	1300 hr.		04-10-90	1400 hr.	
Anions, Total	8.50	meq/l	Oxygen, Dissolved	5.9	mg/l
			04-10-90	1420 hr.	
Calcium	82.1	mg/l	pH	7.65	Units
04-13-90	1430 hr.		04-10-90	1410 hr.	
Cations, Total	8.15	meq/l	Potassium	1.80	mg/l
			04-13-90	1415 hr.	
Chloride	15.0	mg/l	Sodium	11.40	mg/l
04-13-90	1515 hr.		04-13-90	1400 hr.	
Conductivity	520	umhos/cm	Solids, Dissolved	203.0	mg/l
04-16-90	1600 hr.		04-10-90	1610 hr.	
Hardness, Total	381	mg/l CaCO3	Solids, Suspended	19.0	mg/l
			04-10-90	1610 hr.	
Iron	0.21	mg/l	Sulfate	70.0	mg/l
04-23-90	1530 hr.		04-10-90	1607 hr.	
Iron, Dissolved	0.02<	mg/l			
04-23-90	1530 hr.				

ANALYST: D. Tipon

Respectfully submitted,
COMMERCIAL TESTING & ENGINEERING CO.

Manager, Huntington Laboratory

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TIDEWATER AND GREAT LAKES PORTS, AND RIVER LOADING FACILITIES

COMMERCIAL TESTING & ENGINEERING CO.
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10347
Biomonitoring

DEER CREEK MINE
2nd R XC-17

PLEASE ADDRESS ALL CORRESPONDENCE TO
P.O. BOX 1020, HUNTINGTON, UT 84528
TELEPHONE: (801) 653-2311

REGION VIII GUIDANCE FOR ACUTE WHOLE EFFLUENT REPORTING

PERMITTEE NAME Utah Power & Light Co. **NPDES No** _____

20% MORTALITY TEST: X **pass** ___ **fail** **LC50** ___% **OUTFALL NO** _____

TEST ANIMAL & AGE Ceriodaphnia 24h **SAMPLE TIME & DATE** 4/10/90 10:00

Analysis Time & Date: Begin 4/11/90 09:00 **End** 4/13/90 09:00

Receiving Water Hardness 297 **Reconstituted Water Hardness (if used)** ___

Measurements	Dilutions (% Effluent)*						
	0%	6%	12.5%	25%	50%	75%	100%
No @ Start of Test	20		20	20	20	20	20
No live after 24 hrs	20		20	20	20	20	20
No live after 48 hrs	20		20	20	20	20	20
No live after 72 hrs							
No live after 96 hrs							
Initial DO: mg/l	8.0		7.9	7.8	6.8	7.2	6.8
DO; 24 hrs: old/new	7.2/6.6	/	7.2/6.9	7.4/7.2	7.0/7.0	6.9/6.9	6.6/6.7
DO; 48 hrs: old/new	7.0/	/	6.9/	6.8/	7.0/	7.1/	7.1/
DO; 72 hrs: old/new	/	/	/	/	/	/	/
DO; 96 hrs:							
Initial temp: °C	20		20	20	20	20	20
Temp; 24 hrs: old/new	20/20	/	20/20	20/20	20/20	20/20	20/20
Temp; 48 hrs: old/new	20/	/	20/	20/	20/	20/	20/
Temp; 72 hrs: old/new	/	/	/	/	/	/	/
Temp; 96 hrs:							

Initial alkal. 0% 292 **100%** 339 **Initial Effluent Hardness** 381

Initial NH_3 as N 0% .20 **100%** .07 **Initial pH 0%** 8.3 **100%** 7.65

Final pH 0% 8.4 **100%** 8.5 **ANALYST'S NAME** David Councill

LABORATORY CTE-HUNTINGTON **SIGNATURE/DATE** _____

* normally, a minimum of five plus control (0%)

6/28/88

COMMERCIAL TESTING & ENGINEERING CO.
GENERAL OFFICES: 1919 SOUTH HIGHLAND AVE., SUITE 210-B, LOMBARD, ILLINOIS 60148 • (312) 953-9300
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Member of the SGS Group (Société Générale de Surveillance)
PLEASE ADDRESS ALL CORRESPONDENCE TO
P.O. BOX 1020, HUNTINGTON, UT 84528
TELEPHONE (801) 653-2311

10347
Biomonitoring

DEER CREEK MINE
2nd R XC-17

REGION VIII GUIDANCE FOR ACUTE WHOLE EFFLUENT REPORTING

PERMITTEE NAME Utah Power & Light Co. NPDES No _____

20% MORTALITY TEST: X pass ___ fail LC50 ___% OUTFALL NO ___

TEST ANIMAL & AGE Pimephales 4d. SAMPLE TIME & DATE 4/10/90 10:00

Analysis Time & Date: Begin 4/10/90 15:00 End 4/14/90 15:00

Receiving Water Hardness 297 Reconstituted Water Hardness (if used) ___

Measurements	Dilutions (% Effluent)*						
	0%	6%	12.5%	25%	50%	75%	100%
No @ Start of Test	20		20	20	20	20	20
No live after 24 hrs	18		20	19	20	19	20
No live after 48 hrs	18		20	18	20	19	20
No live after 72 hrs	18		20	18	20	19	20
No live after 96 hrs	18		20	18	20	19	20
Initial DO: mg/l	7.8		7.7	7.7	6.9	6.2	5.9
DO; 24 hrs: old/new	6.7/8.0	/	7.0/7.9	7.4/7.8	7.1/6.8	6.2/7.2	6.5/6.8
DO; 48 hrs: old/new	7.6/6.6	/	7.0/6.9	5.5/7.2	6.7/7.0	5.8/6.9	5.8/6.7
DO; 72 hrs: old/new	7.0/7.1	/	7.0/6.5	7.5/6.6	6.9/7.3	6.6/7.4	6.7/6.8
DO; 96 hrs:	6.5		6.9	6.8	6.4	6.6	6.2
Initial temp: °C	20		20	20	20	20	20
Temp; 24 hrs: old/new	20/20	/	20/20	20/20	20/20	20/20	20/20
Temp; 48 hrs: old/new	20/20	/	20/20	20/20	20/20	20/20	20/20
Temp; 72 hrs: old/new	20/20	/	20/20	20/20	20/20	20/20	20/20
Temp; 96 hrs:	20		20	20	20	20	20

Initial alkal. 0% 292 100% 339 Initial Effluent Hardness 381

Initial NH_3 as N 0% 2.0 100% 0.7 Initial pH 0% 8.3 100% 7.65

Final pH 0% 8.3 100% 8.3 ANALYST'S NAME David Councill

LABORATORY CTE-HUNTINGTON SIGNATURE/DATE [signature]

* normally, a minimum of five plus control (0%)

6/28/88

COMMERCIAL TESTING & ENGINEERING CO.
GENERAL OFFICES: 1919 SOUTH HIGHLAND AVE., SUITE 210-B, LOMBARD, ILLINOIS 60148 • (312) 953-9300
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PLEASE ADDRESS ALL CORRESPONDENCE TO:
P.O. BOX 1020, HUNTINGTON, UT 84528
TELEPHONE: (801) 653-2311

June 28, 1990

Job No.: 59 10444

Date Rec'd: June 14, 1990

Date Sampled: June 13, 1990

Sampled By: UP&L

Utah Power and Light Co.
P.O. Box 1005
Huntington UT 84528

Sample ID: UP&L

• DEER CREEK RUNOFF BELOW MINE
Temperature 74 degrees
Flow 12.0
Rec'd 1452 hr.
Sampled 0830 hr.
FIELD MEASUREMENTS
pH 8.03
Conductivity 2425

DCR05

WATER ANALYSIS

Acidity	1<	mg/l CaCO3	Iron, Dissolved	0.02<	mg/l
06-27-90	0910 hr.		06-15-90	1430 hr.	
Alk., Bicarbonate	390	mg/l HCO3	Magnesium	124.00	mg/l
06-18-90	1415 hr.		06-15-90	1415 hr.	
Alk., Carbonate	6	mg/l CaCO3	Manganese	0.02	mg/l
06-18-90	1415 hr.		06-15-90	1445 hr.	
Alk., Total	243	mg/l CaCO3	Oil and Grease	1.0<	mg/l
06-18-90	1415 hr.		06-20-90	1100 hr.	
Anions, Total	31.97	meq/l	Oxygen, Dissolved	6.3	mg/l
			06-14-90	1330 hr.	
Calcium	191.9	mg/l	pH	8.40	Units
06-15-90	1400 hr.		06-14-90	1120 hr.	
Cations, Total	31.72	meq/l	Potassium	8.90	mg/l
			06-15-90	1515 hr.	
Chloride	515.0	mg/l	Sodium	272.80	mg/l
06-20-90	1620 hr.		06-15-90	1500 hr.	
Conductivity	2400	umhos/cm	Solids, Dissolved	1371.0	mg/l
06-14-90	1510 hr.		06-15-90	1630 hr.	
Hardness, Total	990	mg/l CaCO3	Solids, Settleable	0.5<	mg/l
			06-14-90	1545 hr.	
Iron	0.02<	mg/l	Solids, Suspended	6.0	mg/l
06-15-90	1430 hr.		06-15-90	1630 hr.	
			Sulfate	610.0	mg/l
			06-21-90	1315 hr.	

ANALYST: [illegible]

Respectfully submitted,
COMMERCIAL TESTING & ENGINEERING CO.

[illegible]
Manager, Huntington Laboratory

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OVER 40 BRANCH LABORATORIES STRATEGICALLY LOCATED IN PRINCIPAL COAL MINING AREAS,
TIDEWATER AND GREAT LAKES PORTS, AND RIVER LOADING FACILITIES

COMMERCIAL TESTING & ENGINEERING CO.
GENERAL OFFICES. 1919 SOUTH HIGHLAND AVE., SUITE 210-B, LOMBARD, ILLINOIS 60148 • (312) 953-9300
SINCE 1908
Member of the SGS Group (Société Générale de Surveillance)

PLEASE ADDRESS ALL CORRESPONDENCE TO:
P.O. BOX 1020, HUNTINGTON, UT 84528
TELEPHONE: (801) 653-2311

July 25, 1990

Job No.: 59 10470

Date Rec'd: June 29, 1990

Date Sampled: June 29, 1990

Sampled By: UP&L

Sample ID: UP&L

DEER CREEK-IN-MINE
TW-10 TW 3rd North XC-65
Temperature 46 degrees
Flow 6.0 gpm
Rec'd 1200 hr.
Sampled 1000 hr.

Utah Power and Light Co.
P.O. Box 1005
Huntington UT 84528

WATER ANALYSIS

Aluminum	0.01<	mg/l	Chromium	0.02<	mg/l
07-24-90	1400 hr.		07-24-90	1400 hr.	
Alk., Bicarbonate	418	mg/l HCO3	Conductivity	599	umhos/cm
07-10-90	0950 hr.		07-10-90	1325 hr.	
Alk., Carbonate	1<	mg/l CaCO3	Copper	0.010<	mg/l
07-10-90	0950 hr.		07-24-90	1030 hr.	
Alk., Total	343	mg/l CaCO3	Fluoride	0.20	mg/l
07-10-90	0950 hr.		07-10-90	1500 hr.	
Arsenic	0.002<	mg/l	Hardness, Total	430	mg/l CaCO3
07-20-90	0900 hr.				
Anions, Total	8.79	meq/l	Iron	0.30	mg/l
			07-12-90	1415 hr.	
Barium	0.03<	mg/l	Lead	0.050<	mg/l
07-24-90	1400 hr.		07-24-90	1030 hr.	
Boron	0.23	mg/l	Magnesium	39.00	mg/l
07-18-90	0930 hr.		07-12-90	1350 hr.	
Cadmium	0.002<	mg/l	Manganese	0.01<	mg/l
07-24-90	1030 hr.		07-12-90	1400 hr.	
Calcium	107.9	mg/l	Mercury	0.002<	mg/l
07-12-90	1330 hr.		07-19-90	1400 hr.	
Cations, Total	9.02	meq/l	Molybdenum	0.10<	mg/l
			07-24-90	1400 hr.	
Chloride	15.0	mg/l	Nickel	0.02<	mg/l
07-10-90	0930 hr.		07-24-90	1030 hr.	

ANALYST: D. Tipon

Respectfully submitted,
COMMERCIAL TESTING & ENGINEERING CO.

Manager, Huntington Laboratory

JUL 27 1990
MINING DIV
FIELD OFFICE

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PLEASE ADDRESS ALL CORRESPONDENCE TO:
P.O. BOX 1020, HUNTINGTON, UT 84528
TELEPHONE: (801) 653-2311

July 25, 1990

Job No.: 59 10470

Date Rec'd: June 29, 1990

Date Sampled: June 29, 1990

Sampled By: UP&L

Sample ID: UP&L

DEER CREEK-IN-MINE
TW-10 TW 3rd North XC-65
Temperature 46 degrees
Flow 6.0 gpm
Rec'd 1200 hr.
Sampled 1000 hr.

Utah Power and Light Co.
P.O. Box 1005
Huntington UT 84528

WATER ANALYSIS

Nitrogen, Ammonia	0.01	mg/l	Selenium	0.002<	mg/l
07-12-90	1530 hr.		07-20-90	1000 hr.	
Nitrogen, Nitrate	0.01<	mg/l	Sodium	9.81	mg/l
07-13-90	1230 hr.		07-12-90	1430 hr.	
Nitrogen, Nitrite	0.01<	mg/l	Solids, Dissolved	359.0	mg/l
07-13-90	1230 hr.		07-10-90	1630 hr.	
Oxygen, Dissolved	5.8	mg/l	Solids, Suspended	1.0<	mg/l
06-29-90	1815 hr.		07-10-90	1630 hr.	
pH	7.40	Units	Sulfate	80.0	mg/l
06-29-90	1800 hr.		07-12-90	1430 hr.	
Phosphorus, Total	0.01<	mg/l	Sulfide	1.00<	mg/l
07-05-90	1610 hr.		07-12-90	0830 hr.	
Potassium	0.10	mg/l	Zinc	0.00<	mg/l
07-12-90	1445 hr.		07-24-90	1030 hr.	

ANALYST: D. Tyson

Respectfully submitted,
COMMERCIAL TESTING & ENGINEERING CO.

Manager, Huntington Laboratory

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OVER 40 BRANCH LABORATORIES STRATEGICALLY LOCATED IN PRINCIPAL COAL MINING AREAS,
TIDEWATER AND GREAT LAKES PORTS, AND RIVER LOADING FACILITIES

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PLEASE ADDRESS ALL CORRESPONDENCE TO:
P.O. BOX 1020, HUNTINGTON, UT 84528
TELEPHONE: (801) 653-2311

July 25, 1990

Job No.: 59 10468

Date Rec'd: June 29, 1990

Date Sampled: June 29, 1990

Sampled By: UP&L

Utah Power and Light Co.
P.O. Box 1005
Huntington UT 84528

Sample ID: UP&L

DEER CREEK-IN-MINE
2 Right Fault Zone
Temperature 54 degrees
Flow .42 / 781 GPM
Rec'd 1200 hr.
Sampled 1130 hr.

WATER ANALYSIS

Aluminum	0.01<	mg/l	Chromium	0.02<	mg/l
07-24-90	1400 hr.		07-24-90	1400 hr.	
Alk., Bicarbonate	510	mg/l HCO3	Conductivity	700	umhos/cm
07-10-90	0950 hr.		07-10-90	1325 hr.	
Alk., Carbonate	1<	mg/l CaCO3	Copper	0.010<	mg/l
07-10-90	0950 hr.		07-24-90	1030 hr.	
Alk., Total	418	mg/l CaCO3	Fluoride	0.23	mg/l
07-10-90	0950 hr.		07-10-90	1500 hr.	
Arsenic	0.002<	mg/l	Hardness, Total	429	mg/l CaCO3
07-20-90	0900 hr.				
Anions, Total	9.41	meq/l	Iron	0.44	mg/l
			07-12-90	1415 hr.	
Barium	0.03<	mg/l	Lead	0.050<	mg/l
07-24-90	1400 hr.		07-24-90	1030 hr.	
Boron	0.09	mg/l	Magnesium	40.10	mg/l
07-18-90	0930 hr.		07-12-90	1350 hr.	
Cadmium	0.002<	mg/l	Manganese	0.01<	mg/l
07-24-90	1030 hr.		07-12-90	1400 hr.	
Calcium	105.8	mg/l	Mercury	0.002<	mg/l
07-12-90	1330 hr.		07-19-90	1400 hr.	
Cations, Total	9.21	meq/l	Molybdenum	0.10<	mg/l
			07-24-90	1400 hr.	
Chloride	15.0	mg/l	Nickel	0.02<	mg/l
07-10-90	0930 hr.		07-24-90	1030 hr.	

ANALYST: D. Tipon

Respectfully submitted,
COMMERCIAL TESTING & ENGINEERING CO.

Manager, Huntington Laboratory

JUL 27 1990
MINING DIV.
FIELD OFFICE

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P.O. BOX 1020, HUNTINGTON UT 84528
TELEPHONE: (801) 653-2311

July 25, 1990

Job No.: 59 10468

Date Rec'd: June 29, 1990

Date Sampled: June 29, 1990

Sampled By: UP&L

Sample ID: UP&L

DEER CREEK-IN-MINE
2 Right Fault Zone
Temperature 54 degrees
Flow .42 / 781 GPM
Rec'd 1200 hr.
Sampled 1130 hr.

Utah Power and Light Co.
P.O. Box 1005
Huntington UT 84528

WATER ANALYSIS

Nitrogen, Ammonia	0.01	mg/l	Selenium	0.002<	mg/l
07-12-90	1530 hr.		07-20-90	1000 hr.	
Nitrogen, Nitrate	0.11	mg/l	Sodium	13.85	mg/l
07-13-90	1230 hr.		07-12-90	1430 hr.	
Nitrogen, Nitrite	0.01<	mg/l	Solids, Dissolved	408.0	mg/l
07-13-90	1230 hr.		07-10-90	1630 hr.	
Oxygen, Dissolved	4.0	mg/l	Solids, Suspended	5.0	mg/l
06-29-90	1815 hr.		07-10-90	1630 hr.	
pH	7.30	Units	Sulfate	40.0	mg/l
06-29-90	1800 hr.		07-12-90	1430 hr.	
Phosphorus, Total	0.01<	mg/l	Sulfide	1.00<	mg/l
07-05-90	1610 hr.		07-12-90	0830 hr.	
Potassium	1.51	mg/l	Zinc	0.00<	mg/l
07-12-90	1445 hr.		07-24-90	1030 hr.	

ANALYST: D. Tyson

JUL 2 1990
DIV.
FIELD OFFICE

Respectfully submitted,
COMMERCIAL TESTING & ENGINEERING CO.

M Cy
Manager, Huntington Laboratory

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OVER 40 BRANCH LABORATORIES STRATEGICALLY LOCATED IN PRINCIPAL COAL MINING AREAS,
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PLEASE ADDRESS ALL CORRESPONDENCE TO:
P.O. BOX 1020, HUNTINGTON, UT 84528
TELEPHONE: (801) 653-2311

October 10, 1990

Job No.: 59 10593

Date Rec'd: September 10, 1990

Date Sampled: September 7, 1990

Sampled By: UP&L

Utah Power and Light Co.
P.O. Box 1005
Huntington UT 84528

Sample ID: UP&L

DEER CREEK IN MINE 2ND RIGHT FAULT ZONE
Temperature 55 degrees
Flow 270 GPM
Rec'd 0800 hr.
Sampled 1630 hr.

FIELD MEASUREMENTS

pH	7.37
Conductivity	564

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WATER ANALYSIS

Aluminum	0.01<	mg/l	10-01-90 1400 hr.
Alk., Bicarbonate	375	mg/l HCO3	09-12-90 1100 hr.
Alk., Carbonate	1<	mg/l CaCO3	09-12-90 1100 hr.
Alk., Total	307	mg/l CaCO3	09-12-90 1100 hr.
Arsenic	0.013	mg/l	10-08-90 1400 hr.
Anions, Total	7.49	meq/l	
Barium	0.03<	mg/l	10-01-90 1100 hr.
Boron	0.01<	mg/l	09-25-90 1615 hr.
Cadmium	0.002<	mg/l	10-01-90 1300 hr.
Calcium	79.5	mg/l	09-19-90 1500 hr.
Cations, Total	7.66	meq/l	
Chloride	20.0	mg/l	09-12-90 1530 hr.
Chromium	0.02<	mg/l	10-01-90 1100 hr.
Conductivity	575	umhos/cm	09-11-90 1100 hr.
Copper	0.010<	mg/l	10-01-90 1300 hr.
Fluoride	0.23	mg/l	10-01-90 1330 hr.
Hardness, Total	354	mg/l CaCO3	
Iron	0.13	mg/l	09-12-90 1045 hr.
Lead	0.050<	mg/l	10-01-90 1300 hr.
Magnesium	37.80	mg/l	09-19-90 1530 hr.
Manganese	0.01<	mg/l	09-12-90 1100 hr.
Mercury	0.002<	mg/l	10-08-90 1515 hr.
Molybdenum	0.10<	mg/l	10-01-90 1100 hr.
Nickel	0.02<	mg/l	10-01-90 1300 hr.

ANALYST: D. Tyson

Respectfully submitted,
COMMERCIAL TESTING & ENGINEERING CO.

Dave Cowell Lydon

COMMERCIAL TESTING & ENGINEERING CO.
GENERAL OFFICES. 1919 SOUTH HIGHLAND AVE., SUITE 210-B, LOMBARD, ILLINOIS 60148 • (312) 953-9300

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PLEASE ADDRESS ALL CORRESPONDENCE TO:
P.O. BOX 1020, HUNTINGTON, UT 84528
TELEPHONE: (801) 653-2311

October 10, 1990

Job No.: 59 -10593

Date Rec'd: September 10, 1990

Date Sampled: September 7, 1990

Sampled By: UP&L

Utah Power and Light Co.
P.O. Box 1005
Huntington UT 84528

Sample ID: UP&L

DEER CREEK IN MINE 2ND RIGHT FAULT ZONE
Temperature 55 degrees
Flow 270 GPM
Rec'd 0800 hr.
Sampled 1630 hr.
FIELD MEASUREMENTS
pH 7.37
Conductivity 564

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WATER ANALYSIS

Nitrogen, Ammonia	0.00	mg/l	09-21-90 1400 hr.
Nitrogen, Nitrate	0.01<	mg/l	09-28-90 1545 hr.
Nitrogen, Nitrite	0.01<	mg/l	09-28-90 1545 hr.
Oxygen, Dissolved	7.8	mg/l	09-10-90 1320 hr.
pH	7.50	Units	09-10-90 1335 hr.
Phosphorus, Total	0.01<	mg/l	10-05-90 1545 hr.
Potassium	0.25	mg/l	09-12-90 1145 hr.
Selenium	0.002<	mg/l	10-08-90 1325 hr.
Sodium	13.41	mg/l	09-19-90 1445 hr.
Solids, Dissolved	402.0	mg/l	09-13-90 1630 hr.
Solids, Suspended	6.0	mg/l	09-13-90 1630 hr.
Sulfate	45.0	mg/l	09-13-90 1300 hr.
Sulfide	12.80	mg/l	09-21-90 0915 hr.
Zinc	0.00<	mg/l	10-01-90 1300 hr.

ANALYST: D. Igow

Respectfully submitted,
COMMERCIAL TESTING & ENGINEERING CO.

Dave Councell Lyons

COMMERCIAL TESTING & ENGINEERING CO.
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PLEASE ADDRESS ALL CORRESPONDENCE TO:
P.O. BOX 1020, HUNTINGTON, UT 84528
TELEPHONE: (801) 653-2311

October 11, 1990

Job No.: 59 10594

Date Rec'd: September 10, 1990

Date Sampled: September 7, 1990

Sampled By: UP&L

Utah Power and Light Co.
P.O. Box 1005
Huntington UT 84528

Sample ID: UP&L

DEER CREEK IN MINE TW-10
Temperature 55 degrees
Flow 3.3 GPM
Rec'd 0800 hr.
Sampled 1605 hr.

FIELD MEASUREMENTS

pH	7.89
Conductivity	547

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WATER ANALYSIS

Aluminum	4.68	mg/l	10-01-90 1400 hr.
Alk., Bicarbonate	714	mg/l HCO3	09-12-90 1100 hr.
Alk., Carbonate	1<	mg/l CaCO3	09-12-90 1100 hr.
Alk., Total	585	mg/l CaCO3	09-12-90 1100 hr.
Arsenic	0.012	mg/l	10-08-90 1400 hr.
Anions, Total	15.38	meq/l	
Barium	0.03<	mg/l	10-01-90 1100 hr.
Boron	0.01<	mg/l	09-25-90 1615 hr.
Cadmium	0.002<	mg/l	10-01-90 1300 hr.
Calcium	211.0	mg/l	09-19-90 1500 hr.
Cations, Total	15.07	meq/l	
Chloride	7.0	mg/l	09-12-90 1530 hr.
Chromium	0.02<	mg/l	10-01-90 1100 hr.
Conductivity	500	umhos/cm	09-11-90 1100 hr.
Copper	0.030	mg/l	10-01-90 1300 hr.
Fluoride	0.23	mg/l	10-01-90 1330 hr.
Hardness, Total	710	mg/l CaCO3	
Iron	1.35	mg/l	09-12-90 1045 hr.
Lead	0.050<	mg/l	10-01-90 1300 hr.
Magnesium	44.40	mg/l	09-19-90 1530 hr.
Manganese	1.21	mg/l	09-12-90 1100 hr.
Mercury	0.002<	mg/l	10-08-90 1515 hr.
Molybdenum	0.10<	mg/l	10-01-90 1100 hr.
Nickel	0.02<	mg/l	10-01-90 1300 hr.

ANALYST: D. Tepow

Respectfully submitted,
COMMERCIAL TESTING & ENGINEERING CO.

Dave Connell Mgr

COMMERCIAL TESTING & ENGINEERING CO.
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TELEPHONE: (801) 653-2311

October 11, 1990

Job No.: 59 10594

Date Rec'd: September 10, 1990

Date Sampled: September 7, 1990

Sampled By: UP&L

Utah Power and Light Co.
P.O. Box 1005
Huntington UT 84528

Sample ID: UP&L

DEER CREEK IN MINE TW-10
Temperature 55 degrees
Flow 3.3 GPM
Rec'd 0800 hr.
Sampled 1605 hr.
FIELD MEASUREMENTS
pH 7.89
Conductivity 547

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WATER ANALYSIS

Nitrogen, Ammonia 09-21-90 1400 hr.	0.00	mg/l
Nitrogen, Nitrate 09-27-90 1545 hr.	0.01<	mg/l
Nitrogen, Nitrite 09-27-90 1545 hr.	0.01<	mg/l
Oxygen, Dissolved 09-10-90 1320 hr.	8.1	mg/l
pH 09-10-90 1335 hr.	7.85	Units
Phosphorus, Total 09-28-90 1545 hr.	0.01<	mg/l
Potassium 09-12-90 1145 hr.	2.49	mg/l
Selenium 10-08-90 1325 hr.	0.002<	mg/l
Sodium 09-19-90 1445 hr.	18.90	mg/l
Solids, Dissolved 09-13-90 1630 hr.	393.0	mg/l
Solids, Suspended 09-13-90 1630 hr.	3988.0	mg/l
Sulfate 09-13-90 1300 hr.	180.0	mg/l
Sulfide 09-21-90 0915 hr.	7.60	mg/l
Zinc 10-01-90 1300 hr.	0.14	mg/l

ANALYST: D. Lyon

Respectfully submitted,
COMMERCIAL TESTING & ENGINEERING CO.
Dave Councell Mgr Dir
Manager, Huntington Laboratory

COMMERCIAL TESTING & ENGINEERING CO.
GENERAL OFFICES: 1919 SOUTH HIGHLAND AVE., SUITE 210-B, LOMBARD, ILLINOIS 60148 • (708) 953-9300

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P.O. BOX 1020, HUNTINGTON, UT 84528
TELEPHONE: (801) 653-2311
FAX: (801) 653-2479

January 30, 1991

Job No.: 59 10843 -

Date Rec'd: December 19, 1990

Date Sampled: December 19, 1990

Sampled By: DEER CREEK

Sample ID:

DEER CREEK IN MINE
TW-10
Temp 57°C
Flow 5.0 gpm
Time Sampled 09:30 hr.
Time Rec'd 14:00 hr.

Utah Power and Light Co.
P.O. Box 1005
Huntington UT 84528

WATER ANALYSIS

Aluminum	0.07	mg/l	Chromium	0.02<	mg/l
01-11-91		1200 hr.	01-11-91		0930 hr.
Alk., Bicarbonate	348	mg/l HCO3	Conductivity	510	umhos/cm
01-08-91		1400 hr.	12-27-90		1312 hr.
Alk., Carbonate	1<	mg/l CaCO3	Copper	0.010<	mg/l
01-08-91		1400 hr.	01-11-91		0930 hr.
Alk., Total	285	mg/l CaCO3	Fluoride	0.14	mg/l
01-08-91		1400 hr.	01-11-91		0930 hr.
Arsenic	0.002<	mg/l	Hardness, Total	381	mg/l CaCO3
01-11-91		1200 hr.			
Anions, Total	6.71	meq/l	Iron	0.36	mg/l
			01-11-91		0930 hr.
Barium	0.07	mg/l	Iron, Dissolved	0.35	mg/l
01-11-91		1200 hr.	01-11-91		0930 hr.
Boron	0.05	mg/l	Lead	0.050<	mg/l
01-09-91		1300 hr.	01-11-91		0930 hr.
Cadmium	0.002<	mg/l	Magnesium	34.10	mg/l
01-11-91		1200 hr.	01-11-91		0930 hr.
Calcium	96.2	mg/l	Manganese	0.04	mg/l
01-11-91		0930 hr.	01-11-91		0930 hr.
Cations, Total	8.38	meq/l	Mercury	0.002<	mg/l
			01-09-91		0930 hr.
Chloride	15.0	mg/l	Molybdenum	0.10<	mg/l
12-31-90		0900 hr.	01-11-91		1200 hr.

ANALYST: Rio Stofko

Respectfully submitted,
COMMERCIAL TESTING & ENGINEERING CO.

Manager, Huntington Laboratory

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TELEPHONE: (801) 653-2311
FAX: (801) 653-2479

January 30, 1991

Job No.: 59 10843

Date Rec'd: December 19, 1990

Date Sampled: December 19, 1990

Sampled By: DEER CREEK

Sample ID:

DEER CREEK IN MINE
TW-10
Temp 57°C
Flow 5.0 gpm
Time Sampled 09:30 hr.
Time Rec'd 14:00 hr.

Utah Power and Light Co.
P.O. Box 1005
Huntington UT 84528

WATER ANALYSIS

Nickel	0.02<	mg/l	Potassium	0.00<	mg/l
01-11-91		1200 hr.	01-11-91		0930 hr.
Nitrogen, Ammonia	0.08	mg/l	Selenium	0.002<	mg/l
01-02-91		1100 hr.	01-02-91		0900 hr.
Nitrogen, Nitrate	0.01<	mg/l	Sodium	17.89	mg/l
12-21-90		1100 hr.	01-11-91		0930 hr.
Nitrogen, Nitrite	0.01<	mg/l	Solids, Dissolved	358.0	mg/l
12-21-90		1100 hr.	12-20-90		0900 hr.
Oxygen, Dissolved	5.9	mg/l	Solids, Suspended	1.0<	mg/l
12-19-90		1420 hr.	12-20-90		0900 hr.
pH	7.50	Units	Sulfate	35.0	mg/l
12-19-90		1415 hr.	01-07-91		1220 hr.
Phosphorus, Total	0.01<	mg/l	Sulfide	34.00	mg/l
12-20-90		1100 hr.	01-09-91		1400 hr.
			Zinc	0.02	mg/l
			01-09-91		0930 hr.

ANALYST: Lois Stafko

Respectfully submitted,
COMMERCIAL TESTING & ENGINEERING

Manager, Huntington Laboratory

RECEIVED
JAN 31 1991
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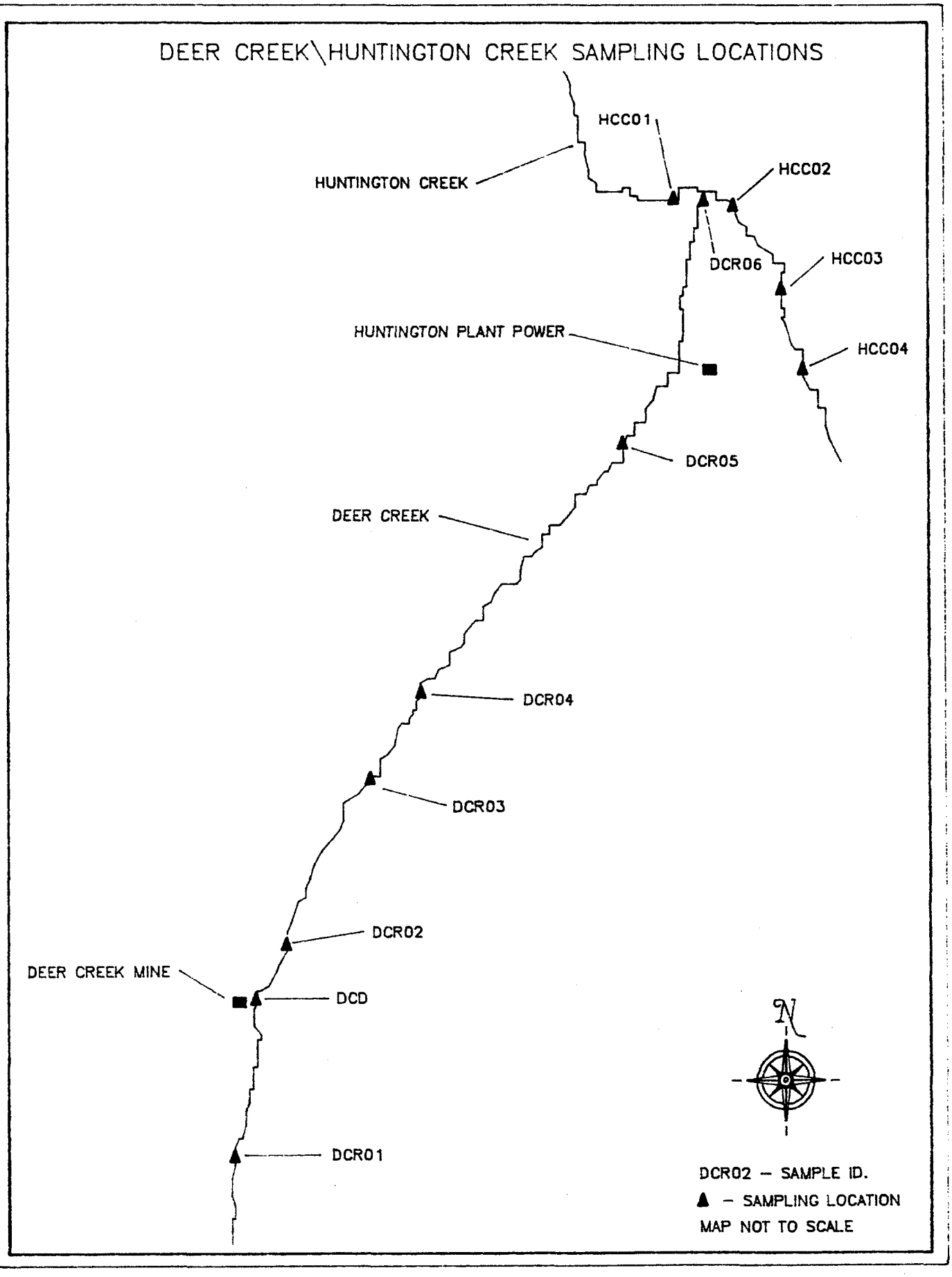
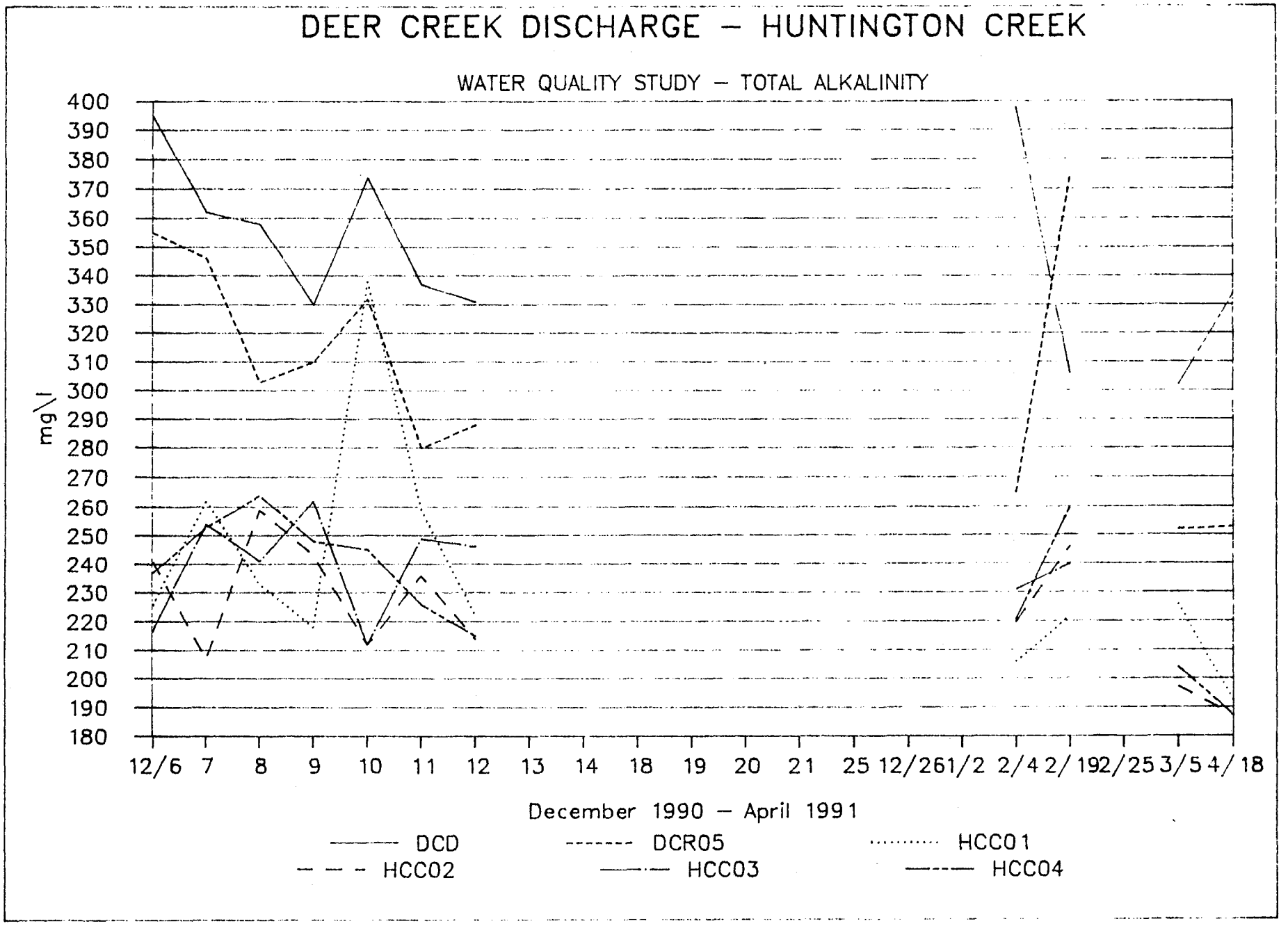
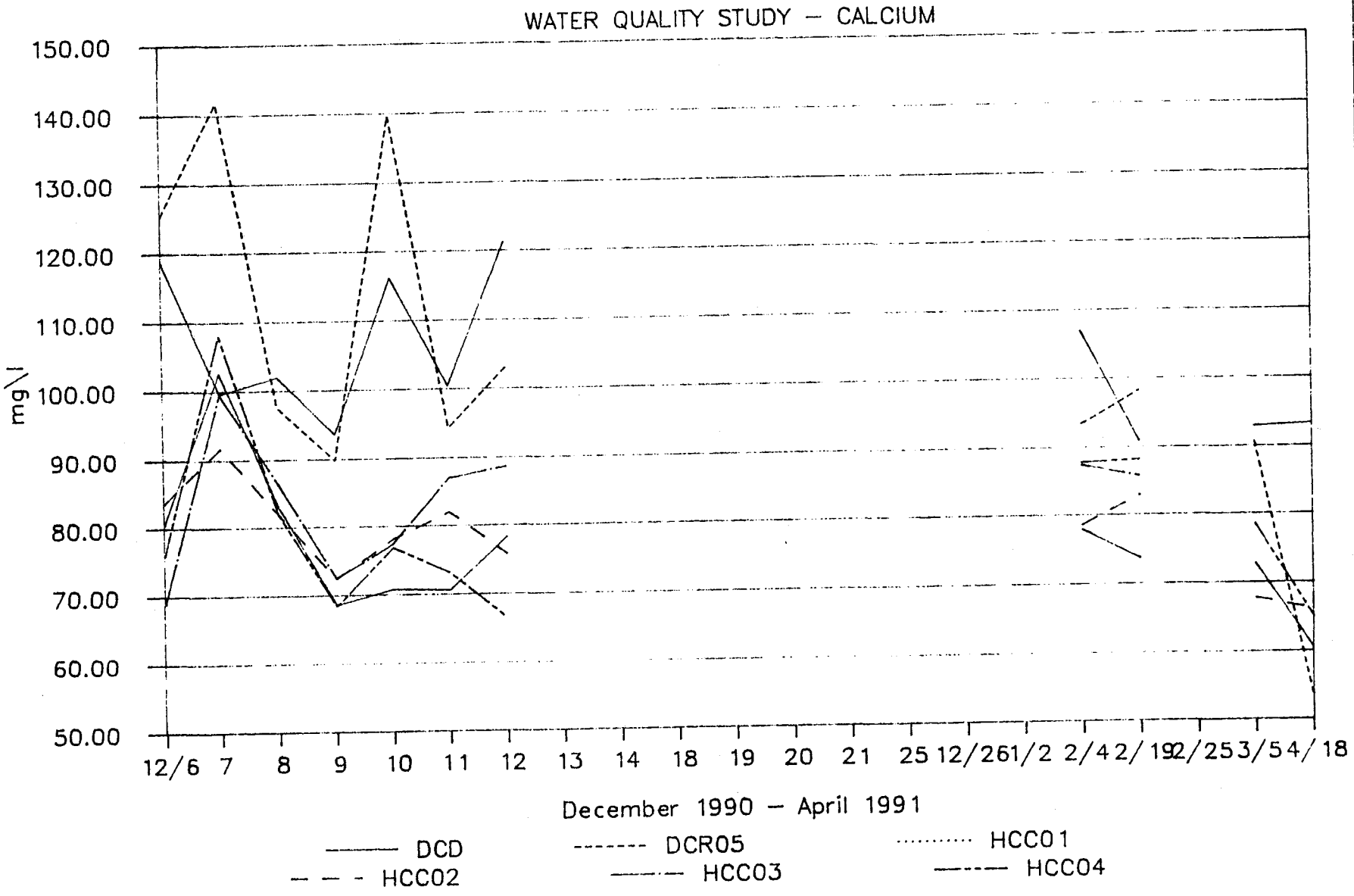
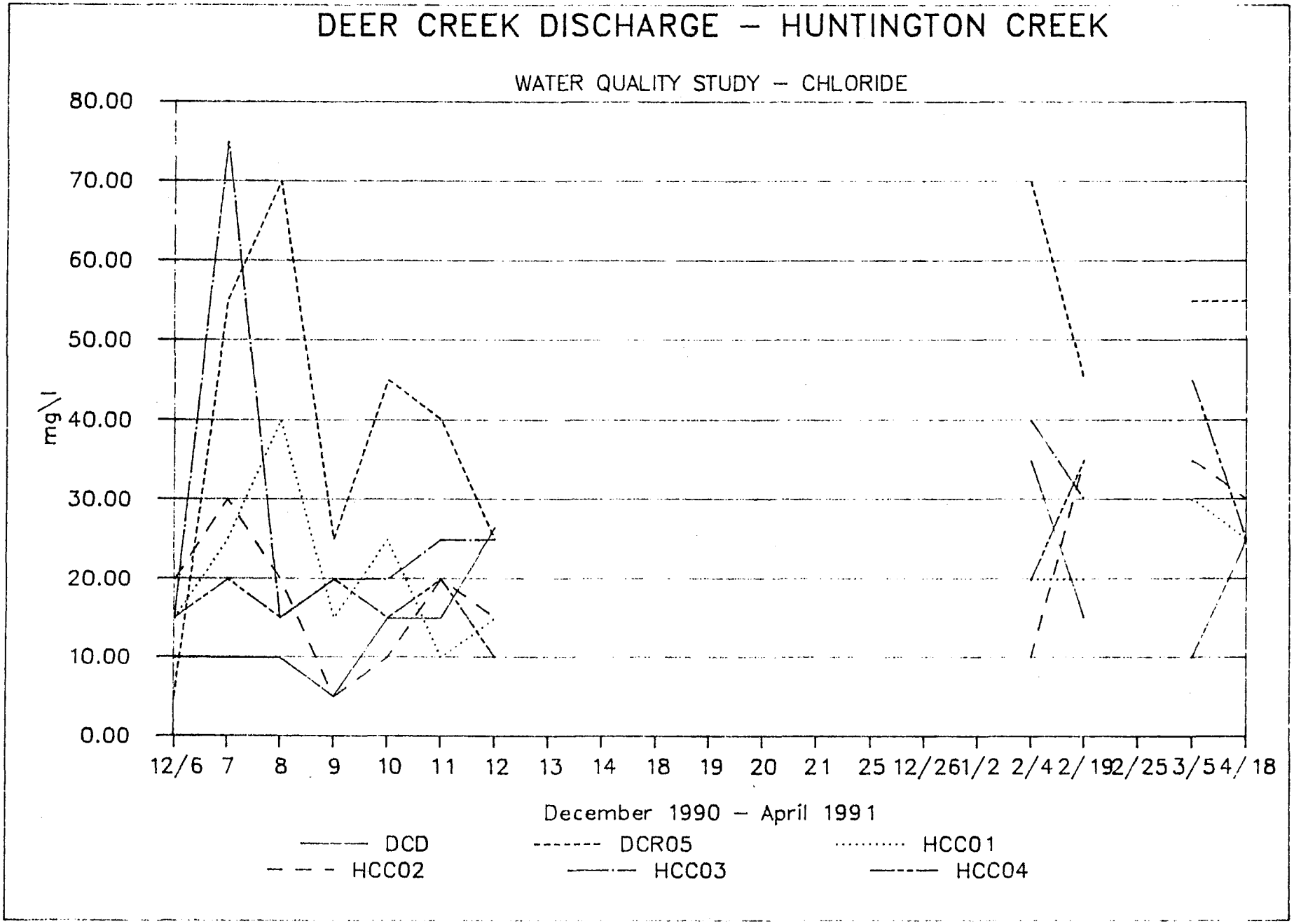
FIELD OFFICE

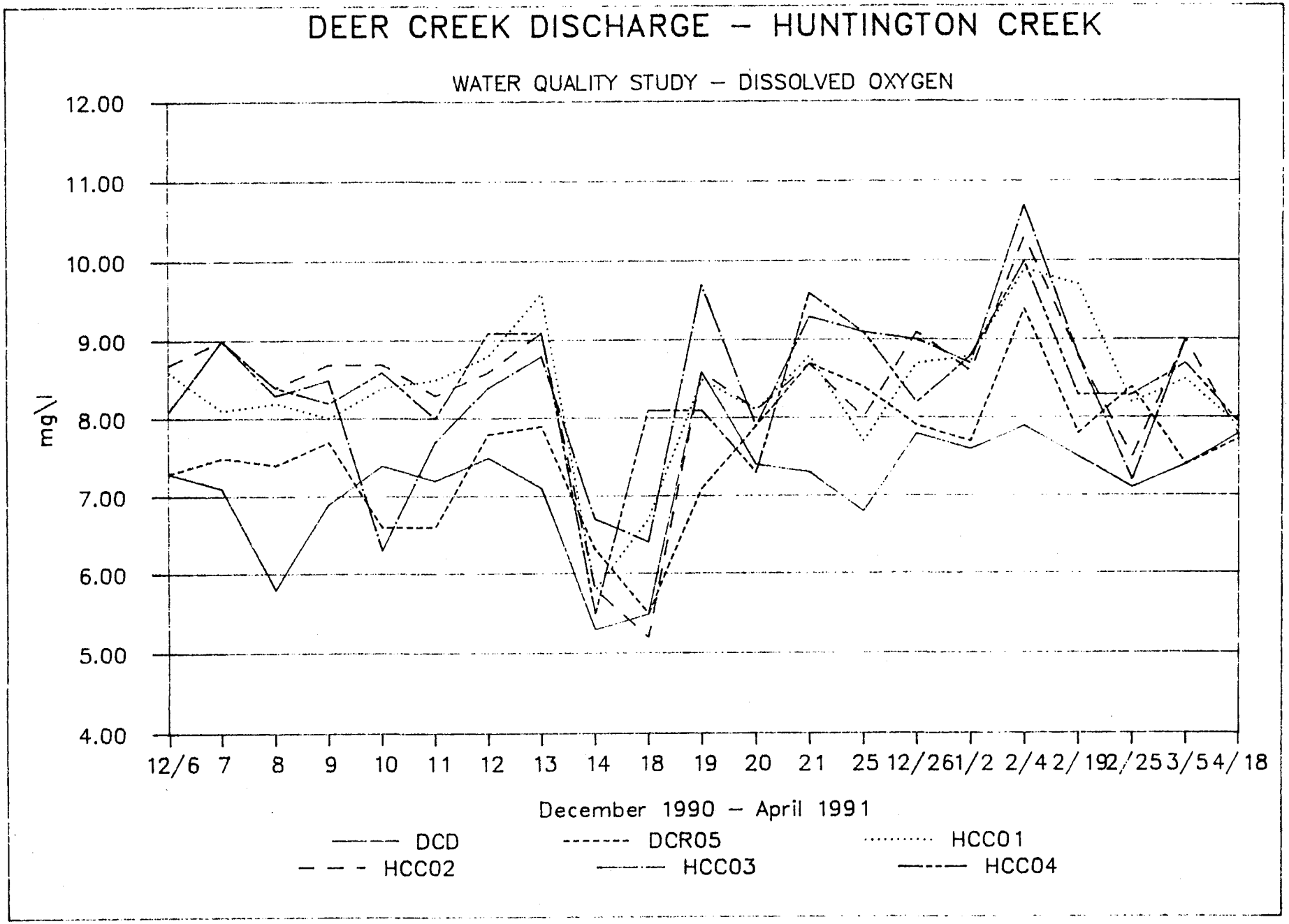

DEER CREEK\HUNTINGTON CREEK SAMPLING LOCATIONS
HCC01
HUNTINGTON CREEK
HCC02
DCR06
HCC03
HUNTINGTON PLANT POWER
HCC04
DCR05
DEER CREEK
DCR04
DCR03
DCR02
DEER CREEK MINE
DCD
DCR01
N
DCR02 – SAMPLE ID.
▲ – SAMPLING LOCATION
MAP NOT TO SCALE

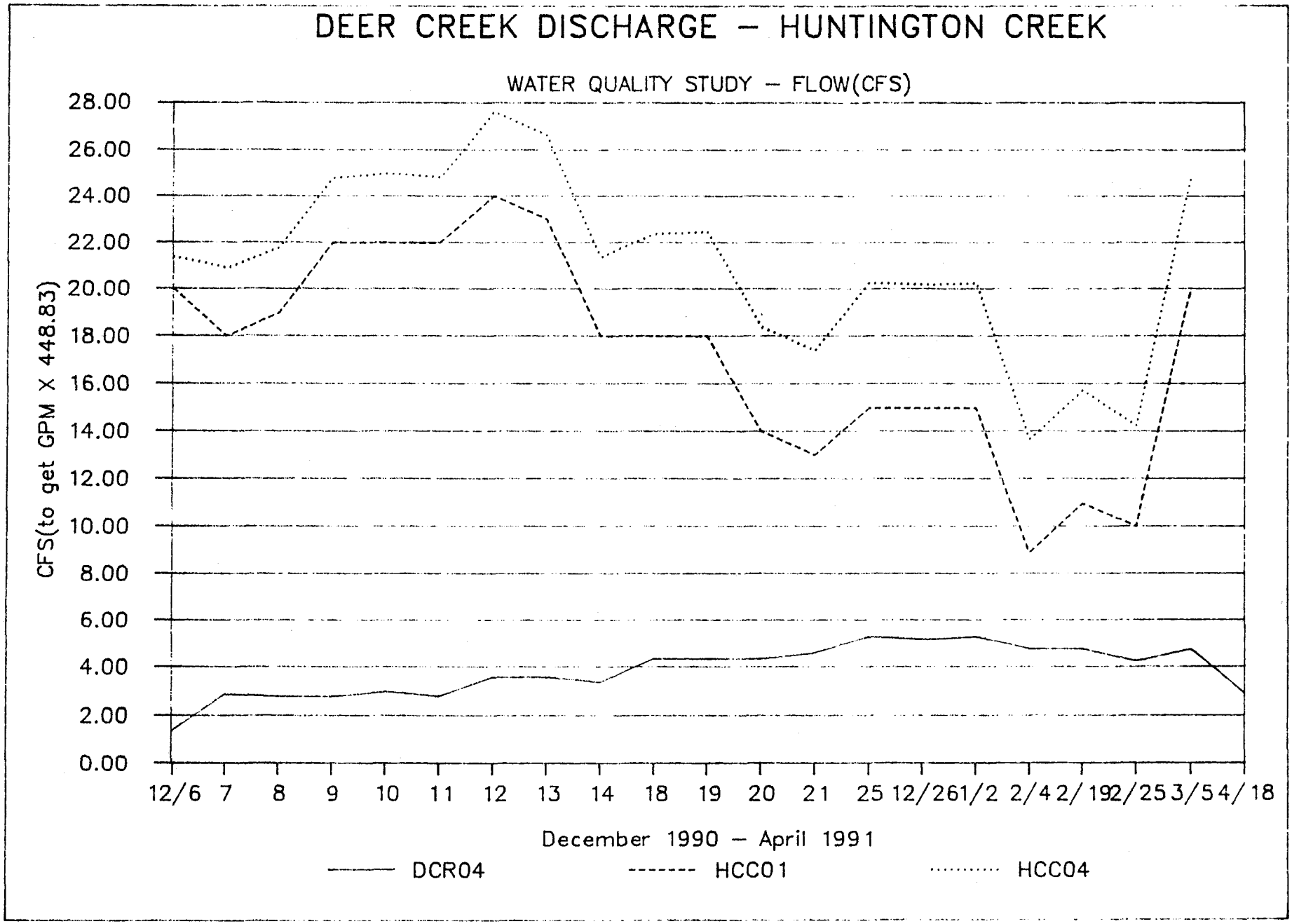

DEER CREEK DISCHARGE – HUNTINGTON CREEK
WATER QUALITY STUDY – TOTAL ALKALINITY
mg\l
400
390
380
370
360
350
340
330
320
310
300
290
280
270
260
250
240
230
220
210
200
190
180
12/6
7
8
9
10
11
12
13
14
18
19
20
21
25
12/26
1/2
2/4
2/19
2/25
3/5
4/18
December 1990 – April 1991
DCD
DCR05
HCC01
HCC02
HCC03
HCC04

DEER CREEK DISCHARGE – HUNTINGTON CREEK

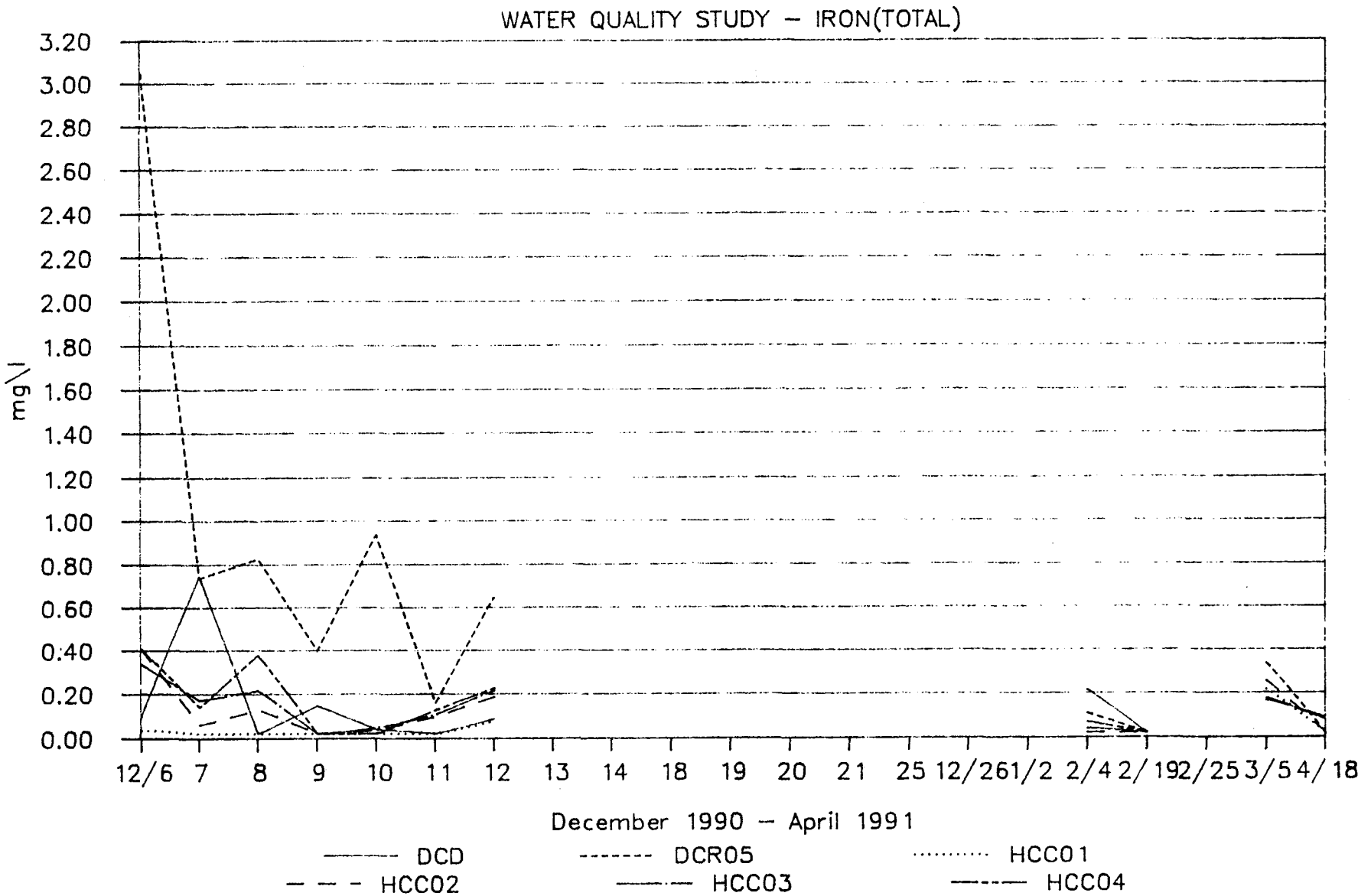


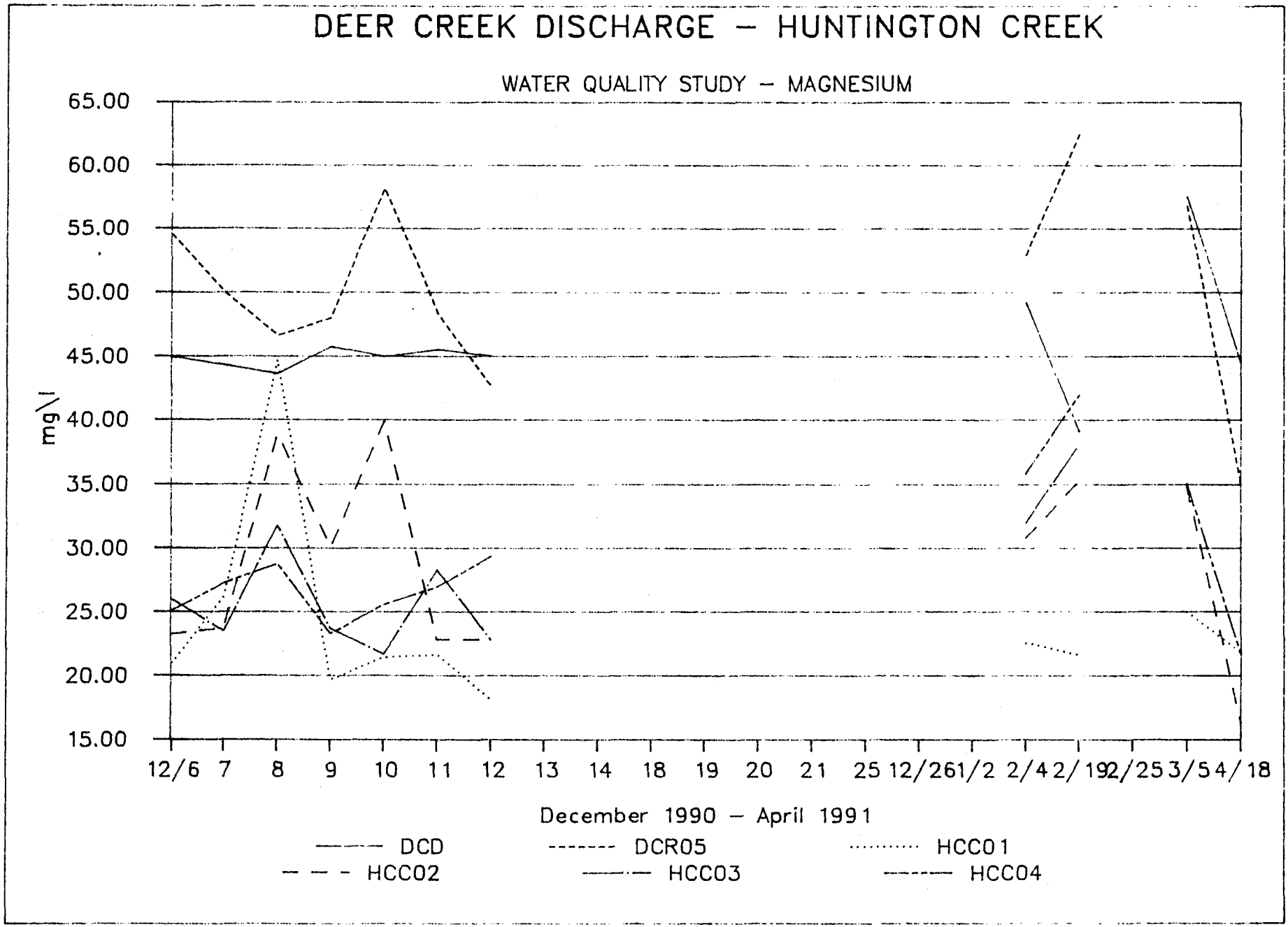

DEER CREEK DISCHARGE – HUNTINGTON CREEK
WATER QUALITY STUDY – CHLORIDE
80.00
70.00
60.00
50.00
40.00
30.00
20.00
10.00
0.00
mg\l
12/6 7 8 9 10 11 12 13 14 18 19 20 21 25 12/26 1/2 2/4 2/19 2/25 3/5 4/18
December 1990 – April 1991
DCD
DCR05
HCC01
HCC02
HCC03
HCC04

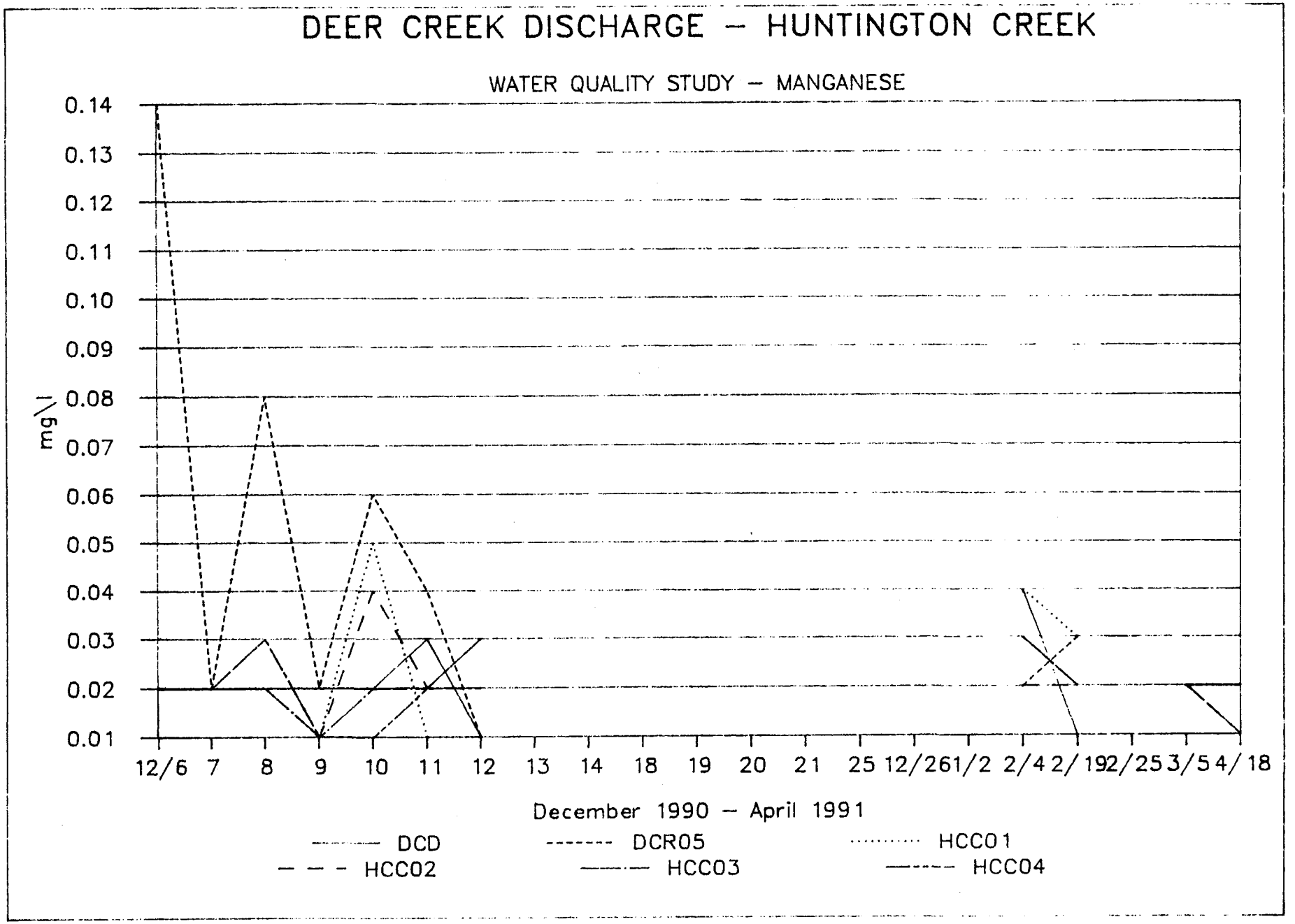

DEER CREEK DISCHARGE – HUNTINGTON CREEK
WATER QUALITY STUDY – DISSOLVED OXYGEN
12.00
11.00
10.00
9.00
8.00
7.00
6.00
5.00
4.00
mg\l
12/6
7
8
9
10
11
12
13
14
18
19
20
21
25
12/26
1/2
2/4
2/19
2/25
3/5
4/18
December 1990 – April 1991
DCD
DCR05
HCC01
HCC02
HCC03
HCC04

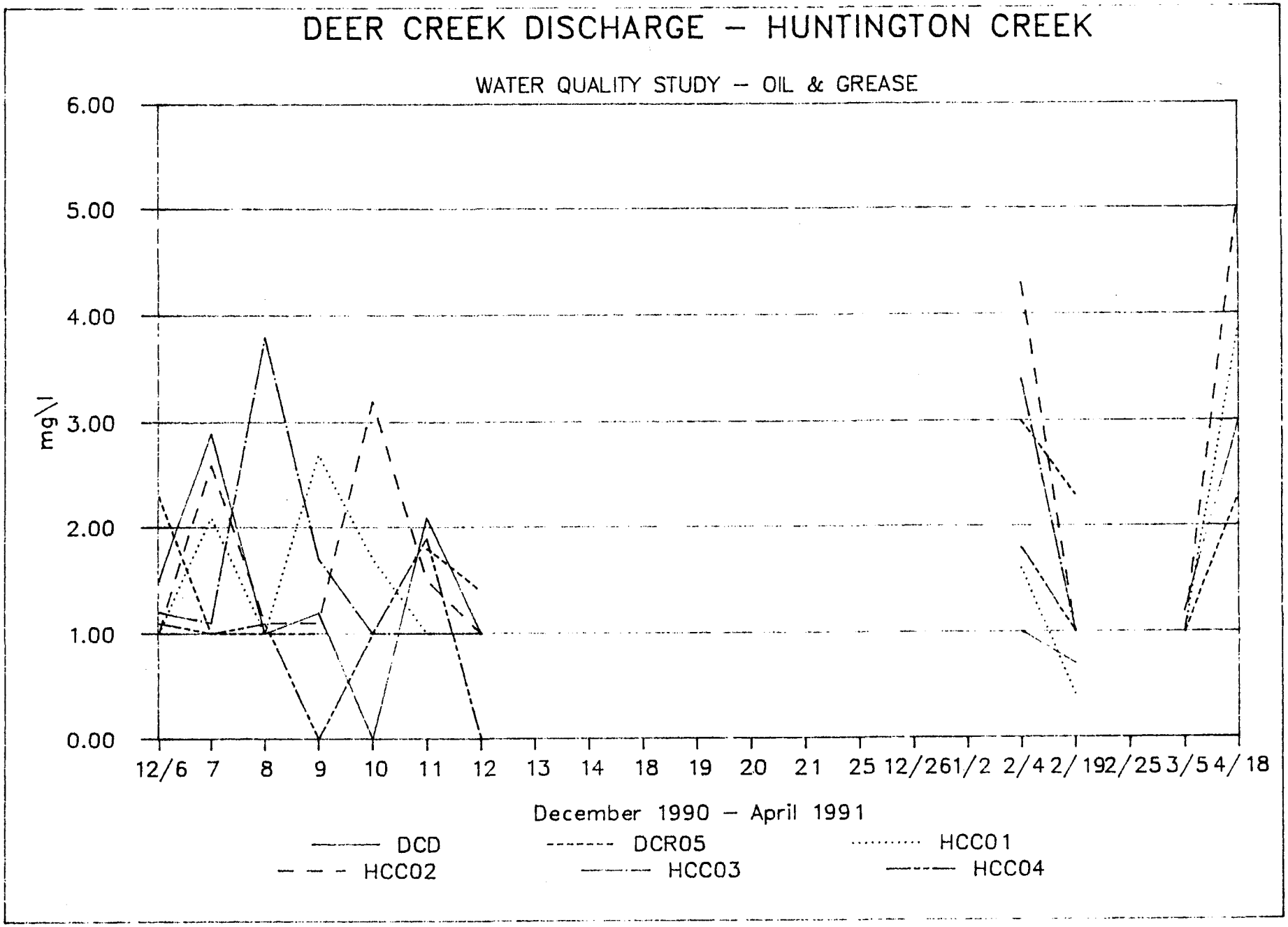

DEER CREEK DISCHARGE – HUNTINGTON CREEK
WATER QUALITY STUDY – FLOW(CFS)
CFS(to get GPM X 448.83)
28.00
26.00
24.00
22.00
20.00
18.00
16.00
14.00
12.00
10.00
8.00
6.00
4.00
2.00
0.00
12/6 7 8 9 10 11 12 13 14 18 19 20 21 25 12/26 1/2 2/4 2/19 2/25 3/5 4/18
December 1990 – April 1991
DCR04
HCC01
HCC04

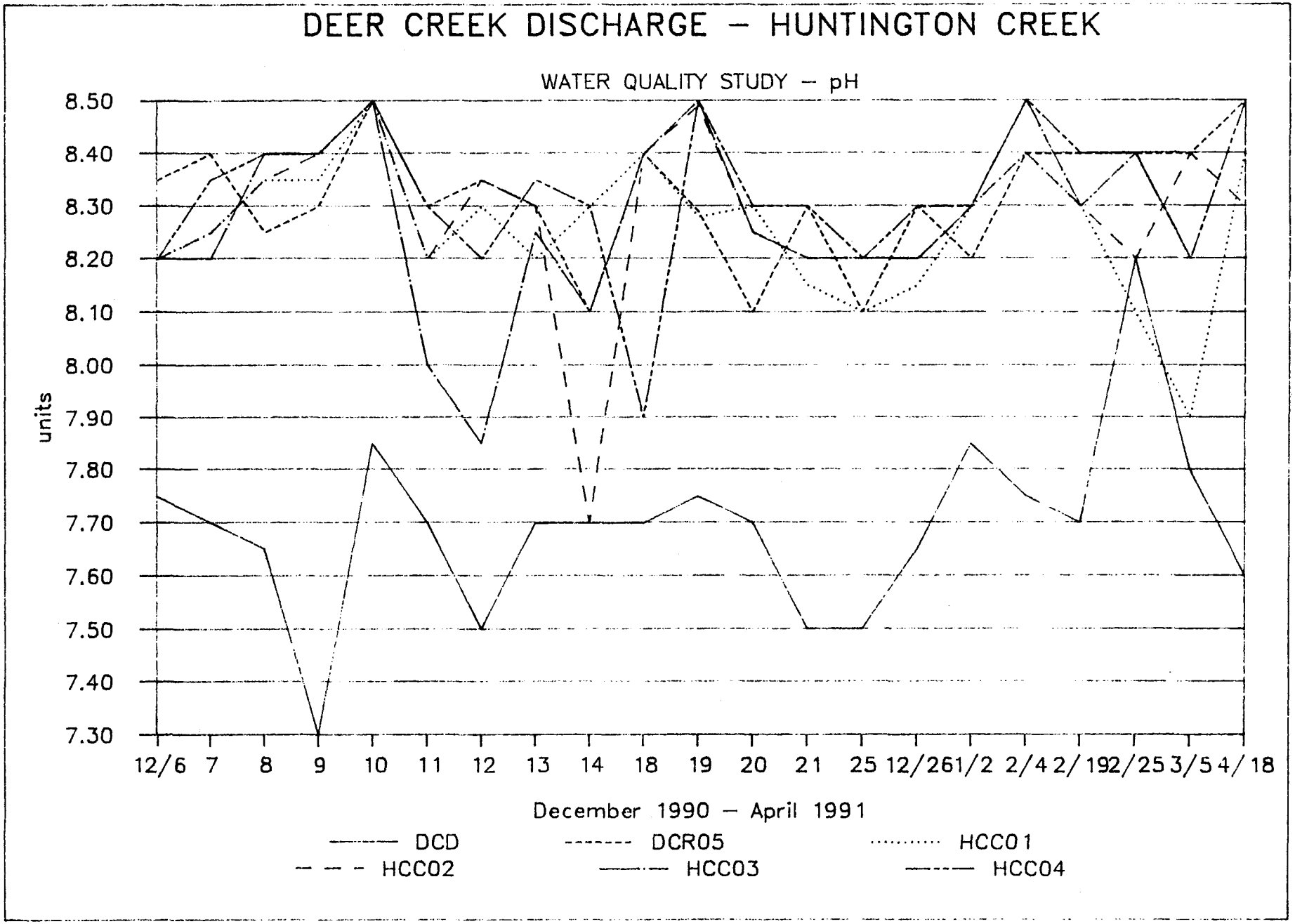
DEER CREEK DISCHARGE – HUNTINGTON CREEK

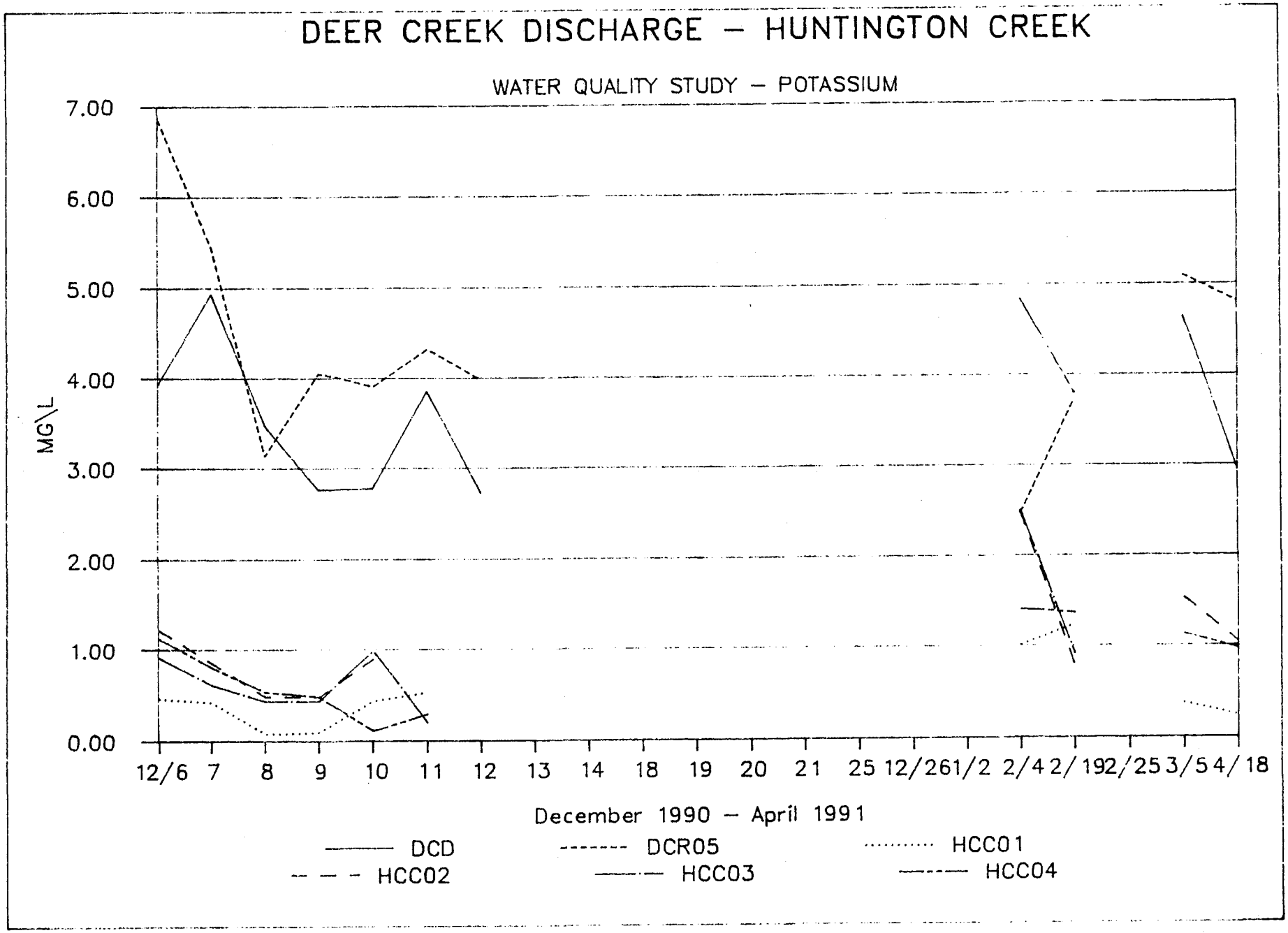


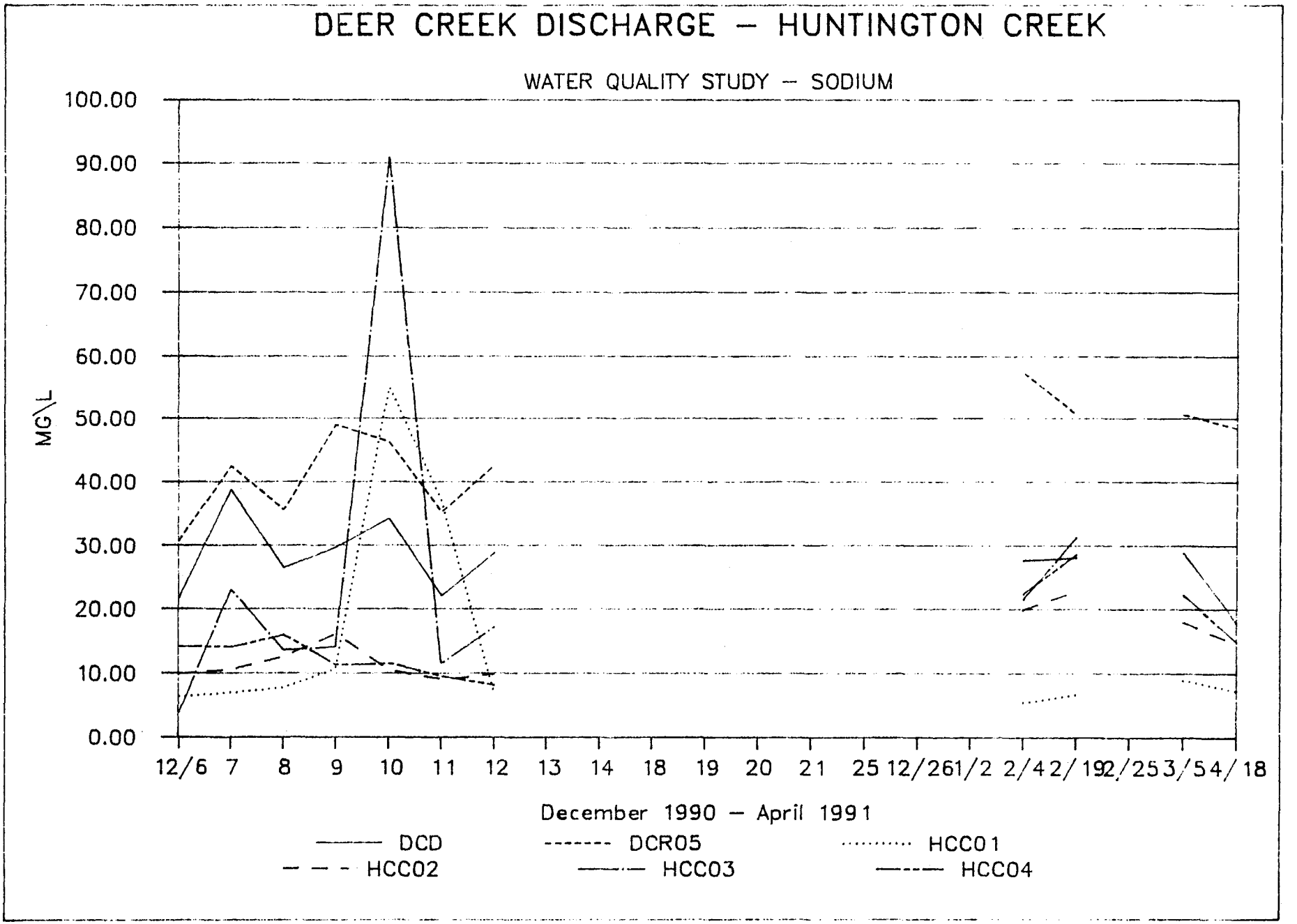

DEER CREEK DISCHARGE – HUNTINGTON CREEK
WATER QUALITY STUDY – MAGNESIUM
mg\l
65.00
60.00
55.00
50.00
45.00
40.00
35.00
30.00
25.00
20.00
15.00
12/6 7 8 9 10 11 12 13 14 18 19 20 21 25 12/26 1/2 2/4 2/19 2/25 3/5 4/18
December 1990 – April 1991
DCD
DCR05
HCC01
HCC02
HCC03
HCC04


DEER CREEK DISCHARGE – HUNTINGTON CREEK
WATER QUALITY STUDY – MANGANESE
mg\l
0.14
0.13
0.12
0.11
0.10
0.09
0.08
0.07
0.06
0.05
0.04
0.03
0.02
0.01
12/6 7 8 9 10 11 12 13 14 18 19 20 21 25 12/26 1/2 2/4 2/19 2/25 3/5 4/18
December 1990 – April 1991
DCD
DCR05
HCC01
HCC02
HCC03
HCC04

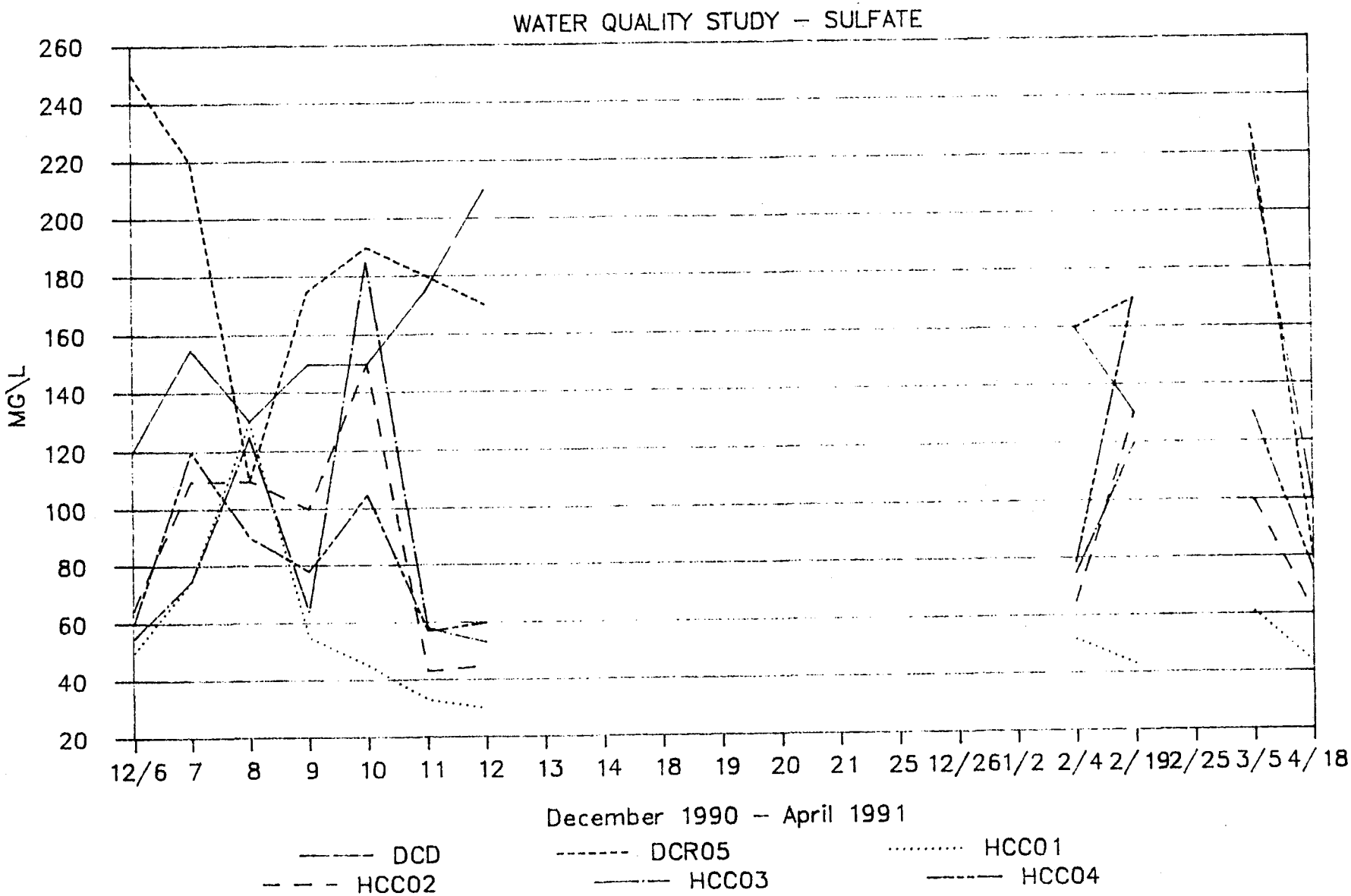

DEER CREEK DISCHARGE – HUNTINGTON CREEK
WATER QUALITY STUDY – OIL & GREASE
mg\l
6.00
5.00
4.00
3.00
2.00
1.00
0.00
12/6
7
8
9
10
11
12
13
14
18
19
20
21
25
12/26
1/2
2/4
2/19
2/25
3/5
4/18
December 1990 – April 1991
DCD
DCR05
HCC01
HCC02
HCC03
HCC04

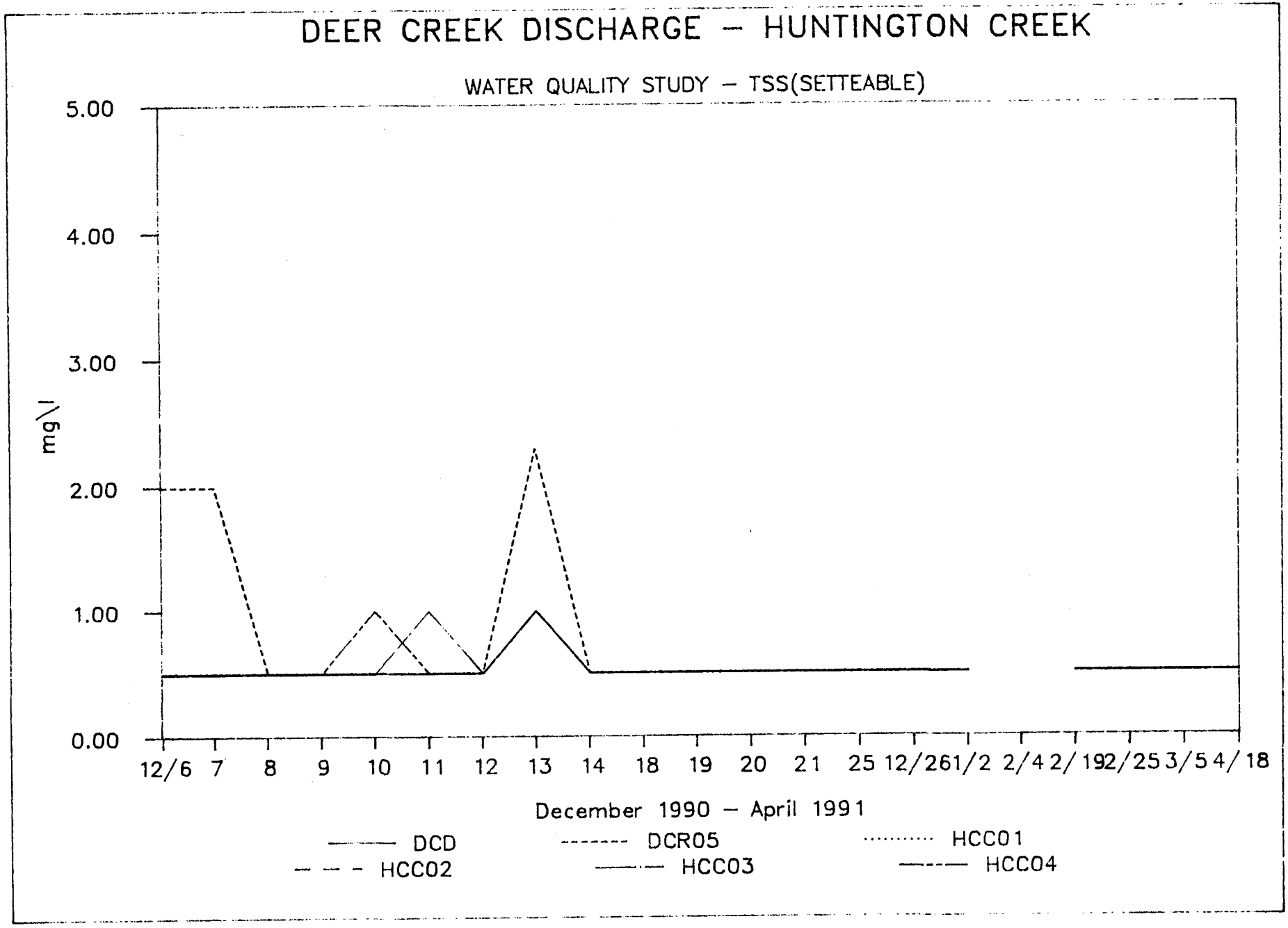

DEER CREEK DISCHARGE – HUNTINGTON CREEK
WATER QUALITY STUDY – pH
units
8.50
8.40
8.30
8.20
8.10
8.00
7.90
7.80
7.70
7.60
7.50
7.40
7.30
12/6 7 8 9 10 11 12 13 14 18 19 20 21 25 12/26 1/2 2/4 2/19 2/25 3/5 4/18
December 1990 – April 1991
DCD
DCR05
HCC01
HCC02
HCC03
HCC04

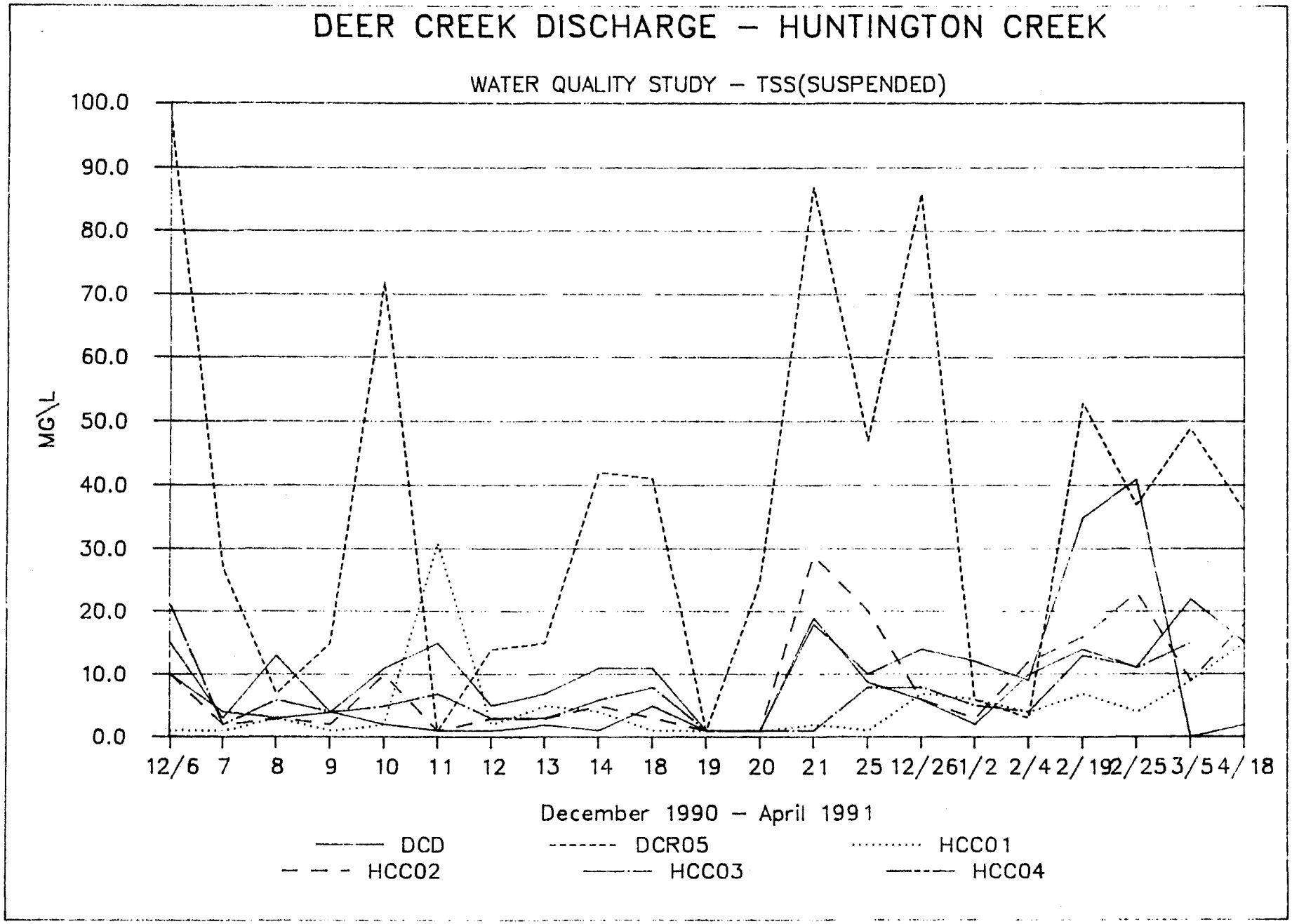

DEER CREEK DISCHARGE – HUNTINGTON CREEK
WATER QUALITY STUDY – POTASSIUM
MG\L
7.00
6.00
5.00
4.00
3.00
2.00
1.00
0.00
12/6
7
8
9
10
11
12
13
14
18
19
20
21
25
12/26
1/2
2/4
2/19
2/25
3/5
4/18
December 1990 – April 1991
DCD
DCR05
HCC01
HCC02
HCC03
HCC04

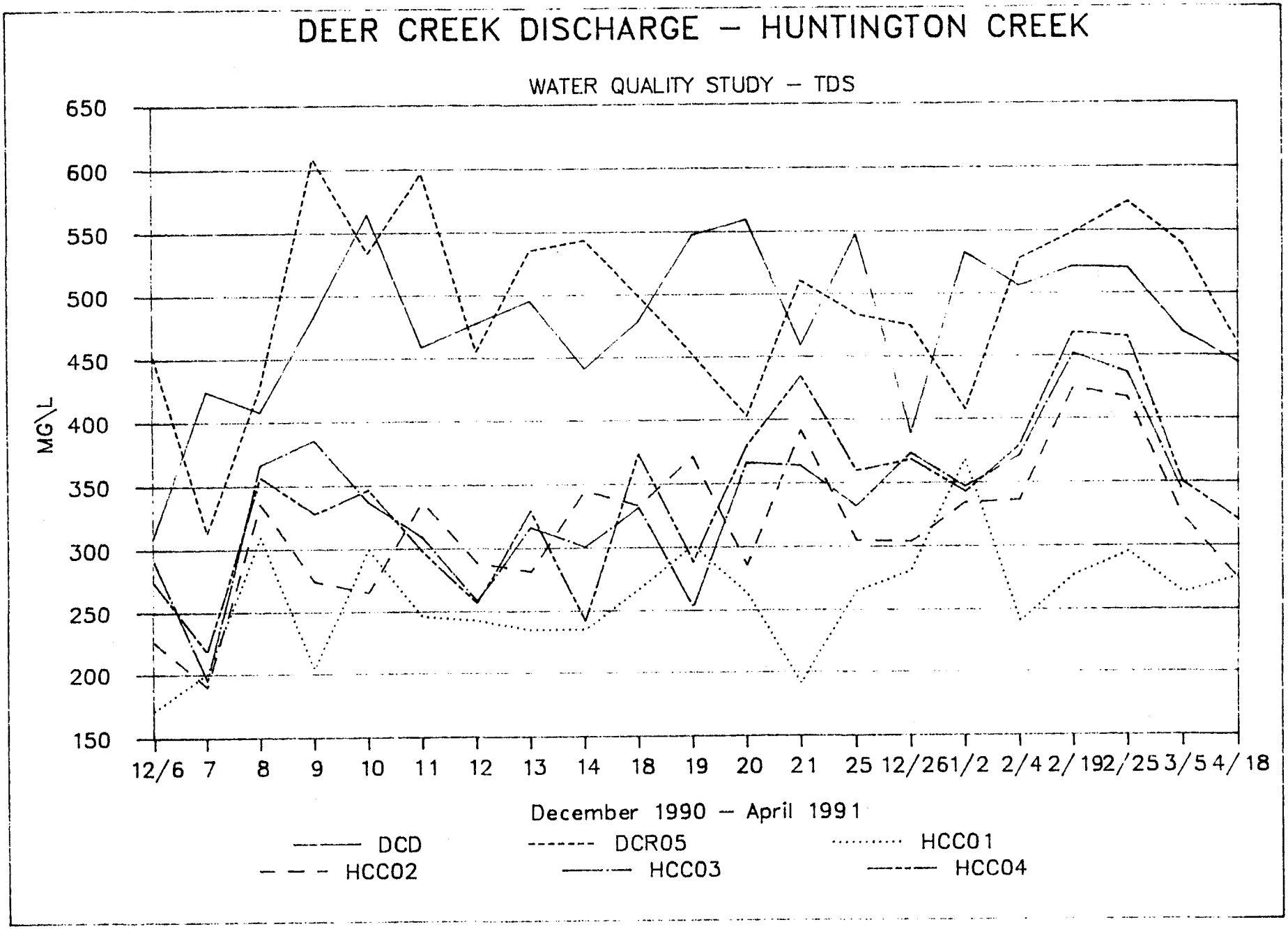

DEER CREEK DISCHARGE – HUNTINGTON CREEK
WATER QUALITY STUDY – SODIUM
MG\L
100.00
90.00
80.00
70.00
60.00
50.00
40.00
30.00
20.00
10.00
0.00
12/6 7 8 9 10 11 12 13 14 18 19 20 21 25 12/26 1/2 2/4 2/19 2/25 3/5 4/18
December 1990 – April 1991
DCD
DCR05
HCC01
HCC02
HCC03
HCC04

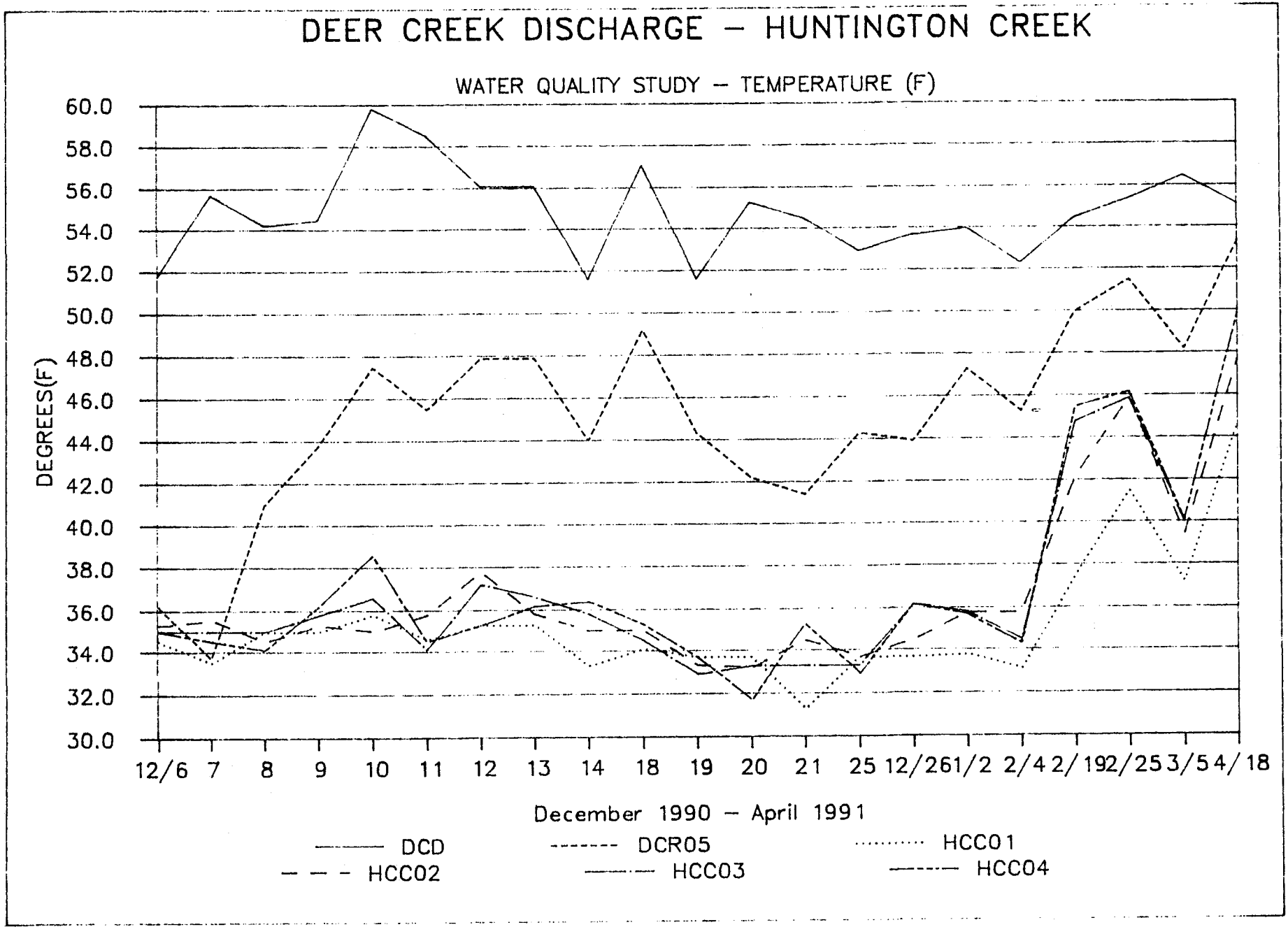
DEER CREEK DISCHARGE – HUNTINGTON CREEK

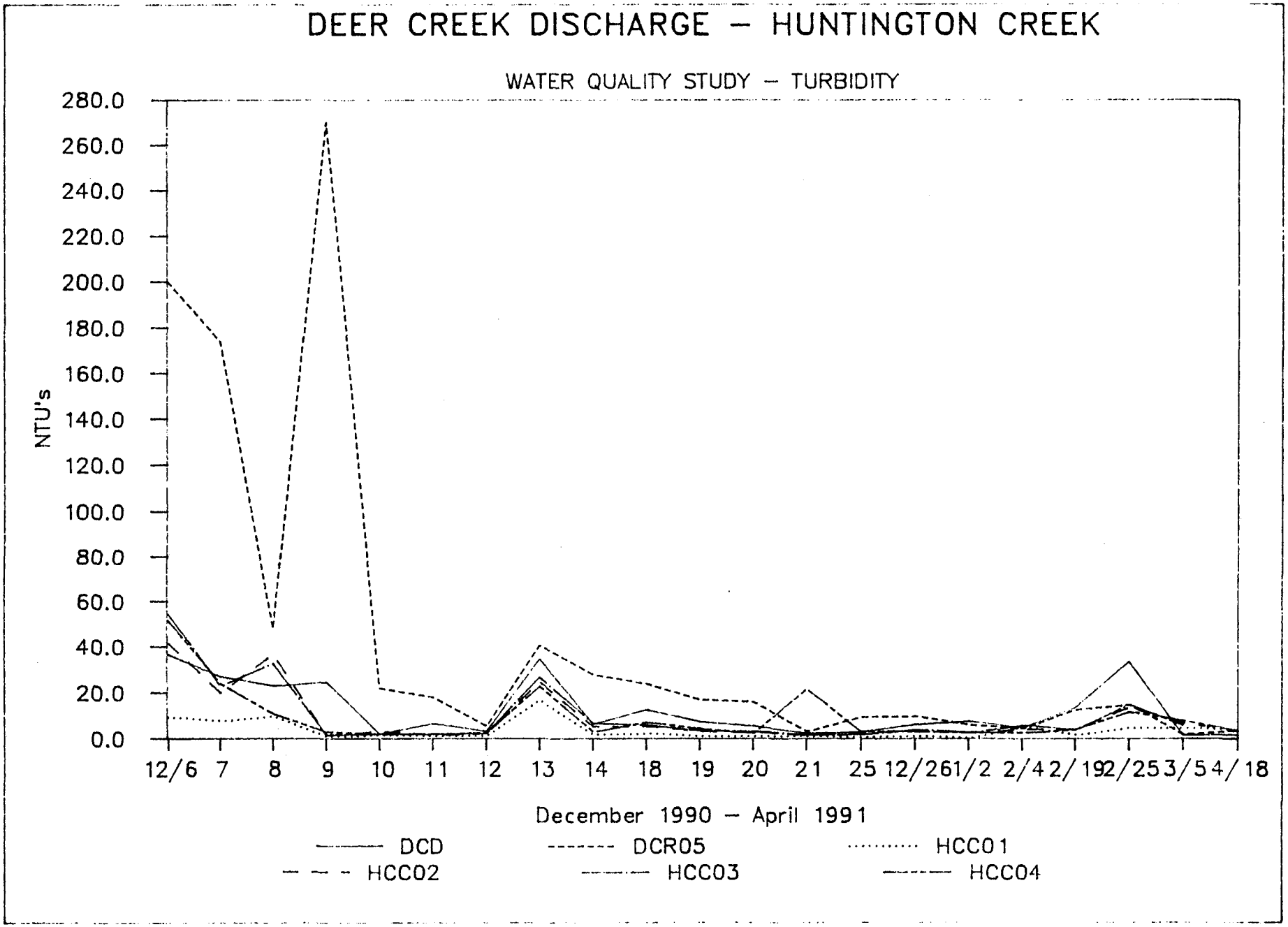



DEER CREEK DISCHARGE – HUNTINGTON CREEK
WATER QUALITY STUDY – TSS(SETTEABLE)
5.00
4.00
3.00
2.00
1.00
0.00
mg\l
12/6
7
8
9
10
11
12
13
14
18
19
20
21
25
12/26
1/2
2/4
2/19
2/25
3/5
4/18
December 1990 – April 1991
DCD
DCR05
HCC01
HCC02
HCC03
HCC04


DEER CREEK DISCHARGE – HUNTINGTON CREEK
WATER QUALITY STUDY – TSS(SUSPENDED)
MG\L
100.0
90.0
80.0
70.0
60.0
50.0
40.0
30.0
20.0
10.0
0.0
12/6 7 8 9 10 11 12 13 14 18 19 20 21 25 12/26 1/2 2/4 2/19 2/25 3/5 4/18
December 1990 – April 1991
DCD
DCR05
HCC01
HCC02
HCC03
HCC04


DEER CREEK DISCHARGE – HUNTINGTON CREEK
WATER QUALITY STUDY – TDS
MG\L
650
600
550
500
450
400
350
300
250
200
150
12/6
7
8
9
10
11
12
13
14
18
19
20
21
25
12/26
1/2
2/4
2/19
2/25
3/5
4/18
December 1990 – April 1991
DCD
DCR05
HCC01
HCC02
HCC03
HCC04


DEER CREEK DISCHARGE – HUNTINGTON CREEK
WATER QUALITY STUDY – TEMPERATURE (F)
DEGREES(F)
60.0
58.0
56.0
54.0
52.0
50.0
48.0
46.0
44.0
42.0
40.0
38.0
36.0
34.0
32.0
30.0
12/6 7 8 9 10 11 12 13 14 18 19 20 21 25 12/26 1/2 2/4 2/19 2/25 3/5 4/18
December 1990 – April 1991
DCD
DCR05
HCC01
HCC02
HCC03
HCC04


DEER CREEK DISCHARGE – HUNTINGTON CREEK
WATER QUALITY STUDY – TURBIDITY
NTU's
280.0
260.0
240.0
220.0
200.0
180.0
160.0
140.0
120.0
100.0
80.0
60.0
40.0
20.0
0.0
12/6
7
8
9
10
11
12
13
14
18
19
20
21
25
12/26
1/2
2/4
2/19
2/25
3/5
4/18
December 1990 – April 1991
DCD
DCR05
HCC01
HCC02
HCC03
HCC04

DEER CREEK\HUNTINGTON CREEK - WATER QUALITY

LOCATION	DATE	ACIDITY	ALK. TOTAL	BICARB	Ca	CL	COND.	DO	FLOW cfs	HARD.	Fe TOTAL	FE DIS.	Mg
DCR01	780516						360.0				0.3		
DCR01	790517	12.0	252.0			12.0	470.0	10.0			40.1		
DCR01	790730		244.0								0.3		
DCR01	800512						820.0				0.2		
DCR01	800701						570.0				0.1		
DCR01	810519						600.0		0.100		0.2		
DCR01	810611						700.0		0.033		0.1		
DCR01	810721						600.0				0.1		
DCR01	820503						510.0				0.9		
DCR01	820601						510.0		1.337		0.8		
DCR01	820706						500.0		0.916		0.8		
DCR01	820803						510.0		0.403		0.8		
DCR01	820915						490.0		0.131		0.2		
DCR01	821011						640.0		0.076		0.2		
DCR01	830110						770.0		0.011		0.1		
DCR01	830411						650.0				0.0		
DCR01	830509						575.0				0.7		
DCR01	830613						575.0				0.2		
DCR01	830711						550.0		1.114		0.1		
DCR01	830809						525.0		1.070		0.1		
DCR01	830913						550.0		0.557		0.1		
DCR01	831011						610.0		0.339		0.1		
DCR01	840110						610.0				0.1		
DCR01	840411						700.0				0.1		
DCR01	840507						600.0				0.1		
DCR01	840605						550.0				0.1		
DCR01	840716						525.0		1.315		0.1		
DCR01	840806						480.0		0.716		0.1		
DCR01	840910						595.0		0.289		0.1		
DCR01	841008						600.0		0.279		0.1		
DCR01	850111						580.0		0.102		0.1		
DCR01	850404						685.0		0.027		0.1		
DCR01	850507						472.0		6.517		0.2		
DCR01	850605						510.0		4.122		0.1		
DCR01	850708						473.0		0.887		0.1		
DCR01	850805						439.0		0.462		0.1		
DCR01	850909						600.0		0.154		0.1		
DCR01	851007						500.0		0.154		0.1		
DCR01	851114						650.0		0.222		0.1		
DCR01	851210						650.0		0.028		0.1		
DCR01	860113						660.0		0.011		0.1		
DCR01	860409	1.0		317.0	56.0	7.9	650.0	9.7	0.131	290.0	0.1		36.5
DCR01	860513	1.0		313.0	62.0	4.9	520.0	9.8	1.857	270.0	0.3		28.0
DCR01	860611	1.0		296.0	56.8	4.5	505.0	9.8	1.857	250.0	0.1		26.3
DCR01	860707	1.0		262.0	42.0	5.8	470.0	8.2	0.828	232.0	0.1		31.0
DCR01	860813	1.0		279.0	44.0	7.0	550.0	10.2	0.260	245.0	0.1		32.8
DCR01	860919	1.0		322.0	46.0	10.1	610.0	8.8	0.102	280.0	0.1		40.1
DCR01	861017			309.0	48.0	10.8	620.0	9.8	0.095	280.0	0.1		38.9
DCR01	870408	1.0		337.0	82.0	176.0	1580.0	7.8	0.056	550.0	0.1	0.1	83.9
DCR01	870616	1.0		272.0	2.2	6.3	440.0	7.5	1.315	225.0	0.3	0.1	27.9
DCR01	870716	1.0		273.0	38.0	8.0	505.0	8.4	0.497	225.0	0.1	0.1	31.6
DCR01	870818	1.0		303.0	46.0	3.5	500.0	5.7	0.187	250.0	0.1	0.1	33.0
DCR01	870922	1.0		328.0	59.1	4.0	360.0	5.3	0.095	296.0	0.0	0.0	36.0

all parameters reported as mg/l unless otherwise noted

LOCATION	DATE	Mn	OIL GREASE	pH units	K	SET. SOLIDS	Na	SO4	SUS. SOLIDS	TEMP F	TDS	TURB ntu's
DCR01	780516	0.2		7.0					521.0		235.0	
DCR01	790517		1.0	7.7				10.0	1400.0		310.0	
DCR01	790730		0.9	8.5				16.5	4.6		260.0	2.4
DCR01	800512	0.2		7.9					3592.0		533.0	
DCR01	800701	0.0		8.0					0.5		337.0	
DCR01	810519	0.0		8.3					3.5		332.0	
DCR01	810611	0.0		8.3					1.0		482.0	
DCR01	810721	0.0		8.3					0.5		340.0	
DCR01	820503	0.2		8.0					92.0		289.0	
DCR01	820601	0.2		7.3					52.0		280.0	
DCR01	820706	0.1		7.8					9.0		276.0	
DCR01	820803	0.1		7.9					0.5		281.0	
DCR01	820915	0.1		8.2					1.5		308.0	
DCR01	821011	0.1		8.1					12.0		359.0	
DCR01	830110	0.1		7.7					8.0		566.0	
DCR01	830411	0.1		8.2					2.5		370.0	
DCR01	830509	0.1		8.0					164.0		319.0	
DCR01	830613	0.0		8.1					56.0		340.0	
DCR01	830711	0.0		8.2					0.5		287.0	
DCR01	830809	0.0		8.2					13.0		280.0	
DCR01	830913	0.0		8.4					7.5		310.0	
DCR01	831011	0.0		8.3					0.5		330.0	
DCR01	840110	0.0		8.0					0.5		350.0	
DCR01	840411	0.0		8.3					3.0		381.0	
DCR01	840507	0.0		7.6					41.5		315.0	
DCR01	840605	0.0		7.3					37.0		332.0	
DCR01	840716	0.0		7.6					3.6		231.0	
DCR01	840806	0.0		8.1					5.0		305.0	
DCR01	840910	0.0		8.1					0.5		305.0	
DCR01	841008	0.0		8.1					0.5		337.0	
DCR01	850111	0.0		7.5					1.0		377.0	
DCR01	850404	0.0		8.0					2.0		362.0	
DCR01	850507	0.0		7.4					162.0		246.0	
DCR01	850605	0.0		7.8					9.0		291.0	
DCR01	850708	0.0		7.7					1.0		268.0	
DCR01	850805	0.1		7.8					4.0		259.0	
DCR01	850909	0.0		8.0					11.0		340.0	
DCR01	851007	0.0		8.0					1.0		346.0	
DCR01	851114	0.0		8.0					27.0		378.0	
DCR01	851210	0.0		8.0					25.0		354.0	
DCR01	860113	0.0		7.8					4.0		385.0	
DCR01	860409	0.0	0.5	7.9	1.1	0.1	24.6	70.0	6.0		362.0	
DCR01	860513	0.0	0.5	7.8	0.8	0.1	13.9	38.0	130.0		277.0	
DCR01	860611	0.0	0.5	7.3	0.8	0.1	15.0	30.0	38.0		269.0	
DCR01	860707	0.0	0.5	7.6	0.8	0.1	16.6	45.0	9.0		275.0	
DCR01	860813	0.0	0.5	7.8	1.1	0.1	21.0	37.0	3.0		284.0	
DCR01	860919	0.0	0.5	7.7	1.3	0.1	27.6	60.0	0.5		353.0	
DCR01	861017	0.0	0.5	7.5	1.1	0.5	21.5	90.0	0.5		338.0	
DCR01	870408	0.0		7.7	4.3	0.1	111.6	255.0	9.0		897.0	
DCR01	870616	0.1	0.6	7.8	0.5	0.1	16.0	24.0	1.0		275.0	
DCR01	870716	0.0	0.6	7.2	0.6	0.1	18.0	25.0	4.0		252.0	
DCR01	870818	0.0	1.0	7.7	0.9	0.1	20.4	64.0	4.0		312.0	
DCR01	870922	0.0	1.0	8.4	1.1	0.0	27.8	62.0	256.0		256.0	

DEER CREEK\HUNTINGTON CREEK - WATER QUALITY

LOCATION	DATE	ACIDITY	ALK. TOTAL	BICARB	Ca	CL	COND.	DO	FLOW cfs	HARD.	Fe TOTAL	FE DIS.	Mg
DCR01	871021	137.0		276.0	60.9	8.4	500.0	6.8	0.070	324.0	0.1	0.1	41.7
DCR01	880121	51.0		397.0	107.2	138.0	1300.0	5.8	0.028	599.0	0.1	0.1	80.5
DCR01	880122	51.0		397.0	107.2	138.0	1300.0	5.8	0.028	599.0	0.1	0.1	80.5
DCR01	880607	13.0		285.0	77.3	6.0	442.0	7.2	2.052	295.0	0.1	0.1	24.8
DCR01	880914	4.0		325.0	56.8	10.0	700.0	7.8	0.131	283.0	0.0	0.0	34.2
DCR01	881017	1.0		328.0	65.6	10.0	580.0	8.1	0.109	313.0	0.0	0.0	36.2
**1990-1991*													
MINIMUM		DRY - NO FLOW SINCE OCTOBER 1988											
MAXIMUM													
AVERAGE													
STD. DEV.													
HISTORICAL													
MINIMUM		1.0	244.0	262.0	2.2	3.5	360.0	5.3	0.011	225.0	0.0	0.0	24.8
MAXIMUM		137.0	252.0	397.0	107.2	176.0	1580.0	10.2	6.517	599.0	40.1	0.1	83.9
AVERAGE		15.6	248.0	312.2	58.7	30.1	605.1	8.0	0.690	322.6	0.8	0.0	41.3
STD. DEV.		33.3	4.0	37.2	23.8	52.8	206.6	1.6	1.165	119.9	5.2	0.0	18.6
** DCR02 : DEER CREEK RUNOFF - NEAR MINE DISCHARGE **													
DCR02	901206	20.0	360.0	439.0	117.1	15.0	800.0	6.6		477.0	1.9	0.5	44.8
DCR02	901207	1.0	347.0	423.0	142.2	35.0	650.0	6.7		561.0	0.1	0.0	50.1
DCR02	901208	1.0	362.0	433.0	94.0	10.0	700.0	6.4		411.0	0.1	0.0	42.7
DCR02	901209	1.0	355.0	433.0	98.6	20.0	700.0	6.6		442.0	0.2	0.0	47.6
DCR02	901210	1.0	305.0	363.0	83.1	10.0	790.0	7.1		382.0	0.1	0.0	42.4
DCR02	901211	1.0	285.0	347.0	91.1	15.0	700.0	6.3		406.0	0.0	0.0	43.4
DCR02	901212	1.0	291.0	355.0	127.1	40.0	700.0	6.5		489.0	0.1	0.1	41.6
DCR02	901213						650.0	7.2					
DCR02	901214						600.0	6.4					
DCR02	901218						675.0	4.7					
DCR02	901219						775.0	6.9					
DCR02	901220						650.0	6.5					
DCR02	901221						695.0	6.7					
DCR02	901225						850.0	7.2					
DCR02	901226						710.0	6.2					
DCR02	910102						650.0	7.1					
DCR02	910204	1.0	325.0	397.0	98.4	10.0	520.0	8.3		439.0	0.2	0.1	47.0
DCR02	910219	1.0	296.0	361.0	89.0	10.0	680.0	7.2		414.0	0.0	0.0	46.5
DCR02	910225						690.0	6.9					
DCR02	910305	1.0	289.0	353.0	117.9	30.0	620.0	7.2		509.0	0.2	0.1	52.1
1990-1991													
MINIMUM		1.0	285.0	347.0	83.1	10.0	520.0	4.7		382.0	0.0	0.0	41.6
MAXIMUM		20.0	362.0	439.0	142.2	40.0	850.0	8.3		561.0	1.9	0.5	52.1
AVERAGE		2.9	321.5	390.4	105.9	19.5	690.3	6.7		453.0	0.3	0.1	45.8
STD. DEV.		5.7	30.2	36.4	18.2	10.8	72.2	0.7		52.5	0.5	0.1	3.3
** DCR03 : DEER CREEK RUNOFF - BELOW COAL PILE **													
DCR03	901206	93.0	368.0	449.0	135.0	15.0	820.0	6.2		535.0	3.5	1.4	48.1
DCR03	901207	1.0	177.0	212.0	94.4	5.0	800.0	6.5		422.0	2.9	1.2	45.2
DCR03	901208	1.0	338.0	403.0	90.6	20.0	700.0	6.3		407.0	0.1	0.0	43.8

all parameters reported as mg/l unless otherwise noted

LOCATION	DATE	Mn	OIL GREASE	pH units	K	SET. SOLIDS	Na	SO4	SUS SOLIDS	TEMP. F	TDS	TURB ntu's
DCR01	871021	0.0	1.0	7.0	1.5	1.0	23.6	130.0	2.0		378.0	
DCR01	880121	0.0	1.0	8.2	3.3	1.0	59.0	185.0	19.0		663.0	
DCR01	880122	0.0	1.0	8.2		1.0	59.0	185.0	19.0		663.0	
DCR01	880607	0.0	2.6	8.3	0.7	0.1	13.4	22.0	16.0		362.0	
DCR01	880914	0.0	1.0	8.4	1.0	0.1	28.7	90.0	1.0		596.0	
DCR01	881017	0.0	1.0	8.5	1.2	0.1	32.6	100.0	1.0		376.0	
**1990-1991*												
MINIMUM												
MAXIMUM												
AVERAGE												
STD. DEV.												
HISTORICAL												
MINIMUM		0.0	0.5	7.0	0.5	0.0	13.4	10.0	0.5		231.0	2.4
MAXIMUM		0.2	2.6	8.5	4.3	1.0	111.6	255.0	3592.0		897.0	2.4
AVERAGE		0.0	0.9	7.9	1.3	0.3	30.6	76.9	115.2		352.1	2.4
STD. DEV.		0.1	0.5	0.4	1.0	0.3	23.5	64.2	495.9		117.3	0.0
** DCR02 : DEER C												
DCR02	901206	0.1	1.9	8.2	5.3	3.0	17.9	145.0	16.0	49.6	398.0	
DCR02	901207	0.0	1.0	8.3	4.4	0.5	31.5	230.0	10.0	50.0	468.0	77.0
DCR02	901208	0.0	1.0	8.3	2.9	0.5	31.5	110.0	5.0	52.4	430.0	14.0
DCR02	901209	0.0	1.0	8.2	3.1	0.5	31.8	150.0	5.0	53.7	414.0	23.0
DCR02	901210	0.0		8.4	2.7	0.5	35.9	140.0	14.0	53.2	489.0	1.9
DCR02	901211	0.0	1.0	8.1	3.7	1.0		175.0	19.0	50.0	420.0	6.1
DCR02	901212	0.0	1.6	8.2	2.5	0.5	26.4	170.0	9.0	52.9	497.0	3.5
DCR02	901213			7.9		1.0			14.0	53.4	523.0	27.0
DCR02	901214			7.9		0.5			17.0	51.2	486.0	9.8
DCR02	901218			7.6		0.5			11.0	52.0	498.0	12.0
DCR02	901219			8.1		0.5			2.0	49.8	493.0	12.0
DCR02	901220			7.9		0.5			7.0	50.8	380.0	7.8
DCR02	901221			8.0		0.5			33.0	50.8	406.0	3.0
DCR02	901225			7.8		0.5			12.0	52.3	501.0	27.0
DCR02	901226			8.0		0.5			20.0	49.6	418.0	6.8
DCR02	910102			8.0		0.5			11.0	52.7	524.0	4.4
DCR02	910204	0.0	1.5	8.3	4.3		29.4	150.0	5.0	52.3	465.0	4.6
DCR02	910219	0.0	1.0	8.1	3.6		30.1	140.0	45.0	54.7	505.0	18.0
DCR02	910225			8.3		0.5			71.0	55.0	535.0	35.0
DCR02	910305	0.0	1.0	8.0	4.9	0.5	29.1	220.0	4.0	54.4	514.0	1.3
1990-1991												
MINIMUM		0.0	1.0	7.6	2.5	0.5	17.9	110.0	2.0	49.6	380.0	1.3
MAXIMUM		0.1	1.9	8.4	5.3	3.0	35.9	230.0	71.0	55.0	535.0	77.0
AVERAGE		0.0	1.2	8.1	3.7	0.7	29.3	163.0	16.5	52.0	468.2	15.5
STD. DEV.		0.0	0.3	0.2	0.9	0.6	4.7	35.3	16.0	1.7	46.9	17.3
** DCR03 : DEER C												
DCR03	901206	0.2	4.8	8.1	0.4	2.5	21.2	180.0	51.0	43.3	376.0	
DCR03	901207	0.2	2.8	8.3	7.6	5.0	12.2	260.0	52.0	45.1	405.0	
DCR03	901208	0.0	1.0	8.4	3.0	0.5	24.9	110.0	8.0	50.4	461.0	36.0

DEER CREEK\HUNTINGTON CREEK - WATER QUALITY

LOCATION	DATE	ACIDITY	ALK. TOTAL	BICARB	Ca	CL	COND.	DO	FLOW cfs	HARD.	Fe TOTAL	FE DIS.	Mg
DCR03	901209	1.0	351.0	428.0	84.4	25.0	800.0	6.8			0.1	0.0	45.8
DCR03	901210	1.0	305.0	410.0	83.1	10.0	700.0	7.0		383.0	0.2	0.0	42.6
DCR03	901211	1.0	322.0	393.0	105.6	20.0	800.0	0.0		444.0	0.1	0.0	43.8
DCR03	901212	1.0	253.0	380.0	134.2	45.0	650.0	6.8		520.0	0.1	0.1	45.0
DCR03	901213						640.0	7.5					
DCR03	901214						690.0	6.2					
DCR03	901218						675.0	4.7					
DCR03	901219						710.0	7.8					
DCR03	901220						625.0	6.6					
DCR03	901221						710.0	8.0					
DCR03	901225						800.0	7.8					
DCR03	901226						705.0	7.2					
DCR03	910102						700.0	7.2					
DCR03	910204	1.0	275.0	328.0	83.2	25.0	520.0	8.6		385.0	0.2	0.1	43.0
DCR03	910219	1.0	275.0	335.0	91.6	15.0	690.0	7.5		398.0	0.0	0.0	41.0
DCR03	910225						700.0	6.5					
DCR03	910305	1.0	267.0	320.0	91.6	45.0	620.0	7.8		433.0	0.1	0.1	49.7
1990-1991													
MINIMUM		1.0	177.0	212.0	83.1	5.0	520.0	0.0		383.0	0.0	0.0	41.0
MAXIMUM		93.0	368.0	449.0	135.0	45.0	820.0	8.6		535.0	3.5	1.4	49.7
AVERAGE		10.2	293.1	365.8	99.4	22.5	702.8	6.7		436.3	0.7	0.3	44.8
STD. DEV.		27.6	53.3	65.7	18.7	12.7	72.7	1.7		52.5	1.2	0.5	2.5
** DCR04 : DEER CREEK RUNOFF - @ PERMIT BOUNDARY **									(CFS)				
DCR04	901206	10.0	334.0	407.0	151.6	15.0	810.0	6.5	1.400	580.0	3.8	1.6	48.9
DCR04	901207	1.0	343.0	409.0	98.5	25.0	800.0	7.3	2.900	479.0	2.5	0.9	56.6
DCR04	901208	1.0	347.0	415.0	92.6	20.0	710.0	6.7	2.790	419.0	0.3	0.0	45.5
DCR04	901209	1.0	350.0	427.0	98.2	30.0	800.0	6.9	2.790	445.0	0.0	0.0	48.5
DCR04	901210	1.0	296.0	348.0	85.2	20.0	730.0	6.3	3.010	389.0	0.3	0.0	42.7
DCR04	901211	1.0	291.0	355.0	97.3	20.0	710.0	6.3	2.790	445.0	0.0	0.0	49.0
DCR04	901212	1.0	289.0	352.0	102.8	45.0	650.0	6.6	3.600	444.0	0.1	0.1	45.6
DCR04	901213						700.0	7.2	3.600				
DCR04	901214						700.0	6.5	3.360				
DCR04	901218						650.0	5.0	4.360				
DCR04	901219						620.0	7.1	4.360				
DCR04	901220						675.0	6.8	4.360				
DCR04	901221						710.0	8.2	4.620				
DCR04	901225						810.0	7.8	5.300				
DCR04	901226						700.0	7.6	5.160				
DCR04	910102						650.0	7.2	5.300				
DCR04	910204	1.0	284.0	338.0	103.8	15.0	520.0	8.9	4.750	447.0	0.2	0.1	45.7
DCR04	910219	10.0	274.0	334.0	97.4	25.0	700.0	8.0	4.750	422.0	0.0	0.0	43.3
DCR04	910225						690.0	7.3	4.230				
DCR04	910305	1.0	261.0	312.0	92.3	30.0	680.0	7.9	4.750	458.0	0.1	0.1	55.3
DCR04	910418		265.0	323.0	85.6	75.0	510.0	7.1	2.900	420.0	0.1	0.0	50.0
1990-1991													
MINIMUM		1.0	261.0	312.0	85.2	15.0	510.0	5.0	1.400	389.0	0.0	0.0	42.7
MAXIMUM		10.0	350.0	427.0	151.6	75.0	810.0	8.9	5.300	580.0	3.8	1.6	56.6
AVERAGE		2.8	303.1	365.5	100.5	29.1	691.7	7.1	3.861	449.8	0.7	0.3	48.3
STD. DEV.		3.6	32.3	39.2	17.2	16.6	77.9	0.8	1.026	47.0	1.2	0.5	4.3

all parameters reported as mg/l unless otherwise noted

LOCATION	DATE	Mn	OIL GREASE	pH units	K	SET. SOLIDS	Na	SO4	SUS. SOLIDS	TEMP. F	TDS	TURB ntu's
DCR03	901209	0.0	2.3	8.2	3.5	1.0	36.2	110.0	3.0	50.8	446.0	11.0
DCR03	901210	0.0		8.4	2.8	0.5	40.2	140.0	16.0	52.0	550.0	4.8
DCR03	901211	0.0	1.6	8.2	3.5	0.5	23.3	190.0	12.0	50.0	567.0	13.0
DCR03	901212	0.0	1.3	8.2	3.1	0.5	33.7	180.0	6.0	51.8	579.0	2.8
DCR03	901213			8.1		1.0			5.0	52.9	516.0	27.0
DCR03	901214			8.1		0.5			54.0	49.6	428.0	14.0
DCR03	901218			7.9		0.5			15.0	51.8	530.0	17.0
DCR03	901219			8.2		0.5			2.0	48.8	508.0	9.5
DCR03	901220			8.0		0.5			15.0	48.7	482.0	16.0
DCR03	901221			8.1		0.5			57.0	47.5	463.0	3.5
DCR03	901225			7.9		0.5			71.0	50.4	459.0	5.4
DCR03	901226			8.2		0.5			21.0	46.3	411.0	5.7
DCR03	910102			8.0		0.5			7.0	52.7	532.0	4.7
DCR03	910204	0.0	1.1	8.4	4.2		32.9	110.0	33.0	51.6	474.0	4.8
DCR03	910219	0.0	0.3	8.2	3.1	0.5	32.2	180.0	43.0	53.5	503.0	12.0
DCR03	910225			8.4		0.5			40.0	53.6	512.0	30.0
DCR03	910305	0.0		7.8	5.2	0.5	69.8	240.0	2.0	52.9	525.0	1.6
1990-1991												
MINIMUM		0.0	0.3	7.8	0.4	0.5	12.2	110.0	2.0	43.3	376.0	1.6
MAXIMUM		0.2	4.8	8.4	7.6	5.0	69.8	260.0	71.0	53.6	579.0	36.0
AVERAGE		0.1	1.9	8.2	3.6	0.9	32.6	170.0	25.7	50.2	486.4	12.2
STD. DEV.		0.1	1.3	0.2	1.8	1.1	14.6	50.4	21.6	2.8	54.1	9.7
** DCR04 : DEER C												
DCR04	901206	0.3	2.8	8.2	7.8	5.0	20.6	255.0	87.0	43.1	449.0	
DCR04	901207	0.1	1.0	8.4	6.7	0.5	38.9	200.0	31.0	44.8	366.0	
DCR04	901208	0.0	1.0	8.3	3.2	0.5	28.2	110.0	8.0	48.8	486.0	22.0
DCR04	901209	0.0	2.4	8.2	3.4	0.5	40.3	155.0	2.0	49.3	468.0	32.0
DCR04	901210	0.0		8.6	0.7	0.5	45.2	130.0	32.0	50.8	475.0	6.0
DCR04	901211	0.0	1.0	8.3	3.8	1.0	29.9	180.0	27.0	49.2	509.0	6.3
DCR04	901212	0.0	2.3	8.3	3.1	0.5	37.2	170.0	8.0	50.8	458.0	3.5
DCR04	901213			8.3		1.0			8.0	51.9	461.0	29.0
DCR04	901214			8.1		0.5			25.0	48.8	374.0	15.0
DCR04	901218			8.2		0.5			8.0	51.0	352.0	15.0
DCR04	901219			8.2		0.5			2.0	48.9	408.0	5.4
DCR04	901220			8.0		0.5			18.0	47.5	375.0	13.0
DCR04	901221			8.1		0.5			58.0	46.3	454.0	3.3
DCR04	901225			7.9		0.5			51.0	49.2	483.0	20.0
DCR04	901226			8.2		0.5			32.0	46.3	391.0	7.4
DCR04	910102			8.0		0.5			7.0	51.6	442.0	4.7
DCR04	910204	0.0	1.0	8.4	4.2		33.4	130.0	7.0	51.1	465.0	3.9
DCR04	910219	0.0	1.3	7.9	3.5	0.5	34.1	140.0	35.0	53.0	508.0	17.0
DCR04	910225			8.4		0.5			36.0	52.9	534.0	23.0
DCR04	910305	0.0	1.0	8.3	5.1	0.5	35.4	230.0	4.0	51.9	519.0	1.3
DCR04	910418	0.0	2.1	8.4	1.8	0.5	36.2	100.0	46.0	53.5	483.0	10.7
1990-1991												
MINIMUM		0.0	1.0	7.9	0.7	0.5	20.6	100.0	2.0	43.1	352.0	1.3
MAXIMUM		0.3	2.8	8.6	7.8	5.0	45.2	255.0	87.0	53.5	534.0	32.0
AVERAGE		0.1	1.6	8.2	3.9	0.8	34.5	163.6	25.3	49.6	450.5	12.6
STD. DEV.		0.1	0.7	0.2	1.9	1.0	6.3	46.9	21.6	2.7	52.0	9.0

DEER CREEK\HUNTINGTON CREEK - WATER QUALITY

LOCATION	DATE	ACIDITY	ALK. TOTAL	BICARB	Ca	CL	COND.	DO	FLOW cfs	HARD.	Fe TOTAL	FE DIS.	Mg
** DCR05 : DEER CREEK RUNOFF - BELOW MINE **													
DCR05	780516						420.0				0.4		
DCR05	790517	14.0	278.0			22.0	730.0	8.8			170.0		
DCR05	790730		287.0								0.7		
DCR05	800515						870.0				0.3		
DCR05	800701						790.0				0.2		
DCR05	810519						1500.0		0.089		0.2		
DCR05	810611						1650.0		0.022		0.1		
DCR05	820503						880.0				1.8		
DCR05	820601						650.0		1.114		1.8		
DCR05	820706						720.0		0.858		1.1		
DCR05	820803						900.0		0.289		1.0		
DCR05	820915						1180.0		0.117		0.3		
DCR05	821011						1380.0		0.076		0.1		
DCR05	830509						1150.0				2.1		
DCR05	830613						650.0				0.7		
DCR05	830711						710.0		1.114		0.3		
DCR05	830809						725.0		1.070		0.1		
DCR05	830913						850.0		0.534		0.1		
DCR05	831011						900.0		0.339		0.1		
DCR05	840110						1650.0				0.1		
DCR05	840411						2150.0				0.1		
DCR05	840507						1310.0				0.1		
DCR05	840605						620.0				0.1		
DCR05	840716						700.0		1.315		0.1		
DCR05	840806						800.0		0.872		0.2		
DCR05	840910						950.0		0.339		0.1		
DCR05	841008						1200.0		0.393		0.1		
DCR05	850111						2079.0		0.138		0.1		
DCR05	850404						2300.0		0.124		0.1		
DCR05	850507						630.0		6.517		0.4		
DCR05	850605						680.0		4.122		0.1		
DCR05	850708						750.0		0.916		0.1		
DCR05	850805						850.0		0.442		0.1		
DCR05	850909						1250.0		0.154		0.1		
DCR05	851007						1308.0		0.154		0.1		
DCR05	851114						1800.0		0.222		0.1		
DCR05	851210						2100.0		0.028		0.4		
DCR05	860409	1.0		359.0	112.0	290.0	2300.0	10.0	0.131	750.0	0.1		114.3
DCR05	860513	1.0		309.0	66.0	42.8	780.0	10.1	1.857	320.0	0.2		37.7
DCR05	860611	1.0		292.0	56.8	30.3	698.0	9.3	1.857	284.0	0.1		34.5
DCR05	860707	1.0		260.0	46.0	45.0	760.0	9.8	0.786	290.0	0.1		42.6
DCR05	860813	1.0		288.0	60.0	94.0	1100.0	11.0	0.319	385.0	0.2		57.2
DCR05	860919	1.0		312.0	80.0	237.0	1800.0	10.1	0.138	555.0	0.1		86.3
DCR05	861017			337.0	90.0	212.0	1710.0	9.4	0.123	565.0	0.1		82.7
DCR05	870408	1.0		305.0	1.4	420.0	2284.0	7.5	0.078	815.0	0.3	0.1	122.8
DCR05	870616	1.0		255.0	2.4	48.0	709.0	7.5	0.018	285.0	0.1	0.1	40.1
DCR05	870716	1.0		267.0	46.0	88.0	930.0	8.2	0.584	320.0	0.1	0.1	49.8
DCR05	870818	1.0		272.0	78.0	34.6	1320.0	5.4	0.339	475.0	0.1	0.1	68.0
DCR05	870922	1.0		344.0	76.0	49.0	1000.0	5.7	0.109	740.0	0.1	0.1	49.6
DCR05	871021	90.0		371.0	102.2	73.6	1300.0	6.6	0.070	607.0	0.1	0.1	85.4

all parameters reported as mg/l unless otherwise noted

LOCATION	DATE	Mn	OIL GREASE	pH units	K	SET. SOLIDS	Na	SO4	SUS. SOLIDS	TEMP F	TDS	TURB ntu's
** DCR05 : DEER C												
DCR05	780516	0.2		6.9					1124.0		273.0	
DCR05	790517		1.0	7.4				113.0	20540.0		477.0	
DCR05	790730		0.9	8.4				141.6	40.6		440.0	21.0
DCR05	800515	0.3		7.9					396.0		567.0	
DCR05	800701	0.0		8.0					9.5		452.0	
DCR05	810519	0.0		8.2					5.5		959.0	
DCR05	810611	0.0		8.3					2.5		1021.0	
DCR05	820503	0.2		8.0					183.0		520.0	
DCR05	820601	0.2		7.7					54.0		367.0	
DCR05	820706	0.2		7.9					3.5		399.0	
DCR05	820803	0.2		8.0					29.5		497.0	
DCR05	820915	0.1		8.2					4.5		649.0	
DCR05	821011	0.1		8.3					2.0		868.0	
DCR05	830509	0.2		8.0					557.0		637.0	
DCR05	830613	0.1		8.1					183.0		407.0	
DCR05	830711	0.0		8.3					7.5		371.0	
DCR05	830809	0.0		8.6					15.0		409.0	
DCR05	830913	0.0		8.5					6.5		478.0	
DCR05	831011	0.0		8.5					9.0		491.0	
DCR05	840110	0.0		8.0					23.5		988.0	
DCR05	840411	0.0		8.2					1.5		1354.0	
DCR05	840507	0.0		7.8					36.5		756.0	
DCR05	840605	0.0		7.8					32.5		387.0	
DCR05	840716	0.0		7.8					0.5		320.0	
DCR05	840806	0.0		8.4					141.0		458.0	
DCR05	840910	0.0		8.5					0.5		534.0	
DCR05	841008	0.0		8.3					2.0		728.0	
DCR05	850111	0.0		7.7					4.0		1346.0	
DCR05	850404	0.0		7.9					18.0		1448.0	
DCR05	850507	0.0		7.6					258.0		334.0	
DCR05	850605	0.0		7.8					28.0		360.0	
DCR05	850708	0.0		8.3							401.0	
DCR05	850805	0.1		7.4					10.0		468.0	
DCR05	850909	0.0		8.2					16.0		790.0	
DCR05	851007	0.0		8.0					25.0		824.0	
DCR05	851114	0.0		8.1					28.0		1095.0	
DCR05	851210	0.0		7.9					10.0		1293.0	
DCR05	860409	0.0	0.5	7.7	6.6	0.1	192.0	450.0	6.0		1315.0	
DCR05	860513	0.0	0.5	7.8	1.4	0.1	39.0	75.0	91.0		402.0	
DCR05	860611	0.0	0.5	7.4	1.3	0.1	32.6	65.0	44.0		358.0	
DCR05	860707	0.0	0.5	7.7	1.8	0.1	45.0	110.0	15.0		434.0	
DCR05	860813	0.0	0.5	7.9	3.4	0.1	81.2	180.0	23.0		619.0	
DCR05	860919	0.0	0.5	7.9	6.2	0.1	179.0	350.0	0.5		1072.0	
DCR05	861017	0.0	0.5	7.7	4.9	0.5	160.9	345.0	0.5		973.0	
DCR05	870408	0.0		7.8	7.3	0.1	233.2	500.0	41.0		1544.0	
DCR05	870616	0.0	1.2	7.8	1.0	0.1	39.0	100.0	9.0		429.0	
DCR05	870716	0.0	0.5	7.4	2.0	0.1	63.0	90.0	8.0		489.0	
DCR05	870818	0.0	1.1	7.6	3.3	0.1	197.8	280.0	4.0		798.0	
DCR05	870922	0.0	1.0	8.5	5.0	1.0	111.6	90.0	1.0		730.0	
DCR05	871021	0.0	1.0	8.3	5.7	1.0	119.2	347.0	4.0		848.0	

DEER CREEK\HUNTINGTON CREEK - WATER QUALITY

LOCATION	DATE	ACIDITY	ALK. TOTAL	BICARB	Ca	CL	COND.	DO	FLOW cfs	HARD.	Fe TOTAL	FE DIS.	Mg
DCR05	880607	27.0		244.0	88.4	82.0	800.0	7.2	2.052	382.0	0.1	0.1	39.2
DCR05	880914	6.0		306.0	129.1	75.0	1215.0	7.5	3.119	559.0	0.8	0.6	57.4
DCR05	881017	1.0		442.0	123.6	195.0	1450.0	7.9	0.117	700.0	0.0	0.0	95.1
DCR05	901206	30.0	355.0	424.0	125.6	5.0	900.0	7.3	1.400	538.0	3.1	1.2	54.5
DCR05	901207	1.0	346.0	412.0	141.7	55.0	800.0	7.5	2.900	560.0	0.7	0.1	50.0
DCR05	901208	1.0	303.0	370.0	97.5	70.0	800.0	7.4	2.790	436.0	0.8		46.7
DCR05	901209	1.0	310.0	371.0	89.8	25.0	850.0	7.7	2.790	422.0	0.4	0.0	48.1
DCR05	901210	1.0	332.0	393.0	139.7	45.0	720.0	6.6	3.010	588.0	0.9	0.8	58.2
DCR05	901211	1.0	280.0	341.0	94.4	40.0	800.0	6.6	2.790	435.0	0.2	0.1	48.4
DCR05	901212	1.0	288.0	351.0	103.0	25.0	620.0	7.8	3.600	433.0	0.7	0.4	42.6
DCR05	901213						700.0	7.9	3.600				
DCR05	901214						790.0	6.3	3.360				
DCR05	901218						710.0	5.5	4.360				
DCR05	901219						695.0	7.1	4.360				
DCR05	901220						750.0	7.9	4.360				
DCR05	901221						625.0	8.7	4.620				
DCR05	901225						800.0	8.4	5.300				
DCR05	901226						800.0	7.9	5.160				
DCR05	910102						700.0	7.7	5.300				
DCR05	910204	1.0	265.0	316.0	93.5	70.0	620.0	9.4	4.750	452.0	0.1	0.0	53.0
DCR05	910219	1.0	374.0	456.0	98.3	45.0	820.0	7.8	4.750	503.0	0.0	0.0	62.5
DCR05	910225						730.0	8.4	4.230				
DCR05	910305	1.0	252.0	300.0	90.6	55.0	750.0	7.4	4.750	460.0	0.3	0.3	56.8
DCR06	910418		253.0	309.0	53.5	55.0	530.0	7.7	2.900	278.0	0.0	0.0	35.1
1990-1991													
MINIMUM		1.0	252.0	300.0	53.5	5.0	530.0	5.5	1.400	278.0	0.0	0.0	35.1
MAXIMUM		30.0	374.0	456.0	141.7	70.0	900.0	9.4	5.300	588.0	3.1	1.2	62.5
AVERAGE		3.9	305.3	367.5	102.5	44.5	738.6	7.6	3.861	464.1	0.7	0.3	50.5
STD. DEV.		8.7	40.1	47.9	24.0	19.0	86.6	0.8	1.026	80.2	0.8	0.4	7.3
HISTORICAL													
MINIMUM		1.0	278.0	244.0	1.4	5.0	420.0	5.4	0.018	284.0	0.0	0.0	34.5
MAXIMUM		90.0	355.0	442.0	141.7	420.0	2300.0	11.0	6.517	815.0	170.0	1.2	122.8
AVERAGE		8.0	308.8	331.5	84.8	96.0	1064.1	7.9	1.562	497.6	3.2	0.2	61.4
STD. DEV.		19.2	27.4	54.8	37.1	99.4	476.0	1.4	1.726	153.6	21.7	0.4	24.1

** HCC01 : HUNTINGTON CANYON CREEK - ABOVE PLANT **

HCC01	901206	1.0	226.0	276.0	80.7	15.0	510.0	8.6	20.000	288.0	0.0	0.0	21.0
HCC01	901207	1.0	262.0	320.0	102.6	25.0	300.0	8.1	18.000	364.0	0.0	0.0	26.2
HCC01	901208	1.0	233.0	278.0	83.1	40.0	400.0	8.2	19.000	392.0	0.0	0.0	44.7
HCC01	901209	1.0	218.0	260.0	68.6	15.0	450.0	8.0	22.000	252.0	0.0	0.0	19.7
HCC01	901210	1.0	338.0	400.0	70.9	25.0	400.0	8.4	22.000	266.0	0.0	0.0	21.5
HCC01	901211	1.0	259.0	316.0	70.6	10.0	490.0	8.5	22.000	266.0	0.0	0.0	21.7
HCC01	901212	1.0	222.0	270.0	78.4	15.0	340.0	8.8	24.000	270.0	0.1	0.1	18.1
HCC01	901213						340.0	9.6	23.000				
HCC01	901214						400.0	5.8	18.000				
HCC01	901218						420.0	6.7	18.000				
HCC01	901219						410.0	8.5	18.000				
HCC01	901220						450.0	8.1	14.000				
HCC01	901221						475.0	8.8	13.000				
HCC01	901225						500.0	7.7	15.000				

all parameters reported as mg/l unless otherwise noted

LOCATION	DATE	Mn	OIL GREASE	pH units	K	SET. SOLIDS	Na	SO4	SUS. SOLIDS	TEMP F	TDS	TURB ntu's
DCR05	880607	0.0	3.6	8.3	1.7	0.1	49.2	130.0	36.0		472.0	
DCR05	880914	0.1	9.0	8.1	7.6	1.5	77.6	310.0	372.0		862.0	
DCR05	881017	0.0	4.2	8.4	5.6	0.1	145.8	350.0	1.0		1164.0	
DCR05	901206	0.1	2.3	8.4	6.9	2.0	30.9	250.0	97.0	36.2	452.0	200.0
DCR05	901207	0.0	1.0	8.4	5.5	2.0	42.4	220.0	27.0	33.7	313.0	174.0
DCR05	901208	0.1	1.0	8.3	3.1	0.5	35.6	110.0	7.0	41.0	427.0	48.0
DCR05	901209	0.0	1.0	8.3	4.1	0.5	49.0	175.0	15.0	43.8	609.0	270.0
DCR05	901210	0.1		8.5	3.9	0.5	46.2	190.0	72.0	47.5	534.0	22.0
DCR05	901211	0.0	1.8	8.3	4.3	0.5	35.3	180.0	1.0	45.5	597.0	18.0
DCR05	901212	0.0	1.4	8.4	4.0	0.5	42.7	170.0	14.0	47.9	455.0	5.6
DCR05	901213			8.3		2.3			15.0	47.9	536.0	41.0
DCR05	901214			8.1		0.5			42.0	44.0	544.0	28.0
DCR05	901218			8.4		0.5			41.0	49.2	499.0	24.0
DCR05	901219			8.3		0.5			1.0	44.3	452.0	17.0
DCR05	901220			8.1		0.5			25.0	42.2	403.0	16.0
DCR05	901221			8.3		0.5			87.0	41.4	511.0	3.3
DCR05	901225			8.1		0.5			47.0	44.3	484.0	9.8
DCR05	901226			8.3		0.5			86.0	43.9	475.0	10.0
DCR05	910102			8.2		0.5			6.0	47.3	408.0	6.1
DCR05	910204	0.0	3.0	8.4	2.5		57.3	160.0	3.0	45.3	528.0	4.4
DCR05	910219	0.0	2.3	8.4	3.7	0.5	50.6	170.0	53.0	50.0	549.0	13.0
DCR05	910225			8.4		0.5			37.0	51.5	573.0	15.0
DCR05	910305	0.0	1.0	8.4	5.1	0.5	50.6	230.0	49.0	48.2	539.0	2.0
DCR06	910418	0.0	2.3	8.5	4.8	0.5	48.4	80.0	36.0	53.3	459.0	3.9
1990-1991												
MINIMUM		0.0	1.0	8.1	2.5	0.5	30.9	80.0	1.0	33.7	313.0	2.0
MAXIMUM		0.1	3.0	8.5	6.9	2.3	57.3	250.0	97.0	53.3	609.0	270.0
AVERAGE		0.0	1.7	8.3	4.3	0.7	44.5	175.9	36.2	45.2	492.7	44.3
STD. DEV.		0.0	0.7	0.1	1.1	0.6	7.6	47.1	29.0	4.6	69.7	72.1
HISTORICAL												
MINIMUM		0.0	0.5	6.9	1.0	0.1	30.9	65.0	0.5	33.7	273.0	3.3
MAXIMUM		0.3	9.0	8.6	7.6	2.3	233.2	500.0	20540.0	49.2	1544.0	270.0
AVERAGE		0.0	1.5	8.0	4.2	0.6	89.0	212.9	373.7	43.5	646.6	56.7
STD. DEV.		0.1	1.9	0.3	2.0	0.6	62.8	120.0	2487.6	4.1	311.0	78.7
** HCC01 : HUNTIN												
HCC01	901206	0.0	1.0	8.2	0.5	0.5	6.5	50.0	1.0	34.5	172.0	9.6
HCC01	901207	0.0	2.1	8.3	0.4	0.5	7.1	75.0	1.0	33.5	201.0	7.8
HCC01	901208	0.0	1.0	8.4	0.1	0.5	7.9	130.0	3.0	35.0	310.0	10.0
HCC01	901209	0.0	2.7	8.4	0.1	0.5	10.8	55.0	1.0	35.0	204.0	0.9
HCC01	901210	0.1	1.7	8.5	0.4	0.5	55.0	45.0	2.0	35.8	300.0	1.8
HCC01	901211	0.0	1.0	8.2	0.5	0.5	37.0	33.0	31.0	34.6	246.0	1.2
HCC01	901212	0.0	1.0	8.3		0.5	6.8	30.0	2.0	35.3	243.0	1.3
HCC01	901213			8.2		1.0			5.0	35.3	235.0	17.0
HCC01	901214			8.3		0.5			4.0	33.3	235.0	1.9
HCC01	901218			8.4		0.5			1.0	34.1	268.0	2.5
HCC01	901219			8.3		0.5			1.0	33.7	302.0	1.0
HCC01	901220			8.3		0.5			1.0	33.7	264.0	1.0
HCC01	901221			8.2		0.5			2.0	31.3	191.0	1.1
HCC01	901225			8.1		0.5			1.0	33.7	266.0	0.7

DEER CREEK\HUNTINGTON CREEK - WATER QUALITY

LOCATION	DATE	ACIDITY	ALK. TOTAL	BICARB	Ca	CL	COND.	DO	FLOW cfs	HARD.	Fe TOTAL	FE DIS.	Mg
HCC01	901226						490.0	8.7	15.000				
HCC01	910102						460.0	8.8	15.000				
HCC01	910204	1.0	206.0	245.0	77.9	20.0	325.0	9.9	8.900	288.0	0.0	0.0	22.6
HCC01	910219	1.0	222.0	270.0	73.7	20.0	400.0	9.7	11.000	273.0	0.0	0.0	21.6
HCC01	910225						450.0	8.2	10.000				
HCC01	910305	1.0	226.0	276.0	72.8	30.0	410.0	8.5	20.000	285.0	0.2	0.2	25.0
HCC01	910418		192.0	234.0	60.6	25.0	330.0	7.9		241.0	0.0	0.0	21.8
1990-1991													
MINIMUM		1.0	192.0	234.0	60.6	10.0	300.0	5.8	8.900	241.0	0.0	0.0	18.1
MAXIMUM		1.0	338.0	400.0	102.6	40.0	510.0	9.9	24.000	392.0	0.2	0.2	44.7
AVERAGE		1.0	236.7	285.9	76.4	21.8	416.7	8.4	17.295	289.5	0.0	0.0	24.0
STD. DEV.		0.0	37.4	43.6	10.2	8.1	60.8	0.9	4.312	44.3	0.1	0.1	6.9
** HCC02 : HUNTINGTON CANYON CREEK - ABOVE PLANT, BELOW DEER CREEK CONFLUENCE **													
HCC02	901206	1.0	241.0	294.0	83.8	20.0	400.0	8.7	21.400	305.0	0.4	0.0	23.3
HCC02	901207	1.0	207.0	249.0	91.7	30.0	400.0	9.0	20.900	327.0	0.1	0.0	23.8
HCC02	901208	1.0	259.0	310.0	81.9	20.0	500.0	8.4	21.800	365.0	0.1	0.0	38.9
HCC02	901209	1.0	243.0	289.0	72.4	5.0	510.0	8.7	24.800	305.0	0.0	0.0	30.1
HCC02	901210	1.0	212.0	251.0	78.2	10.0	450.0	8.7	25.000	360.0	0.0	0.0	39.9
HCC02	901211	1.0	236.0	287.0	82.1	20.0	373.0	8.3	24.800	299.0	0.1	0.1	22.8
HCC02	901212	1.0	214.0	261.0	75.8	15.0	420.0	8.6	27.600	284.0	0.2	0.2	22.9
HCC02	901213						400.0	9.1	26.600				
HCC02	901214						450.0	5.8	21.400				
HCC02	901218						495.0	5.2	22.400				
HCC02	901219						425.0	8.6	22.500				
HCC02	901220						500.0	8.1	18.400				
HCC02	901221						610.0	8.7	17.400				
HCC02	901225						590.0	8.0	20.300				
HCC02	901226						530.0	9.1	20.200				
HCC02	910102						480.0	8.6	20.300				
HCC02	910204	1.0	220.0	262.0	78.7	10.0	420.0	10.3	13.650	324.0	0.0	0.0	30.9
HCC02	910219	1.0	246.0	300.0	83.1	35.0	590.0	8.8	15.750	353.0	0.0	0.0	35.3
HCC02	910225						610.0	7.5	14.230				
HCC02	910305	1.0	197.0	236.0	67.8	35.0	450.0	9.0	24.750	313.0	0.3	0.2	34.8
HCC02	910418		187.0	228.0	66.1	30.0	350.0	7.8		232.0	0.0	0.0	16.3
1990-1991													
MINIMUM		1.0	187.0	228.0	66.1	5.0	350.0	5.2	13.650	232.0	0.0	0.0	16.3
MAXIMUM		1.0	259.0	310.0	91.7	35.0	610.0	10.3	27.600	365.0	0.4	0.2	39.9
AVERAGE		1.0	223.8	269.7	78.3	20.9	474.0	8.3	21.209	315.2	0.1	0.1	29.0
STD. DEV.		0.0	21.6	26.3	7.1	10.0	76.3	1.1	3.788	36.3	0.1	0.1	7.3
** HCC03 : HUNTINGTON CANYON CREEK - BELOW PLANT, @ PIPE CROSSING **													
HCC03	901206	1.0	217.0	265.0	69.0	15.0	400.0	8.1	21.400	279.0	0.3	0.0	26.0
HCC03	901207	1.0	254.0	310.0	99.5	75.0	510.0	9.0	20.900	345.0	0.2	0.0	23.5
HCC03	901208	1.0	241.0	287.0	86.4	15.0	610.0	8.3	21.800	347.0	0.2	0.0	31.8
HCC03	901209	1.0	262.0	312.0	72.5	20.0	520.0	8.5	24.800	279.0	0.0	0.0	23.7
HCC03	901210	1.0	212.0	251.0	77.5	20.0	490.0	6.3	25.000	283.0	0.1	0.0	21.7
HCC03	901211	1.0	249.0	303.0	87.1	25.0	520.0	7.7	24.800	334.0	0.1	0.1	28.3
HCC03	901212	29.0	246.0	300.0	88.7	25.0	420.0	8.4	27.600	315.0	0.2	0.2	22.8

all parameters reported as mg/l unless otherwise noted