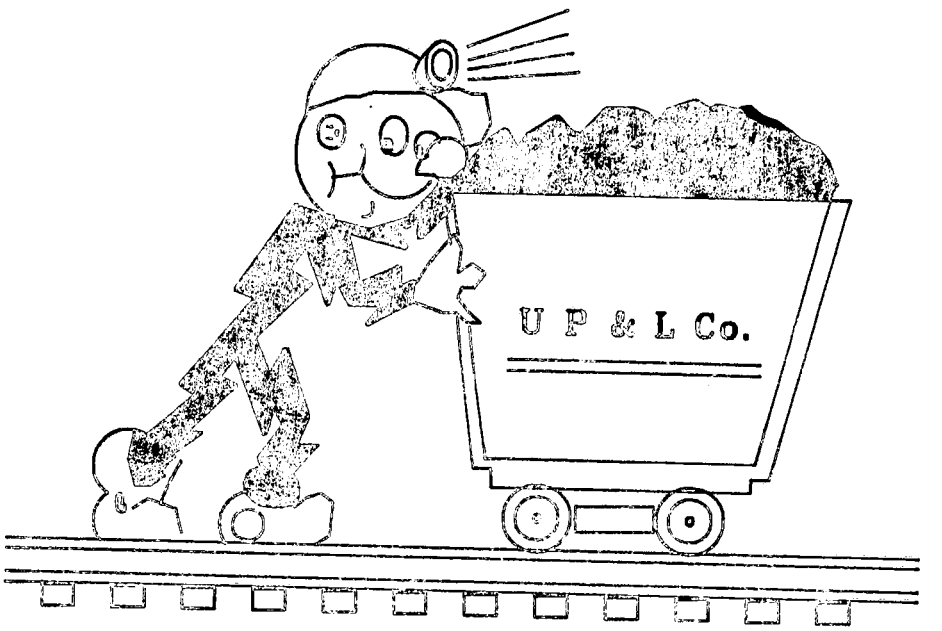
UTAH POWER & LIGHT COMPANY
MINING DIVISION
HYDROLOGIC MONITORING PROGRAM
ANNUAL REPORT FOR 1989



UTAH POWER & LIGHT COMPANY
HYDROLOGIC MONITORING PROGRAM
ANNUAL REPORT FOR 1989

MAY 1990

Submitted to: United States Department of the Interior
Office of Surface Mining
Minerals Management Service
Utah Division of Oil, Gas and Mining

Prepared and submitted for Utah Power & Light Company by:

Hydrologic Section of the Power Operations Department

and

Technical Services Department of the Mining Division

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I. INTRODUCTION

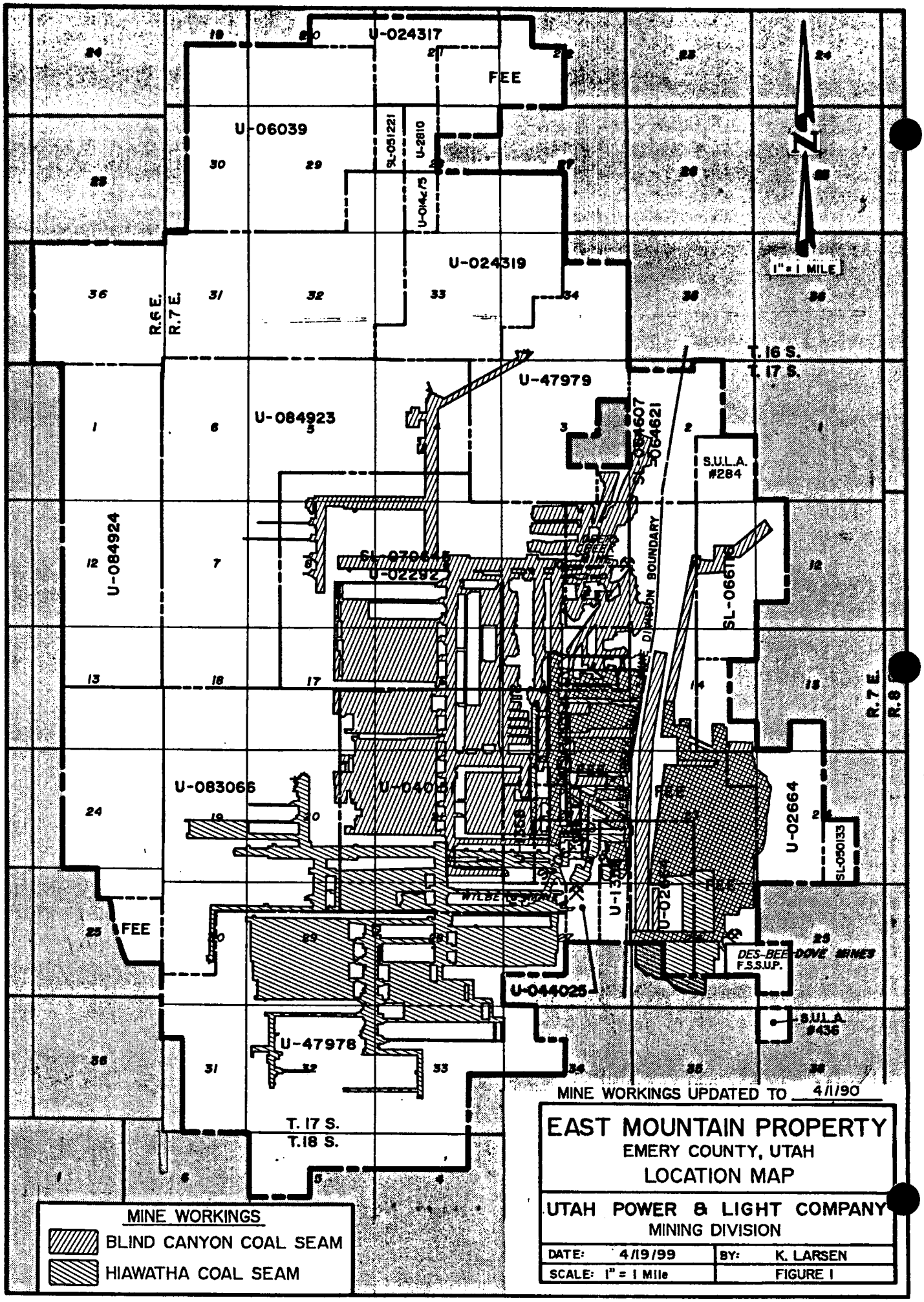
The 1989 Water Monitoring Report is hereby submitted in accordance with the U. S. Department of Interior, Office of Surface Mining requirements and the Utah State Division of Oil, Gas and Mining guidelines for hydrologic monitoring in areas of and adjacent to coal mining operations.

This is the twelfth annual hydrologic report submitted by Utah Power & Light Company 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 Utah Power & Light Company (UP&L) 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.



MINE WORKINGS UPDATED TO 4/1/90

EAST MOUNTAIN PROPERTY
EMERY COUNTY, UTAH
LOCATION MAP

UTAH POWER & LIGHT COMPANY
MINING DIVISION

DATE: 4/19/99	BY: K. LARSEN
SCALE: 1" = 1 Mile	FIGURE 1

MINE WORKINGS
- BLIND CANYON COAL SEAM
- HIAWATHA COAL SEAM

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 and 1989, with runoff amounts less in 1989 than in 1988.

B. Local Climatology

1. Precipitation

Valley precipitation in Emery County during 1989 was below average. The mountains in the San Rafael Basin received below normal snowfall during the 1988-89 winter, and precipitation at Electric Lake (18.79") was below normal.

Precipitation amounts recorded at Hunter Plant, Huntington Plant, Electric Lake, and East Mountain for the 1989 water year (October 1988 to September 1989) 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 1988 and 1989 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 1988-1989 precipitation levels recorded at the four locations.

TABLE 2: COMPARISON OF 1988 AND 1989 PRECIPITATION (Inches)

Station	1989 Amount	1989 % of Normal	1988 Amount	1988 % of Normal	1989 As % of 1988
Hunter Plant	6.26	90	9.14	131	68
Huntington Plant	7.38	99	9.30	124	79
Electric Lake	18.79	96	22.70	116	83
East Mountain	10.59	73	14.61	97	72
Average %		89		117	76

Table 2 indicates that 1989 precipitation was lower than 1988 at all four recording stations. The overall precipitation at the four stations averaged twenty-four percent (24%) lower in 1989 than in 1988.

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 1989 water year.

TABLE 1: PRECIPITATION IN EMERY COUNTY, UTAH (1989 Water Year)

Month	Hunter Plant (Elev. 5800') Precip (in.)	Hunter Plant (Elev. 5800') % Of Normal	Huntington Plant (Elev. 6500') Precip (in.)	Huntington Plant (Elev. 6500') % Of Normal	Electric Lake (Elev. 8350') Precip. (in.)	Electric Lake (Elev. 8350') % Of Normal	East Mountain (Elev. 8985') Precip. (in.)	East Mountain (Elev. 8985') % of Normal
1988								
October	0.69	88	0.31	25	1.20	57	0.61	40
November	0.04	8	0.13	22	2.68	144	0.43	31
December	0.48	89	0.83	172	1.91	66	1.56	136
1989								
January	1.23	286	0.68	128	1.52	75	1.00	93
February	0.02	5	0.28	82	1.99	114	0.68	78
March	0.23	55	0.21	34	3.55	186	1.03	64
April	0.00	0	0.20	36	0.35	21	0.26	29
May	0.37	63	0.22	39	0.06	4	0.47	55
June	0.14	30	1.28	312	1.54	190	0.43	84
July	1.01	174	0.78	82	1.43	122	1.19	82
August	1.70	168	1.72	253	1.37	161	2.44	137
September	0.35	44	0.74	140	1.19	113	0.49	35
TOTALS	6.26	90	7.38	99	18.79	96	10.59	73
Mean Monthly	0.52	---	0.62	---	1.57	---	0.88	---

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									

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									

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									

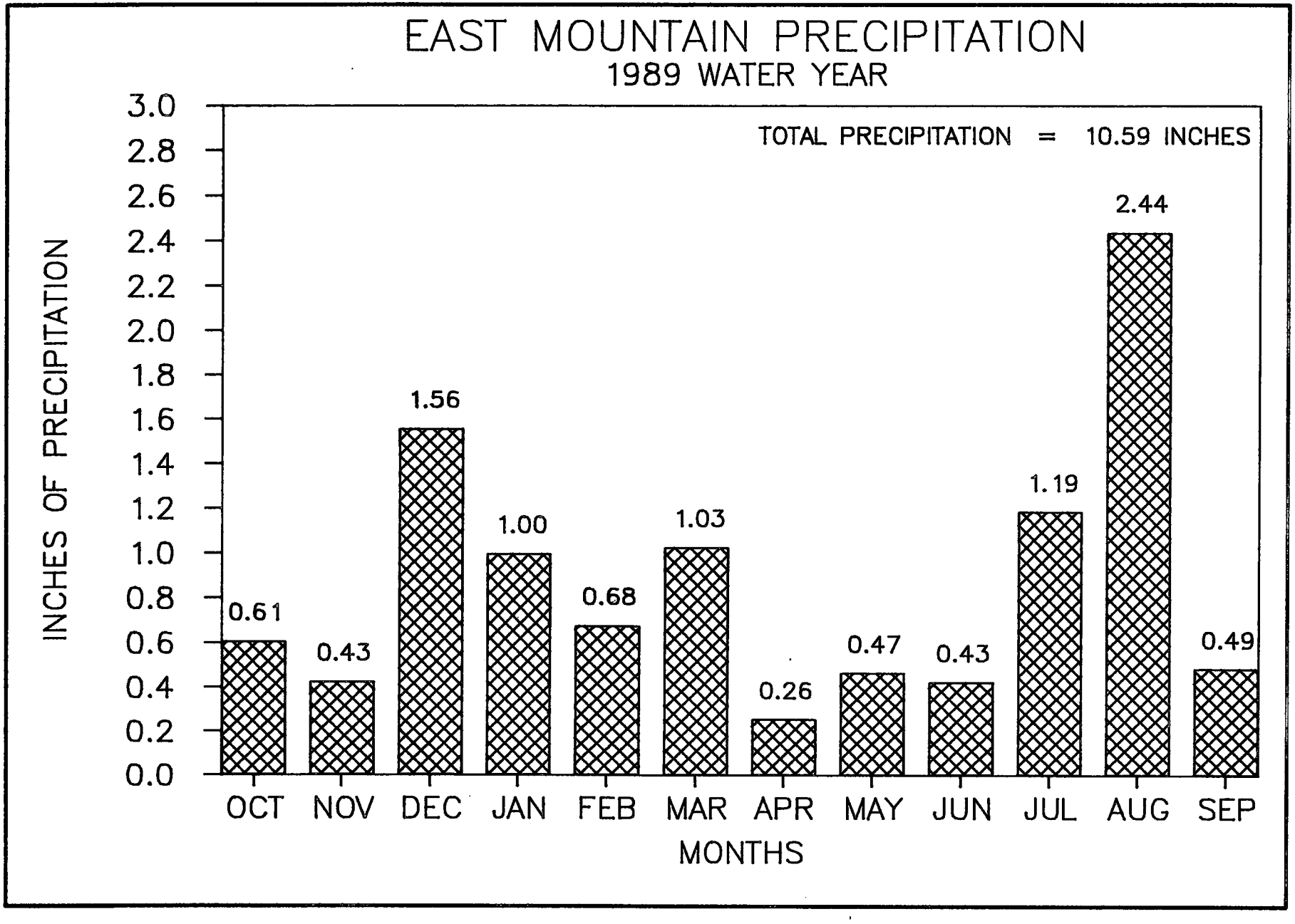
NOTE: Climatic Station was moved from a point one mile above the dam site to a point 500 feet below dam site on November 15, 1973.
October, November, and December 70-71 were estimated by correlation with Clear Creek Weather Station.

TABLE 6: EAST MOUNTAIN PRECIPITATION

Elevation - 9,005 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								

FIGURE 2


EAST MOUNTAIN PRECIPITATION
1989 WATER YEAR
TOTAL PRECIPITATION = 10.59 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
0.61
0.43
1.56
1.00
0.68
1.03
0.26
0.47
0.43
1.19
2.44
0.49
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 1989 water year temperatures were above normal except for the Electric Lake station, which was slightly below normal. At the Hunter Plant station temperatures were much above normal for all months except January and February, which were below normal. Temperatures at the Huntington Plant station were variable throughout the year. At the East Mountain station temperatures were cooler than normal during November through February and June, August, and September, while the rest of the year was above normal. Temperatures at the Electric Lake station were variable throughout the year. (See Table 7.)

A comparison of 1988 and 1989 temperatures for the four stations is addressed since temperatures also influence water supplies from year to year. Table 8 depicts the variation and compares 1988 to 1989.

TABLE 8: COMPARISON OF 1988 AND 1989 TEMPERATURES*

	1989		1988		1989
Station	Average Temp.	Departure From Normal	Average Temp.	Departure From Normal	Departure From 1988
Hunter Plant	50.0	+4.1	49.3	+3.5	+0.7
Huntington Plant	47.9	+0.3	48.2	+0.5	-0.3
Electric Lake	33.8	-0.1	33.8	-0.1	0.0
East Mountain	39.6	+0.6	39.3	-0.2	+0.3
Average Departure From Normal		+1.2		+0.9	+0.2

* Temperatures reported in degrees Fahrenheit.

TABLE 7: TEMPERATURES IN EMERY COUNTY, UTAH (1989 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
1988								
October	57.4	+9.0	56.3	+6.9	45.3	+7.8	43.8	+5.9
November	38.4	+3.2	37.7	+1.7	23.6	-2.1	23.5	-4.2
December	26.8	+0.1	25.1	-2.3	10.9	-4.9	21.1	-0.3
1989								
January	16.3	-7.8	18.8	-4.8	10.3	-4.3	20.1	-2.1
February	27.0	-1.4	24.5	-5.7	12.7	-6.6	20.2	-3.5
March	45.3	+9.5	41.5	+3.8	28.9	+8.1	34.0	+5.7
April	54.1	+9.5	50.8	+5.7	35.6	+6.9	42.1	+6.0
May	58.9	+6.8	55.6	+0.7	43.0	+4.0	46.8	+4.4
June	66.4	+5.0	64.0	-1.8	42.2	-6.4	50.3	-4.5
July	76.5	+8.1	73.4	+1.7	57.9	+2.2	61.8	+0.1
August	69.7	+3.3	66.6	-2.8	50.5	-3.3	53.8	-6.4
September	62.8	+4.1	60.7	+0.3	45.2	-2.3	48.8	-1.6
TOTALS	50.0	+4.1	47.9	+0.3	33.8	-0.1	38.9	0.0

* 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 UP&L'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 1989 water year (October 1988 - September 1989) at the two stations plus the calculated natural flow are found in Appendix A.

TABLE 9: HUNTINGTON CREEK WATER FLOWS (1989 Water Year)

	Huntington Creek Below Electric Lake	Huntington Creek At Plant	Calc. Natural Flow at Plant
Total Yearly Flow (Acre Feet)	14,490	42,540	46,534
% of Normal	*66.5	62	67
Mean Discharge in Cubic Feet Per Second (CFS)	20.0	58.8	
Maximum Discharge (CFS)	46.0	177	
Date of Maximum Discharge	7/31/89	9/29/89	
Minimum Discharge (CFS)	2.6	11.0	
Date of Minimum Discharge	5/24/89	12/3/88	

*Influenced by upstream storage in Electric Lake.

During the 1989 spring runoff period (April through July) approximately 3,687 acre feet of water were impounded behind Electric Lake Dam. During spring runoff the impoundment reached its highest level on June 12. Total storage on that date amounted to 23,760 acre feet, which is 7,512 acre feet below full. Reservoir releases for fishery, irrigation, and Huntington Plant needs during the water year totaled 14,490 acre feet. The total flow of 42,540 acre feet recorded for Huntington Creek at the Huntington Plant is equal to 62% of normal.

A comparison of runoff values from 1988 and 1989 is presented in Table 10.

TABLE 10: COMPARISON OF 1988 AND 1989 RUNOFF VALUES

	1988		1989		
	Amount	% Of Normal	Amount	% Of Normal	1989 as a % of 1988
Spring Runoff Stored in Electric Lake (Acre Feet)	5,017	50	3,687	37	73
Calculated Natural Flow at Plant (Acre Feet)	58,381	84	46,534	67	80

The 1989 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.

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.	Below Electric Lake Max.	Below Electric Lake Min.	Right Above Left Fork Ave.	Right Above Left Fork Max.	Right Above Left Fork Min.	Above Power Plant Ave.	Above Power Plant Max.	Above Power Plant Min.	Below Power Plant Ave.	Below Power Plant Max.	Below Power Plant Min.
pH (N.U.)	7.55	7.7	7.3	7.9	8.2	7.7	7.95	8.3	7.6	7.95	8.0	7.9
Sulfate	10	10	10	17	17	17	23.5	43	4	61	88	34
Suspended Solids	1	1	1	18	42	2	17	21	13	16.5	32	1
Dissolved Solids	177	200	138	202	226	150	321	386	256	279	360	198
Spec. Cond. (umhos)	258	266	251	346	351	341	300	400	200	390	400	380

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 1988 and 1989 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 1988-1989

Parameter	Below Electric Lake 1989	Below Electric Lake 1988	Right Fork Above Left Fork 1989	Right Fork Above Left Fork 1988	Above Power Plant 1989	Above Power Plant 1988	Below Power Plant 1989	Below Power Plant 1988
pH (N.U.)	7.55	7.9	7.9	8.3	7.95	8.2	7.95	8.2
Sulfate	10	10.7	17	16.6	23.5	85	61	61
Total Susp. Solids	1.0	2.4	18	140*	17	10	16.5	15
Total Diss. Solids	177	149	202	184	321	379	279	379

* One sample taken during heavy rainstorm which increased average for the year.

2. Deer Creek

a. Flow and Sampling Schedule

(1) Locations:
(a) Above the Mine
(b) @ Permit Boundary*
(c) Below the Mine
(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 1990; 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 three Parshall flumes. (See Map No. 1 for flume locations.) A hydrograph showing all the data collected for 1989 and 1984-1988 has been generated for each flume location. (See Appendix B.) The hydrographs show that the Deer Creek stream did not flow during 1989 at any of the measuring locations. This is the first time since UP&L started its monitoring in 1979 that all locations along Deer Creek remained dry for the entire year.

c. Quality Information

In accordance with the Deer Creek MRP baseline quality analysis was performed in 1986. Baseline analysis will be repeated once every five (5) years. No samples were collected in 1989 due to the severe drought. The results of the historical operational quality analysis are listed in Tables 13 and 14. The

TABLE 13: DEER CREEK SURFACE WATER QUALITY

ABOVE THE MINE

1989 SAMPLE DATES	ACIDITY	ALKALINITY BICARBONATE	CALCIUM	CARBONATE	CHLORIDE	CONDUCTIVITY	DISSOLVED OXYGEN	HARDNESS	---- IRON ---- DISSOLVED	TOTAL	MAGNESIUM	MANGANESE	OIL & GREASE	pH	POTASSIUM	SODIUM	SULFATE	----- SOLIDS ----- TDS	TSS	SETTLEABLE
No flow during 1989																				
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 1978-1988																				
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

TABLE 14: DEER CREEK SURFACE WATER QUALITY

BELOW THE MINE

1989 SAMPLE DATES	ACIDITY	ALKALINITY BICARBONATE	CALCIUM	CARBONATE	CHLORIDE	CONDUCTIVITY	DISSOLVED OXYGEN	HARDNESS	IRON DISSOLVED	IRON TOTAL	MAGNESIUM	MANGANESE	OIL & GREASE	pH	POTASSIUM	SODIUM	SULFATE	SOLIDS TDS	SOLIDS TSS	SOLIDS SETTLEABLE
No flow during 1989																				
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 1978-1988																				
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

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

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.

(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 1990, 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 1989 and 1984-1988 can be found in Appendix C. As with Deer Creek drainage, Meetinghouse Canyon remained dry throughout the year.

c. Quality Information

In accordance with the Deer Creek MRP 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 1986-1989 along with historical results.

TABLE 15: MEETINGHOUSE CANYON

LEFT FORK

1989 SAMPLE DATES	ACIDITY	ALKALINITY BICARBONATE	CALCIUM	CARBONATE	CHLORIDE	CONDUCTIVITY	DISSOLVED OXYGEN	HARDNESS	---- IRON ---- DISSOLVED	TOTAL	MAGNESIUM	MANGANESE	OIL & GREASE	pH	POTASSIUM	SODIUM	SULFATE	----- SOLIDS ----- TDS	TSS	SETTLEABLE
No flow during 1989																				
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 1986-88																				
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

4. Rilda Canyon Creek

a. Flow and Sampling Schedule

(1) Locations:
(a) Right Fork of Rilda - RCF1
(b) Left Fork of Rilda - RCL1*
(Begin monitoring in 1990)
(c) Rilda Canyon - RCF2*
(d) Rilda Canyon - RCF3
(e) Rilda Canyon - RCW4 (See Map HM-1.)

(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. 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 intermittent and below the stream is perennial. For locations RCF1 and RCF2 (above NEWUA spring area) flow only occurred during the month of June -- 189.9 and 78.02 GPM, respectively. Below the spring area the stream is perennial and increases in flow from RCF3 to RCW4. During 1989 the baseline for RCF3 was approximately 35 GPM and for RCW4, 107 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 is the first year of data collection, 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.

Utah Power & Light 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;

TABLE 16: RILDA CANYON SURFACE WATER QUALITY

1989 SAMPLE DATES	ACIDITY	ALKALINITY BICARBONATE	CALCIUM	CARBONATE	CHLORIDE	CONDUCTIVITY	DISSOLVED OXYGEN	HARDNESS	---- IRON ---- DISSOLVED	TOTAL	MAGNESIUM	MANGANESE	OIL & GREASE	pH	POTASSIUM	SODIUM	SULFATE	----- SOLIDS ----- TDS	TSS	SETTLEABLE
									RCF1											
6-12	<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
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											
4-17	5.0	410	97.8	<1.0	15.0	855	7.0	460	<0.02	0.08	52.5	<0.01	1.7	7.9	2.5	15.9	150.0	513	23.0	<0.05
6-12	<1.0	338	81.7	<1.0	10.0	500	7.5	379	0.41	0.51	42.5	<0.01	<1.0	8.0	1.7	10.4	125.0	372	21.0	0.05
9-14	4.0	500	95.9	<1.0	10.0	700	7.6	449		0.11	50.8	0.02	<1.0	7.9	2.2	13.4	70.0	495	4.0	<0.05
12-6		481	104.3	<1.0	15.0	750	7.5	479	0.04	0.17	53.1	0.04	2.8	8.0	2.3	13.4	100.0	477	10.0	<1.00
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
NO. OF ANALYSES	3	4	4	4	4	5	5	4	3	4	4	4	4	5	4	4	4	4	4	4
									RCW4											
6-12	<1.0	320	63.0	<1.0	15.0	450	7.8	336	0.10	0.12	43.4	<0.01	1.5	8.1	1.9	13.9	95.0	413	6.0	<0.05
9-14	<1.0	410	72.5	<1.0	15.0	710	8.7	403		<0.02	54.0	<0.01	<1.0	8.3	2.8	17.1	85.0	477	7.0	<0.05
12-6		390	73.2	<1.0	10.0	750	7.5	453	<0.02	<0.02	65.7	0.02	2.8	8.2	2.3	17.0	150.0	496	7.0	<1.0
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
NO. OF ANALYSES	2	3	3	3	3	4	4	3	2	3	3	3	3	4	3	3	3	3	3	3

therefore, the baseline study was terminated as of January 1, 1984. As agreed upon in both the Deer Creek Mine and Wilberg Mine permit applications, UP&L will continue to monitor the flow and water quality field measurements at the USGS flume location on a monthly basis. The hydrograph in Appendix E illustrates the flow information collected during 1989 and compares it to the data collected from 1984 through 1988. It shows a peak flow of 613 GPM in April and a baseline flow of approximately 477 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

a. Flow and Sampling Schedule

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

(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 1990, 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 1989 to the data collected from 1984 through

1988 has been generated for each flume location. (See Appendix E.) The hydrographs show that during 1989 both the Right and the Left forks remained dry throughout the year. 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 33 GPM.

c. Quality Information

In accordance with the Deer Creek MRP baseline quality analysis was performed in 1986. Baseline analysis will be repeated once every five (5) years. The results of the 1989 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

RIGHT FORK

1989 SAMPLE DATES	ACIDITY	ALKALINITY BICARBONATE	CALCIUM	CARBONATE	CHLORIDE	CONDUCTIVITY	DISSOLVED OXYGEN	HARDNESS	---- IRON ---- DISSOLVED	TOTAL	MAGNESIUM	MANGANESE	OIL & GREASE	pH	POTASSIUM	SODIUM	SULFATE	------ SOLIDS ------ TDS	TSS	SETTLEABLE
No flow during 1989																				
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 1979-1988																				
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

TABLE 18: GRIMES WASH

LEFT FORK

1989 SAMPLE DATES	ACIDITY	ALKALINITY BICARBONATE	CALCIUM	CARBONATE	CHLORIDE	CONDUCTIVITY	DISSOLVED OXYGEN	HARDNESS	---- IRON ---- DISSOLVED	TOTAL	MAGNESIUM	MANGANESE	OIL & GREASE	pH	POTASSIUM	SODIUM	SULFATE	------ SOLIDS ------ TDS	TSS	SETTLEABLE
No flow during 1989																				
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 1979-1988																				
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

TABLE 19: GRIMES WASH

BELOW MINE

1989 SAMPLE DATES	ACIDITY	ALKALINITY BICARBONATE	CALCIUM	CARBONATE	CHLORIDE	CONDUCTIVITY	DISSOLVED OXYGEN	HARDNESS	---- IRON ---- DISSOLVED	TOTAL	MAGNESIUM	MANGANESE	OIL & GREASE	pH	POTASSIUM	SODIUM	SULFATE	------ SOLIDS ------ TDS	TSS	SETTLEABLE
3-30	<1.0	340	166.0	<1.0	515.0	2400	7.8	788	0.33	0.44	90.8	0.07	8.3	8.2	7.1	376.5	550.0	1877	91.0	<0.05
6-19	5.0	404	149.4	<1.0	135.0	1380	7.6	849	0.10	0.10	115.5	0.04	<1.0	8.0	5.7	111.0	550.0	1310	<1.0	--
9-12	<1.0	410	184.9	<1.0	150.0	1708	7.8	906	0.13	0.13	107.8	0.90	<1.0	7.7	5.2	108.6	580.0	1473	6.0	--
12-5	6.0	425	84.9	<1.0	10.0	900	9.5	420	0.09	0.14	50.6	<0.01	2.5	7.7	3.5	19.3	120.0	594	47.0	--
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
NO. OF ANALYSES	4	4	4	4	4	6	6	4	4	4	4	4	4	6	4	4	4	4	4	1
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	
1984																				
MIN						800				0.05		0.01		7.7				457	1.0	
MAX						1700				0.45		0.07		8.3				923	107.0	
MEAN						1101				0.15		0.02		8.1				649	24.5	
HISTORICAL 1979-1988																				
MIN	<0.1	117	5.1	<1.0	12.0	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	400	274.0	3.0	4531.0	12000	11.5	1165	2.25	22.60	116.8	0.30	27.0	8.5	12.5	3181.0	593.0	7160	9702.0	4.00
MEAN	16.9	335	116.4	1.1	337.8	1353	8.0	608	0.34	1.04	74.1	0.05	3.3	7.9	5.6	267.8	299.3	817	273.1	0.49
NO. OF ANALYSES	22	20	20	20	22	58	20	20	12	62	20	59	22	62	20	20	23	62	62	20

IV. EAST MOUNTAIN SPRINGS

Between the time UP&L began monitoring springs on East Mountain and 1986 the number of springs measured increased from less than fifty (50) to nearly seventy (70). UP&L 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 UP&L'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 UP&L.

*	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.

B. Spring Flow

Both precipitation and spring discharge rates decreased significantly from 1988 to 1989, whereas temperature, a critical factor on spring discharge rates, was 1.1 degrees higher in 1989 than the historical average. Table 20, A and B, is a tabulation of the flow data collected during the 1989 monitoring season. To record the season variation, all springs measured in July are measured again in October. The seasonal variation is represented in Table 20, A and B, under the column

TABLE 20A: EAST MOUNTAIN SPRINGS DISCHARGE

Spring	Date Sampled	Flow (GPM)	Temp. °F	Date Sampled	Flow (GPM)	Temp. °F	Seasonal Net Change %
Sheba	07-17-89	1.1	46	10-16-89	0.1	42	-92
Elk Spring	07-11-89	78.5	40	10-17-89	36.8	39	-53
Burnt Tree	07-18-89	6.4	43	10-16-89	5.0	44	-22
Jerk Water							
Pine Springs							
Pine Sp. Trough							
Ted's Tub	07-18-89	*		10-17-89	dry		
	* pond level above spring (est. @ 5.0 GPM)						
79-1							
79-2	07-17-89	2.7	45	10-16-89	1.7	42	-37
79-3							
79-4							
79-5							
79-6							
79-7							
79-8							
79-9							
79-10	07-17-89	7.0	42	10-16-89	2.7	43	-61
79-11							
79-12	07-18-89	dry		10-17-89	dry		
79-13							
79-14							
79-15	07-18-89	2.9	45	10-17-89	1.2	44	-59
79-16							
79-17							
79-18							
79-19							
79-20							
79-21							
79-22							
79-23	07-18-89	dry		10-16-89	dry		
79-24	07-18-89	dry		10-16-89	dry		
79-25							
79-26	07-11-89	0.3	52	10-16-89	dry		
79-27							
79-28	07-11-89	1.3	47	10-16-89	0.3	43	
79-29	07-11-89	1.1	41	10-16-89	0.7	39	-36
79-30							
79-31							
79-32	07-11-89	0.5	50	10-17-89	dry		
79-33							
79-34	07-18-89	dry		10-17-89	dry		
79-35	07-18-89	dry		10-17-89	dry		
79-36							
79-37							
79-38	07-18-89	1.1	52	10-17-89	1.7	40	55
79-39							
79-40	07-17-89	dry		10-17-89	dry		
80-41	07-17-89	dry		10-17-89	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	07-17-89	dry		10-17-89	dry		
80-44	07-17-89	dry		10-17-89	dry		
80-45							
80-46	07-17-89	dry		10-16-89	dry		
80-47	07-17-89	4.6	45	10-16-89	0.5	40	-89
80-48							
80-49							
80-50							
82-51	07-17-89	dry		10-17-89	dry		
82-52	07-18-89	2.6	48	10-16-89	2.4	40	-8
84-53	07-11-89	1.4	48	10-16-89	1.0	41	
84-54							
84-55							
84-56	07-17-89	1.6	41	10-16-89	1.3	44	-19
85-57							
86-58							
86-59							
89-60	07-18-89	2.7	48	10-17-89	damp		
89-61	07-12-89	30.0	40	10-17-89	24.0	39	
89-62	07-12-89	6.0	41				
89-63	07-12-89	6.0	53				
89-64	07-13-89	3.2	44				
89-65	07-13-89	0.5	43	10-17-89	0.7	44	
89-66	07-13-89	damp		10-17-89	dry		
89-67	07-13-89	3.2	39	10-17-89	2.4	39	
89-68	07-13-89	dry		10-17-89	dry		
89-69	07-13-89	dry					
89-70	07-13-89	dry					
89-71	07-18-89	10.9	40				
				AVERAGE NET CHANGE			-38

heading "Seasonal Net Change." The percentage figures represent the amount of change, either positive or negative. The average change reveals a thirty-eight percent (38%) decrease from the July to the October measurements.

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

* 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

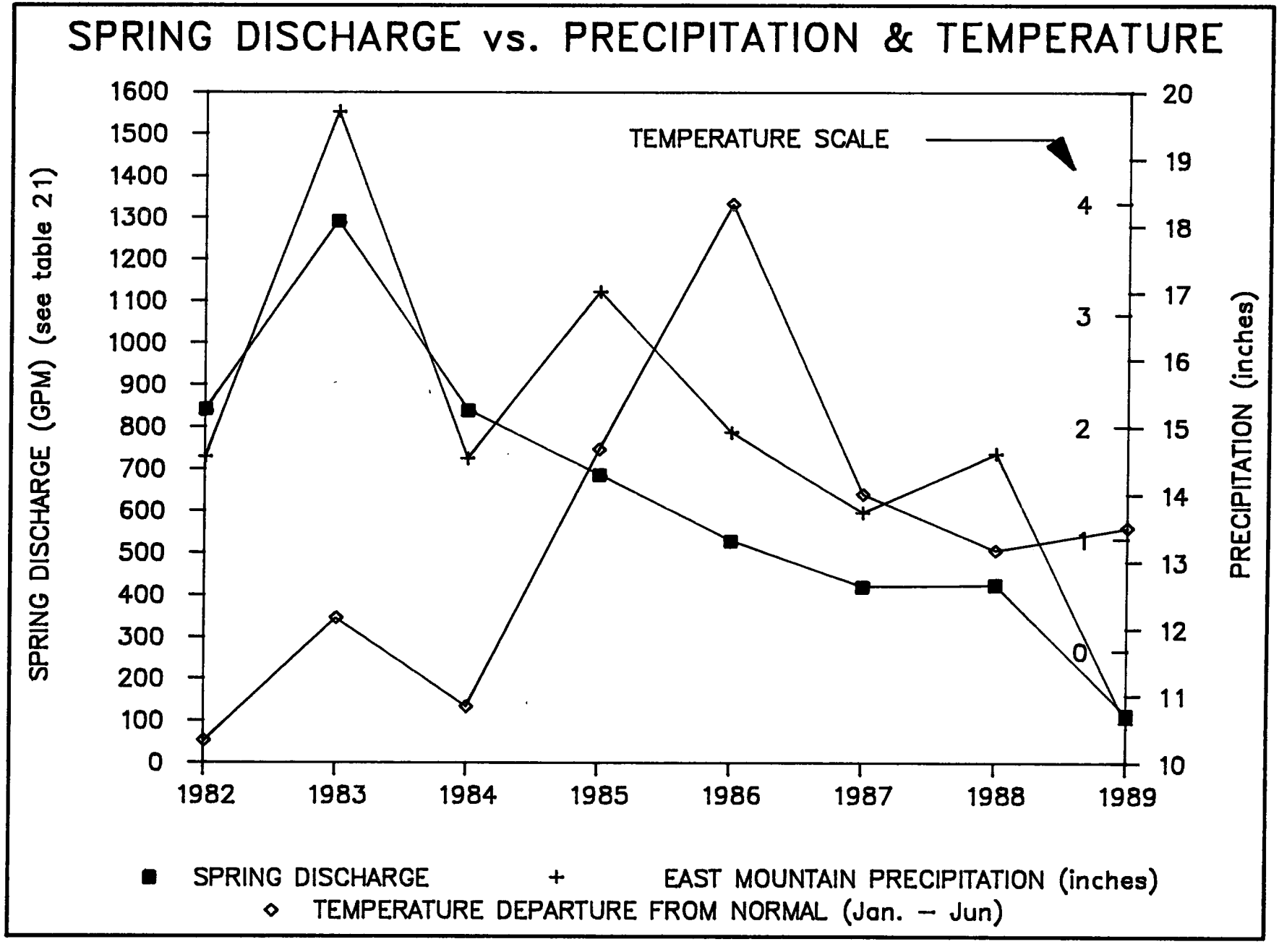

SPRING DISCHARGE vs. PRECIPITATION & TEMPERATURE
SPRING DISCHARGE (GPM) (see table 21)
PRECIPITATION (inches)
TEMPERATURE SCALE
1600
1500
1400
1300
1200
1100
1000
900
800
700
600
500
400
300
200
100
0
20
19
18
17
16
15
14
13
12
11
10
4
3
2
1
0
1982
1983
1984
1985
1986
1987
1988
1989
SPRING DISCHARGE
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

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

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 1989 is shown in Table 24; corresponding spring recession curves comparing 1989, 1988, 1987, 1986, 1985, and 1984 are located in Appendix F.

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

1989

Spring	July	August	September	October
Burnt Tree	6.4/43	3.9/43	5.7/47	5.0/44
Elk Springs	78.5/40	41.4/44	41.4/40	36.8/39
Sheba	1.1/46	0.5/49	0.2/44	0.1/43
79-10	7.0/42	3.0/43	4.9/41	2.7/43
79-23	Dry	Dry	Dry	Dry
79-26	0.3/52	Dry	Dry	Dry
79-29	1.1/41	0.8/42	1.0/41	0.7/39
79-35	Damp	Dry	Dry	Dry
80-44	Damp	Dry	Dry	Dry
80-46	Dry	Damp	Dry	Dry
82-52	2.6/48	2.0/42	2.8/40	2.4/40
84-56	1.6/41	0.9/42	1.3/41	1.3/44

* All flow given in gallons per minute
** Temperatures reported in degrees Fahrenheit

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. The diagrams clearly show the similarity of water quality of springs originating in the same geologic formation. To better visualize the concept, the cation-anion diagrams are presented by the geologic formation in which the spring originates.

The quality of the springs sampled in 1989 reveals an excellent correlation with historical averages. The sulfate content, which showed an unexplainable increase from 1981 through 1982, declined to levels experienced in 1979-80 and 1983-88. 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 1989 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. Surface Water Sources in Relation to Mine Workings

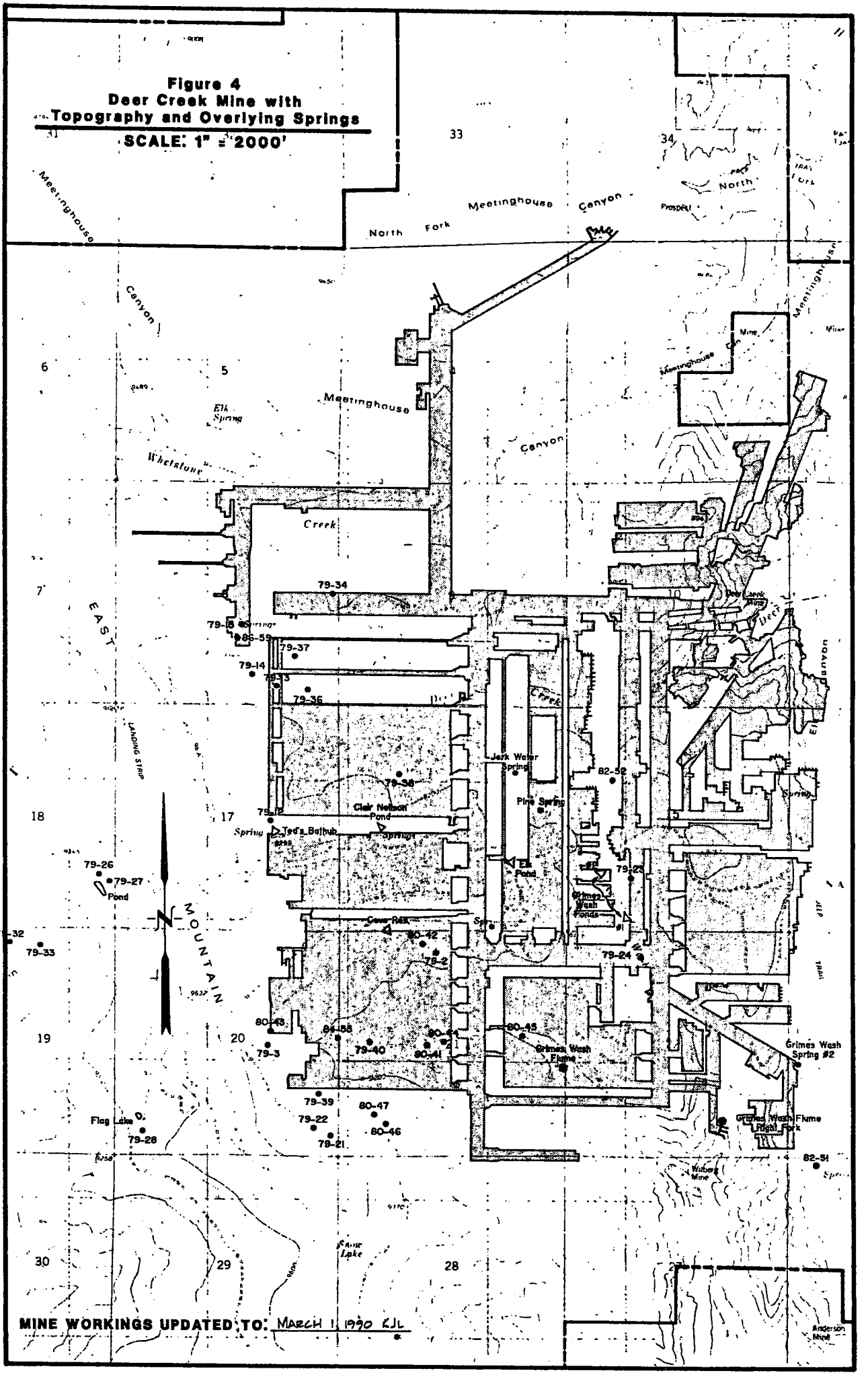
The relationship of the Deer Creek and Wilberg mine workings with the overlying springs is shown in Figures 4 and 5. Beginning in 1979, UP&L has developed an ambitious spring monitoring program with emphasis to detect changes in the East Mountain hydrologic regime as a result of mining. The data collected to date reveal no indication of any mine-related effects on spring discharge rates.

Table 25: East Mountain Springs Water Quality (Historical vs. 1989)

	Burnt Tree		Elk Spring		Sheba Spring		79-10		79-23		79-26	
PARAMETER	Historical	1989	Historical	1989	Historical	1989	Historical	1989	Historical	1989	Historical	1989
Elevation	9260		9350		9740		9350		9035		9310	
Geologic	TKn		TKn		Tf		Kpr		TKn		TKn	
Formation												
Bicarbonate	335	344	290	269	290	282	312	318	413	no	336	337
Calcium	65.0	57.3	67.4	55.8	91.2	76.8	73.1	62.6	79.6	flow	71.0	54.0
Carbonate	<1	<1	<1	<1	<1	<1	<1	<1	<1	during	<1	<1
Chloride	5.1	7.5	4.7	12.5	4.0	10.0	5.4	5.0	11.3	1989	8.2	10.0
Conductivity	503	448	434	364	444	397	472	401	691		520	500
Hardness	270	273	241	231	249	235	276	252			286	288
Iron	0.21	0.07	0.12	0.04	0.14	0.03	0.12	0.02	0.09		0.20	0.27
Magnesium	26.51	31.56	21.73	22.14	9.78	10.54	22.29	23.16	38.30		26.28	37.10
Mangenese	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01		0.02	0.02
pH	7.50	7.67	7.71	7.81	7.55	7.68	7.62	7.64	7.72		7.94	7.50
Potassium	1.15	0.36	2.44	0.88	1.62	0.01	2.80	5.99	1.54		2.15	1.20
Sodium	13.96	13.75	10.16	7.65	5.90	3.35	5.87	4.80	14.90		16.63	13.80
Sulfate	28.0	8.5	36.0	8.0	35.3	3.5	25.2	8.0	27.2		41.9	25.0
TDS	295	298	257	260	270	254	273	240	364		319	277

	79-29		79-35		80-44		80-46		82-52		84-56	
PARAMETER	Historical	1989	Historical	1989	Historical	1989	Historical	1989	Historical	1989	Historical	1989
Elevation	9410		9585		8980		9350		8995		9335	
Geologic	TKn		Tf		Kpr		TKn		Kpr		TKn	
Formation												
Bicarbonate	317	287	304	no	451	no	365	no	414	414	345	326
Calcium	53.6	38.2	93.7	flow	101.6	flow	64.1	flow	79.4	65.4	63.3	56.4
Carbonate	<1	<1	<1	during	<1	during	<1	during	<1	<1	<1	<1
Chloride	17.70	17.50	3.60	1989	11.10	1989	4.90	1989	9.70	12.50	8.30	7.50
Conductivity	548	485	466		876		561		670	595	556	504
Hardness	245	233	273		377		304		318	297	297	283
Iron	0.12	0.07	0.13		0.12		0.27		0.06	0.02	0.04	0.02
Magnesium	32.53	33.34	13.75		41.48		28.57		33.57	33.32	32.15	34.46
Mangenese	0.02	0.01	0.01		0.01		0.01		0.01	0.01	0.01	0.01
pH	7.79	7.95	7.64		7.79		7.43		7.54	7.86	7.56	7.71
Potassium	3.42	1.14	0.89		2.76		0.83		1.51	0.71	0.88	0.62
Sodium	30.61	31.70	9.05		35.17		9.90		23.63	24.35	17.42	16.65
Sulfate	63.1	27.0	46.6		138.7		19.0		44.4	16.5	28.9	37.5
TDS	343	332	275		524		311		373	350	344	338

Figure 4
Deer Creek Mine with
Topography and Overlying Springs
SCALE: 1" = 2000'



MINE WORKINGS UPDATED TO: MARCH 1 1990 KJL

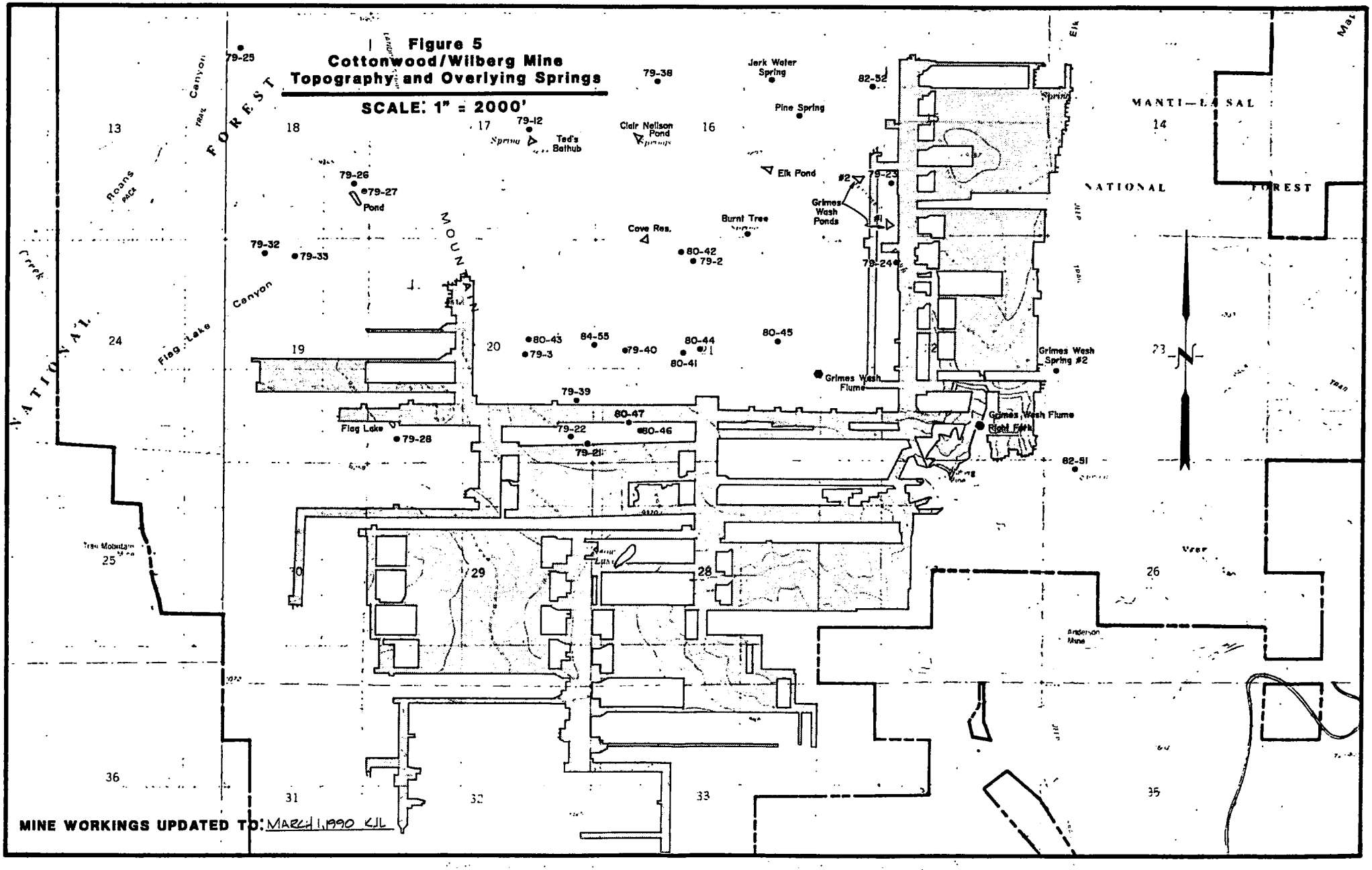


Figure 5
Cottonwood/Wilberg Mine
Topography and Overlying Springs
SCALE: 1" = 2000'
79-25
79-38
Jerk Water Spring
82-52
Pine Spring
79-12
Ted's Bathub
Clair Nelson Pond
Elk Pond
79-26
79-27
Pond
79-23
Grimes Wash Ponds
Burnt Tree
Cove Res.
79-32
79-33
80-42
79-2
79-24
80-43
84-55
79-3
79-40
80-44
80-41
80-45
Grimes Wash Spring #2
Grimes Wash Flume
79-39
80-47
79-22
80-46
Flag Lake
79-28
79-21
Grimes Wash Flume Right Fork
82-51
MANTI—LA SAL
NATIONAL FOREST
MOUNTAIN
Flag Lake
Canyon
Roans Pass
Anderson Mine
MINE WORKINGS UPDATED TO: MARCH 1, 1990 KJL

As expected, there is a direct relationship between annual precipitation, temperature, and spring discharge rates as previously discussed on pages 31 through 39 and shown in Figure 3.

B. Groundwater Quality and Collection Procedures

UP&L began in-mine quality and quantity measurement in 1977 and has continued the measurement through 1989. 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 1989 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

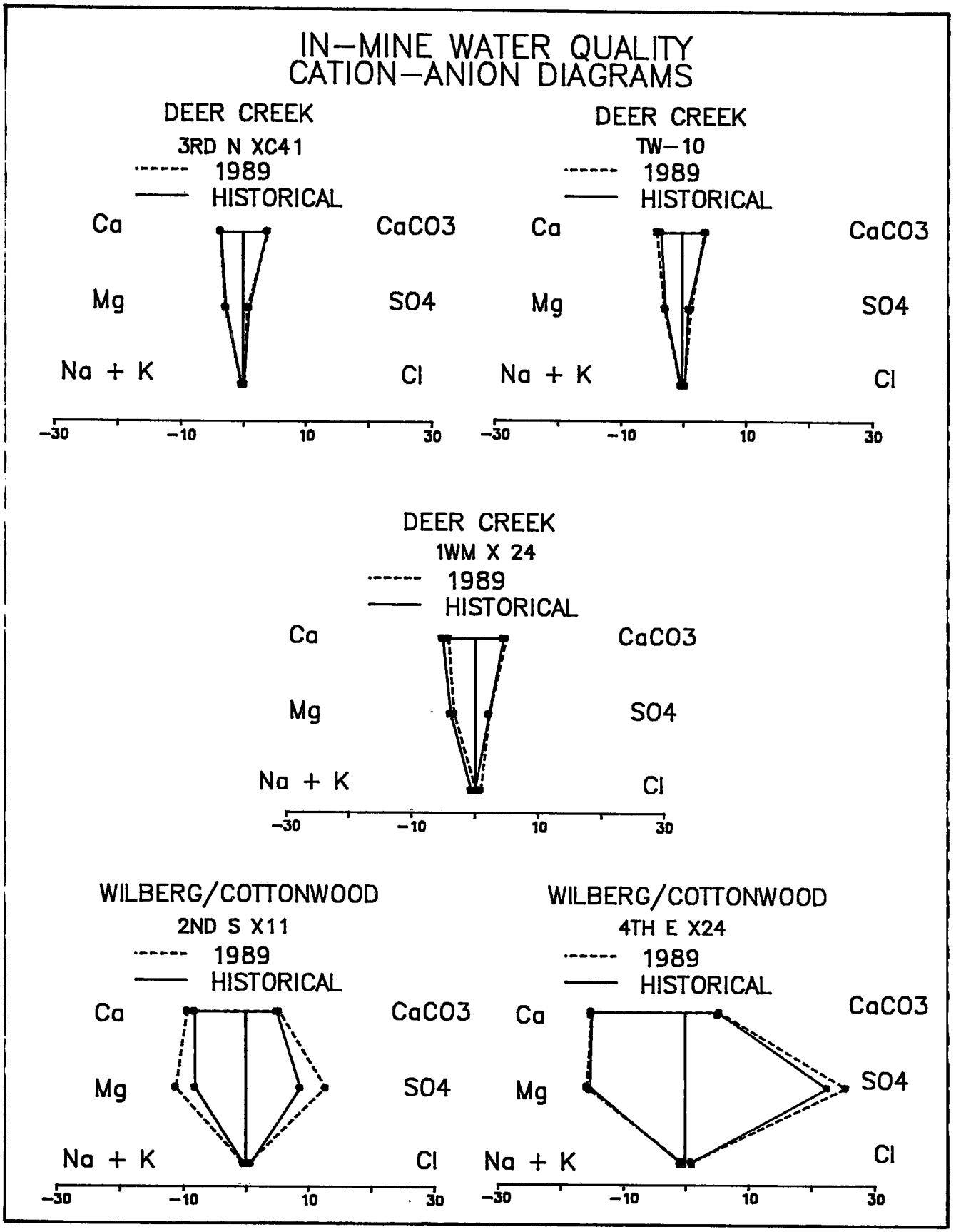
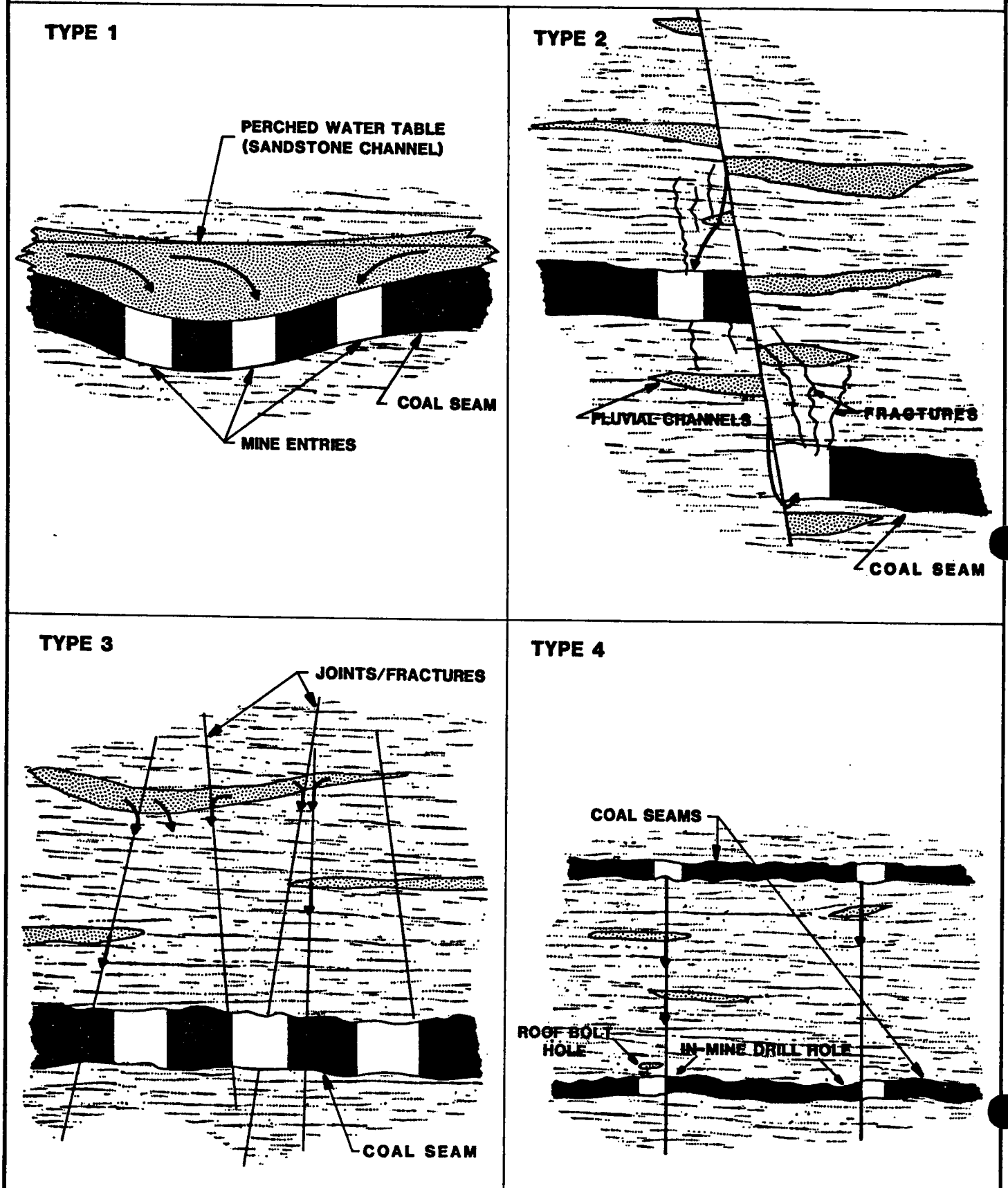

IN–MINE WATER QUALITY
CATION–ANION DIAGRAMS
DEER CREEK
3RD N XC41
1989
HISTORICAL
Ca
Mg
Na + K
CaCO3
SO4
Cl
–30
–10
10
30
DEER CREEK
TW–10
1989
HISTORICAL
Ca
Mg
Na + K
CaCO3
SO4
Cl
–30
–10
10
30
DEER CREEK
1WM X 24
1989
HISTORICAL
Ca
Mg
Na + K
CaCO3
SO4
Cl
–30
–10
10
30
WILBERG/COTTONWOOD
2ND S X11
1989
HISTORICAL
Ca
Mg
Na + K
CaCO3
SO4
Cl
–30
–10
10
30
WILBERG/COTTONWOOD
4TH E X24
1989
HISTORICAL
Ca
Mg
Na + K
CaCO3
SO4
Cl
–30
–10
10
30

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. The description and reasoning for the site which was eliminated follow.

DEER CREEK MINE

1988 ID	Terminated Site Location Description	Reason for Termination
2	1st West Mains xc-24 3L	Ceased flowing as of 12/89

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 1989

In order to access coal reserves from the northern third of the property the Deer Creek Mine Plan includes a fault crossing to be completed during 1989-90. 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 No. 6). The strata within the graben itself have been downthrown as much as 114 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 No. 6.) 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. (See Map No. 6.) 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.

UP&L utilizes a pressure grout program to minimize the long-term groundwater inflow from the water-producing zones encountered during slope development. The grouting program will consist of drilling a series of boreholes prior to water-producing zone interception and forcing fast-setting grout material into the fractures. In zones other than the two major water-producing areas grouting will be done if the groundwater inflow exceeds 50 gpm. Experience with pressure grouting indicates that as much as seventy-five to ninety-five percent (75-95%) of the groundwater inflow was effectively stopped. Tunnel inflow rates range from 50 to 75 gallons per minute.

One factor addressed during the dewatering and grouting evaluation was the influence of the tunnels and prior dewatering on the flow in the surface springs located in the vicinity of the Roans Canyon Fault Graben. A maximum drawdown of approximately ten (10) feet at the surface of the graben was calculated using the

groundwater model. Given the preexisting dominant vertical flow direction and the fact that the springs do not appear to be associated with aquifers of concern to this investigation, it is unlikely that the tunnels or the recommended dewatering systems would exert a measurable influence on the overlying springs.

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	654.3 Million Gallons
Deer Creek to Wilberg Transfer*	5.2 Million Gallons
Estimated Evaporation**	18.9 Million Gallons
Domestic Usage	8.3 Million Gallons
Total Discharge	686.7 Million Gallons

* Utilized to prime Wilberg vertical turbine (10 GPM)
** See 1981 Hydrologic Monitoring Report

b. In-Mine Quality

Ten samples were collected in the Deer Creek Mine in 1989. (See Map No. 4 in pocket for locations.) Parameters analyzed in 1989 are those listed in the DOGM Guidelines for Groundwater Operational Quality. (See Appendix M.) Table 26 lists the characteristics of the samples collected and compares the mean, minimum, and maximum results of 1989 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 1989 can be found in Appendix G.

TABLE 26: DEER CREEK IN-MINE WATER QUALITY

LOCATION	SAMPLE DATES	ALKALINITY BICARBONATE	CALCIUM	CARBONATE	CHLORIDE	CONDUCTIVITY	HARDNESS	IRON DISSOLVED	MAGNESIUM	MANGANESE	pH	POTASSIUM	SODIUM	SULFATE	TDS
3N XC-41	03-08	418	76.3	<1.0	5.0	680	349	0.04	38.60	<0.01	7.30	1.90	15.70	50.0	375
	09-14	398	88.8	<1.0	10.0	600	348	0.54	30.60	<0.01	7.30	2.80	14.50	40.0	375
	12-06	406	56.6	<1.0	5.0	600	287	0.06	35.30	0.03	7.30	1.60	14.40	10.0	361
	MIN	393	56.6	<1.0	5.0	600	287	0.04	30.60	<0.01	7.30	1.60	14.40	10.0	361
	MAX	418	88.8	<1.0	10.0	680	348	0.54	38.60	0.03	7.30	2.80	15.70	50.0	375
	MEAN	407	73.9	<1.0	6.7	627	328	0.25	34.83	0.02	7.30	2.10	14.87	33.3	370
HISTORICAL (1984-88)	MIN	340	65.0	<1.0	3.9	500	299	0.05	29.10	<0.01	6.80	1.00	12.84	16.0	256
	MAX	447	89.5	<1.0	7.0	820	371	0.21	37.10	0.02	7.60	2.60	17.00	100.0	446
	MEAN	388	74.2	<1.0	5.0	685	326	0.11	33.63	0.01	7.26	2.12	15.23	45.7	346
1W Mains* XC-25	03-08	472	104.4	<1.0	5.0	830	459	0.11	48.10	<0.01	7.35	3.30	17.50	120.0	589
	06-06	422	90.0	<1.0	25.0	600	400	<0.02	42.50	<0.01	7.00	3.20	18.30	75.0	493
	09-14	443	85.4	<1.0	15.0	750	406	<0.02	46.70	0.02	7.40	3.90	17.70	62.0	497
	MIN	422	85.4	<1.0	5.0	600	400	<0.02	42.50	<0.01	7.00	3.20	17.50	62.0	493
	MAX	472	104.4	<1.0	25.0	830	459	0.11	48.10	0.02	7.40	3.90	18.30	120.0	589
	MEAN	446	93.3	<1.0	15.0	727	422	0.05	45.77	0.01	7.25	3.47	17.83	85.7	526
HISTORICAL**	MIN	451	84.6	<1.0	5.0	800	395	0.17	40.70	<0.01	7.20	2.80	16.90	75.0	470
	MAX	499	112.8	<1.0	7.5	1000	471	0.27	45.90	<0.01	7.60	3.40	19.40	148.0	642
	MEAN	470	98.4	<1.0	5.8	887	426	0.21	43.77	<0.01	7.35	3.13	18.27	117.7	534
3N XC-65	03-08	389	91.0	<1.0	5.0	680	364	0.10	33.20	0.01	7.40	1.40	14.80	65.0	439
	06-06	292	79.4	<1.0	30.0	950	348	<0.02	36.40	<0.01	7.00	1.60	17.10	100.0	406
	09-14	342	70.4	<1.0	15.0	530	292	<0.02	28.10	<0.01	7.50	2.00	13.50	27.0	396
	12-06	400	85.2	<1.0	5.0	600	371	<0.02	38.50	0.02	7.40	1.10	13.70	80.0	362
	MIN	292	70.4	<1.0	5.0	530	292	<0.02	28.10	<0.01	7.00	1.10	13.50	27.0	362
	MAX	400	91.0	<1.0	30.0	950	371	0.10	38.50	0.02	7.50	2.00	17.10	100.0	439
	MEAN	356	81.5	<1.0	13.8	690	344	0.04	34.05	0.01	7.32	1.52	14.78	68.0	401
HISTORICAL**	MIN	365	62.9	<1.0	10.0	660	300	<0.01	32.10	<0.01	7.20	1.20	13.90	40.0	396
	MAX	378	77.8	<1.0	15.0	720	326	0.25	34.60	<0.01	7.30	1.40	15.90	48.0	398
	MEAN	372	70.3	<1.0	12.5	690	313	0.13	33.35	<0.01	7.25	1.30	14.90	44.0	397

* Site terminated as of 12/89
** Sample site initiated during 1988

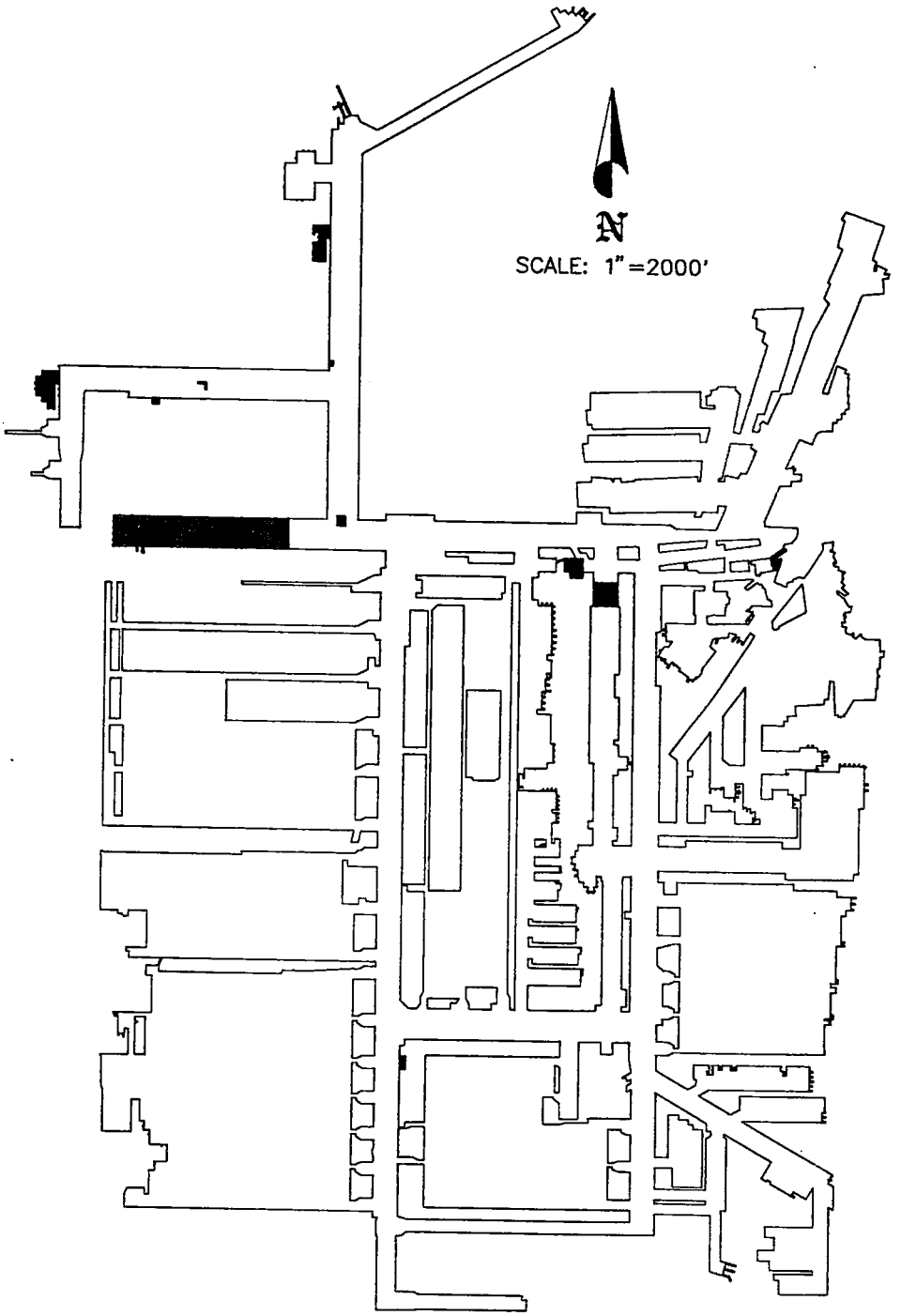
c. Discharge Quantity

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 8. The largest volume of water is stored in the western part of Main West, which has not been actively mined for several years.

An in-line water meter is utilized to record the amount of water discharged from the mine, after which the water passes through an oil skimmer before being piped to UP&L's Huntington Power Plant. None of the discharge water leaving the mine enters any of the natural streams in the region but instead is used in the cooling towers at the power plant.

The total water discharged from the Deer Creek Mine during 1989 was estimated at 2,008 acre feet, or 654.3 million gallons. The recorded flow of 2,008 acre feet during 1989 is a thirteen percent (13%) increase from the 1988 discharge of 1770 acre feet. The average monthly discharges are shown in Figure 9. A graph displaying the historical discharge rates is included as Figure 10. 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

DEER CREEK COAL MINE
WATER SUMP AREAS



MINE WORKINGS UPDATED THROUGH NOV. 30, 1989

FIGURE 8

FIGURE 9

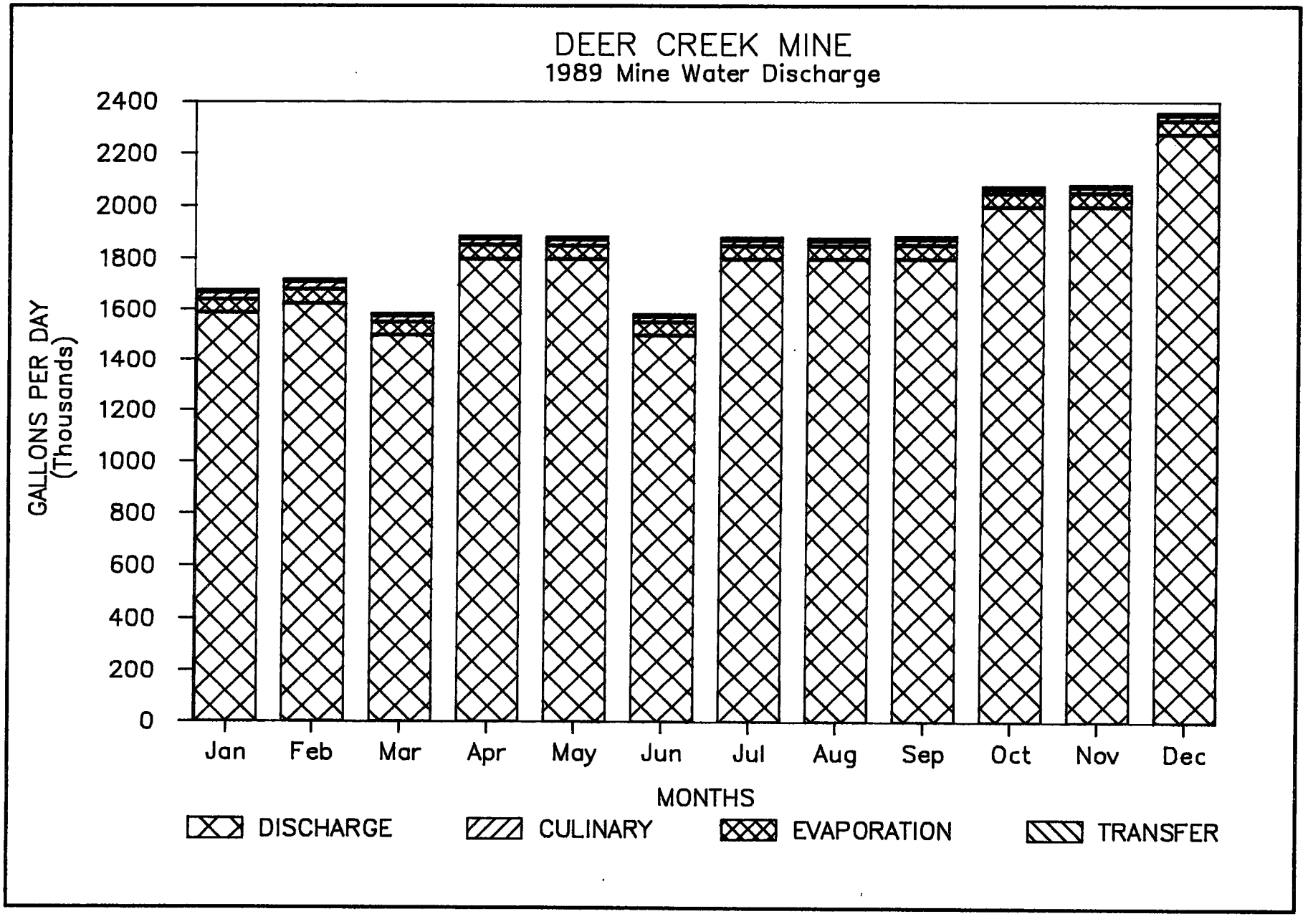
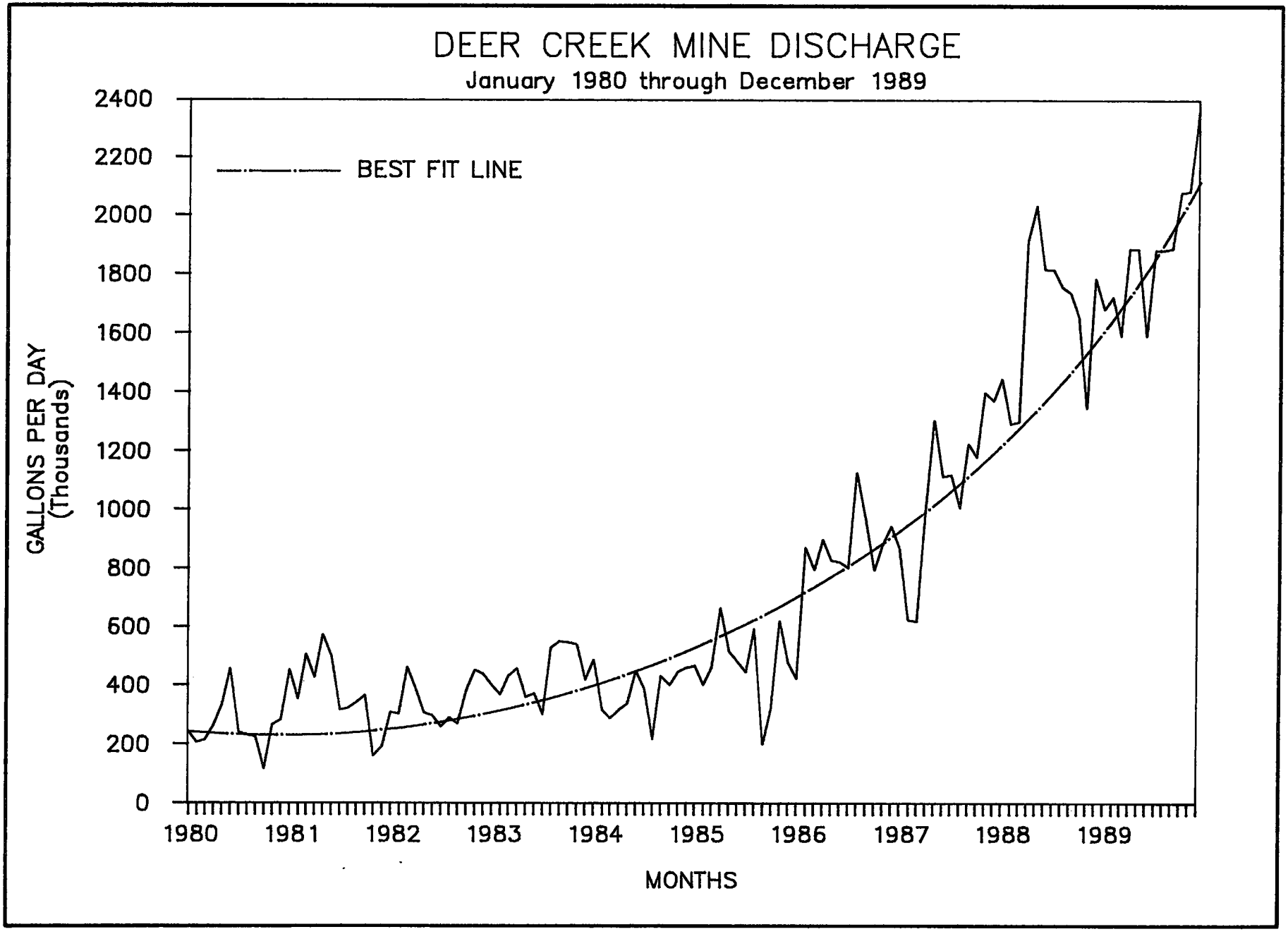

DEER CREEK MINE
1989 Mine Water Discharge
GALLONS PER DAY
(Thousands)
2400
2200
2000
1800
1600
1400
1200
1000
800
600
400
200
0
Jan
Feb
Mar
Apr
May
Jun
Jul
Aug
Sep
Oct
Nov
Dec
MONTHS
DISCHARGE
CULINARY
EVAPORATION
TRANSFER

FIGURE 10


DEER CREEK MINE DISCHARGE
January 1980 through December 1989
BEST FIT LINE
GALLONS PER DAY
(Thousands)
2400
2200
2000
1800
1600
1400
1200
1000
800
600
400
200
0
1980
1981
1982
1983
1984
1985
1986
1987
1988
1989
MONTHS

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 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 1989. Table 27 compares the minimum, maximum, and mean values from an historical standpoint to 1989. An examination of Table 27 shows a slight change in chloride between samples collected in 1989 to the historical results. Individual analysis can be found in Appendix H.

TABLE 27: DEER CREEK MINE - DISCHARGE* WATER QUALITY

	1989			Historical - (1976-1987)		
Parameters	Minimum	Maximum	Mean	Minimum	Maximum	Mean
pH	7.10	8.10	7.71	6.8	8.2	7.55
Acidity	2.0	12.0	8.2	0.7	96.0	12.8
Alkalinity	253.0	348	310.4	207	414	288.6
Chloride	10.0	45.0	15.8	2.4	2700	66.4
Conductivity	820	2900	1143	480	10,000	1164
Iron	0.14	0.94	0.50	0.02	7.53	0.65
Oil & Grease	<1.0	47.8	8.1	0.01	48.8	3.5
Sulfate	120	330	244.2	29.8	497.0	231.1
TDS	525	1854	753	231	5100	705
TSS	4.0	268	70.2	0.1	2784	99.5

* Used only in the power plant cooling system.

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.

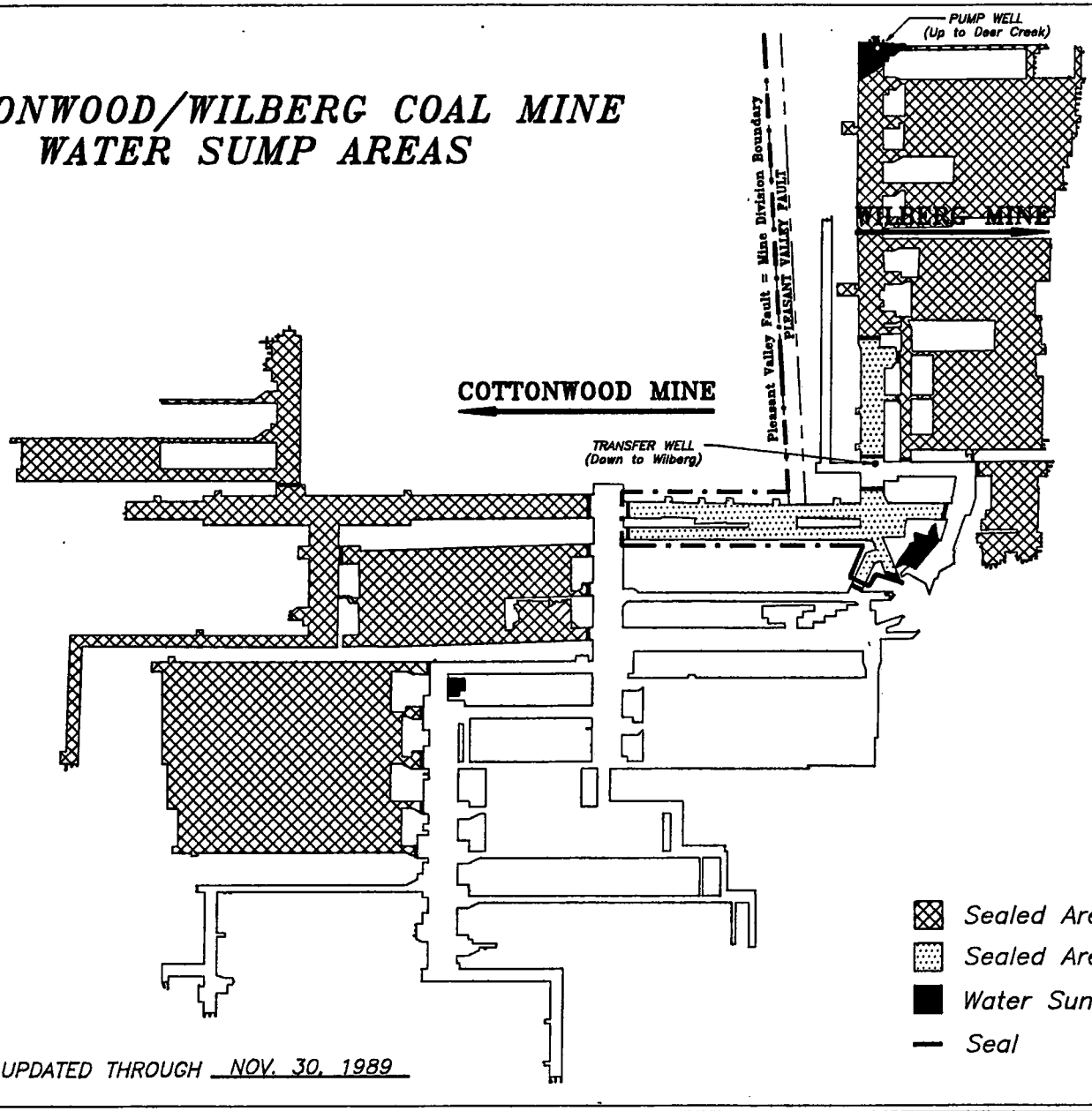
3. Wilberg/Cottonwood Mine

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 1989.

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 11. 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 12.) The main reason for the large decrease was mining in areas dominated by mudstone roof. Future mining (next five 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 11.) Consistent with previous years, the following table lists the factors involved in estimating in-mine water production.

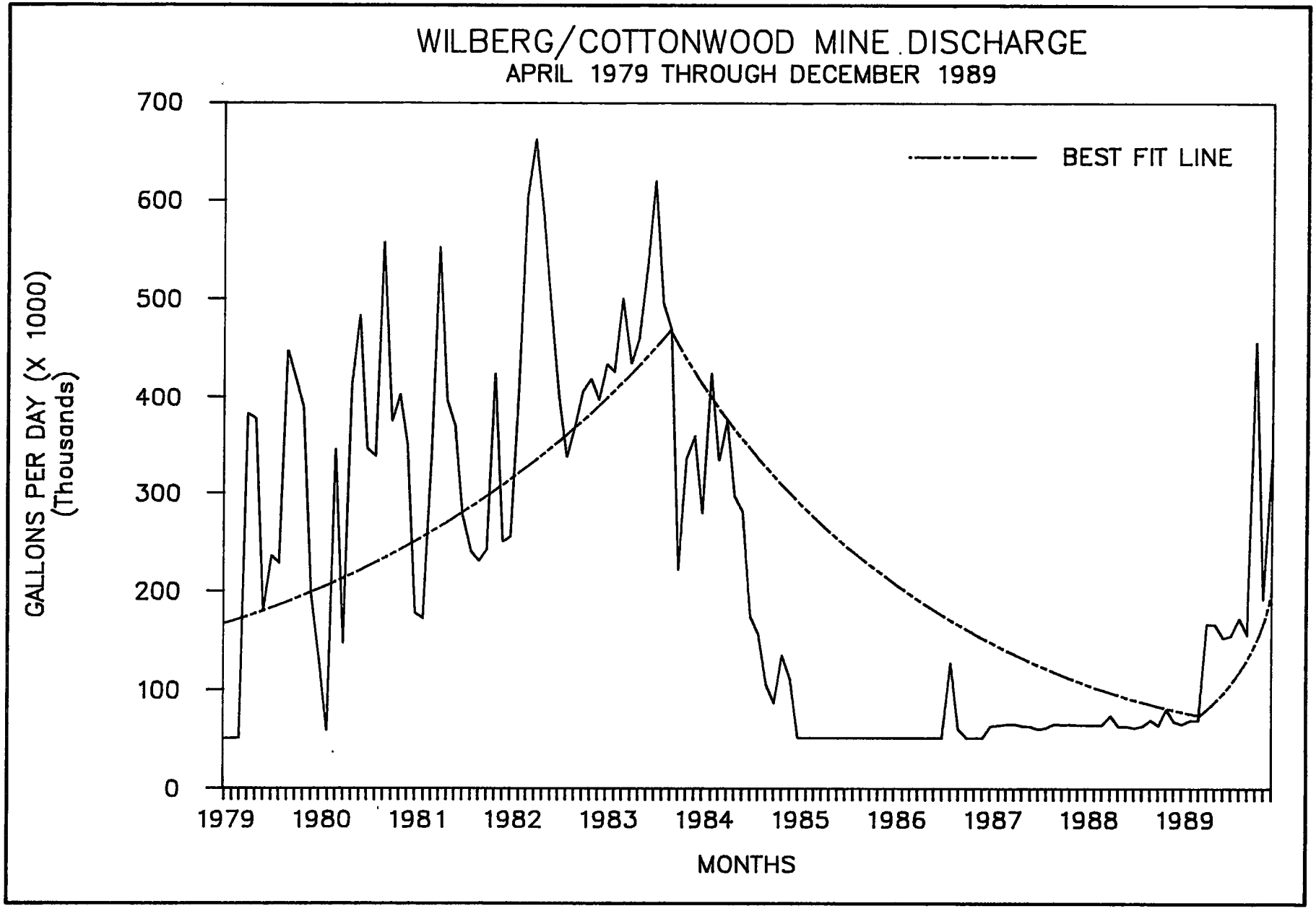
COTTONWOOD/WILBERG COAL MINE
WATER SUMP AREAS



MINE WORKINGS UPDATED THROUGH NOV. 30, 1989

FIGURE 11

FIGURE 12


WILBERG/COTTONWOOD MINE DISCHARGE
APRIL 1979 THROUGH DECEMBER 1989
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
MONTHS

Wilberg/Cottonwood Discharge

Grimes Wash	12.8 Million Gallons
Miller Canyon*	22.3 Million Gallons
Estimated Evaporation**	19.0 Million Gallons
Domestic Usage	5.0 Million Gallons
Total Discharge	59.1 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 1989 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 1989 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. UP&L 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, especially sample sites near the Pleasant Valley Fault System. UP&L believes that water percolating down through the Blackhawk Formation encounters burn-oxidized zones along the Pleasant Valley Fault System; thus, the leaching effect of the water creates an increase in the mineral content of the water. In support of this theory, samples have indicated that the condition exists only in close proximity to the Grimes Wash outcrop.

TABLE 28: WILBERG/COTTONWOOD IN-MINE WATER QUALITY

LOCATION	SAMPLE DATES	ALKALINITY BICARBONATE	CALCIUM	CARBONATE	CHLORIDE	CONDUCTIVITY	HARDNESS	IRON DISSOLVED	MAGNESIUM	MANGANESE	pH	POTASSIUM	SODIUM	SULFATE	TDS
2S XC-11	03-29	406	168.7	<1.0	10.0	1250	975	0.17	134.4	<0.01	8.05	4.1	22.8	690	1156
	07-17	528	165.8	<1.0	10.0	1400	887	0.06	114.9	0.08	7.00	3.7	6.4	460	1101
	09-14	544	156.6	<1.0	10.0	1300	887	0.02	118.1	0.03	7.20	7.4	21.6	450	1061
	12-04	626	176.3	<1.0	20.0	1400	865	0.06	103.2	0.02	7.15	2.9	20.3	350	1047
	MIN	406	156.6	<1.0	10.0	1250	865	0.02	103.2	0.01	7.00	2.9	6.4	350	1049
	MAX	626	176.3	<1.0	20.0	1400	975	0.17	134.4	0.08	8.05	7.8	22.8	690	1156
	MEAN	526	166.9	<1.0	13.3	1338	901	0.08	117.7	0.03	7.35	4.5	17.8	487	1092
HISTORICAL (1983-88)	MIN	403	116.0	<1.0	9.6	1000	725	0.01	5.4	0.01	7.05	2.4	21.4	340	664
	MAX	631	330.0	<1.0	130.0	2600	1013	0.05	115.6	0.03	7.95	6.2	36.9	558	1328
	MEAN	434	167.5	<1.0	25.6	1605	847	0.04	100.4	0.02	7.52	4.5	25.2	420	939
4E XC-24	03-29	565	296.9	<1.0	30.0	2200	1663	<0.02	223.9	<0.01	7.50	7.5	36.7	1700	1314
	07-17	553	305.7	<1.0	25.0	2370	1542	0.17	189.0	0.05	7.50	9.9	21.7	1050	2243
	09-14	500	321.1	<1.0	30.0	2350	1675	<0.02	212.1	0.04	7.65	11.0	39.7	1225	2206
	12-04	572	320.4	<1.0	35.0	2400	1484	<0.02	166.2	0.06	7.40	7.5	40.4	1000	2331
	MIN	500	296.9	<1.0	25.0	2200	1484	<0.02	166.2	<0.01	7.40	7.5	21.7	1000	1314
	MAX	572	321.1	<1.0	35.0	2400	1675	0.17	223.9	0.06	7.65	11.0	40.4	1700	2331
	MEAN	548	311.0	<1.0	30.0	2330	1591	0.06	197.8	0.02	7.51	9.0	34.6	1244	2024
HISTORICAL (1986-88)	MIN	450	236.0	<1.0	17.6	1250	1170	<0.01	106.0	0.01	7.15	8.3	35.7	800	1429
	MAX	612	416.9	<1.0	85.0	5000	2022	0.08	238.2	0.06	8.00	11.3	59.3	1450	2594
	MEAN	522	309.8	<1.0	37.4	2501	1564	0.05	191.6	0.04	7.43	9.5	45.4	1103	1859

c. Discharge Quantity

Water produced in the Wilberg Mine gravity flows to the northern area of 1st North. At that point a vertical turbine located in the Deer Creek Mine picks up the water and pumps it back to the south and down to the Wilberg Mine main sump. This process is utilized to circumvent the area sealed due to the fire in 1984. 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 12.8 million gallons was discharged to Grimes Wash during 1989; and intermittent small quantity discharges did occur at the Miller Canyon breakouts, which were developed for ventilation purposes but sealed in 1987. (See Figure 13.) Discharge usually occurs during the months of June through November 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 22.3 million gallons were discharged during 1989.

d. Discharge Quality

Samples are collected each month from Grimes Wash and Miller Canyon breakouts whenever discharge occurs. Three samples from the Grimes Wash location and ten samples from the Miller Canyon location were collected during 1989. Table 29 compares the minimum, maximum, and mean values from 1989 to the historical values.

FIGURE 13

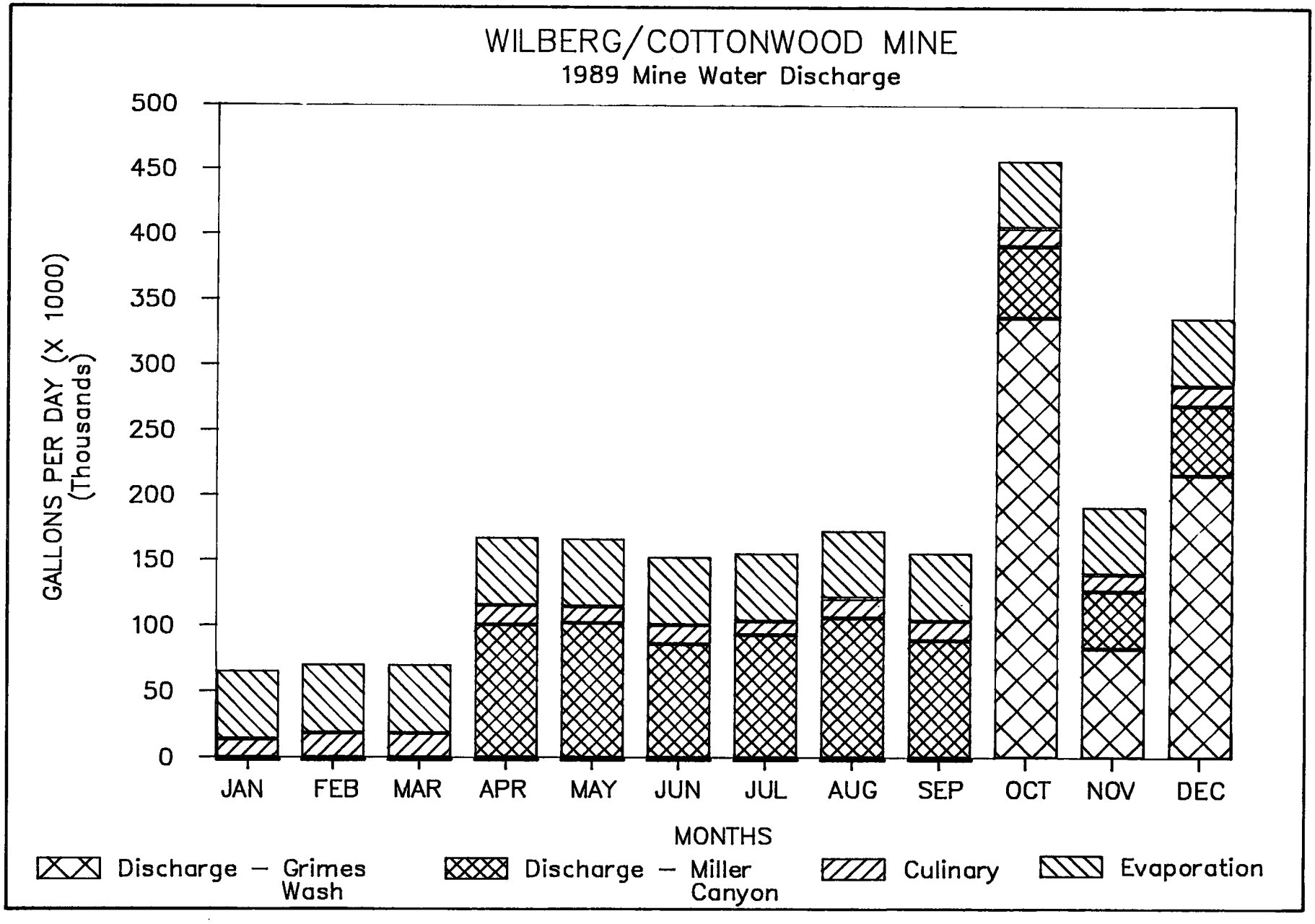

WILBERG/COTTONWOOD MINE
1989 Mine Water Discharge
GALLONS PER DAY (X 1000)
(Thousands)
500
450
400
350
300
250
200
150
100
50
0
JAN
FEB
MAR
APR
MAY
JUN
JUL
AUG
SEP
OCT
NOV
DEC
MONTHS
Discharge – Grimes Wash
Discharge – Miller Canyon
Culinary
Evaporation

TABLE 29: WILBERG/COTTONWOOD - DISCHARGE WATER QUALITY

GRIMES WASH

Parameters	1989 Minimum	1989 Maximum	1989 Mean	Historical - (1976-1987) Minimum	Historical - (1976-1987) Maximum	Historical - (1976-1987) Mean
pH	7.2	7.3	7.27	6.90	8.20	7.64
Acidity	11.0	21.0	15.0	0.1	62.0	7.0
Alkalinity	277	377	335.7	216	364	271.9
Chloride	20	20	20.0	2.7	63.3	14.1
Conductivity	850	1200	990	710	1390	1010
Iron	0.47	0.87	0.69	0.01	3.00	0.29
Oil & Grease	<1.0	<1.0	<1.0	0.2	23.8	2.2
Sulfate	300	350	320.0	29.2	430	213.5
TDS	556	1047	824.0	424	863	568
TSS	<1.0	20	4.8	<0.5	222	8.4

MILLER CANYON

Parameters	1989 Minimum	1989 Maximum	1989 Mean	Historical - (1976-1987) Minimum	Historical - (1976-1987) Maximum	Historical - (1976-1987) Mean
pH	6.90	8.40	7.29	6.95	7.7	7.36
Acidity	19	57	32.3	<1.0	30.0	13.2
Alkalinity	319	393	359.7	225	381	285.5
Chloride	10.0	25.0	16.5	11.5	17.0	14.6
Conductivity	900	1900	1322	650	1398	1090
Iron	0.02	1.18	0.43	<0.05	0.66	0.19
Oil & Grease	<1.0	4.5	1.4	<0.5	5.8	2.2
Sulfate	250	600	422	290	650	408
TDS	827	1039	959	413	1182	831
TSS	<1.0	8.0	3.0	<1.0	31	7.0

VI. PIEZOMETRIC GRADIENT INFORMATION

A. Surface

1. EM-31 and EM-47

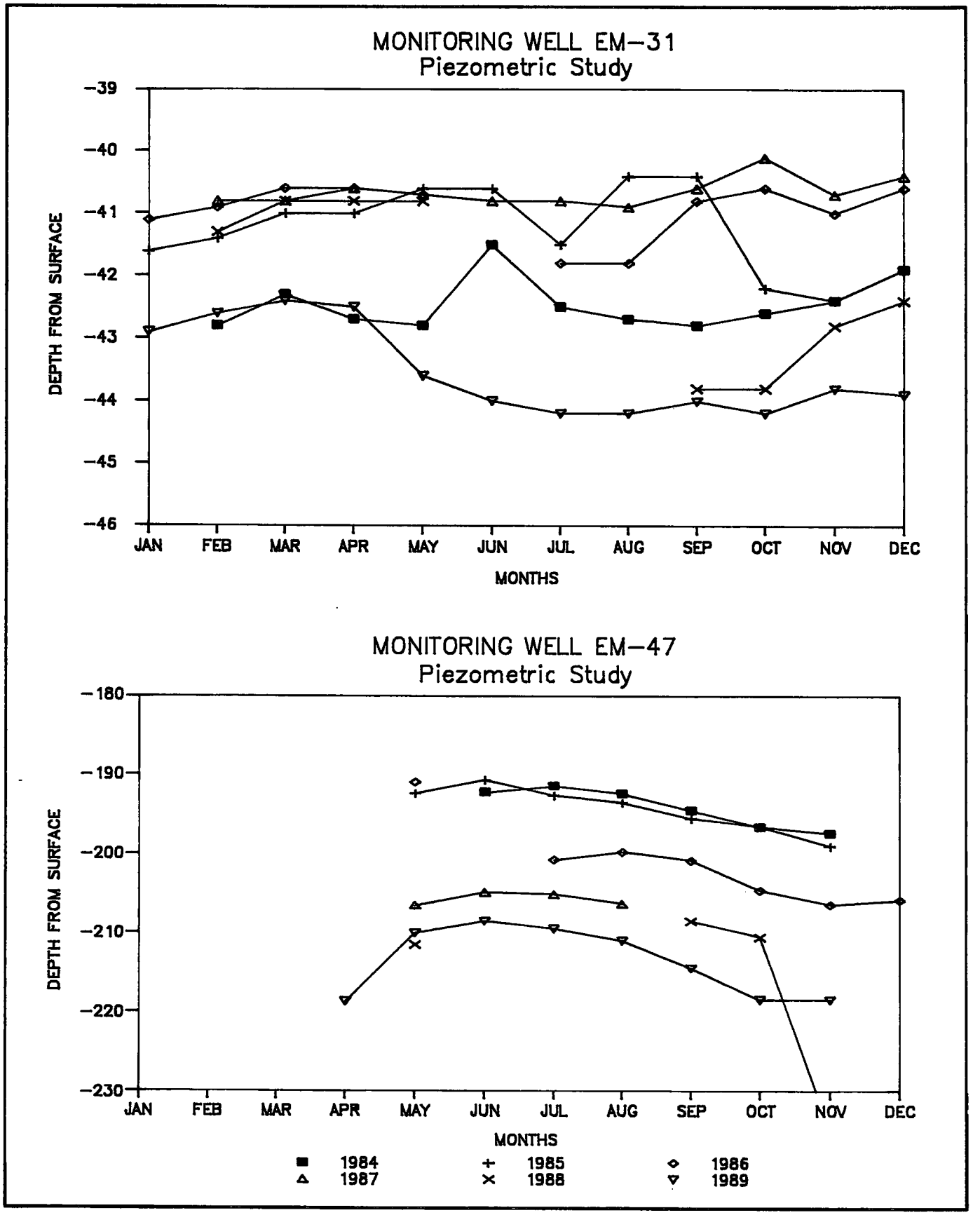
Two surface exploration drill holes which were developed into permanent water monitoring stations in 1978 continued to be monitored on a monthly basis, as access permitted. (See Map No. 1.)

Drill hole EM-31 in Cottonwood Creek Canyon was monitored monthly throughout 1989. (See Map No. 1 in pocket.) The water level in the hole was at its highest point, -42.6 feet, during the month of February and at its lowest point, -44.2 feet, during the months of July, August, and October. 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, -208.5 feet, in June and its lowest, -218.7 feet, during the month of April. Hydrographs of 1984-1989 data collected are shown in Figure 14.

2. Rilda Canyon Study Area

UP&L acquired five wells drilled and developed by West Appa Coal Co. through a coal lease purchase agreement. (See Map No. 1.) The wells are located on the northeastern side of East Mountain adjacent to the abandoned Helco Mine. West Appa Coal Company's primary concern was the close proximity of proposed mining activities in Rilda Canyon to the springs, which are currently utilized as a culinary water source by North Emery Water Users Association (NEWUA). UP&L echoes the same concerns expressed by West Appa Coal Company due to the fact that both the Hiawatha and Blind Canyon seams are mineable in the region surrounding the NEWUA springs.

FIGURE 14


MONITORING WELL EM-31
Piezometric Study
DEPTH FROM SURFACE
-39
-40
-41
-42
-43
-44
-45
-46
JAN
FEB
MAR
APR
MAY
JUN
JUL
AUG
SEP
OCT
NOV
DEC
MONTHS
MONITORING WELL EM-47
Piezometric Study
DEPTH FROM SURFACE
-180
-190
-200
-210
-220
-230
JAN
FEB
MAR
APR
MAY
JUN
JUL
AUG
SEP
OCT
NOV
DEC
MONTHS
1984
1985
1986
1987
1988
1989

A study performed by Vaughn Hansen Associates indicated the Rilda Canyon springs lie directly in line with a north-south trending side canyon on the south as well as one to the north. From examination of topographic features it appears that the linear relationship, or lineament, of side drainage channels can be traced on through Mill Fork Canyon to the north, intersecting the northeast-southwest trending graben (encounter by Beaver Creek Coal) near the northern ridge of Mill Fork Canyon. Said lineament could indicate the existence of a fracture system in the Starpoint Sandstone extending into Rilda Canyon.

Very Low Frequency analysis (VLF), a subsurface geotechnical technique, was used to verify the existence of a fracture zone in line with the lineament traced from Rilda Canyon into Mill Fork Canyon. Two transects were run in an east-west direction across the Rilda Springs area, one along the northern road which bypasses the springs and the other along the road bypassing the springs to the south. In both transects a significant subsurface anomalous condition was encountered in the vicinity of the springs and directly in line with the north and south side canyons.

As evidenced by the location of the principal spring, the positioning of the concrete cutoff wall, the positioning of the perforated pipe collection system behind the cutoff wall, and water quality data which will be subsequently discussed, the source of water for the principal spring is from the north. The principal spring is directly in line with the north-south trending fracture zone identified by the VLF analysis; therefore, the primary source of water for the Rilda Springs area is from the north via the fractured zone of the Starpoint Sandstone.

Water elevations from the five existing piezometers were collected on a monthly basis throughout the year when accessible. Information collected during

1989 correlated well with the data Vaughn Hansen's utilized to construct the piezometric contour of the Rilda Springs area. The Vaughn Hansen study made several significant points concerning Rilda Creek in the vicinity of the springs. In general, one would expect groundwater to be flowing toward and recharging creek flows along its entire reach; however, above the spring area the stream is actually losing water to the groundwater system as evidenced by the fact that the water surface elevation at well P-3 is some eleven (11) feet below the stream bed at its nearest point. This phenomenon is due either to the existence of a fracture zone beneath the creek or a significant, highly permeable gravel bed beneath the creek which is able to drain inflowing water from either the creek or groundwater system fast enough to prevent complete saturation of the overlying alluvial deposits. The latter possibility is the most likely case since subsequent VLF work revealed no significant anomalous subsurface conditions parallel to the stream and since a coarse, water-bearing gravel bed was encountered at a depth of from 35 to 40 feet below ground surface (23 to 28 feet below the stream channel bottom) at well P-3.

As the intersection of the north-south trending fracture system with the Rilda Creek channel is approached, the groundwater surface elevation gradually approaches the stream channel elevation. At the intersection of the fracture system with the stream channel, the location of the principal producing spring area, the groundwater surface elevation has intersected the stream channel with the creek receiving rather than losing water through this reach. Surfacing of the groundwater at that point could be due to one of two possible conditions: 1) the large inflow from the north may be too great for the gravel drain to handle, creating in essence a condition where the "groundwater reservoir" overflows simply because more water has been poured into the system than the system can handle; or 2) a physical

disruption in the gravel drain may be present as the result of the fracture system at that location. The physical disruption may create a barrier or dike to subsurface flow through the gravel bed, forcing the water to surface.

From the spring area to P-1 the stream again loses water to the gravel drain beneath. At well P-1 below the spring area the water surface elevation is some four feet below the nearest stream channel bottom elevation. As stated early in the Rilda Canyon section, the stream again increases in flow from P-1 to the mouth of Rilda Canyon (RCW4).

Flow within the coarse gravel drain below the stream channel is directly tied into surface stream flow. Between September 24 and October 15, 1982 the water surface elevation in well P-3 dropped only 0.7 feet with the creek still flowing on October 15. By December 6, 1982 the creek had dried up above the springs and the water level in well P-3 had fallen below the bottom of the well (a fall of at least 7 feet between October 15 and December 6). Below the springs the creek is perennial, and between October 15 and December 6, 1982 well P-1 dropped only 0.04 feet.

Data collected by UP&L from 1986 through 1989 revealed similar trends in both P-1 and P-3 (Figure 15). From July through November 1989 the stream above P-3 was dry and the water level had fallen below the bottom of the well, whereas the level in P-1 remained relatively constant. Figure 16 compares the data collected during 1988 and 1989.

Further study is needed in defining the actual direction of the major groundwater influx. UP&L is currently considering performing a pump test, with permission granted by NEWUA, or geophysical alternatives to better define the actual direction of water flow.

FIGURE 15

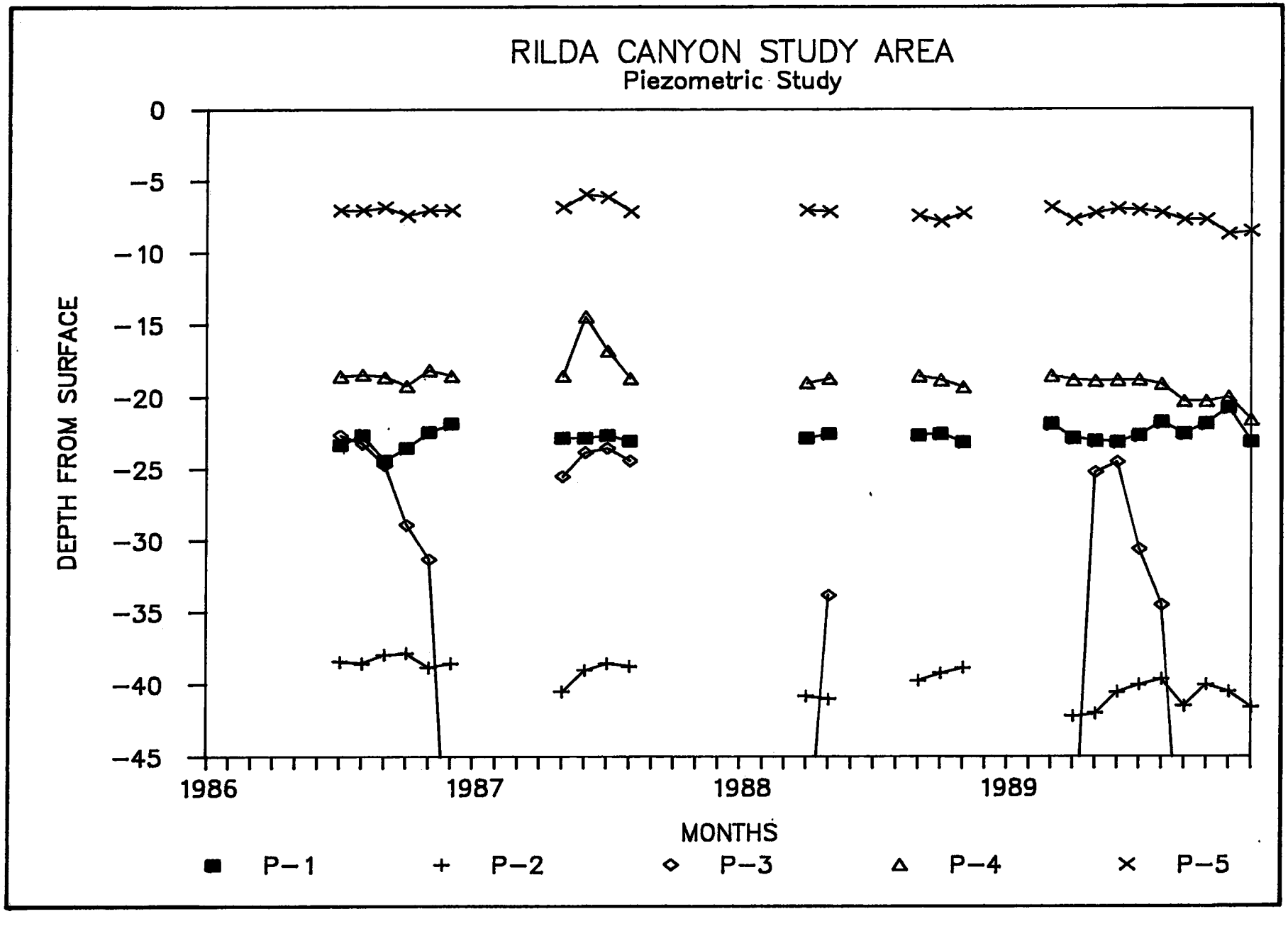
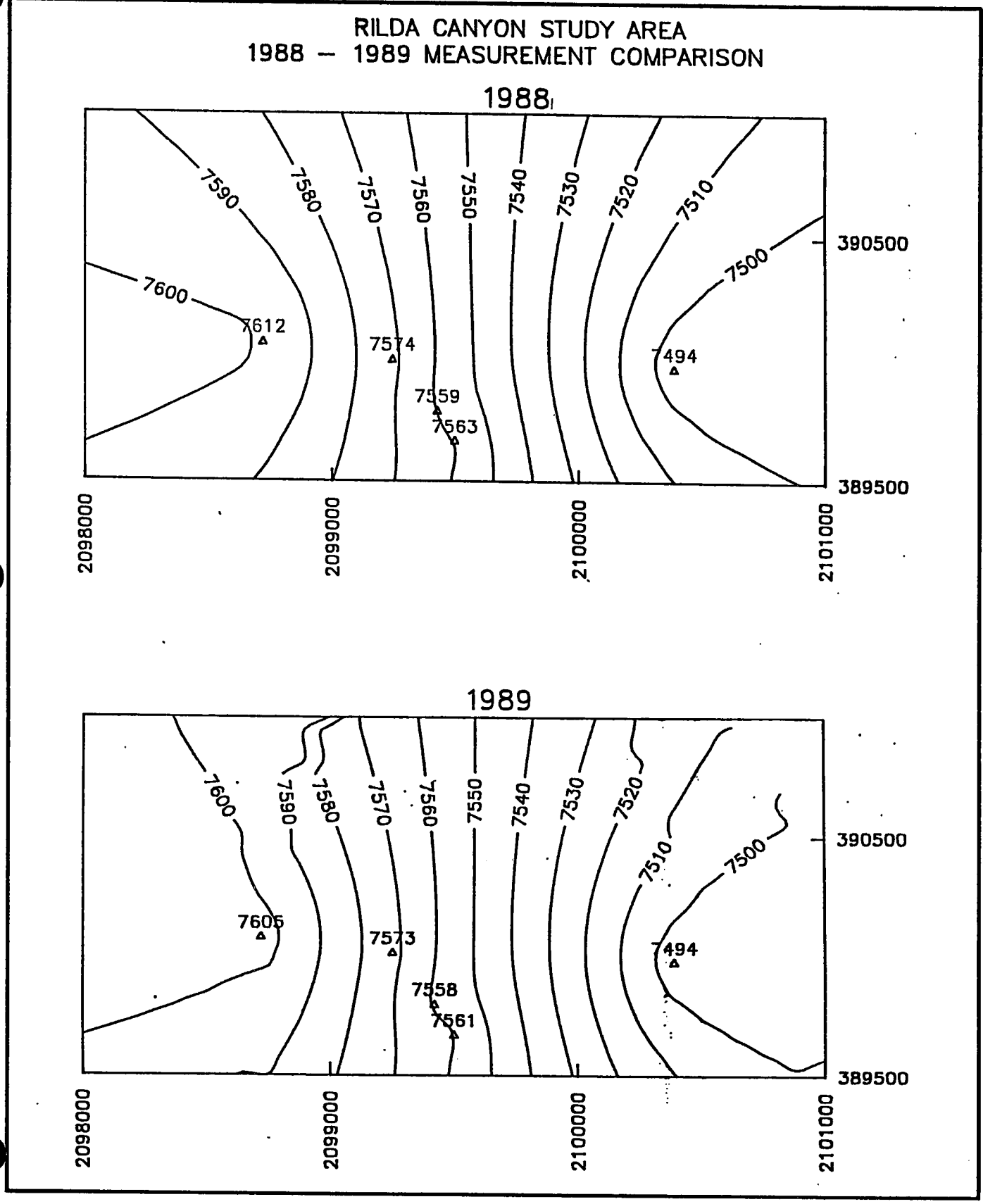

RILDA CANYON STUDY AREA
Piezometric Study
DEPTH FROM SURFACE
0
-5
-10
-15
-20
-25
-30
-35
-40
-45
1986
1987
1988
1989
MONTHS
P-1
P-2
P-3
P-4
P-5

FIGURE 16


RILDA CANYON STUDY AREA
1988 – 1989 MEASUREMENT COMPARISON
1988
7590
7580
7570
7560
7550
7540
7530
7520
7510
7500
7600
7612
7574
7559
7563
7494
390500
389500
2098000
2099000
2100000
2101000
1989
7600
7590
7580
7570
7560
7550
7540
7530
7520
7510
7500
7605
7573
7558
7561
7494
390500
389500
2098000
2099000
2100000
2101000

B. In-Mine

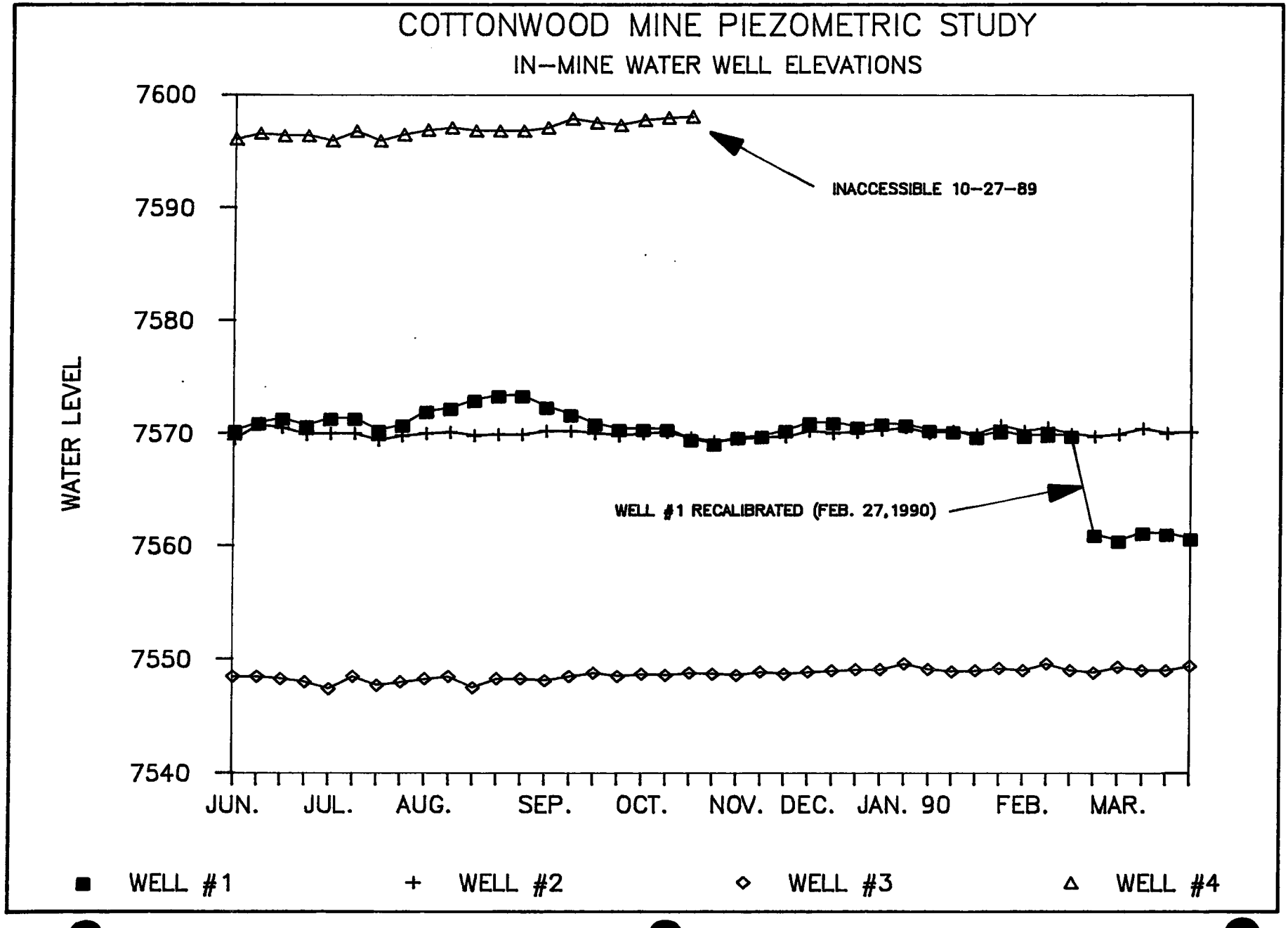
1. Deer Creek

Four (4) long-term monitoring wells were completed during 1989, and data collection was initiated in December. (See Map No. 4 for well locations and Appendix G for lithologic logs.) Following water reports will graphically display groundwater level elevations.

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 No. 5 in pocket and Appendix I for lithologic logs.) Data from the wells is shown in Figure 17. 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. As Figure 17 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 1990 as long as access permits.

FIGURE 17


COTTONWOOD 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)
JUN.
JUL.
AUG.
SEP.
OCT.
NOV.
DEC.
JAN. 90
FEB.
MAR.
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 No. 1 for location.) A detailed geologic description of the well can be found in Appendix K.

Four samples were collected in 1989. 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.

Initially, three test wells were drilled within the site to identify soil conditions present. At each drill hole location water introduced in the hole from drilling was bailed from the drill hole at the end of the day. The next day the water level was checked and, in most cases, had risen. Two of the test wells were cement filled upon

TABLE 30: DEER CREEK WASTE ROCK STORAGE FACILITY

WATER WELL (DCWR-1)

SAMPLE DATES	WATER DEPTH	BICARBONATE	CALCIUM	CARBONATE	CHLORIDE	CONDUCTIVITY	HARDNESS	IRON DISSOLVED	IRON TOTAL	MAGNESIUM	MANGANESE	pH	POTASSIUM	SODIUM	SULFATE	SOLIDS TDS	SOLIDS TSS
05-19	4.0'	700	211.5	<1.0	770.0	22,000	1343	0.33	0.33	197.8	0.05	7.9	22.6	7830.0	15,900	21,057	10.0
08-25	4.5'	712	165.3	<1.0	710.0	22,000	1034	0.11	0.15	150.9	0.02	7.5	43.8	5220.0	10,250	20,975	4.0
09-21	4.5'	705	193.7	<1.0	660.0	22,000	1161	0.17	0.20	164.4	0.05	8.1	23.4	6150.0	12,000	20,492	38.0
12-06	3.6'	698	142.2	<1.0	645.0	26,000	951	0.08	0.08	144.6	0.05	8.4	27.1	6150.0	12,000	21,671	54.0
MIN	3.6'	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	4.0
MAX	4.5'	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	54.0
MEAN	4.2'	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	26.5

completion to prevent any unnatural groundwater migration from occurring, but the third hole was cased. Groundwater in the third hole was interesected at the bedrock contact at fifty (50) feet. The upper fifty-five (55) feet of hole No. 3 consisted of unconsolidated material followed by weathered shale to sixty-three (63) feet. The remainder of the hole was a solid gray, silty shale. An attempt to sample the water in drill hole No. 3 was made on September 11, 1989, but the hole was dry to a depth of sixty-two (62) feet where the casing was silt blocked. On November 29 and 30, 1989 an additional hole was drilled adjacent to the third hole to a depth of eighty-seven (87) feet and will serve as a groundwater monitoring location. (See Appendix K for a detailed geologic description.) The data collected during the original drilling program and subsequent drilling indicate that groundwater enters the hole between depths of forty-five (45) to sixty-three (63) feet and stabilizes at approximately fifty-six (56) feet. The hole was cased from thirty-seven to eighty-seven (37-87) feet depth with 1-1/2-inch schedule 80 slotted PVC pipe and with solid riser from thirty-seven (37) feet to the surface. The slotted section was gravel-packed, and a bentonite seal was placed above the slotted section to prevent cement (utilized to seal the upper portion of the hole) from migrating into the gravel section.

Baseline analysis was performed after a one-week stabilization period. It was apparent from the first sample that the hole still had an elevated suspended solid content. In an attempt to reduce the amount of suspended solids the hole was purged with water until the discharge from the well was clear. Baseline analysis was again performed after a one-week stabilization period. The suspended solid content was still elevated but some improvement was noticed. As anticipated with

groundwater associated with the Mancos Shale Formation, the dissolved solids were extremely high and dominated by calcium, chloride, magnesium, sodium, and sulfate.

Two samples were collected during 1989. The analysis, along with water depth, is listed in Table 31. Values are in milligrams per liter unless otherwise noted. Complete raw data can be found in Appendix K.

VIII. EFFECTS OF MINING AND SUBSIDENCE ON HYDROLOGY

Since the development of the UP&L 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 1989 Subsidence Monitoring Report.)

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 31: WILBERG/COTTONWOOD WASTE ROCK STORAGE FACILITY

WASTE ROCK WELL WELL (WCWR1)

SAMPLE DATES	WATER DEPTH	BICARBONATE	CALCIUM	CARBONATE	CHLORIDE	CONDUCTIVITY	HARDNESS	----- IRON ----- DISSOLVED	TOTAL	MAGNESIUM	MANGANESE	pH	POTASSIUM	SODIUM	SULFATE	-- SOLIDS -- TDS	TSS
12-05	57.0'	414	1135	<1.0	815	10,000	4037	----	5.01	292.0	2.48	7.85	119.1	851	4300	9316	15,754
12-19	57.0'	798	563	<1.0	280	32,000	3354	9.0	11.30	473.0	0.89	7.70	41.6	1905	6200	8714	8,000
MIN		414	563	<1.0	280	10,000	3354	9.0	5.01	292.0	0.89	7.70	41.6	851	4300	8714	8,000
MAX		798	1135	<1.0	815	32,000	4037	9.0	11.30	473.0	2.48	7.85	119.1	1905	6200	9316	15,754
MEAN		606	858	<1.0	548	21,000	3696	9.0	8.16	382.5	1.69	7.78	80.4	1378	5250	9015	11,877

IX. SUMMARY

Utah Power & Light Company 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 twelfth annual report submitted concerning the hydrology.

Unusually high precipitation throughout 1982, 1983, and 1984 caused record level runoff and spring discharge rates for that period. After a downtrend from 1985-1987 the precipitation received increased slightly in 1988. During 1989 precipitation decreased significantly from 1988.

Runoff for drainages surrounding East Mountain did not flow during 1989 except for Cottonwood and Rilda canyons. 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 1989 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 1989 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.

APPENDIX A

UTAH POWER & LIGHT COMPANY

RESERVOIR RECORDS

DAILY CONTENTS (ACRE FEET)

DAY	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	DAY
1	22982.00	22266.00	21796.00	21376.00	20820.00	20346.00	20129.00	21646.00	23693.00	23040.00	20658.00	18648.00	1
2	22902.00	22244.00	21775.00	21365.00	20796.00	20339.00	20122.00	21698.00	23696.00	22975.00	20581.00	18526.00	2
3	22815.00	22234.00	21758.00	21334.00	20795.00	20332.00	20116.00	21751.00	23700.00	22909.00	20505.00	18547.00	3
4	22753.00	22212.00	21737.00	21324.00	20786.00	20326.00	20106.00	21824.00	23704.00	22826.00	20425.00	18495.00	4
5	22717.00	22188.00	21719.00	21303.00	20766.00	20319.00	20086.00	21909.00	23704.00	22750.00	20342.00	18446.00	5
6	22728.00	22173.00	21705.00	21303.00	20766.00	20309.00	20073.00	22004.00	23706.00	22670.00	20283.00	18395.00	6
7	22706.00	22149.00	21688.00	21297.00	20749.00	20303.00	20086.00	22120.00	23719.00	22591.00	20198.00	18513.00	7
8	22688.00	22138.00	21674.00	21286.00	20725.00	20296.00	20112.00	22248.00	23730.00	22512.00	20132.00	18229.00	8
9	22674.00	22117.00	21657.00	21266.00	20708.00	20290.00	20145.00	22380.00	23741.00	22427.00	20063.00	18148.00	9
10	22652.00	22099.00	21639.00	21252.00	20688.00	20283.00	20171.00	22494.00	23749.00	22355.00	20024.00	18091.00	10
11	22631.00	22085.00	21625.00	21242.00	20668.00	20276.00	20201.00	22602.00	23756.00	22280.00	19956.00	18022.00	11
12	22641.00	22067.00	21604.00	21224.00	20648.00	20270.00	20214.00	22703.00	23760.00	22205.00	19888.00	17936.00	12
13	22631.00	22050.00	21591.00	21204.00	20631.00	20263.00	20247.00	22775.00	23737.00	22127.00	19823.00	17874.00	13
14	22615.00	22042.00	21570.00	21190.00	20611.00	20253.00	20286.00	22840.00	23715.00	22053.00	19756.00	17826.00	14
15	22595.00	22021.00	21552.00	21176.00	20591.00	20247.00	20332.00	22902.00	23711.00	21972.00	19688.00	17820.00	15
16	22575.00	21997.00	21534.00	21163.00	20574.00	20240.00	20405.00	22949.00	23700.00	21891.00	19621.00	17823.00	16
17	22565.00	21997.00	21518.00	21132.00	20555.00	20234.00	20491.00	22996.00	23689.00	21807.00	19557.00	17803.00	17
18	22537.00	21986.00	21497.00	21098.00	20538.00	20227.00	20595.00	23048.00	23678.00	21744.00	19490.00	17782.00	18
19	22519.00	21961.00	21480.00	21053.00	20518.00	20221.00	20698.00	23095.00	23656.00	21660.00	19424.00	17770.00	19
20	22494.00	21944.00	21476.00	21047.00	20498.00	20214.00	20739.00	23143.00	23611.00	21580.00	19357.00	17758.00	20
21	22480.00	21923.00	21486.00	21033.00	20478.00	20207.00	20931.00	23194.00	23552.00	21497.00	19294.00	17749.00	21
22	22458.00	21905.00	21479.00	21009.00	20462.00	20198.00	21070.00	23242.00	23493.00	21414.00	19228.00	17742.00	22
23	22440.00	21898.00	21479.00	20992.00	20438.00	20191.00	21204.00	23289.00	23426.00	21334.00	19162.00	17723.00	23
24	22419.00	21895.00	21466.00	20975.00	20422.00	20184.00	21321.00	23341.00	23411.00	21252.00	19096.00	17708.00	24
25	22401.00	21884.00	21473.00	20962.00	20402.00	20178.00	21400.00	23389.00	23400.00	21170.00	19034.00	17708.00	25
26	22380.00	21877.00	21469.00	20941.00	20385.00	20171.00	21469.00	23437.00	23345.00	21087.00	18968.00	17706.00	26
27	22358.00	21856.00	21455.00	20928.00	20365.00	20165.00	21518.00	23489.00	23289.00	21009.00	18903.00	17706.00	27
28	22340.00	21852.00	21428.00	20911.00	20346.00	20158.00	21556.00	23537.00	23227.00	20928.00	18838.00	17703.00	28
29	22323.00	21824.00	21414.00	20887.00	0.00	20152.00	21587.00	23585.00	23168.00	20846.00	18777.00	17703.00	29
30	22301.00	21810.00	21400.00	20863.00	0.00	20142.00	21622.00	23637.00	23102.00	20769.00	18712.00	17703.00	30
31	22280.00	0.00	21390.00	20843.00	0.00	20135.00	0.00	23685.00	0.00	20688.00	18648.00	0.00	31
MONTHLY CHANGE	-786.	-470.	-420.	-547.	-497.	-211.	1487.	2063.	-583.	-2414.	-2040.	-945.	

OCT88-SEPT89 TOTAL CHANGE -5363. MAX CONTENTS 23760. AC FT JUN 12 MIN CONTENTS 17703. AC FT SEP 28

TOTAL CHANGE MAX CONTENTS MIN CONTENTS

REMARKS:

Note: The clock stopped on the recorder on Feb 7. The clock stopped between 3/1 to 4/3/89. The recorder stopped working on 4/4/89 and was removed for repairs. On 4/12/89, a new recorder, float, and float assembly was installed on the tower. From 5/17 to 8/11/89, the pen on the recorder stuck in place. Recorder was removed for slide bar adjustment and reinstalled on tower. On 9/6/89to 10/2/89 the recorder ran 7 days slow.

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	42.00	13.00	12.00	12.00	13.00	13.00	13.00	17.00	19.00	38.00	46.00	34.00	1
2	42.00	13.00	12.00	12.00	13.00	13.00	13.00	15.00	19.00	44.00	45.00	32.00	2
3	44.00	13.00	12.00	12.00	13.00	13.00	13.00	15.00	19.00	44.00	45.00	32.00	3
4	44.00	13.00	12.00	12.00	13.00	14.00	13.00	15.00	17.00	44.00	44.00	32.00	4
5	41.00	13.00	12.00	12.00	13.00	14.00	13.00	15.00	15.00	44.00	44.00	34.00	5
6	41.00	13.00	12.00	12.00	13.00	14.00	13.00	16.00	15.00	44.00	44.00	36.00	6
7	41.00	13.00	12.00	12.00	13.00	13.00	13.00	16.00	15.00	44.00	44.00	36.00	7
8	41.00	13.00	12.00	12.00	13.00	13.00	13.00	16.00	15.00	44.00	44.00	36.00	8
9	41.00	13.00	12.00	12.00	13.00	13.00	13.00	15.00	15.00	44.00	44.00	36.00	9
10	41.00	13.00	12.00	12.00	13.00	13.00	13.00	15.00	15.00	44.00	44.00	36.00	10
11	41.00	13.00	12.00	12.00	13.00	13.00	13.00	15.00	15.00	44.00	44.00	36.00	11
12	41.00	13.00	12.00	12.00	13.00	13.00	13.00	15.00	15.00	44.00	44.00	36.00	12
13	41.00	13.00	12.00	12.00	13.00	13.00	13.00	15.00	15.00	44.00	44.00	36.00	13
14	41.00	13.00	12.00	12.00	13.00	13.00	13.00	15.00	15.00	44.00	44.00	36.00	14
15	41.00	13.00	12.00	12.00	13.00	13.00	13.00	15.00	15.00	44.00	44.00	36.00	15
16	41.00	13.00	12.00	12.00	14.00	13.00	13.00	15.00	15.00	44.00	44.00	36.00	16
17	41.00	13.00	12.00	12.00	14.00	13.00	13.00	15.00	15.00	44.00	44.00	36.00	17
18	41.00	13.00	12.00	12.00	14.00	13.00	13.00	15.00	15.00	44.00	44.00	36.00	18
19	41.00	13.00	12.00	12.00	14.00	13.00	13.00	15.00	15.00	44.00	44.00	36.00	19
20	41.00	13.00	12.00	12.00	14.00	13.00	13.00	16.00	15.00	44.00	44.00	36.00	20
21	41.00	13.00	12.00	12.00	14.00	13.00	13.00	16.00	15.00	44.00	44.00	36.00	21
22	41.00	13.00	12.00	12.00	14.00	13.00	13.00	16.00	15.00	44.00	44.00	36.00	22
23	41.00	13.00	12.00	12.00	14.00	13.00	13.00	16.00	15.00	44.00	44.00	36.00	23
24	41.00	13.00	12.00	12.00	14.00	13.00	13.00	16.00	15.00	44.00	44.00	36.00	24
25	41.00	13.00	12.00	12.00	14.00	13.00	13.00	16.00	15.00	44.00	44.00	36.00	25
26	41.00	13.00	12.00	12.00	14.00	13.00	13.00	16.00	15.00	44.00	44.00	36.00	26
27	41.00	13.00	12.00	12.00	14.00	13.00	13.00	16.00	15.00	44.00	44.00	36.00	27
28	41.00	13.00	12.00	12.00	14.00	13.00	13.00	16.00	15.00	44.00	44.00	36.00	28
29	41.00	13.00	12.00	12.00	14.00	13.00	13.00	16.00	15.00	44.00	44.00	36.00	29
30	41.00	13.00	12.00	12.00	14.00	13.00	13.00	16.00	15.00	44.00	44.00	36.00	30
31	41.00	13.00	12.00	12.00	14.00	13.00	13.00	16.00	15.00	44.00	44.00	36.00	31
MONTHLY													
TOT	518.00	368.00	372.00	379.00	375.00	385.00	424.00	494.00	775.00	1378.00	1119.00	720.00	
MEA	16.70	12.30	12.00	12.20	13.40	12.40	14.10	15.90	25.80	44.50	36.10	24.00	
MAX	44.00	13.00	12.00	13.00	14.00	14.00	17.00	19.00	40.00	46.00	46.00	36.00	
MIN	11.00	12.00	12.00	12.00	13.00	12.00	13.00	15.00	15.00	38.00	14.00	0.00	
ACR FT	1030.00	730.00	738.00	752.00	744.00	764.00	841.00	980.00	1540.00	2730.00	2220.00	1430.00	

OCT88-SEPT89 TOTAL 7307.00 MEAN 20.00 MAX 46.00 MIN 0.00 TOT ACR FT 14490.00

TOTAL MEAN MAX MIN TOT ACR FT

MAX UNIT DISCHARGE 46.00 CFS DATE JUL 31 MIN UNIT DISCHARGE 2.60 CFS DATE MAY 24
(1.66 FT)

REMARKS:

Note: From 11/6 to 11/30/88, the clock stopped. A new clock was installed on the recorder on 12/01/88.

ENG0006A HUNTINGTON CREEK NATURAL FLOW AT PLANT-IN C.F.S. (USES ALSO NOS. 41,22,23) OCT86-SEPT87 PAGE 0

UTAH POWER & LIGHT COMPANY

INFLOW AND UTILIZATION RECORDS

DAY	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	DAY
1	164.46	34.83	34.59	22.65	31.48	34.94	40.29	159.23	119.34	55.17	87.64	86.19	1
2	66.62	33.28	31.31	27.82	30.66	36.09	40.75	155.61	119.04	53.72	88.38	82.26	2
3	24.77	36.46	21.30	30.84	29.90	40.71	43.67	152.37	109.37	51.45	105.40	97.29	3
4	30.78	32.47	18.93	30.41	28.54	41.00	42.85	154.84	98.09	52.23	101.39	98.91	4
5	30.69	30.37	9.97	27.91	27.35	38.85	42.77	120.49	98.40	67.04	90.53	85.42	5
6	38.16	30.42	9.78	24.25	27.71	38.32	40.07	131.48	101.10	66.49	90.34	89.35	6
7	34.12	30.32	16.43	29.70	30.80	38.14	35.08	132.38	98.13	60.99	88.73	106.92	7
8	56.57	33.56	20.11	40.03	20.64	40.07	38.66	136.81	131.19	63.26	92.69	105.30	8
9	64.35	33.92	13.70	41.65	17.44	41.26	53.13	147.58	126.58	59.85	92.53	92.04	9
10	52.51	40.64	15.10	39.55	19.24	40.71	73.04	157.75	138.24	60.77	98.39	81.05	10
11	52.94	41.30	20.97	39.57	28.67	42.68	87.81	160.62	137.31	61.31	105.47	80.68	11
12	52.74	38.53	14.05	32.86	28.10	43.10	85.88	149.79	135.86	77.26	110.07	86.24	12
13	46.61	42.02	18.76	34.19	26.14	35.87	80.29	152.98	129.12	96.90	105.36	92.80	13
14	48.61	40.69	20.35	37.19	25.85	36.20	69.57	150.78	130.56	93.01	91.07	86.68	14
15	66.71	41.68	21.11	35.23	26.39	36.49	67.16	135.62	107.05	88.99	90.42	85.88	15
16	74.25	44.28	19.02	36.53	28.18	32.82	79.55	132.25	76.31	88.06	80.75	93.28	16
17	68.84	40.92	19.89	30.16	29.77	34.09	87.49	128.04	75.39	86.42	80.03	101.17	17
18	54.09	35.45	19.39	37.60	30.03	34.96	100.44	124.64	82.00	83.27	58.06	120.90	18
19	52.74	40.59	20.41	31.43	32.11	36.72	123.68	106.97	78.45	78.86	64.16	119.61	19
20	50.97	43.43	19.93	24.36	24.87	37.84	144.85	106.55	76.51	81.45	53.08	105.78	20
21	52.07	33.86	22.10	22.39	22.25	39.12	156.56	108.44	75.58	79.28	50.33	92.39	21
22	43.14	32.13	25.37	30.16	25.71	36.56	136.12	105.21	83.74	79.00	49.58	81.39	22
23	41.57	32.69	28.80	37.24	32.39	38.66	166.88	108.72	54.55	75.29	42.17	85.58	23
24	40.11	28.91	31.01	26.10	33.73	37.86	189.85	110.23	56.39	80.38	25.60	82.38	24
25	38.24	32.47	28.59	33.31	34.40	38.34	169.32	122.48	68.36	79.30	23.60	78.41	25
26	37.27	38.91	27.29	33.73	35.19	39.54	150.52	112.69	79.35	91.84	24.14	67.89	26
27	39.06	43.01	29.16	35.17	36.59	38.26	141.05	106.19	85.18	91.59	27.56	72.46	27
28	42.07	39.63	28.85	35.20	38.55	41.32	183.92	102.78	76.09	92.52	51.18	76.15	28
29	34.32	38.69	23.44	36.75	0.00	39.86	182.42	104.35	60.03	94.02	26.89	55.99	29
30	33.44	36.17	20.01	37.01	0.00	36.80	168.65	107.37	58.26	94.27	42.95	49.04	30
31	33.89	0.00	16.65	33.28	0.00	41.79	0.00	108.91	0.00	87.63	85.50	0.00	31
MONTHLY													
TOT	1544.91	1102.09	667.07	1050.56	819.69	1194.99	3022.72	3994.17	2845.58	2368.59	2210.96	2639.41	
MEA	49.84	36.74	21.52	33.89	29.27	38.55	100.76	128.84	94.85	76.41	71.32	87.98	
MAX	164.46	44.28	34.59	41.65	38.55	43.10	189.85	160.62	138.24	96.90	110.07	120.90	
MIN	24.77	28.91	9.78	22.39	17.44	32.82	35.08	102.78	54.55	51.45	23.60	49.04	

OCT86-SEPT87 TOTAL 23461. MEAN 64. MAX 190. MIN 10.

TOTAL MEAN MAX MIN

REMARKS:

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	53.00	38.00	15.00	22.00	27.00	32.00	40.00	122.00	79.00	67.00	122.00	28.00	1
2	57.00	34.00	13.00	24.00	26.00	29.00	39.00	120.00	79.00	68.00	116.00	27.00	2
3	58.00	31.00	12.00	24.00	26.00	29.00	39.00	79.00	80.00	84.00	116.00	26.00	3
4	61.00	31.00	12.00	24.00	26.00	27.00	37.00	85.00	82.00	89.00	118.00	100.00	4
5	62.00	32.00	12.00	23.00	25.00	27.00	36.00	78.00	81.00	88.00	118.00	117.00	5
6	60.00	34.00	14.00	22.00	25.00	30.00	40.00	77.00	114.00	87.00	116.00	117.00	6
7	52.00	36.00	14.00	22.00	25.00	30.00	46.00	81.00	107.00	85.00	116.00	115.00	7
8	48.00	42.00	14.00	22.00	24.00	30.00	56.00	85.00	116.00	82.00	124.00	115.00	8
9	53.00	42.00	14.00	22.00	25.00	32.00	66.00	84.00	115.00	85.00	126.00	114.00	9
10	47.00	41.00	15.00	22.00	24.00	32.00	64.00	67.00	115.00	102.00	124.00	112.00	10
11	46.00	42.00	14.00	21.00	23.00	32.00	55.00	83.00	119.00	121.00	119.00	112.00	11
12	48.00	42.00	14.00	20.00	23.00	32.00	44.00	85.00	117.00	115.00	113.00	110.00	12
13	67.00	42.00	15.00	21.00	23.00	32.00	61.00	85.00	97.00	113.00	111.00	108.00	13
14	68.00	43.00	14.00	21.00	25.00	30.00	47.00	82.00	75.00	111.00	111.00	107.00	14
15	66.00	41.00	14.00	21.00	25.00	31.00	50.00	80.00	65.00	105.00	103.00	106.00	15
16	62.00	40.00	15.00	20.00	26.00	33.00	56.00	84.00	62.00	103.00	75.00	103.00	16
17	62.00	39.00	14.00	20.00	27.00	34.00	71.00	87.00	62.00	105.00	66.00	102.00	17
18	58.00	36.00	15.00	20.00	26.00	34.00	84.00	86.00	66.00	103.00	74.00	102.00	18
19	48.00	36.00	15.00	20.00	26.00	34.00	90.00	87.00	68.00	100.00	72.00	86.00	19
20	45.00	36.00	16.00	20.00	27.00	35.00	86.00	65.00	65.00	102.00	70.00	72.00	20
21	49.00	35.00	16.00	20.00	28.00	35.00	95.00	67.00	65.00	100.00	63.00	76.00	21
22	41.00	31.00	15.00	20.00	28.00	35.00	93.00	74.00	67.00	106.00	62.00	74.00	22
23	41.00	31.00	16.00	20.00	30.00	35.00	86.00	83.00	79.00	105.00	63.00	68.00	23
24	41.00	32.00	16.00	20.00	28.00	36.00	73.00	72.00	77.00	120.00	63.00	65.00	24
25	44.00	34.00	16.00	20.00	31.00	36.00	78.00	64.00	75.00	120.00	65.00	62.00	25
26	37.00	31.00	15.00	19.00	34.00	37.00	133.00	62.00	76.00	122.00	48.00	62.00	26
27	37.00	31.00	14.00	20.00	35.00	37.00	139.00	65.00	73.00	123.00	48.00	41.00	27
28	37.00	30.00	13.00	20.00	35.00	38.00	139.00	66.00	71.00	123.00	61.00	34.00	28
29	37.00	29.00	15.00	20.00	0.00	38.00	139.00	68.00	70.00	117.00	103.00	26.00	29
30	37.00	27.00	16.00	22.00	0.00	37.00	125.00	78.00	69.00	117.00	103.00	24.00	30
31	37.00	0.00	20.00	22.00	0.00	38.00	0.00	77.00	0.00	117.00	101.00	0.00	31
MONTHLY													
TOT	1503.00	1076.00	457.00	916.00	721.00	1025.00	2171.00	2406.00	2506.00	3202.00	2835.00	2631.00	
MEA	48.50	35.90	14.70	29.50	25.80	33.10	72.40	77.60	83.50	103.00	91.50	87.70	
MAX	67.00	43.00	20.00	34.00	34.00	38.00	139.00	122.00	117.00	123.00	126.00	117.00	
MIN	37.00	27.00	12.00	22.00	15.00	27.00	36.00	62.00	65.00	67.00	43.00	24.00	
ACR FT	2980.00	2130.00	906.00	1820.00	1430.00	2030.00	4310.00	4770.00	4970.00	6350.00	5620.00	5220.00	

OCT88-SEPT89 TOTAL 21449.00 MEAN 58.80 MAX 139.00 MIN 12.00 TOT ACR FT 42540.00

TOTAL MEAN MAX MIN TOT ACR FT

MAX UNIT DISCHARGE 177.00 CFS DATE SEP 29 MIN UNIT DISCHARGE 11.00 CFS DATE DEC 3
(3.24 FT)

REMARKS:

DESCRIPTIONS FOR LOCATIONS

LOC_DESC	LOCATION
ELECTRIC LAKE	UPL3A
HUNTINGTON CR BELOW ELECT. LAKE	UPL3
HUNTINGTON CREEK	UPL2
HUNTINGTON CREEK ABOVE FISH CR	UPL9
HUNTINGTON CREEK BELOW DIVERSION	H1
LEFT FORK HUNTINGTON CREEK	UPL1

HUNTINGTON CREEK
1989

LOCATION HI				UPL2A			UPL9		
PARAMETER	AVE VALUE	MIN VALUE	MAX VALUE	AVE VALUE	MIN VALUE	MAX VALUE	AVE VALUE	MIN VALUE	MAX VALUE
FCOND	300.0000	200.0000	400.0000	262.0000	262.0000	262.0000	396.0000	396.0000	400.0000
PH	7.7500	7.6000	8.1000	7.3500	7.5000	7.6000	7.9500	7.9000	8.0000
SO4	23.5000	4.0000	43.0000	.	.	.	61.0000	34.0000	88.0000
TDS	321.0000	256.0000	386.0000	179.0000	148.0000	192.0000	279.0000	193.0000	369.0000
TSS	17.0000	13.0000	21.0000	3.5000	1.0000	6.0000	16.5000	1.0000	32.0000

FCOND. IS CONDUCTIVITY AS MEASURED IN THE FIELD

HUNTINGTON CREEK
1989

PARAMETER	LOCATION UPL1 AVE VALUE	UPL1 MIN VALUE	UPL1 MAX VALUE	UPL2 AVE VALUE	UPL2 MIN VALUE	UPL2 MAX VALUE	UPL3 AVE VALUE	UPL3 MIN VALUE	UPL3 MAX VALUE
FCOND	384.0000	384.0000	384.0000	346.0000	341.0000	351.0000	258.5000	251.0000	266.0000
PH	7.7666	7.6000	8.0000	7.9375	7.7000	8.2000	7.5500	7.3000	7.7000
SO4	.	.	.	17.0000	17.0000	17.0000	10.0000	10.0000	10.0000
TDS	245.3333	174.0000	236.0000	292.5000	159.0000	226.0000	177.5000	138.0000	209.0000
TSS	6.6666	4.0000	10.0000	10.0000	2.0000	42.0000	1.0000	1.0000	1.0000

FCOND, IS CONDUCTIVITY AS MEASURED IN THE FIELD

WATER QUALITY
HUNTINGTON CREEK
1989

LOCATION	PARAMETER	TEST_DATE	VALUE	UNITS
F1	FIELD CONDUCTIVITY	89/09/29	266.6666	UMOHS/L
		89/11/13	493.3333	UMOHS/L
	PH	89/09/29	7.6666	UNITS
		89/11/13	8.3333	UNITS
	SOLIDS-TOTAL DISSOLVED	89/09/29	386.6666	MG/L
		89/11/13	256.6666	MG/L
	SOLIDS-TOTAL SUSPENDED	89/09/29	21.6666	MG/L
		89/11/13	13.0000	MG/L
	SULFATE	89/09/29	4.6666	MG/L
		89/11/13	43.0000	MG/L

WATER QUALITY
HUNTINGTON CREEK
1989

LOCATION	PARAMETER	TEST_DATE	VALUE	UNITS
UPL1	FIELD CONDUCTIVITY	89/10/13	384.0000	UMOHS/L
	PH	89/06/27	7.7000	UNITS
		89/08/15	8.0000	UNITS
		89/10/13	7.6000	UNITS
	SOLIDS-TOTAL DISSOLVED	89/06/27	236.0000	MG/L
		89/08/15	174.0000	MG/L
		89/10/13	236.0000	MG/L
	SOLIDS-TOTAL SUSPENDED	89/06/27	4.0000	MG/L
		89/08/15	18.0000	MG/L
		89/10/13	4.0000	MG/L

WATER QUALITY
HUNTINGTON CREEK
1989

LOCATION	PARAMETER	TEST_DATE	VALUE	UNITS
UP-1	FIELD CONDUCTIVITY	89/01/31	351.0000	UMOHS/L
		89/10/13	341.0000	UMOHS/L
	PH	89/01/31	8.2000	UNITS
		89/06/27	7.7000	UNITS
		89/09/15	8.9500	UNITS
		89/10/13	7.8000	UNITS
	SOLIDS-TOTAL DISSOLVED	89/01/31	226.0000	MG/L
		89/06/27	210.0000	MG/L
		89/09/15	159.0000	MG/L
		89/10/13	224.0000	MG/L
	SOLIDS-TOTAL SUSPENDED	89/01/31	42.0000	MG/L
		89/06/27	14.0000	MG/L
		89/09/15	12.0000	MG/L
		89/10/13	2.0000	MG/L
	SULFATE	89/01/31	17.0000	MG/L

WATER QUALITY
HUNTINGTON CREEK
1989

LOCATION	PARAMETER	TEST_DATE	VALUE	UNITS
UPL3	FIELD CONDUCTIVITY	89/01/31	266.0000	UMOHS/L
		89/10/13	251.0000	UMOHS/L
	PH	89/01/31	7.6000	UNITS
		89/06/27	7.4000	UNITS
		89/08/15	7.7000	UNITS
		89/10/13	7.3000	UNITS
	SOLIDS-TOTAL DISSOLVED	89/01/31	200.0000	MG/L
		89/06/27	196.0000	MG/L
		89/08/15	138.0000	MG/L
		89/10/13	176.0000	MG/L
	SOLIDS-TOTAL SUSPENDED	89/01/31	1.0000	MG/L
		89/06/27	1.0000	MG/L
		89/08/15	1.0000	MG/L
		89/10/13	1.0000	MG/L
	SULFATE	89/01/31	10.0000	MG/L

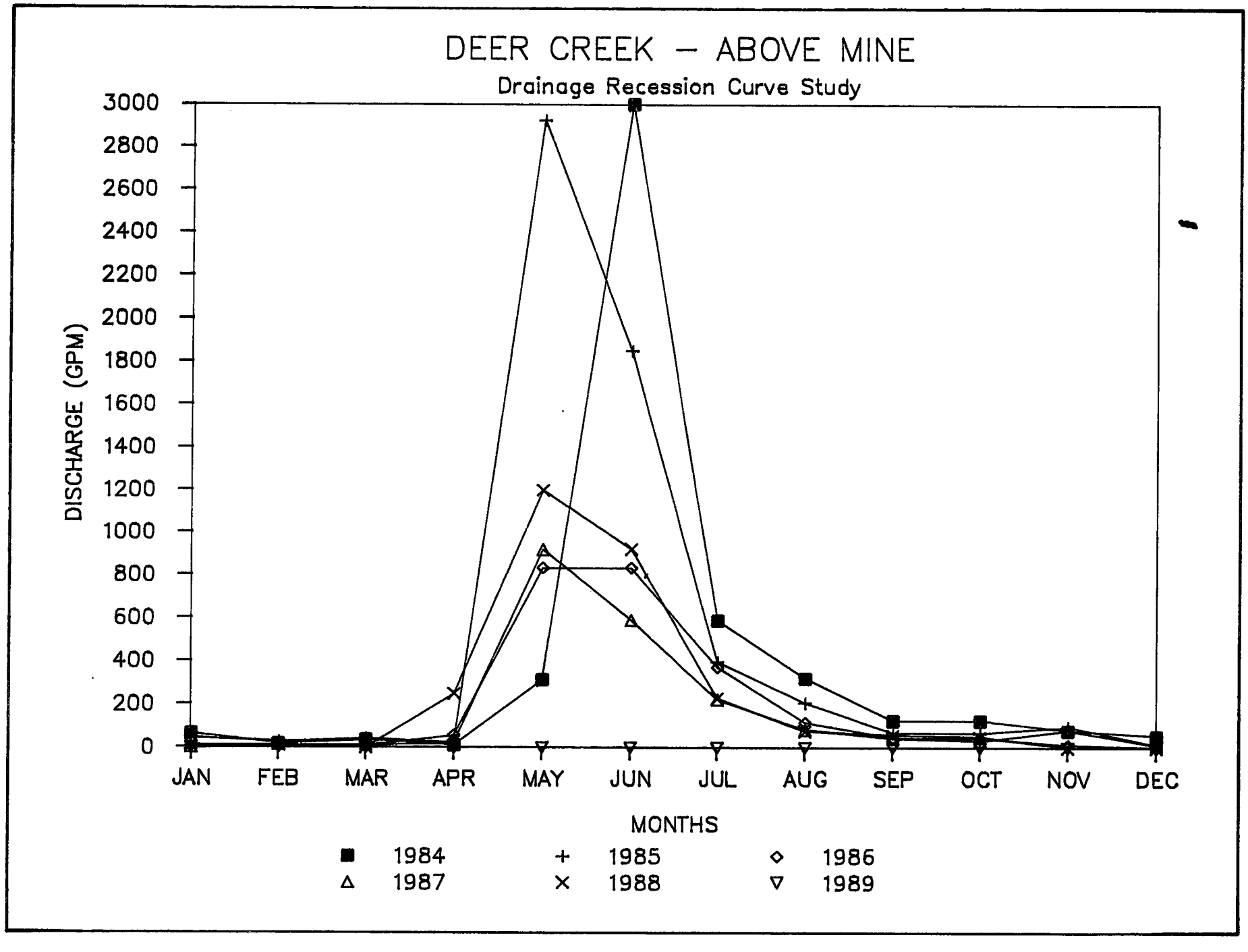
WATER QUALITY
HUNTINGTON CREEK
1989

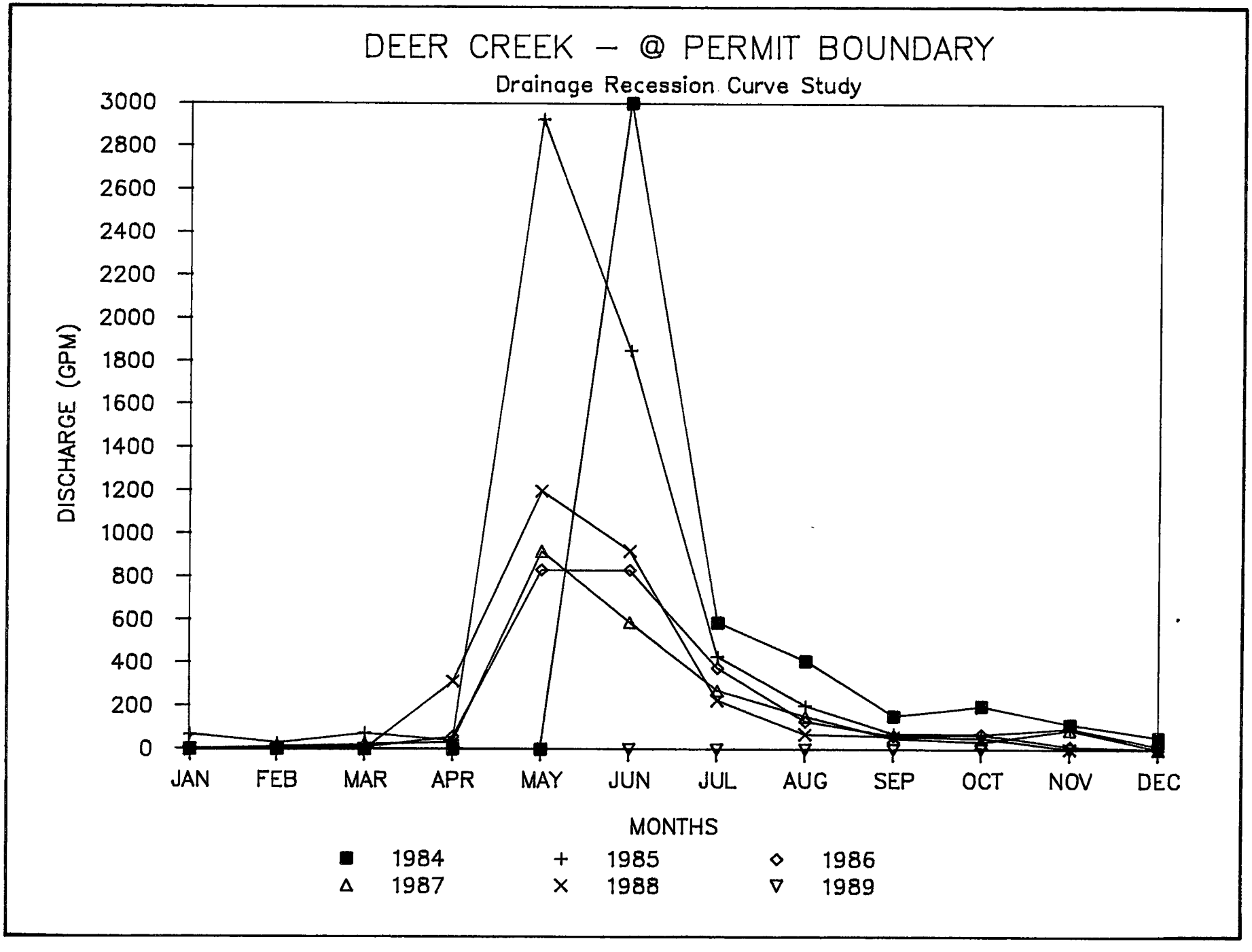
LOCATION	PARAMETER	TEST_DATE	VALUE	UNITS
JPL34	FIELD CONDUCTIVITY	89/10/13	202.0000	UMHO/CM
	PH	89/06/27	7.6000	UNITS
		89/10/13	7.5000	UNITS
	SOLIDS-TOTAL DISSOLVED	89/06/27	192.0000	MG/L
		89/10/13	148.0000	MG/L
	SOLIDS-TOTAL SUSPENDED	89/06/27	6.0000	MG/L
		89/10/13	1.0000	MG/L

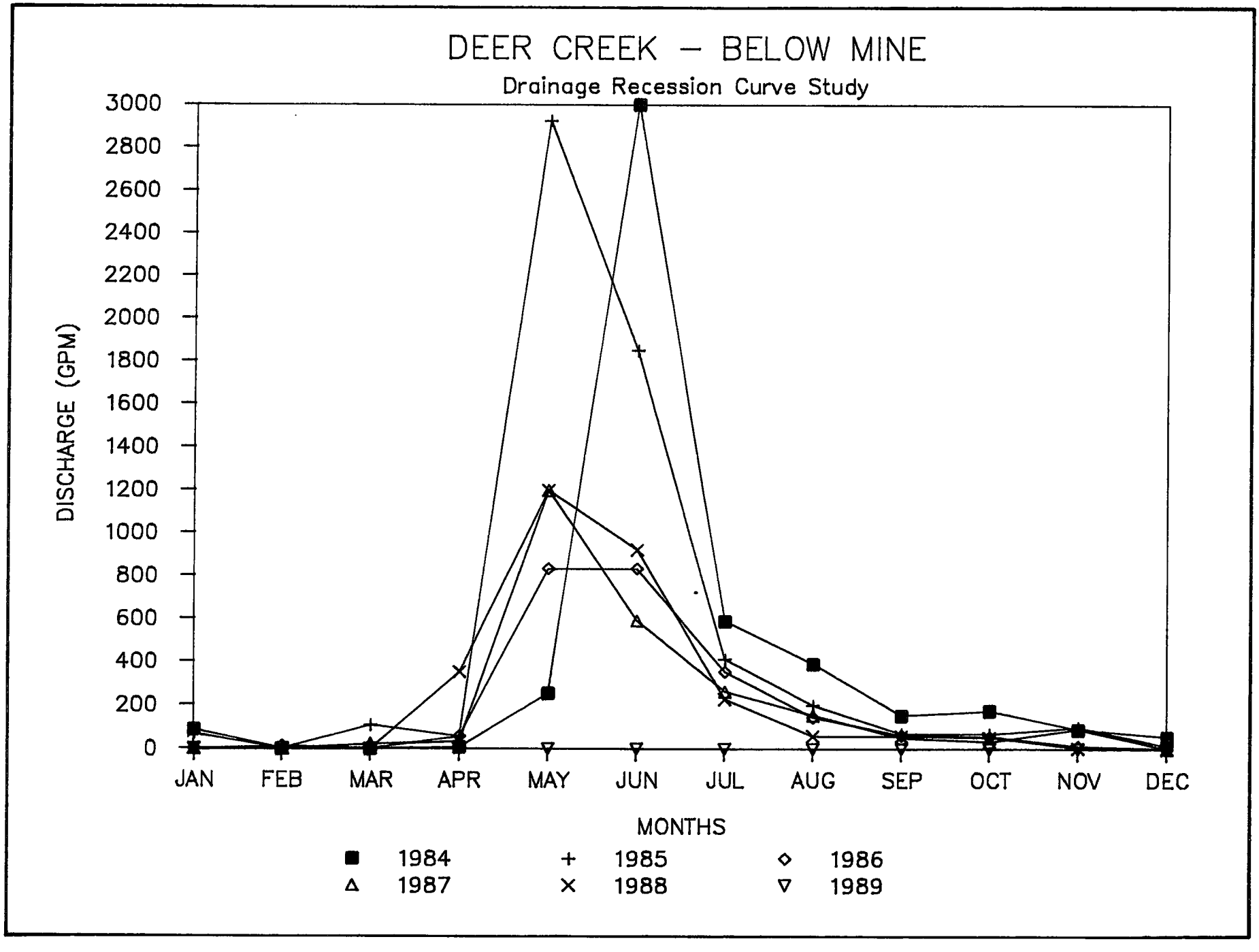
WATER QUALITY
HUNTINGTON CREEK
1989

LOCATION	PARAMETER	TEST_DATE	VALUE	UNITS
UPL9	FIELD CONDUCTIVITY	89/09/29	350.0000	UMOHS/L
		89/11/13	400.0000	UMOHS/L
	PH	89/09/29	7.9000	UNITS
		89/11/13	8.0000	UNITS
	SOLIDS-TOTAL DISSOLVED	89/09/29	198.0000	MG/L
		89/11/13	360.0000	MG/L
	SOLIDS-TOTAL SUSPENDED	89/09/29	32.0000	MG/L
		89/11/13	1.0000	MG/L
	SULFATE	89/09/29	34.0000	MG/L
		89/11/13	88.0000	MG/L

APPENDIX B


DEER CREEK – ABOVE 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
1984
1985
1986
1987
1988
1989


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
1984
1985
1986
1987
1988
1989


DEER CREEK – BELOW MINE
Drainage Recession Curve Study
DISCHARGE (GPM)
3000
2800
2600
2400
2200
2000
1800
1600
1400
1200
1000
800
600
400
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JAN
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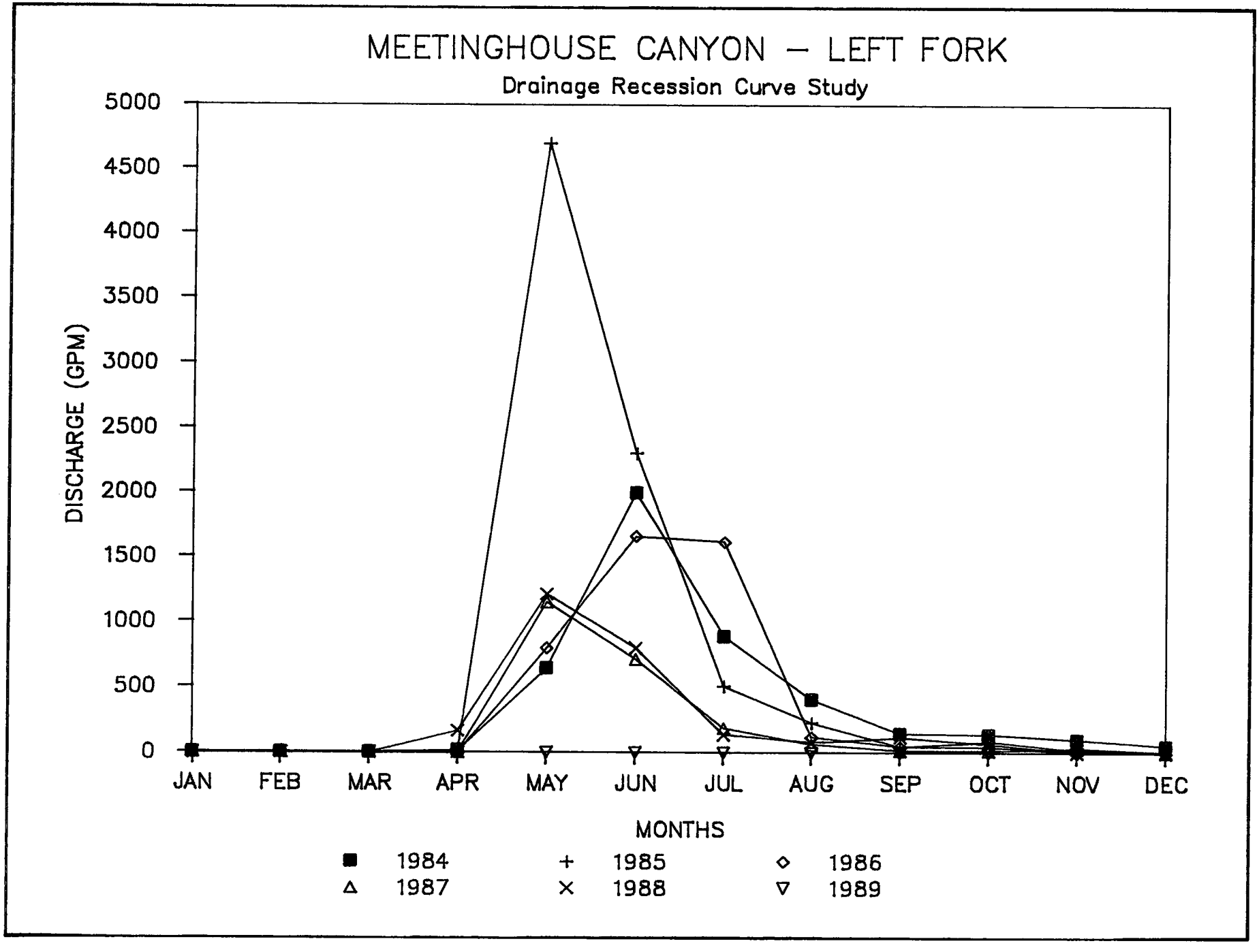
1988
1989

APPENDIX C


MEETINGHOUSE CANYON – LEFT FORK
Drainage Recession Curve Study
DISCHARGE (GPM)
5000
4500
4000
3500
3000
2500
2000
1500
1000
500
0
JAN
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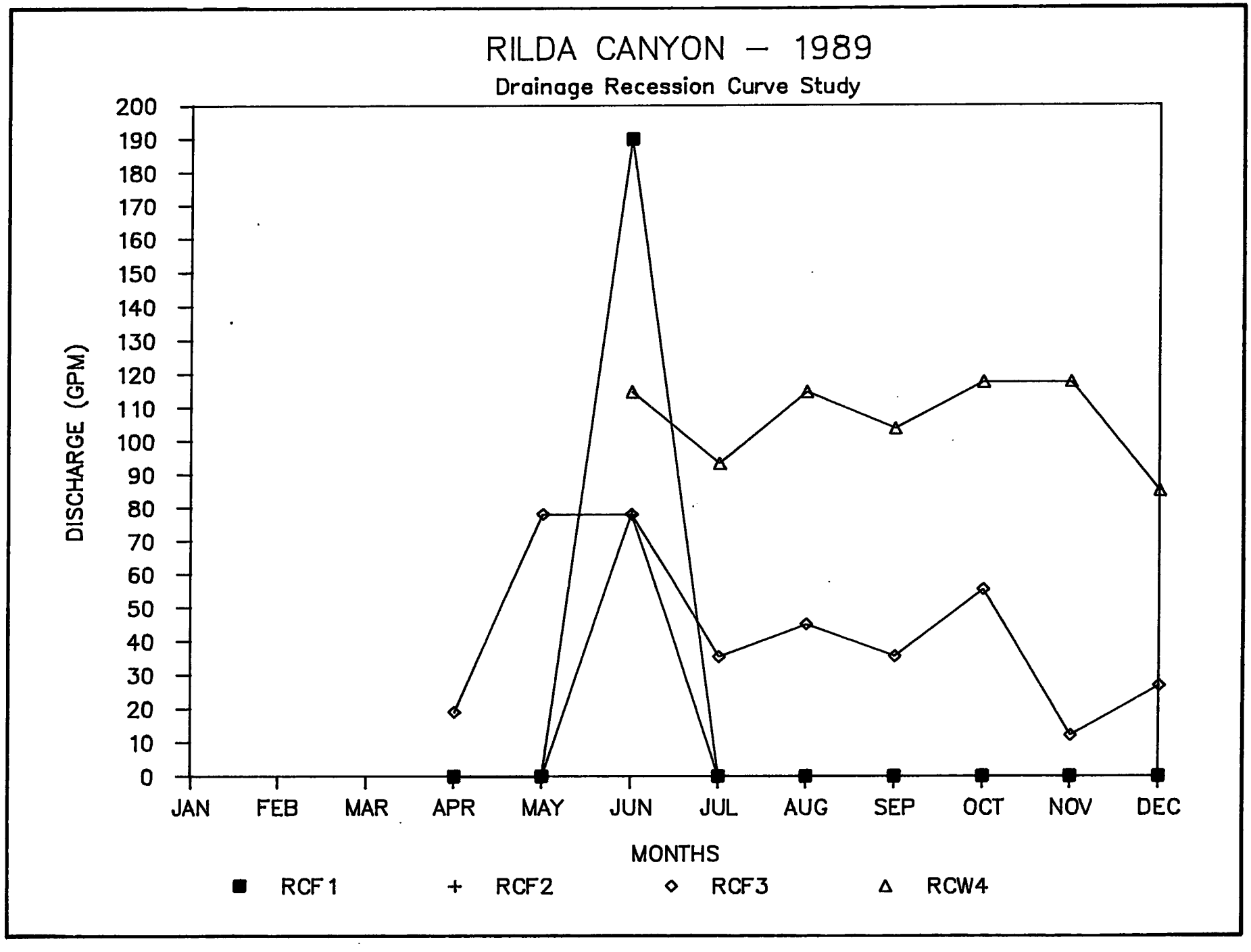
APPENDIX D


RILDA CANYON – 1989
Drainage Recession Curve Study
DISCHARGE (GPM)
200
190
180
170
160
150
140
130
120
110
100
90
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70
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JAN
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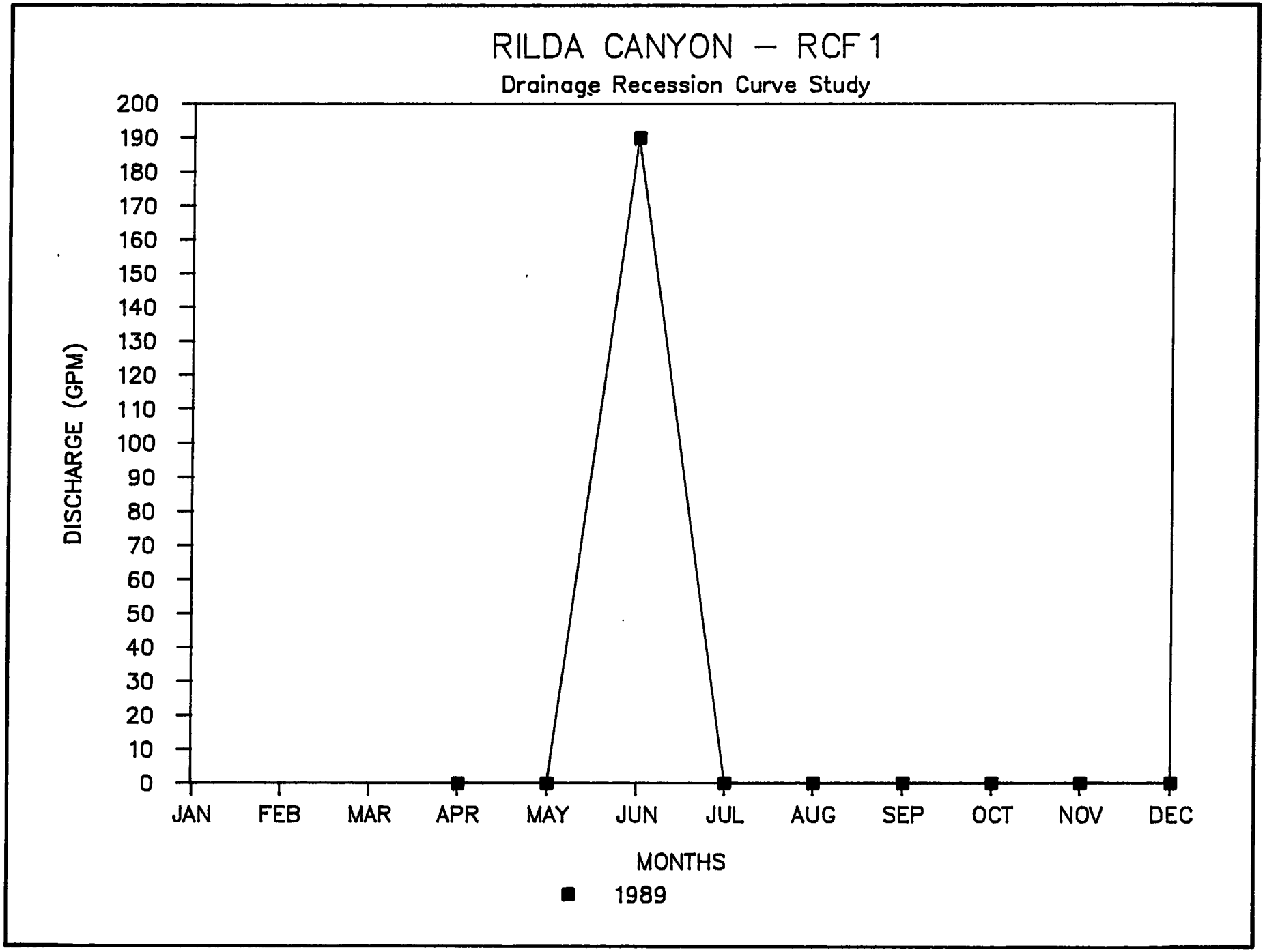
MONTHS
RCF1
RCF2
RCF3
RCW4


RILDA CANYON – RCF 1
Drainage Recession Curve Study
DISCHARGE (GPM)
200
190
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160
150
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120
110
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MONTHS
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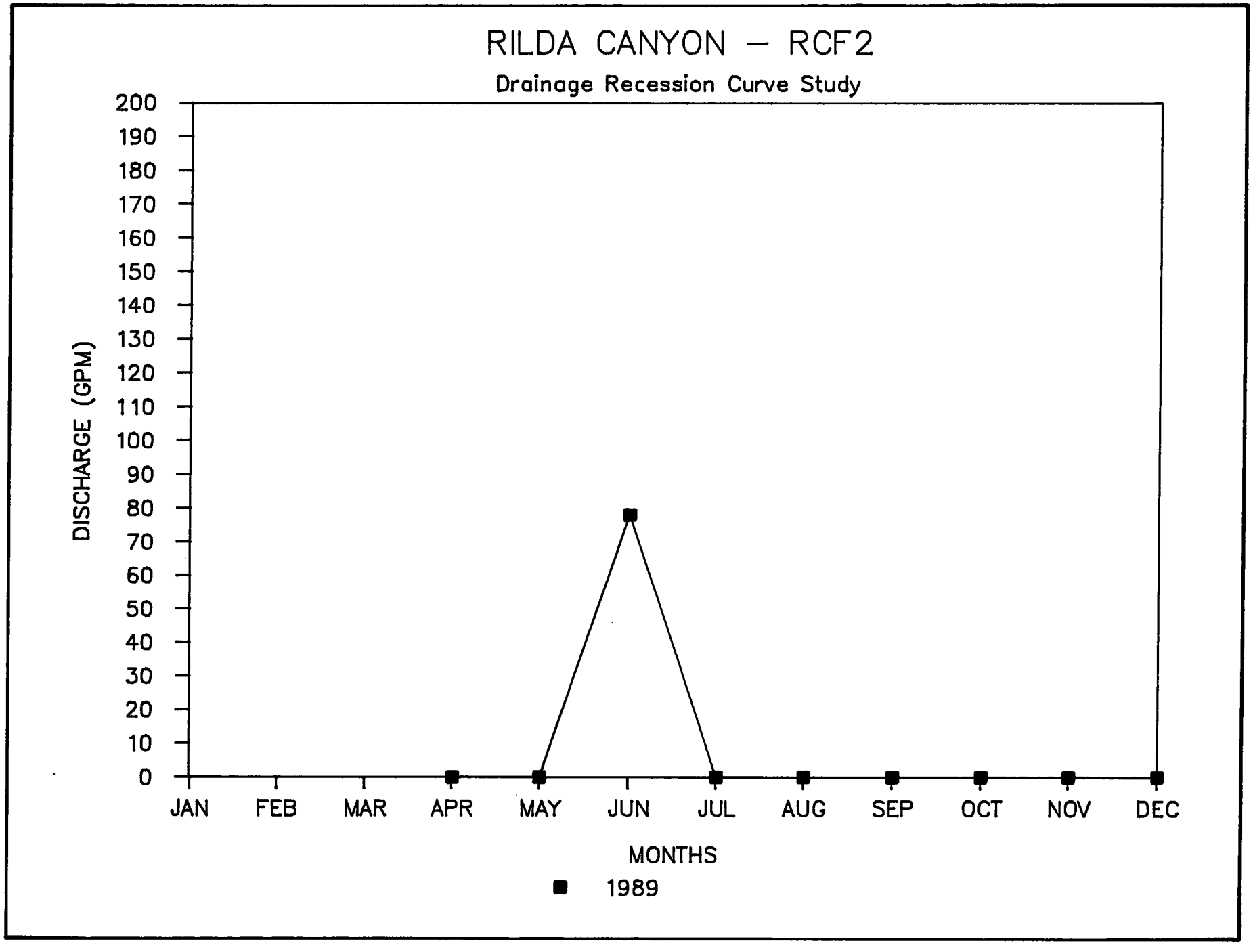
RILDA CANYON – RCF2
Drainage Recession Curve Study
DISCHARGE (GPM)
200
190
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160
150
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130
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110
100
90
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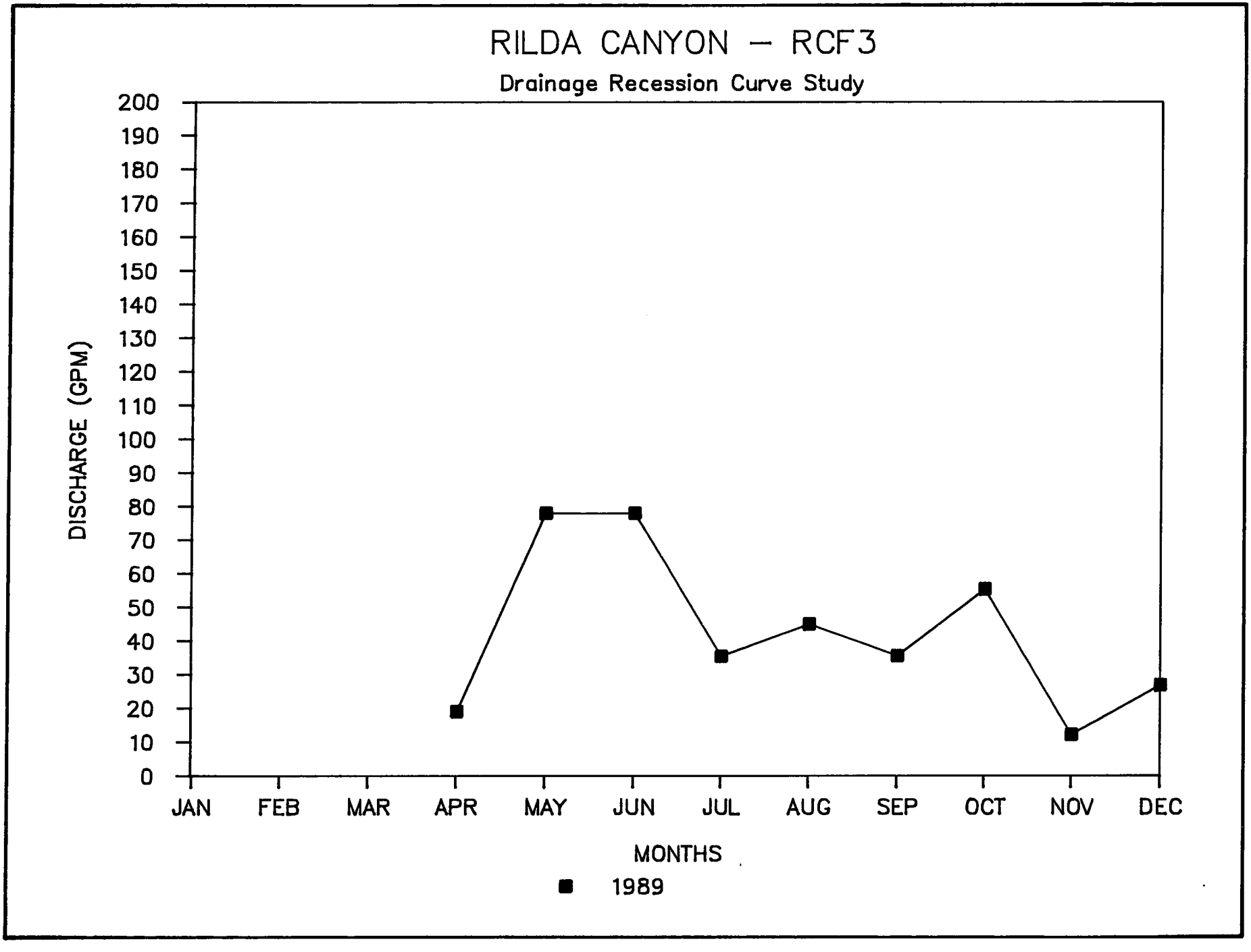
MONTHS
1989


RILDA CANYON – RCF3
Drainage Recession Curve Study
DISCHARGE (GPM)
200
190
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170
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130
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110
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MONTHS
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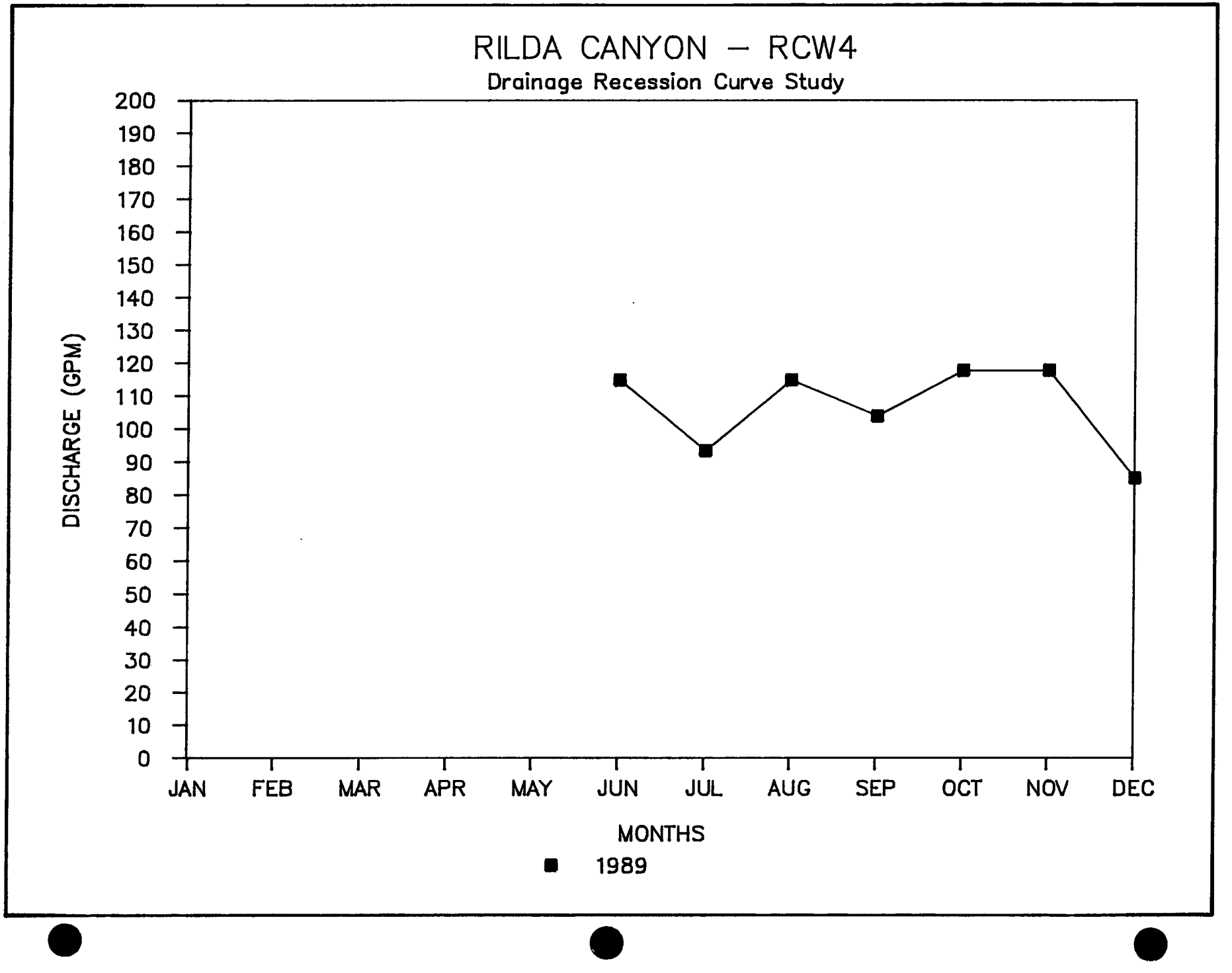
RILDA CANYON – RCW4
Drainage Recession Curve Study
DISCHARGE (GPM)
200
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JAN
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MAY
JUN
JUL
AUG
SEP
OCT
NOV
DEC
MONTHS
1989

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, 1989

Job No.: 59 9761

Date Rec'd: June 12, 1989

Date Sampled: June 12, 1989

Sampled By: UP&L

Sample ID: UP&L

RILDA CANYON RCF#1
Above EM-47
Temperature 54 degrees
Flow 0.15/189.8 gpm
Rec'd 1630 hr.
Sampled 1505 hr.

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

WATER ANALYSIS

Acidity	06-21-89	1400 hr.	1< mg/l CaCO3	Chloride	06-13-89	1515 hr.	10.0 mg/l
Aluminum	07-09-89	1100 hr.	0.01< mg/l	Chromium	07-09-89	1100 hr.	0.02< mg/l
Alk., Bicarbonate	06-20-89	1600 hr.	227 mg/l HCO3	Conductivity	06-16-89	1315 hr.	300 umhos/cm
Alk., Carbonate	06-20-89	1600 hr.	1< mg/l CaCO3	Copper	07-08-89	1700 hr.	0.010< mg/l
Alk., Total	06-20-89	1600 hr.	186 mg/l CaCO3	Fluoride	06-30-89	1400 hr.	0.17 mg/l
Arsenic	07-11-89	1000 hr.	0.002< mg/l	Hardness, Total			201 mg/l CaCO3
Anions, Total			4.39 meq/l	Iron	06-28-89	1315 hr.	0.02< mg/l
Barium	07-09-89	1100 hr.	0.03< mg/l	Iron, Dissolved	06-28-89	1315 hr.	0.02< mg/l
Boron	07-09-89	0900 hr.	0.22 mg/l	Lead	07-08-89	1500 hr.	0.050< mg/l
Cadmium	07-08-89	1500 hr.	0.005< mg/l	Magnesium	06-28-89	1330 hr.	18.60 mg/l
Calcium	06-28-89	1300 hr.	49.8 mg/l	Manganese	06-28-89	1345 hr.	0.01< mg/l
Cations, Total			4.27 meq/l	Mercury	07-10-89	1000 hr.	0.002< mg/l

ANALYST: D. Ipson

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Manager, Huntington Laboratory

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TELEPHONE: (801) 653-2311

July 17, 1989

Job No.: 59 9761

Date Rec'd: June 12, 1989

Date Sampled: June 12, 1989

Sampled By: UP&L

Sample ID: UP&L

RILDA CANYON RCF#1
Above EM-47
Temperature 54 degrees
Flow 0.15/189.8 gpm
Rec'd 1630 hr.
Sampled 1505 hr.

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

WATER ANALYSIS

Molybdenum	0.10<	mg/l	
07-09-89	1100 hr.		
Nickel	0.02<	mg/l	
07-08-89	1600 hr.		
Nitrogen, Ammonia	0.01<	mg/l	
06-19-89	1540 hr.		
Nitrogen, Nitrate	0.21	mg/l	
06-21-89	1000 hr.		
Nitrogen, Nitrite	0.01	mg/l	
06-21-89	1000 hr.		
Oil and Grease	1.0<	mg/l	
06-14-89	0945 hr.		
Oxygen, Dissolved	7.1	mg/l	
06-12-89	1700 hr.		
pH	8.15	Units	
06-12-89	1645 hr.		
Phosphorus, Total	0.01<	mg/l	
06-29-89	1330 hr.		
Potassium	0.60	mg/l	
06-28-89	1400 hr.		
Selenium	0.002<	mg/l	
07-11-89	1030 hr.		
Sodium	5.60	mg/l	
06-28-89	1415 hr.		
Solids, Dissolved	222.0	mg/l	
06-19-89	1630 hr.		
Solids, Settleable	0.05	mg/l	
06-13-89	0930 hr.		
Solids, Suspended	12.0	mg/l	
06-19-89	1630 hr.		
Sulfate	23.0	mg/l	
07-05-89	1300 hr.		
Sulfide	34.40	mg/l	
07-12-89	1500 hr.		
Zinc	0.02	mg/l	
07-08-89	1400 hr.		

ANALYST: D. Tyson

Respectfully submitted,
COMMERCIAL TESTING & ENGINEERING CO.

Manager, Huntington Laboratory

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TELEPHONE: (801) 653-2311

July 17, 1989

Job No.: 59 9760

Date Rec'd: June 12, 1989

Date Sampled: June 12, 1989

Sampled By: UP&L

Sample ID: UP&L

RILDA CANYON RCF # 3
Below New UA
Temperature 62 degrees
Flow 0.10/78.02 gpm
Rec'd 1630 hr.
Sampled 1530 hr.

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

WATER ANALYSIS

Acidity	1<	mg/l CaCO3	Chloride	10.0	mg/l
06-21-89	1400 hr.		06-13-89	1515 hr.	
Aluminum	0.01<	mg/l	Chromium	0.02<	mg/l
07-09-89	1100 hr.		07-09-89	1100 hr.	
Alk., Bicarbonate	338	mg/l HCO3	Conductivity	500	umhos/cm
06-20-89	1600 hr.		06-16-89	1315 hr.	
Alk., Carbonate	1<	mg/l CaCO3	Copper	0.010<	mg/l
06-20-89	1600 hr.		07-08-89	1700 hr.	
Alk., Total	277	mg/l CaCO3	Fluoride	0.19	mg/l
06-20-89	1600 hr.		06-30-89	1400 hr.	
Arsenic	0.003	mg/l	Hardness, Total	379	mg/l CaCO3
07-11-89	1000 hr.				
Anions, Total	8.31	meq/l	Iron	0.51	mg/l
			06-28-89	1315 hr.	
Barium	0.03<	mg/l	Iron, Dissolved	0.41	mg/l
07-09-89	1100 hr.		06-28-89	1315 hr.	
Boron	0.24	mg/l	Lead	0.050<	mg/l
07-09-89	0900 hr.		07-08-89	1500 hr.	
Cadmium	0.006	mg/l	Magnesium	42.50	mg/l
07-08-89	1500 hr.		06-28-89	1330 hr.	
Calcium	81.7	mg/l	Manganese	0.01<	mg/l
06-28-89	1300 hr.		06-28-89	1345 hr.	
Cations, Total	8.06	meq/l	Mercury	0.002<	mg/l
			07-10-89	1000 hr.	

ANALYST: D. Lyon

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

July 17, 1989

Job No.: 59 9760

Date Rec'd: June 12, 1989

Date Sampled: June 12, 1989

Sampled By: UP&L

Sample ID: UP&L

RILDA CANYON RCF #3
Below New UA
Temperature 62 degrees
Flow 0.10/78.02 gpm
Rec'd 1630 hr.
Sampled 1530 hr.

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

WATER ANALYSIS

Molybdenum	0.10<	mg/l	Potassium	1.70	mg/l
07-09-89 1100 hr.			06-28-89 1400 hr.		
Nickel	0.02<	mg/l	Selenium	0.002	mg/l
07-08-89 1600 hr.			07-11-89 1030 hr.		
Nitrogen, Ammonia	0.01<	mg/l	Sodium	10.40	mg/l
06-19-89 1540 hr.			06-28-89 1415 hr.		
Nitrogen, Nitrate	0.01<	mg/l	Solids, Dissolved	372.0	mg/l
06-21-89 1000 hr.			06-19-89 1630 hr.		
Nitrogen, Nitrite	0.01<	mg/l	Solids, Settleable	0.05	mg/l
06-21-89 1000 hr.			06-13-89 0930 hr		
Oil and Grease	1.0<	mg/l	Solids, Suspended	21.0	mg/l
06-14-89 0945 hr.			06-19-89 1630 hr.		
Oxygen, Dissolved	7.5	mg/l	Sulfate	125.0	mg/l
06-12-89 1700 hr.			07-05-89 1300 hr.		
pH	8.00	Units	Sulfide	27.20	mg/l
06-12-89 1645 hr.			07-12-89 1500 hr.		
Phosphorus, Total	0.01<	mg/l	Zinc	0.01	mg/l
06-29-89 1330 hr.			07-08-89 1400 hr.		

ANALYST: D. Tipon

Respectfully submitted,
COMMERCIAL TESTING & ENGINEERING CO.

Manager, Huntington Laboratory

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TELEPHONE: (801) 653-2311

July 17, 1989

Job No.: 59 9759

Date Rec'd: June 12, 1989

Date Sampled: June 12, 1989

Sampled By: UP&L

Sample ID: UP&L

RILDA CANYON RCW4
Temperature 54 degrees
Flow 0.40/114.9 gpm
Rec'd 1630 hr.
Sampled 1540 hr.

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

WATER ANALYSIS

Acidity	1<	mg/l CaCO3	Chloride	15.0	mg/l
06-21-89 1400 hr.			06-13-89 1100 hr.		
Aluminum	0.01<	mg/l	Chromium	0.02<	mg/l
07-09-89 1100 hr.			07-09-89 1100 hr.		
Alk., Bicarbonate	320	mg/l HCO3	Conductivity	450	umhos/cm
06-20-89 1600 hr.			06-16-89 1315 hr.		
Alk., Carbonate	1<	mg/l CaCO3	Copper	0.010<	mg/l
06-20-89 1600 hr.			07-08-89 1700 hr.		
Alk., Total	262	mg/l CaCO3	Fluoride	0.19	mg/l
06-20-89 1600 hr.			06-30-89 1400 hr.		
Arsenic	0.003	mg/l	Hardness, Total	336	mg/l CaCO3
07-11-89 1000 hr.					
Anions, Total	7.52	meq/l	Iron	0.12	mg/l
			06-28-89 1315 hr.		
Barium	0.03<	mg/l	Iron, Dissolved	0.10	mg/l
07-09-89 1100 hr.			06-28-89 1315 hr.		
Boron	0.29	mg/l	Lead	0.050<	mg/l
07-09-89 0900 hr.			07-08-89 1500 hr.		
Cadmium	0.005<	mg/l	Magnesium	43.40	mg/l
07-08-89 1500 hr.			06-28-89 1330 hr.		
Calcium	63.0	mg/l	Manganese	0.01<	mg/l
06-28-89 1300 hr.			06-28-89 1345 hr.		
Cations, Total	7.36	meq/l	Mercury	0.002	mg/l
			07-10-89 1000 hr.		

ANALYST: D. Tyson

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

July 17, 1989

Job No.: 59 9759

Date Rec'd: June 12, 1989

Date Sampled: June 12, 1989

Sampled By: UP&L

Sample ID: UP&L

RILDA CANYON RCW4
Temperature 54 degrees
Flow 0.40/114.9 gpm
Rec'd 1630 hr.
Sampled 1540 hr.

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

WATER ANALYSIS

Molybdenum	07-09-89	1100 hr.	0.10<	mg/l	Potassium	06-28-89	1400 hr.	1.90	mg/l
Nickel	07-08-89	1600 hr.	0.02<	mg/l	Selenium	07-11-89	1030 hr.	0.005	mg/l
Nitrogen, Ammonia	06-19-89	1540 hr.	0.01<	mg/l	Sodium	06-28-89	1415 hr.	13.90	mg/l
Nitrogen, Nitrate	06-21-89	1000 hr.	0.01<	mg/l	Solids, Dissolved	06-19-89	1630 hr.	413.0	mg/l
Nitrogen, Nitrite	06-21-89	1000 hr.	0.01<	mg/l	Solids, Settleable	06-13-89	0930 hr.	0.05<	mg/l
Oil and Grease	06-14-89	0945 hr.	1.5	mg/l	Solids, Suspended	06-19-89	1630 hr.	6.0	mg/l
Oxygen, Dissolved	06-12-89	1700 hr.	7.8	mg/l	Sulfate	07-05-89	1300 hr.	95.0	mg/l
pH	06-12-89	1645 hr.	8.10	Units	Sulfide	07-12-89	1500 hr.	13.80	mg/l
Phosphorus, Total	06-29-89	1330 hr.	0.01<	mg/l	Zinc	07-08-89	1400 hr.	0.02	mg/l

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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 2, 1989

Job No.: 59 10011

Date Rec'd: September 14, 1989

Date Sampled: September 14, 1989

Sampled By: UP&L

Sample ID: UP&L

RCF3
Temperature 47 degrees
Flow 0.06/35.6 gpm
Rec'd 1620 hr.
Sampled 1320 hr.

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

WATER ANALYSIS

Acidity	4	mg/l CaCO3	Chromium	0.02<	mg/l
09-20-89	0900 hr.		09-22-89	1500 hr.	
Aluminum	0.01<	mg/l	Conductivity	700	umhos/cm
09-22-89	1500 hr.		09-26-89	1415 hr.	
Alk., Bicarbonate	500	mg/l HCO3	Copper	0.010<	mg/l
09-20-89	1115 hr.		09-22-89	1525 hr.	
Alk., Carbonate	1<	mg/l CaCO3	Fluoride	0.42	mg/l
09-20-89	1115 hr.		09-25-89	1300 hr.	
Arsenic	0.003	mg/l	Hardness, Total	449	mg/l CaCO3
09-25-89	1000 hr.				
Anions, Total	9.75	meq/l	Iron	0.11	mg/l
			09-29-89	1445 hr.	
Barium	0.03<	mg/l	Lead	0.050<	mg/l
09-22-89	1500 hr.		09-22-89	1417 hr.	
Boron	0.01<	mg/l	Magnesium	50.80	mg/l
09-25-89	0930 hr.		09-29-89	1430 hr.	
Cadmium	0.002<	mg/l	Manganese	0.02	mg/l
09-22-89	1429 hr.		09-29-89	1530 hr.	
Calcium	95.9	mg/l	Mercury	0.002<	mg/l
09-19-89	1400 hr.		09-26-89	1300 hr.	
Cations, Total	9.59	meq/l	Molybdenum	0.10<	mg/l
			09-22-89	1500 hr.	
Chloride	10.0	mg/l	Nickel	0.02<	mg/l
09-20-89	1540 hr.		09-22-89	1432 hr.	

ANALYST: D. Tyson

Respectfully submitted,
COMMERCIAL TESTING & ENGINEERING CO.

Manager, Huntington Laboratory

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TELEPHONE: (801) 653-2311

October 2, 1989

Job No.: 59 10011

Date Rec'd: September 14, 1989

Date Sampled: September 14, 1989

Sampled By: UP&L

Sample ID: UP&L

RCF3
Temperature 47 degrees
Flow 0.06/35.6 gpm
Rec'd 1620 hr.
Sampled 1320 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
09-15-89	1450 hr.		09-28-89	1100 hr.	
Nitrogen, Nitrate	0.13	mg/l	Sodium	13.40	mg/l
09-22-89	1320 hr.		09-19-89	1415 hr.	
Nitrogen, Nitrite	0.01<	mg/l	Solids, Dissolved	495.0	mg/l
09-22-89	1320 hr.		09-19-89	1600 hr.	
Oil and Grease	1.0<	mg/l	Solids, Settleable	0.05<	mg/l
09-25-89	1630 hr.		09-14-89	1700 hr.	
Oxygen, Dissolved	7.6	mg/l	Solids, Suspended	4.0	mg/l
09-14-89	1650 hr.		09-19-89	1600 hr.	
pH	7.90	Units	Sulfate	70.0	mg/l
09-14-89	1635 hr.		09-21-89	1000 hr.	
Phosphorus, Total	0.01<	mg/l	Sulfide	0.01	mg/l
09-22-89	1445 hr.		09-19-89	1335 hr.	
Potassium	2.20	mg/l	Zinc	0.02	mg/l
09-19-89	1445 hr.		09-22-89	1414 hr.	

ANALYST: D. Tyson

OCT - 2 1989

Respectfully submitted,
COMMERCIAL TESTING & ENGINEERING CO.

Manager, Huntington Laboratory

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 2, 1989

Job No.: 59 10012

Date Rec'd: September 14, 1989

Date Sampled: September 14, 1989

Sampled By: UP&L

Sample ID: UP&L

RCF4
Temperature 52 degrees
Flow 0.39/103.9 gpm
Rec'd 1620 hr.
Sampled 1340 hr.

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

WATER ANALYSIS

Acidity	1<	mg/l CaCO3	Chromium	0.11	mg/l
09-20-89	0900 hr.		09-22-89	1500 hr.	
Aluminum	0.01<	mg/l	Conductivity	710	umhos/cm
09-22-89	1500 hr.		09-26-89	1415 hr.	
Alk., Bicarbonate	410	mg/l HCO3	Copper	0.010<	mg/l
09-20-89	1115 hr.		09-22-89	1525 hr.	
Alk., Carbonate	1<	mg/l CaCO3	Fluoride	0.31	mg/l
09-20-89	1115 hr.		09-25-89	1300 hr.	
Arsenic	0.002<	mg/l	Hardness, Total	403	mg/l CaCO3
09-25-89	1000 hr.				
Anions, Total	8.77	meq/l	Iron	0.02<	mg/l
			09-19-89	1445 hr.	
Barium	0.03<	mg/l	Lead	0.050<	mg/l
09-22-89	1500 hr.		09-22-89	1417 hr.	
Boron	0.07	mg/l	Magnesium	54.00	mg/l
09-25-89	0930 hr.		09-19-89	1430 hr.	
Cadmium	0.002<	mg/l	Manganese	0.01<	mg/l
09-22-89	1429 hr.		09-19-89	1530 hr.	
Calcium	72.5	mg/l	Mercury	0.002<	mg/l
09-19-89	1400 hr.		09-26-89	1300 hr.	
Cations, Total	8.86	meq/l	Molybdenum	0.10<	mg/l
			09-22-89	1500 hr.	
Chloride	15.0	mg/l	Nickel	0.10	mg/l
09-20-89	1540 hr.		09-22-89	1432 hr.	

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 2, 1989

Job No.: 59 10012

Sample ID: UP&L

Date Rec'd: September 14, 1989

RCF4
Temperature 52 degrees
Flow 0.39/103.9 gpm
Rec'd 1620 hr.
Sampled 1340 hr.

Date Sampled: September 14, 1989

Sampled By: UP&L

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
09-15-89	1450 hr.		09-28-89	1100 hr.	
Nitrogen, Nitrate	0.17	mg/l	Sodium	17.10	mg/l
09-22-89	1320 hr.		09-19-89	1415 hr.	
Nitrogen, Nitrite	0.01<	mg/l	Solids, Dissolved	477.0	mg/l
09-22-89	1320 hr.		09-19-89	1600 hr.	
Oil and Grease	1.0<	mg/l	Solids, Settleable	0.05<	mg/l
09-25-89	1630 hr.		09-14-89	1700 hr.	
Oxygen, Dissolved	8.7	mg/l	Solids, Suspended	7.0	mg/l
09-14-89	1650 hr.		09-19-89	1600 hr.	
pH	8.30	Units	Sulfate	85.0	mg/l
09-14-89	1635 hr.		09-21-89	1000 hr.	
Phosphorus, Total	0.01<	mg/l	Sulfide	0.01	mg/l
09-22-89	1445 hr.		09-19-89	1335 hr.	
Potassium	2.80	mg/l	Zinc	0.00<	mg/l
09-19-89	1445 hr.		09-22-89	1414 hr.	

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OCT - 3 1989
MINING DIV.
FIELD OFFICE

ANALYST: D. Tyson

Respectfully submitted,
COMMERCIAL TESTING & ENGINEERING CO.

Manager, Huntington Laboratory

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

December 22, 1989

Job No.: 59 10190

Date Rec'd: December 6, 1989

Date Sampled: December 6, 1989

Sampled By: UP&L

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

Sample ID: UP&L

RILDA CANYON RCW 3
Temperature 38 degrees
Flow 0.05/26.9 gpm
pH 7.77
D.O. 5.04
Conductivity 641
Rec'd 1630 hr.
Sampled 1345 hr.

WATER ANALYSIS

Aluminum	0.01<	mg/l	Chromium	0.02<	mg/l
12-19-89	14:00 hr.		12-19-89	14:00 hr.	
Alk., Bicarbonate	481	mg/l HCO3	Conductivity	750	umhos/cm
12-07-89	15:20 hr.		12-07-89	14:30 hr.	
Alk., Carbonate	1<	mg/l CaCO3	Copper	0.010<	mg/l
12-07-89	15:20 hr.		12-19-89	11:00 hr.	
Alk., Total	394	mg/l CaCO3	Fluoride	0.32	mg/l
12-07-89	15:20 hr.		12-19-89	14:00 hr.	
Arsenic	0.002<	mg/l	Hardness, Total	479	mg/l CaCO3
12-21-89	10:00 hr.				
Anions, Total	10.20	meq/l	Iron	0.17	mg/l
			12-11-89	12:00 hr.	
Barium	0.03<	mg/l	Iron, Dissolved	0.04	mg/l
12-19-89	14:00 hr.		12-11-89	12:00 hr.	
Boron	0.04	mg/l	Lead	0.050<	mg/l
12-22-89			12-19-89	11:00 hr.	
Cadmium	0.002<	mg/l	Magnesium	53.10	mg/l
12-19-89	11:00 hr.		12-11-89	11:15 hr.	
Calcium	104.3	mg/l	Manganese	0.04	mg/l
12-11-89	10:30 hr.		12-11-89	12:15 hr.	
Cations, Total	10.21	meq/l	Mercury	0.002<	mg/l
			12-20-89	17:00 hr.	
Chloride	15.0	mg/l	Molybdenum	0.10<	mg/l
12-07-89	13:15 hr.		12-19-89	14:00 hr.	

ANALYST: _____

Respectfully submitted,
COMMERCIAL TESTING & ENGINEERING CO.

Manager, Huntington Laboratory

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

December 22, 1989

Job No.: 59 10190

Date Rec'd: December 6, 1989

Date Sampled: December 6, 1989

Sampled By: UP&L

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

Sample ID: UP&L

RILDA CANYON RCW 3
Temperature 38 degrees
Flow 0.05/26.9 gpm
pH 7.77
D.O. 5.04
Conductivity 641
Rec'd 1630 hr.
Sampled 1345 hr.

WATER ANALYSIS

Nickel	0.02<	mg/l	Selenium	0.002<	mg/l
12-19-89	11:00 hr.		12-21-89	11:00 hr.	
Nitrogen, Ammonia	0.29	mg/l	Sodium	13.40	mg/l
12-13-89	15:50 hr.		12-11-89	11:00 hr.	
Nitrogen, Nitrate	0.06	mg/l	Solids, Dissolved	477.0	mg/l
12-08-89	13:00 hr.		12-14-89	16:00 hr.	
Nitrogen, Nitrite	0.03	mg/l	Solids, Settleable	1.0<	mg/l
12-08-89	13:00 hr.		12-07-89	15:00 hr.	
Oil and Grease	2.8	mg/l	Solids, Suspended	10.0	mg/l
12-14-89	14:35 hr.		12-14-89	16:00 hr.	
Oxygen, Dissolved	7.5	mg/l	Sulfate	100.0	mg/l
12-06-89	16:55 hr.		12-08-89	16:25 hr.	
pH	8.00	Units	Sulfide	1.40	mg/l
12-06-89	17:10 hr.		12-07-89	08:30 hr.	
Phosphorus, Total	0.01<	mg/l	Zinc	0.00<	mg/l
12-19-89	09:30 hr.		12-19-89	11:00 hr.	
Potassium	2.30	mg/l			
12-11-89	11:30 hr.				

ANALYST: _____

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

December 22, 1989

Job No.: 59 10189

Date Rec'd: December 6, 1989

Date Sampled: December 6, 1989

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 37 degrees
Flow 0.36/85.1 gpm
pH 8.04
D.O. 6.4
Conductivity 570
Rec'd 1630 hr.
Sampled 1400 hr.

WATER ANALYSIS

Aluminum	0.01<	mg/l	Chromium	0.02<	mg/l
12-19-89	14:00 hr.		12-19-89	14:00 hr.	
Alk., Bicarbonate	390	mg/l HCO3	Conductivity	750	umhos/cm
12-07-89	15:20 hr.		12-07-89	14:30 hr.	
Alk., Carbonate	1<	mg/l CaCO3	Copper	0.010<	mg/l
12-07-89	15:20 hr.		12-19-89	11:00 hr.	
Alk., Total	320	mg/l CaCO3	Fluoride	0.38	mg/l
12-07-89	15:20 hr.		12-19-89	14:00 hr.	
Arsenic	0.002<	mg/l	Hardness, Total	453	mg/l CaCO3
12-21-89	10:00 hr.				
Anions, Total	9.67	meq/l	Iron	0.02<	mg/l
			12-11-89	12:00 hr.	
Barium	0.03<	mg/l	Iron, Dissolved	0.02<	mg/l
12-19-89	14:00 hr.		12-11-89	12:00 hr.	
Boron	0.15	mg/l	Lead	0.050<	mg/l
12-22-89			12-19-89	11:00 hr.	
Cadmium	0.002<	mg/l	Magnesium	65.70	mg/l
12-19-89	11:00 hr.		12-11-89	11:15 hr.	
Calcium	73.2	mg/l	Manganese	0.02	mg/l
12-11-89	10:30 hr.		12-11-89	12:15 hr.	
Cations, Total	9.84	meq/l	Mercury	0.002<	mg/l
			12-20-89	17:00 hr.	
Chloride	10.0	mg/l	Molybdenum	0.10<	mg/l
12-07-89	13:15 hr.		12-19-89	14:00 hr.	

ANALYST: _____

Respectfully submitted,
COMMERCIAL TESTING & ENGINEERING CO.

Manager, Huntington Laboratory

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

December 22, 1989

Job No.: 59 10189

Date Rec'd: December 6, 1989

Date Sampled: December 6, 1989

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 37 degrees
Flow 0.36/85.1 gpm
pH 8.04
D.O. 6.4
Conductivity 570
Rec'd 1630 hr.
Sampled 1400 hr.

WATER ANALYSIS

Nickel	0.02<	mg/l	Selenium	0.002<	mg/l
12-19-89	11:00 hr.		12-21-89	11:00 hr.	
Nitrogen, Ammonia	0.34	mg/l	Sodium	17.00	mg/l
12-13-89	15:50 hr.		12-11-89	11:00 hr.	
Nitrogen, Nitrate	0.09	mg/l	Solids, Dissolved	496.0	mg/l
12-08-89	13:00 hr.		12-14-89	16:00 hr.	
Nitrogen, Nitrite	0.01<	mg/l	Solids, Settleable	1.0<	mg/l
12-08-89	13:00 hr.		12-07-89	14:00 hr.	
Oil and Grease	2.8	mg/l	Solids, Suspended	7.0	mg/l
12-14-89	14:35 hr.		12-14-89	16:00 hr.	
Oxygen, Dissolved	7.5	mg/l	Sulfate	150.0	mg/l
12-06-89	16:55 hr.		12-08-89	16:25 hr.	
pH	8.20	Units	Sulfide	13.60	mg/l
12-06-89	17:10 hr.		12-07-89	08:30 hr.	
Phosphorus, Total	0.01<	mg/l	Zinc	0.00<	mg/l
12-19-89	08:30 hr.		12-19-89	11:00 hr.	
Potassium	2.30	mg/l			
12-11-89	11:30 hr.				

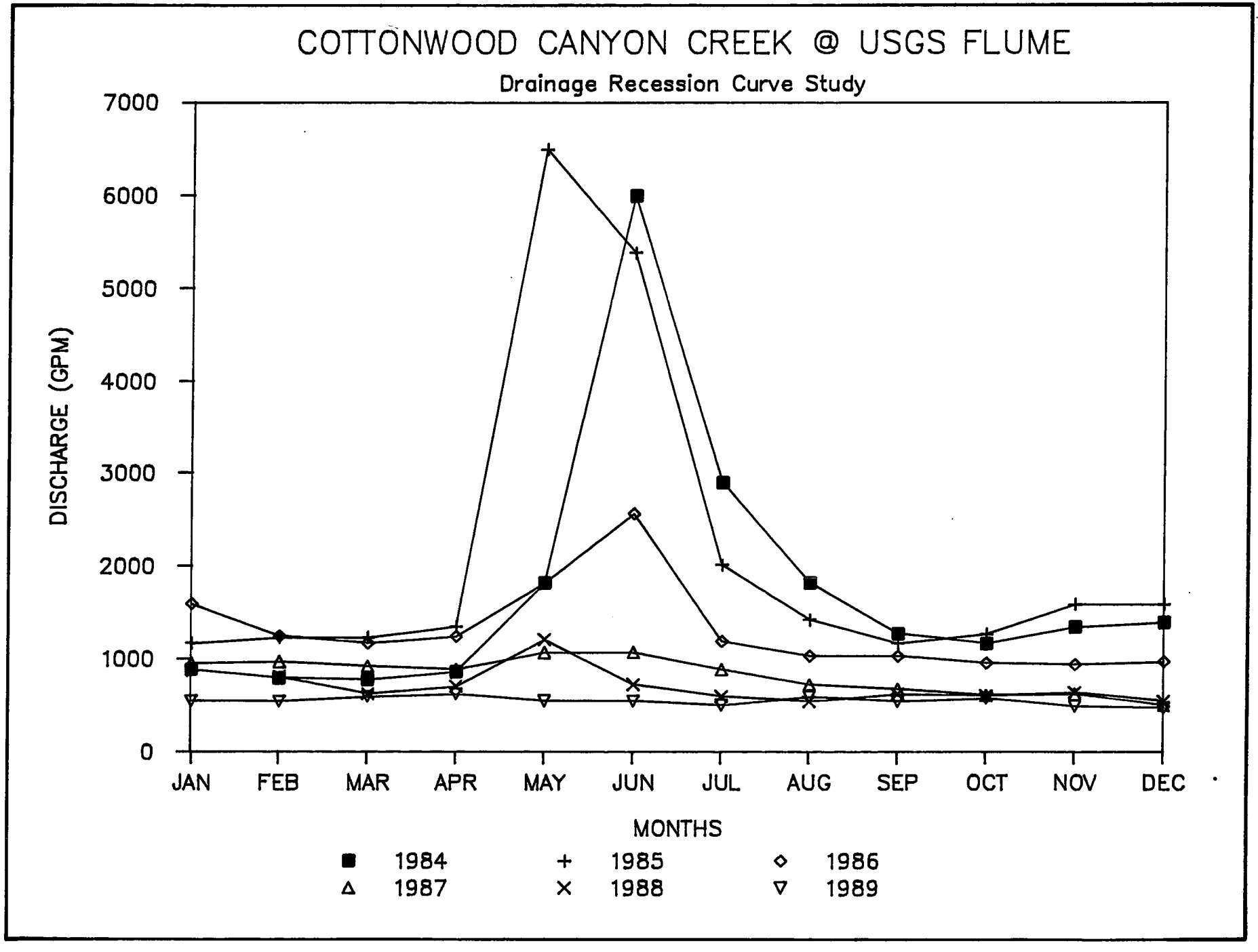
ANALYST: dal cl

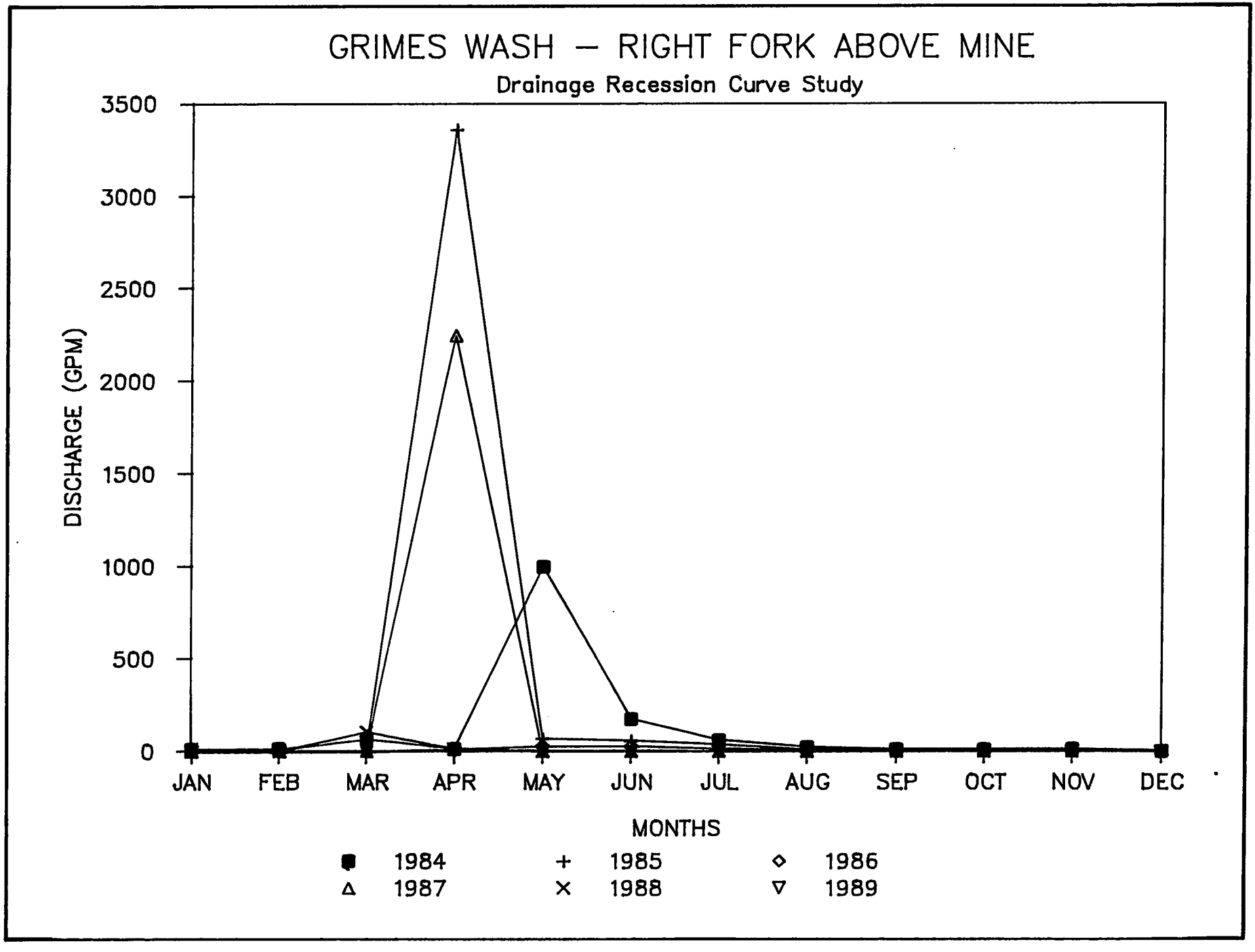
Respectfully submitted,
COMMERCIAL TESTING & ENGINEERING CO.

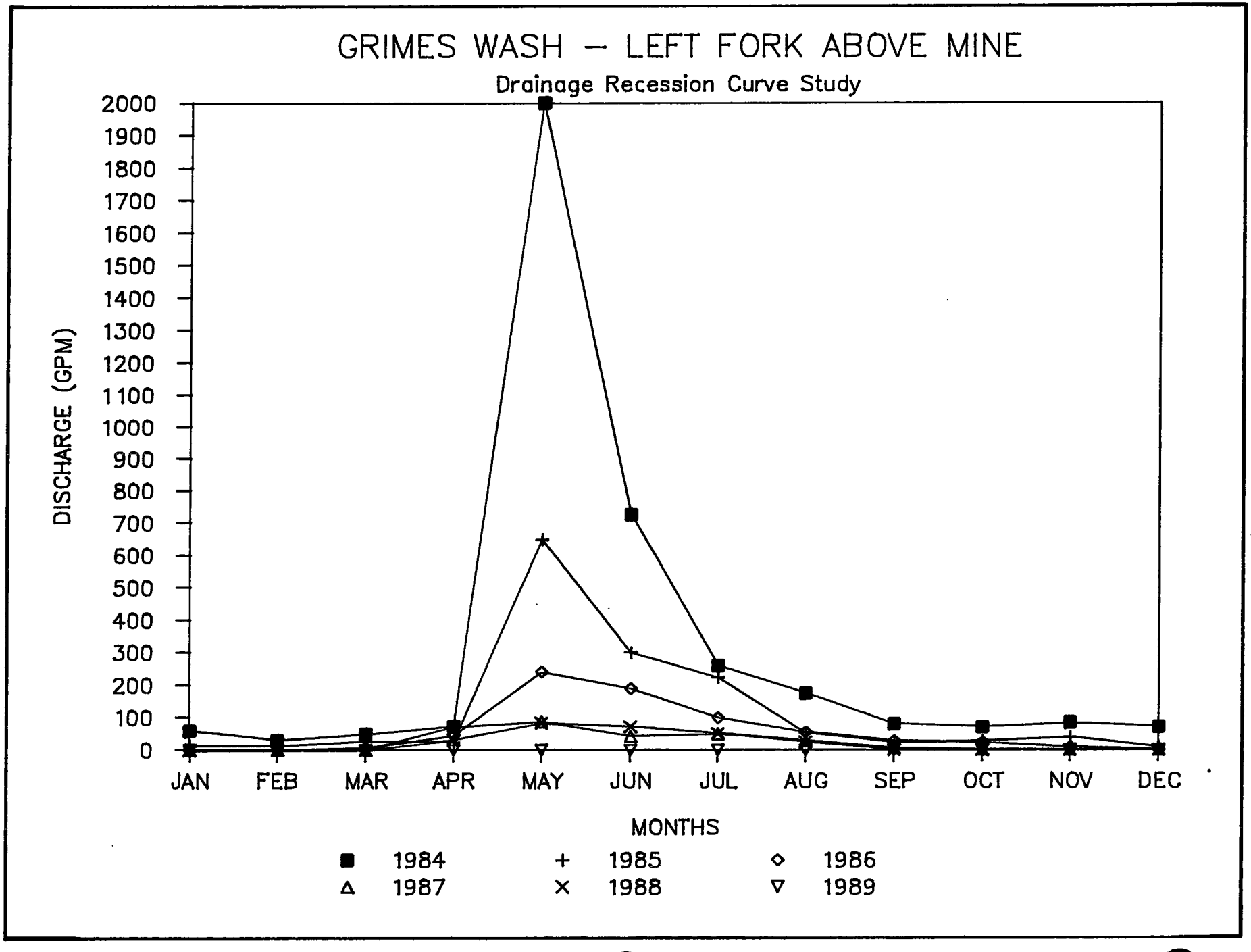
dal cl

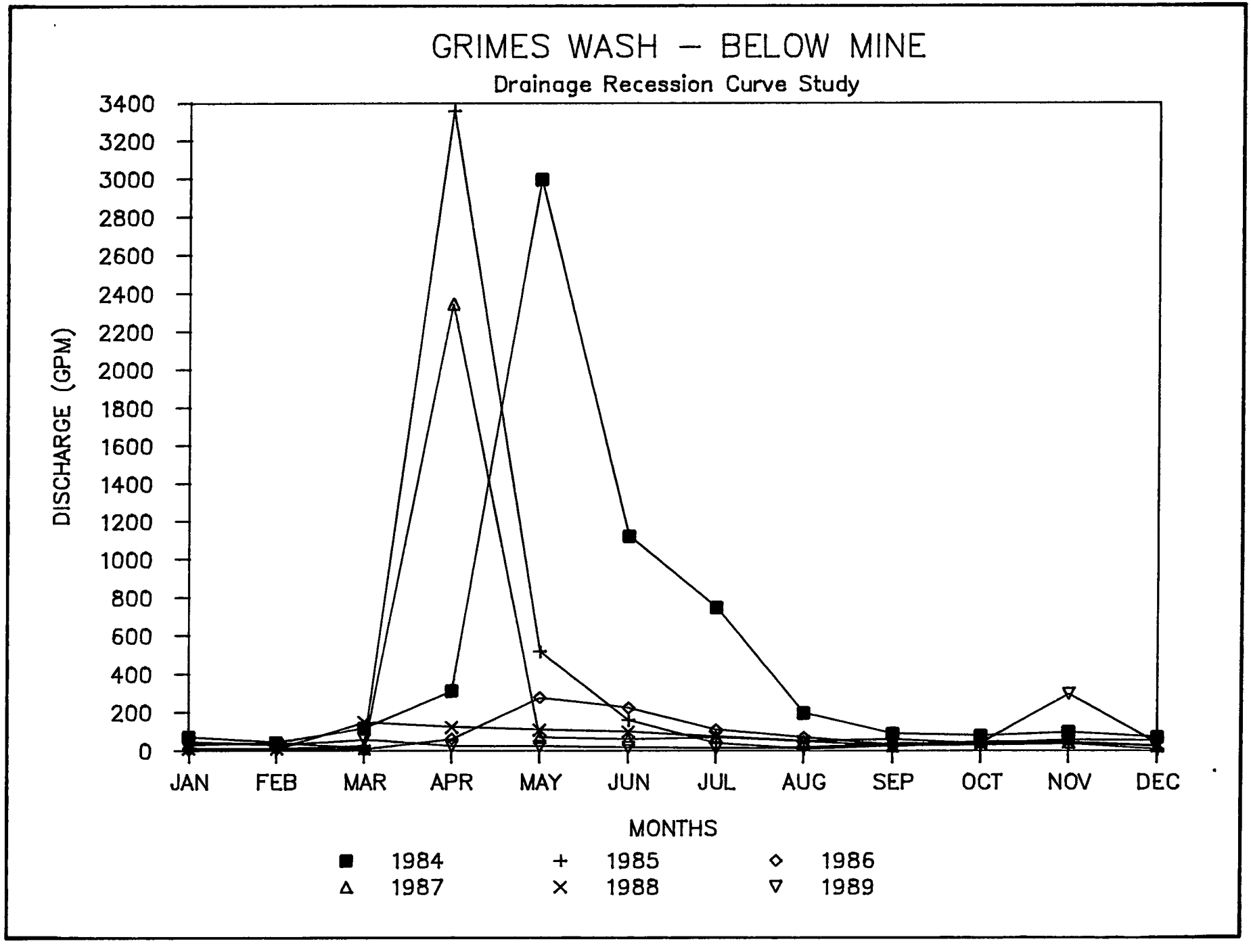
Manager, Huntington Laboratory

APPENDIX E


COTTONWOOD CANYON CREEK @ USGS FLUME
Drainage Recession Curve Study
DISCHARGE (GPM)
7000
6000
5000
4000
3000
2000
1000
0
JAN
FEB
MAR
APR
MAY
JUN
JUL
AUG
SEP
OCT
NOV
DEC
MONTHS
1984
1985
1986
1987
1988
1989


GRIMES WASH – RIGHT FORK ABOVE MINE
Drainage Recession Curve Study
DISCHARGE (GPM)
3500
3000
2500
2000
1500
1000
500
0
JAN
FEB
MAR
APR
MAY
JUN
JUL
AUG
SEP
OCT
NOV
DEC
MONTHS
1984
1985
1986
1987
1988
1989


GRIMES WASH – LEFT FORK ABOVE MINE
Drainage Recession Curve Study
DISCHARGE (GPM)
2000
1900
1800
1700
1600
1500
1400
1300
1200
1100
1000
900
800
700
600
500
400
300
200
100
0
JAN
FEB
MAR
APR
MAY
JUN
JUL
AUG
SEP
OCT
NOV
DEC
MONTHS
1984
1985
1986
1987
1988
1989


GRIMES WASH – BELOW MINE
Drainage Recession Curve Study
DISCHARGE (GPM)
3400
3200
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
1984
1985
1986
1987
1988
1989

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

February 28, 1989

Job No.: 9571

Date Rec'd: March 30, 1989

Date Sampled: March 30, 1989

Sampled By: UP&L

Sample ID:

WILBERG RUN OFF
BELOW THE MINE
Temperature 47 degrees
Flow 60 gpm
Rec'd 1430 hr.
Sampled 1350 hr.

UTAH POWER & LIGHT CO.
P.O. Box 1005
Huntington, Utah 84528

WATER ANALYSIS

Acidity	1<	mg/l CaCO3	Magnesium	90.80	mg/l
04/03/89 . 1345 hr.			04/04/89 . 1315 hr.		
Alk., Bicarbonate	340	mg/l HCO3	Manganese	0.07	mg/l
04/03/89 . 1345 hr.			04/04/89 . 1400 hr.		
Alk., Carbonate	1<	mg/l CaCO3	Oil and Grease	8.3	mg/l
04/03/89 . 1345 hr.			04/07/89 . 1500 hr.		
Anions, Total	31.41	meq/l	Oxygen, Dissolved	7.8	mg/l
			03/30/89 . 1530 hr.		
Calcium	166.0	mg/l	pH	8.15	Units
04/04/89 . 1215 hr.			03/30/89 . 1515 hr.		
Cations, Total	32.12	meq/l	Potassium	7.10	mg/l
			04/04/89 . 1300 hr.		
Chloride	515.0	mg/l	Sodium	376.50	mg/l
04/03/89 . 1530 hr.			04/04/89 . 1200 hr.		
Conductivity	2400	umhos/cm	Solids, Dissolved	1877.0	mg/l
04/05/89 . 1515 hr.			04/05/89 . 1100 hr.		
Hardness, Total	788	mg/l CaCO3	Solids, Setteable	0.05<	mg/l
			03/30/89 . 1600 hr.		
Iron	0.44	mg/l	Solids, Suspended	91.0	mg/l
04/05/89 . 1330 hr.			04/05/89 . 1100 hr.		
Iron, Dissolved	0.33	mg/l	Sulfate	550.0	mg/l
04/05/89 . 1330 hr.			04/04/89 . 1420 hr.		

ANALYST: D. Tipon

Respectfully submitted,
COMMERCIAL TESTING & ENGINEERING CO.

Manager, Huntington Laboratory

COMMERCIAL TESTING & ENGINEERING CO.
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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

July 6, 1989

Job No.: 59 9779

Date Rec'd: June 20, 1989

Date Sampled: June 19, 1989

Sampled By: UP&L

Sample ID: UP&L

GRIMES WASH BELOW MINE
Temperature 63 degrees
Flow 19 gpm
Rec'd 1500 hr.
Sampled 1020 hr.

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

WATER ANALYSIS

Acidity	5	mg/l CaCO3	Iron, Dissolved	0.10	mg/l
06-21-89	1400 hr.		06-28-89	1315 hr.	
Alk., Bicarbonate	404	mg/l HCO3	Magnesium	115.50	mg/l
06-22-89	0900 hr.		06-28-89	1330 hr.	
Alk., Carbonate	1<	mg/l CaCO3	Manganese	0.04	mg/l
06-22-89	0900 hr.		06-28-89	1345 hr.	
Alk., Total	331	mg/l CaCO3	Oil and Grease	1.0<	mg/l
06-22-89	0900 hr.		06-22-89	1100 hr.	
Anions, Total	21.78	meq/l	Oxygen, Dissolved	7.6	mg/l
			06-20-89	1600 hr.	
Calcium	149.4	mg/l	pH	8.00	Units
06-28-89	1300 hr.		06-20-89	1659 hr.	
Cations, Total	21.86	meq/l	Potassium	5.70	mg/l
			06-28-89	1400 hr.	
Chloride	135.0	mg/l	Sodium	111.00	mg/l
06-22-89	1610 hr.		06-28-89	1415 hr.	
Conductivity	1380	umhos/cm	Solids, Dissolved	1310.0	mg/l
06-22-89	1000 hr.		06-21-89	1630 hr.	
Hardness, Total	849	mg/l CaCO3	Solids, Suspended	1.0<	mg/l
			06-21-89	1630 hr.	
Iron	0.10	mg/l	Sulfate	550.0	mg/l
06-28-89	1315 hr.		07-05-89	1300 hr.	

ANALYST: D. Tyson

RECEIVED
JUL 06 1989
MINING DIV.
FIELD OFFICE

Respectfully submitted,
COMMERCIAL TESTING & ENGINEERING CO.

Manager, Huntington Laboratory

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

September 25, 1989

Job No.: 59 10001

Date Rec'd: September 12, 1989

Date Sampled: September 12, 1989

Sampled By: UP&L

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

Sample ID: UP&L

GRIMES WASH BELOW MINE
Temperature 53 degrees
Flow 40 gpm
Rec'd 1600 hr.
Sampled 1440 hr.
FIELD MEASUREMENTS
pH 7.70
D.O. 7.83
Conductivity 1708

WATER ANALYSIS

Acidity	1<	mg/l CaCO3	Iron, Dissolved	0.13	mg/l
09-20-89	1500 hr.		09-19-89	1500 hr.	
Alk., Bicarbonate	410	mg/l HCO3	Magnesium	107.80	mg/l
09-13-89	1130 hr.		09-19-89	1430 hr.	
Alk., Carbonate	1<	mg/l CaCO3	Manganese	0.90	mg/l
09-13-89	1130 hr.		09-19-89	1530 hr.	
Alk., Total	336	mg/l CaCO3	Oil and Grease	1.0<	mg/l
09-13-89	1130 hr.		09-20-89	1100 hr.	
Anions, Total	22.93	meq/l	Potassium	5.20	mg/l
			09-19-89	1445 hr.	
Calcium	184.9	mg/l	Sodium	108.60	mg/l
09-19-89	1400 hr.		09-19-89	1415 hr.	
Cations, Total	22.89	meq/l	Solids, Dissolved	1473.0	mg/l
			09-13-89	1340 hr.	
Chloride	150.0	mg/l	Solids, Suspended	6.0	mg/l
09-13-89	1500 hr.		09-13-89	1340 hr.	
Hardness, Total	906	mg/l CaCO3	Sulfate	580.0	mg/l
			09-13-89	1415 hr.	
Iron	0.13	mg/l			
09-19-89	1500 hr.				

ANALYST: D. Tyson

Respectfully submitted,
COMMERCIAL TESTING & ENGINEERING CO.

Manager, Huntington Laboratory

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

December 18, 1989

Job No.: 59 10186

Date Rec'd: December 5, 1989

Date Sampled: December 5, 1989

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 36 degrees
Flow 40 gpm
pH 7.70
D.O. 9.13
Conductivity 1509
Rec'd 1620 hr.
Sampled 1320 hr.

WATER ANALYSIS

Acidity	6	mg/l CaCO3	Iron, Dissolved	0.09	mg/l
12-13-89 1230 hr.			12-11-89 1200 hr.		
Alk., Bicarbonate	425	mg/l HCO3	Magnesium	50.60	mg/l
12-07-89 1520 hr.			12-11-89 1115 hr.		
Alk., Carbonate	1<	mg/l CaCO3	Manganese	0.01<	mg/l
12-07-89 1520 hr.			12-11-89 1215 hr.		
Alk., Total	348	mg/l CaCO3	Oil and Grease	2.5	mg/l
12-07-89 1520 hr.			12-14-89 1500 hr.		
Anions, Total	9.59	meq/l	Oxygen, Dissolved	9.5	mg/l
			12-05-89 1645 hr.		
Calcium	84.9	mg/l	pH	7.70	Units
12-11-89 1030 hr.			12-05-89 1700 hr.		
Cations, Total	9.32	meq/l	Potassium	3.50	mg/l
			12-11-89 1130 hr.		
Chloride	10.0	mg/l	Sodium	19.30	mg/l
12-07-89 1315 hr.			12-11-89 1100 hr.		
Conductivity	900	umhos/cm	Solids, Dissolved	594.0	mg/l
12-07-89 1430 hr.			12-14-89 1600 hr.		
Hardness, Total	420	mg/l CaCO3	Solids, Suspended	47.0	mg/l
			12-14-89 1600 hr.		
Iron	0.14	mg/l	Sulfate	120.0	mg/l
12-11-89 1200 hr.			12-08-89 1625 hr.		

ANALYST: D. Tyson

RECEIVED
DEC 19 1989
MINING DIV.
FIELD OFFICE

Respectfully submitted,
COMMERCIAL TESTING & ENGINEERING CO.

Russell Snyder
Manager, Huntington Laboratory

APPENDIX F

SPRINGS GEOLOGIC CONDITIONS INVENTORY

Spring Name/Number: 89-61

Location: 1650 **Feet** N [redacted] 2350 **Feet** [redacted] **W of the** Southeast

Corner of Section 5 **Township** 17 South **Range** 7 East

Elevation: 9180 **Feet above mean sea level**

Location Comments: Located on the eastern flanks of East Mountain within a heavily timbered slope.

Formation: North Horn 250 **Feet from** [redacted] **BOTTOM**

Probable Recharge Area: A large portion of the northwest area of UP&L's property may provide recharge to this spring. The spring is located in the base of the Straight Canyon Syncline. Waters from both the north and south can flow downdip to the spring.

Relationship to Adjacent Springs: 89-61 is located along the same fault as springs 79-1, 79-18, 79-19, 79-20 and Elk Spring.

Geologic Circumstances of Spring: Water flowing through channel sands in the North Horn Formation intersects the southern fault of the Roans Canyon Fault graben and flows to the surface. Because this spring is located in the trough of the Straight Canyon Syncline, water will flow toward the spring both from the north and south.

SPRINGS GEOLOGIC CONDITIONS INVENTORY

Spring Name/Number: 89-60 (Alpine Springs)

Location: 1000 **Feet** [redacted] **S** 1800 **Feet E** [redacted] **of the** Southeast

Corner of Section 16 **Township** 17 South **Range** 7 East

Elevation: 8970 **Feet above mean sea level**

Location Comments: Spring located in small clearing

Formation: Price River 100 **Feet from TOP** [redacted]

Probable Recharge Area: Areas of higher elevation to the southwest

Relationship to Adjacent Springs: This spring occurs downdip from spring 79-38.

Geologic Circumstances of Spring: The geologic occurrence of this spring hasnot been identified. It is possible that this spring occurs as a reemergence of water from spring 79-38 or water flowing along fractures in the Price River Formation intersects the land surface forming the spring.

SPRINGS GEOLOGIC CONDITIONS INVENTORY

Spring Name/Number: 89-62

Location: 1850 **Feet** [redacted] **S** 1580 **Feet** [redacted] **W of the** Northeast

Corner of Section 36 **Township** 16 South **Range** 6 East

Elevation: 9980 **Feet above mean sea level**

Location Comments: Spring is located on hillside which is densely populated with spruce trees.

Formation: North Horn 200 **Feet from TOP** [redacted]

Probable Recharge Area: Areas of higher elevation to the west.

Relationship to Adjacent Springs: This spring is not related to other springs within the immediate area.

Geologic Circumstances of Spring: Water flows down from the Flagstaff Limestone along vertical fractures which intersect moderately permeable lenticular channel sandstones in the North Horn Formation. The spring is formed where this channel sandstone intersects the land surface.

SPRINGS GEOLOGIC CONDITIONS INVENTORY

Spring Name/Number: 89-63

Location: 2150 **Feet** N [redacted] 400 **Feet** [redacted] **W of the** Southeast

Corner of Section 36 **Township** 16 South **Range** 6 East

Elevation: 9900 **Feet above mean sea level**

Location Comments: Spring is located on hillside which is densely populated with spruce trees.

Formation: North Horn 300 **Feet from TOP** [redacted]

Probable Recharge Area: Areas of higher elevation to the west.

Relationship to Adjacent Springs: Spring occurs in same manner as spring 89-62

Geologic Circumstances of Spring: Water flows down from the Flagstaff Limestone along vertical fractures which intersect moderately permeable lenticular channel sandstones in the North Horn Formation. The spring is formed where this channel sandstone intersects the land surface.

SPRINGS GEOLOGIC CONDITIONS INVENTORY

Spring Name/Number: 89-64

Location: 2400 **Feet N** [redacted] 800 **Feet E** [redacted] **of the** Southwest **Corner of Section** 31 **Township** 16 South **Range** 7 East

Elevation: 9720 **Feet above mean sea level**

Location Comments: Spring is located in small clearing surrounded by aspen trees.

Formation: North Horn 400 **Feet from TOP** [redacted]

Probable Recharge Area: Areas of higher elevation to the north and west.

Relationship to Adjacent Springs: Spring occurs in same manner as springs 89-62 and 89-63

Geologic Circumstances of Spring: Water flows down from the Flagstaff Limestone along vertical fractures which intersect moderately permeable lenticular channel sandstones in the North Horn Formation. The spring is formed where this channel sandstone intersects the land surface.

SPRINGS GEOLOGIC CONDITIONS INVENTORY

Spring Name/Number: 89-65

Location: 50 **Feet** N [redacted] 600 **Feet** [redacted] **W of the** Southeast

Corner of Section 31 **Township** 17 South **Range** 7 East

Elevation: 9460 **Feet above mean sea level**

Location Comments: Spring is located at the head of a small stock reservoir. Water from this spring feeds the reservoir in part.

Formation: North Horn 350 **Feet from TOP** [redacted]

Probable Recharge Area: Highland areas located to the west.

Relationship to Adjacent Springs: Spring occurs in same manner as 79-17.

Geologic Circumstances of Spring: Water flows down from the Flagstaff Limestone along vertical fractures which intersect moderately permeable fluvial sandstones in the North Horn Formation. The spring is formed where this channel sandstone intersects the land surface.

SPRINGS GEOLOGIC CONDITIONS INVENTORY

Spring Name/Number: 89-66

Location: 700 **Feet** [redacted] **S** 1400 **Feet** [redacted] **W of the** Northeast **Corner of Section** 5 **Township** 17 South **Range** 7 East

Elevation: 9440 **Feet above mean sea level**

Location Comments: Spring is located in a small group of aspen trees.

Formation: North Horn 300 **Feet from** [redacted] **BOTTOM**

Probable Recharge Area: Areas of higher elevation to the west

Relationship to Adjacent Springs: Spring occurs in same manner as 80-48, 89-67, and 89-68.

Geologic Circumstances of Spring: Water flowing laterally through channel sandstones in the North Horn Formation intersects the land surface forming the spring.

SPRINGS GEOLOGIC CONDITIONS INVENTORY

Spring Name/Number: 89-67

Location: 100 **Feet** N [redacted] 1300 **Feet** [redacted] W **of the** Southeast

Corner of Section 32 **Township** 16 South **Range** 7 East

Elevation: 9500 **Feet above mean sea level**

Location Comments: Spring is located at the edge of small group of spruce trees. Water from spring feeds a small reservoir in part.

Formation: North Horn 325 **Feet from** [redacted] **BOTTOM**

Probable Recharge Area: Highland areas located to the west

Relationship to Adjacent Springs: Spring occurs in same manner as 80-48, 89-66, and 89-68.

Geologic Circumstances of Spring: Water flowing laterally through channel sandstones in the North Horn Formation intersects the land surface forming the spring.

SPRINGS GEOLOGIC CONDITIONS INVENTORY

Spring Name/Number: 89-68

Location: 350 **Feet** N [redacted] 800 **Feet** [redacted] **W of the** Southeast

Corner of Section 32 **Township** 16 South **Range** 7 East

Elevation: 9450 **Feet above mean sea level**

Location Comments: Spring is located north of pond in aspen grove.

Formation: North Horn 300 **Feet from** [redacted] **BOTTOM**

Probable Recharge Area: Highland areas located to the west

Relationship to Adjacent Springs: Spring occurs in same manner as 80-48, 89-66, and 89-67.

Geologic Circumstances of Spring: Water flowing laterally through channel sandstones in the North Horn Formation intersects the land surface forming the spring.

SPRINGS GEOLOGIC CONDITIONS INVENTORY

Spring Name/Number: 89-69

Location: 1350 **Feet** S 400 **Feet** W **of the** Northeast

Corner of Section 1 **Township** 17 South **Range** 6 East

Elevation: 9980 **Feet above mean sea level**

Location Comments: Spring is located on top of East Mountain.

Formation: Flagstaff Limestone 180 **Feet from TOP BOTTOM**

Probable Recharge Area: Limited recharge of waters flowing southeast from higher elevations

Relationship to Adjacent Springs: Spring occurs in same manner as Pine Springs and Pine Springs Trough.

Geologic Circumstances of Spring: Water flowing down dip in the Flagstaff Limestone intersects the surface along a joint system trending northeast.

SPRINGS GEOLOGIC CONDITIONS INVENTORY

Spring Name/Number: 89-70

Location: 500 **Feet** N [redacted] 3700 **Feet** [redacted] **W of the** Southeast **Corner of Section** 36 **Township** 16 South **Range** 6 East

Elevation: 9660 **Feet above mean sea level**

Location Comments: Spring is located in small grassy meadow surrounded by aspen trees.

Formation: North Horn 250 **Feet from TOP** [redacted]

Probable Recharge Area: Areas of higher elevation to the northeast

Relationship to Adjacent Springs: Not related to other springs.

Geologic Circumstances of Spring: Water flows down from the Flagstaff Limestone along vertical fractures which intersect a moderately permeable lenticular sandstone channel in the North Horn Formation. The spring is formed where this channel sandstone intersects the land surface.

SPRINGS GEOLOGIC CONDITIONS INVENTORY

Spring Name/Number: 89-71

Location: 900 **Feet** [redacted] **S** 3850 **Feet** [redacted] **W of the** Northeast

Corner of Section 1 **Township** 17 South **Range** 6 East

Elevation: 9450 **Feet above mean sea level**

Location Comments: Spring is located on western flanks of East Mountain in clearing surrounded by aspen and spruce trees.

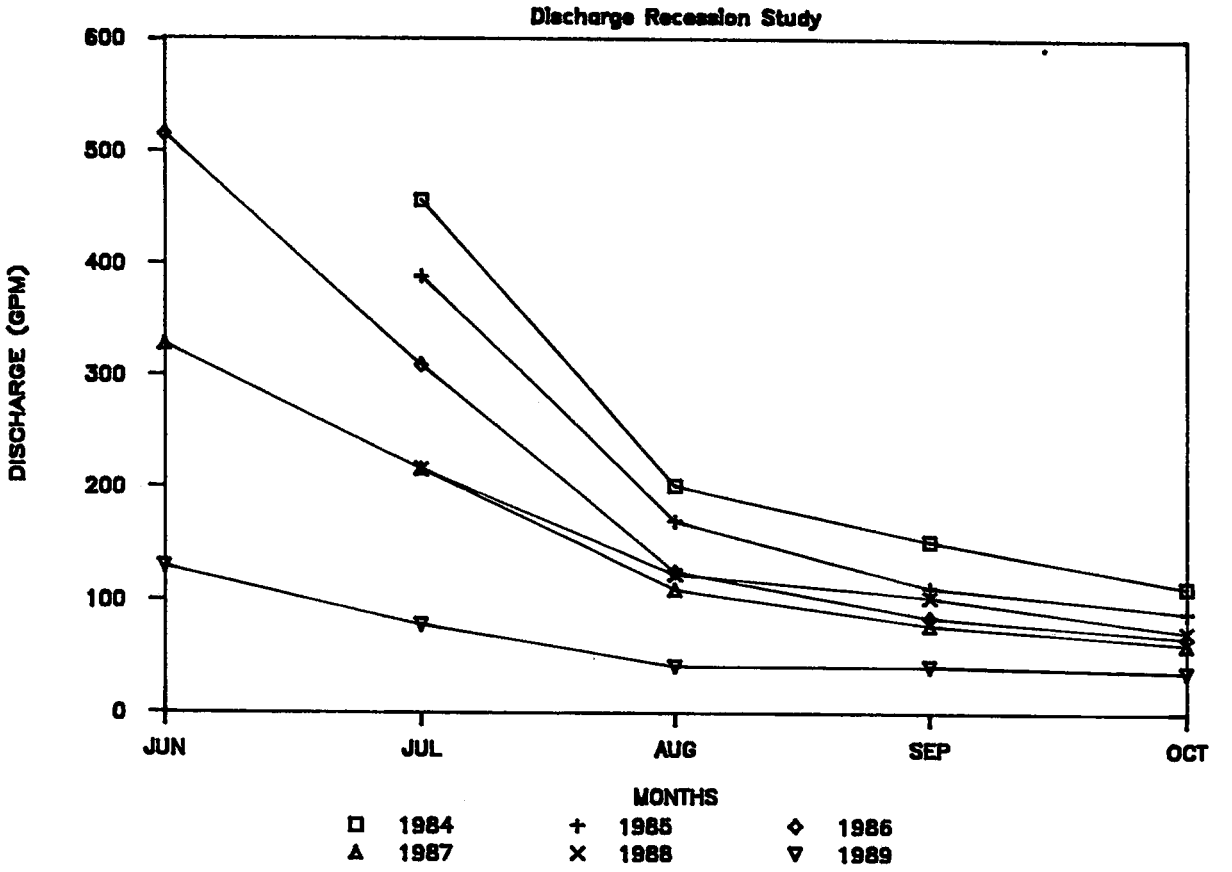
Formation: North Horn 300 **Feet from TOP** [redacted]

Probable Recharge Area: Highlands located to the east

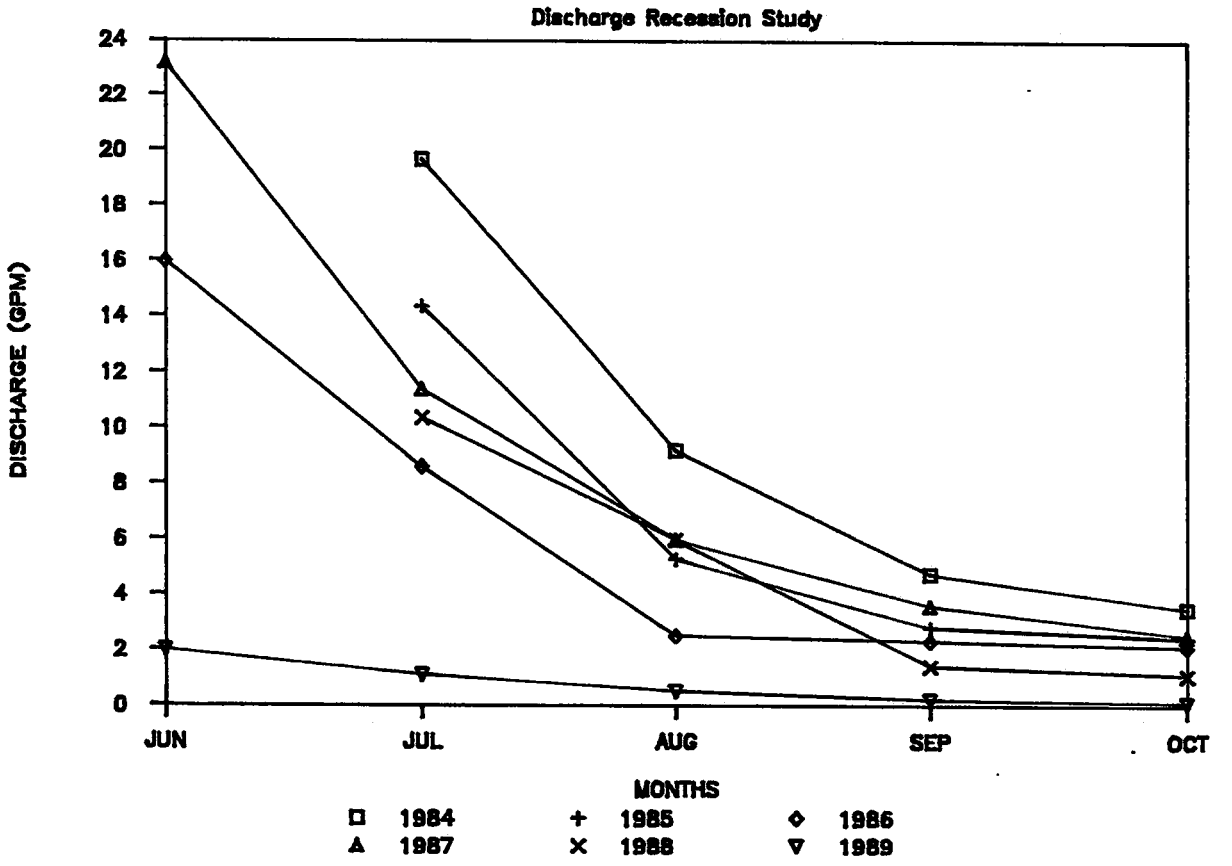
Relationship to Adjacent Springs: Not related to other springs.

Geologic Circumstances of Spring: Water flows down from the Flagstaff Limestone along vertical fractures which intersect a moderately permeable lenticular sandstone channel in the North Horn Formation. The spring is formed where this channel sandstone intersects the land surface.

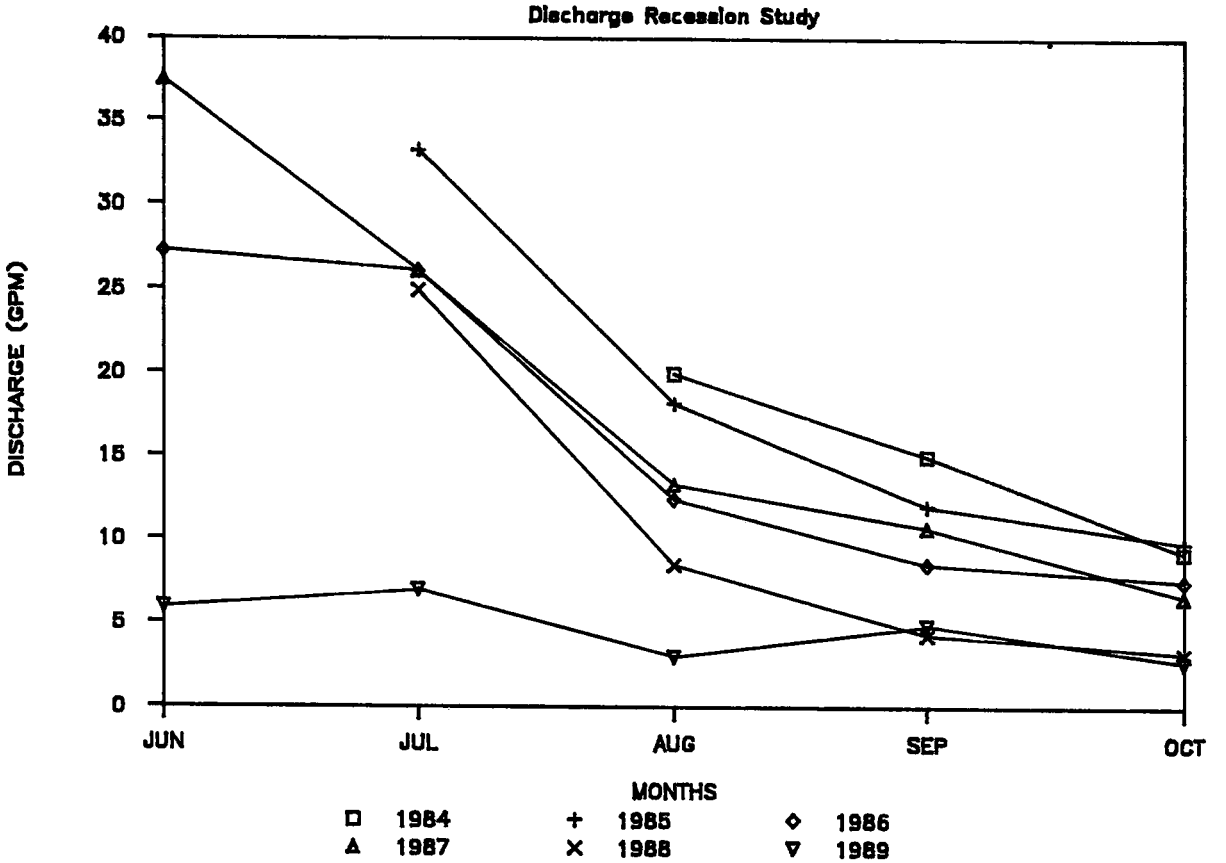
ELK SPRING



SHEBA SPRINGS



79 – 10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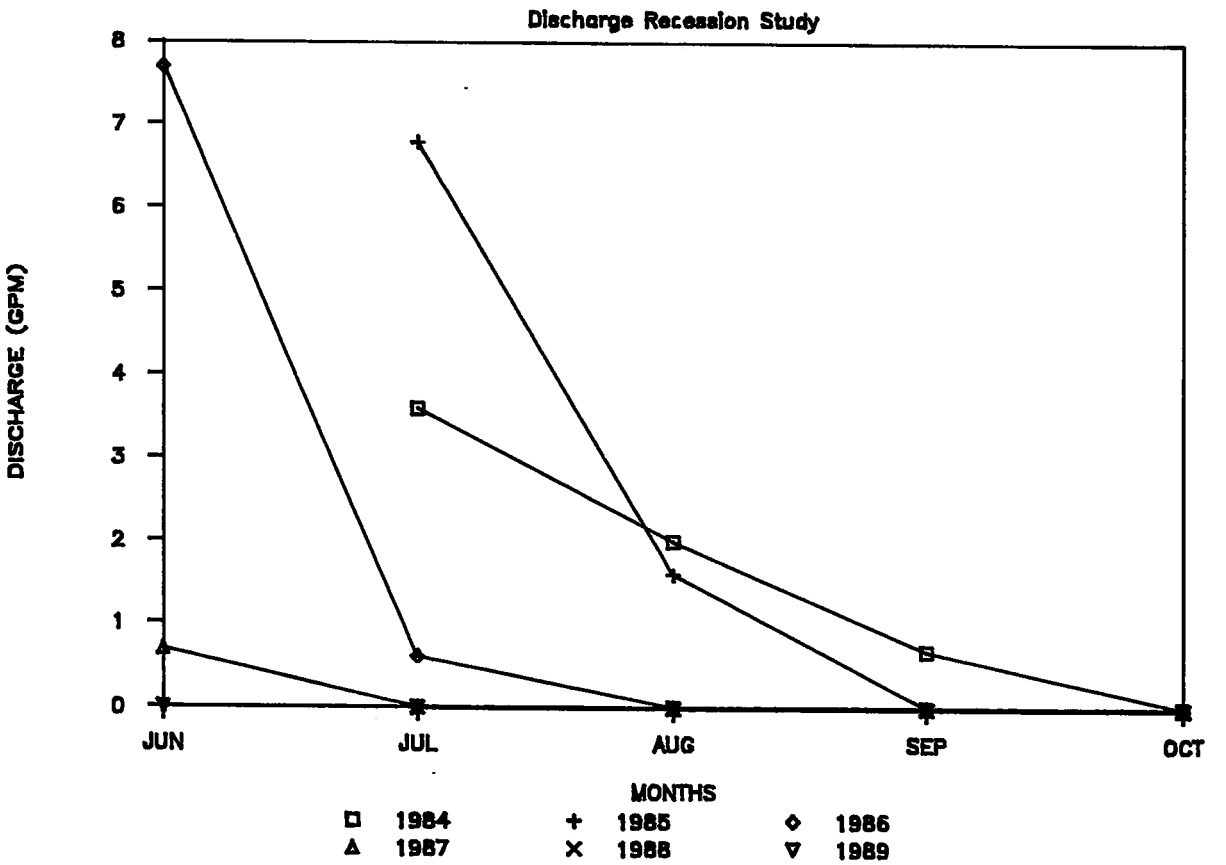
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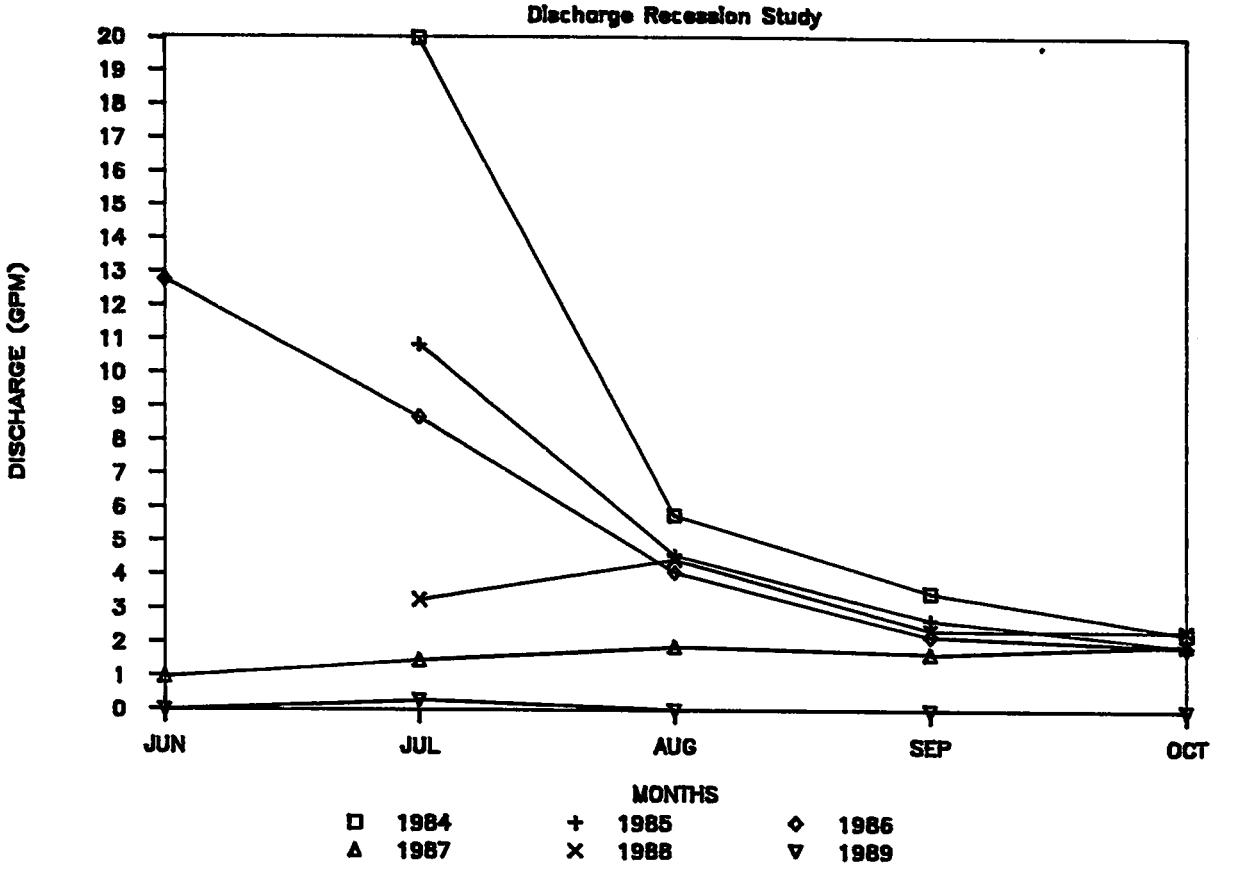
79 – 26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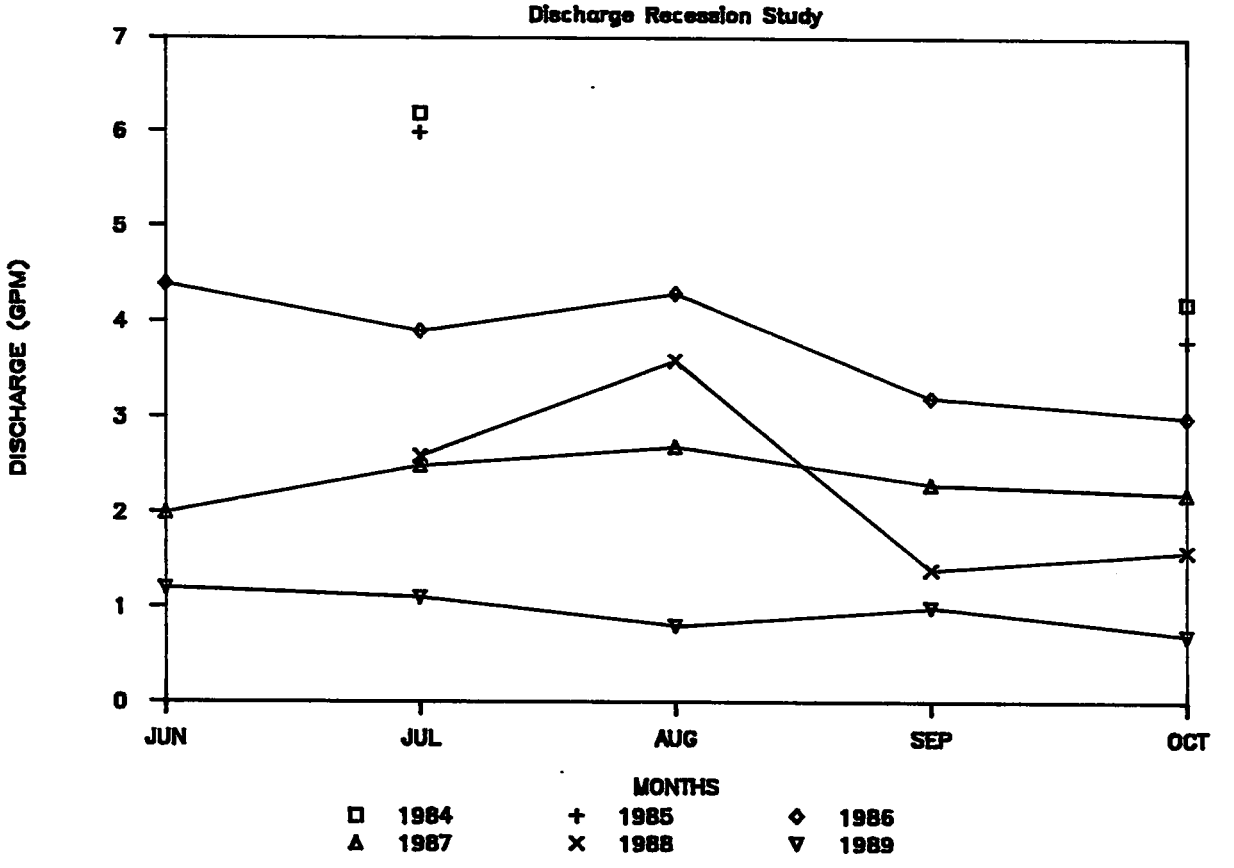
79 – 29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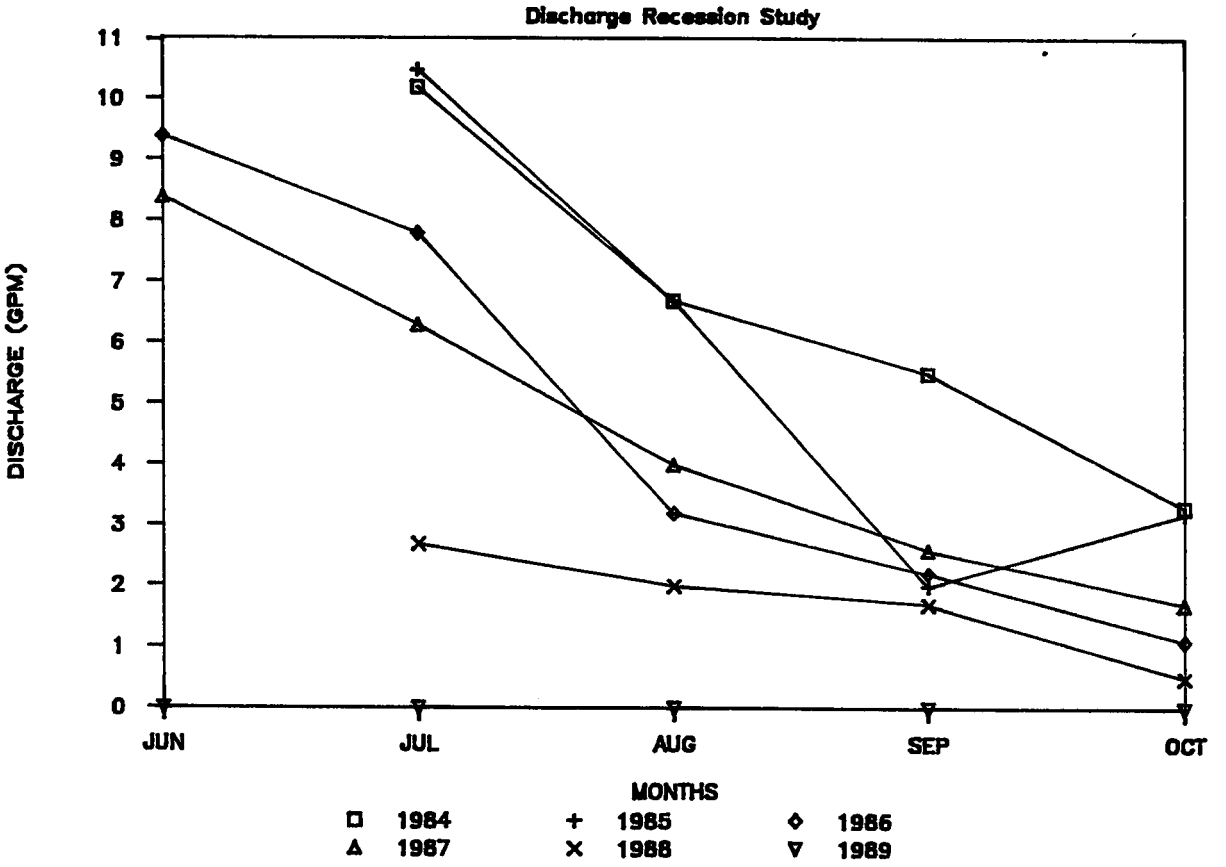
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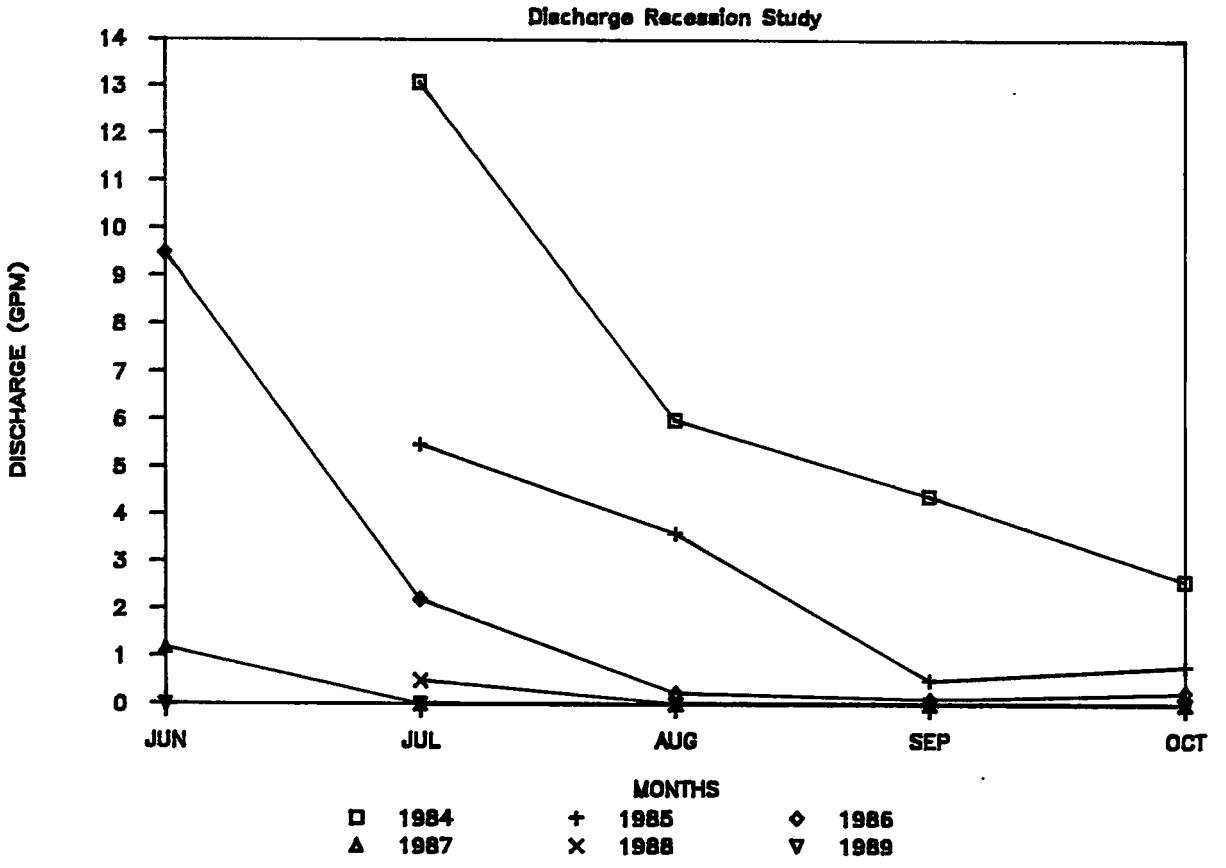
80 – 44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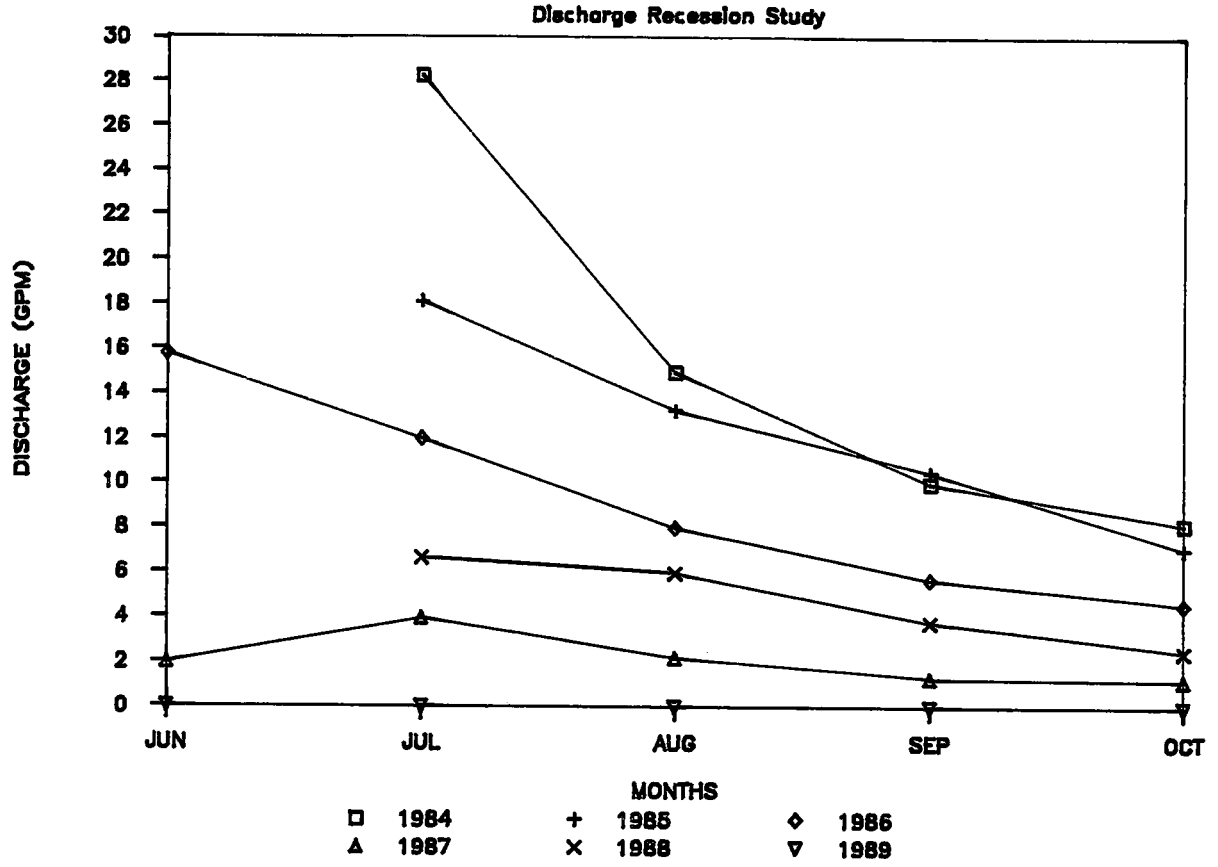
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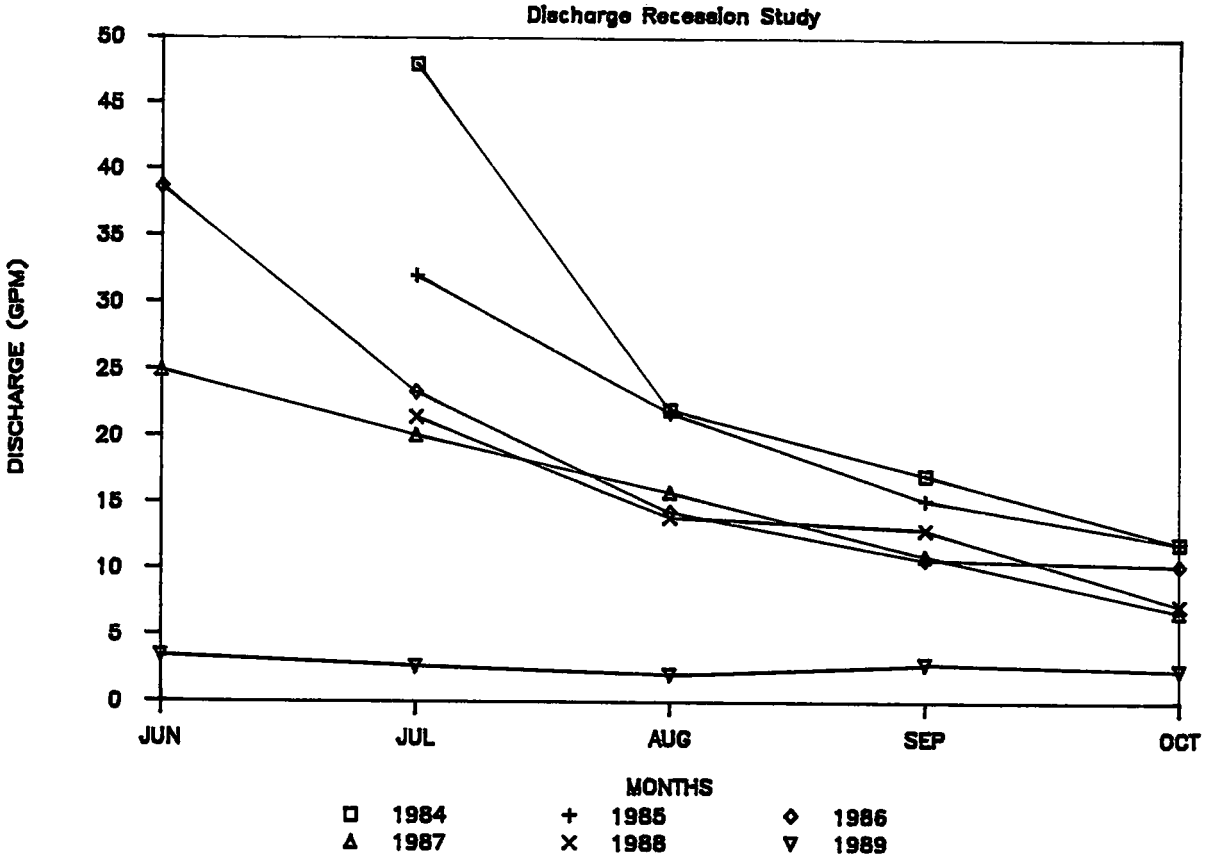
82 – 52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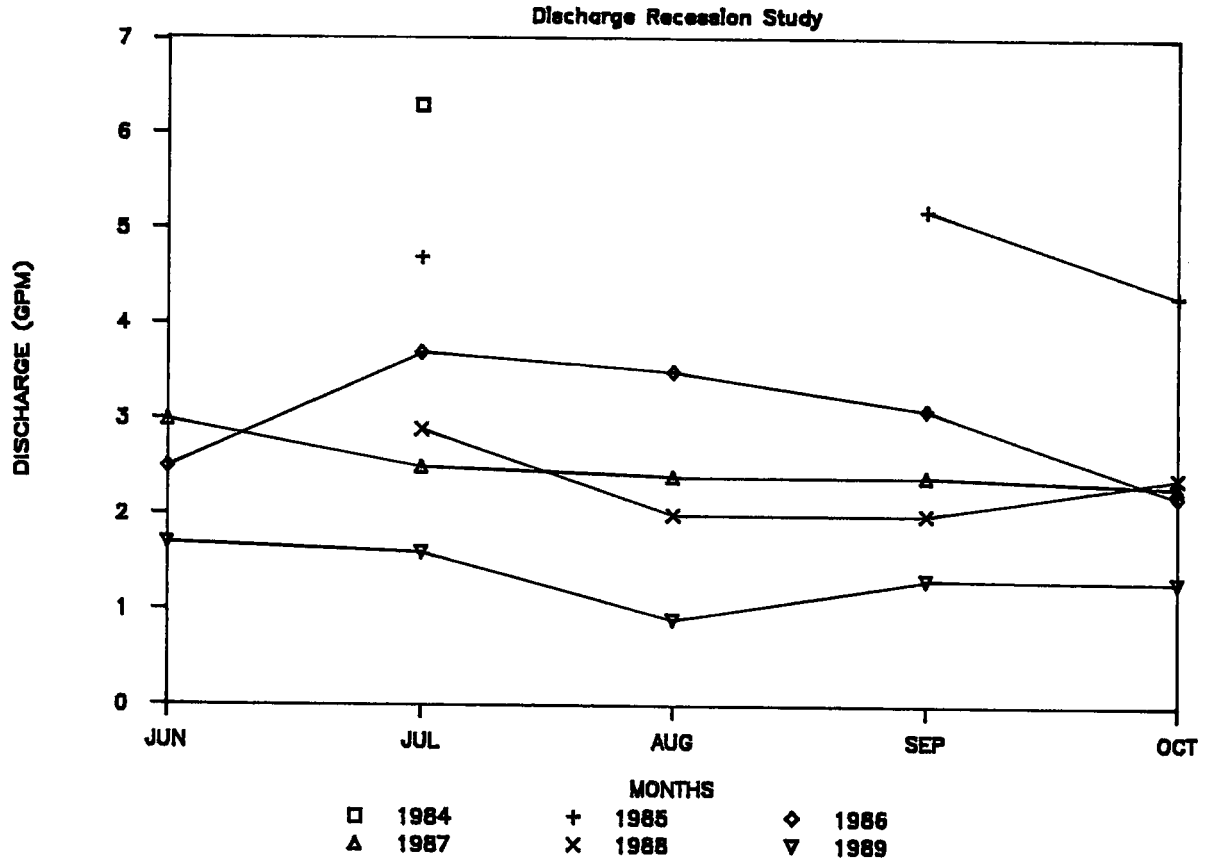
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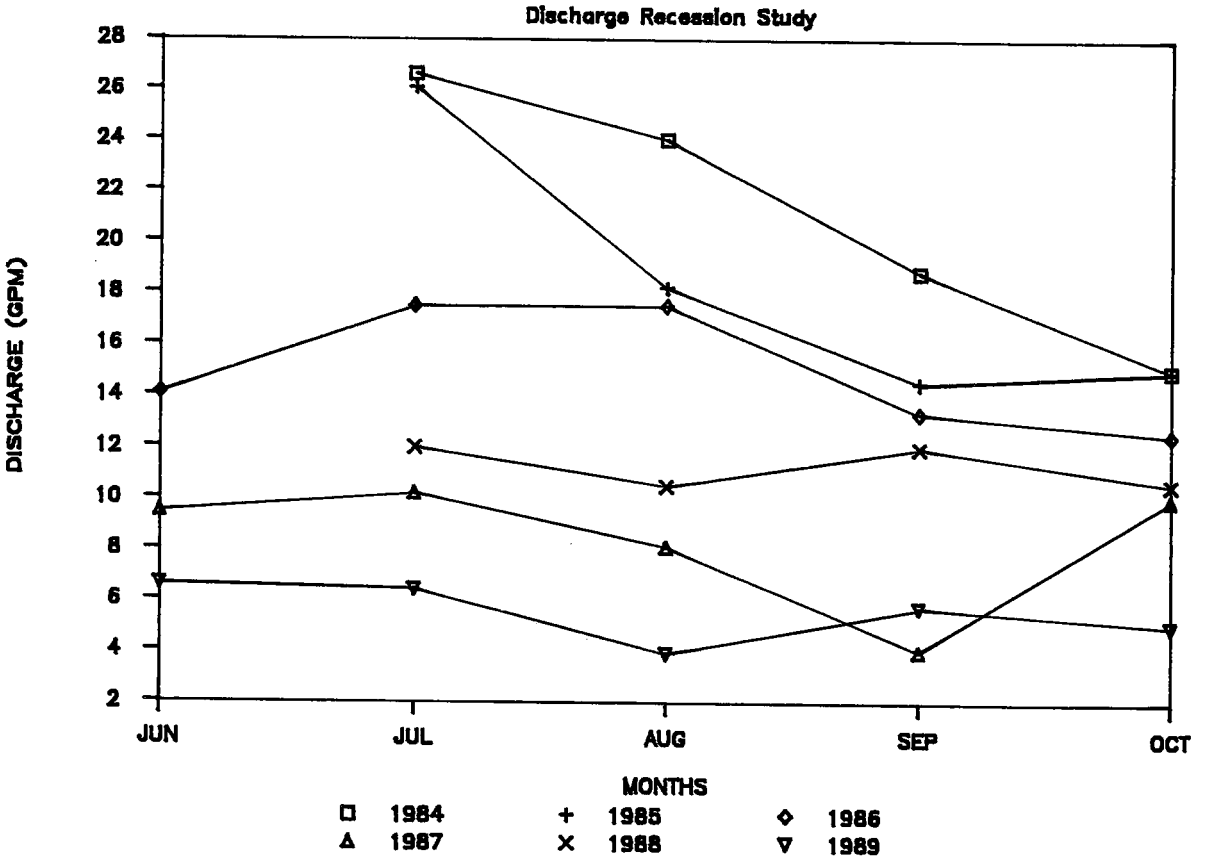
BURNT TREE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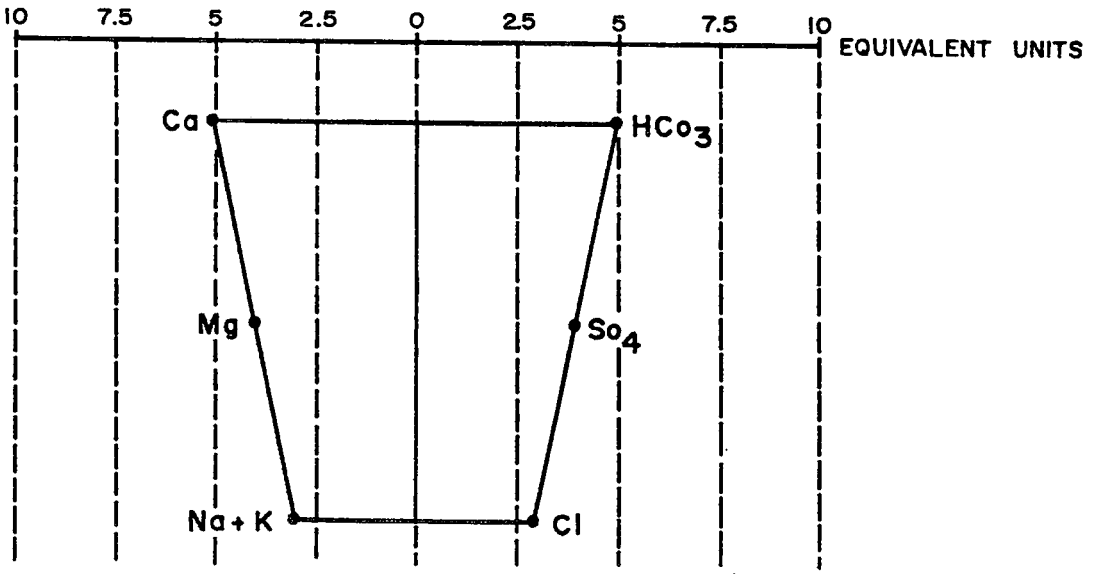
CATION – ANION DIAGRAMS



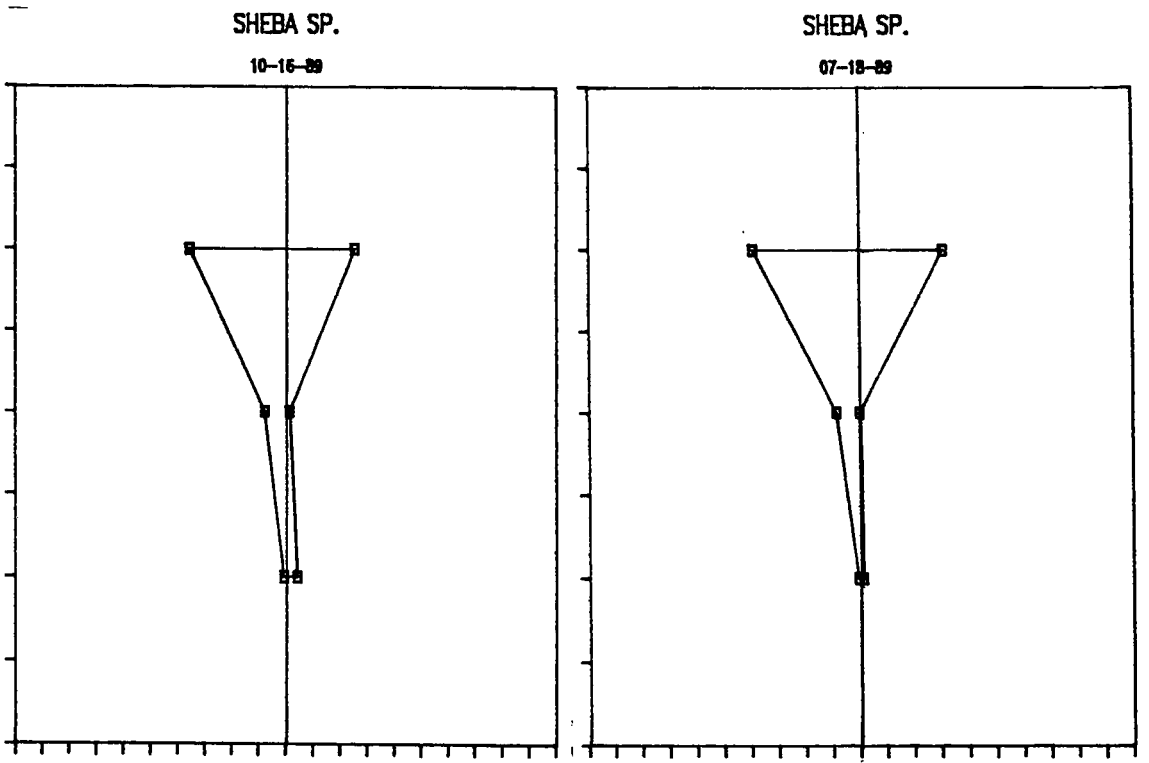
$$\frac{\text{P P M}}{\text{Equivalent Weight}} = \text{Equivalent Unit}$$

1" = 5 Equivalent Units

Equivalent Weights

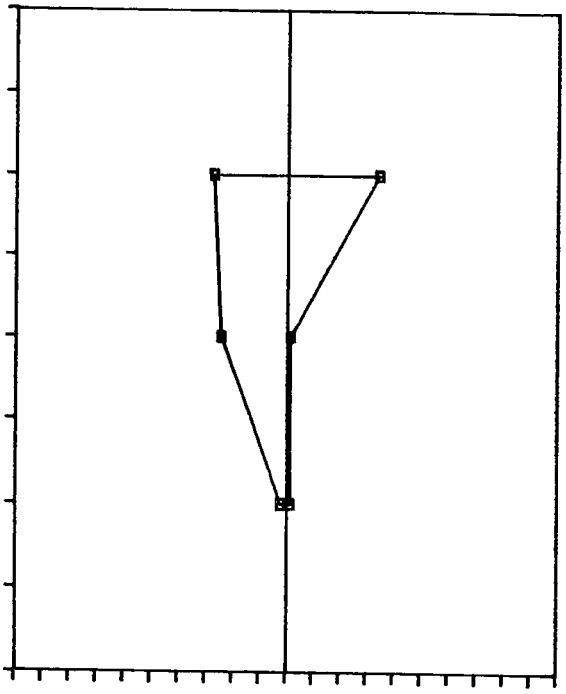
Mg	12.16	(Magnesium)
Ca	20.04	(Calcium)
Na	23.00	(Sodium)
K	39.10	(Potassium)
So_4	48.03	(Sulfate)
$CaCO_3$	100.1	(Total Alkalinity)
Cl	35.46	(Chloride)

FLAGSTAFF LIMESTONE



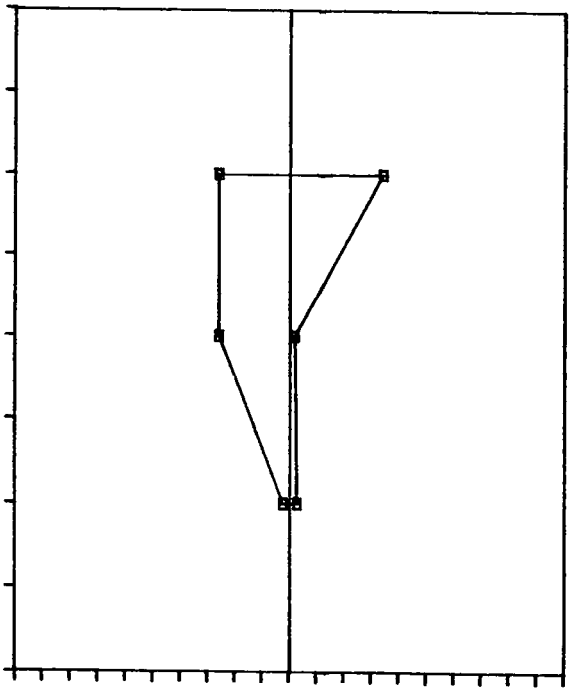
BURNT TREE

07-18-89



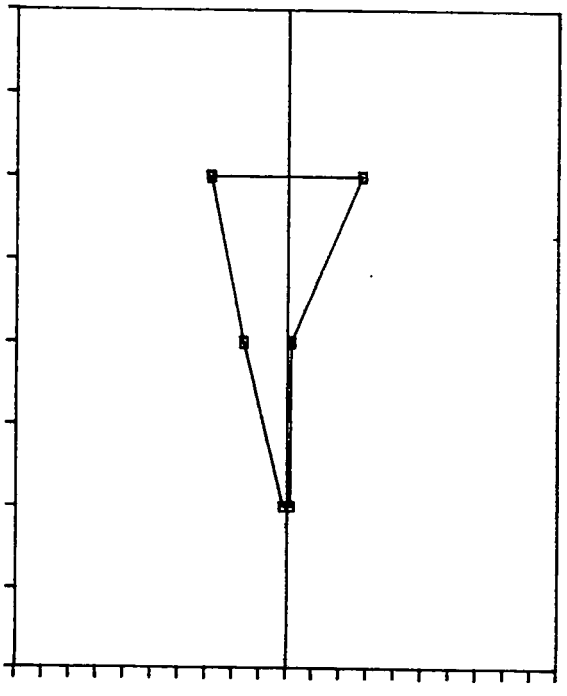
BURNT TREE

10-15-89



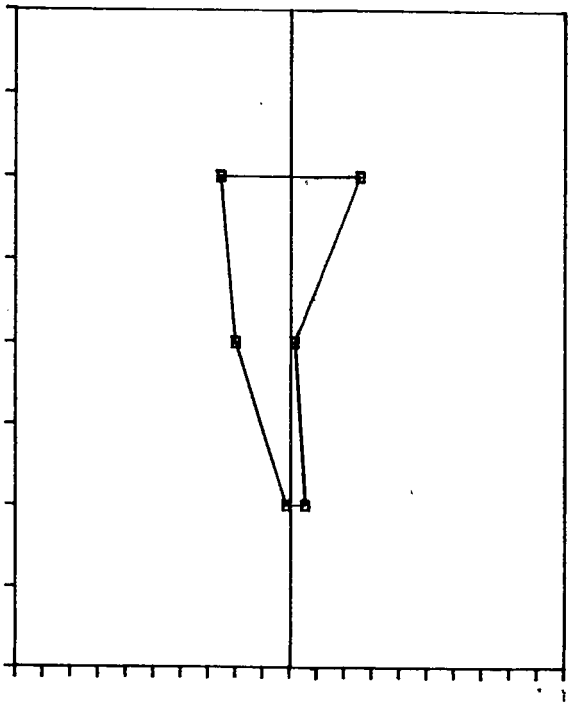
ELK SP.

07-11-89



ELK SP.

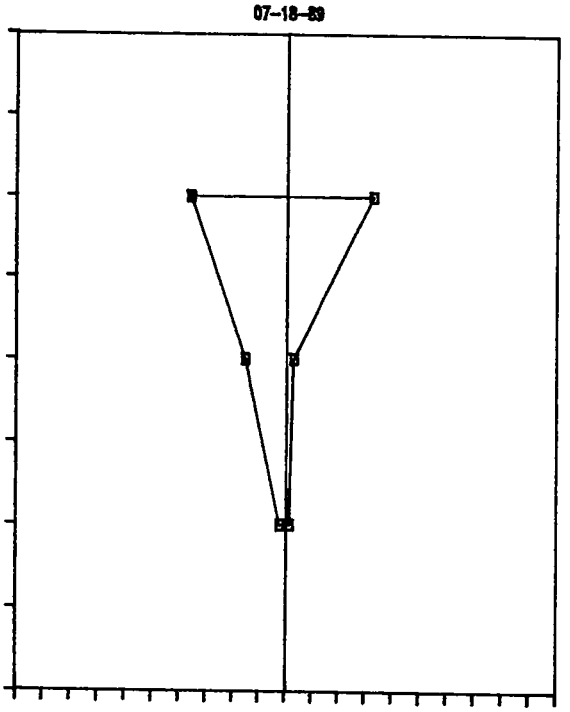
10-17-89



NORTH HORN FORMATION

79-2

07-18-89



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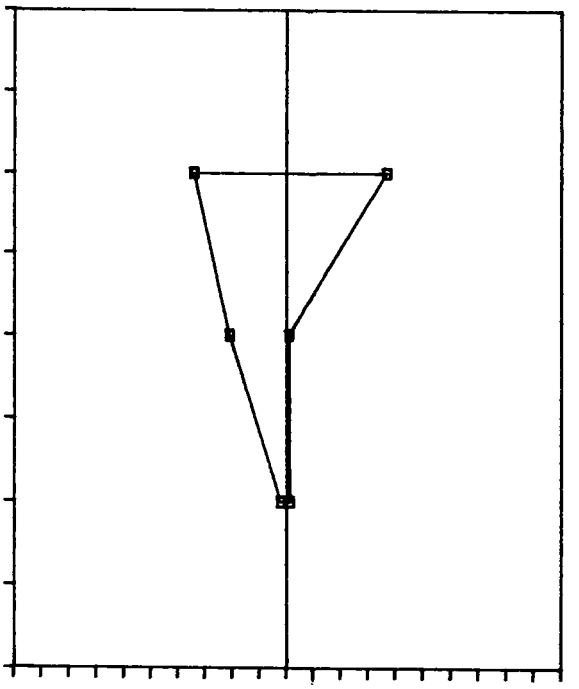
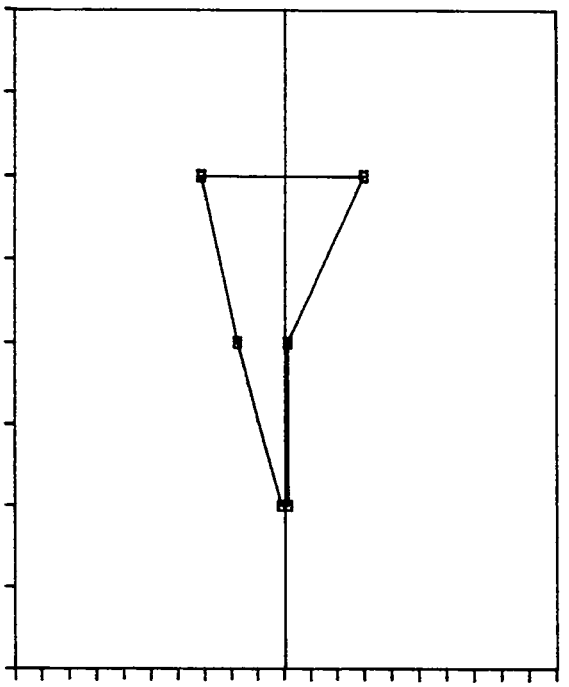
10-16-89



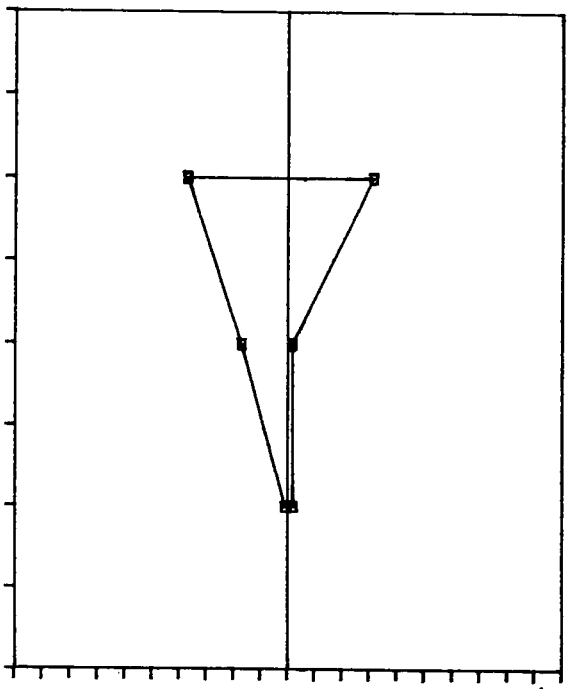
79-10

07-18-89



79-10

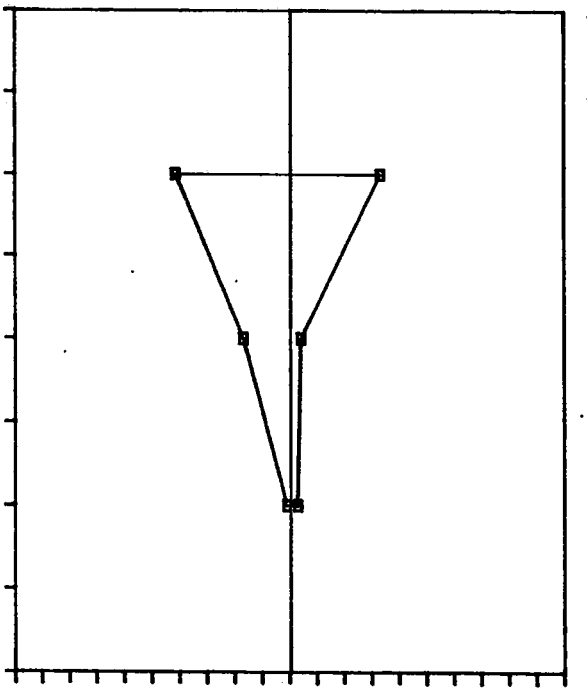
10-16-89



NORTH HORN FORMATION

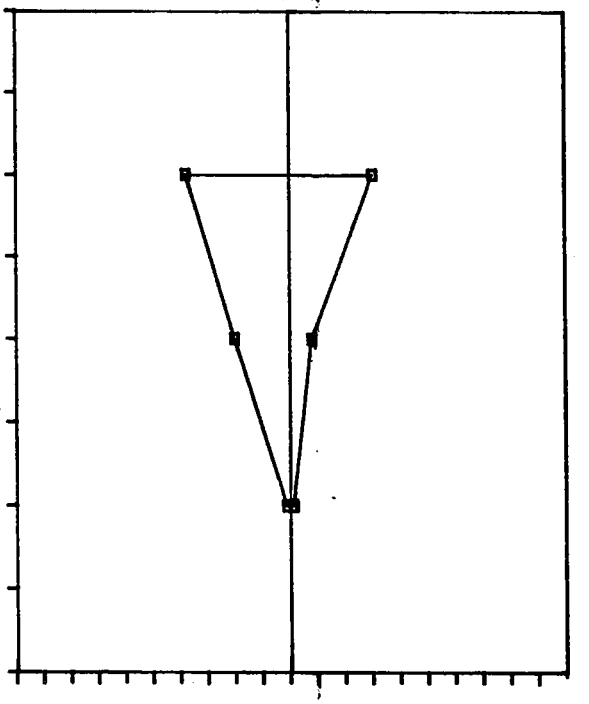
79–15

07–18–89



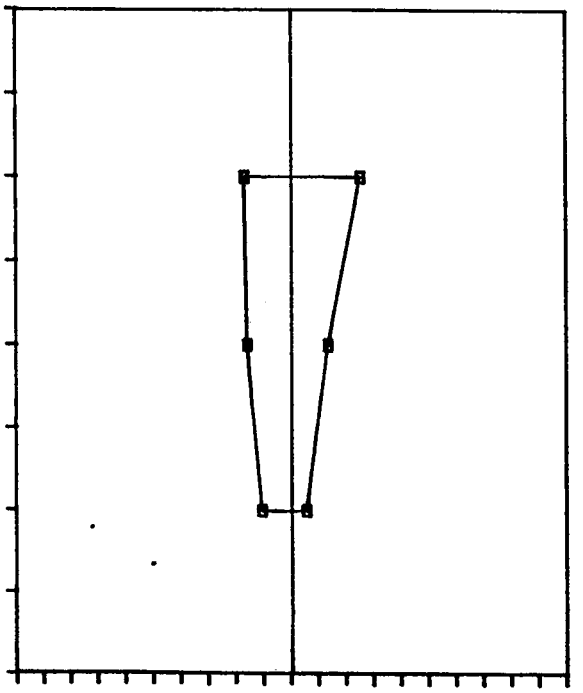
79–15

10–17–89



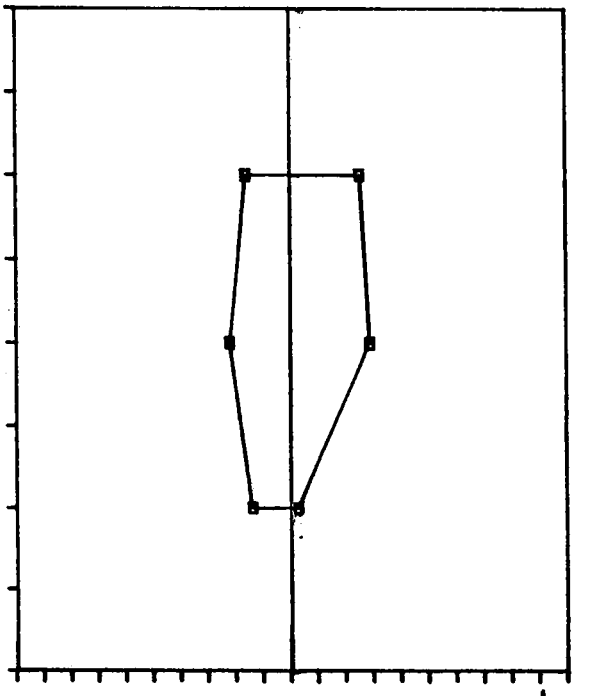
79–28

07–11–89



79–28

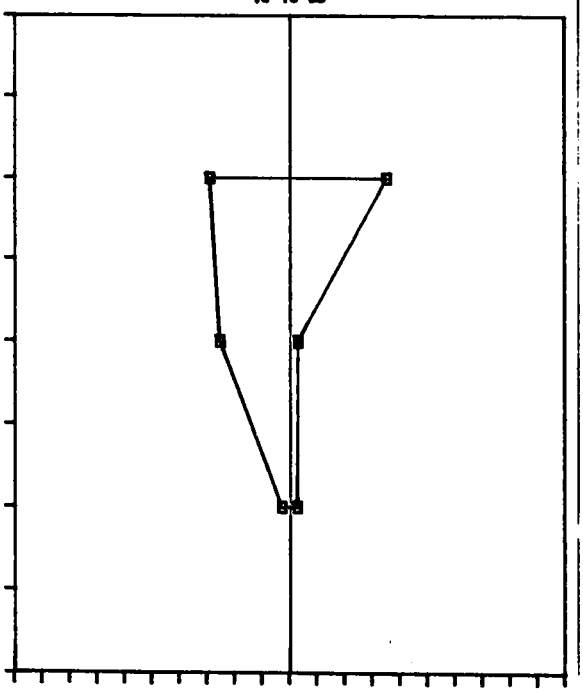
10–16–89



NORTH HORN FORMATION

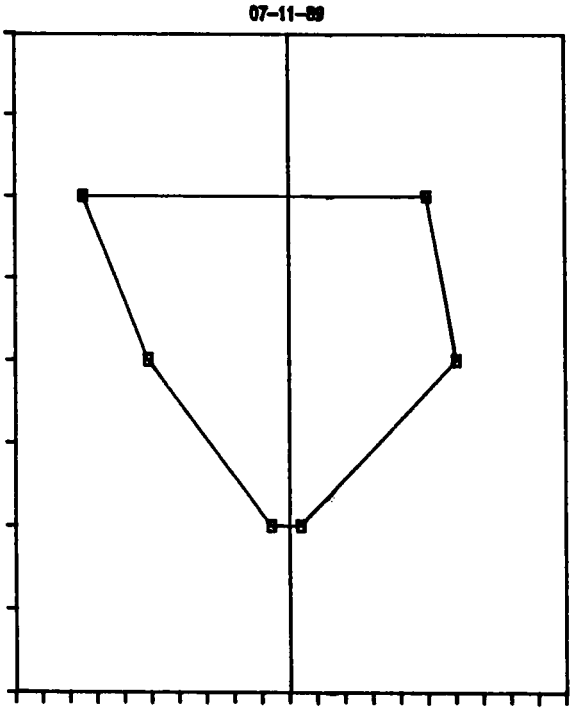
79–26

10–16–89



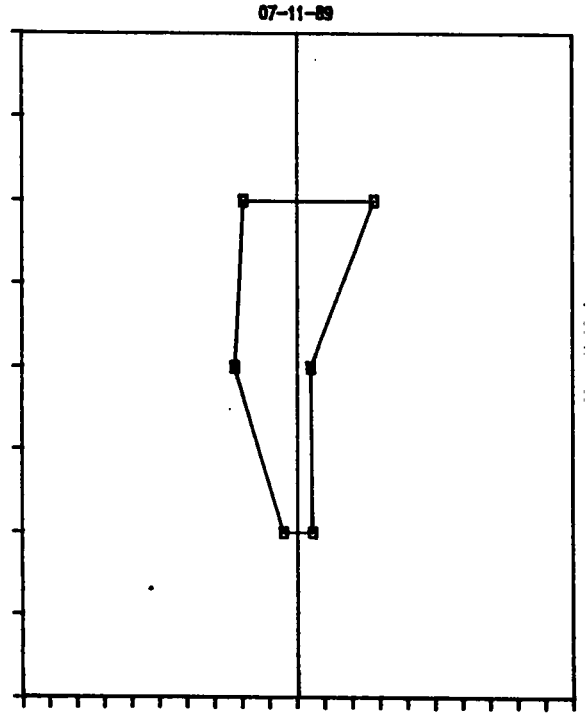
79–32

07–11–89



79–29

07–11–89



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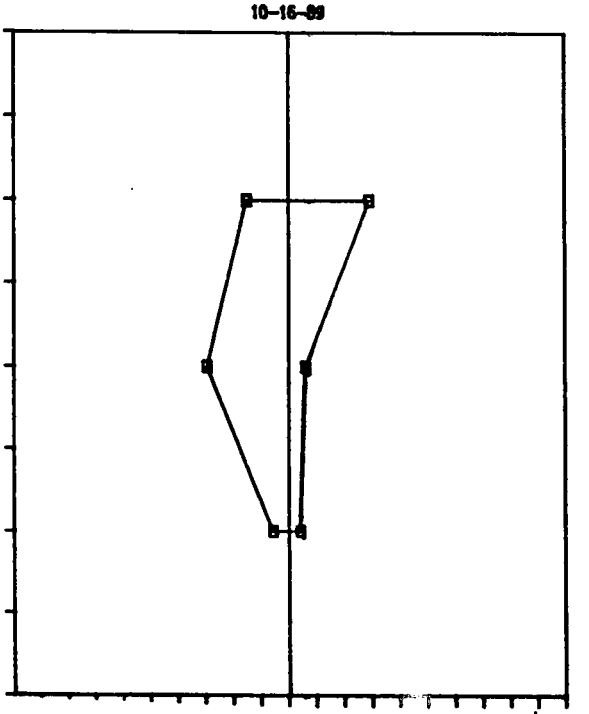
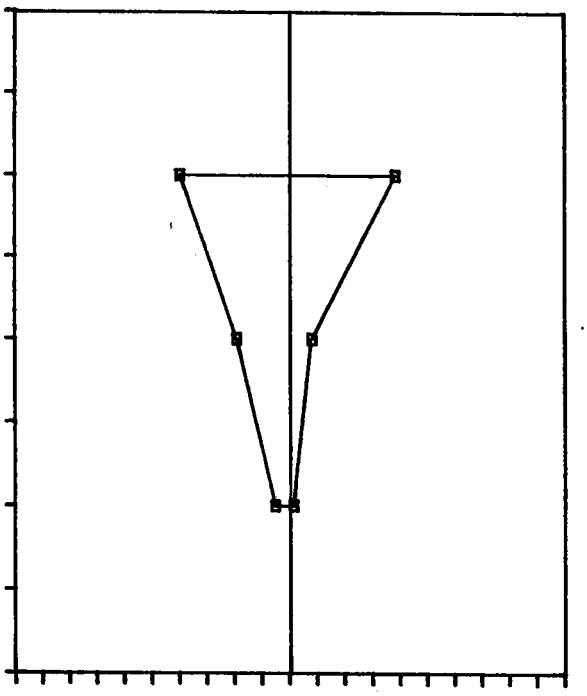
10–16–89



NORTH HORN FORMATION

79–38

07–18–89



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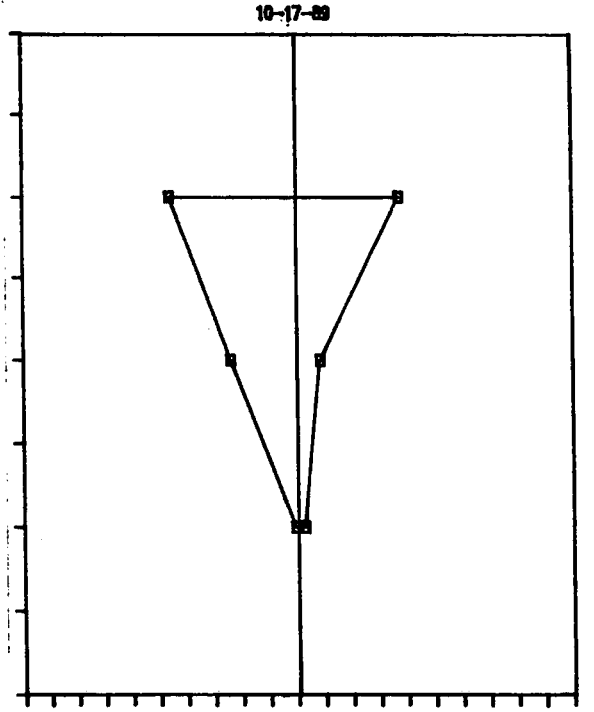
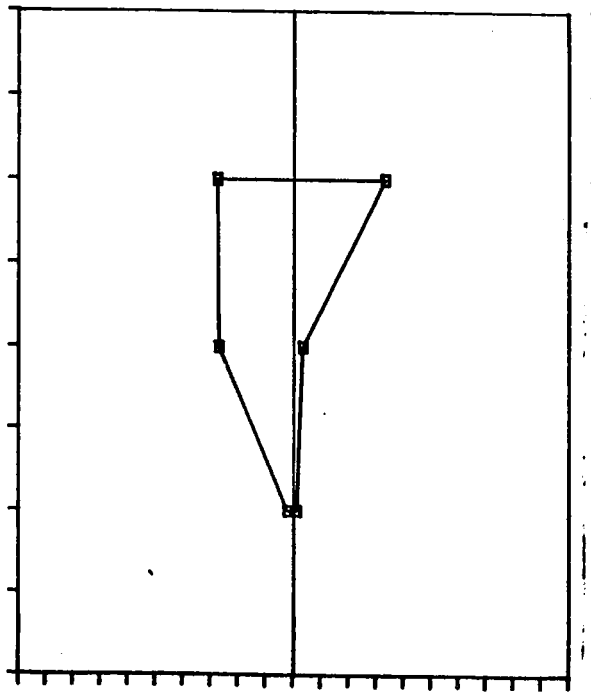
10–17–89



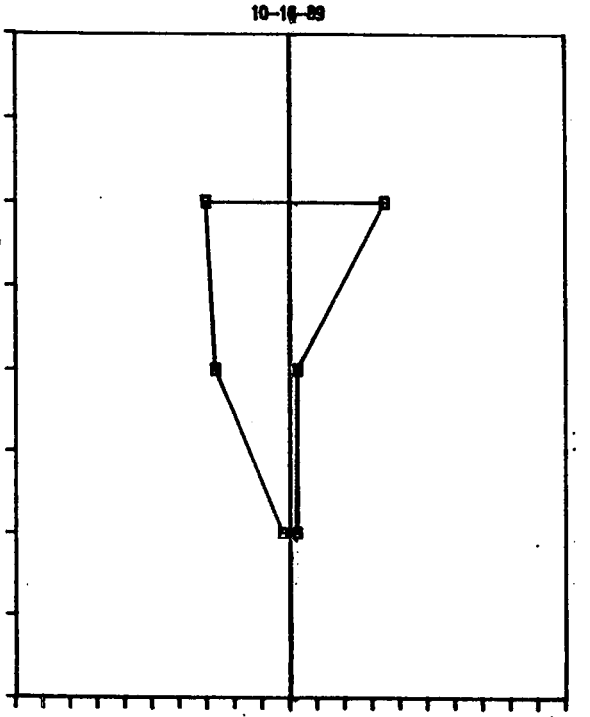
80–47

07–18–89



80–47

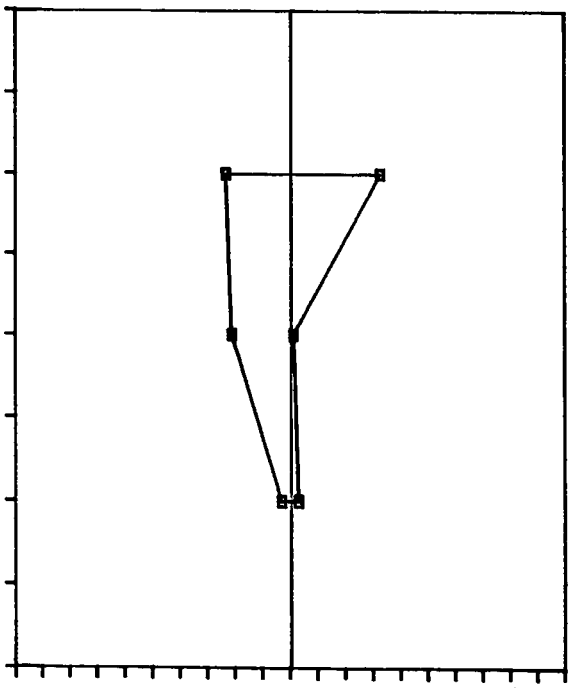
10–16–89



NORTH HORN FORMATION

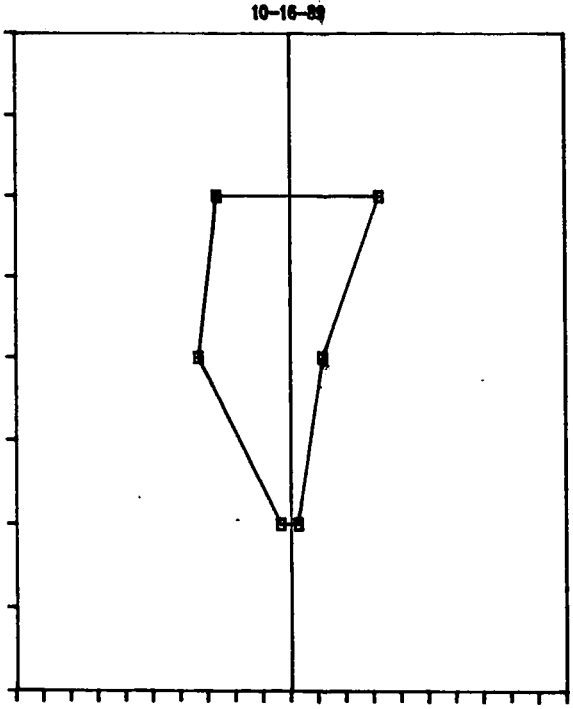
84–53

07–11–89



84–53

10–16–89



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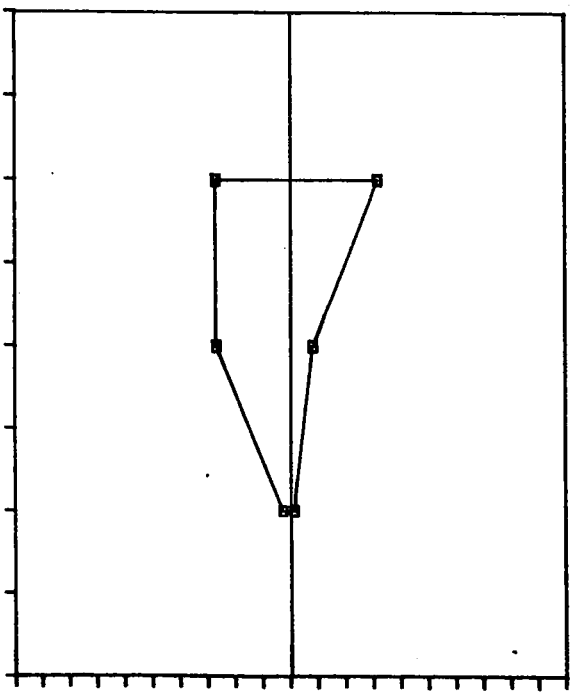
07–18–89



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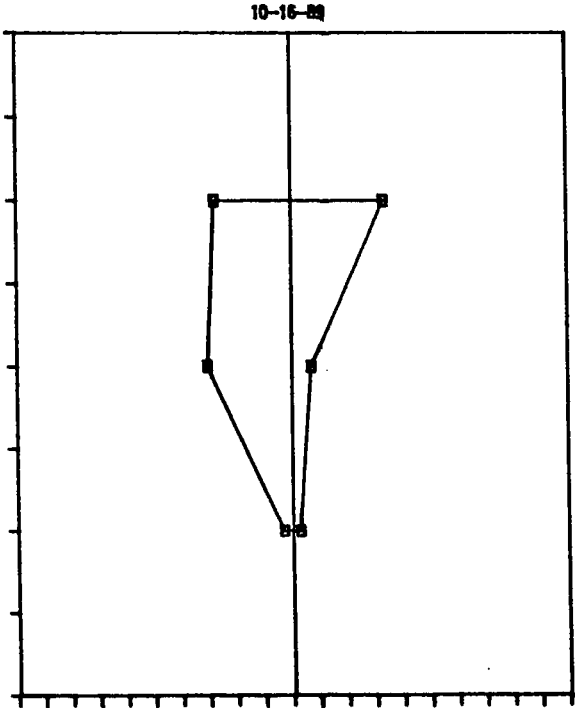
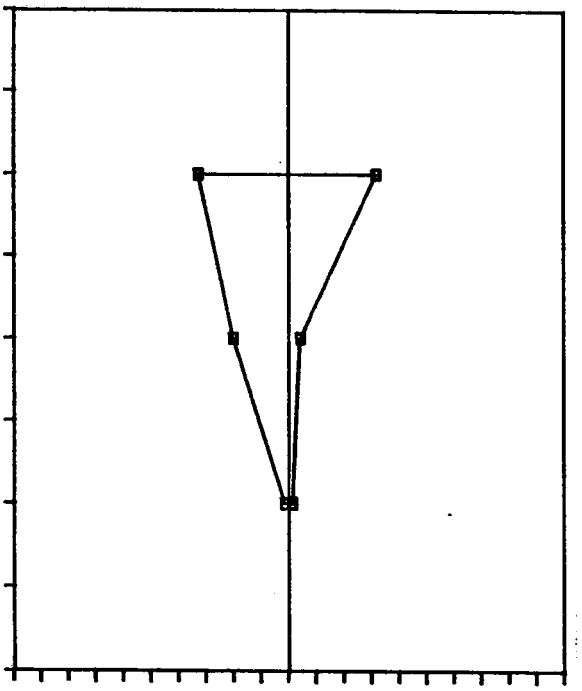
10–16–89



NORTH HORN FORMATION

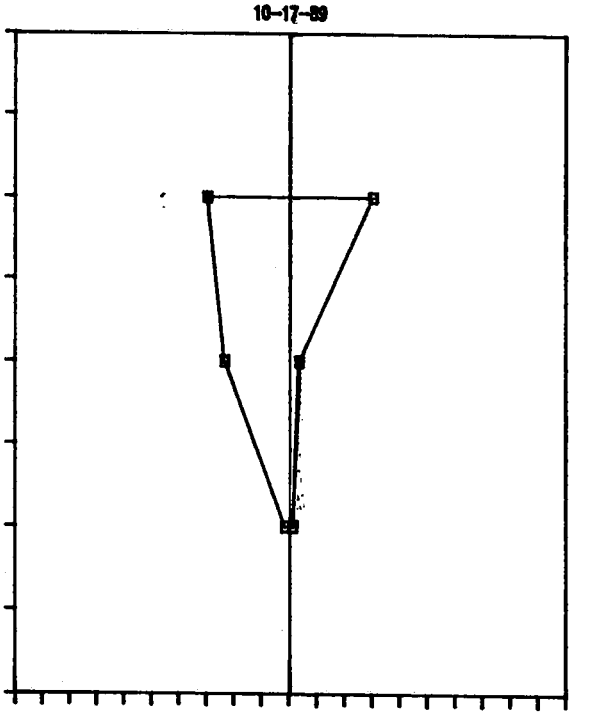
89–61

07–12–89



89–61

10–17–89



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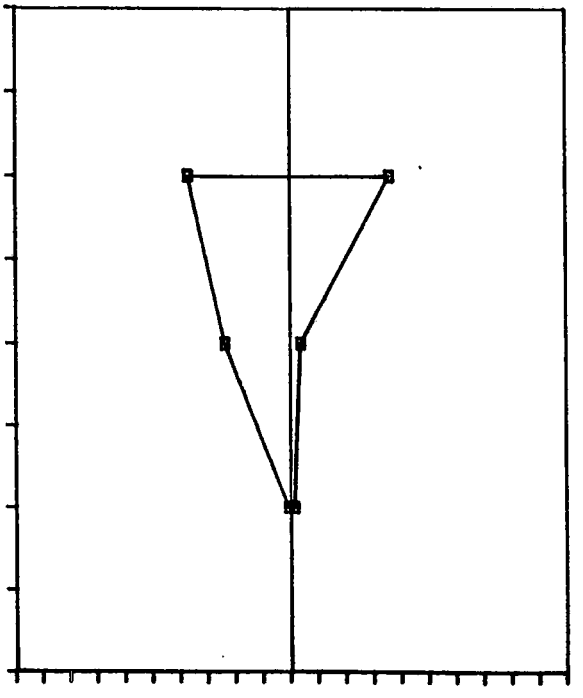
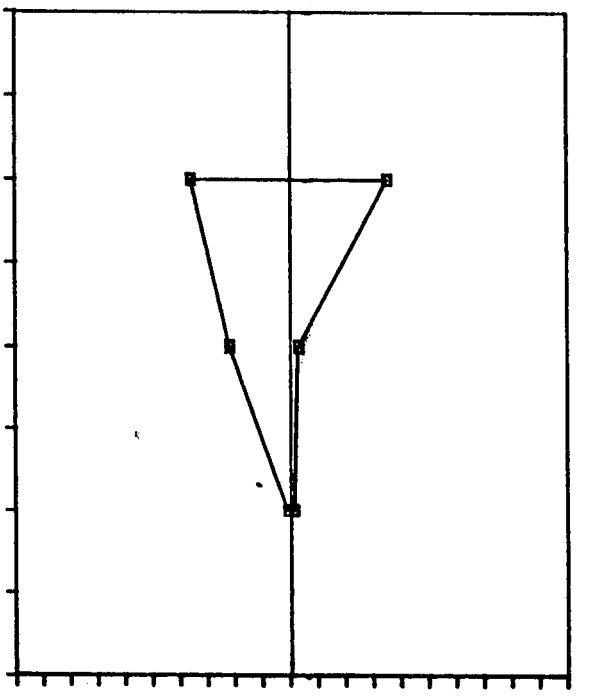
07–12–89

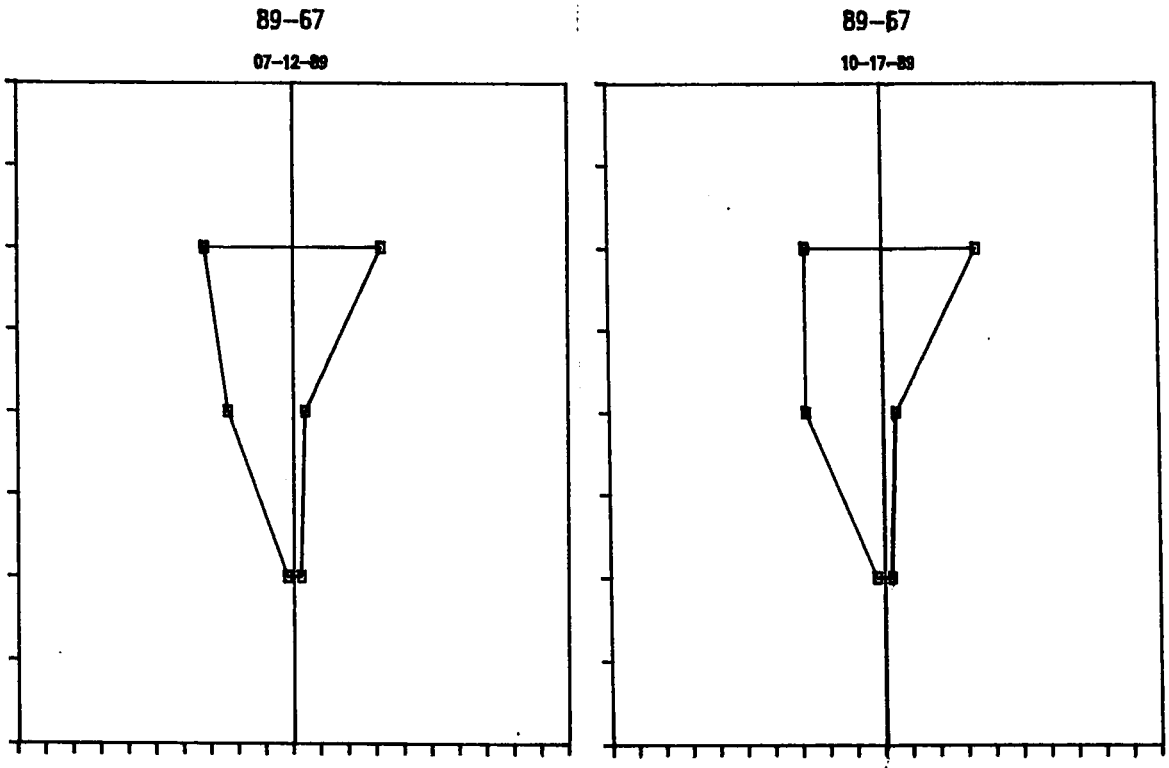


89–65

10–17–89



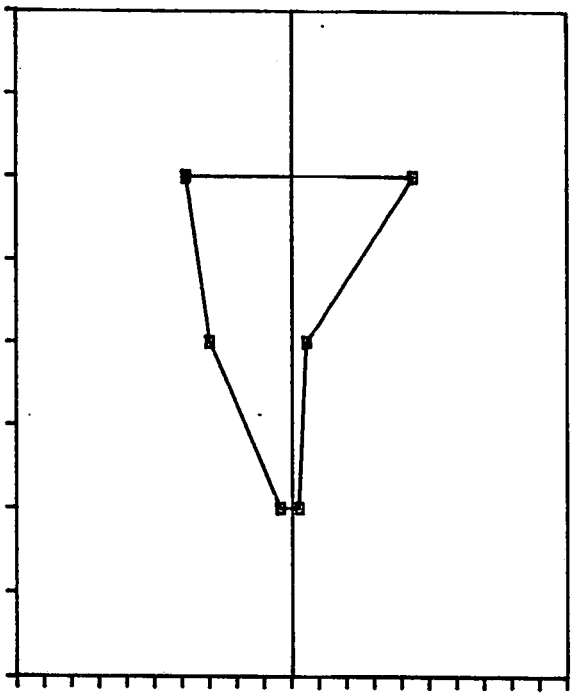
NORTH HORN FORMATION



PRICE RIVER FORMATION

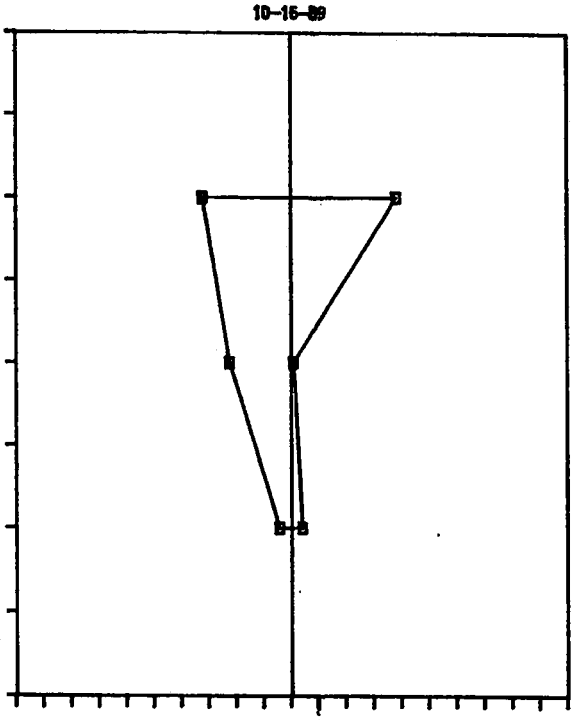
82-52

07-18-89



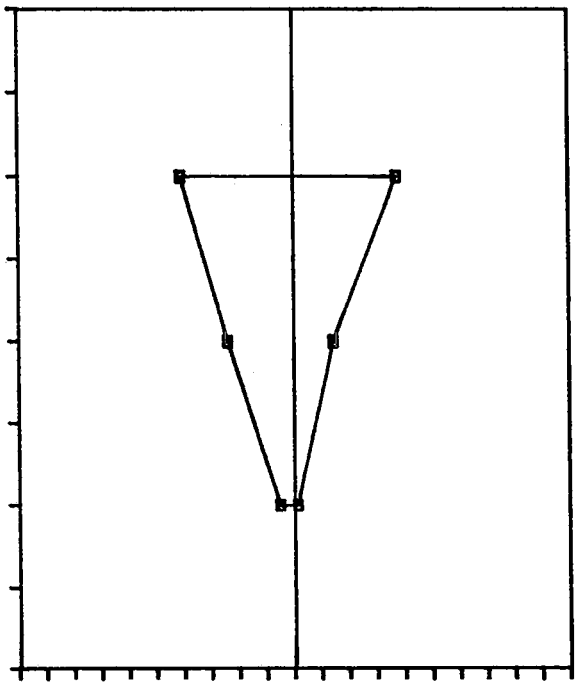
82-52

10-16-89



89-60

07-18-89



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

June 30, 1989

Job No.: 59 9775

Date Rec'd: June 20, 1989

Date Sampled: June 19, 1989

Sampled By: UP&L

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

Sample ID: UP&L

EMS Burnt Tree
Temperature 44 degrees
Flow 6.6 gpm
Rec'd 1500 hr.
Sampled 1255 hr.

WATER ANALYSIS

Alk., Carbonate	1<	mg/l CaCO3	Hardness, Total	288	mg/l CaCO3
06-22-89	0900 hr.		06-28-89	1300 hr.	
Alk., Total	256	mg/l CaCO3	Magnesium	36.10	mg/l
06-22-89	0900 hr.		06-28-89	1330 hr.	
Calcium	56.0	mg/l	Manganese	0.01<	mg/l
06-28-89	1300 hr.		06-28-89	1345 hr.	
Conductivity	360	umhos/cm	pH	7.60	Units
06-22-89	1000 hr.		06-20-89	1645 hr.	

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ANALYST: D. Lyon

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TELEPHONE: (801) 653-2311

June 30, 1989

Job No.: 59 9774

Date Rec'd: June 20, 1989

Date Sampled: June 19, 1989

Sampled By: UP&L

Sample ID: UP&L

EMS ELK SPRINGS
Temperature 40 degrees
Flow 0.29/130.8 gpm
Rec'd 1500 hr.
Sampled 1420 hr.

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

WATER ANALYSIS

Alk., Carbonate	1<	mg/l CaCO3	Hardness, Total	226	mg/l CaCO3
06-22-89	0900 hr.		06-28-89	1300 hr.	
Alk., Total	222	mg/l CaCO3	Magnesium	21.40	mg/l
06-22-89	0900 hr.		06-28-89	1330 hr.	
Calcium	55.4	mg/l	Manganese	0.01<	mg/l
06-28-89	1300 hr.		06-28-89	1345 hr.	
Conductivity	300	umhos/cm	pH	7.90	Units
06-22-89	1000 hr.		06-20-89	1645 hr.	

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June 30, 1989

Job No.: 59 9773

Date Rec'd: June 20, 1989

Date Sampled: June 19, 1989

Sampled By: UP&L

Sample ID: UP&L

EMS Sheba Springs
Temperature 40 degrees
Flow 2.0 gpm
Rec'd 1500 hr.
Sampled 1510 hr.

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

WATER ANALYSIS

Alk., Carbonate	1<	mg/l CaCO3	Hardness, Total	273	mg/l CaCO3
06-22-89	0900 hr.		06-28-89	1300 hr.	
Alk., Total	233	mg/l CaCO3	Magnesium	10.90	mg/l
06-22-89	0900 hr.		06-28-89	1330 hr.	
Calcium	91.4	mg/l	Manganese	0.02	mg/l
06-28-89	1300 hr.		06-28-89	1345 hr.	
Conductivity	310	umhos/cm	pH	7.60	Units
06-22-89	1000 hr.		06-20-89	1645 hr.	

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P.O. BOX 1020, HUNTINGTON, UT 84528
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June 30, 1989

Job No.: 59 9778

Date Rec'd: June 20, 1989

Date Sampled: June 19, 1989

Sampled By: UP&L

Sample ID: UP&L

EMS 79-10
Temperature 45 degrees
Flow 3.0 gpm
Rec'd 1500 hr.
Sampled 1455 hr.

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

WATER ANALYSIS

Alk., Carbonate		1<	mg/l CaCO3	Hardness, Total		259	mg/l CaCO3
	06-22-89	0900 hr.			06-28-89	1300 hr.	
Alk., Total		264	mg/l CaCO3	Magnesium		22.30	mg/l
	06-22-89	0900 hr.			06-28-89	1330 hr.	
Calcium		66.9	mg/l	Manganese		0.01<	mg/l
	06-28-89	1300 hr.			06-28-89	1345 hr.	
Conductivity		280	umhos/cm	pH		7.60	Units
	06-22-89	1000 hr.			06-20-89	1645 hr.	

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TELEPHONE: (801) 653-2311

June 30, 1989

Job No.: 59 9772

Date Rec'd: June 20, 1989

Date Sampled: June 19, 1989

Sampled By: UP&L

Sample ID: UP&L

EMS 79-29
Temperature 43 degrees
Flow 1.2 gpm
Rec'd 1500 hr.
Sampled 1350 hr.

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P.O. Box 1005
Huntington UT 84528

WATER ANALYSIS

Alk., Carbonate		1<	mg/l CaCO3	Hardness, Total		223	mg/l CaCO3
06-22-89	0900 hr.			06-22-89	1300 hr.		
Alk., Total		224	mg/l CaCO3	Magnesium		29.20	mg/l
06-22-89	0900 hr.			06-22-89	1330 hr.		
Calcium		41.0	mg/l	Manganese		0.01<	mg/l
06-28-89	1300 hr.			06-22-89	1345 hr.		
Conductivity		380	umhos/cm	pH		7.70	Units
06-22-89	1000 hr.			06-20-89	1645 hr.		

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TELEPHONE: (801) 653-2311

June 30, 1989

Job No.: 59 9776

Date Rec'd: June 20, 1989

Date Sampled: June 19, 1989

Sampled By: UP&L

Sample ID: UP&L

EMS 82-52
Temperature 42 degrees
Flow 3.4 gpm
Rec'd 1500 hr.
Sampled 1230 hr.

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

WATER ANALYSIS

Alk., Carbonate	1<	mg/l CaCO3	Hardness, Total	266	mg/l CaCO3
06-22-89	0900 hr.		06-28-89	1300 hr.	
Alk., Total	280	mg/l CaCO3	Magnesium	28.00	mg/l
06-22-89	0900 hr.		06-28-89	1330 hr.	
Calcium	60.2	mg/l	Manganese	0.01<	mg/l
06-28-89	1300 hr.		06-28-89	1345 hr.	
Conductivity	500	umhos/cm	pH	8.00	Units
06-22-89	1000 hr.		06-20-89	1645 hr.	

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June 30, 1989

Job No.: 59 9777

Date Rec'd: June 20, 1989

Date Sampled: June 19, 1989

Sampled By: UP&L

Sample ID: UP&L

EMS 84-56
Temperature 41 degrees
Flow 1.9 gpm
Rec'd 1500 hr.
Sampled 1327 hr.

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

Alk., Carbonate 06-22-89	1< 0900 hr.	mg/l CaCO3	Hardness, Total 06-22-89	275 1300 hr.	mg/l CaCO3
Alk., Total 06-22-89	309 0900 hr.	mg/l CaCO3	Magnesium 06-28-89	33.40 1330 hr.	mg/l
Calcium 06-28-89	55.1 1300 hr.	mg/l	Manganese 06-28-89	0.01< 1345 hr.	mg/l
Conductivity 06-22-89	405 1000 hr.	umhos/cm	pH 06-20-89	7.40 1645 hr.	Units

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TELEPHONE: (801) 653-2311

August 3, 1989

Job No.: 59 9851

Date Rec'd: July 19, 1989

Date Sampled: July 18, 1989

Sampled By: UP&L

Sample ID: UP&L

EMS BURNT TREE
Temperature 43 degrees
Flow 6.4 gpm
Rec'd 0830 hr.
Sampled 1345 hr.

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

WATER ANALYSIS

Acidity	7	mg/l CaCO3	Iron	0.02<	mg/l
07-25-89	1500 hr.		07-28-89	1415 hr.	
Alk., Bicarbonate	345	mg/l HCO3	Iron, Dissolved	0.02<	mg/l
07-24-89	1600 hr.		07-28-89	1415 hr.	
Alk., Carbonate	1<	mg/l CaCO3	Magnesium	29.90	mg/l
07-24-89	1600 hr.		07-28-89	1315 hr.	
Alk., Total	283	mg/l CaCO3	Manganese	0.01<	mg/l
07-24-89	1600 hr.		07-28-89	1430 hr.	
Anions, Total	5.81	meq/l	pH	7.50	Units
			07-19-89	1600 hr.	
Calcium	55.1	mg/l	Potassium	0.22	mg/l
07-28-89	1300 hr.		07-28-89	1400 hr.	
Cations, Total	5.79	meq/l	Sodium	13.50	mg/l
			07-28-89	1330 hr.	
Chloride	5.0	mg/l	Solids, Dissolved	305.0	mg/l
07-25-89	1000 hr.		07-28-89	1215 hr.	
Conductivity	480	umhos/cm	Solids, Suspended	1.0<	mg/l
07-24-89	0830 hr.		07-28-89	1215 hr.	
Fluoride	0.29	mg/l	Sulfate	7.0	mg/l
07-31-89	1300 hr.		07-26-89	1315 hr.	
Hardness, Total	261	mg/l CaCO3	Turbidity	3.5	NTU
			08-01-89	1700 hr.	

ANALYST: D. Tipon

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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

August 3, 1989

Job No.: 59 9814

Date Rec'd: July 12, 1989

Date Sampled: July 11, 1989

Sampled By: UP&L

Sample ID: UP&L

ELK SPRINGS
Temperature 40 degrees
Rec'd 0800 hr.
Sampled 1530 hr.

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

WATER ANALYSIS

Acidity	6	mg/l CaCO3	Iron	0.02<	mg/l
07-25-89	1500 hr.		07-28-89	1415 hr.	
Alk., Bicarbonate	281	mg/l HCO3	Iron, Dissolved	0.02<	mg/l
07-24-89	1600 hr.		07-28-89	1415 hr.	
Alk., Carbonate	1<	mg/l CaCO3	Magnesium	19.90	mg/l
07-24-89	1600 hr.		07-28-89	1315 hr.	
Alk., Total	230	mg/l CaCO3	Manganese	0.01<	mg/l
07-24-89	1600 hr.		07-28-89	1430 hr.	
Anions, Total	4.79	meq/l	pH	7.35	Units
			07-12-89	0930 hr.	
Calcium	57.1	mg/l	Potassium	1.20	mg/l
07-28-89	1300 hr.		07-28-89	1400 hr.	
Cations, Total	4.84	meq/l	Sodium	7.60	mg/l
			07-28-89	1330 hr.	
Chloride	5.0	mg/l	Solids, Dissolved	269.0	mg/l
07-25-89	1000 hr.		07-28-89	1215 hr.	
Conductivity	450	umhos/cm	Solids, Suspended	21.0	mg/l
07-24-89	0830 hr.		07-28-89	1215 hr.	
Fluoride	0.31	mg/l	Sulfate	8.0	mg/l
07-31-89	1300 hr.		07-26-89	1315 hr.	
Hardness, Total	225	mg/l CaCO3	Turbidity	0.5	NTU
			08-01-89	1700 hr.	

ANALYST: D. Tyson

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Respectfully submitted,
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Manager, Huntington Laboratory

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TELEPHONE: (801) 653-2311

August 3, 1989

Job No.: 59 9815

Date Rec'd: July 12, 1989

Date Sampled: July 11, 1989

Sampled By: UP&L

Sample ID: UP&L

FLAG LAKE SPRING
Temperature 47 degrees
Flow 1.3 gpm
Rec'd 0800 hr.
Sampled 1052 hr.

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

WATER ANALYSIS

Acidity	4	mg/l CaCO3	Iron	0.10	mg/l
07-25-89	1500 hr.		07-28-89	1415 hr.	
Alk., Bicarbonate	254	mg/l HCO3	Iron, Dissolved	0.10	mg/l
07-24-89	1600 hr.		07-28-89	1415 hr.	
Alk., Carbonate	1<	mg/l CaCO3	Magnesium	19.40	mg/l
07-24-89	1600 hr.		07-28-89	1315 hr.	
Alk., Total	208	mg/l CaCO3	Manganese	0.02	mg/l
07-24-89	1600 hr.		07-28-89	1430 hr.	
Anions, Total	5.98	meq/l	pH	7.35	Units
			07-12-89	0930 hr.	
Calcium	34.0	mg/l	Potassium	1.20	mg/l
07-28-89	1300 hr.		07-28-89	1400 hr.	
Cations, Total	6.10	meq/l	Sodium	64.60	mg/l
			07-28-89	1330 hr.	
Chloride	20.0	mg/l	Solids, Dissolved	513.0	mg/l
07-25-89	1000 hr.		07-28-89	1215 hr.	
Conductivity	730	umhos/cm	Solids, Suspended	1.0<	mg/l
07-25-89	0830 hr.		07-28-89	1215 hr.	
Fluoride	0.59	mg/l	Sulfate	65.0	mg/l
07-31-89	1300 hr.		07-26-89	1315 hr.	
Hardness, Total	165	mg/l CaCO3	Turbidity	1.0	NTU
			08-01-89	1700 hr.	

ANALYST: D. Tyson

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TELEPHONE: (801) 653-2311

August 4, 1989

Job No.: 59 9855

Date Rec'd: July 19, 1989

Date Sampled: July 18, 1989

Sampled By: UP&L

Sample ID: UP&L

EMS SHEBA SPRINGS
Temperature 46 degrees
Flow 1.0 gpm
Rec'd 0830 hr.
Sampled 1135 hr.

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

WATER ANALYSIS

Acidity	2	mg/l CaCO3	Iron	0.04	mg/l
07-25-89 1500 hr.			07-28-89 1415 hr.		
Alk., Bicarbonate	311	mg/l HCO3	Iron, Dissolved	0.03	mg/l
07-24-89 1600 hr.			07-28-89 1415 hr.		
Alk., Carbonate	1<	mg/l CaCO3	Magnesium	10.10	mg/l
07-24-89 1600 hr.			07-28-89 1315 hr.		
Alk., Total	255	mg/l CaCO3	Manganese	0.01<	mg/l
07-24-89 1600 hr.			07-28-89 1430 hr.		
Anions, Total	5.13	meq/l	pH	7.60	Units
			07-19-89 0930 hr.		
Calcium	78.2	mg/l	Potassium	0.01<	mg/l
07-28-89 1300 hr.			07-28-89 1400 hr.		
Cations, Total	4.87	meq/l	Sodium	3.00	mg/l
			07-28-89 1330 hr.		
Chloride	5.0	mg/l	Solids, Dissolved	258.0	mg/l
07-25-89 1000 hr.			07-28-89 1215 hr.		
Conductivity	470	umhos/cm	Solids, Suspended	7.0	mg/l
07-24-89 0830 hr.			07-28-89 1215 hr.		
Fluoride	0.20	mg/l	Sulfate	1.0	mg/l
07-31-89 1300 hr.			07-26-89 1315 hr.		
Hardness, Total	237	mg/l CaCO3	Turbidity	0.3	NTU
			08-01-89 1700 hr.		

ANALYST: D. Tyson

Respectfully submitted,
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TELEPHONE: (801) 653-2311

August 3, 1989

Job No.: 59 9847

Date Rec'd: July 19, 1989

Date Sampled: July 18, 1989

Sampled By: UP&L

Sample ID: UP&L

EMS 79-2
Temperature 45 degrees
Flow 2.7 gpm
Rec'd 0830 hr.
Sampled 1325 hr.

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

WATER ANALYSIS

Acidity	13	mg/l CaCO3	Iron	0.02<	mg/l
07-25-89	1500 hr.		07-28-89	1415 hr.	
Alk., Bicarbonate	328	mg/l HCO3	Iron, Dissolved	0.02<	mg/l
07-24-89	1600 hr.		07-28-89	1415 hr.	
Alk., Carbonate	1<	mg/l CaCO3	Magnesium	19.00	mg/l
07-24-89	1600 hr.		07-28-89	1315 hr.	
Alk., Total	269	mg/l CaCO3	Manganese	0.01<	mg/l
07-24-89	1600 hr.		07-28-89	1430 hr.	
Anions, Total	5.68	meq/l	pH	7.30	Units
			07-19-89	1600 hr.	
Calcium	72.6	mg/l	Potassium	0.07	mg/l
07-28-89	1300 hr.		07-28-89	1400 hr.	
Cations, Total	5.77	meq/l	Sodium	13.60	mg/l
			07-28-89	1330 hr.	
Chloride	5.0	mg/l	Solids, Dissolved	313.0	mg/l
07-25-89	1000 hr.		07-28-89	1215 hr.	
Conductivity	500	umhos/cm	Solids, Suspended	2.0	mg/l
07-24-89	0830 hr.		07-28-89	1215 hr.	
Fluoride	0.25	mg/l	Sulfate	14.0	mg/l
07-31-89	1300 hr.		07-26-89	1315 hr.	
Hardness, Total	260	mg/l CaCO3	Turbidity	3.0	NTU
			08-01-89	1700 hr.	

ANALYST: D. Lyon

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TELEPHONE: (801) 653-2311

August 3, 1989

Job No.: 59 9852

Date Rec'd: July 19, 1989

Date Sampled: July 18, 1989

Sampled By: UP&L

Sample ID: UP&L

EMS 79-10
Temperature 42 degrees
Flow 7.0 gpm
Rec'd 0830 hr.
Sampled 1115 hr.

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

WATER ANALYSIS

Acidity	5	mg/l CaCO3	Iron	0.02<	mg/l
07-25-89	1500 hr.		07-28-89	1415 hr.	
Alk., Bicarbonate	299	mg/l HCO3	Iron, Dissolved	0.02<	mg/l
07-24-89	1600 hr.		07-28-89	1415 hr.	
Alk., Carbonate	1<	mg/l CaCO3	Magnesium	21.70	mg/l
07-24-89	1600 hr.		07-28-89	1315 hr.	
Alk., Total	245	mg/l CaCO3	Manganese	0.01<	mg/l
07-24-89	1600 hr.		07-28-89	1430 hr.	
Anions, Total	5.04	meq/l	pH	7.60	Units
			07-19-89	1600 hr.	
Calcium	63.2	mg/l	Potassium	0.17	mg/l
07-28-89	1300 hr.		07-28-89	1400 hr.	
Cations, Total	5.13	meq/l	Sodium	4.40	mg/l
			07-28-89	1330 hr.	
Chloride	5.0	mg/l	Solids, Dissolved	279.0	mg/l
07-25-89	1000 hr.		07-28-89	1215 hr.	
Conductivity	420	umhos/cm	Solids, Suspended	4.0	mg/l
07-24-89	0830 hr.		07-28-89	1215 hr.	
Fluoride	0.25	mg/l	Sulfate	6.0	mg/l
07-31-89	1300 hr.		07-26-89	1315 hr.	
Hardness, Total	247	mg/l CaCO3	Turbidity	33.0	NTU
			08-01-89	1700 hr.	

ANALYST: D. Tyson

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TELEPHONE: (801) 653-2311

August 3, 1989

Job No.: 59 9850

Date Rec'd: July 19, 1989

Date Sampled: July 18, 1989

Sampled By: UP&L

Sample ID: UP&L

EMS 79-15
Temperature 41 degrees
Flow 2.9 gpm
Rec'd 0830 hr.
Sampled 1545 hr.

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

WATER ANALYSIS

Acidity	6	mg/l CaCO3	Iron	0.02<	mg/l
07-25-89	1500 hr.		07-28-89	1415 hr.	
Alk., Bicarbonate	331	mg/l HCO3	Iron, Dissolved	0.02<	mg/l
07-24-89	1600 hr.		07-28-89	1415 hr.	
Alk., Carbonate	1<	mg/l CaCO3	Magnesium	20.50	mg/l
07-24-89	1600 hr.		07-28-89	1315 hr.	
Alk., Total	271	mg/l CaCO3	Manganese	0.01<	mg/l
07-24-89	1600 hr.		07-28-89	1430 hr.	
Anions, Total	5.98	meq/l	pH	7.30	Units
			07-19-89	1600 hr.	
Calcium	83.3	mg/l	Potassium	0.29	mg/l
07-28-89	1300 hr.		07-28-89	1400 hr.	
Cations, Total	6.13	meq/l	Sodium	6.40	mg/l
			07-28-89	1330 hr.	
Chloride	10.0	mg/l	Solids, Dissolved	286.0	mg/l
07-25-89	1000 hr.		07-28-89	1215 hr.	
Conductivity	450	umhos/cm	Solids, Suspended	5.0	mg/l
07-24-89	0830 hr.		07-28-89	1215 hr.	
Fluoride	0.26	mg/l	Sulfate	20.0	mg/l
07-31-89	1300 hr.		07-26-89	1315 hr.	
Hardness, Total	292	mg/l CaCO3	Turbidity	0.5	NTU
			08-01-89	1700 hr.	

ANALYST: D. Tipon

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August 3, 1989

Job No.: 59 9819

Date Rec'd: July 12, 1989

Date Sampled: July 11, 1989

Sampled By: UP&L

Sample ID: UP&L

EMS 79-26
Temperature 52 degrees
Flow 0.33 gpm
Rec'd 0800 hr.
Sampled 1118 hr.

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P.O. Box 1005
Huntington UT 84528

WATER ANALYSIS

Acidity	1<	mg/l CaCO3	Iron	0.30	mg/l
07-25-89	1500 hr.		07-28-89	1415 hr.	
Alk., Bicarbonate	337	mg/l HCO3	Iron, Dissolved	0.27	mg/l
07-24-89	1600 hr.		07-28-89	1415 hr.	
Alk., Carbonate	1<	mg/l CaCO3	Magnesium	37.10	mg/l
07-24-89	1600 hr.		07-28-89	1315 hr.	
Alk., Total	276	mg/l CaCO3	Manganese	0.02	mg/l
07-24-89	1600 hr.		07-28-89	1430 hr.	
Anions, Total	6.19	meq/l	pH	7.50	Units
			07-12-89	0930 hr.	
Calcium	54.0	mg/l	Potassium	1.20	mg/l
07-28-89	1300 hr.		07-28-89	1400 hr.	
Cations, Total	6.37	meq/l	Sodium	13.80	mg/l
			07-28-89	1330 hr.	
Chloride	10.0	mg/l	Solids, Dissolved	277.0	mg/l
07-25-89	1000 hr.		07-28-89	1215 hr.	
Conductivity	500	umhos/cm	Solids, Suspended	17.0	mg/l
07-24-89	0830 hr.		07-28-89	1215 hr.	
Fluoride	0.34	mg/l	Sulfate	25.0	mg/l
07-31-89	1300 hr.		07-26-89	1315 hr.	
Hardness, Total	288	mg/l CaCO3	Turbidity	5.0	NTU
			08-01-89	1700 hr.	

ANALYST: D. Tyson

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August 3, 1989

Job No.: 59 9816

Date Rec'd: July 12, 1989

Date Sampled: July 11, 1989

Sampled By: UP&L

Sample ID: UP&L

EMS 79-29
Temperature 41 degrees
Flow 1.1 gpm
Rec'd 0800 hr.
Sampled 1142 hr.

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P.O. Box 1005
Huntington UT 84528

WATER ANALYSIS

Acidity	3	mg/l CaCO3	Iron	0.12	mg/l
07-25-89	1500 hr.		07-28-89	1415 hr.	
Alk., Bicarbonate	281	mg/l HCO3	Iron, Dissolved	0.12	mg/l
07-24-89	1600 hr.		07-28-89	1415 hr.	
Alk., Carbonate	1<	mg/l CaCO3	Magnesium	27.70	mg/l
07-24-89	1600 hr.		07-28-89	1315 hr.	
Alk., Total	230	mg/l CaCO3	Manganese	0.01<	mg/l
07-24-89	1600 hr.		07-28-89	1430 hr.	
Anions, Total	5.55	meq/l	pH	8.20	Units
			07-12-89	0930 hr.	
Calcium	39.0	mg/l	Potassium	0.87	mg/l
07-28-89	1300 hr.		07-28-89	1400 hr.	
Cations, Total	5.54	meq/l	Sodium	30.10	mg/l
			07-28-89	1330 hr.	
Chloride	20.0	mg/l	Solids, Dissolved	411.0	mg/l
07-25-89	1000 hr.		07-28-89	1215 hr.	
Conductivity	580	umhos/cm	Solids, Suspended	1.0<	mg/l
07-24-89	0830 hr.		07-28-89	1215 hr.	
Fluoride	0.38	mg/l	Sulfate	24.0	mg/l
07-31-89	1300 hr.		07-26-89	1315 hr.	
Hardness, Total	211	mg/l CaCO3	Turbidity	0.6	NTU
			08-01-89	1700 hr.	

ANALYST: D. Lyon

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August 3, 1989

Job No.: 59 9817

Date Rec'd: July 12, 1989

Date Sampled: July 11, 1989

Sampled By: UP&L

Sample ID: UP&L

EMS 79-32
Temperature 50 degrees
Flow 0.5 gpm
Rec'd 0800 hr.
Sampled 1215 hr.

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P.O. Box 1005
Huntington UT 84528

WATER ANALYSIS

Acidity	1<	mg/l CaCO3	Iron	1.72	mg/l
07-25-89	1500 hr.		07-28-89	1415 hr.	
Alk., Bicarbonate	498	mg/l HCO3	Iron, Dissolved	0.72	mg/l
07-24-89	1600 hr.		07-28-89	1415 hr.	
Alk., Carbonate	1<	mg/l CaCO3	Magnesium	62.10	mg/l
07-24-89	1600 hr.		07-28-89	1315 hr.	
Alk., Total	408	mg/l CaCO3	Manganese	0.14	mg/l
07-24-89	1600 hr.		07-28-89	1430 hr.	
Anions, Total	14.47	meq/l	pH	7.60	Units
			07-12-89	0930 hr.	
Calcium	150.3	mg/l	Potassium	3.00	mg/l
07-28-89	1300 hr.		07-28-89	1400 hr.	
Cations, Total	14.28	meq/l	Sodium	37.20	mg/l
			07-28-89	1330 hr.	
Chloride	15.0	mg/l	Solids, Dissolved	327.0	mg/l
07-25-89	1000 hr.		07-28-89	1215 hr.	
Conductivity	820	umhos/cm	Solids, Suspended	1.0<	mg/l
07-24-89	0830 hr.		07-28-89	1215 hr.	
Fluoride	0.38	mg/l	Sulfate	290.0	mg/l
07-31-89	1300 hr.		07-26-89	1315hr.	
Hardness, Total	631	mg/l CaCO3	Turbidity	64.0	NTU
			08-01-89	1700 hr.	

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

August 3, 1989

Job No.: 59 9854

Date Rec'd: July 19, 1989

Date Sampled: July 18, 1989

Sampled By: UP&L

Sample ID: UP&L

EMS 79-38
Temperature 52 degrees
Flow 1.1 gpm
Rec'd 0830 hr.
Sampled 1455 hr.

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

WATER ANALYSIS

Acidity	7	mg/l CaCO3	Iron	1.15	mg/l
07-25-89	1500 hr.		07-28-89	1415 hr.	
Alk., Bicarbonate	384	mg/l HCO3	Iron, Dissolved	0.69	mg/l
07-24-89	1600 hr.		07-28-89	1415 hr.	
Alk., Carbonate	1<	mg/l CaCO3	Magnesium	23.40	mg/l
07-24-89	1600 hr.		07-28-89	1315 hr.	
Alk., Total	315	mg/l CaCO3	Manganese	0.06	mg/l
07-24-89	1600 hr.		07-28-89	1430 hr.	
Anions, Total	7.10	meq/l	pH	8.10	Units
			07-19-89	1600 hr.	
Calcium	79.9	mg/l	Potassium	1.70	mg/l
07-28-89	1300 hr.		07-28-89	1400 hr.	
Cations, Total	7.32	meq/l	Sodium	31.60	mg/l
			07-28-89	1330 hr.	
Chloride	5.0	mg/l	Solids, Dissolved	340.0	mg/l
07-25-89	1000 hr.		07-28-89	1215 hr.	
Conductivity	500	umhos/cm	Solids, Suspended	20.0	mg/l
07-24-89	0830 hr.		07-28-89	1215 hr.	
Fluoride	0.32	mg/l	Sulfate	39.0	mg/l
07-31-89	1300 hr.		07-26-89	1315 hr.	
Hardness, Total	296	mg/l CaCO3	Turbidity	0.2	NTU
			08-01-89	1700 hr.	

ANALYST: D. Tyson

Respectfully submitted,
COMMERCIAL TESTING & ENGINEERING CO.

Manager, Huntington Laboratory

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 3, 1989

Job No.: 59 9848

Date Rec'd: July 19, 1989

Date Sampled: July 18, 1989

Sampled By: UP&L

Sample ID: UP&L

EMS 80-47
Temperature 45 degrees
Flow 4.6 gpm
Rec'd 0830 hr.
Sampled 1300 hr.

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

WATER ANALYSIS

Acidity	1<	mg/l CaCO3	Iron	0.02<	mg/l
07-25-89	1500 hr.		07-28-89	1415 hr.	
Alk., Bicarbonate	333	mg/l HCO3	Iron, Dissolved	0.02<	mg/l
07-24-89	1600 hr.		07-28-89	1415 hr.	
Alk., Carbonate	1<	mg/l CaCO3	Magnesium	32.90	mg/l
07-24-89	1600 hr.		07-28-89	1315 hr.	
Alk., Total	273	mg/l CaCO3	Manganese	0.01<	mg/l
07-24-89	1600 hr.		07-28-89	1430 hr.	
Anions, Total	5.82	meq/l	pH	8.05	Units
			07-19-89	1600 hr.	
Calcium	55.2	mg/l	Potassium	0.32	mg/l
07-28-89	1300 hr.		07-28-89	1400 hr.	
Cations, Total	6.01	meq/l	Sodium	12.60	mg/l
			07-28-89	1330 hr.	
Chloride	5.0	mg/l	Solids, Dissolved	610.0	mg/l
07-25-89	1000 hr.		07-28-89	1215 hr.	
Conductivity	490	umhos/cm	Solids, Suspended	30.0	mg/l
07-24-89	0830 hr.		07-28-89	1215 hr.	
Fluoride	0.27	mg/l	Sulfate	17.0	mg/l
07-31-89	1300 hr.		07-26-89	1315 hr.	
Hardness, Total	273	mg/l CaCO3	Turbidity	3.4	NTU
			08-01-89	1700 hr.	

ANALYST: D. Tipon

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TELEPHONE: (801) 653-2311

August 3, 1989

Job No.: 59 9849

Date Rec'd: July 19, 1989

Date Sampled: July 18, 1989

Sampled By: UP&L

Sample ID: UP&L

EMS 82-52
Temperature 48 degrees
Flow 2.6 gpm
Rec'd 0830 hr.
Sampled 1405 hr.

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

WATER ANALYSIS

Acidity	5	mg/l CaCO3	Iron	0.02<	mg/l
07-25-89	1500 hr.		07-28-89	1415 hr.	
Alk., Bicarbonate	444	mg/l HCO3	Iron, Dissolved	0.02<	mg/l
07-24-89	1600 hr.		07-28-89	1415 hr	
Alk., Carbonate	1<	mg/l CaCO3	Magnesium	36.40	mg/l
07-24-89	1600 hr.		07-28-89	1315 hr.	
Alk., Total	364	mg/l CaCO3	Manganese	0.01<	mg/l
07-24-89	1600 hr.		07-28-89	1430 hr.	
Anions, Total	7.97	meq/l	pH	7.60	Units
			07-19-89	1600 hr.	
Calcium	77.2	mg/l	Potassium	0.65	mg/l
07-28-89	1300 hr.		07-28-89	1400 hr.	
Cations, Total	7.90	meq/l	Sodium	24.10	mg/l
			07-28-89	1330 hr.	
Chloride	10.0	mg/l	Solids, Dissolved	388.0	mg/l
07-25-89	1000 hr.		07-28-89	1215 hr.	
Conductivity	620	umhos/cm	Solids, Suspended	35.0	mg/l
07-24-89	0830 hr.		07-28-89	1215 hr.	
Fluoride	0.36	mg/l	Sulfate	28.0	mg/l
07-31-89	1300 hr.		07-26-89	1315 hr.	
Hardness, Total	343	mg/l CaCO3	Turbidity	2.8	NTU
			08-01-89	1700 hr.	

ANALYST: D. Tipon

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TELEPHONE: (801) 653-2311

August 3, 1989

Job No.: 59 9818

Date Rec'd: July 12, 1989

Date Sampled: July 11, 1989

Sampled By: UP&L

Sample ID: UP&L

EMS 84-53
Temperature 48 degrees
Flow 1.4 gpm
Rec'd 0800 hr.
Sampled 1020 hr.

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

WATER ANALYSIS

Acidity	4	mg/l CaCO3	Iron	0.31	mg/l
07-25-89	1500 hr.		07-28-89	1415 hr.	
Alk., Bicarbonate	326	mg/l HCO3	Iron, Dissolved	0.31	mg/l
07-24-89	1600 hr.		07-28-89	1415 hr.	
Alk., Carbonate	1<	mg/l CaCO3	Magnesium	25.90	mg/l
07-24-89	1600 hr.		07-28-89	1315 hr.	
Alk., Total	267	mg/l CaCO3	Manganese	0.01	mg/l
07-24-89	1600 hr.		07-28-89	1430 hr.	
Anions, Total	5.59	meq/l	pH	8.20	Units
			07-12-89	0930 hr.	
Calcium	46.9	mg/l	Potassium	0.52	mg/l
07-28-89	1300 hr.		07-28-89	1400 hr.	
Cations, Total	5.31	meq/l	Sodium	19.20	mg/l
			07-28-89	1330 hr.	
Chloride	10.0	mg/l	Solids, Dissolved	317.0	mg/l
07-25-89	1000 hr.		07-28-89	1215 hr.	
Conductivity	550	umhos/cm	Solids, Suspended	1.0<	mg/l
07-24-89	0830 hr.		07-28-89	1215 hr.	
Fluoride	0.33	mg/l	Sulfate	5.0	mg/l
07-31-89	1300 hr.		07-26-89	1315 hr.	
Hardness, Total	224	mg/l CaCO3	Turbidity	2.7	NTU
			08-01-89	1700 hr.	

ANALYST: D. Lyon

Respectfully submitted,
COMMERCIAL TESTING & ENGINEERING CO.

Manager, Huntington Laboratory

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TELEPHONE: (801) 653-2311

August 3, 1989

Job No.: 59 9853

Date Rec'd: July 19, 1989

Date Sampled: July 18, 1989

Sampled By: UP&L

Sample ID: UP&L

EMS 84-56
Temperature 41 degrees
Flow 1.6 gpm
Rec'd 0830 hr.
Sampled 1230 hr.

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

WATER ANALYSIS

Acidity	11	mg/l CaCO3	Iron	0.02<	mg/l
07-25-89	1500 hr.		07-28-89	1415 hr.	
Alk., Bicarbonate	317	mg/l HCO3	Iron, Dissolved	0.02<	mg/l
07-24-89	1600 hr.		07-28-89	1415 hr.	
Alk., Carbonate	1<	mg/l CaCO3	Magnesium	32.70	mg/l
07-24-89	1600 hr.		07-28-89	1315 hr.	
Alk., Total	260	mg/l CaCO3	Manganese	0.01<	mg/l
07-24-89	1600 hr.		07-28-89	1430 hr.	
Anions, Total	6.05	meq/l	pH	7.40	Units
			07-19-89	1600 hr.	
Calcium	54.2	mg/l	Potassium	0.49	mg/l
07-28-89	1300 hr.		07-28-89	1400 hr.	
Cations, Total	6.08	meq/l	Sodium	15.80	mg/l
			07-28-89	1330 hr.	
Chloride	5.0	mg/l	Solids, Dissolved	346.0	mg/l
07-25-89	1000 hr.		07-28-89	1215 hr.	
Conductivity	490	umhos/cm	Solids, Suspended	6.0	mg/l
07-24-89	0830 hr.		07-28-89	1215 hr.	
Fluoride	0.32	mg/l	Sulfate	40.0	mg/l
07-31-89	1300 hr.		07-26-89	1315 hr.	
Hardness, Total	270	mg/l CaCO3	Turbidity	77.0	NTU
			08-01-89	1700 hr.	

ANALYST: D. Lyon

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TELEPHONE: (801) 653-2311

August 3, 1989

Job No.: 59 9846

Date Rec'd: July 19, 1989

Date Sampled: July 18, 1989

Sampled By: UP&L

Sample ID: UP&L

EMS 89-60
Temperature 49 degrees
Flow 2.7 gpm
Rec'd 0830 hr.
Sampled 1445 hr.

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

WATER ANALYSIS

Acidity	5	mg/l CaCO3	Iron	0.10	mg/l
07-25-89	1500 hr.		07-28-89	1415 hr.	
Alk., Bicarbonate	375	mg/l HCO3	Iron, Dissolved	0.07	mg/l
07-24-89	1600 hr.		07-28-89	1415 hr.	
Alk., Carbonate	1<	mg/l CaCO3	Magnesium	29.00	mg/l
07-24-89	1600 hr.		07-28-89	1315 hr.	
Alk., Total	307	mg/l CaCO3	Manganese	0.01	mg/l
07-24-89	1600 hr.		07-28-89	1430 hr.	
Anions, Total	7.60	meq/l	pH	7.70	Units
			07-19-89	1600 hr.	
Calcium	81.8	mg/l	Potassium	0.52	mg/l
07-28-89	1300 hr.		07-28-89	1400 hr.	
Cations, Total	7.79	meq/l	Sodium	30.40	mg/l
			07-28-89	1330 hr.	
Chloride	5.0	mg/l	Solids, Dissolved	411.0	mg/l
07-25-89	1000 hr.		07-28-89	1215 hr.	
Conductivity	650	umhos/cm	Solids, Suspended	26.0	mg/l
07-24-89	0830 hr.		07-28-89	1215 hr.	
Fluoride	0.31	mg/l	Sulfate	70.0	mg/l
07-31-89	1300 hr.		07-26-89	1315 hr.	
Hardness, Total	324	mg/l CaCO3	Turbidity	0.9	NTU
			08-01-89	1700 hr.	

ANALYST: D. Tyson

Respectfully submitted,
COMMERCIAL TESTING & ENGINEERING CO.

Manager, Huntington Laboratory

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TELEPHONE: (801) 653-2311

August 3, 1989

Job No.: 59 9826

Date Rec'd: July 14, 1989

Date Sampled: July 12, 1989

Sampled By: UP&L

Sample ID: UP&L

EMS 89-61
Temperature 40 degrees
Flow 30.0 gpm
Rec'd 1600 hr.
Sampled 1100 hr.

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

WATER ANALYSIS

Acidity	11	mg/l CaCO3	Iron	0.08	mg/l
07-25-89	1500 hr.		07-28-89	1415 hr.	
Alk., Bicarbonate	318	mg/l HCO3	Iron, Dissolved	0.08	mg/l
07-24-89	1600 hr.		07-28-89	1415 hr.	
Alk., Carbonate	1<	mg/l CaCO3	Magnesium	24.60	mg/l
07-24-89	1600 hr.		07-28-89	1315 hr.	
Alk., Total	261	mg/l CaCO3	Manganese	0.01<	mg/l
07-24-89	1600 hr.		07-28-89	1430 hr.	
Anions, Total	5.67	meq/l	pH	7.40	Units
			07-14-89	1700 hr.	
Calcium	66.1	mg/l	Potassium	0.44	mg/l
07-28-89	1300 hr.		07-28-89	1400 hr.	
Cations, Total	5.66	meq/l	Sodium	7.70	mg/l
			07-28-89	1330 hr.	
Chloride	5.0	mg/l	Solids, Dissolved	293.0	mg/l
07-25-89	1000 hr.		07-28-89	1215 hr.	
Conductivity	500	umhos/cm	Solids, Suspended	10.0	mg/l
07-24-89	0830 hr.		07-28-89	1215 hr.	
Fluoride	0.21	mg/l	Sulfate	21.0	mg/l
07-31-89	1300 hr.		07-26-89	1315 hr.	
Hardness, Total	266	mg/l CaCO3	Turbidity	3.5	NTU
			08-01-89	1700 hr.	

ANALYST: D. Tyson

Respectfully submitted,
COMMERCIAL TESTING & ENGINEERING CO.

Manager, Huntington Laboratory

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

August 3, 1989

Job No.: 59 9825

Date Rec'd: July 14, 1989

Date Sampled: July 12, 1989

Sampled By: UP&L

Sample ID: UP&L

EMS 89-62
Temperature 41 degrees
Flow 6.0 gpm
Rec'd 1600 hr.
Sampled 1300 hr.

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

WATER ANALYSIS

Acidity	1<	mg/l CaCO3	Iron	0.10	mg/l
07-25-89	1500 hr.		07-28-89	1415 hr.	
Alk., Bicarbonate	266	mg/l HCO3	Iron, Dissolved	0.10	mg/l
07-24-89	1600 hr.		07-28-89	1415 hr.	
Alk., Carbonate	1<	mg/l CaCO3	Magnesium	25.10	mg/l
07-24-89	1600 hr.		07-28-89	1315 hr.	
Alk., Total	218	mg/l CaCO3	Manganese	0.01<	mg/l
07-24-89	1600 hr.		07-28-89	1430 hr.	
Anions, Total	4.73	meq/l	pH	7.90	Units
			07-14-89	1700 hr.	
Calcium	45.3	mg/l	Potassium	0.76	mg/l
07-28-89	1300 hr.		07-28-89	1400 hr.	
Cations, Total	4.54	meq/l	Sodium	4.50	mg/l
			07-28-89	1330 hr.	
Chloride	5.0	mg/l	Solids, Dissolved	187.0	mg/l
07-25-89	1000 hr.		07-28-89	1215 hr.	
Conductivity	350	umhos/cm	Solids, Suspended	1.0<	mg/l
07-24-89	0830 hr.		07-28-89	1215 hr.	
Fluoride	0.19	mg/l	Sulfate	16.0	mg/l
07-31-89	1300 hr.		07-26-89	1315 hr.	
Hardness, Total	216	mg/l CaCO3	Turbidity	1.7	NTU
			08-01-89	1700 hr.	

ANALYST: D. Tyson

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Manager, Huntington Laboratory

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TELEPHONE: (801) 653-2311

August 3, 1989

Job No.: 59 9824

Date Rec'd: July 14, 1989

Date Sampled: July 12, 1989

Sampled By: UP&L

Sample ID: UP&L

EMS 89-63
Temperature 53 degrees
Flow 6.0 gpm
Rec'd 1600 hr.
Sampled 1340 hr.

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

WATER ANALYSIS

Acidity	5	mg/l CaCO3	Iron	0.10	mg/l
07-25-89	1500 hr.		07-28-89	1415 hr.	
Alk., Bicarbonate	294	mg/l HCO3	Iron, Dissolved	0.10	mg/l
07-24-89	1600 hr.		07-28-89	1415 hr.	
Alk., Carbonate	1<	mg/l CaCO3	Magnesium	22.40	mg/l
07-24-89	1600 hr.		07-28-89	1315 hr.	
Alk., Total	241	mg/l CaCO3	Manganese	0.01<	mg/l
07-24-89	1600 hr.		07-28-89	1430 hr.	
Anions, Total	4.94	meq/l	pH	8.10	Units
			07-14-89	1700 hr.	
Calcium	50.3	mg/l	Potassium	0.76	mg/l
07-28-89	1300 hr.		07-28-89	1400 hr.	
Cations, Total	4.49	meq/l	Sodium	2.80	mg/l
			07-28-89	1330 hr.	
Chloride	5.0	mg/l	Solids, Dissolved	213.0	mg/l
07-25-89	1000 hr.		07-28-89	1215 hr.	
Conductivity	400	umhos/cm	Solids, Suspended	9.0	mg/l
07-24-89	0830 hr.		07-28-89	1215 hr.	
Fluoride	0.19	mg/l	Sulfate	5.0	mg/l
07-31-89	1300 hr.		07-26-89	1315 hr.	
Hardness, Total	218	mg/l CaCO3	Turbidity	2.5	NTU
			08-01-89	1700 hr.	

ANALYST: D. Lyon

Respectfully submitted,
COMMERCIAL TESTING & ENGINEERING CO.

Manager, Huntington Laboratory

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TELEPHONE: (801) 653-2311

August 3, 1989

Job No.: 59 9829

Date Rec'd: July 14, 1989

Date Sampled: July 12, 1989

Sampled By: UP&L

Sample ID: UP&L

EMS 89-64
Temperature 44 degrees
Flow 3.2 gpm
Rec'd 1600 hr.
Sampled 1100 hr.

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

WATER ANALYSIS

Acidity 07-25-89	1< 1500 hr.	mg/l CaCO3	Iron 07-28-89	0.90 1415 hr.	mg/l
Alk., Bicarbonate 07-24-89	532 1600 hr.	mg/l HCO3	Iron, Dissolved 07-28-89	0.90 1415 hr.	mg/l
Alk., Carbonate 07-24-89	1< 1600 hr.	mg/l CaCO3	Magnesium 07-28-89	29.60 1315 hr.	mg/l
Alk., Total 07-24-89	436 1600 hr.	mg/l CaCO3	Manganese 07-28-89	0.06 1430 hr.	mg/l
Anions, Total	10.74	meq/l	pH 07-14-89	7.90 1700 hr.	Units
Calcium 07-28-89	163.9 1300 hr.	mg/l	Potassium 07-28-89	0.79 1400 hr.	mg/l
Cations, Total	10.86	meq/l	Sodium 07-28-89	5.10 1330 hr.	mg/l
Chloride 07-25-89	5.0 1000 hr.	mg/l	Solids, Dissolved 07-28-89	317.0 1215 hr.	mg/l
Conductivity 07-24-89	550 0830 hr.	umhos/cm	Solids, Suspended 07-28-89	1430.0 1215 hr.	mg/l
Fluoride 07-31-89	0.29 1300 hr.	mg/l	Sulfate 07-26-89	100.0 1315 hr.	mg/l
Hardness, Total	531	mg/l CaCO3	Turbidity 08-01-89	1.0 1700 hr.	NTU

ANALYST: D. Lyon

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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

August 4, 1989

Job No.: 59 9828

Date Rec'd: July 14, 1989

Date Sampled: July 12, 1989

Sampled By: UP&L

Sample ID: UP&L

EMS 89-65
Temperature 44 degrees
Flow 3.2 gpm
Rec'd 1600 hr.
Sampled 1130 hr.

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

WATER ANALYSIS

Acidity	07-25-89	7 1500 hr.	mg/l CaCO3	Iron	07-28-89	0.05 1415 hr.	mg/l
Alk., Bicarbonate	07-24-89	360 1600 hr.	mg/l HCO3	Iron, Dissolved	07-28-89	0.05 1415 hr.	mg/l
Alk., Carbonate	07-24-89	1< 1600 hr.	mg/l CaCO3	Magnesium	07-28-89	28.90 1315 hr.	mg/l
Alk., Total	07-24-89	295 1600 hr.	mg/l CaCO3	Manganese	07-28-89	0.01< 1430 hr.	mg/l
Anions, Total		6.29	meq/l	pH	07-14-89	7.40 1700 hr.	Units
Calcium	07-28-89	74.3 1300 hr.	mg/l	Potassium	07-28-89	0.28 1400 hr.	mg/l
Cations, Total		6.25	meq/l	Sodium	07-28-89	3.70 1330 hr.	mg/l
Chloride	07-25-89	5.0 1000 hr.	mg/l	Solids, Dissolved	07-28-89	306.0 1215 hr.	mg/l
Conductivity	07-24-89	500 0830 hr.	umhos/cm	Solids, Suspended	07-28-89	44.0 1215 hr.	mg/l
Fluoride	07-31-89	0.18 1300 hr.	mg/l	Sulfate	07-26-89	19.0 1315 hr.	mg/l
Hardness, Total		305	mg/l CaCO3	Turbidity	08-01-89	3.5 1700 hr.	NTU

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ANALYST: D. Tyson

Respectfully submitted,
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TELEPHONE: (801) 653-2311

August 4, 1989

Job No.: 59 9827

Date Rec'd: July 14, 1989

Date Sampled: July 12, 1989

Sampled By: UP&L

Sample ID: UP&L

EMS 89-67
Temperature 43 degrees
Flow 0.5 gpm
Rec'd 1600 hr.
Sampled 1305 hr.

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

WATER ANALYSIS

Acidity		6	mg/l CaCO3	Iron		0.47	mg/l
07-25-89	1500 hr.			07-28-89	1415 hr.		
Alk., Bicarbonate		321	mg/l HCO3	Iron, Dissolved		0.47	mg/l
07-24-89	1600 hr.			07-28-89	1415 hr.		
Alk., Carbonate		1<	mg/l CaCO3	Magnesium		28.90	mg/l
07-24-89	1600 hr.			07-28-89	1315 hr.		
Alk., Total		263	mg/l CaCO3	Manganese		0.01<	mg/l
07-24-89	1600 hr.			07-28-89	1430 hr.		
Anions, Total		5.87	meq/l	pH		7.40	Units
				07-14-89	1700 hr.		
Calcium		54.5	mg/l	Potassium		0.85	mg/l
07-28-89	1300 hr.			07-28-89	1400 hr.		
Cations, Total		5.65	meq/l	Sodium		12.30	mg/l
				07-28-89	1330 hr.		
Chloride		10.0	mg/l	Solids, Dissolved		308.0	mg/l
07-25-89	1000 hr.			07-28-89	1215 hr.		
Conductivity		520	umhos/cm	Solids, Suspended		10.0	mg/l
07-24-89	0830 hr.			07-28-89	1215 hr.		
Fluoride		0.26	mg/l	Sulfate		22.0	mg/l
07-31-89	1300 hr.			07-26-89	1315 hr.		
Hardness, Total		255	mg/l CaCO3	Turbidity		7.2	NTU
				08-01-89	1700 hr.		

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ANALYST: D. Tyson

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TELEPHONE: (801) 653-2311

August 3, 1989

Job No.: 59 9837

Date Rec'd: July 17, 1989

Date Sampled: July 17, 1989

Sampled By: UP&L

Sample ID: UP&L

EMS 89-71
Temperature 40 degrees
Flow 10.9 gpm
Rec'd 1500 hr.
Sampled 1347 hr.

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

WATER ANALYSIS

Acidity	5	mg/l CaCO3	Iron	0.03	mg/l
07-25-89	1500 hr.		07-28-89	1415 hr.	
Alk., Bicarbonate	378	mg/l HCO3	Iron, Dissolved	0.03	mg/l
07-24-89	1600 hr.		07-28-89	1415 hr.	
Alk., Carbonate	1<	mg/l CaCO3	Magnesium	27.20	mg/l
07-24-89	1600 hr.		07-28-89	1315 hr.	
Alk., Total	310	mg/l CaCO3	Manganese	1.54	mg/l
07-24-89	1600 hr.		07-28-89	1430 hr.	
Anions, Total	6.94	meq/l	pH	7.20	Units
			07-17-89	1600 hr.	
Calcium	76.8	mg/l	Potassium	0.66	mg/l
07-28-89	1300 hr.		07-28-89	1400 hr.	
Cations, Total	6.86	meq/l	Sodium	17.90	mg/l
			07-28-89	1330 hr.	
Chloride	5.0	mg/l	Solids, Dissolved	407.0	mg/l
07-25-89	1000 hr.		07-28-89	1215 hr.	
Conductivity	590	umhos/cm	Solids, Suspended	48.0	mg/l
07-24-89	0830 hr.		07-28-89	1215 hr.	
Fluoride	0.18	mg/l	Sulfate	36.0	mg/l
07-31-89	1300 hr.		07-26-89	1315 hr.	
Hardness, Total	304	mg/l CaCO3	Turbidity	0.2	NTU
			08-01-89	1700 hr.	

ANALYST: D. Ipson

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September 1, 1989

Job No.: 59 9968

Date Rec'd: August 28, 1989

Date Sampled: August 25, 1989

Sampled By: UP&L

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

Sample ID: UP&L

EMS BURNT TREE
Flow 3.9 gpm
Temperature 43 degrees F.
Rec'd 1600 hr.
Sampled 1725 hr.
Field Parameters
pH 7.71
D.O. 7.92
Conductivity 422

WATER ANALYSIS

Alk., Carbonate	1<	mg/l CaCO3	Magnesium	28.20	mg/l
08-29-89	0900 hr.		08-29-89	1315 hr.	
Calcium	55.3	mg/l	Manganese	0.01<	mg/l
08-29-89	1300 hr.		08-30-89	1400 hr.	
Hardness, Total	254	mg/l CaCO3			

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ANALYST: D. Tyson

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TELEPHONE: (801) 653-2311

September 1, 1989

Job No.: 59 9970

Date Rec'd: August 28, 1989

Date Sampled: August 25, 1989

Sampled By: UP&L

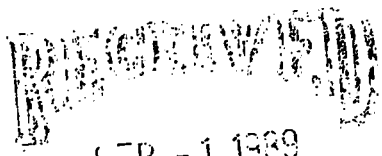
Utah Power and Light Co.
P.O. Box 1005
Huntington UT 84528

Sample ID: UP&L

EMS ELK SPRINGS
Flow 0.14 gpm
Temperature 44 degrees F.
Rec'd 1600 hr.
Sampled 1335 hr.
Field Parameters
pH 7.95
D.O. 8.20
Conductivity 346

WATER ANALYSIS

Alk., Carbonate 08-29-89	1< 0900 hr.	mg/l CaCO3	Magnesium 08-29-89	21.80 1315 hr.	mg/l
Calcium 08-29-89	53.2 1300 hr.	mg/l	Manganese 08-30-89	0.01< 1400 hr.	mg/l
Hardness, Total	223	mg/l CaCO3			



ANALYST: D. Tipton

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September 1, 1989

Job No.: 59 9969

Date Rec'd: August 28, 1989

Date Sampled: August 25, 1989

Sampled By: UP&L

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

Sample ID: UP&L

EMS SHEBA SPRINGS
Flow 0.5 gpm
Temperature 49 degrees F.
Rec'd 1600 hr.
Sampled 1410 hr.
Field Parameters
pH 7.65
D.O. 8.36
Conductivity 396

WATER ANALYSIS

Alk., Carbonate	1<	mg/l CaCO3	Magnesium	10.30	mg/l
08-29-89	0900 hr.		08-29-89	1315 hr.	
Calcium	67.7	mg/l	Manganese	0.01<	mg/l
08-29-89	1300 hr.		08-30-89	1400 hr.	
Hardness, Total	211	mg/l CaCO3			

ANALYST: D. Tipon

Respectfully submitted,
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Manager, Huntington Laboratory

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September 1, 1989

Job No.: 59 9967

Date Rec'd: August 28, 1989

Date Sampled: August 25, 1989

Sampled By: UP&L

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

Sample ID: UP&L

EMS 79-10
Flow 3.0 gpm
Temperature 43 degrees F.
Rec'd 1600 hr.
Sampled 1357 hr.
Field Parameters
pH 7.7
D.O. 8.19
Conductivity 394

WATER ANALYSIS

Alk., Carbonate	1<	mg/l CaCO3	Magnesium	23.50	mg/l
08-29-89	0900 hr.		08-29-89	1315 hr.	
Calcium	41.5	mg/l	Manganese	0.01<	mg/l
08-29-89	1300 hr.		08-30-89	1400 hr.	
Hardness, Total	200	mg/l CaCO3			

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September 1, 1989

Job No.: 59 9964

Date Rec'd: August 28, 1989

Date Sampled: August 25, 1989

Sampled By: UP&L

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

Sample ID: UP&L

EMS 79-29
Flow 0.75 gpm
Temperature 42 degrees F.
Rec'd 1600 hr.
Sampled 1445 hr.
Field Parameters
pH 8.28
D.O. 8.08
Conductivity 451

WATER ANALYSIS

Alk., Carbonate	1<	mg/l CaCO3	Magnesium	37.70	mg/l
08-29-89	0900 hr.		08-29-89	1315 hr.	
Calcium	38.8	mg/l	Manganese	0.01<	mg/l
08-29-89	1300 hr.		08-30-89	1400 hr.	
Hardness, Total	252	mg/l CaCO3			

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September 1, 1989

Job No.: 59 9965

Date Rec'd: August 28, 1989

Date Sampled: August 25, 1989

Sampled By: UP&L

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

Sample ID: UP&L

EMS SHEEP HERDER SPRING 82-52
Flow 2.00 gpm
Temperature 41 degrees F.
Rec'd 1600 hr.
Sampled 1540 hr.
Field Parameters
pH 8.20
D.O. 8.0
Conductivity 570

WATER ANALYSIS

Alk., Carbonate	1<	mg/l CaCO3	Magnesium	34.90	mg/l
08-29-89	0900 hr.		08-29-89	1315 hr.	
Calcium	56.6	mg/l	Manganese	0.01<	mg/l
08-29-89	1300 hr.		08-30-89	1400 hr.	
Hardness, Total	285	mg/l CaCO3			

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ANALYST: D. Tyson

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September 1, 1989

Job No.: 59 9966

Date Rec'd: August 28, 1989

Date Sampled: August 25, 1989

Sampled By: UP&L

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

Sample ID: UP&L

EMS 84-56
Flow 0.9 gpm
Temperature 42 degrees F.
Rec'd 1600 hr.
Sampled 1510 hr.
Field Parameters
pH 8.42
D.O. 8.06
Conductivity 489

WATER ANALYSIS

Alk., Carbonate	1<	mg/l CaCO3	Magnesium	35.60	mg/l
08-29-89	0900 hr.		08-29-89	1315 hr.	
Calcium	51.7	mg/l	Manganese	0.01<	mg/l
08-29-89	1300 hr.		08-30-89	1400 hr.	
Hardness, Total	276	mg/l CaCO3			

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TELEPHONE: (801) 653-2311

September 20, 1989

Job No.: 59 10003

Date Rec'd: September 12, 1989

Date Sampled: September 12, 1989

Sampled By: UP&L

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

Sample ID: UP&L

EMS BURNT TREE
Flow 5.7 gpm
Rec'd 1600 hr.
Sampled 1045 hr.
FIELD MEASUREMENTS
pH 8.02
D.O. 8.32
Conductivity 490

WATER ANALYSIS

Alk., Carbonate	1<	mg/l CaCO3	Magnesium	31.90	mg/l
09-12-89	1630 hr.		09-19-89	1430 hr.	
Calcium	67.9	mg/l	Manganese	0.01	mg/l
09-19-89	1400 hr.		09-19-89	1530 hr.	
Hardness, Total	301	mg/l CaCO3			

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ANALYST: D. Tyson

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TELEPHONE: (801) 653-2311

September 20, 1989

Job No.: 59 10005

Date Rec'd: September 12, 1989

Date Sampled: September 11, 1989

Sampled By: UP&L

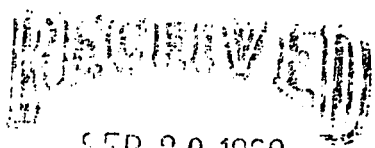
Utah Power and Light Co.
P.O. Box 1005
Huntington UT 84528

Sample ID: UP&L

EMS ELK SPRINGS
Temperature 40 degrees
Flow 0.14 gpm
Rec'd 1600 hr.
Sampled 1940 hr.
FIELD MEASUREMENTS
pH 7.59
D.O. 9.12
Conductivity 367

WATER ANALYSIS

Alk., Carbonate	1<	mg/l CaCO3	Magnesium	23.20	mg/l
09-12-89	1630 hr.		09-19-89	1430 hr.	
Calcium	62.2	mg/l	Manganese	0.01	mg/l
09-19-89	1400 hr.		09-19-89	1530 hr.	
Hardness, Total	251	mg/l CaCO3			



ANALYST: D. Tipon

Respectfully submitted,
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Manager, Huntington Laboratory

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TELEPHONE: (801) 653-2311

September 20, 1989

Job No.: 59 10008

Date Rec'd: September 12, 1989

Date Sampled: September 11, 1989

Sampled By: UP&L

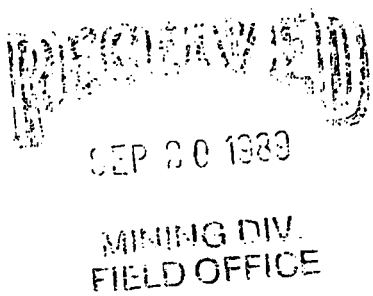
Utah Power and Light Co.
P.O. Box 1005
Huntington UT 84528

Sample ID: UP&L

EMS SHEBA SPRINGS
Temperature 44 degrees
Flow 0.17 gpm
Rec'd 1600 hr.
Sampled 2020 hr.
FIELD MEASUREMENTS
pH 7.87
D.O. 8.27
Conductivity 406

WATER ANALYSIS

Alk., Carbonate	1<	mg/l CaCO3	Magnesium	11.90	mg/l
09-12-89	1630 hr.		09-19-89	1430 hr.	
Calcium	74.9	mg/l	Manganese	0.01<	mg/l
09-19-89	1400 hr.		09-19-89	1530 hr.	
Hardness, Total	236	mg/l CaCO3			



ANALYST: D. Tipon

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COMMERCIAL TESTING & ENGINEERING CO.

Manager, Huntington Laboratory

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TELEPHONE: (801) 653-2311

September 20, 1989

Job No.: 59 10004

Date Rec'd: September 12, 1989

Date Sampled: September 11, 1989

Sampled By: UP&L

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

Sample ID: UP&L

EMS 79-10
Temperature 41 degrees
Flow 4.9 gpm
Rec'd 1600 hr.
Sampled 2005 hr.
FIELD MEASUREMENTS
pH 7.48
D.O. 6.68
Conductivity 415

WATER ANALYSIS

Alk., Carbonate	1<	mg/l CaCO3	Magnesium	23.80	mg/l
09-12-89	1630 hr.		09-19-89	1430 hr.	
Calcium	77.7	mg/l	Manganese	0.01<	mg/l
09-19-89	1400 hr.		09-19-89	1530 hr.	
Hardness, Total	292	mg/l CaCO3			

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ANALYST: D. Tyson

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TELEPHONE: (801) 653-2311

September 20, 1989

Job No.: 59 10006

Date Rec'd: September 12, 1989

Date Sampled: September 12, 1989

Sampled By: UP&L

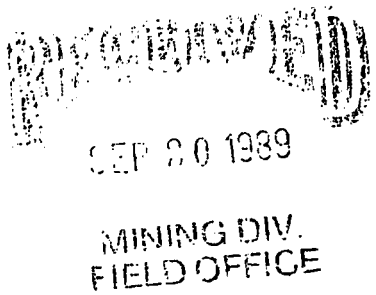
Utah Power and Light Co.
P.O. Box 1005
Huntington UT 84528

Sample ID: UP&L

EMS 79-29
Temperature 41 degrees
Flow 1.0 gpm
Rec'd 1600 hr.
Sampled 0835 hr.
FIELD MEASUREMENTS
pH 7.99
D.O. 6.04
Conductivity 514

WATER ANALYSIS

Alk., Carbonate	1<	mg/l CaCO3	Magnesium	36.00	mg/l
09-12-89	1630 hr.		09-19-89	1430 hr.	
Calcium	41.8	mg/l	Manganese	0.01<	mg/l
09-19-89	1400 hr.		09-19-89	1530 hr.	
Hardness, Total	253	mg/l CaCO3			



ANALYST: D. Tyson

Respectfully submitted,
COMMERCIAL TESTING & ENGINEERING CO.

Manager, Huntington Laboratory

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TELEPHONE: (801) 653-2311

September 20, 1989

Job No.: 59 10007

Date Rec'd: September 12, 1989

Date Sampled: September 12, 1989

Sampled By: UP&L

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

Sample ID: UP&L

EMS 82-52
Temperature 40 degrees
Flow 2.8 gpm
Rec'd 1600 hr.
Sampled 1105 hr.
FIELD MEASUREMENTS
pH 7.88
D.O. 9.42
Conductivity 591

WATER ANALYSIS

Alk., Carbonate	1<	mg/l CaCO3	Magnesium	35.20	mg/l
09-12-89	1630 hr.		09-19-89	1430 hr.	
Calcium	68.8	mg/l	Manganese	0.01<	mg/l
09-19-89	1400 hr.		09-19-89	1530 hr.	
Hardness, Total	317	mg/l CaCO3			

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ANALYST: D. Tipon

Respectfully submitted,
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Manager, Huntington Laboratory

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TELEPHONE: (801) 653-2311

September 20, 1989

Job No.: 59 10002

Date Rec'd: September 12, 1989

Date Sampled: September 12, 1989

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 1.3 gpm
Rec'd 1600 hr.
Sampled 0940 hr.
FIELD MEASUREMENTS
pH 8.01
D.O. 9.27
Conductivity 525

WATER ANALYSIS

Alk., Carbonate	1<	mg/l CaCO3	Magnesium	33.50	mg/l
09-12-89	1630 hr.		09-19-89	1430 hr.	
Calcium	65.7	mg/l	Manganese	0.01	mg/l
09-19-89	1400 hr.		09-19-89	1530 hr.	
Hardness, Total	302	mg/l CaCO3			

ANALYST: D. Tyson

Respectfully submitted,
COMMERCIAL TESTING & ENGINEERING CO.

Manager, Huntington Laboratory

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October 20, 1989

Job No.: 59 10078

Date Rec'd: October 16, 1989

Date Sampled: October 16, 1989

Sampled By: UP&L

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

Sample ID: UP&L

BURNT TREE EMS
Temperature 44 degrees
Flow 5.06 gpm
Rec'd 1630 hr.
Sampled 1025 hr.
Field Measurements
pH 7.72
D.O. 10.90
Conductivity 451

WATER ANALYSIS

Alk., Bicarbonate	344	mg/l HCO3	Magnesium	31.70	mg/l
10-17-89	1300 hr.		10-19-89	1400 hr.	
Alk., Carbonate	1<	mg/l CaCO3	Manganese	0.01<	mg/l
10-17-89	1300 hr.		10-19-89	1430 hr.	
Alk., Total	282	mg/l CaCO3	Oxygen, Dissolved	7.7	mg/l
10-17-89	1300 hr.		10-16-89	1630 hr.	
Anions, Total	5.99	meq/l	pH	7.50	Units
			10-16-89	1645 hr.	
Calcium	52.3	mg/l	Potassium	0.50	mg/l
10-19-89	1330 hr.		10-19-89	1300 hr.	
Cations, Total	5.83	meq/l	Sodium	14.00	mg/l
			10-19-89	1530 hr.	
Chloride	10.0	mg/l	Solids, Dissolved	290.0	mg/l
10-17-89	1430 hr.		10-17-89	1500 hr.	
Conductivity	490	umhos/cm	Solids, Suspended	1.0<	mg/l
10-17-89	1155 hr.		10-17-89	1500 hr.	
Hardness, Total	261	mg/l CaCO3	Sulfate	10.0	mg/l
			10-18-89	1000 hr.	
Iron	0.13	mg/l			
10-19-89	1445 hr.				

ANALYST: D. Tyson

Respectfully submitted,
COMMERCIAL TESTING & ENGINEERING CO.

Manager, Huntington Laboratory

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October 20, 1989

Job No.: 59 10083

Date Rec'd: October 17, 1989

Date Sampled: October 17, 1989

Sampled By: UP&L

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

Sample ID: UP&L

ELK SPRINGS
Temperature 39 degrees
Flow 0.13/36.8 gpm
Rec'd 1630 hr.
Sampled 1415 hr.
Field Measurements
pH 8.22
D.O. 12.22
Conductivity 370

WATER ANALYSIS

Alk., Bicarbonate	257	mg/l HCO3	Magnesium	24.40	mg/l
10-19-89	1530 hr.		10-19-89	1400 hr.	
Alk., Carbonate	1<	mg/l CaCO3	Manganese	0.01<	mg/l
10-19-89	1600 hr.		10-19-89	1430 hr.	
Alk., Total	211	mg/l CaCO3	Oxygen, Dissolved	4.9	mg/l
10-19-89	1600 hr.		10-17-89	1750 hr.	
Anions, Total	4.84	meq/l	pH	8.25	Units
			10-17-89	1700 hr.	
Calcium	51.1	mg/l	Potassium	0.55	mg/l
10-19-89	1330 hr.		10-19-89	1300 hr.	
Cations, Total	4.90	meq/l	Sodium	7.70	mg/l
			10-19-89	1530 hr.	
Chloride	20.0	mg/l	Solids, Dissolved	251.0	mg/l
10-19-89	1630 hr.		10-18-89	1645 hr.	
Conductivity	355	umhos/cm	Solids, Suspended	1.0<	mg/l
10-19-89	1425 hr.		10-18-89	1645 hr.	
Hardness, Total	228	mg/l CaCO3	Sulfate	8.0	mg/l
			10-18-89	1000 hr.	
Iron	0.05	mg/l			
10-19-89	1445 hr.				

ANALYST: D. Tyson

Respectfully submitted,
COMMERCIAL TESTING & ENGINEERING CO.

Manager, Huntington Laboratory

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October 20, 1989

Job No.: 59 10080

Date Rec'd: October 16, 1989

Date Sampled: October 16, 1989

Sampled By: UP&L

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

Sample ID: UP&L

SHEBA SPRINGS
Temperature 43 degrees
Flow 0.09 gpm
Rec'd 1630 hr.
Sampled 1410 hr.
Field Measurements
pH 7.91
D.O. 11.17
Conductivity 410

WATER ANALYSIS

Alk., Bicarbonate	253	mg/l HCO3	Magnesium	9.50	mg/l
10-17-89	1300 hr.		10-19-89	1400 hr.	
Alk., Carbonate	1<	mg/l CaCO3	Manganese	0.01<	mg/l
10-17-89	1300 hr.		10-19-89	1430 hr.	
Alk., Total	207	mg/l CaCO3	Oxygen, Dissolved	7.8	mg/l
10-17-89	1300 hr.		10-16-89	1630 hr.	
Anions, Total	4.58	meq/l	pH	7.70	Units
			10-16-89	1645 hr.	
Calcium	72.0	mg/l	Potassium	0.01	mg/l
10-19-89	1330 hr.		10-19-89	1300 hr.	
Cations, Total	4.54	meq/l	Sodium	3.70	mg/l
			10-19-89	1530 hr.	
Chloride	15.0	mg/l	Solids, Dissolved	249.0	mg/l
10-17-89	1430 hr.		10-17-89	1500 hr.	
Conductivity	405	umhos/cm	Solids, Suspended	1.0<	mg/l
10-17-89	1155 hr.		10-17-89	1500 hr.	
Hardness, Total	219	mg/l CaCO3	Sulfate	6.0	mg/l
			10-18-89	1000 hr.	
Iron	0.03	mg/l			
10-19-89	1445 hr.				

ANALYST: D. Tyson

Respectfully submitted,
COMMERCIAL TESTING & ENGINEERING CO.

Manager, Huntington Laboratory

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October 20, 1989

Job No.: 59 10072

Date Rec'd: October 16, 1989

Date Sampled: October 16, 1989

Sampled By: UP&L

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

Sample ID: UP&L

EMS 79-2
Temperature 42 degrees
Flow 1.67 gpm
Rec'd 1630 hr.
Sampled 1120 hr.
Field Measurements
pH 7.93
D.O. 10.88
Conductivity 493

WATER ANALYSIS

Alk., Bicarbonate	372	mg/l HCO3	Magnesium	25.70	mg/l
10-17-89 1300 hr.			10-19-89 1400 hr.		
Alk., Carbonate	1<	mg/l CaCO3	Manganese	0.01<	mg/l
10-17-89 1300 hr.			10-19-89 1430 hr.		
Alk., Total	305	mg/l CaCO3	Oxygen, Dissolved	6.7	mg/l
10-17-89 1300 hr.			10-16-89 1630 hr.		
Anions, Total	6.19	meq/l	pH	7.30	Units
			10-16-89 1645 hr.		
Calcium	68.7	mg/l	Potassium	7.90	mg/l
10-19-89 1330 hr.			10-19-89 1300 hr.		
Cations, Total	5.97	meq/l	Sodium	5.20	mg/l
			10-19-89 1530 hr.		
Chloride	5.0	mg/l	Solids, Dissolved	174.0	mg/l
10-17-89 1430 hr.			10-17-89 1500 hr.		
Conductivity	505	umhos/cm	Solids, Suspended	1.0<	mg/l
10-17-89 1155 hr.			10-17-89 1500 hr.		
Hardness, Total	277	mg/l CaCO3	Sulfate	5.0	mg/l
			10-18-89 1000 hr.		
Iron	0.02<	mg/l			
10-19-89 1445 hr.					

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ANALYST: D. Tipon

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Manager, Huntington Laboratory

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October 20, 1989

Job No.: 59 10071

Date Rec'd: October 16, 1989

Date Sampled: October 16, 1989

Sampled By: UP&L

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

Sample ID: UP&L

EMS 79-10
Temperature 43 degrees
Flow 2.7 gpm
Rec'd 1630 hr.
Sampled 1350 hr.
Field Measurements
pH 8.23
D.O. 11.11
Conductivity 438

WATER ANALYSIS

Alk., Bicarbonate	337	mg/l HCO3	Magnesium	24.50	mg/l
10-17-89	1300 hr.		10-19-89	1400 hr.	
Alk., Carbonate	1<	mg/l CaCO3	Manganese	0.01<	mg/l
10-17-89	1300 hr.		10-19-89	1430 hr.	
Alk., Total	276	mg/l CaCO3	Oxygen, Dissolved	7.4	mg/l
10-17-89	1300 hr.		10-16-89	1630 hr.	
Anions, Total	5.73	meq/l	pH	7.80	Units
			10-16-89	1645 hr.	
Calcium	63.8	mg/l	Potassium	11.80	mg/l
10-19-89	1330 hr.		10-19-89	1300 hr.	
Cations, Total	5.73	meq/l	Sodium	5.20	mg/l
			10-19-89	1530 hr.	
Chloride	5.0	mg/l	Solids, Dissolved	200.0	mg/l
10-17-89	1430 hr.		10-17-89	1500 hr.	
Conductivity	498	umhos/cm	Solids, Suspended	1.0<	mg/l
10-17-89	1155 hr.		10-17-89	1500 hr.	
Hardness, Total	260	mg/l CaCO3	Sulfate	10.0	mg/l
			10-18-89	1000 hr.	
Iron	0.02<	mg/l			
10-19-89	1445 hr.				

ANALYST: D. Tepox

Respectfully submitted,
COMMERCIAL TESTING & ENGINEERING CO.

Manager, Huntington Laboratory

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October 20, 1989

Job No.: 59 10084

Date Rec'd: October 17, 1989

Date Sampled: October 17, 1989

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 1.2 gpm
Rec'd 1630 hr.
Sampled 1125 hr.
Field Measurements
pH 7.37
D.O. 10.78
Conductivity 477

WATER ANALYSIS

Alk., Bicarbonate 10-19-89	307	mg/l HCO3 15:30 hr.	Magnesium 10-19-89	24.30	mg/l 14:00 hr.
Alk., Carbonate 10-19-89	1<	mg/l CaCO3 16:00 hr.	Manganese 10-19-89	0.04	mg/l 14:30 hr.
Alk., Total 10-19-89	252	mg/l CaCO3 15:30 hr.	Oxygen, Dissolved 10-17-89	8.2	mg/l 17:50 hr.
Anions, Total	5.89	meq/l	pH 10-17-89	7.40	Units 17:00 hr.
Calcium 10-19-89	75.4	mg/l 13:30 hr.	Potassium 10-19-89	0.38	mg/l 13:00 hr.
Cations, Total	6.04	meq/l	Sodium 10-19-89	6.30	mg/l 15:30 hr.
Chloride 10-19-89	5.0	mg/l 16:30 hr.	Solids, Dissolved 10-18-89	287.0	mg/l 16:45 hr.
Conductivity 10-19-89	367	umhos/cm 14:25 hr.	Solids, Suspended 10-18-89	112.0	mg/l 16:45 hr.
Hardness, Total	288	mg/l CaCO3	Sulfate 10-18-89	40.0	mg/l 10:00 hr.
Iron 10-19-89	0.29	mg/l 14:45 hr.			

ANALYST: D. Tipon

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COMMERCIAL TESTING & ENGINEERING CO.

Manager, Huntington Laboratory

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October 20, 1989

Job No.: 59 10073

Date Rec'd: October 16, 1989

Date Sampled: October 16, 1989

Sampled By: UP&L

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

Sample ID: UP&L

EMS 79-28 FLAG LAKE
Temperature 43 degrees
Flow 0.25 gpm
Rec'd 1630 hr.
Sampled 1240 hr.
Field Measurements
pH 7.74
D.O. 10.92
Conductivity 619

WATER ANALYSIS

Alk., Bicarbonate	256	mg/l HCO3	Magnesium	26.80	mg/l
10-17-89	1300 hr.		10-19-89	1400 hr.	
Alk., Carbonate	1<	mg/l CaCO3	Manganese	0.01<	mg/l
10-17-89	1300 hr.		10-19-89	1430 hr.	
Alk., Total	210	mg/l CaCO3	Oxygen, Dissolved	7.2	mg/l
10-17-89	1300 hr.		10-16-89	1630 hr.	
Anions, Total	7.32	meq/l	pH	7.75	Units
			10-16-89	1645 hr.	
Calcium	32.2	mg/l	Potassium	1.90	mg/l
10-19-89	1330 hr.		10-19-89	1300 hr.	
Cations, Total	7.47	meq/l	Sodium	84.10	mg/l
			10-19-89	1530 hr.	
Chloride	10.0	mg/l	Solids, Dissolved	371.0	mg/l
10-17-89	1430 hr.		10-17-89	1500 hr.	
Conductivity	610	umhos/cm	Solids, Suspended	1.0<	mg/l
10-17-89	1155 hr.		10-17-89	1500 hr.	
Hardness, Total	191	mg/l CaCO3	Sulfate	140.0	mg/l
			10-18-89	1000 hr.	
Iron	0.02<	mg/l			
10-19-89	1445 hr.				

ANALYST: D. Tyson

Respectfully submitted,
COMMERCIAL TESTING & ENGINEERING CO.

Manager, Huntington Laboratory

COMMERCIAL TESTING & ENGINEERING CO.
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October 20, 1989

Job No.: 59 10075

Date Rec'd: October 16, 1989

Date Sampled: October 16, 1989

Sampled By: UP&L

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

Sample ID: UP&L

EMS 79-29
Temperature 39 degrees
Flow 0.70 gpm
Rec'd 1630 hr.
Sampled 1320 hr.
Field Measurements
pH 7.96
D.O. 10.14
Conductivity 497

WATER ANALYSIS

Alk., Bicarbonate	293	mg/l HCO3	Magnesium	36.10	mg/l
10-17-89	1300 hr.		10-19-89	1400 hr.	
Alk., Carbonate	1<	mg/l CaCO3	Manganese	0.01<	mg/l
10-17-89	1300 hr.		10-19-89	1430 hr.	
Alk., Total	240	mg/l CaCO3	Oxygen, Dissolved	6.8	mg/l
10-17-89	1300 hr.		10-16-89	1630 hr.	
Anions, Total	5.73	meq/l	pH	7.60	Units
			10-16-89	1645 hr.	
Calcium	30.2	mg/l	Potassium	1.40	mg/l
10-19-89	1300 hr.		10-19-89	1300 hr.	
Cations, Total	5.94	meq/l	Sodium	33.30	mg/l
			10-19-89	1530 hr.	
Chloride	15.0	mg/l	Solids, Dissolved	252.0	mg/l
10-17-89	1430 hr.		10-17-89	1500 hr.	
Conductivity	500	umhos/cm	Solids, Suspended	1.0<	mg/l
10-17-89	1155 hr.		10-17-89	1500 hr.	
Hardness, Total	224	mg/l CaCO3	Sulfate	30.0	mg/l
			10-18-89	1000 hr.	
Iron	0.02<	mg/l			
10-19-89	1445 hr.				

ANALYST: D. Tyson

Respectfully submitted,
COMMERCIAL TESTING & ENGINEERING CO.

Manager, Huntington Laboratory

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

October 20, 1989

Job No.: 59 10085

Date Rec'd: October 17, 1989

Date Sampled: October 17, 1989

Sampled By: UP&L

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

Sample ID: UP&L

EMS 79-38
Temperature 40 degrees
Flow 1.7 gpm
Rec'd 1630 hr.
Sampled 1050 hr.
Field Measurements
pH 7.44
D.O. 9.60
Conductivity 399

WATER ANALYSIS

Alk., Bicarbonate 10-19-89	375	mg/l HCO3 15:30 hr.	Magnesium 10-19-89	29.00	mg/l 14:00 hr.
Alk., Carbonate 10-19-89	1<	mg/l CaCO3 16:00 hr.	Manganese 10-19-89	0.09	mg/l 14:30 hr.
Alk., Total 10-19-89	307	mg/l CaCO3 15:30 hr.	Oxygen, Dissolved 10-17-89	7.4	mg/l 17:50 hr.
Anions, Total	7.15	meq/l	pH 10-17-89	7.40	Units 17:00 hr.
Calcium 10-19-89	92.1	mg/l 13:30 hr.	Potassium 10-19-89	0.72	mg/l 13:00 hr.
Cations, Total	7.14	meq/l	Sodium 10-19-89	3.10	mg/l 15:30 hr.
Chloride 10-19-89	10.0	mg/l 16:30 hr.	Solids, Dissolved 10-18-89	361.0	mg/l 16:45 hr.
Conductivity 10-19-89	452	umhos/cm 14:25 hr.	Solids, Suspended 10-18-89	36.0	mg/l 16:46 hr.
Hardness, Total	349	mg/l CaCO3	Sulfate 10-18-89	42.0	mg/l 16:45 hr.
Iron 10-19-89	0.58	mg/l 14:45 hr.			

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ANALYST: D. Tipon

Respectfully submitted,
COMMERCIAL TESTING & ENGINEERING CO.

Manager, Huntington Laboratory

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TELEPHONE: (801) 653-2311

October 26, 1989

Job No.: 59 10074

Date Rec'd: October 16, 1989

Date Sampled: October 16, 1989

Sampled By: UF&L

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

Sample ID: UP&L

EMS 80-47
Temperature 40 degrees
Flow 0.50 gpm
Rec'd 1630 hr.
Sampled 1145 hr.
Field Measurements
pH 7.88
D.O. 10.85
Conductivity 473

WATER ANALYSIS

Alk., Bicarbonate	348	mg/l HCO3	Magnesium	33.70	mg/l
10-17-89	1300 hr.		10-21-89	1500 hr.	
Alk., Carbonate	1<	mg/l CaCO3	Manganese	0.01<	mg/l
10-17-89	1300 hr.		10-19-89	1430 hr.	
Alk., Total	285	mg/l CaCO3	Oxygen, Dissolved	8.3	mg/l
10-17-89	1300 hr.		10-16-89	1630 hr.	
Anions, Total	6.15	meq/l	pH	7.80	Units
			10-16-89	1645 hr.	
Calcium	60.5	mg/l	Potassium	0.65	mg/l
10-21-89	1430 hr.		10-19-89	1300 hr.	
Cations, Total	6.40	meq/l	Sodium	13.80	mg/l
			10-19-89	1530 hr.	
Chloride	10.0	mg/l	Solids, Dissolved	281.0	mg/l
10-17-89	1430 hr.		10-17-89	1500 hr.	
Conductivity	500	umhos/cm	Solids, Suspended	3.0	mg/l
10-17-89	1155 hr.		10-17-89	1500 hr.	
Hardness, Total	290	mg/l CaCO3	Sulfate	15.0	mg/l
			10-18-89	1000 hr.	
Iron	0.05	mg/l			
10-19-89	1445 hr.				

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ANALYST: D. Tyson

Respectfully submitted,
COMMERCIAL TESTING & ENGINEERING CO.
FIELD OFFICE

Manager, Huntington Laboratory

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 26, 1989

Job No.: 59 10076

Date Rec'd: October 16, 1989

Date Sampled: October 16, 1989

Sampled By: UP&L

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

Sample ID: UP&L

EMS 82-52
Temperature 40 degrees
Flow 2.40 gpm
Rec'd 1630 hr.
Sampled 1105 hr.
Field Measurements
pH 7.54
D.O. 10.44
Conductivity 582

WATER ANALYSIS

Alk., Bicarbonate	384	mg/l HCO3	Magnesium	27.10	mg/l
10-17-89	1300 hr.		10-21-89	1500 hr.	
Alk., Carbonate	1<	mg/l CaCO3	Manganese	0.01<	mg/l
10-17-89	1300 hr.		10-19-89	1430 hr.	
Alk., Total	315	mg/l CaCO3	Oxygen, Dissolved	8.3	mg/l
10-17-89	1300 hr.		10-16-89	1630 hr.	
Anions, Total	6.67	meq/l	pH	7.60	Units
			10-16-89	1645 hr.	
Calcium	64.2	mg/l	Potassium	0.76	mg/l
10-21-89	1430 hr.		10-19-89	1300 hr.	
Cations, Total	6.51	meq/l	Sodium	24.60	mg/l
			10-19-89	1530 hr.	
Chloride	15.0	mg/l	Solids, Dissolved	311.0	mg/l
10-17-89	1430 hr.		10-17-89	1500 hr.	
Conductivity	600	umhos/cm	Solids, Suspended	1.0<	mg/l
10-17-89	1155 hr.		10-17-89	1500 hr.	
Hardness, Total	272	mg/l CaCO3	Sulfate	5.0	mg/l
			10-18-89	1000 hr.	
Iron	0.02<	mg/l			
10-19-89	1445 hr.				

ANALYST: D. Tyson

Respectfully submitted,
COMMERCIAL TESTING & ENGINEERING CO.

M M
Manager, Huntington Laboratory

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 20, 1989

Job No.: 59 10079

Date Rec'd: October 16, 1989

Date Sampled: October 16, 1989

Sampled By: UP&L

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

Sample ID: UP&L

EMS 84-53
Temperature 41 degrees
Flow 1.00 gpm
Rec'd 1630 hr.
Sampled 1255 hr.
Field Measurements
pH 7.59
D.O. 10.48
Conductivity 460

WATER ANALYSIS

Alk., Bicarbonate	326	mg/l HCO3	Magnesium	40.50	mg/l
10-17-89	1300 hr.		10-19-89	1400 hr.	
Alk., Carbonate	1<	mg/l CaCO3	Manganese	0.01<	mg/l
10-17-89	1300 hr.		10-19-89	1430 hr.	
Alk., Total	267	mg/l CaCO3	Oxygen, Dissolved	8.0	mg/l
10-17-89	1300 hr.		10-16-89	1630 hr.	
Anions, Total	6.70	meq/l	pH	8.10	Units
			10-16-89	1645 hr.	
Calcium	53.0	mg/l	Potassium	1.10	mg/l
10-19-89	1330 hr.		10-19-89	1300 hr.	
Cations, Total	6.89	meq/l	Sodium	20.80	mg/l
			10-19-89	1530 hr.	
Chloride	10.0	mg/l	Solids, Dissolved	336.0	mg/l
10-17-89	1430 hr.		10-17-89	1500 hr.	
Conductivity	495	umhos/cm	Solids, Suspended	21.0	mg/l
10-17-89	1155 hr.		10-17-89	1500 hr.	
Hardness, Total	299	mg/l CaCO3	Sulfate	58.0	mg/l
			10-18-89	1000 hr.	
Iron	0.16	mg/l			
10-19-89	1445 hr.				

ANALYST: D Tyson

Respectfully submitted,
COMMERCIAL TESTING & ENGINEERING CO.

Manager, Huntington Laboratory

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 20, 1989

Job No.: 59 10077

Date Rec'd: October 16, 1989

Date Sampled: October 16, 1989

Sampled By: UP&L

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

Sample ID: UP&L

EMS 84-56
Temperature 44 degrees
Flow 1.30 gpm
Rec'd 1630 hr.
Sampled 1200 hr.
Field Measurements
pH 7.94
D.O. 10.45
Conductivity 507

WATER ANALYSIS

Alk., Bicarbonate	336	mg/l HCO3	Magnesium	37.10	mg/l
10-17-89 1300 hr.			10-19-89 1400 hr.		
Alk., Carbonate	1<	mg/l CaCO3	Manganese	0.01<	mg/l
10-17-89 1300 hr.			10-19-89 1430 hr.		
Alk., Total	275	mg/l CaCO3	Oxygen, Dissolved	6.5	mg/l
10-17-89 1300 hr.			10-16-89 1630 hr.		
Anions, Total	6.38	meq/l	pH	7.30	Units
			10-16-89 1645 hr.		
Calcium	55.5	mg/l	Potassium	0.76	mg/l
10-19-89 1330 hr.			10-19-89 1300 hr.		
Cations, Total	6.59	meq/l	Sodium	17.50	mg/l
			10-19-89 1530 hr.		
Chloride	10.0	mg/l	Solids, Dissolved	331.0	mg/l
10-17-89 1430 hr.			10-17-89 1500 hr.		
Conductivity	510	umhos/cm	Solids, Suspended	1.0<	mg/l
10-17-89 1155 hr.			10-17-89 1500 hr.		
Hardness, Total	291	mg/l CaCO3	Sulfate	35.0	mg/l
			10-18-89 1000 hr.		
Iron	0.02<	mg/l			
10-19-89 1445 hr.					

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 27, 1989

Job No.: 59 10088

Date Rec'd: October 17, 1989

Date Sampled: October 17, 1989

Sampled By: UP&L

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

Sample ID: UP&L

EMS 89-61
Temperature 39 degrees
Flow 24.0 gpm
Rec'd 1630 hr.
Sampled 1350 hr.
Field Measurements
pH 7.96
D.O. 12.71
Conductivity 417

WATER ANALYSIS

Aluminum	0.01<	mg/l	Chromium	0.02<	mg/l
10-18-89	1300 hr.		10-21-89	1330 hr.	
Alk., Bicarbonate	306	mg/l HCO3	Conductivity	390	umhos/cm
10-19-89	1530 hr.		10-19-89	1425 hr.	
Alk., Carbonate	1<	mg/l CaCO3	Copper	0.010<	mg/l
10-19-89	1530 hr.		10-21-89	1425 hr.	
Alk., Total	251	mg/l CaCO3	Fluoride	0.24	mg/l
10-19-89	1530 hr.		10-18-89	1400 hr.	
Arsenic	0.002<	mg/l	Hardness, Total	266	mg/l CaCO3
10-24-89	1300 hr.				
Anions, Total	5.41	meq/l	Iron	0.02<	mg/l
			10-19-89	1445 hr.	
Barium	0.03<	mg/l	Lead	0.050<	mg/l
10-18-89	1315 hr.		10-21-89	1100 hr.	
Boron	0.05	mg/l	Magnesium	28.50	mg/l
10-26-89	1700 hr.		10-21-89	1400 hr.	
Cadmium	0.002<	mg/l	Manganese	0.01<	mg/l
10-21-89	1300 hr.		10-19-89	1430 hr.	
Calcium	59.6	mg/l	Mercury	0.002<	mg/l
10-21-89	1330 hr.		10-23-89	1430 hr.	
Cations, Total	5.71	meq/l	Molybdenum	0.10	mg/l
			10-21-89	1400 hr.	
Chloride	5.0	mg/l	Nickel	0.02<	mg/l
10-19-89	1630 hr.		10-21-89	1330 hr.	

ANALYST: D. Tyson

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Respectfully submitted,
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Manager, Huntington Laboratory

COMMERCIAL TESTING & ENGINEERING CO.
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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

October 27, 1989

Job No.: 59 10088

Date Rec'd: October 17, 1989

Date Sampled: October 17, 1989

Sampled By: UP&L

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

Sample ID: UP&L

EMS 89-61
Temperature 39 degrees
Flow 24.0 gpm
Rec'd 1630 hr.
Sampled 1350 hr.
Field Measurements
pH 7.96
D.O. 12.71
Conductivity 417

WATER ANALYSIS

Nitrogen, Ammonia	0.19	mg/l	Selenium	0.002<	mg/l
10-26-89	1100 hr.		10-24-89	1100 hr.	
Nitrogen, Nitrate	0.08	mg/l	Sodium	8.70	mg/l
10-20-89	1545 hr.		10-19-89	1530 hr.	
Nitrogen, Nitrite	0.01	mg/l	Solids, Dissolved	299.0	mg/l
10-20-89	1545 hr.		10-18-89	1645 hr.	
Oxygen, Dissolved	8.7	mg/l	Solids, Suspended	4.0	mg/l
10-17-89	1750 hr.		10-18-89	1645 hr.	
pH	7.40	Units	Sulfate	18.0	mg/l
10-17-89	1700 hr.		10-18-89	1000 hr.	
Phosphorus, Total	0.01<	mg/l	Sulfide	0.01<	mg/l
10-18-89	0840 hr.		10-20-89	1415 hr.	
Potassium	0.64	mg/l	Zinc	0.00<	mg/l
10-19-89	1300 hr.		10-21-89	1400 hr.	

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ANALYST: D. Tyson

Respectfully submitted,
COMMERCIAL TESTING & ENGINEERING CO.

David Connell

Manager, Huntington Laboratory

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

October 27, 1989

Job No.: 59 10087

Date Rec'd: October 17, 1989

Date Sampled: October 17, 1989

Sampled By: UP&L

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

Sample ID: UP&L

EMS 89-65
Temperature 44 degrees
Flow 0.67 gpm
Rec'd 1630 hr.
Sampled 1310 hr.
Field Measurements
pH 8.06
D.O. 13.44
Conductivity 501

WATER ANALYSIS

Aluminum	0.01<	mg/l	Chromium	0.02<	mg/l
10-18-89	1300 hr.		10-21-89	1330 hr.	
Alk., Bicarbonate	353	mg/l HCO3	Conductivity	403	umhos/cm
10-19-89	1530 hr.		10-19-89	1425 hr.	
Alk., Carbonate	1<	mg/l CaCO3	Copper	0.010<	mg/l
10-19-89	1530 hr.		10-21-89	1425 hr.	
Alk., Total	289	mg/l CaCO3	Fluoride	0.20	mg/l
10-19-89	1530 hr.		10-18-89	1400 hr.	
Arsenic	0.002<	mg/l	Hardness, Total	290	mg/l CaCO3
10-24-89	1300 hr.				
Anions, Total	6.09	meq/l	Iron	0.04	mg/l
			10-19-89	1445 hr.	
Barium	0.03<	mg/l	Lead	0.050<	mg/l
10-18-89	1315 hr.		10-21-89	1100 hr.	
Boron	0.07	mg/l	Magnesium	26.70	mg/l
10-26-89	1700 hr.		10-19-89	1400 hr.	
Cadmium	0.002<	mg/l	Manganese	0.01<	mg/l
10-21-89	1300 hr.		10-19-89	1430 hr.	
Calcium	72.1	mg/l	Mercury	0.002	mg/l
10-19-89	1330 hr.		10-23-89	1430 hr.	
Cations, Total	6.02	meq/l	Molybdenum	0.10 <	mg/l
	1400 hr.		10-18-89		
Chloride	5.0	mg/l	Nickel	0.04	mg/l
10-19-89	1630 hr.		10-21-89	1330 hr.	

ANALYST: D. Tyson

Respectfully submitted,
COMMERCIAL TESTING & ENGINEERING CO.

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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

October 27, 1989

Job No.: 59 10087

Date Rec'd: October 17, 1989

Date Sampled: October 17, 1989

Sampled By: UP&L

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

Sample ID: UP&L

EMS 89-65
Temperature 44 degrees
Flow 0.67 gpm
Rec'd 1630 hr.
Sampled 1310 hr.
Field Measurements
pH 8.06
D.O. 13.44
Conductivity 501

WATER ANALYSIS

Nitrogen, Ammonia	0.19	mg/l	Selenium	0.002<	mg/l
10-26-89	1100 hr.		10-24-89	1100 hr.	
Nitrogen, Nitrate	0.07	mg/l	Sodium	4.90	mg/l
10-20-89	1545 hr.		10-19-89	1530 hr.	
Nitrogen, Nitrite	0.03	mg/l	Solids, Dissolved	321.0	mg/l
10-20-89	1545 hr.		10-18-89	1645 hr.	
Oxygen, Dissolved	8.4	mg/l	Solids, Suspended	2.0	mg/l
10-17-89	1750 hr.		10-18-89	1645 hr.	
pH	7.40	Units	Sulfate	15.0	mg/l
10-17-89	1700 hr.		10-18-89	1000 hr.	
Phosphorus, Total	0.01<	mg/l	Sulfide	0.01<	mg/l
10-18-89	0840 hr.		10-20-89	1415 hr.	
Potassium	0.54	mg/l	Zinc	0.02	mg/l
10-19-89	1300 hr.		10-21-89	1400 hr.	

ANALYST: D. Lyon

Respectfully submitted,
COMMERCIAL TESTING & ENGINEERING CO.

Manager, Huntington Laboratory

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

October 27, 1989

Job No.: 59 10086

Date Rec'd: October 17, 1989

Date Sampled: October 17, 1989

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 2.4 gpm
Rec'd 1630 hr.
Sampled 1240 hr.
Field Measurements
pH 7.67
D.O. 12.14
Conductivity 446

WATER ANALYSIS

Aluminum	0.55	mg/l	Chromium	0.02<	mg/l
10-18-89	1300 hr.		10-18-89	1330 hr.	
Alk., Bicarbonate	342	mg/l HCO3	Conductivity	374	umhos/cm
10-19-89	1530 hr.		10-19-89	1425 hr.	
Alk., Carbonate	1<	mg/l CaCO3	Copper	0.010<	mg/l
10-19-89	1530 hr.		10-21-89	1425 hr.	
Alk., Total	280	mg/l CaCO3	Fluoride	0.29	mg/l
10-19-89	1530 hr.		10-18-89	1400 hr.	
Arsenic	0.002<	mg/l	Hardness, Total	280	mg/l CaCO3
10-24-89	1300 hr.				
Anions, Total	6.24	meq/l	Iron	0.30	mg/l
			10-19-89	1445 hr.	
Barium	0.03<	mg/l	Lead	0.050<	mg/l
10-18-89	1315 hr.		10-21-89	1100 hr.	
Boron	0.14	mg/l	Magnesium	34.10	mg/l
10-26-89	1700 hr.		10-21-89	1400 hr.	
Cadmium	0.002<	mg/l	Manganese	0.01<	mg/l
10-18-89	1300 hr.		10-19-89	1430 hr.	
Calcium	55.9	mg/l	Mercury	0.002	mg/l
10-21-89	1330 hr.		10-23-89	1430 hr.	
Cations, Total	6.24	meq/l	Molybdenum	0.10<	mg/l
			10-18-89	1400 hr.	
Chloride	10.0	mg/l	Nickel	0.02<	mg/l
10-19-89	1630 hr.		10-21-89	1330 hr.	

ANALYST: D. Tyson

Respectfully submitted,
COMMERCIAL TESTING & ENGINEERING CO.

Manager, Huntington Laboratory

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 27, 1989

Job No.: 59 10086

Date Rec'd: October 17, 1989

Date Sampled: October 17, 1989

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 2.4 gpm
Rec'd 1630 hr.
Sampled 1240 hr.
Field Measurements
pH 7.67
D.O. 12.14
Conductivity 446

WATER ANALYSIS

Nitrogen, Ammonia	0.22	mg/l	Selenium	0.002<	mg/l
10-26-89	1100 hr.		10-24-89	1100 hr.	
Nitrogen, Nitrate	0.27	mg/l	Sodium	14.40	mg/l
10-20-89	1545 hr.		10-19-89	1530 hr.	
Nitrogen, Nitrite	0.06	mg/l	Solids, Dissolved	323.0	mg/l
10-20-89	1545 hr.		10-18-89	1645 hr.	
Oxygen, Dissolved	8.8	mg/l	Solids, Suspended	37.0	mg/l
10-17-89	1750 hr.		10-18-89	1645 hr.	
pH	7.35	Units	Sulfate	24.0	mg/l
10-17-89	1700 hr.		10-18-89	1000 hr.	
Phosphorus, Total	0.02	mg/l	Sulfide	0.01<	mg/l
10-18-89	0840 hr.		10-20-89	1415 hr.	
Potassium	1.20	mg/l	Zinc	0.00<	mg/l
10-19-89	1300 hr.		10-21-89	1400 hr.	

ANALYST: D. Tyson

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Respectfully submitted,
COMMERCIAL TESTING & ENGINEERING CO.

Manager, Huntington Laboratory

APPENDIX G

COAL LITHOLOGIC LOG
UTAH POWER & LIGHT COMPANY
DEPT. OF MINING & EXPLORATION

PROJECT: Deer Creek Mine DRILL HOLE: Well #2

LOCATION: DC3NXC29 50'W #9825
COLLAR ELEV.: 7567'
HOLE TYPE: Core
PLUG INTERVAL: 0.0-9.5
CORE INTERVAL: 9.5-170.5
TOTAL DEPTH: 170.5
DATE: Jun 2, 1989
SCALE: 1" = 5'
GEOLOGIST: T. Lloyd

GEOPHYSICAL DATA

LOG	FROM	TO
DENSITY:	NDA	
H.R.D.:		
E. LOG:		
GAMMA:		
CALIPER:		
S.P.:		

COAL SUMMARY:

SEAM	THICKNESS	INT.
Blind Can		111.2'
Hiawatha	3.3	

DEPTH	PLUG	CORE	GRAPHIC LOG	FORMATION NAME	LITHOLOGIC DESCRIPTION	R.Q.D.	BOX NO.	RUN NO.	% REC.	SAMPLE
10					9.5-24.2' Sandstone fine to med Grnd Lt Gray, fining upward	85	1	1	100	
15								2	100	
20								3	100	
25					24.2-53.5 Interbedded MS/SLTS Lt to med Gray	78	2	4	100	
30								5	100	
35							3	6	100	
40							4	7	100	
45								8	100	

COAL LITHOLOGIC LOG

UTAH POWER & LIGHT COMPANY
DEPT. OF MINING & EXPLORATION

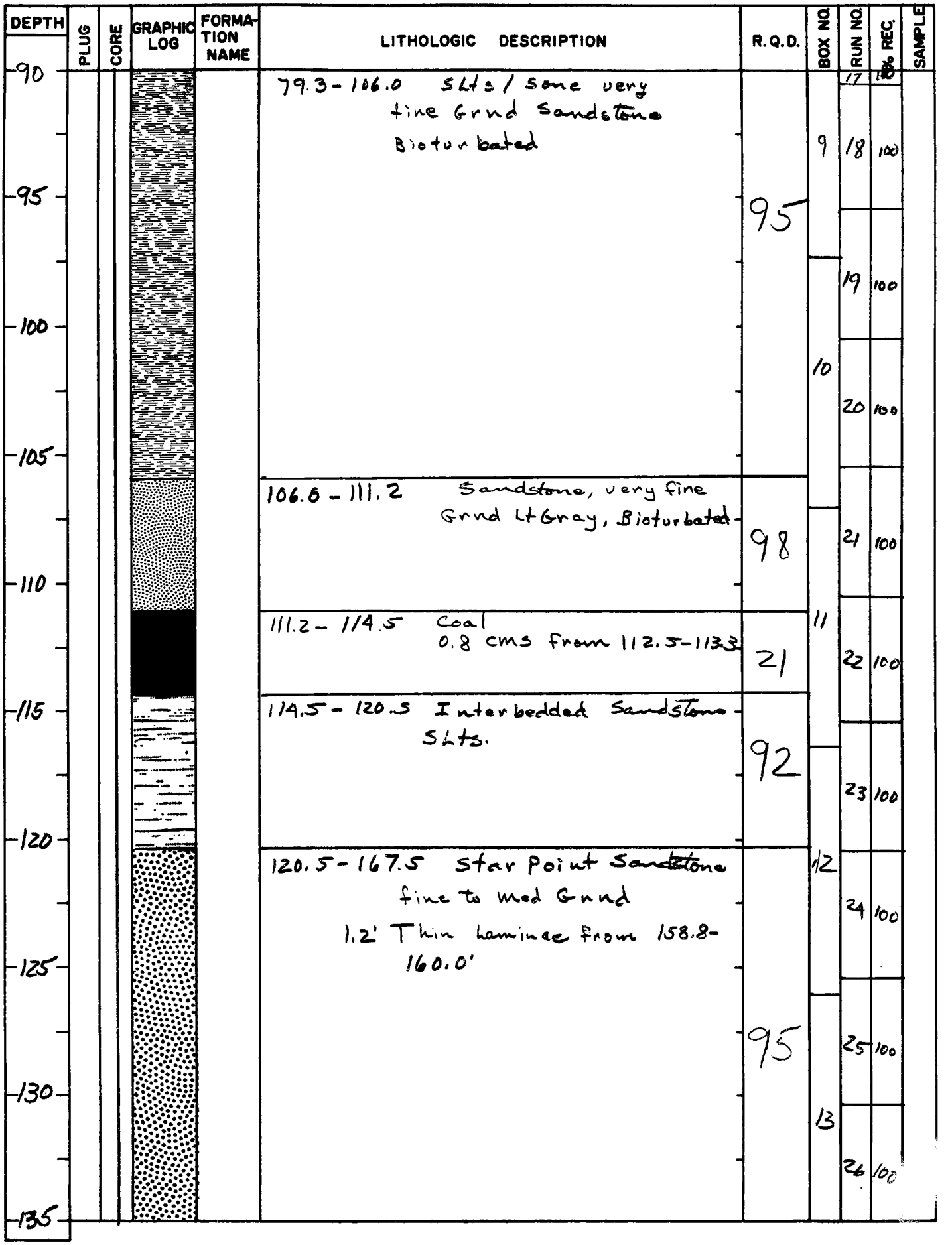
PROJECT: Deer Creek
DRILL HOLE: Well 2
PAGE 2 OF 4

DEPTH	PLUG	CORE	GRAPHIC LOG	FORMATION NAME	LITHOLOGIC DESCRIPTION	R.Q.D.	BOX NO.	RUN NO.	% REC.	SAMPLE
45					24.2-53.5 Interbedded MS/SLTS Lt to med Gray	78	4	9	100	
50							5	10	100	
55					53.5-69.4. Sandstone fine to very fine Grnd, Lt Gray, vertical fractures at 59.5 and 61.5'	84		11	100	
60							6	12	100	
65								13	100	
70					69.4-72.5 Interbedded MS/SLTS	64				
75					72.5-79.3 CMS with Local Zones of thin coal varying from 0.5 to 1.0' thick	18	7	14	100	
80					79.3-106 SLTS / some very fine Grnd Sandstone Bioturbated	93	8	15	100	
85								16	100	
90							9	17	100	

COAL LITHOLOGIC LOG

UTAH POWER & LIGHT COMPANY
DEPT. OF MINING & EXPLORATION

PROJECT: Deer Creek
DRILL HOLE: Well # 2



DEPTH	LITHOLOGIC DESCRIPTION	R.Q.D.	BOX NO.	RUN NO.	% REC.	SAMPLE
90	79.3 - 106.0 Slts / some very fine Grnd Sandstone Bioturbated	95	9	17	100	
				18	100	
95			10	19	100	
100				20	100	
105	106.6 - 111.2 Sandstone, very fine Grnd Lt Gray, Bioturbated	98	11	21	100	
110	111.2 - 114.5 Coal 0.8 cms from 112.5-113.3	21		22	100	
115	114.5 - 120.5 Interbedded Sandstone Slts.	92	12	23	100	
120	120.5 - 167.5 Star Point Sandstone fine to med Grnd 1.2' Thin laminae from 158.8-160.0'	95	13	24	100	
125				25	100	
130				26	100	
135						

COAL LITHOLOGIC LOG

UTAH POWER & LIGHT COMPANY
DEPT. OF MINING & EXPLORATION

PROJECT: Deer Creek
DRILL HOLE: Well # 2
PAGE 4 OF 4

DEPTH	PLUG	CORE	GRAPHIC LOG	FORMATION NAME	LITHOLOGIC DESCRIPTION	R.Q.D.	BOX NO.	RUN NO.	% REC.	SAMPLE
135					120.5 - 167.5 Star Point Sandstone fine to Med Grnd 1.2' thin laminae from 158.8 to 160.0'		13	26	100	
								27	100	
140							14			
								28	100	
145						95				
								29	100	
150							15			
								30	100	
155										
								31	100	
160							16			
								32	100	
165										
					167.5 - 170.5 Sandstone very fine Grnd, Lt Gray thin laminae Bioturbated	87	17	33	100	
170										

COAL LITHOLOGIC LOG
UTAH POWER & LIGHT COMPANY
DEPT. OF MINING & EXPLORATION

PROJECT: Deer Creek Mine DRILL HOLE: Well #1

LOCATION: DC 3 NXC 8 151' N 10' W #3631
COLLAR ELEV.: 7530'
HOLE TYPE: Core
PLUG INTERVAL:
CORE INTERVAL: 9.4 - 155.4'
TOTAL DEPTH: 155.4'
DATE: May 27, 1989
SCALE: 1" = 5'
GEOLOGIST: T. Lloyd

GEOPHYSICAL DATA

LOG	FROM	TO
DENSITY:	NDA	
H.R.D.:		
E. LOG:		
GAMMA:		
CALIPER:		
S.P.:		

COAL SUMMARY:

SEAM	THICKNESS	INT.
Blind Can ?		69.4'
Hiawatha	2.7'	8.6'
Hiawatha	4.5'	

DEPTH	PLUG	CORE	GRAPHIC LOG	FORMATION NAME	LITHOLOGIC DESCRIPTION	R.Q.D.	BOX NO.	RUN NO.	% REC.	SAMPLE
10					9.4 - 12.3 Interbedded MS/SLts	93				
15					12.3 - 35.4 Sandstone, fine Grnd Lt Gray, some clay Clast	94	1	1	100	
20								2	100	
25							2	3	100	
30								4	100	
35							3	5	100	
40					35.4 - 69.4 Interbedded MS/SLts 0.2 CMS from 36.1 - 36.3	64		6	100	
45							4	7	100	

COAL LITHOLOGIC LOG

UTAH POWER & LIGHT COMPANY
DEPT. OF MINING & EXPLORATION

PROJECT: Deer Creek
DRILL HOLE: Well #1
PAGE 2 OF 4

DEPTH	PLUG	CORE	GRAPHIC LOG	FORMATION NAME	LITHOLOGIC DESCRIPTION	R.Q.D.	BOX NO.	RUN NO.	% REC.	SAMPLE
45					35.4 - 69.4 Interbedded MS/SLts 0.7 Coal/cms from 47.9-48.6	64	4	8	100	
50							6	9	100	
55								10	100	
60								11	100	
65							6	12	100	
70					69.4-72.1 Coal/cms Coal 69.4-70.4 Coal 71.5 72.1	22				
75					72.1 - 80.7 Interbedded MS/SLts Vertical Fractures from 79.1-80.0	81	7	13	100	
80								14	100	
85					79.7 - 85.2 4.5' Coal - Interbedded 0.5 cms from 79.7-81.2 0.3 cms from 84.2-85.2	55	8	15	100	
90					85.2 — 140.7 Sandstone - - - - - - from Star Point Sandstone	95	9	16	100	

COAL LITHOLOGIC LOG

UTAH POWER & LIGHT COMPANY
DEPT. OF MINING & EXPLORATION

PROJECT: Deer Creek
DRILL HOLE: Well #1
PAGE 3 OF 4

DEPTH	PLUG	CORE	GRAPHIC LOG	FORMATION NAME	LITHOLOGIC DESCRIPTION	R.Q.D.	BOX NO.	RUN NO.	% REC.	SAMPLE
90					85.2 - 140.7' Star Point Sandstone, fine to Med Grnd, Lt Gray	95	9	7		
								8	100	
95								9	100	
100							10	10	100	
105								11	100	
110							11	12	100	
115								13	100	
120							12	14	100	
125								15	100	
130							13	16	100	
135										

COAL LITHOLOGIC LOG

UTAH POWER & LIGHT COMPANY
DEPT. OF MINING & EXPLORATION

PROJECT: Deer Creek Mine
DRILL HOLE: Well #1
PAGE 4 OF 4

DEPTH	PLUG	CORE	GRAPHIC LOG	FORMATION NAME	LITHOLOGIC DESCRIPTION	R.Q.D.	BOX NO.	RUN NO.	% REC.	SAMPLE
135					85.2 – 140.7 Star Point Sandstone	95	13	17	100	
140					140.7 – 155.4 Sandstone fine to very fine Grnd. Lt Gray, Med to Lt Gray Bioturbated, and burrowed	95	14	18	100	
145								19	100	
150							15	20	100	
155										

COAL LITHOLOGIC LOG
UTAH POWER & LIGHT COMPANY
DEPT. OF MINING & EXPLORATION

PROJECT: Deer Creek Mine, Water Monitor Wells DRILL HOLE: Well #4

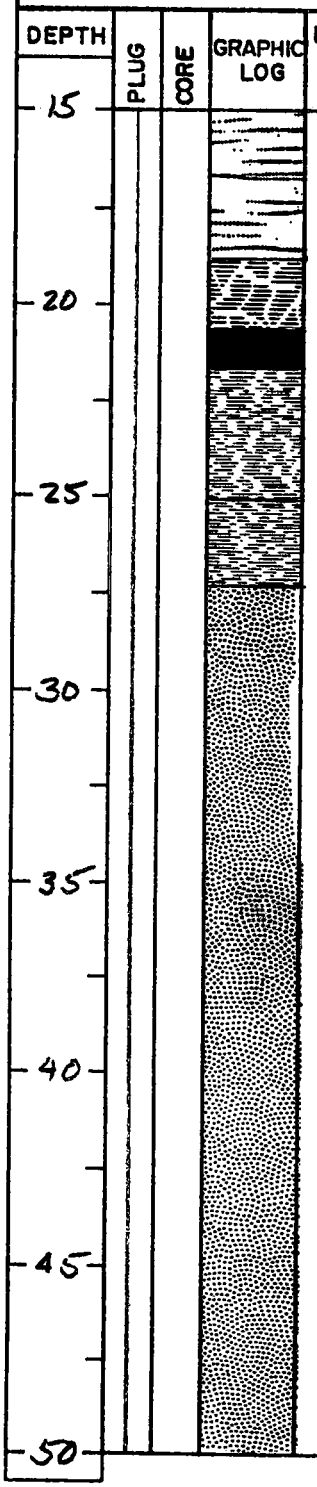
LOCATION: DC 1st Wm # 29
COLLAR ELEV.: 7529'
HOLE TYPE: Core
PLUG INTERVAL: 0.0 - 9.8
CORE INTERVAL: 9.8 - 169.4
TOTAL DEPTH: 169.4
DATE: December 2, 1989
SCALE: 1" = 5'
GEOLOGIST: T. Lloyd

GEOPHYSICAL DATA

LOG	FROM	TO
DENSITY:		
H.R.D.:		
E. LOG:		
GAMMA:		
CALIPER:		
S.P.:		

COAL SUMMARY:

SEAM	THICKNESS	INT.
Blind Can.	?	20.6
Coal	0.5	49.0
coal	1.8	1.7
Coal	0.5	61
Coal	1.6	



DEPTH	PLUG	CORE	GRAPHIC LOG	FORMATION NAME	LITHOLOGIC DESCRIPTION	R.Q.D.	BOX NO.	RUN NO.	% REC.	SAMPLE
					0-9.8 Plug interval					
					9.8 - 18.8 Interbedded ms/slts	96	1	1	100	
					18.8 - 20.6' cms, coaly	0				
					20.6 - 21.1 Coal, Boney	60				
					21.1 - 25.1 ms / cms	65	2	2	100	
					25.1 - 27.3 Mudstone	100				
					27.3 - 53.4' Sandstone, fine to med Grnd, Lt Gray, fining upward fluvial sequence, clay clasts in lower 4.0 feet	74	3	3	100	
								4	100	
								5	100	
							4	6	100	
								7	100	

COAL LITHOLOGIC LOG

UTAH POWER & LIGHT COMPANY

DEPT. OF MINING & EXPLORATION

PROJECT: DC water wells
DRILL HOLE: Well 4

DEPTH	PLUG	CORE	GRAPHIC LOG	FORMATION NAME	LITHOLOGIC DESCRIPTION	R.Q.D.	BOX NO.	RUN NO.	% REC.	SAMPLE
50				Black Hawk	27.3 - 53.4' Sandstone, fine to Med Grnd, Lt Gray, fining upward.	74	5	8	100	
55					53.4 - 70.1 Interbedded ms/slts	76		9	100	
60							6	10	100	
65								11	100	
70					70.1 - 71.9' Coal, Boney	33	7	12	100	
75					71.9 - 73.6 Carb. Mudstone	0				
					73.6 - 74.1 Coal	0				
					74.1 - 74.6 CMS	0				
					74.6 - 79.0 Interbedded ms/slts	77		13	100	
80					79.0 - 80.2 CMS, Black,	42	8	14	100	
					80.2 - 81.8 Coal	38				
					81.8 - 82.7' ms/cms BIK	0				
85				Star Point	82.7 - 92.2 Sandstone, Fine Grnd, Thin Laminae, Bioturbated, Lt Gray w. th DK Layers	93		15	100	
90					92.2 - 126.5' Sandstone, fine to med. Grnd,	95	9	16	100	
95										

COAL LITHOLOGIC LOG

UTAH POWER & LIGHT COMPANY
DEPT. OF MINING & EXPLORATION

PROJECT: DC Water Wells
DRILL HOLE: Well 4
PAGE 3 OF 3

DEPTH	PLUG	CORE	GRAPHIC LOG	FORMATION NAME	LITHOLOGIC DESCRIPTION	R.Q.D.	BOX NO.	RUN NO.	% REC.	SAMPLE
95				Star Point Sandstone	92.2 - 126.5 Sandstone, fine to med Grnd, Salt + Pepper texture.	95				
100										
105										
110										
115										
120										
125										
					126.6 - 126.8 Lag Deposit Subangular, Brownish sandstone clasts					
					126.8 - 168.0 Sandstone, fine Grnd, Some bioturbation, worm burrows	95				
130										
135										
170										

COAL LITHOLOGIC LOG
UTAH POWER & LIGHT COMPANY
DEPT. OF MINING & EXPLORATION

PROJECT: Deer Creek Mine (Hydrologic Monitoring) DRILL HOLE: Well #3

LOCATION: DC-3 N 855 90'E of 5830
COLLAR ELEV.: 7577'
HOLE TYPE: Core
PLUG INTERVAL: 0.0-9.5'
CORE INTERVAL: 9.5-148.9
TOTAL DEPTH: 148.9'
DATE: May 23, 1990
SCALE: 1" = 5'
GEOLOGIST: T. Lloyd

GEOPHYSICAL DATA

LOG	FROM	TO
DENSITY:	No log	
H.R.D.:		
E. LOG:		
GAMMA:		
CALIPER:		
S.P.:		

COAL SUMMARY:

SEAM	THICKNESS	INT.
Blind Can	?	40.0'
Hiawatha	3.9'	

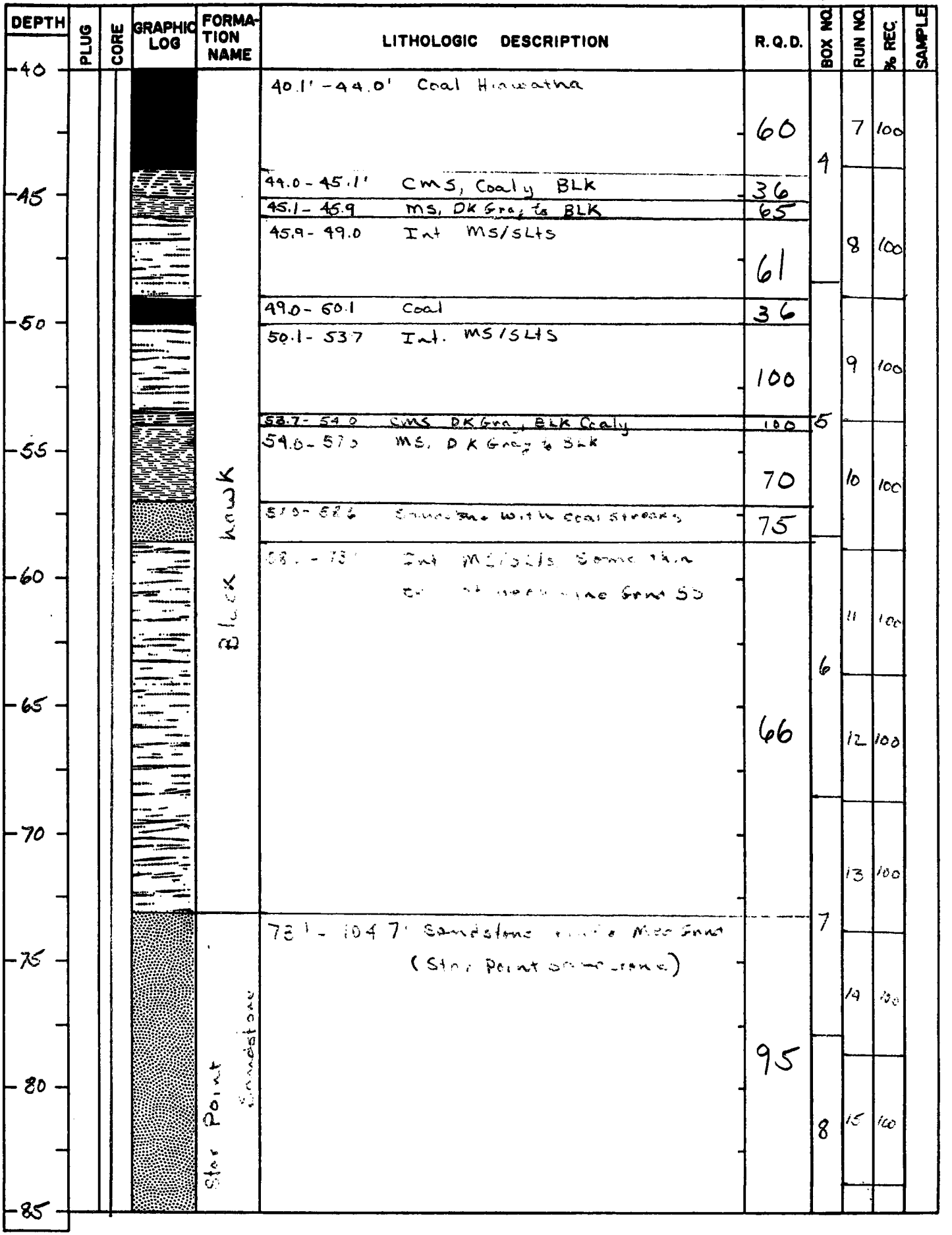
DEPTH	PLUG	CORE	GRAPHIC LOG	FORMATION NAME	LITHOLOGIC DESCRIPTION	R.Q.D.	BOX NO.	RUN NO.	% REC.	SAMPLE
0					0.0 - 9.5 Data Not available					
10					9.5' - 17.3' Interbedded MS/SLts, Lt. to Med Gray	69	1	1	100	
15								2	100	
20					17.3 - 20.9' Sandstone, very fine Grnd, Lt. Gray	69				
					20.9 - 21.3 Coal	100		3	100	
					21.3 - 38.9' Interbedded MS/SLts		2			
25								4	100	
30						85		5	100	
35							3			
								6	100	
40					38.9 - 39.4 CMS, BLK, Coaly 39.4 - 40.1 Mudstone	90		7	100	

COAL LITHOLOGIC LOG

UTAH POWER & LIGHT COMPANY

DEPT. OF MINING & EXPLORATION

PROJECT: DC Hydrology
DRILL HOLE: Well #3
PAGE 2 OF 4



DEPTH	PLUG	CORE	GRAPHIC LOG	FORMATION NAME	LITHOLOGIC DESCRIPTION	R.Q.D.	BOX NO.	RUN NO.	% REC.	SAMPLE
40				Blackhawk	40.1' - 44.0' Coal Hiawatha	60	4	7	100	
					44.0 - 45.1' CMS, Coaly BLK	36				
45					45.1 - 45.9 MS, DK Gray to BLK	65				
					45.9 - 49.0 Int MS/SLTS	61		8	100	
					49.0 - 50.1 Coal	36				
50					50.1 - 53.7 Int. MS/SLTS	100		9	100	
					53.7 - 54.0 SMS DK Gray, BLK Coaly	100	5			
55					54.0 - 57.0 MS, DK Gray to BLK	70		10	100	
					57.0 - 58.6 Sandstone with coal streaks	75				
60					58.6 - 73.1 Int MS/SLTS some thin to [illegible] fine Grnd SS	66	6	11	100	
								12	100	
65										
70								13	100	
				Star Point Sandstone	73.1 - 104.7' Sandstone white Med Grnd (Star Point Sandstone)	95	7	14	100	
75										
80							8	15	100	
85										

COAL LITHOLOGIC LOG

UTAH POWER & LIGHT COMPANY
DEPT. OF MINING & EXPLORATION

PROJECT: DC. Hydrology
DRILL HOLE: Well #3
PAGE 3 OF 4

DEPTH	PLUG	CORE	GRAPHIC LOG	FORMATION NAME	LITHOLOGIC DESCRIPTION	R.Q.D.	BOX NO.	RUN NO.	% REC.	SAMPLE
85					73.1 - 104.7' Sandstone, Fine to Med Grnd	95	8	16	100	
90							9	17	100	
95								18	100	
100							10	19	100	
105					104.7 - 105.1 Sandstone, Lt Gray Coal Streaks	0		20	100	
110					105.1 - 140.9 Sandstone Fine Grnd - Lt Gray fining downward slightly darker Gray tones above Sand unit	95	11	21	100	
115								22	100	
120							12	23	100	
125								24	100	
130							13	25	100	

COAL LITHOLOGIC LOG

UTAH POWER & LIGHT COMPANY
DEPT. OF MINING & EXPLORATION

PROJECT: DC. Hydrology
DRILL HOLE: Well #3
PAGE 4 OF 4

DEPTH	PLUG	CORE	GRAPHIC LOG	FORMATION NAME	LITHOLOGIC DESCRIPTION	R.Q.D.	BOX NO.	RUN NO.	% REC.	SAMPLE
130					105.1-140.9 Sandstone, fine grnd, fining downward	95	13	25	100	
135								26	100	
140					140.9- 148.9 Interbedded SLTS/SS Bioturbated, Mottled zones of DK mudstone.	85	14	27	100	
145								28	100	
					148.9 T.D.		15			

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

February 28, 1989

Job No.: 9554

Date Rec'd: March 8, 1989

Date Sampled: March 8, 1989

Sampled By: UP&L

Sample ID:

DEER CREEK-IN-MINE
3rd No. XC-41
Temperature 54 degrees
Flow 3.1 gpm
Rec'd 1550 hr
Sampled 1410 hr.

UTAH POWER & LIGHT CO.
P.O. Box 1005
Huntington, Utah 84528

WATER ANALYSIS

Acidity	9	mg/l CaCO3	03/10/89 0900 hr.
Aluminum	0.10<	mg/l	03/14/89 1100 hr.
Alk., Bicarbonate	418	mg/l HCO3	03/08/89 1100 hr.
Alk., Carbonate	1<	mg/l CaCO3	03/08/89 1100 hr.
Arsenic	0.002<	mg/l	03/16/89 1500 hr.
Anions, Total	7.88	meq/l	
Barium	0.03<	mg/l	03/14/89 1130 hr.
Boron	0.04	mg/l	03/14/89 1000 hr.
Cadmium	0.005<	mg/l	03/13/89 0915 hr.
Calcium	76.3	mg/l	03/13/89 1400 hr.
Cations, Total	7.70	meq/l	
Chloride	5.0	mg/l	03/10/89 0945 hr.
Chromium	0.01<	mg/l	03/14/89 1300 hr.
Conductivity	680	umhos/cm	03/10/89 1300 hr.
Copper	0.010<	mg/l	03/13/89 1030 hr.
Fluoride	0.39	mg/l	03/10/89 1100 hr.
Hardness, Total	349	mg/l CaC	
Iron	0.04	mg/l	03/13/89 1430 hr.
Iron, Dissolved	0.04	mg/l	03/13/89 1430 hr.
Lead	0.050<	mg/l	03/13/89 0900 hr.
Magnesium	38.60	mg/l	03/13/89 1300 hr.
Manganese	0.01<	mg/l	03/13/89 1500 hr.
Mercury	0.003	mg/l	03/15/89 1400 hr.
Molybdenum	0.10<	mg/l	03/14/89 1315 hr.
Nickel	0.01<	mg/l	03/13/89 1000 hr.
Nitrogen, Ammonia	0.01<	mg/l	03/13/89 1430 hr.
Nitrogen, Nitrate	0.04	mg/l	03/14/89 1100 hr.
Nitrogen, Nitrite	0.01	mg/l	03/14/89 1100 hr.

ANALYST: D. Lyon

Respectfully submitted,
COMMERCIAL TESTING & ENGINEERING CO.

Manager, Huntington Laboratory

COMMERCIAL TESTING & ENGINEERING CO.
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February 28, 1989

Job No.: 9554

Date Rec'd: March 8, 1989

Date Sampled: March 8, 1989

Sampled By: UP&L

Sample ID:

DEER CREEK-IN-MINE
3rd No. XC-41
Temperature 54 degrees
Flow 3.1 gpm
Rec'd 1550 hr
Sampled 1410 hr.

UTAH POWER & LIGHT CO.
P.O. Box 1005
Huntington, Utah 84528

WATER ANALYSIS

Oxygen, Dissolved	5.2	mg/l	Solids, Dissolved	375.0	mg/l
03/08/89	1630 hr.		03/15/89	0930 hr.	
pH	7.30	Units	Solids, Setteable	0.05	mg/l
03/08/89	1615 hr.		03/09/89	0900 hr.	
Phosphorus, Total	0.01<	mg/l	Solids, Suspended	4.0<	mg/l
03/17/89	1430 hr.		03/15/89	0930 hr.	
Potassium	1.90	mg/l	Sulfate	50.0	mg/l
03/13/89	1315 hr.		03/13/89	1405 hr.	
Selenium	0.002<	mg/l	Sulfide	6.80	mg/l
03/17/89	1400 hr.		03/14/89	1615 hr.	
Sodium	15.70	mg/l	Zinc	0.04	mg/l
03/13/89	1330 hr.		03/13/89	1015 hr.	

ANALYST: D. Lyon

Respectfully submitted,
COMMERCIAL TESTING & ENGINEERING CO.

Manager, Huntington Laboratory

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

February 28, 1989

Job No.: 9555

Date Rec'd: March 8, 1989

Date Sampled: March 8, 1989

Sampled By: UP&L

Sample ID:

DEER CREEK-IN-MINE
1st West Mains XC-24
Temperature 52 degrees
Flow 99.6 gpm
Rec'd 1550 hr
Sampled 1430 hr.

UTAH POWER & LIGHT CO.
P.O. Box 1005
Huntington, Utah 84528

WATER ANALYSIS

Acidity	21	mg/l CaCO3	Copper	0.010<	mg/l
03/10/89	0900 hr.		03/13/89	1030 hr.	
Aluminum	0.10<	mg/l	Fluoride	0.35	mg/l
03/14/89	1100 hr.		03/10/89	1100 hr.	
Alk., Bicarbonate	472	mg/l HCO3	Hardness, Total	459	mg/l CaC
03/08/89	1100 hr.				
Alk., Carbonate	1<	mg/l CaCO3	Iron	0.11	mg/l
03/08/89	1100 hr.		03/13/89	1430 hr.	
Arsenic	0.002<	mg/l	Iron, Dissolved	0.11	mg/l
03/16/89	1500 hr.		03/13/89	1430 hr.	
Anions, Total	10.66	meq/l	Lead	0.050<	mg/l
			03/13/89	0900 hr.	
Barium	0.03<	mg/l	Magnesium	48.10	mg/l
03/14/89	1130 hr.		03/13/89	1300 hr.	
Boron	0.03	mg/l	Manganese	0.01<	mg/l
03/14/89	1000 hr.		03/13/89	1500 hr.	
Cadmium	0.005<	mg/l	Mercury	0.002<	mg/l
03/13/89	0915 hr.		03/15/89	1400 hr.	
Calcium	104.4	mg/l	Molybdenum	0.10<	mg/l
03/13/89	1400 hr.		03/14/89	1315 hr.	
Cations, Total	10.00	meq/l	Nickel	0.01<	mg/l
			03/13/89	1000 hr.	
Chloride	5.0	mg/l	Nitrogen, Ammonia	0.01<	mg/l
03/10/89	0945 hr.		03/13/89	1430 hr.	
Chromium	0.01<	mg/l	Nitrogen, Nitrate	0.03	mg/l
03/14/89	1300 hr.		03/14/89	1100 hr.	
Conductivity	830	umhos/cm	Nitrogen, Nitrite	0.01	mg/l
03/10/89	1300 hr.		03/14/89	1100 hr.	

ANALYST: D. Tyson

Respectfully submitted,
COMMERCIAL TESTING & ENGINEERING CO.

M M
Manager, Huntington Laboratory

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

February 28, 1989

Job No.: 9555

Date Rec'd: March 8, 1989

Date Sampled: March 8, 1989

Sampled By: UP&L

Sample ID:

DEER CREEK-IN-MINE
1st West Mains XC-24
Temperature 52 degrees
Flow 99.6 gpm
Rec'd 1550 hr
Sampled 1430 hr.

UTAH POWER & LIGHT CO.
P.O. Box 1005
Huntington, Utah 84528

WATER ANALYSIS

Oxygen, Dissolved	5.8	mg/l	Solids, Dissolved	589.0	mg/l
03/08/89	1630 hr.		03/15/89	0930 hr.	
pH	7.35	Units	Solids, Setteable	0.05	mg/l
03/08/89	1615 hr.		03/09/89	0900 hr.	
Phosphorus, Total	0.01<	mg/l	Solids, Suspended	1.0<	mg/l
03/17/89	1430 hr.		03/15/89	0930 hr.	
Potassium	3.30	mg/l	Sulfate	120.0	mg/l
03/13/89	1315 hr.		03/13/89	1405 hr.	
Selenium	0.002<	mg/l	Sulfide	5.60	mg/l
03/17/89	1400 hr.		03/14/89	1615 hr.	
Sodium	17.50	mg/l	Zinc	0.06	mg/l
03/13/89	1330 hr.		03/13/89	1015 hr.	

ANALYST: D. Tyson

Respectfully submitted,
COMMERCIAL TESTING & ENGINEERING CO.

Manager, Huntington Laboratory

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

February 28, 1989

Job No.: 9553

Date Rec'd: March 8, 1989

Date Sampled: March 8, 1989

Sampled By: UP&L

Sample ID:

DEER CREEK-IN-MINE
TW 10
Temperature 44 degrees
Flow 25 gpm
Rec'd 1550 hr
Sampled 1400 hr.

RECEIVED
MAR 20 1989
MINING DIV.
FIELD OFFICE

UTAH POWER & LIGHT CO.
P.O. Box 1005
Huntington, Utah 84528

WATER ANALYSIS

Acidity	11	mg/l	CaCO3	Copper	0.010<	mg/l	
03/10/89	0900 hr.			03/13/89	1030 hr.		
Aluminum	0.10<	mg/l		Fluoride	0.39	mg/l	
03/14/89	1100 hr.			03/10/89	1100 hr.		
Alk., Bicarbonate	389	mg/l	HCO3	Hardness, Total	364	mg/l	CaC
03/08/89	1100 hr.						
Alk., Carbonate	1<	mg/l	CaCO3	Iron	0.39	mg/l	
03/08/89	1100 hr.			03/13/89	1430 hr.		
Arsenic	0.002<	mg/l		Iron, Dissolved	0.10	mg/l	
03/16/89	1500 hr.			03/13/89	1430 hr.		
Anions, Total	7.83	meq/l		Lead	0.050<	mg/l	
				03/13/89	0900 hr.		
Barium	0.03<	mg/l		Magnesium	33.20	mg/l	
03/14/89	1130 hr.			03/13/89	1300 hr.		
Boron	0.03	mg/l		Manganese	0.01	mg/l	
03/14/89	1000 hr.			03/13/89	1500 hr.		
Cadmium	0.005<	mg/l		Mercury	0.002	mg/l	
03/13/89	0915 hr.			03/15/89	1400 hr.		
Calcium	91.0	mg/l		Molybdenum	0.10<	mg/l	
03/13/89	1400 hr.			03/14/89	1315 hr.		
Cations, Total	7.95	meq/l		Nickel	0.01<	mg/l	
				03/13/89	1000 hr.		
Chloride	5.0	mg/l		Nitrogen, Ammonia	0.01<	mg/l	
03/10/89	0945 hr.			03/13/89	1430 hr.		
Chromium	0.01<	mg/l		Nitrogen, Nitrate	0.03	mg/l	
03/14/89	1300 hr.			03/14/89	1100 hr.		
Conductivity	680	umhos/cm		Nitrogen, Nitrite	0.03	mg/l	
03/10/89	1300 hr.			03/14/89	1100 hr.		

ANALYST: D. Tyson

Respectfully submitted,
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TELEPHONE: (801) 653-2311

February 28, 1989

Job No.: 9553

Date Rec'd: March 8, 1989

Date Sampled: March 8, 1989

Sampled By: UP&L

Sample ID:

DEER CREEK-IN-MINE
TW 10
Temperature 44 degrees
Flow 25 gpm
Rec'd 1550 hr
Sampled 1400 hr.

UTAH POWER & LIGHT CO.
P.O. Box 1005
Huntington, Utah 84528

WATER ANALYSIS

Oxygen, Dissolved	5.0	mg/l	Solids, Dissolved	439.0	mg/l
03/08/89	1630 hr.		03/15/89	0930 hr.	
pH	7.40	Units	Solids, Setteable	0.05	mg/l
03/08/89	1615 hr.		03/09/89	0900 hr.	
Phosphorus, Total	0.01<	mg/l	Solids, Suspended	1.0<	mg/l
03/17/89	1430 hr.		03/15/89	0930 hr.	
Potassium	1.40	mg/l	Sulfate	65.0	mg/l
03/13/89	1315 hr.		03/13/89	1405 hr.	
Selenium	0.002<	mg/l	Sulfide	12.00	mg/l
03/17/89	1400 hr.		03/14/89	1615 hr.	
Sodium	14.80	mg/l	Zinc	0.01	mg/l
03/13/89	1330 hr.		03/13/89	1015 hr.	

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MAR 20 1989
MINING DIV.
FIELD OFFICE

ANALYST: D. Tipon

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

June 13, 1989

Job No.: 9744

Date Rec'd: June 6, 1989

Date Sampled: June 6, 1989

Sampled By: UP&L

Sample ID:

DEER CREEK-IN-MINE
1st W. Mains xc-24
Flow .09/10.7 gpm
Rec'd 1400 hr.
Sampled 1000 hr.

UTAH POWER & LIGHT CO.
P.O. Box 1005
Huntington, Utah 84528

WATER ANALYSIS

Alk., Bicarbonate		422	mg/l HCO3	Magnesium		42.50	mg/l
	06/09/89 1530 hr.				06/08/89 1345 hr.		
Alk., Carbonate		1<	mg/l CaCO3	Manganese		0.01<	mg/l
	06/09/89 1530 hr.				06/08/89 1400 hr.		
Alk., Total		346	mg/l CaCO3	Oil and Grease		1.0<	mg/l
	06/09/89 1530 hr.				06/07/89 1000 hr.		
Anions, Total		9.02	meq/l	pH		7.00	Units
					06/06/89 1630 hr.		
Calcium		90.0	mg/l	Potassium		3.20	mg/l
	06/08/89 1315 hr.				06/08/89 1415 hr.		
Cations, Total		8.86	meq/l	Sodium		18.30	mg/l
					06/08/89 1300 hr.		
Chloride		25.0	mg/l	Solids, Dissolved		493.0	mg/l
	06/07/89 1400 hr.				06/07/89 1630 hr.		
Conductivity		600	umhos/cm	Solids, Suspended		5.0	mg/l
	06/09/89 1300 hr.				06/07/89 1630 hr.		
Hardness, Total		400	mg/l CaCO3	Sulfate		75.0	mg/l
					06/12/89 1335 hr.		
Iron, Dissolved		0.02<	mg/l				
	06/08/89 1330 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

June 13, 1989

Job No.: 9745

Date Rec'd: June 6, 1989

Date Sampled: June 6, 1989

Sampled By: UP&L

Sample ID:

DEER CREEK-IN-MINE
TW-10
Flow 16.7 gpm
Rec'd 1400 hr.
Sampled 1080 hr.

UTAH POWER & LIGHT CO.
P.O. Box 1005
Huntington, Utah 84528

WATER ANALYSIS

Alk., Bicarbonate	292	mg/l HCO3	Magnesium	36.40	mg/l
06/09/89	1530 hr.		06/08/89	1345 hr.	
Alk., Carbonate	1<	mg/l CaCO3	Manganese	0.01<	mg/l
06/09/89	1530 hr.		06/08/89	1400 hr.	
Alk., Total	239	mg/l CaCO3	Oil and Grease	1.0<	mg/l
06/09/89	1530 hr.		06/07/89	1200 hr.	
Anions, Total	7.60	meq/l	pH	7.00	Units
			06/06/89	1630 hr.	
Calcium	79.4	mg/l	Potassium	1.60	mg/l
06/08/89	1315 hr.		06/08/89	1415 hr.	
Cations, Total	7.73	meq/l	Sodium	17.10	mg/l
			06/08/89	1300 hr.	
Chloride	30.0	mg/l	Solids, Dissolved	406.0	mg/l
06/07/89	1400 hr.		06/07/89	1630 hr.	
Conductivity	950	umhos/cm	Solids, Suspended	82.0	mg/l
06/09/89	1300 hr.		06/07/89	1630 hr.	
Hardness, Total	348	mg/l CaCO3	Sulfate	100.0	mg/l
			06/12/89	1335 hr.	
Iron, Dissolved	0.02<	mg/l			
06/08/89	1330 hr.				

ANALYST: D. Tipon

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

October 2, 1989

Job No.: 59 10015

Date Rec'd: September 14, 1989

Date Sampled: September 14, 1989

Sampled By: UP&L

Sample ID: UP&L

DEER CREEK-IN-MINE
TW-10
Temperature 43 degrees
Flow 8.60 gpm
Rec'd 1620 hr.
Sampled 1115 hr.

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

WATER ANALYSIS

Aluminum	0.01<	mg/l	Conductivity	530	umhos/cm
09-22-89	1500 hr.		09-26-89	1415 hr.	
Alk., Bicarbonate	342	mg/l HCO3	Copper	0.010<	mg/l
09-20-89	1115 hr.		09-22-89	1525 hr.	
Alk., Carbonate	1<	mg/l CaCO3	Fluoride	0.29	mg/l
09-20-89	1115 hr.		09-22-89	1300 hr.	
Arsenic	0.002<	mg/l	Hardness, Total	292	mg/l CaCO3
09-25-89	1000 hr.				
Anions, Total	6.46	meq/l	Iron	0.02<	mg/l
			09-19-89	1445 hr.	
Barium	0.03<	mg/l	Lead	0.050<	mg/l
09-22-89	1500 hr.		09-22-89	1417 hr.	
Boron	0.50	mg/l	Magnesium	28.10	mg/l
09-25-89	0930 hr.		09-19-89	1430 hr.	
Cadmium	0.002<	mg/l	Manganese	0.01<	mg/l
09-22-89	1429 hr.		09-19-89	1530 hr.	
Calcium	70.4	mg/l	Mercury	0.003	mg/l
09-29-89	1400 hr.		09-26-89	1300 hr.	
Cations, Total	6.46	meq/l	Molybdenum	0.10<	mg/l
			09-22-89	1500 hr.	
Chloride	15.0	mg/l	Nickel	0.10	mg/l
09-20-89	1540 hr.		09-22-89	1432 hr.	
Chromium	0.08	mg/l	Nitrogen, Ammonia	0.01	mg/l
09-22-89	1500 hr.		09-15-89	1450 hr.	

ANALYST: D. Tyson

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

October 2, 1989

Job No.: 59 10015

Date Rec'd: September 14, 1989

Date Sampled: September 14, 1989

Sampled By: UP&L

Sample ID: UP&L

DEER CREEK-IN-MINE
TW-10
Temperature 43 degrees
Flow 8.60 gpm
Rec'd 1620 hr.
Sampled 1115 hr.

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

WATER ANALYSIS

Nitrogen, Nitrate	0.11	mg/l	Sodium	13.50	mg/l
09-22-89	1320 hr.		09-19-89	1415 hr.	
Nitrogen, Nitrite	0.01<	mg/l	Solids, Dissolved	396.0	mg/l
09-22-89	1320 hr.		09-19-89	1600 hr.	
pH	7.50	Units	Sulfate	27.0	mg/l
09-14-89	1635 hr.		09-21-89	1000 hr.	
Phosphorus, Total	0.01<	mg/l	Sulfide	0.01	mg/l
09-22-89	1445 hr.		09-19-89	1335 hr.	
Potassium	2.00	mg/l	Zinc	0.00<	mg/l
09-19-89	1445 hr.		09-22-89	1335 hr.	
Selenium	0.002<	mg/l			
09-28-89	1100 hr.				

ANALYST: D. Lyon

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 2, 1989

Job No.: 59 10017

Date Rec'd: September 14, 1989

Date Sampled: September 14, 1989

Sampled By: UP&L

Sample ID: UP&L

DEER CREEK-IN-MINE
3rd North XC-41
Temperature 50 degrees
Flow 2.6 gpm
Rec'd 1620 hr.
Sampled 1100 hr.

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

WATER ANALYSIS

Aluminum	0.01<	mg/l	Conductivity	600	umhos/cm
09-22-89 1500 hr.			09-26-89 1415 hr.		
Alk., Bicarbonate	398	mg/l HCO3	Copper	0.010<	mg/l
09-20-89 1115 hr.			09-22-89 1525 hr.		
Alk., Carbonate	1<	mg/l CaCO3	Fluoride	0.24	mg/l
09-20-89 1115 hr.			09-25-89 1300 hr.		
Arsenic	0.002<	mg/l	Hardness, Total	348	mg/l CaCO3
09-25-89 1000 hr.					
Anions, Total	7.49	meq/l	Iron	0.54	mg/l
			09-19-89 1445 hr.		
Barium	0.03<	mg/l	Lead	0.050<	mg/l
09-22-89 1500 hr.			09-22-89 1417 hr.		
Boron	0.07	mg/l	Magnesium	30.60	mg/l
09-25-89 0930 hr.			09-19-89 1430 hr.		
Cadmium	0.002<	mg/l	Manganese	0.01<	mg/l
09-22-89 1429 hr.			09-19-89 1530 hr.		
Calcium	88.8	mg/l	Mercury	0.002<	mg/l
09-19-89 1400 hr.			09-26-89 1300 hr.		
Cations, Total	7.65	meq/l	Molybdenum	0.10<	mg/l
			09-22-89 1500 hr.		
Chloride	10.0	mg/l	Nickel	0.02<	mg/l
09-20-89 1540 hr.			09-22-89 1432 hr.		
Chromium	0.02<	mg/l	Nitrogen, Ammonia	0.01	mg/l
09-22-89 1500 hr.			09-15-89 1450 hr.		

ANALYST: D. Tyson

Respectfully submitted,
COMMERCIAL TESTING & ENGINEERING CO.

OCT - 3 1989

Manager, Huntington Laboratory

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TELEPHONE: (801) 653-2311

October 2, 1989

Job No.: 59 10017

Date Rec'd: September 14, 1989

Date Sampled: September 14, 1989

Sampled By: UP&L

Sample ID: UP&L

DEER CREEK-IN-MINE
3rd North XC-41
Temperature 50 degrees
Flow 2.6 gpm
Rec'd 1620 hr.
Sampled 1100 hr.

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

WATER ANALYSIS

Nitrogen, Nitrate	0.12	mg/l	Sodium	14.50	mg/l
09-22-89	1320 hr.		09-19-89	1415 hr.	
Nitrogen, Nitrite	0.01<	mg/l	Solids, Dissolved	375.0	mg/l
09-22-89	1320 hr.		09-19-89	1600 hr.	
pH	7.30	Units	Sulfate	40.0	mg/l
09-14-89	1635 hr.		09-21-89	1000 hr.	
Phosphorus, Total	0.01<	mg/l	Sulfide	0.01	mg/l
09-22-89	1445 hr.		09-19-89	1335 hr.	
Potassium	2.80	mg/l	Zinc	0.00<	mg/l
09-19-89	1445 hr.		09-22-89	1335 hr.	
Selenium	0.002<	mg/l			
09-28-89	1100 hr.				

ANALYST: D. Tyson

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

October 2, 1989

Job No.: 59 10016

Date Rec'd: September 14, 1989

Date Sampled: September 14, 1989

Sampled By: UP&L

Sample ID: UP&L

DEER CREEK-IN-MINE
1st West Mains XC-24
Temperature 54 degrees
Flow 0.02/1.04 gpm
Rec'd 1620 hr.
Sampled 1040 hr.

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

WATER ANALYSIS

Aluminum	0.01<	mg/l	Conductivity	750	umhos/cm
09-22-89	1500 hr.		09-26-89	1415 hr.	
Alk., Bicarbonate	443	mg/l HCO3	Copper	0.010<	mg/l
09-20-89	1115 hr.		09-22-89	1525 hr.	
Alk., Carbonate	1<	mg/l CaCO3	Fluoride	0.24	mg/l
09-20-89	1115 hr.		09-25-89	1300 hr.	
Arsenic	0.002<	mg/l	Hardness, Total	406	mg/l CaCO3
09-25-89	1000 hr.				
Anions, Total	8.98	meq/l	Iron	0.02<	mg/l
			09-19-89	1445 hr.	
Barium	0.03<	mg/l	Lead	0.050<	mg/l
09-22-89	1500 hr.		09-22-89	1417 hr.	
Boron	0.01<	mg/l	Magnesium	46.70	mg/l
09-25-89	0930 hr.		09-19-89	1430 hr.	
Cadmium	0.002<	mg/l	Manganese	0.02	mg/l
09-22-89	1429 hr.		09-19-89	1530 hr.	
Calcium	85.4	mg/l	Mercury	0.002<	mg/l
09-19-89	1400 hr.		09-26-89	1300 hr.	
Cations, Total	8.96	meq/l	Molybdenum	0.10<	mg/l
			09-22-89	1500 hr.	
Chloride	15.0	mg/l	Nickel	0.02<	mg/l
09-20-89	1540 hr.		09-22-89	1432 hr.	
Chromium	0.02<	mg/l	Nitrogen, Ammonia	0.01	mg/l
09-22-89	1500 hr.		09-15-89	1450 hr.	

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 2, 1989

Job No.: 59 10016

Date Rec'd: September 14, 1989

Date Sampled: September 14, 1989

Sampled By: UP&L

Sample ID: UP&L

DEER CREEK-IN-MINE
1st West Mains XC-24
Temperature 54 degrees
Flow 0.02/1.04 gpm
Rec'd 1620 hr.
Sampled 1040 hr.

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

WATER ANALYSIS

Nitrogen, Nitrate	0.08	mg/l	Sodium	17.70	mg/l
09-22-89	1320 hr.		09-19-89	1415 hr.	
Nitrogen, Nitrite	0.01<	mg/l	Solids, Dissolved	497.0	mg/l
09-22-89	1320 hr.		09-19-89	1600 hr.	
pH	7.40	Units	Sulfate	62.0	mg/l
09-14-89	1635 hr.		09-21-89	1000 hr.	
Phosphorus, Total	0.01<	mg/l	Sulfide	0.01	mg/l
09-22-89	1445 hr.		09-19-89	1335 hr.	
Potassium	3.90	mg/l	Zinc	0.00<	mg/l
09-19-89	1445 hr.		09-22-89	1335 hr.	
Selenium	0.002<	mg/l			
09-28-89	1100 hr.				

ANALYST: D. Tyson

OCT - 6 1989

Respectfully submitted,
COMMERCIAL TESTING & ENGINEERING CO.

Manager, Huntington Laboratory

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

December 22, 1989

Job No.: 59 10191

Date Rec'd: December 6, 1989

Date Sampled: December 6, 1989

Sampled By: UP&L

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

Sample ID: UP&L

DEER CREEK-IN-MINE TW10
3rd North XC-65
Flow 4.5 gpm
Temperature 46 degrees
Rec'd 1630 hr.
Sampled 1130 hr.

WATER ANALYSIS

Aluminum	0.01<	mg/l	Chromium	0.02<	mg/l
12-19-89	14:00 hr.		12-19-89	14:00 hr.	
Alk., Bicarbonate	400	mg/l HCO3	Conductivity	600	umhos/cm
12-07-89	15:20 hr.		12-07-89	14:30 hr.	
Alk., Carbonate	1<	mg/l CaCO3	Copper	0.010<	mg/l
12-07-89	15:20 hr.		12-19-89	11:00 hr.	
Alk., Total	328	mg/l CaCO3	Fluoride	0.30	mg/l
12-07-89	15:20 hr.		12-19-89	14:00 hr.	
Arsenic	0.002<	mg/l	Hardness, Total	371	mg/l CaCO3
12-21-89	10:00 hr.		12-11-89		
Anions, Total	8.22	meq/l	Iron	1.06	mg/l
			12-11-89	12:00 hr.	
Barium	0.03<	mg/l	Iron, Dissolved	0.02<	mg/l
12-19-89	14:00 hr.		12-11-89	12:00 hr.	
Boron	0.02	mg/l	Lead	0.050<	mg/l
12-22-89			12-19-89	11:00 hr.	
Cadmium	0.002<	mg/l	Magnesium	38.50	mg/l
12-19-89	11:00 hr.		12-11-89	11:15 hr.	
Calcium	85.2	mg/l	Manganese	0.02	mg/l
12-11-89	10:30 hr.		12-11-89	12:15 hr.	
Cations, Total	8.03	meq/l	Mercury	0.002<	mg/l
			12-20-89	17:00 hr.	
Chloride	5.0	mg/l	Molybdenum	0.10<	mg/l
12-07-89	13:15 hr.		12-19-89	14:00 hr.	

ANALYST: _____

RECEIVED
DEC 27 1989

Respectfully submitted,
COMMERCIAL TESTING & ENGINEERING CO.

Manager, Huntington Laboratory

MINING DIV.
FIELD OFFICE

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

December 22, 1989

Job No.: 59 10191

Date Rec'd: December 6, 1989

Date Sampled: December 6, 1989

Sampled By: UP&L

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

Sample ID: UP&L

DEER CREEK-IN-MINE TW10
3rd North XC-65
Flow 4.5 gpm
Temperature 46 degrees
Rec'd 1630 hr.
Sampled 1130 hr.

WATER ANALYSIS

Nickel	0.02<	mg/l	Selenium	0.002<	mg/l
12-19-89	11:00 hr.		12-21-89	11:00 hr.	
Nitrogen, Ammonia	0.25	mg/l	Sodium	13.70	mg/l
12-13-89	15:50 hr.		12-11-89	11:00 hr.	
Nitrogen, Nitrate	0.10	mg/l	Solids, Dissolved	362.0	mg/l
12-08-89	15:00 hr.		12-14-89	16:00 hr.	
Nitrogen, Nitrite	0.03	mg/l	Solids, Suspended	7.0	mg/l
12-08-89	15:00 hr.		12-14-89	16:00 hr.	
Oxygen, Dissolved	7.7	mg/l	Sulfate	80.0	mg/l
12-06-89	16:55 hr.		12-08-89	16:25 hr.	
pH	7.40	Units	Sulfide	40.00	mg/l
12-06-89	17:10 hr.		12-07-89	08:30 hr.	
Phosphorus, Total	0.01<	mg/l	Zinc	0.00<	mg/l
12-19-89	09;30 hr.		12-19-89	11:00 hr.	
Potassium	1.10	mg/l			
12-11-89	11:30 hr.				

ANALYST: _____

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

December 22, 1989

Job No.: 59 10192

Date Rec'd: December 6, 1989

Date Sampled: December 6, 1989

Sampled By: UP&L

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

Sample ID: UP&L

DEER CREEK-IN-MINE
3rd North XC-41
Flow 3.2 gpm
Temperature 52 degrees
Rec'd 1630 hr.
Sampled 1115 hr.

WATER ANALYSIS

Aluminum	0.01<	mg/l	Chromium	0.03	mg/l
12-19-89	14:00 hr.		12-19-89	14:00 hr.	
Alk., Bicarbonate	406	mg/l HCO3	Conductivity	600	umhos/cm
12-07-89	15:20 hr.		12-07-89	14:30 hr.	
Alk., Carbonate	1<	mg/l CaCO3	Copper	0.010<	mg/l
12-07-89	15:20 hr.		12-19-89	11:00 hr.	
Alk., Total	333	mg/l CaCO3	Fluoride	0.30	mg/l
12-07-89	15:20 hr.		12-19-89	14:00 hr.	
Arsenic	0.002<	mg/l	Hardness, Total	287	mg/l CaCO3
12-21-89	10:00 hr.		12-11-89		
Anions, Total	6.84	meq/l	Iron	0.18	mg/l
			12-11-89	12.00 hr.	
Barium	0.03<	mg/l	Iron, Dissolved	0.06	mg/l
12-19-89	14:00 hr.		12-11-89	12:00 hr.	
Boron	0.02	mg/l	Lead	0.050<	mg/l
12-22-89			12-19-89	11:00 hr.	
Cadmium	0.002<	mg/l	Magnesium	35.30	mg/l
12-19-89	11:00 hr.		12-11-89	11:15 HR.	
Calcium	56.6	mg/l	Manganese	0.03	mg/l
12-11-89	10:30 hr.		12-11-89	12:15 hr.	
Cations, Total	6.39	meq/l	Mercury	0.002<	mg/l
			12-20-89	17:00 hr.	
Chloride	5.0	mg/l	Molybdenum	0.10<	mg/l
12-07-89	13:15 hr.		12-19-89	14:00 hr.	

ANALYST: _____

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December 22, 1989

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Utah Power and Light Co.
P.O. Box 1005
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Sample ID: UP&L

DEER CREEK-IN-MINE
3rd North XC-41
Flow 3.2 gpm
Temperature 52 degrees
Rec'd 1630 hr.
Sampled 1115 hr.

WATER ANALYSIS

Nickel	0.02<	mg/l	Selenium	0.002<	mg/l
12-19-89	11:00 hr.		12-21-89	11:00 hr.	
Nitrogen, Ammonia	0.24	mg/l	Sodium	14.40	mg/l
12-13-89	15:50 hr.		12-11-89	11:00 hr.	
Nitrogen, Nitrate	0.10	mg/l	Solids, Dissolved	361.0	mg/l
12-08-89	13:00 hr.		12-14-89	16:00 hr.	
Nitrogen, Nitrite	0.01<	mg/l	Solids, Suspended	6.0	mg/l
12-08-89	13:00 hr.		12-14-89	16:00 hr.	
Oxygen, Dissolved	6.3	mg/l	Sulfate	10.0	mg/l
12-06-89	16:55 hr.		12-08-89	16:25 hr.	
pH	7.30	Units	Sulfide	40.00	mg/l
12-06-89	17:10 hr.		12-07-89	08:30 hr.	
Phosphorus, Total	0.01<	mg/l	Zinc	0.01	mg/l
12-19-89	09:30 hr.		12-19-89	11:00 hr.	
Potassium	1.60	mg/l			
12-11-89	11:30 hr.				

ANALYST: dd cll

Respectfully submitted,
COMMERCIAL TESTING & ENGINEERING CO.

dd cll

Manager, Huntington Laboratory