COTTONWOOD/WILBERG
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HYDROLOGIC MONITORING PROGRAM

ANNUAL REPORT FOR 1988

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UTAH POWER & LIGHT COMPANY
HYDROLOGIC MONITORING PROGRAM
ANNUAL REPORT FOR 1988

FEBRUARY 1989

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 Operation Department

and

Technical Services Department of the Mining Division

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I. INTRODUCTION

The 1988 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 eleventh 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.

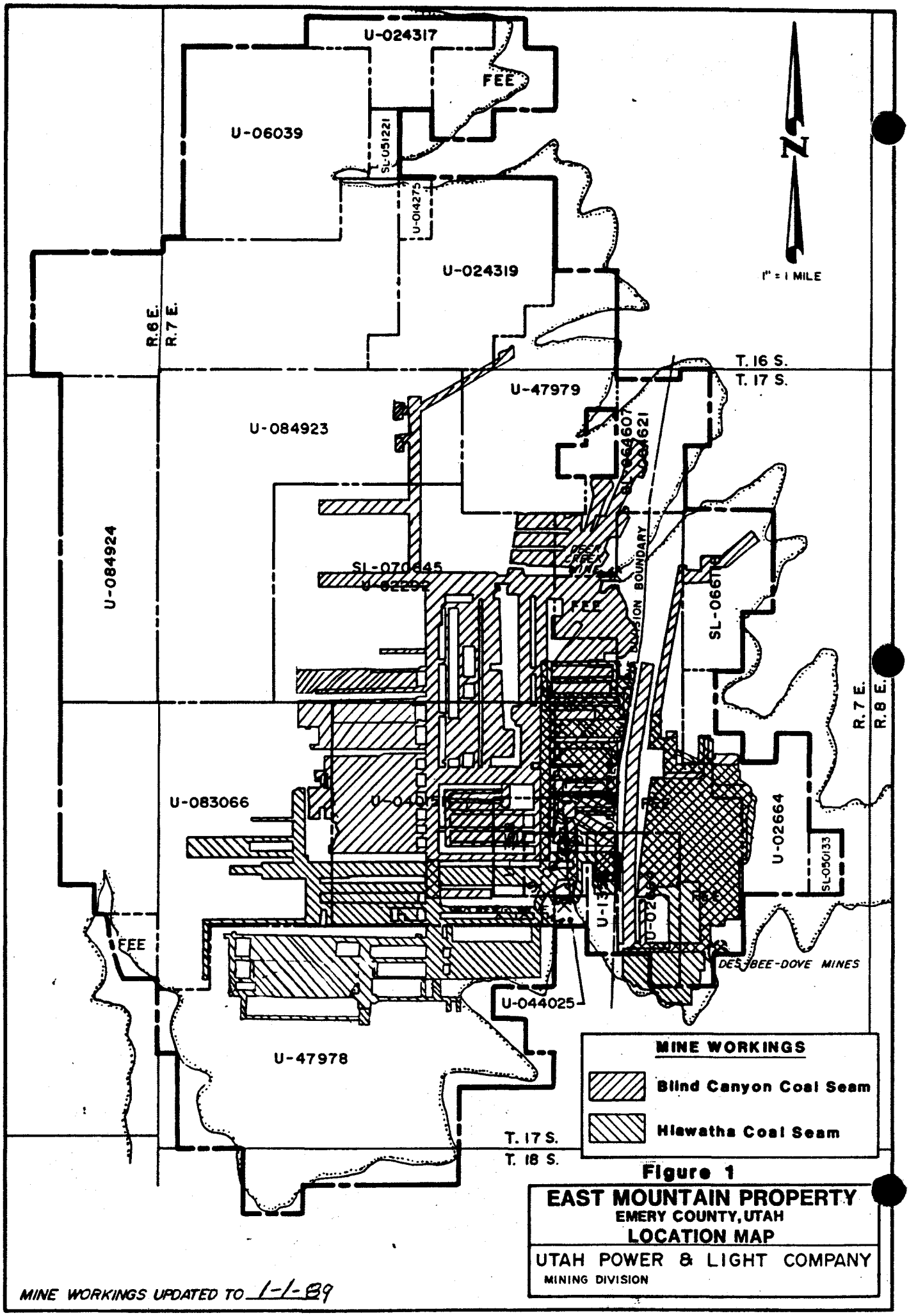


Figure 1

EAST MOUNTAIN PROPERTY
EMERY COUNTY, UTAH
LOCATION MAP

UTAH POWER & LIGHT COMPANY
MINING DIVISION

MINE WORKINGS UPDATED TO 1-1-89

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 with runoff amounts less than in 1987.

B. Local Climatology

1. Precipitation

Valley precipitation in Emery County during 1988 was above average. The mountains in the San Rafael Basin received normal snowfall during the 1987-88 winter, and precipitation at Electric Lake (22.7") was above normal.

Precipitation amounts recorded at Hunter Plant, Huntington Plant, Electric Lake, and East Mountain for the 1988 water year (October 1987 to September 1988) 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 1987 and 1988 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 1987-1988 precipitation levels recorded at the four locations.

TABLE 2: COMPARISON OF 1987 AND 1988 PRECIPITATION (INCHES)

Station	1987 Amount	1987 % of Normal	1988 Amount	1988 % of Normal	1988 As % of 1987
Hunter Plant	8.55	123	8.96	129	105
Huntington Plant	8.68	116	9.30	124	107
Electric Lake	19.65	100	22.70	116	116
East Mountain	13.73	91	14.61	97	106
Average %		108		119	109

Table 2 indicates that 1988 precipitation was higher than 1987 at all four recording stations. The overall precipitation at the four stations averaged nine percent (9%) higher in 1988 than in 1987.

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. These 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 1988 water year.

TABLE 1: PRECIPITATION IN EMERY COUNTY, UTAH (1988 Water Year)

	Hunter Plant (Elev. 5800')		Huntington Plant (Elev. 6500')		Electric Lake (Elev. 8350')		East Mountain (Elev. 8985')	
Month	Precip. (in.)	% Of Normal	Precip. (in.)	% Of Normal	Precip. (in.)	% Of Normal	Precip. (in.)	% Of Normal
1987								
Oct.	1.91	245	1.36	109	1.39	66	2.77	169
Nov.	1.02	200	1.35	229	1.68	90	1.91	128
Dec.	0.66	122	0.51	109	3.50	121	1.29	118
1988								
Jan.	0.55	128	1.77	334	3.06	151	1.42	132
Feb.	0.00	0	0.00	0	0.72	41	0.00	0
Mar.	0.66	157	0.10	16	3.32	174	0.99	59
Apr.	1.46	340	1.35	245	2.14	127	2.08	217
May	0.59	100	0.94	165	1.60	107	1.03	114
June	0.20	43	0.83	202	0.86	106	0.81	156
July	0.69	119	0.04	4	1.04	89	0.45	30
Aug.	0.44	44	0.13	19	2.23	262	0.96	57
Sept.	0.78	98	0.92	174	1.16	110	0.91	59
TOTALS	8.96	129	9.30	124	22.70	116	14.61	97
Mean Monthly	0.75	--	0.78	--	1.89	--	1.22	--

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	.13	.25	.19	.02	.40	.00	.89	.84	.03	.31	.08	.70	3.84
76-77	.00	.02	.00	.37	.07	.00	.03	1.28	.07	1.35	.41	.50	4.10
77-78	.01	.18	.00	1.28	1.05	1.74	.34	1.21	.00	.69	1.14	.14	7.78
78-79	.03	2.22	.22	1.43	.53	2.43	.24	.47	.00	.00	.79	.00	8.36
79-80	.00	.00	.41	1.70	1.70	.67	.75	1.11	.00	.02	.51	2.06	8.93
80-81	.66	.06	.02	.00	.07	1.48	.16	.45	.14	.20	.70	2.43	6.37
81-82	.58	.27	.45	.94	.45	.54	.00	.02	.00	.15	1.06	1.23	5.69
82-83	.20	1.25	.45	.54	.41	.84	.37	.51	.00	2.18	1.58	.88	9.21
83-84	.53	.66	1.07	.03	.35	.34	.34	.05	1.09	1.80	1.89	2.35	10.50
84-85	1.69	.06	1.24	.20	.95	1.01	.67	.64	.26	1.50	.03	.86	9.11
85-86	.92	1.40	.42	.10	.97	.40	.31	.00	.31	.55	1.01	.57	7.05
86-87	.92	.08	.10	.32	.45	.90	.12	1.38	1.25	1.65	1.27	.11	8.55
87-88	1.91	1.02	.66	.55	.00	.66	1.64	.59	.20	.69	.44	.78	9.14
88-89	.69	.04	.48										

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	-	-	-	-	-	.08	.29	.16	.11	.57	.63	.43	2.27
71-72	2.26	.59	1.62	.04	.00	.32	.28	.16	.77	.40	.66	1.07	8.17
72-73	4.27	1.28	.34	.49	.80	2.42	.50	.17	.97	1.09	1.94	.12	14.39
73-74	.08	.02	.37	.20	.03	.01	.00	.00	.00	.09	.00	.07	.87
74-75	.68	1.19	.13	1.01	.30	.80	.03	.75	1.44	2.62	.31	.24	9.50
75-76	.23	.95	.03	.20	.23	.00	2.34	.86	.02	.73	.19	.85	6.63
76-77	.56	.00	.00	.35	.00	.00	.00	1.76	.00	2.08	.96	.70	6.41
77-78	.66	.12	.82	1.45	1.00	1.36	.94	.72	.12	.05	.72	.77	8.73
78-79	.02	2.65	.25	1.21	.52	2.50	.00	.84	.05	.09	3.32	.20	11.65
79-80	.17	.14	.15	2.88	3.63	.68	1.13	1.88	.65	.18	.38	2.22	14.09
80-81	1.20	.06	.00	.00	.00	.62	.08	1.75	.48	.00	.58	1.53	6.30
81-82	1.12	.25	1.30	1.63	.20	.73	.00	.17	.00	.08	.71	1.91	8.10
82-83	.20	.60	.67	.16	.65	1.87	.08	.40	.00	1.61	.39	1.15	7.78
83-84	.76	.76	2.13	.10	.15	1.18	.72	.17	1.04	.74	1.39	.46	9.60
84-85	2.07	.34	1.74	.49	.27	.53	.44	1.08	.42	3.21	.04	.81	11.44
85-86	.77	1.28	.64	.01	.98	.28	.43	.10	.17	.42	.55	1.08	6.71
86-87	.38	.15	.05	.81	.66	.13	1.22	1.48	1.01	2.14	.65	.00	8.68
87-88	1.36	1.35	.51	1.77	.00	.10	1.35	.94	.83	.04	.13	.92	9.30
88-89	.31	.13	.83										

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	.36	1.05	.66	.47	.40	2.15	.78	19.88
71-72	3.49	1.69	4.07	3.35	.58	.70	1.02	.28	1.49	.70	.80	2.91	21.08
72-73	4.18	3.43	3.27	.97	2.09	2.74	3.67	1.42	.85	.82	1.23	1.15	25.82
73-74	.79	1.90	3.52	2.70	1.12	1.52	2.49	.20	.13	2.09	.06	.09	16.61
74-75	2.27	.62	1.73	2.10	2.37	3.42	1.23	3.21	1.08	1.93	.49	.25	20.70
75-76	1.31	2.57	.82	1.44	2.23	1.35	1.47	2.00	1.23	1.07	.54	1.19	17.22
76-77	1.00	.25	.14	.76	1.14	2.00	.05	3.00	.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	.30	.10	.24	.77	21.40
78-79	.40	3.18	2.66	2.90	2.18	2.53	.72	1.67	.19	.96	2.29	.32	20.00
79-80	1.55	2.23	.37	4.95	6.01	3.34	1.27	3.09	.12	.37	.38	1.80	25.48
10-Year	1.892	2.032	2.619	2.398	2.212	2.112	1.543	1.671	.666	1.072	.949	1.052	20.218
80-81	1.45	.98	.32	1.30	1.04	3.20	1.45	3.06	.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	.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	.89	3.04	.03	4.35	26.41
85-86	4.40	6.62	1.99	1.81	8.54	2.48	3.79	1.62	.26	1.01	1.68	2.73	36.93
86-87	1.86	1.98	.55	2.14	2.07	2.47	1.03	2.93	.79	2.12	1.22	.49	19.65
87-88	1.39	1.68	3.50	3.06	.72	3.32	2.14	1.60	.86	1.04	2.23	1.16	22.70
88-89	1.20	2.68	1.91										

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.

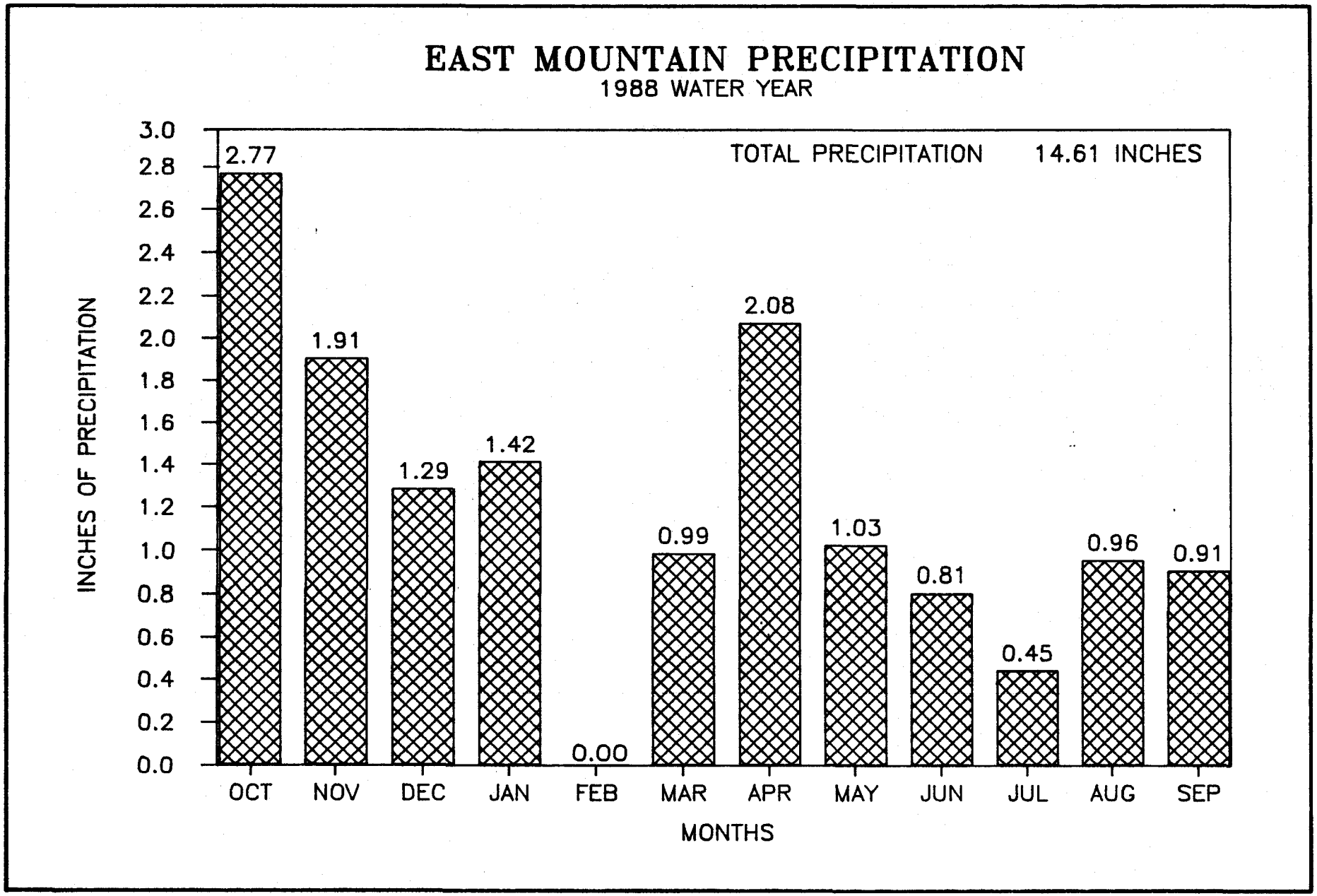
October, November, and December 70-71 were estimated by correlation with Clear Creek Weather Station.

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	10.9
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										

FIGURE 2


EAST MOUNTAIN PRECIPITATION
1988 WATER YEAR
TOTAL PRECIPITATION 14.61 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
2.77
1.91
1.29
1.42
0.00
0.99
2.08
1.03
0.81
0.45
0.96
0.91
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 1988 water year temperatures were substantially above normal except for the Electric Lake station which was slightly below normal. At the Hunter Plant station, temperatures were above normal except for December and January, which were below normal. The Huntington Plant station was hotter than normal for all months except November, December, January, and March, which were below normal. At the East Mountain station temperatures were cooler than normal during November through January, and March, August, and September, while the rest of the year was above normal. The Electric Lake station was cooler than normal for November through March and September, while the rest of the year was above normal. (See Table 7.)

A comparison of 1987 and 1988 temperatures for the four stations is addressed since temperatures also influence water supplies from year to year. Table 8 depicts the variation and compares 1987 to 1988.

TABLE 8: COMPARISON OF 1987 AND 1988 TEMPERATURES*

	1987		1988		1988
Station	Average Temp.	Departure From Normal	Average Temp.	Departure From Normal	Departure From 1987
Hunter Plant	47.5	+3.2	49.3	+3.5	+1.8
Huntington Plant	48.2	+0.6	48.2	+0.5	0.0
Electric Lake	32.3	-1.6	33.8	-0.1	+1.5
East Mountain	40.1	+1.3	39.3	+0.3	-0.8
Average Departure From Normal		+0.9		+1.1	0.63

* Temperatures reported in degrees Fahrenheit.

TABLE 7: TEMPERATURES IN EMERY COUNTY, UTAH (1988 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
1987								
Oct.	55.1	+6.7	53.9	+4.5	41.4	+3.9	42.0	+4.8
Nov.	38.5	+3.3	35.8	-0.2	24.6	-1.1	25.8	-2.4
Dec.	25.0	-1.7	24.4	-3.0	11.2	-4.6	15.3	-6.1
1988								
Jan.	17.0	-7.1	20.5	-3.1	10.4	-4.2	17.7	-3.7
Feb.	31.4	+3.0	30.9	+0.7	16.3	-3.0	24.7	+0.7
Mar.	38.4	+2.6	36.2	-1.5	17.4	-3.4	25.9	-1.8
Apr.	49.1	+4.5	47.3	+2.2	32.8	+4.1	38.0	+2.6
May	57.0	+4.9	55.8	+0.9	40.2	+1.2	46.1	+4.2
June	71.0	+9.6	68.2	+2.4	53.1	+4.5	58.5	+3.2
July	75.7	+7.3	74.2	+2.5	58.4	+2.7	62.6	+0.9
Aug.	72.2	+5.8	70.1	+0.7	54.5	+0.7	60.0	-1.0
Sept	61.6	+2.9	60.8	+0.4	45.6	-1.9	47.0	-3.6
TOTALS	49.3	+3.5	48.2	+0.5	33.8	-0.1	38.6	-0.2

* 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

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 1988 water year (October 1987 - September 1988) at the two stations plus the calculated natural flow are found in Appendix A.

TABLE 9: HUNTINGTON CREEK WATER FLOWS (1988 WATER YEAR)

	Huntington Creek Below Electric Lake	Huntington Creek At Plant	Calc. Natural Flow At Plant
Total Yearly Flow (Ac. Ft.)	11,120	50,150	58,381
% Of Normal	51	73	84
Mean Discharge In Cubic Feet Per Second (CFS)	15.3	69.1	
Maximum Discharge (CFS)	61	377	
Date of Maximum Discharge	8/30/88	5/15/88	
Minimum Discharge In CFS	1.3	4.3	
Date Of Minimum Discharge	10/5/88	3/8/88	

* Influenced by upstream storage in Electric Lake.

During the 1988 spring runoff period (April through July) approximately 5,000 acre feet of water was impounded behind Electric Lake Dam. During spring runoff the impoundment reached its highest level on June 21. Total storage on that date amounted to 26,635 acre feet, which is 4,637 acre feet below full. Reservoir releases for the fishery and Huntington Plant needs during the water year totaled 11,120 acre feet. The total flow of 50,150 acre feet recorded for Huntington Creek at the Huntington Plant is equal to 73% of normal.

A comparison of runoff values from 1987 and 1988 is presented in Table 10.

TABLE 10: COMPARISON OF 1987 AND 1988 RUNOFF VALUES

	1988		1987		
	Amount	% Of Normal	Amount	% Of Normal	1988 as a % of 1987
Spring Runoff Stored In Electric Lake (Ac. Ft.)	5,017	50	2,981	29	168
Calculated Natural Flow At Plant (Ac. Ft.)	58,381	84	60,641	87	96

The 1988 water quality information on Huntington Creek was compiled on a monthly basis for stations above and below the Huntington Plant, while samples for Huntington Creek below Electric Lake and the Right Fork were taken quarterly. 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 are listed as follow (refer to Map No. 1 in pocket):

1. Below Electric Lake*
2. Above the Forks*
3. Below the Power Plant Diversion
4. 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 (1988 WATER YEAR)

	Below Electric Lake			Right Fork Above Left Fork			Above Power Plant			Below Power Plant		
Parameter	Ave.	Max.	Min.	Ave.	Max.	Min.	Ave.	Max.	Min.	Ave.	Max.	Min.
pH (N.U.)	7.9	8.3	7.7	8.3	8.7	8.0	8.2	8.4	8.1	8.2	8.3	8.0
Sulfate	10.7	12.0	9.0	16.6	19	13	85	143	14	61	102	28
Susp. Solids	2.4	6.0	1.0	140	936	4	10	22	1.0	15	31	4.0
Diss. Solids	149	250	92	184	220	160	379	647	210	379	495	312
Spec. Cond. (umhos)	277	325	239	341	418	276	527	990	320	578	760	480

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 1987 and 1988 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 1987-1988

	Below Electric Lake		Right Fork Above Left Fork		Above Power Plant		Below Power Plant	
Parameter	1988	1987	1988	1987	1988	1987	1988	1987
pH (N.U.)	7.9	8.0	8.3	8.3	8.2	8.2	8.2	8.5
Sulfate	10.7	11.5	16.6	17.5	85	-	61	-
T. Susp. Solids	2.4	20	140*	5.5	10	270**	15	155*
T. Diss. Solids	149	157	184	275	379	329	379	334

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

** 2 samples taken during spring runoff period

2. Deer Creek

a. Flow and Sampling Schedule

(1) Locations: a) Above the Mine
b) 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 Addendum in Appendix K.) The program was initiated in March 1988 and will continue through 1989; 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

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 1988 and 1984-1987 has been generated for each flume location (See Appendix B). During 1988 the hydrographs show a peak flow was estimated at 1200 GPM in May for all measuring locations along the Deer Creek stream. Base flow for all locations was 0.0 GPM during the month of December.

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 1988 operational quality analysis are listed in Tables 13 and 14. The minimum, maximum, and mean values, along with the historical results, are given for a five-year period. Values are in milligrams per liter unless otherwise noted. Complete raw data can be found in Appendix B. It is apparent from 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. An examination of Tables 13 and 14 reveals that all parameters tested for both locations follow the historical results closely.

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 K.) The program was initiated in March 1988 and will continue through 1989; 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 1988 and 1984-1987 can be found in Appendix C. The peak flow occurred during the month of May at a rate of 1,213 GPM. A base flow of 0.0 GPM existed during December.

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; results of the 1988 operational analysis are listed in Table 15. The minimum, maximum, and mean values for 1988 are listed in Table 15. Complete raw data can be found in Appendix C.

TABLE 13 [illegible]ER CREEK SURFACE WATER QUALITY
ABOVE THE MINE

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
1988																				
1-21	51.0	397	107.2	<1.0	138.0	1300	5.80	599	<0.05	0.05	80.5	<1.0	<1.0	8.2	3.30	59.0	185.0	663	19.0	<0.1
March	Frozen, no flow																			
6-07	13.0	285	77.3	<1.0	6.0	442	7.20	295	0.09	0.13	24.8	<0.01	2.6	8.3	0.68	13.40	22.0	362	16.0	<0.05
9-14	4.0	325	56.8	8.0	10.0	700	7.80	283	<0.02	<0.02	34.2	<0.01	<1.0	8.4	1.00	28.70	90.0	596	<1.0	<0.1
10-17	<1.0	328	65.6	7.0	10.0	580	8.10	313	0.03	0.03	36.2	0.01	1.0	8.5	1.20	36.60	100.0	376	<1.0	<0.05
December:	Frozen, no flow																			
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	7.53	1.37	34.35	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	7.63	1.48	36.24	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	0.8	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	9.46	263.9	<0.05	0.08	33.4	0.01	0.5	7.66	1.0	20.0	52.9	317.9	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				317.9	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				319.5	11.5	
HISTORICAL 1978-1987																				
MIN	<1.0	262	2.2	<1.0	3.5	360	5.3	225	<0.02	0.03	26.3	<0.01	<0.5	7.0	0.5	13.9	10.0	231	<0.5	<0.1
MAX	137.0	337	82.0	<1.0	176.0	1580	10.2	550	0.05	40.10	183.9	0.24	1.0	8.5	4.33	111.6	255.0	897	3592.0	<0.5
MEAN	12.3	299	49.5	<1.0	19.2	581	8.4	286	0.05	0.90	37.5	0.04	0.7	7.86	1.22	27.5	63.8	335.0	124.9	0.21

TABLE 14: DEER CREEK SURFACE WATER QUALITY
BELOW THE MINE

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
1988																				
March		No flow																		
6-07	27.0	244	88.4	<1.0	82.0	800	7.20	382	0.05	0.12	39.2	<0.01	3.6	8.30	1.70	49.2	130.0	472	6.0	<0.05
9-14	6.0	306	129.1	<1.0	75.0	1215	7.50	559	0.64	0.78	57.4	0.06	9.0	8.15	7.60	77.6	310.0	862	372.0	1.5
10-17	<1.0	442	123.6	11.0	195.0	1450	7.90	700	0.03	0.04	95.1	<0.01	4.2	8.40	5.60	145.8	350.0	1164	<1.0	<0.05
December		No flow																		
MIN	<1.0	244	88.4	<1.0	75.0	800	7.20	382	0.03	0.04	39.2	<0.01	3.6	8.10	1.70	49.2	130.0	472	<1.0	<0.05
MAX	27.0	442	129.1	11.0	195.0	1450	7.90	700	0.64	0.78	95.1	0.06	9.0	8.40	7.60	145.8	350.0	1164	372.0	1.5
MEAN	15.2	309	113.7	3.5	117.3	1155	7.40	547	0.19	0.27	63.9	0.02	5.6	8.27	5.00	90.9	263.3	832.7	136.3	0.53
1987																				
MIN	<1.0	255	2.4	<1.0	34.6	620	5.40	285	<0.05	<0.05	40.1	<0.01	<1.0	7.35	1.00	39.0	90.0	429	<4.0	<0.1
MAX	90.0	371	124.0	8.0	420.0	2650	8.20	815	0.07	0.29	122.8	0.02	1.2	8.50	7.31	233.8	500.0	1544	410	<1.0
MEAN	15.2	302.3	71.4	2.2	118.9	1303.3	6.78	540.3	0.53	0.10	78.2	0.01	0.8	7.82	4.05	127.3	234.5	806.3	11.2	0.40
1986																				
MIN	<1.0	260	46.0	<1.0	30.3	698	9.35	284	<0.05	<0.05	34.5	<0.01	<0.5	7.35	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	7.90	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	0.017	0.5	7.71	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				690.6	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				465.5	29.8	
HISTORICAL 1978-1987																				
MIN	<1.0	255	2.4	<1.0	22.0	420	5.4	284	<0.05	<0.05	34.5	<0.01	<0.5	6.9	1.0	32.6	65.0	273	<0.5	<0.1
MAX	90.0	371	112	8.0	420.0	2300	11.0	815	0.07	170.00	122.8	0.27	1.2	8.6	7.31	233.8	500.0	1544	20,540.0	<1.0
MEAN	8.8	305	73	1.5	120.4	1153	8.5	492	0.05	3.68	67.0	0.05	0.7	7.96	3.84	114.9	215.8	684	490.9	0.3

TABLE 15: MEETINGHOUSE CANYON WATER QUALITY
LEFT FORK

1988 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
March		No flow																		
6-07	15.0	243	71.1	<1.0	5.0	380	7.1	270	0.19	0.27	22.5	<0.01	<1.0	8.1	0.96	6.9	22.0	298	26.0	<0.05
9-21	13.0	215	43.2	<1.0	15.0	460	7.4	222	0.04	0.11	27.7	<0.01	1.4	7.8	1.50	9.9	85.0	268	18.0	<0.05
10-24	<1.0	267	57.6	7.0	5.0	480	7.9	288	0.06	0.08	35.0	<0.01	<1.0	8.5	1.50	12.5	100.0	304	<1.0	<0.05
December		No flow																		
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	5.40	195	0.04	<0.05	24.3	<0.01	<1.0	7.25	0.60	3.80	20.0	190	<1.0	0.1
MAX	49.0	307	55.6	8.0	47.5	420	7.35	267	0.08	0.90	33.0	0.04	10.9	8.55	1.29	10.74	45.0	259	42.0	<1.0
MEAN	10.4	250.2	33.8	3.2	14.1	366.4	6.39	226	0.10	0.28	29.4	0.02	2.9	7.92	1.02	8.23	30.8	229.6	15.8	0.48
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	7.35	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	7.66	1.23	9.5	43.2	252.7	24.0	0.2
HISTORICAL		1986-87																		
MIN	<1.0	222	2.2	<1.0	3.0	300	5.4	195	<0.05	<0.05	22.6	<0.01	<0.5	7.25	0.60	3.8	20.0	190	<0.5	<0.1
MAX	49	307	55.6	8.0	47.5	500	8.1	350	0.30	0.90	36.5	0.04	10.9	8.55	1.62	13.1	85.0	292	74.0	<1.0
MEAN	6.3	249	39.6	2.0	9.2	412	10.3	241	0.10	0.18	29.5	0.02	1.6	7.78	1.16	8.9	37.5	242	22.2	0.2

B. Cottonwood Creek Drainage System

Utah Power & Light monitors two of the tributaries of the Cottonwood Creek Drainage system: 1) Cottonwood Canyon Creek and 2) Grimes Wash (see Map No. 1 in pocket).

1. Cottonwood Canyon Creek

An extensive baseline study conducted on Cottonwood Canyon Creek to determine water characteristics prior to mining at the proposed Cottonwood Mine began in 1979. A property acquisition in 1981 resulted in mine plan changes; therefore, the baseline study was terminated as of January 1, 1984. As agreed upon 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 D illustrates the flow information collected during 1988 and compares it to the data collected from 1984 through 1987. It shows a peak flow of 1,213 GPM in May and a baseline flow of approximately 552 GPM in December.

2. Grimes Wash

a. Flow and Sampling Schedule

(1) Locations: 1) Right Fork
2) Left Fork
3) 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 will be those stated in the DOGM Guidelines for Surface Water Operational Quality. (See Addendum in Appendix K.) The program was initiated in March 1988 and will continue through 1989; 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

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 1988, 1987, 1986, 1985, and 1984 has been generated for each flume location (See Appendix D). The hydrographs show that during 1988 the Right Fork and Below the Mine locations reached a peak flow of 108.2 and 150 GPM, respectively, during the month of March, whereas the Left Fork peaked during the month of May at 84.5 GPM. Base flow for the Right Fork was 0.0 GPM during January through February and May through December, and the Left Fork base flow was 0.0 GPM during January through March and September through December. 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. Baseline flow averaged approximately 12-35 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 1988 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 D.

Grimes Wash drainage quality is greatly affected by the influx of the Right Fork. The Right Fork originates in the North Horn Formation (interbedded shales, siltstones, and sandstones), which is abundant with calcareous material. As a result, the Right Fork contributes a relatively high amount of suspended solids to the Grimes

Wash drainage. The greatest factor influencing the suspended solids level in the Right Fork drainage during 1988 was the sudden increase in temperature resulting in a rapid increase in flow which occurred in March.

As reported in 1985, the TDS level increased slightly at the Below the Mine location. Two possible factors stated for the rise were Wilberg Mine Discharge and Mancos Shale seeps. Due to the fact that no water was discharged from the mine during 1985 through 1988 (one exception in August 1986), the second factor, seeps emanating from the Mancos Shale, is thought to have the greatest influence upon the level. Periodic sampling during 1986 and early 1987 confirmed the seeps' contribution to the TDS level. The average for the four samples collected was 1,188 mg/l, representing a nearly 3.3 fold increase over the historical averages for the Right and Left Forks.

TABLE 16: GRIMES WASH SURFACE QUALITY
RIGHT FORK

1988 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
3-23	39.0	112	43.8	<1.0	26.4	225	9.7	154	0.61	0.78	10.9	0.04	9.0	8.22	5.2	1.9	27.0	196	8.0	<1.0
April - December			Dry -																	
MIN	39.0	112	43.8	<1.0	26.4	225	9.7	154	0.61	0.78	10.90	0.04	9.0	8.22	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	10.90	0.04	9.0	8.22	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	10.90	0.04	9.0	8.22	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	20.6	6.3	0.05	---	7.2	7.64	2.0	20.0	115	2000	3.3
MAX	<1.0	104	34.4	<1.0	3.0	190	6.8	112	3.31	20.6	6.3	0.05	---	7.2	7.64	2.0	20.0	115	2000	3.3
MEAN	<1.0	104	34.4	<1.0	3.0	190	6.8	112	3.31	20.6	6.3	0.05	---	7.2	7.64	2.0	20.0	115	2000	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	7.45	1.60	3.40	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	8.10	3.30	20.44	120.0	389	257.0	<0.5
MEAN	<1.0	274.9	41.6	<1.0	10.2	547.6	8.76	268.1	<0.05	0.24	39.9	0.02	0.74	7.77	2.47	15.72	61.3	315.6	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				304.3	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				332.6	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				328.2	183.3	
HISTORICAL 1979-1987																				
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	1.60	2.0	20.0	125	0.5	<0.1
MAX	14.0	320	52.0	<1.0	16.0	750	9.8	320	3.31	20.60	46.2	0.30	5.2	8.7	7.64	20.44	161.7	700	7116.0	3.3
MEAN	2.2	254.0	40.7	<1.0	9.8	569	8.5	249.0	0.87	1.37	35.71	0.06	1.2	8.1	3.12	15.63	67.5	342	384.5	0.55

TABLE 17: GRIMES WASH SURFACE QUALITY
LEFT FORK

1988 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
March	Dry - - - - -																			
6-07	34.0	312	71.5	<1.0	10.0	600	7.00	337	<0.02	<0.02	38.5	<0.01	2.0	8.40	1.13	24.2	105.0	428	4.0	<0.05
September - December		Damp - No flow - - - - -																		
MIN	34.0	312	71.5	<1.0	10.0	600	7.00	337	<0.02	<0.02	38.5	<0.01	2.0	8.40	1.13	24.2	105.0	428	4.0	<0.05
MAX	34.0	312	71.5	<1.0	10.0	600	7.00	337	<0.02	<0.02	38.5	<0.01	2.0	8.40	1.13	24.2	105.0	428	4.0	<0.05
MEAN	34.0	312	71.5	<1.0	10.0	600	7.00	337	<0.02	<0.02	38.5	<0.01	2.0	8.40	1.13	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	7.60	1.00	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	8.60	2.48	34.0	90.0	382	48.0	0.2
MEAN	<1.0	317.2	38.1	3.8	56.6	526.4	7.0	296.2	0.07	0.17	43.4	0.02	1.7	7.83	1.37	28.5	73.6	306.8	14.6	0.1
1986																				
MIN	<1.0	281	36	<1.0	7.7	410	7.40	252	<0.05	<0.05	37.7	<0.01	<0.5	7.40	1.30	25.2	67.0	293	3	<0.1
MAX	<1.0	331	58	<1.0	10.9	690	9.60	310	<0.05	0.22	43.8	0.07	0.6	8.00	3.00	34.0	115.0	427	253	<0.5
MEAN	<1.0	304.3	45.5	<1.0	8.8	590.7	8.56	278	<0.05	0.12	39.9	0.02	0.5	7.65	1.90	29.2	77.9	345.6	54.1	0.2
1985																				
MIN						473				<0.05		<0.01		7.5				283	<0.5	
MAX						750				0.22		0.08		8.3				438	141.0	
MEAN						628.2				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						639.3				0.06		<0.01		8.1				343.9	17.0	
HISTORICAL 1979-1987																				
MIN	<1.0	188	2.3	<1.0	6.0	410	5.0	196	<0.05	0.04	23.8	<0.01	0.1	7.3	1.0	11.1	30.4	212	<0.5	<0.1
MAX	<1.0	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	253.0	<0.5
MEAN	<1.0	309	42.5	2.1	20.4	628	7.8	286	0.07	0.16	41.48	0.03	1.0	8.0	1.63	28.9	71.5	362	27.2	0.14

TABLE 18: GRIMES WASH SURFACE QUALITY BELOW THE MINE

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
1988																				
1-21	114.0	398	274.0	<1.0	4531.0	12,000	7.15	146	2.25	22.60	10.7	0.04	---	7.20	7.31	9.0	46.0	155	3295.0	4.0
3-23	53.0	205	91.5	<1.0	281.5	1,470	7.75	625	0.06	0.64	89.9	0.09	0.6	7.70	6.00	104.0	350.00	1033	4.0	<0.1
6-07	34.0	307	115.6	<1.0	142.0	1,440	7.10	585	0.05	0.12	85.1	0.09	<0.5	7.10	5.00	88.0	315.00	943	<4.0	<0.1
9-13	7.0	379	138.8	<1.0	205.0	1,700	6.70	705	0.10	0.23	102.0	0.17	2.5	7.35	6.70	121.0	340.0	1201	5.0	<0.1
10-12	2.0	359	177.7	<1.0	155.0	1,200	4.50	672	0.05	0.26	72.9	0.10	5.2	8.15	6.80	93.6	400.0	885	<1.0	<1.0
12-15	5.0	329	144.9	3.0	1010.0	1,420	5.90	855	<0.05	0.05	91.6	0.11	2.4	7.94	7.81	82.9	593.0	1078	4.0	<1.0
MIN	2.0	205	91.5	<1.0	142.5	1.200	5.10	356	0.04	0.06	30.9	<0.01	0.67	7.73	0.48	85.1	462.0	673	<1.0	<0.05
MAX	114.0	398	274.0	3.0	4531.0	12,000	8.90	1,165	0.48	0.76	116.8	0.13	27.00	8.25	12.50	3181.0	135.0	7160	36.0	<1.0
MEAN	35.8	329.5	157.1	1.3	1054.1	3,783.3	7.53	702.0	0.25	0.38	75.3	0.05	8.5	8.03	6.74	717.82	356.5	2375.	13.2	0.37
1987																				
MIN	<1.0	117	5.1	<1.0	9.0	295	4.50	146	<0.05	<0.05	10.7	0.04	<0.5	7.10	5.00	9.0	46.0	155	<1.0	<0.1
MAX	127.0	400	191.5	<1.0	154.0	1.700	7.75	855	2.25	22.60	102.0	0.17	5.2	8.15	7.81	121.0	593.0	1201	3295.0	4.0
MEAN	22.0	330.5	99.1	<1.0	67.5	1,254.2	6.52	598.0	0.43	3.98	75.4	0.10	2.2	7.57	6.60	83.1	340.7	882.5	552.2	1.05
1986																				
MIN	<1.0	284	72.4	<1.0	36.3	890	7.85	405	<0.05	<0.05	51.1	<0.01	<0.5	7.15	2.60	47.0	150.0	523	<0.5	<0.1
MAX	<1.0	381	150	<1.0	141.2	1,800	11.45	760	0.13	0.40	87.6	0.08	1.0	7.95	5.80	119.8	320.0	1224	248.0	<0.5
MEAN	<1.0	342.8	99	<1.0	71.4	1,238.9	9.38	544.6	0.06	0.13	72.2	0.03	0.17	7.56	4.10	68.9	243.3	760.4	37.1	0.2
1985																				
MIN						220				0.05		0.01		7.4				152	2.0	
MAX						1,810				2.70		0.13		8.1				1129	9702.0	
MEAN						1,182.6				0.37		0.04		7.8				732.9	994.8	
1984																				
MIN						800				0.05		0.01		7.7				457	1.0	
MAX						1,700				0.45		0.07		8.3				923	107.0	
MEAN						1,101.3				0.15		0.02		8.1				649.3	24.5	
HISTORICAL 1979-1987																				
MIN	<0.1	117	5.1	<1.0	12.0	220	4.5	146	<0.05	0.01	10.7	<0.01	<0.5	7.10	2.60	9.0	46.0	152	<0.5	<0.1
MAX	127.0	400	191.5	<1.0	154.0	1,810	11.45	855	2.25	22.60	102.0	0.30	5.2	8.50	7.81	121.0	593.0	1224	9702.0	4.0
MEAN	9.8	338	99.1	<1.0	69.2	1,072	8.1	568	0.43	1.11	73.6	0.05	1.3	7.88	5.17	74.99	279.1	650	300.9	0.54

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 50 to nearly 70. It was felt that more benefit could be realized by concentrating our 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.

* Burnt Tree Springs	79-34
* Elk Spring	* 79-35
* Sheba Springs	79-38
Ted's Tub	79-40
79-2	80-41
* 79-10	80-43
79-12	* 80-44
79-15	* 80-46
* 79-23	80-47
79-24	82-51
* 79-26	* 82-52
* 79-29	* 84-56
79-32	

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 listed above 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 K.) In addition, the twelve discharge recession springs denoted by asterisks in the above 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 increased slightly from 1987 to 1988, whereas temperature, a critical factor on spring discharge rates, was 0.9 degrees higher in 1988 than the historical average. Table 19, A and B, is a tabulation of the flow data collected during the 1988 monitoring season. To record the season variation, all

TABLE 19A: EAST MOUNTAIN SPRINGS DISCHARGE

Spring	Date Sampled	Flow (GPM)	Temp. °F	Date Sampled	Flow (GPM)	Temp. °F	Seasonal Net Change %
Sheba	07-06-88	10.4	41	10-20-88	1.1	44	-89
Elk Spring	07-06-88	217.4	41	10-20-88	72.7	40	-67
Burnt Tree	07-06-88	12.0	43	10-20-88	10.6	44	-12
Jerk Water							
Pine Springs							
Pine Sp. Trough							
Ted's Tub	07-07-88	60.0	48	10-20-88	2.3	49	-96
79-1							
79-2	07-07-88	2.1	43	10-20-88	3.0	42	43
79-3							
79-4							
79-5							
79-6							
79-7							
79-8							
79-9							
79-10	07-06-88	25.0	41	10-20-88	3.2	46	-87
79-11							
79-12	07-07-88	Damp		10-20-88	Damp		
79-13							
79-14							
79-15	07-06-88	12.7	40	10-20-88	4.7	44	-63
79-16							
79-17							
79-18							
79-19							
79-20							
79-21							
79-22							
79-23	07-06-88	Damp		10-20-88	Dry		
79-24	07-06-88	0.8	66	10-20-88	Dry		
79-25							
79-26	07-06-88	3.3	60	10-12-88	2.4	42	-27
79-27							
79-28							
79-29	07-06-88	2.6	42	10-12-88	1.6	40	-38
79-30							
79-31							
79-32	07-06-88	0.6	56	10-12-88	Inaccessible		
79-33							
79-34	07-06-88	13.3	42	10-20-88	Dry		
79-35	07-06-88	2.7	40	10-20-88	0.5	42	-81
79-36							
79-37							
79-38	07-07-88	10.0	46	10-20-88	2.1	42	-79
79-39							
79-40	07-07-88	5.4	43	10-20-88	Dry		
80-41	07-07-88	3.9	42	10-20-88	Dry		

TABLE 19B: EAST MOUNTAIN SPRINGS DISCHARGE

Spring	Date Sampled	Flow (GPM)	Temp. °F	Date Sampled	Flow (GPM)	Temp. °F	Seasonal Net Change %
80-42							
80-43	07-07-88	1.8	49	10-20-88	Dry		
80-44	07-07-88	0.5	49	10-20-88	Dry		
80-45							
80-46	07-06-88	6.7	41	10-20-88	2.5	42	-63
80-47	07-06-88	9.9	41	10-20-88	10.0	42	1
80-48							
80-49							
80-50							
82-51	07-06-88	Damp		10-20-88	Dry		
82-52	07-06-88	21.5	46	10-20-88	7.3	41	-66
84-53							
84-54							
84-55							
84-56	07-07-88	2.9	46	10-20-88	2.4	43	-17
85-57							
86-58							
86-59							

Average Net Change -49.49

springs measured in July are measured again in October. The seasonal variation is represented in Table 19, A and B, under the column heading "Seasonal Net Change." The percentage figures represent the amount of change, either positive or negative. The average change reveals a forty-nine percent (49%) decrease from the July to the October measurements.

A six-year comparison of spring discharge is shown in Table 20. The table includes a year by year comparison of springs identified from each mode of occurrence (Table 21). The springs utilized in the comparison are underlined in Table 21. 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 20 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 22 is a comparison of January through June temperature data from surrounding weather stations for the period 1982-88 versus departure from normal. The comparison is vital in determining mining effects on spring discharge versus general changes in annual precipitation.

TABLE 20: YEARLY SPRING DISCHARGE VARIATIONS (GPM)

JULY FLOW DATA

Spring	1982	1983	1984	1985	1986	1987	1988
Burnt Tree	12.0	30.5	26.6	26.1	17.5	10.2	12.0
Elk Spring	546.0	642.3	427.9	390.5	309.7	217.0	217.4
Sheba	15.0	22.9	19.7	14.4	8.6	11.4	10.4
Ted's Tub	60.0	89.0	48.0	39.1	31.6	69.0	60.0
79-2	12.0	9.1	9.7	5.5	2.9	4.0	2.1
79-10	32.0	57.1	20.0	33.3	26.1	26.1	25.0
79-12	1.0	1.0	5.5	3.4	2.0	Damp	Damp
79-15	27.5	42.9	26.1	18.2	18.2	14.6	12.7
79-23	3.0	20.0	3.6	6.8	0.6	Damp	Damp
79-24	6.1*	9.3*	6.1*	5.0	4.3	Damp	0.8
79-26	7.5	20.7	20.0	10.9	8.7	1.5	3.3
79-29	4.0	10.0	6.2	6.0	4.7	2.5	2.6
79-32	2.1	3.3	3.1	2.7	1.3*	1.0	0.6
79-34	30.0	56.7	42.9	18.5	16.7	10.5	13.3
79-35	7.6	15.0	10.5	10.5	7.8	6.3	2.7
79-38	10.0	10.9	9.2	4.7	3.6	8.3	10.0
79-40	3.2	15.0	8.3	5.6	4.7	2.0	5.4
80-41	1.0	10.9	15.0	5.8	4.1	2.5	3.9
80-43	10.0	24.0	20.0	6.6	3.1	0.4	1.8
80-44	12.0	24.0	13.1	5.5	2.2	Dry	0.5
80-46	12.0	60.0	28.3	18.2	12.0	4.0	6.7
80-47	12.0	20.0	15.0	12.5	12.2	7.4	9.9
80-51	3.0	10.0	5.9	3.8	2.6	Damp	Damp
82-52	16.0	80.0	48.0	32.1	23.3	20.1	21.5
84-56	6.3*	9.6*	6.3	4.7	3.7	2.5	2.9
TOTALS	845.0	1,294.2	845.0	690.4	532.2	421.3	425.5

* No measurement - utilized yearly comparison.

TABLE 21: 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		Elk Springs, 79-10, 79-18, 79-19, 79-20, 84-54	
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 Horizons	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 Trou Price River Formation 79-24, 79-33, 79-40, 80-41, 80-44, 80-45, 82-52, Jerk Water

Table 22 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 replaced 79-32 during 1986, (8) 79-35, (9) 80-44, (10) 80-46, (11) 82-52, (12) 84-56. The flow information collected during 1988 is shown in Table 23; corresponding spring recession curves comparing 1988, 1987, 1986, 1985, and 1984 are located in Appendix E.

FIGURE 3

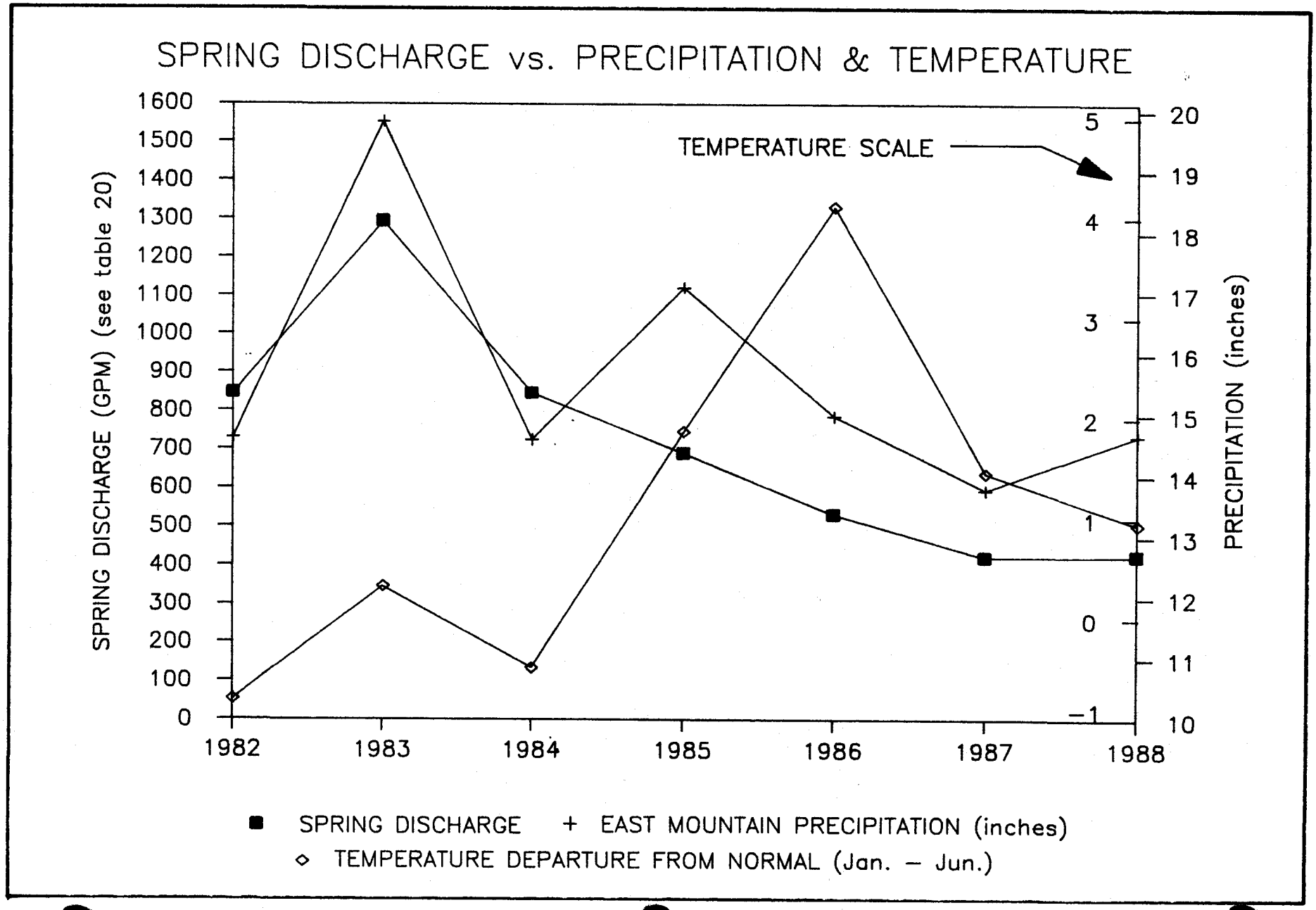

SPRING DISCHARGE vs. PRECIPITATION & TEMPERATURE
SPRING DISCHARGE (GPM) (see table 20)
PRECIPITATION (inches)
TEMPERATURE SCALE
1600
1500
1400
1300
1200
1100
1000
900
800
700
600
500
400
300
200
100
0
20
19
18
17
16
15
14
13
12
11
10
5
4
3
2
1
0
−1
1982
1983
1984
1985
1986
1987
1988
SPRING DISCHARGE
EAST MOUNTAIN PRECIPITATION (inches)
TEMPERATURE DEPARTURE FROM NORMAL (Jan. – Jun.)

TABLE 22: TEMPERATURE COMPARISON

MONTH	AS NO DEPARTURE FROM NORMAL	DEPARTURE FROM NORMAL	DEPARTURE FROM NORMAL	DEPARTURE FROM NO
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

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	0.90	+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

TABLE 23: EAST MOUNTAIN REGRESSION STUDY (FLOW*/TEMP.**)

1988

Spring	July	August	September	October
Burnt Tree	12.0/43	10.5/43	12.0/44	10.6/44
Elk Springs	217.4/41	123.7/41	103.4/40	72.7/40
Sheba	10.4/41	6.0/41	1.4/48	1.1/44
79-10	25.0/41	8.5/41	4.3/43	3.2/46
79-23	Damp	Damp	Dry	Dry
79-26	3.3/60	4.5/52	2.4/59	2.4/42
79-29	2.6/42	3.6/42	1.4/41	1.6/40
79-35	2.7/40	2.0/40	1.7/40	0.5/42
80-44	0.5/49	Damp	Dry	Dry
80-46	6.7/41	6.0/41	3.8/43	2.5/42
82-52	21.5/46	13.9/46	13.0/42	7.3/41
84-56	2.9/46	2.0/46	2.0/41	2.4/43

* 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 E). 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 it originates.

The quality of the springs sampled in 1988 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 24. In the table the mean values for 1988 are compared

Table 24: East Mountain Springs Water Quality (Historical vs. 1988)

Parameter	Burnt Tree Historical	Burnt Tree 1988	Elk Spring Historical	Elk Spring 1988	Sheba Spring Historical	Sheba Spring 1988	79-10 Historical	79-10 1988	79-23 Historical	79-23 1988	79-26 Historical	79-26 1988
Elevation	9260		9350		9740		9350		9035		9310	
Geologic Formation	TKn		TKn		Tf		Kpr		TKn		TKn	
Bicarbonate	334.00	334.00	296.00	278.00	290.00	274.00	314.00	300.00	413.00	no	336.00	330.00
Calcium	68.40	52.30	74.20	58.30	94.50	88.00	79.90	77.40	79.60	flow	74.70	60.90
Carbonate	<1	<1	<1	<1	<1	<1	<1	<1	<1	during	<1	<1
Chloride	4.80	5.30	3.70	3.50	3.20	2.50	5.00	7.00	11.30	July	7.80	7.10
Conductivity	504.00	566.00	443.00	485.00	447.00	472.00	481.00	552.00	691.00		485.00	582.00
Hardness	268.00	263.00	254.00	243.00	252.00	254.00	296.00	284.00			282.00	287.00
Iron	0.25	0.04	0.14	0.02	0.15	0.11	0.15	0.12	0.09		0.17	0.18
Magnesium	24.84	27.82	21.36	22.90	9.81	9.00	22.38	20.93	38.30		25.73	26.97
Mangenese	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01		0.01	0.02
pH	7.46	7.52	7.65	7.78	7.53	7.53	7.55	7.61	7.72		7.84	8.02
Potassium	1.31	0.60	2.97	0.87	1.93	0.11	2.08	0.47	1.54		2.36	0.81
Sodium	14.11	12.87	11.16	6.47	6.49	2.62	6.66	4.16	14.90		17.12	13.95
Sulfate	32.00	5.50	42.70	13.30	40.90	4.00	31.70	11.00	27.20		47.60	13.50
TDS	290.00	346.00	254.00	294.00	269.00	280.00	270.00	312.00	364.00		280.00	413.00

Parameter	79-29 Historical	79-29 1988	79-35 Historical	79-35 1988	80-44 Historical	80-44 1988	80-46 Historical	80-46 1988	82-52 Historical	82-52 1988	84-56 Historical	84-56 1988
Elevation	9410		9585		8980		9350		8995		9335	
Geologic Formation	TKn		Tf		Kpr		TKn		Kpr		TKn	
Bicarbonate	327.00	302.00	306.00	286.00	455.00	426.00	344.00	496.00	411.00	428.00	344.00	366.00
Calcium	64.50	46.60	95.90	82.00	104.90	78.60	61.10	75.80	83.50	86.20	64.00	73.60
Carbonate	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1
Chloride	18.70	15.50	3.50	4.00	11.30	10.00	4.80	5.20	9.50	8.00	9.00	7.50
Conductivity	552.00	618.00	453.00	499.00	904.00	680.00	556.00	578.00	672.00	738.00	563.00	599.00
Hardness	265.00	237.00	282.00	258.00		377.00	308.00	302.00	294.00	362.00	302.00	310.00
Iron	0.14	0.02	0.15	0.02	0.13	0.06	0.32	0.03	0.08	0.02	0.05	0.04
Magnesium	34.69	26.77	14.20	13.10	41.10	44.00	28.77	27.77	33.60	35.50	31.92	28.70
Mangenese	0.03	0.01	0.01	0.01	<.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01
pH	7.69	7.66	7.55	7.76	7.75	8.10	7.38	7.61	7.38	7.68	7.45	7.57
Potassium	4.15	1.55	0.98	0.11	3.05	0.78	0.87	0.55	1.74	0.90	0.89	1.10
Sodium	29.83	33.35	9.73	2.96	34.30	41.30	10.07	8.86	23.22	25.35	17.60	17.75
Sulfate	75.80	24.50	51.70	3.00	145.70	90.00	19.40	16.50	52.10	26.50	28.00	22.50
TDS	339.00	358.00	275.00	268.00	523.00	530.00	309.00	322.00	381.00	350.00	318.00	416.00

to the historical results for each respective spring. The raw data regarding all springs sampled is contained in Appendix E.

V. MINE HYDROLOGY

A. Surface Water Sources in Relation to Mine Workings

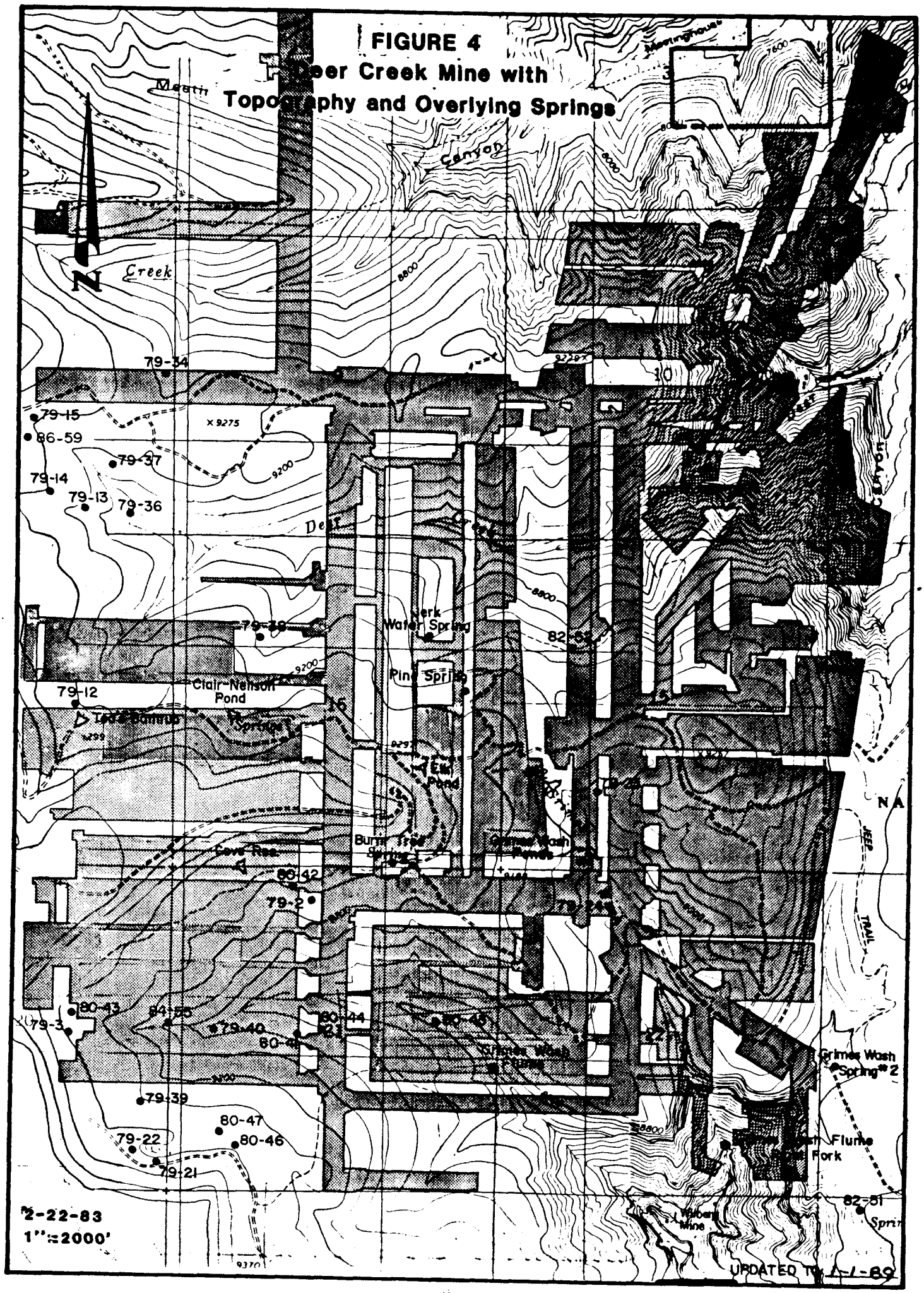
The relationship of the Deer Creek and Wilberg mine workings with the overlying springs is shown in Figures 4 and 5. Beginning in 1979, UP&L has developed an ambitious spring monitoring program with emphasis to detect changes in the East Mountain hydrologic regime as a result of mining. The data collected to date reveal no indication of any mine-related effects on spring discharge rates. As expected, there is a direct relationship between annual precipitation, temperature, and spring discharge rates as previously discussed on pages 30 and 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 1988. 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 1988 groundwater quality for individual locations by the use of cation and anion diagrams.

Collection procedures for groundwater quality consist of two grab samples collected and analyzed per quarter at each of the mines which produce 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

FIGURE 4
Deer Creek Mine with Topography and Overlying Springs



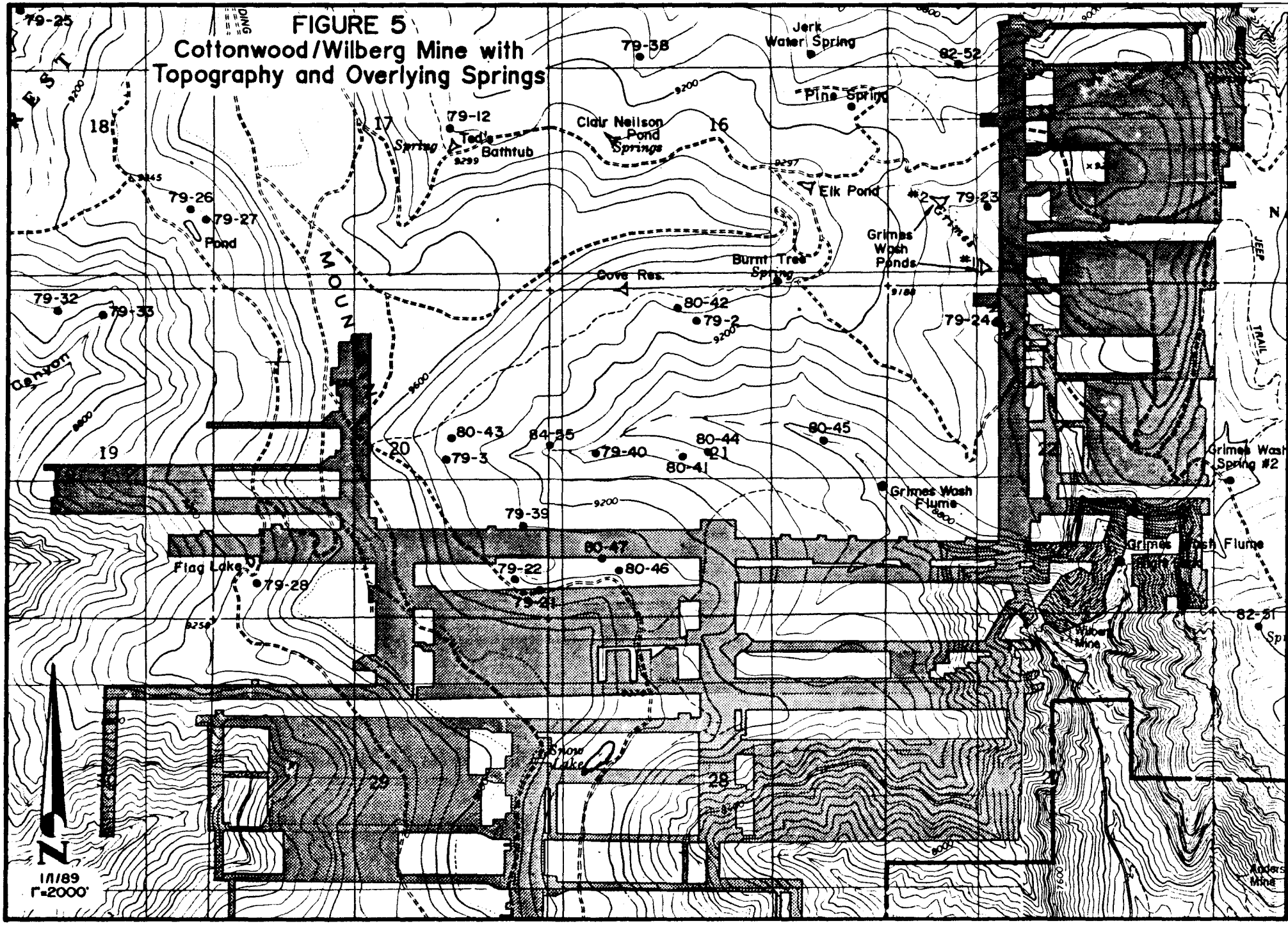
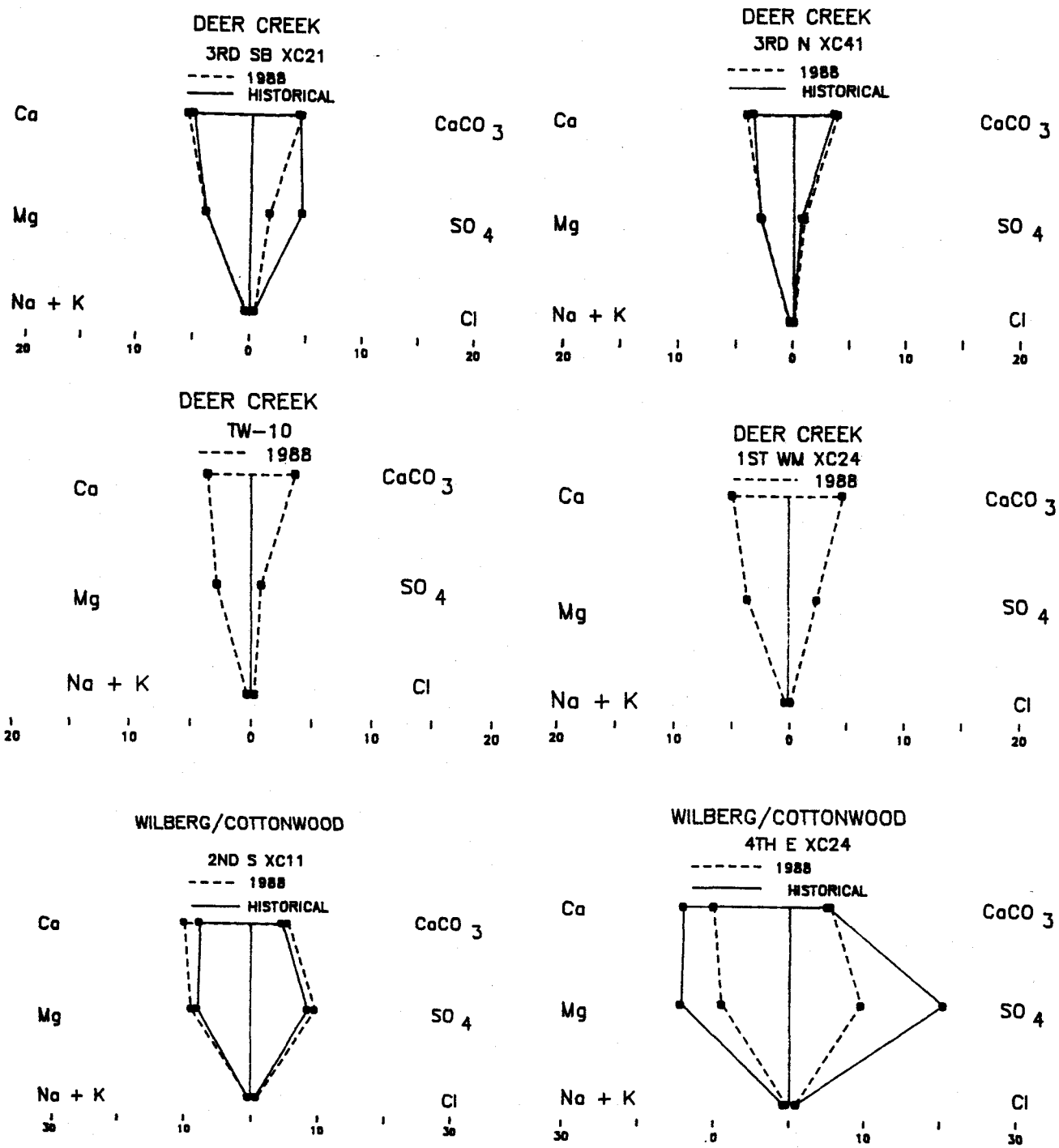


FIGURE 5
Cottonwood/Wilberg Mine with
Topography and Overlying Springs
79-25
79-38
Jerk
Water Spring
82-52
Pine Spring
79-12
Ted's
Bathtub
Clair Neilson
Pond
Springs
Spring
18
17
16
79-26
79-27
Pond
Elk Pond
#2
79-23
Grimes
Wash
Ponds
Burnt Tree
Spring
Cove Res.
80-42
79-2
79-24
79-32
79-33
Canyon
19
20
80-43
79-3
84-35
79-40
80-44
21
80-41
80-45
Grimes Wash
Flume
Grimes Wash
Spring #2
79-39
80-47
79-22
80-46
Flag Lake
79-28
79-41
Grimes Wash Flume
82-51
Wilberg
Mine
Snow
Lake
29
28
Kidders
Mine
N
1/1/89
1"=2000'

FIGURE 6
IN-MINE WATER QUALITY CATION-ANION DIAGRAMS



Operational Quality except when new sites are established. In that case baseline information will be collected for two (2) years. (See Appendix K.)

Long-term monitoring locations have been established at each of the mines which produce 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 mines were fairly consistent. (See Appendices F and H for the Deer Creek and Wilberg In-Mine hydrographs.)

Due to the ever-changing conditions experienced in underground mining one long-term monitoring site in the Deer Creek Mine was eliminated and two new sites were established during 1988. The description and reasoning for the site which was eliminated and a list of the new sites established follows.

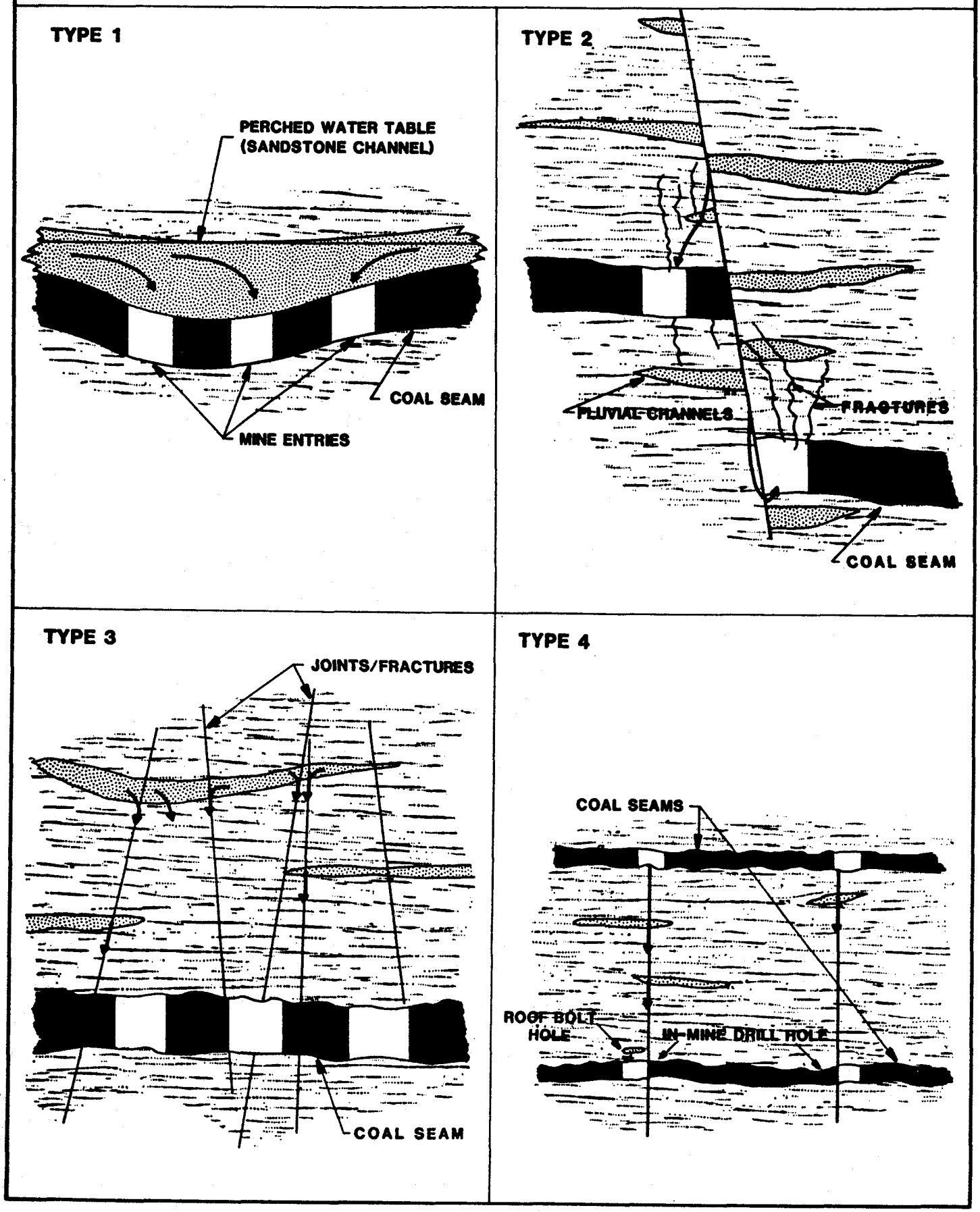
DEER CREEK MINE

1987 ID	Terminated Site Location Description	Reason for Termination
1	AB-50 3rd South "B" xc-21 B-1R	Poor access, deteriorating roof conditions

1988 ID	Additional Sites Location Description	Water Source Type
2	1st West Mains xc-24 3L	1-Sandstone Channel
3	3rd North xc-65 TW-10	4b,2 Horizontal exploration borehole intersecting the Roans Canyon Fault System.

FIGURE 7

LONG TERM WATER SOURCES



During development of 1st West Mains a fluvial sandstone channel was encountered trending almost due east-west. Normally when channels are intersected in the mine, moderate flows of water are produced for a short duration and then cease or become insignificant. In the case of 1st West Mains, where mining has approached within 1500 feet of the Roans Canyon Fault System, flow from the intersected channel was approximately 500 GPM of water from an area with horizontal cross-section of 100 square feet. This amount of water emanating from a sandstone channel is not typical, and it appears that there is migration of water from the fault system into the channel and fractures associated with the channel. Cement enclosers were installed to direct the flow through a Parshall flume. Flow from the area has reduced substantially from the time the channel was initially intersected and averages approximately 100-125 GPM.

Another site was established in 1988 as a result of the Roans Canyon Hydrologic Study. A geologic and hydrologic description is discussed below in Section V, C. (Also see accompanying Roans Canyon Investigation and Evaluation Report.)

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 1988

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 degrees 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 hydrologeologic 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 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, whereas 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.

From the data collected during the investigation and subsequent modeling the initial flow rates and total quantity produced from one of the water-producing zones in the first month are substantial. It was therefore recommended that a dewatering and grouting program be

instituted to reduce the amount of water encountered during slope development and the increase in effective stress in the rock mass related to a decrease in fluid pressure before the working face reaches the area dewatered. Without grouting and the dewatering employed, predicted tunnel inflow rates are given in Table 25.

TABLE 25: Predicted Tunnel Inflow Rates

Time (days)	With Dewatering (gpd)	(gpm)
0.01	342,000	238
0.05	286,660	199
0.10	272,540	189
0.37	267,160	186
0.50	267,140	179
0.75	250,610	174
1.00	247,940	172
5.00	240,560	167
10.00	239,880	167
16.00	239,880	167
23.00	238,810	166
31.00	239,800	167
100.00	239,800	167

It is UP&L's intent to utilize 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. Past experience with pressure grouting has indicated that as much as seventy-five to ninety-five percent (75-95%) of the groundwater inflow can be effectively stopped. Table 26 compares the predicted tunnel inflow rates with dewatering and pressure grouting.

TABLE 26: Predicted Tunnel Inflow Rates

Time	With Dewatering		Pressure Grout Effectiveness 50%		75%		95%	
Days	(gpd)	(gpm)	(gpd)	(gpm)	(gpd)	(gpm)	(gpd)	(gpm)
0.01	342,000	238	171,000	119	85,500	60	17,100	12
0.05	286,660	199	143,330	100	71,665	50	14,333	10
0.10	272,540	189	136,270	95	68,135	47	13,627	9
0.37	267,140	186	133,570	93	66,785	47	13,357	9
0.50	250,610	179	125,305	90	62,653	45	12,531	9
0.75	247,940	174	123,970	87	61,985	44	12,397	9
1.00	240,560	172	120,280	86	60,140	43	12,028	9
5.00	239,880	167	119,940	84	59,970	42	11,994	8
10.00	238,880	167	119,440	84	59,720	42	11,944	8
16.00	238,810	167	119,405	84	59,703	42	11,941	8
23.00	238,810	166	119,405	83	59,703	42	11,941	8
31.00	238,810	167	119,405	84	59,703	42	11,941	8
100.00	238,810	167	119,405	84	59,703	42	11,941	8

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	576.7 Million Gallons
Deer Creek to Wilberg Transfer*	10.5 Million Gallons
Estimated Evaporation**	19.5 Million Gallons
Domestic Usage	7.0 Million Gallons
Total Discharge	606.7 Million Gallons

* Utilized to prime Wilberg vertical turbine (20 GPM)
** See 1981 Hydrologic Monitoring Report

b. In-Mine Quality

Ten samples were collected in the Deer Creek Mine in 1988. (See Map No. 4 in pocket for locations.) Parameters analyzed in 1988 are those listed in the DOGM Guidelines for Groundwater Operational Quality. Table 27 lists the characteristics of the samples collected and compares the mean, minimum, and maximum results of 1988 to the historical values for each location. It is apparent from Table 27 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 1988 can be found in Appendix F.

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.

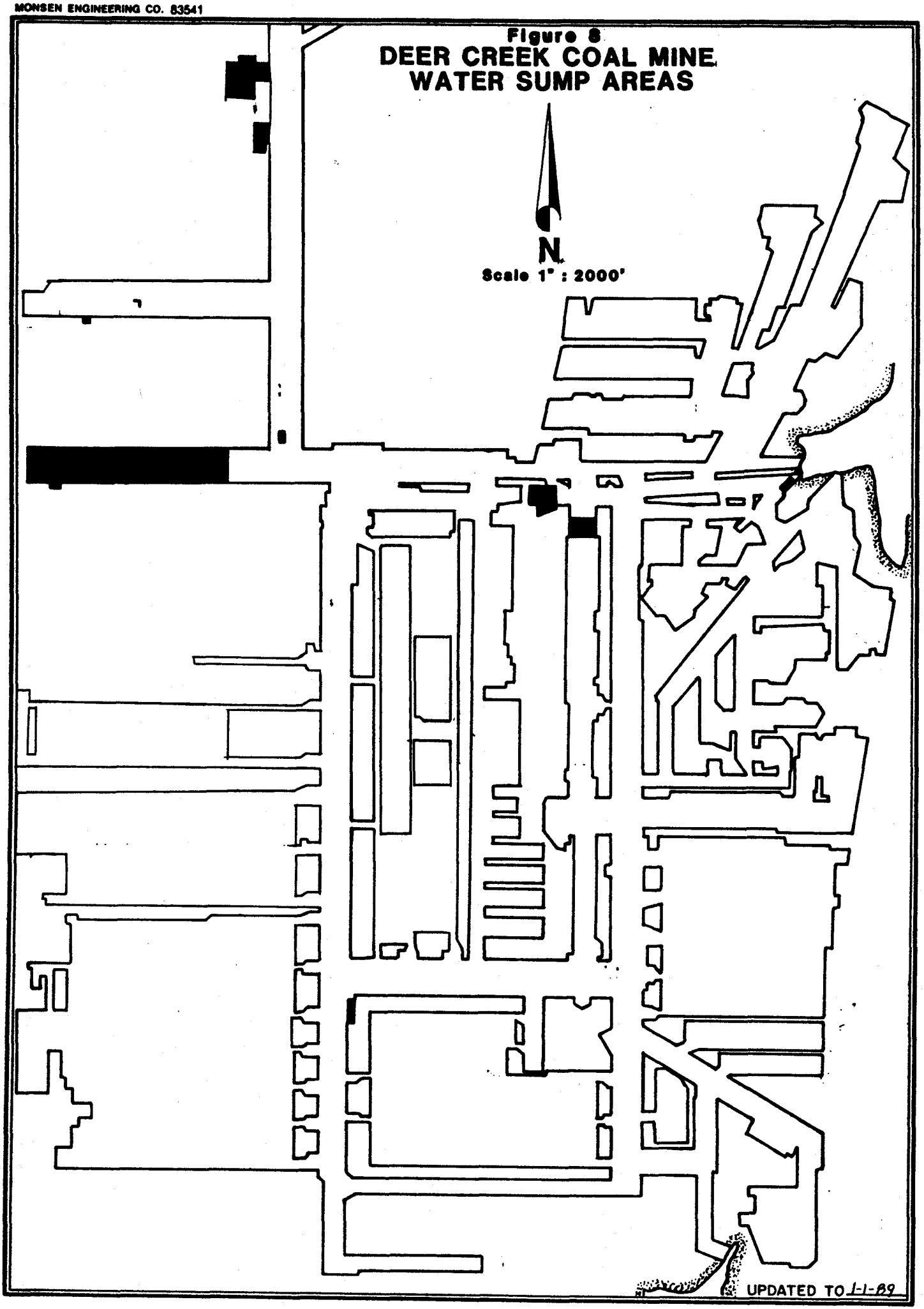
TABLE 27: DEER CREEK IN-MINE WATER QUALITY

LOCATION	1988 SAMPLE DATES	ALKALINITY BICARBONATE	CALCIUM	CARBONATE	CHLORIDE	CONDUCTIVITY	HARDNESS	IRON DISSOLVED	MAGNESIUM	MANGANESE	pH	POTASSIUM	SODIUM	SULFATE	TDS
3N XC-41	03-25	397	79.0	<1.0	6.5	820	317	0.10	29.10	0.02	7.44	1.90	15.30	16.0	302
	07-30	388	89.5	<1.0	7.0	682	371	0.18	35.90	<0.01	7.60	2.10	16.60	100.0	446
	10-26	447	88.2	<1.0	5.0	780	349	0.10	31.30	<0.01	7.25	2.20	16.40	32.0	324
	12-15	377	65.0	<1.0	5.0	700	307	<0.01	35.10	<0.01	7.30	1.40	14.20	60.0	410
	MIN	377	65.0	<1.0	5.0	682	307	<0.01	29.10	<0.01	7.25	1.40	14.20	16.0	302
	MAX	447	89.5	<1.0	7.0	820	371	0.18	35.90	0.02	7.60	2.20	16.60	100.0	446
	MEAN	402.2	80.4	<1.0	5.9	745.5	336	0.10	32.90	0.01	7.40	1.90	15.63	52.0	370.5
HISTORICAL (1984-87)	MIN	340	66.0	<1.0	3.9	500	299	0.05	30.44	<0.01	6.80	1.00	12.84	27.0	256
	MAX	383	72.0	<1.0	6.0	700	325	0.21	37.10	0.02	7.33	2.60	17.00	55.0	352
	MEAN	368	69.2	<1.0	4.4	634	312	0.14	34.57	0.01	7.13	2.14	14.97	39.4	320
1W Mains XC-25	07-30	459	112.8	<1.0	7.5	800	471	0.17	45.90	<0.01	7.60	3.40	19.40	130.0	642
	10-26	499	97.7	<1.0	5.0	1000	412	0.27	40.70	<0.01	7.25	3.20	18.50	75.0	470
	12-15	451	84.6	<1.0	5.0	860	395	0.19	44.70	<0.01	7.20	2.80	16.90	143.0	490
	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	143.0	642
	MEAN	470.0	98.4	<1.0	5.8	886.7	426.0	0.21	43.80	<0.01	7.35	3.10	18.27	117.7	534.0
HISTORICAL	Sample site initiated during 1988														
3SB XC-21	03-25	440	112.6	<1.0	16.0	640	480	0.17	48.30	0.03	7.37	1.90	18.70	81.0	418
	Site terminated as of 4/88														
	MIN	440	112.6	<1.0	16.0	640	480	0.17	48.30	0.03	7.37	1.90	18.70	81.0	418
	MAX	440	112.6	<1.0	16.0	640	480	0.17	48.30	0.03	7.37	1.90	18.70	81.0	418
	MEAN	440	112.6	<1.0	16.0	640	480	0.17	48.30	0.03	7.37	1.90	18.70	81.0	418
HISTORICAL (1980-88)	MIN	380	60.8	<1.0	8.0	800	425	0.05	4.42	0.01	6.85	1.90	10.22	102.0	265
	MAX	449	160.0	<1.0	85.0	1090	497	0.06	55.00	0.06	7.60	5.00	21.20	915.2	625
	MEAN	425	101.6	<1.0	18.0	913	466	0.05	47.00	0.02	7.26	3.52	18.89	222.5	499
3N XC-65 TW-10	09-15	364.8	77.8	<1.0	15.0	720	326	0.25	32.10	<0.01	7.20	1.40	15.90	40.0	398
	12-15	378.0	62.9	<1.0	10.0	660	300	<0.01	34.60	<0.01	7.30	1.20	13.90	48.0	396
	MIN	364.8	62.9	<1.0	10.0	660	300	<0.01	32.10	<0.01	7.20	1.20	13.90	40.0	396
	MAX	378.0	77.8	<1.0	15.0	720	326	0.25	34.60	<0.01	7.30	1.40	15.90	48.0	398
	MEAN	371.4	70.4	<1.0	12.5	690	313	0.13	33.35	<0.01	7.25	1.30	14.90	44.0	397
HISTORICAL	Sample site initiated during 1988														

MONSEN ENGINEERING CO. 83541

Figure 8

DEER CREEK COAL MINE WATER SUMP AREAS



In-line water meters are 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 1988 was estimated at 1,770 acre feet, or 576.7 million gallons. The recorded flow of 1,770 acre feet during 1988 is a seventy-one percent (71%) increase from the 1987 discharge of 1,034 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 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

FIGURE 9

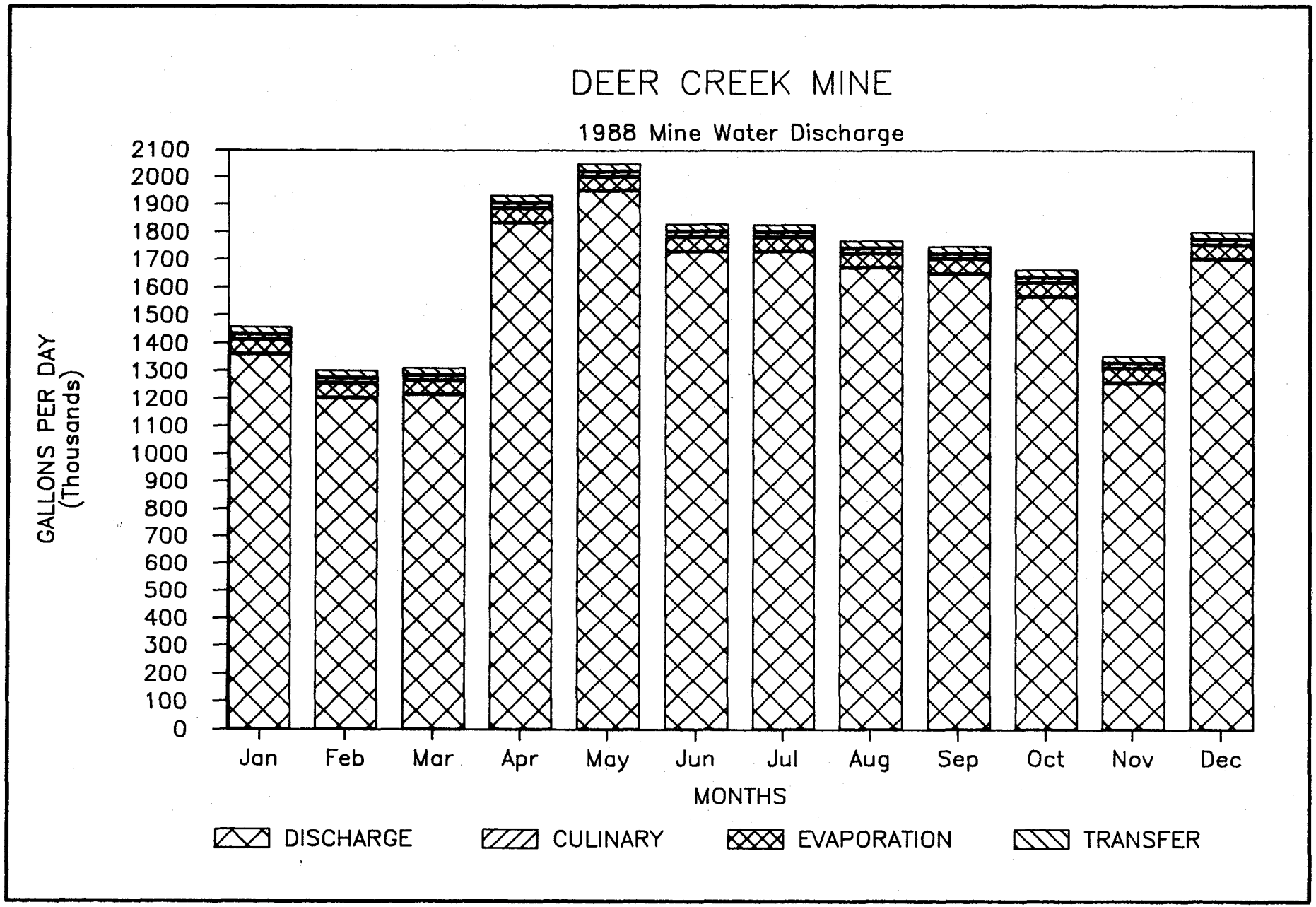
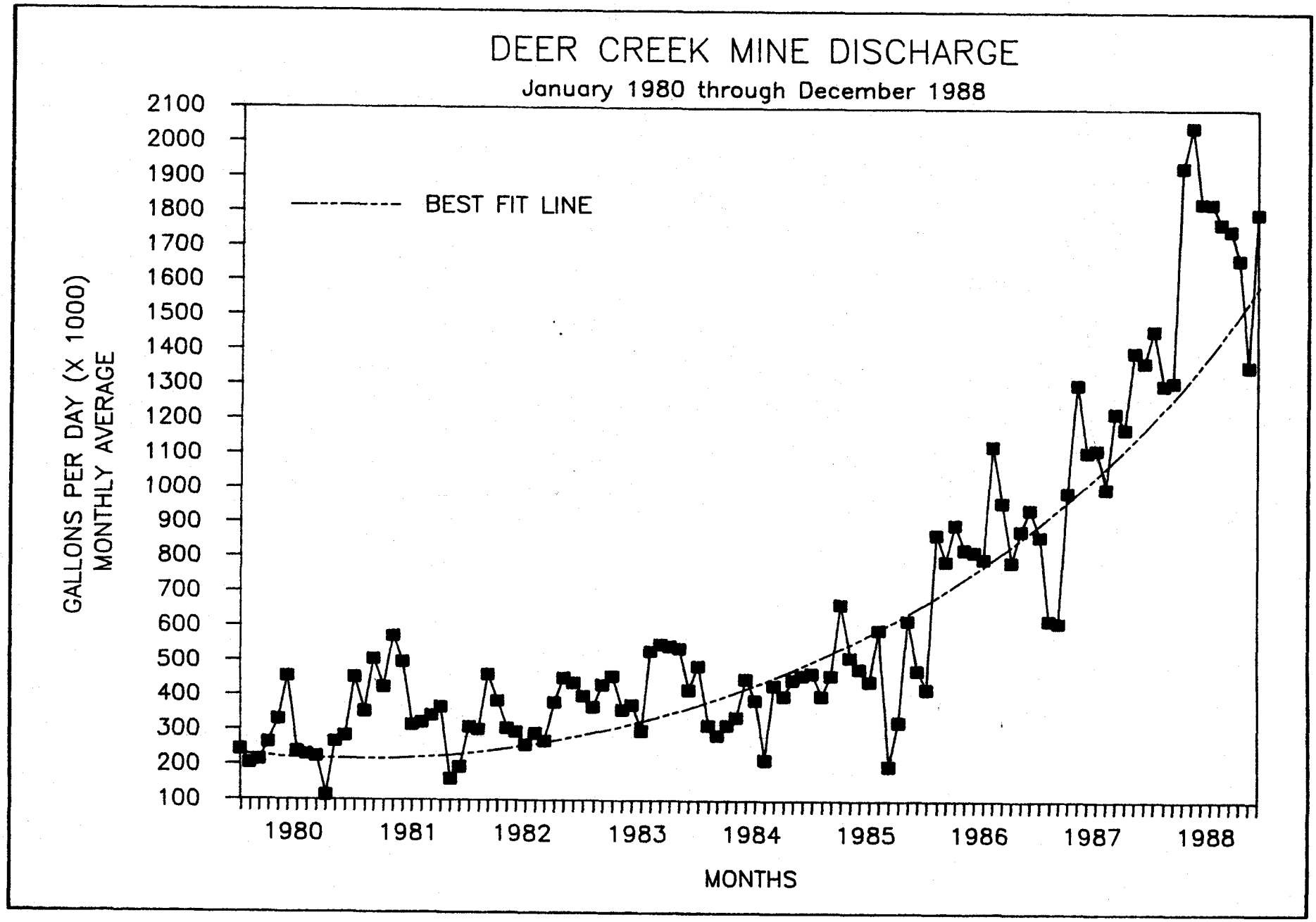

DEER CREEK MINE
1988 Mine Water Discharge
GALLONS PER DAY
(Thousands)
2100
2000
1900
1800
1700
1600
1500
1400
1300
1200
1100
1000
900
800
700
600
500
400
300
200
100
0
Jan
Feb
Mar
Apr
May
Jun
Jul
Aug
Sep
Oct
Nov
Dec
MONTHS
DISCHARGE
CULINARY
EVAPORATION
TRANSFER

FIGURE 10


DEER CREEK MINE DISCHARGE
January 1980 through December 1988
BEST FIT LINE
GALLONS PER DAY (X 1000)
MONTHLY AVERAGE
2100
2000
1900
1800
1700
1600
1500
1400
1300
1200
1100
1000
900
800
700
600
500
400
300
200
100
1980
1981
1982
1983
1984
1985
1986
1987
1988
MONTHS

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 1988. Table 28 compares the minimum, maximum, and mean values from an historical standpoint to 1988. An examination of Table 28 shows a slight change in acidity, chloride, and sulfate between samples collected in 1988 to the historical results. Individual analysis can be found in Appendix G.

TABLE 28: DEER CREEK MINE - DISCHARGE* WATER QUALITY

	1988			Historical - (1976-1987)		
Parameters	Minimum	Maximum	Mean	Minimum	Maximum	Mean
pH	7.18	8.15	7.86	6.8	8.1	7.51
Acidity	4.0	88.0	37.0	0.7	96.0	9.3
Alkalinity	244	359	281.2	207	414	289.3
Chloride	13.5	56.0	25.3	2.4	2700	71.2
Conductivity	800	1050	941	480	10,000	1191
Iron	0.02	1.81	0.43	0.02	7.53	0.68
Oil & Grease	1.0	48.8	13.4	0.01	19.9	2.1
Sulfate	178	335	274.3	29.8	497.0	226.1
TDS	410	896	631	231	5100	713.0
TSS	7.0	2784	336.3	0.1	2019	70.4

* 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 1988.

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 to ten 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 table below lists the factors involved in estimating in-mine water production:

Wilberg/Cottonwood Discharge	
Grimes Wash	0.0 Million Gallons
Miller Canyon*	0.7 Million Gallons
Estimated Evaporation**	19.0 Million Gallons
Domestic Usage	4.7 Million Gallons
Total Discharge	24.4 Million Gallons

* Sealed ventilation breakout which intermittently discharges.

** See 1981 Hydrologic Monitoring Report

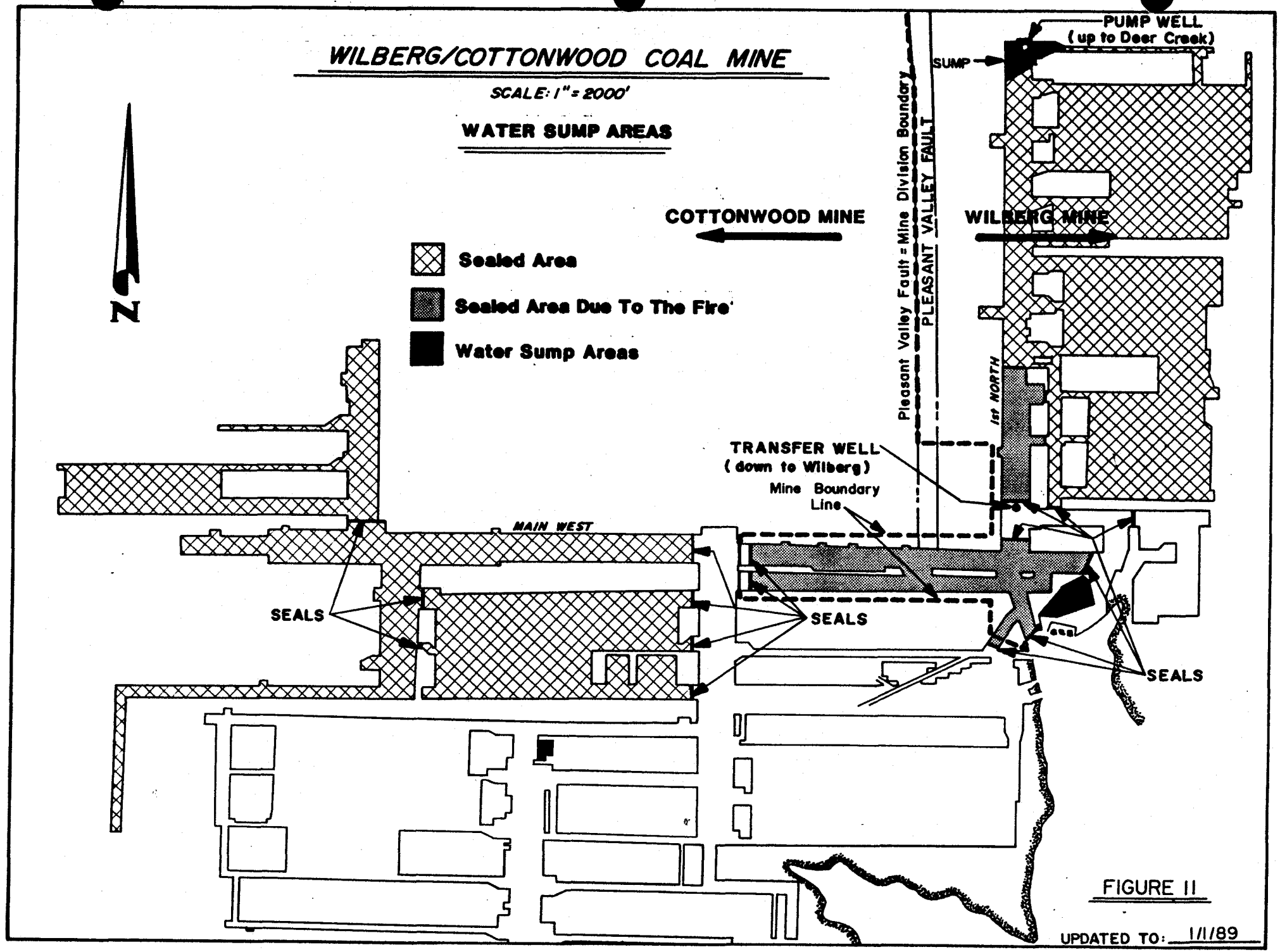
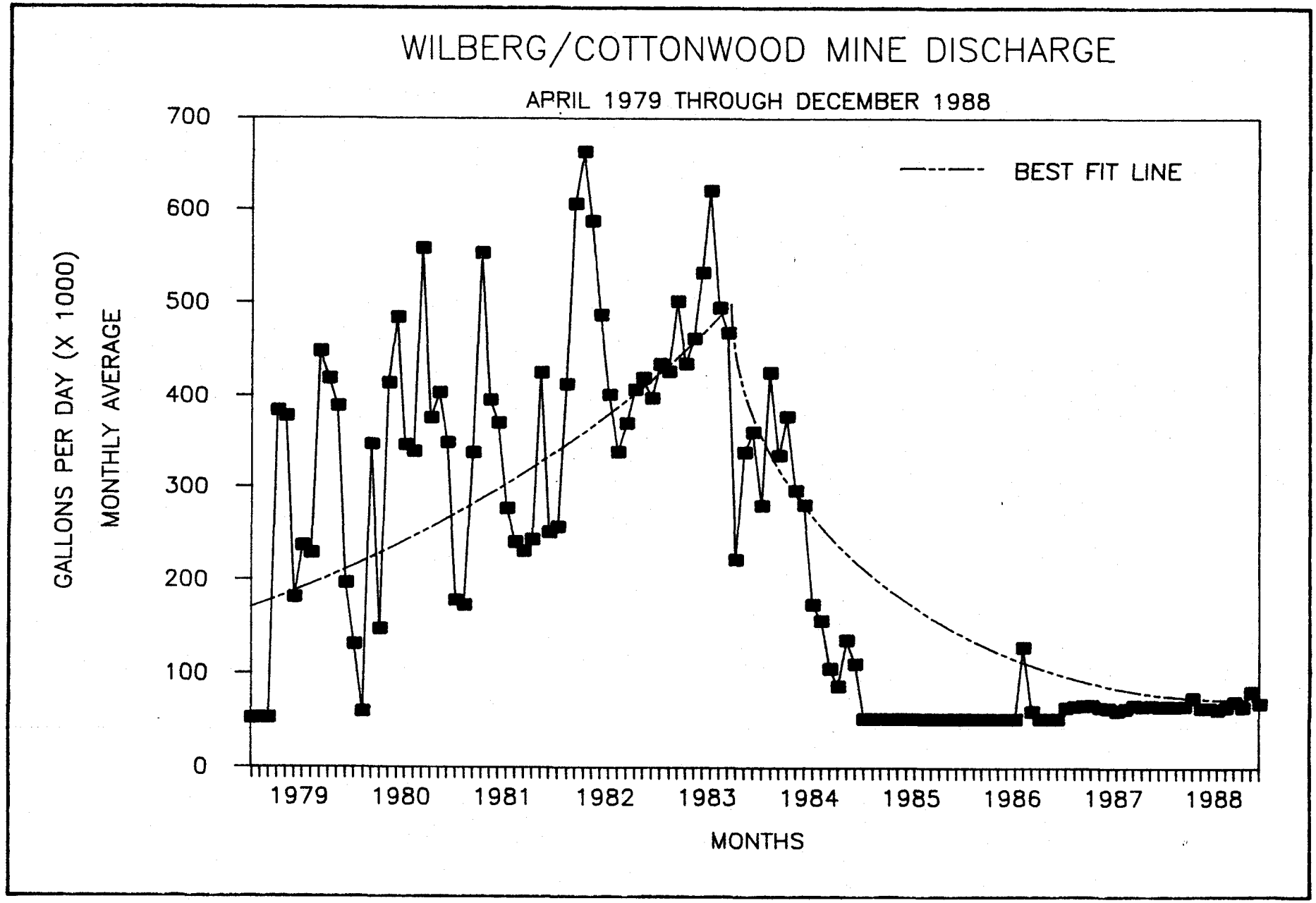

WILBERG/COTTONWOOD COAL MINE
SCALE: 1" = 2000'
WATER SUMP AREAS
N
Sealed Area
Sealed Area Due To The Fire
Water Sump Areas
COTTONWOOD MINE
WILBERG MINE
PUMP WELL
(up to Deer Creek)
SUMP
Pleasant Valley Fault = Mine Division Boundary
PLEASANT VALLEY FAULT
1st NORTH
TRANSFER WELL
(down to Wilberg)
Mine Boundary Line
MAIN WEST
SEALS
SEALS
SEALS
FIGURE 11
UPDATED TO: 1/1/89

FIGURE 12


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

b. In-Mine Quality

Eight samples were collected in the Wilberg/Cottonwood Mine in 1988. (See Map No. 5 in pocket for locations.) Parameters analyzed in 1988 are those listed in the DOGM Guidelines for Groundwater Operational Quality. Table 29 lists the characteristics of the samples collected and compares the mean, minimum, and maximum results of 1988 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 H.

The 1986 review performed by DOGM raised questions concerning the elevated mineral levels found in the 4th East area, specifically sulfate and TDS (DOGM Sept. 28, 1987). UP&L has collected numerous samples throughout the 3rd, 4th East, and 2nd South areas (see Map No. 4 in pocket) and all samples have indicated elevated mineral content, especially sample sites near the Pleasant Valley Fault System. UP&L feels 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 only exists in close proximity to the Grimes Wash outcrop.

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

TABLE 29: WILBERG/COTTONWOOD IN-MINE WATER QUALITY

LOCATION	1988 SAMPLE DATES	ALKALINITY BICARBONATE	CALCIUM	CARBONATE	CHLORIDE	CONDUCTIVITY	HARDNESS	IRON DISSOLVED	MAGNESIUM	MANGANESE	pH	POTASSIUM	SODIUM	SULFATE	TDS
2S XC-11	03-23	532	194.1	<1.0	41.4	1390	928	<0.02	107.6	0.03	7.18	4.50	23.20	356	739
	07-27	521	222.1	<1.0	15.0	1900	1013	<0.02	111.3	0.03	7.47	4.40	21.40	558	1328
	10-26	631	208.6	<1.0	40.0	1800	958	0.05	106.1	0.03	7.60	4.20	23.80	440	1230
	12-15	492	178.8	<1.0	20.0	2600	894	<0.01	108.6	0.02	7.50	4.00	22.20	480	1120
	MIN	492	178.8	<1.0	15.0	1390	894	<0.01	106.1	0.02	7.18	4.00	21.40	356	739
	MAX	631	222.1	<1.0	41.4	2600	1013	0.05	111.3	0.03	7.60	4.50	23.80	558	1328
	MEAN	544	200.9	<1.0	29.1	1922	948	0.02	108.4	0.03	7.44	4.28	22.65	458.5	1104
HISTORICAL (1983-87)	MIN	403	116.0	<1.0	9.6	1000	725	0.02	5.4	0.01	7.05	2.39	23.00	340	664
	MAX	543	330.0	<1.0	130.0	2500	983	0.05	115.6	0.02	7.95	4.56	36.90	490	973
	MEAN	453	155.3	<1.0	24.4	1490	797	0.05	97.49	0.01	7.56	6.16	26.17	406	880
4E XC-24	03-23	529	348.4	<1.0	61.4	2150	1762	0.05	216.5	0.03	7.33	9.50	43.40	1240	1429
	07-27	551	416.9	<1.0	40.0	5000	2022	0.04	238.2	0.01	7.40	11.30	45.30	1450	2502
	10-26	612	364.9	<1.0	50.0	3100	1792	0.04	213.8	<0.01	7.55	10.10	53.00	1300	2594
	12-15	532	313.0	<1.0	25.0	2800	1689	<0.01	220.4	<0.01	8.00	10.70	51.50	1280	1698
	MIN	529	313.0	<1.0	25.0	2150	1689	<0.01	213.8	<0.01	7.33	9.50	43.40	1240	1429
	MAX	612	416.9	<1.0	61.4	5000	2022	0.05	238.2	0.03	8.00	11.30	53.00	1450	2594
	MEAN	556	360.8	<1.0	44.1	3262	1816	0.04	213.8	0.02	7.57	10.40	48.30	1317.5	2056
HISTORICAL (1986-87)	MIN	450	236.0	<1.0	17.6	1250	1170	0.03	106.0	0.01	7.15	8.33	35.70	800	1472
	MAX	604	383.9	<1.0	85.0	2400	1896	0.08	227.6	0.06	7.60	9.72	59.30	1202	2111
	MEAN	502	280.7	<1.0	33.6	2066	1419	0.05	174.2	0.03	7.35	8.94	43.73	980.3	1746

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 passing through an oil skimmer in accordance with stipulations of the Wilberg Mine Discharge Permit UT-0022896-01. No water was discharged to Grimes Wash during 1988; however, intermittent small quantity discharges did occur at the Miller Canyon breakouts, which were developed for ventilation purposes but sealed in 1987. Discharge usually occurs during the months of June through November with a flow rate ranging from 5 to 25 GPM. Discharge from Miller Canyon is monitored in accordance with stipulations of the Wilberg Mine Discharge Permit UT-0022896-04. Approximately 0.7 million gallons were discharged during 1988.

d. Discharge Quality

Samples are collected each month from Miller Canyon Breakout whenever it is found to be discharging. Two samples were collected and analyzed during 1988. Table 30 compares the minimum, maximum, and mean values from 1988 to the historical values.

TABLE 30: WILBERG/COTTONWOOD - DISCHARGE* WATER QUALITY
MILLER CANYON

	1988			Historical - (1985-1987)		
Parameters	Minimum	Maximum	Mean	Minimum	Maximum	Mean
pH						
Acidity	7.3	7.4	7.35	6.95	7.8	7.5
Alkalinity	28	30	29	<1.0	4.3	2.7
Chloride	274	381	328	225	282	248
Conductivity	1350	1398	1374	650	1150	927
Iron	0.11	0.14	0.13	<0.05	0.66	0.25
Oil & Grease	<1.0	3.5	2.3	<0.5	1.2	0.80
Sulfate	383	650	517	290	355	325
TDS	1017	1182	1100	413	810	653
TSS	<1.0	<1.0	<1.0	<1.0	31	13.5

VI. PIEZOMETRIC GRADIENT INFORMATION

A. Surface

1. EM-31 and EM-47

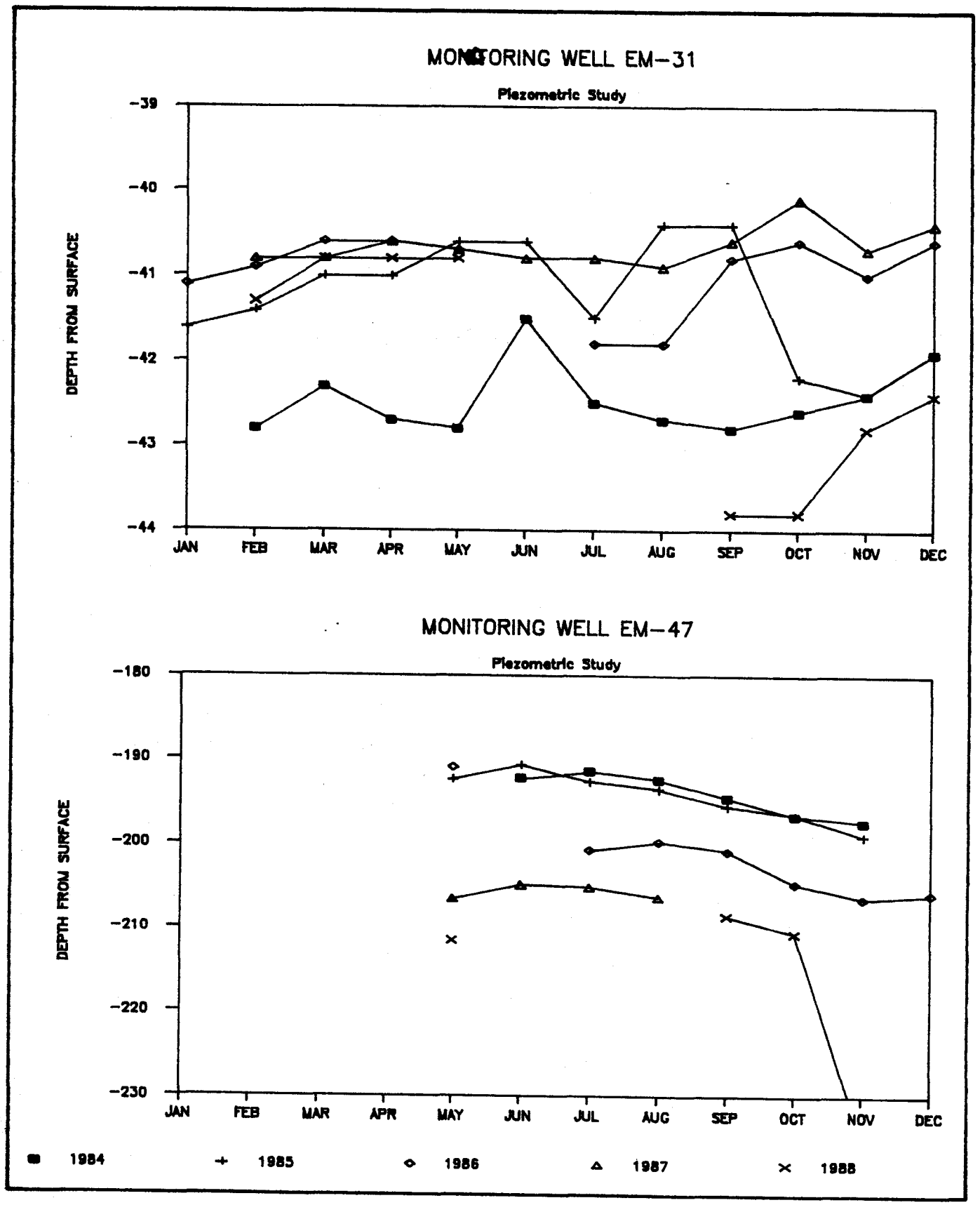
Two surface exploration drill holes which were developed into permanent water monitoring stations in 1978 continued to be monitored on a monthly basis, as access permitted (see Map No. 1).

Drill hole EM-31 in Cottonwood Creek Canyon was monitored monthly throughout 1988 except for January (inaccessible due to weather) and June through August (meter out of service). (See Map No. 1 in pocket.) The water level in the hole was at its highest point, -40.8 feet, during the months of March through May and at its lowest point, -44.0 feet, in October. Drill hole EM-47 in Rilda Canyon was accessible only during the months of May through November, and during this period the meter was out-of-service from June through August. During this time frame the water was at its highest, -208.5 feet, in October; and the lowest point, during the month of November, was beyond the cased portion of the hole, a first-time occurrence. Hydrographs of 1984, 1985, 1986, 1987, and 1988 data collected are shown in Figure 13.

2. Rilda Canyon Study Area

UP&L acquired five wells drilled and developed by West Appa Coal Co. through a coal lease purchase agreement. 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

FIGURE 13


MONITORING WELL EM-31
Piezometric Study
DEPTH FROM SURFACE
-39
-40
-41
-42
-43
-44
JAN
FEB
MAR
APR
MAY
JUN
JUL
AUG
SEP
OCT
NOV
DEC
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
1984
1985
1986
1987
1988

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.

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 Star Point Sandstone extending into Rilda Canyon.

To verify the existence of a fracture zone in line with the lineament traced from Rilda Canyon into Mill Fork Canyon, a subsurface geotechnical technique known as Very Low Frequency analysis (VLF) was used. 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 Star Point sandstone.

Water elevations from the five existing piezometers were collected on a monthly basis throughout the year when accessible. Information collected during 1988 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. In this situation 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 dyke to subsurface flow through the gravel bed, forcing the water to surface.

Below the spring area 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.

Flow within the coarse gravel drain below the stream channel is directly tied into surface stream flow. Between September 24, 1982 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 had fallen in well P-3 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 1988 revealed similar trends in both P-1 and P-3 (Figure 14). From September through November 1988 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 dropped only 0.6 feet. Figure 15 compares the data collected during 1987 and 1988.

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.

B. In-Mine

All remaining in-mine drill holes located in the Deer Creek Mine were destroyed by mining activities, primarily a diesel roadway construction project. New holes are tentatively scheduled to be drilled in both the Cottonwood and Deer Creek mines during 1989.

FIGURE 14

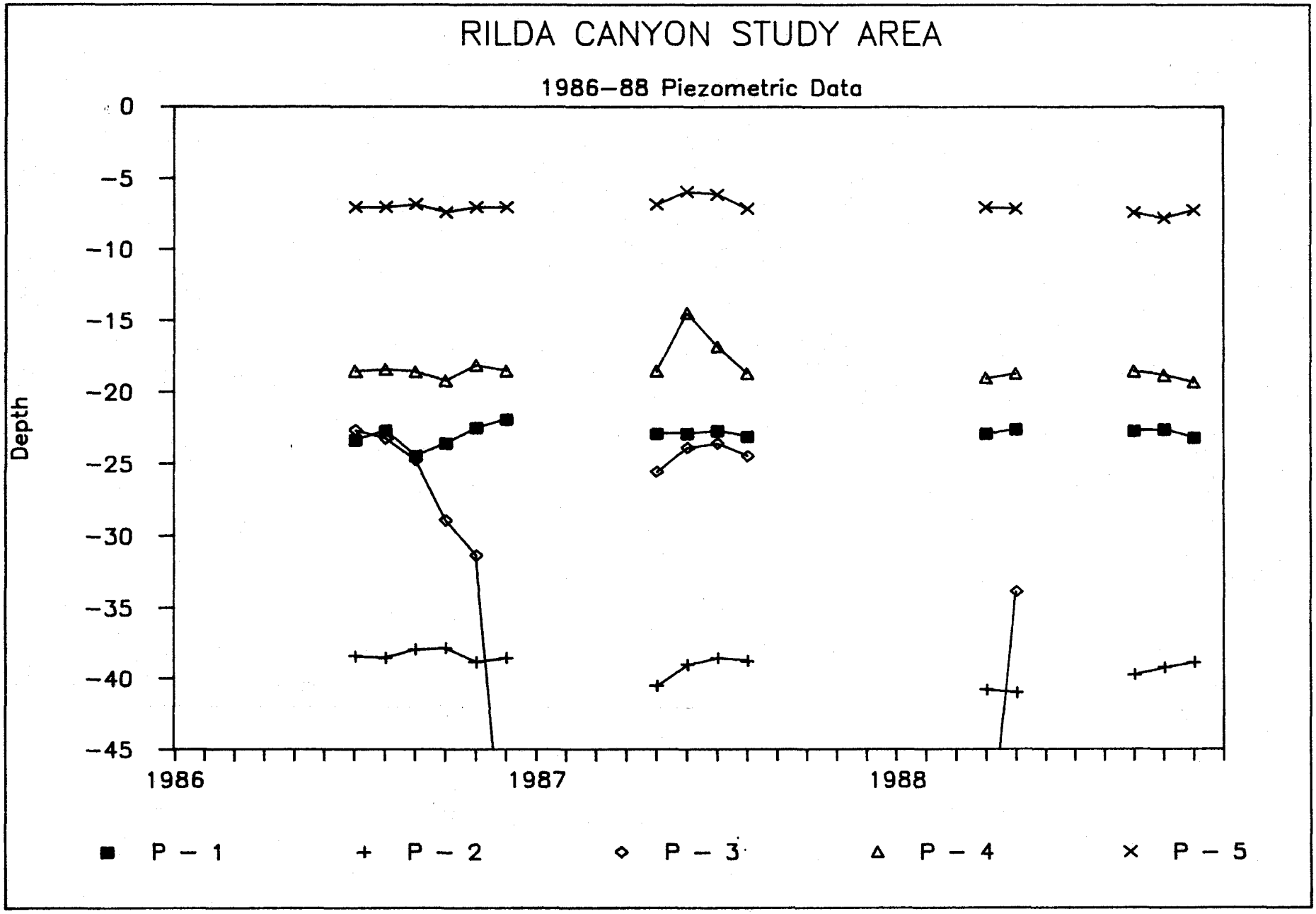
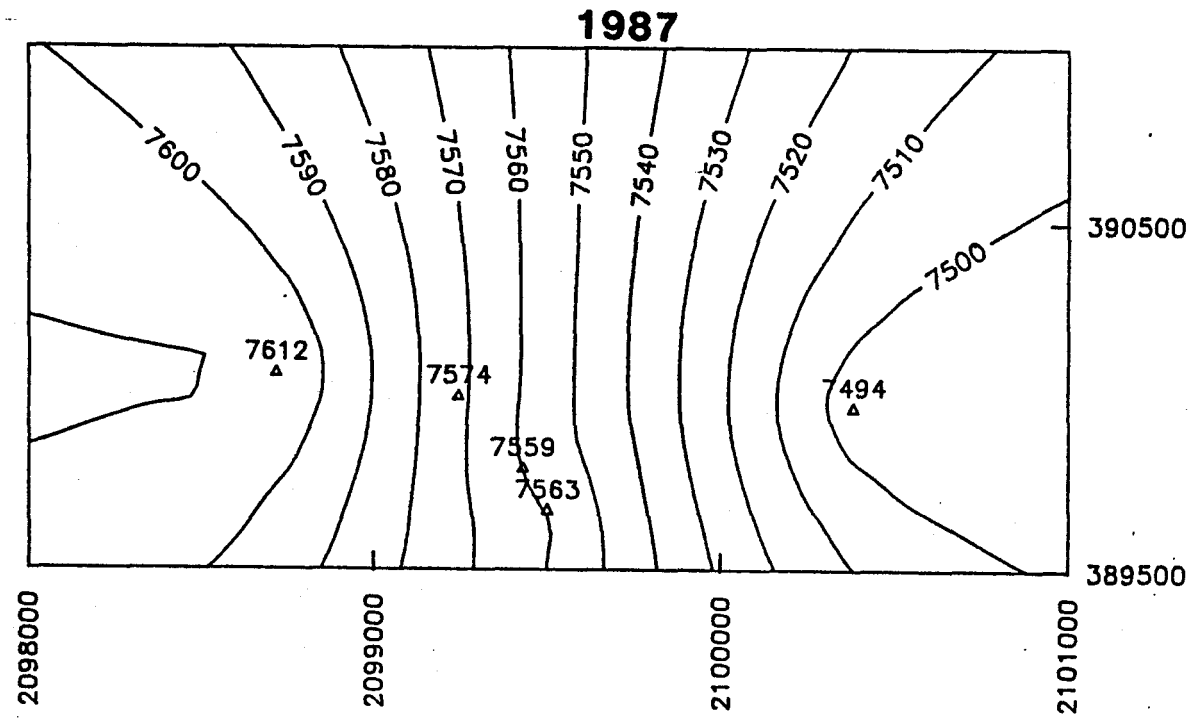
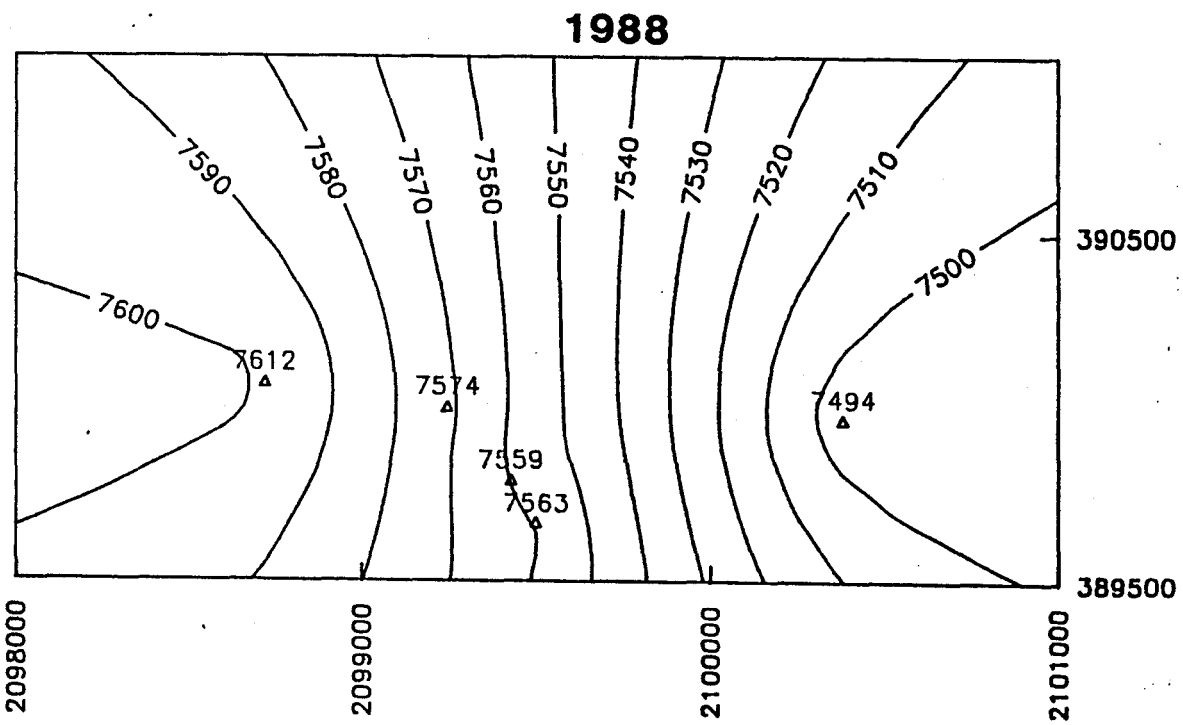

RILDA CANYON STUDY AREA
1986–88 Piezometric Data
Depth
0
−5
−10
−15
−20
−25
−30
−35
−40
−45
1986
1987
1988
P − 1
P − 2
P − 3
P − 4
P − 5

FIGURE 15

RILDA CANYON STUDY AREA
1987 – 1988 MEASUREMENT COMPARISON





VII. 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 1988 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.

VIII. 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 eleventh 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.

Runoff for drainages surrounding East Mountain did not reach the peak flow levels recorded for previous years. 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 1988 with similar discharge patterns being recorded. Several of the springs show a possible double porosity feature, i.e., the springs 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 1988 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

STREAM DISCHARGE RECORDS

DAILY DISCHARGE (CFS)

DAY	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	DAY
1	118.00	48.00	47.00	31.00	29.00	28.00	27.00	72.00	138.00	98.00	93.00	66.00	1
2	108.00	49.00	48.00	31.00	29.00	28.00	27.00	60.00	134.00	96.00	84.00	59.00	2
3	108.00	51.00	48.00	31.00	29.00	28.00	27.00	59.00	150.00	98.00	69.00	59.00	3
4	104.00	47.00	48.00	31.00	29.00	28.00	27.00	62.00	171.00	99.00	67.00	59.00	4
5	99.00	43.00	48.00	30.00	29.00	28.00	36.00	70.00	186.00	95.00	69.00	55.00	5
6	98.00	57.00	46.00	31.00	29.00	28.00	38.00	80.00	182.00	94.00	68.00	55.00	6
7	82.00	48.00	45.00	30.00	29.00	28.00	44.00	71.00	186.00	90.00	70.00	57.00	7
8	78.00	45.00	44.00	30.00	29.00	25.00	44.00	71.00	199.00	91.00	65.00	66.00	8
9	75.00	44.00	46.00	30.00	29.00	27.00	37.00	72.00	185.00	87.00	65.00	59.00	9
10	79.00	45.00	42.00	29.00	29.00	28.00	37.00	87.00	172.00	87.00	63.00	64.00	10
11	80.00	43.00	38.00	29.00	29.00	26.00	41.00	121.00	161.00	92.00	68.00	62.00	11
12	79.00	43.00	38.00	29.00	28.00	25.00	46.00	151.00	184.00	100.00	71.00	60.00	12
13	84.00	44.00	38.00	30.00	29.00	24.00	51.00	198.00	180.00	109.00	70.00	64.00	13
14	74.00	45.00	37.00	30.00	28.00	21.00	53.00	224.00	168.00	109.00	68.00	83.00	14
15	68.00	41.00	38.00	30.00	28.00	21.00	55.00	246.00	141.00	114.00	67.00	73.00	15
16	67.00	48.00	42.00	30.00	29.00	22.00	57.00	265.00	138.00	113.00	75.00	67.00	16
17	65.00	44.00	51.00	30.00	29.00	23.00	59.00	297.00	144.00	116.00	78.00	60.00	17
18	60.00	56.00	44.00	30.00	28.00	25.00	57.00	248.00	142.00	115.00	77.00	57.00	18
19	58.00	46.00	42.00	30.00	28.00	27.00	52.00	190.00	142.00	114.00	85.00	54.00	19
20	55.00	45.00	37.00	30.00	27.00	28.00	53.00	169.00	143.00	95.00	85.00	53.00	20
21	53.00	46.00	36.00	29.00	28.00	27.00	55.00	172.00	137.00	93.00	87.00	59.00	21
22	46.00	47.00	41.00	30.00	28.00	28.00	50.00	174.00	133.00	98.00	80.00	68.00	22
23	45.00	45.00	38.00	30.00	27.00	28.00	49.00	183.00	130.00	95.00	73.00	72.00	23
24	47.00	44.00	35.00	30.00	27.00	28.00	54.00	187.00	127.00	95.00	67.00	72.00	24
25	49.00	46.00	34.00	30.00	27.00	26.00	55.00	200.00	126.00	93.00	83.00	66.00	25
26	45.00	46.00	33.00	30.00	27.00	25.00	52.00	208.00	137.00	93.00	67.00	66.00	26
27	42.00	43.00	34.00	30.00	28.00	23.00	54.00	208.00	126.00	93.00	74.00	63.00	27
28	42.00	46.00	35.00	29.00	28.00	24.00	57.00	193.00	119.00	91.00	67.00	59.00	28
29	45.00	46.00	34.00	29.00	29.00	27.00	60.00	194.00	86.00	93.00	82.00	58.00	29
30	52.00	45.00	34.00	29.00	0.00	27.00	70.00	182.00	99.00	89.00	65.00	58.00	30
31	46.00	0.00	32.00	29.00	0.00	27.00	0.00	158.00	0.00	98.00	64.00	0.00	31
MONTHLY													
TOT	2151.00	1381.00	1253.00	927.00	822.00	808.00	1424.00	4872.00	4466.00	3043.00	2266.00	1873.00	
MEA	69.40	46.00	40.40	29.90	28.30	26.10	47.50	157.00	149.00	98.20	73.10	62.40	
MAX	118.00	57.00	51.00	31.00	29.00	28.00	70.00	297.00	199.00	116.00	93.00	83.00	
MIN	42.00	41.00	32.00	29.00	27.00	21.00	27.00	59.00	86.00	87.00	63.00	53.00	
ACR FT	4270.00	2740.00	2490.00	1840.00	1630.00	1600.00	2820.00	9660.00	8860.00	6040.00	4490.00	3720.00	

OCT87-SEPT88 TOTAL 25286.00 MEAN 69.10 MAX 297.00 MIN 21.00 TOT ACR FT 50150.00

TOTAL MEAN MAX MIN TOT ACR FT

MAX UNIT DISCHARGE 377.00 CFS (4.36 FT) DATE MAY 15 MIN UNIT DISCHARGE 4.30 CFS DATE MAR 8

REMARKS:

On Monday April 4, 1988 the creek bottom was cleaned about 40 ft. above and 30 ft. below the gage house, and a rock dam was installed downstream. Their will be two rating tables established, rating table #1 will be used from Oct. 1, 1987 to April 4, 1988 and rating table #2 will be used from April 5, 1988 to Sept. 30 1988. Because of heavy silt and sand build up in front of the gage house, the daily discharge flows from July 17, 1988 to Sep. 30, 1988 were established in conjunction with information from Vardan Nilson. (Huntington-Cleveland Irrigation Co.) On Sept. 29, 1988 Huntington Plant personnel removed about 1/3 of the right hand side of the rock dam. On Sept. 30 1988 C. Burton, D. Edginton, and C. Sinquefield dug out the intake pipes, and flushed out and cleaned the silt and sand from the gage house.

24 OCT. 88
complete

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	11.00	12.00	13.00	11.00	12.00	12.00	16.00	15.00	15.00	17.00	17.00	25.00	1
2	9.00	12.00	13.00	11.00	12.00	12.00	16.00	15.00	15.00	17.00	16.00	25.00	2
3	9.60	12.00	12.00	11.00	12.00	12.00	16.00	15.00	15.00	17.00	16.00	23.00	3
4	9.50	12.00	12.00	11.00	12.00	12.00	16.00	15.00	15.00	17.00	16.00	23.00	4
5	9.10	12.00	12.00	11.00	12.00	12.00	16.00	15.00	15.00	17.00	16.00	23.00	5
6	10.00	12.00	12.00	11.00	12.00	13.00	16.00	15.00	15.00	17.00	16.00	23.00	6
7	10.00	11.00	12.00	11.00	12.00	13.00	14.00	14.00	15.00	17.00	16.00	8.90	7
8	10.00	11.00	12.00	11.00	12.00	13.00	13.00	14.00	15.00	17.00	16.00	14.00	8
9	10.00	12.00	12.00	11.00	12.00	13.00	13.00	14.00	15.00	17.00	16.00	36.00	9
10	11.00	12.00	12.00	11.00	12.00	13.00	13.00	14.00	15.00	17.00	16.00	24.00	10
11	11.00	12.00	12.00	11.00	12.00	13.00	13.00	15.00	15.00	17.00	16.00	23.00	11
12	11.00	12.00	11.00	5.90	12.00	13.00	13.00	15.00	15.00	17.00	16.00	37.00	12
13	11.00	12.00	11.00	2.10	12.00	13.00	13.00	15.00	15.00	17.00	16.00	40.00	13
14	11.00	12.00	11.00	4.80	12.00	13.00	13.00	15.00	15.00	17.00	16.00	43.00	14
15	11.00	12.00	20.00	6.10	12.00	15.00	15.00	15.00	15.00	18.00	17.00	37.00	15
16	12.00	12.00	29.00	6.10	12.00	13.00	15.00	15.00	15.00	18.00	17.00	38.00	16
17	12.00	12.00	19.00	6.10	12.00	13.00	13.00	15.00	15.00	18.00	18.00	38.00	17
18	12.00	12.00	11.00	6.10	12.00	14.00	13.00	15.00	15.00	18.00	15.00	38.00	18
19	12.00	12.00	11.00	6.10	12.00	15.00	13.00	16.00	15.00	18.00	18.00	41.00	19
20	12.00	12.00	11.00	6.10	13.00	15.00	13.00	16.00	15.00	18.00	16.00	45.00	20
21	12.00	12.00	11.00	6.10	13.00	15.00	13.00	16.00	15.00	18.00	16.00	45.00	21
22	11.00	12.00	11.00	8.80	13.00	15.00	13.00	16.00	15.00	17.00	16.00	42.00	22
23	11.00	12.00	11.00	10.00	12.00	15.00	13.00	15.00	15.00	17.00	16.00	46.00	23
24	11.00	13.00	11.00	10.00	13.00	15.00	13.00	16.00	15.00	17.00	16.00	46.00	24
25	12.00	13.00	11.00	10.00	13.00	15.00	13.00	16.00	15.00	17.00	16.00	46.00	25
26	12.00	13.00	11.00	10.00	12.00	15.00	13.00	15.00	15.00	17.00	16.00	46.00	26
27	11.00	13.00	11.00	10.00	12.00	15.00	15.00	15.00	15.00	17.00	17.00	42.00	27
28	12.00	13.00	11.00	10.00	12.00	16.00	15.00	15.00	15.00	17.00	17.00	42.00	28
29	12.00	13.00	11.00	11.00	12.00	16.00	15.00	15.00	16.00	17.00	17.00	41.00	29
30	12.00	13.00	11.00	11.00	0.00	16.00	15.00	15.00	16.00	17.00	22.00	45.00	30
31	12.00	0.00	11.00	11.00	0.00	16.00	0.00	15.00	0.00	17.00	23.00	0.00	31
MONTHLY													
TOT	344.20	365.00	389.00	278.30	354.00	429.00	416.00	468.00	453.00	534.00	518.00	1059.90	
MEA	11.10	12.20	12.50	8.98	12.20	13.80	13.90	15.10	15.10	17.20	16.70	35.30	
MAX	13.00	13.00	29.00	11.00	13.00	16.00	16.00	16.00	16.00	18.00	23.00	48.00	
MIN	9.00	11.00	11.00	2.10	12.00	12.00	12.00	14.00	15.00	17.00	15.00	8.90	
CFS FT	683.00	724.00	772.00	552.00	702.00	851.00	825.00	928.00	899.00	1060.00	1030.00	2100.00	

OCT87-SEPT88 TOTAL 5608.40 MEAN 15.30 MAX 48.00 MIN 2.10 TOT ACR FT 11120.00

TOTAL MEAN MAX MIN TOT ACR FT

MAX UNIT DISCHARGE 61.00 CFS DATE AUG 30 MIN UNIT DISCHARGE 1.30 CFS DATE OCT 5
(1.81 FT)

REMARKS:

On Sept. 9, 1988 D. Edginton and C. Burton found and removed a large beaver dam in Huntington Creek. The beaver dam was located in Huntington Creek by the main gate to the entrance of the weather station - spill way works area of Electric Lake Dam. On Sept. 29,1988 D. Edginton and C. Sinquefield removed the precipation pan from service, painted the instrument shelter for the temperature recorder, replaced the batteries in the weather station, pumped out the gage house and cleaned the inside staff gage, and serviced the gage house for winter. On Sept. 7, 1988 the Division of Wildlife Resources performed their fish shocking program on Huntington Creek.

EN00006A HU[illegible]STON CREEK NATURAL FLOW AT PLANT-IN C.F.S. (USES ALSO NOS. 4[illegible],23)

Complete 27 Oct 88

OCT87-SEPT88

UTAH POWER & LIGHT COMPANY

INFLOW AND UTILIZATION RECORDS

DAY	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	DAY
1	117.49	48.40	44.81	41.96	42.57	40.86	33.55	119.84	184.58	100.90	99.34	54.75	1
2	114.92	52.84	49.56	42.24	42.16	41.95	31.76	101.22	176.39	101.30	91.32	48.45	2
3	112.36	55.90	49.60	39.62	39.12	37.73	29.49	83.90	193.15	104.07	78.15	50.94	3
4	104.99	42.62	47.16	41.56	38.24	34.01	30.79	88.23	214.54	107.23	75.44	48.01	4
5	101.90	45.46	51.05	41.37	37.53	32.51	42.81	107.55	227.64	103.51	72.53	47.66	5
6	101.77	63.12	47.61	45.70	35.14	32.08	46.92	129.57	222.48	99.95	72.62	48.58	6
7	85.33	54.08	47.42	39.98	36.64	40.14	53.91	110.71	222.80	94.50	77.37	55.59	7
8	81.43	46.46	47.73	35.21	36.32	36.03	56.15	98.65	231.51	93.94	69.37	66.02	8
9	78.71	42.80	47.96	39.09	34.34	36.35	51.53	99.32	212.81	91.77	68.36	56.56	9
10	76.12	42.66	46.11	38.51	34.32	39.77	49.48	127.94	199.04	88.15	64.21	59.48	10
11	78.15	42.35	42.40	40.92	37.22	36.09	55.15	177.35	188.45	88.64	71.26	52.54	11
12	77.24	42.11	44.11	42.67	34.58	29.18	67.03	225.06	210.20	96.05	77.39	52.12	12
13	86.28	36.59	41.40	42.57	37.09	26.33	80.75	255.29	203.10	105.11	74.38	53.82	13
14	79.81	44.04	40.46	42.33	37.53	19.64	85.13	334.58	189.36	105.97	62.62	54.38	14
15	64.02	46.91	35.39	43.24	36.29	18.43	80.60	363.17	160.45	109.41	65.86	50.22	15
16	57.76	49.31	28.61	43.45	37.70	25.34	86.29	388.92	155.25	107.25	75.90	42.44	16
17	52.69	44.81	43.71	42.87	38.71	34.11	92.38	433.70	161.88	110.82	80.99	37.70	17
18	58.35	55.89	43.35	42.48	35.47	27.38	93.34	386.06	159.23	105.23	82.08	30.86	18
19	55.34	41.50	43.57	42.31	33.24	34.31	87.10	304.98	150.23	112.45	90.62	28.10	19
20	52.29	43.24	38.12	41.94	33.27	33.50	91.53	266.28	152.47	95.05	90.65	29.06	20
21	49.36	46.15	37.12	40.08	33.65	31.94	100.60	258.70	162.55	87.10	94.45	32.82	21
22	43.44	47.40	54.65	35.19	35.60	33.28	91.67	261.99	157.43	92.14	89.27	33.85	22
23	49.01	43.91	52.51	35.28	37.57	34.46	79.10	275.01	150.67	92.42	81.23	38.07	23
24	54.83	41.86	37.00	35.19	33.85	35.05	72.41	276.27	143.82	99.32	70.09	35.92	24
25	52.32	43.07	36.12	37.61	33.52	33.69	74.16	287.70	138.88	99.32	88.09	36.30	25
26	45.26	46.19	36.25	39.44	35.02	31.75	73.91	294.27	130.69	99.83	75.07	31.31	26
27	41.91	41.52	38.03	42.79	36.51	30.29	75.24	296.24	142.82	98.87	84.34	24.08	27
28	42.56	44.94	41.68	42.69	35.49	31.83	82.54	274.90	134.58	97.26	75.26	25.04	28
29	44.98	44.73	42.03	41.52	36.81	34.20	93.03	267.23	126.35	96.62	85.14	21.08	29
30	52.12	43.02	44.57	36.00	0.00	34.85	110.35	251.20	91.25	97.84	50.29	29.33	30
31	47.38	0.00	41.97	41.06	0.00	35.24	0.00	216.45	102.14	95.29	64.62	0.00	31
MONTHLY													
TOT	2168.83	1385.00	1342.06	1256.78	1048.93	1019.02	2098.84	7202.97	5153.40	3079.76	2405.10	1273.55	
MEA	69.96	46.17	43.29	40.54	36.17	32.87	69.96	232.35	171.78	99.35	77.58	42.45	
MAX	117.49	63.12	54.65	45.70	42.57	41.95	110.35	433.70	231.51	112.45	99.34	66.02	
MIN	41.91	36.99	28.61	35.19	31.57	18.43	29.49	83.90	91.25	87.10	58.07	21.31	

OCT87-SEPT88 TOTAL 29434. MEAN 80. MAX 434. MIN 18.

TOTAL MEAN MAX MIN

REMARKS:

Unpublished records

Subject to revision

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	23865.00	23415.00	22986.00	22634.00	22480.00	22088.00	21712.00	22412.00	26188.00	26549.00	25815.00	25063.00	1
2	23861.00	23415.00	22982.00	22627.00	22476.00	22085.00	21695.00	22448.00	26241.00	26529.00	25799.00	25021.00	2
3	23835.00	23404.00	22964.00	22616.00	22462.00	22067.00	21667.00	22483.00	26293.00	26508.00	25787.00	24970.00	3
4	23816.00	23389.00	22949.00	22609.00	22455.00	22050.00	21653.00	22509.00	26346.00	26500.00	25768.00	24924.00	4
5	23801.00	23385.00	22949.00	22602.00	22437.00	22035.00	21639.00	22573.00	26398.00	26480.00	25736.00	24881.00	5
6	23782.00	23389.00	22927.00	22613.00	22419.00	22032.00	21629.00	22649.00	26439.00	26459.00	25724.00	24838.00	6
7	23764.00	23381.00	22927.00	22584.00	22408.00	22028.00	21622.00	22692.00	26476.00	26435.00	25700.00	24815.00	7
8	23745.00	23367.00	22913.00	22577.00	22387.00	22018.00	21622.00	22728.00	26500.00	26411.00	25676.00	24781.00	8
9	23726.00	23348.00	22898.00	22566.00	22369.00	22007.00	21622.00	22764.00	26520.00	26390.00	25648.00	24746.00	9
10	23704.00	23330.00	22891.00	22555.00	22358.00	22007.00	21618.00	22833.00	26541.00	26366.00	25617.00	24692.00	10
11	23689.00	23315.00	22884.00	22555.00	22344.00	22004.00	21622.00	22927.00	26561.00	26342.00	25597.00	24646.00	11
12	23670.00	23297.00	22866.00	22552.00	22326.00	21997.00	21646.00	23069.00	26578.00	26317.00	25577.00	24615.00	12
13	23670.00	23267.00	22851.00	22548.00	22319.00	21986.00	21681.00	23253.00	26590.00	26293.00	25550.00	24546.00	13
14	23663.00	23267.00	22840.00	22544.00	22305.00	21961.00	21716.00	23448.00	26598.00	26269.00	25522.00	24442.00	14
15	23652.00	23260.00	22804.00	22541.00	22291.00	21947.00	21754.00	23663.00	26602.00	26241.00	25486.00	24355.00	15
16	23626.00	23242.00	22750.00	22537.00	22283.00	21944.00	21803.00	23880.00	26606.00	26212.00	25463.00	24283.00	16
17	23611.00	23234.00	22732.00	22534.00	22273.00	21937.00	21859.00	24147.00	26610.00	26188.00	25435.00	24204.00	17
18	23582.00	23212.00	22721.00	22530.00	22259.00	21926.00	21898.00	24374.00	26614.00	26152.00	25419.00	24120.00	18
19	23574.00	23194.00	22710.00	22526.00	22244.00	21912.00	21940.00	24546.00	26618.00	26120.00	25392.00	24045.00	19
20	23555.00	23175.00	22696.00	22523.00	22223.00	21891.00	21993.00	24704.00	26627.00	26092.00	25376.00	23962.00	20
21	23533.00	23164.00	22685.00	22519.00	22209.00	21873.00	22064.00	24846.00	26635.00	26059.00	25357.00	23883.00	21
22	23518.00	23146.00	22721.00	22516.00	22184.00	21856.00	22103.00	25005.00	26634.00	26031.00	25349.00	23801.00	22
23	23522.00	23132.00	22714.00	22512.00	22166.00	21842.00	22131.00	25153.00	26627.00	26007.00	25325.00	23711.00	23
24	23518.00	23110.00	22699.00	22509.00	22152.00	21828.00	22145.00	25302.00	26623.00	25983.00	25302.00	23626.00	24
25	23507.00	23095.00	22692.00	22505.00	22138.00	21814.00	22177.00	25443.00	26610.00	25967.00	25282.00	23500.00	25
26	23492.00	23080.00	22681.00	22501.00	22124.00	21800.00	22188.00	25585.00	26610.00	25939.00	25270.00	23407.00	26
27	23477.00	23058.00	22674.00	22498.00	22113.00	21786.00	22209.00	25736.00	26610.00	25919.00	25258.00	23326.00	27
28	23463.00	23044.00	22667.00	22494.00	22095.00	21772.00	22234.00	25851.00	26602.00	25895.00	25235.00	23234.00	28
29	23448.00	23022.00	22659.00	22491.00	22088.00	21758.00	22280.00	25967.00	26594.00	25875.00	25208.00	23154.00	29
30	23444.00	23007.00	22649.00	22487.00	0.00	21744.00	22344.00	26067.00	26573.00	25855.00	25169.00	23066.00	30
31	23426.00	0.00	22641.00	22483.00	0.00	21733.00	0.00	26140.00	0.00	25835.00	25122.00	0.00	31
MONTHLY CHANGE	-461.	-419.	-366.	-158.	-395.	-355.	611.	3796.	433.	-738.	-713.	-2056.	

OCT87-SEPT88 TOTAL CHANGE -821. MAX CONTENTS 26635. AC FT JUN 21 MIN CONTENTS 21618. AC FT APR 10

TOTAL CHANGE MAX CONTENTS MIN CONTENTS

REMARKS:

* Note: From 1/13 to 2/2/88, the clock stopped. Elevations will be stright lined between 1/13 to 2/2/88, and corrections of .10 will be applied. On 6/1/88 the evaporation pan was placed in service at the weather station. On 9/29/88 the evaporation pan was taken out of service.

Unpublished records
Subject to revision

DESCRIPTIONS FOR LOCATIONS

LOC DESC	LOCATION
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

WATER QUALITY
HUNTINGTON CREEK
1988

LOCATION	PARAMETER	TEST_DATECODE	VALUE	UNITS
UPL3	CONDUCTIVITY	88/02/25	325.0000	UMOHS/L
		88/04/05	250.0000	UMOHS/L
		88/06/03	275.0000	UMOHS/L
		88/08/09	282.0000	UMOHS/L
		88/08/31	252.0000	UMOHS/L
		88/09/30	239.0000	UMOHS/L
		88/10/27	282.0000	UMOHS/L
		88/11/22	307.0000	UMOHS/L
		88/12/21	285.0000	UMOHS/L
	PH	88/02/25	7.9000	UNITS
		88/04/05	8.0000	UNITS
		88/06/03	8.0000	UNITS
		88/08/09	8.3000	UNITS
		88/08/31	7.9000	UNITS
		88/09/30	7.8000	UNITS
		88/10/27	7.7000	UNITS
		88/11/22	7.8000	UNITS
		88/12/21	8.0000	UNITS
	SOLIDS-SUSPENDED	88/02/25	2.0000	MG/L
		88/04/05	6.0000	MG/L
		88/06/03	2.0000	MG/L
		88/08/09	2.0000	MG/L
		88/08/31	6.0000	MG/L
		88/09/30(	1.0000	MG/L
		88/10/27	1.0000	MG/L
		88/11/22(	1.0000	MG/L
		88/12/21(	1.0000	MG/L
	SOLIDS-TOTAL DISSOLVED	88/02/25	162.0000	MG/L
		88/04/05	158.0000	MG/L
		88/06/03	144.0000	MG/L
		88/08/09	126.0000	MG/L
		88/08/31	92.0000	MG/L
		88/09/30	155.0000	MG/L
		88/10/27	126.0000	MG/L
		88/11/22	124.0000	MG/L
		88/12/21	250.0000	MG/L
	SULFATE	88/02/25	10.0000	MG/L
		88/04/05	9.0000	MG/L
		88/06/03	12.0000	MG/L
		88/08/09	11.0000	MG/L
		88/08/31	9.0000	MG/L
		88/09/30	9.0000	MG/L
		88/10/27	12.0000	MG/L
		88/11/22	12.0000	MG/L

WATER QUALITY
HUNTINGTON CREEK
1988

LOCATION	PARAMETER	TEST_DATECODE	VALUE	UNITS
UPL3	SULFATE	88/12/21	12.0000	MG/L

HUNTINGTON CREEK
1988

LOCATION
UPL3

PARAMETER	AVE VALUE	MIN VALUE	MAX VALUE
CONDUCTIVITY	277.4444	239.0000	325.0000
PH	7.9333	7.7000	8.3000
SOLIDS-SUSPENDED	2.4444	1.0000	6.0000
SOLIDS-TOTAL DISSOLVED	148.5555	92.0000	250.0000
SULFATE	10.6666	9.0000	12.0000

WATER QUALITY
HUNTINGTON CREEK
1988

LOCATION	PARAMETER	TEST_DATECODE	VALUE	UNITS
UPL2	CONDUCTIVITY	88/02/25	418.0000	UMOHS/L
		88/04/05	320.0000	UMOHS/L
		88/06/03	345.0000	UMOHS/L
		88/08/09	338.0000	UMOHS/L
		88/08/31	310.0000	UMOHS/L
		88/09/30	276.0000	UMOHS/L
		88/10/27	380.0000	UMOHS/L
	PH	88/02/25	8.2000	UNITS
		88/04/05	8.2000	UNITS
		88/06/03	8.2000	UNITS
		88/08/09	8.7000	UNITS
		88/08/31	8.0000	UNITS
		88/09/30	8.4000	UNITS
		88/10/27	8.2000	UNITS
	SOLIDS-SUSPENDED	88/02/25	4.0000	MG/L
		88/04/05	7.0000	MG/L
		88/06/03	8.0000	MG/L
		88/08/09	19.0000	MG/L
		88/08/31	936.0000	MG/L
		88/09/30	5.0000	MG/L
		88/10/27	4.0000	MG/L
	SOLIDS-TOTAL DISSOLVED	88/02/25	220.0000	MG/L
		88/04/05	206.0000	MG/L
		88/06/03	196.0000	MG/L
		88/08/09	166.0000	MG/L
		88/08/31	164.0000	MG/L
		88/09/30	178.0000	MG/L
		88/10/27	160.0000	MG/L
	SULFATE	88/02/25	19.0000	MG/L
		88/04/05	16.0000	MG/L
		88/06/03	17.0000	MG/L
		88/08/09	17.0000	MG/L
		88/08/31	16.0000	MG/L
		88/09/30	13.0000	MG/L
		88/10/27	18.0000	MG/L

WATER QUALITY
HUNTINGTON CREEK
1988

LOCATION	PARAMETER	TEST_DATECODE	VALUE	UNITS
UPL9	CONDUCTIVITY	88/03/23	550.0000	UMOHS/L
		88/06/28	480.0000	UMOHS/L
		88/09/27	520.0000	UMOHS/L
		88/11/03	760.0000	UMOHS/L
	PH	88/03/23	8.0000	UNITS
		88/06/28	8.3000	UNITS
		88/09/27	8.2000	UNITS
		88/11/03	8.2000	UNITS
	SOLIDS-SUSPENDED	88/03/23	16.0000	MG/L
		88/06/28	31.0000	MG/L
		88/09/27	8.0000	MG/L
		88/11/03	4.0000	MG/L
	SOLIDS-TOTAL DISSOLVED	88/03/23	362.0000	MG/L
		88/06/28	312.0000	MG/L
		88/09/27	346.0000	MG/L
		88/11/03	495.0000	MG/L
	SULFATE	88/03/23	102.0000	MG/L
		88/06/28	28.0000	MG/L
		88/09/27	40.0000	MG/L
		88/11/03	75.0000	MG/L

WATER QUALITY
HUNTINGTON CREEK
1988

LOCATION	PARAMETER	TEST_DATECODE	VALUE	UNITS
H1	CONDUCTIVITY	88/03/23	440.0000	UMOHS/L
		88/06/28	357.0000	UMOHS/L
		88/09/27	320.0000	UMOHS/L
		88/11/03	990.0000	UMOHS/L
	PH	88/03/23	8.2000	UNITS
		88/06/28	8.4000	UNITS
		88/09/27	8.2000	UNITS
		88/11/03	8.1000	UNITS
	SOLIDS-SUSPENDED	88/03/23	10.0000	MG/L
		88/06/28	22.0000	MG/L
		88/09/27	8.0000	MG/L
		88/11/03	1.0000	MG/L
	SOLIDS-TOTAL DISSOLVED	88/03/23	281.0000	MG/L
		88/06/28	380.0000	MG/L
		88/09/27	210.0000	MG/L
		88/11/03	647.0000	MG/L
	SULFATE	88/03/23	60.0000	MG/L
		88/06/28	125.0000	MG/L
		88/09/27	14.0000	MG/L
		88/11/03	143.0000	MG/L

HUNTINGTON CREEK
1988

PARAMETER	LOCATION H1 AVE VALUE	H1 MIN VALUE	H1 MAX VALUE	UPL9 AVE VALUE	UPL9 MIN VALUE	UPL9 MAX VALUE
CONDUCTIVITY	526.7500	320.0000	990.0000	577.5000	480.0000	760.0000
PH	8.2250	8.1000	8.4000	8.1750	8.0000	8.3000
SOLIDS-SUSPENDED	10.2500	1.0000	22.0000	14.7500	4.0000	31.0000
SOLIDS-TOTAL DISSOLVED	379.5000	210.0000	647.0000	378.7500	312.0000	495.0000
SULFATE	85.5000	14.0000	143.0000	61.2500	28.0000	102.0000

WATER QUALITY
HUNTINGTON CREEK
1988

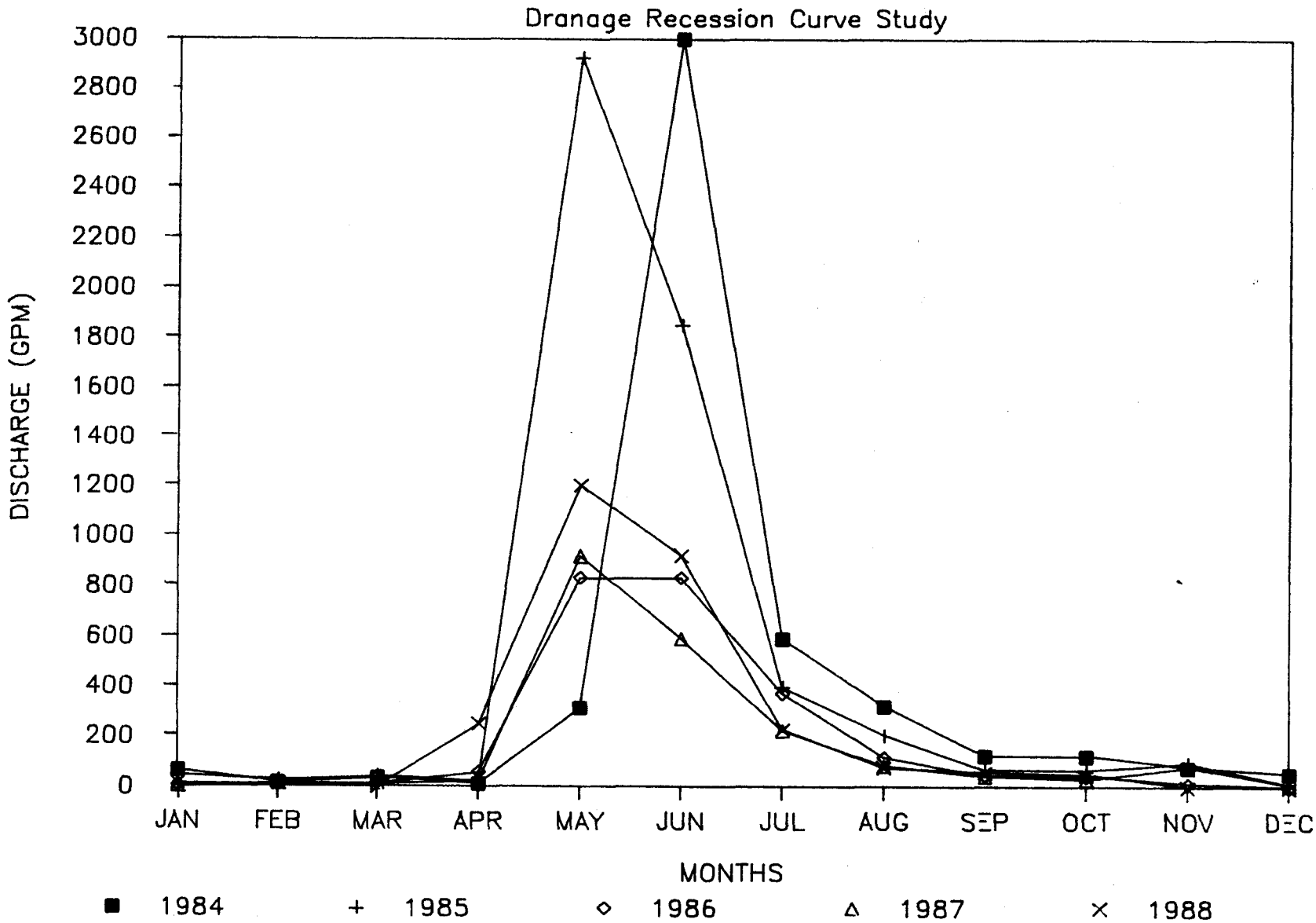
LOCATION	PARAMETER	TEST_DATECODE	VALUE	UNITS
UPL1	CONDUCTIVITY	88/02/25	437.0000	UMOHS/L
		88/04/05	320.0000	UMOHS/L
		88/06/03	313.0000	UMOHS/L
		88/08/09	294.0000	UMOHS/L
		88/08/31	304.0000	UMOHS/L
		88/09/30	349.0000	UMOHS/L
		88/10/27	417.0000	UMOHS/L
		88/12/21	404.0000	UMOHS/L
	PH	88/02/25	7.7000	UNITS
		88/04/05	7.9000	UNITS
		88/06/03	8.4000	UNITS
		88/08/09	8.2000	UNITS
		88/08/31	8.0500	UNITS
		88/09/30	8.2000	UNITS
		88/10/27	7.6000	UNITS
		88/12/21	8.1500	UNITS
	SOLIDS-SUSPENDED	88/02/25	4.0000	MG/L
		88/04/05	67.0000	MG/L
		88/06/03	21.0000	MG/L
		88/08/09	12.0000	MG/L
		88/08/31	55.0000	MG/L
		88/09/30	2.0000	MG/L
		88/10/27	8.0000	MG/L
		88/12/21(	1.0000	MG/L
	SOLIDS-TOTAL DISSOLVED	88/02/25	256.0000	MG/L
		88/04/05	202.0000	MG/L
		88/06/03	170.0000	MG/L
		88/08/09	136.0000	MG/L
		88/08/31	114.0000	MG/L
		88/09/30	226.0000	MG/L
		88/10/27	190.0000	MG/L
		88/12/21	236.0000	MG/L
	SULFATE	88/02/25	17.0000	MG/L
		88/04/05	12.0000	MG/L
		88/06/03	5.0000	MG/L
		88/08/09	5.0000	MG/L
		88/08/31	7.0000	MG/L
		88/09/30	10.0000	MG/L
		88/10/27	31.0000	MG/L
		88/12/21	13.0000	MG/L

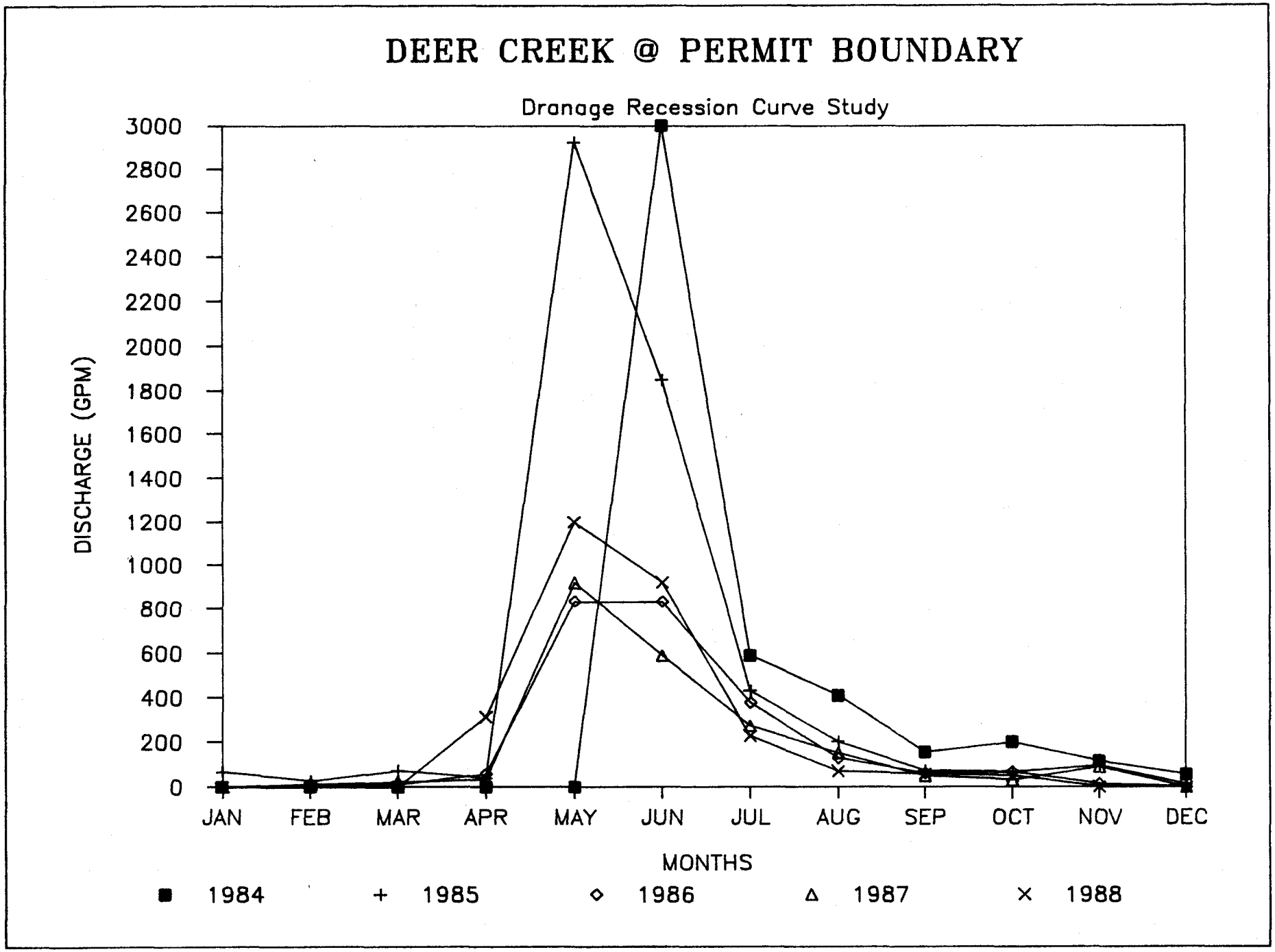
HUNTINGTON CREEK
1988

PARAMETER	LOCATION UPL1 AVE VALUE	UPL1 MIN VALUE	UPL1 MAX VALUE	UPL2 AVE VALUE	UPL2 MIN VALUE	UPL2 MAX VALUE
CONDUCTIVITY	354.7500	294.0000	437.0000	341.0000	276.0000	418.0000
PH	8.0250	7.6000	8.4000	8.2714	8.0000	8.7000
SOLIDS-SUSPENDED	21.2500	1.0000	67.0000	140.4285	4.0000	936.0000
SOLIDS-TOTAL DISSOLVED	191.2500	114.0000	256.0000	184.2857	160.0000	220.0000
SULFATE	12.5000	5.0000	31.0000	16.5714	13.0000	19.0000

APPENDIX B

DEER CREEK ABOVE MINE




DEER CREEK @ PERMIT BOUNDARY
Dronage 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

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

CE 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

January 28,1988

Job No.: 9101

Date Rec'd: January 22, 1988

Date Sampled: January 21, 1988

Sampled By: UP&L

Sample ID:

DEER CREEK
Above the Mine
Temp 32
Flow 12.6 gpm
Time Sampled 2:20 p.m. hr.
Time Rec'd 2:20 p.m. hr.

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

WATER ANALYSIS

Acidity 01/22/88	51 mg/l CaCO3	Magnesium 01/27/88	80.50 mg/l
Alk., Bicarbonate 01/22/88	397 mg/l HCO3	Manganese 01/28/88	<0.01 mg/l
Alk., Carbonate 01/22/88	<1 mg/l CaCO3	Oil and Grease 01/26/88	<1.0 mg/l
Anions, Total	14.10 meq/l	Oxygen, Dissolved 01/22/88	5.8 mg/l
Calcium 01/28/88	107.2 mg/l	pH 01/22/88	8.24 Units
Cations, Total	14.58 meq/l	Potassium 01/27/88	3.30 mg/l
Chloride 01/28/88	138.0 mg/l	Sodium 01/28/88	59.00 mg/l
Conductivity 01/22/88	1300 umhos/cm	Solids, Dissolved 01/26/88	663.0 mg/l
Hardness, Total	599 mg/l CaCO3	Solids, Setteable 01/22/88	<1.0 mg/l
Iron 01/26/88	0.05 mg/l	Solids, Suspended 01/26/88	19.0 mg/l
Iron, Dissolved 01/26/88	<0.05 mg/l	Sulfate 01/26/88	185.0 mg/l

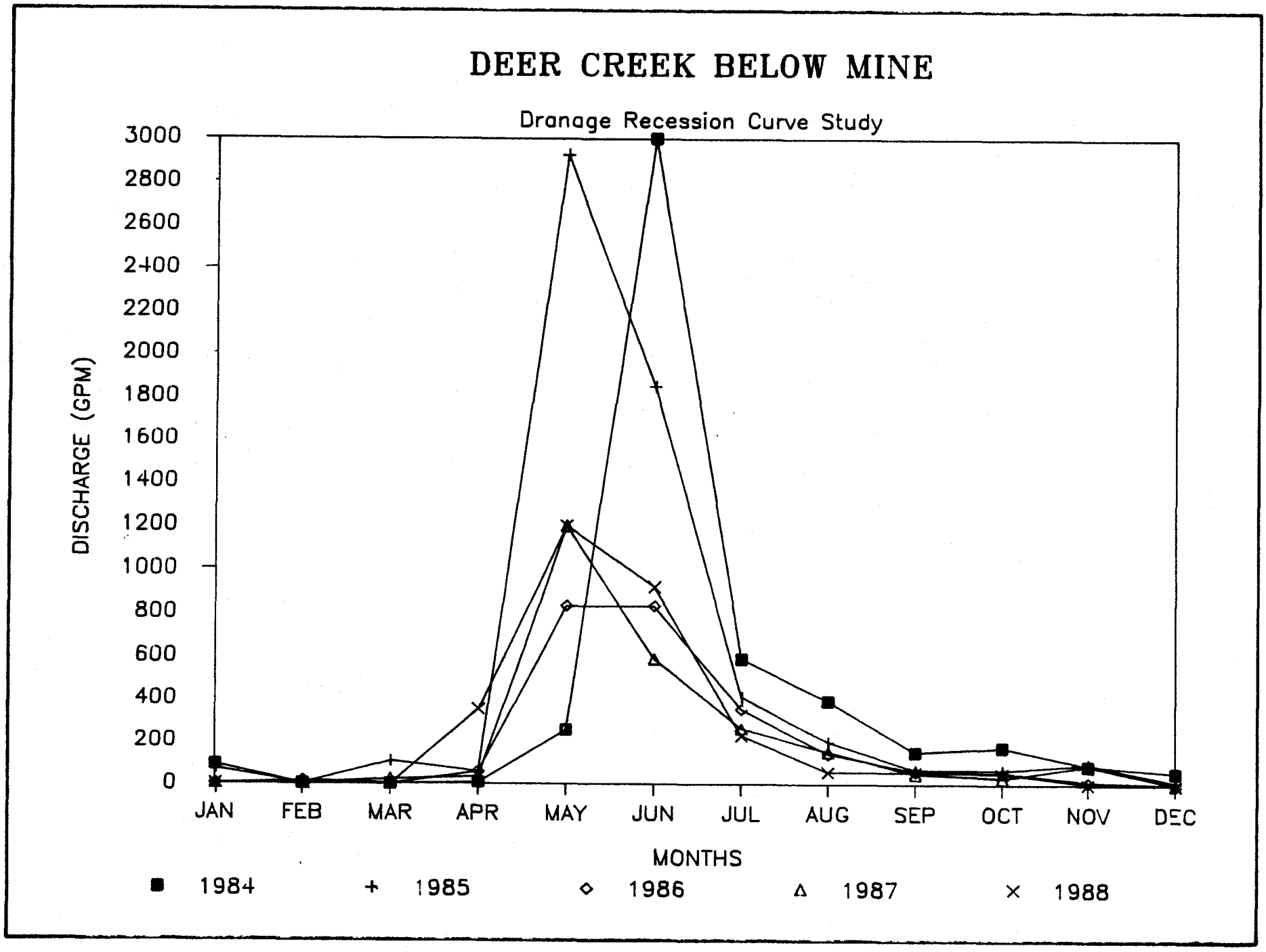
RECEIVED
JAN 29 1988
MINING DIV.
FIELD OFFICE

ANALYST: D. Igoe

Respectfully submitted,
COMMERCIAL TESTING & ENGINEERING CO.

Manager, Huntington Laboratory

Original Copy Watermarked
For Your Protection


DEER CREEK BELOW MINE
Dranage 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

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

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

June 15, 1988

Job No.: 9274

Date Rec'd: June 7, 1988

Date Sampled: June 7, 1988

Sampled By: UP&L

Sample ID:

DEER CREEK RUN OFF
Above the Mine
Temp 42
Flow 921.2 gpm
Time Sampled 11:00 hr.
Time Rec'd 3:30 p.m. hr.

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

RECEIVED
JUN 15 1988
MINING DIV.
FIELD OFFICE

WATER ANALYSIS

Acidity 06/08/88	13	mg/l CaCO3 14:30 hr.	Magnesium 06/13/88	24.80	mg/l 13:15 hr.
Alk., Bicarbonate 06/08/88	285	mg/l HCO3 08:30 hr.	Manganese 06/13/88	0.01<	mg/l 14:15 hr.
Alk., Carbonate 06/08/88	1<	mg/l CaCO3 08:30 hr.	Oil and Grease 06/10/88	2.6	mg/l 11:00 hr.
Anions, Total	5.19	meq/l	Oxygen, Dissolved 06/07/88	7.2	mg/l 17:00 hr.
Calcium 06/13/88	77.3	mg/l 13:00 hr.	pH 06/07/88	8.25	Units 16:30 hr.
Cations, Total	6.49	meq/l	Potassium 06/13/88	0.68	mg/l 13:30 hr.
Chloride 06/10/88	6.0	mg/l 14:30 hr.	Sodium 06/08/88	13.40	mg/l 14:00 hr.
Conductivity 06/08/88	442	umhos/cm 10:00 hr.	Solids, Dissolved 06/09/88	362.0	mg/l 10:00 hr.
Hardness, Total	295	mg/l CaCO3	Solids, Setteable 06/08/88	0.05<	mg/l 08:45 hr.
Iron 06/13/88	0.13	mg/l 14:30 hr.	Solids, Suspended 06/09/88	16.0	mg/l 10:00 hr.
Iron, Dissolved 06/13/88	0.09	mg/l 14:45 hr.	Sulfate 06/08/88	22.0	mg/l 11:15 hr.

ANALYST: D. Tyson

Respectfully submitted,
COMMERCIAL TESTING & ENGINEERING CO.

Manager, Huntington Laboratory

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

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

June 15, 1988

Job No.: 9276

Date Rec'd: June 7, 1988

Date Sampled: June 7, 1988

Sampled By: UP&L

Sample ID:

DEER CREEK
Below the Mine
Temp 58
Flow 1.6/921.2 gpm
Time Sampled 12:10 hr.
Time Rec'd 3:30 p.m. hr.

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

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WATER ANALYSIS

Acidity 06/08/88	27	mg/l CaCO3 14:30 hr.	Magnesium 06/13/88	39.20	mg/l 13:15 hr.
Alk., Bicarbonate 06/08/88	244	mg/l HCO3 08:30 hr.	Manganese 06/13/88	0.01<	mg/l 14:15 hr.
Alk., Carbonate 06/08/88	1<	mg/l CaCO3 08:30 hr.	Oil and Grease 06/10/88	3.6	mg/l 13:00 hr.
Anions, Total	8.93	meq/l	Oxygen, Dissolved 06/07/88	7.2	mg/l 17:00 hr.
Calcium 06/13/88	88.4	mg/l 13:00 hr.	pH 06/07/88	8.30	Units 16:30 hr.
Cations, Total	9.79	meq/l	Potassium 06/13/88	1.70	mg/l 13:30 hr.
Chloride 06/10/88	82.0	mg/l 14:30 hr.	Sodium 06/13/88	49.20	mg/l 14:00 hr.
Conductivity 06/08/88	800	umhos/cm 10:00 hr.	Solids, Dissolved 06/09/88	472.0	mg/l 10:00 hr.
Hardness, Total	382	mg/l CaCO3	Solids, Setteable 06/08/88	0.05 <	mg/l 09:30 hr.
Iron 06/13/88	0.12	mg/l 14:30 hr.	Solids, Suspended 06/09/88	36.0	mg/l 10:00 hr.
Iron, Dissolved 06/13/88	0.05	mg/l 14:45 hr.	Sulfate 06/08/88	130.0	mg/l 11:15 hr.

ANALYST: D. Tyson

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TELEPHONE: (801) 653-2311

September 23, 1988

Job No.: 9421

Date Rec'd: September 15, 1988

Date Sampled: September 14, 1988

Sampled By: UP&L

Sample ID:

DEER CREEK RUNOFF
Above the Mine
Temp 54
Flow 0.27/58.8 gpm
Time Sampled 15:50 hr.
Time Rec'd 09:10 hr.

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

WATER ANALYSIS

Acidity 09/15/88	4	mg/l CaCO3 14:00 hr.	Magnesium 09/19/88	34.20	mg/l 14:39 hr.
Alk., Bicarbonate 09/15/88	325	mg/l HCO3 14:30 hr.	Manganese 09/19/88	0.01<	mg/l 15:15 hr.
Alk., Carbonate 09/15/88	8	mg/l CaCO3 14:30 hr.	Oil and Grease 09/20/88	1.0<	mg/l 13:00 hr.
Anions, Total	7.37	meq/l	Oxygen, Dissolved 09/15/88	7.8	mg/l 12:30 hr.
Calcium	56.8	mg/l 13:00 hr.	pH 09/15/88	8.40	Units 11:20 hr.
Cations, Total	6.90	meq/l	Potassium 09/19/88	1.00	mg/l 14:50 hr.
Chloride 09/23/88	10.0	mg/l 09:00 hr.	Sodium 09/19/88	28.70	mg/l 14:45 hr.
Conductivity 09/15/88	700	umhos/cm 12:00 hr.	Solids, Dissolved 09/20/88	596.0	mg/l 09:30 hr.
Hardness, Total	283	mg/l CaCO3	Solids, Setteable 09/15/88	0.1<	mg/l 15:00 hr.
Iron 09/19/88	0.02<	mg/l 15:30 hr.	Solids, Suspended 09/20/88	1.0<	mg/l 09:30 hr.
Iron, Dissolved 09/19/88	0.02<	mg/l 15:30 hr.	Sulfate 09/20/88	90.0	mg/l 11:10 hr.

SEP 26 1988
MINING DIV.
FIELD OFFICE

ANALYST: D. Tipon

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

September 26, 1988

Job No.: 9419

Date Rec'd: September 15, 1988

Date Sampled: September 14, 1988

Sampled By: UP&L

Sample ID:

DEER CREEK RUNOFF
Below the Mine
Temperature 56 degrees
Flow 1400 gpm
Rec'd 910 hr.
Sampled 1620 hr

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

WATER ANALYSIS

Acidity 09/15/88	6	mg/l CaCO3	Magnesium 09/19/88	57.40	mg/l
Alk., Bicarbonate 09/15/88	306	mg/l HCO3	Manganese 09/19/88	0.06	mg/l
Alk., Carbonate 09/15/88	1<	mg/l CaCO3	Oil and Grease 09/20/88	9.0	mg/l
Anions, Total	13.50	meq/l	Oxygen, Dissolved 09/15/88	7.5	mg/l
Calcium 09/19/88	129.1	mg/l	pH 09/15/88	8.10	Units
Cations, Total	14.70	meq/l	Potassium 09/19/88	7.60	mg/l
Chloride 09/23/88	75.0	mg/l	Sodium 09/19/88	77.60	mg/l
Conductivity 09/15/88	1215	umhos/cm	Solids, Dissolved 09/20/88	862.0	mg/l
Hardness, Total	559	mg/l CaCO3	Solids, Setteable 09/15/88	1.5	mg/l
Iron 09/19/88	0.78	mg/l	Solids, Suspended 09/20/88	372.0	mg/l
Iron, Dissolved 09/19/88	0.64	mg/l	Sulfate 09/20/88	310.0	mg/l

ANALYST: D Tipon

Respectfully submitted,
COMMERCIAL TESTING & ENGINEERING CO.

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

October 24, 1988

Job No.: 9453

Date Rec'd: October 17, 1988

Date Sampled: October 17, 1988

Sampled By: UP&L

Sample ID:

DEER CREEK RUN OFF
Above the Mine
Temperature 38 degrees
Flow 0.24/48.9 gpm
Rec'd 1345 hr.
Sampled 1050 hr.

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

WATER ANALYSIS

Acidity	1<	mg/l CaCO3	14:35 hr.
10/20/88			
Alk., Bicarbonate	328	mg/l HCO3	14:35 hr.
10/20/88			
Alk., Carbonate	7	mg/l CaCO3	14:35 hr.
10/20/88			
Anions, Total	7.62	meq/l	
10/21/88			
Calcium	65.6	mg/l	13:30 hr.
10/19/88			
Cations, Total	7.68	meq/l	
Chloride	10.0	mg/l	15:00 hr.
10/20/88			
Conductivity	580	umhos/cm	16:00 hr.
10/17/88			
Hardness, Total	313	mg/l CaCO3	
Iron	0.03	mg/l	14:00 hr.
10/19/88			
Iron, Dissolved	0.03	mg/l	14:10 hr.
10/19/88			
Magnesium	36.20	mg/l	13:45 hr.
10/19/88			
Manganese	0.01<	mg/l	13:45 hr.
10/19/88			
Oil and Grease	1.0<	mg/l	14:00 hr.
10/21/88			
Oxygen, Dissolved	8.1	mg/l	14:30 hr.
10/17/88			
pH	8.50	Units	14:30 hr.
10/17/88			
Potassium	1.20	mg/l	15:10 hr.
10/19/88			
Sodium	32.60	mg/l	14:20 hr.
10/19/88			
Solids, Dissolved	376.0	mg/l	09:30 hr.
10/18/88			
Solids, Setteable	.05<	mg/l	15:00 hr.
10/17/88			
Solids, Suspended	1.0<	mg/l	09:30 hr.
10/18/88			
Sulfate	100.0	mg/l	10:20 hr.
10/21/88			

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OCT 24 1988
MINING DIV.
FIELD OFFICE

ANALYST: D. Tyson

Respectfully submitted,
COMMERCIAL TESTING & ENGINEERING CO.

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

October 24, 1988

Job No.: 9454

Date Rec'd: October 17, 1988

Date Sampled: October 17, 1988

Sampled By: UP&L

Sample ID:

DEER CREEK RUN OFF
Below the Mine
Temperature 46 degrees
Flow 0.25/52.5 gpm
Rec'd 1345 hr.
Sampled 1130 hr.

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

WATER ANALYSIS

Acidity	1<	mg/l CaCO3	Magnesium	95.10	mg/l
10/20/88		14:35 hr.	10/19/88		13;45 hr.
Alk., Bicarbonate	442	mg/l HCO3	Manganese	0.01<	mg/l
10/20/88		14:35 hr.	10/19/88		14:00 hr.
Alk., Carbonate	11	mg/l CaCO3	Oil and Grease	4.2	mg/l
10/20/88		14:35 hr.	10/21/88		15;00 hr.
Anions, Total	19.88	meq/l	Oxygen, Dissolved	7.9	mg/l
10/21/88			10/17/88		14:30 hr.
Calcium	123.6	mg/l	pH	8.40	Units
10/19/88		13:30 hr.	10/17/88		14;30 hr.
Cations, Total	20.39	meq/l	Potassium	5.60	mg/l
			10/19/88		15:10 hr.
Chloride	195.0	mg/l	Sodium	145.80	mg/l
10/20/88		15:00 hr.	10/19/88		14;20 hr.
Conductivity	1450	umhos/cm	Solids, Dissolved	1164.0	mg/l
10/17/88		16:00 hr.	10/18/88		09;30 hr.
Hardness, Total	700	mg/l CaCO3	Solids, Setteable	.05<	mg/l
			10/17/88		16;00 hr.
Iron	0.04	mg/l	Solids, Suspended	1.0<	mg/l
10/19/88		14:00 hr.	10/18/88		09;30 hr.
Iron, Dissolved	0.03	mg/l	Sulfate	350.0	mg/l
10/19/88		14:10 hr.	10/21/88		10:20 hr.

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OCT 24 1988
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FIELD OFFICE

ANALYST: D. Igpon

Respectfully submitted,
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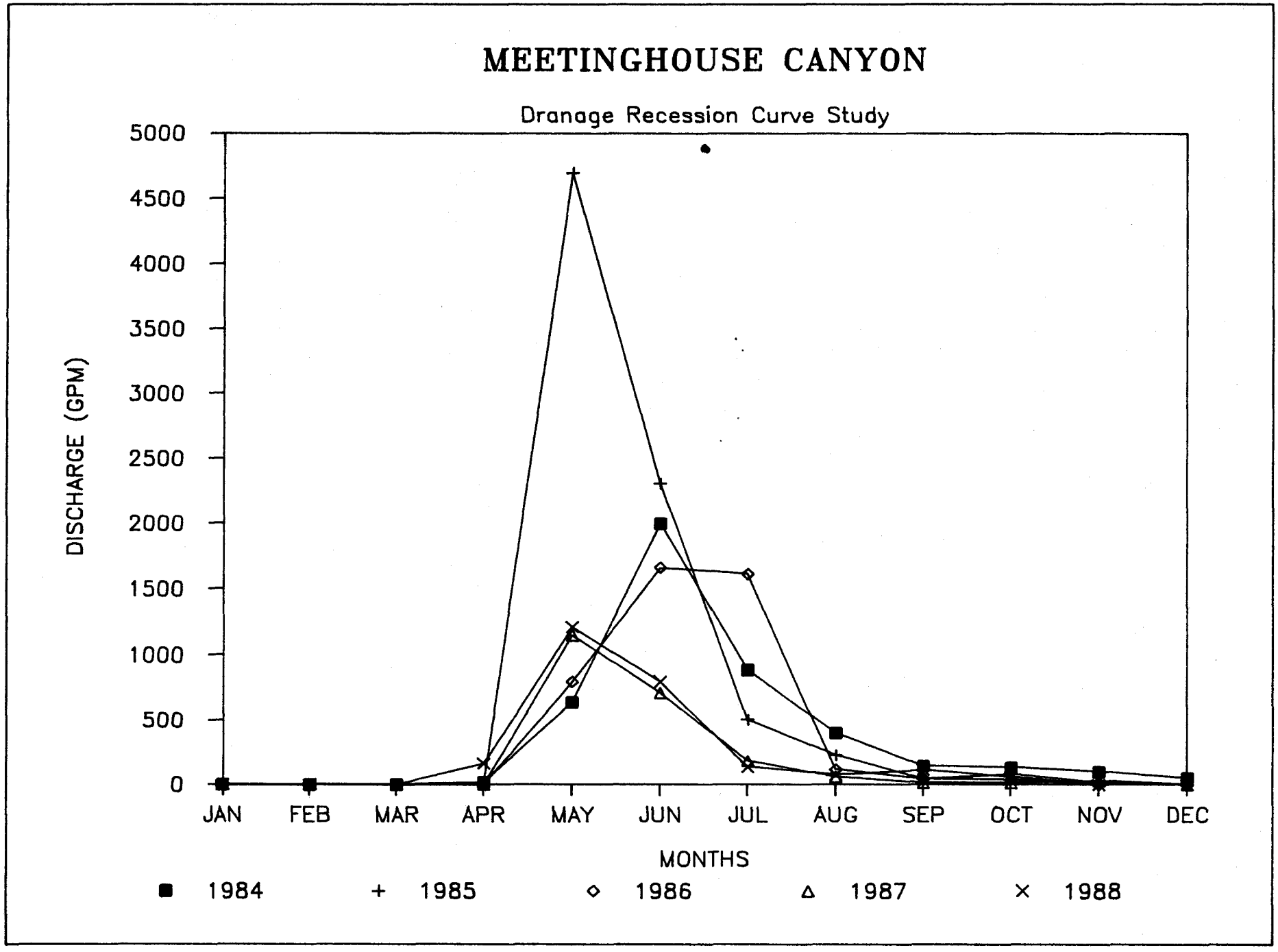
APPENDIX C


MEETINGHOUSE CANYON
Dranage Recession Curve Study
DISCHARGE (GPM)
5000
4500
4000
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

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TELEPHONE: (801) 653-2311

June 15, 1988

Job No.: 9273

Date Rec'd: June 7, 1988

Date Sampled: June 7, 1988

Sampled By: UP&L

Sample ID:

MEETING HOUSE CANYON
Temp 46
Flow 0.70/798.4 gpm
Time Sampled 10:15 hr.
Time Rec'd 3:30 p.m. hr.

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

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WATER ANALYSIS

Acidity	15	mg/l CaCO3	Magnesium	22.50	mg/l
06/08/88		14:30 hr.	06/13/88		13:15 hr.
Alk., Bicarbonate	243	mg/l HCO3	Manganese	0.01<	mg/l
06/08/88		08:30 hr.	06/13/88		14:15 hr.
Alk., Carbonate	1<	mg/l CaCO3	Oil and Grease	1.0<	mg/l
06/08/88		08:30 hr.	06/10/88		09:00 hr.
Anions, Total	4.49	meq/l	Oxygen, Dissolved	7.1	mg/l
			06/07/88		17:00 hr.
Calcium	71.1	mg/l	pH	8.10	Units
06/13/88		13:00 hr.	06/07/88		16:30 hr.
Cations, Total	5.72	meq/l	Potassium	0.96	mg/l
			06/13/88		13:30 hr.
Chloride	5.0	mg/l	Sodium	6.90	mg/l
06/10/88		14:30 hr.	06/13/88		14:00 hr.
Conductivity	380	umhos/cm	Solids, Dissolved	298.0	mg/l
06/08/88		10:00 hr.	06/09/88		10:00 hr.
Hardness, Total	270	mg/l CaCO3	Solids, Setteable	0.05<	mg/l
			06/08/88		08:45 hr.
Iron	0.27	mg/l	Solids, Suspended	26.0	mg/l
06/13/88		14:30 hr.	06/09/88		10:00 hr.
Iron, Dissolved	0.19	mg/l	Sulfate	22.0	mg/l
06/13/88		14:45 hr.	06/08/88		11:15 hr.

ANALYST: D. Tipon

Respectfully submitted,
COMMERCIAL TESTING & ENGINEERING CO.

Manager, Huntington Laboratory

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

September 21, 1988

Job No.: 9415

Date Rec'd: September 13, 1988

Date Sampled: September 13, 1988

Sampled By: UP&L

Sample ID:

Meeting House Canyon
Temperature 46 degrees
Flow 0.2/117.4 gpm
Rec'd 1625 hr.
Sampled 1230 hr.

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

WATER ANALYSIS

Acidity	13	mg/l CaCO3	09/14/88 1315 hr.
Alk., Bicarbonate	215	mg/l HCO3	09/14/88 1400 hr.
Alk., Carbonate	1<	mg/l CaCO3	09/14/88 1400 hr.
Anions, Total	5.64	meq/l	
Calcium	43.2	mg/l	09/19/88 1300 hr.
Cations, Total	4.90	meq/l	
Chloride	15.0	mg/l	09/14/88 1600 hr.
Conductivity	460	umhos/cm	09/14/88 915 hr.
Hardness, Total	222	mg/l CaCO3	
Iron	0.11	mg/l	09/19/88 1530 hr.
Iron, Dissolved	0.04	mg/l	09/19/88 1530 hr.
Magnesium	27.70	mg/l	09/19/88 1439 hr.
Manganese	0.01<	mg/l	09/19/88 1515
Oil and Grease	1.4	mg/l	09/16/88 1600 hr.
Oxygen, Dissolved	7.4	mg/l	09/13/88 1645 hr.
pH	7.80	Units	09/13/88 1625 hr.
Potassium	1.50	mg/l	09/19/88 1450 hr.
Sodium	9.90	mg/l	09/19/88 1445 hr.
Solids, Dissolved	268.0	mg/l	09/15/88 930 hr.
Solids, Setteable	0.05<	mg/l	09/14/88 830 hr.
Solids, Suspended	18.0	mg/l	09/15/88 930 hr.
Sulfate	85.0	mg/l	09/14/88 945 hr.

ANALYST: D. Tyson

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TELEPHONE: (801) 653-2311

October 24, 1988

Job No.: 9452

Date Rec'd: October 17, 1988

Date Sampled: October 17, 1988

Sampled By: UP&L

Sample ID:

MEETING HOUSE CANYON
Temperature 41 degrees
Flow 0.13/60.8 gpm
Rec'd 1345 hr.
Sampled 1025 hr.

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

WATER ANALYSIS

Acidity 10/20/88	1<	mg/l CaCO3 14:35 hr.	Magnesium 10/19/88	35.00	mg/l 13:45 hr.
Alk., Bicarbonate 10/20/88	267	mg/l HCO3 14:35 hr.	Manganese 10/19/88	0.01<	mg/l 14:00 hr.
Alk., Carbonate 10/20/88	7	mg/l CaCO3 14:35 hr.	Oil and Grease 10/21/88	1.0<	mg/l 13:00 hr.
Anions, Total 10/21/88	6.51	meq/l	Oxygen, Dissolved 10/17/88	7.9	mg/l 14:30 hr.
Calcium 10/19/88	57.6	mg/l 13:30 hr.	pH 10/17/88	8.50	Units 14:30 hr.
Cations, Total	6.33	meq/l	Potassium 10/19/88	1.50	mg/l 15:10 hr.
Chloride 10/20/88	5.0	mg/l 15:00 hr.	Sodium 10/19/88	12.50	mg/l 14:20 hr.
Conductivity 10/17/88	480	umhos/cm 16:00 hr.	Solids, Dissolved 10/18/88	304.0	mg/l 09:30 hr.
Hardness, Total	288	mg/l CaCO3	Solids, Setteable 10/17/88	.05<	mg/l 15:00 hr.
Iron 10/19/88	0.08	mg/l 14:00 hr.	Solids, Suspended 10/18/88	1.0<	mg/l 09:30 hr.
Iron, Dissolved 10/19/88	0.06	mg/l 14:10 hr.	Sulfate 10/21/88	100.0	mg/l 10:20 hr.

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ANALYST: D. Tyson

Respectfully submitted,
COMMERCIAL TESTING & ENGINEERING CO.

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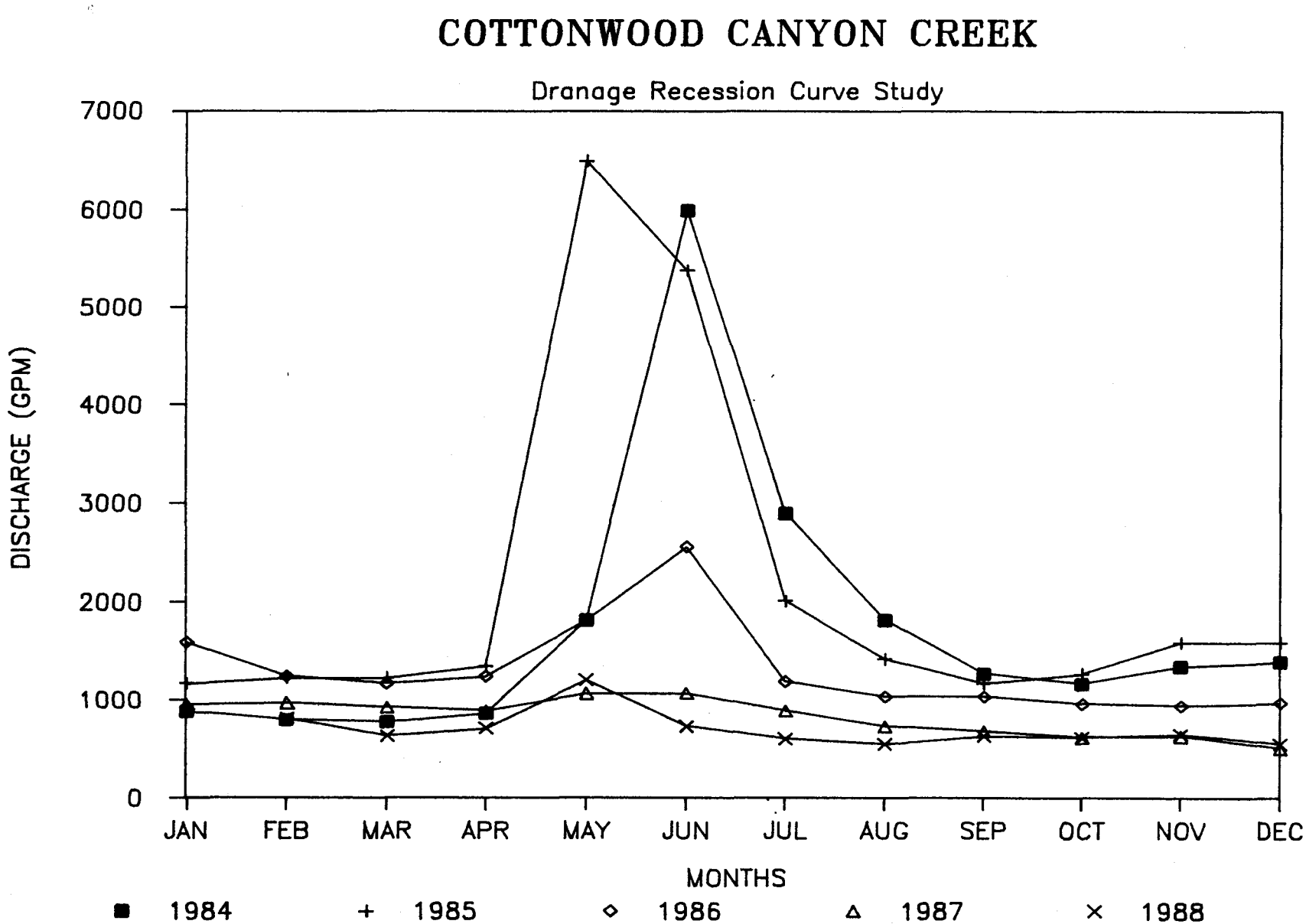
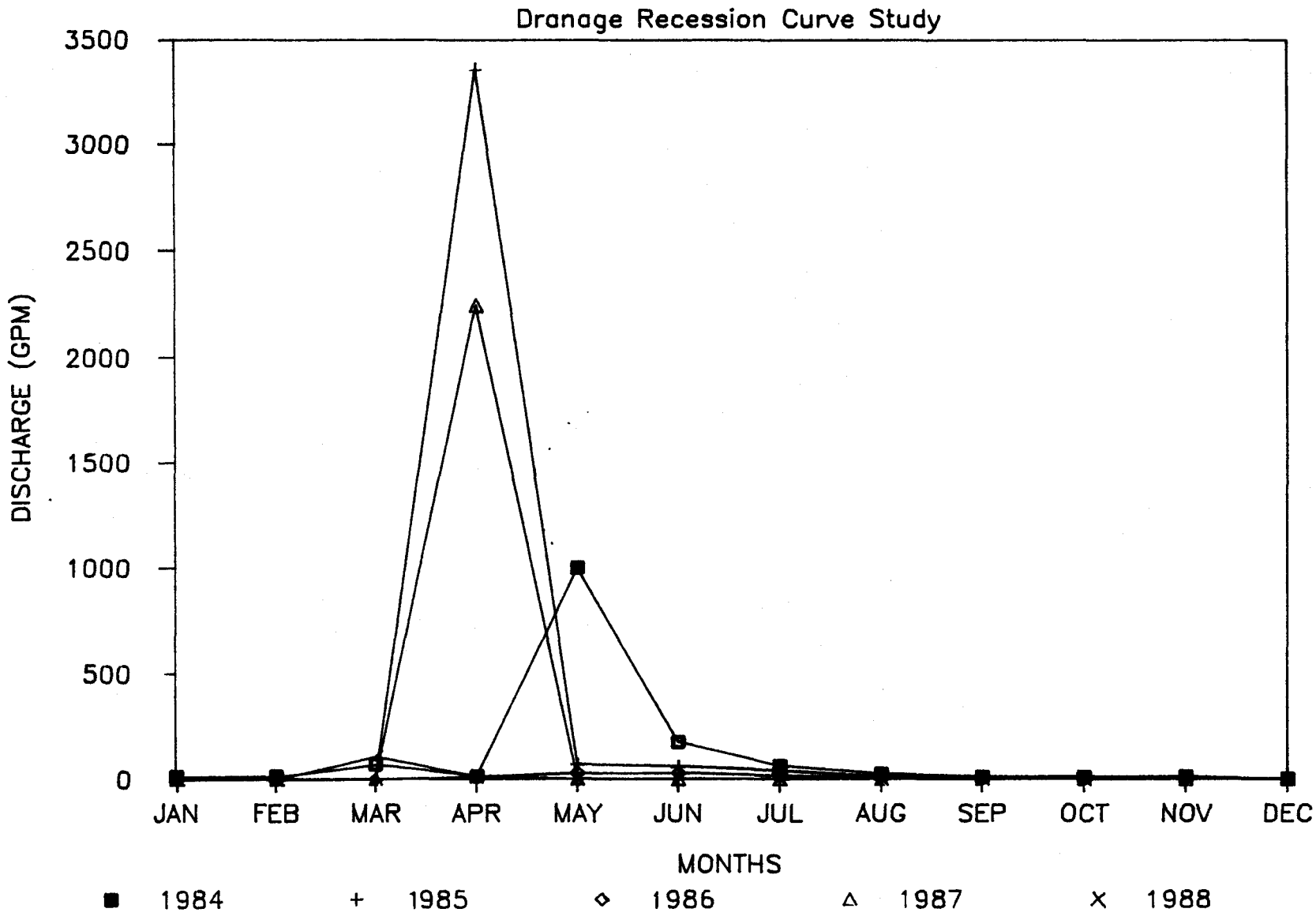
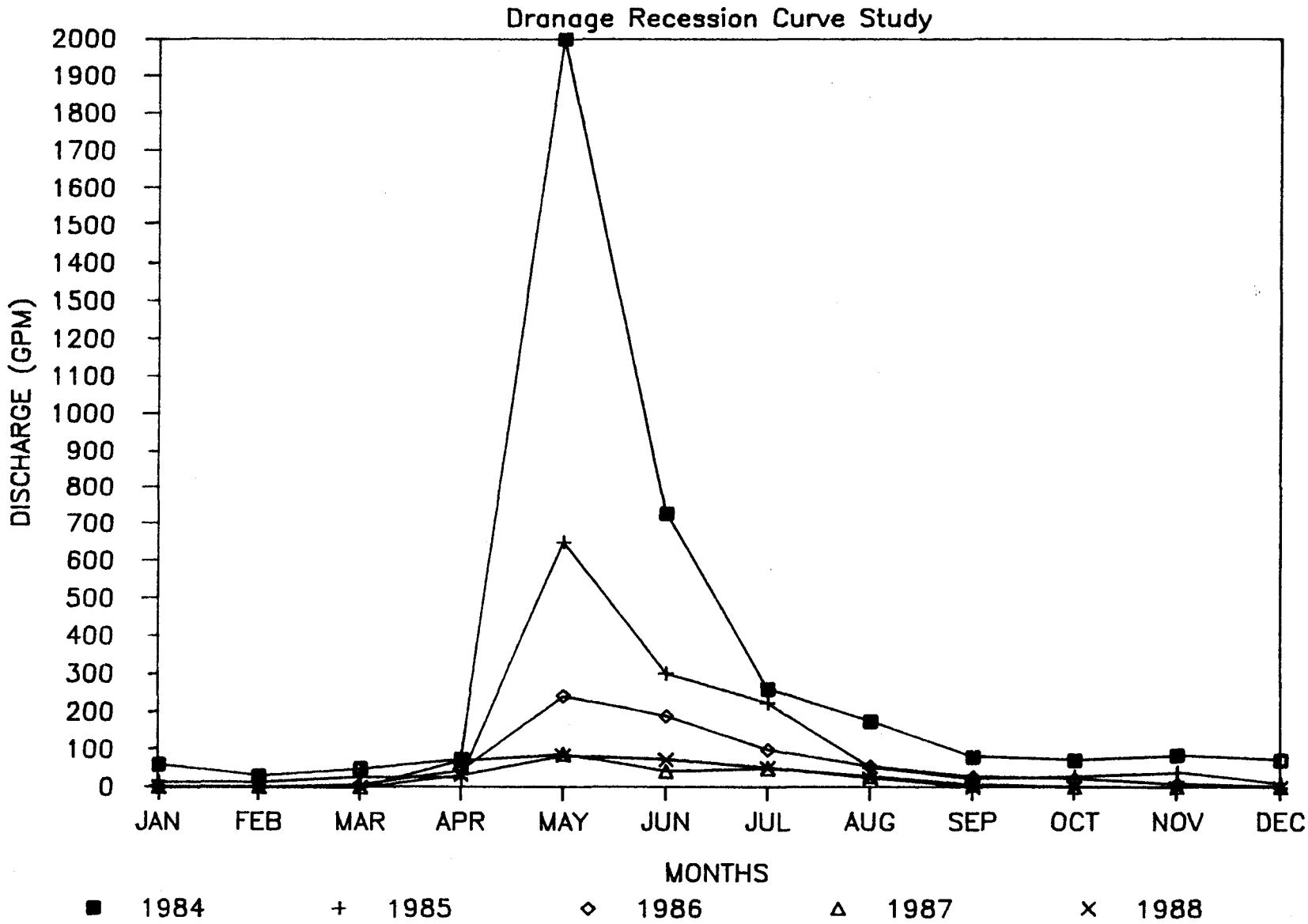
APPENDIX D

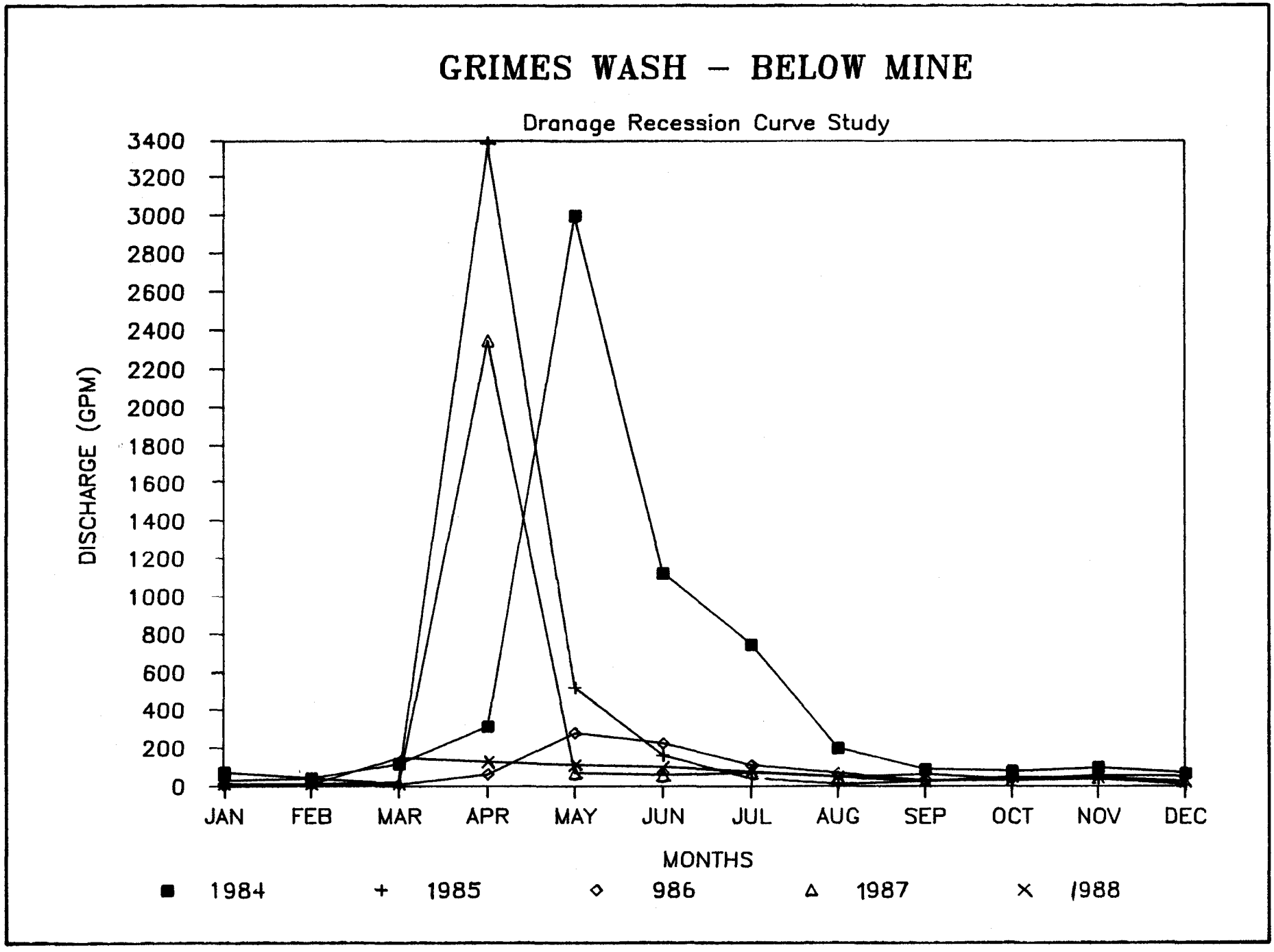

COTTONWOOD CANYON CREEK
Dranage Recession Curve Study
DISCHARGE (GPM)
7000
6000
5000
4000
3000
2000
1000
0
JAN
FEB
MAR
APR
MAY
JUN
JUL
AUG
SEP
OCT
NOV
DEC
MONTHS
1984
1985
1986
1987
1988

GRIMES WASH – RIGHT FORK ABOVE MINE



GRIMES WASH – LEFT FORK ABOVE MINE




GRIMES WASH – BELOW MINE
Dranage 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
986
1987
/988

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TELEPHONE: (801) 653-2311

January 29,1988

Job No.: 9099

Date Rec'd: January 22, 1988

Date Sampled: January 21, 1988

Sampled By: UP&L

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

Sample ID:

GRIMES WASH
Below the Mine
Temp 32 Flow 10-15 gpm.
Right Fork>No Flow
Left Fork> No Flow
Below = Mancos Seeps
Time Sampled 14:00 hr.
Time Rec'd 2:20 p.m. hr.

WATER ANALYSIS

Acidity 01/22/88	114 mg/l CaCO3	Magnesium 01/27/88	116.80 mg/l
Alk., Bicarbonate 01/22/88	398 mg/l HCO3	Manganese 01/27/88	<0.01 mg/l
Alk., Carbonate 01/22/88	<1 mg/l CaCO3	Oil and Grease 01/26/88	27.0 mg/l
Anions, Total	142.94 meq/l	Oxygen, Dissolved 01/22/88	5.1 mg/l
Calcium 01/27/88	274.0 mg/l	pH 01/22/88	8.10 Units
Cations, Total	160.39 meq/l	Potassium 01/26/88	12.50 mg/l
Chloride 01/28/88	4531.0 mg/l	Sodium 01/28/88	3181.00 mg/l
Conductivity 01/22/88	12000 umhos/cm	Solids, Dissolved 01/28/88	7160.0 mg/l
Hardness, Total	1165 mg/l CaCO3	Solids, Setteable 01/22/88	<1.0 mg/l
Iron 01/25/88	0.37 mg/l	Solids, Suspended 01/26/88	<1.0 mg/l
Iron, Dissolved 01/25/88	0.14 mg/l	Sulfate 01/25/88	462.0 mg/l

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JAN 29 1988
MINING DIV.
FIELD OFFICE

ANALYST: D. Tyson

Respectfully submitted,
COMMERCIAL TESTING & ENGINEERING CO.

Manager, Huntington Laboratory

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

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

April 4, 1988

Job No.: 9186

Date Rec'd: March 23, 1988

Date Sampled: March 23, 1988

Sampled By: UP&L

Sample ID:

GRIME'S WASH
Right Fork
Temp 36
Flow 0.40/1082
Time Sampled 12:35 hr.
Time Rec'd 4:15 p.m. hr.

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

WATER ANALYSIS

Acidity 03/25/88	39 mg/l CaCO3 15:20 hr.	Magnesium 03/29/88	10.90 mg/l 14:00 hr.
Alk., Bicarbonate 03/25/88	112 mg/l HCO3 15:45 hr.	Manganese 03/28/88	0.04 mg/l 14:30 hr.
Alk., Carbonate 03/25/88	1< mg/l CaCO3 15:45 hr.	Oil and Grease 03/31/88	9.0 mg/l 13:30 hr.
Anions, Total	3.10 meq/l	Oxygen, Dissolved 03/23/88	9.7 mg/l 17:00 hr.
Calcium 03/28/88	43.8 mg/l 14:10 hr.	pH 03/23/88	8.22 Units 16:45 hr.
Cations, Total	3.30 meq/l	Potassium 03/28/88	5.20 mg/l 14:45 hr.
Chloride 03/24/88	26.4 mg/l 14:30 hr.	Sodium 03/28/88	1.85 mg/l 14:00 hr.
Conductivity 03/25/88	225 umhos/cm 14:00 hr.	Solids, Dissolved 03/24/88	196.0 mg/l 09:30 hr.
Hardness, Total	154 mg/l CaCO3	Solids, Setteable 03/24/88	1.0< mg/l 09:00 hr.
Iron 03/29/88	0.78 mg/l 14:30 hr.	Solids, Suspended 03/29/88	8.0 mg/l 14:00 hr.
Iron, Dissolved 03/29/88	0.61 mg/l 14:45 hr.	Sulfate 03/29/88	27.0 mg/l 09:30 hr.

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ANALYST: M M

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

April 4, 1988

Job No.: 9184

Date Rec'd: March 23, 1988

Date Sampled: March 23, 1988

Sampled By: UP&L

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

Sample ID:

WILBERG MINE
Below the Mine
Temp 38
Flow ~~108.2~~ gpm /50
Staff Gage .05'
Time Sampled 12:00 hr.
Time Rec'd 4:15 p.m. hr.

WATER ANALYSIS

Acidity	53 mg/l CaCO3	03/25/88 15:20 p.m. hr.
Alk., Bicarbonate	205 mg/l HCO3	03/25/88 15:45 hr.
Alk., Carbonate	1< mg/l CaCO3	03/25/88 15:45 hr.
Alk., Total	168 mg/l CaCO3	03/25/88 15:45 hr.
Anions, Total	13.99 meq/l	
Calcium	91.5 mg/l	03/28/88 14:10 hr.
Cations, Total	14.37 meq/l	
Chloride	281.5 mg/l	03/31/88 14:40 hr.
Conductivity	1300 umhos/cm	03/25/88 14:00 hr.
Hardness, Total	356 mg/l CaCO3	
Iron	0.51 mg/l	03/29/88 14:30 hr.
Iron, Dissolved	0.48 mg/l	03/29/88 14:45 hr.
Magnesium	30.90 mg/l	03/29/88 14:00 hr.
Manganese	0.05 mg/l	03/28/88 14:30 hr.
Oil and Grease	13.6 mg/l	03/31/88 13:00 hr.
Oxygen, Dissolved	8.6 mg/l	03/23/88 17:00 hr.
pH	7.73 Units	03/23/88 16:45 hr.
Potassium	0.48 mg/l	03/28/88 14:45 hr.
Sodium	168.50 mg/l	03/28/88 14:00 hr.
Solids, Dissolved	673.0 mg/l	03/30/88 09:30 hr.
Solids, Setteable	1.0< mg/l	03/24/88 09:00 hr.
Solids, Suspended	32.0 mg/l	03/29/88 14:00 hr.
Sulfate	135.0 mg/l	03/29/88 09:30 hr.

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M M

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

June 15, 1988

Job No.: 9277

Date Rec'd: June 7, 1988

Date Sampled: June 7, 1988

Sampled By: UP&L

Sample ID:

WILBERG MINE- LEFT FORK
Run Off
Temp 56
Flow 0.20/72.7 gpm
Time Sampled 13:40 hr.
Time Rec'd 3:30 p.m. hr.

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

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WATER ANALYSIS

Acidity	34	mg/l CaCO3	Magnesium	38.50	mg/l
06/08/88		14:30 hr.	06/13/88		13:15 hr
Alk., Bicarbonate	312	mg/l HCO3	Manganese	0.01<	mg/l
06/08/88		08:30 hr.	06/13/88		14:15 hr
Alk., Carbonate	1<	mg/l CaCO3	Oil and Grease	2.0	mg/l
06/08/88		08:30 hr.	06/10/88		13:45 hr
Anions, Total	7.48	meq/l	Oxygen, Dissolved	7.0	mg/l
			06/07/88		17:00 hr
Calcium	71.5	mg/l	pH	8.40	Units
06/13/88		13:00 hr.	06/07/88		16:30 hr
Cations, Total	7.80	meq/l	Potassium	1.18	mg/l
			06/13/88		13:30 hr
Chloride	10.0	mg/l	Sodium	24.20	mg/l
06/10/88		14:30 hr.	06/13/88		14:00 hr
Conductivity	600	umhos/cm	Solids, Dissolved	428.0	mg/l
06/08/88		10:00 hr.	06/09/88		10:00 hr
Hardness, Total	337	mg/l CaCO3	Solids, Setteable	0.05<	mg/l
			06/08/88		11:00 hr
Iron	0.02<	mg/l	Solids, Suspended	4.0	mg/l
06/13/88		14:30 hr.	06/09/88		10:00 hr
Iron, Dissolved	0.02<	mg/l	Sulfate	105.0	mg/l
06/13/88		14:45 hr.	06/08/88		11:15 hr

ANALYST: D Tyson

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COMMERCIAL TESTING & ENGINEERING CO.

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

June 15, 1988

Job No.: 9278

Date Rec'd: June 7, 1988

Date Sampled: June 7, 1988

Sampled By: UP&L

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

Sample ID:

WILBERG MINE
Run Off Below the Mine
Temp 57
Flow 100 est gpm
Time Sampled 13:50 hr.
Time Rec'd 3:30 p.m. hr.

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WATER ANALYSIS

Acidity 06/08/88	34	mg/l CaCO3 14:30 hr.	Magnesium 06/13/88	65.40	mg/l 13:15 hr
Alk., Bicarbonate 06/08/88	307	mg/l HCO3 08:30 hr.	Manganese 06/13/88	0.03	mg/l 14:15 hr
Alk., Carbonate 06/08/88	1<	mg/l CaCO3 08:30 hr.	Oil and Grease 06/10/88	6.3	mg/l 14:30 hr
Anions, Total	14.77	meq/l	Oxygen, Dissolved 06/07/88	7.8	mg/l 17:00 hr
Calcium 06/13/88	115.6	mg/l 13:00 hr.	pH 06/07/88	8.25	Units 16:30 hr
Cations, Total	14.90	meq/l	Potassium 06/13/88	3.84	mg/l 13:30 hr
Chloride 06/10/88	142.0	mg/l 14:30 hr.	Sodium 06/13/88	85.10	mg/l 14:00 hr
Conductivity 06/08/88	1200	umhos/cm 10:00 hr.	Solids, Dissolved 06/09/88	890.0	mg/l 10:00 hr
Hardness, Total	558	mg/l CaCO3	Solids, Setteable 06/08/88	0.05<	mg/l 11:00 hr
Iron 06/13/88	0.06	mg/l 14:30 hr.	Solids, Suspended 06/09/88	1.0<	mg/l 10:00 hr
Iron, Dissolved 06/13/88	0.04	mg/l 14:45 hr.	Sulfate 06/08/88	280.0	mg/l 11:15 hr

ANALYST: D. Tipon

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COMMERCIAL TESTING & ENGINEERING CO.

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TELEPHONE: (801) 653-2311

September 21, 1988

Job No.: 9414

Date Rec'd: September 13, 1988

Date Sampled: September 13, 1988

Sampled By: UP&L

Sample ID:

Grimes Wash
Below the Mine
Temperature 49 degrees
Flow 50 - 70 gpm (est)
Rec'd 1625 hr.
Sampled 1340 hr.

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

WATER ANALYSIS

Acidity	7	mg/l CaCO3	09/14/88 1315 hr.
Alk., Bicarbonate	379	mg/l HCO3	09/14/88 1400 hr.
Alk., Carbonate	1<	mg/l CaCO3	09/14/88 1400 hr.
Anions, Total	20.16	meq/l	
Calcium	138.8	mg/l	09/19/88 1300 hr.
Cations, Total	20.47	meq/l	
Chloride	205.0	mg/l	09/14/88 1600 hr.
Conductivity	1800	umhos/cm	09/14/88 915 hr.
Hardness, Total	688	mg/l CaCO3	
Iron	0.76	mg/l	09/19/88 1530 hr.
Iron, Dissolved	0.40	mg/l	09/19/88 1530 hr.
Magnesium	83.00	mg/l	09/19/88 1439 hr.
Manganese	0.01<	mg/l	09/19/88 1515 hr.
Oil and Grease	2.0	mg/l	09/16/88 1500 hr.
Oxygen, Dissolved	7.7	mg/l	09/13/88 1645 hr.
pH	7.50	Units	09/13/88 1625 hr.
Potassium	7.40	mg/l	09/19/88 1450 hr.
Sodium	152.00	mg/l	09/19/88 1445 hr.
Solids, Dissolved	1576.0	mg/l	09/15/88 930 hr.
Solids, Setteable	0.05<	mg/l	09/14/88 830 hr.
Solids, Suspended	36.0	mg/l	09/15/88 930 hr.
Sulfate	398.0	mg/l	09/14/88 945 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 21, 1988

Job No.: 9444

Date Rec'd: October 13, 1988

Date Sampled: October 12, 1988

Sampled By: UP&L

Sample ID:

WILBERG MINE RUNOFF
Temperature 52 degrees
Flow 3.5 gpm
Rec'd 930 hr.
Sampled 1105 hr.
BELOW THE MINE

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

WATER ANALYSIS

Acidity	2	mg/l CaCO3	10/17/88 945 hr.
Alk., Bicarbonate	359	mg/l HCO3	10/17/88 945 hr.
Alk., Carbonate	1<	mg/l CaCO3	10/17/88 945 hr.
Anions, Total	19.51	meq/l	
Calcium	177.7	mg/l	10/19/88 1330 hr.
Cations, Total	21.02	meq/l	
Chloride	155.0	mg/l	10/20/88 930 hr.
Conductivity	1900	umhos/cm	10/13/88 1500 hr.
Hardness, Total	774	mg/l CaCO3	
Iron	0.26	mg/l	10/19/88 1400 hr.
Iron, Dissolved	0.23	mg/l	10/19/88 1400 hr.
Magnesium	80.30	mg/l	10/19/88 1345 hr.
Manganese	0.13	mg/l	10/19/88 1400 hr.
Oil and Grease	1.2	mg/l	10/20/88 1300 hr.
Oxygen, Dissolved	7.1	mg/l	10/13/88 1400 hr.
pH	8.15	Units	10/13/88 1400 hr.
Potassium	7.40	mg/l	10/19/88 1510 hr.
Sodium	124.60	mg/l	10/19/88 1420 hr.
Solids, Dissolved	1380.0	mg/l	10/18/88 930 hr.
Solids, Setteable	0.05<	mg/l	10/13/88 1515 hr.
Solids, Suspended	1.0 <	mg/l	10/18/88 930 hr.
Sulfate	449.0	mg/l	10/18/88 1600 hr.

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

January 3, 1989

Job No.: 9500

Date Rec'd: December 15, 1988

Date Sampled: December 15, 1988

Sampled By: UP&L

Sample ID:

WILBERG RUN OFF
Below the Mine
Temperature 41 degrees
Flow 25 gpm
Rec'd 1600 hr.
Sampled 1430 hr.

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

WATER ANALYSIS

Acidity	5	mg/l CaCO3	12/21/88 1130 hr.
Alk., Bicarbonate	329	mg/l HCO3	12/21/88 1130 hr.
Alk., Carbonate	3	mg/l CaCO3	12/21/88 1130 hr.
Anions, Total	42.26	meq/l	
Calcium	144.9	mg/l	12/16/88 1300 hr.
Cations, Total	39.26	meq/l	
Chloride	1010.0	mg/l	12/21/88 0845 hr.
Conductivity	4500	umhos/cm	12/16/88 1300 hr.
Hardness, Total	671	mg/l CaCO3	
Iron	0.30	mg/l	12/28/88 1430 hr.
Iron, Dissolved	0.21	mg/l	12/28/88 1430 hr.
Magnesium	75.20	mg/l	12/28/88 1500 hr.
Manganese	0.04	mg/l	12/28/88 1445 hr.
Oil and Grease	0.6<	mg/l	12/22/88 1400 hr.
Oxygen, Dissolved	8.9	mg/l	12/15/88 1700 hr.
pH	8.25	Units	12/15/88 1700 hr.
Potassium	8.80	mg/l	12/16/88 1315 hr.
Sodium	595.70	mg/l	12/16/88 1330 hr.
Solids, Dissolved	2572.0	mg/l	12/20/88 1000 hr.
Solids, Setteable	0.05	mg/l	12/16/88 1600 hr.
Solids, Suspended	8.0	mg/l	12/20/88 1000 hr.
Sulfate	415.0	mg/l	12/21/88 1430 hr.

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ANALYST: D. Tipon

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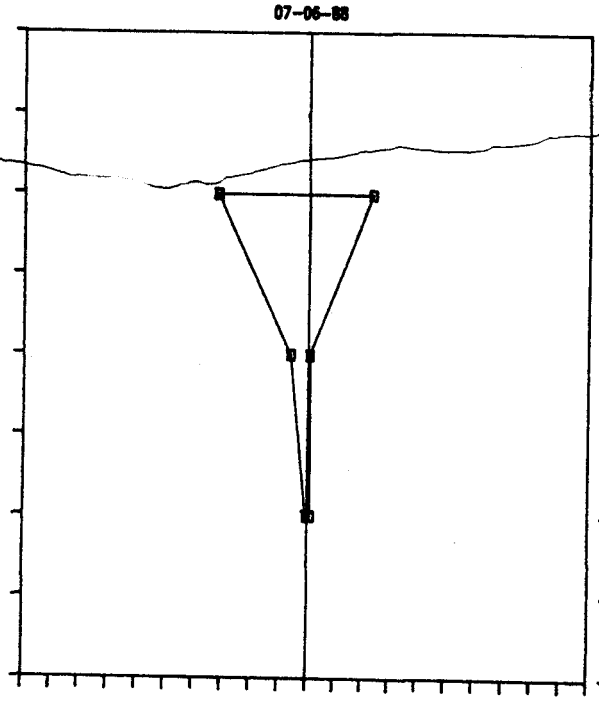
APPENDIX E

FLAGSTAFF LIMESTONE

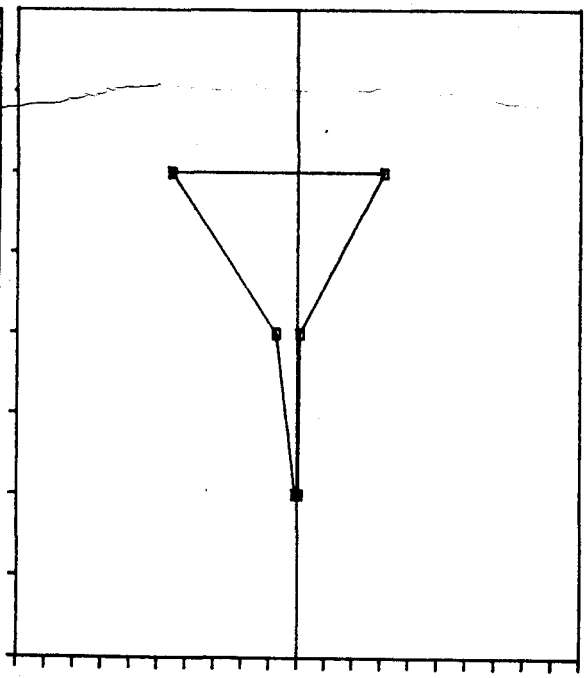
SHEBA SP.

07-06-88



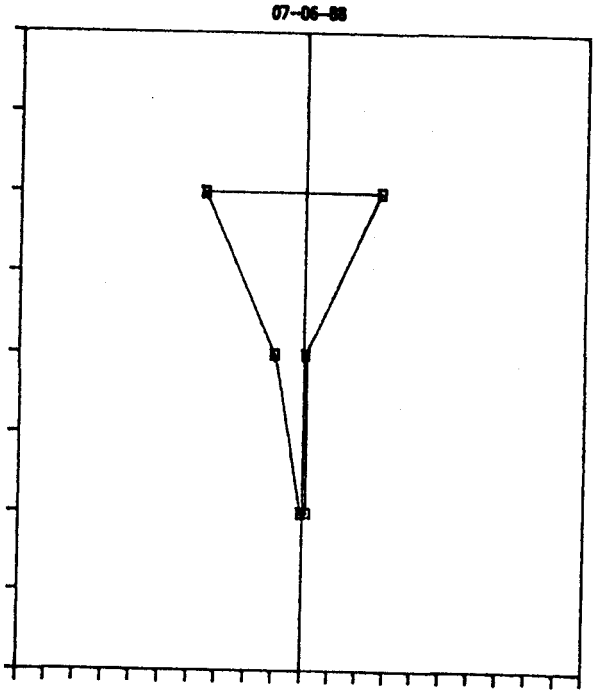
SHEBA SP.

10-20-88



79-35

07-06-88



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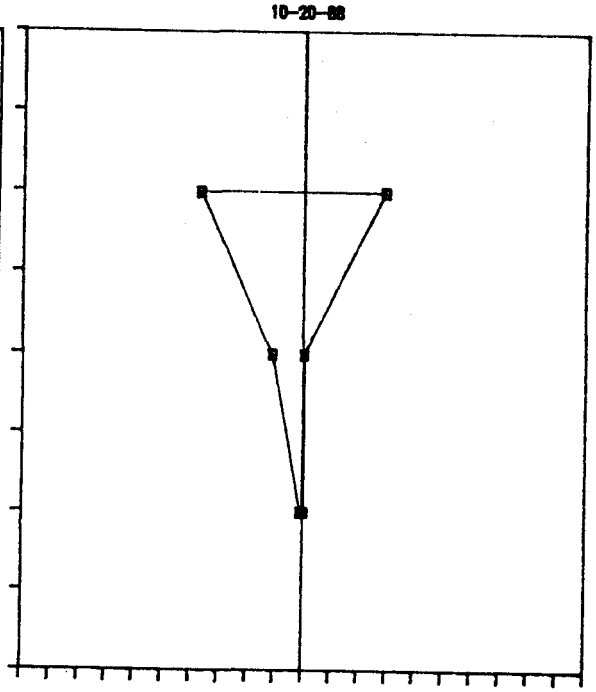
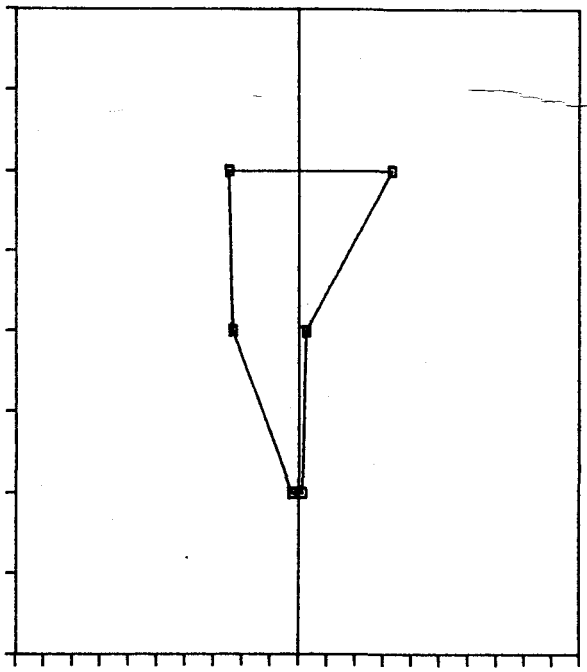
10-20-88



NORTH HORN FORMATION

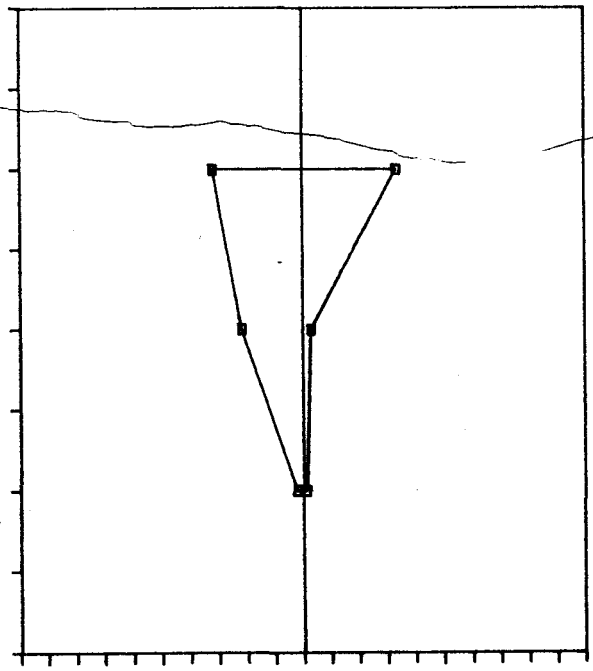
BURNT TREE

07-06-88



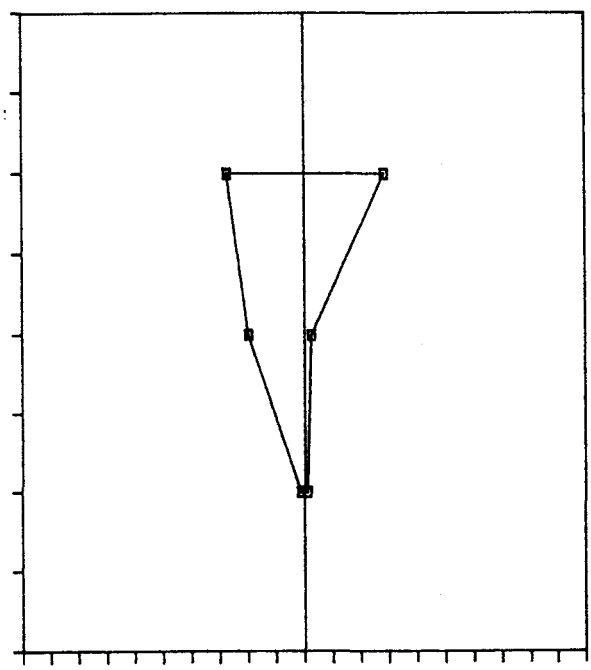
BURNT TREE

10-20-88



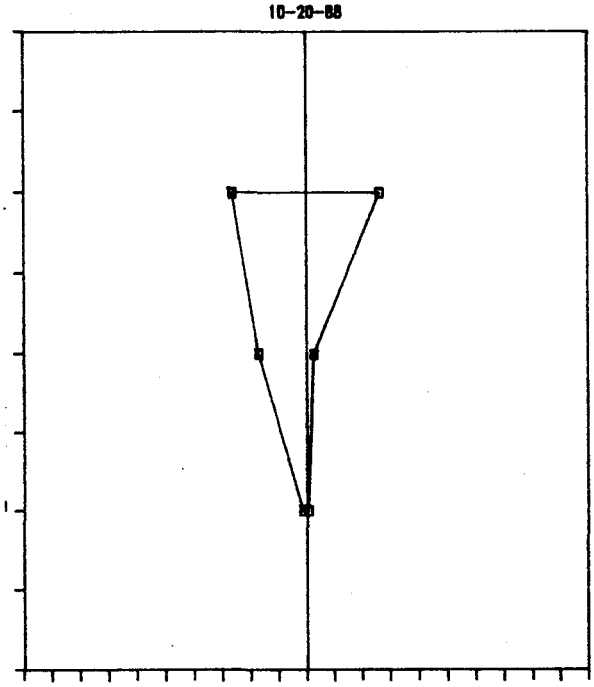
ELK SP.

07-06-88



ELK SP.

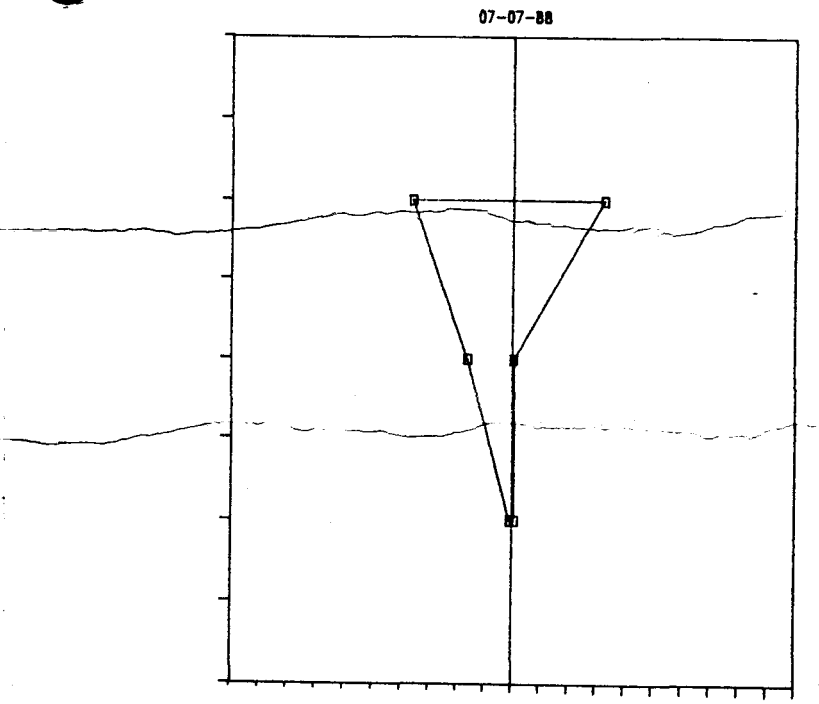
10-20-88



INCLINOMETER INFORMATION

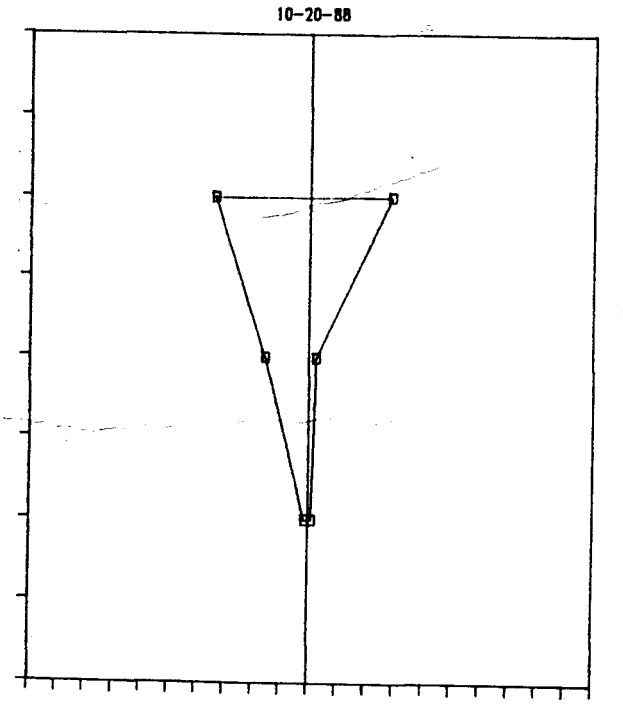
TEDS TUB

07-07-88



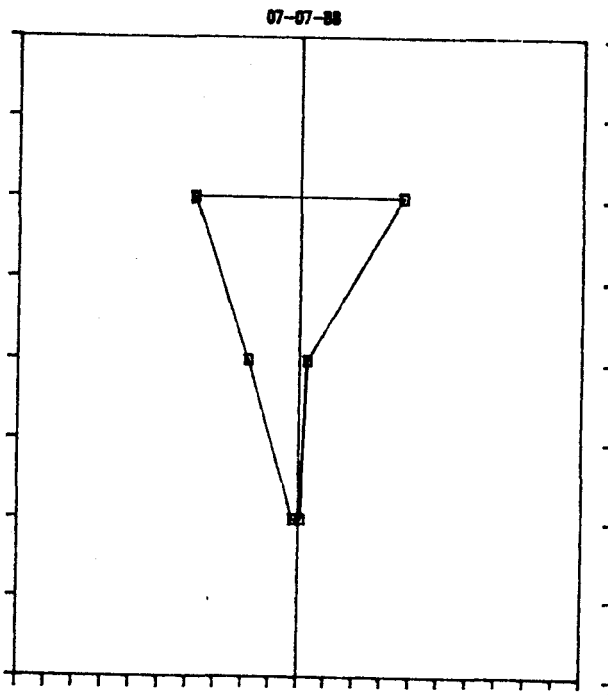
TEDS TUB

10-20-88



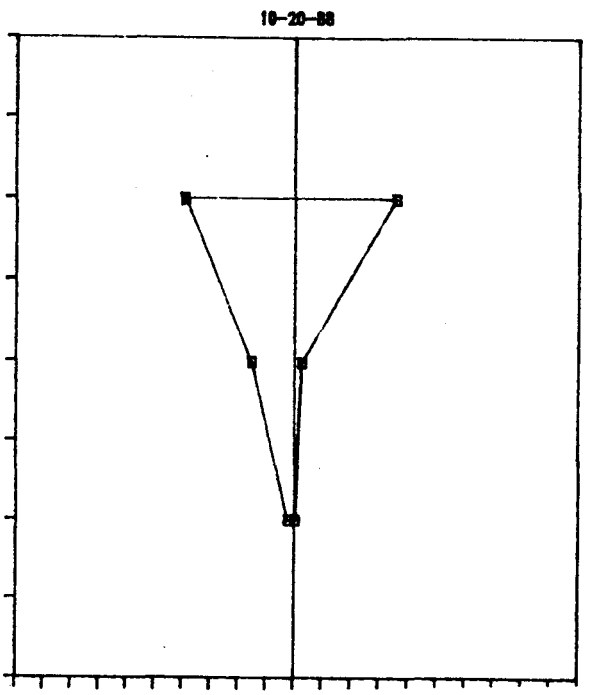
79-2

07-07-88



79-2

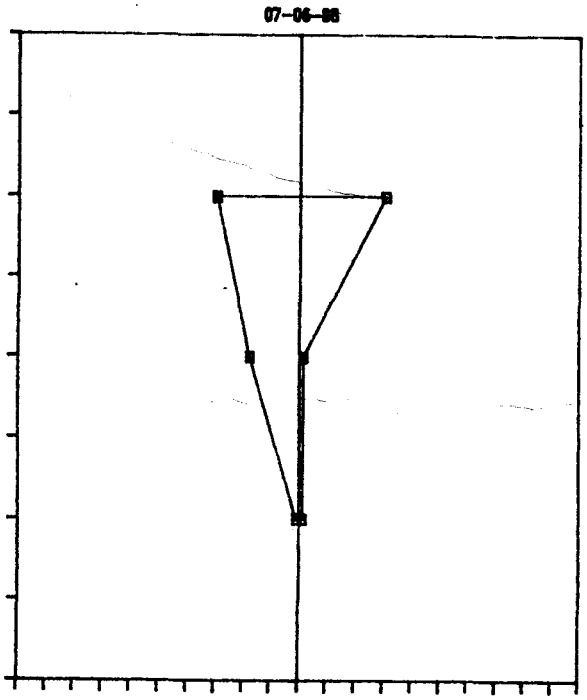
10-20-88



NORTH HORN FORMATION

79-15

07-06-88



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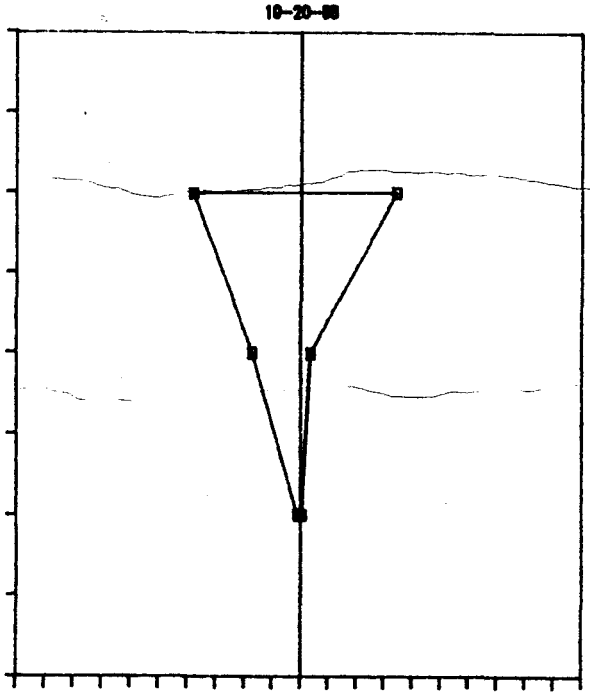

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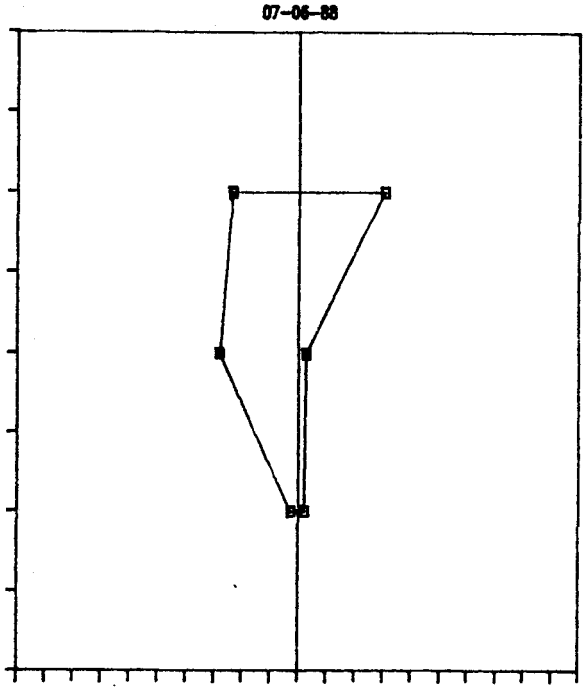

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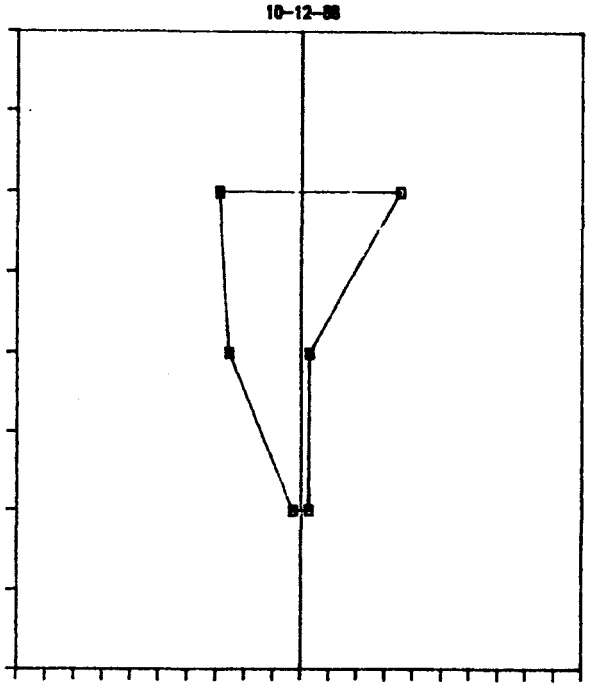

NORTH HORN FORMATION

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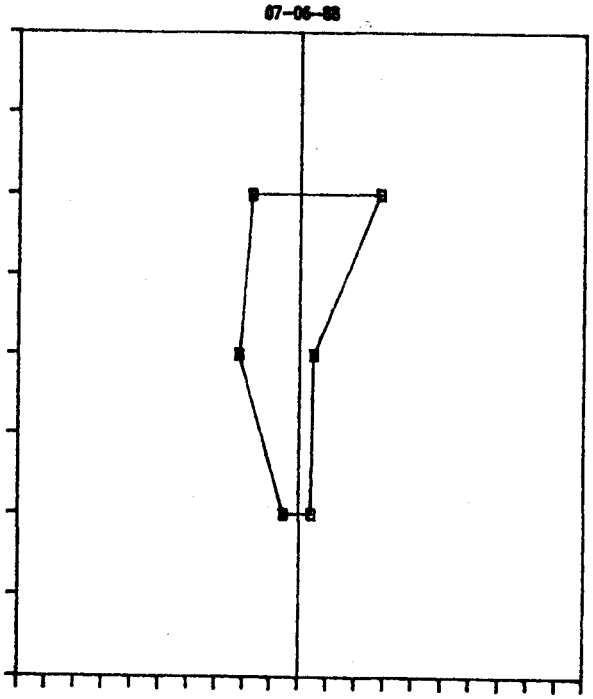
07-06-88



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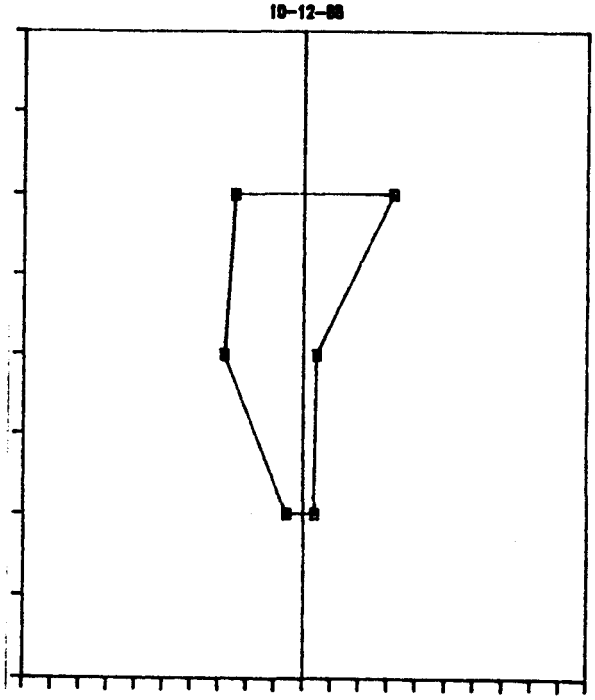

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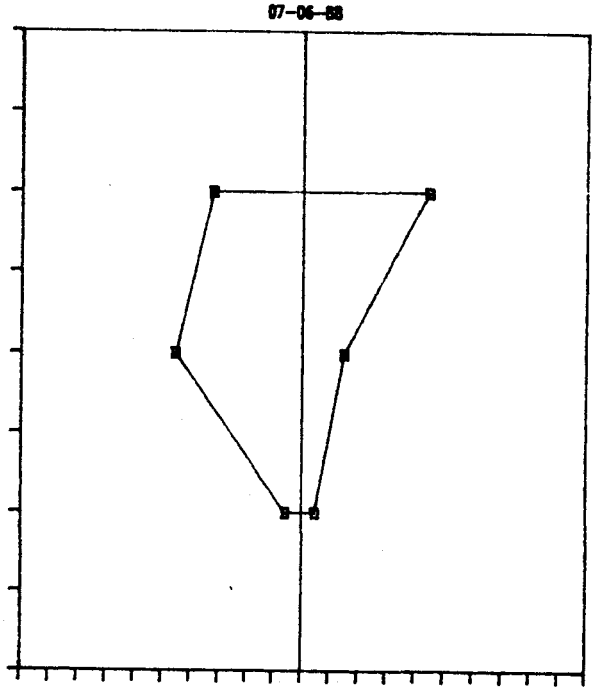

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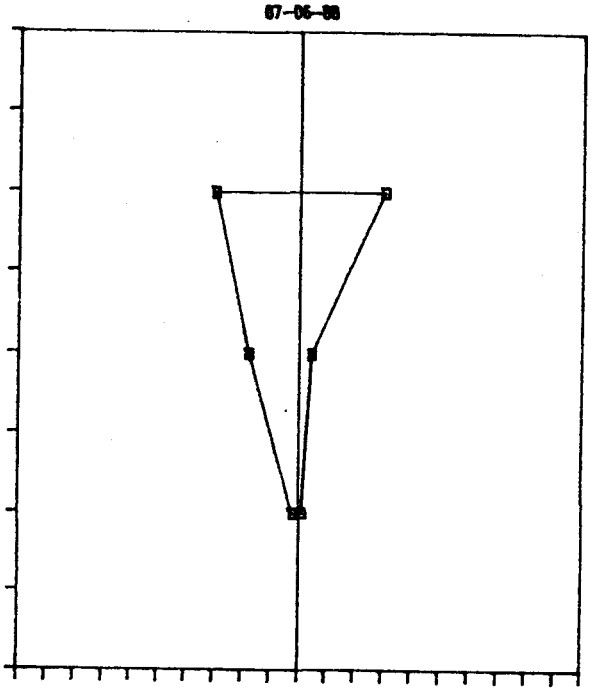
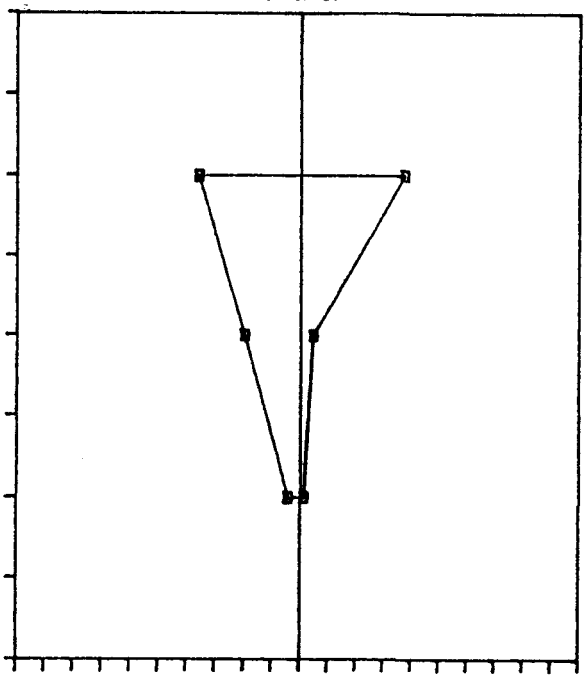


NORTH HORN FORMATION

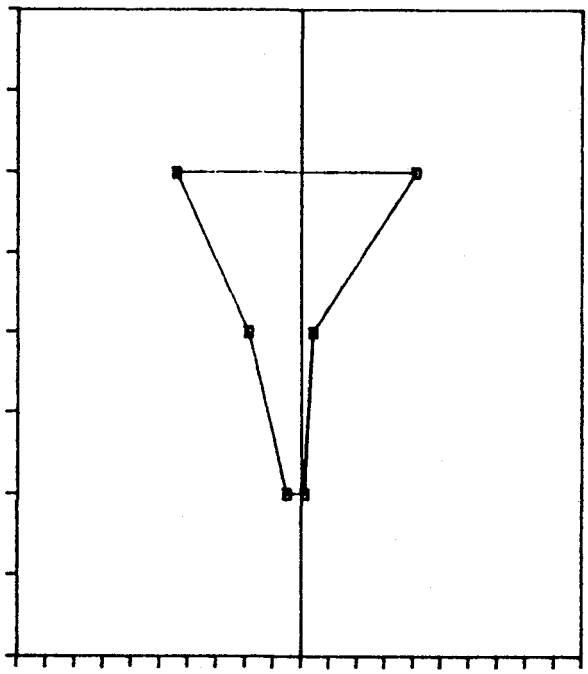
79-38

07-07-88



79-38

10-20-88



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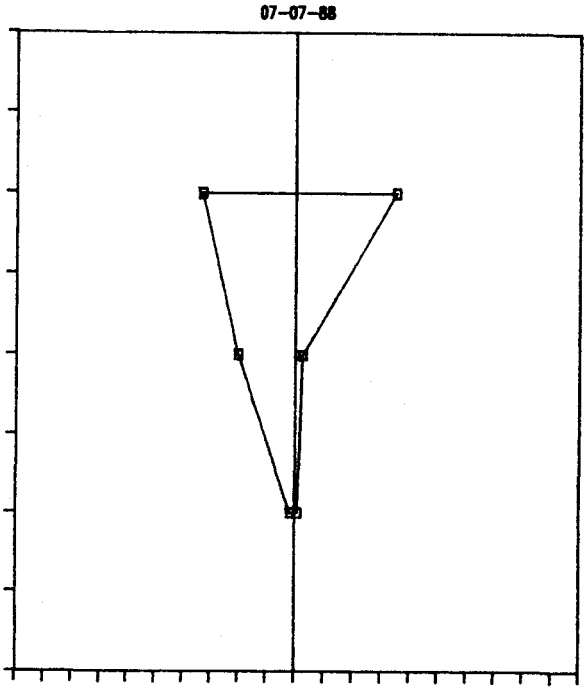
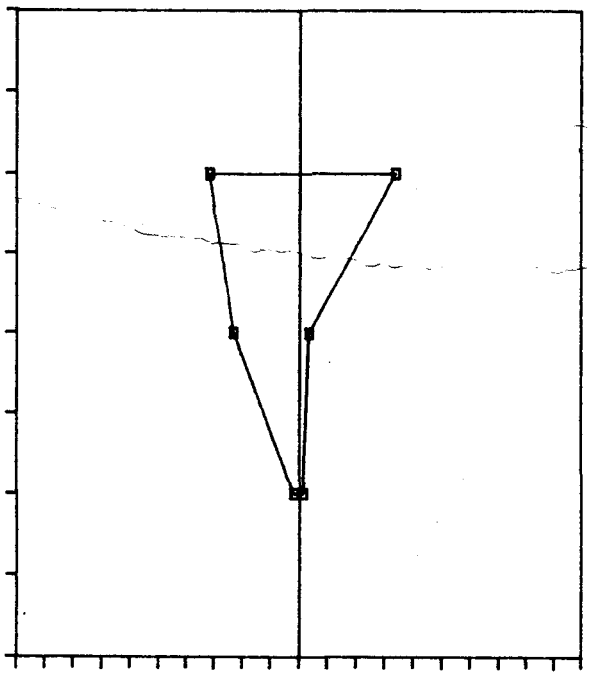


NORTH HORN FORMATION

80-46

07-07-88



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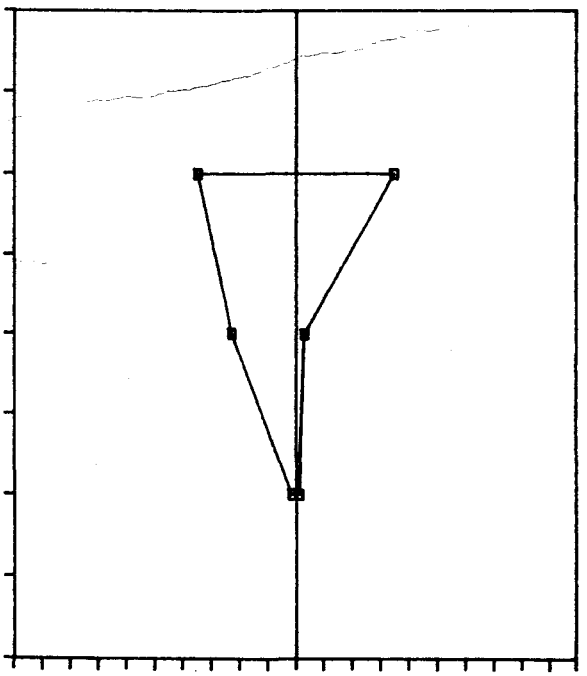

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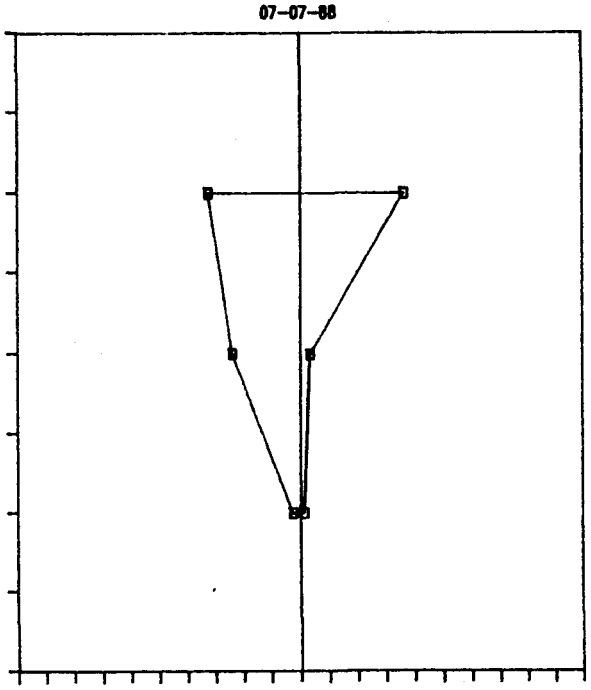

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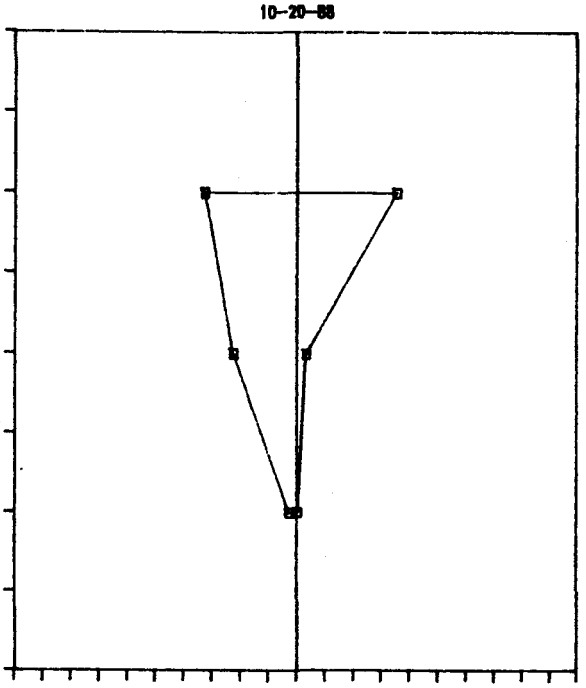
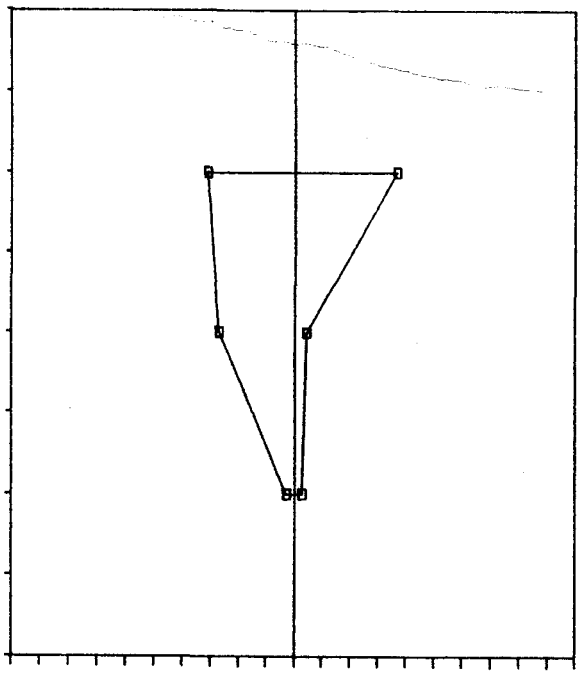


NORTH HORN FORMATION

84-56

07-07-88



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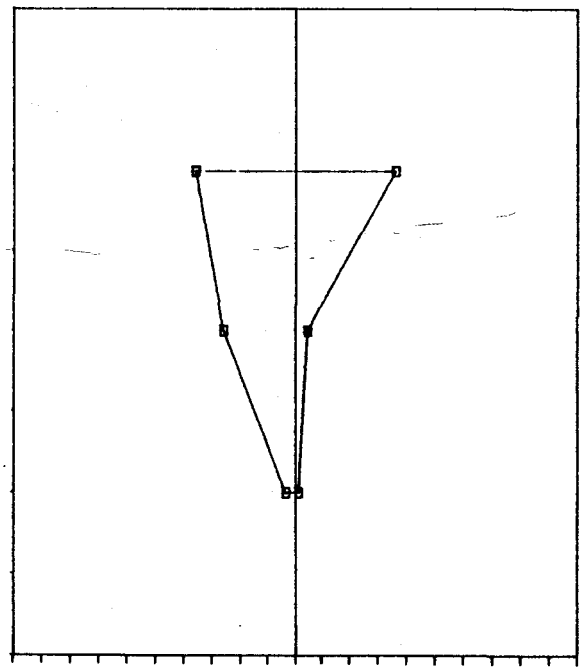

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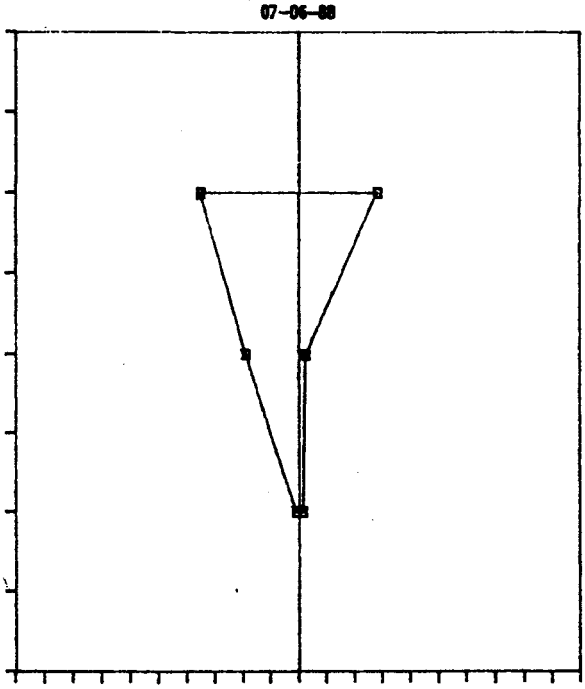

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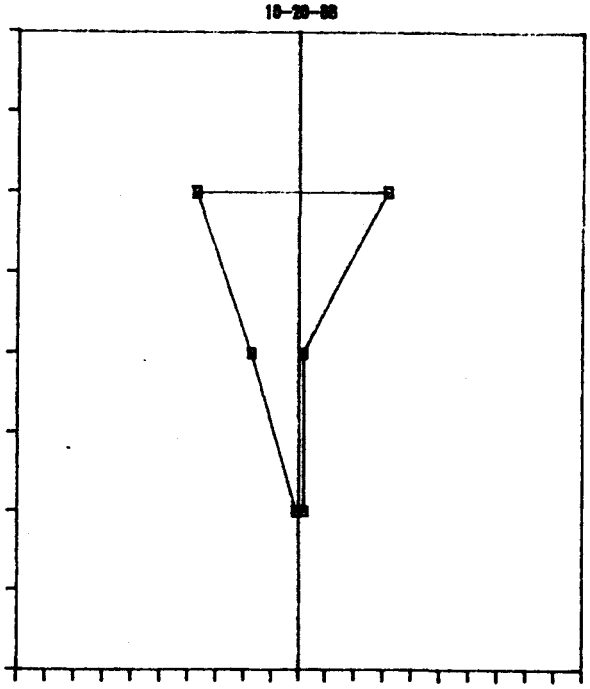

PRICE RIVER FORMATION

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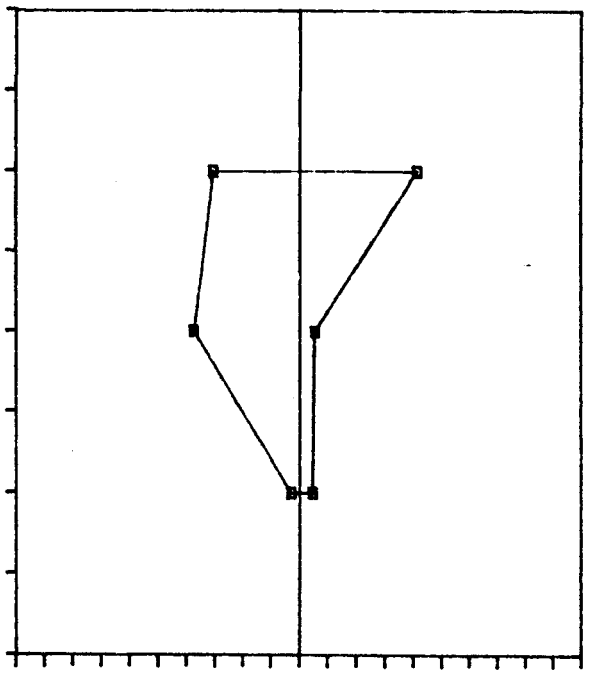
07-06-88



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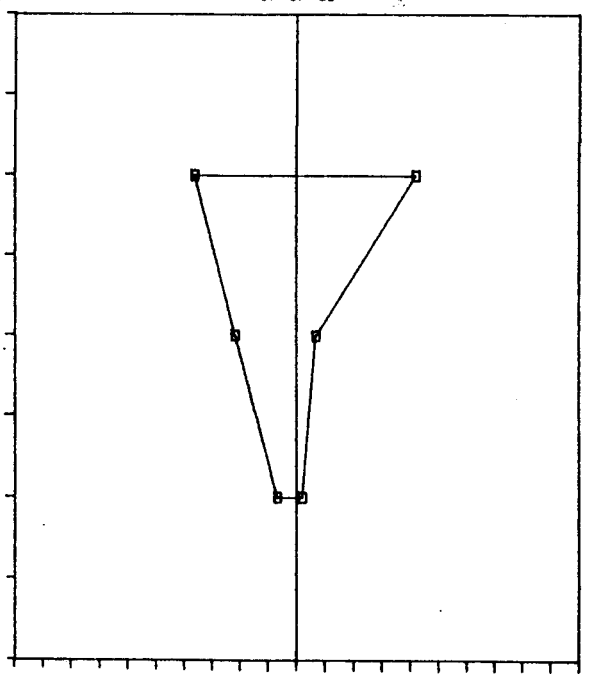

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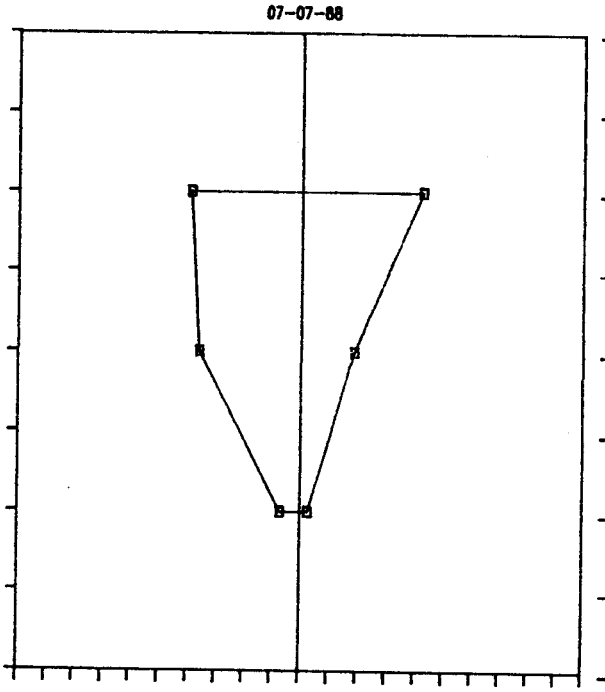

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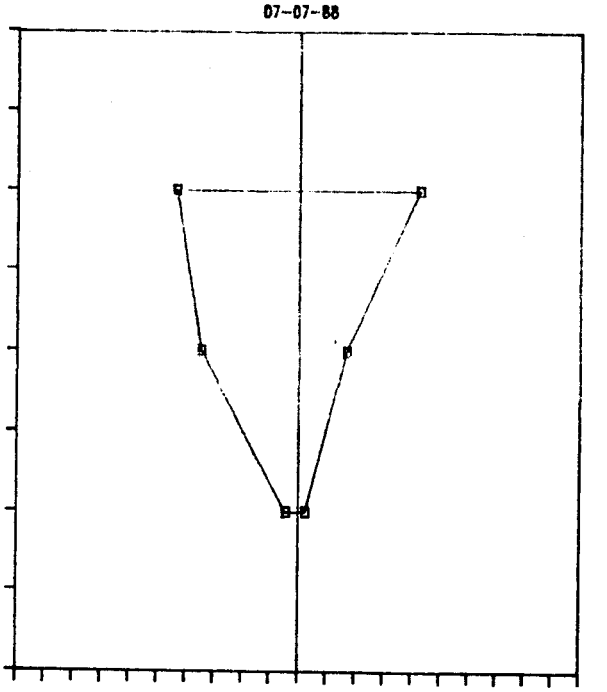
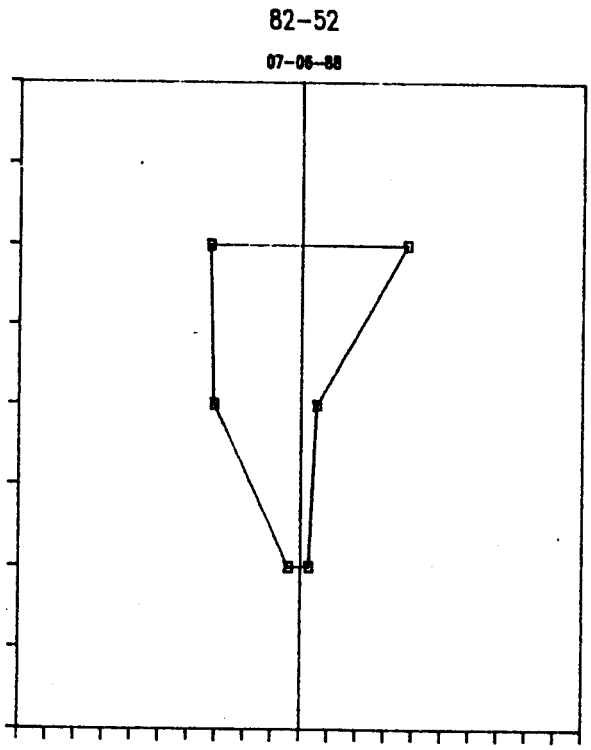
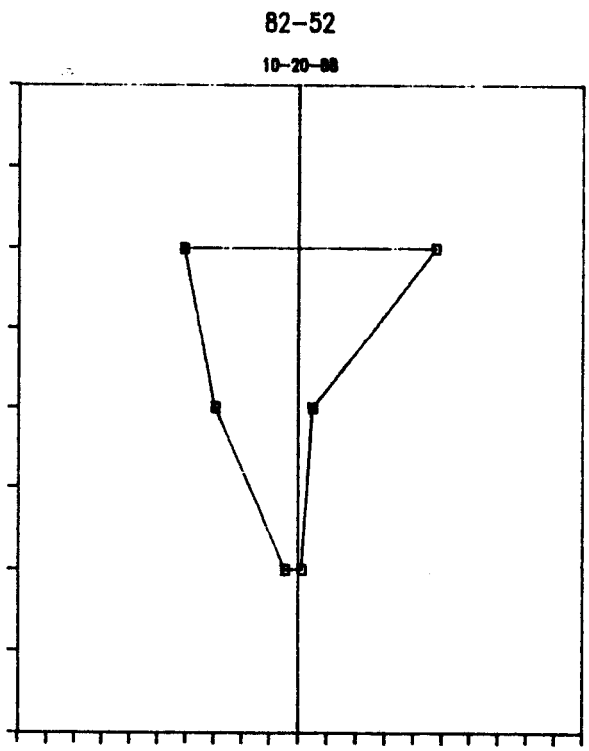


PRICE RIVER FORMATION





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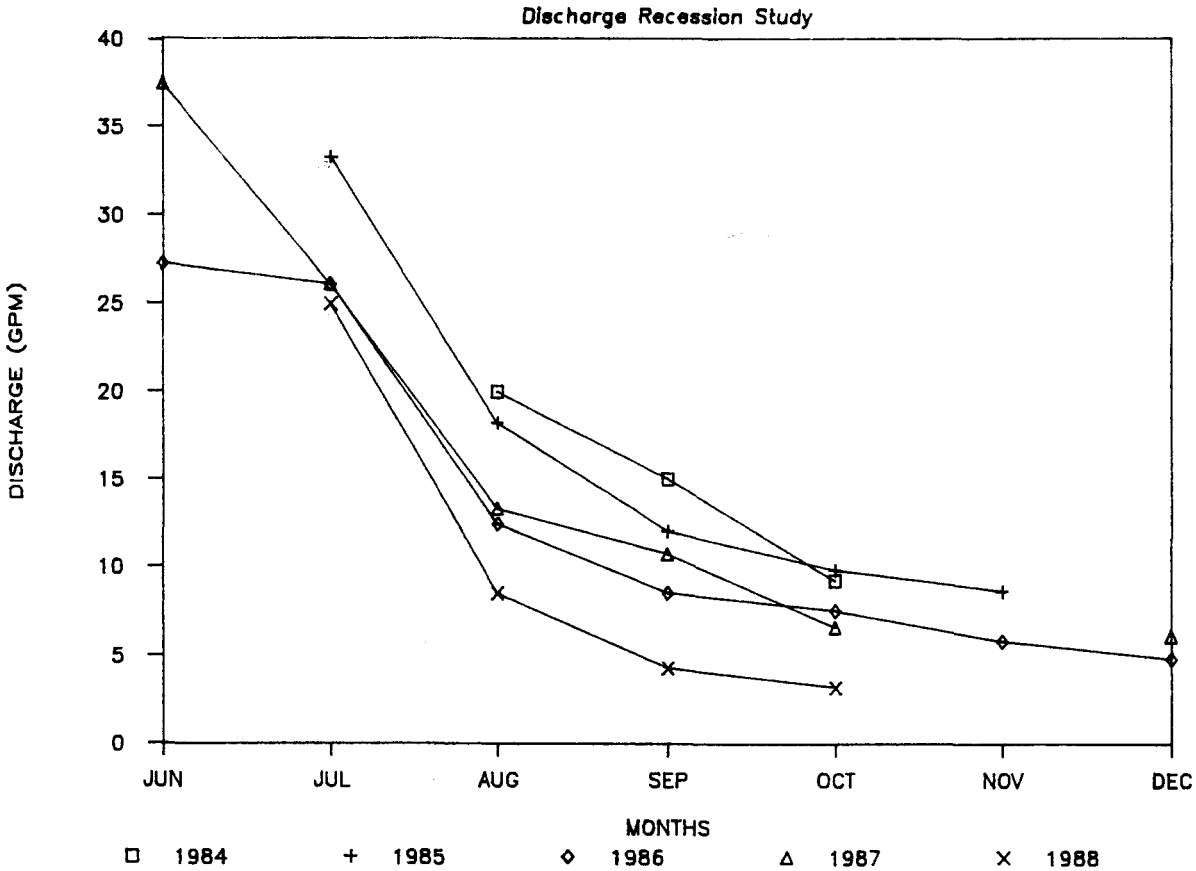
Discharge Recession Study
DISCHARGE (GPM)
40
35
30
25
20
15
10
5
0
JUN
JUL
AUG
SEP
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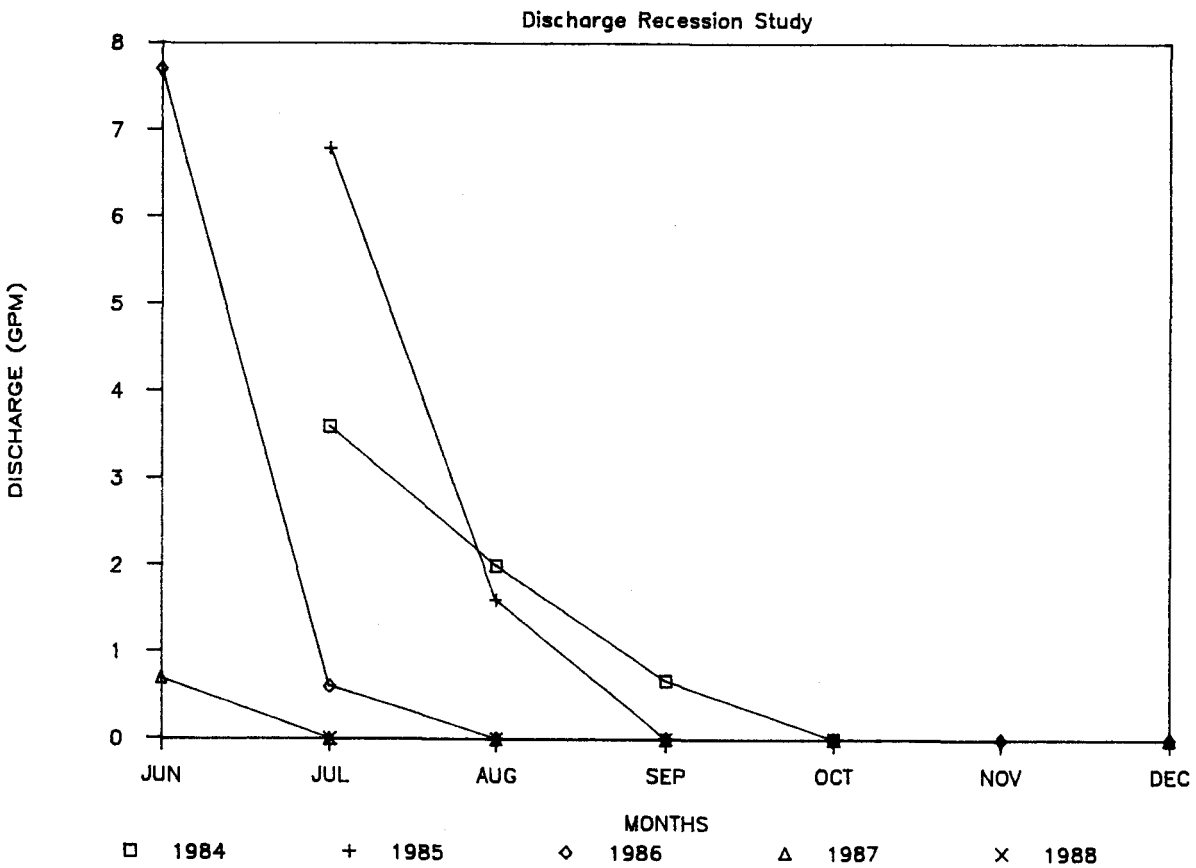
NOV
DEC
MONTHS
1984
1985
1986
1987
1988

79-23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8
7
6
5
4
3
2
1
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JUN
JUL
AUG
SEP
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NOV
DEC
MONTHS
1984
1985
1986
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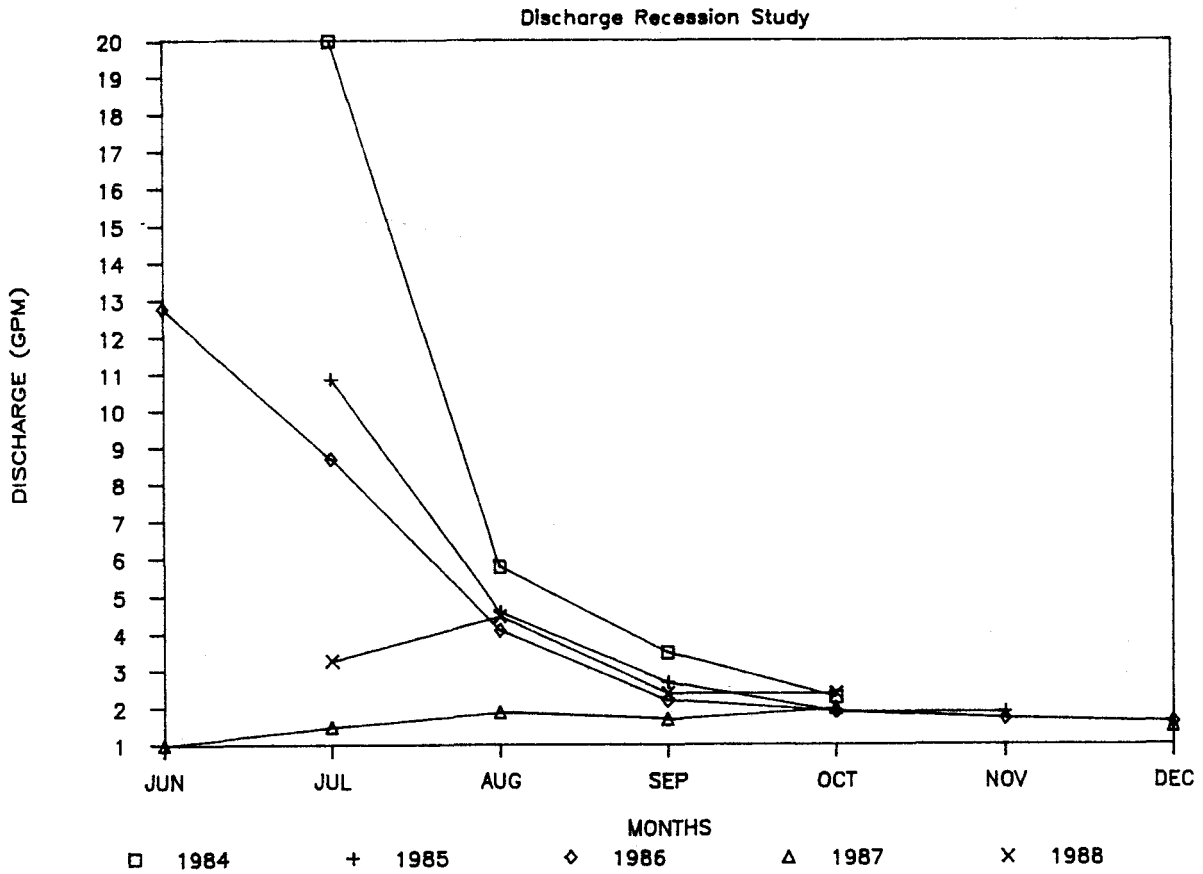
1988

79-26


Discharge Recession Study
DISCHARGE (GPM)
20
19
18
17
16
15
14
13
12
11
10
9
8
7
6
5
4
3
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JUN
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MONTHS
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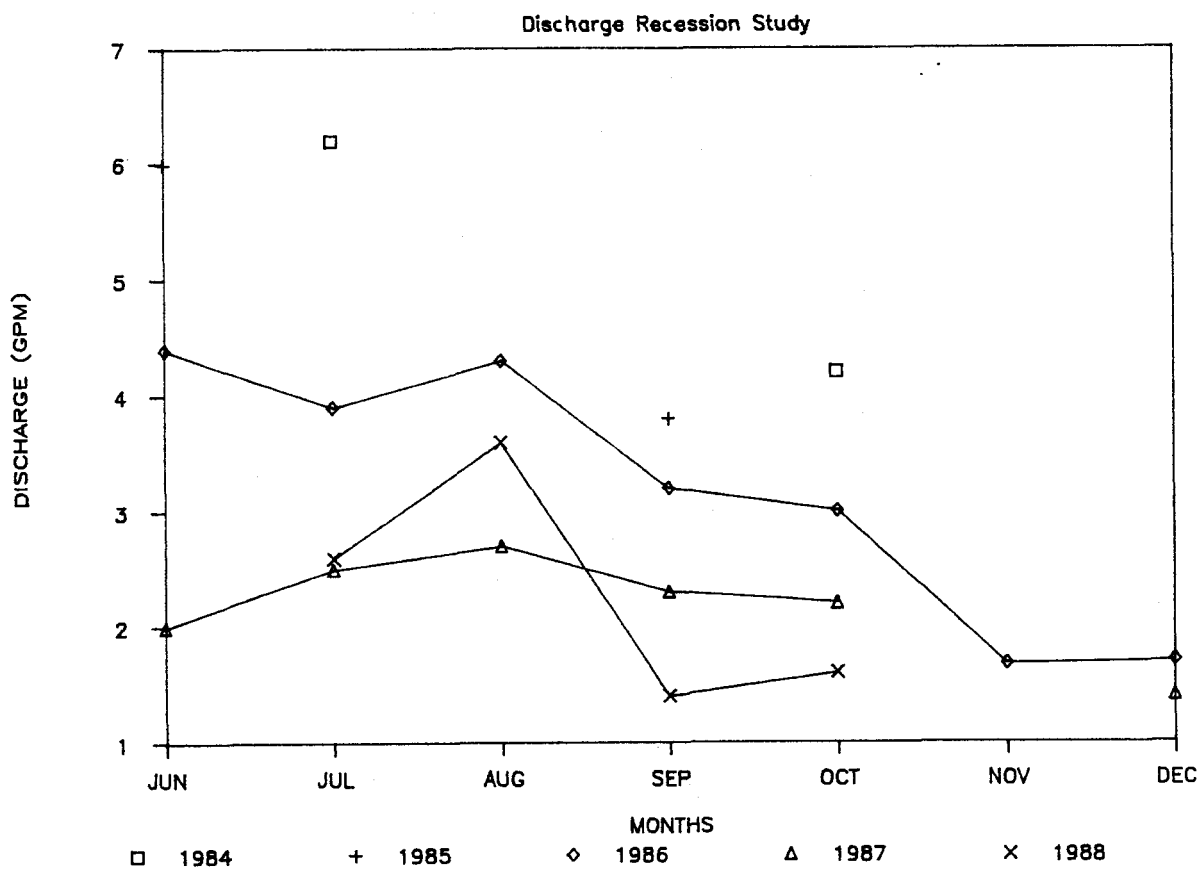
1987
1988

79-29


Discharge Recession Study
DISCHARGE (GPM)
7
6
5
4
3
2
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JUN
JUL
AUG
SEP
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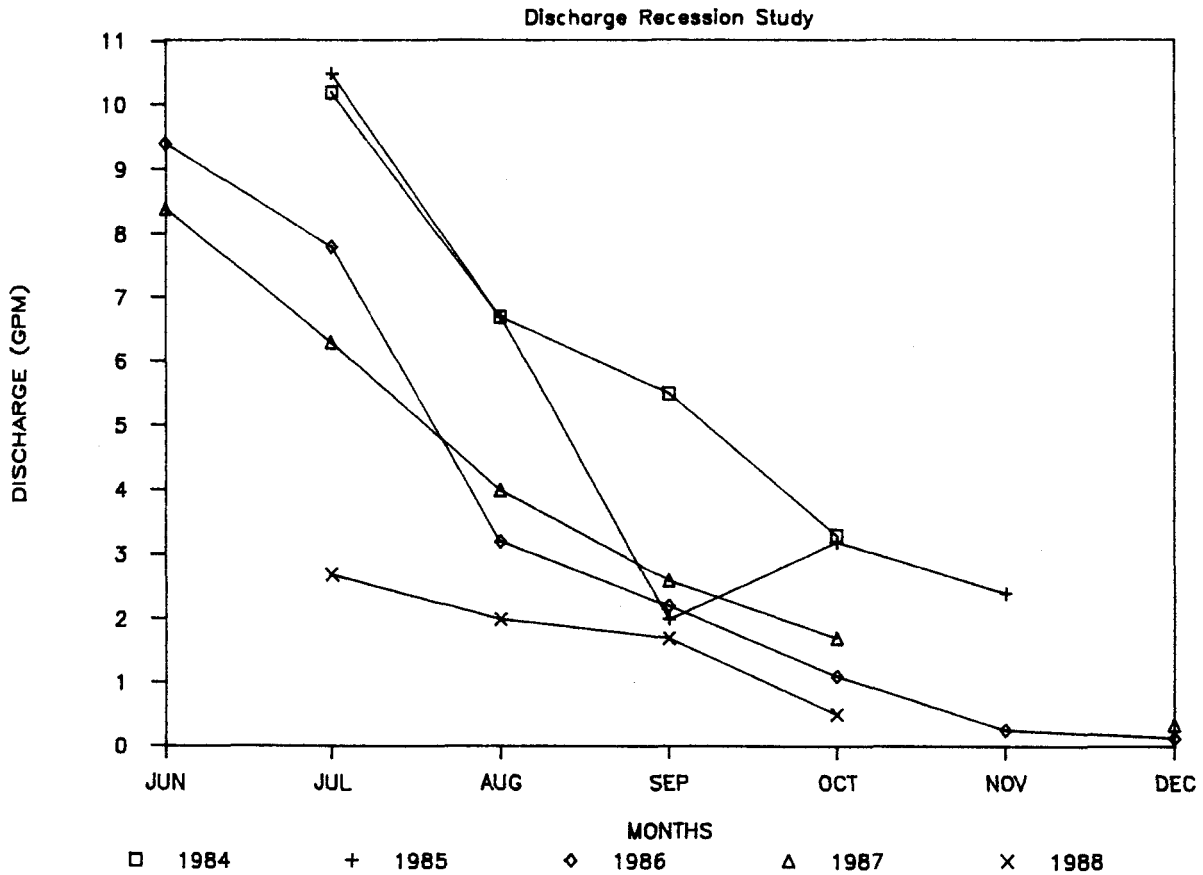
NOV
DEC
MONTHS
1984
1985
1986
1987
1988

79-35


Discharge Recession Study
DISCHARGE (GPM)
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MONTHS
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1987
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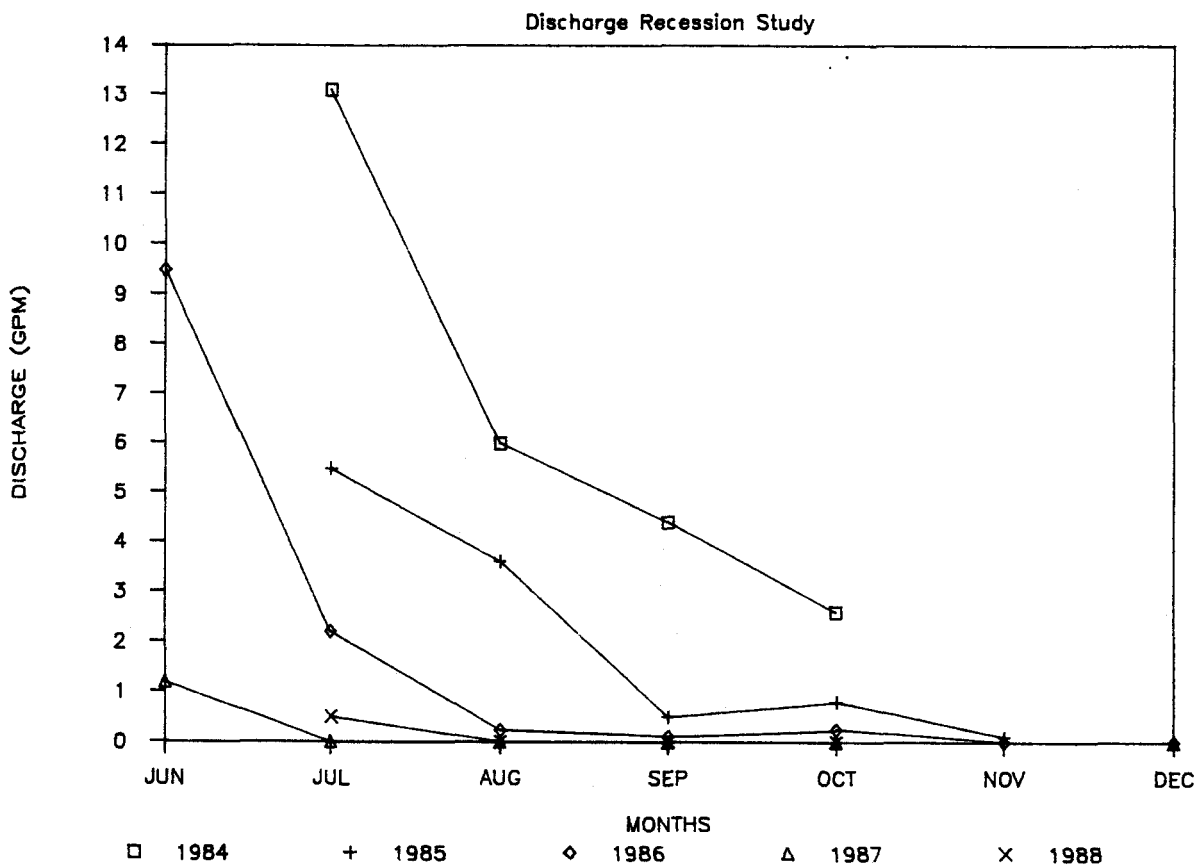
80-44


Discharge Recession Study
DISCHARGE (GPM)
0
1
2
3
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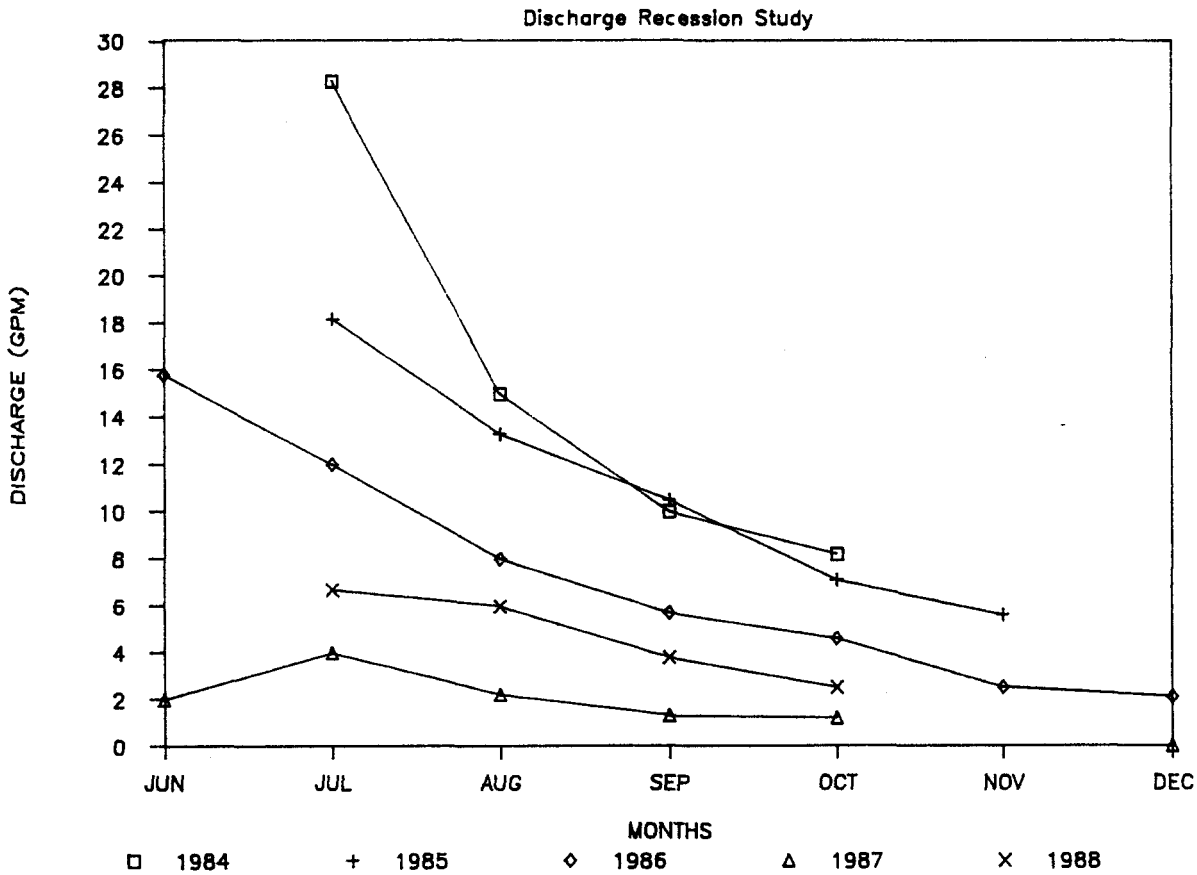
80-46


Discharge Recession Study
DISCHARGE (GPM)
30
28
26
24
22
20
18
16
14
12
10
8
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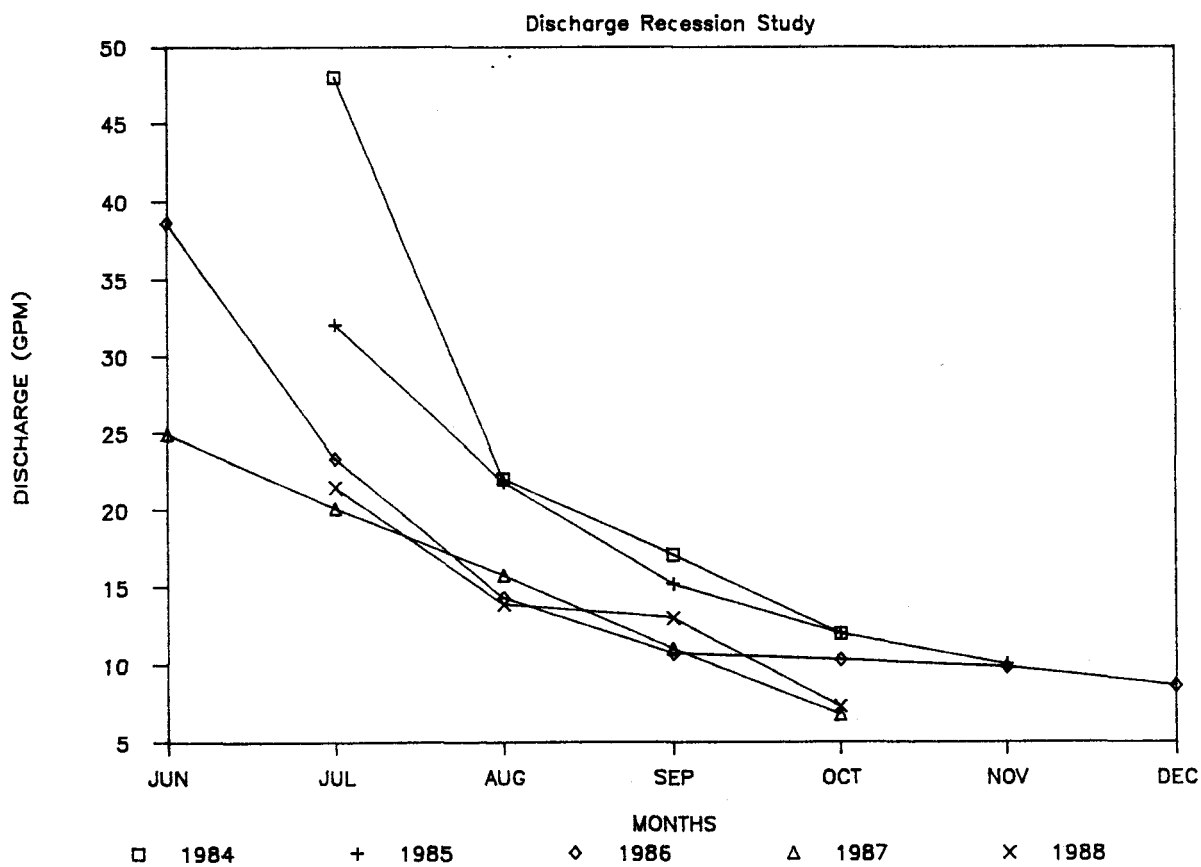
82-52


Discharge Recession Study
DISCHARGE (GPM)
50
45
40
35
30
25
20
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10
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JUN
JUL
AUG
SEP
OCT
NOV
DEC
MONTHS
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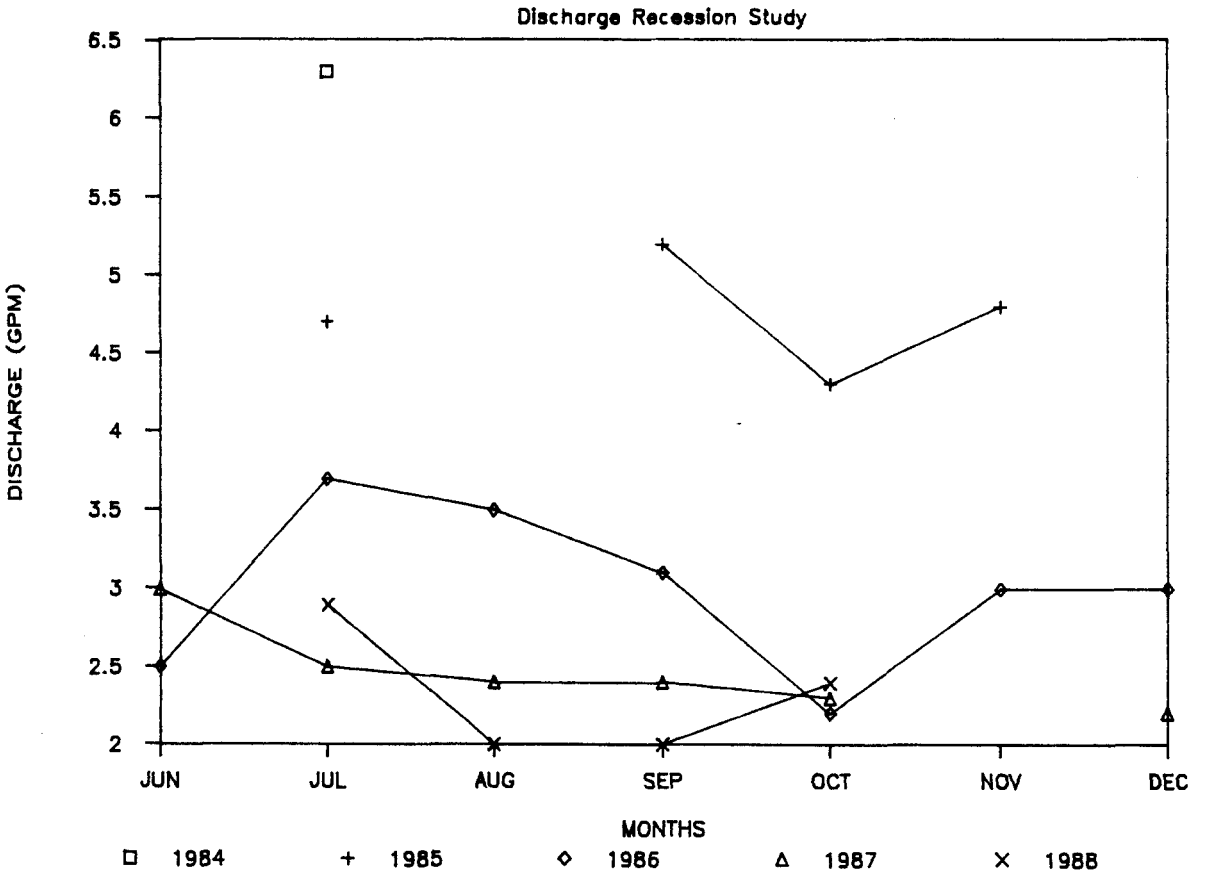
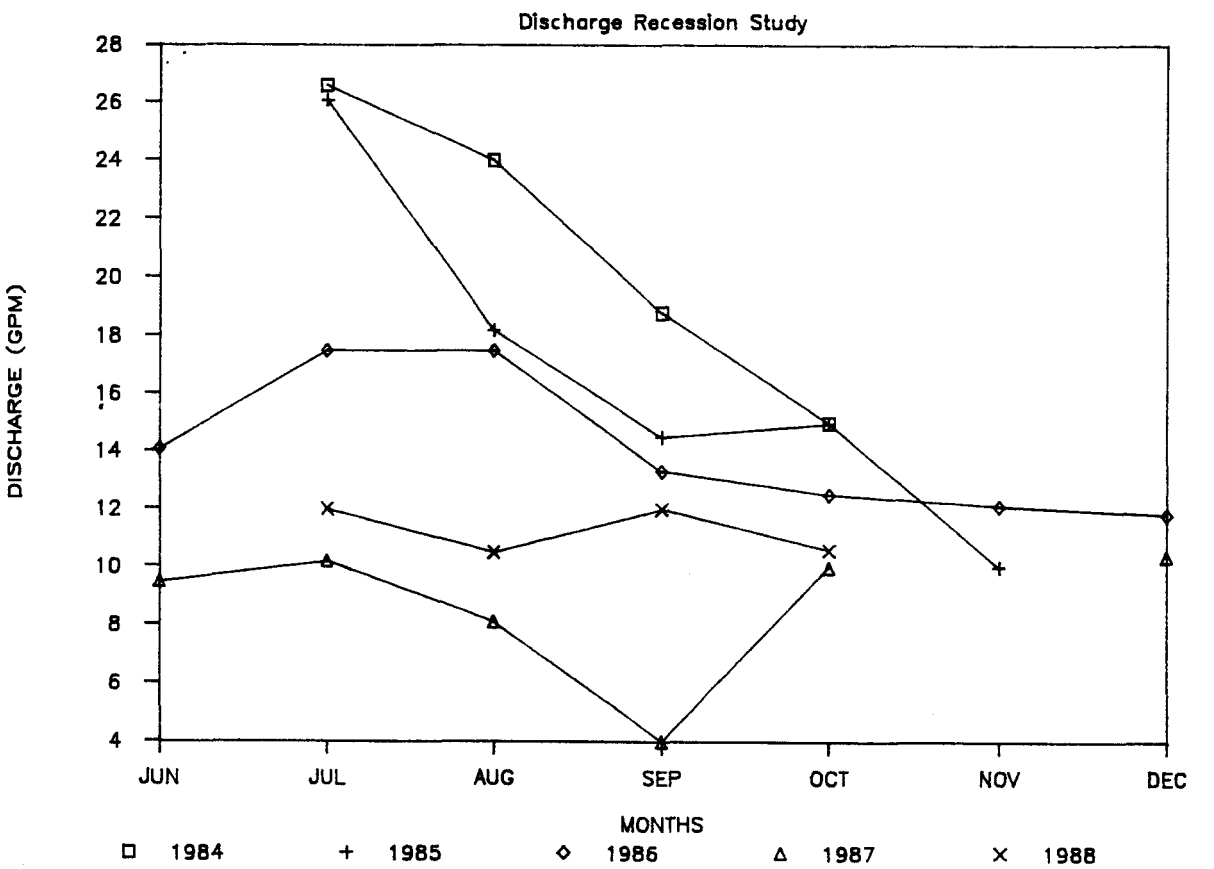
1988

84-56

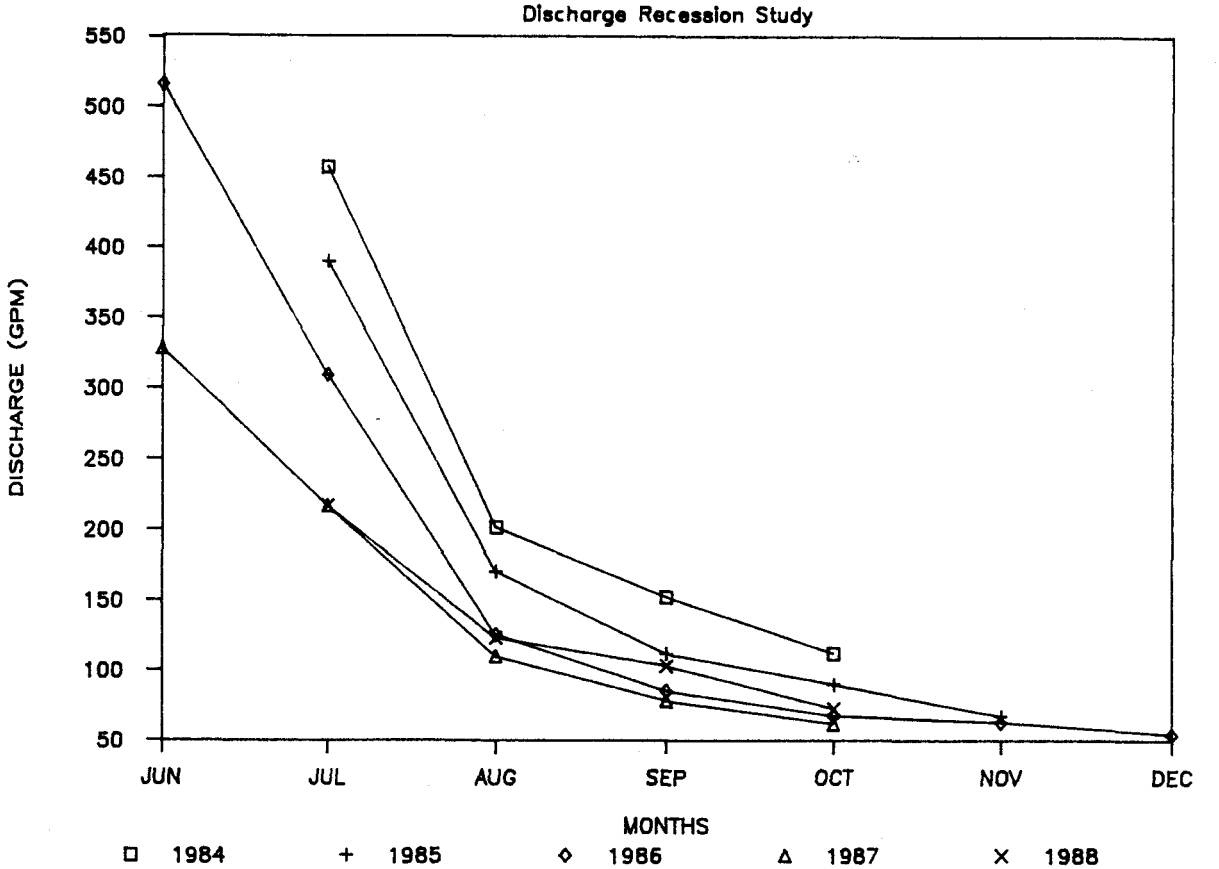


BURNT TREE



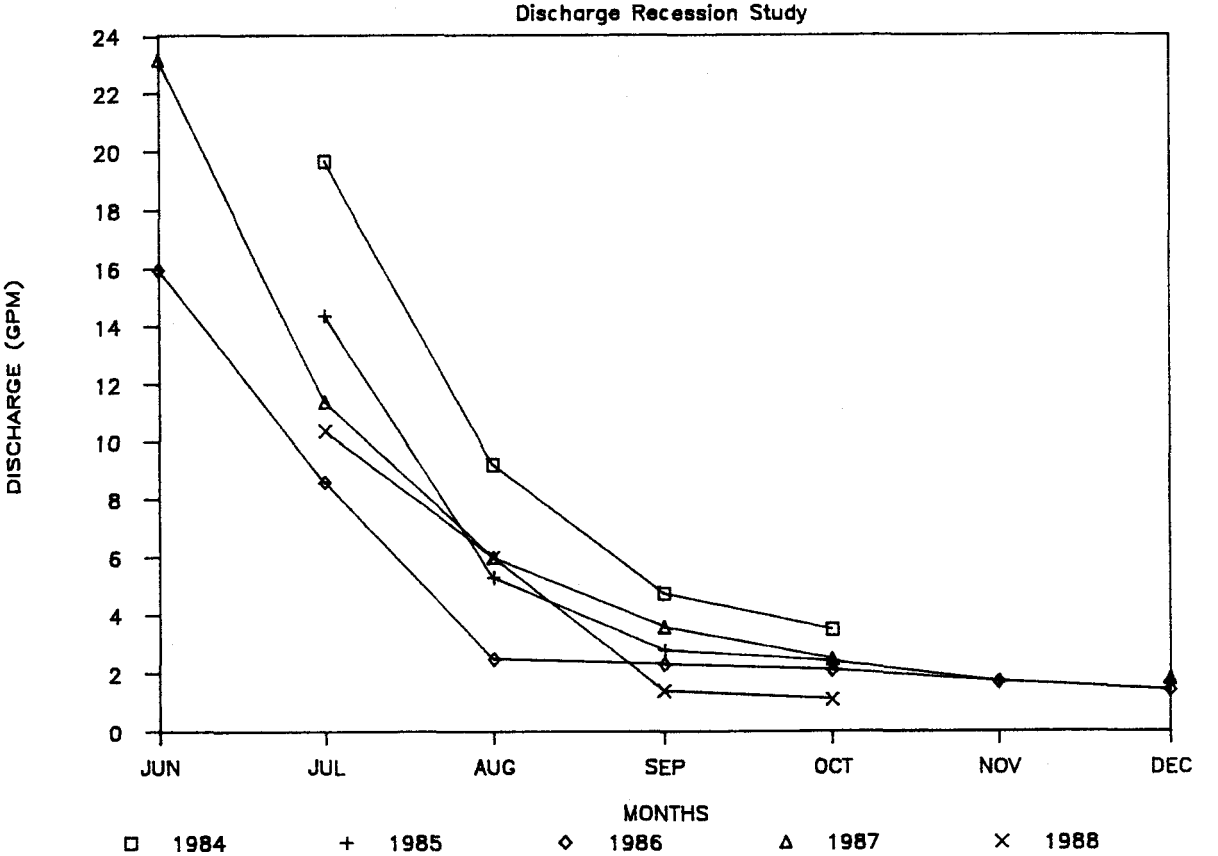
ELK SPRING

Discharge Recession Study

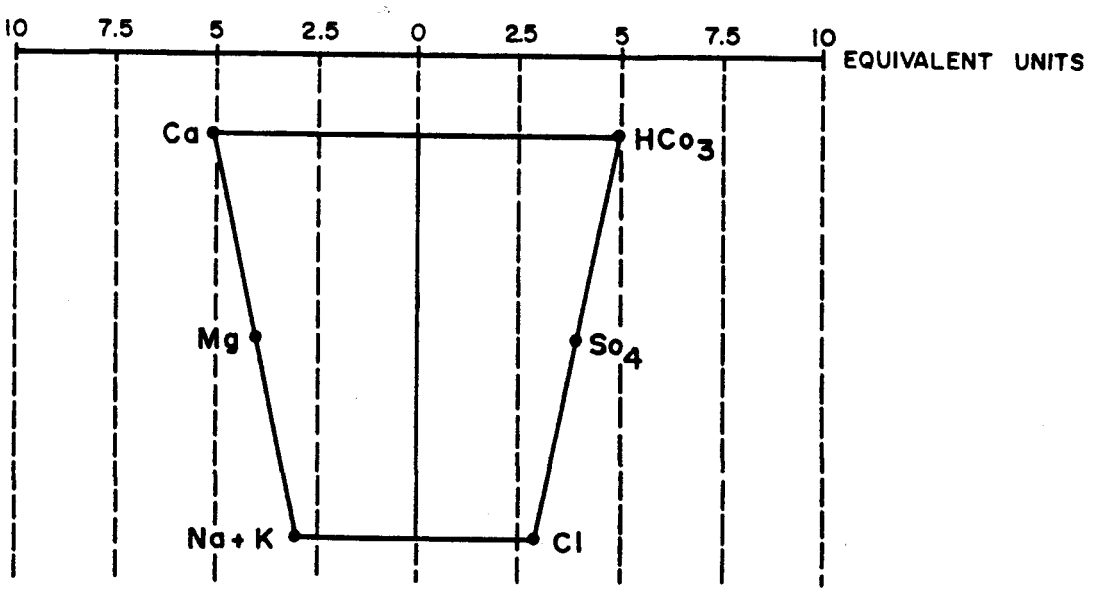


SHEBA SPRINGS

Discharge Recession Study



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)

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 14, 1988

Job No.: 9301

Date Rec'd: July 7, 1988

Date Sampled: July 6, 1988

Sampled By: UP&L

Sample ID:

BURNT TREE SPRINGS
Temp 43
Flow 12.0
Time Sampled 15:20 hr.
Time Rec'd 9:00 hr.

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

WATER ANALYSIS

Alk., Bicarbonate	333	mg/l HCO3	Iron	0.02<	mg/l
07/07/88		11:45 hr.	07/11/88		14:30 hr.
Alk., Carbonate	1<	mg/l CaCO3	Magnesium	28.50	mg/l
07/07/88		11:45 hr.	07/12/88		14:45 hr.
Alk., Total	273	mg/l CaCO3	Manganese	0.02	mg/l
07/07/88		11:45 hr.	07/11/88		15:30 hr.
Anions, Total	5.75	meq/l	pH	7.70	Units
			07/07/88		11:30 hr.
Calcium	49.6	mg/l	Potassium	0.65	mg/l
07/12/88		14:25 hr.	07/11/88		14:10 hr.
Cations, Total	5.38	meq/l	Sodium	12.80	mg/l
			07/11/88		15:20 hr.
Chloride	5.5	mg/l	Solids, Dissolved	367.0	mg/l
07/07/88		13:00 hr.	07/11/88		11:00 hr.
Conductivity	560	umhos/cm	Solids, Suspended	1.0<	mg/l
07/07/88		11:30 hr.	07/11/88		11:00 hr.
Fluoride	0.23	mg/l	Sulfate	13.0	mg/l
07/11/88		13:00 hr.	07/13/88		10:30 hr.
Hardness, Total	241	mg/l CaCO3	Turbidity	0.2	NTU
			07/08/88		15:30 hr.

RECEIVED
JUL 14 1988
MINING DIV.
FIELD OFFICE

ANALYST: [signature]

Respectfully submitted,
COMMERCIAL TESTING & ENGINEERING CO.

[signature]
Manager, Huntington Laboratory

Original Copy Watermarked
For Your Protection

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 14, 1988

Job No.: 9292

Date Rec'd: July 7, 1988

Date Sampled: July 6, 1988

Sampled By: UP&L

Sample ID:

ELKS SPRINGS
Temp 41
Flow 0.4/217.4
Time Sampled 11:10 hr.
Time Rec'd 9:00 hr.

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

WATER ANALYSIS

Alk., Bicarbonate 07/07/88	285	mg/l HCO3 11:45 hr.	Iron 07/11/88	0.02<	mg/l 14:30 hr.
Alk., Carbonate 07/07/88	1<	mg/l CaCO3 11:45 hr.	Magnesium 07/12/88	24.00	mg/l 14:45 hr.
Alk., Total 07/07/88	234	mg/l CaCO3 11:45 hr.	Manganese 07/11/88	0.02	mg/l 15:30 hr.
Anions, Total	4.95	meq/l	pH 07/07/88	7.60	Units 11:30 hr.
Calcium 07/12/88	54.8	mg/l 14:25 hr.	Potassium 07/11/88	1.06	mg/l 14:10 hr.
Cations, Total	5.00	meq/l	Sodium 07/11/88	6.10	mg/l 15:20 hr.
Chloride 07/07/88	4.0	mg/l 13:00 hr.	Solids, Dissolved 07/11/88	331.0	mg/l 11:00 hr.
Conductivity 07/07/88	450	umhos/cm 11:30 hr.	Solids, Suspended 07/11/88	4.0	mg/l 11:00 hr.
Fluoride 07/11/88	0.14	mg/l 13:00 hr.	Sulfate 07/13/88	13.0	mg/l 10:30 hr.
Hardness, Total	236	mg/l CaCO3	Turbidity 07/08/88	0.2	NTU 15:30 hr.

RECEIVED
JUL 14 1988
MINING DIV.
FIELD OFFICE

ANALYST: [illegible]

Respectfully submitted,
COMMERCIAL TESTING & ENGINEERING CO.

[illegible]
Manager, Huntington Laboratory

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For Your Protection

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

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

July 14, 1988

Job No.: 9294

Date Rec'd: July 7, 1988

Date Sampled: July 6, 1988

Sampled By: UP&L

Sample ID:

SHEBA SPRINGS
Temp 41
Flow 10.4
Time Sampled 11:40 hr.
Time Rec'd 9:00 hr.

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

WATER ANALYSIS

Alk., Bicarbonate 07/07/88	234	mg/l HCO3 11:45 hr.	Iron 07/11/88	0.18	mg/l 14:30 hr.
Alk., Carbonate 07/07/88	1<	mg/l CaCO3 11:45 hr.	Magnesium 07/12/88	7.50	mg/l 14:45 hr.
Alk., Total 07/07/88	192	mg/l CaCO3 11:45 hr.	Manganese 07/11/88	0.02	mg/l 15:30 hr.
Anions, Total	3.92	meq/l	pH 07/07/88	7.55	Units 11:30 hr.
Calcium 07/12/88	64.3	mg/l 14:25 hr.	Potassium 07/11/88	0.12	mg/l 14:10 hr.
Cations, Total	3.93	meq/l	Sodium 07/11/88	2.34	mg/l 15:20 hr.
Chloride 07/07/88	4.0	mg/l 13:00 hr.	Solids, Dissolved 07/11/88	312.0	mg/l 11:00 hr.
Conductivity 07/07/88	410	umhos/cm 11:30 hr.	Solids, Suspended 07/11/88	1.0<	mg/l 11:00 hr.
Fluoride 07/11/88	0.13	mg/l 13:00 hr.	Sulfate 07/13/88	3.0	mg/l 10:30 hr.
Hardness, Total	191	mg/l CaCO3	Turbidity 07/08/88	0.2	NTU 15:30 hr.

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MINING DIV.
FIELD OFFICE

ANALYST: [illegible]

Respectfully submitted,
COMMERCIAL TESTING & ENGINEERING CO.

[illegible]
Manager, Huntington Laboratory

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

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TELEPHONE: (801) 653-2311

July 18, 1988

Job No.: 9312

Date Rec'd: July 7, 1988

Date Sampled: July 7, 1988

Sampled By: UP&L

Sample ID:

TED'S TUBB
Temp 48
Flow 60.0 gpm
Time Sampled 14:10 hr.
Time Rec'd 4:15 p.m. hr.

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

WATER ANALYSIS

Alk., Bicarbonate 07/12/88	329	mg/l HCO3	16:00 hr.
Alk., Carbonate 07/12/88	1<	mg/l CaCO3	16:00 hr.
Alk., Total 07/12/88	270	mg/l CaCO3	16:00 hr.
Anions, Total	5.43	meq/l	
Calcium 07/15/88	72.8	mg/l	16:00 hr.
Cations, Total	5.46	meq/l	
Chloride 07/14/88	3.5	mg/l	15:30 hr.
Conductivity 07/14/88	420	umhos/cm	16:20 hr.
Fluoride 07/11/88	0.16	mg/l	13:00 hr.
Hardness, Total	263	mg/l CaCO3	
Iron 07/11/88	0.02<	mg/l	14:30 hr.
Magnesium 07/15/88	19.70	mg/l	15:30 hr.
Manganese 07/11/88	0.01<	mg/l	15:30 hr.
pH 07/07/88	7.70	Units	16:35 hr.
Potassium 07/15/88	0.39	mg/l	14:00 hr.
Sodium 07/15/88	4.54	mg/l	16:30 hr.
Solids, Dissolved 07/12/88	313.0	mg/l	10:50 hr.
Solids, Suspended 07/12/88	3.0	mg/l	10:50 hr.
Sulfate 07/13/88	3.0	mg/l	10:30 hr.
Turbidity 07/08/88	0.4	NTU	15:30 hr.

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ANALYST: [illegible]

Respectfully submitted,
COMMERCIAL TESTING & ENGINEERING CO.

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

July 18, 1988

Job No.: 9313

Date Rec'd: July 7, 1988

Date Sampled: July 7, 1988

Sampled By: UP&L

Sample ID:

EMS 79-2
Temp 43
Flow 2.1 gpm
Time Sampled 13:30 hr.
Time Rec'd 4:15 p.m. hr.

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

WATER ANALYSIS

Alk., Bicarbonate 07/12/88	371	mg/l HCO3 16:00 hr.	Iron 07/11/88	0.18	mg/l 14:30 hr.
Alk., Carbonate 07/12/88	1<	mg/l CaCO3 16:00 hr.	Magnesium 07/15/88	22.20	mg/l 15:30 hr.
Alk., Total 07/12/88	304	mg/l CaCO3 16:00 hr.	Manganese 07/11/88	0.01<	mg/l 15:30 hr.
Anions, Total	6.34	meq/l	pH 07/07/88	7.70	Units 16:35 hr.
Calcium 07/15/88	75.8	mg/l 16:00 hr.	Potassium 07/15/88	0.39	mg/l 14:00 hr.
Cations, Total	6.10	meq/l	Sodium 07/15/88	11.23	mg/l 16:30 hr.
Chloride 07/14/88	3.5	mg/l 15:30 hr.	Solids, Dissolved 07/12/88	352.0	mg/l 10:50 hr.
Conductivity 07/14/88	500	umhos/cm 16:20 hr.	Solids, Suspended 07/12/88	1.0<	mg/l 10:50 hr.
Fluoride 07/11/88	0.20	mg/l 13:00 hr.	Sulfate 07/13/88	15.0	mg/l 10:30 hr.
Hardness, Total	281	mg/l CaCO3	Turbidity 07/08/88	0.3	NTU 15:30 hr.

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ANALYST: M M

Respectfully submitted,
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M M

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TELEPHONE: (801) 653-2311

July 14, 1988

Job No.: 9293

Date Rec'd: July 7, 1988

Date Sampled: July 6, 1988

Sampled By: UP&L

Sample ID:

EMS 79-10
Temp 41
Flow 25.0
Time Sampled 11:30 hr.
Time Rec'd 9:00 hr.

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

WATER ANALYSIS

Alk., Bicarbonate 07/07/88	283	mg/l HCO3 11:45 hr.	Iron 07/11/88	0.18	mg/l 14:30 hr.
Alk., Carbonate 07/07/88	1<	mg/l CaCO3 11:45 hr.	Magnesium 07/12/88	23.00	mg/l 14:45 hr.
Alk., Total 07/07/88	232	mg/l CaCO3 11:45 hr.	Manganese 07/11/88	0.02	mg/l 15:30 hr.
Anions, Total	4.97	meq/l	pH 07/07/88	7.60	Units 11:30 hr.
Calcium 07/12/88	70.4	mg/l 14:25 hr.	Potassium 07/11/88	0.53	mg/l 14:10 hr.
Cations, Total	5.59	meq/l	Sodium 07/11/88	3.92	mg/l 15:20 hr.
Chloride 07/07/88	6.0	mg/l 13:00 hr.	Solids, Dissolved 07/11/88	382.0	mg/l 11:00 hr.
Conductivity 07/07/88	550	umhos/cm 11:30 hr.	Solids, Suspended 07/11/88	1.0<	mg/l 11:00 hr.
Fluoride 07/11/88	0.20	mg/l 13:00 hr.	Sulfate 07/13/88	13.0	mg/l 10:30 hr.
Hardness, Total	271	mg/l CaCO3	Turbidity 07/08/88	0.2	NTU 15:30 hr.

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ANALYST: [illegible]

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[illegible]
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TELEPHONE: (801) 653-2311

July 14, 1988

Job No.: 9295

Date Rec'd: July 7, 1988

Date Sampled: July 6, 1988

Sampled By: UP&L

Sample ID:

EMS 79-15
Temp 43
Flow 12.70 gpm
Time Sampled 12:15 hr.
Time Rec'd 9:00 hr.

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

WATER ANALYSIS

Alk., Bicarbonate	306	mg/l HCO3	Iron	0.02<	mg/l
07/07/88		11:45 hr.	07/11/88		14:30 hr.
Alk., Carbonate	1<	mg/l CaCO3	Magnesium	21.40	mg/l
07/07/88		11:45 hr.	07/12/88		14:45 hr.
Alk., Total	251	mg/l CaCO3	Manganese	0.02	mg/l
07/07/88		11:45 hr.	07/11/88		15:30 hr.
Anions, Total	5.20	meq/l	pH	7.65	Units
			07/07/88		11:30 hr.
Calcium	59.4	mg/l	Potassium	0.58	mg/l
07/12/88		14:25 hr.	07/11/88		14:10 hr.
Cations, Total	4.94	meq/l	Sodium	4.59	mg/l
			07/11/88		15:20 hr.
Chloride	5.0	mg/l	Solids, Dissolved	360.0	mg/l
07/07/88		13:00 hr.	07/11/88		11:00 hr.
Conductivity	530	umhos/cm	Solids, Suspended	1.0<	mg/l
07/07/88		11:30 hr.	07/11/88		11:00 hr.
Fluoride	0.20	mg/l	Sulfate	8.0	mg/l
07/11/88		13:00 hr.	07/13/88		10:30 hr.
Hardness, Total	236	mg/l CaCO3	Turbidity	0.3	NTU
			07/08/88		15:30 hr.

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ANALYST: M M

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

July 14, 1988

Job No.: 9295

Date Rec'd: July 7, 1988

Date Sampled: July 6, 1988

Sampled By: UP&L

Sample ID:

EMS 79-15
Temp 43
Flow 12.70 gpm
Time Sampled 12:15 hr.
Time Rec'd 9:00 hr.

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

WATER ANALYSIS

Alk., Bicarbonate 07/07/88	306	mg/l HCO3 11:45 hr.	Iron 07/11/88	0.02<	mg/l 14:30 hr.
Alk., Carbonate 07/07/88	1<	mg/l CaCO3 11:45 hr.	Magnesium 07/12/88	21.40	mg/l 14:45 hr.
Alk., Total 07/07/88	251	mg/l CaCO3 11:45 hr.	Manganese 07/11/88	0.02	mg/l 15:30 hr.
Anions, Total	5.20	meq/l	pH 07/07/88	7.65	Units 11:30 hr.
Calcium 07/12/88	59.4	mg/l 14:25 hr.	Potassium 07/11/88	0.58	mg/l 14:10 hr.
Cations, Total	4.94	meq/l	Sodium 07/11/88	4.59	mg/l 15:20 hr.
Chloride 07/07/88	5.0	mg/l 13:00 hr.	Solids, Dissolved 07/11/88	360.0	mg/l 11:00 hr.
Conductivity 07/07/88	530	umhos/cm 11:30 hr.	Solids, Suspended 07/11/88	1.0<	mg/l 11:00 hr.
Fluoride 07/11/88	0.20	mg/l 13:00 hr.	Sulfate 07/13/88	8.0	mg/l 10:30 hr.
Hardness, Total	236	mg/l CaCO3	Turbidity 07/08/88	0.3	NTU 15:30 hr.

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ANALYST: [illegible]

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TELEPHONE: (801) 653-2311

July 14, 1988

Job No.: 9302

Date Rec'd: July 7, 1988

Date Sampled: July 6, 1988

Sampled By: UP&L

Sample ID:

EMS 79-24
Temp 66
Flow 0.75
Time Sampled 15:35 hr.
Time Rec'd 9:00 hr.

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

WATER ANALYSIS

Alk., Bicarbonate	414	mg/l HCO3	Iron	0.16	mg/l
07/07/88		11:45 hr.	07/11/88		14:30 hr.
Alk., Carbonate	1<	mg/l CaCO3	Magnesium	45.70	mg/l
07/07/88		11:45 hr.	07/12/88		14:45 hr.
Alk., Total	339	mg/l CaCO3	Manganese	0.02	mg/l
07/07/88		11:45 hr.	07/11/88		15:30 hr.
Anions, Total	7.62	meq/l	pH	8.10	Units
			07/07/88		11:30 hr.
Calcium	61.5	mg/l	Potassium	2.06	mg/l
07/12/88		14:25 hr.	07/11/88		14:10 hr.
Cations, Total	7.64	meq/l	Sodium	17.80	mg/l
			07/11/88		15:20 hr.
Chloride	16.5	mg/l	Solids, Dissolved	584.0	mg/l
07/07/88		13:00 hr.	07/11/88		11:00 hr.
Conductivity	700	umhos/cm	Solids, Suspended	30.0	mg/l
07/07/88		11:30 hr.	07/11/88		11:00 hr.
Fluoride	0.30	mg/l	Sulfate	26.0	mg/l
07/11/88		13:00 hr.	07/13/88		10:30 hr.
Hardness, Total	342	mg/l CaCO3	Turbidity	7.8	NTU
			07/08/88		15:30 hr.

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ANALYST: [illegible]

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TELEPHONE: (801) 653-2311

July 14, 1988

Job No.: 9303

Date Rec'd: July 7, 1988

Date Sampled: July 6, 1988

Sampled By: UP&L

Sample ID:

EMS 79-26
Temp 60
Flow 3.3
No Time Sampled
Time Rec'd 9:00 hr.

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

WATER ANALYSIS

Alk., Bicarbonate 07/07/88	305	mg/l HCO3 11:45 hr.	Iron 07/11/88	0.08	mg/l 14:30 hr.
Alk., Carbonate 07/07/88	1<	mg/l CaCO3 11:45 hr.	Magnesium 07/12/88	34.20	mg/l 14:45 hr.
Alk., Total 07/07/88	250	mg/l CaCO3 11:45 hr.	Manganese 07/11/88	0.03	mg/l 15:30 hr.
Anions, Total	5.39	meq/l	pH 07/07/88	8.20	Units 11:30 hr.
Calcium 07/12/88	47.2	mg/l 14:25 hr.	Potassium 07/11/88	1.12	mg/l 14:10 hr.
Cations, Total	5.84	meq/l	Sodium 07/11/88	15.00	mg/l 15:20 hr.
Chloride 07/07/88	8.0	mg/l 13:00 hr.	Solids, Dissolved 07/11/88	482.0	mg/l 11:00 hr.
Conductivity 07/07/88	585	umhos/cm 11:30 hr.	Solids, Suspended 07/11/88	11.0	mg/l 11:00 hr.
Fluoride 07/11/88	0.25	mg/l 13:00 hr.	Sulfate 07/13/88	14.0	mg/l 10:30 hr.
Hardness, Total	259	mg/l CaCO3	Turbidity 07/08/88	1.8	NTU 15:30 hr.

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ANALYST: [signature]

Respectfully submitted,
COMMERCIAL TESTING & ENGINEERING CO.

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Manager, Huntington Laboratory

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

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

July 14, 1988

Job No.: 9299

Date Rec'd: July 7, 1988

Date Sampled: July 6, 1988

Sampled By: UP&L

Sample ID:

EMS 79-29
Temp 42
Flow 2.6 gpm
Time Sampled 14:00 hr.
Time Rec'd 9:00 hr.

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

WATER ANALYSIS

Alk., Bicarbonate	284	mg/l HCO3	Iron	0.02<	mg/l
07/07/88		11:45 hr.	07/11/88		14:30 hr.
Alk., Carbonate	1<	mg/l CaCO3	Magnesium	26.70	mg/l
07/07/88		11:45 hr.	07/12/88		14:45 hr.
Alk., Total	233	mg/l CaCO3	Manganese	0.02	mg/l
07/07/88		11:45 hr.	07/11/88		15:30 hr.
Anions, Total	5.52	meq/l	pH	7.70	Units
			07/07/88		11:30 hr.
Calcium	34.8	mg/l	Potassium	1.70	mg/l
07/12/88		14:25 hr.	07/11/88		14:10 hr.
Cations, Total	5.34	meq/l	Sodium	31.80	mg/l
			07/11/88		15:20 hr.
Chloride	16.0	mg/l	Solids, Dissolved	369.0	mg/l
07/07/88		13:00 hr.	07/11/88		11:00 hr.
Conductivity	600	umhos/cm	Solids, Suspended	1.0<	mg/l
07/07/88		11:30 hr.	07/11/88		11:00 hr.
Fluoride	0.29	mg/l	Sulfate	25.0	mg/l
07/11/88		13:00 hr.	07/13/88		10:30 hr.
Hardness, Total	197	mg/l CaCO3	Turbidity	0.4	NTU
			07/08/88		15:30 hr.

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TELEPHONE: (801) 653-2311

July 14, 1988

Job No.: 9296

Date Rec'd: July 7, 1988

Date Sampled: July 6, 1988

Sampled By: UP&L

Sample ID:

EMS 79-34
Temp 43
Flow 13.30 gpm
Time Sampled 12:30 hr.
Time Rec'd 9:00 hr.

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

WATER ANALYSIS

Alk., Bicarbonate	306	mg/l HCO3	Iron	0.02<	mg/l
07/07/88		11:45 hr.	07/11/88		14:30 hr.
Alk., Carbonate	1<	mg/l CaCO3	Magnesium	21.40	mg/l
07/07/88		11:45 hr.	07/12/88		14:45 hr.
Alk., Total	251	mg/l CaCO3	Manganese	0.03	mg/l
07/07/88		11:45 hr.	07/11/88		15:30 hr.
Anions, Total	5.52	meq/l	pH	7.60	Units
			07/07/88		11:30 hr.
Calcium	59.4	mg/l	Potassium	1.20	mg/l
07/12/88		14:25 hr.	07/11/88		14:10 hr.
Cations, Total	5.22	meq/l	Sodium	10.80	mg/l
			07/11/88		15:20 hr.
Chloride	5.0	mg/l	Solids, Dissolved	435.0	mg/l
07/07/88		13:00 hr.	07/11/88		11:00 hr.
Conductivity	530	umhos/cm	Solids, Suspended	61.0	mg/l
07/07/88		11:30 hr.	07/11/88		11:00 hr.
Fluoride	0.20	mg/l	Sulfate	23.0	mg/l
07/11/88		13:00 hr.	07/13/88		10:30 hr.
Hardness, Total	236	mg/l CaCO3	Turbidity	20.0	NTU
			07/08/88		15:30 hr.

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ANALYST: M M

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TELEPHONE: (801) 653-2311

July 14, 1988

Job No.: 9298

Date Rec'd: July 7, 1988

Date Sampled: July 6, 1988

Sampled By: UP&L

Sample ID:

EMS 79-32
Temp 56
Flow 0.55
Time Sampled 13:50 hr.
Time Rec'd 9:00 hr.

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

WATER ANALYSIS

Alk., Bicarbonate	446	mg/l HCO3	Iron	0.11	mg/l
07/07/88		11:45 hr.	07/11/88	14:30	hr.
Alk., Carbonate	1<	mg/l CaCO3	Magnesium	55.40	mg/l
07/07/88		11:45 hr.	07/12/88	14:45	hr.
Alk., Total	366	mg/l CaCO3	Manganese	0.02	mg/l
07/07/88		11:45 hr.	07/11/88	15:30	hr.
Anions, Total	9.14	meq/l	pH	0.70	Units
			07/07/88	11:30	hr.
Calcium	64.6	mg/l	Potassium	0.95	mg/l
07/12/88		14:25 hr.	07/11/88	14:10	hr.
Cations, Total	9.26	meq/l	Sodium	33.90	mg/l
			07/11/88	15:20	hr.
Chloride	17.5	mg/l	Solids, Dissolved	563.0	mg/l
07/07/88		13:00 hr.	07/11/88	11:00	hr.
Conductivity	700	umhos/cm	Solids, Suspended	1.0<	mg/l
07/07/88		11:30 hr.	07/11/88	11:00	hr.
Fluoride	0.31	mg/l	Sulfate	72.0	mg/l
07/11/88		13:00 hr.	07/13/88	10:30	hr.
Hardness, Total	389	mg/l CaCO3	Turbidity	7.4	NTU
			07/08/88	15:30	hr.

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ANALYST: [illegible]

Respectfully submitted,
COMMERCIAL TESTING & ENGINEERING CO.

[illegible]

Manager, Huntington Laboratory

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Member of the SGS Group (Société Générale de Surveillance)

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

July 14, 1988

Job No.: 9297

Date Rec'd: July 7, 1988

Date Sampled: July 6, 1988

Sampled By: UP&L

Sample ID:

EMS 79-35
Temp 40
Flow 2.76
Time Sampled 12:45 hr.
Time Rec'd 9:00 hr.

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

WATER ANALYSIS

Alk., Bicarbonate 07/07/88	278	mg/l HCO3 11:45 hr.	Iron 07/11/88	0.02<	mg/l 14:30 hr.
Alk., Carbonate 07/07/88	1<	mg/l CaCO3 11:45 hr.	Magnesium 07/12/88	12.40	mg/l 14:45 hr.
Alk., Total 07/07/88	228	mg/l CaCO3 11:45 hr.	Manganese 07/11/88	0.02	mg/l 15:30 hr.
Anions, Total	4.68	meq/l	pH 07/07/88	7.60	Units 11:30 hr.
Calcium 07/12/88	70.8	mg/l 14:25 hr.	Potassium 07/11/88	0.11	mg/l 14:10 hr.
Cations, Total	4.68	meq/l	Sodium 07/11/88	2.83	mg/l 15:20 hr.
Chloride 07/07/88	5.5	mg/l 13:00 hr.	Solids, Dissolved 07/11/88	319.0	mg/l 11:00 hr.
Conductivity 07/07/88	440	umhos/cm 11:30 hr.	Solids, Suspended 07/11/88	1.0<	mg/l 11:00 hr.
Fluoride 07/11/88	0.29	mg/l 13:00 hr.	Sulfate 07/13/88	4.0	mg/l 10:30 hr.
Hardness, Total	228	mg/l CaCO3	Turbidity 07/08/88	0.2	NTU 15:30 hr.

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

July 18, 1988

Job No.: 9310

Date Rec'd: July 7, 1988

Date Sampled: July 7, 1988

Sampled By: UP&L

Sample ID:

EMS 79-38
Temp 46
Flow 10.0 gpm
Time Sampled 13:50 hr.
Time Rec'd 4:15 p.m. hr.

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

WATER ANALYSIS

Alk., Bicarbonate	377	mg/l HCO3	Iron	0.32	mg/l
07/12/88		16:00 hr.	07/11/88		14:30 hr.
Alk., Carbonate	1<	mg/l CaCO3	Magnesium	24.00	mg/l
07/12/88		16:00 hr.	07/15/88		15:30 hr.
Alk., Total	309	mg/l CaCO3	Manganese	0.02	mg/l
07/12/88		16:00 hr.	07/11/88		15:30 hr.
Anions, Total	6.68	meq/l	pH	7.80	Units
			07/07/88		16:35 hr.
Calcium	71.9	mg/l	Potassium	0.72	mg/l
07/15/88		16:00 hr.	07/15/88		14:00 hr.
Cations, Total	6.64	meq/l	Sodium	24.70	mg/l
			07/15/88		16:30 hr.
Chloride	6.0	mg/l	Solids, Dissolved	338.0	mg/l
07/14/88		15:30 hr.	07/12/88		10:50 hr.
Conductivity	520	umhos/cm	Solids, Suspended	5.0	mg/l
07/14/88		16:20 hr.	07/12/88		10:50 hr.
Fluoride	0.27	mg/l	Sulfate	23.0	mg/l
07/11/88		13:00 hr.	07/13/88		10:30 hr.
Hardness, Total	278	mg/l CaCO3	Turbidity	0.5	NTU
			07/08/88		15:30 hr.

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

July 18, 1988

Job No.: 9311

Date Rec'd: July 7, 1988

Date Sampled: July 7, 1988

Sampled By: UP&L

Sample ID:

EMS 79-40
Temp 43
Flow 5.4 gpm
Time Sampled 11:30 hr.
Time Rec'd 4:15 p.m. hr.

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

WATER ANALYSIS

Alk., Bicarbonate 07/12/88	420	mg/l HCO3 16:00 hr.	Iron 07/11/88	0.03	mg/l 14:30 hr.
Alk., Carbonate 07/12/88	1<	mg/l CaCO3 16:00 hr.	Magnesium 07/15/88	26.30	mg/l 15:30 hr.
Alk., Total 07/12/88	344	mg/l CaCO3 16:00 hr.	Manganese 07/11/88	0.01<	mg/l 15:30 hr.
Anions, Total	7.65	meq/l	pH 07/07/88	7.90	Units 16:35 hr.
Calcium 07/15/88	72.2	mg/l 16:00 hr.	Potassium 07/15/88	0.96	mg/l 14:00 hr.
Cations, Total	7.52	meq/l	Sodium 07/15/88	40.30	mg/l 16:30 hr.
Chloride 07/14/88	8.0	mg/l 15:30 hr.	Solids, Dissolved 07/12/88	408.0	mg/l 10:50 hr.
Conductivity 07/14/88	560	umhos/cm 16:20 hr.	Solids, Suspended 07/12/88	1.0<	mg/l 10:50 hr.
Fluoride 07/11/88	0.29	mg/l 13:00 hr.	Sulfate 07/13/88	34.0	mg/l 10:30 hr.
Hardness, Total	289	mg/l CaCO3	Turbidity 07/08/88	0.3	NTU 15:30 hr.

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TELEPHONE: (801) 653-2311

July 18, 1988

Job No.: 9308

Date Rec'd: July 7, 1988

Date Sampled: July 7, 1988

Sampled By: UP&L

Sample ID:

EMS 80-41
Temp 42
Flow 3.9 gpm
Time Sampled 11:19 hr.
Time Rec'd 4:15 p.m. hr.

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

WATER ANALYSIS

Alk., Bicarbonate 07/12/88	427	mg/l HCO3	16:00 hr.	Iron 07/11/88	0.02<	mg/l	14:30 hr.
Alk., Carbonate 07/12/88	1<	mg/l CaCO3	16:00 hr.	Magnesium 07/15/88	42.10	mg/l	15:30 hr.
Alk., Total 07/12/88	350	mg/l CaCO3	16:00 hr.	Manganese 07/11/88	0.01<	mg/l	15:30 hr.
Anions, Total	8.81	meq/l		pH 07/07/88	7.90	Units	16:35 hr.
Calcium 07/15/88	87.4	mg/l	16:00 hr.	Potassium 07/15/88	0.90	mg/l	14:00 hr.
Cations, Total	8.94	meq/l		Sodium 07/15/88	25.50	mg/l	16:30 hr.
Chloride 07/14/88	9.5	mg/l	15:30 hr.	Solids, Dissolved 07/12/88	502.0	mg/l	10:50 hr.
Conductivity 07/14/88	640	umhos/cm	16:20 hr.	Solids, Suspended 07/12/88	1.0<	mg/l	10:50 hr.
Fluoride 07/11/88	0.25	mg/l	13:00 hr.	Sulfate 07/13/88	82.0	mg/l	10:30 hr.
Hardness, Total	392	mg/l CaCO3		Turbidity 07/08/88	0.2	NTU	15:30 hr.

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TELEPHONE: (801) 653-2311

July 18, 1988

Job No.: 9309

Date Rec'd: July 7, 1988

Date Sampled: July 7, 1988

Sampled By: UP&L

Sample ID:

EMS 80-43
Temp 49
Flow 1.8 gpm
Time Sampled 12:50 hr.
Time Rec'd 4:15 p.m. hr.

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

WATER ANALYSIS

Alk., Bicarbonate 07/12/88	354	mg/l HCO3 16:00 hr.	Iron 07/11/88	0.06	mg/l 14:30 hr
Alk., Carbonate 07/12/88	1<	mg/l CaCO3 16:00 hr.	Magnesium 07/15/88	24.50	mg/l 15:30 hr
Alk., Total 07/12/88	290	mg/l CaCO3 16;00 hr.	Manganese 07/11/88	0.01<	mg/l 15:30 hr
Anions, Total	6.04	meq/l	pH 07/07/88	7.80	Units 16:35 hr
Calcium 07/15/88	66.6	mg/l 16:00 hr.	Potassium 07/15/88	0.60	mg/l 14:00 hr
Cations, Total	5.72	meq/l	Sodium 07/15/88	8.43	mg/l 16:30 hr
Chloride 07/14/88	4.0	mg/l 15:30 hr.	Solids, Dissolved 07/12/88	318.0	mg/l 10:50 hr
Conductivity 07/14/88	480	umhos/cm 16:20 hr.	Solids, Suspended 07/12/88	4.0	mg/l 10:50 hr
Fluoride 07/11/88	0.17	mg/l 13:00 hr.	Sulfate 07/13/88	13.0	mg/l 10:30 hr
Hardness, Total	267	mg/l CaCO3	Turbidity 07/08/88	0.5	NTU 15:30 hr

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ANALYST: [illegible]

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TELEPHONE: (801) 653-2311

July 18, 1988

Job No.: 9306

Date Rec'd: July 7, 1988

Date Sampled: July 7, 1988

Sampled By: UP&L

Sample ID:

EMS 80-44
Temp 49
Flow 0.5 gpm
Time Sampled 11:05 hr.
Time Rec'd 4:15 p.m. hr.

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

WATER ANALYSIS

Alk., Bicarbonate 07/12/88	426	mg/l HCO3 16:00 hr.	Iron 07/11/88	0.06	mg/l 14:30 hr.
Alk., Carbonate 07/12/88	1<	mg/l CaCO3 16:00 hr.	Magnesium 07/15/88	44.00	mg/l 15:30 hr.
Alk., Total 07/12/88	349	mg/l CaCO3 16:00 hr.	Manganese 07/11/88	0.01<	mg/l 15:30 hr.
Anions, Total	8.98	meq/l	pH 07/07/88	8.10	Units 16:35 hr.
Calcium 07/15/88	78.6	mg/l 16:00 hr.	Potassium 07/15/88	0.78	mg/l 14:00 hr.
Cations, Total	9.33	meq/l	Sodium 07/15/88	41.30	mg/l 16:30 hr.
Chloride 07/14/88	10.0	mg/l 15:30 hr.	Solids, Dissolved 07/12/88	530.0	mg/l 10:50 hr.
Conductivity 07/14/88	680	umhos/cm 16:20 hr.	Solids, Suspended 07/12/88	1.0<	mg/l 10:50 hr.
Fluoride 07/11/88	0.26	mg/l 13:00 hr.	Sulfate 07/13/88	90.0	mg/l 10:30 hr.
Hardness, Total	377	mg/l CaCO3	Turbidity 07/08/88	3.2	NTU 15:30 hr.

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ANALYST: [illegible]

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

July 18, 1988

Job No.: 9307

Date Rec'd: July 7, 1988

Date Sampled: July 7, 1988

Sampled By: UP&L

Sample ID:

EMS 80-46
Flow 6.7 gpm
Time Sampled 12:30 hr.
Time Rec'd 4:15 p.m. hr.

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

WATER ANALYSIS

Alk., Bicarbonate 07/12/88	340	mg/l HCO3 16:00 hr.	Iron 07/11/88	0.03	mg/l 14:30 hr.
Alk., Carbonate 07/12/88	1<	mg/l CaCO3 16:00 hr.	Magnesium 07/15/88	28.00	mg/l 15:30 hr.
Alk., Total 07/12/88	279	mg/l CaCO3 16:00 hr.	Manganese 07/11/88	0.01<	mg/l 15:30 hr.
Anions, Total	5.95	meq/l	pH 07/07/88	7.90	Units 16:35 hr.
Calcium 07/15/88	63.5	mg/l 16:00 hr.	Potassium 07/15/88	0.71	mg/l 14:00 hr.
Cations, Total	5.91	meq/l	Sodium 07/15/88	9.82	mg/l 16:30 hr.
Chloride 07/14/88	5.5	mg/l 15:30 hr.	Solids, Dissolved 07/12/88	343.0	mg/l 10:50 hr.
Conductivity 07/14/88	480	umhos/cm 16:20 hr.	Solids, Suspended 07/12/88	1.0<	mg/l 10:50 hr.
Fluoride 07/11/88	0.23	mg/l 13:00 hr.	Sulfate 07/13/88	17.0	mg/l 10:30 hr.
Hardness, Total	274	mg/l CaCO3	Turbidity 07/08/88	0.3	NTU 15:30 hr.

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ANALYST: [illegible]

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

July 18, 1988

Job No.: 9304

Date Rec'd: July 7, 1988

Date Sampled: July 7, 1988

Sampled By: UP&L

Sample ID:

EMS 80-47
Temp 41
Flow 9.9 gpm
Time Sampled 12:30 hr.
Time Rec'd 4:15 p.m. hr.

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

WATER ANALYSIS

Alk., Bicarbonate 07/12/88	365	mg/l HCO3 16:00 hr.	Iron 07/11/88	0.08	mg/l 14:30 hr
Alk., Carbonate 07/12/88	1<	mg/l CaCO3 16:00 hr.	Magnesium 07/15/88	28.80	mg/l 15:30 hr.
Alk., Total 07/12/88	299	mg/l CaCO3 16:00 hr.	Manganese	0.01<	mg/l 15:30 hr.
Anions, Total	6.33	meq/l	pH 07/07/88	8.10	Units 16:35 hr.
Calcium 07/15/88	64.9	mg/l 16:00 hr.	Potassium 07/15/88	0.94	mg/l 14:00 hr.
Cations, Total	6.22	meq/l	Sodium 07/15/88	13.80	mg/l 16:30 hr.
Chloride 07/14/88	5.0	mg/l 15:30 hr.	Solids, Dissolved 07/12/88	413.0	mg/l 10:50 hr.
Conductivity 07/14/88	480	umhos/cm 16:20 hr.	Solids, Suspended 07/12/88	1.0<	mg/l 10:50 hr.
Fluoride 07/11/88	0.22	mg/l 13:00 hr.	Sulfate 07/13/88	17.0	mg/l 10:30 hr.
Hardness, Total	281	mg/l CaCO3	Turbidity 07/08/88	0.8	NTU 15:30 hr.

4

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

July 14, 1988

Job No.: 9300

Date Rec'd: July 7, 1988

Date Sampled: July 6, 1988

Sampled By: UP&L

Sample ID:

EMS 82-52
Temp 46
Flow 21.5
Time Sampled 15:00 hr.
Time Rec'd 9:00 hr.

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

WATER ANALYSIS

Alk., Bicarbonate 07/07/88	377	mg/l HCO3 11:45 hr.	Iron 07/11/88	0.02<	mg/l 14:30 hr.
Alk., Carbonate 07/07/88	1<	mg/l CaCO3 11:45 hr.	Magnesium 07/12/88	37.60	mg/l 14:45 hr.
Alk., Total 07/07/88	309	mg/l CaCO3 11:45 hr.	Manganese 07/11/88	0.02	mg/l 15:30 hr.
Anions, Total	6.92	meq/l	pH 07/07/88	7.65	Units 11:30 hr.
Calcium 07/12/88	65.2	mg/l 14:25 hr.	Potassium 07/11/88	0.99	mg/l 14:10 hr.
Cations, Total	7.43	meq/l	Sodium 07/11/88	24.60	mg/l 15:20 hr.
Chloride 07/07/88	11.0	mg/l 13:00 hr.	Solids, Dissolved 07/11/88	439.0	mg/l 11:00 hr.
Conductivity 07/07/88	750	umhos/cm 11:30 hr.	Solids, Suspended 07/11/88	1.0<	mg/l 10:30 hr.
Fluoride 07/11/88	0.28	mg/l 13:00 hr.	Sulfate 07/13/88	28.0	mg/l 10:30 hr.
Hardness, Total	318	mg/l CaCO3	Turbidity 07/08/88	0.3	NTU 15:30 hr.

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ANALYST: [illegible]

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

July 18, 1988

Job No.: 9305

Date Rec'd: July 7, 1988

Date Sampled: July 7, 1988

Sampled By: UP&L

Sample ID:

EMS 84-56
Temp 46
Flow 2.9 gpm
Time Sampled 10:40 hr.
Time Rec'd 4:15 p.m. hr.

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

WATER ANALYSIS

Alk., Bicarbonate	368	mg/l HCO3	Iron	0.06	mg/l
07/12/88		16:00 hr.	07/11/88		14:30 hr.
Alk., Carbonate	1<	mg/l CaCO3	Magnesium	32.70	mg/l
07/12/88		16:00 hr.	07/15/88		15:30 hr.
Alk., Total	302	mg/l CaCO3	Manganese	0.01<	mg/l
07/12/88		16:00 hr.	07/11/88		15:30 hr.
Anions, Total	6.63	meq/l	pH	7.80	Units
			07/07/88		16:35 hr.
Calcium	62.2	mg/l	Potassium	1.10	mg/l
07/15/88		16:00 hr.	07/15/88		14:00 hr.
Cations, Total	6.51	meq/l	Sodium	16.10	mg/l
			07/15/88		16:30 hr.
Chloride	10.0	mg/l	Solids, Dissolved	445.0	mg/l
07/14/88		15:30 hr.	07/12/88		10:50 hr.
Conductivity	500	umhos/cm	Solids, Suspended	1.0<	mg/l
07/14/88		16:20 hr.	07/12/88		10:50 hr.
Fluoride	0.26	mg/l	Sulfate	22.0	mg/l
07/11/88		13:00 hr.	07/13/88		10:30 hr.
Hardness, Total	290	mg/l CaCO3	Turbidity	0.3	NTU
					15:30 hr.

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ANALYST: M M

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M M
Manager, Huntington Laboratory

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

August 9, 1988

Job No.: 9359

Date Rec'd: August 3, 1988

Date Sampled: August 2, 1988

Sampled By: UP&L

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

Sample ID:

EMS
Burnt Tree
Temp 43
Flow 10.5
Time Sampled 19:00 hr.
Time Rec'd 14:20 hr.

WATER ANALYSIS

Alk., Carbonate 08/04/88	1<	mg/l CaCO3 10:00 hr.	Manganese 08/05/88	0.01<	mg/l 15:30 hr.
Conductivity 08/05/88	620	umhos/cm 09:30 hr.	pH 08/03/88	7.10	Units 15:40 hr.
Hardness, Total 08/09/88	242	mg/l CaCO3			

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ANALYST: J. Komar

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TELEPHONE: (801) 653-2311

August 9, 1988

Job No.: 9358

Date Rec'd: August 3, 1988

Date Sampled: August 2, 1988

Sampled By: UP&L

Sample ID:

ELK SPRINGS
Temp 41
Flow 123.7
Time Sampled 14:10 hr.
Time Rec'd 14:20 hr.

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

WATER ANALYSIS

Alk., Carbonate 08/04/88	1<	mg/l CaCO3 10:00 hr.	Manganese 08/05/88	0.01<	mg/l 15:30 hr.
Conductivity 08/05/88	545	umhos/cm 09:30 hr.	pH 08/03/88	7.90	Units 15:40 hr.
Hardness, Total 08/09/88	255	mg/l CaCO3			

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

August 9, 1988

Job No.: 9356

Date Rec'd: August 3, 1988

Date Sampled: August 2, 1988

Sampled By: UP&L

Sample ID:

SHEBA SPRINGS
Temp 41
Flow 6.0
Time Sampled 13:30 hr.
Time Rec'd 14:20 hr.

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

WATER ANALYSIS

Alk., Carbonate 08/04/88	1<	mg/l CaCO3 10:00 hr.	Manganese 08/05/88	0.01<	mg/l 15:30 hr.
Conductivity 08/05/88	548	umhos/cm 09:30 hr.	pH 08/03/88	7.52	Units 15:40 hr.
Hardness, Total 08/09/88	249	mg/l CaCO3			

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TELEPHONE: (801) 653-2311

August 9, 1988

Job No.: 9355

Date Rec'd: August 3, 1988

Date Sampled: August 2, 1988

Sampled By: UP&L

Sample ID:

EMS 79-10
Temp 41
Flow 8.5
Time Sampled 13:00 hr.
Time Rec'd 14:20 hr.

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

WATER ANALYSIS

Alk., Carbonate	1<	mg/l CaCO3	Manganese	0.01<	mg/l
08/04/88		10:00 hr.	08/05/88		15:30 hr.
Conductivity	605	umhos/cm	pH	7.69	Units
08/05/88		09:30 hr.	08/03/88		15:40 hr.
Hardness, Total	295	mg/l CaCO3			
08/09/88					

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

August 9, 1988

Job No.: 9353

Date Rec'd: August 3, 1988

Date Sampled: August 2, 1988

Sampled By: UP&L

Sample ID:

EMS 79-26
Temp 52
Flow 4.5 gpm
Time Sampled 16:00 hr.
Time Rec'd 14:20 hr.

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

WATER ANALYSIS

Alk., Carbonate 08/04/88	1<	mg/l CaCO3 10:00 hr.	Manganese 08/05/88	0.01<	mg/l 15:30 hr.
Conductivity 08/05/88	615	umhos/cm 09:30 hr.	pH 08/05/88	7.82	Units 15:40 hr.
Hardness, Total 08/09/88	289	mg/l CaCO3			

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OVER 40 BRANCH LABORATORIES STRATEGICALLY LOCATED IN PRINCIPAL COAL MINING AREAS,
TIDEWATER AND GREAT LAKES PORTS, AND TIMBER CUTTING FIELD OFFICES

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

August 9, 1988

Job No.: 9352

Date Rec'd: August 3, 1988

Date Sampled: August 2, 1988

Sampled By: UP&L

Sample ID:

EMS 79-29
Temp 42
Flow 3.6 gpm
Time Sampled 15:40 hr.
Time Rec'd 14:20 hr.

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

WATER ANALYSIS

Alk., Carbonate	1<	mg/l CaCO3	Manganese	0.01<	mg/l
08/04/88		10:00 hr.	08/05/88		15:30 hr.
Conductivity	660	umhos/cm	pH	7.55	Units
08/05/88		09:30 hr.	08/03/88		15:40 hr.
Hardness, Total	267	mg/l CaCO3			
08/09/88					

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TELEPHONE: (801) 653-2311

August 9, 1988

Job No.: 9357

Date Rec'd: August 3, 1988

Date Sampled: August 2, 1988

Sampled By: UP&L

Sample ID:

EMS 79-35
Temp 40
Flow 2.0
Time Sampled 15:15 hr.
Time Rec'd 14:20 hr.

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

WATER ANALYSIS

Alk., Carbonate 08/04/88	1< mg/l CaCO3 10:00 hr.		Manganese 08/05/88	0.01< mg/l 15:30 hr.	
Conductivity 08/05/88	570 umhos/cm 09:30 hr.		pH 08/03/88	7.83 Units 15:40 hr.	
Hardness, Total 08/09/88	257 mg/l CaCO3				

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TELEPHONE: (801) 653-2311

August 9, 1988

Job No.: 9360

Date Rec'd: August 3, 1988

Date Sampled: August 2, 1988

Sampled By: UP&L

Sample ID:

EMS
80-46
Temp 45
Flow 6.0 gpm
Time Sampled 16:40 hr.
Time Rec'd 14:20 hr.

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

WATER ANALYSIS

Alk., Carbonate 08/04/88	1<	mg/l CaCO3 10:00 hr.	Manganese 08/05/88	0.01<	mg/l 15:30 hr.
Conductivity 08/05/88	658	umhos/cm 09:30 hr.	pH 08/03/88	7.23	Units 15:40 hr.
Hardness, Total 08/09/88	295	mg/l CaCO3			

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ANALYST: J. Komar

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

August 9, 1988

Job No.: 9354

Date Rec'd: August 3, 1988

Date Sampled: August 2, 1988

Sampled By: UP&L

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

Sample ID:

EMS
Sheep Herder 82-52
Temp 46
Flow 13.9
Time Sampled 16:30 hr.
Time Rec'd 14:20 hr.

WATER ANALYSIS

Alk., Carbonate 08/04/88	1<	mg/l CaCO3 10:00 hr.	Manganese 08/05/88	0.01<	mg/l 15:30 hr.
Conductivity 08/05/88	800	umhos/cm 09:30 hr.	pH 08/03/88	7.78	Units 15:40 hr.
Hardness, Total 08/09/88	362	mg/l CaCO3			

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ANALYST: J. Komar

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TELEPHONE: (801) 653-2311

August 9, 1988

Job No.: 9351

Date Rec'd: August 3, 1988

Date Sampled: August 2, 1988

Sampled By: UP&L

Sample ID:

EMS 84-56
Temp 46
Flow 2.0 gpm
Time Sampled 16:30 hr.
Time Rec'd 14:20 hr.

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

WATER ANALYSIS

Alk., Carbonate	1<	mg/l CaCO3	Manganese	0.01<	mg/l
08/04/88		10:00 hr.	08/05/88		15:30 hr.
Conductivity	680	umhos/cm	pH	7.40	Units
08/05/88		09:30 hr.	08/03/88		15:40 hr.
Hardness, Total	332	mg/l CaCO3			
08/09/88					

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ANALYST: J. Komar

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

September 13, 1988

Job No.: 9398

Date Rec'd: September 7, 1988

Date Sampled: September 7, 1988

Sampled By: UP&L

Sample ID:

BURNT TREE SPRING
Temp 44
Flow 2.0 gpm.
Time Sampled 13:35 hr.
Time Rec'd 4:00 p.m. hr.

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

WATER ANALYSIS

Alk., Carbonate 09/07/88	1<	mg/l CaCO3 16:30 hr.	Magnesium 09/13/88	28.10	mg/l 14:15 hr.
Calcium 09/13/88	83.1	mg/l 14:00 hr.	Manganese 09/13/88	0.01<	mg/l 14:30 hr.
Conductivity 09/13/88	540	umhos/cm 13:30 hr.	pH 09/07/88	7.30	Units 16:30 hr.
Hardness, Total	323	mg/l CaCO3			

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ANALYST: D. Tyson

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

September 13, 1988

Job No.: 9405

Date Rec'd: September 7, 1988

Date Sampled: September 7, 1988

Sampled By: UP&L

Sample ID:

ELK SPRINGS
Temp 40
Flow 103.4 gpm.
Time Sampled 11:23 hr.
Time Rec'd 4:00 p.m. hr.

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

WATER ANALYSIS

Alk., Carbonate	1<	mg/l CaCO3	Magnesium	23.00	mg/l
09/07/88		16:30 hr.	09/13/88		14:15 hr.
Calcium	70.9	mg/l	Manganese	0.01<	mg/l
09/13/88		14:00 hr.	09/13/88		14:30 hr.
Conductivity	482	umhos/cm	pH	7.75	Units
09/13/88		13:30 hr.	09/07/88		16:30 hr.
Hardness, Total	272	mg/l CaCO3			

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ANALYST: D. Tyson

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

September 13, 1988

Job No.: 9402

Date Rec'd: September 7, 1988

Date Sampled: September 7, 1988

Sampled By: UP&L

Sample ID:

SHEBA SPRINGS
Temp 48
Flow 1.4 gpm.
Time Sampled 11:12 hr.
Time Rec'd 4:00 p.m. hr.

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

WATER ANALYSIS

Alk., Carbonate 09/07/88	1<	mg/l CaCO3 16:30 hr.	Magnesium 09/13/88	10.10	mg/l 14:15 hr.
Calcium 09/13/88	109.2	mg/l 14:00 hr.	Manganese 09/13/88	0.01<	mg/l 14:30 hr.
Conductivity 09/13/88	519	umhos/cm 13:30 hr.	pH 09/07/88	7.20	Units 16:30 hr.
Hardness, Total	314	mg/l CaCO3			

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ANALYST: D. Tyson

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TELEPHONE: (801) 653-2311

September 13, 1988

Job No.: 9401

Date Rec'd: September 7, 1988

Date Sampled: September 7, 1988

Sampled By: UP&L

Sample ID:

EMS 79-10
Temp 43
Flow 4.3 gpm.
Time Sampled 11:08 hr.
Time Rec'd 4:00 p.m. hr.

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

WATER ANALYSIS

Alk., Carbonate	1<	mg/l CaCO3	Magnesium	18.90	mg/l
09/07/88		16:30 hr.	09/13/88		14:15 hr.
Calcium	67.5	mg/l	Manganese	0.01<	mg/l
09/13/88		14:00 hr.	09/13/88		14:30 hr.
Conductivity	543	umhos/cm	pH	7.45	Units
09/13/88		13:30 hr.	09/07/88		16:30 hr.
Hardness, Total	296	mg/l CaCO3			

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ANALYST: D. Tipon

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

September 13, 1988

Job No.: 9400

Date Rec'd: September 7, 1988

Date Sampled: September 7, 1988

Sampled By: UP&L

Sample ID:

EMS 79-26
Temp 59
Flow 2.3 gpm.
Time Sampled 2:47 hr.
Time Rec'd 4:00 p.m. hr.

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

WATER ANALYSIS

Alk., Carbonate	1<	mg/l CaCO3	Magnesium	32.90	mg/l
09/07/88		16:30 hr.	09/13/88		14:15 hr.
Calcium	77.4	mg/l	Manganese	0.03	mg/l
09/13/88		14:00 hr.	09/13/88		14:30 hr.
Conductivity	578	umhos/cm	pH	7.90	Units
09/13/88		13:30 hr.	09/07/88		16:30 hr.
Hardness, Total	329	mg/l CaCO3			

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ANALYST: D. Tipon

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

September 13, 1988

Job No.: 9404

Date Rec'd: September 7, 1988

Date Sampled: September 7, 1988

Sampled By: UP&L

Sample ID:

EMS 79-29
Temp 41
Flow 1.4 gpm.
Time Sampled 2:36 hr.
Time Rec'd 4:00 p.m. hr.

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

WATER ANALYSIS

Alk., Carbonate 09/07/88	1<	mg/l CaCO3 16:30 hr.	Magnesium 09/13/88	19.50	mg/l 14:15 hr.
Calcium 09/13/88	55.9	mg/l 14:00 hr.	Manganese 09/13/88	0.01<	mg/l 14:30 hr.
Conductivity 09/13/88	619	umhos/cm 13:30 hr.	pH 09/07/88	7.70	Units 16:30 hr.
Hardness, Total	220	mg/l CaCO3			

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

September 13, 1988

Job No.: 9403

Date Rec'd: September 7, 1988

Date Sampled: September 7, 1988

Sampled By: UP&L

Sample ID:

EMS 79-35
Temp 40
Flow 1.7 gpm.
Time Sampled 11:37 hr.
Time Rec'd 4:00 p.m. hr.

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

WATER ANALYSIS

Alk., Carbonate 09/07/88	1<	mg/l CaCO3 16:30 hr.	Magnesium 09/13/88	13.50	mg/l 14:15 hr.
Calcium 09/13/88	101.2	mg/l 14:00 hr.	Manganese 09/13/88	0.01<	mg/l 14:30 hr.
Conductivity 09/13/88	485	umhos/cm 13:30 hr.	pH 09/07/88	7.67	Units 16:30 hr.
Hardness, Total	308	mg/l CaCO3			

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SEP 13 1988
MINING DIV.
FIELD OFFICE

ANALYST: D. Tipon

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Manager, Huntington Laboratory

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TIDEWATER AND GREAT LAKES PORTS, AND RIVERS

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TELEPHONE: (801) 653-2311

September 13, 1988

Job No.: 9406

Date Rec'd: September 7, 1988

Date Sampled: September 7, 1988

Sampled By: UP&L

Sample ID:

EMS 80-46
Temp 43
Flow 38 gpm.
Time Sampled 2:02 hr.
Time Rec'd 4:00 p.m. hr.

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

WATER ANALYSIS

Alk., Carbonate 09/07/88	1<	mg/l CaCO3 16:30 hr.	Magnesium 09/13/88	27.80	mg/l 14:15 hr.
Calcium 09/13/88	94.6	mg/l 14:00 hr.	Manganese 09/13/88	0.01<	mg/l 14:30 hr.
Conductivity 09/13/88	580	umhos/cm 13:30 hr.	pH 09/07/88	7.65	Units 16:30 hr.
Hardness, Total	351	mg/l CaCO3			

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TELEPHONE: (801) 653-2311

September 13, 1988

Job No.: 9399

Date Rec'd: September 7, 1988

Date Sampled: September 7, 1988

Sampled By: UP&L

Sample ID:

EMS 82-52
Temp 42
Flow 13 gpm.
Time Sampled 1:21 hr.
Time Rec'd 4:00 p.m. hr.

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

WATER ANALYSIS

Alk., Carbonate 09/07/88	1<	mg/l CaCO3 16:30 hr.	Magnesium 09/13/88	33.10	mg/l 14:15 hr.
Calcium 09/13/88	112.0	mg/l 14:00 hr.	Manganese 09/13/88	0.01<	mg/l 14:30 hr.
Conductivity 09/13/88	680	umhos/cm 13:30 hr.	pH 09/07/88	7.30	Units 16:30 hr,
Hardness, Total	416	mg/l CaCO3			

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ANALYST: D. Tyson

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TELEPHONE: (801) 653-2311

September 13, 1988

Job No.: 9407

Date Rec'd: September 7, 1988

Date Sampled: September 7, 1988

Sampled By: UP&L

Sample ID:

EMS 84-56
Temp 41
Flow 2.0 gpm.
Time Sampled 2:10 hr.
Time Rec'd 4:00 p.m. hr.

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

WATER ANALYSIS

Alk., Carbonate	1<	mg/l CaCO3	Magnesium	22.00	mg/l
09/07/88		16:30 hr.	09/13/88		14:15 hr.
Calcium	86.9	mg/l	Manganese	0.01<	mg/l
09/13/88		14:00 hr.	09/13/88		14:30 hr.
Conductivity	610	umhos/cm	pH	7.60	Units
09/13/88		13:30 hr.	09/07/88		16:30 hr.
Hardness, Total	308	mg/l CaCO3			

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ANALYST: D. Tyson

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TELEPHONE: (801) 653-2311

October 28, 1988

Job No.: 9457

Date Rec'd: October 20, 1988

Date Sampled: October 20, 1988

Sampled By: UP&L

Sample ID:

BURNT TREE
Temperature 44 degrees
Flow 10.6 gpm
Rec'd 1640 hr.
Sampled 1355 hr.

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

WATER ANALYSIS

Alk., Bicarbonate	337	mg/l HCO3	10/25/88 1315 hr.
Alk., Carbonate	1<	mg/l CaCO3	10/25/88 1315 hr.
Alk., Total	276	mg/l CaCO3	10/25/88 1315 hr.
Anions, Total	5.86	meq/l	10/28/88
Calcium	63.4	mg/l	10/25/88 1330 hr.
Cations, Total	5.89	meq/l	10/28/88
Chloride	5.0	mg/l	10/26/88 830 hr.
Conductivity	550	umhos/cm	10/21/88 1000 hr.
Fluoride	0.21	mg/l	10/26/88 1430 h4.
Hardness, Total	266	mg/l CaCO3	
Iron	0.07	mg/l	10/25/88 1415 hr.
Magnesium	26.20	mg/l	10/25/88 1400 hr.
Manganese	0.01<	mg/l	10/25/88 1400 hr.
pH	7.80	Units	10/20/88 1650 hr.
Potassium	0.50	mg/l	10/25/88 1315 hr.
Sodium	13.00	mg/l	10/25/88 1300 hr.
Solids, Dissolved	304.0	mg/l	10/27/88 930 hr.
Solids, Suspended	1.0<	mg/l	10/27/88 930 hr.
Sulfate	16.0	mg/l	10/26/88 1250 hr.
Turbidity	0.2	NTU	10/25/88 1535 hr.

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ANALYST: D. Tyson

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TELEPHONE: (801) 653-2311

October 28, 1988

Job No.: 9467

Date Rec'd: October 20, 1988

Date Sampled: October 20, 1988

Sampled By: UP&L

Sample ID:

ELKS SPRING
Temperature 40 degrees
Flow 72.7 gpm (.2)
Rec'd 1640 hr.
Sampled 1100 hr.

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

WATER ANALYSIS

Alk., Bicarbonate	265	mg/l HCO3		Iron	0.02<	mg/l	
10/25/88	1315 hr.			10/25/88	1415 hr.		
Alk., Carbonate	1<	mg/l CaCO3		Magnesium	20.60	mg/l	
10/25/88	1315 hr.			10/25/88	1400 hr.		
Alk., Total	217	mg/l CaCO3		Manganese	0.01<	mg/l	
10/25/88	1315 hr.			10/25/88	1400 hr.		
Anions, Total	4.60	meq/l		pH	8.05	Units	
10/28/88				10/20/88	1650 hr.		
Calcium	52.7	mg/l		Potassium	0.50	mg/l	
10/25/88	1330 hr.			10/25/88	1315 hr.		
Cations, Total	4.65	meq/l		Sodium	7.20	mg/l	
10/28/88				10/25/88	1300 hr.		
Chloride	2.5	mg/l		Solids, Dissolved	220.0	mg/l	
10/26/88	830 hr.			10/27/88	930 hr.		
Conductivity	500	umhos/cm		Solids, Suspended	1.0<	mg/l	
10/21/88	1000 hr.			10/27/88	930 hr.		
Fluoride	0.22	mg/l		Sulfate	14.0	mg/l	
10/26/88	1430 hr.			10/26/88	1250 hr.		
Hardness, Total	216	mg/l CaCO3		Turbidity	0.3	NTU	
				10/25/88	1535 hr.		

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ANALYST: D. Tipon

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

October 28, 1988

Job No.: 9458

Date Rec'd: October 20, 1988

Date Sampled: October 20, 1988

Sampled By: UP&L

Sample ID:

SHEBA SPRING
Temperature 44 degrees
Flow 1.1 gpm
Rec'd 1640 hr.
Sampled 1045 hr.

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

WATER ANALYSIS

Alk., Bicarbonate	314	mg/l HCO3	10/25/88 1315 hr.
Alk., Carbonate	1<	mg/l CaCO3	10/25/88 1315 hr.
Alk., Total	257	mg/l CaCO3	10/25/88 1315 hr.
Anions, Total	5.19	meq/l	10/28/88
Calcium	90.5	mg/l	10/25/88 1330 hr.
Cations, Total	5.40	meq/l	10/28/88
Chloride	2.5	mg/l	10/26/88 830 hr.
Conductivity	410	umhos/cm	10/21/88 1000 hr.
Fluoride	0.17	mg/l	10/26/88 1430 hr.
Hardness, Total	263	mg/l CaCO3	
Iron	0.04	mg/l	10/25/88 1415 hr.
Magnesium	9.10	mg/l	10/25/88 1400 hr.
Manganese	0.01<	mg/l	10/25/88 1400 hr.
pH	7.85	Units	10/20/88 1650 hr.
Potassium	0.10	mg/l	10/25/88 1315 hr.
Sodium	2.90	mg/l	10/25/88 1300 hr.
Solids, Dissolved	248.0	mg/l	10/27/88 930 hr.
Solids, Suspended	1.0<	mg/l	10/27/88 930 hr.
Sulfate	5.0	mg/l	10/26/88 1250 hr.
Turbidity	0.2	NTU	10/25/88 1535 hr.

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ANALYST: D. Tyson

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TELEPHONE: (801) 653-2311

October 28, 1988

Job No.: 9462

Date Rec'd: October 20, 1988

Date Sampled: October 20, 1988

Sampled By: UP&L

Sample ID:

TEDS TUBB
Temperature 49 degrees
Flow 2.3 gpm
Rec'd 1640 hr.
Sampled 1300 hr.

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

WATER ANALYSIS

Alk., Bicarbonate	292	mg/l HCO3	10/25/88 1315 hr.	Iron	0.05	mg/l	10/25/88 1415 hr.
Alk., Carbonate	1<	mg/l CaCO3	10/25/88 1315 hr.	Magnesium	18.70	mg/l	10/25/88 1400 hr.
Alk., Total	239	mg/l CaCO3	10/25/88 1315 hr.	Manganese	0.01<	mg/l	10/25/88 1400 hr.
Anions, Total	5.09	meq/l	10/28/88	pH	7.70	Units	10/20/88 1650 hr.
Calcium	67.9	mg/l	10/25/88 1330 hr.	Potassium	1.20	mg/l	10/25/88 1315 hr.
Cations, Total	5.20	meq/l	10/28/88	Sodium	5.60	mg/l	10/25/88 1300 hr.
Chloride	5.0	mg/l	10/26/88 830 hr.	Solids, Dissolved	310.0	mg/l	10/27/88 930 hr.
Conductivity	560	umhos/cm	10/21/88 1000 hr.	Solids, Suspended	1.0<	mg/l	10/27/88 930 hr.
Fluoride	0.14	mg/l	10/26/88 1430 hr.	Sulfate	14.0	mg/l	10/26/88 1250 hr.
Hardness, Total	247	mg/l CaCO3		Turbidity	0.9	NTU	10/25/88 1535 hr.

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ANALYST: D. Tyson

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

October 28, 1988

Job No.: 9460

Date Rec'd: October 20, 1988

Date Sampled: October 20, 1988

Sampled By: UP&L

Sample ID:

EMS 79-2
Temperature 42 degrees
Flow 3.0 gpm
Rec'd 1640 hr.
Sampled 1410 hr.

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

WATER ANALYSIS

Alk., Bicarbonate	359	mg/l HCO3	10/25/88 1315 hr.
Alk., Carbonate	1<	mg/l CaCO3	10/25/88 1315 hr.
Alk., Total	294	mg/l CaCO3	10/25/88 1315 hr.
Anions, Total	6.10	meq/l	10/28/88
Calcium	78.4	mg/l	10/25/88 1330 hr.
Cations, Total	5.96	meq/l	10/28/88
Chloride	2.5	mg/l	10/26/88 830 hr.
Conductivity	600	umhos/cm	10/21/88 1000 hr.
Fluoride	0.22	mg/l	10/26/88 1430 hr.
Hardness, Total	271	mg/l CaCO3	
Iron	0.04	mg/l	10/25/88 1415 hr.
Magnesium	18.20	mg/l	10/25/88 1400 hr.
Manganese	0.01<	mg/l	10/25/88 1400 hr.
pH	7.55	Units	10/20/88 1650 hr.
Potassium	0.10	mg/l	10/25/88 1315 hr.
Sodium	12.60	mg/l	10/25/88 1300 hr.
Solids, Dissolved	352.0	mg/l	10/27/88 930 hr.
Solids, Suspended	1.0<	mg/l	10/27/88 930 hr.
Sulfate	14.0	mg/l	10/26/88 1250 hr.
Turbidity	0.1	NTU	10/25/88 1535 hr.

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TELEPHONE: (801) 653-2311

October 28, 1988

Job No.: 9465

Date Rec'd: October 20, 1988

Date Sampled: October 20, 1988

Sampled By: UP&L

Sample ID:

EMS-10
Temperature 46 degrees
Flow 3.2 gpm
Rec'd 1640 hr.
Sampled 1025 hr.

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

WATER ANALYSIS

Alk., Bicarbonate	317	mg/l HCO3	10/25/88 1315 hr.	Iron	0.07	mg/l	10/25/88 1415 hr.
Alk., Carbonate	1<	mg/l CaCO3	10/25/88 1315 hr.	Magnesium	20.90	mg/l	10/25/88 1400 hr.
Alk., Total	260	mg/l CaCO3	10/25/88 1315 hr.	Manganese	0.01<	mg/l	10/25/88 1400 hr.
Anions, Total	5.48	meq/l	10/28/88	pH	7.70	Units	10/20/88 1650 hr.
Calcium	74.3	mg/l	10/25/88 1330 hr.	Potassium	0.40	mg/l	10/25/88 1315 hr.
Cations, Total	5.63	meq/l	10/28/88	Sodium	4.40	mg/l	10/25/88 1300 hr.
Chloride	8.0	mg/l	10/26/88 830 hr.	Solids, Dissolved	242.0	mg/l	10/27/88 930 hr.
Conductivity	510	umhos/cm	10/21/88 1000 hr.	Solids, Suspended	1.0<	mg/l	10/27/88 930 hr.
Fluoride	0.26	mg/l	10/26/88 1430 hr.	Sulfate	9.0	mg/l	10/26/88 1250 hr.
Hardness, Total	272	mg/l CaCO3		Turbidity	0.2	NTU	10/25/88 1535 hr.

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TELEPHONE: (801) 653-2311

October 28, 1988

Job No.: 9461

Date Rec'd: October 20, 1988

Date Sampled: October 20, 1988

Sampled By: UP&L

Sample ID:

EMS 79-15
Temperature 44 degrees
Flow 4.7 gpm
Rec'd 1640 hr.
Sampled 1200 hr.

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

WATER ANALYSIS

Alk., Bicarbonate	345	mg/l HCO3	10/25/88 1315 hr.
Alk., Carbonate	1<	mg/l CaCO3	10/25/88 1315 hr.
Alk., Total	283	mg/l CaCO3	10/25/88 1315 hr.
Anions, Total	5.97	meq/l	10/28/88
Calcium	76.0	mg/l	10/25/88 1330 hr.
Cations, Total	5.72	meq/l	10/28/88
Chloride	2.5	mg/l	10/26/88 830 hr.
Conductivity	600	umhos/cm	10/21/88 1000 hr.
Fluoride	0.22	mg/l	10/26/88 1430 hr.
Hardness, Total	275	mg/l CaCO3	
Iron	0.03	mg/l	10/25/88 1415 hr.
Magnesium	20.60	mg/l	10/25/88 1400 hr.
Manganese	0.01<	mg/l	10/25/88 1400 hr.
pH	7.65	Units	10/20/88 1650 hr.
Potassium	0.40	mg/l	10/25/88 1315 hr.
Sodium	5.20	mg/l	10/25/88 1300 hr.
Solids, Dissolved	298.0	mg/l	10/27/88 930 hr.
Solids, Suspended	1.0<	mg/l	10/27/88 930 hr.
Sulfate	18.0	mg/l	10/26/88 1250 hr.
Turbidity	0.2	NTU	10/25/88 1535 hr.

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

October 21, 1988

Job No.: 9447

Date Rec'd: October 13, 1988

Date Sampled: October 12, 1988

Sampled By: UP&L

Sample ID:

EMS 79-26
Temperature 42 degrees
Flow 2.4 gpm
Rec'd 930 hr.
Sampled 1320 hr.

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

WATER ANALYSIS

Alk., Bicarbonate	354	mg/l HCO3		Iron	0.27	mg/l	
10/17/88	945 hr.			10/19/88	1400 hr.		
Alk., Carbonate	1<	mg/l CaCO3		Magnesium	30.80	mg/l	
10/17/88	945 hr.			10/19/88	1345 hr.		
Alk., Total	258	mg/l CaCO3		Manganese	0.02	mg/l	
10/17/88	945 hr.			10/19/88	1400 hr.		
Anions, Total	5.63	meq/l		pH	8.15	Units	
				10/13/88	1400 hr.		
Calcium	58.2	mg/l		Potassium	1.00	mg/l	
10/19/88	1330 hr.			10/19/88	1510 hr.		
Cations, Total	6.15	meq/l		Sodium	16.00	mg/l	
				10/19/88	1420 hr.		
Chloride	10.0	mg/l		Solids, Dissolved	434.0	mg/l	
10/20/88	930 hr.			10/18/88	930 hr.		
Conductivity	550	umhos/cm		Solids, Suspended	16.0	mg/l	
10/13/88	1500 hr.			10/18/88	930 hr.		
Fluoride	0.34	mg/l		Sulfate	15.0	mg/l	
10/20/88	1000 hr.			10/18/88	1600 hr.		
Hardness, Total	272	mg/l CaCO3		Turbidity	4.2	NTU	
				10/13/88	1000 hr.		

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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 21, 1988

Job No.: 9445

Date Rec'd: October 13, 1988

Date Sampled: October 12, 1988

~~Sampled By:~~ UP&L

Sample ID:

EMS 79-29
Temperature 40 degrees
Flow 1.6 gpm
Rec'd 930 hr.
Sampled 1330 hr.

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

WATER ANALYSIS

Alk., Bicarbonate	320	mg/l HCO3	
10/17/88	945 hr.		
Alk., Carbonate	1<	mg/l CaCO3	
10/17/88	945 hr.		
Alk., Total	262	mg/l CaCO3	
10/17/88	945 hr.		
Anions, Total	6.03	meq/l	
Calcium	49.0	mg/l	
10/19/88	1330 hr.		
Cations, Total	6.78	meq/l	
Chloride	15.0	mg/l	
10/20/88	930 hr.		
Conductivity	595	umhos/cm	
10/13/88	1500 hr.		
Fluoride	0.45	mg/l	
10/20/88	1000 hr.		
Hardness, Total	263	mg/l CaCO3	
Iron	0.02<	mg/l	
10/19/88	1400 hr.		
Magnesium	34.10	mg/l	
10/19/88	1345 hr.		
Manganese	0.01<	mg/l	
10/19/88	1400 hr.		
pH	7.70	Units	
10/13/88	1400 hr.		
Potassium	1.40	mg/l	
10/19/88	1510 hr.		
Sodium	34.90	mg/l	
10/19/88	1420 hr.		
Solids, Dissolved	348.0	mg/l	
10/18/88	930 hr.		
Solids, Suspended	1.0<	mg/l	
10/18/88	930 hr.		
Sulfate	24.0	mg/l	
10/18/88	1600 hr.		
Turbidity	0.4	NTU	
10/13/88	1000 hr.		

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

October 28, 1988

Job No.: 9466

Date Rec'd: October 20, 1988

Date Sampled: October 20, 1988

Sampled By: UP&L

Sample ID:

EMS 79-35
Temperature 42 degrees
Flow 0.5 gpm (31g/lt)
Rec'd 1640 hr.
Sampled 1130 hr.

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

WATER ANALYSIS

Alk., Bicarbonate	294	mg/l HCO3	10/25/88 1315 hr.
Alk., Carbonate	1<	mg/l CaCO3	10/25/88 1315 hr.
Alk., Total	241	mg/l CaCO3	10/25/88 1315 hr.
Anions, Total	4.81	meq/l	10/28/88
Calcium	74.0	mg/l	10/25/88 1330 hr.
Cations, Total	4.93	meq/l	10/28/88
Chloride	2.5	mg/l	10/26/88 830 hr.
Conductivity	500	umhos/cm	10/21/88 1000 hr.
Fluoride	0.21	mg/l	10/26/88 1430 hr.
Hardness, Total	240	mg/l CaCO3	
Iron	0.02<	mg/l	10/25/88 1415 hr.
Magnesium	13.40	mg/l	10/25/88 1400 hr.
Manganese	0.01<	mg/l	10/25/88 1400 hr.
pH	7.95	Units	10/20/88 1650 hr.
Potassium	0.10	mg/l	10/25/88 1315 hr.
Sodium	3.10	mg/l	10/25/88 1300 hr.
Solids, Dissolved	218.0	mg/l	10/27/88 930 hr.
Solids, Suspended	1.0<	mg/l	10/27/88 930 hr.
Sulfate	2.0	mg/l	10/26/88 1250 hr.
Turbidity	0.7	NTU	10/25/88 1535 hr.

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

October 28, 1988

Job No.: 9456

Date Rec'd: October 20, 1988

Date Sampled: October 20, 1988

Sampled By: UP&L

Sample ID:

EMS 79-38
Temperature 42 degrees
Flow 2.1 gpm
Rec'd 1640 hr.
Sampled 1325 hr.

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

WATER ANALYSIS

Alk., Bicarbonate	414	mg/l HCO3	10/25/88 1315 hr.
Alk., Carbonate	1<	mg/l CaCO3	10/25/88 1315 hr.
Alk., Total	339	mg/l CaCO3	10/25/88 1315 hr.
Anions, Total	7.21	meq/l	10/28/88
Calcium	88.2	mg/l	10/25/88 1330 hr.
Cations, Total	7.59	meq/l	10/28/88
Chloride	5.0	mg/l	10/26/88 830 hr.
Conductivity	600	umhos/cm	10/21/88 1000 hr.
Fluoride	0.38	mg/l	10/26/88 1430 hr.
Hardness, Total	313	mg/l CaCO3	
Iron	0.61	mg/l	10/25/88 1415 hr.
Magnesium	22.60	mg/l	10/25/88 1400 hr.
Manganese	0.01<	mg/l	10/25/88 1400 hr.
pH	8.10	Units	10/20/88 1650 hr.
Potassium	0.70	mg/l	10/25/88 1315 hr.
Sodium	30.40	mg/l	10/25/88 1300 hr.
Solids, Dissolved	394.0	mg/l	10/27/88 930 hr.
Solids, Suspended	46.0	mg/l	10/27/88 930 hr.
Sulfate	22.0	mg/l	10/26/88 1250 hr.
Turbidity	8.6	NTU	10/25/88 1535 hr.

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

October 28, 1988

Job No.: 9459

Date Rec'd: October 20, 1988

Date Sampled: October 20, 1988

Sampled By: UP&L

Sample ID:

EMS 80-46
Temperature 42 degrees
Flow 2.5 gpm
Rec'd 1640 hr.
Sampled 1430 hr.

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

WATER ANALYSIS

Alk., Bicarbonate	351	mg/l HCO3		Iron	0.02<	mg/l	
10/25/88	1315 hr.			10/25/88	1415 hr.		
Alk., Carbonate	1<	mg/l CaCO3		Magnesium	27.50	mg/l	
10/25/88	1315 hr.			10/25/88	1400 hr.		
Alk., Total	288	mg/l CaCO3		Manganese	0.01<	mg/l	
10/25/88	1315 hr.			10/25/88	1400 hr.		
Anions, Total	6.09	meq/l		pH	7.65	Units	
10/28/88				10/20/88	1650 hr.		
Calcium	69.4	mg/l		Potassium	0.40	mg/l	
10/25/88	1330 hr.			10/25/88	1315 hr.		
Cations, Total	6.08	meq/l		Sodium	7.90	mg/l	
10/28/88				10/25/88	1300 hr.		
Chloride	5.0	mg/l		Solids, Dissolved	300.0	mg/l	
10/26/88	830 hr.			10/27/88	930 hr.		
Conductivity	595	umhos/cm		Solids, Suspended	1.0<	mg/l	
10/21/88	1000 hr.			10/27/88	930 hr.		
Fluoride	0.21	mg/l		Sulfate	16.0	mg/l	
10/26/88	1430 hr.			10/26/88	1250 hr.		
Hardness, Total	287	mg/l CaCO3		Turbidity	0.2	NTU	
				10/25/88	1535 hr.		

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

October 28, 1988

Job No.: 9463

Date Rec'd: October 20, 1988

Date Sampled: October 20, 1988

Sampled By: UF&L

Sample ID:

EMS 80-47
Temperature 42 degrees
Flow 10.0 gpm
Rec'd 1640 hr.
Sampled 1435 hr.

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

WATER ANALYSIS

Alk., Bicarbonate	10/25/88	1315 hr.	357	mg/l HCO3	Iron	10/25/88	1415 hr.	0.04	mg/l
Alk., Carbonate	10/25/88	1315 hr.	1<	mg/l CaCO3	Magnesium	10/25/88	1400 hr.	27.00	mg/l
Alk., Total	10/25/88	1315 hr.	293	mg/l CaCO3	Manganese	10/25/88	1400 hr.	0.02	mg/l
Anions, Total	10/28/88		6.14	meq/l	pH	10/20/88	1650 hr.	8.15	Units
Calcium	10/25/88	1330 hr.	65.1	mg/l	Potassium	10/25/88	1315 hr.	0.60	mg/l
Cations, Total	10/28/88		6.10	meq/l	Sodium	10/25/88	1300 hr.	14.40	mg/l
Chloride	10/26/88	830 hr.	2.5	mg/l	Solids, Dissolved	10/27/88	930 hr.	328.0	mg/l
Conductivity	10/21/88	1000 hr.	600	umhos/cm	Solids, Suspended	10/27/88	930 hr.	8.0	mg/l
Fluoride	10/26/88	1430 hr.	0.24	mg/l	Sulfate	10/26/88	1250 hr.	17.0	mg/l
Hardness, Total			274	mg/l CaCO3	Turbidity	10/25/88	1535 hr.	0.2	NTU

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

October 28, 1988

Job No.: 9464

Date Rec'd: October 20, 1988

Date Sampled: October 20, 1988

Sampled By: UP&L

Sample ID:

EMS 82-52
Temperature 41 degrees
Flow 7.3 gpm
Rec'd 1640 hr.
Sampled 1340 hr.

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

WATER ANALYSIS

Alk., Bicarbonate	479	mg/l HCO3	10/25/88 1315 hr.
Alk., Carbonate	1<	mg/l CaCO3	10/25/88 1315 hr.
Alk., Total	393	mg/l CaCO3	10/25/88 1315 hr.
Anions, Total	8.33	meq/l	10/28/88
Calcium	81.5	mg/l	10/25/88 1330 hr.
Cations, Total	8.15	meq/l	10/28/88
Chloride	5.0	mg/l	10/26/88 830 hr.
Conductivity	720	umhos/cm	10/21/88 1000 hr.
Fluoride	0.40	mg/l	10/26/88 1430 hr.
Hardness, Total	351	mg/l CaCO3	
Iron	0.02<	mg/l	10/25/88 1415 hr.
Magnesium	35.80	mg/l	10/25/88 1400 hr.
Manganese	0.01<	mg/l	10/25/88 1400 hr.
pH	8.00	Units	10/20/88 1650 hr.
Potassium	0.80	mg/l	10/25/88 1315 hr.
Sodium	26.10	mg/l	10/25/88 1300 hr.
Solids, Dissolved	262.0	mg/l	10/27/88 930 hr.
Solids, Suspended	1.0<	mg/l	10/27/88 930 hr.
Sulfate	25.0	mg/l	10/26/88 1250 hr.
Turbidity	0.2	NTU	10/25/88 1535 hr.

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TELEPHONE: (801) 653-2311

October 21, 1988

Job No.: 9446

Date Rec'd: October 13, 1988

Date Sampled: October 12, 1988

Sampled By: UP&L

Sample ID:

EMS 84-56
Temperature 43 degrees
Flow 2.4 gpm
Rec'd 930 hr.
Sampled 1440 hr.

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

WATER ANALYSIS

Alk., Bicarbonate	364	mg/l HCO3		Iron	0.02<	mg/l	
10/17/88	945 hr.			10/19/88	1400 hr.		
Alk., Carbonate	1<	mg/l CaCO3		Magnesium	31.40	mg/l	
10/17/88	945 hr.			10/19/88	1345 hr.		
Alk., Total	294	mg/l CaCO3		Manganese	0.01<	mg/l	
10/17/88	945 hr.			10/19/88	1400 hr.		
Anions, Total	6.36	meq/l		pH	7.50	Units	
				10/13/88	1400 hr.		
Calcium	71.7	mg/l		Potassium	1.10	mg/l	
10/19/88	1330 hr.			10/19/88	1510 hr.		
Cations, Total	7.02	meq/l		Sodium	19.40	mg/l	
				10/19/88	1420 hr.		
Chloride	5.0	mg/l		Solids, Dissolved	386.0	mg/l	
10/20/88	930 hr.			10/18/88	930 hr.		
Conductivity	605	umhos/cm		Solids, Suspended	1.0<	mg/l	
10/13/88	1500 hr.			10/18/88	930 hr.		
Fluoride	0.39	mg/l		Sulfate	23.0	mg/l	
10/20/88	1000 hr.			10/18/88	1600 hr.		
Hardness, Total	308	mg/l CaCO3		Turbidity	0.2	NTU	
				10/13/88	1000 hr.		

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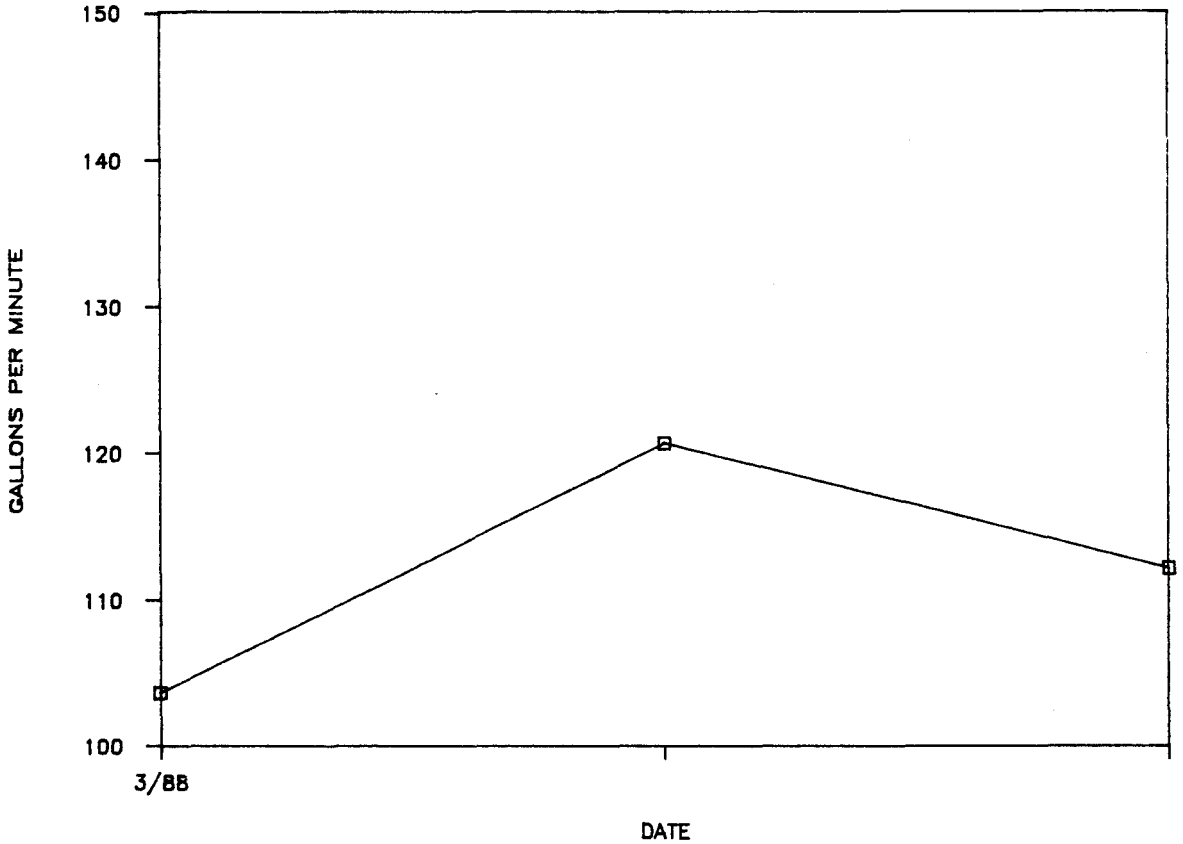
APPENDIX F

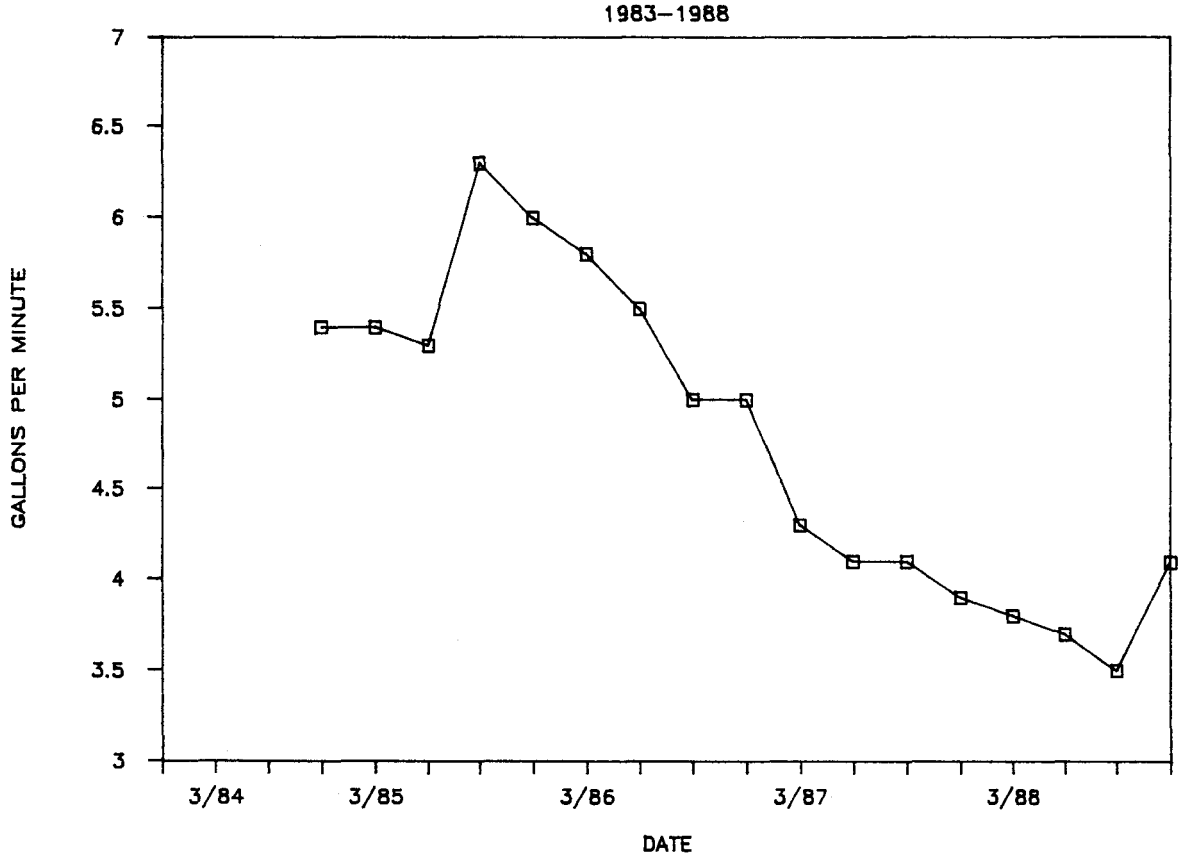
DEER CREEK IN-MINE MON. 1WM xc-24-flume

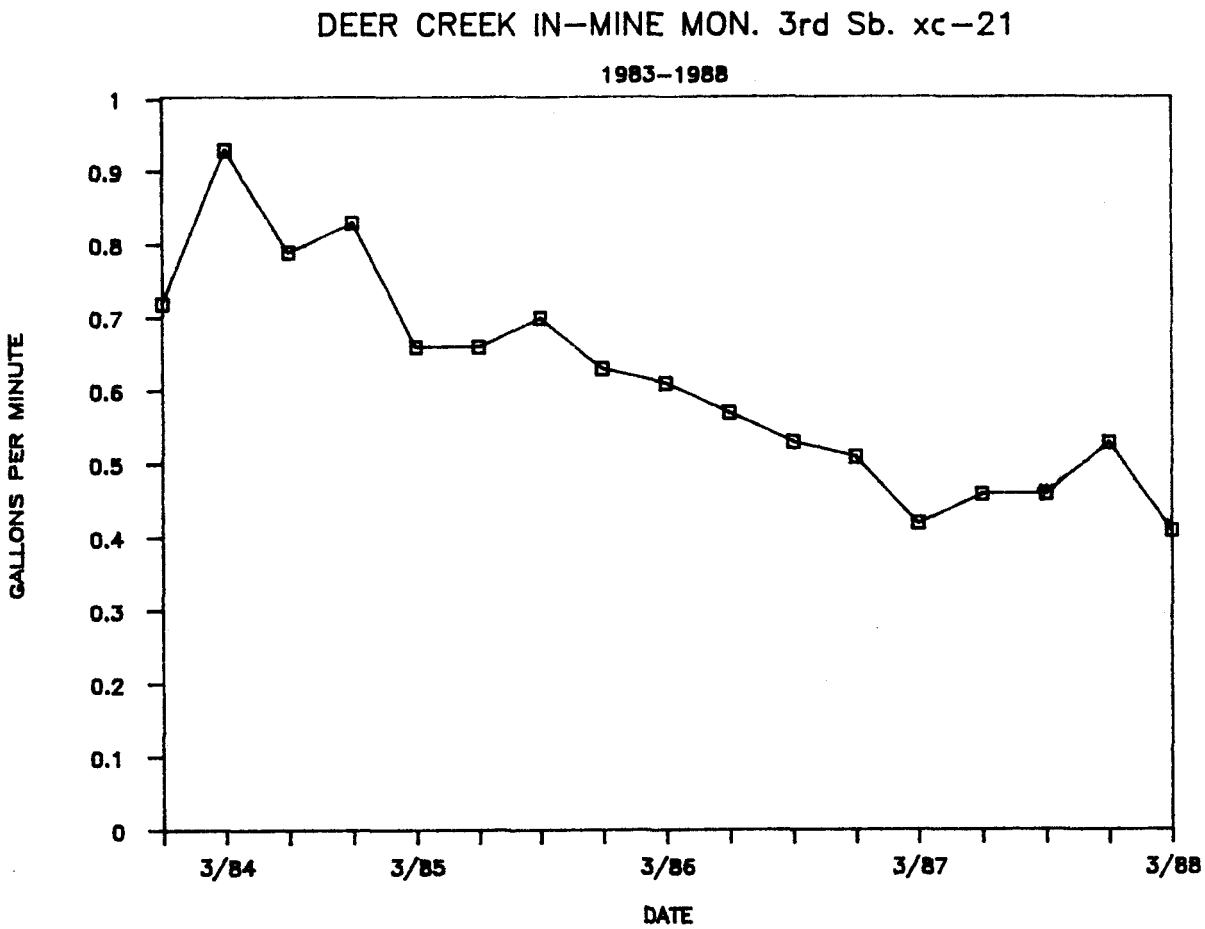
1988



DEER CREEK IN-MINE MON. 3rd N. xc-41

1983-1988




DEER CREEK IN-MINE MON. 3rd Sb. xc-21
1983-1988
GALLONS PER MINUTE
1
0.9
0.8
0.7
0.6
0.5
0.4
0.3
0.2
0.1
0
3/84
3/85
3/86
3/87
3/88
DATE

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

April 4, 1988

Job No.: 9189

Date Rec'd: March 25, 1988

Date Sampled: March 25, 1988

Sampled By: UP&L

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

Sample ID:

DEER CREEK -IN-MINE
3rd SB
XC-21
Temp 56
Flow 0.41 gpm
Time Sampled 12:45 hr.
Time Rec'd 3:30 p.m. hr.

WATER ANALYSIS

Alk., Bicarbonate 03/25/88	440 mg/l HCO3	15:45 hr.
Alk., Carbonate 03/25/88	1< mg/l CaCO3	
Alk., Total 03/28/88	361 mg/l CaCO3	
Anions, Total	9.19 meq/l	
Calcium 03/28/88	112.6 mg/l	
Cations, Total	10.44 meq/l	
Chloride 03/29/88	16.0 mg/l	14:00 hr.
Conductivity 03/26/88	640 umhos/cm	
Hardness, Total	480 mg/l CaCO3	
Iron, Dissolved 03/29/88	0.17 mg/l	14:45 hr.
Magnesium 03/29/88	48.30 mg/l	14:00 hr.
Manganese 03/28/88	0.03 mg/l	14:10 hr.
pH 03/25/88	7.37 Units	15:35 hr.
Potassium 03/28/88	1.90 mg/l	14:45 hr.
Sodium 03/28/88	18.70 mg/l	14:00 hr.
Solids, Dissolved 03/30/88	418.0 mg/l	09:30 hr.
Solids, Suspended 03/29/88	2.0 mg/l	14:00 hr.
Sulfate 03/29/88	81.0 mg/l	09:30 hr.

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ANALYST: M M

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M M

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

April 4, 1988

Job No.: 9190

Date Rec'd: March 25, 1988

Date Sampled: March 25, 1988

Sampled By: UP&L

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

Sample ID:

DEER CREEK -IN-MINE
3rd no.
XC-41
Temp 54
Flow 3.76 gpm
Time Sampled 13:00 hr.
Time Rec'd 3:30 p.m. hr.

WATER ANALYSIS

Alk., Bicarbonate	397 mg/l HCO3		Iron, Dissolved	0.10 mg/l	
03/25/88	15:45 hr.		03/29/88	14:45 hr.	
Alk., Carbonate	1< mg/l CaCO3		Magnesium	29.10 mg/l	
03/25/88	15:45 hr.		03/29/88	14:00 hr.	
Alk., Total	325 mg/l CaCO3		Manganese	0.02 mg/l	
03/25/88	15:45 hr.		03/28/88	14:30 hr.	
Anions, Total	6.86 meq/l		pH	7.44 Units	
			03/25/88	15:35 hr.	
Calcium	79.0 mg/l		Potassium	1.90 mg/l	
03/28/88	14:10 hr.		03/28/88	14:45 hr.	
Cations, Total	7.04 meq/l		Sodium	15.30 mg/l	
			03/28/88	14:00 hr.	
Chloride	6.5 mg/l		Solids, Dissolved	302.0 mg/l	
03/29/88	14:00 hr.		03/30/88	09:30 hr.	
Conductivity	820 umhos/cm		Solids, Suspended	3.0 mg/l	
03/26/88	14:00 hr.		03/29/88	14:00 hr.	
Hardness, Total	317 mg/l CaCO3		Sulfate	16.0 mg/l	
			03/29/88	09:30 hr.	

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Member of the SGS Group (Société Générale de Surveillance)

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

August 9, 1988

Job No.: 9350

Date Rec'd: August 1, 1988

Date Sampled: July 30, 1988

Sampled By: UP&L

Sample ID:

DEER CREEK-IN-MINE
3rd No. x Cut 41
Temp 54
Flow 3.7
Time Sampled 14:50 hr.
Time Rec'd 10:30 hr.

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

WATER ANALYSIS

Alk., Bicarbonate 08/01/88	388	mg/l HCO3 14:30 hr.	Iron, Dissolved 08/05/88	0.18	mg/l 16:45 hr.
Alk., Carbonate 08/01/88	1<	mg/l CaCO3 14:30 hr.	Magnesium 08/05/88	35.90	mg/l 15:10 hr.
Alk., Total 08/01/88	318	mg/l CaCO3 14:30 hr.	Manganese 08/05/88	0.01<	mg/l 15:30 hr.
Anions, Total	8.50	meq/l	pH 08/01/88	7.60	Units 13:30 hr.
Calcium 08/05/88	89.5	mg/l 14:30 hr.	Potassium 08/05/88	2.10	mg/l 13:30 hr.
Cations, Total	8.19	meq/l	Sodium 08/05/88	16.60	mg/l 14:00 hr.
Chloride 08/05/88	7.0	mg/l 16:00 hr.	Solids, Dissolved 08/03/88	446.0	mg/l 11:20 hr.
Conductivity 08/01/88	682	umhos/cm 13:30 hr.	Solids, Suspended 08/09/88	1.0<	mg/l 11:00 hr.
Hardness, Total	371	mg/l CaCO3	Sulfate 08/02/88	100.0	mg/l 09:35 hr.

ANALYST: J. Komar

Respectfully submitted,
COMMERCIAL TESTING & ENGINEERING CO.

Manager, Huntington Laboratory

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OVER 40 BRANCH LABORATORIES STRATEGICALLY LOCATED IN PRINCIPAL COAL MINING AREAS,
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PLEASE ADDRESS ALL CORRESPONDENCE TO:
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TELEPHONE: (801) 653-2311

August 9, 1988

Job No.: 9349

Date Rec'd: August 1, 1988

Date Sampled: July 30, 1988

Sampled By: UP&L

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

Sample ID:

DEER CREEK-IN-MINE
1st West Mains x C 25
Temp 56
Flow 0.39/103.7
Time Sampled 14:20 hr.
Time Rec'd 10:30 hr.

WATER ANALYSIS

Alk., Bicarbonate	459	mg/l HCO3	Iron, Dissolved	0.17	mg/l
08/01/88		14:30 hr.	08/05/88		16:45 hr.
Alk., Carbonate	1<	mg/l CaCO3	Magnesium	45.90	mg/l
08/01/88		14:30 hr.	08/05/88		15:10 hr.
Alk., Total	376	mg/l CaCO3	Manganese	0.01<	mg/l
08/01/88		14:30 hr.	08/05/88		15:30 hr.
Anions, Total	10.27	meq/l	pH	7.60	Units
			08/01/88		13:30 hr.
Calcium	112.8	mg/l	Potassium	3.40	mg/l
08/05/88		14:30 hr.	08/05/88		13:30 hr.
Cations, Total	10.33	meq/l	Sodium	19.40	mg/l
			08/05/88		14:00 hr.
Chloride	7.5	mg/l	Solids, Dissolved	642.0	mg/l
08/05/88		16:00 hr.	08/03/88		11:20 hr.
Conductivity	800	umhos/cm	Solids, Suspended	1.0<	mg/l
08/01/88		13:30 hr.	08/09/88		11:00 hr.
Hardness, Total	471	mg/l CaCO3	Sulfate	130.0	mg/l
			08/02/88		09:35 hr.

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ANALYST: J. Komar

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

September 29, 1988

Job No.: 9420

Date Rec'd: September 15, 1988

Date Sampled: September 14, 1988

Sampled By: UP&L

Sample ID:

RUANS CANYON FAULT
TW-10
Flow 0.35/79.3 gpm
Rec'd 910 hr.
Sampled 1511 hr.

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

WATER ANALYSIS

Acidity	24	mg/l CaCO3	09/15/88 1400 hr.
Aluminum	0.10<	mg/l	09/22/88 1000 hr.
Alk., Carbonate	1[illegible]	mg/l CaCO3	09/15/88 1430 hr.
Alk., Total	299	mg/l CaCO3	09/15/88 1430 hr.
Arsenic	0.001<	mg/l	09/28/88 930 hr.
Anions, Total	7.09	meq/l	09/29/88
Barium	0.20<	mg/l	09/22/88 1200 hr.
Beryllium	0.01<	mg/l	09/23/88 1100 hr.
Boron	0.04	mg/l	09/23/88 930 hr.
Cadmium	0.002<	mg/l	09/23/88 1130 hr.
Calcium	77.8	mg/l	09/19/88 1300 hr.
Cations, Total	7.24	meq/l	09/29/88
Chloride	15.0	mg/l	09/23/88 900 hr.
Chromium	0.02<	mg/l	09/22/88 1030 hr.
Conductivity	720	umhos/cm	09/15/88 1200 hr.
Copper	0.010<	mg/l	09/23/88 1000 hr.
Fluoride	0.30	mg/l	09/22/88 1500 hr.
Hardness, Total	326	mg/l Ca[illegible]	
Iron	0.28	mg/l	09/19/88 1530 hr.
Iron, Dissolved	0.25	mg/l	09/19/88 1530 hr.
Lead	0.030<	mg/l	09/23/88 1300 hr.
Magnesium	32.10	mg/l	09/19/88 1439 hr.
Manganese	0.01<	mg/l	09/19/88 1515 hr.
Mercury	0.001<	mg/l	09/28/88 1000 hr.
Molybdenum	0.10<	mg/l	09/22/88 1400 hr.
Nickel	0.03	mg/l	09/23/88 1400 hr.
pH	7.20	Units	09/15/88 1120hr.
Phosphorus, Total	0.01<	mg/l	09/29/88 1445 hr.

ANALYST: D. Tyson

Respectfully submitted,
COMMERCIAL TESTING & ENGINEERING CO.

M M

Manager, Huntington Laboratory

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TELEPHONE: (801) 653-2311

September 29, 1988

Job No.: 9420

Date Rec'd: September 15, 1988

Date Sampled: September 14, 1988

Sampled By: UP&L

Sample ID:

ROANS CANYON FAULT
TW-10
Flow 0.35/79.3 gpm
Rec'd 910 hr.
Sampled 1511 hr.

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

WATER ANALYSIS

Potassium	09/19/88 1450 hr.	1.40	mg/l
Selenium	09/22/88 1300 hr.	0.001<	mg/l
Silica	09/22/88 1500 hr.	3.90	mg/l
Silver	09/23/88 1350 hr.	0.010<	mg/l
Sodium	09/19/88 1445 hr.	15.90	mg/l
Solids, Dissolved	09/23/88 930 hr.	398.0	mg/l
Solids, Suspended	09/20/88 930 hr.	6.0	mg/l
Sulfate	09/20/88 1110 hr.	40.0	mg/l
Vanadium	09/22/88 1600 hr.	0.20<	mg/l
Zinc	09/23/88 1030 hr.	0.05	mg/l

ANALYST: D. Tipon

Respectfully submitted,
COMMERCIAL TESTING & ENGINEERING CO.

M W

Manager, Huntington Laboratory

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

November 1, 1988

Job No.: 9471

Date Rec'd: October 26, 1988

Date Sampled: October 26, 1988

Sampled By: UP&L

Sample ID:

DEER CREEK-IN-MINE
3rd North XC-41
Temperature 55 degrees
Flow 3.5 gpm
Rec'd 1600 hr.
Sampled 1100 hr.

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

WATER ANALYSIS

Alk., Bicarbonate	447	mg/l HCO3	10/27/88 1400 hr.
Alk., Carbonate	1<	mg/l CaCO3	10/27/88 1400 hr.
Alk., Total	366	mg/l CaCO3	10/27/88 1400 hr.
Anions, Total	7.95	meq/l	
Calcium	88.2	mg/l	11/01/88 1445 hr.
Cations, Total	7.74	meq/l	
Chloride	5.0	mg/l	10/31/88 1445 hr.
Conductivity	780	umhos/cm	11/01/88 925 hr.
Hardness, Total	349	mg/l CaCO3	
Iron, Dissolved	0.10	mg/l	11/01/88 1350 hr.
Magnesium	31.30	mg/l	11/01/88 1440 hr.
Manganese	0.01<	mg/l	11/01/88 1400 hr.
pH	7.25	Units	10/26/88 1610 hr.
Potassium	2.20	mg/l	11/01/88 1450 hr.
Sodium	16.40	mg/l	11/01/88 1500 hr.
Solids, Dissolved	324.0	mg/l	11/02/88 930 hr.
Solids, Suspended	1.0<	mg/l	11/02/88 930 hr.
Sulfate	32.0	mg/l	11/01/88 915 hr.

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ANALYST: D. Lyson

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

November 1, 1988

Job No.: 9470

Date Rec'd: October 26, 1988

Date Sampled: October 26, 1988

Sampled By: UP&L

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

Sample ID:

DEER CREEK-IN-MINE
1st West Mains
XC-24 2L
Temperature 56 degrees
Flow 0.43/120.7 gpm
Rec'd 1600 hr.
Sampled 1045 hr.

WATER ANALYSIS

Alk., Bicarbonate	499	mg/l HCO3	Iron, Dissolved	0.27	mg/l
10/27/88	1400 hr.		11/01/88	1340 hr.	
Alk., Carbonate	1<	mg/l CaCO3	Magnesium	40.70	mg/l
10/27/88	1400 hr.		11/01/88	1440 hr.	
Alk., Total	409	mg/l CaCO3	Manganese	0.01<	mg/l
10/27/88	1400 hr.		11/01/88	1400 hr.	
Anions, Total	9.69	meq/l	pH	7.25	Units
			10/26/88	1610 hr.	
Calcium	97.7	mg/l	Potassium	3.20	mg/l
11/01/88	1445 hr.		11/01/88	1450 hr.	
Cations, Total	9.10	meq/l	Sodium	18.50	mg/l
			11/01/88	1500 hr.	
Chloride	5.0	mg/l	Solids, Dissolved	470.0	mg/l
10/31/88	1445 hr.		11/02/88	930 hr.	
Conductivity	1000	umhos/cm	Solids, Suspended	1.0<	mg/l
11/01/88	925 hr.		11/02/88	930 hr.	
Hardness, Total	412	mg/l CaCO3	Sulfate	75.0	mg/l
			11/01/88	915 hr.	

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ANALYST: D. Tyson

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

January 3, 1989

Job No.: 9504

Date Rec'd: December 15, 1988

Date Sampled: December 15, 1988

Sampled By: UP&L

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

Sample ID:

DEER CREEK-IN-MINE
3rd North XC-40
Temperature 56 degrees
Flow 4.1 gpm .5 g/1.20 sec.
Rec'd 1600 hr.
Sampled 1040 hr.

WATER ANALYSIS

Acidity	15	mg/l CaCO3	
12/21/88	1130 hr.		
Alk., Bicarbonate	377	mg/l HCO3	
12/21/88	1130 hr.		
Alk., Carbonate	1<	mg/l CaCO3	
12/21/88	1130 hr.		
Alk., Total	309	mg/l CaCO3	
12/21/88	1130 hr.		
Anions, Total	7.43	meq/l	
Calcium	65.0	mg/l	
12/16/88	1300 hr.		
Cations, Total	6.78	meq/l	
Chloride	5.0	mg/l	
12/21/88	0845 hr.		
Conductivity	700	umhos/cm	
12/16/88	1300 hr.		
Hardness, Total	307	mg/l CaCO3	
Iron, Dissolved	0.01<	mg/l	
12/28/88	1430 hr.		
Magnesium	35.10	mg/l	
12/28/88	1500 hr.		
Manganese	0.01<	mg/l	
12/28/88	1445 hr.		
pH	7.30	Units	
12/15/88	1700 hr.		
Potassium	1.40	mg/l	
12/16/88	1315 hr.		
Sodium	14.20	mg/l	
12/16/88	1330 hr.		
Solids, Dissolved	410.0	mg/l	
12/22/88	0930 hr.		
Solids, Suspended	1.0<	mg/l	
12/22/88	0930 hr.		
Sulfate	60.0	mg/l	
12/21/88	1430 hr.		

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ANALYST: D. Igoe

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

January 3, 1989

Job No.: 9502

Date Rec'd: December 15, 1988

Date Sampled: December 15, 1988

Sampled By: UP&L

Sample ID:

DEER CREEK-IN-MINE
1st West Mains
Flow 0.41/112.2 gpm
Rec'd 1600 hr.
Sampled 1050 hr.

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

WATER ANALYSIS

Acidity	30	mg/l CaCO3	Iron, Dissolved	0.19	mg/l
12/21/88	1130 hr.		12/28/88	1430 hr.	
Alk., Bicarbonate	451	mg/l HCO3	Magnesium	44.70	mg/l
12/21/88	1130 hr.		12/28/88	1500 hr.	
Alk., Carbonate	1<	mg/l CaCO3	Manganese	0.01<	mg/l
12/21/88	1130 hr.		12/28/88	1445 hr.	
Alk., Total	370	mg/l CaCO3	pH	7.20	Units
12/21/88	1130 hr.		12/15/88	1700 hr.	
Anions, Total	10.46	meq/l	Potassium	2.80	mg/l
			12/16/88	1315 hr.	
Calcium	84.6	mg/l	Sodium	16.90	mg/l
12/16/88	1300 hr.		12/16/88	1330 hr.	
Cations, Total	8.69	meq/l	Solids, Dissolved	490.0	mg/l
			12/22/88	0930 hr.	
Chloride	5.0	mg/l	Solids, Suspended	1.0<	mg/l
12/21/88	0845 hr.		12/22/88	0930 hr.	
Conductivity	860	umhos/cm	Sulfate	148.0	mg/l
12/16/88	1300 hr.		12/21/88	1430 hr.	
Hardness, Total	395	mg/l CaCO3			

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ANALYST: D. Tyson

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

January 11, 1989

Job No.: 9503

Date Rec'd: December 15, 1988

Date Sampled: December 15, 1988

Sampled By: UP&L

Sample ID:

DEER CREEK-IN-MINE
TW-10
Temperature 44 degrees
Flow 38 gpm
Rec'd 1600 hr.
Sampled 1200 hr.

UTAH POWER & LIGHT CO.
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WATER ANALYSIS

Acidity	7	mg/l CaCO3	12/21/88 1130 hr.
Aluminum	0.17	mg/l	01/03/89 1300 hr.
Alk., Bicarbonate	378	mg/l HCO3	12/21/88 1130 hr.
Alk., Carbonate	1<	mg/l CaCO3	12/21/88 1130 hr.
Arsenic	0.004	mg/l	01/03/89 1100 hr.
Anions, Total	7.33	meq/l	
Barium	0.05	mg/l	01/03/89 1315 hr.
Boron	0.07	mg/l	01/03/89 1400 hr.
Cadmium	0.005<	mg/l	01/03/89 1245 hr.
Calcium	62.9	mg/l	12/16/88 1300 hr.
Cations, Total	6.61	meq/l	
Chloride	10.0	mg/l	12/21/88 0845 hr.
Chromium	0.01<	mg/l	01/03/89 1255 hr.
Conductivity	660	umhos/cm	12/16/88 1300 hr.
Copper	0.010<	mg/l	01/03/89 1000 hr.
Fluoride	0.58	mg/l	12/23/88 1100 hr.
Hardness, Total	300	mg/l CaC	
Iron	0.01<	mg/l	12/28/88 1430 hr.
Iron, Dissolved	0.01<	mg/l	12/28/88 1430 hr.
Lead	0.020<	mg/l	01/03/89 1030 hr.
Magnesium	34.60	mg/l	12/28/88 1500 hr.
Manganese	0.01<	mg/l	12/28/88 1445 hr.
Mercury	0.002<	mg/l	01/04/89 1300 hr.
Molybdenum	0.10<	mg/l	01/03/89 1330 hr.
Nickel	0.01<	mg/l	01/03/89 1015 hr.
Nitrogen, Ammonia	0.01	mg/l	01/06/89 1430 hr.
Nitrogen, Nitrate	0.03	mg/l	12/16/88 1430 hr.
Nitrogen, Nitrite	0.01	mg/l	12/16/88 1430 hr.

ANALYST: D. Tyson

Respectfully submitted,
COMMERCIAL TESTING & ENGINEERING CO.

Manager, Huntington Laboratory

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TELEPHONE: (801) 653-2311

January 11, 1989

Job No.: 9503

Date Rec'd: December 15, 1988

Date Sampled: December 15, 1988

Sampled By: UP&L

Sample ID:

DEER CREEK-IN-MINE
TW-10
Temperature 44 degrees
Flow 38 gpm
Rec'd 1600 hr.
Sampled 1200 hr.

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

WATER ANALYSIS

Oil and Grease	0.8	mg/l	Solids, Dissolved	396.0	mg/l
12/22/88	1500 hr.		12/22/88	0930 hr.	
pH	7.30	Units	Solids, Setteable	0.05<	mg/l
12/15/88	1700 hr.		12/16/88	1400 hr.	
Potassium	1.20	mg/l	Solids, Suspended	1.0<	mg/l
12/16/88	1315 hr.		12/22/88	0930 hr.	
Selenium	0.008	mg/l	Sulfate	48.0	mg/l
01/04/89	1130 hr.		12/21/88	1430 hr.	
Sodium	13.90	mg/l	Zinc	0.01<	mg/l
12/16/88	1330 hr.		01/03/89	1045 hr.	

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ANALYST: D. Lyon

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

January 12, 1989

Job No.: 9515

Date Rec'd: January 11, 1989

Date Sampled: January 11, 1989

Sampled By: UP&L

Sample ID:

DEER CREEK-IN-MINE
TW-10
Rec'd 1400 hr.
Sampled 1200 hr.

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

WATER ANALYSIS

Phosphorus, Total	0.01< mg/l		Sulfide	1.10	mg/l
01/12/89	1440 hr.		01/11/89	1600 hr.	

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ANALYST: D. Tyson

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COMMERCIAL TESTING & ENGINEERING CO.

Manager, Huntington Laboratory

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APPENDIX G

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

January 28, 1988

Job No.: 9100

Date Rec'd: January 22, 1988

Date Sampled: January 21, 1988

Sampled By: UP&L

Sample ID:

DEER CREEK DISCHARGE
Temp 55
Flow 1000 gpm
Time Sampled 14:00 hr.
Time Rec'd 2:20 p.m. hr.

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

WATER ANALYSIS

Acidity 01/22/88	79 mg/l CaCO3	Magnesium 01/27/88	58.80 mg/l
Alk., Bicarbonate 01/22/88	311 mg/l HCO3	Manganese 01/28/88	<0.01 mg/l
Alk., Carbonate 01/22/88	<1 mg/l CaCO3	Oil and Grease 01/26/88	21.0 mg/l
Anions, Total	11.50 meq/l	Oxygen, Dissolved 01/22/88	5.9 mg/l
Calcium 01/27/88	107.8 mg/l	pH 01/22/88	8.05 Units
Cations, Total	12.89 meq/l	Potassium 01/27/88	7.20 mg/l
Chloride 01/28/88	56.0 mg/l	Sodium 01/28/88	57.90 mg/l
Conductivity 01/22/88	1000 umhos/cm	Solids, Dissolved 01/26/88	410.0 mg/l
Hardness, Total	511 mg/l CaCO3	Solids, Setteable 01/22/88	1.0 mg/l
Iron 01/26/88	0.25 mg/l	Solids, Suspended 01/26/88	65.0 mg/l
Iron, Dissolved 01/26/88	<0.05 mg/l	Sulfate 01/26/88	236.0 mg/l

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

February 17, 1988

Job No.: 9123

Date Rec'd: February [illegible]

Date Sampled: February 15, 1988

Sampled By: UP&L

Sample ID:

DEER CREEK DISCHARGE
Flow 1200 gpm
Temp 56
Time Sampled 10:30 hr.
Time Rec'd 3:15 p.m. hr.
pH ran at 3:30 p.m. hr.

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

WATER ANALYSIS

Acidity 02/15/88	88	mg/l CaCO3	9:00 a.m. hr.	Iron, Dissolved 02/15/88	0.12	mg/l	10:00 a.m.
Alk., Bicarbonate 02/15/88	345	mg/l HCO3	9:30 a.m. hr.	Magnesium 02/15/88	42.47	mg/l	10:15 a.m.
Alk., Carbonate 02/15/88	1<	mg/l CaCO3	9:30 a.m. hr.	Manganese 02/15/88	0.01<	mg/l	10:10 a.m.
Alk., Total 02/15/88	283	mg/l CaCO3	9:30 a.m. hr.	Oil and Grease 02/15/88	8.0	mg/l	1:00 p.m. h
Anions, Total	12.31	meq/l		Oxygen, Dissolved 02/15/88	8.2	mg/l	8:30 a.m. h
Calcium 02/15/88	117.2	mg/l	10:25 a.m. hr.	pH 02/15/88	7.69	Units	
Cations, Total	13.70	meq/l		Potassium 02/15/88	13.30	mg/l	10:40 a.m.
Chloride 02/15/88	55.0	mg/l	1:00 p.m. hr.	Sodium 02/15/88	93.40	mg/l	11:15 a.m.
Conductivity 02/15/88	800	umhos/cm	9:45 a.m. hr.	Solids, Dissolved 02/15/88	470.0	mg/l	10:00 a.m.
Hardness, Total	468	mg/l CaCO3		Solids, Suspended 02/15/88	20.0	mg/l	10:00 a.m.
Iron 02/15/88	0.22	mg/l	10:00 a.m. hr.	Sulfate 02/16/88	250.0	mg/l	10:30 a.m.

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ANALYST: D. Tipon

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TELEPHONE: (801) 653-2311

April 4, 1988

Job No.: 9183

Date Rec'd: March 23, 1988

Date Sampled: March 23, 1988

Sampled By: UP&L

Sample ID:

DEER CREEK DISCHARGE
Temp 55
Flow 1200 gpm
Time Sampled 10:45 hr.
Time Rec'd 4:15 p.m. hr.

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

WATER ANALYSIS

Acidity	66 mg/l CaCO3	
03/25/88	15:20 hr.	
Alk., Bicarbonate	318 mg/l HCO3	
03/25/88	15:45 hr.	
Alk., Carbonate	1< mg/l CaCO3	
03/25/88	15:45 hr.	
Anions, Total	9.72 meq/l	
Calcium	90.2 mg/l	
03/28/88	14:10 hr.	
Cations, Total	10.45 meq/l	
Chloride	32.0 mg/l	
03/29/88	15:45 hr.	
Conductivity	930 umhos/cm	
03/25/88	14:00 hr.	
Hardness, Total	409 mg/l CaCO3	
Iron	0.24 mg/l	
03/29/88	14:30 hr.	
Iron, Dissolved	0.24 mg/l	
03/29/88	14:45 hr.	
Magnesium	44.70 mg/l	
03/29/88	14:00 hr.	
Manganese	0.02 mg/l	
03/28/88	14:30 hr.	
Oil and Grease	20.4 mg/l	
03/31/88	15:00 hr.	
Oxygen, Dissolved	8.9 mg/l	
03/23/88	17:00 hr.	
pH	7.64 Units	
03/23/88	16:45 hr.	
Potassium	6.80 mg/l	
03/28/88	14:45 hr.	
Sodium	48.80 mg/l	
03/28/88	14:00 hr.	
Solids, Dissolved	490.0 mg/l	
03/30/88	09:30 hr.	
Solids, Suspended	48.0 mg/l	
03/29/88	14:00 hr.	
Sulfate	178.0 mg/l	
03/29/88	09:30 hr.	

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

January 20, 1989

Job No.: 9193

Date Rec'd: April 18, 1988

Date Sampled: April 18, 1988

Sampled By: UP&L

Sample ID:

DEER CREEK DISCHARGE
Temperature 56 degrees
Flow 650 gpm
Rec'd 1630 hr.
Sampled 1300 hr.
Amended

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

WATER ANALYSIS

Acidity	32	mg/l CaCO3	Iron, Dissolved	0.02<	mg/l
04/19/88	1600 hr.		04/25/88	1400 hr.	
Alk., Bicarbonate	322	mg/l HCO3	Magnesium	41.10	mg/l
04/19/88	1545 hr.		04/20/88	1415 hr.	
Alk., Carbonate	1<	mg/l CaCO3	Manganese	0.01<	mg/l
04/19/88	1545 hr.		04/20/88	1415 hr.	
Alk., Total	264	mg/l CaCO3	Oil and Grease	1.0<	mg/l
04/19/88	1545 hr.		04/22/88	1330 hr.	
Anions, Total	11.69	meq/l	Oxygen, Dissolved	4.3	mg/l
			04/18/88	1700 hr.	
Calcium	118.6	mg/l	pH	7.73	Units
04/20/88	1400 hr.		04/18/88	1650 hr.	
Cations, Total	11.63	meq/l	Potassium	10.10	mg/l
			04/20/88	1320 hr.	
Chloride	23.5	mg/l	Sodium	48.00	mg/l
04/21/88	1415 hr.		04/20/88	1300 hr.	
Conductivity	930	umhos/cm	Solids, Dissolved	450.0	mg/l
04/19/88	1630 hr.		04/20/88	1000 hr.	
Hardness, Total	465	mg/l CaCO3	Solids, Suspended	17.0	mg/l
			04/20/88	1000 hr.	
Iron	0.02<	mg/l	Sulfate	280.0	mg/l
04/25/88	1340 hr.		04/21/88	0930 hr.	

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

May 25, 1988

Job No.: 9237

Date Rec'd: May 17, 1988

Date Sampled: May 16, 1988

Sampled By: UP&L

Sample ID:

DEER CREEK MINE DISCHARGE
Temp 58
Flow 1550 gpm
Time Sampled 11:00 hr.
Time Rec'd 8:00 a.m. hr.

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

WATER ANALYSIS

Acidity 05/17/88	10	mg/l CaCO3 10:20 hr.	Iron, Dissolved 05/24/88	0.02<	mg/l 13:00 hr.
Alk., Bicarbonate 05/17/88	353	mg/l HCO3 10:20 hr.	Magnesium 05/20/88	44.80	mg/l 13:30 hr.
Alk., Carbonate 05/17/88	1<	mg/l CaCO3 10:20 hr.	Manganese 05/20/88	0.01<	mg/l 13:45 hr.
Alk., Total 05/17/88	289	mg/l CaCO3 10:20 hr.	Oil and Grease 05/19/88	16.0	mg/l 11:30 hr.
Anions, Total	12.85	meq/l	Oxygen, Dissolved 05/17/88	6.3	mg/l 09:00 hr.
Calcium 05/20/88	129.2	mg/l 13:00 hr.	pH 05/17/88	8.10	Units 08:45 hr.
Cations, Total	12.68	meq/l	Potassium 05/20/88	8.82	mg/l 13:15 hr.
Chloride 05/17/88	17.5	mg/l 14:00 hr.	Sodium 05/20/88	53.80	mg/l 13:30 hr.
Conductivity 05/17/88	970	umhos/cm 09:25 hr.	Solids, Dissolved 05/18/88	750.0	mg/l 09:00 hr.
Hardness, Total	507	mg/l CaCO3	Solids, Suspended 05/18/88	2784.0	mg/l 09:00 hr.
Iron 05/20/88	0.22	mg/l 14:00 hr.	Sulfate 05/19/88	320.0	mg/l 09:10 hr.

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

June 15, 1988

Job No.: 9275

Date Rec'd: June 7, 1988

Date Sampled: June 7, 1988

Sampled By: UP&L

Sample ID:

DEER CREEK DISCHARGE
Temp 56
Flow 750 gpm
Time Sampled 11:15 hr.
Time Rec'd 3:30 p.m. hr.

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P.O. Box 1005
Huntington, Utah 84528

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WATER ANALYSIS

Acidity	14	mg/l CaCO3	Magnesium	46.80	mg/l
06/08/88		14:30 hr.	06/13/88		13:15 hr.
Alk., Bicarbonate	342	mg/l HCO3	Manganese	0.01	mg/l
06/08/88		08:30 hr.	06/13/88		14:15 hr.
Alk., Carbonate	1<	mg/l CaCO3	Oil and Grease	19.4	mg/l
06/08/88		08:30 hr.	06/10/88		12:00 hr.
Alk., Total	280	mg/l CaCO3	Oxygen, Dissolved	7.0	mg/l
06/08/88		08:30 hr.	06/07/88		17:00 hr.
Anions, Total	12.12	meq/l	pH	8.10	Units
			06/07/88		16:30 hr.
Calcium	106.7	mg/l	Potassium	9.44	mg/l
06/13/88		13:00 hr.	06/13/88		13:30 hr.
Cations, Total	12.29	meq/l	Sodium	66.90	mg/l
			06/13/88		14:00 hr.
Chloride	16.5	mg/l	Solids, Dissolved	648.0	mg/l
06/10/88		14:30 hr.	06/09/88		10:00 hr.
Conductivity	910	umhos/cm	Solids, Setteable	0.05<	mg/l
06/08/88		10:00 hr.	06/08/88		09:30 hr.
Hardness, Total	459	mg/l CaCO3	Solids, Suspended	54.0	mg/l
			06/09/88		10:00 hr.
Iron	0.28	mg/l	Sulfate	295.0	mg/l
06/13/88		14:30 hr.	06/08/88		11:15 hr.
Iron, Dissolved	0.24	mg/l			
06/13/88		14:45 hr.			

ANALYST: D. Tyson

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TELEPHONE: (801) 653-2311

August 3, 1988

Job No.: 9344

Date Rec'd: July 29, 1988

Date Sampled: July 28, 1988

Sampled By: UP&L

Sample ID:

DEER CREEK DISCHARGE
Temp 56
Flow 1400 gpm
Time Sampled 17:00 hr.
Time Rec'd 2:00 p.m. hr.

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

WATER ANALYSIS

Acidity	80	mg/l CaCO3	Iron, Dissolved	0.38	mg/l
08/02/88		11:00 hr.	08/01/88		13:50 hr
Alk., Bicarbonate	362	mg/l HCO3	Magnesium	54.10	mg/l
08/01/88		14:30 hr.	08/01/88		13:30 hr
Alk., Carbonate	1<	mg/l CaCO3	Manganese	0.01<	mg/l
08/01/88		14:30 hr.	08/01/88		13:40 hr
Alk., Total	297	mg/l CaCO3	Oil and Grease	48.8	mg/l
08/01/88		14:30 hr.	08/02/88		14:45 hr
Anions, Total	12.62	meq/l	Oxygen, Dissolved	5.6	mg/l
			07/29/88		14:30 hr
Calcium	115.0	mg/l	pH	8.15	Units
08/01/88		13:20 hr.	07/29/88		14:30 hr
Cations, Total	12.80	meq/l	Potassium	12.30	mg/l
			08/01/88		13:00 hr
Chloride	15.0	mg/l	Sodium	53.30	mg/l
08/02/88		09:00 hr.	08/01/88		11:45 hr
Conductivity	800	umhos/cm	Solids, Dissolved	684.0	mg/l
07/29/88		15:15 hr.	08/01/88		11:00 hr
Hardness, Total	510	mg/l CaCO3	Solids, Suspended	630.0	mg/l
			08/01/88		11:00 hr
Iron	0.44	mg/l	Sulfate	305.0	mg/l
08/01/88		13:50 hr.	08/02/88		10:30 hr

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ANALYST: D. Tipon

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Dave Coulter

Manager, Huntington Laboratory

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

August 19, 1988

Job No.: 9372

Date Rec'd: August 16, 1988

Date Sampled: August 16, 1988

Sampled By: UP&L

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

Sample ID:

DEER CREEK DISCHARGE
11th Line-High in SS
Temp 58 Flow 960 gpm
Meter #1 90.443 #2 687.658
#3 9.301 #4 755.243
Time Sampled 09:40 hr.
Time Rec'd 10:35 hr.

WATER ANALYSIS

Acidity	8	mg/l CaCO3	Magnesium	54.90	mg/l
08/19/88		11:15 hr.	08/18/88		14:30 hr
Alk., Bicarbonate	438	mg/l HCO3	Manganese	0.01<	mg/[illegible]
08/18/88		11:25 hr.	08/18/88		14:25 hr
Alk., Carbonate	1<	mg/l CaCO3	Oil and Grease	8.7	mg/l
08/18/88		11:25 hr.	08/19/88		11:20 hr
Alk., Total	359	mg/l CaCO3	Oxygen, Dissolved	7.0	mg/l
08/18/88		11:25 hr.	08/16/88		12:02 hr
Anions, Total	13.52	meq/l	pH	7.18	Units
			08/16/88		16:25 hr
Calcium	113.8	mg/l	Potassium	8.80	mg/l
08/18/88		14:40 hr.	08/18/88		14:50 hr
Cations, Total	13.50	meq/l	Sodium	71.70	mg/l
			08/18/88		15:00 hr
Chloride	17.0	mg/l	Solids, Dissolved	745.0	mg/l
08/18/88		11:45 hr.	08/17/88		08:15 hr
Conductivity	1050	umhos/cm	Solids, Suspended	116.0	mg/l
08/18/88		13:30 hr.	08/17/88		08:15 hr
Hardness, Total	510	mg/l CaCO3	Sulfate	288.0	mg/l
			08/18/88		17:30 hr
Iron	0.66	mg/l			
08/18/88		14:15 hr.			

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ANALYST: J. Komar

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

October 5, 1988

Job No.: 09429

Date Rec'd: September 29, 1988

Date Sampled: September 28, 1988

Sampled By: UP&L

Sample ID:

DEER CREEK DISCHARGE
Temperature 54 degrees
Flow 780 gpm
Rec'd 1030 hr.
Sampled 1610 hr.

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

WATER ANALYSIS

Acidity	7	mg/l CaCO3	10/03/88 1100 hr.
Alk., Bicarbonate	333	mg/l HCO3	10/03/88 915 hr.
Alk., Carbonate	1	mg/l CaCO3	10/03/88 915 hr.
Alk., Total	273	mg/l CaCO3	10/03/88 915 hr.
Anions, Total	12.71	meq/l	
Calcium	144.8	mg/l	10/05/88 1500 hr.
Cations, Total	13.44	meq/l	
Chloride	20.0	mg/l	10/04/88 1000 hr.
Conductivity	1000	umhos/cm	10/03/88 1015 hr.
Hardness, Total	572	mg/l CaCO3	
Iron	0.15	mg/l	09/29/88 1300 hr.
Iron, Dissolved	0.15	mg/l	09/29/88 1315 hr.
Magnesium	51.10	mg/l	10/05/88 1530 hr.
Manganese	0.006	mg/l	09/29/88 1400 hr.
Oil and Grease	3.3	mg/l	10/04/88 1400 hr.
Oxygen, Dissolved	7.3	mg/l	09/29/88 1645 hr.
pH	7.90	Units	09/29/88 1620 hr.
Potassium	5.90	mg/l	09/29/88 1415 hr.
Sodium	43.20	mg/l	09/29/88 1330 hr.
Solids, Dissolved	818.0	mg/l	10/03/88 900 hr.
Solids, Suspended	7.0	mg/l	10/03/88 900 hr.
Sulfate	325.0	mg/l	10/03/88 1330 hr.

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ANALYST: _____

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

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

October 24, 1988

Job No.: 9455

Date Rec'd: October 17, 1988

Date Sampled: October 17, 1988

Sampled By: UP&L

Sample ID:

DEER CREEK DISCHARGE
Temperature 55 degrees
Flow 1000 gpm
Rec'd 1345 hr.
Sampled 1100 hr.

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

WATER ANALYSIS

Acidity 10/20/88	28	mg/l CaCO3 14:35 hr.	Iron, Dissolved 10/19/88	0.37	mg/l 14:10 hr.
Alk., Bicarbonate 10/20/88	298	mg/l HCO3 14:35 hr.	Magnesium 10/19/88	61.10	mg/l 13:45 hr.
Alk., Carbonate 10/20/88	1<	mg/l CaCO3 14:35 hr.	Manganese 10/19/88	0.06	mg/l 14:00 hr.
Alk., Total 10/20/88	244	mg/l CaCO3 14:35 hr.	Oil and Grease 10/21/88	4.8	mg/l 16:00 hr.
Anions, Total 10/21/88	12.21	meq/l	pH 10/17/88	7.70	Units 14:30 hr.
Calcium 10/19/88	121.5	mg/l 13:30 hr.	Potassium 10/19/88	4.70	mg/l 15:10 hr.
Cations, Total	12.49	meq/l	Sodium 10/19/88	29.80	mg/l 14:20 hr.
Chloride 10/20/88	15.0	mg/l 15:00 hr.	Solids, Dissolved 10/18/88	896.0	mg/l 09:30 hr.
Conductivity 10/17/88	1000	umhos/cm 16:00 hr.	Solids, Suspended 10/18/88	52.0	mg/l 09:30 hr.
Hardness, Total	555	mg/l CaCO3	Sulfate 10/21/88	335.0	mg/l 10:20 hr.
Iron 10/19/88	0.42	mg/l 14:10 hr.			

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ANALYST: D. Tepon

Respectfully submitted,
COMMERCIAL TESTING & ENGINEERING CO.

M W

Manager, Huntington Laboratory

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

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

December 2, 1988

Job No.: 9488

Date Rec'd: November 30, 1988

Date Sampled: November 30, 1988

Sampled By: UP&L

Sample ID:

DEER CREEK DISCHARGE
Oil Skimmer
Temperature 56 degrees
Flow 1250 gpm
Rec'd 1600 hr.
Sampled 1515 hr.

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

WATER ANALYSIS

Acidity	4	mg/l CaCO3	12/01/88 1600 hr.
Alk., Bicarbonate	389	mg/l HCO3	12/01/88 1600 hr.
Alk., Carbonate	1<	mg/l CaCO3	12/01/88 1600 hr.
Alk., Total	319	mg/l CaCO3	12/01/88 1600 hr.
Anions, Total	12.52	meq/l	
Calcium	128.6	mg/l	12/02/88 1400 hr.
Cations, Total	12.15	meq/l	
Chloride	15.0	mg/l	12/01/88 1130 hr.
Conductivity	900	umhos/cm	12/01/88 1115 hr.
Hardness, Total	528	mg/l CaCO3	
Iron	1.81	mg/l	12/02/88 1300 hr.
Iron, Dissolved	1.56	mg/l	12/02/88 1330 hr.
Magnesium	50.20	mg/l	12/02/88 1415 hr.
Manganese	0.02	mg/l	12/02/88 1330 hr.
Oil and Grease	8.1	mg/l	12/02/88 1400 hr.
Oxygen, Dissolved	9.1	mg/l	11/30/88 1600 hr.
pH	8.00	Units	11/30/88 1545 hr.
Potassium	7.50	mg/l	12/02/88 1430 hr.
Sodium	32.80	mg/l	12/02/88 1345 hr.
Solids, Dissolved	534.0	mg/l	12/02/88 0930 hr.
Solids, Suspended	179.0	mg/l	12/02/88 0930 hr.
Sulfate	280.0	mg/l	12/02/88 1230 hr.

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ANALYST: D. Tipon

Respectfully submitted,
COMMERCIAL TESTING & ENGINEERING CO.

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

December 2, 1988

Job No.: 9489

Date Rec'd: November 30, 1988

Date Sampled: November 30, 1988

Sampled By: UP&L

Sample ID:

DEER CREEK DISCHARGE
#1 and 2
Rec'd 1600 hr.
No Sampling Time

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

WATER ANALYSIS

Acidity	5	mg/l CaCO3		Iron, Dissolved	1.07	mg/l	
12/01/88	1600 hr.			12/02/88	1315 hr.		
Alk., Bicarbonate	438	mg/l HCO3		Magnesium	43.60	mg/l	
12/01/88	1600 hr.			12/02/88	1415 hr.		
Alk., Carbonate	1<	mg/l CaCO3		Manganese	0.02	mg/l	
12/01/88	1600 hr.			12/02/88	1330 hr.		
Alk., Total	359	mg/l CaCO3		Oxygen, Dissolved	8.8	mg/l	
12/01/88	1600 hr.			11/30/88	1600 hr.		
Anions, Total	10.96	meq/l		pH	7.95	Units	
				11/30/88	1545 hr.		
Calcium	115.8	mg/l		Potassium	6.60	mg/l	
12/02/88	1400 hr.			12/02/88	1430 hr.		
Cations, Total	10.87	meq/l		Sodium	30.90	mg/l	
				12/02/88	1345 hr.		
Chloride	10.0	mg/l		Solids, Dissolved	587.0	mg/l	
12/01/88	1130 hr.			12/02/88	0930 hr.		
Conductivity	890	umhos/cm		Solids, Suspended	131.0	mg/l	
12/01/88	1115 hr.			12/02/88	0930 hr.		
Hardness, Total	469	mg/l CaCO3		Sulfate	175.0	mg/l	
				12/02/88	1230 hr.		
Iron	1.55	mg/l					
12/02/88	1300 hr.						

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ANALYST: D. Tepon

Respectfully submitted,
COMMERCIAL TESTING & ENGINEERING CO.

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

December 2, 1988

Job No.: 9487

Date Rec'd: November 30, 1988

Date Sampled: November 30, 1988

Sampled By: UP&L

Sample ID:

DEER CREEK DISCHARGE
#3 Flow
250 gpm
Rec'd 1600 hr.
No Sampling Time

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

WATER ANALYSIS

Acidity	4	mg/l CaCO3	12/01/88 1600 hr.
Alk., Bicarbonate	338	mg/l HCO3	12/01/88 1600 hr.
Alk., Carbonate	1<	mg/l CaCO3	12/01/88 1600 hr.
Alk., Total	277	mg/l CaCO3	12/01/88 1600 hr.
Anions, Total	12.26	meq/l	
Calcium	123.2	mg/l	12/02/88 1400 hr.
Cations, Total	12.33	meq/l	
Chloride	20.0	mg/l	12/01/88 1130 hr.
Conductivity	1000	umhos/cm	12/01/88 1115 hr.
Hardness, Total	516	mg/l CaCO3	
Iron	1.76	mg/l	12/02/88 1300 hr.
Iron, Dissolved	1.42	mg/l	12/02/88 1315 hr.
Magnesium	50.60	mg/l	12/02/88 1415 hr.
Manganese	0.02	mg/l	12/02/88 1330 hr.
Oxygen, Dissolved	8.7	mg/l	11/30/88 1600 hr.
pH	8.10	Units	11/30/88 1545 hr.
Potassium	8.10	mg/l	12/02/88 1430 hr.
Sodium	42.00	mg/l	12/02/88 1345 hr.
Solids, Dissolved	645.0	mg/l	12/02/88 0930 hr.
Solids, Suspended	267.0	mg/l	12/02/88 0930 hr.
Sulfate	300.0	mg/l	12/02/88 1230 hr.

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ANALYST: D. Tyson

Respectfully submitted,
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FIELD OFFICE

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

January 3, 1989

Job No.: 9507

Date Rec'd: December 15, 1988

Date Sampled: December 15, 1988

Sampled By: UP&L

Sample ID:

DEER CREEK DISCHARGE
Oil Skimmer
Flow 1270 gpm
Rec'd 1600 hr.
Sampled 1340 hr.

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

WATER ANALYSIS

Acidity	28	mg/l CaCO3	12/21/88 1130 hr.
Alk., Bicarbonate	306	mg/l HCO3	12/21/88 1130 hr.
Alk., Carbonate	1<	mg/l CaCO3	12/21/88 1130 hr.
Alk., Total	251	mg/l CaCO3	12/21/88 1130 hr.
Anions, Total	9.79	meq/l	
Calcium	98.1	mg/l	12/16/88 1300 hr.
Cations, Total	10.08	meq/l	
Chloride	25.0	mg/l	12/21/88 0845 hr.
Conductivity	1000	umhos/cm	12/16/88 1300 hr.
Hardness, Total	436	mg/l CaCO3	
Iron	0.52	mg/l	12/28/88 1430 hr.
Iron, Dissolved	0.36	mg/l	12/28/88 1430 hr.
Magnesium	46.40	mg/l	12/28/88 1500 hr.
Manganese	0.01	mg/l	12/28/88 1445 hr.
Oil and Grease	1.4	mg/l	12/22/88 1600 hr.
Oxygen, Dissolved	8.0	mg/l	12/15/88 1700 hr.
pH	8.10	Units	12/15/88 1700 hr.
Potassium	5.40	mg/l	12/16/88 1315 hr.
Sodium	28.50	mg/l	12/16/88 1330 hr.
Solids, Dissolved	678.0	mg/l	12/22/88 0930 hr.
Solids, Suspended	64.0	mg/l	12/22/88 0930 hr.
Sulfate	200.0	mg/l	12/21/88 1430 hr.

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Respectfully submitted,
COMMERCIAL TESTING & ENGINEERING CO.

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

January 3, 1989

Job No.: 9501

Date Rec'd: December 15, 1988

Date Sampled: December 15, 1988

Sampled By: UP&L

Sample ID:

DEER CREEK DISCHARGE
#1
Flow 370 gpm
Rec'd 1600 hr.
Sampled 1340 hr.

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

WATER ANALYSIS

Acidity	3	mg/l CaCO3	12/21/88 1130 hr.
Alk., Bicarbonate	315	mg/l HCO3	12/21/88 1130 hr.
Alk., Carbonate	1<	mg/l CaCO3	12/21/88 1130 hr.
Alk., Total	258	mg/l CaCO3	12/21/88 1130 hr.
Anions, Total	11.02	meq/l	
Calcium	109.5	mg/l	12/16/88 1300 hr.
Cations, Total	11.13	meq/l	
Chloride	15.0	mg/l	12/21/88 0845 hr.
Conductivity *	1050	umhos/cm	12/16/88 1300 hr.
Hardness, Total	460	mg/l CaCO3	
Iron	0.27	mg/l	12/28/88 1430 hr.
Iron, Dissolved	0.16	mg/l	12/28/88 1430 hr.
Magnesium	45.40	mg/l	12/28/88 1500 hr.
Manganese	0.01<	mg/l	12/28/88 1445 hr.
Oxygen, Dissolved	7.2	mg/l	12/15/88 1700 hr.
pH	8.10	Units	12/15/88 1700 hr.
Potassium	7.80	mg/l	12/16/88 1315 hr.
Sodium	40.20	mg/l	12/16/88 1330 hr.
Solids, Dissolved	656.0	mg/l	12/22/88 0930 hr.
Solids, Suspended	64.0	mg/l	12/22/88 0930 hr.
Sulfate	265.0	mg/l	12/21/88 1430 hr.

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ANALYST: D. Tyson

Respectfully submitted,
COMMERCIAL TESTING & ENGINEERING CO.

Manager, Huntington Laboratory

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

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

January 3, 1989

Job No.: 9505

Date Rec'd: December 15, 1988

Date Sampled: December 15, 1988

Sampled By: UP&L

Sample ID:

DEER CREEK DISCHARGE
#2
Flow 600 gpm
Rec'd 1600 hr.
Sampled 1340 hr.

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

WATER ANALYSIS

Acidity	7	mg/l CaCO3	
12/21/88	1130 hr.		
Alk., Bicarbonate	381	mg/l HCO3	
12/21/88	1130 hr.		
Alk., Carbonate	1<	mg/l CaCO3	
12/21/88	1130 hr.		
Alk., Total	312	mg/l CaCO3	
12/21/88	1130 hr.		
Anions, Total	9.83	meq/l	
Calcium	101.4	mg/l	
12/16/88	1300 hr.		
Cations, Total	9.67	meq/l	
Chloride	10.0	mg/l	
12/21/88	0845 hr.		
Conductivity *	1000	umhos/cm	
12/16/88	1300 hr.		
Hardness, Total	430	mg/l CaCO3	
Iron	0.92	mg/l	
12/28/88	1430 hr.		
Iron, Dissolved	0.73	mg/l	
12/28/88	1430 hr.		
Magnesium	43.00	mg/l	
12/28/88	1500 hr.		
Manganese	0.01<	mg/l	
12/28/88	1445 hr.		
Oxygen, Dissolved	8.2	mg/l	
12/15/88	1700 hr.		
pH	7.80	Units	
12/15/88	1700 hr.		
Potassium	3.10	mg/l	
12/16/88	1315 hr.		
Sodium	23.14	mg/l	
12/16/88	1330 hr.		
Solids, Dissolved	600.0	mg/l	
12/22/88	0930 hr.		
Solids, Suspended	156.0	mg/l	
12/22/88	0930 hr.		
Sulfate	165.0	mg/l	
12/21/88	1430 hr.		

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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

January 3, 1989

Job No.: 9506

Date Rec'd: December 15, 1988

Date Sampled: December 15, 1988

Sampled By: UP&L

Sample ID:

DEER CREEK DISCHARGE
#3
Flow 250 gpm
Rec'd 1600 hr.
Sampled 1340 hr.

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

WATER ANALYSIS

Acidity	3	mg/l CaCO3	12/21/88 1130 hr.
Alk., Bicarbonate	290	mg/l HCO3	12/21/88 1130 hr.
Alk., Carbonate	1<	mg/l CaCO3	12/21/88 1130 hr.
Alk., Total	238	mg/l CaCO3	12/21/88 1130 hr.
Anions, Total	10.52	meq/l	
Calcium	89.7	mg/l	12/16/88 1300 hr.
Cations, Total	10.13	meq/l	
Chloride	15.0	mg/l	12/21/88 0845 hr.
Conductivity	1100	umhos/cm	12/16/88 1300 hr.
Hardness, Total	432	mg/l CaCO3	
Iron	0.03	mg/l	12/28/88 1430 hr.
Iron, Dissolved	0.02	mg/l	12/28/88 1430 hr.
Magnesium	50.50	mg/l	12/28/88 1500 hr.
Manganese	0.01<	mg/l	12/28/88 1445 hr.
Oxygen, Dissolved	6.6	mg/l	12/15/88 1700 hr.
pH	8.10	Units	12/15/88 1700 hr.
Potassium	5.80	mg/l	12/16/88 1315 hr.
Sodium	31.40	mg/l	12/16/88 1330 hr.
Solids, Dissolved	684.0	mg/l	12/22/88 0930 hr.
Solids, Suspended	16.0	mg/l	12/22/88 0930 hr.
Sulfate	260.0	mg/l	12/21/88 1430 hr.

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ANALYST: D. Tyson

Respectfully submitted,
COMMERCIAL TESTING & ENGINEERING CO.

Manager, Huntington Laboratory

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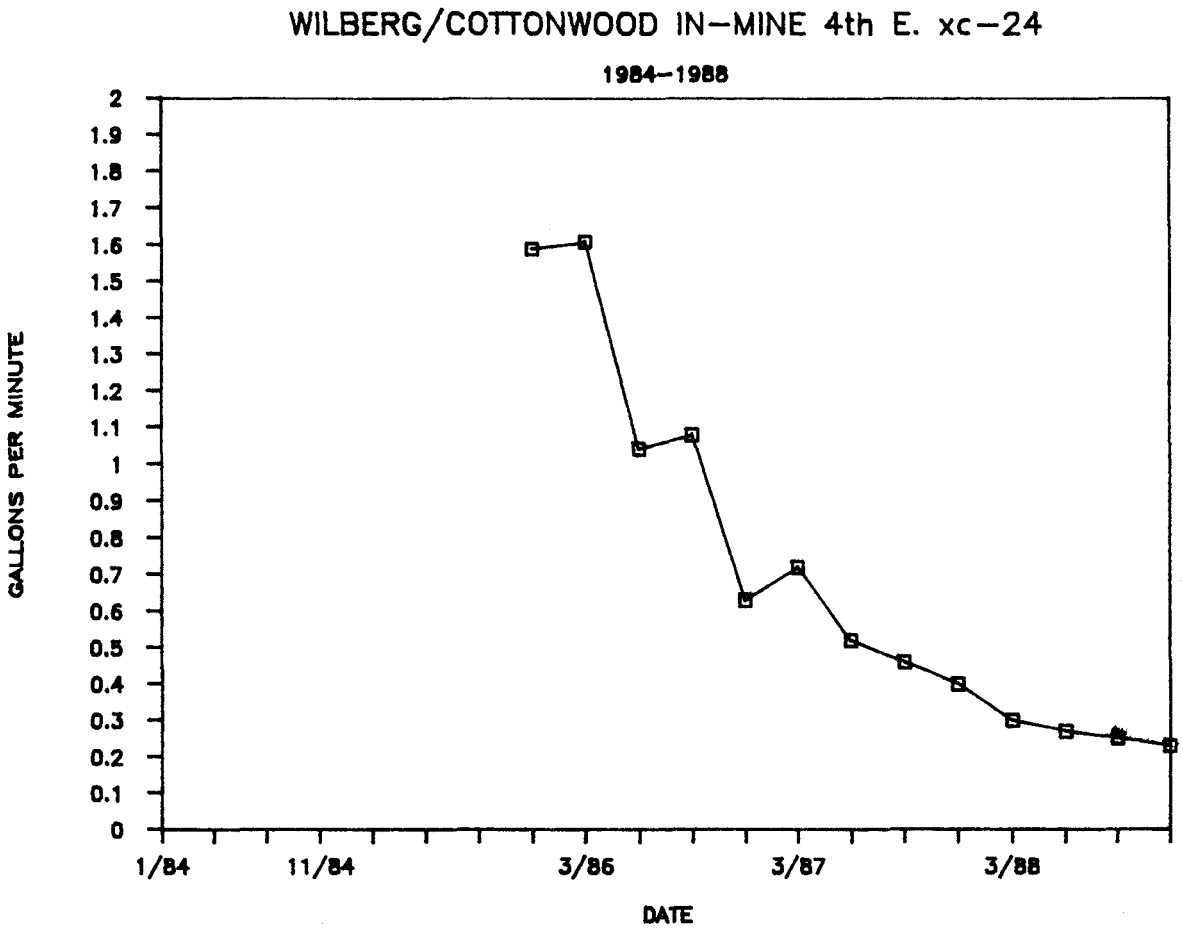
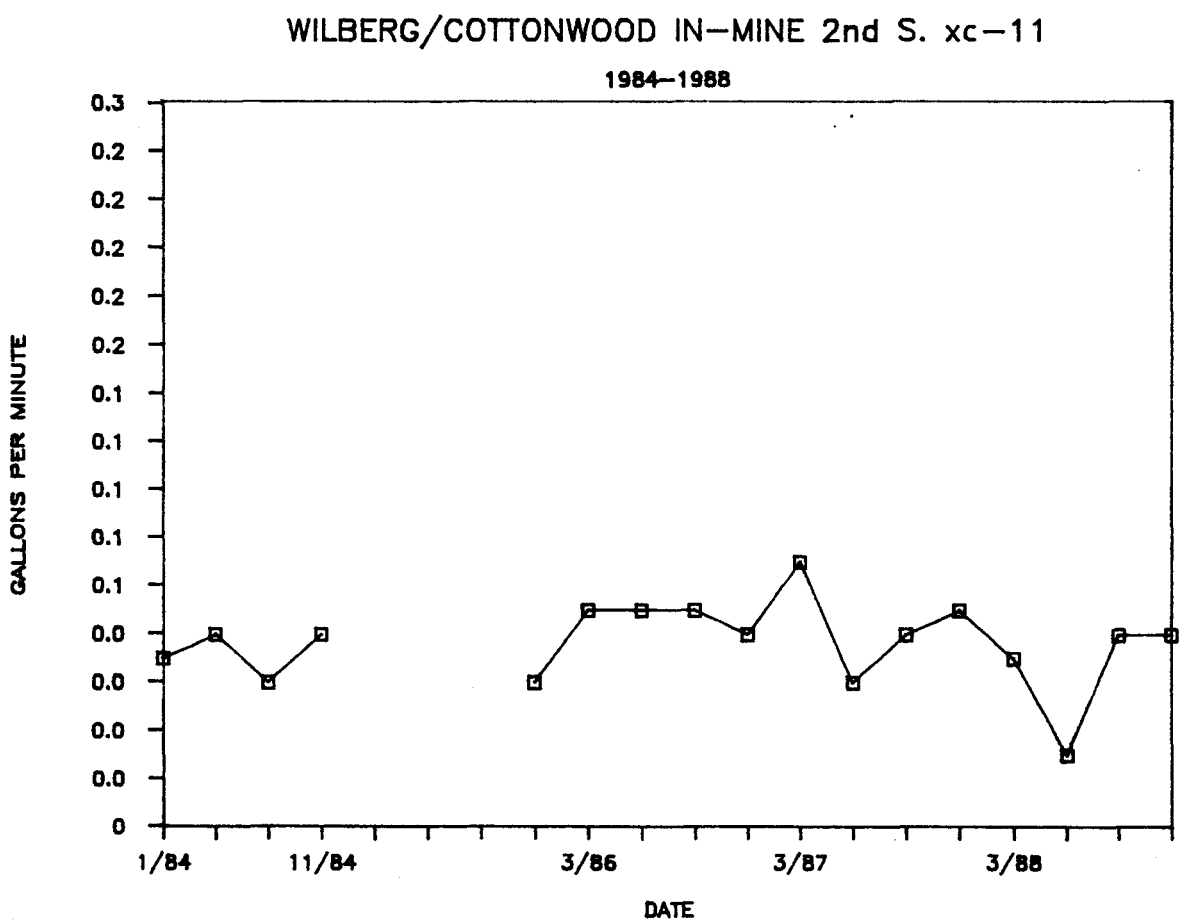
OVER 40 BRANCH LABORATORIES STRATEGICALLY LOCATED IN PRINCIPAL COAL MINING AREAS,

APPENDIX H


WILBERG/COTTONWOOD IN-MINE 4th E. xc-24
1984-1988
GALLONS PER MINUTE
2
1.9
1.8
1.7
1.6
1.5
1.4
1.3
1.2
1.1
1
0.9
0.8
0.7
0.6
0.5
0.4
0.3
0.2
0.1
0
1/84
11/84
3/86
3/87
3/88
DATE


WILBERG/COTTONWOOD IN-MINE 2nd S. xc-11
1984-1988
GALLONS PER MINUTE
0.3
0.2
0.2
0.2
0.2
0.2
0.1
0.1
0.1
0.1
0.1
0.0
0.0
0.0
0.0
0
1/84
11/84
3/86
3/87
3/88
DATE

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

April 4, 1988

Job No.: 9187

Date Rec'd: March 24, 1988

Date Sampled: March 23, 1988

Sampled By: UP&L

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

Sample ID:

WILBER-IN-MINE
2nd So.
XC-11
Temp 54
Flow 0.07 gpm
Time Sampled 13:30 hr.
Time Rec'd 1:27 p.m. hr.

WATER ANALYSIS

Alk., Bicarbonate	532 mg/l HCO3		Iron, Dissolved	0.02< mg/l	
03/25/88	15:45 hr.		03/29/88	14:45 hr.	
Alk., Carbonate	1< mg/l CaCO3		Magnesium	107.60 mg/l	
03/25/88	15:45 hr.		03/29/88	14:00 hr.	
Alk., Total	436 mg/l CaCO3		Manganese	0.03 mg/l	
03/25/88			03/28/88	14:00 hr.	
Anions, Total	17.14 meq/l		pH	7.18 Units	
			03/24/88		
Calcium	194.1 mg/l		Potassium	4.50 mg/l	
03/28/88	14:10 hr.		03/28/88	14:45 hr.	
Cations, Total	19.64 meq/l		Sodium	23.20 mg/l	
			03/28/88	14:00 hr.	
Chloride	41.4 mg/l		Solids, Dissolved	739.0 mg/l	
03/24/88	14:30 hr.		03/30/88	09:30 hr.	
Conductivity	1390 umhos/cm		Solids, Suspended	5.0 mg/l	
03/25/88	14:00 hr.		03/29/88	14:00 hr.	
Hardness, Total	928 mg/l CaCO3		Sulfate	356.0 mg/l	
			03/29/88	09:30 hr.	

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ANALYST: M M

Respectfully submitted,
COMMERCIAL TESTING & ENGINEERING CO.

M M

Manager, Huntington Laboratory

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

April 4, 1988

Job No.: 9188

Date Rec'd: March 24, 1988

Date Sampled: March 23, 1988

Sampled By: UP&L

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

Sample ID:

WILBER-IN-MINE
4th E.
X-Cut 24
Temp 54
Flow 0.30 gpm
Time Sampled 14:45 hr.
Time Rec'd 1:27 p.m. hr.

WATER ANALYSIS

Alk., Bicarbonate	529 mg/l HCO3	
03/25/88	15:45 hr.	
Alk., Carbonate	1< mg/l CaCO3	
03/25/88	15:45 hr.	
Alk., Total	434 mg/l CaCO3	
03/25/88	15:45 hr.	
Anions, Total	36.22 meq/l	
Calcium	348.4 mg/l	
03/28/88	14:10 hr.	
Cations, Total	37.29 meq/l	
Chloride	61.4 mg/l	
03/24/88	14:30 hr.	
Conductivity	2150 umhos/cm	
03/25/88	14:00 hr.	
Hardness, Total	1762 mg/l CaCO3	
Iron, Dissolved	0.05 mg/l	
03/29/88	14:45 hr.	
Magnesium	216.50 mg/l	
03/29/88	14:00 hr.	
Manganese	0.03 mg/l	
03/28/88	14:30 hr.	
pH	7.33 Units	
03/24/88	14:20 hr.	
Potassium	9.50 mg/l	
03/28/88	14:45 hr.	
Sodium	43.40 mg/l	
03/28/88	14:00 hr.	
Solids, Dissolved	1429.0 mg/l	
03/30/88	09:30 hr.	
Solids, Suspended	1.0< mg/l	
03/29/88	14:00 hr.	
Sulfate	1240.0 mg/l	
03/29/88	09:30 hr.	

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ANALYST: [illegible]

Respectfully submitted,
COMMERCIAL TESTING & ENGINEERING CO.

[illegible]
Manager, Huntington Laboratory

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

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

August 2, 1988

Job No.: 9337

Date Rec'd: July 27, 1988

Date Sampled: July 27, 1988

Sampled By: UP&L

Sample ID:

WILBERG
25x11
Flow .03 gpm
40s /6 oz
Time Sampled 10:20 a.m. hr.
Time Rec'd 3:00 p.m. hr.

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

WATER ANALYSIS

Alk., Bicarbonate 08/01/88	521	mg/l HCO3 14:30 hr.	Iron, Dissolved 08/01/88	0.02<	mg/l 13:50 hr.
Alk., Carbonate 08/01/88	1<	mg/l CaCO3 14:30 hr.	Magnesium 08/01/88	111.30	mg/l 13:30 hr.
Alk., Total 08/01/88	427	mg/l CaCO3 14:30 hr.	Manganese 08/01/88	0.03	mg/l 13:40 hr.
Anions, Total	20.46	meq/l	pH 07/27/88	7.47	Units 16:00 hr.
Calcium	222.1	mg/l 13:20 hr.	Potassium 08/01/88	4.40	mg/l 13:00 hr.
Cations, Total	21.27	meq/l	Sodium 08/01/88	21.40	mg/l 11:45 hr.
Chloride 08/02/88	15.0	mg/l 09:00 hr.	Solids, Dissolved 07/29/88	1328.0	mg/l 09:30 hr.
Conductivity 07/27/88	1900	umhos/cm 16:20 hr.	Solids, Suspended 07/29/88	1.0<	mg/l 09:30 hr.
Hardness, Total	1013	mg/l CaCO3	Sulfate 08/02/88	558.0	mg/l 10:30 hr.

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ANALYST: D. Tyson

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COMMERCIAL TESTING & ENGINEERING CO.

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

August 2, 1988

Job No.: 9336

Date Rec'd: July 27, 1988

Date Sampled: July 27, 1988

Sampled By: UP&L

Sample ID:

WILBERG
4ex24
Flow .27 gpm
54 5/qt
Time Sampled 1:20 p.m. hr.
Time Rec'd 3:00 p.m. hr.

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

WATER ANALYSIS

Alk., Bicarbonate	551	mg/l HCO3	Iron, Dissolved	0.04	mg/l
08/01/88		14:30 hr.	08/01/88		13:50 hr.
Alk., Carbonate	1<	mg/l CaCO3	Magnesium	238.20	mg/l
08/01/88		14:30 hr.	08/01/88		13:40 hr.
Alk., Total	452	mg/l CaCO3	Manganese	0.01	mg/l
08/01/88		14:30 hr.	08/01/88		13:40 hr.
Anions, Total	40.38	meq/l	pH	7.40	Units
			07/27/88		16:00 hr.
Calcium	416.9	mg/l	Potassium	11.30	mg/l
08/01/88		13:20 hr.	08/01/88		13:00 hr.
Cations, Total	42.62	meq/l	Sodium	45.30	mg/l
			08/01/88		11:45 hr.
Chloride	40.0	mg/l	Solids, Dissolved	2502.0	mg/l
08/02/88		09:00 hr.	07/29/88		09:30 hr.
Conductivity	5000	umhos/cm	Solids, Suspended	1.0<	mg/l
07/27/88		16:20 hr.	07/29/88		09:30 hr.
Hardness, Total	2022	mg/l CaCO3	Sulfate	1450.0	mg/l
			08/02/88		10:30 hr.

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ANALYST: O. Lipon

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

November 1, 1988

Job No.: 9469

Date Rec'd: October 26, 1988

Date Sampled: October 26, 1988

Sampled By: UP&L

Sample ID:

WILBERG-IN-MINE
2nd S. XC-11
Temperature 56 degrees
Flow 0.08 gpm
Rec'd 1505 hr.
Sampled 1015 hr.

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

WATER ANALYSIS

Alk., Bicarbonate	631	mg/l HCO3	
10/27/88	1400 hr.		
Alk., Carbonate	1<	mg/l CaCO3	
10/27/88	1400 hr.		
Alk., Total	517	mg/l CaCO3	
10/27/88	1400 hr.		
Anions, Total	20.44	meq/l	
Calcium	208.6	mg/l	
11/01/88	1445 hr.		
Cations, Total	20.26	meq/l	
Chloride	40.0	mg/l	
10/31/88	1445 hr.		
Conductivity	1800	umhos/cm	
11/01/88	925 hr.		
Hardness, Total	958	mg/l CaCO3	
Iron, Dissolved	0.05	mg/l	
11/01/88	1340 hr.		
Magnesium	106.10	mg/l	
11/01/88	1440 hr.		
Manganese	0.03	mg/l	
11/01/88	1400 hr.		
pH	7.60	Units	
10/26/88	1610 hr.		
Potassium	4.20	mg/l	
11/01/88	1450 hr.		
Sodium	23.80	mg/l	
11/01/88	1500 hr.		
Solids, Dissolved	1230.0	mg/l	
11/02/88	930 hr.		
Solids, Suspended	1.0<	mg/l	
11/02/88	930 hr.		
Sulfate	440.0	mg/l	
11/01/88	915 hr.		

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ANALYST: D. Igoe

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

November 1, 1988

Job No.: 9468

Date Rec'd: October 26, 1988

Date Sampled: October 26, 1988

Sampled By: UP&L

Sample ID:

WILBERG-IN-MINE
4th E. XC-24
Temperature 58 degrees
Flow .25 gpm
Rec'd 1505 hr.
Sampled 1330 hr.

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

WATER ANALYSIS

Alk., Bicarbonate	612	mg/l HCO3	10/27/88 1400 hr.
Alk., Carbonate	1<	mg/l CaCO3	10/27/88 1400 hr.
Alk., Total	502	mg/l CaCO3	10/27/88 1400 hr.
Anions, Total	38.49	meq/l	
Calcium	364.9	mg/l	11/01/88 1445 hr.
Cations, Total	38.32	meq/l	
Chloride	50.0	mg/l	10/31/88 1445 hr.
Conductivity	3100	umhos/cm	11/01/88 925 hr.
Hardness, Total	1792	mg/l CaCO3	
Iron, Dissolved	0.04	mg/l	11/01/88 1350 hr.
Magnesium	213.80	mg/l	11/01/88 1440 hr.
Manganese	0.01<	mg/l	11/01/88 1400 hr.
pH	7.55	Units	10/26/88 1610 hr.
Potassium	10.10	mg/l	11/01/88 1450 hr.
Sodium	53.00	mg/l	11/01/88 1500 hr.
Solids, Dissolved	2594.0	mg/l	11/02/88 930 hr.
Solids, Suspended	1.0<	mg/l	11/02/88 930 hr.
Sulfate	1300.0	mg/l	11/01/88 915 hr.

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ANALYST: D. Tyson

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

January 3, 1989

Job No.: 9499

Date Rec'd: December 15, 1988

Date Sampled: December 15, 1988

Sampled By: UP&L

Sample ID:

WILBERG-IN-MINE
2nd South XC-11
Temperature 53 degrees
Flow 0.08 gpm
Rec'd 1600 hr.
Sampled 1355 hr.

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

WATER ANALYSIS

Acidity	22	mg/l CaCO3	
12/21/88	1130 hr.		
Alk., Bicarbonate	492	mg/l HCO3	
12/21/88	1130 hr.		
Alk., Carbonate	1<	mg/l CaCO3	
12/21/88	1130 hr.		
Alk., Total	403	mg/l CaCO3	
12/21/88	1130 hr.		
Anions, Total	18.50	meq/l	
Calcium	178.8	mg/l	
12/16/88	1300 hr.		
Cations, Total	18.90	meq/l	
Chloride	20.0	mg/l	
12/21/88	0845 hr.		
Conductivity	2600	umhos/cm	
12/16/88	1300 hr.		
Hardness, Total	894	mg/l CaCO3	
Iron, Dissolved	0.01<	mg/l	
12/28/88	1430 hr.		
Magnesium	108.60	mg/l	
12/28/88	1500 hr.		
Manganese	0.02	mg/l	
12/28/88	1445 hr.		
pH	7.50	Units	
12/15/88	1700 hr.		
Potassium	4.00	mg/l	
12/16/88	1315 hr.		
Sodium	22.20	mg/l	
12/16/88	1330 hr.		
Solids, Dissolved	1120.0	mg/l	
12/20/88	1000 hr.		
Solids, Suspended	1.0<	mg/l	
12/20/88	1000 hr.		
Sulfate	480.0	mg/l	
12/21/88	1430 hr.		

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

January 3, 1989

Job No.: 9498

Date Rec'd: December 15, 1988

Date Sampled: December 15, 1988

Sampled By: UP&L

Sample ID:

WILBERG-IN-MINE
4th East XC-24
Temperature 54 degrees
Flow 0.23 gpm
Rec'd 1600 hr.
Sampled 1330 hr.

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

WATER ANALYSIS

Alk., Bicarbonate	532	mg/l HCO3	
12/21/88	1130 hr.		
Alk., Carbonate	1<	mg/l CaCO3	
12/21/88	1130 hr.		
Alk., Total	436	mg/l CaCO3	
12/21/88	1130 hr.		
Anions, Total	36.08	meq/l	
Calcium	313.0	mg/l	
12/16/88	1300		
Cations, Total	36.22	meq/l	
Chloride	25.0	mg/l	
12/21/88	0845		
Conductivity	2800	umhos/cm	
12/16/88	1300		
Hardness, Total	1689	mg/l CaCO3	
Iron, Dissolved	0.01<	mg/l	
12/28/88	1430 hr.		
Magnesium	220.40	mg/l	
12/28/88	1500 hr.		
Manganese	0.01<	mg/l	
12/28/88	1445 hr.		
pH	8.00	Units	
12/15/88	1700 hr.		
Potassium	10.70	mg/l	
12/16/88	1315 hr.		
Sodium	51.50	mg/l	
12/16/88	1330 hr.		
Solids, Dissolved	1698.0	mg/l	
12/20/88	1000 hr.		
Solids, Suspended	2.0	mg/l	
12/20/88	1000 hr.		
Sulfate	1280.0	mg/l	
12/21/88	1430 hr.		

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ANALYST: D. Tyson

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APPENDIX I

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

September 21, 1988

Job No.: 9413

Date Rec'd: September 13, 1988

Date Sampled: September 13, 1988

Sampled By: UP&L

Sample ID:

Miller Canyon Breakout
Temperature 52 degrees
Flow 4.3 gpm
Rec'd 1625 hr.
Sampled 1500 hr.

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

WATER ANALYSIS

Acidity 09/14/88 1315 hr.	28	mg/l	CaCO3
Alk., Bicarbonate 09/14/88 1400 hr.	334	mg/l	HCO3
Alk., Carbonate 09/14/88 1400 hr.	1<	mg/l	CaCO3
Alk., Total 09/14/88 1400 hr.	274	mg/l	CaCO3
Anions, Total	13.81	meq/l	
Calcium 09/19/88 1300 hr.	136.4	mg/l	
Cations, Total	14.62	meq/l	
Chloride 09/14/88 1600 hr.	15.0	mg/l	
Conductivity 09/14/88 915 hr.	1398	umhos/cm	
Hardness, Total	657	mg/l	CaCO3
Iron 09/19/88 1530 hr.	0.14	mg/l	
Iron, Dissolved 09/19/88 1530 hr.	0.14	mg/l	
Magnesium 09/19/88 1439 hr.	76.90	mg/l	
Manganese 09/19/88 1515 hr.	0.01<	mg/l	
Oil and Grease 09/16/88 1400 hr.	3.5	mg/l	
Oxygen, Dissolved 09/13/88 1645 hr.	4.2	mg/l	
pH 09/13/88 1625 hr.	7.30	Units	
Potassium 09/19/88 1450 hr.	8.10	mg/l	
Sodium 09/19/88 1445 hr.	29.90	mg/l	
Solids, Dissolved 09/15/88 930 hr.	1182.0	mg/l	
Solids, Suspended 09/15/88 930 hr.	1.0<	mg/l	
Sulfate 09/14/88 945 hr.	383.0	mg/l	

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ANALYST: D. Tyson

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COMMERCIAL TESTING & ENGINEERING CO.

Manager, Huntington Laboratory

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

COMMERCIAL TESTING & ENGINEERING CO.
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

Job No.: 9486

Date Rec'd: November 30, 1988

Date Sampled: November 30, 1988

Sampled By: UP&L

December 2, 1988

Sample ID:

MILLER CANYON BREAKOUT
Rec'd 1400 hr.
No Sampling Time

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

WATER ANALYSIS

Acidity			
12/01/88	1600 hr.	30	mg/l CaCO3
Alk., Bicarbonate			
12/01/88	1600 hr.	465	mg/l HCO3
Alk., Carbonate			
12/01/88	1600 hr.	1<	mg/l CaCO3
Alk., Total			
12/01/88	1600 hr.	381	mg/l CaCO3
Anions, Total		21.50	meq/l
Calcium			
12/02/88	1400 hr.	220.9	mg/l
Cations, Total		20.73	meq/l
Chloride			
12/01/88	1130 hr.	15.0	mg/l
Conductivity			
12/01/88	1115 1115 hr.	1350	umhos/cm
Hardness, Total		963	mg/l CaCO3
Iron			
12/02/88	1300 hr.	0.11	mg/l
Iron, Dissolved			
12/02/88	1315 hr.	0.11	mg/l
Magnesium			
12/02/88	1415 hr.	100.00	mg/l
Manganese			
12/02/88	1330 hr.	0.06	mg/l
Oil and Grease			
12/02/88	1400 hr.	1.0<	mg/l
Oxygen, Dissolved			
11/30/88	1600 hr.	6.1	mg/l
pH			
11/30/88	1545 hr.	7.40	Units
Potassium			
12/02/88	1430 hr.	9.00	mg/l
Sodium			
12/02/88	1345 hr.	29.00	mg/l
Solids, Dissolved		1017.0	mg/l
12/02/88	0930 hr.		
Solids, Suspended		1.0<	mg/l
12/02/88	0930 hr.		
Sulfate			
12/02/88	1230 hr.	650.0	mg/l

ANALYST: D. Tyson

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Respectfully submitted,
COMMERCIAL TESTING & ENGINEERING CO.

Manager, Huntington Laboratory

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APPENDIX J

DO PROBE OUT OF SERVICE

JANUARY 1988
FIELD DATA

GRIMES WASH - RIGHT FORK 01/21/88				GRIMES WASH - LEFT FORK 01/21/88				GRIMES WASH - BELOW THE MINE 01/21/88			
pH	uS	DO-ppm	F	pH	uS	DO-ppm	F	pH	uS	DO-ppm	F
DRY				DRY				7.74	14132	*	32
AVERAGE								7.74	14132.00		

DEER CREEK - ABOVE MINE 01/21/88				DEER CREEK - @ PERMIT BOUNDARY 11/10/87				DEER CREEK - BELOW THE MINE 01/21/88			
pH	uS	DO-ppm	F	pH	uS	DO-ppm	F	pH	uS	DO-ppm	F
7.57	1519	*	32	DRY				DRY			
AVERAGE	7.57	1519.00									

MEETINGHOUSE CANYON 01/21/88				COTTONWOOD CANYON CREEK 01/21/88			
pH	uS	DO-ppm	F	pH	uS	DO-ppm	F
DRY				INACCESSIBLE			
AVERAGE							

EAST MOUNTAIN SPRINGS - INACCESSIBLE

	79-10	SHEBA	ELK	79-35	79-29	79-26	84-56	80-44	80-46	BURNT TREE	79-23	82-52
pH												
uS												
DO												
F												

* DO PROBE OUT OF SERVICE

FEBRUARY 1988
FIELD DATA

GRIMES WASH - RIGHT FORK 02/12/88				GRIMES WASH - LEFT FORK 02/12/88				GRIMES WASH - BELOW THE MINE 02/12/88			
pH	uS	DO-ppm	F	pH	uS	DO-ppm	F	pH	uS	DO-ppm	F
DRY				DRY				7.92	4763	*	36
AVERAGE								7.92	4763.00		

DEER CREEK - ABOVE MINE 02/12/88				DEER CREEK - @ PERMIT BOUNDARY 11/10/87				DEER CREEK - BELOW THE MINE 02/12/88			
pH	uS	DO-ppm	F	pH	uS	DO-ppm	F	pH	uS	DO-ppm	F
7.93	1140	*	34	DRY				DRY			
AVERAGE	7.93	1140.00									

MEETINGHOUSE CANYON 02/12/88				COTTONWOOD CANYON CREEK 02/12/88			
pH	uS	DO-ppm	F	pH	uS	DO-ppm	F
DRY				8.15	582	*	34
AVERAGE				AVERAGE	8.15	582.00	

EAST MOUNTAIN SPRINGS - INACCESSIBLE

79-10	SHEBA	ELK	79-35	79-29	79-26	84-56	80-44	80-46	BURNT TREE	79-23	82-52

==========

pH
uS
DO
F

DO PROBE OUT OF SERVICE

MARCH 1988
FIELD DATA

GRIMES WASH - RIGHT FORK 03/23/88				GRIMES WASH - LEFT FORK 03/23/88				GRIMES WASH - BELOW THE MINE			
pH	uS	DO-ppm	F	pH	uS	DO-ppm	F	pH	uS	DO-ppm	F
DRY				DRY				7.21	1021	*	36
AVERAGE								7.21	1021.00		

DEER CREEK - ABOVE MINE 03/23/88				DEER CREEK - @ PERMIT BOUNDARY 03/23/88				DEER CREEK - BELOW THE MINE			
pH	uS	DO-ppm	F	pH	uS	DO-ppm	F	pH	uS	DO-ppm	F
FROZEN				FROZEN				DRY			
AVERAGE											

MEETINGHOUSE CANYON 03/23/88				COTTONWOOD CANYON CREEK 03/23/88			
pH	uS	DO-ppm	F	pH	uS	DO-ppm	F
DRY				7.74	506	*	35
AVERAGE				AVERAGE	7.74	506.00	

EAST MOUNTAIN SPRINGS - INACCESSIBLE

79-10	SHEBA	ELK	79-35	79-29	79-26	84-56	80-44	80-46	BURNT TREE	79-23	82-52

pH
uS
DO
F

APRIL 18,1988
FIELD DATA

	GRIMES WASH - RIGHT FORK				GRIMES WASH - LEFT FORK				GRIMES WASH - BELOW THE MINE			
	pH	uS	DO-ppm	F	pH	uS	DO-ppm	F	pH	uS	DO-ppm	F
	8.18	375	*	46	8.07	456	*	49	8.07	1975	*	48
AVERAGE	8.18	375.00			8.07	456.00			8.07	1975.00		

	DEER CREEK - ABOVE THE MINE				DEER CREEK - @ PERMIT BOUNDARY				DEER CREEK - BELOW THE MINE			
	pH	uS	DO-ppm	F	pH	uS	DO-ppm	F	pH	uS	DO-ppm	F
	8.38	425	*	41	8.27	1382	*	40	8.33	1114	*	46
AVERAGE	8.38	425.00			8.27	1382.00			8.33	1114.00		

	MEETINGHOUSE CANYON				COTTONWOOD CANYON CREEK			
	pH	uS	DO-ppm	F	pH	uS	DO-ppm	F
	8.45	358	*	39	7.95	434	*	43
AVERAGE	8.45	358.00			7.95	434.00		

EAST MOUNTAIN SPRINGS

	79-10	SHEBA	ELK	79-35	79-29	79-26	84-56	80-44	80-46	BURNT TREE	79-23	82-52
pH												
uS												
DO												
F												

* meter out of service

MAY 16,1988
FIELD DATA

	GRIMES WASH - RIGHT FORK				GRIMES WASH - LEFT FORK				GRIMES WASH - BELOW THE MINE			
	pH	uS	DO-ppm	F	pH	uS	DO-ppm	F	pH	uS	DO-ppm	F
	DRY				7.83	500	*	60	7.92	1090	*	58
AVERAGE					7.83	500.00			7.92	1090.00		

	DEER CREEK - ABOVE THE MINE				DEER CREEK - @ PERMIT BOUNDARY				DEER CREEK - BELOW THE MINE			
	pH	uS	DO-ppm	F	pH	uS	DO-ppm	F	pH	uS	DO-ppm	F
	8.15	376	*	44	8.16	474	*	46	8.19	612	*	46
AVERAGE	8.15	376.00			8.16	474.00			8.19	612.00		

	MEETINGHOUSE CANYON				COTTONWOOD CANYON CREEK			
	pH	uS	DO-ppm	F	pH	uS	DO-ppm	F
	8.21	314	*	49	7.51	422	*	52
AVERAGE	8.21	314.00			7.51	422.00		

EAST MOUNTAIN SPRINGS

	79-10	SHEBA	ELK	79-35	79-29	79-26	84-56	80-44	80-46	BURNT TREE	79-23	82-52
pH												
uS												
DO												
F												

* meter out of service

JUNE 07,1988
FIELD DATA

	GRIMES WASH - RIGHT FORK				GRIMES WASH - LEFT FORK				GRIMES WASH - BELOW THE MINE			
	pH	uS	DO-ppm	F	pH	uS	DO-ppm	F	pH	uS	DO-ppm	F
	DRY				8.45	559	*	56	8.2	1118	*	56
AVERAGE					8.45	559.00			8.20	1118.00		

	DEER CREEK - ABOVE THE MINE				DEER CREEK - @ PERMIT BOUNDARY				DEER CREEK - BELOW THE MINE			
	pH	uS	DO-ppm	F	pH	uS	DO-ppm	F	pH	uS	DO-ppm	F
	8.05	434	*	42	8.42	324	*	47	8.18	678	*	58
AVERAGE	8.05	434.00			8.42	324.00			8.18	678.00		

	MEETINGHOUSE CANYON				COTTONWOOD CANYON CREEK			
	pH	uS	DO-ppm	F	pH	uS	DO-ppm	F
	7.01	354	*	46	7.98	526	*	50
AVERAGE	7.01	354.00			7.98	526.00		

EAST MOUNTAIN SPRINGS

	79-10	SHEBA	ELK	79-35	79-29	79-26	84-56	80-44	80-46	BURNT TREE	79-23	82-52
pH												
uS												
DO												
F												

* meter out of service

* METER OUT OF SERVICE *

JULY,1988
FIELD DATA

	GRIMES WASH - RIGHT FORK				GRIMES WASH - LEFT FORK				GRIMES WASH - BELOW THE MINE			
	pH	uS	DO-ppm	F	pH	uS	DO-ppm	F	pH	uS	DO-ppm	F
	DRY											
AVERAGE					0.00	0.00			0.00	0.00		

	DEER CREEK - ABOVE THE MINE				DEER CREEK - @ PERMIT BOUNDARY				DEER CREEK - BELOW THE MINE			
	pH	uS	DO-ppm	F	pH	uS	DO-ppm	F	pH	uS	DO-ppm	F
AVERAGE	0.00	0.00			0.00	0.00			0.00	0.00		

	MEETINGHOUSE CANYON				COTTONWOOD CANYON CREEK			
	pH	uS	DO-ppm	F	pH	uS	DO-ppm	F
AVERAGE	0.00	0.00			0.00	0.00		

EAST MOUNTAIN SPRINGS

	79-10	SHEBA	ELK	79-35	79-29	79-26	84-56	80-44	80-46	BURNT TREE	79-23	82-52
pH												
uS												
DO												
F	41	41	41	40	42	60	46	49	41	43		46

* METER OUT OF SERVICE *

AUGUST,1988
FIELD DATA

	GRIMES WASH - RIGHT FORK				GRIMES WASH - LEFT FORK				GRIMES WASH - BELOW THE MINE			
	pH	uS	DO-ppm	F	pH	uS	DO-ppm	F	pH	uS	DO-ppm	F
	DRY											
AVERAGE					0.00	0.00			0.00	0.00		

	DEER CREEK - ABOVE THE MINE				DEER CREEK - @ PERMIT BOUNDARY				DEER CREEK - BELOW THE MINE			
	pH	uS	DO-ppm	F	pH	uS	DO-ppm	F	pH	uS	DO-ppm	F
AVERAGE	0.00	0.00			0.00	0.00			0.00	0.00		

	MEETINGHOUSE CANYON				COTTONWOOD CANYON CREEK			
	pH	uS	DO-ppm	F	pH	uS	DO-ppm	F
AVERAGE	0.00	0.00			0.00	0.00		

EAST MOUNTAIN SPRINGS

	79-10	SHEBA	ELK	79-35	79-29	79-26	84-56	80-44	80-46	BURNT TREE	79-23	82-52
pH												
uS												
DO												
F	41	41	41	40	52	42	46		41	43		46

SEPTEMBER,1988
FIELD DATA

	GRIMES WASH - RIGHT FORK				GRIMES WASH - LEFT FORK				GRIMES WASH - BELOW THE MINE			
	pH	uS	DO-ppm	F	pH	uS	DO-ppm	F	pH	uS	DO-ppm	F
	DRY				DAMP				7.00	1677	9.84	49
AVERAGE					[illegible]				7.00	1677.00	9.84	

	DEER CREEK - ABOVE THE MINE				DEER CREEK - @ PERMIT BOUNDARY				DEER CREEK - BELOW THE MINE			
	pH	uS	DO-ppm	F	pH	uS	DO-ppm	F	pH	uS	DO-ppm	F
	7.32	538	10.76	54	7.83	1006	9.42	53	8.05	1061	9.18	56
AVERAGE	7.32	538.00	10.76		7.83	1006.00	9.42		8.05	1061.00	9.18	

	MEETINGHOUSE CANYON				COTTONWOOD CANYON CREEK			
	pH	uS	DO-ppm	F	pH	uS	DO-ppm	F
	7.02	384	10.92	46	7.01	502	10.22	48
AVERAGE	7.02	384.00	10.92		7.01	502.00	10.22	

EAST MOUNTAIN SPRINGS

	79-10	SHEBA	ELK	79-35	79-29	79-26	84-56	80-44	80-46	BURNT TREE	79-23	82-52
pH	Meter received after spring monitoring was completed.											
uS												
DO												
F	43	48	40	40	59	41	41		43	44		42

OCTOBER,1988
FIELD DATA

	GRIMES WASH - RIGHT FORK				GRIMES WASH - LEFT FORK				GRIMES WASH - BELOW THE MINE			
	pH	uS	DO-ppm	F	pH	uS	DO-ppm	F	pH	uS	DO-ppm	F
	DRY				DAMP				7.54	1658	10.13	52
AVERAGE					0.00	0.00			7.54	1658.00	10.13	

	DEER CREEK - ABOVE THE MINE				DEER CREEK - @ PERMIT BOUNDARY				DEER CREEK - BELOW THE MINE			
	pH	uS	DO-ppm	F	pH	uS	DO-ppm	F	pH	uS	DO-ppm	F
	6.94	548	9.6	38	6.80	853	9.3	40	6.7	954	8.8	46
AVERAGE	6.94	548.00	9.60		6.80	853.00	9.30		6.70	954.00	8.80	

	MEETINGHOUSE CANYON				COTTONWOOD CANYON CREEK			
	pH	uS	DO-ppm	F	pH	uS	DO-ppm	F
	7.13	450	10	41	7.74	465	11.56	46
AVERAGE	7.13	450.00	10.00		7.74	465.00	11.56	

EAST MOUNTAIN SPRINGS

	79-10	SHEBA	ELK	79-35	79-29	79-26	84-56	80-44	80-46	BURNT TREE	79-23	82-52
pH	6.99	7.24	7	7.09	7.84	7.87	7.98	DRY	7.04	7.02	DRY	7.11
uS	446	379	387	403	507	443	501		442	434		523
DO	7.04	9.54	10.24	10.04	8.88	10.5	7.74		11.34	9.81		10.46
F	46	44	40	42	40	42	43		42	44		41

NOVEMBER,1988
FIELD DATA

	GRIMES WASH - RIGHT FORK				GRIMES WASH - LEFT FORK				GRIMES WASH - BELOW THE MINE			
	pH	uS	DO-ppm	F	pH	uS	DO-ppm	F	pH	uS	DO-ppm	F
	DRY				DAMP				7.12	1548	9.69	46
AVERAGE									7.12	1548.00	9.69	

	DEER CREEK - ABOVE THE MINE				DEER CREEK - @ PERMIT BOUNDARY				DEER CREEK - BELOW THE MINE			
	pH	uS	DO-ppm	F	pH	uS	DO-ppm	F	pH	uS	DO-ppm	F
	FROZEN - NO FLOW				7.08	972	8.81	31	7.44	1816	13.87	32
AVERAGE	0.00				7.08	972.00	8.81		7.44	1816.00	13.87	

	MEETINGHOUSE CANYON				COTTONWOOD CANYON CREEK			
	pH	uS	DO-ppm	F	pH	uS	DO-ppm	F
	NO FLOW				7.26	490	9.28	41
AVERAGE					7.26	490.00	9.28	

EAST MOUNTAIN SPRINGS

	79-10	SHEBA	ELK	79-35	79-29	79-26	84-56	80-44	80-46	BURNT TREE	79-23	82-52
pH	INACCESSIBLE											
uS												
DO												
F												

DECEMBER,1988
FIELD DATA

	GRIMES WASH - RIGHT FORK				GRIMES WASH - LEFT FORK				GRIMES WASH - BELOW THE MINE			
	pH	uS	DO-ppm	F	pH	uS	DO-ppm	F	pH	uS	DO-ppm	F
	DRY				FROZEN - NO FLOW				7.98	3680	9.88	41
VERAGE									7.98	3680.00	9.88	

	DEER CREEK - ABOVE THE MINE				DEER CREEK - @ PERMIT BOUNDARY				DEER CREEK - BELOW THE MINE			
	pH	uS	DO-ppm	F	pH	uS	DO-ppm	F	pH	uS	DO-ppm	F
	FROZEN - NO FLOW				FROZEN - NO FLOW				FROZEN - NO FLOW			
VERAGE												

	MEETINGHOUSE CANYON				COTTONWOOD CANYON CREEK			
	pH	uS	DO-ppm	F	pH	uS	DO-ppm	F
	FROZEN - NO FLOW				7.81	562	10.38	37
VERAGE					7.81	562.00	10.38	

EAST MOUNTAIN SPRINGS

	79-10	SHEBA	ELK	79-35	79-29	79-26	84-56	80-44	80-46	BURNT TREE	79-23	82-52
	INACCESSIBLE											
H												
S												
O												