PacifiCorp

COTTONWOOD MINE
ACT/015/019

DEER CREEK MINE
ACT/015/018

DES-BEE-DOVE MINES
ACT/015/017

TRAIL MOUNTAIN MINE
ACT/015/009

Energy West Mining Co.

ANNUAL HYDROLOGIC REPORT
1999

PACIFICORP – ENERGY WEST MINING COMPANY
HYDROLOGIC MONITORING PROGRAM
ANNUAL REPORT FOR 1999

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I. INTRODUCTION

The 1999 Hydrologic Monitoring Report is hereby submitted in accordance with the U.S. Department of Interior, Office of Surface Mining requirements and the Utah State Division of Oil, Gas and Mining guidelines for hydrologic monitoring in areas of and adjacent to coal mining operations.

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

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.

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/Trail Mountain springs cannot be over-emphasized.

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 from 1988 through 1992 with runoff amounts much below normal for six consecutive years. 1993 runoff improved substantially with above average flow conditions occurring in most river basins. 1994 brought the return of drought conditions throughout the West. The 1995 through 1998 water supplies were much improved with above average runoff in Emery County. In 1999 runoff was higher than normal although not as high as 1998 runoff.

B. Local Climatology

1. Precipitation

Precipitation in Emery County during 1999 was variable. All reporting stations showed above normal. High elevation stations showed the highest increase above average while the lowest elevation reporting station also showed substantially above average values. The recorded precipitation at the East Mountain weather station was near normal.

Precipitation amounts recorded at Hunter Plant, Huntington Plant, Electric Lake, and East Mountain for the 1999 water year (October 1998 to September 1999) 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 1998 and 1999 merits consideration in this study. The intent is to develop a correlation between yearly precipitation and spring discharges on East

and Trail mountains. Table 2 is a comparison of the 1998 and 1999 precipitation levels recorded at the four locations.

Tables 3, 4, 5, and 6 indicate monthly precipitation values at Hunter, Huntington, Electric Lake, and East Mountain from the beginning of operation at each site. The tables indicate monthly trends as well as the great fluctuation in yearly totals. Figure 2 shows monthly precipitation at the East Mountain site for the 1999 water year.

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

2. Temperatures

During the 1999 water year temperatures were much above normal at the Hunter Plant and East Mountain, and near normal at Electric Lake and Huntington Plant. Temperatures at the Hunter Plant station were above normal for all months during the year, except October and April. At the Huntington Plant temperatures were below normal for October, November, and April through August. At the East Mountain station temperatures were above normal for all months during the year, except during April - May and August. Temperatures at the Electric Lake station were variable during the entire year. (See Table 7.)

A comparison of 1998 and 1999 temperatures for the four stations is addressed since temperatures also influence water supplies from year to year. Table 8 depicts the variation and compares 1998 to 1999.

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 HM-1 in pocket.) The drainage boundaries, including minor subdivisions to Cottonwood and Huntington creeks, are designated on the accompanying map. The surface drainage system on Trail Mountain is totally contained within the Cottonwood Creek drainage system, with minor subdivisions flowing to Indian and Cottonwood Canyon creeks. (See Plate 7-2 in pocket.) Both Huntington and Cottonwood creeks flow out of the Wasatch Plateau in a southeasterly direction. The creeks merge with Ferron Creek to form the San Rafael River, which is a tributary of the Green River.

A. Huntington Creek Drainage System

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

1. Huntington Creek

Flow data are recorded on a continuous basis by PacifiCorp at four locations; stations are located near PacifiCorp's Huntington Plant, Huntington Plant Diversion, below Electric Lake about 22 miles upstream from the Huntington Plant and Electric Lake elevations. Flow records are maintained by PacifiCorp 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 1999 water year (October 1998 - September 1999) at the two stations and Electric Lake storage are found in Appendix A.

During the 1999 spring runoff period (April through June) 8,059 acre feet of water were impounded behind Electric Lake Dam. During spring runoff the impoundment reached its highest level on June 10. Total storage on that date amounted to 31,768 acre feet, which is full pool plus surcharge storage of 504 acre feet. Reservoir releases for fishery, irrigation, flood control, and Huntington Plant needs during the water year totaled 20,080 acre feet. The total flow of 68,160 acre feet recorded for Huntington Creek at the Huntington Plant is equal to 100% of average. A comparison of runoff values from 1998 and 1999 is presented in Table 10.

During 1999 water quality information on Huntington Creek near the Deer Creek confluence was compiled on a quarterly basis. Locations of water quality sampling stations monitored by PacifiCorp-Energy West Mining Company are listed below (refer to Map HM-1).

a. HCC01 - Above Power Plant Bridge
b. HCC02 - Below Deer Creek Confluence
c. HCC04 - Below Bridge @ Research Farm Bridge+
+ Not listed on map due to scale.

Specific water quality constituents analyzed are shown in Tables 11, 12, and 13. Values are in milligrams per liter unless otherwise noted. Raw data is on file at the Energy West Main Office. In general, the water shows a gradual increase in concentration of dissolved minerals as the flow proceeds down Huntington Canyon.

2. Deer Creek

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

a. Flow and Sampling Schedule
(1) Locations:
(a) Above the Mine - DCR01
(b) @ Permit Boundary - DCR04
(c) Below the Mine - DCR06
(See Map HM-1 in pocket)
(2) Flow: Information is collected during the first or second week of each month.
(3) Water Quality Sampling:
Water samples will be collected and analyzed quarterly (one sample at low flow and high flow) during the first or second week of the quarter. Parameters analyzed are those listed in the DOGM Guidelines for Surface Water Operational Quality. (See Appendix N.) The program was initiated in March 1988 and will continue through 2000; i.e., June, September, and December. Field measurements including pH, specific conductivity, and temperature will be performed in conjunction with quality measurements. Quantity will be monitored monthly.

b. Flow Information

As stated above, flow information is collected monthly throughout the year with the use of two Parshall flumes. (See Map HM-1 for flume locations.) A hydrograph showing all the data collected for 1999 and 1984-1998 has been generated for each location. (See Appendix B.) The hydrographs show that the flow in the Deer Creek drainage occurred from May through October at DCR01 with peak flow occurring in June (DCR01 - 675 GPM). Flow at the lower two locations occurred throughout the year as the result of Deer Creek Mine discharge with peak flow occurring in May and November (DCR04 - 2420 GPM, DCR06 - 2425 GPM).

c. Quality Information

In accordance with the Hydrologic Monitoring Plan, baseline quality analysis was performed in 1996. Baseline analysis will be repeated once every five (5) years. The results of the historical operational quality analysis are listed in Tables 14 and 15. The minimum, maximum, and mean values are given for a five-year period along with the historical results. Values are in milligrams per liter unless otherwise noted. It is apparent from historical information in the tables that the quality of the Deer Creek runoff degrades 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. Raw data is on file at the Energy West Main Office.

3. Meetinghouse Canyon Creek

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

a. Flow and Sampling Schedule

(1) Location: South Fork of Meetinghouse Canyon (See Map HM-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 Appendix N.) The program was initiated in March 1984 and will continue through 2000, i.e., June, September, and December. Field measurements including pH, specific conductivity, and temperature will be performed monthly in conjunction with quality measurements. Quantity will be monitored monthly.

b. Flow Information

A hydrograph comparing 1999 and 1984-1998 can be found in Appendix C. Peak flow occurred during the month of June at a rate of 1336 GPM. Base flow of 0.0 GPM existed during January through April, and November - December.

c. Quality Information

In accordance with the Hydrologic Monitoring Plan, baseline quality analysis was performed in 1996. Baseline analysis will be repeated once every five (5) years. Quality sampling was initiated in 1986. Table 16 lists the minimum, maximum, and mean values for 1992-1999 along with historical results. Raw data is on file at the Energy West Main Office.

4. Mill Fork Canyon

Mill Fork Canyon is a tributary of Huntington Creek and was included in PacifiCorp's monitoring program starting in 1997. Monitoring of Mill Fork is conducted according to the following schedule (see Appendix N). Mill Fork Canyon is ephemeral from its headwaters to the western border of Section 21, Township 16 South, Range 7 East, and intermittent from that point to the confluence of Huntington Creek.

a. Flow and Sampling Schedule

(1) Locations:

(a) Above old mines - MFA1

(b) Mill Fork Canyon Culvert – MFB2

(See Map HM-1.)

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

(3) Water Quality Sampling:

Water samples will be collected and analyzed quarterly (one sample at low flow and high flow) during the first or second week of the quarter. Parameters analyzed are those listed in the DOGM Guidelines for Surface Water Operational Quality. (See Appendix N.) The program was initiated in 1997, and will continue through 2000 on a quarterly basis, i.e., March, June, September, December. Field measurements, including pH, specific conductivity, temperature will be performed quarterly in conjunction with quality measurements. Quantity will be monitored monthly.

b. Flow Information

Flow information is collected monthly throughout the year (See Map HM-1 for locations.) A hydrograph has been generated for each location. (See Appendix D.) Flow at

locations MFA1 occurred during the months June through August with a peak flow estimated at 1500 GPM during the month of June. For location MFB2 flow occurred during the months of May through November, with peak flow estimated at 1,600 GPM during the month June.

c. Quality Information

Historical monitoring data collected by Beaver Creek Coal Company - No. 4 Mine and the United States Geological Survey (site No. 76: Open File Report 81-539) has been incorporated in PacifiCorp's hydrologic database. Operational water quality monitoring was conducted during 1997 and 1998 (refer to the Quarterly Hydrologic submittals). Baseline quality analysis was initiated in November 1998. In accordance with the Hydrologic Monitoring Plan, baseline quality analysis will be conducted for a two-year period, forth quarter 1998 - fourth quarter 2000 (refer to the respective Annual Hydrologic reports). Thereafter, baseline analysis will be repeated once every five (5) years.

Results of the samples collected in 1999 are presented in Tables 17, and 18. It is apparent from the data that the quality of the water degrades slightly from the upper reaches of Mill Fork, i.e., MFA1 to the mouth of the canyon, i.e., MFB2. Water quality has remained relatively consistent from year to year. (See Tables 17, and 18). Raw data is on file at the Energy West Main Office.

5. Rilda Canyon Creek

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

a. Flow and Sampling Schedule

(1) Locations:

(a) Right Fork of Rilda - RCF1*
(b) Left Fork of Rilda - RCLF1**
(c) Left Fork of Rilda - RCLF2**
(d) Rilda Canyon - RCF2*
(e) Rilda Canyon - RCF3
(f) Rilda Canyon - RCW4 (See Map HM-1.)

* During mining of the North Rilda leases, an additional site was added in 1999 upstream of RCF1 (adjacent to EM-163) to monitor surface/groundwater relationships. Flow will be measured yearly during base flow conditions.

** Flow and field parameters only.

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

(3) Water Quality Sampling:
Water samples will be collected and analyzed quarterly (one sample at low flow and high flow) during the first or second week of the quarter. Parameters analyzed are those listed in the DOGM Guidelines for Surface Water Operational Quality. (See Appendix N.) The program was initiated in June 1989 except for RCLF1 and RCLF2, which were initiated in 1990 and 1995, respectively, and will continue through 2000 on a quarterly basis, i.e., March, June, September, December. Field measurements, including pH, specific conductivity, temperature, and dissolved oxygen, will be performed at the perennial stream locations, i.e., RCF3 and RCW4, monthly in conjunction with quality measurements. Quantity will be monitored monthly.

b. Flow Information

Flow information is collected monthly throughout the year with the use of three Parshall flumes and one V-notch weir. (See Map HM-1 for locations.) A hydrograph has been generated for each flume-weir location. (See Appendix E.) Springs utilized by North Emery Water Users Association (NEWUA) for culinary purposes are situated between monitoring locations RCF2 and RCF3. Flow above the spring area is ephemeral and below the stream is perennial. For location RCF1 flow occurred from May through October with a peak flow estimated at 1,303 in June. Location RCF1 was inaccessible from February through April. Flow at locations RCLF1 and RCLF2 occurred during the months May through August with a peak flow estimated at 165 GPM. For location RCF2 flow occurred during the months of May through October, with peak flow estimated at 3,474 GPM in June and a base flow of 0.0 GPM during the months of January through April and November through December. Below the spring area the stream is perennial and increases in flow from RCF3 to RCW4. During 1999 the peak flow for RCF3 was estimated at 3,500 GPM (June); for RCW4, 3,550 GPM (June). Baseline flow for 1999 at RCF3 and RCW4 was approximately 120 and 160 GPM, respectively. Data suggest that above the NEWUA springs the stream loses water to the alluvium and below the spring area the alluvium recharges the stream causing the flow to increase.

c. Quality Information

In accordance with the Hydrologic Monitoring Plan baseline quality analysis was performed in 1996. Thereafter, baseline analysis will be repeated once every five (5) years. Quality sampling was initiated in 1989; results of the samples collected are presented in Tables 19, 20, and 21. It is apparent from the data that the quality of the water degrades from the upper reaches of Rilda Canyon, i.e., RCF1, to the NEWUA spring area, and from that point

to the mouth of the canyon, i.e., RCW4. Water quality has remained relatively consistent from year to year. (See Tables 19, 20, and 21.) Raw data is on file at the Energy West Main Office.

B. Cottonwood Creek Drainage System

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

PacifiCorp monitors two of the tributaries of the Cottonwood Creek drainage system, Cottonwood Canyon Creek and Grimes Wash. (See Map HM-1 in pocket.)

1. Cottonwood Canyon Creek

Based on data collected by PacifiCorp, Cottonwood Canyon Creek is an ephemeral stream from its headwaters to Section 24, Township 17 South, Range 6 East and intermittent from that point to its confluence with Cottonwood Creek. The majority of water moving through Cottonwood Canyon Creek appears to be through the colluvial valley deposits. An extensive hydrogeologic investigation was conducted in Cottonwood Canyon Creek during 1992. Results can be found in Appendix C of the PAP submitted March 31, 1993, October 28, 1998. Four (4) permanent runoff sampling sites have been established along Cottonwood Canyon Creek and sampled as listed below. (See Hydrologic Monitoring Plan in Appendix N).

a. Flow and Sampling Schedule

(1) Locations: (See Map HM-1 in pocket.)

(a) Above Mine - SW-1
(b) Below Mine - SW-2
(c) @ USGS Flume - CCC01*
(d) Above Straight Canyon - SW-3

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

(3) Water Quality Sampling:
Water samples will be collected and analyzed quarterly (one sample at low flow and high flow) during the first or second week of the quarter. Parameters analyzed will be those stated in the DOGM Guidelines for Surface Water Operational Quality. (See Appendix N.) The program was initiated in December 1992 and

will continue through 2000, i.e., June, September, and December. Field measurements including pH, specific conductivity, and temperature will be performed monthly in conjunction with quality measurements. Quantity will be monitored monthly.
* Flow and field parameters only.

b. Flow Information

As stated above, flow information is collected monthly throughout the year. (See Map HM-1 for flume locations.) A hydrograph for 1999 has been generated for each sampling location. (See Appendix F.) The hydrographs show the intermittent nature of Cottonwood Canyon Creek. Flow at SW-1, occurred from January through December with a peak and base flow estimated at 1,100 (June) and 200 GPM, respectively. Flow at SW-2 occurred from January through December with a peak and base flow estimated at 1,200 (June) and 350 GPM, respectively. Flow at SW-3 occurred throughout the year with a peak and base flow estimated at 1,255 (June) and 350 GPM, respectively.

c. Quality Information

In accordance with the Hydrologic Monitoring Plan, baseline quality analysis was performed in 1996. Thereafter, baseline analysis will be repeated once every five (5) years. The results of the historical operational quality analysis are listed in Tables 22, 23, and 24. 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. Raw data is on file at the Energy West Main Office.

The Cottonwood Canyon Creek drainage quality is influenced by the following factors: 1) A relatively high amount of suspended solids during spring runoff from Indian, Roans, Mill, and Marines canyons; 2) Alluvial/colluvial deposit recharge and discharge areas.

2. <u>Grimes Wash</u>

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

a. Flow and Sampling Schedule

(1) Locations: (See Map HM-1 in pocket.)

(a) Right Fork - GWR01

(b) Left Fork - GWR02

(c) Below the Mine - GWR03

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

(3) Water Quality Sampling:
Water samples will be collected and analyzed quarterly (one sample at low flow and high flow) during the first or second week of the quarter. Parameters analyzed will be those stated in the DOGM Guidelines for Surface Water Operational Quality. (See Appendix N.) The program was initiated in March 1988 and will continue through 2000 i.e., June, September, and December. Field measurements including pH, specific conductivity, and temperature will be performed in conjunction with quality measurements. Quantity will be monitored monthly.

b. Flow Information

As stated above, flow information is collected monthly throughout the year with the use of two Parshall flumes. (See Map HM-1 for flume locations.) A hydrograph comparing 1999 to the data collected from 1984 through 1998 has been generated for each flume location. (See Appendix G.) The hydrographs show that the Right Fork remained dry throughout the year and flow occurred from June (54.5 GPM) through November (20 GPM) in the Left Fork. Flow at the Below the Mine location continued throughout the year due to the influence of the springs emanating from the Starpoint Sandstone/Mancos Shale formational contact and Wilberg/Cottonwood Mine discharge. Peak flow occurred during the month of August at 367 GPM, and baseline flow averaged approximately 50 GPM.

c. Quality Information

In accordance with the Hydrologic Monitoring Plan baseline quality analysis was performed in 1996. Baseline analysis will be repeated once every five (5) years. The results of the 1999 operational quality analysis are listed in Tables 25, 26, and 27. 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. Raw data is on file at the Energy West Main Office.

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

IV. SPRINGS

A. East Mountain

Between the time PacifiCorp began monitoring springs on East Mountain and 1986 the number of springs measured increased from less than fifty (50) to nearly eighty (80). PacifiCorp believed that more benefit could be realized by concentrating its monitoring to selective springs in the areas that will be undermined within the next five years. (See Map HM-5 in pocket.) A meeting was held on March 25, 1987 with the U. S. Forest Service and the Utah State Division of Oil, Gas and Mining to determine the most effective plan for PacifiCorp's monitoring. A subsequent meeting was held on April 15, 1987 with the State Division of Oil, Gas and Mining to finalize the monitoring plan revisions. In addition to major revisions made in 1987, each year a meeting is held with State and Federal agencies to adjust the monitoring schedule based on field investigations.

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

*	Burnt Tree Springs		79-40
*	Elk Spring		80-41
*	Sheba Springs		80-43
	Ted's Tub	*	80-44
	79-2	*	80-46
*	79-10		80-47
	79-15	+	80-48
*	79-23		80-50
	79-24		82-51
*	79-26	*	82-52
+	79-28	*	84-56
*	79-29	+	89-60 (Alpine Spring)
	79-32	+	89-61
	79-34	+	89-65
*	79-35	+	89-66
	79-38	+	89-67
		+	89-68

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

1. Flow and Sampling Schedule

a. Flow

All springs on the preceding list are measured during the months of July and October. In addition, a minimum of twelve springs are monitored to establish a discharge recession curve. Generally, measurements are made on a monthly basis during the months of July through

October if weather and reasonable access permit; but when historical data indicate that a spring is short-lived, all efforts are made to measure discharge from that spring at least three times, equally spaced, within its flow period.

b. 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 N.)

2. Spring Flow

Precipitation increased from 1998 to 1999 and spring discharge rates decreased from 1998 to 1999, whereas temperature, a critical factor on spring discharge rates, was 2.7 degrees higher in 1998 than the historical average. East Mountain received substantial precipitation during the summer months, which contributes to the yearly but not to the snowpack, the critical factor in spring outflow. Table 28, is a tabulation of the flow data collected during the 1999 monitoring season. To record the season variation, all springs measured in July are measured again in October. The seasonal variation is represented in Table 28, under the column heading "Seasonal Net Change." The percentage figures represent the amount of change, either positive or negative. The average change reveals a fifty-three percent (53%) [seventy-four percent (74%) by volume] decrease from the July to the October measurements.

A seventeen-year comparison of spring discharge is shown in Table 29. The table includes a year by year comparison of springs identified from each mode of occurrence (Table 30). The springs utilized in the comparison are underlined in Table 30. The flow values for the individual springs represent the July measurements. October measurements were not utilized because winter weather conditions caused some springs to become inaccessible.

Table 29 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. Along with precipitation, temperature plays a critical role in yearly discharge variations, especially during the early stages of the runoff period. Listed in Table 31 is a comparison of January through June temperature data from surrounding weather stations for the period 1982-99 versus departure from normal. The comparison is vital in determining mining effects on spring discharge versus general changes in annual precipitation.

Table 31 clearly demonstrates near average temperatures between 1982 and 1984, but starting in 1985 and continuing through 1999 (except for 1991) positive departure from normal has been significant. In 1999 the temperatures were 3.0 degrees above average. Comparison between spring discharge rate and general changes in annual precipitation patterns correlated well in the past due to relatively normal temperatures experienced during the early runoff period (January through June). Figure 3 not only includes a comparison of spring discharge rate and precipitation as in the past but also temperature departure due to critical influence temperature has on peak discharge occurrence.

An additional flow information study was initiated during the summer of 1985. The purpose of the program is to establish flow recession curves for the following springs: (1) Burnt

Tree, (2) Elk Springs, (3) Sheba, (4) 79-10, (5) 79-23, (6) 79-26, (7) 79-29, (8) 79-35, (9) 80-44, (10) 80-46, (11) 82-52, (12) 84-56. The flow information collected during 1998 is shown in Table 32; corresponding spring recession curves comparing 1999 to 1984-1997 are located in Appendix H.

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

The quality of the springs sampled in 1999 reveals an excellent correlation with historical averages. A summary of the water quality analysis for a representative group of East Mountain Springs is presented in Table 33. In the table, the mean values for 1999 are compared to the historical results for each respective spring. Raw data is on file at the Energy West Main Office.

B. Rilda Canyon - North Emery Water Users Association (NEWUA)

Of concern to PacifiCorp Energy West is the proximity of proposed mining activities in Rilda Canyon to the Rilda Canyon Springs which currently serve as a culinary water source to the North Emery Water Users Association (NEWUA). The NEWUA spring system consists of a series of collection lines extending westward up Rilda Canyon and southward up a small side drainage (shown on Map HM-8 in Volume 9 of the PAP). The NEWUA spring system is metered at four locations. Meter 1 (Side Canyon Spring) is located at the downstream end of a collection line which enters Rilda Canyon from the South. Meter 2 (Side Canyon Spring plus South Spring) is located near the bottom of the main east-west trending collection line which lies to the south of Rilda Canyon Creek at a point just upstream (west) of the main spring collection box. Meter 2 records combined flows from both the Side Canyon (Meter 1) as well as additional inflows known as South Spring which enter the system below Meter 1. Meter 3 (North Spring) records flows for the east-west central collection line which was constructed through the central portions of the valley near Rilda Canyon Creek. Meter 4 (North Spring) collects data from the north collection line located on the north side of Rilda Canyon Creek. During 1995 flow from the north collection line was combined with the central collection system. As a result Meter 4 was terminated.

1. Spring Flow

Through the cooperative efforts of PacifiCorp and NEWUA, flow meters were installed in September 1990 to isolate individual spring areas for quantity and quality (see Map HM-8 in Volume 9 of the PAP). Table 34 lists the individual flow rates for meters 2 and 3 (flow from Meter 1 is included in Meter 2).

The seasonal variation of the monthly average flow from NEWUA's Rilda Canyon Springs is shown in Figure 4. With the installation of flow meters, individual spring contribution to the total flow can be plotted over time.

2. Quality

Baseline quality sampling of the individual springs was performed in 1997. The minimum, maximum, and mean results of the 1999 spring flow compared to historical quality analysis are listed in Table 35. Values are in milligrams per liter unless otherwise noted. Raw data is on file at the Energy West Main Office. As stated in Volume 9 of the PAP, differences in the groundwater quality data reflect differences in the groundwater source or the origin of groundwater for the various springs issuing within the Rilda Springs area. The higher sulfate and TDS concentrations from the Meter 2 samples are characteristic of waters associated with the Blackhawk Formation. Waters issuing from the North Spring collection system (Meters 3 and 4) area are of a better quality than waters from the Side Canyon and South Spring collection areas. Water issuing from the North Spring originates primarily from water moving within the alluvial valley sediments and fracture systems of the Starpoint Sandstone and is not derived from the Blackhawk Formation.

C. Trail Mountain

PacifiCorp began monitoring springs on Trail Mountain in 1993. Monitoring prior to 1993 was completed by the previous lease holders. The nine (9) springs listed below are monitored.

T-6 (18-2-1)	T-14 (17-25-1)
T-8 (17-21-1)	T-14A (17-26-5)
T-9 (17-22-1)	T-15 (17-35-1)
T-10 (17-26-4)	T-16 (17-35-2)
TM-23 (17-14-4)	

1. Flow and Sampling Schedule

a. Flow

All springs on the preceding list are measured during the months of July through October if weather and reasonable access permit.

b. 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 N.)

2. Spring Flow

As indicated earlier, precipitation increased and spring discharge rates decreased from 1998 to 1999 (except for spring TM-23, Cottonwood Spring, which increased in flow). Table 36 is a tabulation of the flow data collected during the 1999 monitoring season. The seasonal variation is represented in Table 36 under the column heading "Seasonal Net Change %." The percentage figures represent the amount of change, either positive or negative. The average change reveals a thirty-six percent (36%) [nine percent (9%) by volume] decrease from July to the October measurements . Discounting flow from TM-23, the average change was forty-two percent (42%) [fifty-four percent (54%) by volume] decrease from the July to the October measurements (similar to East Mountain, see Table 28).

A twelve-year comparison of spring discharge is shown in Table 37. The flow values for the individual springs represent the July measurements. October measurements were not utilized because winter weather conditions caused some springs to become inaccessible.

Cottonwood Spring (TM-23) Data:

On July 31, 1991 a citizen complaint claiming that the mining in the Deer Creek Mine dried up a spring known as Cottonwood Spring was filed by Jim Peacock. According to Mr. Peacock, Cottonwood Spring produced approximately one to three cubic feet/second and was the main source of flow for Cottonwood Canyon Creek (conversation during an on site visit with Utah State Division of Water Rights, Cottonwood Irrigation Company, United States Forest Service, Utah State Division of Oil, Gas & Mining [DOGM], and PacifiCorp held on August 1, 1991). Mr. Peacock indicated that production from the spring had been decreasing over the past several years and that he was unable to irrigate approximately twenty-two acres located on the north side of Highway 31 at the junction of Cottonwood Canyon Creek and Straight Canyon. Discussions during the on site visit centered around the location and extent of mining in the Deer Creek Mine, the drought which has had a major impact on the hydrologic resources of the area, and the hydrogeology of Cottonwood Spring.

As a result of the on site visit DOGM reviewed the available historical data on the flow and quality of Cottonwood Spring. In addition to historical review, DOGM requested that PacifiCorp update the Probable Hydrologic Consequences (PHC) in the Deer Creek Mine Permit Application Package (PAP). The Deer Creek PHC was updated and submitted on three separate occasions: December 19, 1991; March 23, 1992; and again on July 15, 1992. As part of the March 23, 1992 submittal PacifiCorp committed to drilling a series of wells and conducting a resistivity survey in Cottonwood Canyon Creek during the 1992 field season to determine the hydrologic significance of the alluvial deposits and the interrelationship of the surrounding strata. In addition to the work completed in 1992, PacifiCorp contracted Mayo & Associates during 1996 to complete a comprehensive hydrologic investigation of surface and groundwater systems in the East & Trail Mountain areas (refer to Appendix C in Volume 9 and Mayo & Associates Study in Volume 9: Hydrologic Support Information). During the investigation,

Mayo & Associates analyzed 1) solute and isotopic compositions of surface waters and groundwaters, 2) surface water and groundwater discharge data, 3) piezometric data, and 4) geologic information. During the fall of 1998, Energy West Mining initiated gain/loss surveys of Cottonwood Creek to compare historical studies conducted by the USGS.

The United States Geological Survey (USGS) collected quality and quantity data at the Cottonwood Spring site from 1978 through 1982 (Open File Report 81-539 and 84-067). Monitoring of Cottonwood Spring was included in the Trail Mountain MRP in 1986 following a spring and seep survey conducted by JBR in 1985.

The following is a list of sources and the time frame in which data was collected:

USGS	1978-1982
JBR	1985
Trail Mountain Coal Co.	1986-1987
Mountain Coal Co.	1987-1992
Energy West Mining	1992-Present

As document in Volume 9, Cottonwood Canyon Creek is a major drainage system which borders the western limit of the East Mountain Permit area. Based on data collected by PacifiCorp, Cottonwood Canyon Creek is an ephemeral stream from its headwaters to Section 24, Township 17 South, Range 6 East and intermittent from that point to its confluence with Cottonwood Creek at Straight Canyon. During periods of drought flow in Cottonwood Canyon Creek is limited to flow emanating from the alluvial deposits at the intersection of Roans Canyon. From the intersection of Roans Canyon to Section 36 the stream loses water to the alluvial deposits. The drainage is dry from Section 36 to Section 6 except during spring runoff which occurs normally from late April through June or during precipitation events. Flow in the channel reemerges in Section 6 and continues to the confluence with Cottonwood Canyon at Straight Canyon.

It is evident in reviewing all of the data including; drilling results, resistivity surveys, well hydrographs and isotope information that the source of groundwater for Cottonwood Spring is the alluvial system of Cottonwood Canyon. Groundwater production from Cottonwood Spring area is function of precipitation and groundwater recharge. In reviewing the well hydrographs for wells CCCW1-3, groundwater levels in the alluvial wells have been increasing since mid 1995 in direct response to normal precipitation patterns (refer to Appendix F for hydrograph information). Groundwater trends in the Star Point Sandstone in wells CCCW-1 and CCCW-3 have been relatively constant or decreasing slightly. As stated previously, data collected during the development of the wells indicated that the alluvial system is not hydrologically connected to lower Blackhawk/Star Point formations. Monitoring data from the wells supports this conclusion.

Data collected during gain/loss surveys conducted from November 1998 through November 1999, compares directly to the measurements reported by the USGS in 1979 (Open File Report 81-539). Cottonwood Spring flow data reported by the USGS was not from a individual source, but was the difference in flow measurements above and below the spring area (refer to Appendix I for gain/loss survey results). Included in Appendix I is a hydrograph comparing the Palmer Drought Index (average of Regions 4 & 5) to Cottonwood Spring area flow. In reviewing the hydrograph, flow from the Cottonwood Spring area fluctuates in direct response to precipitation patterns and was not influence by mining in the Deer Creek Mine.

3. 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 I.) The purpose of the cation-anion diagram is to identify groups of related springs by water chemistry. To better visualize the concept, the cation-anion diagrams are presented by the geologic formation in which the spring originates. A general pattern for the geologic formations can be recognized for each year in which the cations/anions were analyzed. A consistent pattern for the North Horn Formation is less obvious due to the complex geology of the formation itself. One aspect the cation-anion diagrams demonstrate, is that, even though the quality varies slightly from individual sites as well as from different formations, seasonal variations do not exist.

The quality of the springs sampled in 1999 reveals an excellent correlation with historical averages. A summary of the water quality analysis for springs monitored on Trail Mountain is presented in Table 38. In the table, the mean values for 1999 are compared to the historical results for each respective spring. Raw data is on file at the Energy West Main Office.

V. MINE HYDROLOGY

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

The relationship of the Deer Creek, Cottonwood/Wilberg, and Trail Mountain mine workings with the overlying springs is shown in Map HM-5 (in pocket). Beginning in 1979 (Trail Mountain - 1992), PacifiCorp has developed an ambitious spring monitoring program with emphasis to detect changes in the East and Trail Mountain hydrologic regime as a result of mining. The data collected to date reveal no indication of any mine-related effects on spring discharge or surface flow rates. As expected, there is a direct relationship between annual precipitation, temperature, and spring discharge rates as previously discussed in the SPRING SECTION and shown in Figure 3.

B. Groundwater Quality and Collection Procedures

PacifiCorp began in-mine quality and quantity measurement in 1977 and has continued the measurement through 1999. With the collection of numerous samples throughout the extent of the mine workings, the quality has remained relatively constant. (Refer to Cation/Anion diagrams in Appendices J, K and L).

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

Long-term monitoring locations have been established at each of the mines which produces measurable quantities of water, i.e., Deer Creek, Cottonwood/Wilberg, and Trail Mountain mines. (See Maps HM-2, HM-3, and Plate 7-3 in pocket.) Four types of occurrences have been recognized to exist within the current mine workings. (Refer to Figure 5.)

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 J, K, and L for the Deer Creek, Cottonwood/Wilberg, and Trail Mountain In-Mine hydrographs.)

C. 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	678.1 Million Gallons
Estimated Evaporation*	18.9 Million Gallons
Domestic Usage	6.5 Million Gallons
Total Discharge	703.5 Million Gallons

*See 1981 Hydrologic Monitoring Report

b. In-Mine Quality

Eight samples were collected in the Deer Creek Mine in 1999. (See Map HM-2 in pocket for locations.) Parameters analyzed in 1999 are those listed in the DOGM Guidelines for Groundwater Baseline or Operational Quality. (See Appendix N.)

Table 39 lists the characteristics of the samples collected and compares the mean, minimum, and maximum results of 1999 to the historical values for each location. It is apparent from Table 39 that the average quality of the in-mine water has remained relatively constant. (Refer to Cation/Anion diagrams in Appendix J.) Raw data is on file at the Energy West Main Office.

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

In-line flow meters are utilized to record the amount of water discharged from the mine, after which it passes through underground sedimentation sumps. Discharge from Deer Creek is either shipped directly to Huntington Power Plant or to the Deer Creek drainage in accordance with stipulations of the Deer Creek UPDES Discharge Permit UT-0023604-002.

The total water discharged from the Deer Creek Mine during 1999 was estimated at 2,064 acre feet, or 678.1 million gallons. The recorded flow of 2,064 acre feet during 1999 is a six

percent (6%) increase from the 1998 discharge of 1,965 acre feet. The average monthly discharges are shown in Figure 7.

A graph displaying the historical discharge rates is included as Figure 8. The volume of water discharged from the mine has increased at a significant rate from 1988 through 1991 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 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. Water production decreased significantly in 1992 with the sealing of the 4th South area.

d. Discharge Quality

Monthly water quality samples were collected for 1999. Table 40 compares the minimum, maximum, and mean values from an historical standpoint to 1999. An examination of Table 40 reveals excellent correlation with historical results. Raw data is on file at the Energy West Main Office.

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 1999.

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 9. As reported in the 1984 Annual Report, water discharged from the Wilberg Mine complex includes the area designated as the Cottonwood Mine. (See Figure 10.) Consistent with previous years, the following table lists the factors involved in estimating in-mine water production.

Wilberg/Cottonwood Discharge

Grimes Wash	58.1 Million Gallons
Miller Canyon*	0.0 Million Gallons
Estimated Evaporation**	19.0 Million Gallons
Domestic Usage	3.4 Million Gallons
Total Discharge	80.5 Million Gallons

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

b. In-Mine Quality

Eight samples were collected in the Wilberg/Cottonwood Mine in 1999. (See Map HM-3 in pocket for locations.) Parameters analyzed in 1999 are those listed in the DOGM Guidelines for Groundwater Baseline or Operational Quality. (See Appendix N.) Table 41 lists the characteristics of the samples collected and compares the mean, minimum, and maximum results of 1999 to the historical values. The average quality by location has remained relatively constant for each individual location. (Refer to Cation/Anion diagrams in Appendix K.) Raw data is on file at the Energy West Main Office.

c. Discharge Quantity

Water produced in the Wilberg Mine gravity flows to the northern area of 1st North. At that point it can either be pumped by a vertical turbine located in the Deer Creek Mine which picks up the water and pumps it back to the south and down to the Wilberg Mine main sump or pumped directly to the main sump utilizing submersible pumps. Water produced in the Cottonwood Mine (2nd North area) is transferred to the Wilberg Mine sump. The sump, which functions as a settling basin, effectively removes settleable solids from the water. A portion of the water is redistributed to various areas of the mine to be utilized in the mining operations. A total of 58.1 million gallons was discharged to Grimes Wash during 1999. No discharge occurred in 1999 at the Miller Canyon breakouts, which were developed for ventilation purposes but sealed in 1987. (See Figure 11.) Discharge from Cottonwood Mine is monitored in accordance with stipulations of the Wilberg Mine Discharge UPDES Permit UT-0022896.

d. Discharge Quality

Samples are collected each month from Grimes Wash and Miller Canyon breakouts whenever discharge occurs. Monthly samples were collected from the Grimes Wash location during 1999. Table 42 compares the minimum, maximum, and mean values from 1999 to the historical values.

4. Trail Mountain Mine

a. In-Mine Water Production

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

Trail Mountain Discharge	157.5 Million Gallons
Estimated Evaporation*	19.0 Million Gallons
Domestic Usage	3.2 Million Gallons
Total Discharge	179.7 Million Gallons

* See 1981 Hydrologic Monitoring Report

b. In-Mine Quality

Four samples were collected in the Trail Mountain Mine in 1999. (See Plate 7-3 for locations.) Site UG-2 was terminated in 1995 due to insufficient flow. Parameters analyzed in 1999 are those listed in the DOGM Guidelines for Groundwater Baseline or Operational Quality. (See Appendix N.) Table 43 lists the characteristics of the samples collected and compares the mean, minimum, and maximum results of 1999 to the historical values for each location. It is apparent from Table 43 that the average quality of the in-mine water has remained relatively constant. (Refer to Cation/Anion diagrams in Appendix L.)

c. Discharge Quantity

Water produced in the Trail Mountain Mine either is pumped or gravity flows to a sump located in 4th Left, 5th Left, and 3rd South. (See Figure 12.) A portion of the water is redistributed to various areas of the mine to be utilized in the mining operations. Excess water not used in the mining operations is stored in sealed areas of the mine or discharged to Cottonwood Canyon Creek. A total of 157.5 million gallons was discharged to Cottonwood Canyon Creek during 1999. (See Figure 13.) Discharge from Trail Mountain is monitored in accordance with stipulations of the Trail Mountain Mine UPDES Discharge Permit UTG040003-002.

d. Discharge Quality

Monthly water quality samples were collected for 1999. Discharge from the Trail Mountain Mine was initiated in June of 1997. Table 44 compares the minimum, maximum, and mean values from an historical standpoint to 1999. Raw data is on file at the Energy West Main Office.

VI. PIEZOMETRIC GRADIENT INFORMATION

A. Surface

1. Cottonwood Canyon Creek

Eight (8) wells located along the extent of Cottonwood Canyon Creek are monitored monthly. The following table lists the zone isolated with each well.

Well I.D.	Monitoring Zone
CCCW-1A	Alluvial Deposits
CCCW-1S	Starpoint Sandstone
CCCW-2A	Alluvial Deposits
CCCW-3A	Alluvial Deposits
CCCW-3S U	Blackhawk - Fluvial Sandstone
CCCW-3S L	Starpoint Sandstone
EM-31	Lower Blackhawk/Starpoint Sandstone
TM-1B	Starpoint Sandstone
TM-3	Starpoint Sandstone (Straight Canyon)

2. Rilda Canyon

Six (6) wells located in Rilda Canyon are monitored monthly when accessible. The following table lists the zone isolated with each well.

Well I.D.	Monitoring Zone
P-1	Alluvial Deposits
P-4	Alluvial Deposits
P-5	Alluvial Deposits
P-6	Alluvial Deposits
P-7	Alluvial Deposits
EM-47	Lower Blackhawk/Starpoint Sandstone

Information collected during 1999 correlated well with historical information. As a result of mining in the western portion of the Trail Mountain Mine Well TM-3 in Straight Canyon decreased in level due to depressurization of the Star Point sandstone. Hydrographs for the individual wells can be found in Appendix E - Rilda Canyon, Appendix F - Cottonwood Canyon.

B. In-Mine

1. Deer Creek

Four (4) long-term monitoring wells were completed during 1989. (See Map HM-2 for well locations.) Due to changes in the mine layout only one well remained active during 1999. Water levels remained relatively constant during 1999. (See Appendix J.)

2. Cottonwood Mine

During 1989 four holes were drilled in the Cottonwood Mine. Monitoring of the long-term wells, WCP 1-3, was discontinued in 1992 due to the sealing of the 3rd South area.

VII. WASTE ROCK WELLS

A. Deer Creek Mine - Waste Rock Storage Facility

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

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

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

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

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

Four samples were collected in 1999. The analysis, along with water depth, is listed in Table 45. Values are in milligrams per liter unless otherwise noted. Raw data is on file at the Energy West Main Office. It is a well known fact that the Mancos Shale typically contains large quantities of soluble minerals such as gypsum; therefore, any water passing through it will be naturally high in dissolved solids. Samples at the waste rock well verify this condition.

B. Cottonwood/Wilberg Mines - Waste Rock Storage Facility

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

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

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

Four samples were collected in 1999. The analysis, along with water depth, is listed in Table 45. Values are in milligrams per liter unless otherwise noted. Raw data is on file at the Energy West Main Office. It is a well known fact that the Mancos Shale typically contains large quantities of soluble minerals such as gypsum; therefore, any water passing through it will be naturally high in dissolved solids. Samples at the waste rock well verify this condition.

VIII. EFFECTS OF MINING AND SUBSIDENCE ON HYDROLOGY

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

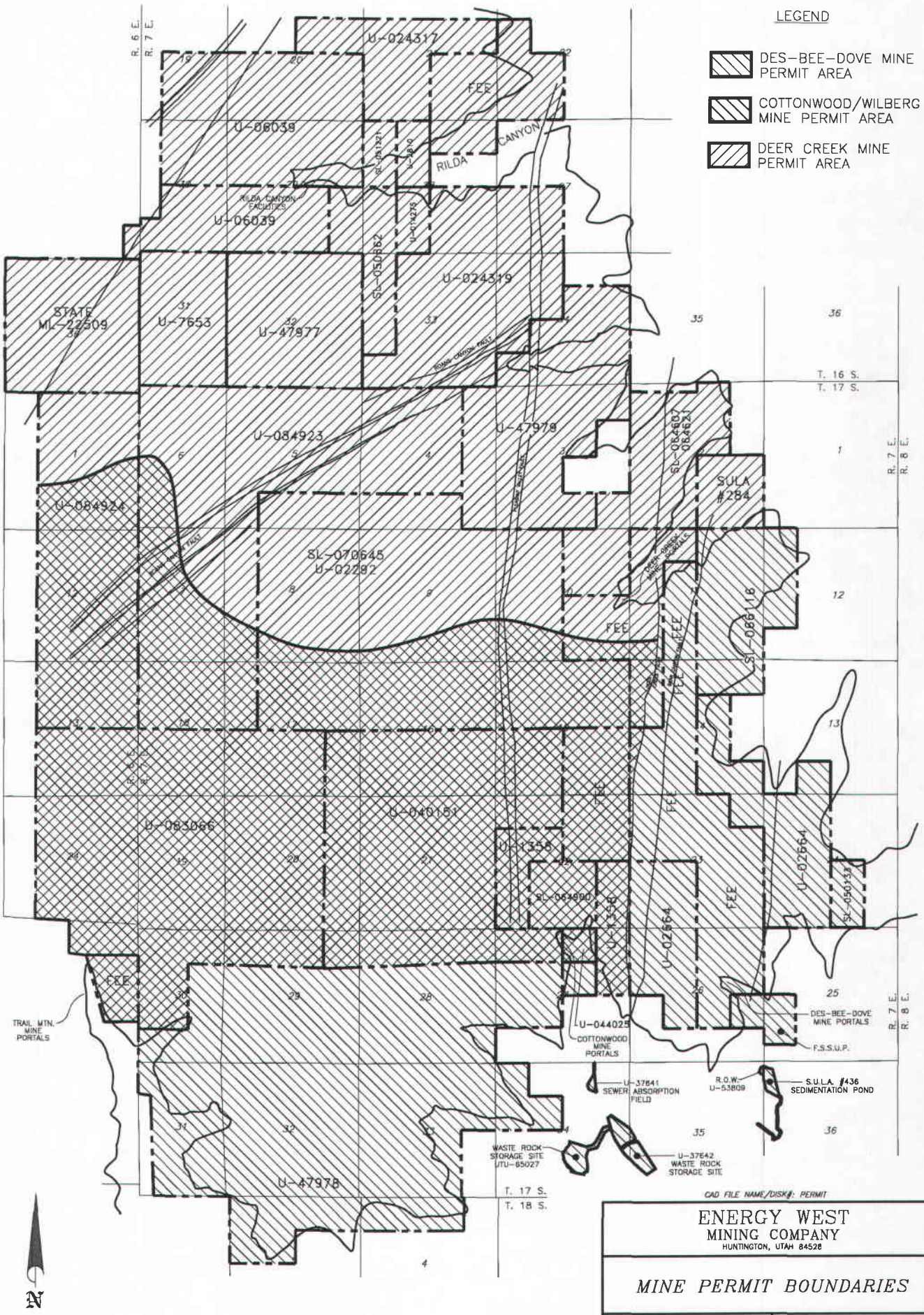
The springs and surface waters above all areas of mine workings are being monitored closely to measure the effects of mining. No mining-related changes to the springs or surface waters have been identified in the data collected. The water flowing into the mine workings, although temporarily diverted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

IX. SUMMARY

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

From 1982 to 1984 the Western United States, especially Utah, experienced an unprecedented wet cycle of precipitation. The pattern changed in 1985 with conditions returning to slightly above normal. During the 1986 water year the extremely wet trend returned, and the upper Colorado River Basin experienced above average precipitation. The 1987 weather pattern changed dramatically with near normal valley precipitation and mountain snowfall much below normal. The resulting 1987 runoff was substantially below normal. The drought continued from 1988 through 1992 and returned in 1994. Runoff improved substantially in 1993 and 1995 through 1998 with above average flow conditions occurring in most drainages. In 1999 runoff was higher than normal although not as high as 1998.

The data collected in 1999 continued to show the relationship between the variation in surface water quantity and precipitation, but the hydrologic monitoring completed on East and Trail mountains to date has failed to identify any change in the quantity or quality of ground or surface water which can be attributed to mining on the East and Trail Mountain properties.



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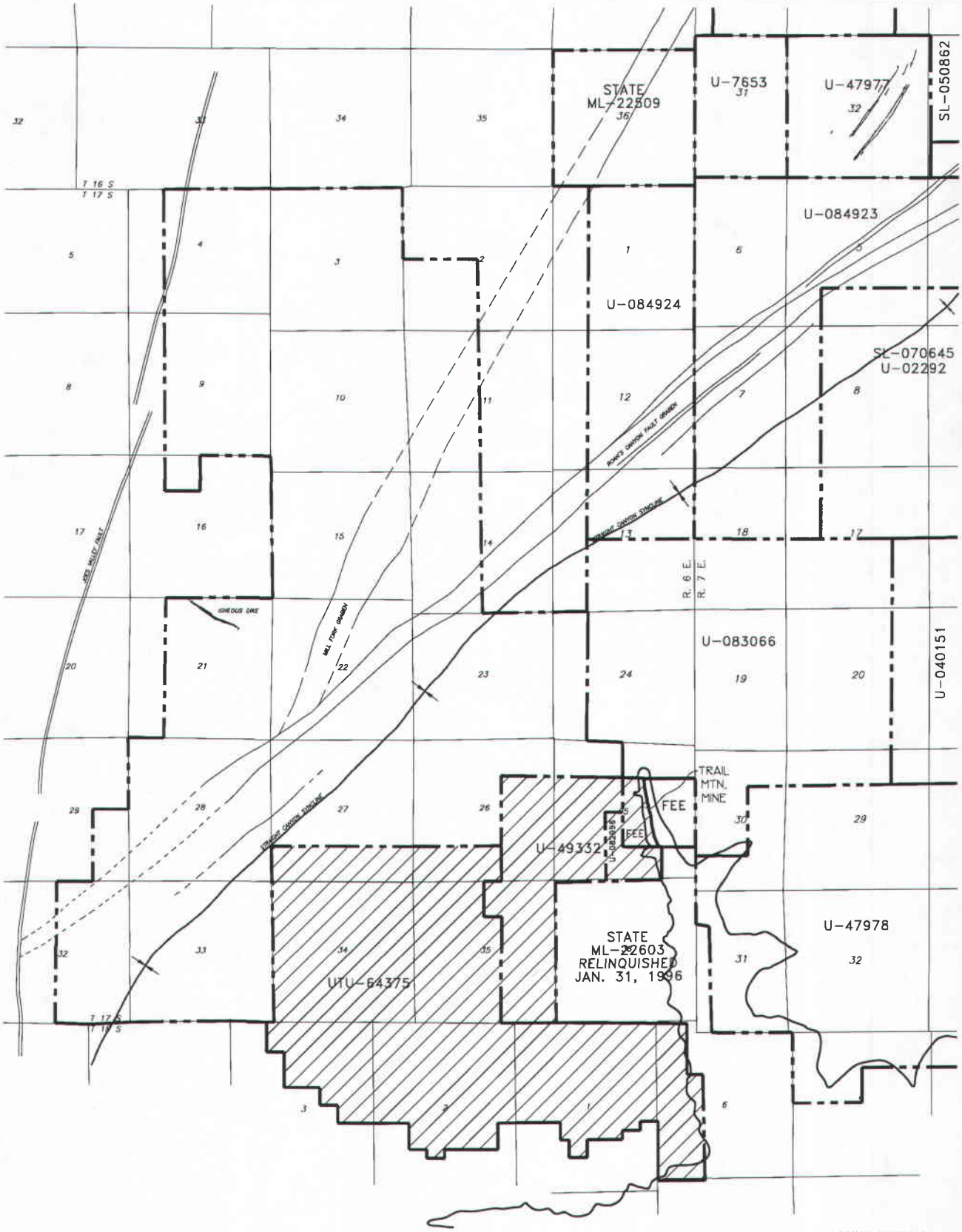
CAD FILE NAME/DISK#: PERMIT

ENERGY WEST
MINING COMPANY
HUNTINGTON, UTAH 84528

MINE PERMIT BOUNDARIES

DRAWN BY: K. LARSEN		FIGURE 1
SCALE: 1"=1 MILE		DRAWING #:
DATE: JANUARY 9, 1997	SHEET 1 OF 1	REV.



N

SCALE: 1"=1 MILE

TRAIL MOUNTAIN MINE
PERMIT AREA

CAD FILE NAME/DISK#: TMPERMIT

ENERGY WEST
MINING COMPANY
HUNTINGTON, UTAH 84528

TRAIL MOUNTAIN MINE
MINE PERMIT BOUNDARY

DRAWN BY: K. LARSEN	FIGURE 1B	
SCALE: 1"=1 MILE	DRAWING #:	
DATE: APRIL 7, 1997	SHEET 1 OF 1	REV.

FIGURE 2

EAST MOUNTAIN PRECIPITATION

1999 WATER YEAR

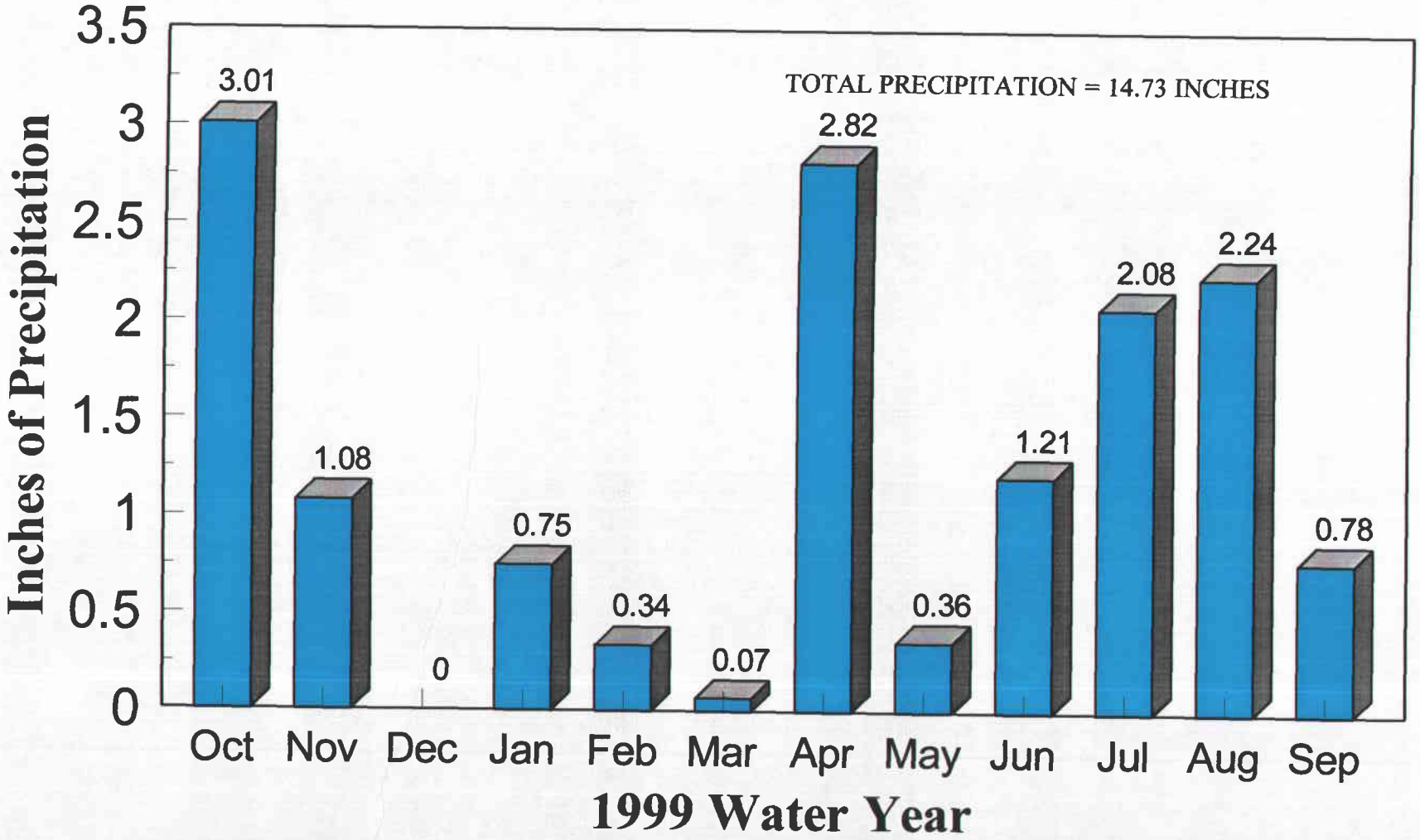
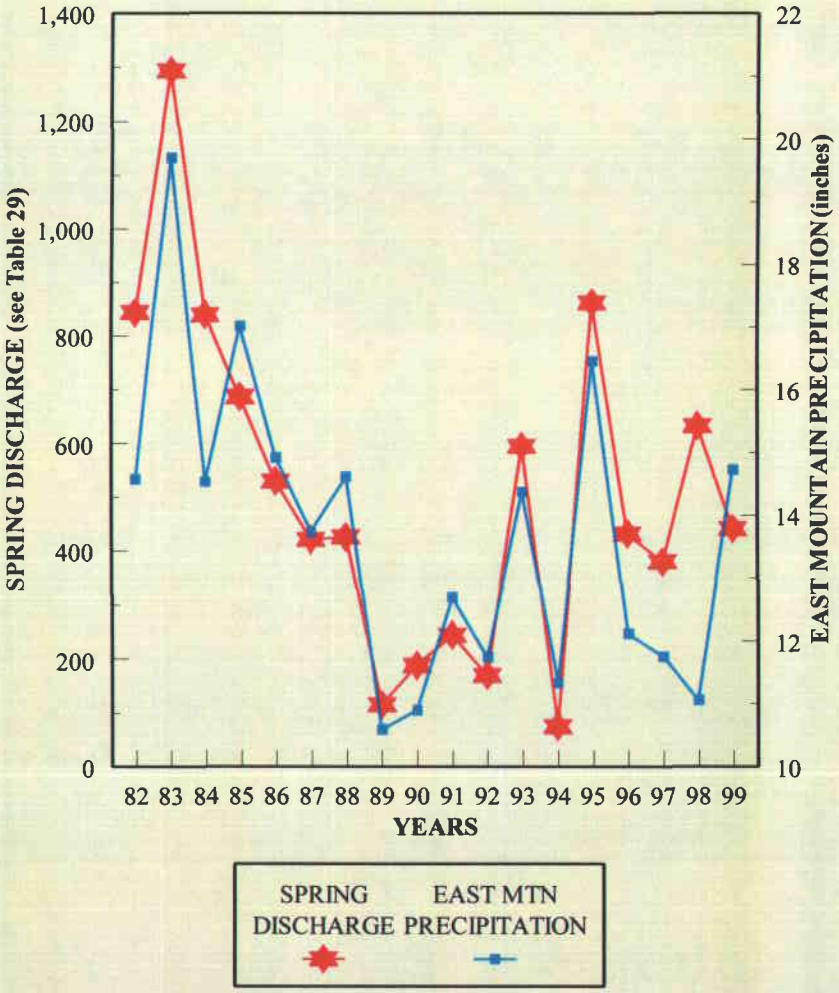


FIGURE 3a
EAST MOUNTAIN
SPRING DISCHARGE vs. PRECIPITATION & TEMPERATURE



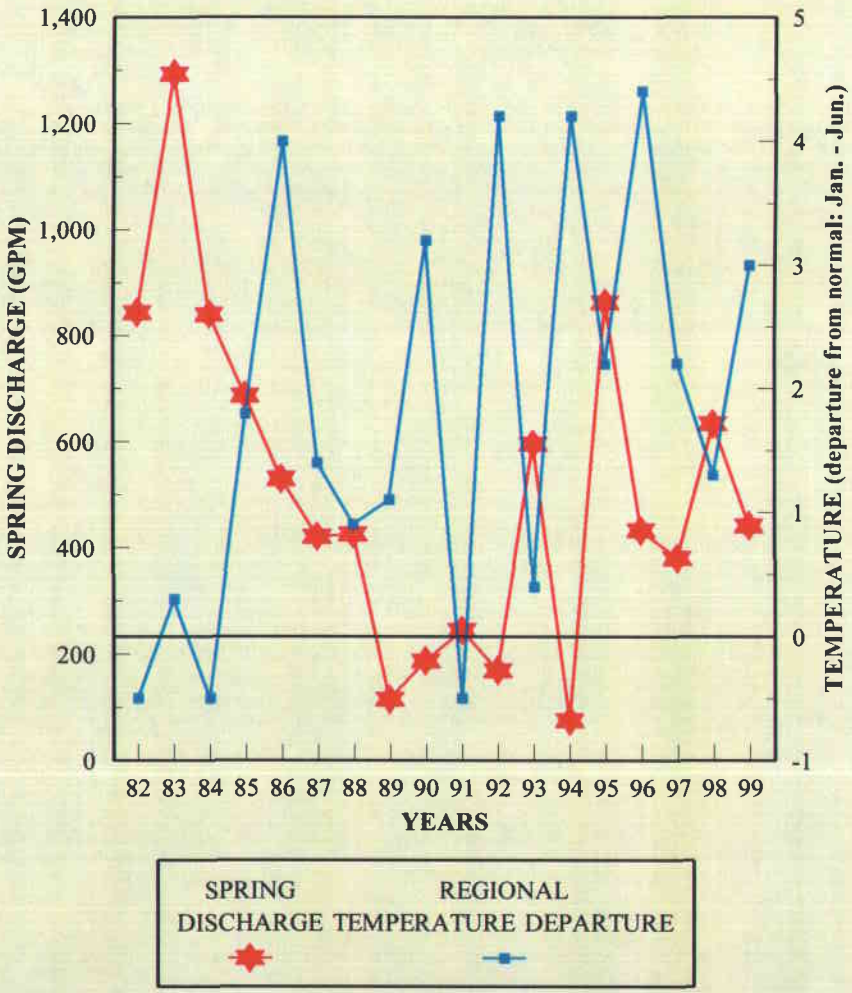


FIGURE 3b
EAST MOUNTAIN
SPRING DISCHARGE vs. PALMER DROUGHT INDEX
(Palmer Data - Average of Region 4 & 5)

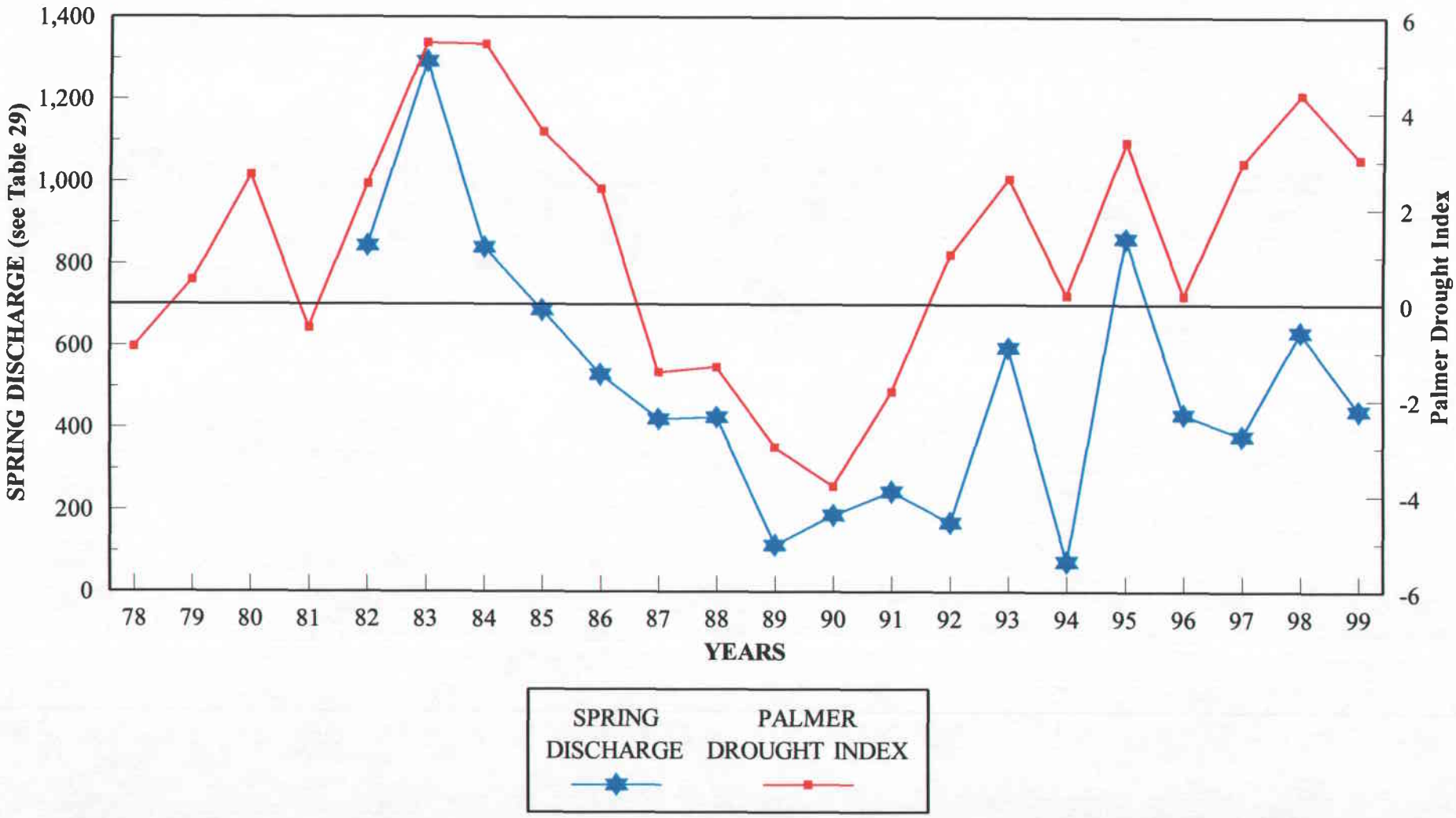


FIGURE 3c
TRAIL MOUNTAIN
SPRING DISCHARGE vs. PALMER DROUGHT INDEX
(Palmer Data - Average of Region 4 & 5)

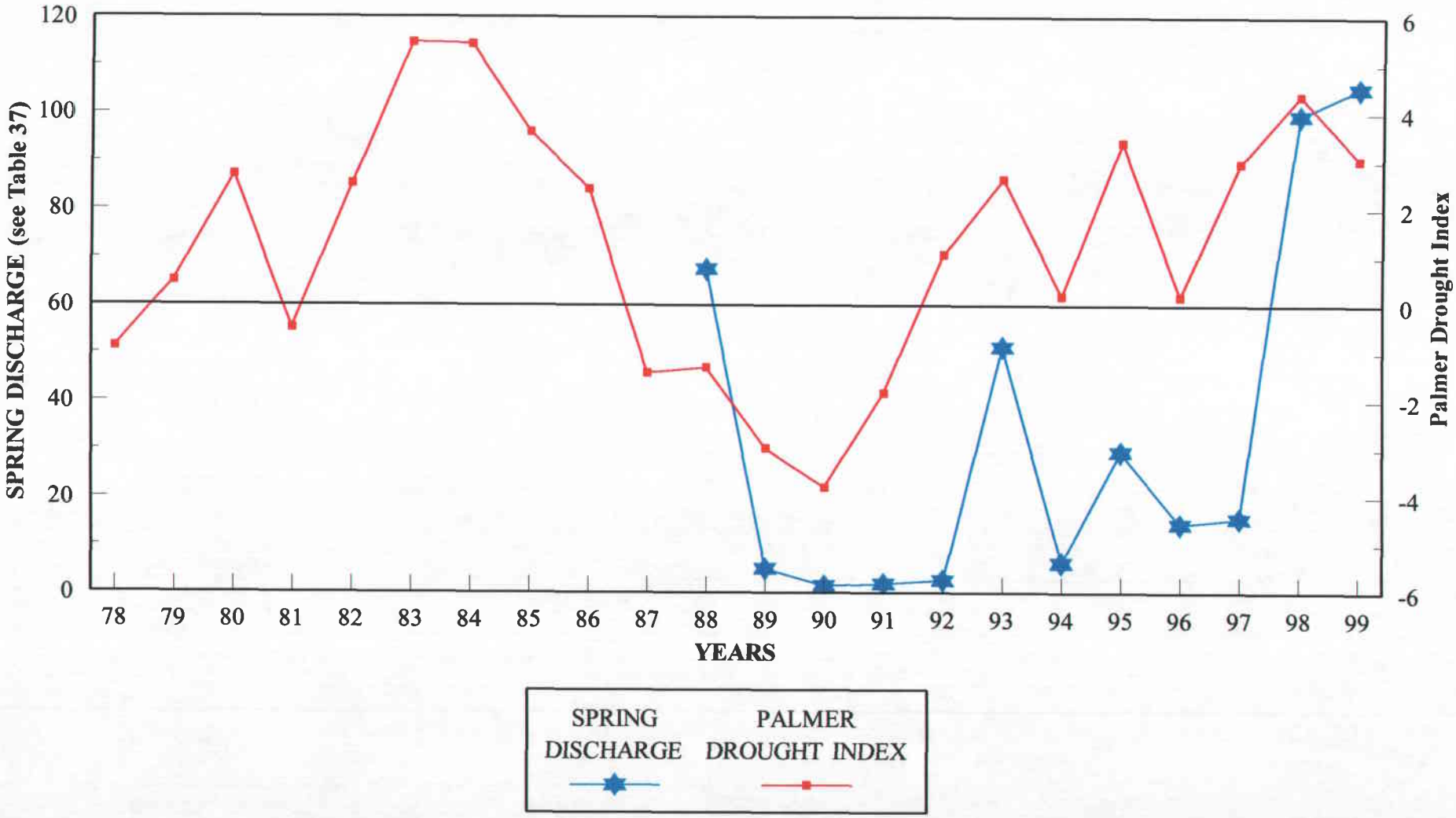


FIGURE 4 (a)

NORTH EMERY WATER USERS ASSOCIATION
RILDA CANYON SPRINGS

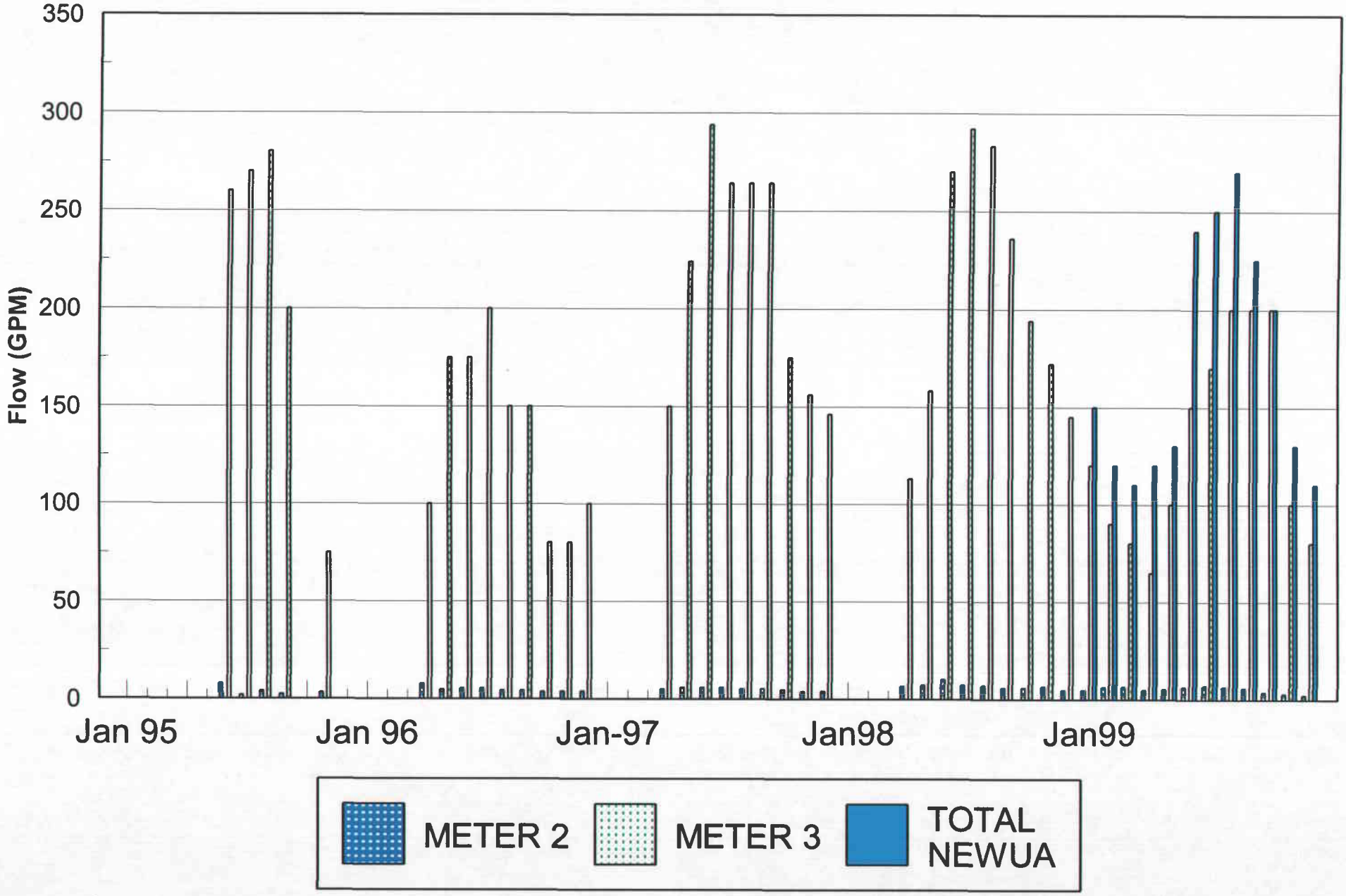
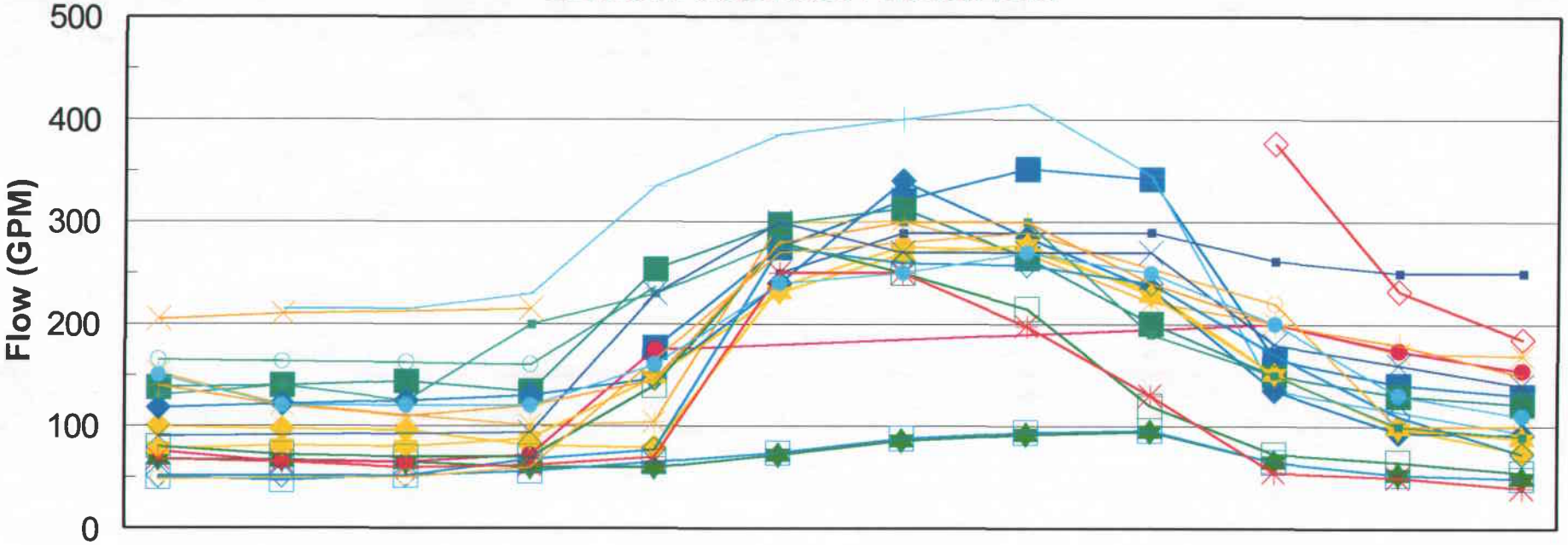


FIGURE 4 (b)

NORTH EMERY WATER USERS ASSOCIATION

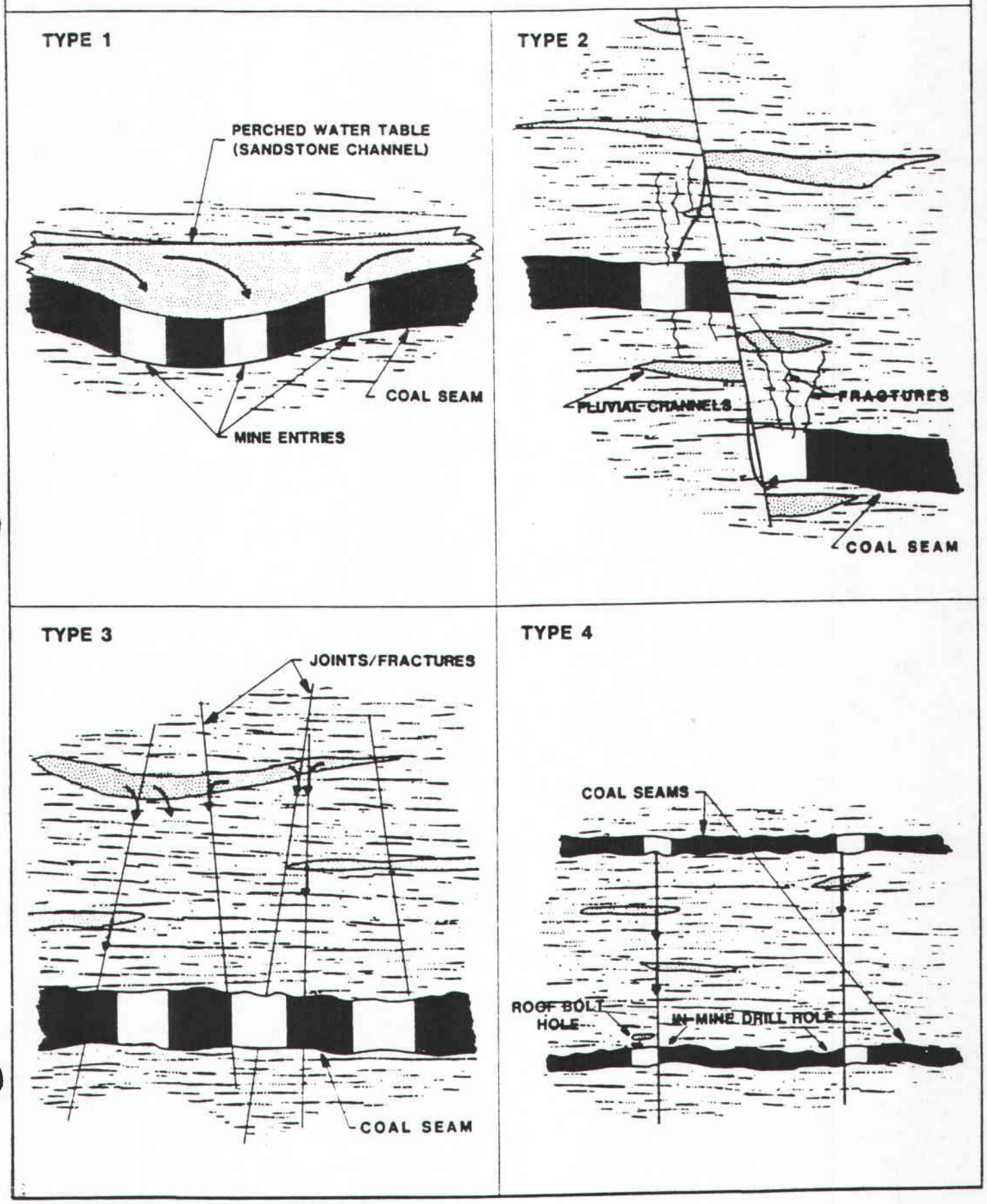
RILDA CANYON SPRINGS



	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
1975					177	275	321	352	342	166	141	130
1976	100	97	96	81	79	237	276	272	233	151	99	75
1977	68	67	65	60	60	72	86	92	95	65	53	49
1978	50	47	52	56	65	74	88	94	96	65	53	49
1980										376	232	185
1981	152	121	111	101	104	299	301	269	222	201	172	169
1982	165	163	162	160	237							
1983						250	289		290	262	250	250
1984	205	210		215								
1987		215	215	230	335	385	400	415	345	135	114	94
1988	76	65	65	72	175					200	174	154
1989	138	140	144	134	254	298	313	265	201	150	130	122
1990	118	122	125	130	147	240	340	285	235	135	94	92
1991	78	81	80	88	148	231	269	278	229	151	98	88
1992	80	72	70	70	140	280	250	215	120	73	65	55
1993	51	51	52	68	77	275	260	258	240	170	110	73
1994	68	65	60	62	70	250	250	198	130	55	50	40
1995	48		50	60		270	280	290		220	100	100
1996	130	140	125	200	230	280	300	300	190	150	100	90
1997	90			94	230	300	270	270	270	180	160	140
1998	140	120	110	120	145	280	300	300	240	200	180	150
1999	150	120	120	120	160	240	250	270	250	200	130	110

FIGURE 5

LONG TERM WATER SOURCES



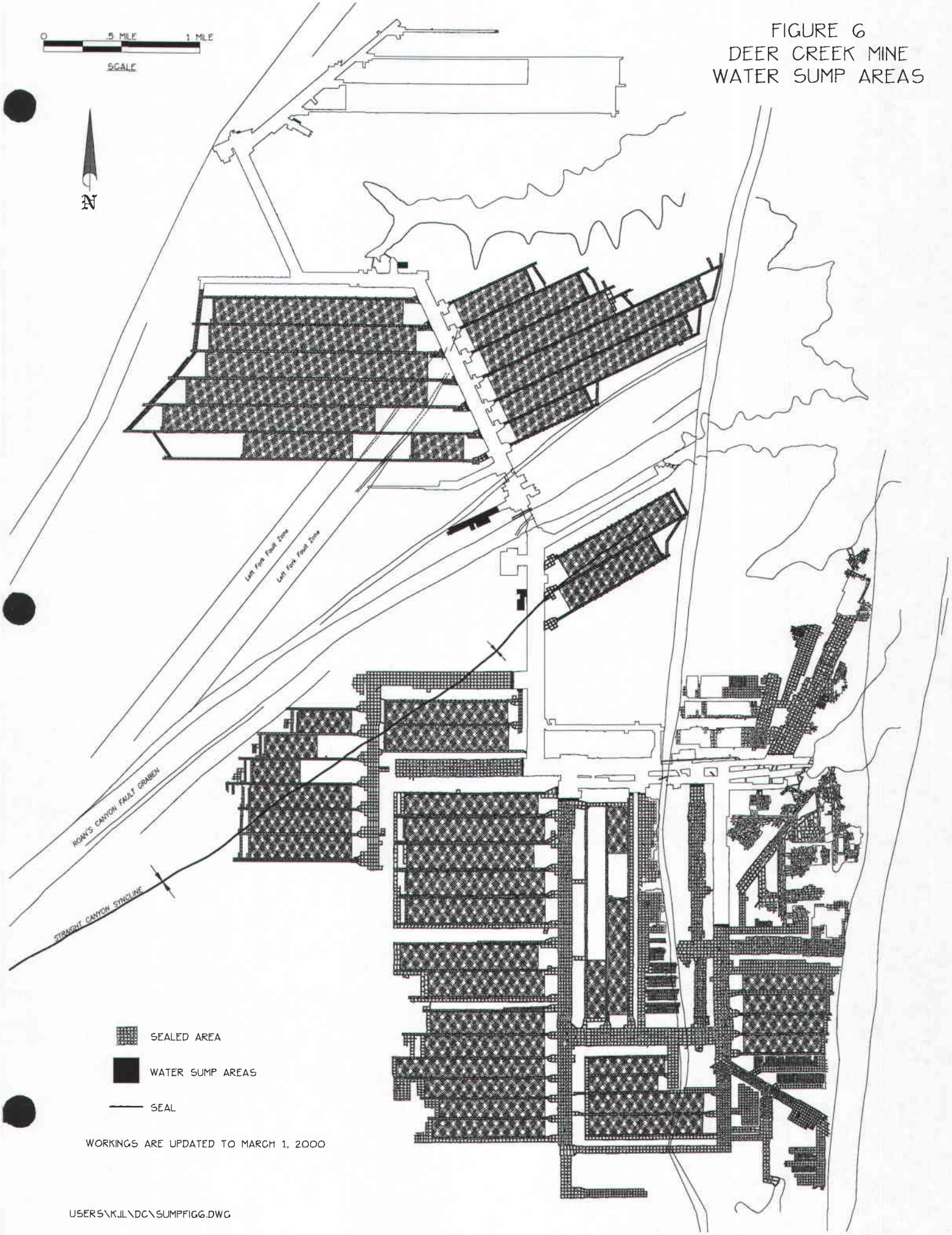


FIGURE 6
DEER CREEK MINE
WATER SUMP AREAS
0
.5 MILE
1 MILE
SCALE
N
Left Fork Fault Zone
Left Fork Fault Zone
ROAN'S CANYON FAULT GRABEN
STRAIGHT CANYON SYNCLINE
SEALED AREA
WATER SUMP AREAS
SEAL
WORKINGS ARE UPDATED TO MARCH 1, 2000
USERS\KJL\DC\SUMPFIG6.DWG

FIGURE 7

DEER CREEK MINE

1999 MINE WATER DISCHARGE

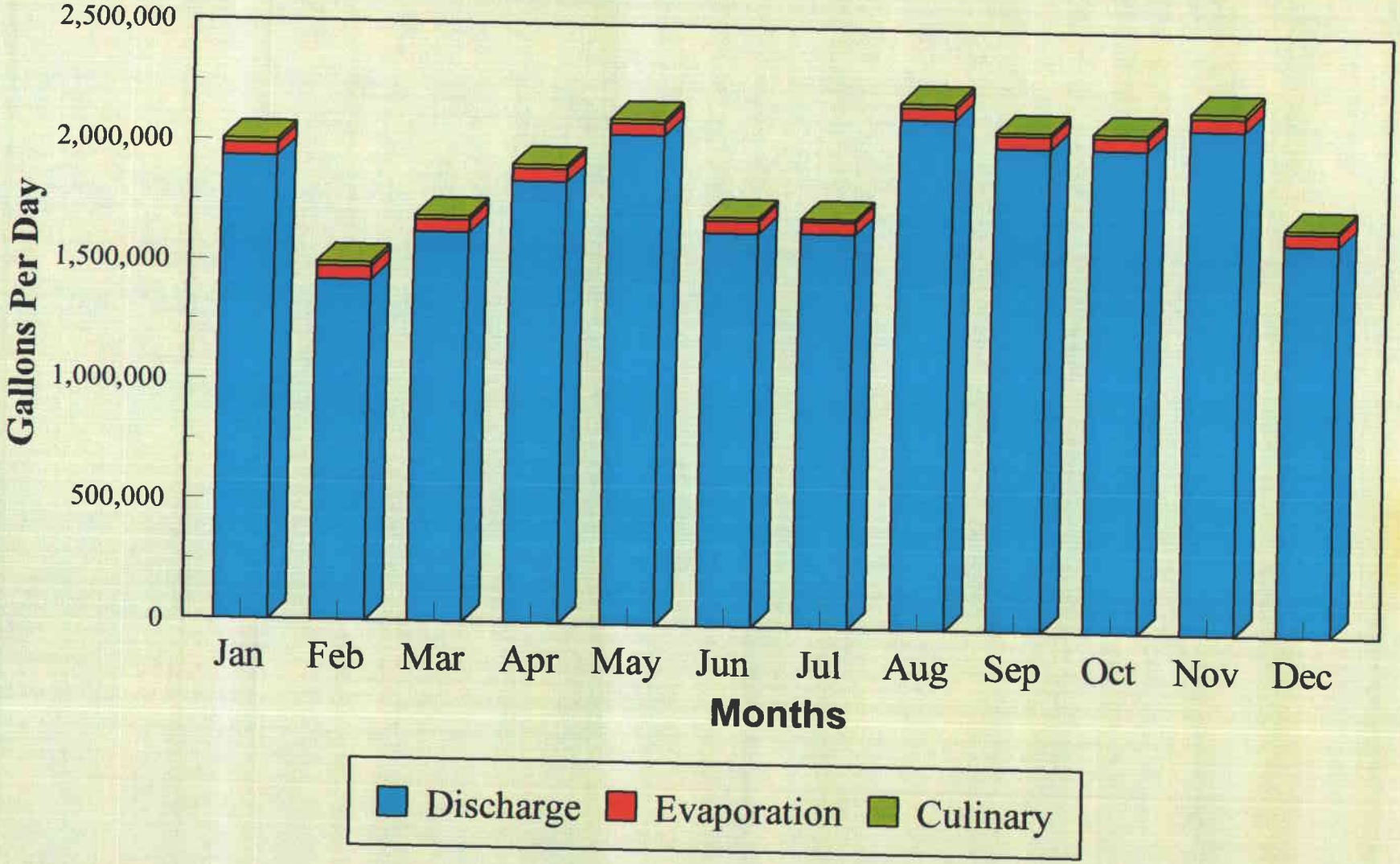


FIGURE 8

DEER CREEK MINE DISCHARGE

@ Deer Creek (UPDES UT-0023604)

January 1980 through December 1999

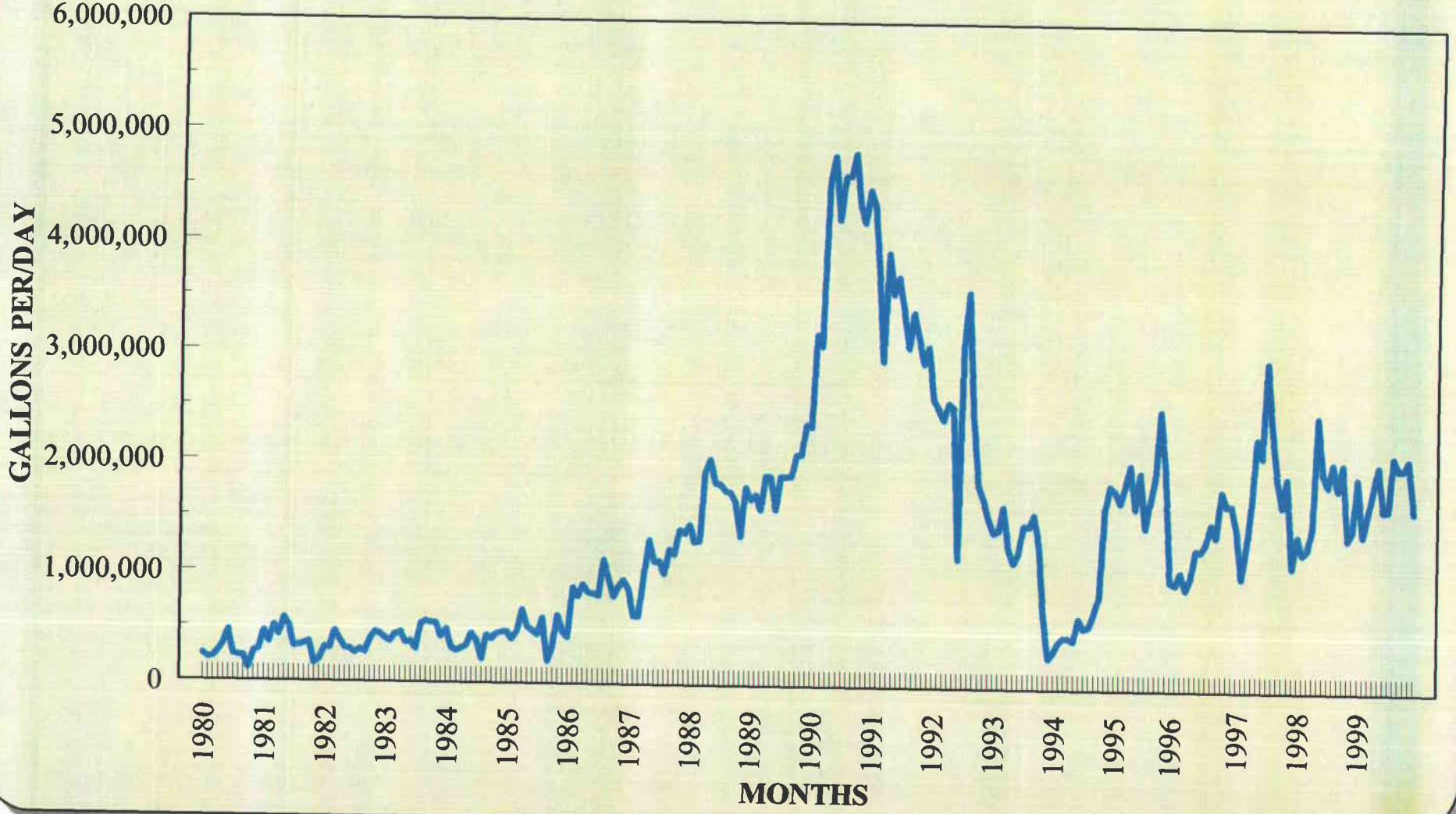
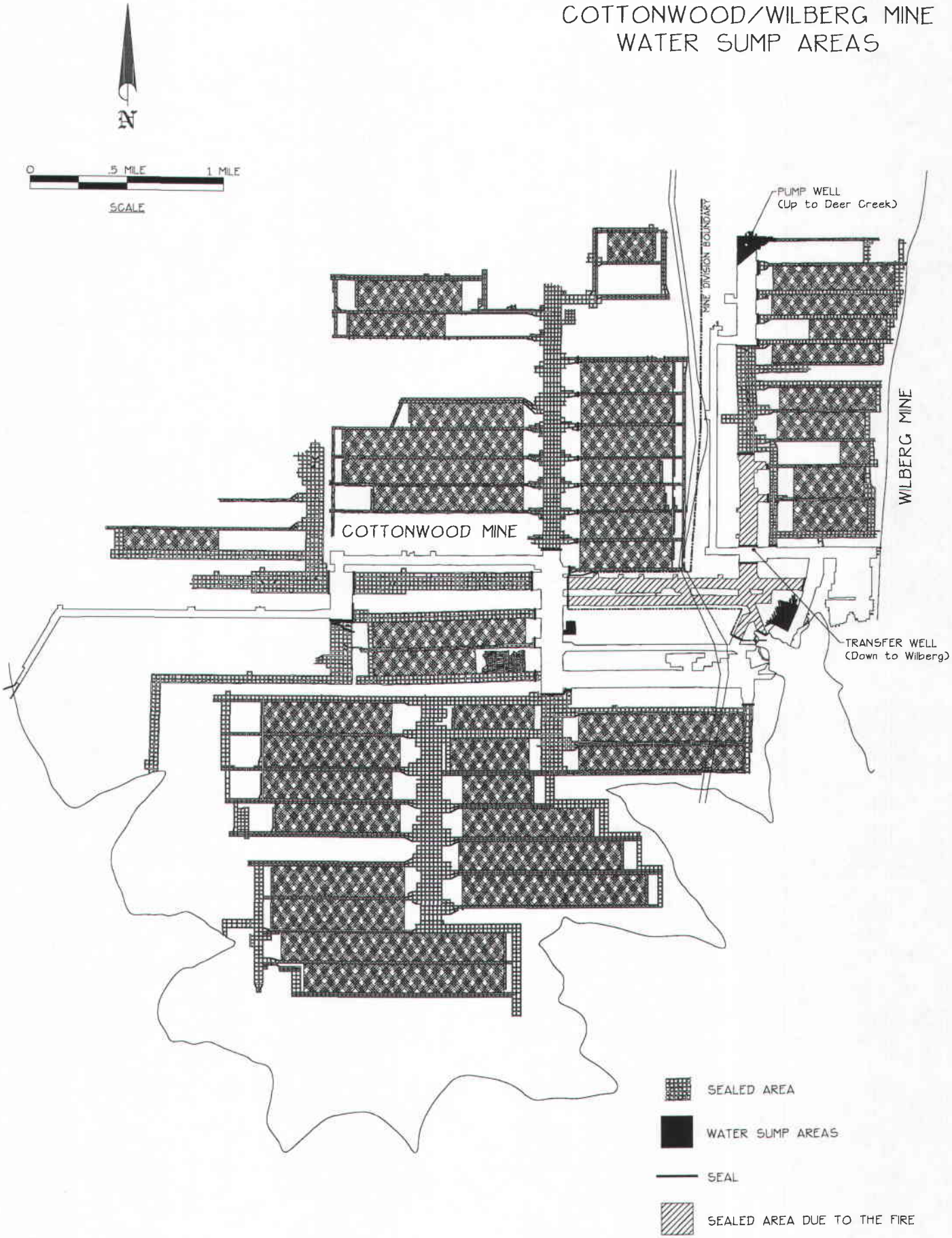


FIGURE 9
COTTONWOOD/WILBERG MINE
WATER SUMP AREAS



WORKINGS ARE UPDATED TO MARCH 1. 1997

USERS\KJL\CW\SUMPFIG9.DWG

FIGURE 10

WILBERG/COTTONWOOD MINE DISCHARGE

@ Grimes Wash (UPDES UT-0022986)

April 1979 through December 1999

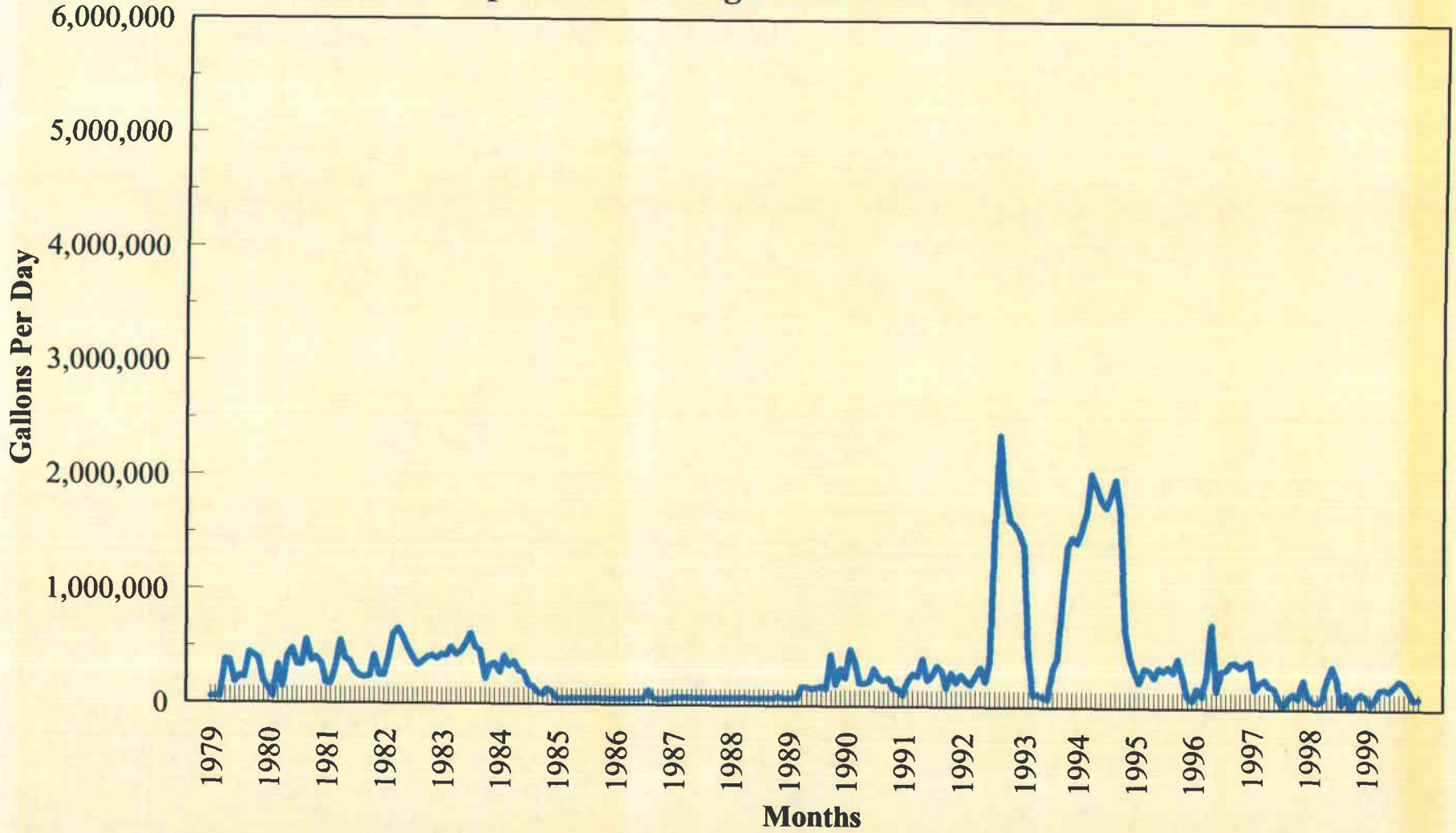


FIGURE 11

WILBERG/COTTONWOOD
1999 MINE WATER DISCHARGE

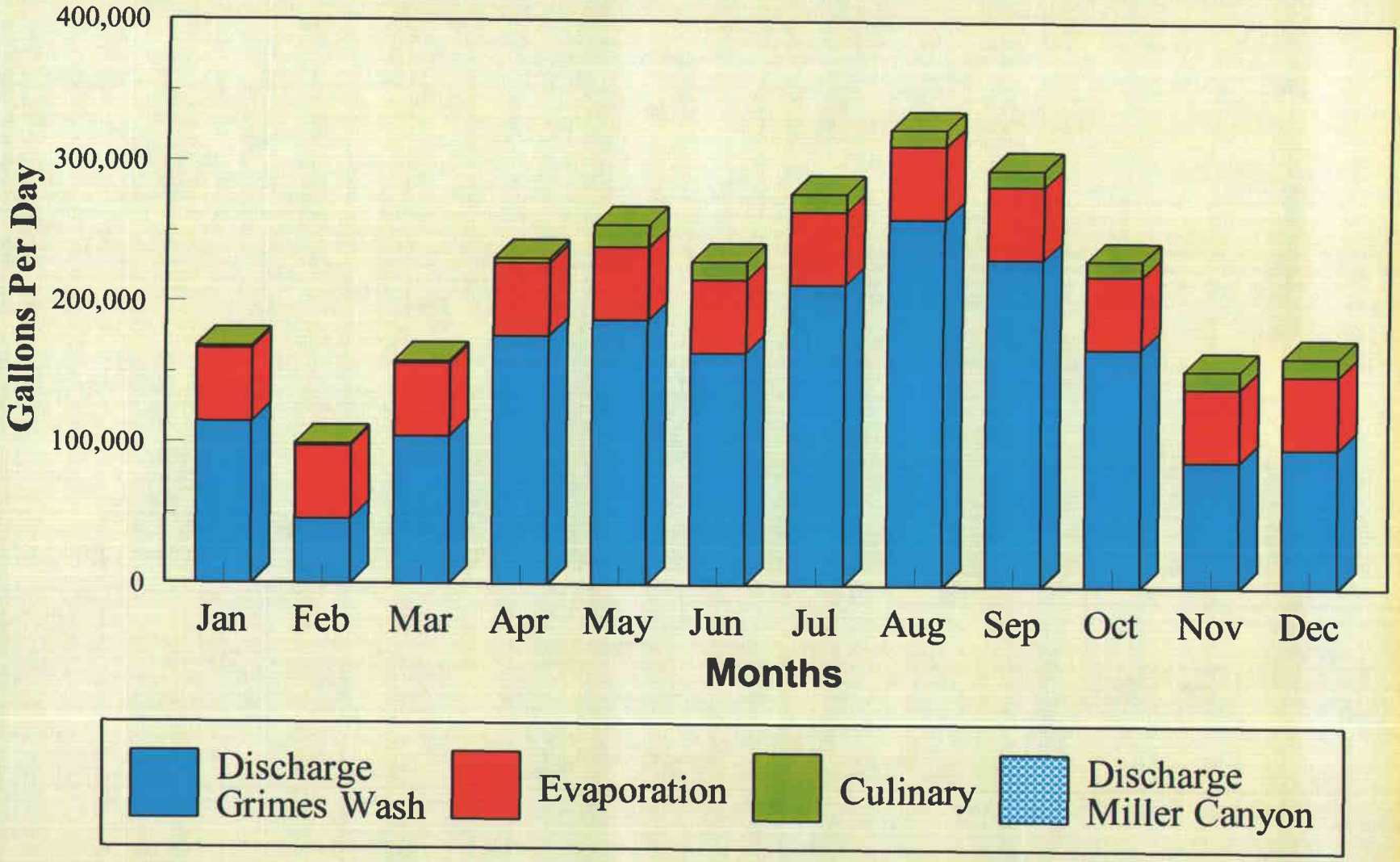
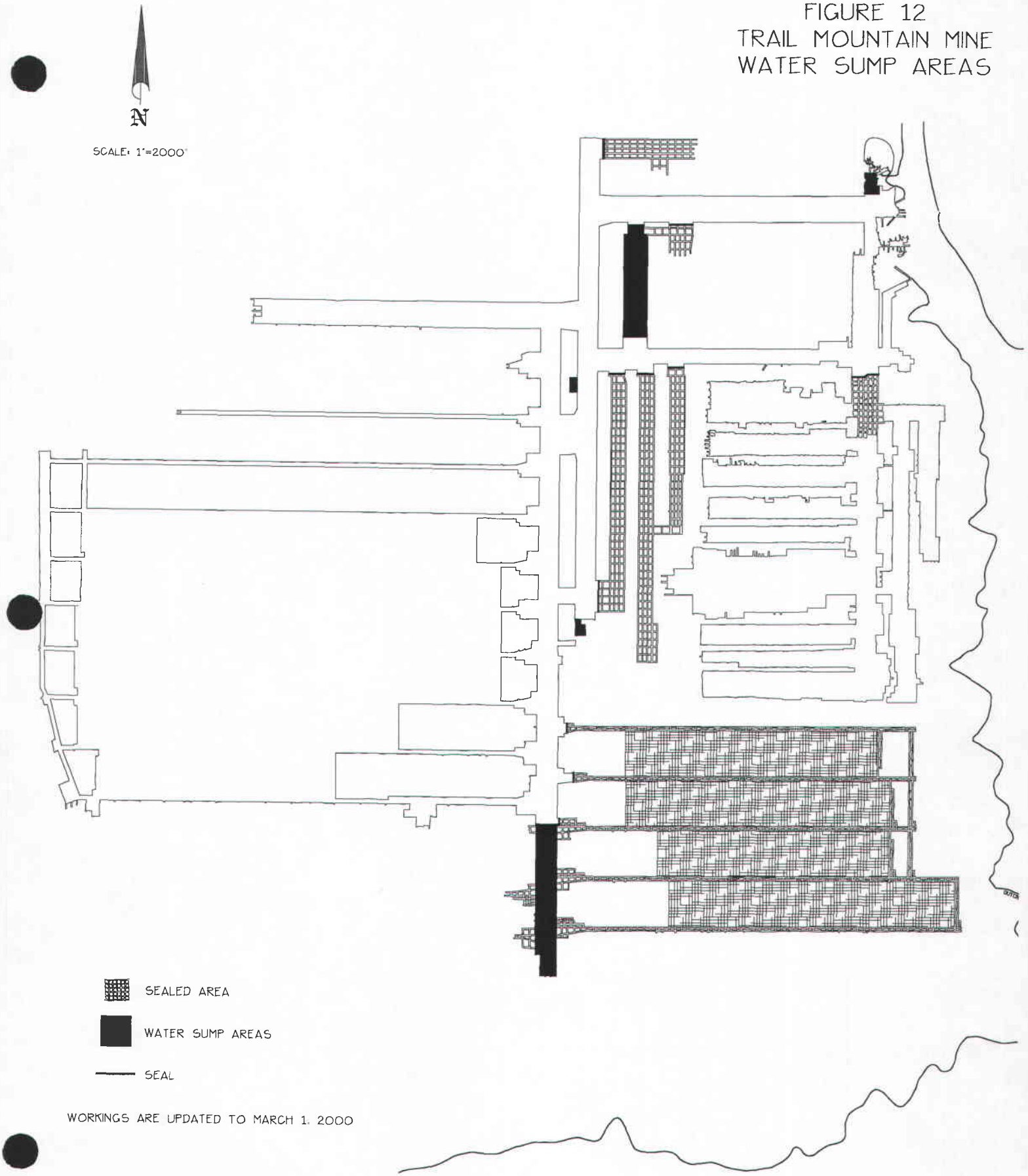


FIGURE 12
TRAIL MOUNTAIN MINE
WATER SUMP AREAS



WORKINGS ARE UPDATED TO MARCH 1, 2000

USERS\KJL\TRAIL\SUMP12.DWG

FIGURE 13

Trail Mountain Mine

@ Cottonwood Canyon Creek (UPDES UT-0023728)

January 1997 through December 1999

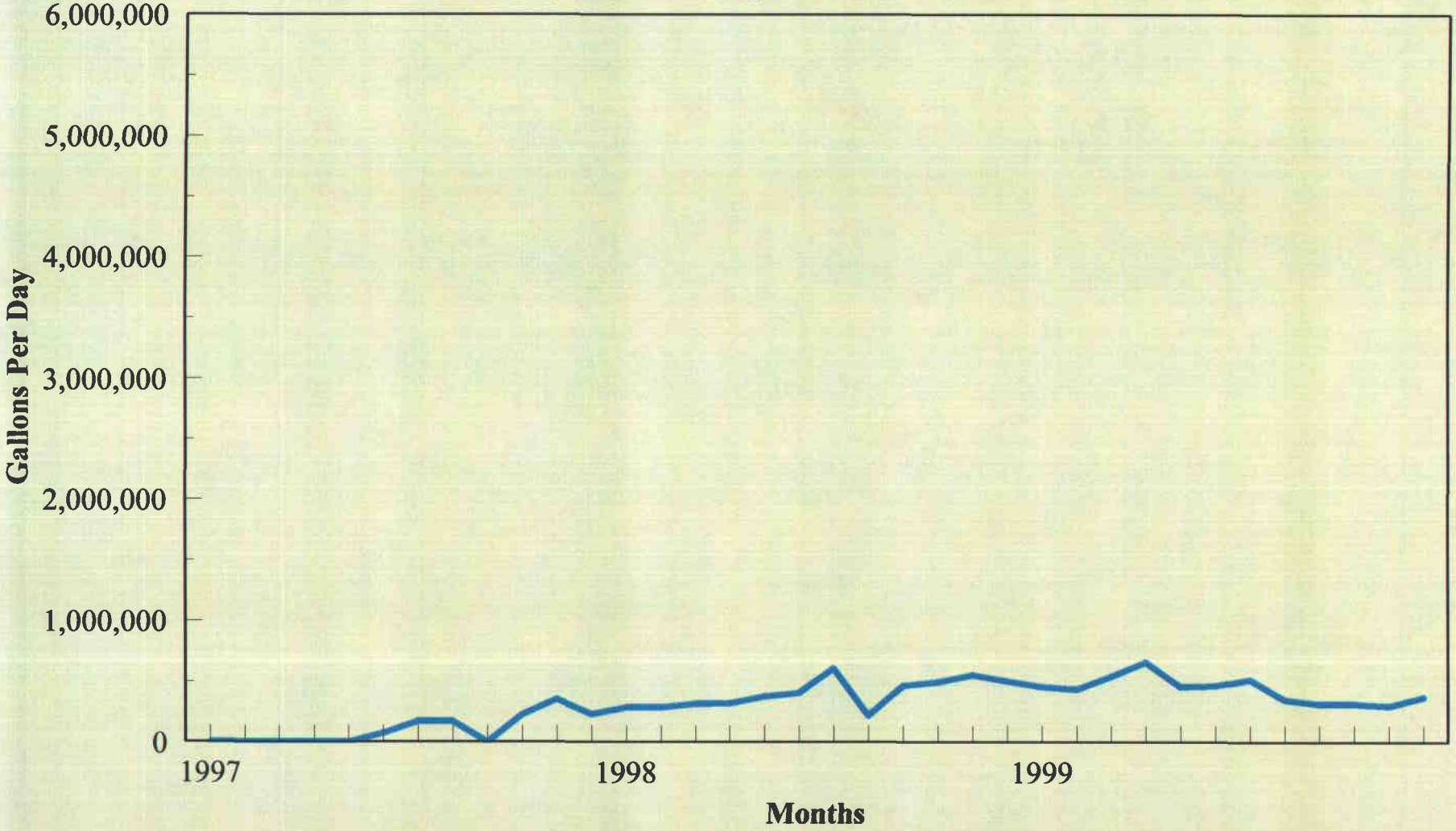


FIGURE 14

TRAIL MOUNTAIN

1999 MINE WATER DISCHARGE

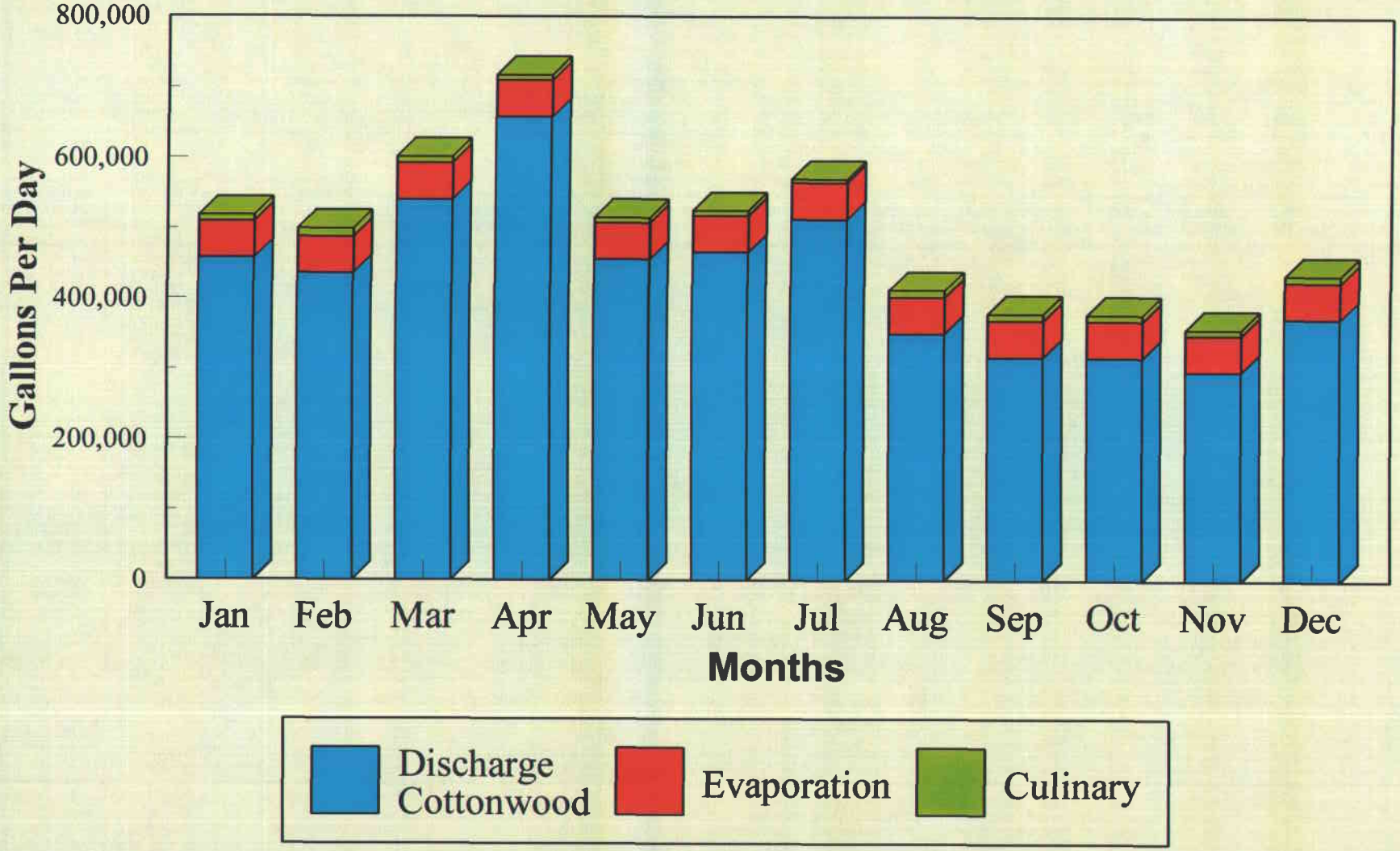


TABLE 1: PRECIPITATION IN EMERY COUNTY, UTAH (1999 Water Year)

	Hunter Plant (Elev. 5800')		Huntington Plant (Elev. 6500')		Electric Lake (Elev. 8350')		East Mountain (Elev. 8985')	
	Precip. (inches)	*% of Normal*	*Precip. (inches)*	*% of Normal*	*Precip. (inches)*	*% of Normal*	*Precip. (inches)*	*% of Normal*
1998								
October	1.69	219	2.59	207	3.65	462	3.01	224
November	0.93	182	2.29	369	2.98	160	1.08	97
December	0.00	0	0.00	0	1.15	105	0.00	0
1999								
January	0.13	30	0.48	41	4.05	204	0.75	62
February	0.33	87	0.37	112	1.70	97	0.34	28
March	0.00	0	0.00	0	1.44	77	0.07	5
April	1.66	415	2.11	384	4.95	295	2.82	254
May	0.34	79	0.29	51	2.03	137	0.36	38
June	0.34	76	0.74	195	1.28	154	1.21	232
July	0.08	15	1.91	222	2.90	245	2.08	199
August	2.78	278	3.41	501	3.54	407	2.24	160
September	1.03	124	1.47	277	1.20	114	0.78	51
TOTALS	9.31	134	15.66	143	30.87	159	14.73	109
Mean Monthly	0.78	---	1.31	---	2.57	---	1.23	---

TABLE 2: COMPARISON OF 1999 AND 1998 PRECIPITATION (Inches)

	1998		*1999*		*1999 As*
Station	***Amount***	***% of Normal***	***Amount***	***% of Normal***	***% of 1998***
Hunter Plant	7.42	107	9.31	134	125
Huntington Plant	13.11	120	15.56	143	119
Electric Lake	27.76	143	30.87	159	111
East Mountain	11.05	82	14.73	109	133

TABLE 3: HUNTER PLANT PRECIPITATION

Elevation - 5,800 Feet

Water Year	*OCT*	*NOV*	*DEC*	*JAN*	*FEB*	*MAR*	*APR*	*MAY*	*JUN*	*JUL*	*AUG*	*SEPT*	*TOTAL*
75-76	0.13	0.25	0.19	0.02	0.40	0.00	0.89	0.84	0.03	0.31	0.08	0.70	3.84
76-77	0.00	0.02	0.00	0.37	0.07	0.00	0.03	1.28	0.07	1.35	0.41	0.50	4.10
77-78	0.01	0.18	0.00	1.28	1.05	1.74	0.34	1.21	0.00	0.69	1.14	0.14	7.78
78-79	0.03	2.22	0.22	1.43	0.53	2.43	0.24	0.47	0.00	0.00	0.79	0.00	8.36
79-80	0.00	0.00	0.41	1.70	1.70	0.67	0.75	1.11	0.00	0.02	0.51	2.06	8.93
80-81	0.66	0.06	0.02	0.00	0.07	1.48	0.16	0.45	0.14	0.20	0.70	2.43	6.37
81-82	0.58	0.27	0.45	0.94	0.45	0.54	0.00	0.02	0.00	0.15	1.06	1.23	5.69
82-83	0.20	1.25	0.45	0.54	0.41	0.84	0.37	0.51	0.00	2.18	1.58	0.88	9.21
83-84	0.53	0.66	1.07	0.03	0.35	0.34	0.34	0.05	1.09	1.80	1.89	2.35	10.50
84-85	1.60	0.06	1.24	0.20	0.95	1.01	0.67	0.64	0.26	1.50	0.03	0.86	9.11
85-86	0.92	1.40	0.42	0.10	0.97	0.40	0.31	0.00	0.31	0.55	1.01	0.57	7.05
86-87	0.92	0.08	0.10	0.32	0.45	0.90	0.12	1.38	1.25	1.65	1.27	0.11	8.55
87-88	1.91	1.02	0.66	0.55	0.00	0.66	1.64	0.59	0.20	0.69	0.44	0.78	9.14
88-89	0.69	0.04	0.48	1.23	0.02	0.23	0.00	0.37	0.14	1.01	1.70	0.35	6.26
89-90	0.20	0.00	0.03	0.31	0.72	0.71	0.51	0.06	0.24	0.56	0.38	1.11	4.73
90-91	0.04	0.00	0.19	0.02	0.29	0.77	0.10	1.09	0.58	0.94	0.53	2.11	6.66
91-92	0.17	0.50	0.14	1.04	2.72	0.87	0.22	1.56	0.34	0.22	1.60	0.52	9.90
92-93	0.81	0.07	0.78	1.44	1.67	1.18	0.50	0.92	0.15	0.05	0.93	0.05	8.55
93-94	1.54	0.51	0.08	Tr.	0.53	0.01	0.67	0.17	0.31	0.09	0.75	1.39	6.05
94-95	1.38	0.22	0.96	0.78	0.10	1.13	2.35	1.12	0.61	0.14	1.89	1.16	11.84
95-96	NA	NA	0.10	0.55	0.25	1.60	0.02	0.68	0.29	0.14	0.16	2.05	-----
96-97	1.04	2.34	0.46	1.45	0.03	0.00	0.79	0.50	1.27	1.41	2.17	2.73	14.19
97-98	0.20	0.46	0.20	0.15	2.04	0.09	0.41	0.31	0.55	0.56	0.73	1.72	7.42
98-99	1.69	0.93	0.00	0.13	0.33	0.00	1.66	0.34	0.34	0.08	2.78	1.03	9.31

TABLE 4: HUNTINGTON PLANT PRECIPITATION

Elevation - 6,500 Feet

Water Year	*OCT*	*NOV*	*DEC*	*JAN*	*FEB*	*MAR*	*APR*	*MAY*	*JUN*	*JUL*	*AUG*	*SEPT*	*TOTAL*
70-71	---	---	---	---	---	0.08	0.29	0.16	0.11	0.57	0.63	0.43	2.27
71-72	2.26	0.59	1.62	0.04	0.00	0.32	0.28	0.16	0.77	0.40	0.66	1.07	8.17
72-73	4.27	1.28	0.34	0.49	0.80	2.42	0.50	0.17	0.97	1.09	1.94	0.12	14.39
73-74	0.08	0.02	0.37	0.20	0.03	0.01	0.00	0.00	0.00	0.09	0.00	0.07	0.87
74-75	0.68	1.19	1.13	1.01	0.30	0.80	0.03	0.75	1.44	2.62	0.31	0.24	9.50
75-76	0.23	0.95	0.03	0.20	0.23	0.00	2.34	0.86	0.02	0.73	0.19	0.85	6.63
76-77	0.56	0.00	0.00	0.35	0.00	0.00	0.00	1.76	0.00	2.08	0.96	0.70	6.41
77-78	0.66	0.12	0.82	1.45	1.00	1.36	0.94	0.72	0.12	0.05	0.72	0.77	8.73
78-79	0.02	2.65	0.25	1.21	0.52	2.50	0.00	0.84	0.05	0.09	3.32	0.20	11.65
79-80	0.17	0.14	0.15	2.88	3.63	0.68	1.13	1.88	0.65	0.18	0.38	2.22	14.09
80-81	1.20	0.06	0.00	0.00	0.00	0.62	0.08	1.75	0.48	0.00	0.58	1.53	6.30
81-82	1.12	0.25	1.30	1.63	0.20	0.73	0.00	0.17	0.00	0.08	0.71	1.91	8.10
82-83	0.20	0.60	0.67	0.16	0.65	1.87	0.08	0.40	0.00	1.61	0.39	1.15	7.78
83-84	0.76	0.76	2.13	0.10	0.15	1.18	0.72	0.17	1.04	0.74	1.39	0.46	9.60
84-85	2.07	0.34	1.74	0.49	0.27	0.53	0.44	1.08	0.42	3.21	0.04	0.81	11.44
85-86	0.77	1.28	0.64	0.01	0.98	0.28	0.43	0.10	0.17	0.42	0.55	1.08	6.71
86-87	0.38	0.15	0.05	0.81	0.66	0.13	1.22	1.48	1.01	2.14	0.65	0.00	8.68
87-88	1.36	1.35	0.51	1.77	0.00	0.10	1.35	0.94	0.83	0.04	0.13	0.92	9.30
88-89	0.31	0.13	0.83	0.68	0.28	0.21	0.20	0.22	1.28	0.78	1.72	0.74	7.38
89-90	0.21	0.28	0.42	0.51	1.18	0.94	1.30	1.35	0.65	1.30	1.27	2.35	11.76
90-91	0.45	0.03	0.43	0.44	0.37	0.68	0.13	3.13	0.60	1.14	1.87	2.38	11.61
91-92	0.21	0.99	0.37	1.20	1.98	1.55	0.47	1.92	1.97	2.99	1.53	0.60	15.78
92-93	1.93	1.02	1.67	2.32	1.71	1.87	0.46	0.65	0.31	0.08	1.68	0.46	14.16
93-94	2.11	0.88	0.23	0.12	0.88	1.17	1.69	0.53	0.05	Tr.	2.14	1.69	11.49
94-95	1.33	0.26	0.33	1.10	0.26	1.05	2.65	2.67	1.17	0.32	2.81	1.48	15.42
95-96	NA	NA	0.90	1.10	0.86	1.52	0.46	1.41	0.72	1.15	0.19	2.18	-----
96-97	0.69	1.31	0.63	1.61	0.05	0.00	0.90	1.11	1.20	2.31	3.28	2.49	15.58
97-98	1.92	0.53	0.00	1.27	1.89	0.15	1.13	1.28	0.90	1.27	1.17	1.60	13.11
98-99	2.59	2.29	0.00	0.48	0.37	0.00	2.11	0.29	0.74	1.91	3.41	1.47	15.66

TABLE 5: ELECTRIC LAKE PRECIPITATION

Elevation - 8,350 Feet

Water Year	*OCT*	*NOV*	*DEC*	*JAN*	*FEB*	*MAR*	*APR*	*MAY*	*JUN*	*JUL*	*AUG*	*SEPT*	*TOTAL*
70-71	2.46	2.35	6.41	1.13	1.66	0.36	1.05	0.66	0.47	0.40	2.15	0.78	19.88
71-72	3.49	1.69	4.07	3.35	0.58	0.70	1.02	0.28	1.49	0.70	0.80	2.91	21.08
72-73	4.18	3.43	3.27	0.97	2.09	2.74	3.67	1.42	0.85	0.82	1.23	1.15	25.82
73-74	0.79	1.90	3.52	2.70	1.12	1.52	2.49	0.20	0.13	2.09	0.06	0.09	16.61
74-75	2.27	0.62	1.73	2.10	2.37	3.42	1.23	3.21	1.08	1.93	0.49	0.25	20.70
75-76	1.31	2.57	0.82	1.44	2.23	1.35	1.47	2.00	1.23	1.07	0.54	1.19	17.22
76-77	1.00	0.25	0.14	0.76	1.14	2.00	0.05	3.00	0.90	2.28	1.31	1.26	14.09
77-78	1.47	2.10	3.20	3.68	2.74	3.16	2.46	1.18	0.30	0.10	0.24	0.77	21.40
78-79	0.40	3.18	2.66	2.90	2.18	2.53	0.72	1.67	0.19	0.96	2.29	0.32	20.00
79-80	1.55	2.23	0.37	4.95	6.01	3.34	1.27	3.09	0.12	0.37	0.38	1.80	25.48
10-Year	1.89	2.03	2.62	2.40	2.21	2.11	1.54	1.67	0.67	1.07	0.95	1.05	20.22
80-81	1.45	0.98	0.32	1.30	1.04	3.20	1.45	3.06	0.39	1.61	2.73	1.44	18.97
81-82	4.18	1.44	4.79	5.26	1.66	5.06	1.11	1.40	0.59	1.26	2.29	5.38	34.42
82-83	1.88	3.68	2.76	2.41	4.00	4.30	2.35	2.81	1.35	1.34	1.50	2.88	31.26
83-84	2.15	4.81	7.43	1.27	1.56	2.77	3.23	1.73	3.41	2.55	2.26	1.47	34.64
84-85	2.92	2.63	3.24	1.54	1.09	3.54	1.95	1.19	0.89	3.04	0.03	4.35	26.41
85-86	4.40	6.62	1.99	1.81	8.54	2.48	3.79	1.62	0.26	1.01	1.68	2.73	36.93
86-87	1.86	1.98	0.55	2.14	2.07	2.47	1.03	2.93	0.79	2.12	1.22	0.49	19.65
87-88	1.39	1.68	3.50	3.06	0.72	3.32	2.14	1.60	0.86	1.04	2.23	1.16	22.70
88-89	1.20	2.68	1.91	1.52	1.99	3.55	0.35	0.06	1.54	1.43	1.37	1.19	18.79
89-90	1.21	1.88	0.70	2.00	4.06	2.30	2.00	0.81	1.87	1.08	0.62	1.87	20.40
90-91	1.32	0.90	1.64	1.49	1.64	4.24	3.06	2.60	0.57	1.04	1.39	2.70	22.56
91-92	1.43	2.10	0.87	0.72	2.21	1.95	0.54	1.55	1.01	0.59	1.64	1.02	15.63
92-93	1.51	1.33	3.60	5.01	4.76	2.25	2.49	2.40	1.57	0.48	1.32	0.60	27.32
93-94	2.10	2.19	0.90	1.00	4.00	1.10	2.81	0.99	0.10	0.25	0.75	2.32	18.51
94-95	2.40	4.26	1.60	3.25	1.90	3.84	3.94	5.07	2.04	1.00	2.53	1.95	33.78
95-96	1.54	1.38	3.54	5.84	3.25	3.23	1.75	1.73	0.90	1.09	0.45	2.20	26.90
96-97	1.43	2.35	3.90	4.00	1.31	0.77	1.97	2.03	1.03	0.64	1.98	4.45	25.86
97-98	2.30	1.88	2.00	3.65	3.60	2.86	1.80	1.82	2.30	2.01	1.86	1.68	27.76
98-99	3.65	2.98	1.15	4.05	1.70	1.44	4.95	2.03	1.28	2.90	3.54	1.20	30.87

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

TABLE 6: EAST MOUNTAIN PRECIPITATION

Elevation - 8,985 Feet

Water Year	*OCT*	*NOV*	*DEC*	*JAN*	*FEB*	*MAR*	*APR*	*MAY*	*JUN*	*JUL*	*AUG*	*SEPT*	*TOTAL*
80-81	1.28	0.39	0.05	0.29	0.52	2.77	0.64	0.87	0.11	0.57	0.85	2.55	10.90
81-82	1.93	0.53	0.97	3.22	0.14	1.67	0.00	0.45	0.09	1.86	1.10	2.61	14.57
82-83	0.38	2.90	1.39	1.30	1.81	1.98	0.92	0.71	0.61	1.27	4.83	1.62	19.71
83-84	0.76	2.43	2.42	0.27	0.65	1.22	0.50	0.22	1.18	1.90	2.33	0.64	14.53
84-85	3.27	0.97	1.67	0.49	0.59	1.77	1.35	1.73	0.28	2.47	0.12	2.31	17.02
85-86	1.15	2.38	0.87	0.30	2.10	1.43	1.05	0.38	0.53	0.87	2.24	1.63	14.92
86-87	1.57	0.39	0.16	1.37	1.37	1.65	1.16	1.77	0.58	2.49	1.16	0.06	13.73
87-88	2.77	1.91	1.29	1.42	0.00	0.99	2.08	1.03	0.81	0.45	0.96	0.91	14.61
88-89	0.61	0.43	1.56	1.00	0.68	1.03	0.26	0.47	0.43	1.19	2.44	0.49	10.59
89-90	0.28	0.39	0.16	0.74	2.08	1.75	1.03	0.26	0.67	0.88	1.03	1.62	10.90
10-Year	1.40	1.27	1.05	1.04	0.99	1.63	0.90	0.79	0.53	1.40	1.71	1.44	14.15
90-91	0.48	0.26	0.66	0.34	0.39	2.34	0.59	1.83	0.21	1.01	1.48	3.11	12.69
91-92	0.49	1.07	0.07	0.61	1.73	2.39	0.56	2.19	0.95	0.85	0.48	0.35	11.74
92-93	1.57	0.57	1.53	4.10	2.34	2.01	0.33	0.72	0.19	0.04	0.82	0.14	14.37
93-94	2.23	1.12	0.14	0.32	1.35	0.34	2.65	0.36	0.39	0.10	0.83	1.49	11.33
94-95	1.86	1.42	0.65	1.37	0.66	0.79	3.75	2.29	1.19	0.34	1.52	0.62	16.46
95-96	0.18	0.46	0.64	1.39	1.18	2.23	0.21	1.14	0.30	0.58	0.35	3.46	12.12
96-97	1.50	1.63	1.66	2.49	1.56	0.00	0.40	0.91	0.15	0.15	1.30	2.43	11.75
97-98	0.24	0.84	0.23	0.97	3.34	0.71	0.81	0.37	0.04	0.78	0.57	2.16	11.06
98-99	3.01	1.08	0.00	0.75	0.34	0.07	2.82	0.36	1.21	2.08	2.24	0.78	14.73

TABLE 7: TEMPERATURES IN EMERY COUNTY, UTAH (1999 Water Year)

	Hunter Plant		Huntington Plant		Electric Lake		East Mountain	
1998	*Average Temperature**	*Departure From Normal*	*Average Temperature**	*Departure From Normal*	*Average Temperature**	*Departure From Normal*	*Average Temperature**	*Departure From Normal*
October	51.0	-0.4	47.7	-1.7	33.0	-4.6	42.2	2.5
November	38.8	3.6	35.4	-0.6	25.8	-0.5	31.4	3.0
December	28.8	2.1	27.8	0.4	15.5	-0.3	26.2	5.0
1999								
January	33.0	8.9	31.6	8.0	20.0	5.4	30.2	7.8
February	36.0	7.6	32.3	2.1	18.8	-0.5	29.7	4.7
March	44.4	8.6	44.4	6.7	24.9	4.1	37.5	7.4
April	45.8	-1.8	41.2	-1.9	25.0	-3.7	35.5	-0.9
May	57.0	4.9	54.0	-0.1	38.0	-1.0	44.5	-0.4
June	67.7	6.3	62.7	-3.1	48.8	0.2	57.9	1.8
July	75.7	7.3	70.1	-1.6	56.0	0.3	65.6	2.2
August	71.9	5.5	66.0	-3.4	51.8	-2.0	61.7	-0.7
September	63.0	11.1	62.0	1.6	46.4	-1.1	52.9	0.0
AVERAGE	51.1	5.3	47.9	0.5	33.7	-0.3	42.9	2.7

* Temperatures reported in degrees Fahrenheit.

TABLE 8: COMPARISON OF 1998 AND 1999 TEMPERATURES*

	1998		*1999*		*1999*
Station	***Average Temperature***	***Departure From Normal***	***Average Temperature***	***Departure From Normal***	***Departure From 1998***
Hunter Plant	51.0	5.7	51.1	5.8	0.1
Huntington Plant	46.9	-0.7	47.9	0.3	1.0
Electric Lake	34.1	0.1	33.7	-0.3	-0.4
East Mountain	43.1	3.0	42.9	2.7	-0.2
Average Departure From Normal		2.0		2.1	0.1

* Temperatures reported in degrees Fahrenheit.

TABLE 9: HUNTINGTON CREEK WATER FLOWS (1999 Water Year)

	*Huntington Creek Below Electric Lake**	*Huntington Creek At Plant**	*Calc. Natural Flow at Plant*
Total Yearly Flow (Acre Feet)	20,080	68,160	78,203
% of Normal	92	100	110
Mean Discharge in Cubic Feet Per Second (CFS)	27.7	94	
Maximum Discharge (CFS)	102	463	
Date of Maximum Discharge	09/21/1999	06/16/1999	
Minimum Discharge (CFS)	8.6	8	
Date of Minimum Discharge	09/30/1999	02/01/1999	

*Influenced by upstream storage in Electric Lake.

TABLE 10: COMPARISON OF 1998 AND 1998 RUNOFF VALUES

	1999		1998		
	Amount	*% of Normal*	*Amount*	*% of Normal*	*1999 as a % of 1998*
Spring Runoff Stored in Electric Lake (Acre Feet)	8,059	78	9,320	90	86
Calculated Natural Flow at Plant (Acre Feet)	78,203	110	86,412	123	91

TABLE 11: HUNTINGTON CREEK WATER QUALITY *

HCC01 - ABOVE POWER PLANT

1999** SAMPLE DATES	ACIDITY	ALKALINITY BICARBONATE	CALCIUM	CARBONATE	CHLORIDE	CONDUCTIVITY (umhos/cm)	DISSOLVED OXYGEN	HARDNESS	IRON TOTAL	IRON DISSOLVED	MAGNESIUM	MANGANESE	OIL & GREASE	PH (units)	POTASSIUM	SODIUM	SULFATE	TSS	TDS
3-99		256	56	6	10	471	6.00	230	0.10		22			8.43	2	9	34	7	286
6-99		185	45		2	305	6.20	158	0.90		11			8.49		4	7	111	179
9-99		185	46		6	329	6.30	164	0.30		12			8.05			11	21	186
12-99		275	58	6	9	500	7.90	252			26			8.39	2	10	41	9	305
1999**																			
MIN		185	45	6	2	305	6.00	158	0.10		11			8.05	2	4	7	7	179
MAX		275	58	6	10	500	7.90	252	0.90		26			8.49	2	10	41	111	305
MEAN		225	51	6	7	401	6.60	201	0.43		18			8.34	2	8	23	37	239
No. of Analysis	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	3	4	4	4
1998**																			
MIN		126	46	5	7	346	5.5	164	0.2		12			7.32	1	5	17	8	209
MAX		268	55	38	7	475	9.2	225	0.5		22			8.65	1	8	28	100	275
MEAN		210	50.5	21	7	412	7.15	198	0.3		17.5			8.06	1	6.25	22.25	34	240
1997**																			
MIN		174	39	8	5	303	6.50	139	0.10		10			8.18	1	3	13	17	170
MAX		282	57	8	14	476	9.60	229	13.30		21			8.50	1	7	33	504	250
MEAN		217	48	8	9	377	7.98	179	4.57		15			8.35	1	5	19	179	210
1996**																			
MIN	9.0	167	46.0	19.0	5.0	304	8.80	164	0.08		12.00		2.0	8.38	1.00	3.00	8.0	5.0	157
MAX	20.0	246	64.0	24.0	16.0	533	11.60	263	0.60		25.00		2.0	8.54	2.00	11.00	38.0	32.0	272
MEAN	14.5	200	54.3	22.0	10.5	410.5	10.33	210.25	0.39		18.25		2.0	8.45	1.40	6.75	22.5	17.3	215
1995																			
MIN	10.0	165	47.0	5.0	4.0	287	3.80	167	0.10	0.10	12.00	0.10	5.0	8.10	1.00	4.00	7.0	5.0	170
MAX	10.0	255	57.0	15.0	14.0	441	9.20	228	1.40	0.10	22.00	0.10	5.0	8.81	2.00	11.00	29.0	70.0	260
MEAN	10.0	204	53.3	10.0	9.0	360.5	6.75	203.75	0.58	0.10	17.50	0.10	5.0	8.56	1.25	7.25	18.5	30.0	208
1994																			
MIN	10.0	173	40.0	1.0	2.0	310	6.2	149	0.10	0.20	11.00	0.10	5.0	8.17	1.00	3.00	2.0	4.0	170
MAX	10.0	249	57.0	5.0	30.0	484	9.9	235	0.20	0.60	23.00	0.20	7.0	8.88	5.00	11.00	40.0	40.0	280
MEAN	10.0	211	50.6	2.0	10.6	379	7.8	193	0.19	0.28	16.42	0.14	5.3	8.60	3.00	6.17	19.7	15.9	224
1993																			
MIN	0.0	159	32.7	0.0	1.0	309	4.3	118	0.05	0.10	9.00	0.00	0.0	7.80	0.00	1.00	3.0	6.0	164
MAX	3.0	253	76.4	6.0	20.0	640	10.5	275	0.25	1.95	25.60	0.20	5.0	9.17	2.00	19.60	60.0	95.0	330
MEAN	0.6	210	51.6	1.2	9.7	410	7.1	202	0.14	0.54	17.82	0.60	1.2	8.42	0.71	7.65	26.0	25.9	228
1992																			
MIN	0.1	189	40.3	0.1	10.0	309	5.8	177	0.01	0.01	11.30	0.01	0.1	8.01	0.01	1.24	5.0	1.0	134
MAX	17.0	281	80.7	6.0	25.0	475	10.1	289	0.10	0.25	30.00	0.07	3.7	8.90	3.12	23.00	70.0	25.0	269
MEAN	2.1	224	60.9	2.4	13.8	385	8.1	234	0.03	0.09	19.80	0.02	0.9	8.58	0.54	8.09	33.7	9.3	210
1991																			
MIN	1.0	183	46.7	0.0	0.0	210	7.1	189	0.00	0.00	12.30	0.00	0.0	7.1	0.00	1.20	17.0	0.0	170
MAX	25.0	288	77.9	11.0	45.0	460	10.5	288	0.20	0.33	35.50	0.06	3.9	8.4	4.52	9.03	80.0	85.0	369
MEAN	4.8	227	64.9	1.9	21.5	341	8.6	245	0.06	0.14	20.03	0.03	1.2	8.1	0.91	4.57	36.8	17.7	243
HISTORICAL 1991-1998																			
MIN	0.1	126	32.7	0.1	1.0	210	3.8	118	0.01	0.01	9.00	0.01	0.1	7.10	0.01	1.00	2.0	1.00	134
MAX	25.0	400	102.6	38.0	45.0	640	11.6	392	13.30	0.25	44.70	0.30	7.0	8.90	5.00	55.00	130.0	504.00	369
MEAN	4.8	224	58.1	4.3	13.8	390	8.1	222	0.45	0.10	18.80	0.07	2.5	8.37	1.32	7.70	30.3	22.60	229
No. of Analysis	59	71	71	60	70	81	81	71	64	58	71	57	53	81	59	71	71	78	81

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

** Data: Database input restricted to values greater then laboratory minimum detection limit.

TABLE 12: HUNTINGTON CREEK WATER QUALITY *

HCC02 - @ POWER PLANT (BELOW DEER CREEK CONFLUENCE)

1999** SAMPLE DATES	ACIDITY	ALKALINITY BICARBONATE	CALCIUM	CARBONATE	CHLORIDE	CONDUCTIVITY (umhos/cm)	DISSOLVED OXYGEN	HARDNESS	IRON TOTAL	IRON DISSOLVED	MAGNESIUM	MANGANESE	OIL & GREASE	PH (units)	POTASSIUM	SODIUM	SULFATE	TSS	TDS
3-99		258	58	6	17	523	6.30	256			27			8.52	2	13	46	6	316
6-99		195	45	7	3	311	7.20	158	0.90		11			8.56		4	8	119	183
9-99		188	46		7	337	6.20	168	0.30		13			8.35		1	14	25	188
12-99		285	64	16	18	597	8.60	296	0.20		33			8.46	2	21	68	14	365
1999**																			
MIN		188	45	6	3	311	6.20	158	0.20		11			8.35	2	1	8	6	183
MAX		285	64	16	18	597	8.60	296	0.90		33			8.56	2	21	68	119	365
MEAN		232	53	10	11	442	7.08	219.5	0.47		21			8.47	2	10	34	41	263
No. of Analysis	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4
1998**																			
MIN		152	47	6	6	353	6.10	174	0.10		13			7.69	1	7	15	7	221
MAX		265	58	37	29	562	9.20	448	0.40		25			8.56	2	18	38	60	323
MEAN		210	52	23	15	453.25	8.05	259.75	0.20		20			8.12	2	11	27	25	266
1997**																			
MIN		175	40	7	5	309	6.20	141	0.20		10			8.20	1	4	13	18	170
MAX		292	56	7	10	491	9.60	230	11.50		22			8.52	1	8	35	490	260
MEAN		221	47	7	8	384	7.93	177.00	4.00		15			8.35	1	6	20	177	205
1996**																			
MIN	6.0	174	46.0	12.0	6.0	304	7.70	164	0.10		12.00		3.0	8.37	1.30	3.00	8.0	5.0	165
MAX	26.0	279	64.0	20.0	17.0	522	11.70	267	0.60		26.00		3.0	8.56	2.00	11.00	42.0	32.0	278
MEAN	16.0	210	54.3	14.7	11.0	407.5	10.00	211.25	0.40		18.50		3.0	8.45	1.65	6.75	23.8	18.3	221
1995																			
MIN	10.0	160	46.0	5.0	4.0	283	3.80	164	0.10	0.10	12.00	0.10	5.0	7.97	1.00	4.00	10.0	10.0	180
MAX	10.0	250	64.0	15.0	14.0	442	7.80	230	1.60	0.10	22.00	1.00	5.0	8.89	2.00	11.00	31.0	100.0	260
MEAN	10.0	201	55.5	10.0	9.5	357	6.43	213	0.63	0.10	17.50	0.33	5.0	8.50	1.50	7.25	20.5	40.0	210
1994																			
MIN	10.0	176	46.0	1.0	1.0	313	5.0	156	0.10	0.20	10.00	0.10	5.0	8.30	5.00	3.00	10.0	4.0	167
MAX	10.0	250	58.0	5.0	12.0	490	9.9	240	0.20	0.50	23.00	0.20	5.0	8.98	10.00	12.00	50.0	30.0	290
MEAN	10.0	212	52.5	2.1	6.7	386	7.5	200	0.19	0.25	16.58	0.14	5.0	8.62	3.36	6.50	23.3	13.5	221
1993																			
MIN	0.0	151	32.0	0.0	1.3	413	3.1	129	0.05	0.11	8.00	0.00	0.0	8.24	0.00	3.40	4.0	8.0	161
MAX	1.0	250	78.1	6.0	35.0	535	8.2	288	0.20	2.00	28.00	0.20	5.0	8.96	4.00	23.00	50.0	98.0	361
MEAN	0.1	206	53.8	1.4	13.3	418	5.9	209	0.11	0.40	18.23	0.07	1.1	8.67	1.08	11.10	28.4	25.8	254
1992																			
MIN	0.1	195	40.1	0.1	10.0	328	4.9	183	0.01	0.01	8.40	0.01	0.1	7.89	0.01	1.52	14.0	2.0	185
MAX	33.0	285	82.9	7.0	25.0	604	9.8	334	0.19	0.25	35.30	0.07	2.7	8.97	3.42	21.85	90.0	28.0	371
MEAN	4.5	239	63.2	2.1	17.5	456	7.8	255	0.05	0.09	23.54	0.02	0.6	8.64	0.97	11.25	45.6	12.1	252
1991																			
MIN	0.0	183	49.1	0.0	10.0	210	5.8	179	0.00	0.00	13.76	0.00	0.0	7.5	0.00	2.00	15.0	3.0	174
MAX	14.0	300	83.1	1.0	45.0	700	10.3	353	0.21	0.32	35.30	0.70	5.1	8.5	4.90	22.94	130.0	77.0	425
MEAN	2.1	233	69.6	0.8	25.0	406	8.4	263	0.04	0.13	21.55	0.02	1.5	8.1	1.31	10.00	55.0	19.6	278
HISTORICAL 1991-1998																			
MIN	0.1	151	32.0	0.1	1.0	210	3.8	129	0.01	0.01	8.00	0.01	0.1	7.14	0.01	1.52	4.0	1.00	161
MAX	33.0	310	91.7	37.0	45.0	700	11.7	448	11.50	0.21	39.90	1.00	5.1	8.98	5.00	23.00	150.0	490.00	425
MEAN	5.4	226	60.3	4.1	15.0	423	7.9	237	0.43	0.10	20.30	0.08	2.4	8.38	1.70	9.40	39.8	23.20	256
No. of Analysis	57	70	70	60	69	80	80	70	65	57	70	55	54	80	56	70	70	78	80

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

** Data: Database input restricted to values greater then laboratory minimum detection limit.

TABLE 13: HUNTINGTON CREEK WATER QUALITY *

HCC04 - @ RESEARCH FARM

1999** SAMPLE DATES	ACIDITY	ALKALINITY BICARBONATE	CALCIUM	CARBONATE	CHLORIDE	CONDUCTIVITY (umhos/cm)	DISSOLVED OXYGEN	HARDNESS	IRON TOTAL	IRON DISSOLVED	MAGNESIUM	MANGANESE	OIL & GREASE	PH (units)	POTASSIUM	SODIUM	SULFATE	TSS	TDS
3-99		253	60	7	26	577	7.30	269			29			8.52	2	17	60	6	348
6-99		195	45		3	316	6.10	162	0.90		12			8.58		4	9	125	182
9-99		188	47		9	345	6.00	171	0.40		13			8.39		2	16	29	196
12-99		275	64	8	33	688	7.60	308	0.20		36			8.42	3	24	98	15	431
1999**																			
MIN		188	45	7	3	316	6.00	162	0.20		12			8.39	2	2	9	6	182
MAX		275	64	8	33	688	7.60	308	0.90		36			8.58	3	24	98	125	431
MEAN		228	54	8	18	482	6.75	228	0.50		23			8.48	3	12	46	44	289
No. of Analysis	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4
1998**																			
MIN		96	46	18	8	361	7.10	168	0.10		13			8.01	2	6	16	6	217
MAX		266	57	44	36	613	8.70	249	0.80		26			8.45	2	22	57	197	353
MEAN		203	52	31	20	476	8.05	216	0.43		21			8.25	2	14	39	62	288
1997**																			
MIN		175	40	5	7	365	6.50	145	0.10		11			8.22	1	5	17	15	200
MAX		271	60	5	20	570	9.50	257	10.10		26			8.55	1	14	59	458	330
MEAN		215	48	5	12	444	8.03	186	3.50		16			8.37	1	8	30	164	250
1996**																			
MIN	9.0	160	47.0	16.0	6.0	318	7.80	167	0.08		12.00		2.0	8.36	1.00	5.00	16.0	5.0	180
MAX	23.0	271	68.0	33.0	23.0	602	11.80	293	0.70		30.00		2.0	8.44	2.00	15.00	62.0	20.0	325
MEAN	16.0	200	56.0	23.7	15.0	443.75	9.98	221.5	0.39		20.00		2.0	8.42	1.33	9.75	35.5	15.0	244.3
1995																			
MIN	10.0	165	49.0	5.0	6.0	311	4.20	176	0.10	0.10	13.00	0.10	5.0	7.90	1.00	3.00	15.0	5.0	180
MAX	10.0	250	65.0	15.0	21.0	500	8.50	264	1.70	0.10	27.00	0.10	5.0	8.69	2.00	17.00	71.0	95.0	330
MEAN	10.0	200	57.5	11.3	13.8	409.25	6.83	225	0.63	0.10	19.75	0.10	5.0	8.47	1.25	10.25	37.0	35.0	230
1994																			
MIN	10.0	176	40.0	1.0	2.0	324	5.2	150	0.10	0.10	11.00	0.10	5.0	8.11	2.00	4.00	13.0	7.0	180
MAX	10.0	250	64.0	5.0	30.0	610	9.6	275	0.20	0.80	28.00	0.20	5.0	8.94	5.00	21.00	80.0	33.0	360
MEAN	10.0	213	54.0	2.1	11.7	432	7.6	213	0.19	0.29	19.00	0.14	5.0	8.61	3.25	9.92	34.5	16.0	255
1993																			
MIN	0.0	130	35.3	0.0	8.5	297	2.2	149	0.05	0.14	9.90	0.00	0.0	7.82	0.00	4.60	17.0	0.0	170
MAX	6.0	269	82.3	6.0	61.2	729	7.6	310	0.37	2.46	33.00	0.20	5.0	8.97	5.00	58.60	110.0	80.0	436
MEAN	0.9	214	57.0	1.8	21.3	462	5.4	235	0.14	0.89	22.67	0.05	0.7	8.66	1.03	16.64	55.8	26.1	285
1992																			
MIN	0.1	201	42.4	0.1	10.0	354	4.3	194	0.01	0.01	12.80	0.01	0.1	7.35	0.01	3.96	19.0	1.0	197
MAX	25.0	326	92.0	10.0	30.0	762	9.6	397	0.19	1.12	41.80	0.08	2.8	8.89	3.59	22.35	170.0	37.0	469
MEAN	4.0	250	67.2	2.2	19.6	516	7.5	276	0.06	0.18	26.19	0.02	0.6	8.51	0.97	16.61	78.3	15.0	298
1991																			
MIN	0.0	187	40.6	0.0	10.0	220	6.6	163	0.00	0.00	13.70	0.00	0.0	7.70	0.00	3.79	17.0	2.0	182
MAX	8.0	317	88.3	1.0	45.0	640	10.0	393	0.15	10.00	42.00	0.08	1.8	8.50	4.70	28.78	170.0	82.0	469
MEAN	1.6	233	71.2	0.8	25.4	410	8.1	278	0.04	0.94	24.43	0.02	0.8	8.20	1.20	12.78	70.8	22.7	309
HISTORICAL 1991-1998																			
MIN	0.1	96	35.3	0.1	2.0	220	4.2	145	0.01	0.01	9.90	0.01	0.1	7.35	0.01	3.00	13.0	1.00	170
MAX	25.0	326	108.1	44.0	61.2	762	11.8	397	10.10	0.37	42.00	0.30	5.0	8.94	10.70	58.60	170.0	458.00	469
MEAN	4.7	229	62.0	4.6	18.2	457	7.9	247.8	0.47	0.10	22.50	0.07	2.4	8.40	1.79	12.93	56.5	25.60	287.6
No. of Analysis	57	70	70	59	70	79	80	70	63	56	70	55	48	80	59	70	70	77	80

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

**Data: Database input restricted to values greater then laboratory minimum detection limit.

TABLE 14: DEER CREEK SURFACE WATER QUALITY *

DCR01 - ABOVE THE MINE

1999** SAMPLE DATES	ACIDITY	ALKALINITY BICARBONATE	CALCIUM	CARBONATE	CHLORIDE	CONDUCTIVITY (umhos/cm)	HARDNESS	IRON TOTAL	IRON DISSOLVED	MAGNESIUM	MANGANESE	OIL & GREASE	PH (units)	POTASSIUM	SODIUM	SULFATE	TSS	TDS
6-99		328	48		4	513	231	0		27			8		31	31	20	295
9-99		326	45		6	583	240			31			8	1	40	49		330
1999**																		
MIN		326	45		4	513	231	0		27			8		31	31	20	295
MAX		328	48		6	583	240	0		31			8		40	49	20	330
MEAN		327	47		5	548	236	0		29			8		36	40	20	313
No. of Analysis	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2
1998**																		
MIN		292	44	17	7	553	227	1		23			8		25	27	5	330
MAX		301	53	19	8	604	238	1		31			8		40	54	92	343
MEAN		297	49	18	8	579	233	1		27			8		33	41	49	337
1997**																		
MIN		329	43.0	16.0	6.0	533	216			24.00			8.48		26.0	30.0	22	340
MAX		393	47.0	16.0	15.0	587	247			30.00			8.52		41.0	55.0	22	380
MEAN		361	45.0	16.0	10.5	560	232			27.00			8.50		33.5	42.5	22	360
1996**																		
MIN		279	44	12	7	518	245	0		28			9	1	34	40	19	294
MAX		288	52	18	9	616	262	0		37			9	1	40	66	19	365
MEAN		284	48	15	8	567	254	0		33			9	1	37	53	19	330
1995																		
MIN	10	280	50	15	6	503	240	0	0	25	0	5	7	1	27	26	5	250
MAX	10	280	56	15	8	530	269	0	0	35	0	5	9	1	43	52	25	360
MEAN	10	280	53	15	7	517	255	0	0	30	0	5	8	1	35	39	15	305
1994																		
MIN	No samples taken in 1994 - No flow.																	
MAX																		
MEAN																		
1993																		
MIN	0.0	241	36.0	0.0	5.6	484	193	0.05	0.07	19.30	0.03	0.0	8.26	0.94	20.00	36.0	1.0	284
MAX	2.0	373	94.2	9.0	9.0	580	343	0.35	8.10	37.00	0.20	1.3	8.73	2.20	45.70	100.0	31.0	377
MEAN	0.3	307	58.9	1.0	7.6	528	263	0.18	1.52	28.28	0.08	0.3	8.61	1.59	30.28	54.5	13.0	333
1992																		
MIN	0.0	335	59.3	0.0	20.0	540	267	0.00	0.00	29.00	0.10	1.2	8.80	0.00	42.95	43.0	2.0	325
MAX	0.0	335	59.3	0.0	20.0	540	267	0.00	0.00	29.00	0.10	1.2	8.80	0.00	42.95	43.0	2.0	325
MEAN	0.0	335	59.3	0.0	20.0	540	267	0.00	0.00	29.00	0.10	1.2	8.80	0.00	42.95	43.0	2.0	325
1991																		
MIN	No flow 1991 back to 1989																	
MAX																		
MEAN																		
HISTORICAL 1978-1998																		
MIN	0.1	241	2.2	0.1	3.5	360	193	0.01	0.01	19.30	0.01	0.1	6.97	0.01	13.40	10.0	0.50	231
MAX	137.0	397	107.2	19.0	176.0	1580	599	40.10	0.35	83.90	0.24	5.0	8.81	4.33	111.60	255.0	3592.00	897
MEAN	11.3	310	56.3	5.3	20.7	595	290.9	0.84	0.09	35.60	0.04	1.2	7.98	1.28	31.84	64.5	97.90	348
No. of Analysis	27	33	33	29	34	73	33	70	20	33	66	25	74	27	33	35	72	74

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

**** Data: Database input restricted to values greater then laboratory minimum detection limit.**

TABLE 15: DEER CREEK SURFACE WATER QUALITY *

DCR06 - BELOW THE MINE

1999** SAMPLE DATES	ACIDITY	ALKALINITY BICARBONATE	CALCIUM	CARBONATE	CHLORIDE	CONDUCTIVITY (umhos/cm)	HARDNESS	IRON TOTAL	IRON DISSOLVED	MAGNESIUM	MANGANESE	OIL & GREASE	PH (units)	POTASSIUM	SODIUM	SULFATE	TSS	TDS
6-99		341	58		54	822	330	1.10		45		3.0	8.33	4	51	126	42	492
9-99		297	60		48	825	331			44			8.52	5	40	127	5	492
12-99		354	74	7	55	952	440	0.40		62			8.47	6	50	177	24	613
1999**																		
MIN		297	58	7	48	822	330	0.40		44			8.33	4	40	126	5	492
MAX		354	74	7	55	952	440	1.10		62			8.52	6	51	177	42	613
MEAN		331	64	7	52	866	367	0.75		50			8.44	5	47	143	24	532
No. of Analysis	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3
1998**																		
MIN		278	64	38	66	952	325	0.10		40.00			8	3	56	127	11	582
MAX		365	74	38	102	1061	415	1.90		56.00			9	7	89	163	84	640
MEAN		320	67	38	85	1007	369	0.90		48.67			8	5	72	147	58	618
1997**																		
MIN		295	46	10	83	806	243	0.20		31.00			9	1	62	65	6	490
MAX		320	103	10	1112	4590	529	0.20		66.00			9	6	758	132	32	2460
MEAN		305	68	10	467	2239	366	0.20		47.33			9	3	320	108	18	1243
1996**																		
MIN		244	56	23	132	1022	313	0		42			9	2	99	84	13	597
MAX		244	56	23	132	1022	313	0		42			9	2	99	84	13	597
MEAN		244	56	23	132	1022	313	0		42			9	2	99	84	13	597
1995																		
MIN	10	250	66	20	111	936	330	0	0	41	0	5	8	2	79	70	5	490
MAX	10	255	66	25	279	1270	400	0	0	57	0	5	9	3	199	120	30	900
MEAN	10	253	66	23	195	1103	365	0	0	49	0	5	8	3	139	95	18	695
1994																		
MIN	No samples taken in 1994 - No flow.																	
MAX																		
MEAN																		
1993																		
MIN	0.0	274	38.2	0.0	35.4	724	260	0.04	0.06	34.00	0.00	0.0	7.75	2.20	34.00	90.0	1.0	413
MAX	1.0	431	95.3	9.0	205.0	1360	483	0.30	2.70	65.00	0.10	5.0	8.81	10.30	138.00	190.0	200.0	862
MEAN	0.1	315	68.3	2.5	85.8	961	375	0.14	0.46	49.61	0.04	1.0	8.43	4.94	68.91	161.8	30.7	620
1992																		
MIN	0.1	162	46.1	0.1	20.0	692	313	0.01	0.01	41.20	0.01	0.1	7.80	2.53	28.19	78.0	3.0	446
MAX	28.0	356	129.8	6.0	60.0	1340	703	0.23	0.57	91.90	0.09	1.7	8.94	9.23	77.76	600.0	97.0	1001
MEAN	6.2	296	82.1	0.9	39.6	889	429	0.04	0.08	54.41	0.02	0.7	8.56	6.09	50.08	219.0	26.3	581
1991																		
MIN	<1.0	268	53.5	0.0	25.0	520	278	0.00	0.00	27.14	0.00	0.0	7.40	2.29	28.13	80.0	2.0	304
MAX	60.0	456	105.1	6.0	90.0	890	503	0.25	0.34	62.50	0.05	3.7	8.50	7.36	71.40	230.0	59.0	741
MEAN	7.3	316	84.2	1.6	43.5	696	407	0.06	0.12	47.68	0.02	1.5	8.20	4.74	43.52	170.0	23.8	517
HISTORICAL 1978-1998																		
MIN	0.1	162	2.4	0.1	5.0	420	243	0.01	0.01	27.14	0.01	0.1	6.92	1.00	28.13	65.0	0.50	273
MAX	90.0	456	191.9	38.0	1112.0	4590	990	170.00	1.22	124.00	0.27	9.0	8.94	10.30	758.00	610.0	20540.00	2460
MEAN	6.1	315	82.5	3.5	99.7	1029.1	438	2.00	0.12	54.80	0.04	1.5	8.19	4.73	84.02	191.4	229.00	642
No. of Analysis	60	69	69	61	70	115	69	103	52	69	93	57	116	69	69	71	115	116

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

** Data: Database input restricted to values greater then laboratory minimum detection limit.

TABLE 16: MEETINGHOUSE CANYON WATER QUALITY *

MHC01 - LEFT FORK

1999** SAMPLE DATES	ACIDITY	ALKALINITY BICARBONATE	CALCIUM	CARBONATE	CHLORIDE	CONDUCTIVITY (umhos/cm)	HARDNESS	IRON TOTAL	IRON DISSOLVED	MAGNESIUM	MANGANESE	OIL & GREASE	PH (units)	POTASSIUM	SODIUM	SULFATE	TSS	TDS
6-99		246	45		2	399	211	0.10		24			9		7	19	21	223
9-99		240	38	10	4	431	214			29			9	1	6	26		231
1998**																		
MIN		240	38	10	2	399	211	0		24			9	1	6	19	21	223
MAX		246	45	10	4	431	214	0		29			9	1	7	26	21	231
MEAN		243	42	10	3	415	213	0		27			9	1	7	23	21	227
No. of Analysis	3	2	2	1	2	2	2	1	3	2	3	3	2	3	2	2	1	2
1998**																		
MIN		204	37.0	13.0	1.0	429	208	0.50		19.00			7.03	1.00	6.00	34.0	40.0	247
MAX		257	52.0	34.0	5.0	557	238	0.60		30.00			8.55	1.00	11.00	44.0	95.0	290
MEAN		234	45.0	20.7	3.7	475	218	0.53		25.67			7.96	1.00	8.67	38.3	63.0	266.33
1997**																		
MIN		240	36.0	5.0	5.0	424	197	0.50		23.00			8.46		6.0	18.0	9	240
MAX		254	43.0	10.0	8.0	435	202	0.50		26.00			8.52		8.0	31.0	36	280
MEAN		247	39.5	7.5	6.5	429.5	200	0.50		24.50			8.49		7.0	24.5	22.5	260
1996**																		
MIN		219	42	7	5	421	225	0		23			9	1	7	13	10	229
MAX		236	52	20	11	423	233	1		31			9	1	9	26	31	245
MEAN		228	47	14	8	422	229	0		27			9	1	8	20	21	237
1995																		
MIN	10	230	46	10	4	399	220	0	0	21	0	5	9	1	9	14	10	190
MAX	40	240	53	15	5	402	234	0	0	29	0	5	9	1	9	28	15	200
MEAN	25	235	50	13	5	401	227	0	0	25	0	5	9	1	9	21	13	195
1994																		
MIN	No samples taken in 1994 - No flow.																	
MAX																		
MEAN																		
1993																		
MIN	0.0	254	39.0	0.0	4.6	394	217	<0.05	0.10	18.90	<0.03	0.0	8.30	<0.10	4.80	14.0	9.0	219
MAX	0.0	256	65.8	<1.0	5.0	395	242	0.07	0.27	29.00	<0.03	0.1	8.80	<0.10	14.00	26.0	32.0	271
MEAN	0.0	255	52.4	0.5	4.8	395	229	0.06	0.18	23.90	<0.03	0.1	8.50	<0.10	9.40	20.0	20.5	245
1992																		
MIN	0.0	195	33.7	0.0	15.0	344	175	0.21	0.28	22.10	0.05	1.2	8.80	0.00	5.40	12.0	30.0	183
MAX	0.0	195	33.7	0.0	15.0	344	175	0.21	0.28	22.10	0.05	1.2	8.80	0.00	5.40	12.0	30.0	183
MEAN	0.0	195	33.7	0.0	15.0	344	175	0.21	0.28	22.10	0.05	1.2	8.80	0.00	5.40	12.0	30.0	183
1991																		
MIN	<1.0	232	66.6	<1.0	10.0	300	237	<0.02	<0.02	17.20	0.03	<0.1	8.30	<0.02	4.00	8.0	49.0	197
MAX	<1.0	272	80.4	<1.0	25.0	300	316	0.10	0.21	28.00	0.08	2.0	8.40	0.28	6.70	18.0	175.0	238
MEAN	<1.0	252	66.6	<1.0	17.5	300	277	0.06	0.11	22.60	0.06	1.1	8.40	0.15	5.40	13.0	112.0	218
HISTORICAL 1986-1998																		
MIN	0.1	195	2.2	0.1	1.0	300	175	0.02	0.01	17.20	0.01	0.1	7.03	0.01	3.80	8.0	0.10	183
MAX	49.0	307	80.4	34.0	47.5	557	350	0.90	0.30	36.50	0.10	10.9	8.81	1.62	14.00	100.0	175.00	304
MEAN	7.2	243	46.4	6.0	8.4	413	235	0.24	0.09	27.00	0.03	1.7	8.13	0.92	8.43	33.7	31.91	244
No. of Analysis	20	28	28	27	28	28	28	27	21	28	21	20	28	23	28	28	27	28

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

**** Data: Database input restricted to values greater then laboratory minimum detection limit.**

TABLE 17: MILL FORK CANYON WATER QUALITY *

MFA1 - ABOVE MINE

1999** SAMPLE DATES	ACIDITY	ALKALINITY BICARBONATE	CALCIUM	CARBONATE	CHLORIDE	CONDUCTIVITY (umhos/cm)	HARDNESS	IRON TOTAL	IRON DISSOLVED	MAGNESIUM	MANGANESE	OIL & GREASE	PH (units)	POTASSIUM	SODIUM	SULFATE	TSS	TDS
6-99		275	53	5		451	219.00	0.10		21			8		4	15	13	247
1999**																		
MIN		275	53			451	219			21			8		4	15	13	247
MAX		275	53			451	219			21			8		4	15	13	247
MEAN		275	53			451	219			21			8		4	15	13	247
No. of Analysis	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1
1998**																		
MIN		285	54.0		2.0	444	239			21.00			8.37	1.00	5.00	19.0	19.0	262
MAX		301	61.0		3.0	455	242			26.00			8.45	1.00	5.00	26.0	19.0	264
MEAN		293	57.5		2.5	449.5	240.5			23.50			8.41	1.00	5.00	22.5	19.0	263
HISTORICAL 1986-1998																		
MIN		153	32.0	8.0	3.0	180	208	0.06	0.48	13			8.00	1.00	1.00	12	1	176
MAX		400	82.0	8.0	24.0	813	462	3.03	0.50	73			8.45	3.00	24.00	223	342	710
MEAN		293	57.1	8.0	11.6	540	320.8	0.76	0.49	43.37			8.10	2.00	11.58	77.1	56.35	367.3
No. of Analysis		18	19	1	19	19	19	14	2	19			20	17	19	19	17	19

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

** Data: Database input restricted to values greater then laboratory minimum detection limit.

TABLE 18: MILL FORK CANYON WATER QUALITY *

MFB2 - BELOW MINE

1999** SAMPLE DATES	ACIDITY	ALKALINITY BICARBONATE	CALCIUM	CARBONATE	CHLORIDE	CONDUCTIVITY (umhos/cm)	HARDNESS	IRON TOTAL	IRON DISSOLVED	MAGNESIUM	MANGANESE	OIL & GREASE	PH (units)	POTASSIUM	SODIUM	SULFATE	TSS	TDS
6-99		286	57	7	2	481	241	0.40	0	24			8	1	5	22	64	274
9-99		328	54	7	9	608	312			43			8	2	7	59		355
1999**																		
MIN		286	54	7	2	481	241	0.40		24			8	1	5	22	64	274
MAX		328	57	7	9	608	312	0.40		43			8	2	7	59	64	355
MEAN		307	56	7	6	545	277	0.40		34			8	2	6	41	64	315
1998**																		
MIN		291	57.0	18.0	4.0	490	257	0.30		26.00			7.27	1.00	6.00	26.0	10.0	296
MAX		350	66.0	19.0	11.0	680	379	0.30		52.00			8.65	3.00	13.00	75.0	55.0	424
MEAN		333	60.0	18.5	7.8	605.5	322.75	0.30		42.00			8.20	2.00	10.25	58.5	27.0	371.5
No. of Analysis	4	2	2	4	2	2	2	4		2			2	2	2	2	4	2
HISTORICAL 1986-1998																		
MIN		186	1.0	10.0	2.0	240	227	0.05	0.50	14			7.27	0.70	5.00	16	1	204
MAX		412	76.0	19.0	17.0	725	416	0.97	10.00	81			8.90	5.20	14.00	103	56	504
MEAN		319	53.8	15.0	8.7	494	310	0.31	4.13	43.79			8.12	1.94	9.98	56.4	17.02	343
No. of Analysis		23	23	4	24	25	24	14	4	24			25	23	24	24	18	23

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

** Data: Database input restricted to values greater then laboratory minimum detection limit.

TABLE 19: RILDA CANYON SURFACE WATER QUALITY *

RCF1 - RILDA CANYON FLUME - RIGHT FORK

1999** SAMPLE DATES	ACIDITY	ALKALINITY BICARBONATE	CALCIUM	CARBONATE	CHLORIDE	CONDUCTIVITY (umhos/cm)	HARDNESS	IRON TOTAL	IRON DISSOLVED	MAGNESIUM	MANGANESE	OIL & GREASE	PH (units)	POTASSIUM	SODIUM	SULFATE	TSS	TDS
6-99		269	63	9	1	449	256	0.40		24			8		23	14	43	257
9-99		245	57	6	2	437	241			24			9	1	6	24		243
1999**																		
MIN		245	57	6	1	437	241	0.40		24			8	1	6	14	43	243
MAX		269	63	9	2	449	256	0.40		24			9	1	23	24	43	257
MEAN		257	60	8	2	443	249	0.40		24			9	1	15	19	43	250
No. of Analysis	3	2	2	2	2	2	2	3	3	2	3	3	2	3	2	2	3	2
1998**																		
MIN		237	55.0	15.0	3.0	447	227	0.10		21.00			8.25	1.00	5.00	17.0	18.0	254
MAX		247	62.0	26.0	3.0	464	241	0.70		22.00			8.56	1.00	7.00	23.0	96.0	292
MEAN		242	58.5	20.5	3.0	455.5	234	0.40		21.50			8.41	1.00	6.00	20.0	57.0	273
1997**																		
MIN		266	52.0	5.0	3.0	420	204	1.10		18.00			8.39	1.00	5.0	18.0	6	250
MAX		275	56.0	7.0	4.0	465	222	1.10		20.00			8.47	1.00	7.0	25.0	56	290
MEAN		271	54.0	6.0	3.5	442.5	213	1.10		19.00			8.43	1.00	6.0	21.5	31	270
1996**																		
MIN		240	53	12	4	423	235	1		21			9	1	5	1	96	245
MAX		245	68	14	11	451	256	1		25			9	1	9	1	96	272
MEAN		243	61	13	8	437	246	1		23			9	1	7	1	96	259
1995																		
MIN	10	245	60	10	4	384	270	2	0	21	0	5	8	1	6	15	120	220
MAX	10	260	83	20	5	423	290	3	1	30	0	5	9	2	24	47	240	270
MEAN	10	253	72	15	5	404	280	2	1	26	0	5	8	2	15	31	180	245
1994																		
MIN	10.0	239	48.0	1.0	1.0	378	202	0.20	0.20	20.00	0.10	5.0	8.73	4.00	8.00	19.0	4.0	230
MAX	10.0	239	48.0	1.0	1.0	378	202	0.20	0.20	20.00	0.10	5.0	8.73	4.00	8.00	19.0	4.0	230
MEAN	10.0	239	48.0	1.0	1.0	378	202	0.20	0.20	20.00	0.10	5.0	8.73	4.00	8.00	19.0	4.0	230
1993																		
MIN	0.0	254	54.0	0.0	2.5	399	238	0.05	0.07	19.20	0.03	0.0	8.69	0.10	4.90	17.0	0.0	225
MAX	0.0	290	63.6	1.0	5.0	915	250	0.12	0.23	28.00	0.03	0.0	8.99	10.00	12.00	23.0	41.0	266
MEAN	0.0	272	58.8	0.5	3.7	657	244	0.08	0.15	23.60	0.03	0.0	8.84	5.05	8.45	20.0	20.0	245
1992																		
MIN	0.1	262	63.9	0.1	15.0	371	255	0.07	0.11	23.10	0.14	0.7	8.90	0.00	6.30	17.0	8.0	222
MAX	0.1	262	63.9	0.1	15.0	371	255	0.07	0.11	23.10	0.14	0.7	8.90	0.00	6.30	17.0	8.0	222
MEAN	0.1	262	63.9	0.1	15.0	371	255	0.07	0.11	23.10	0.14	0.7	8.90	0.00	6.30	17.0	8.0	222
1991																		
MIN	<1.0	244	58.2	<1.0	15.0	300	225	<0.02	<0.02	19.40	<0.02	1.5	8.20	0.12	3.78	7.0	2.0	231
MAX	<1.0	329	108.6	<1.0	15.5	350	384	0.09	1.13	27.40	0.04	1.9	8.40	1.78	7.48	23.0	160.0	242
MEAN	<1.0	287	83.4	<1.0	15.3	325	305	0.06	0.58	23.40	0.03	1.7	8.30	0.95	5.63	15.0	81.0	237
HISTORICAL 1989-1998																		
MIN	0.1	227	48.0	0.1	1.0	300	201	0.02	0.02	18.00	0.01	0.7	7.78	0.01	3.78	1.0	2.0	220
MAX	10.0	329	108.6	26.0	15.0	482	384	2.50	1.20	30.00	0.14	5.0	8.88	10.00	24.00	80.0	240.0	290
MEAN	4.2	254	63.1	7.9	6.9	405	250.2	0.65	0.20	22.62	0.06	2.7	8.41	1.97	7.84	23.9	63.1	254
No. of Analysis	8	16	16	16	16	16	16	13	9	16	9	8	16	14	16	15	13	16

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

** Data: Database input restricted to values greater then laboratory minimum detection limit.

TABLE 20: RILDA CANYON SURFACE WATER QUALITY *

RCF3 - RILDA CANYON FLUME - ABOVE NEWUA SPRINGS

1999** SAMPLE DATES	ACIDITY	ALKALINITY BICARBONATE	CALCIUM	CARBONATE	CHLORIDE	CONDUCTIVITY (umhos/cm)	DISSOLVED OXYGEN	HARDNESS	IRON TOTAL	IRON DISSOLVED	MAGNESIUM	MANGANESE	OIL & GREASE	PH (units)	POTASSIUM	SODIUM	SULFATE	TSS	TDS
3-99		416	86		9	828	7	433	0		53			8.12	2	17	134		538
6-99		276	60	7	2	448	7	245	1		23			8.69		6	19	116	264
9-99		354	69		5	688	6	333	0		39			8.19	3	9	89	33	391
12-99		438	87		9	858	8	435	0		53			8.05	3	19	141	5	549
1999**																			
MIN		276	60	7	2	448	6	245	0		23			8.05	2	6	19	5	264
MAX		438	87	7	9	858	8	435	1		53			8.69	3	19	141	116	549
MEAN		371	76	7	6	706	7	362	0		42			8.26	3	13	96	51	436
No. of Analysis	4	4	4	3	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4
1998**																			
MIN		257	59.0	28.0	2.0	477	4.40	250	0.20		23.00			8.00	1.00	6.00	33.0	17.0	306
MAX		380	79.0	28.0	6.0	692	6.60	370	1.40		42.00			8.32	2.00	15.00	74.0	244.0	413
MEAN		316	66.7	28.0	4.0	563	5.67	294.333333	0.60		31.00			8.20	1.33	10.00	49.7	130.5	342.3
1997**																			
MIN		273	59	8	4	468	6.30	246	0.30		24			8.13	2	6	24	16	290
MAX		307	61	8	5	527	6.90	255	1.90		25			8.34	2	9	48	101	300
MEAN		290	60	8	5	498	6.60	251	1.10		25			8.24	2	8	36	59	295
1996**																			
MIN	9	244	72	15	5	442	7	281	0		24			8	1	6	17	6	258
MAX	14	406	82	18	14	747	13	397	2		47			9	2	13	91	136	461
MEAN	12	343	75	17	9	647	10	351	1		40			8	2	11	63	71	379
1995																			
MIN	10	270	59	5	4	443	5	279	0	0	25	0	5	8	1	7	10	5	260
MAX	10	415	90	20	8	710	7	400	3	0	47	0	5	8	3	15	76	250	470
MEAN	10	335	77	11	6	564	6	347	1	0	38	0	5	8	2	11	47	79	350
1994																			
MIN	10.0	375	72.0	1.0	4.0	631	6.5	335	0.20	0.20	37.00	0.10	5.0	7.86	2.00	11.00	50.0	4.0	380
MAX	10.0	401	73.0	1.0	6.0	719	7.9	370	0.20	0.40	47.00	0.20	5.0	8.37	5.00	13.00	60.0	6.0	436
MEAN	10.0	388	72.5	1.0	5.0	675	7.2	352	0.20	0.30	42.00	0.15	5.0	8.12	3.50	12.00	55.0	5.0	408
1993																			
MIN	0.0	242	67.7	0.0	4.0	437	6.7	265	0.05	0.20	23.30	0.03	1.0	8.34	0.20	11.20	40.0	6.0	254
MAX	0.0	412	75.0	1.0	5.0	674	7.7	381	0.08	0.31	47.00	0.10	1.2	8.83	2.00	16.00	70.0	39.0	469
MEAN	0.0	327	71.3	0.5	4.5	555	7.2	323	0.06	0.25	35.15	0.06	1.1	8.59	1.10	13.60	55.0	22.5	361
1992																			
MIN	0.1	278	58.1	0.1	10.0	476	6.7	268	0.01	0.06	29.90	0.01	0.4	8.16	0.01	8.48	27.0	3.0	273
MAX	4.0	453	97.6	0.1	20.0	722	9.0	444	0.28	0.34	48.60	0.15	1.1	8.47	1.60	17.55	110.0	18.0	430
MEAN	1.4	375	80.1	0.1	13.3	634	7.9	370	0.10	0.19	41.37	0.06	0.7	8.33	0.92	13.86	72.3	8.7	377
1991																			
MIN	<1.0	340	72.2	0.0	15.0	380	7.1	365	0.01	<0.02	25.00	0.00	0.7	7.50	0.23	5.40	7.0	<1.0	241
MAX	14.0	422	105.1	<1.0	50.0	620	10.0	453	0.14	2.84	49.80	0.10	3.6	8.30	4.57	14.50	140.0	185.0	487
MEAN	5.3	382	91.7	0.8	31.3	525	8.1	401	0.06	0.78	41.80	0.04	2.5	7.90	1.65	11.40	74.3	48.5	389
HISTORICAL 1989-1998																			
MIN	0.1	242	58.1	0.1	2.0	380	4.4	246	0.02	0.01	23.30	0.01	0.4	7.50	0.01	5.40	7.0	1.0	226
MAX	14.0	500	112.2	28.0	50.0	855	13.2	748	3.00	0.41	53.20	0.20	5.0	8.83	5.00	17.55	150.0	250.0	513
MEAN	5.9	364	80.4	4.9	11.1	611	7.4	376	0.55	0.13	39.74	0.06	2.5	8.11	1.81	11.85	68.1	44.4	382
No. of Analysis	22	32	32	25	32	33	33	32	31	21	32	21	22	33	31	32	32	27	32

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

** Data: Database input restricted to values greater then laboratory minimum detection limit.

TABLE 21: RILDA CANYON SURFACE WATER QUALITY *

RCW4 - RILDA CANYON FLUME - NEAR HIGHWAY 31

1999** SAMPLE DATES	ACIDITY	ALKALINITY BICARBONATE	CALCIUM	CARBONATE	CHLORIDE	CONDUCTIVITY (umhos/cm)	DISSOLVED OXYGEN	HARDNESS	IRON TOTAL	IRON DISSOLVED	MAGNESIUM	MANGANESE	OIL & GREASE	PH (units)	POTASSIUM	SODIUM	SULFATE	TSS	TDS
3-99		416	74		12	804	6.90	411			55			8.43	3	22	117	5	463
6-99		312	61	7	2	475	6.80	255	1.30		25			8.65		7	26	20	271
9-99		377	69	9	90	766	5.60	374			49			8.46	2	15	109		445
1999**																			
MIN		312	61.0	7.0	2.0	475	5.60	255	1.30		25.00			8.43	2.00	7.00	26.0	5.0	271
MAX		416	74.0	9.0	90.0	804	6.90	411	1.30		55.00			8.65	3.00	22.00	117.0	20.0	463
MEAN		368	68.0	8.0	34.7	682	6.43	347	1.30		43.00			8.51	2.50	14.67	84.0	12.5	393
No. of Analysis	3	3	3	3	3	3	3	3	4	3	3	3	3	3	3	3	3	3	3
1998**																			
MIN		209	62.0	16.0	4.0	506	6.50	254	0.10		24.00			7.27	2.00	7.00	25.0	18.0	313
MAX		434	79.0	51.0	11.0	801	9.30	420	1.80		54.00			8.41	3.00	22.00	94.0	306.0	499
MEAN		330	67.3	30.0	7.8	668.25	7.68	341	0.95		42.00			8.01	2.67	15.50	70.3	162.0	415.5
1997**																			
MIN		292	59	7	5	507	6.10	267	0.40		29		2.0	7.80	1	9	15	34	290
MAX		432	68	7	48	845	8.70	385	2.10		54		2.0	8.36	3	22	109	129	500
MEAN		376	64	7	18	694	7.50	333	1.25		42		2.0	8.20	2	16	58	82	415
1996**																			
MIN	14	263	69	11	5	478	9	301	2		27			8	1	7	20	5	270
MAX	14	428	76	18	15	813	15	419	2		58			9	3	24	113	154	527
MEAN	14	369	73	14	11	720	11	385	2		50			8	2	19	83	80	451
1995																			
MIN	10	310	65	5	5	476	4	352	0	0	29	0	5	8	1	8	20	5	260
MAX	10	420	100	20	13	802	7	424	4	0	58	0	5	9	3	26	110	290	500
MEAN	10	355	80	13	11	655	6	384	1	0	45	0	5	8	2	19	75	80	420
1994																			
MIN	10.0	416	75.0	1.0	10.0	831	6.80	422	0.20	0.20	57.00	0.10	5.0	8.51	2.00	9.00	130.0	4.0	500
MAX	10.0	432	76.0	1.0	10.0	840	7.50	440	0.20	0.20	61.00	0.20	5.0	8.57	5.00	22.00	140.0	9.0	510
MEAN	10.0	424	75.5	1.0	10.0	835	7.1	431	0.20	0.20	59.00	0.10	5.0	8.54	3.50	20.50	135.0	6.5	505
1993																			
MIN	0.0	317	69.0	0.0	4.8	486	5.5	290	0.05	0.20	28.50	0.03	0.7	8.62	0.20	7.90	37.0	6.0	262
MAX	0.0	403	79.0	1.0	14.0	707	7.5	453	0.06	0.71	62.00	0.10	1.0	8.73	10.00	20.00	110.0	96.0	642
MEAN	0.0	360	74.0	0.5	9.4	596	6.5	371	0.05	0.45	45.25	0.06	0.8	8.67	5.10	13.90	73.5	56.0	452
1992																			
MIN	0.1	374	77.0	0.1	10.0	585	5.9	338	0.01	0.01	35.30	0.01	0.1	8.60	0.01	11.50	40.0	1.0	351
MAX	10.0	429	83.0	0.1	20.0	719	10.1	448	0.28	0.40	58.50	0.04	1.9	8.90	7.69	23.10	150.0	49.0	437
MEAN	3.4	400	79.9	0.1	13.3	665	8.2	383	0.10	0.14	44.60	0.03	0.9	8.80	2.57	15.90	90.0	17.7	380
1991																			
MIN	<1.0	298	72.7	0.0	13.5	400	6.9	389	0.00	0.00	36.70	0.00	<1.0	7.70	0.95	7.60	40.0	1.0	286
MAX	10.0	417	117.0	<1.0	45.0	700	10.9	457	0.18	2.06	58.70	0.15	2.4	8.30	4.71	19.00	100.0	505.0	490
MEAN	4.0	373	89.5	0.8	24.6	603	8.5	433	0.06	0.61	51.00	0.05	1.7	8.00	2.64	15.40	80.0	131.0	424
HISTORICAL 1989-1998																			
MIN	0.1	209	59.0	0.1	4.0	400	3.9	254	0.01	0.01	24.00	0.01	0.1	7.27	0.01	7.00	15.0	1.0	260
MAX	14.0	461	132.7	51.0	700.0	845	15.1	545	3.80	0.28	67.20	0.20	5.0	8.86	10.00	52.00	250.0	505.0	642
MEAN	5.2	373	78.1	7.5	34.5	677	7.6	393	0.62	0.09	47.93	0.06	2.4	8.27	2.58	18.39	94.5	69.4	433
No. of Analysis	20	33	33	27	33	33	34	33	25	19	33	20	22	34	32	33	33	27	33

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

** Data: Database input restricted to values greater then laboratory minimum detection limit.

TABLE 22: COTTONWOOD CANYON CREEK WATER QUALITY *

SW-1

1999** SAMPLE DATES	ACIDITY	ALKALINITY BICARBONATE	CALCIUM	CARBONATE	CHLORIDE	CONDUCTIVITY (umhos/cm)	HARDNESS	IRON TOTAL	IRON DISSOLVED	MAGNESIUM	MANGANESE	OIL & GREASE	PH (units)	POTASSIUM	SODIUM	SULFATE	TSS	TDS
3-99		347	66		11	629	313	0.1		36			8.25	2	14	59		376
6-99		337	60		4	508	295	1.1		28			8.43	1	8	24	159	289
9-99		286	51		7	495	247	0.3		29			8.33	1	6	31	14	271
12-99		325	58		9	545	277	0.1	0.1	32			8.21	1	11	33	10	299
1999**																		
MIN		286.0	51.0		4.0	495.0	247.0	0.1		28.0			8.2	1.0	6.0	24.0	10.0	271.0
MAX		347.0	66.0		11.0	629.0	313.0	1.1		36.0			8.4	2.0	14.0	59.0	159.0	376.0
MEAN		323.8	58.8		7.8	544.3	283.0	0.4		31.3			8.3	1.3	9.8	36.8	61.0	308.8
No. of Analysis	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	3	4
1998**																		
MIN		282	55.0	14.0	6.0	500	259	0.10		27.00		6.0	7.74	1.00	8.00	33.0	12.0	310
MAX		324	64.0	14.0	9.0	562	300	1.00		34.00		6.0	8.38	2.00	12.00	62.0	130.0	330
MEAN		310	59.3	14.0	7.7	528	274.67	0.63		30.67		6.0	8.14	1.33	10.00	44.0	70.3	318
1997**																		
MIN		304	54	5	8	528	246	0		27			8	1	9	32	6	300
MAX		346	58	5	22	595	281	1		33			8	2	11	50	78	300
MEAN		317	55	5	16	546	257	1		29			8	2	10	42	43	300
1996**																		
MIN	14	288	63	12	9	537	293	0		33			8	1	12	29	36	308
MAX	27	413	77	12	18	822	425	1		56			8	2	23	108	36	518
MEAN	21	376	70	12	15	729	377	0		49			8	2	20	78	36	446
1995																		
MIN	10	290	6	15	8	502	300	0	0	28	0	5	8	1	11	25	5	280
MAX	10	395	81	20	27	961	520	2	0	78	0	5	8	3	38	170	105	690
MEAN	10	352	54	18	17	721	405	1	0	52	0	5	8	2	24	95	48	467
HISTORICAL 1977-1998																		
MIN	1.0	231	6.0	1.0	0.7	380.0	210.0	0.02	0.1	2.4	0.0	0.5	7.1	1.0	6.0	20.0	0.5	226.0
MAX	27.0	433	152.3	20.0	27.0	961.0	520.0	15.9	0.4	78.0	1.3	358.0	8.7	21.0	60.0	238.7	1298.0	690.0
MEAN	5.4	338	66.6	5.6	12.8	663.0	334.2	1.0	0.1	38.5	0.1	11.1	7.9	3.1	20.7	73.6	73.8	377.4
No. of Analysis	43	72	71	19	72	33	39	67	17	72	54	41	67	69	71	72	66	72

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

** Data: Database input restricted to values greater then laboratory minimum detection limit.

TABLE 23: COTTONWOOD CANYON CREEK WATER QUALITY *

SW-2

1999** SAMPLE DATES	ACIDITY	ALKALINITY BICARBONATE	CALCIUM	CARBONATE	CHLORIDE	CONDUCTIVITY (umhos/cm)	HARDNESS	IRON TOTAL	IRON DISSOLVED	MAGNESIUM	MANGANESE	OIL & GREASE	PH (units)	POTASSIUM	SODIUM	SULFATE	TSS	TDS
3-99		642	33	14	21	1237	181	0.3		24			8.56	5	231	115	6	784
6-99		346	58		6	521	268	1		30			8.48	2	11	31	89	298
9-99		460	40		72	1050	248	0.3		36			8.32	4	139	105	30	622
12-99		332	56	11	11	630	300	0.2		39			8.43	2	20	53	7	341
1999**																		
MIN		332	33	11	6	521	181	0.20		24			8	2	11	31	6	298
MAX		642	58	14	72	1237	300	1.00		39			9	5	231	115	89	784
MEAN		445	47	13	28	860	249	0.45		32			8	3	100	76	33	511
No. of Analysis	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4
1998**																		
MIN		356	28.0	7.0	4.0	587	185	0.40	0.20	26.00		5.0	8.18	1.00	29.00	25.0	11.0	353
MAX		635	53.0	7.0	68.0	1330	257	1.00	0.30	34.00		5.0	8.53	5.00	230.00	146.0	107.0	834
MEAN		496	43.8	7.0	33.3	980.75	232.5	0.68	0.25	30.00		5.0	8.38	3.25	140.25	87.3	52.0	617
1997**																		
MIN		308	29	85	10	531	151	1	0	19			8	1	11	35	10	310
MAX		606	69	85	179	1344	460	1	0	65			9	4	221	145	148	840
MEAN		440	49	85	71	1013	285	1	0	38			9	3	118	107	79	637
1995																		
MIN	10	290	63	10	8	515	300	0	0	30	0	5	8	1	12	32	5	350
MAX	10	440	74	35	40	955	490	1	0	73	0	10	9	4	46	190	85	700
MEAN	10	344	71	24	26	749	415	1	0	58	0	6	9	3	31	116	36	550
HISTORICAL 1977-1998																		
MIN	0.10	233	11.1	1.0	1.5	410	151	0.05	0.05	2.40	0.01	0.1	7.00	1.00	8	19.5	1.0	267
MAX	22.00	635	136.9	85.0	179.0	1709	631	16.20	1.25	109.00	1.37	39.0	8.93	25.60	230	254.0	1004.0	1170
MEAN	4.76	347.10	64.74	13.64	21.50	842	344	1.13	0.18	41.33	0.10	3.23	8.05	4.56	39.3	95.99	74.0	438
No. of Analysis	41	71	71	22	71	32	38	69	21	71	57	50	66	70	70	71	69	71

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

**** Data: Database input restricted to values greater then laboratory minimum detection limit.**

TABLE 24: COTTONWOOD CANYON CREEK WATER QUALITY *

SW-3

1999** SAMPLE DATES	ACIDITY	ALKALINITY BICARBONATE	CALCIUM	CARBONATE	CHLORIDE	CONDUCTIVITY (umhos/cm)	HARDNESS	IRON TOTAL	IRON DISSOLVED	MAGNESIUM	MANGANESE	OIL & GREASE	PH (units)	POTASSIUM	SODIUM	SULFATE	TSS	TDS
3-99		565	24	24	25	1277	171	0.3		27			8.8	5	211	122	10	758
6-99		405	41	8	14	703	226	1		30			8.59	2	82	64	123	420
9-99		384	32	11	76	1020	232	0.5		37			8.63	4	130	114	25	599
12-99		485	24	70	38	1256	175	0.2		28			8.59	4	249	144		782
1999**																		
MIN		384	24	8	14	703	171	0.20		27			8.59	2.00	82	64	10	420
MAX		565	41	70	76	1277	232	1.00		37			8.80	5.00	249	144	123	782
MEAN		460	30	28	38	1064	201	0.50		31			8.65	3.75	168	111	53	640
No. of Analysis	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4
1998**																		
MIN		308	20.0	18.0	10.0	592	165	0.40	0.20	27.00			8.06	2.00	33.00	35.0	8.0	340
MAX		633	48.0	37.0	61.0	1361	231	2.30	0.20	31.00			8.72	6.00	267.00	181.0	224.0	876
MEAN		484	31.8	26.0	36.3	1006.25	198.5	1.10	0.20	29.00			8.52	4.00	178.25	111.8	99.3	664.5
1997**																		
MIN		350	32	10	22	795	181	1		24		28	8	2	67	121	11	490
MAX		569	115	18	95	1595	687	1		97		28	9	4	220	438	114	1130
MEAN		479	57	14	48	1224	329	1		46		28	8	4	153	228	78	798
1996**																		
MIN	16	265	55	20	20	651	327	1		46		3	8	2	25	100	38	400
MAX	27	452	111	20	78	1491	652	1		95		3	9	4	100	398	38	1052
MEAN	22	385	91	20	56	1237	563	1		82		3	8	3	78	267	38	852
1995																		
MIN	10	290	71	5	7	506	310	0	0	32	0	5	8	1	12	30	5	380
MAX	10	420	102	30	56	1184	654	1	0	97	0	5	9	4	90	355	95	960
MEAN	10	365	90	17	39	956	536	1	0	75	0	5	8	3	64	241	35	763
HISTORICAL 1977-1998																		
MIN	0.1	253	14.3	0.1	1.7	506	165	0.04	0.05	2.40	0.01	0.2	7.20	1.00	3	22	1.0	40
MAX	27.0	633	159.0	37.0	95.0	1595	687	19.00	0.43	97.00	2.48	114.0	8.72	30.00	220	438	5024.0	1130
MEAN	5.2	358	73.7	8.3	28.3	1123	431	1.25	0.14	48.60	0.14	4.9	8.05	4.31	55.34	159.1	151.4	549
No. of Analysis	44	75	74	25	74	36	42	68	22	75	53	58	70	73	74	75	68	75

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

** Data: Database input restricted to values greater then laboratory minimum detection limit.

TABLE 25: GRIMES WASH WATER QUALITY *

GWR01 - RIGHT FORK

1999 **SAMPLE DATES	ACIDITY	ALKALINITY BICARBONATE	CALCIUM	CARBONATE	CHLORIDE	CONDUCTIVITY (umhos/cm)	DISSOLVED OXYGEN	HARDNESS	IRON TOTAL	IRON DISSOLVED	MAGNESIUM	MANGANESE	OIL & GREASE	PH (units)	POTASSIUM	SODIUM	SULFATE	TSS	TDS
1999**	NO SAMPLES COLLECTED DURING 1999																		
MIN																			
MAX																			
MEAN																			
1998**	NO SAMPLES COLLECTED DURING 1998																		
MIN																			
MAX																			
MEAN																			
1997**																			
MIN		240	57		5	419	9	237	2.60		23			8.39	2	6	55		280
MAX		240	57		5	419	9	237	2.60		23			8.39	2	6	55		280
MEAN		240	57		5	419	9	237	2.60		23			8.39	2	6	55		280
No. of	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1
No flow during 1989 - 96																			
1988																			
MIN	39.0	112	43.8	<1.0	26.4	225	9.70	154	0.61	0.78	10.90	0.04	9.0	8.20	5.20	1.90	27.0	8.0	196
MAX	39.0	112	43.8	<1.0	26.4	225	9.70	154	0.61	0.78	10.90	0.04	9.0	8.20	5.20	1.90	27.0	8.0	196
MEAN	39.0	112	43.8	<1.0	26.4	225	9.70	154	0.61	0.78	10.90	0.04	9.0	8.20	5.20	1.90	27.0	8.0	196
1987																			
MIN	<1.0	104	34.4	<1.0	3.0	190	6.80	112	3.31	20.60	6.30	0.05	---	7.20	7.60	2.00	20.0	2000.0	115
MAX	<1.0	104	34.4	<1.0	3.0	190	6.80	112	3.31	20.60	6.30	0.05	---	7.20	7.60	2.00	20.0	2000.0	115
MEAN	<1.0	104	34.4	<1.0	3.0	190	6.80	112	3.31	20.60	6.30	0.05	---	7.20	7.60	2.00	20.0	2000.0	115
1986																			
MIN	<1.0	240	30.0	<1.0	8.3	465	7.6	222	<0.05	<0.05	35.70	<0.01	<0.5	7.50	1.60	3.40	40.0	0.5	262
MAX	<1.0	320	52.0	<1.0	11.5	680	9.8	320	<0.05	0.73	46.20	0.05	2.2	8.10	3.30	20.40	120.0	257.0	389
MEAN	<1.0	275	41.6	<1.0	10.2	547.6	8.8	268	<0.05	0.24	39.90	0.02	0.7	7.80	2.50	15.70	61.3	60.6	316
HISTORICAL 1979-1998																			
MIN	0.1	104	30.0	1.0	3.0	190	6.8	112	0.01	0.05	6.30	0.01	0.5	7.20	1.60	1.85	20.0	0.5	115
MAX	39.0	320	57.0	1.0	26.4	750	9.8	320	20.60	3.31	46.20	0.30	9.0	8.70	7.64	20.44	161.7	7116.0	700
MEAN	5.5	238	42.6	1.0	10.8	557	8.6	238	1.38	0.47	31.96	0.06	1.8	8.09	3.21	13.20	63.7	370.2	338
No. of Analysis	11	10	10	9	12	43	10	10	47	9	9	42	12	47	10	10	14	47	47

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

**** Data: Database input restricted to values greater then laboratory minimum detection limit.**

TABLE 26: GRIMES WASH WATER QUALITY *

GWR02 - RIGHT FORK

1999** SAMPLE DATES	ACIDITY	ALKALINITY BICARBONATE	CALCIUM	CARBONATE	CHLORIDE	CONDUCTIVITY (umhos/cm)	HARDNESS	IRON TOTAL	IRON DISSOLVED	MAGNESIUM	MANGANESE	OIL & GREASE	PH (units)	POTASSIUM	SODIUM	SULFATE	TSS	TDS
6-99		436	79		9	836	424			55			8.21	1	31	124	8	523
9-99		293	35	13	7	618	252	0.2		40			8.61	1	37	86		367
1999**																		
MIN		293	35		7	618	252			40			8.21	1	31	86	8	367
MAX		436	79		9	836	424			55			8.61	1	37	124	8	523
MEAN		365	57		8	727	338			47.5			8.41	1	34	105	8	445
No. of	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2
1998**																		
MIN		249	32.0		9.0	585	232			37.00			7.92	1.00	30.00	83.0	32.0	372
MAX		368	61.0		10.0	721	321			41.00			8.70	2.00	38.00	83.0	53.0	451
MEAN		309	46.5		9.5	653	276.5			39.00			8.31	1.50	34.00	83.0	42.5	411.5
1997**																		
MIN		280	47		10	637	286			41			8	1	28	98		380
MAX		355	73		15	845	376			47			9	2	29	212		540
MEAN		318	60		13	741	331			44			8	2	29	155		460
No flow during 1994 -1996																		
1993																		
MIN	3.0	276	88.9	0.0	8.9	470	327	0.22	2.52	25.40	0.10	0.6	8.70	1.90	13.20	80.0	294.0	366
MAX	3.0	276	88.9	0.0	8.9	470	327	0.22	2.52	25.40	0.10	0.6	8.70	1.90	13.20	80.0	294.0	366
MEAN	3.0	276	88.9	0.0	8.9	470	327	0.22	2.52	25.40	0.10	0.6	8.70	1.90	13.20	80.0	294.0	366
No flow during 1989 - 92																		
1988																		
MIN	34.0	312	71.5	<1.0	10.0	600	337	<0.02	<0.02	38.50	<0.01	2.0	8.40	1.10	24.20	105.0	4.0	428
MAX	34.0	312	71.5	<1.0	10.0	600	337	<0.02	<0.02	38.50	<0.01	2.0	8.40	1.10	24.20	105.0	4.0	428
MEAN	34.0	312	71.5	<1.0	10.0	600	337	<0.02	<0.02	38.50	<0.01	2.0	8.40	1.10	24.20	105.0	4.0	428
1987																		
MIN	<1.0	188	2.3	<1.0	6.0	412	337	<0.05	<0.05	23.80	<0.01	<0.5	7.60	1.00	11.10	45.0	<1.0	212
MAX	<1.0	482	71.1	15.0	156.0	610	460	0.12	0.62	68.50	0.06	3.5	8.60	2.50	34.00	9.0	48.0	382
MEAN	<1.0	317	38.1	3.8	56.6	526	296	0.07	0.17	43.40	0.02	1.7	7.80	1.40	28.50	73.6	14.6	307
1986																		
MIN	<1.0	281	36.0	<1.0	7.7	410	252	<0.05	<0.05	37.70	<0.01	<0.5	7.40	1.30	25.20	67.0	3.0	293
MAX	<1.0	331	58.0	<1.0	10.9	690	310	<0.05	0.22	43.80	0.07	0.6	8.00	3.00	34.00	115.0	253.0	427
MEAN	<1.0	304	45.5	<1.0	8.8	591	278	<0.05	0.12	39.90	0.02	0.5	7.70	1.90	29.20	77.9	54.1	346
HISTORICAL 1979-1998																		
MIN	1.0	188	2.3	1.0	6.0	410	196	0.02	0.02	23.80	0.01	0.1	7.30	1.00	11.10	30.4	0.5	212
MAX	34.0	482	88.9	26.0	156.0	845	460	2.52	0.22	68.50	0.15	3.5	8.85	3.00	38.00	212.0	1428.0	570
MEAN	3.3	308	48.8	4.0	17.3	630	294	0.21	0.08	40.50	0.03	1.0	8.01	1.59	28.30	83.1	56.1	368
No. of Analysis	15	19	19	16	19	54	19	54	7	19	51	15	56	19	19	20	55	56

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

** Data: Database input restricted to values greater then laboratory minimum detection limit.

TABLE 27: GRIMES WASH WATER QUALITY *

GWR03 - RIGHT FORK

1999** SAMPLE DATES	ACIDITY	ALKALINITY BICARBONATE	CALCIUM	CARBONATE	CHLORIDE	CONDUCTIVITY (umhos/cm)	HARDNESS	IRON TOTAL	IRON DISSOLVED	MAGNESIUM	MANGANESE	OIL & GREASE	PH (units)	POTASSIUM	SODIUM	SULFATE	TSS	TDS
3-99		305	111		257	1832	598			78			8.45	5	169	399	7	1212
6-99		359	97		188	1566	542			73			8.18		122	321		1020
9-99		321	98		74	1283	549	0.2		74			8.25	5	64	373	34	893
12-99		364	120		152	1765	703	2.2		98			8.28	6	116	354		1225
1999**																		
MIN		305	97		74	1283	542	0.20		73			8.18	5	64	321	7	893
MAX		364	120		257	1832	703	2.20		98			8.45	6	169	399	34	1225
MEAN		337	107		168	1612	598	1.20		81			8.29	5	118	362	21	1088
No. of Analysis	4	4	4	4	4	4	4	4	4	4	4	4	4	3	4	4	4	4
1998**																		
MIN		350	91.0		55.0	1216	495	0.20		65.00			8.12	4.00	58.00	249.0	14.0	812
MAX		372	136.0		399.0	2440	731	1.40		95.00			8.55	7.00	262.00	484.0	49.0	1629
MEAN		361	113.3		187.0	1707.75	619.5	0.67		81.75			8.29	5.75	132.00	385.5	31.0	1161
1997**																		
MIN		335	86		108	1362	487	0		66			8	3	83	165	7	910
MAX		374	133		590	3040	699	0		89			8	6	443	403	13	1910
MEAN		359	108		255	1900	591	0		78			8	5	182	285	10	1243
1996**																		
MIN	13	317	113	12	38	1184	599	0		75			8	6	49	304	6	821
MAX	17	343	125	12	575	3070	775	0		113			8	7	447	442	11	1808
MEAN	15	335	119	12	223	1831	663	0		89			8	7	175	346	9	1195
1995																		
MIN	10	315	86	5	27	970	440	0	0	55	0	5	8	6	44	180	5	650
MAX	10	375	107	15	94	1128	572	1	0	74	0	5	9	8	82	264	10	930
MEAN	10	339	94	10	68	1072	499	0	0	65	0	5	8	7	72	224	8	798
1994																		
MIN	10.0	325	86.0	1.0	19.0	941	430	0.10	0.20	53.00	0.10	5.0	8.06	8.00	37.00	180.0	4.0	579
MAX	10.0	398	108.0	5.0	140.0	1560	607	0.20	1.90	82.00	0.20	5.0	8.81	9.00	114.00	310.0	40.0	980
MEAN	10.0	358	96.2	2.7	61.5	1199	498	0.18	0.90	63.00	0.13	5.0	8.42	8.25	73.00	227.5	16.0	754
1993																		
MIN	0.0	249	95.8	0.0	17.4	590	364	0.05	0.23	30.40	0.06	0.0	7.76	2.10	27.10	120.0	2.0	444
MAX	10.0	362	163.0	1.0	103.7	3280	736	0.22	5.10	93.00	0.10	5.0	8.61	10.00	60.00	370.0	280.0	2109
MEAN	2.5	320	127.0	0.3	46.2	1640	578	0.16	1.90	63.35	0.09	1.6	8.28	6.40	42.60	247.0	78.5	1079
1992																		
MIN	0.1	214	96.0	0.1	25.0	1230	488	0.01	0.07	60.20	0.04	0.1	8.20	3.41	60.80	340.0	8.0	955
MAX	50.0	369	190.8	0.1	365.0	2190	766	0.30	0.34	74.00	0.11	1.1	8.70	10.70	283.70	450.0	58.0	1393
MEAN	12.4	313	154.2	0.1	252.6	1754	665	0.11	0.22	67.86	0.06	0.8	8.42	7.14	207.80	400.0	22.2	1201
1991																		
MIN	<1.0	295	71.4	0.0	25.0	710	385	<0.02	0.09	26.90	<0.02	0.6	7.60	<0.01	25.70	200.0	3.0	565
MAX	22.0	338	205.6	<1.0	735.0	3000	849	0.85	0.86	81.60	0.12	2.3	8.20	12.80	460.50	420.0	247.0	2080
MEAN	7.0	313	151.7	0.8	236.0	1510	629	0.20	0.35	60.70	0.06	1.4	7.90	4.67	148.30	312.0	64.0	1131
HISTORICAL 1979-1998																		
MIN	0.1	117	5.1	0.1	10.0	220	146	0.01	0.01	10.70	0.01	0.1	7.10	0.01	9.00	46.0	0.5	152
MAX	127.0	486	274.0	15.0	4531.0	12000	1165	22.60	2.26	116.80	0.90	27.0	8.81	12.80	3181.00	600.0	9702.0	7160
MEAN	11.5	343	126.6	2.0	260.3	1513.8	624	0.83	0.18	73.89	0.07	2.9	8.02	5.89	192.81	319.6	182.6	953
No. of Analysis	55	62	62	48	64	102	62	101	51	62	89	52	106	62	62	65	99	104

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

** Data: Database input restricted to values greater then laboratory minimum detection limit.

Table 28
EAST MOUNTAIN SPRINGS DISCHARGE
1999

Spring	Date Sampled	Flow (GPM)	Temp. C	Date Sampled	Flow (GPM)	Temp. C	Seasonal Net Change %
Sheba	07/13/1999	6.1	5.5	10/12/1999	1.8	7.3	-70.49
Elk Spring	07/13/1999	309.0	4.4	10/11/1999	73.0	4.5	-76.38
Burnt Tree	07/14/1999	5.0	5.5	10/14/1999	6.0	6.8	20.00
Jerk Water							
Pine Springs							
Pine Sp. Trough							
Ted's Tub	07/19/1999	30.0	4.4	10/12/1999	8.6	4.7	-71.33
79-1							
79-2	07/14/1999	2.2	5.2	10/14/1999	1.7	5.8	-22.73
79-3							
79-4							
79-5							
79-6							
79-7							
79-8							
79-9							
79-10	07/14/1999	20.0	5.6	10/12/1999	6.3	5.9	-68.50
79-11							
79-12	07/19/1999	0.1	est., sheet flow	10/12/1999	dry		
79-13							
79-14							
79-15	07/14/1999	15.0	5.3	10/12/1999	3.8	6.2	-74.67
79-16							
79-17							
79-18							
79-19							
79-20							
79-21							
79-22							
79-23	07/19/1999		dry	10/14/1999	dry		
79-24	07/19/1999		dry	10/14/1999	dry		
79-25							
79-26	07/14/1999	2.7	5.6	10/12/1999	1.5	5.9	-44.44
79-27							
79-28	07/14/1999	1.4	5.4	10/12/1999	1.2	6.5	-14.29
79-29	07/14/1999	1.7	4.4	10/12/1999	1.0	4.8	-41.18
79-30							
79-31							
79-32	07/20/1999	1.0	10.3	10/12/1999	0.6	7.7	-42.00
79-33							
79-34	07/14/1999	8.6	5.0	10/12/1999	est., sheet flow		
79-35	07/14/1999	5.0	4.8	10/12/1999	1.8	5.2	-64.00
79-36							
79-37							
79-38	07/19/1999	5.0	5.4	10/14/1999	2.0	4.9	-60.00
79-39							
79-40	07/20/1999	1.7	4.3	10/14/1999	dry		
80-41	07/20/1999	3.7	3.7	10/14/1999	1.3	3.7	-64.86
80-42							

Table 28
EAST MOUNTAIN SPRINGS DISCHARGE
1999

Spring	Date Sampled	Flow (GPM)	Temp. C	Date Sampled	Flow (GPM)	Temp. C	Seasonal Net Change %
80-43	07/14/1999	0.1	est., sheet flow	10/14/1999	dry		
80-44	07/20/1999	0.1	est., sheet flow	10/14/1999	est., sheet flow		
80-45							
80-46	07/20/1999	2.5	5.0	10/14/1999	est., sheet flow		
80-47	07/20/1999	8.6	4.3	10/14/1999	5.0		-41.86
80-48	07/13/1999	5.3	6.6	10/11/1999	2.1	6.4	-60.38
80-49							
80-50	07/26/1999	2.8	7.5	10/19/1999	0.6	8.1	-77.50
82-51	07/19/1999	0.7	6.3	10/14/1999	0.1	9.3	-80.00
82-52	07/19/1999	12.0	4.4	10/14/1999	4.0	3.6	-66.67
84-53							
84-54							
84-55							
84-56	07/14/1999	0.9	5.2	10/14/1999	0.8	5.2	-10.75
85-57							
86-58							
86-59							
89-60	07/19/1999	12.0	6.8	10/14/1999	1.2	5.3	-90.00
89-61	07/13/1999	150.0	4.5	10/11/1999	30.0	4.8	-80.00
89-62							
89-63							
89-64							
89-65	07/13/1999	3.0	4.8	10/11/1999	0.6	6.0	-80.33
89-66	07/13/1999	4.2	4.7	10/11/1999	0.8	6.9	-80.24
89-67	07/13/1999	12.0	4.9	10/11/1999	3.8	4.3	-68.33
89-68	07/13/1999	2.5	6.4	10/11/1999	0.9	7.6	-65.60
89-69							
89-70							
89-71							
91-72	07/13/1999	10.0	8.7	10/11/1999	9.2	8.3	-8.00
91-73	07/13/1999	0.9	8.3	10/11/1999	1	8.2	8.70

TOTAL FLOW FOR JULY (W\OUT 80-50, 91-72 & 73)	**632.0**	**160.6**	
		Net Change - Average	-53.42
		Net Change - By Volume	-74.59

TOTAL FOR JULY 1998 = 826.6 GPM
JULY 1999 31 % LOWER THAN JULY 1998

Table 29: East Mountain Yearly Spring Discharge Variations (GPM)

July Flow Data

Spring	1983	1984	1985	1986	1987	1988	1989	1990	1991	1992	1993	1994	1995	1996	1997	1998	1999
Burnt Tree	30.5	26.6	26.1	17.5	10.2	12.0	6.4	4.1	2.0	4.0	8.6	7.5	7.5	5.5	8.5	6.8	5.0
Elk Spring	642.3	427.9	390.5	309.7	217.0	217.4	78.5	130.8	176.0	116.8	369.9	46.2	599.3	309.0	235.0	413.0	309.0
Sheba	22.9	19.7	14.4	8.6	11.4	10.4	1.1	8.1	10.1	6.3	11.0	0.9	10.6	14.9	4.8	7.2	6.1
Ted's Tub	89.0	48.0	39.1	31.6	69.0	60.0	5.0	13.0	21.0	13.6	51.0	6.0	76.2	36.7	42.9	83.2	30.0
79-2	9.1	9.7	5.5	2.9	4.0	2.1	2.7	3.9	2.4	2.3	7.5	1.7	2.6	2.0	2.1	2.1	2.2
79-10	37.1	20.0	33.3	26.1	26.1	25.0	7.0	10.2	12.5	10.5	30.0	4.0	30.0	17.6	14.0	24.0	20.0
79-15	42.9	26.1	18.2	18.2	14.6	12.7	2.9	3.0	5.0	4.1	20.7	2.0	33.3	11.0	13.6	18.3	15.0
79-23	20.0	3.6	6.8	0.6	damp	damp	dry	dry	damp	dry	damp	dry	no flow	dry	dry	0.2	dry
79-24	9.3	6.1	5.0	4.3	damp	0.8	dry	dry	dry	dry	damp	dry	0.1	dry	dry	1.0	dry
79-26	20.7	20.0	10.9	8.7	1.5	3.3	0.3	dry	damp	damp	10.0	dry	10.0	0.8	5.0	7.9	2.7
79-29	10.0	6.2	6.0	4.7	2.5	2.6	1.1	1.3	1.7	0.8	2.9	0.7	3.1	1.2	1.0	3.0	1.7
79-32	3.3	3.1	2.7	1.3	1.0	0.6	0.5	damp	no flow	no flow	1.3	damp	1.0	0.6	1.0	2.2	1.0
79-34	56.7	42.9	18.5	16.7	10.5	13.3	dry	dry	0.3	damp	13.0	dry	30.0	7.5	5.5	13.2	8.6
79-35	15.0	10.5	10.5	7.8	6.3	2.7	dry	1.9	4.3	4.4	8.9	0.5	3.0	4.5	8.6	4.6	5.0
79-38	10.9	9.2	4.7	3.6	8.3	10.0	1.1	7.8	6.5	2.3	6.4	0.5	10.0	7.5	4.0	7.5	5.0
79-40	15.0	8.3	5.6	4.7	2.0	5.4	dry	dry	dry	dry	4.0	dry	2.0	0.5	1.4	2.0	1.7
80-41	10.9	15.0	5.8	4.1	2.5	3.9	dry	dry	dry	dry	4.0	dry	2.4	0.5	4.5	5.4	3.7
80-43	24.0	20.0	6.6	3.1	0.4	1.8	dry	dry	dry	dry	2.7	dry	1.5	damp	damp	0.5	0.1
80-44	24.0	13.1	5.5	2.2	dry	0.5	dry	dry	dry	dry	1.4	dry	3.0	damp	0.2	0.5	0.1
80-46	60.0	28.3	18.2	12.0	4.0	6.7	dry	dry	dry	dry	7.5	dry	5.0	damp	4.0	4.6	2.5
80-47	20.0	15.0	12.5	12.2	7.4	9.9	4.6	2.0	1.3	3.3	13.3	2.2	12.6	5.0	9.2	10.5	8.6
82-51	10.0	5.9	3.8	2.6	damp	damp	dry	dry	0.1	damp	3.2	damp	3.0	0.5	2.0	2.1	0.7
82-52	80.0	48.0	32.1	23.3	20.1	21.5	2.6	1.3	1.0	1.0	16.7	2.0	15.0	7.0	12.0	12.0	12.0
84-56	9.6	6.3	4.7	3.7	2.5	2.9	1.6	1.0	0.5	0.6	1.0	0.3	1.0	0.3	0.7	1.7	0.9
Totals	1254.3	839.5	687.0	530.2	421.3	425.5	115.4	188.4	244.7	170.0	595.0	74.5	862.2	432.6	379.9	633.5	441.6

xx No measurement - utilized yearly comparison.

Table 30

Mode 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 he land surface	Contact of permeable beds and the Roans Canyon Fault zone	Mode of Occurrence not identified
Base of Flagstaff		79-6, 79-7, 79-35, 86-58, 89-69	Sheba Springs, 79-1	
North Horn Formation	Ted's 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, 80-53, 84-56, 86-59, 89-62, 89-63, 89-64, 89-65, 89-66, 89-67, 89-68, 89-71		Elk Springs, 79-10, 79-18, 79-19, 79-20, 84-54, 89-61, 89-70	
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, 91-73 Price River Formation Bear Canyon Fault Zone 82-51		Price River 80-49, Blackhawk 91-72	Flagstaff Limestone 79-4, 79-5, Pine Springs Trough Price River Formation 79-24, 79-33, 79-40, 80-41, 80-44, 80-45, 82-52, Jerk Water, 89-60 (Alpine)

TABLE 31: TEMPERATURE COMPARISON

	EAST MOUNTAIN DEPARTURE FROM NORMAL	ELECTRIC LAKE DEPARTURE FROM NORMAL	HUNTER PLANT DEPARTURE FROM NORMAL	HUNTINGTON PLANT DEPARTURE FROM NORMAL
1989				
JAN	-2.1	-4.3	-7.8	-4.8
FEB	-3.5	-6.6	-1.4	-5.7
MAR	5.7	8.1	9.5	3.8
APR	6.0	6.9	9.5	5.7
MAY	4.4	4.0	6.8	0.7
JUN	-4.5	-6.4	5.0	-1.8
1990				
JAN	-2.4	-0.8	3.7	0.9
FEB	-1.1	-4.9	5.2	-2.0
MAR	1.9	7.0	8.7	2.6
APR	2.1	6.3	10.9	4.6
MAY	0.8	3.0	6.8	-1.3
JUN	3.3	4.8	10.9	1.0
1991				
JAN	-1.9	-2.2	-4.5	-4.4
FEB	5.8	0.6	7.5	3.7
MAR	-13.3	-2.5	2.8	-5.8
APR	-5.5	-3.0	1.9	-3.3
MAY	-0.7	-1.8	5.1	-5.1
JUN	-1.2	-0.6	7.7	-2.8
1992				
JAN	-0.4	0.8	-6.2	-1.6
FEB	0.8	7.8	5.5	0.9
MAR	2.2	8.0	8.5	2.9
APR	4.9	11.8	12.6	8.6
MAY	4.5	7.0	11.8	3.3
JUN	-0.5	3.6	7.6	-3.3
1993				
JAN	-3.8	2.7	0.9	-0.8
FEB	-3.5	-2.9	0.5	-4.3
MAR	4.2	-3.6	7.2	-0.5
APR	-2.2	0.1	4.4	-2.0
MAY	4.1	2.8	8.9	1.6
JUN	-3.9	-2.2	5.8	-4.1
1994				
JAN	0.8	2.3	-1.2	6.3
FEB	-3.5	3.2	1.6	-3.5
MAR	6.1	6.6	10.1	5.0
APR	0.0	6.0	4.7	0.2
MAY	4.6	7.2	8.9	2.7
JUN	9.1	4.8	13.4	5.4
1995				
JAN	1.4	1.6	3.9	1.5
FEB	10.3	5.2	11.8	7.4
MAR	3.1	2.4	7.6	0.1
APR	3.4	-0.1	3.4	-2.0
MAY	2.2	-3.9	3.4	-5.5
JUN	1.1	-2.2	2.5	-6.6
1996				
JAN	5.1	2.1	3.5	2.4
FEB	7.7	-0.9	8.4	1.6
MAR	7.5	0.6	7.8	1.5
APR	3.0	2.6	5.4	1.1
MAY	8.5	3.6	8.0	2.2
JUN	8.5	5.2	9.6	1.2
1997				
JAN	-0.9	1.6	0.1	0.3
FEB	0.8	-5.7	-2.3	-4.2
MAR	8.8	6.2	8.1	2.2
APR	1.4	-0.7	3.2	-3.1
MAY	0.0	4.2	10.5	3.5
JUN	4.6	4.9	8.9	-0.6
1998				
JAN	4.2	2.0	6.9	5.4
FEB	-1.5	-3.1	4.6	-2.8
MAR	6.4	2.1	5.7	1.0
APR	0.6	-2.0	0.8	-2.9
MAY	5.0	0.3	5.3	-0.5
JUN	-2.3	-1.1	3.0	-6.1
1999				
JAN	7.8	5.4	8.9	8.0
FEB	4.7	-0.5	7.6	2.1
MAR	7.4	4.1	8.6	6.7
APR	-0.9	-3.7	-1.8	-1.9
MAY	-0.4	-1.0	4.9	-0.1
JUN	1.8	0.2	6.3	-3.1

YEAR	EAST MOUNTAIN	ELECTRIC LAKE	HUNTER PLANT	HUNTINGTON PLANT	TOTAL
1982		-2.8	0.0	1.2	-0.5
1983		-2.7	2.5	1.0	0.3
1984		-2.2	0.5	0.1	-0.5
1985	3.1	0.3	3.0	0.9	1.8
1986	2.9	3.4	6.3	3.2	4.0
1987	1.7	-0.5	3.2	1.1	1.4
1988	-0.2	-0.1	3.5	0.5	0.9
1989	0.0	-0.1	4.1	0.3	1.1
1990	2.3	1.8	7.3	1.2	3.2
1991	-1.9	-1.4	3.8	-2.5	-0.5
1992	1.9	6.5	6.6	1.8	4.2
1993	-0.9	-0.5	4.6	-1.7	0.4
1994	2.9	5.0	6.3	2.7	4.2
1995	3.6	0.5	5.4	-0.9	2.2
1996	6.7	2.2	7.1	1.7	4.4
1997	2.5	1.8	4.8	-0.3	2.2
1998	2.1	-0.3	4.4	-1.0	1.3
1999	3.4	0.8	5.8	2.0	3.0

Table 32
EAST MOUNTAIN
SPRING DISCHARGE RECESSION STUDY
YEAR 1999

SPRING		JUL	AUG	SEP	OCT
79-10	Flow (GPM)	20.0	14.0	7.5	6.3
	Temp. (C)	5.6	5.8	5.8	5.9
SHEBA SPRINGS	Flow (GPM)	6.1	3.9	2.7	1.8
	Temp. (C)	5.5	6.5	7.0	7.3
ELK SPRING	Flow (GPM)	309.0	138.0	103.0	73.0
	Temp. (C)	4.4	4.6	4.6	4.5
79-35	Flow (GPM)	5.0	3.0	2.5	1.8
	Temp. (C)	4.8	4.7	5.3	5.2
79-26	Flow (GPM)	2.7	5.4	1.8	1.5
	Temp. (C)	5.6	5.9	5.7	5.9
79-29	Flow (GPM)	1.7	1.7	1.6	1.0
	Temp. (C)	4.4	4.8	4.9	4.8
84-56	Flow (GPM)	0.9	0.8	0.8	0.8
	Temp. (C)	5.2	5.3	5.7	5.2
80-44	Flow (GPM)	est. < 0.5 gpm	est.<0.5gpm	<0.5gpm	<0.5gpm
	Temp. (C)				
80-46	Flow (GPM)	2.5	1.2	0.3	<0.5gpm
	Temp. (C)	5.0	5.5	7.9	
BURNT TREE	Flow (GPM)	5.0	5.0	5.5	6.0
	Temp. (C)	5.5	6.7	6.9	6.8
79-23	Flow (GPM)	dry	dry	dry	dry
	Temp. (C)				
82-52	Flow (GPM)	12.0	7.6	5.7	4.0
	Temp. (C)	4.4	4.6	4.9	3.6

Table 33: East Mountain Springs Water Quality (Historical vs. 1999) *

PARAMETER	Burnt Tree Historical	Burnt Tree 1999	Elk Spring Historical	Elk Spring 1999	Sheba Spring Historical	Sheba Spring 1999	79-10 Historical	79-10 1999	79-23 Historical	79-23 1999	79-26 Historical	79-26 1999
Elevation	9260		9350		9740		9350		9035		9310	
Geologic Formation	TKn		TKn		Tf		Kpr		TKn		TKn	
Bicarbonate	338	319	293	305	293	307	321	339	413	no	328	344
Calcium	60.9	53.0	64.0	57.0	84.3	80.0	72.6	72.0	79.6	flow	57.0	47.5
Carbonate	1.70	<5	1.77	<5	1.43	<5	1.53	<5	1.00	during	5.25	<5
Chloride	6.4	3.0	5.9	2.0	5.9	2.0	6.8	2.5	11.3	1999	7.5	5.00
Cond.(umhos/cm)	499	507	434	462	434	457	467	509	691		511	516
Hardness	263	248	248	237	246	243	273	274			267	257
Iron	0.20	<0.1	0.17	<0.1	0.17	<0.1	0.19	<.1	0.09		0.14	0.20
Magnesium	27.70	28.00	22.50	23.00	10.30	10.50	21.92	23.00	38.28		29.64	33.50
Mangenese	0.05	<0.1	0.05	<0.1	0.05	<0.1	0.05	<0.1	0.01		0.05	<0.1
pH(units)	7.55	7.52	7.77	8.00	7.52	7.42	7.62	7.71	7.72		8.05	8.26
Potassium	1.55	<1	2.45	<1	2.43	<1	2.79	<1	1.54		1.83	<1
Sodium	14.60	15.50	7.90	5.00	4.40	2.50	4.93	4.00	14.87		16.01	14.00
Sulfate	21.6	11.0	21.5	6.5	20.6	4.0	14.7	6.0	27.2		26.0	9.5
TDS	289	285	254	253	259	260	275	291	364		299	282

PARAMETER	79-29 Historical	79-29 1999	79-35 Historical	79-35 1999	80-44 Historical	80-44 1999	80-46 Historical	80-46 1999	82-52 Historical	82-52 1999	84-56 Historical	84-56 1999
Elevation	9410		9585		8980		9350		8995		9335	
Geologic Formation	TKn		Tf		Kpr		TKn		Kpr		TKn	
Bicarbonate	329	331	304	291	443	no	356	330	422	453	349	339
Calcium	46.2	38.5	83.1	72.5	98.0	flow	61.1	60.0	75.0	71.5	62.0	58.0
Carbonate	1.70	<5	1.64	<5	1.00	during	1.80	<.5	1.83	<5	1.70	<5
Chloride	18.80	15.50	6.08	1.50	10.86	1999	4.80	3.00	11.00	7.50	10.49	7.00
Cond.(umhos/cm)	544	577	434	473	863		546	527	649	719	544	546
Hardness	255	243	269	249	374		281	269	326	339	293	281
Iron	0.56	<0.1	0.13	1.20	0.11		0.10	0.10	0.17	<0.1	0.17	<.1
Magnesium	34.90	35.50	15.66	15.50	41.10		28.75	29.00	34.88	39.00	32.80	33.00
Mangenese	1.13	<0.1	0.05	<0.1	0.02		0.03	<0.1	0.05	<0.1	0.05	<0.1
pH(units)	7.72	7.71	7.74	8.01	7.83		7.42	7.41	7.66	7.61	7.49	7.48
Potassium	2.60	1.00	1.46	<0.1	3.90		0.84	<0.1	1.71	1.00	1.51	<1
Sodium	32.32	31.50	5.31	2.50	35.01		9.72	10.00	26.15	32.50	16.70	15.00
Sulfate	40.4	29.0	25.6	4.0	136.0		16.8	13.0	42.0	43.5	28.0	26.5
TDS	328	317	269	263	530		314	300	385	414	326	328

* Quality parameters reported as mg/l unless otherwise noted

TABLE 34: NEWUA - RILDA CANYON SPRING FLOW (GPM)
MONTHLY MEASUREMENTS

DATE	METER 2	METER 3	METER 4	TOTAL
09/06/1990	20	75	120	215
09/18/1990	15.8	78.9	91	186
11/07/1990	13.3	37.5*	20	71
11/14/1990	14.5	67.4	9.3	91
11-19-90**	13.6	57.7	6.3	78
04/08/1991	10.9	56.5	4.7	72
06/11/1991	10.9	107	136	253.9
07/17/1991	12.5	95	160	267.5
08/19/1991	9.3	95	160	264.3
09/10/1991	9.2	105	140	254.2
10/21/1991	7.5	85	55	147.5
11/20/1991	8	80	16.2	104.2
04/07/1992	8	46	7.7	61.7
05/18/1992	7.5	110	140	257.5
06/12/1992	7	100	180	287
07/20/1992	7	80	150	237
08/14/1992	7.1	90	110	207.1
09/03/1992	6	35	75	116
10/30/1992	5.5	45	2.6	53.1
05/13/1993	6	25	13	44
06/11/1993	8.6	90	150	248.6
07/29/1993	6	110	170	286
08/27/1993	4	96	170	270
09/28/1993	2	60	110	172
10/22/1993	3	30	55	88
05/24/1994	4.6	65	75	144.6
06/16/1994	5	100	160	265
07/18/1994	5.5	100	130	235.5
08/24/1994	2	70	80	152
09/13/1994	2.7	30	20	52.7
10/23/1994	2	30	1.5	33.5
12/14/1995	2	38	***	40
06/28/1995	8	over capacity	***	
07/21/1995	2	over capacity	***	
08/24/1995	4	over capacity		
09/15/1995	2.3	150	***	157.3
10/31/1995			NEWUA conducting maintenance	
11/30/1995	3.3	75	***	78.3
04/02/1996	8	100	***	108
05/17/1996	5	175	***	180
06/11/1996	5.5	175.0'	***	180
07/23/1996	5.5	200.0'	***	205
08/21/1996	4.5	150.0'	***	154.5
09/16/1996	4.5	150.0'	***	154.5
10/23/1996	3.8	80	***	83.8
11/14/1996	4	80	***	84
12/12/1996	4	100	***	104

1996 problems: Valve seating affected flow measurements

	METER 2	METER 3	TOTAL	NEWUA METER
04/28/1997	5.2	150	+ 150 ****	94.0 *****
05/29/1997	6	150	+ 150 ****	230
06/25/1997	6	150	+ 150 ****	300
07/17/1997	6	150	+ 150 ****	270
08/26/1997	5.5	150	+ 150 ****	270
09/15/1997	5.5	150	+ 150 ****	270
10/13/1997	5	150	+ 150 ****	180
11/18/1997	3.9	100	+100.0 ****	160
12/04/1997	4	100	+100.0 ****	150

	METER 2	METER 3	TOTAL	NEWUA METER
04/14/1998	6.7	100		120
05/27/1998	7.5	158		145
06/08/1998	10.3	+100.0 ****		280
07/06/1998	7.5	+100.0 ****		300
08/10/1998	7.1	+100.0 ****		300
09/14/1998	6.0	+100.0 ****		240
10/05/1998	6.0	+100.0 ****		200
11/09/1998	6.7	172		180
12/09/1998	5.0	95		150

	METER 2	METER 3	TOTAL	NEWUA METER
01/12/1999	5.0	120	125+	150
02/02/1999	6.3	90	96+	120
03/03/1999	6.6	80	87+	110
04/13/1999	5.0	65	70+	120
05/11/1999	5.5	100	106+	130
06/15/1999	6.6	150	157+	240
07/26/1999	6.9	170	177+	250
08/12/1999	6.7	200	207+	270
09/16/1999	6.0	200	206+	225
10/05/1999	4.0	200	204	200
11/17/1999	3.2	100	103	130
12/09/1999	2.5	80	83	110

* Flow not stabilized.
** Data collected during pump test.
*** Diverted through Meter 3.
**** Over capacity
***** Meter problems
\+ Meter 3 - Valve would not seat

TABLE 35
NEWUA - RILDA CANYON SPRINGS
AVERAGE WATER QUALITY*

PARAMETER **	METER 2		METER 3		METER 4	
	1999	Historical	1999	Historical	1999	Historical
Bicarbonate	445	432	403	395	Combined with Meter 3 in 1995	356
Calcium	88.8	88.4	76.5	77.6		70.3
Carbonate	<1	1.8		2.1		0.7
Chloride	9.5	11.8	8.3	10.8		13.1
Cond.(umhos/cm)	863	746	762	656		535
Hardness	442	430	388	381		348
Iron	0.20	0.36	0.20	0.15		0.13
Magnesium	53.50	50.74	47.80	45.42		41.90
Mangenese		0.11		0.08		0.08
pH(units)	7.30	7.29	7.39	7.41		7.40
Potassium	2.75	2.61	2.00	1.94		2.13
Sodium	17.50	14.81	15.50	13.30		12.96
Sulfate	132.8	89.2	98.0	71.7		55.4
TDS	538	475	461	417		365

* Quality parameters reported as mg/l unless otherwise noted
** Data: Database input restricted to values greater then laboratory minimum detection limit.
Flow through Meter 4 was combined with Meter 3 in 1995

Table 36

TRAIL MOUNTAIN

SPRING DISCHARGE RECESSION STUDY

YEAR 1999

SPRING		JUL	AUG	SEP	OCT	Seasonal Net Change %
T-6	Flow (GPM)	3.5	3.5	3.3	2.6	-25.7
18-2-1	Temp. (C)	9	8	8	8	
T-8	Flow (GPM)	1.4	1.2	1.0	0.8	-45.0
17-21-1	Temp. (C)	7	7	8	7	
T-9	Flow (GPM)	10.9	12.0	5.5	3.0	-72.5
17-22-1	Temp. (C)	7	7	7	7	
T-10	Flow (GPM)	0.7	0.7	0.5	0.5	-34.3
17-26-4	Temp. (C)	6	6	7	6	
T-14	Flow (GPM)	2.1	1.8	1.0	0.7	-64.8
17-25-1	Temp. (C)	8	9	9	7	
T-14A	Flow (GPM)	DAMP	DAMP	DAMP	DAMP	
17-26-5	Temp. (C)					
T-15	Flow (GPM)	2.3	2.5	2.7	2.0	-13.0
17-35-1	Temp. (C)	10	10	11	9	
T-16	Flow (GPM)	DAMP	DAMP	DAMP	DAMP	
17-35-2	Temp. (C)					
TM-23*	Flow (GPM)	84.4	84.4	49.2**	85.8	1.7
	Temp. (C)	NA	NA	NA	NA	

JULY TOTAL **105.3**

OCTOBER TOTAL **95.37**

Net Change - Average -36.23

Net Change - By Volume -9.43

TOTAL FOR JULY 1998 = 99.6

JULY 1999 5.7% HIGHER THAN JULY 1998

* Gain-Loss : November 10, 1999 98.89 gpm

** Difficulty Sealing Weir @ Below Roans Site

TABLE 37: TRAIL MOUNTAIN YEARLY SPRING DISCHARGE VARIATIONS (GPM)

JULY FLOW DATA

Spring	*1988*	*1989*	*1990*	*1991*	*1992*	*1993* ***	*1994*	*1995*	*1996*	*1997*	*1998*	*1999*
T-6 (18-2-1)	11	0.5	0.5	1.2	0.03	6	1.6	4.1	3.3	7.5	9.8	3.5
T-8 (17-21-1)	4.7	0.2	0.25	Dry	0.14	1.7	0.2	1.7	0.6	0.9	2.1	1.4
T-9 (17-22-1)	8	0.2	0.1	Dry	2.5	40	4	20	8.6	4.8	24	10.9
T-10 (17-26-4)	4.7	Dry	0.15	Dry	Dry	0.4	Damp	0.4	0.2	0.4	0.5	0.7
T-14 (17-25-1)	5	Dry	Dry	Dry	Dry	1.6	Damp	2	0.9	1	2.1	2.1
T-14A (17-26-5)	10	Dry	Dry	Dry	Dry	Dry	Dry	Dry	Dry	Dry	Dry	Damp
T-15 (17-35-1)	2.1	0.2	0.5	0.75	0.33	1.6	0.5	1.2	0.8	1	3.3	2.3
T-16 (17-35-2)	Dry	Dry	Dry	Dry	Dry	Dry	Dry	Dry	Dry	Dry	Damp	Damp
T-23 (17-14-4)	22**	4.0*	Dry	Dry	Dry	Dry	Dry	Dry	Dry	Dry	57.8****	84.4
TOTAL	67.5	5.1	1.5	1.95	2.67	51.3	6.3	29.4	14.4	15.6	99.6	105.3

* August measurement

** September measurement

*** First year monitored by PacifiCorp

**** Cottonwood Creek Gain/Loss Survey - November 10, 1998

Table 38: Trail Mountain Springs Water Quality (Historical vs. 1998) *

PARAMETER	18-2-1 Historical	18-2-1 1999	17-21-1 Historical	17-21-1 1999	17-22-1 Historical	17-22-1 1999	17-26-4 Historical	17-26-4 1999	17-25-1 Historical	17-25-1 1999	17-26-5 ** Historical	17-26-5 ** 1999
Elevation	8395		9320		9210		8880		8155		9080	
Geologic Formation	TKn		TKn		TKn		TKn		Kcg		TKn	
Bicarbonate	403	407	399	396	340	306	395	420	469	509	399	no
Calcium	61.1	58.5	53.1	50.0	48.7	41.5	55.6	52.0	85.6	96.5	77.5	flow
Carbonate	1.48	<5	1.53	<5	3.41	<5	8.33	<5	3.50	<5	<5	during
Chloride	46.4	42.0	31.0	31.5	10.9	8.5	28.0	32.0	34.7	19.00	20.0	1999
Cond.(umhos/cm)	934	966	704	694	545	678	703	740	1224	926	849	
Hardness	383	373	245	232	267	236	336	328	487	458	429	
Iron	0.18	<0.1	0.11	<0.1	0.30	<0.1	1.43	0.35	0.13	18.70	0.45	
Magnesium	56.00	55.00	28.21	26.00	35.37	32.00	47.46	48.00	60.95	52.50	58.68	
Mangenese	0.05	<0.1	0.06	<0.1	0.07	<0.1	0.11	<0.1	0.04	0.60	0.02	
pH(units)	7.79	7.56	7.65	7.42	7.73	7.61	8.02	8.10	7.79	7.88	7.79	
Potassium	1.70	<1	2.11	1.50	1.69	<1	1.85	1.00	2.61	1.00	1.84	
Sodium	66.10	67.50	61.10	63.00	22.62	15.00	33.07	36.00	80.68	26.00	31.70	
Sulfate	132.2	154.5	18.2	16.0	21.2	13.0	33.3	32.5	243.4	174.0	141.7	
TDS	573	579	397	386	307	270	394	408	754	596	512	

PARAMETER	17-35-1 Historical	17-35-1 1999	17-35-2 Historical	17-35-2 1999	17-14-4 Historical	17-14-4 1999
Elevation	8880		9000		7880	
Geologic Formation	TKn		TKn		Alluvium	
Bicarbonate	385	422	No	No	362	No
Calcium	41.7	41.5	Historical	Flow	65.9	Samples
Carbonate	5.71	<5	Flow	During		During
Chloride	42.44	42.50		1999	13.91	1999
Cond.(umhos/cm)	766	811			641	
Hardness	252	242			346	
Iron	0.67	<0.1			0.19	
Magnesium	36.50	33.50			43.95	
Mangenese	0.08	<0.1			0.02	
pH(units)	8.00	7.93			7.77	
Potassium	1.60	1.00			1.95	
Sodium	77.10	87.00			15.83	
Sulfate	45.2	44.5			61.8	
TDS	439	463			385	

TRAIL MOUNTAIN SPRINGS
CROSS REFERENCE

ARCO'S	ENERGY WEST
T-6	18-2-1
T-8	17-21-1
T-9	17-22-1
T-10	17-26-4
T-14	17-25-1
T-14A	17-26-5
T-15	17-35-1
T-16	17-35-2
TM-23	17-14-4

* Quality parameters reported as mg/l unless otherwise noted
** High TSS, Elevated Total Iron

TABLE 39: DEER CREEK IN-MINE WATER QUALITY *

1999*** SAMPLE DATES	ALKALINITY BICARBONATE	CALCIUM	CARBONATE	CHLORIDE	CONDUCTIVITY (umhos/cm)	HARDNESS	IRON DISSOLVED	MAGNESIUM	MANGANESE	PH (units)	POTASSIUM	SODIUM	SULFATE	TDS
TW-10														
3-99	383	70		4	644	319		35		7.34	1	14	46	367
6-99	388	71		4	634	330		37		7.27	1	15	43	333
9-99	384	70		4	629	323		36		7.3	1	14	44	353
12-99	374	70		5	639	319		35		7.24	1	14	43	362
1999* **														
MIN	374	70		4	629	319		35		7.24	1.00	14	43	333
MAX	388	71		5	644	330		37		7.34	1.00	15	46	367
MEAN	382	70		4	637	323		36		7.29	1.00	14	44	354
No. of Analysis	4	4	4	4	4	4	4	4	4	4	4	4	4	4
HISTORICAL 1988-1998														
MIN	279	61.3	0.1	0.4	450	279	0.01	18.70	0.01	6.60	0.01	9.81	27.00	313
MAX	714	211.0	5.0	30.0	950	732	1.17	77.10	1.21	8.40	5.00	55.03	350.00	505
MEAN	385	81.7	1.6	9.3	613	362	0.17	36.19	0.09	7.45	1.51	16.01	54.30	378
No. of Analysis	43	43	28	42	43	43	29	43	30	41	41	43	43	43
MN-ME**														
3-99	442	91		7	798	421		47		7.83	3	18	110	491
6-99	444	93		6	812	430		48		7.86	3	19	104	482
9-99	456	96		6	823	437		48		7.63	3	18	110	499
12-99	444	93		7	814	422		46		7.73	3	17	103	504
1999* **														
MIN	442	91.0		6	798	421		46.00		7.63	3.00	17.0	103	482
MAX	456	96.0		7	823	437		48.00		7.86	3.00	19.0	110	504
MEAN	447	93.3		6.5	811.75	427.5		47.25		7.76	3.00	18.0	106.75	494
No. of Analysis	4	4	4	4	4	4	4	4	4	4	4	4	4	4
HISTORICAL 1991-1998														
MIN	355.0	69.0	0.1	4	500	329.00	0.01	38.00	0.01	6.90	0.74	15.0	40	240
MAX	469	100.0	5.0	25.0	897	432	2.81	49.60	0.20	7.99	14.00	37.16	110.0	520
MEAN	416	85.5	2.0	9.6	734.7	390.7	0.26	43.02	0.07	7.52	3.22	19.10	81.6	451
No. of Analysis	30	30	15	30	30	30	17	30	17	29	30	30	30	30

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

**** Sample site intiated during 1991.**

***** 1997 Data: Database input restricted to values greater then laboratory minimum detection limit.**

TABLE 40: DEER CREEK MINE - DISCHARGE WATER QUALITY*

	1999**				Historical - (1976-1998)			
Parameters	*Minimum*	*Maximum*	*Mean*	*No. of Analysis*	*Minimum*	*Maximum*	*Mean*	*No. of Analysis*
pH (units)	7.13	7.55	7.38	13	6.76	8.51	7.57	288
Acidity	10	25	15.88	13	0.1	97	13.04	252
Chloride	9	86	33.62	13	0.7	63	19.4	272
Conductivity (umhos/cm)	841	1203	974	13	480	1900	919	281
Iron	0.6	1.1	0.84	13	0.01	7.53	0.58	277
Oil & Grease	Visal Observation - No Samples During 1999				0.1	48.8	3.21	238
Sulfate	112	191	152.8	13	13	518	210	280
TDS	516	693	589	13	289	1111	610	287
TSS	5	32	13	13	0.1	2784	60.3	287

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

** Data: Database input restricted to values greater than laboratory minimum detection limit.

TABLE 41: WILBERG/COTTONWOOD IN-MINE WATER QUALITY *

1999** SAMPLE DATES	ALKALINITY BICARBONATE	CALCIUM	CARBONATE	CHLORIDE	CONDUCTIVITY (umhos/cm)	HARDNESS	IRON DISSOLVED	MAGNESIUM	MANGANESE	PH (units)	POTASSIUM	SODIUM	SULFATE	TDS
2S XC-11														
3-99	611	169		13	1528	871		109		7.00	5	22	462	1120
6-99	584	161		12	1475	866		110		7.48	4	23	432	1094
9-99	540	146		11	1367	764		97		8.07	4	18	370	1044
12-99	629	169		12	1523	887		113		7.07	4	26	327	1132
1999**														
MIN	540	146		11	1367	764		97		7.00	4.00	18	327	1044
MAX	629	169		13	1528	887		113		8.07	5.00	26	462	1132
MEAN	591	161		12	1473	847		107		7.41	4.25	22	398	1098
No. of Analysis	4	4	4	4	4	4	4	4	4	4	4	4	4	4
HISTORICAL 1983-1998														
MIN	403	116.0	0.1	9.6	1000	725	0.01	5.40	0.01	6.50	0.30	5.80	250.0	664
MAX	676	330.0	5.0	160.0	2600	1022	0.30	134.40	0.20	8.05	7.40	36.90	690.0	1328
MEAN	556	172.0	1.6	21.9	1488	869	0.10	105.20	0.05	7.25	4.24	22.59	411.4	1030
No. of Analysis	48	51	32	50	51	48	35	51	36	51	50	51	51	51
TMA XC-32														
3-99	465	120		10	1206	613	0.7	76		7.17	8	40	348	846
6-99	459	118		10	1185	595		73		7.08	9	42	313	828
9-99	450	114		9	1171	581	0.7	72		7.03	8	36	284	816
12-99	461	114		10	1187	585		73		7.19	8	43	256	816
1999**														
MIN	450	114		9	1171	581		72		7.03	8	36	256	816
MAX	465	120		10	1206	613		76		7.19	9	43	348	846
MEAN	459	117		10	1187	594		74		7.12	8.3	40	300	827
No. of Analysis	4	4	4	4	4	4	4	4	4	4	4	4	4	4
HISTORICAL 1983-1998														
MIN	379	114	1	7	1203	581	0.10	72	0.10	7.05	6	33	327	825
MAX	467	133	5	17	1352	688	0.20	90	0.20	8.20	10	44	491	993
MEAN	432	125	4	13	1285	636	0.14	79	0.11	7.38	7	38	375	908
No. of Analysis	20	20	8	20	20	20	9	20	8	20	20	20	20	20

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

**** 1997 Data: Database input restricted to values greater then laboratory minimum detection limit.**

TABLE 42 : WILBERG/COTTONWOOD - DISCHARGE WATER QUALITY

GRIMES WASH

	1999				Historical - (1976-1998)			
	Min	Max	Mean	No. of Analysis	Min	Max	Mean	No. of Analysis
pH	7.75	7.93	7.83	13	6.9	8.47	7.69	241
Acidity	10	10	10	13	0.1	62	10.37	189
Bicarb. Alkalinity	329	383	360	13	190	539	365.4	145
Chloride	15	32	20.46	13	0.6	80	16.8	219
Conductivity	1140	1210	1176	13	490	1590	1009	174
Iron	0.2	0.2	0.2	13	0.01	3	0.33	227
Oil & Grease	Visal Observation - No Samples During 1999				0.1	23.8	2.3	193
Sulfate	335	405	377	13	29.2	600	250.6	221
TDS	804	919	856	13	407	1287	648	242
TSS	5	5	5	13	0.1	222	7.6	244

MILLER CANYON

	1999				Historical - (1984-1998)			
	Min	Max	Mean	No. of Analysis	Min	Max	Mean	No. of Analysis
pH	No Discharge During 1999				6.4	8.83	7.3	81
Acidity					0.1	100	22.45	72
Bicarb. Alkalinity					267	543	408.7	79
Chloride					10	155	22.14	77
Conductivity					480	1900	1216	81
Iron					0.01	1.38	0.24	79
Oil & Grease					0.1	7.2	2.1	71
Sulfate					200	680	419.3	79
TDS					413	1182	926	81
TSS					0.1	32	4.8	109

TABLE 43: TRAIL MOUNTAIN IN-MINE WATER QUALITY *

1999** SAMPLE DATES	ALKALINITY BICARBONATE	CALCIUM	CARBONATE	CHLORIDE	CONDUCTIVITY (umhos/cm)	HARDNESS	IRON DISSOLVED	MAGNESIUM	MANGANESE	PH (units)	POTASSIUM	SODIUM	SULFATE	TDS
UG-3														
3-99	316	34		9	549	200		28		8.18	4	40	32	300
6-99	311	35		7	516	207		29		8.14	4	40	26	302
9-99	308	32		8	516	195		28		8.15	4	33	24	279
12-99	322	34		9	521	196		27		8.21	3	44	24	291
1999**														
MIN	308	32.0		7	516	195		27		8.14	3	33	24	279
MAX	322	35.0		9	549	207		29		8.21	4	44	32	302
MEAN	314	33.8		8	526	200		28		8.17	4	39	27	293
No. of Analysis	4	4	4	4	4	4	4	4	4	4	4	4	4	4
HISTORICAL 1985 - 98														
MIN	260	26.0	0.1	2	380	151	0.03	20	0.03	7.41	2	39	15	252
MAX	344	49.3	25.0	16	696	222	0.20	29	0.20	8.48	5	61	130	424
MEAN	302	34.5	7.3	9	543	188	0.12	25	0.10	8.08	4	48	35	311
No. of Analysis	32	32	13	32	32	32	13	32	11	32	32	32	32	32

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

** Data: Database input restricted to values greater then laboratory minimum detection limit.

TABLE 44 : TRAIL MOUNTAIN - DISCHARGE WATER QUALITY

@ COTTONWOOD CANYON PORTALS

	1999				Historical			
	Min	Max	Mean	No. of Analysis	Min	Max	Mean	No. of Analysis
pH	8.07	8.53	8.3	18	7.89	8.49	8.26	19
Acidity				12				19
Bicarb. Alkalinity	802	922	860	12	596	836	746	19
Chloride	6	31	28.3	12	10	410	48.3	19
Conductivity	1477	1655	1589	12	1314	1570	1458.6	20
Iron	0.5	0.3	0.46	20	0.5	2.3	1.01	20
Oil & Grease	Visal Observation - No Samples During 1999				2	2	2	1
Sulfate	128	193	150	12	50	277	159	18
TDS	937	1072	1021	20	824	1030	940	19
TSS	5	20	9.6	11	6	42	13.9	17

OLIPHANT PORTALS

	1999				Historical			
	Min	Max	Mean	No. of Analysis	Min	Max	Mean	No. of Analysis
pH	7.65	7.97	7.82	4	7.63	8.91	8.21	34
Acidity				4	1	10	6.25	12
Bicarb. Alkalinity	279	290	284	4	214	327	282	34
Chloride	6	7.5	6.25	4	5.9	21	9	34
Conductivity	626	643	636	4	482	925	663	31
Iron				4	0.01	0.7	0.16	23
Oil & Grease				4	0.4	5	4.4	8
Sulfate	110	119	116	4	90	174	119	34
TDS	373	397	389	4	354	584	416	34
TSS				4	1	90	22.6	23

TABLE 45: WELLS - WATER QUALITY *

1999** SAMPLE DATES	ALKALINITY BICARBONATE	CALCIUM	CARBONATE	CHLORIDE	CONDUCTIVITY (umhos/cm)	HARDNESS	IRON DISSOLVED	MAGNESIUM	MANGANESE	PH (units)	POTASSIUM	SODIUM	SULFATE	TDS
						DEER CREEK - DCWR-1								
3-99	788	123		817	21300	1110	0.1	195		7.75	14	5890	13073	19473
6-99	793	118		775	21000	1011		174		7.58	15	5705	12229	19446
9-99	803	111		776	20900	994		174		7.78	13	5420	11783	19164
12-99	781	128		801	20800	1020		170		7.73	14	5560	11746	19061
1999**														
MIN	781	111		775	20,800	994		170		7.58	13	5,420	11,746	19,061
MAX	803	128		817	21,300	1110		195		7.78	15	5,890	13,073	19,473
MEAN	791	120		792	21,000	1034		178		7.71	14	5,644	12,208	19,286
No. of Analysis	4	4	4	4	4	4	4	4	4	4	4	4	4	4
HISTORICAL 1989-1998:														
MIN	626	113	0	17	17,300	546	0.05	47	0.01	7.34	11	5,165	6,000	11,466
MAX	935	880	15	1140	45,000	3351	1.74	351	0.20	8.21	44	9,978	18,000	24,189
MEAN	770	215	2	775	24,443	1459	0.32	223	0.07	7.75	20	6,898	13,132	21,058
No. of Analysis	39	40	28	40	40	40	25	40	28	40	40	40	40	39
						WILBERG/COTTONWOOD - WCWR-1								
3-99	241	202		1952	12700	2325		442		7.74	17	2440	3713	10266
6-99	299	277		2721	15070	3055		574		7.97	23	2900	5918	12636
9-99	346	317		2863	17020	3369		626		7.64	26	3255	6566	14633
12-99	350	351		2940	17040	3907		736		7.55	29	3780	7031	15500
1999**														
MIN	241	202		1952	12,700	2325		442		7.55	17.0	2,440	3,713	10,266
MAX	350	351		2940	17,040	3907		736		7.97	29.0	3,780	7,031	15,500
MEAN	309	287		2619	15,458	3164		595		7.73	23.8	3,094	5,807	13,259
No. of Analysis	4	4	4	4	4	4	4	4	4	4	4	4	4	4
HISTORICAL 1989-1998:														
MIN	233	132	0	280	10,666	1629	0.05	138	0.02	6.90	8.0	851	750	8,492
MAX	864	1135	10	4020	120,000	8327	9.00	1717	2.48	8.33	119.1	8,812	24,000	30,440
MEAN	442	373	2	2091	27,300	3908	0.75	709	0.36	7.66	39.7	4,776	10,396	18,068
No. of Analysis	36	36	26	36	36	36	23	36	30	36	36	36	36	36
						TRAIL MOUNTAIN TM-1B								
3-99	438	10	7	37	800	66		10		8.45	3	171	14	473
6-99	444	10	7	37	798	62		9		8.39	2	173	13	469
9-99	446	10		35	802	66		10		8.42	2	161	12	475
12-99	435	10	14	35	807	62		9		8.45	3	166	10	460
1999**														
MIN	435	10		35	798	62		9.0		8.39	2.0	161	10	460
MAX	446	10		37	807	66		10.0		8.45	3.0	173	14	475
MEAN	441	10		36	802	64		9.5		8.43	2.5	168	12	469
No. of Analysis	4	4	4	4	4	4	4	4	4	4	4	4	4	4
HISTORICAL 1985-1998:														
MIN	304	2.4	1	16	790	7	0.05	1.0	0.01	8.20	1.0	5	2	450
MAX	1015	14.0	164	717	4,580	72	0.20	10.7	0.20	9.55	15.7	1,316	664	3,290
MEAN	691	6.7	65	131	1,658	39	0.14	5.7	0.08	8.64	3.7	386	57	990
No. of Analysis	17	17	8	17	16	16	4	16	5	17	17	17	17	17

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

**** Data: Database input restricted to values greater than laboratory minimum detection limit.**

APPENDIX A

1999

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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	25660.00	25400.00	25166.00	24547.00	24191.00	23820.00	23720.00	23861.00	30124.00	31501.00	31182.00	29408.00	1
2	25656.00	25397.00	25159.00	24528.00	24176.00	23798.00	23716.00	23880.00	30445.00	31491.00	31135.00	29341.00	2
3	25648.00	25385.00	25143.00	24524.00	24149.00	23790.00	23723.00	23954.00	30714.00	31486.00	31112.00	29279.00	3
4	25648.00	25377.00	25135.00	24524.00	24134.00	23783.00	23727.00	23992.00	30952.00	31481.00	31032.00	29208.00	4
5	25628.00	25369.00	25128.00	24501.00	24127.00	23775.00	23727.00	24040.00	31149.00	31467.00	30980.00	29142.00	5
6	25616.00	25373.00	25112.00	24478.00	24116.00	23768.00	23727.00	24074.00	31339.00	31458.00	30933.00	29067.00	6
7	25605.00	25357.00	25100.00	24467.00	24104.00	23768.00	23727.00	24123.00	31529.00	31458.00	30882.00	28983.00	7
8	25593.00	25373.00	25085.00	24448.00	24078.00	23760.00	23723.00	24198.00	31663.00	31458.00	30835.00	28826.00	8
9	25581.00	25381.00	25062.00	24437.00	24063.00	23749.00	23723.00	24308.00	31735.00	31458.00	30821.00	28669.00	9
10	25565.00	25365.00	25038.00	24414.00	24063.00	23753.00	23723.00	24395.00	31768.00	31458.00	30760.00	28517.00	10
11	25550.00	25341.00	25008.00	24395.00	24063.00	23753.00	23723.00	24456.00	31764.00	31443.00	30751.00	28370.00	11
12	25534.00	25350.00	24973.00	24380.00	24055.00	23753.00	23723.00	24486.00	31764.00	31434.00	30695.00	28212.00	12
13	25522.00	25338.00	24942.00	24361.00	24040.00	23746.00	23723.00	24543.00	31759.00	31434.00	30621.00	28054.00	13
14	25506.00	25334.00	24907.00	24349.00	24029.00	23742.00	23716.00	24627.00	31730.00	31429.00	30561.00	27918.00	14
15	25487.00	25326.00	24884.00	24334.00	24018.00	23738.00	23697.00	24711.00	31721.00	31443.00	30491.00	27719.00	15
16	25475.00	25318.00	24853.00	24323.00	23996.00	23734.00	23686.00	24792.00	31716.00	31443.00	30422.00	27500.00	16
17	25455.00	25311.00	24826.00	24312.00	23981.00	23720.00	23675.00	24861.00	31706.00	31439.00	30358.00	27275.00	17
18	25447.00	25303.00	24803.00	24289.00	23969.00	23716.00	23668.00	24988.00	31697.00	31434.00	30293.00	27052.00	18
19	25428.00	25287.00	24780.00	24289.00	23958.00	23712.00	23675.00	25174.00	31682.00	31420.00	30239.00	26834.00	19
20	25420.00	25275.00	24757.00	24285.00	23943.00	23712.00	23709.00	25416.00	31658.00	31420.00	30170.00	26613.00	20
21	25408.00	25264.00	24738.00	24308.00	23924.00	23709.00	23727.00	25691.00	31644.00	31424.00	30111.00	26396.00	21
22	25408.00	25252.00	24734.00	24300.00	23928.00	23705.00	23731.00	25993.00	31625.00	31429.00	30038.00	26177.00	22
23	25400.00	25244.00	24727.00	24289.00	23917.00	23705.00	23738.00	26374.00	31615.00	31424.00	29965.00	25961.00	23
24	25393.00	25236.00	24723.00	24281.00	23898.00	23705.00	23742.00	26805.00	31596.00	31415.00	29906.00	25751.00	24
25	25397.00	25225.00	24677.00	24259.00	23883.00	23709.00	23753.00	27238.00	31586.00	31410.00	29843.00	25538.00	25
26	25412.00	25213.00	24661.00	24259.00	23865.00	23709.00	23760.00	27647.00	31567.00	31396.00	29775.00	25326.00	26
27	25420.00	25163.00	24639.00	24247.00	23854.00	23709.00	23772.00	28075.00	31558.00	31377.00	29717.00	25116.00	27
28	25416.00	25194.00	24623.00	24236.00	23839.00	23709.00	23798.00	28513.00	31539.00	31339.00	29658.00	24911.00	28
29	25412.00	25182.00	24597.00	24229.00	0.00	23709.00	23831.00	28975.00	31529.00	31306.00	29591.00	24704.00	29
30	25412.00	25174.00	24566.00	24221.00	0.00	23712.00	23846.00	29426.00	31510.00	31272.00	29524.00	24497.00	30
31	25408.00	0.00	24547.00	24202.00	0.00	23716.00	0.00	29807.00	0.00	31230.00	29475.00	0.00	31
MONTHLY CHANGE	0.	-234.	-627.	-345.	-363.	-123.	130.	5961.	1703.	-280.	-1755.	-4978.	

OCT98-SEPT99 TOTAL CHANGE -911. MAX CONTENTS 31768. AC FT JUN 10 MIN CONTENTS 23668. AC FT APR 18

TOTAL CHANGE MAX CONTENTS MIN CONTENTS

REMARKS:

Note: The low elevation for the year was 246.49, recorded on 4/19/99. The high elevation for the year was 275.75, was recorded on 6/10/99.

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UTAH POWER & LIGHT COMPANY

DAILY GAGE HEIGHT (FEET)

DAY	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	DAY
1	261.70	261.04	260.44	258.83	257.89	256.90	256.63	257.01	272.24	275.19	274.52	270.65	1
2	261.69	261.03	260.42	258.78	257.85	256.84	256.62	257.06	272.94	275.17	274.42	270.50	2
3	261.67	261.00	260.38	258.77	257.78	256.82	256.64	257.26	273.52	275.16	274.37	270.36	3
4	261.67	260.98	260.36	258.77	257.74	256.80	256.65	257.36	274.03	275.15	274.20	270.20	4
5	261.62	260.96	260.34	258.71	257.72	256.78	256.65	257.49	274.45	275.12	274.09	270.05	5
6	261.59	260.97	260.30	258.65	257.69	256.76	256.65	257.58	274.85	275.10	273.99	269.88	6
7	261.56	260.93	260.27	258.62	257.66	256.76	256.65	257.71	275.25	275.10	273.88	269.69	7
8	261.53	260.97	260.23	258.57	257.59	256.74	256.64	257.91	275.53	275.10	273.78	269.33	8
9	261.50	260.99	260.17	258.54	257.55	256.71	256.64	258.20	275.68	275.10	273.75	268.97	9
10	261.46	260.95	260.11	258.48	257.55	256.72	256.64	258.43	275.75	275.10	273.62	268.62	10
11	261.42	260.94	260.03	258.43	257.55	256.72	256.64	258.59	275.74	275.07	273.60	268.28	11
12	261.38	260.91	259.94	258.39	257.53	256.72	256.64	258.67	275.74	275.05	273.48	267.91	12
13	261.35	260.88	259.86	258.34	257.49	256.70	256.64	258.82	275.73	275.05	273.32	267.54	13
14	261.31	260.87	259.77	258.31	257.46	256.69	256.62	259.04	275.67	275.04	273.19	267.22	14
15	261.26	260.85	259.71	258.27	257.43	256.68	256.57	259.26	275.65	275.07	273.04	266.75	15
16	261.23	260.83	259.63	258.24	257.37	256.67	256.54	259.47	275.64	275.07	272.89	266.23	16
17	261.18	260.81	259.56	258.21	257.33	256.63	256.51	259.65	275.62	275.06	272.75	265.69	17
18	261.16	260.79	259.50	258.15	257.30	256.62	256.49	259.98	275.60	275.05	272.61	265.15	18
19	261.11	260.75	259.44	258.15	257.27	256.61	256.51	260.46	275.57	275.02	272.49	264.62	19
20	261.09	260.72	259.38	258.14	257.23	256.61	256.60	261.08	275.52	275.02	272.34	264.08	20
21	261.06	260.69	259.33	258.20	257.18	256.60	256.65	261.78	275.49	275.03	272.21	263.54	21
22	261.06	260.66	259.32	258.18	257.19	256.59	256.66	262.54	275.45	275.04	272.05	263.00	22
23	261.04	260.64	259.30	258.15	257.16	256.59	256.68	263.49	275.43	275.03	271.89	262.46	23
24	261.02	260.62	259.29	258.13	257.11	256.59	256.69	264.55	275.39	275.01	271.76	261.93	24
25	261.03	260.59	259.17	258.07	257.07	256.60	256.72	265.60	275.37	275.00	271.62	261.39	25
26	261.07	260.56	259.13	258.07	257.02	256.60	256.74	266.58	275.33	274.97	271.47	260.85	26
27	261.09	260.43	259.07	258.04	256.99	256.60	256.77	267.59	275.31	274.93	271.34	260.31	27
28	261.08	260.51	259.03	258.01	256.95	256.60	256.84	268.61	275.27	274.85	271.21	259.78	28
29	261.07	260.48	258.96	257.99	0.00	256.60	256.93	269.67	275.25	274.78	271.06	259.24	29
30	261.07	260.46	258.88	257.97	0.00	256.61	256.97	270.69	275.21	274.71	270.91	258.70	30
31	261.06	0.00	258.83	257.92	0.00	256.62	0.00	271.54	0.00	274.62	270.80	0.00	31

MAXIMUM GAGE HEIGHT 275.75 JUN 10 MINIMUM GAGE HEIGHT 256.49 APR 18

NOTE: ADD 8300 FEET TO GAGE HEIGHT TO OBTAIN ELEVATION

ENG0006A HUNTINGTON CREEK BELOW ELECTRIC LAKE OCT98-SEPT99 PAGE 1

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	20.00	16.00	14.00	15.00	15.00	15.00	13.00	31.00	17.00	25.00	36.00	44.00	1
2	13.00	16.00	14.00	15.00	15.00	12.00	13.00	31.00	17.00	20.00	36.00	44.00	2
3	17.00	13.00	14.00	15.00	15.00	12.00	13.00	31.00	16.00	18.00	36.00	44.00	3
4	17.00	13.00	14.00	15.00	15.00	12.00	13.00	12.00	15.00	17.00	36.00	44.00	4
5	17.00	13.00	14.00	15.00	15.00	12.00	13.00	11.00	15.00	16.00	36.00	43.00	5
6	17.00	13.00	14.00	15.00	15.00	12.00	13.00	11.00	15.00	15.00	36.00	43.00	6
7	17.00	13.00	14.00	15.00	15.00	12.00	13.00	14.00	28.00	21.00	36.00	52.00	7
8	17.00	13.00	19.00	15.00	15.00	12.00	13.00	19.00	59.00	36.00	36.00	70.00	8
9	18.00	14.00	25.00	15.00	15.00	12.00	13.00	19.00	81.00	36.00	36.00	77.00	9
10	19.00	14.00	25.00	15.00	15.00	12.00	13.00	18.00	92.00	36.00	39.00	77.00	10
11	19.00	14.00	25.00	15.00	15.00	12.00	13.00	26.00	93.00	36.00	36.00	76.00	11
12	19.00	14.00	25.00	15.00	15.00	12.00	13.00	41.00	89.00	36.00	36.00	76.00	12
13	19.00	14.00	25.00	15.00	15.00	12.00	17.00	46.00	84.00	36.00	36.00	76.00	13
14	19.00	14.00	25.00	15.00	15.00	12.00	25.00	49.00	84.00	36.00	36.00	80.00	14
15	19.00	14.00	25.00	15.00	15.00	12.00	25.00	41.00	71.00	36.00	36.00	85.00	15
16	19.00	14.00	25.00	15.00	15.00	12.00	25.00	41.00	71.00	36.00	40.00	89.00	16
17	19.00	14.00	25.00	15.00	15.00	12.00	25.00	22.00	70.00	36.00	39.00	99.00	17
18	19.00	14.00	25.00	15.00	15.00	12.00	25.00	19.00	68.00	36.00	39.00	101.00	18
19	19.00	14.00	25.00	15.00	15.00	12.00	25.00	18.00	63.00	36.00	42.00	100.00	19
20	17.00	14.00	25.00	15.00	15.00	12.00	29.00	18.00	58.00	36.00	44.00	94.00	20
21	16.00	14.00	25.00	15.00	15.00	12.00	34.00	18.00	54.00	36.00	44.00	79.00	21
22	16.00	14.00	20.00	15.00	15.00	12.00	34.00	18.00	49.00	36.00	44.00	101.00	22
23	16.00	14.00	15.00	15.00	15.00	12.00	32.00	18.00	47.00	36.00	44.00	95.00	23
24	16.00	14.00	15.00	15.00	15.00	12.00	29.00	18.00	44.00	36.00	44.00	94.00	24
25	16.00	14.00	15.00	15.00	15.00	12.00	29.00	18.00	41.00	36.00	44.00	94.00	25
26	16.00	14.00	15.00	15.00	15.00	12.00	29.00	18.00	38.00	36.00	44.00	94.00	26
27	16.00	14.00	15.00	15.00	15.00	12.00	30.00	18.00	35.00	36.00	44.00	93.00	27
28	16.00	14.00	15.00	15.00	15.00	12.00	31.00	18.00	33.00	36.00	44.00	90.00	28
29	16.00	14.00	13.00	15.00	0.00	12.00	31.00	18.00	30.00	36.00	44.00	33.00	29
30	16.00	14.00	21.00	15.00	0.00	12.00	31.00	18.00	29.00	36.00	44.00	8.60	30
31	16.00	0.00	18.00	15.00	0.00	12.00	0.00	18.00	0.00	36.00	44.00	0.00	31
MONTHLY													
TOT	536.00	418.00	604.00	465.00	420.00	375.00	662.00	716.00	1506.00	996.00	1231.00	2195.60	
MEA	17.30	13.90	19.50	15.00	15.00	12.10	22.10	23.10	50.20	32.10	39.70	73.20	
MAX	20.00	16.00	25.00	15.00	15.00	15.00	34.00	49.00	93.00	36.00	44.00	101.00	
MIN	13.00	13.00	13.00	15.00	15.00	12.00	13.00	11.00	15.00	15.00	36.00	8.60	
ACR FT	1060.00	829.00	1200.00	922.00	833.00	744.00	1310.00	1420.00	2990.00	1980.00	2440.00	4350.00	

OCT98-SEPT99 TOTAL 10124.60 MEAN 27.70 MAX 101.00 MIN 8.60 TOT ACR FT 20080.00

TOTAL MEAN MAX MIN TOT ACR FT

MAX UNIT DISCHARGE 102.00 CFS DATE SEP 21 MIN UNIT DISCHARGE 8.60 CFS DATE SEP 30
(2.12 FT)

REMARKS:

Utah Power & Light Company
Stream Discharge Records
Huntington Creek at Plant 1998-1999
Daily Discharge (CFS)

Day	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Day
1	86	131	37	41	17	28	29	60	249	157	92	69	1
2	86	130	34	36	18	27	27	67	305	192	90	73	2
3	92	124	33	33	22	26	28	77	294	180	89	78	3
4	94	121	33	34	23	25	28	65	270	173	88	78	4
5	92	120	27	34	26	23	26	51	243	169	83	78	5
6	103	121	32	29	23	24	27	50	216	168	86	73	6
7	101	118	41	29	24	24	27	57	233	188	83	77	7
8	88	121	26	26	24	23	28	83	280	194	81	109	8
9	88	118	24	28	25	23	30	99	335	189	82	109	9
10	87	117	22	28	25	24	27	87	354	188	85	111	10
11	86	117	24	38	22	23	28	79	353	187	95	115	11
12	86	114	34	39	25	22	26	97	350	182	73	111	12
13	86	105	29	37	27	23	31	123	357	159	71	111	13
14	103	88	31	33	32	23	40	165	374	90	70	116	14
15	109	88	35	33	26	23	40	141	402	111	69	132	15
16	102	100	44	33	25	23	41	131	431	103	66	132	16
17	89	115	47	33	27	24	42	120	427	102	64	137	17
18	90	100	43	33	25	26	52	128	415	99	60	143	18
19	90	87	32	33	25	28	58	162	411	102	62	146	19
20	88	75	22	34	25	30	62	191	371	102	65	147	20
21	90	43	24	28	26	21	66	228	333	94	68	136	21
22	92	38	31	30	24	21	56	254	303	87	67	136	22
23	92	34	29	29	25	24	57	274	286	84	66	126	23
24	88	35	30	33	25	23	52	303	263	95	65	128	24
25	103	33	40	29	27	28	52	306	237	92	60	126	25
26	107	34	44	29	25	32	49	307	214	91	59	121	26
27	108	33	48	28	26	29	58	310	196	97	60	119	27
28	135	34	46	27	26	28	64	306	178	98	63	119	28
29	135	34	48	22		27	69	317	171	102	59	136	29
30	136	34	50	20		32	60	297	170	104	58	93	30
31	132		52	18		31		272		95	64		31
						Monthly Totals							Yearly Totals
Total	3,064	2,562	1,092	957	690	788	1,280	5,207	9,021	4,074	2,243	3,385	34,363
Daily Mean	99	85	35	31	25	25	43	168	301	131	72	113	94
Daily Min	86	33	22	18	17	21	26	50	170	84	58	69	17
Daily Max	136	131	52	41	32	32	69	317	431	194	95	147	431
Ins. Min	50	28	12	8	12	20	20	44	163	65	57	48	8
Ins. Max	155	138	85	51	56	51	77	376	463	208	147	218	463
Acre Ft	6,080	5,080	2,170	1,900	1,370	1,560	2,540	10,330	17,890	8,080	4,450	6,710	68,160

Notes: A new sutron data loger was installed on 01/14/99. All flows from 1/1/99 to 1/14/99 will be calculated from the flow chart. Heavy spring run off begins on 5/12/99.

Huntington Canyon Plant Raw Water Flow

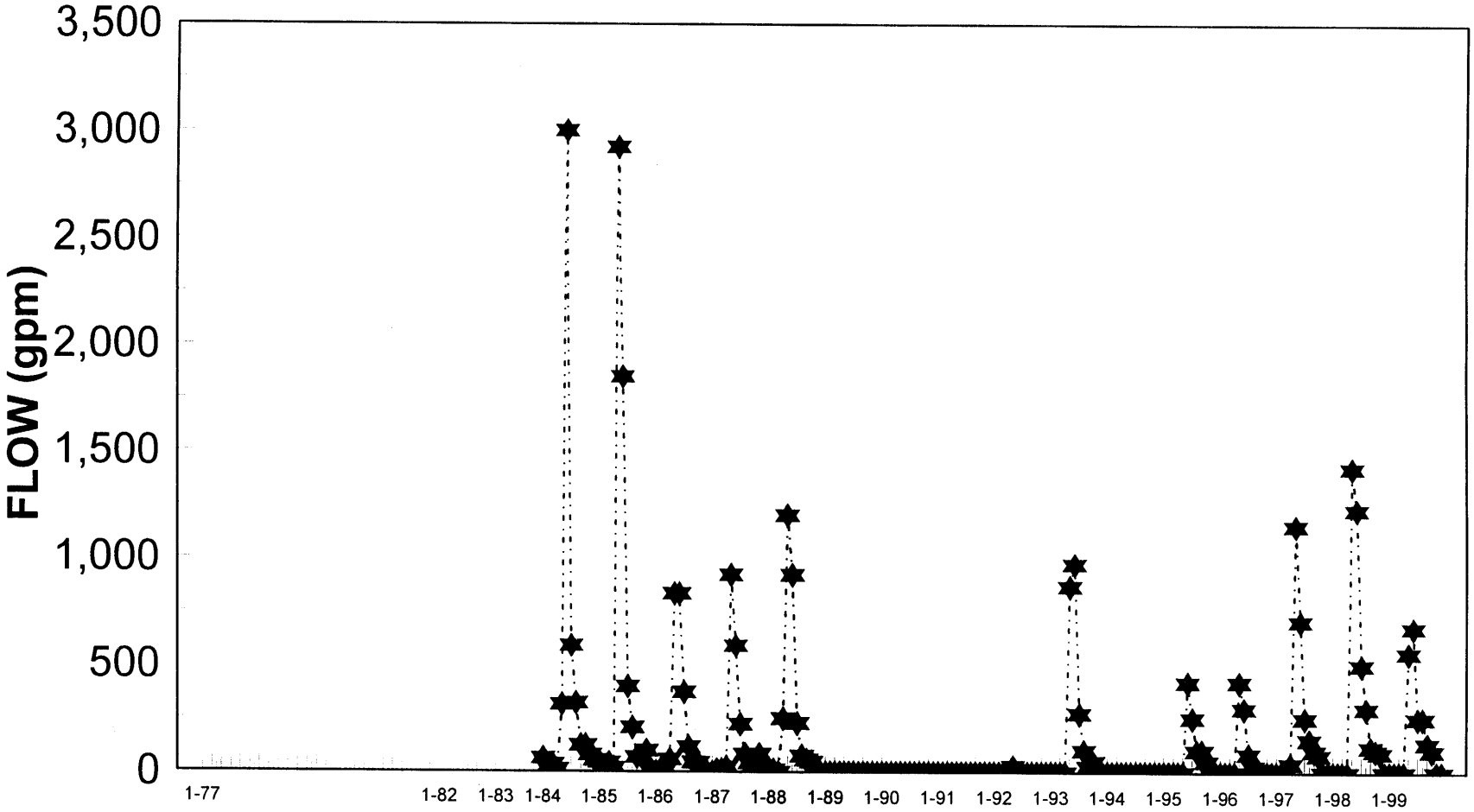
Month	Average Cu Ft/Sec	Total Acre Feet
October 98	16.25	999.15
November 98	13.53	805.22
December 98	14.69	903.29
January 99	13.17	809.52
February 99	14.98	831.68
March 99	12.91	793.65
April 99	13.28	790.15
May 99	16.56	1017.83
June 99	16.82	1000.52
July 99	18.72	1151.18
August 99	16.73	1028.63
September 99	13.77	819.30
YEARLY TOTAL	181.41 Cu Ft/Sec	10,950.12 Acre Feet

APPENDIX B

1999

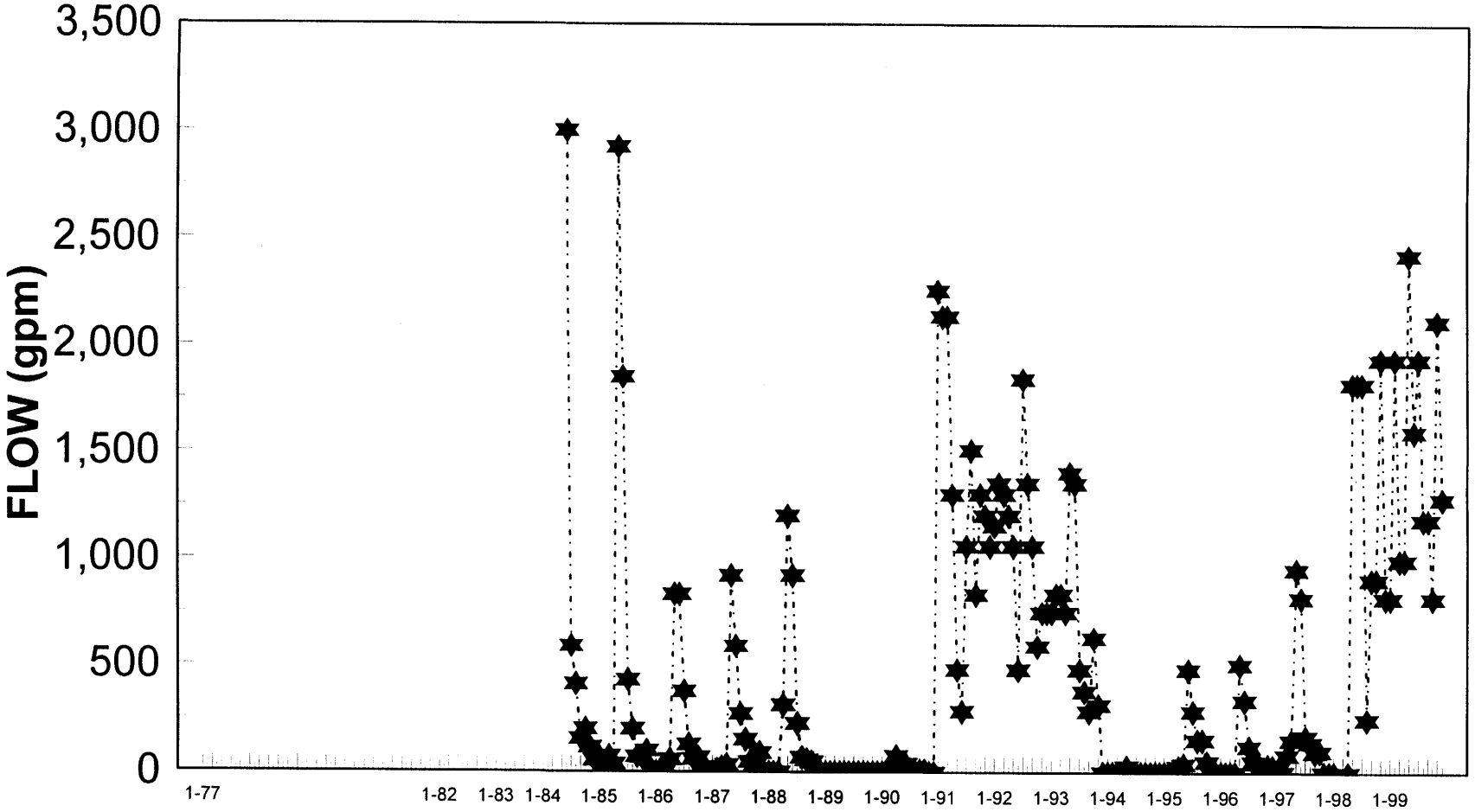
DEER CREEK

ABOVE MINE
DISCHARGE RECESSION CURVE



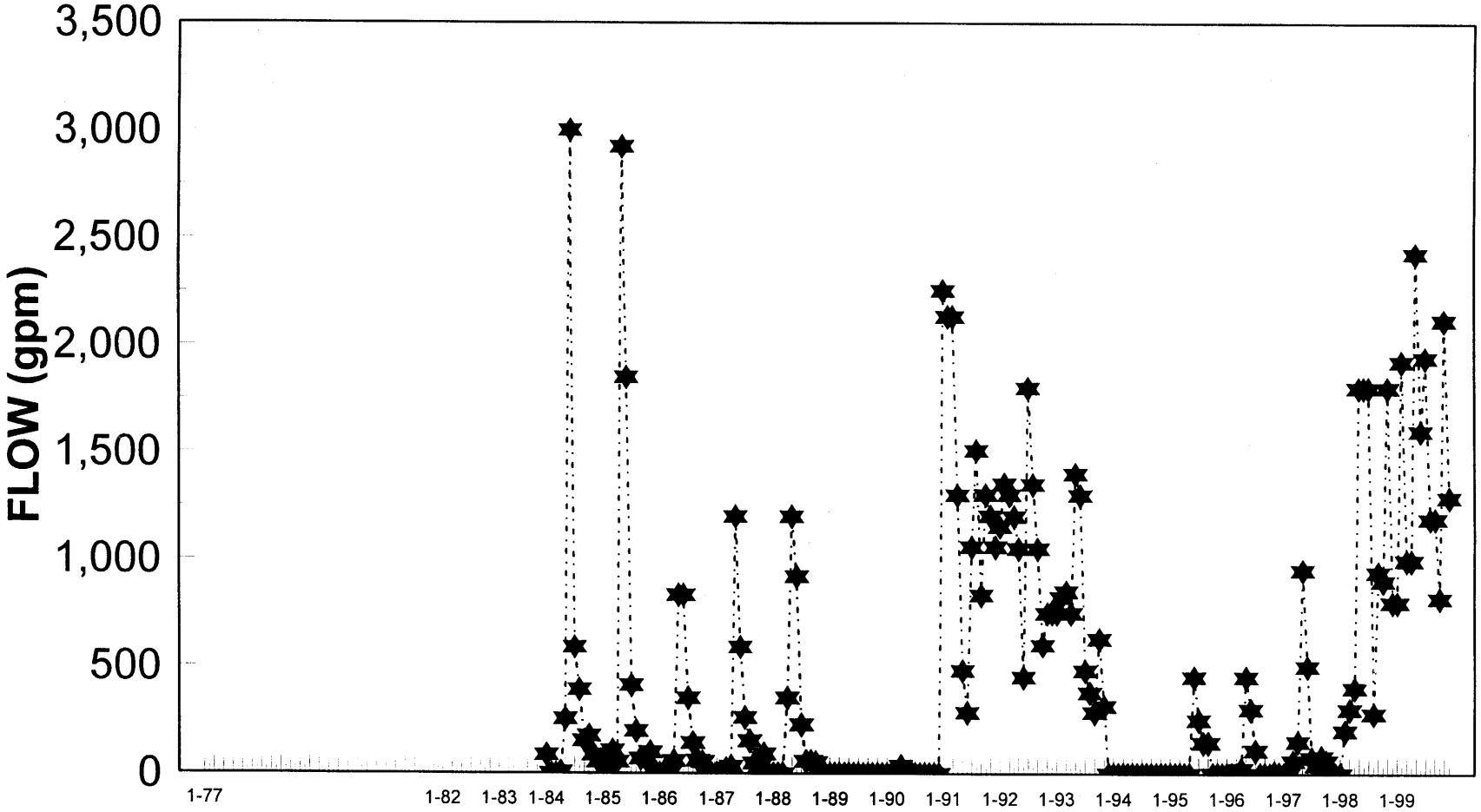
DEER CREEK

@ PERMIT BOUNDARY
DISCHARGE RECESSION CURVE



DEER CREEK

@ BELOW MINE
DISCHARGE RECESSION CURVE

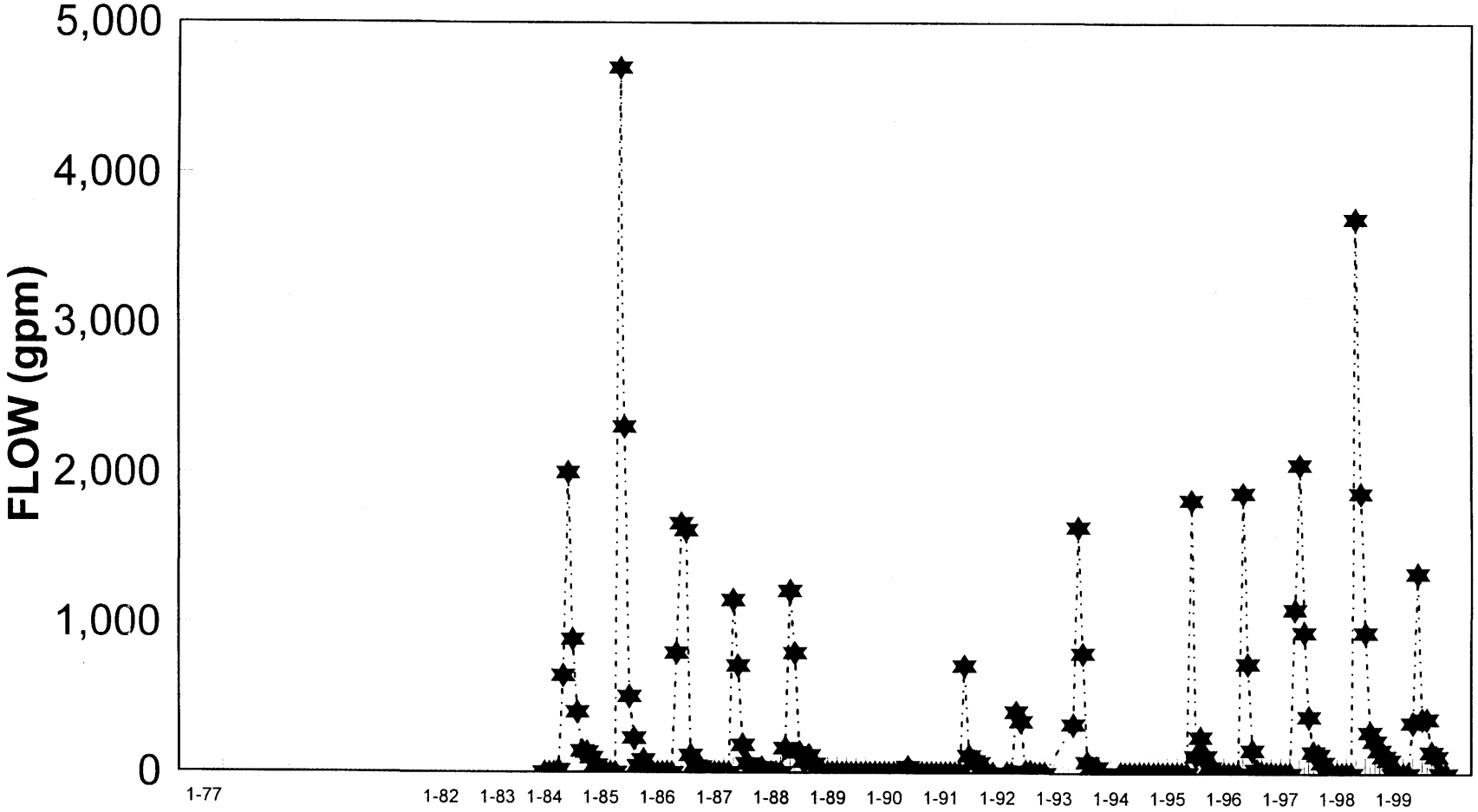


APPENDIX C

1999

MEETINGHOUSE CANYON

LEFT FORK
DISCHARGE RECESSION CURVE

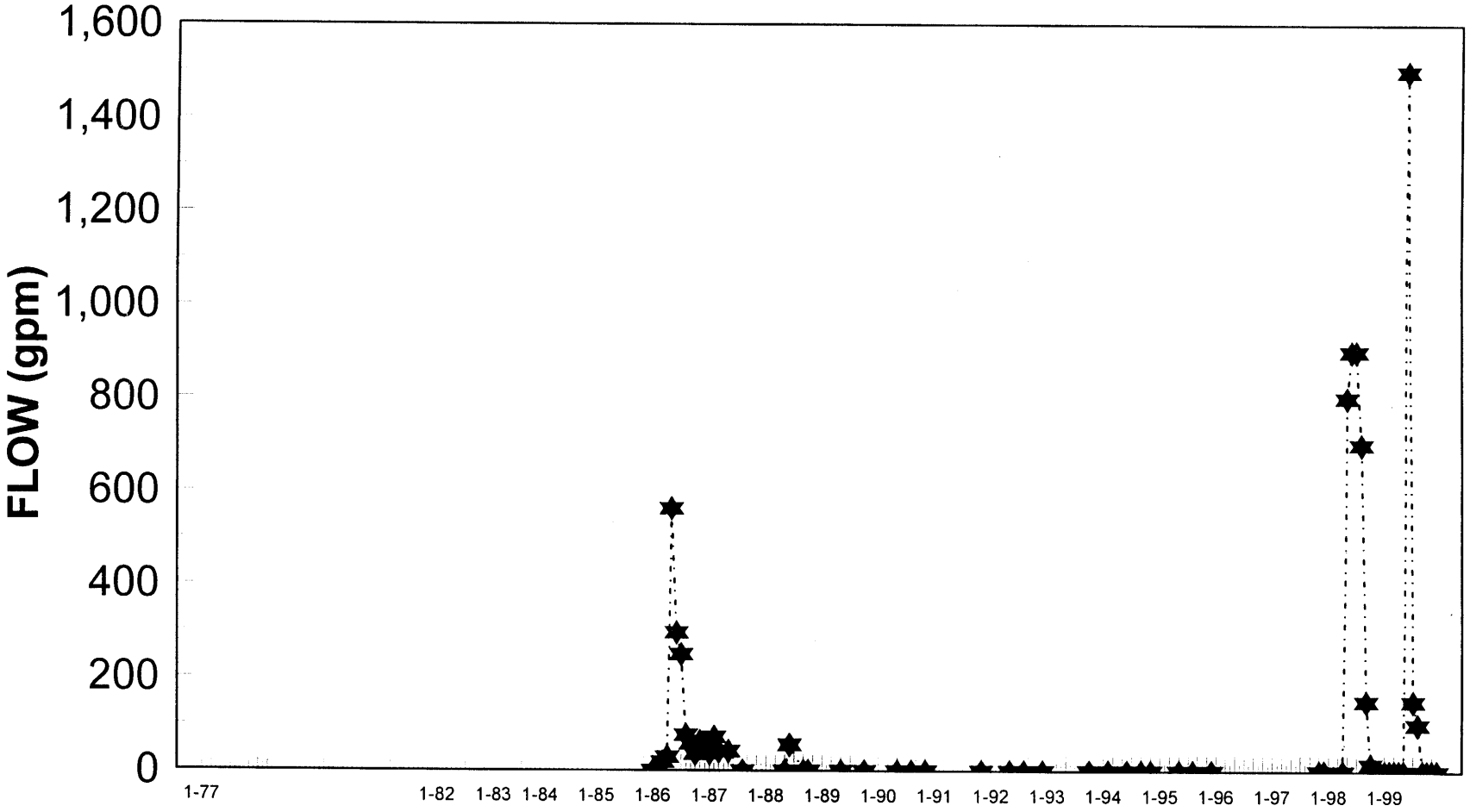


APPENDIX D

1999

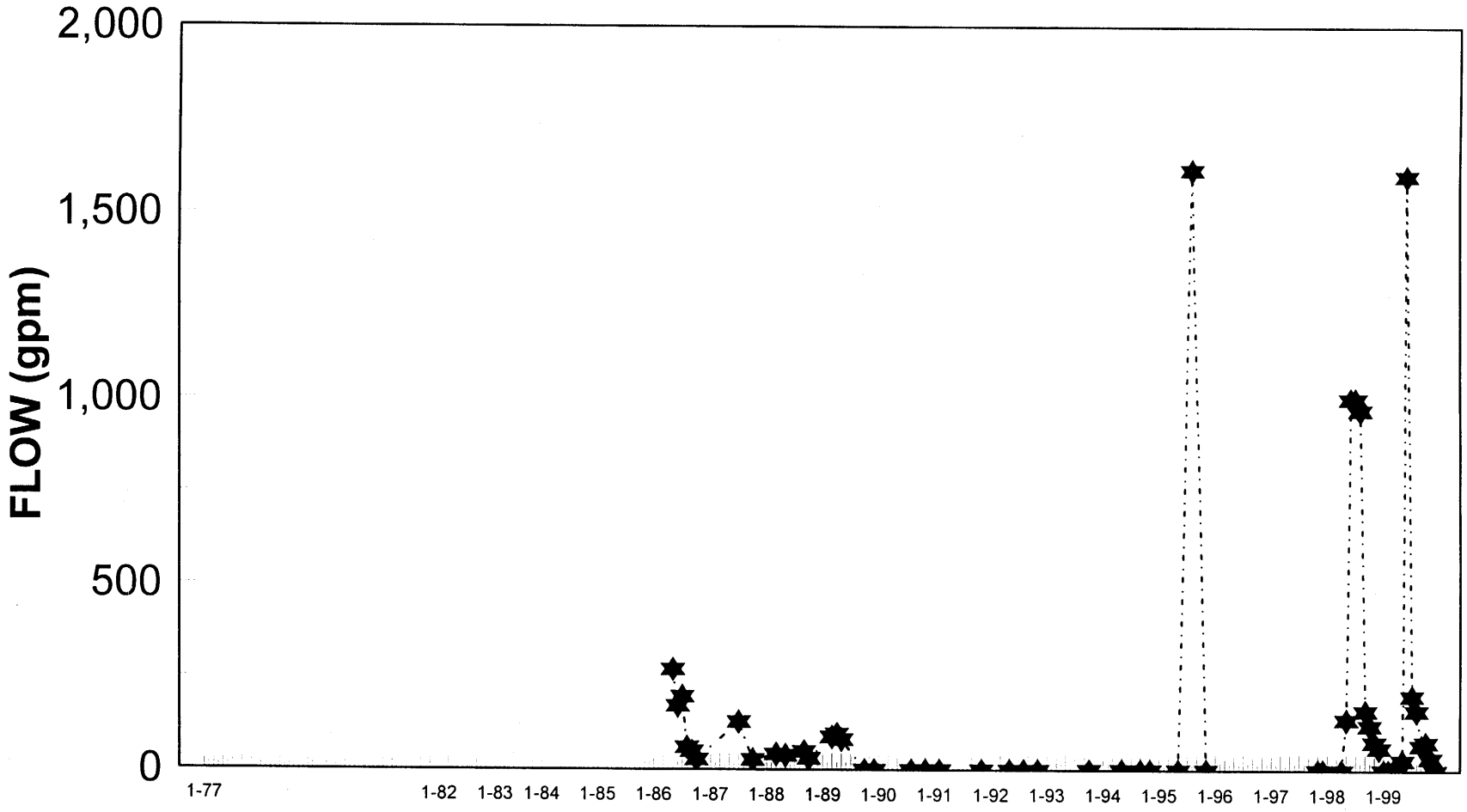
MILL FORK

MFA1: ABOVE MINE
DISCHARGE RECESSION CURVE



MILL FORK

MFB2: BELOW MINE
DISCHARGE RECESSION CURVE

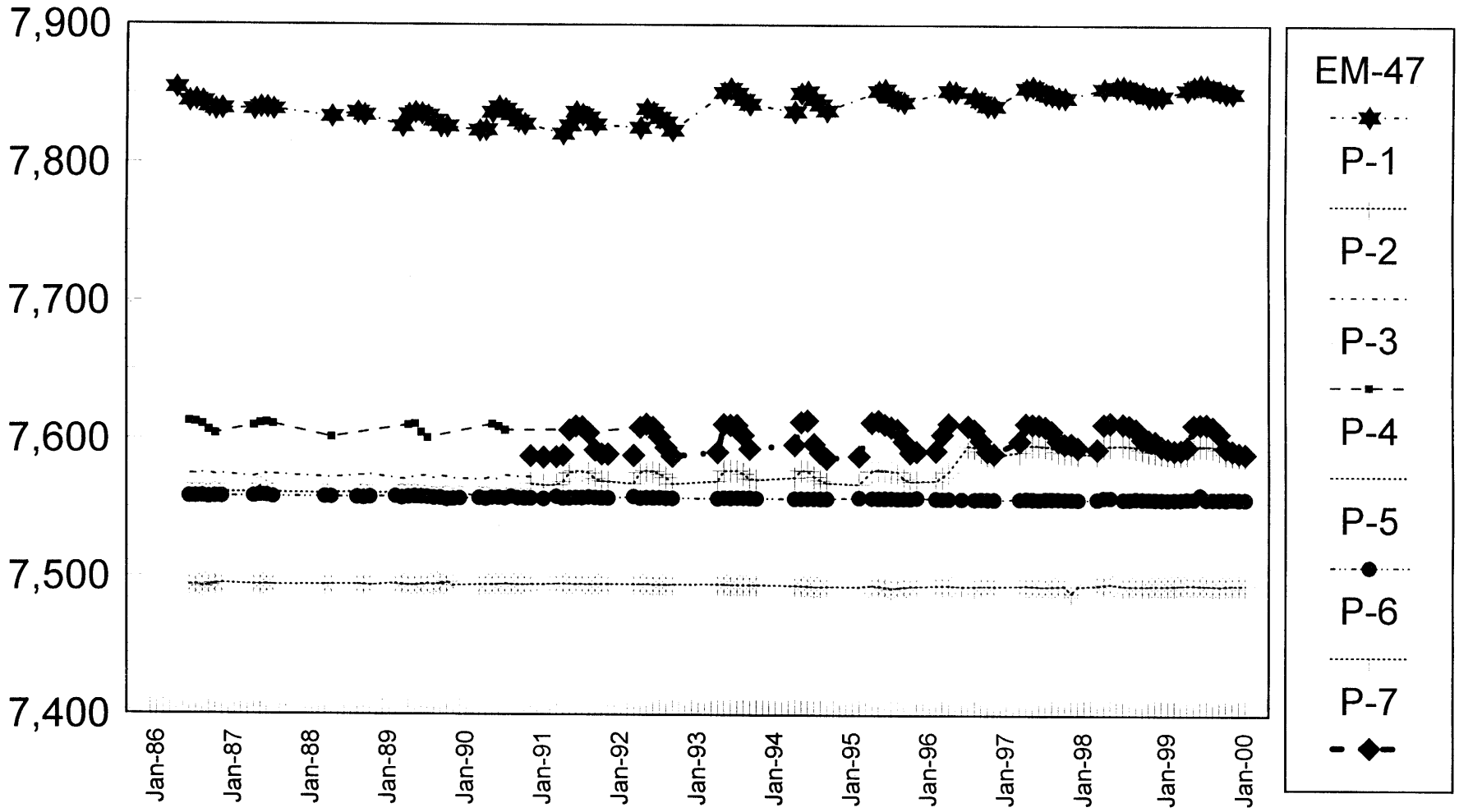


APPENDIX E

1999

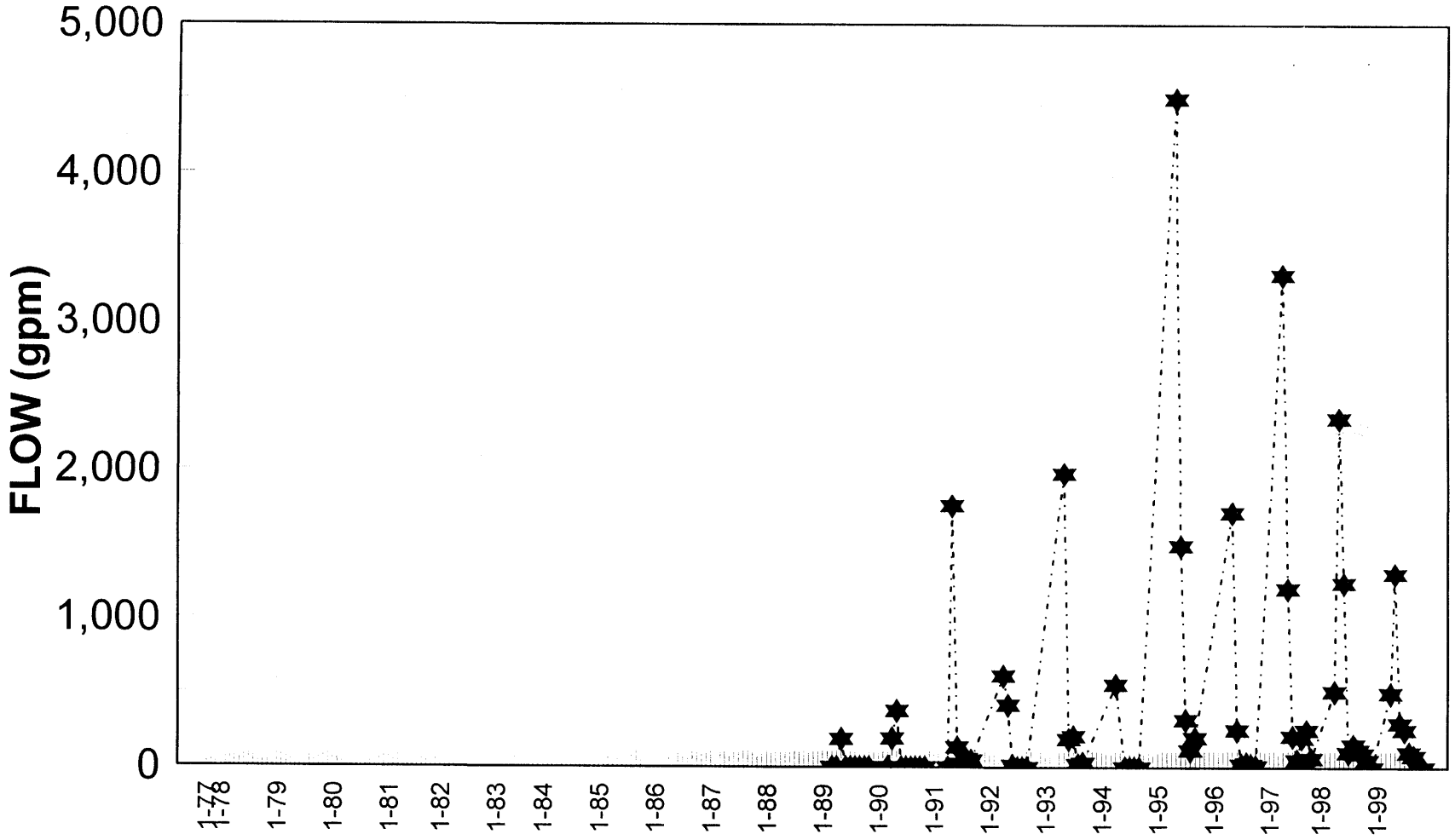
RILDA CANYON

MONITORING WELLS
PIEZOMETRIC DATA



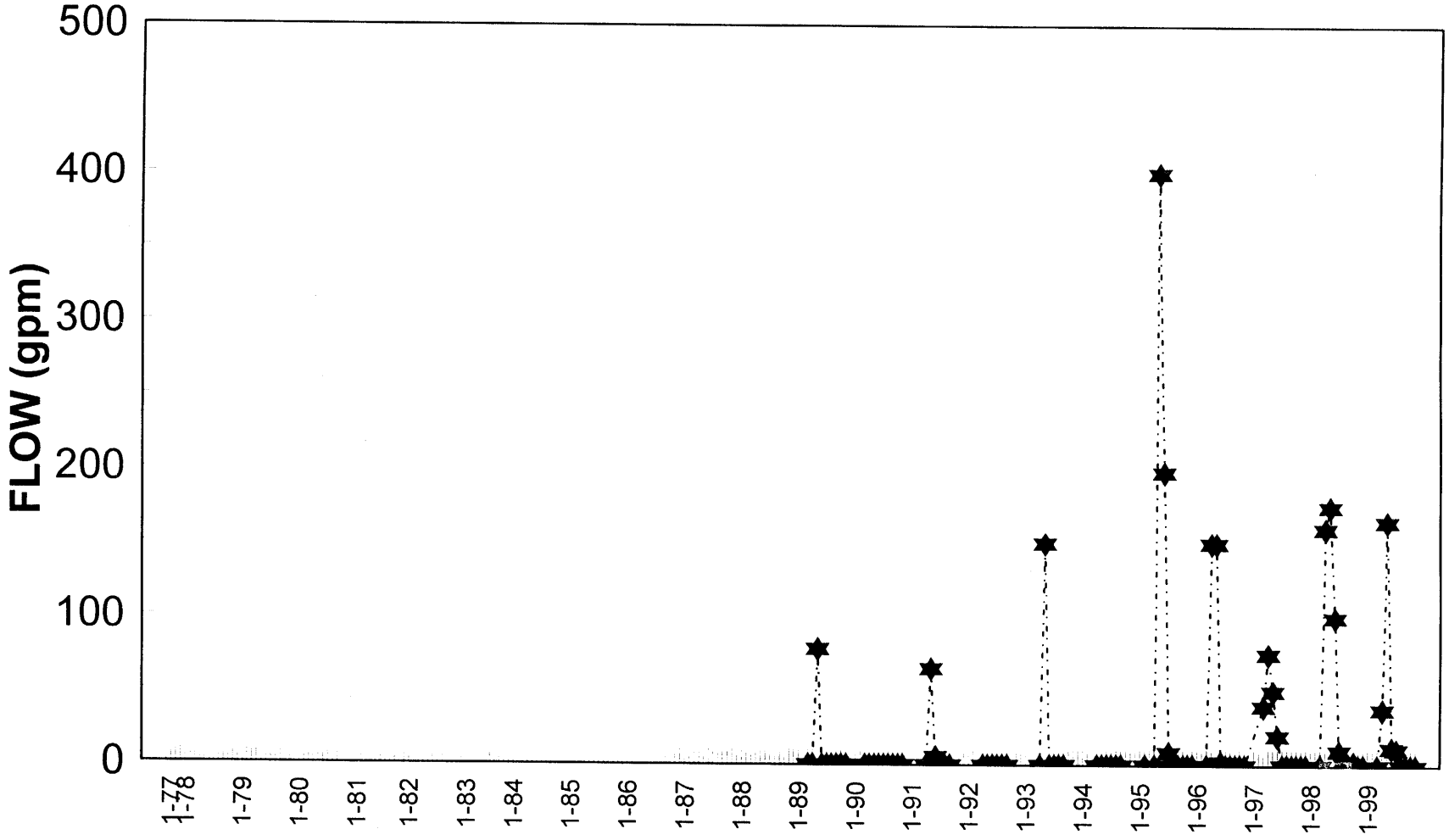
RILDA CANYON

RCF-1: RIGHT FORK
DISCHARGE RECESSION CURVE



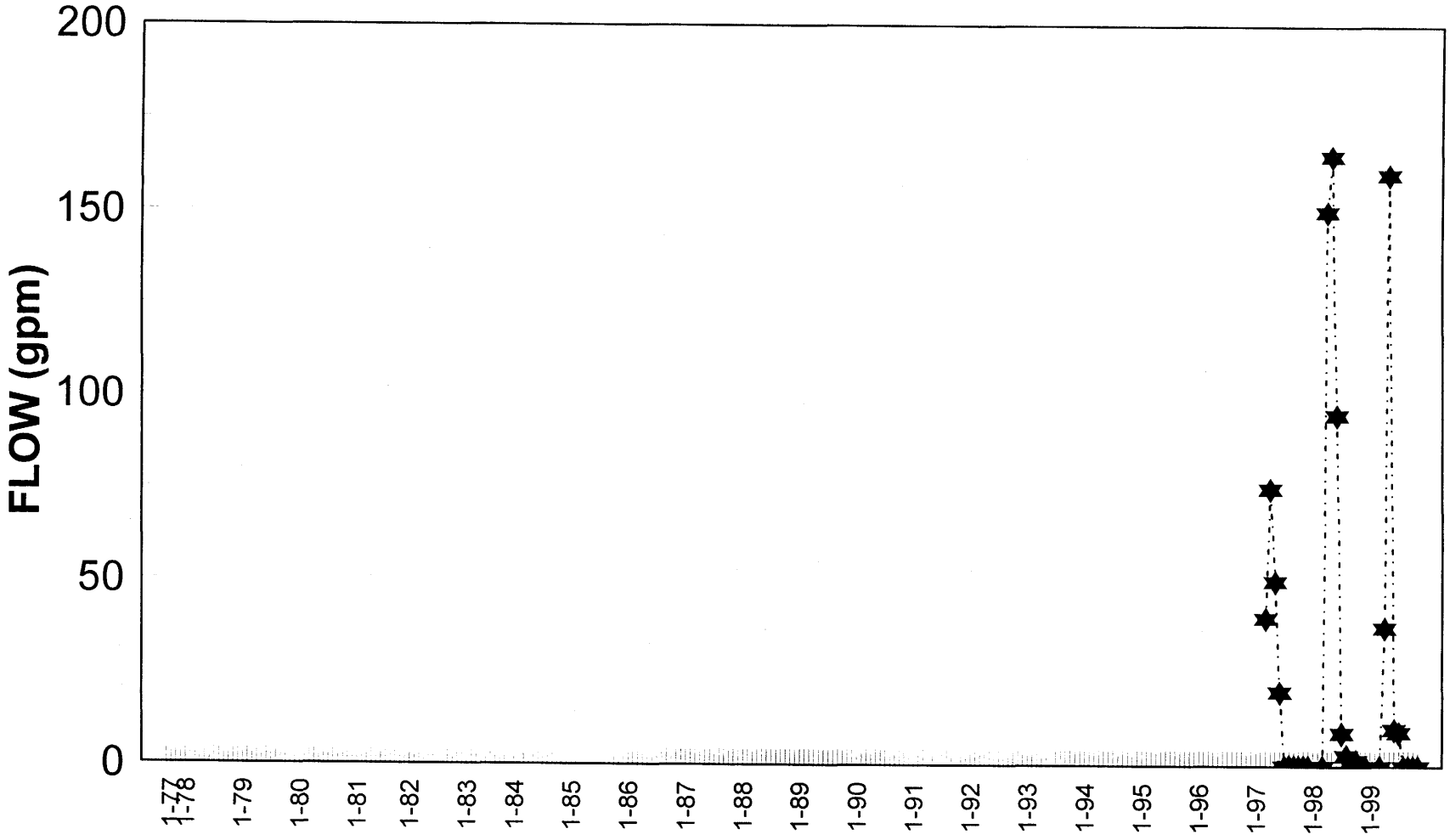
RILDA CANYON

RCLF-1: LEFT FORK - BELOW BREAKOUTS
DISCHARGE RECESSION CURVE



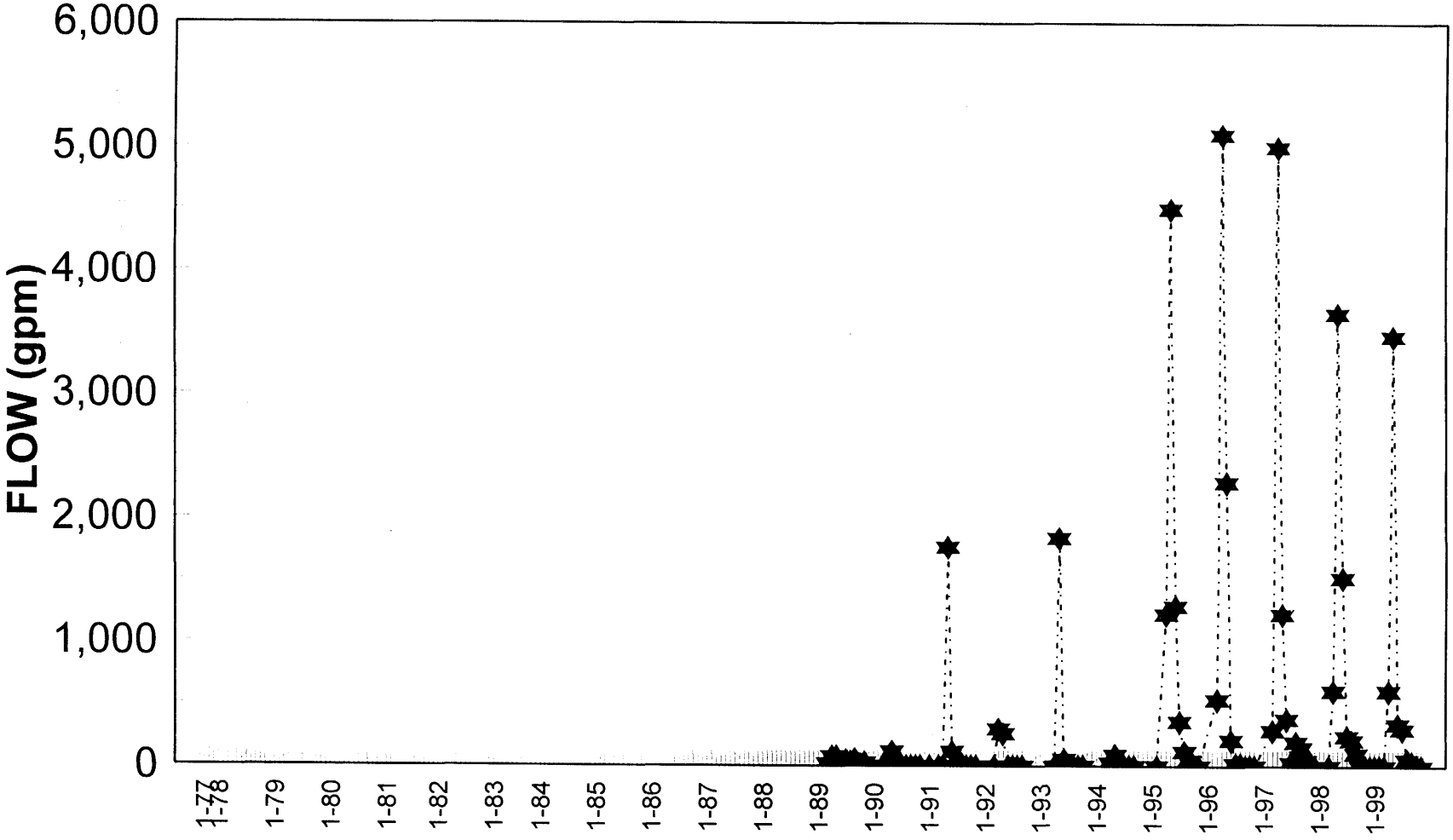
RILDA CANYON

RCLF-2: RIGHT FORK - ABOVE BREAKOUTS
DISCHARGE RECESSION CURVE



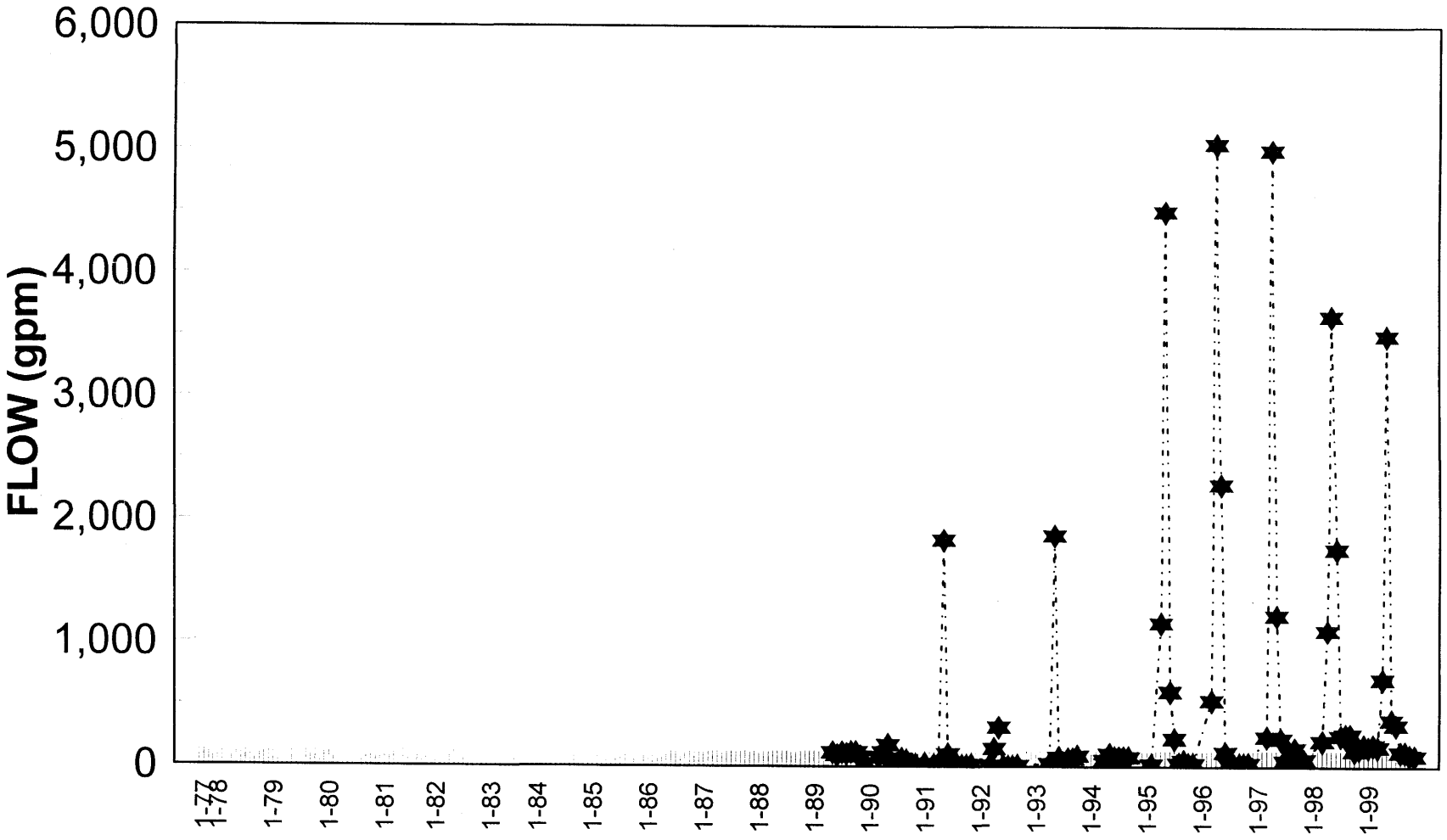
RILDA CANYON

RCF-2: ABOVE NEWUA SPRINGS DISCHARGE RECESSION CURVE



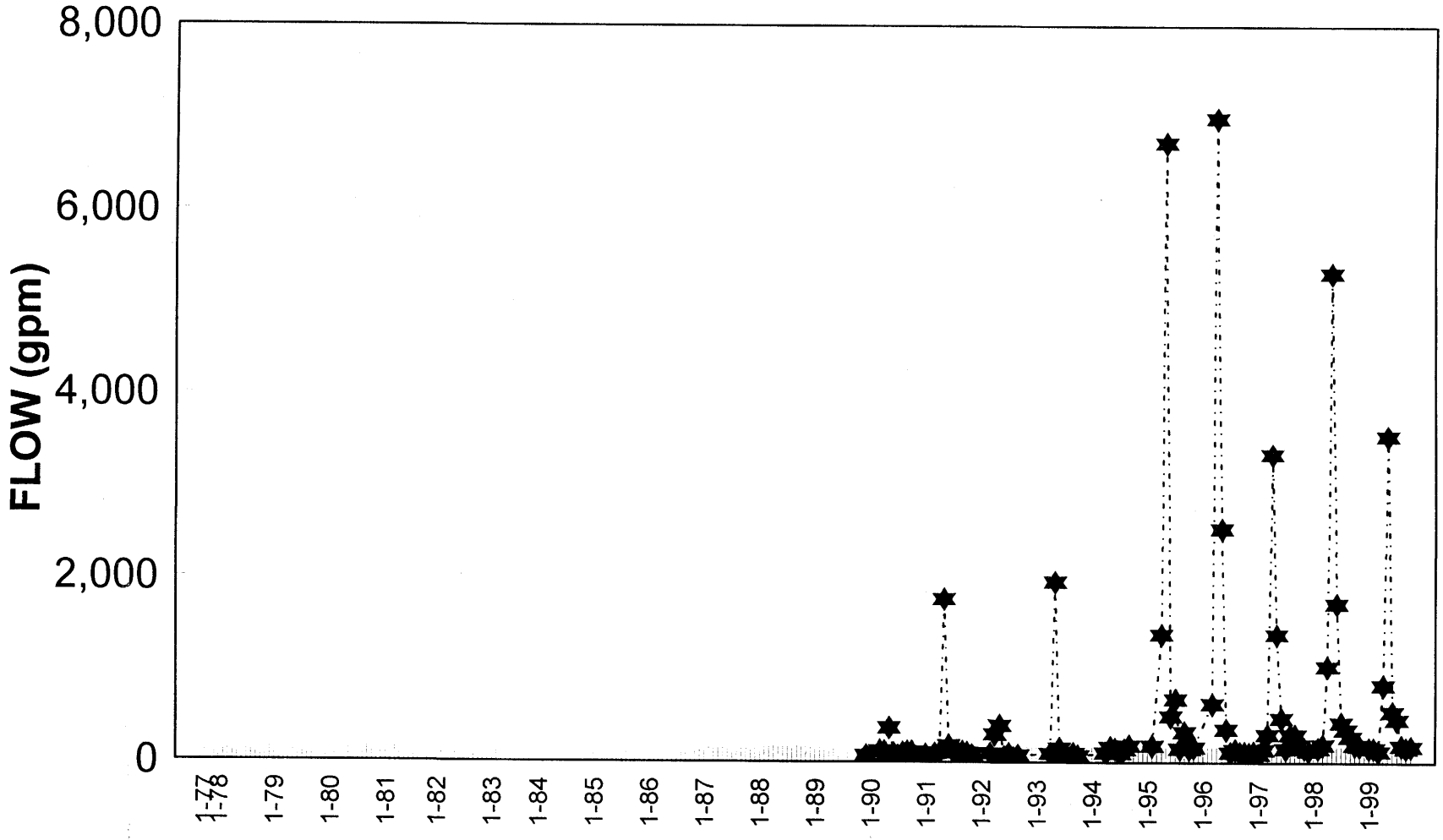
RILDA CANYON

RCF-3: BELOW NEWUA SPRINGS
DISCHARGE RECESSION CURVE



RILDA CANYON

RCW-4: NEAR HUNTINGTON CANYON
DISCHARGE RECESSION CURVE

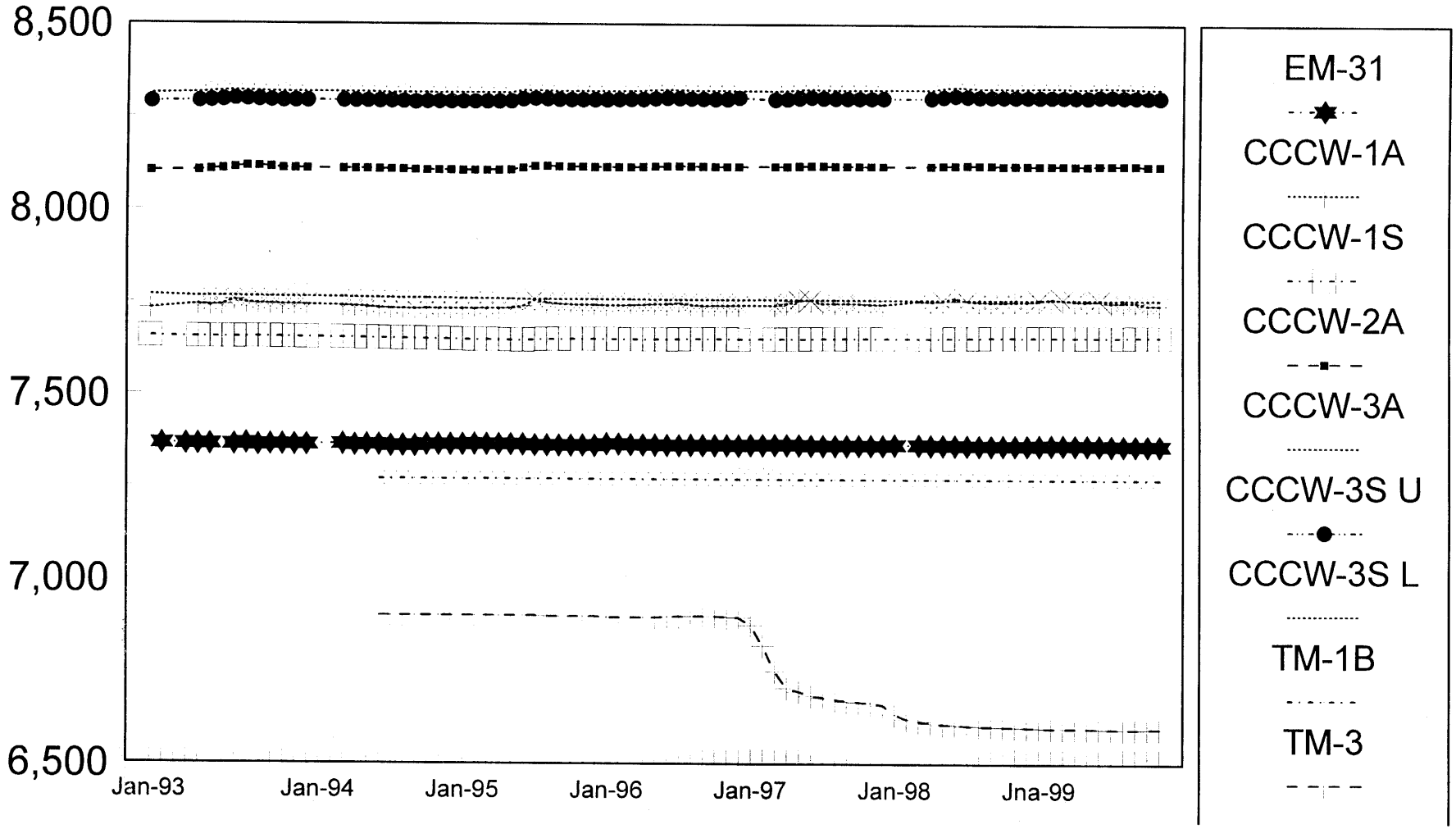


APPENDIX F

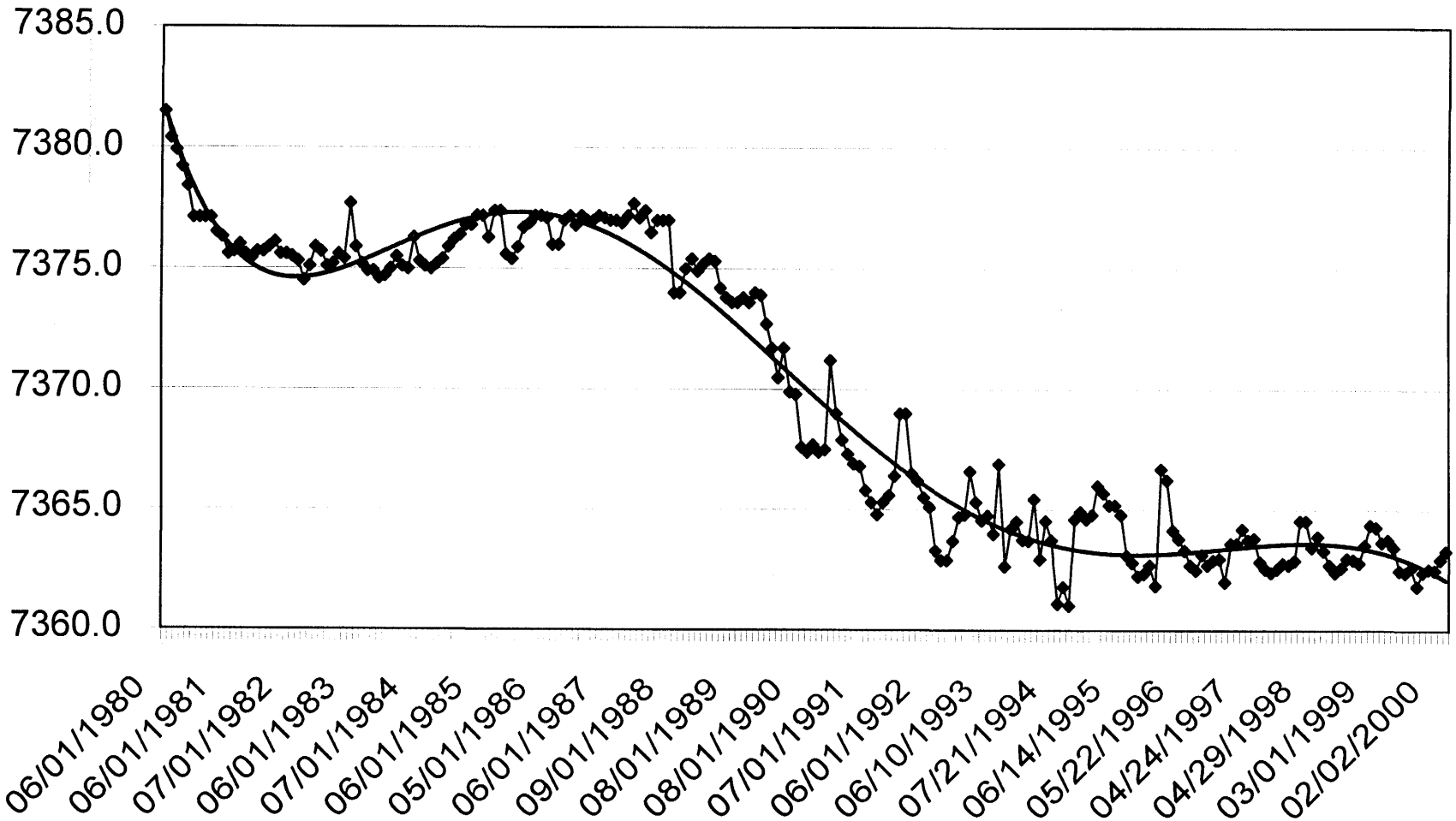
1999

COTTONWOOD CANYON

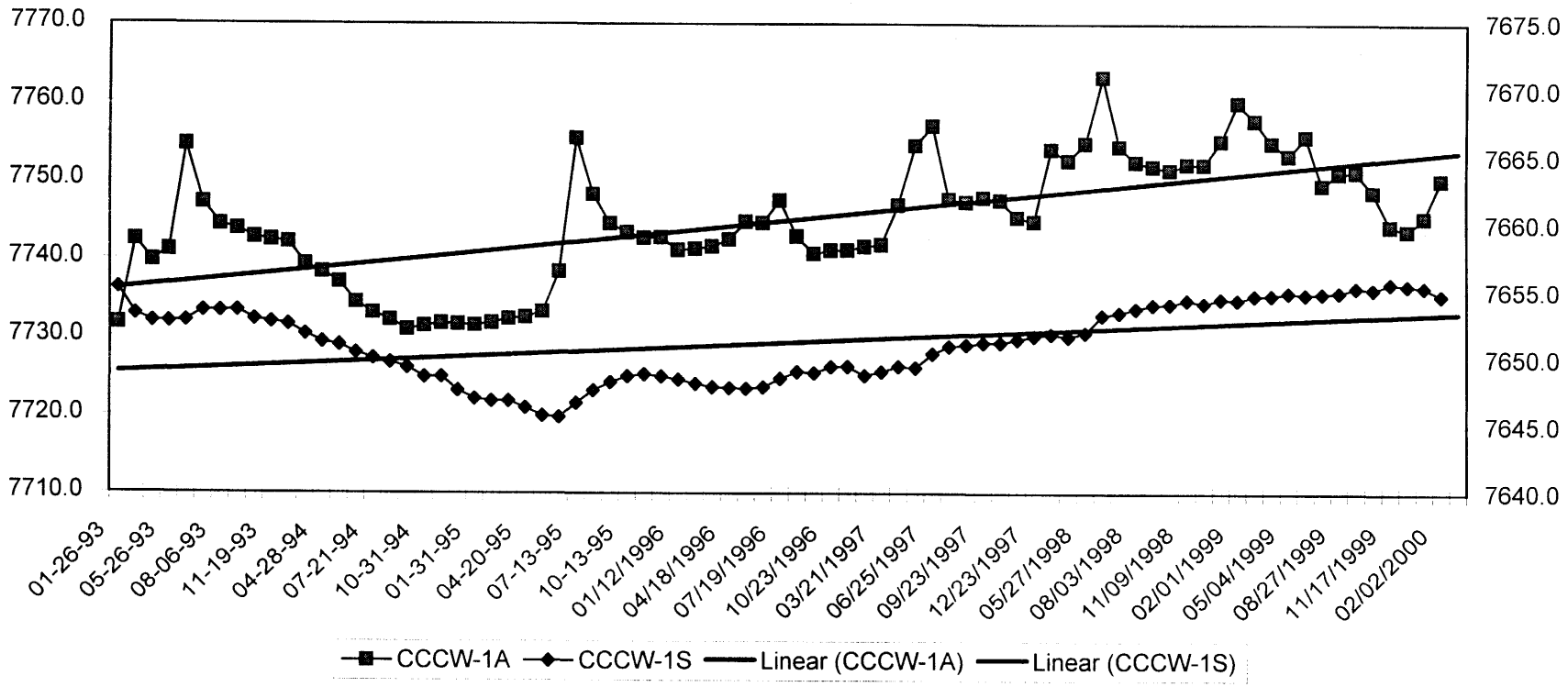
MONITORING WELLS
PIEZOMETRIC DATA

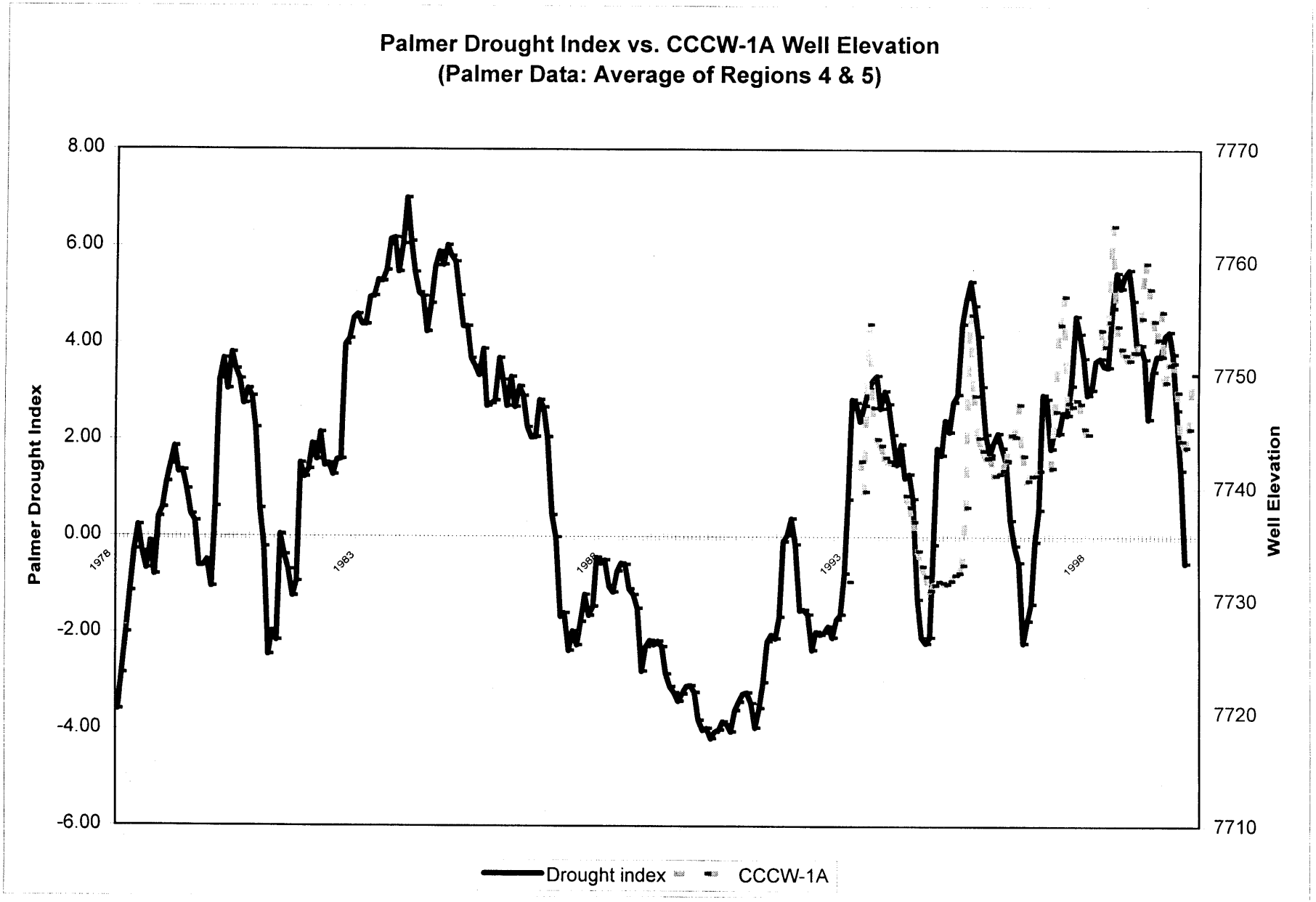


Cottonwood Well EM-31

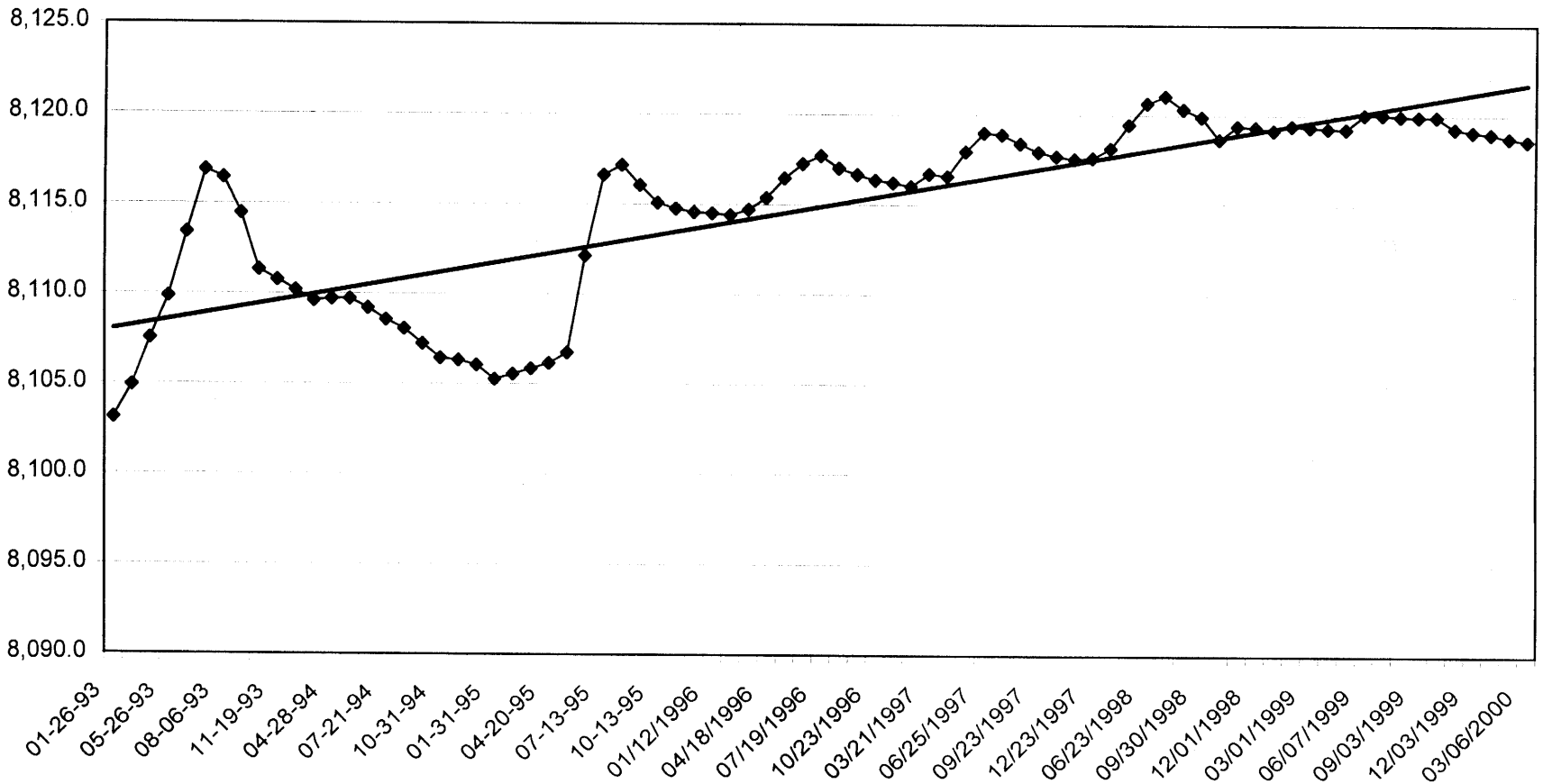


Cottonwood Wells - Site 1

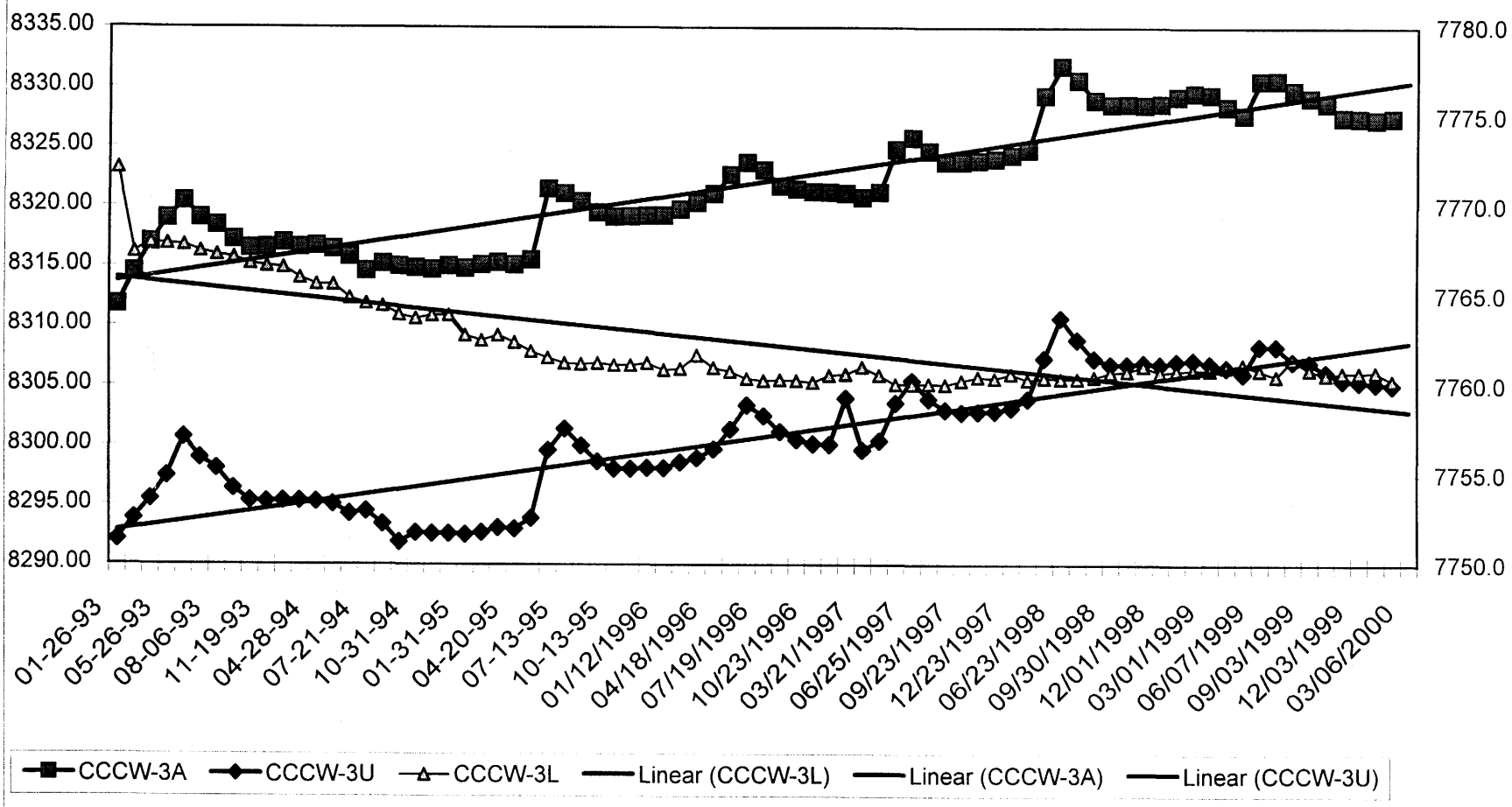



Palmer Drought Index vs. CCCW-1A Well Elevation
(Palmer Data: Average of Regions 4 & 5)
Palmer Drought Index
Well Elevation
8.00
6.00
4.00
2.00
0.00
-2.00
-4.00
-6.00
7770
7760
7750
7740
7730
7720
7710
1978
1983
1988
1993
1998
Drought index
CCCW-1A

Cottonwood Well 2A

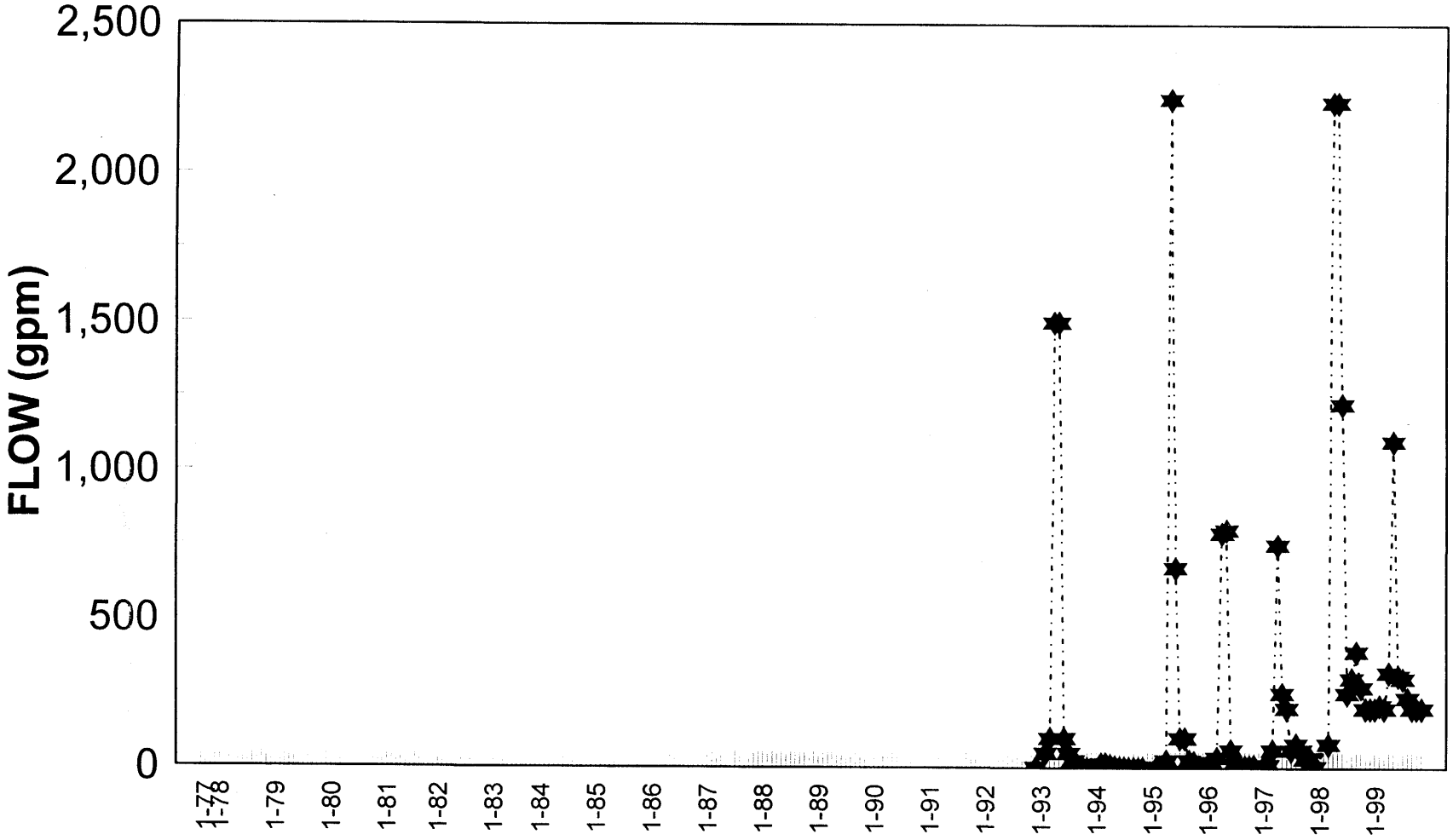


Cottonwood Wells - Site 3



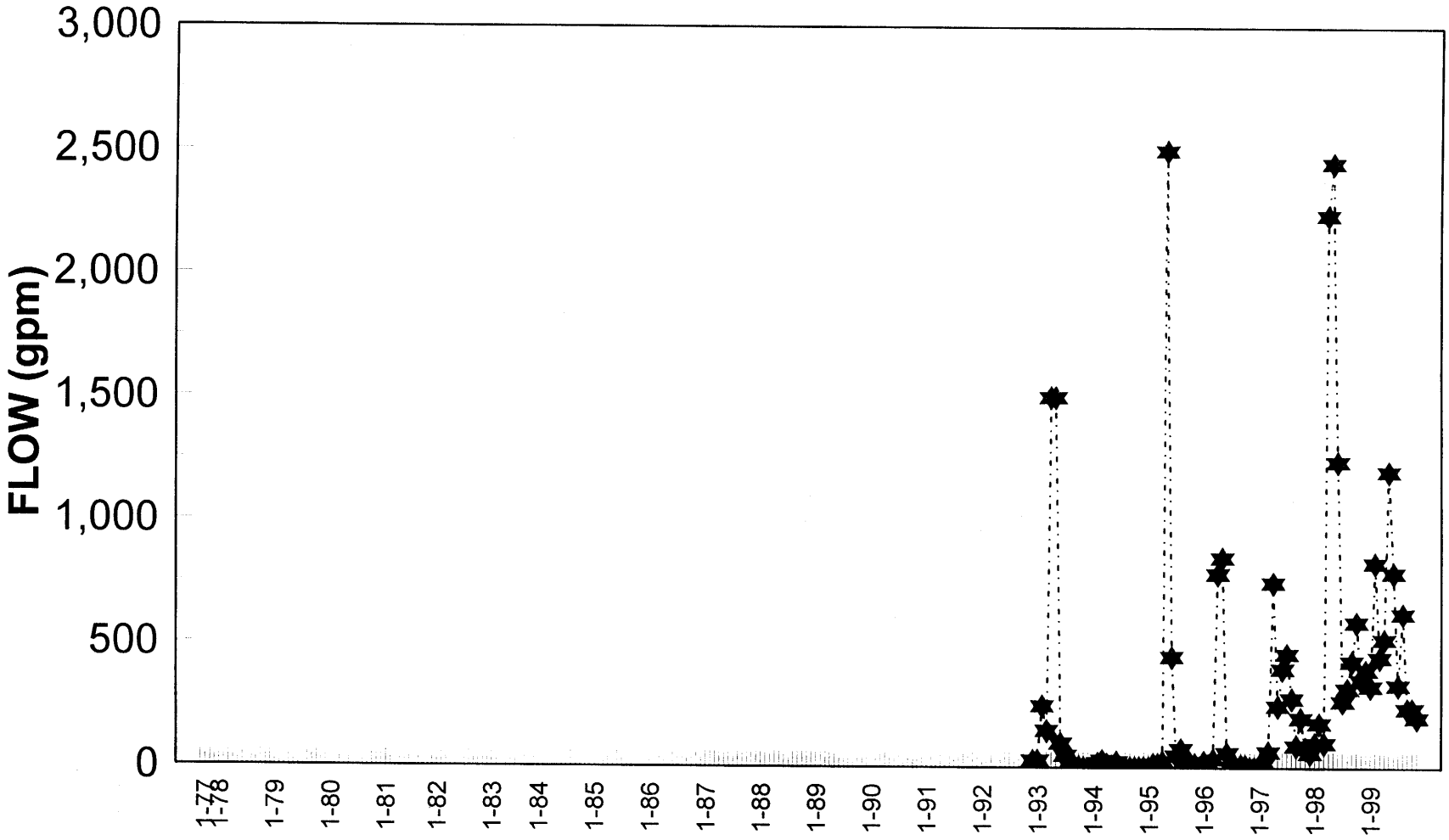
COTTONWOOD CANYON CREEK

SW-1
DISCHARGE RECESSION CURVE



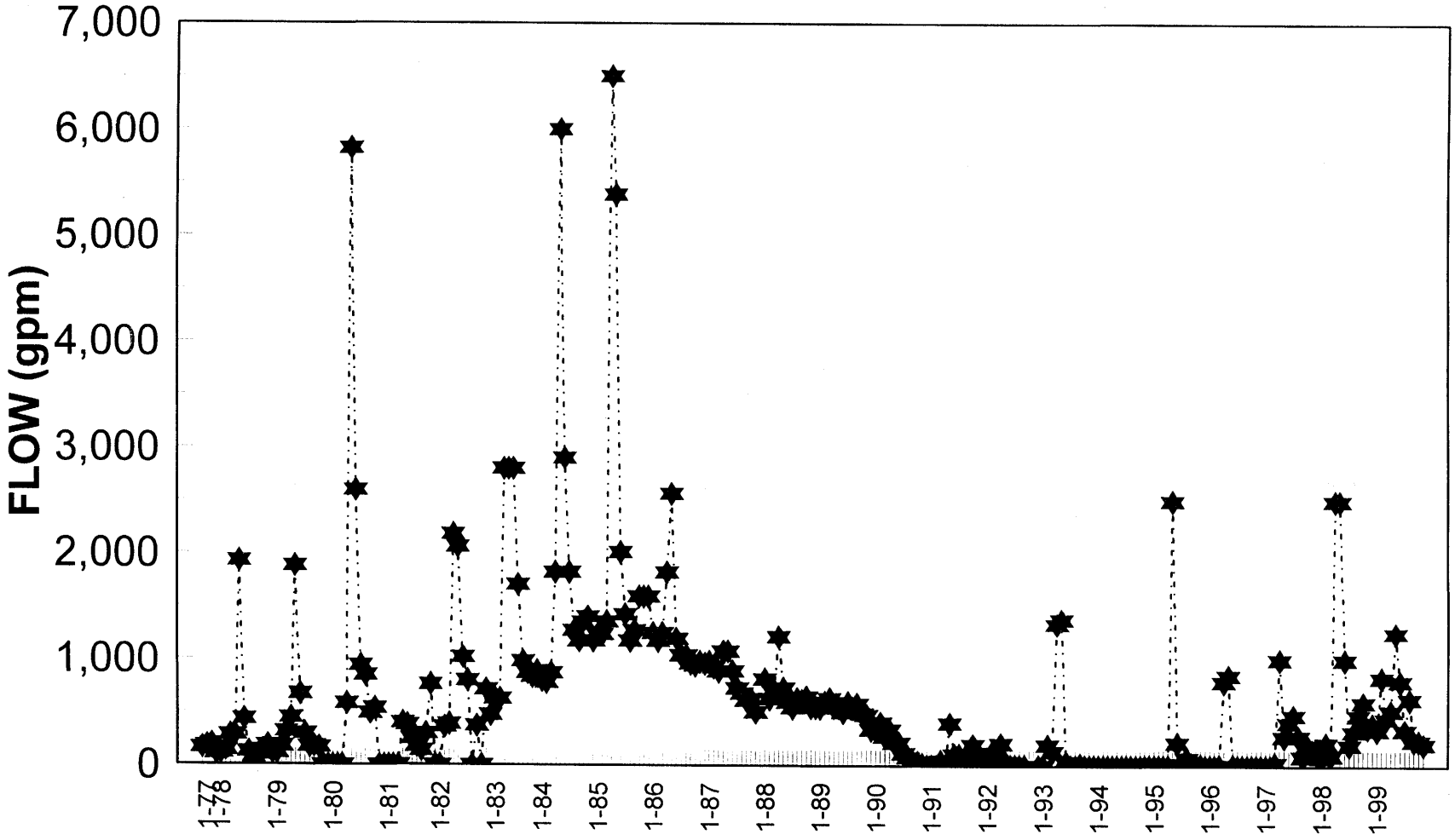
COTTONWOOD CANYON CREEK

SW-2
DISCHARGE RECESSION CURVE



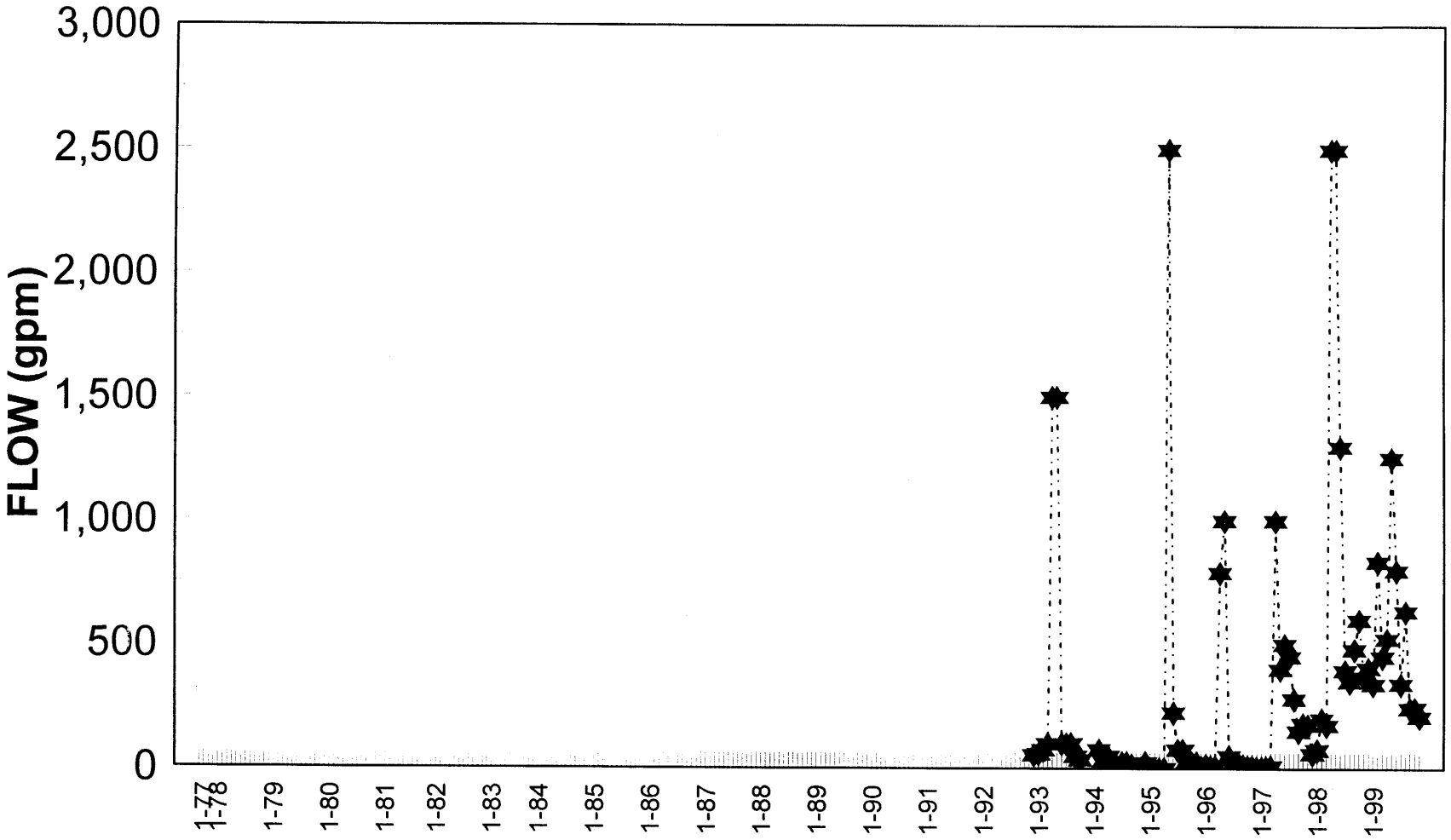
COTTONWOOD CANYON CREEK

@ USGS FLUME
DISCHARGE RECESSION CURVE



COTTONWOOD CANYON CREEK

SW-3
DISCHARGE RECESSION CURVE



STRAIGHT CANYON WATER QUALITY *

T-19

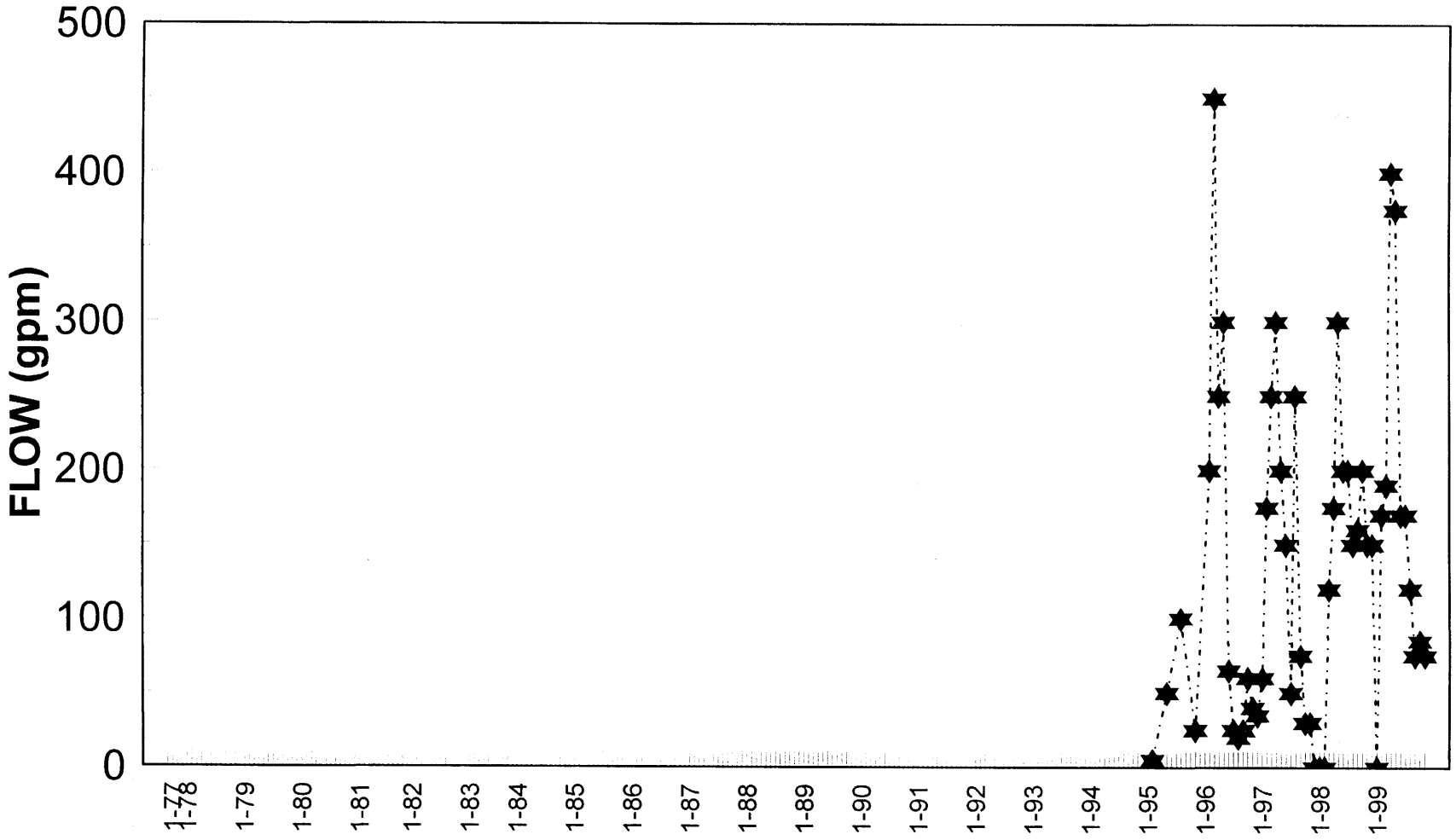
1999** SAMPLE DATES	ACIDITY	ALKALINITY BICARBONATE	CALCIUM	CARBONATE	CHLORIDE	CONDUCTIVITY (umhos/cm)	HARDNESS	IRON TOTAL	IRON DISSOLVED	MAGNESIUM	MANGANESE	OIL & GREASE	PH (units)	POTASSIUM	SODIUM	SULFATE	TSS	TDS
3-99		380	45	10	45	953	355			59			8.49	2	81	163		605
6-99		427	44	9	40	897	640	0.7		56			8.62	4	73	124	69	539
9-99		371	42	14	44	980	340	0.3		57			8.55	3	80	161	15	599
12-99		404	52	19	46	1097	426	0.3		72			8.41	3	87	196	25	684
1999**																		
MIN		371	42	9	40	897	340	0.3		56			8.4	2	73	124	15	539
MAX		427	52	19	46	1097	640	0.7		72			8.6	4	87	196	69	684
MEAN		396	46	13	44	982	440	0.4		61			8.5	3	80	161	36	607
No. of Analysis	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4
1998**																		
MIN		317	36.0	11.0	30.0	780	275	0.30		45.00			8.19	2.00	52.00	84.0	27.0	464
MAX		433	54.0	30.0	41.0	979	993	1.30		67.00			8.64	3.00	86.00	144.0	317.0	631
MEAN		356	42.7	20.5	35.0	851	560	0.67		53.33			8.48	2.50	64.67	105.7	132.7	529
1997**																		
MIN		303	34	6	20	596	241	0		38			8	1	34	53	36	340
MAX		420	48	9	35	912	350	2		56			9	1	62	125	321	540
MEAN		352	41	8	29	756	284	1		45			9	1	48	83	132	443
1996**																		
MIN		190	39	34	22	631	299	0		43	0		8	2	37	50	40	388
MAX		437	74	78	30	776	406	4		54	0		9	3	54	84	269	500
MEAN		303	53	56	26	685	331	1		48	0		9	2	45	65	122	427
1995																		
MIN	10.00	275.00	50.00	10.00	21.00	614.00	300.00	0.50	0.10	41.00	0.10	5.00	7.99	1.00	34.00	39.00	35.00	360.00
MAX	10.00	340.00	60.00	20.00	41.00	1062.00	430.00	1.20	0.10	70.00	0.10	5.00	8.87	4.00	84.00	160.00	115.00	680.00
MEAN	10.00	312.50	55.00	17.50	28.00	821.30	366.50	0.80	0.10	55.80	0.10	5.00	8.40	2.30	53.50	94.80	63.80	515.00
HISTORICAL 1977-1998																		
MIN	0.1	190	14.3	1.0	20.0	581	178	0.05	0.03	24.00	0.01	1.0	7.44	0.70	12	39.0	1.0	340
MAX	10.0	437	92.0	78.0	67.9	1380	993	5.10	0.38	85.00	0.20	5.0	8.87	30.20	125	336.0	420.0	910
MEAN	6.3	346	45.6	17.5	36.5	872	364	0.77	0.16	56.31	0.06	4.2	8.41	3.44	67.91	139.4	86.7	540
No. of Analysis	12	37	37	23	37	33	37	32	13	37	18	10	36	35	37	37	31	37

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

** Data: Database input restricted to values greater then laboratory minimum detection limit.

COTTONWOOD CREEK

T-19
DISCHARGE RECESSION CURVE

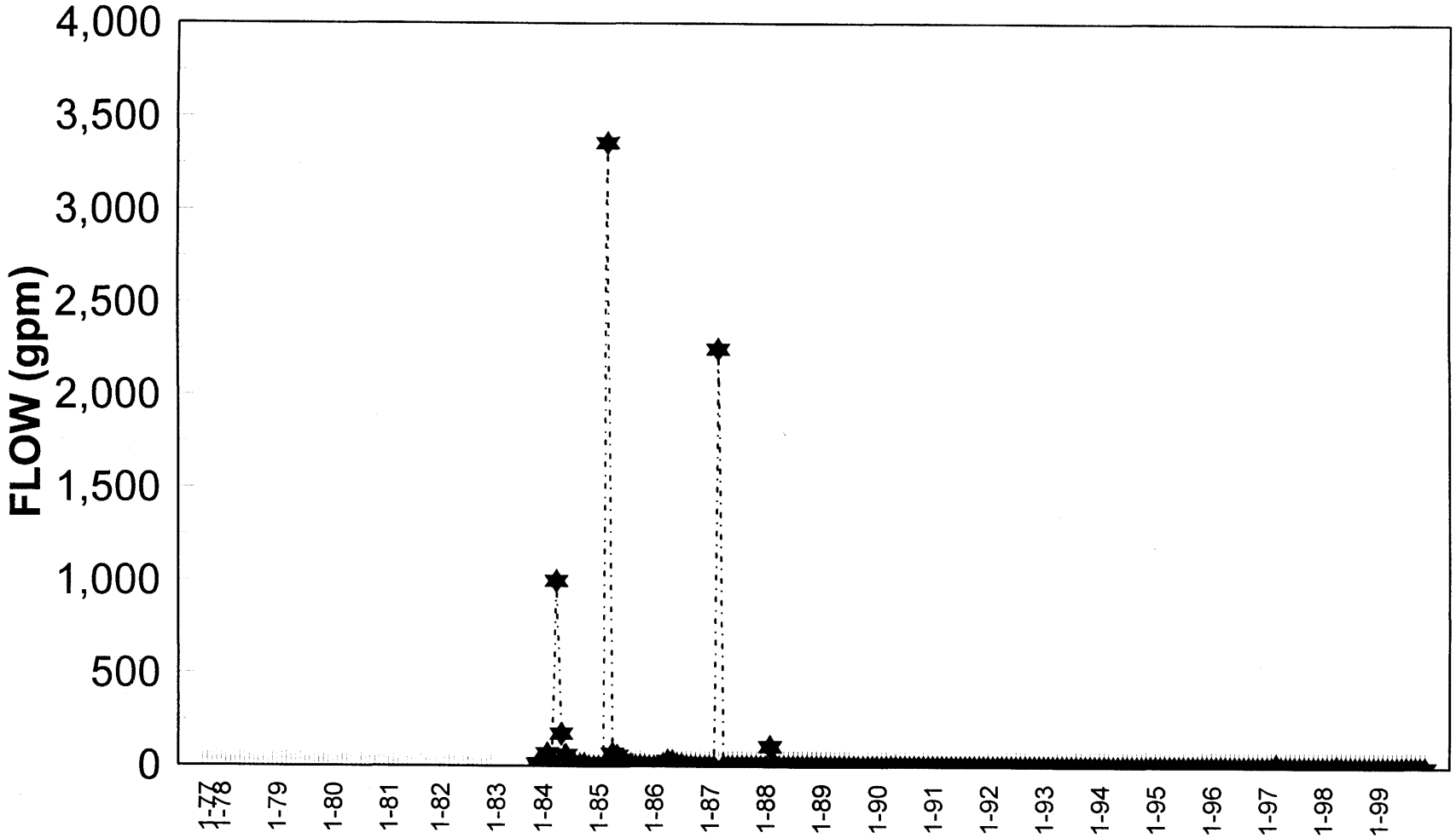


APPENDIX G

1999

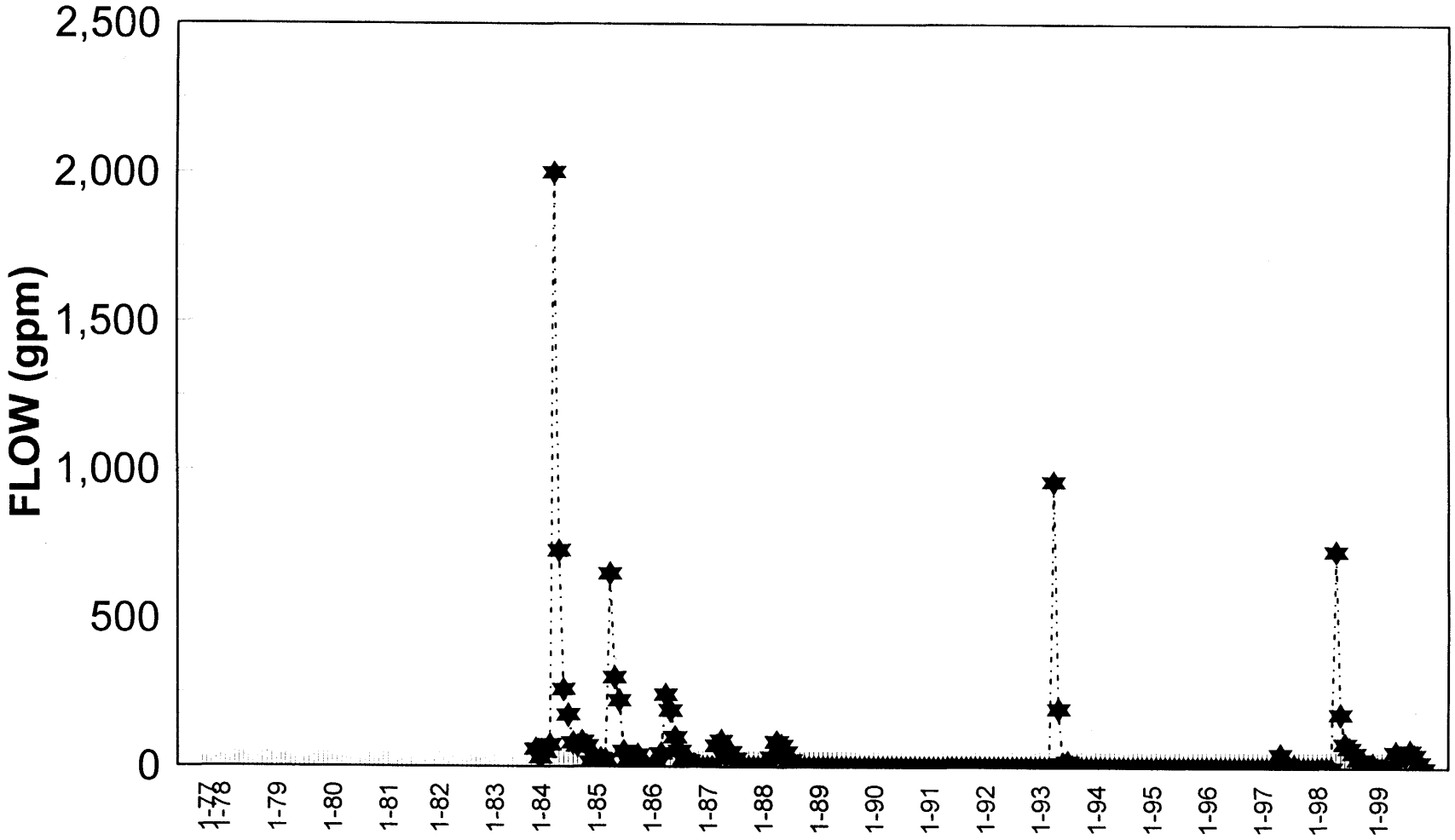
GRIMES WASH

RIGHT FORK
DISCHARGE RECESSION CURVE



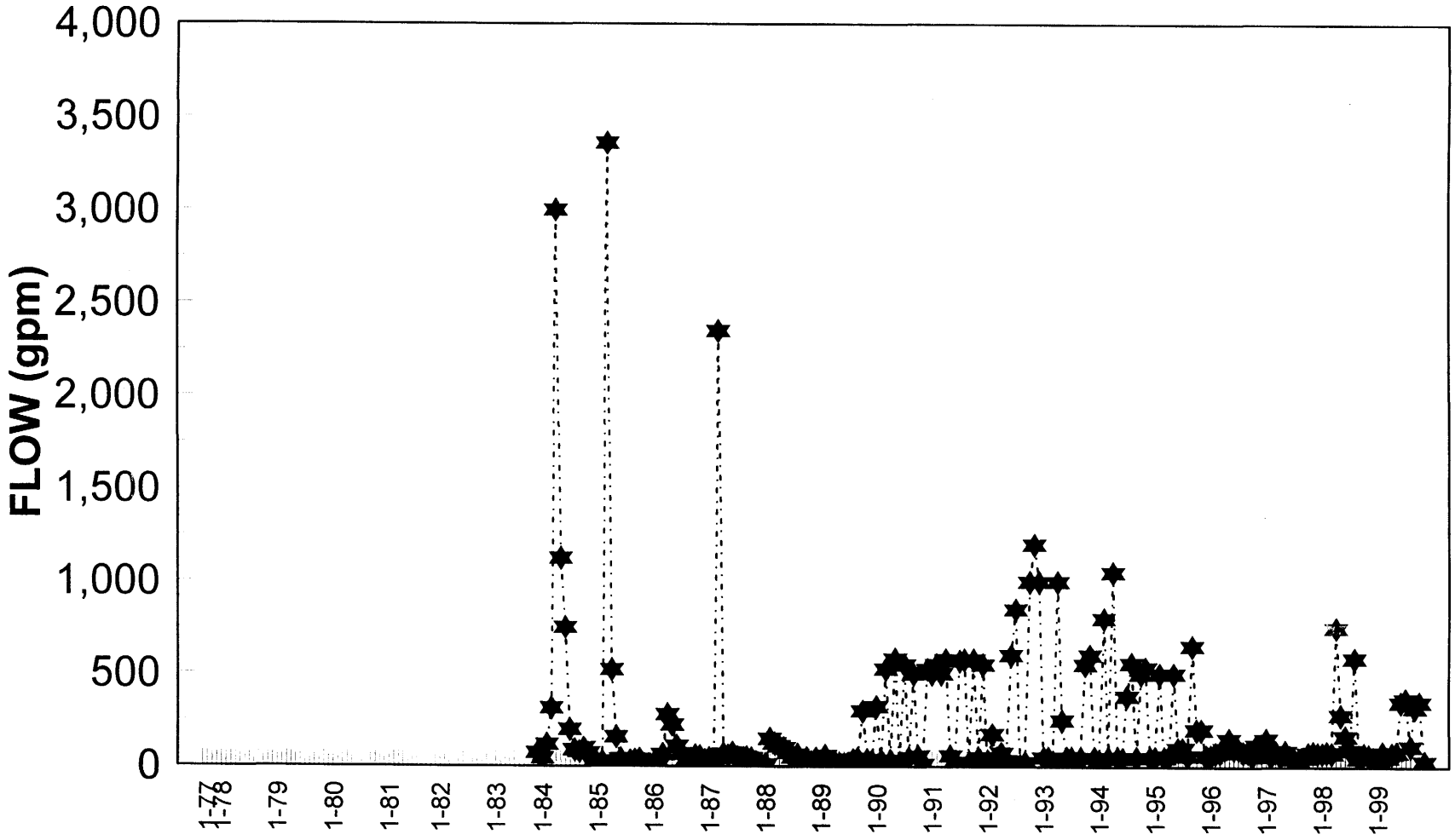
GRIMES WASH

LEFT FORK
DISCHARGE RECESSION CURVE



GRIMES WASH

BELOW MINE
DISCHARGE RECESSION CURVE

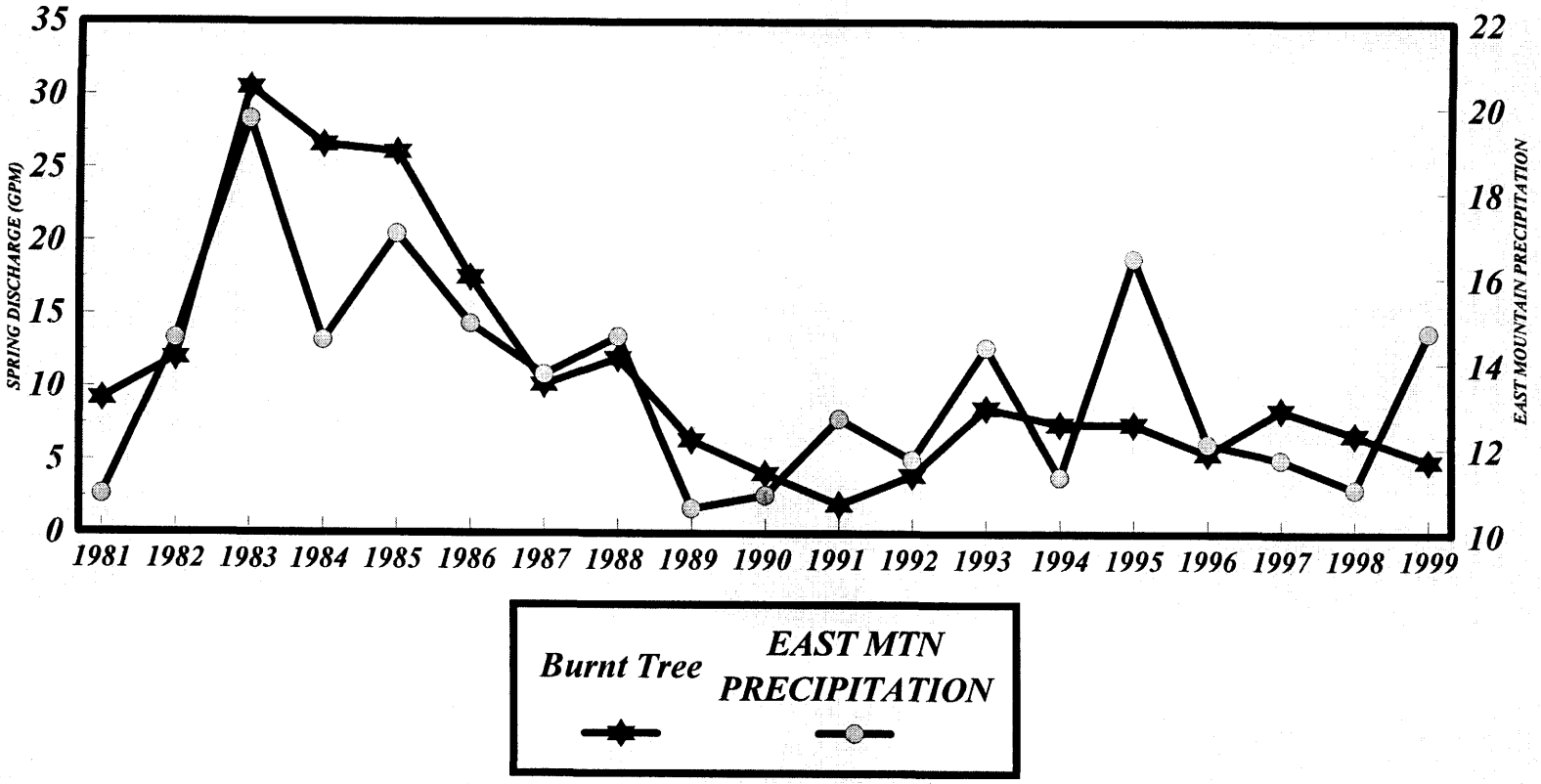


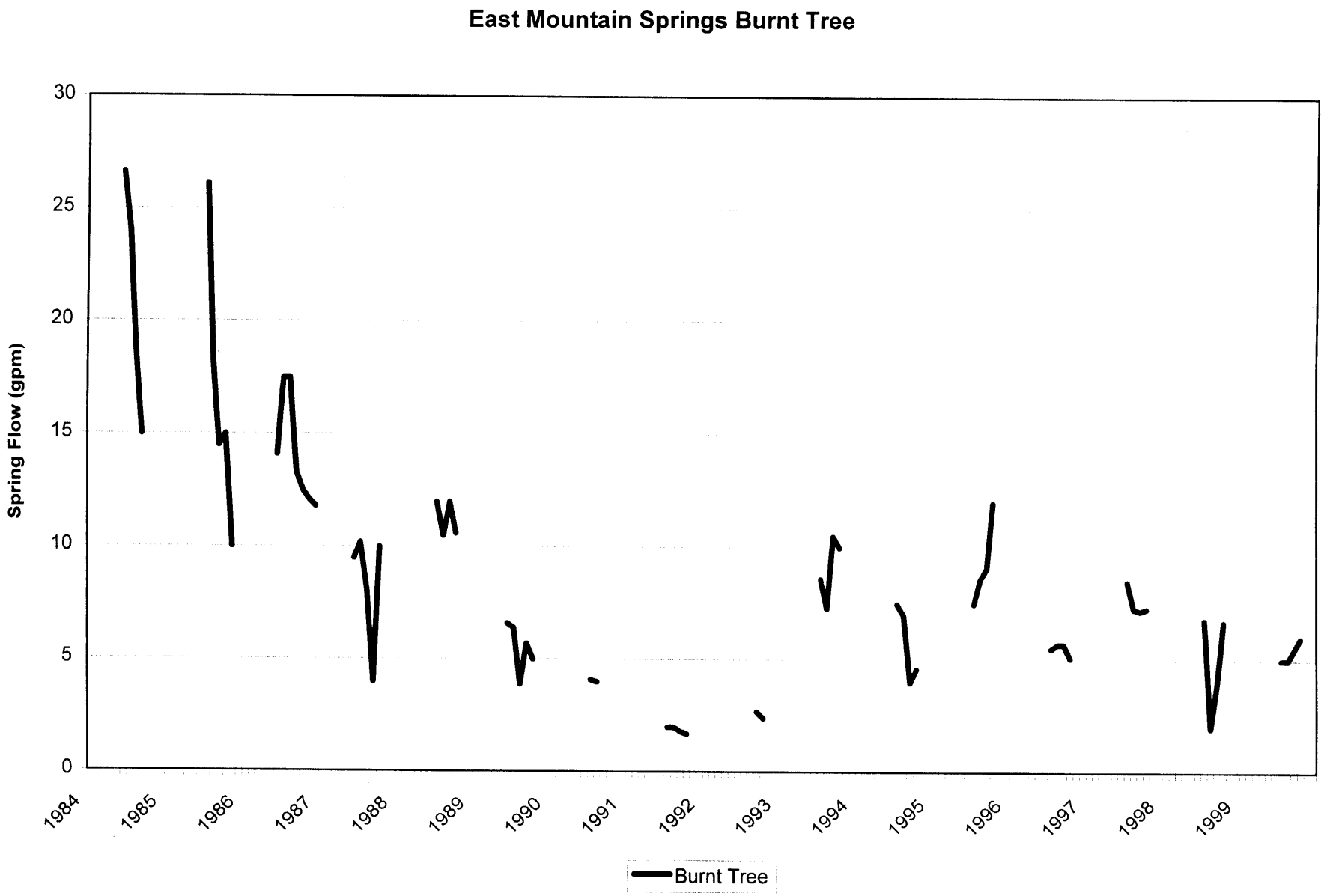
APPENDIX H

1999

EAST MOUNTAIN SPRINGS
Spring: Burnt Tree vs. Precipitation

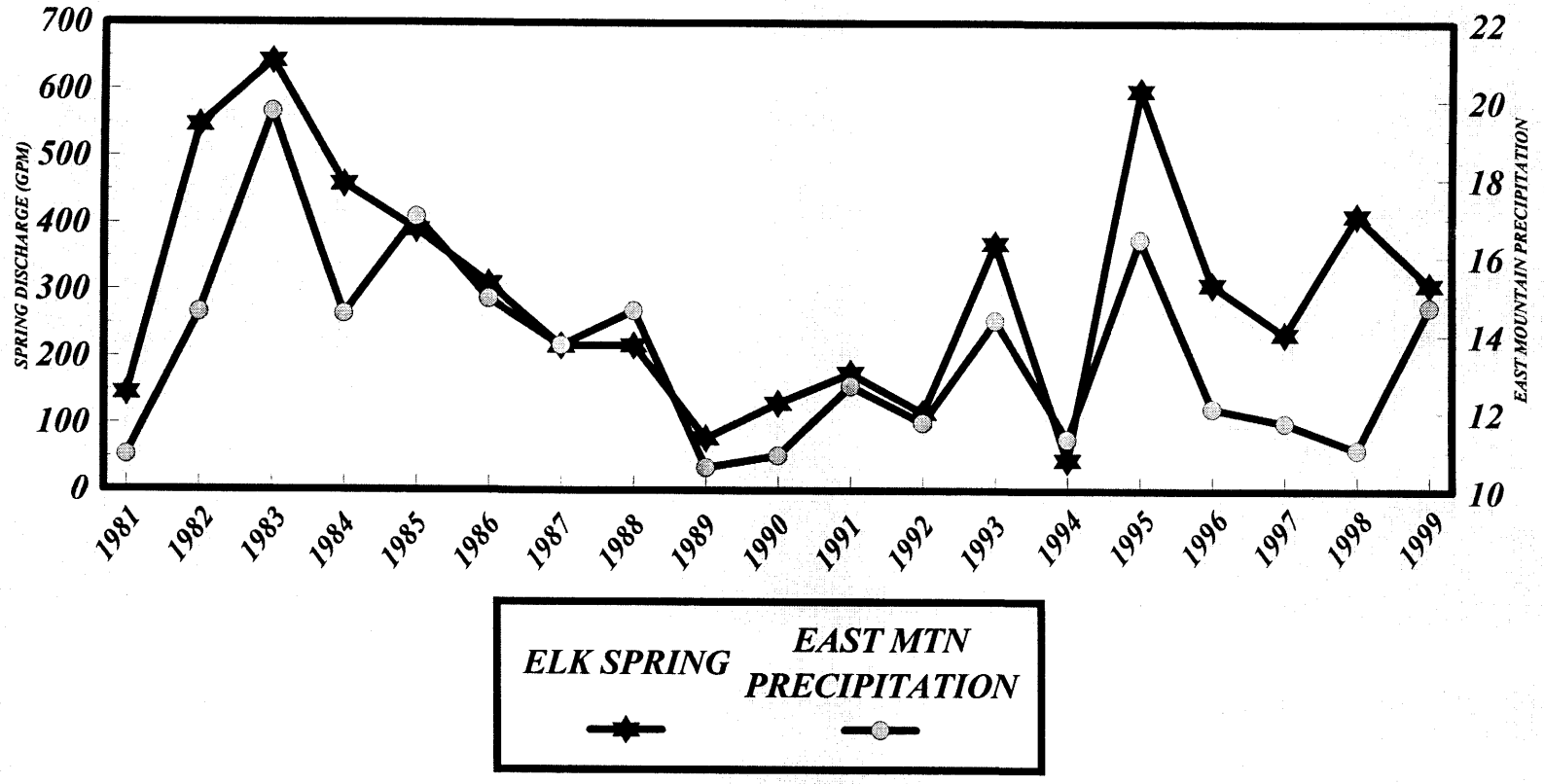
PEAK FLOW (JULY) vs. EAST MOUNTAIN WEATHER STATION

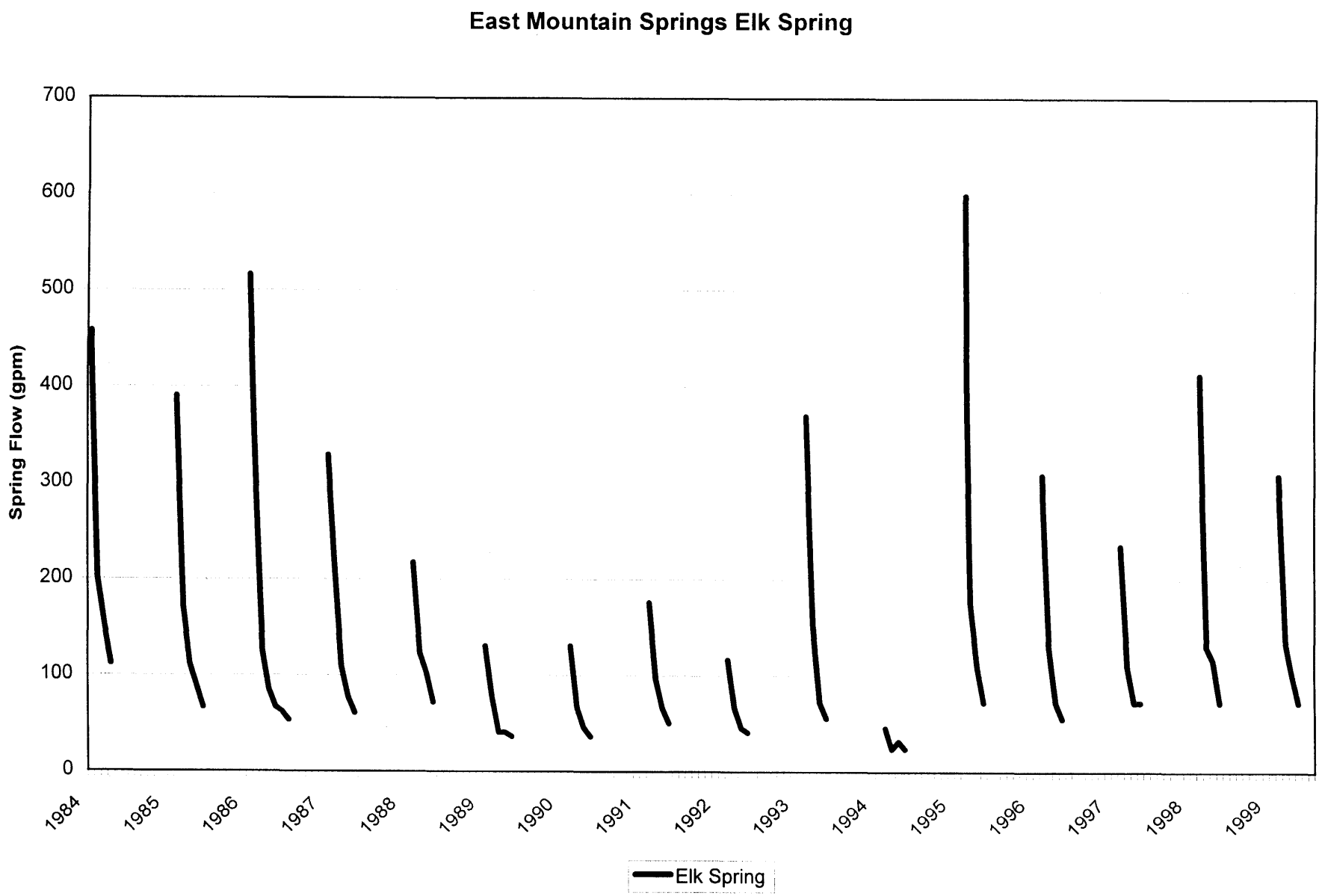



East Mountain Springs Burnt Tree
Spring Flow (gpm)
30
25
20
15
10
5
0
1984
1985
1986
1987
1988
1989
1990
1991
1992
1993
1994
1995
1996
1997
1998
1999
Burnt Tree

EAST MOUNTAIN SPRINGS
Spring: Elk Spring vs. Precipitation

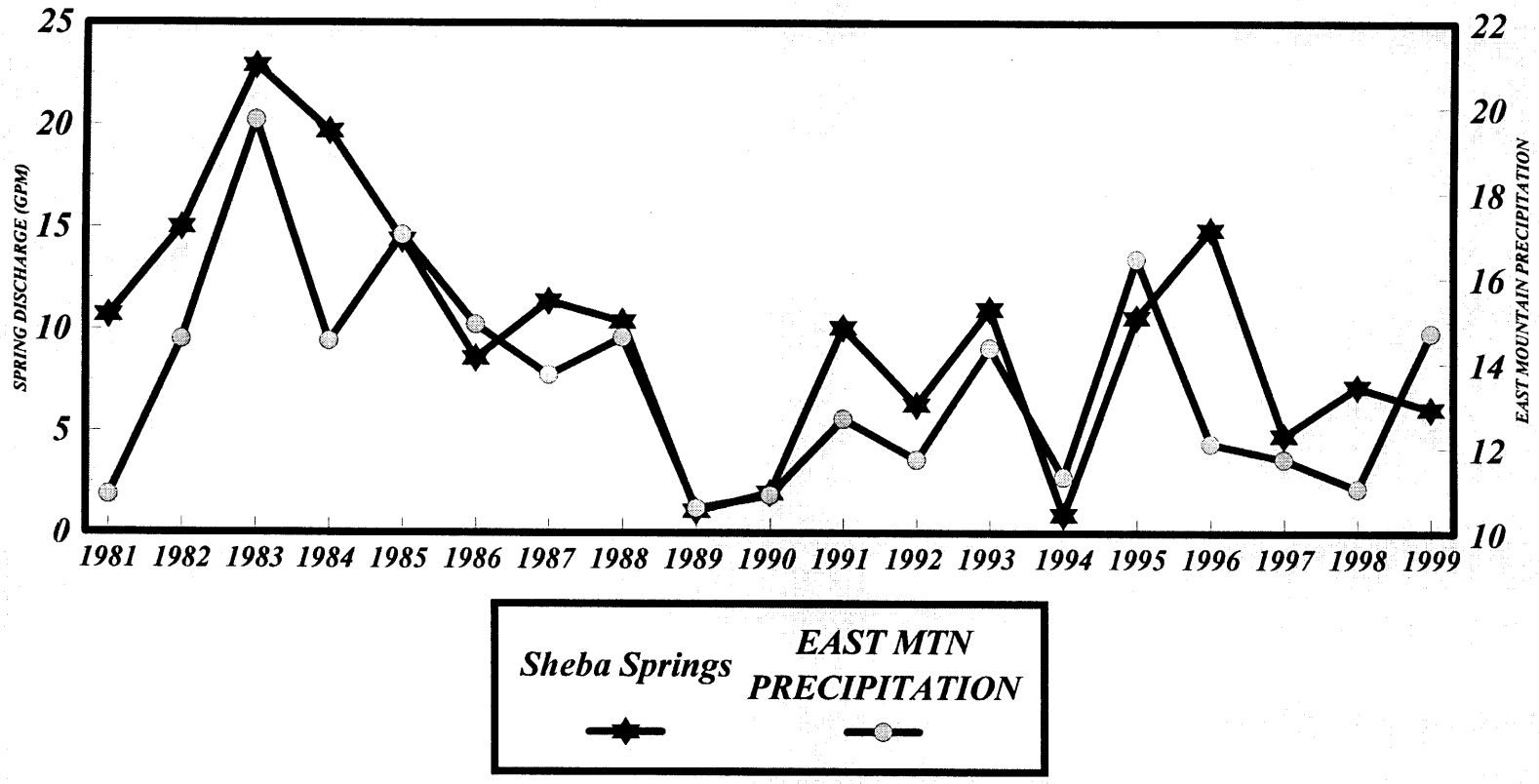
PEAK FLOW (JULY) vs. EAST MOUNTAIN WEATHER STATION



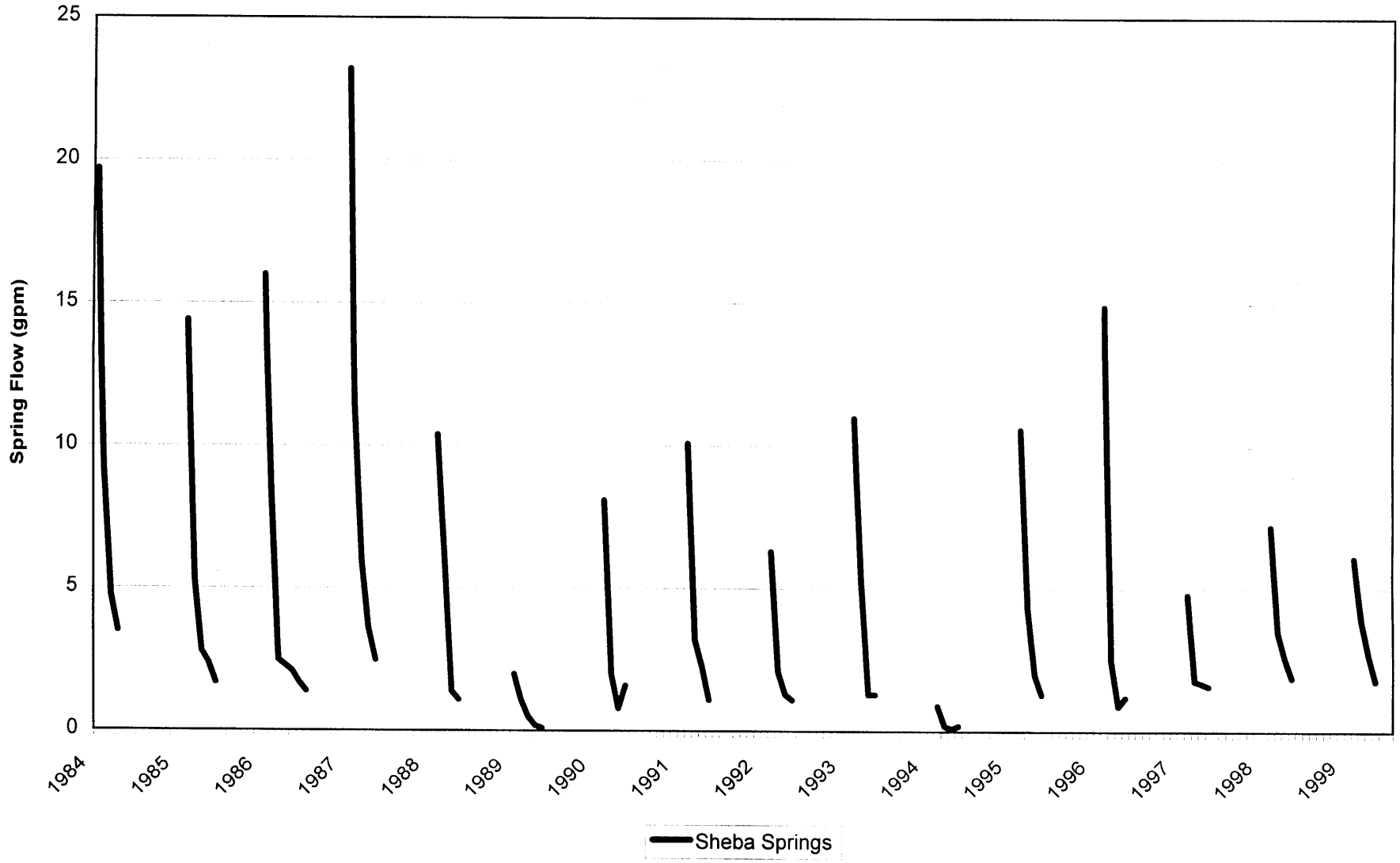

East Mountain Springs Elk Spring
Spring Flow (gpm)
700
600
500
400
300
200
100
0
1984
1985
1986
1987
1988
1989
1990
1991
1992
1993
1994
1995
1996
1997
1998
1999
Elk Spring

EAST MOUNTAIN SPRINGS
Spring: Sheba Springs vs. Precipitation

PEAK FLOW (JULY) vs. EAST MOUNTAIN WEATHER STATION

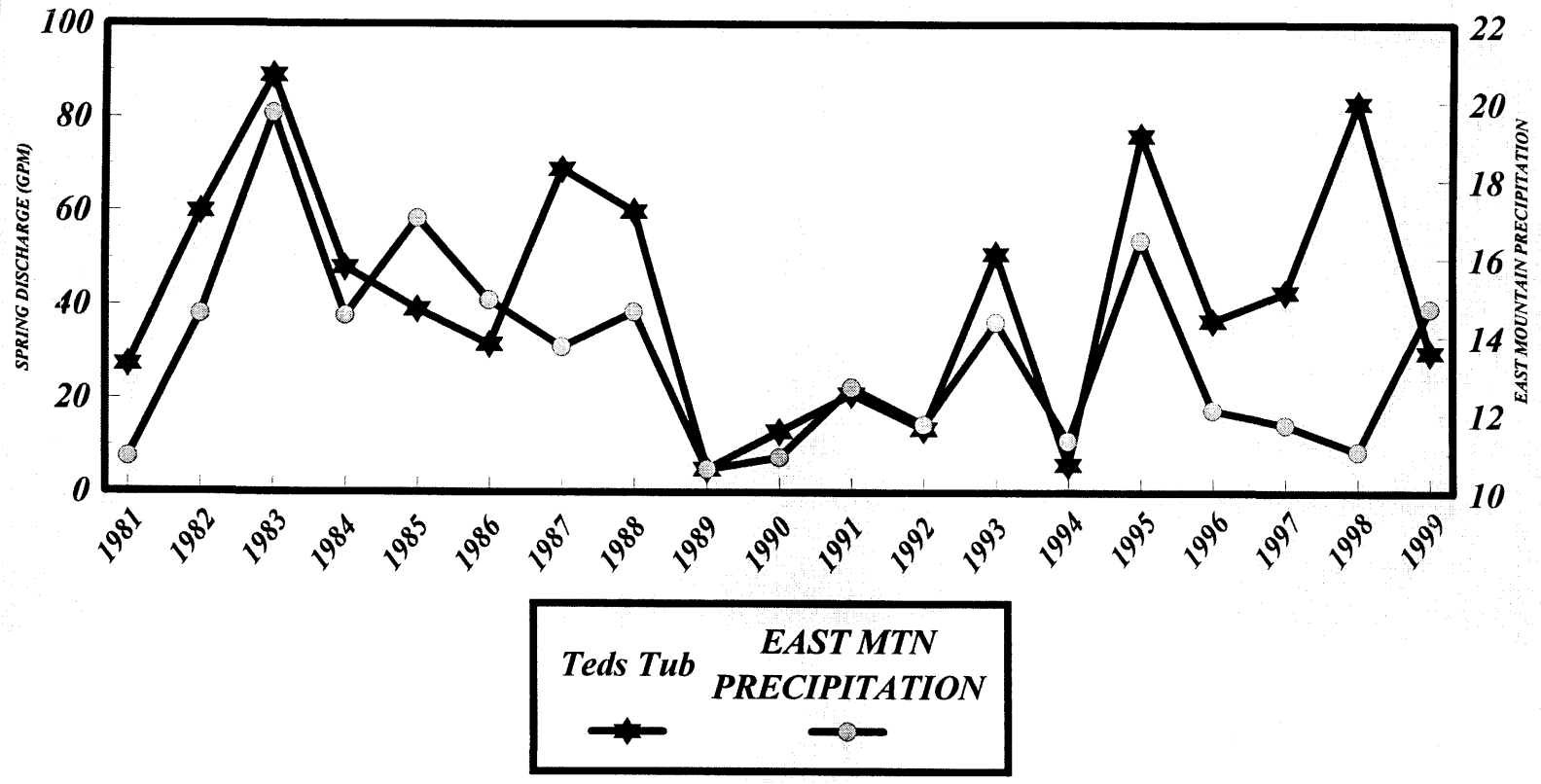


East Mountain Springs Sheba Springs



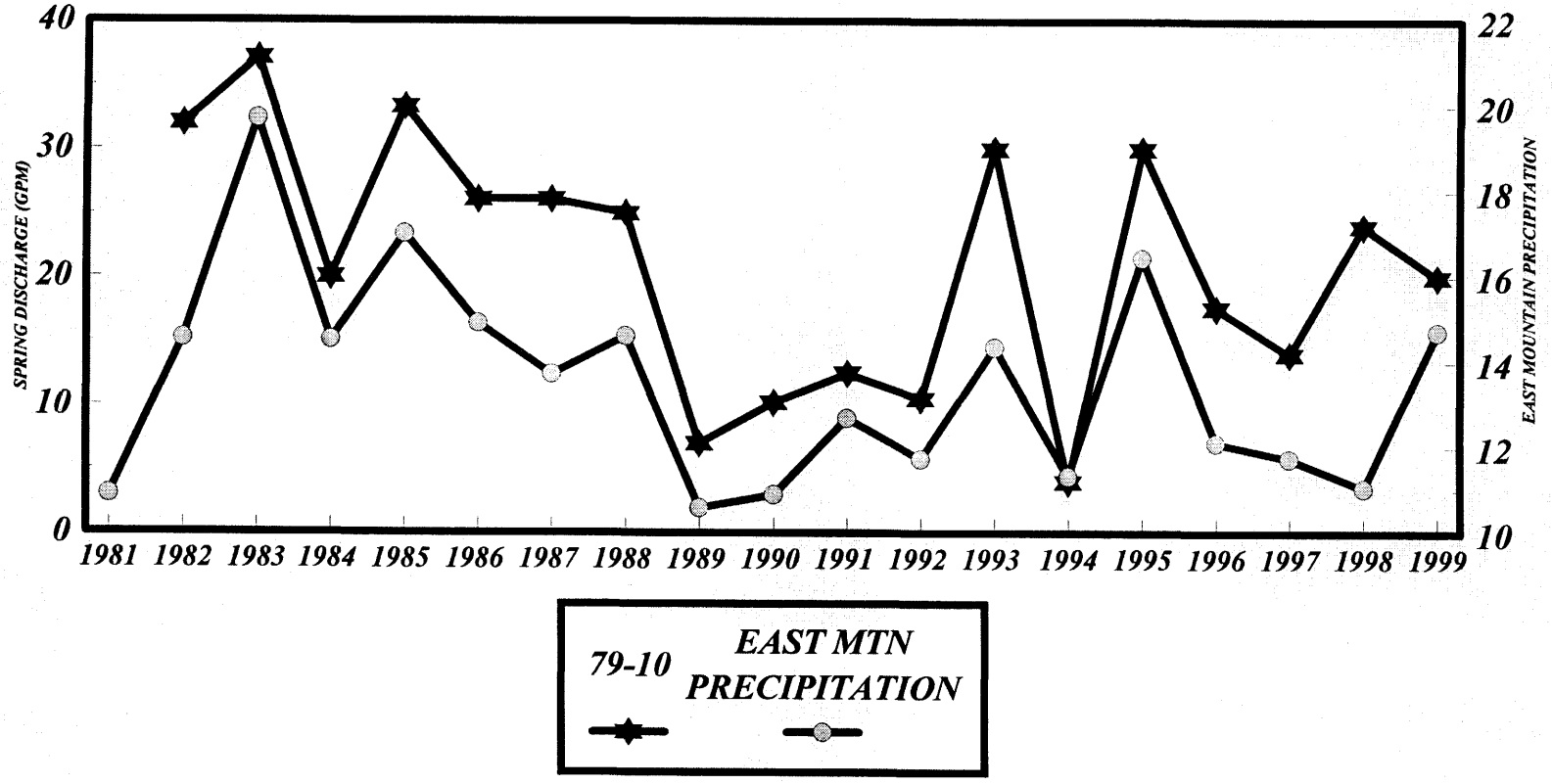
EAST MOUNTAIN SPRINGS
Spring: Teds Tub vs. Precipitation

PEAK FLOW (JULY) vs. EAST MOUNTAIN WEATHER STATION

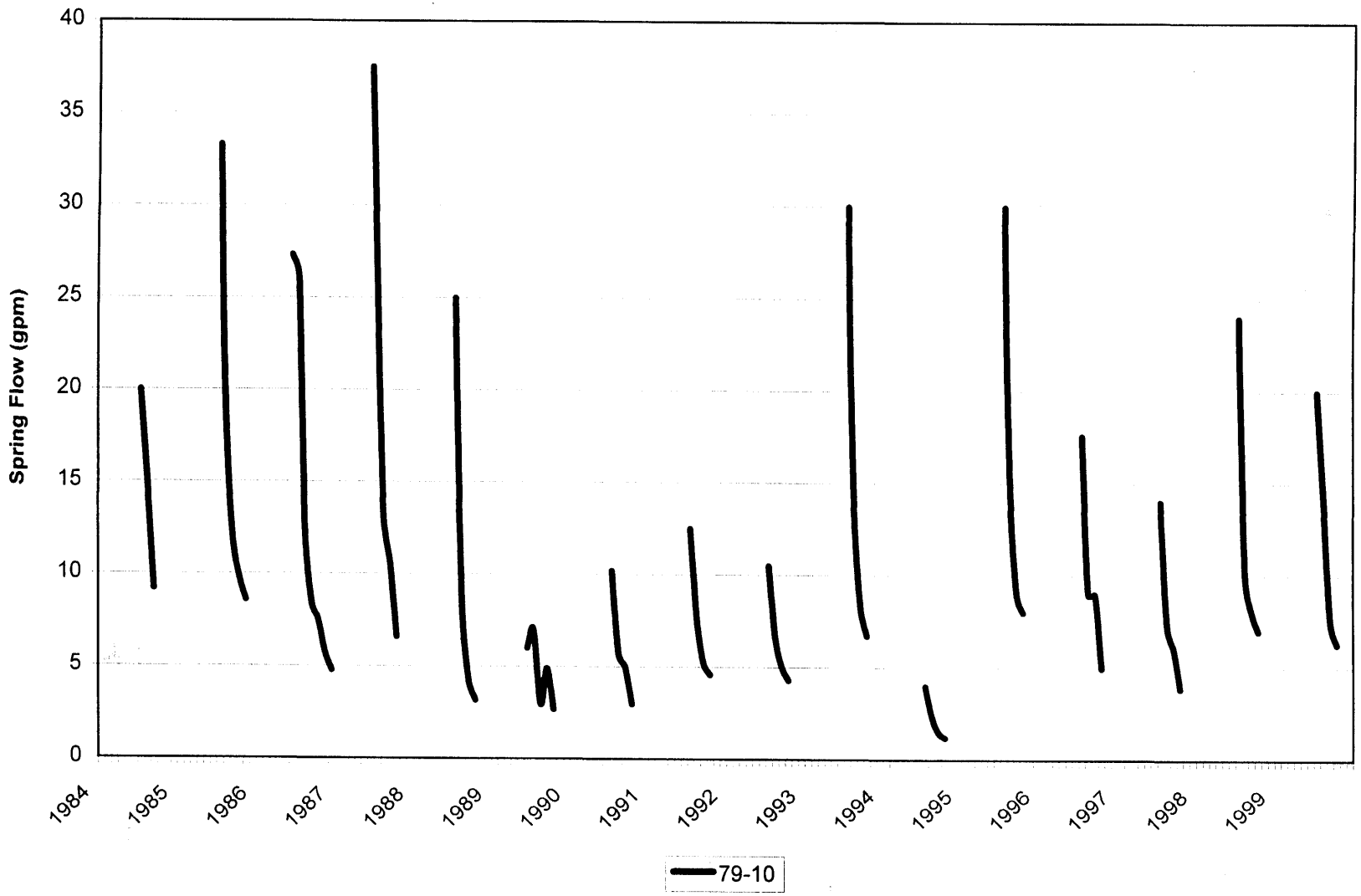


EAST MOUNTAIN SPRINGS
Spring: 79-10 vs. Precipitation

PEAK FLOW (JULY) vs. EAST MOUNTAIN WEATHER STATION

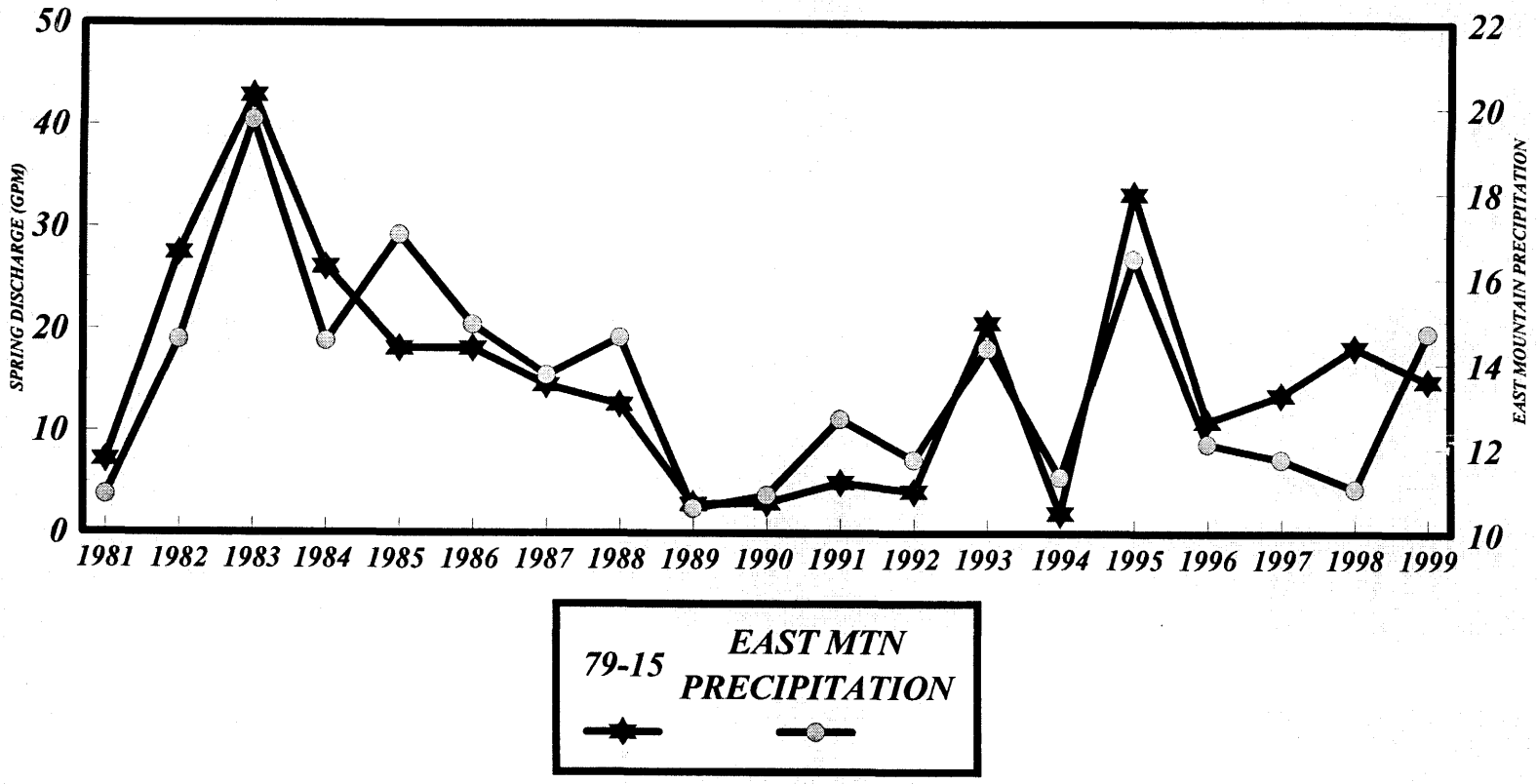


East Mountain Springs 79-10



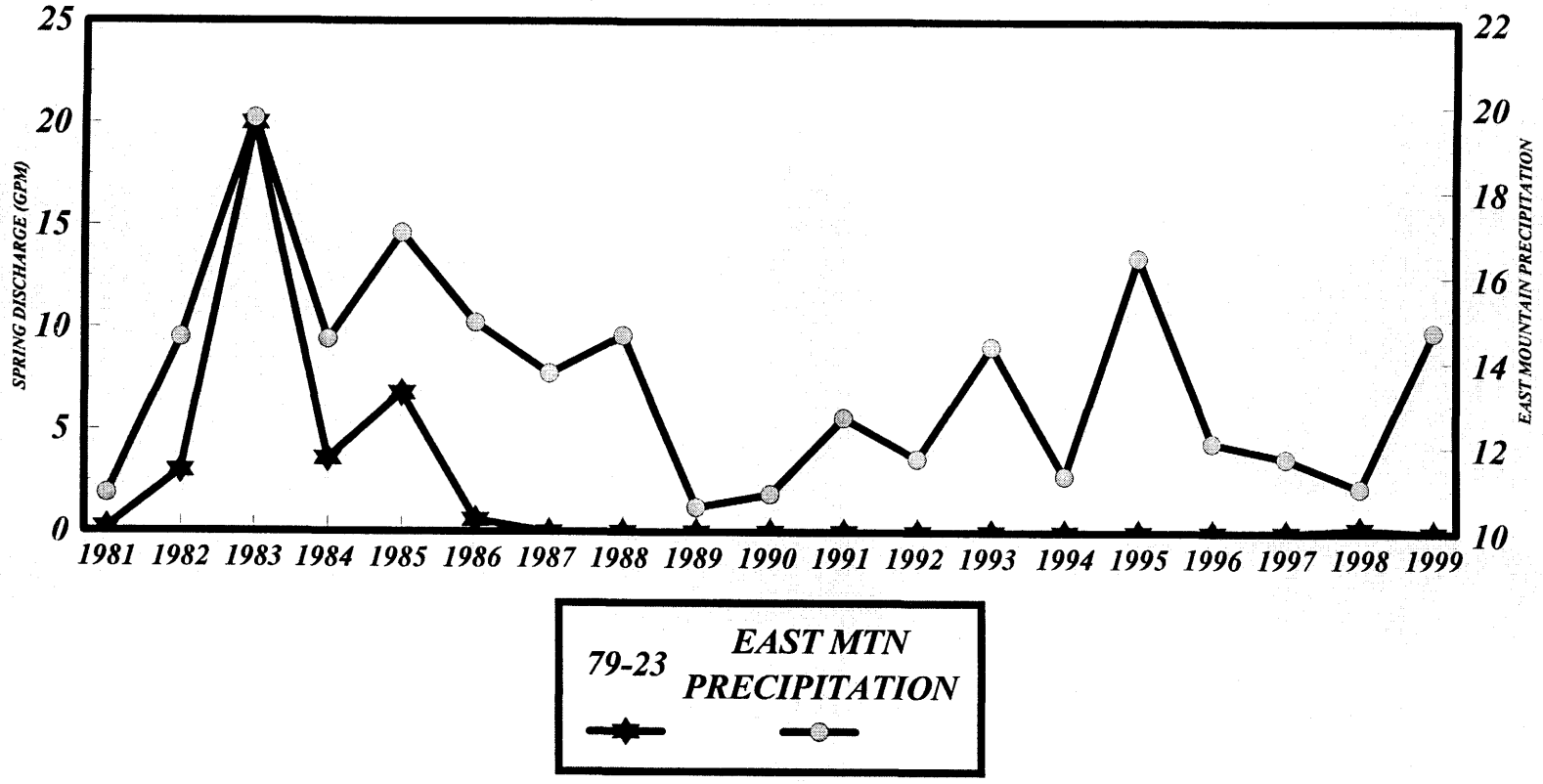
EAST MOUNTAIN SPRINGS
Spring: 79-15 vs. Precipitation

PEAK FLOW (JULY) vs. EAST MOUNTAIN WEATHER STATION

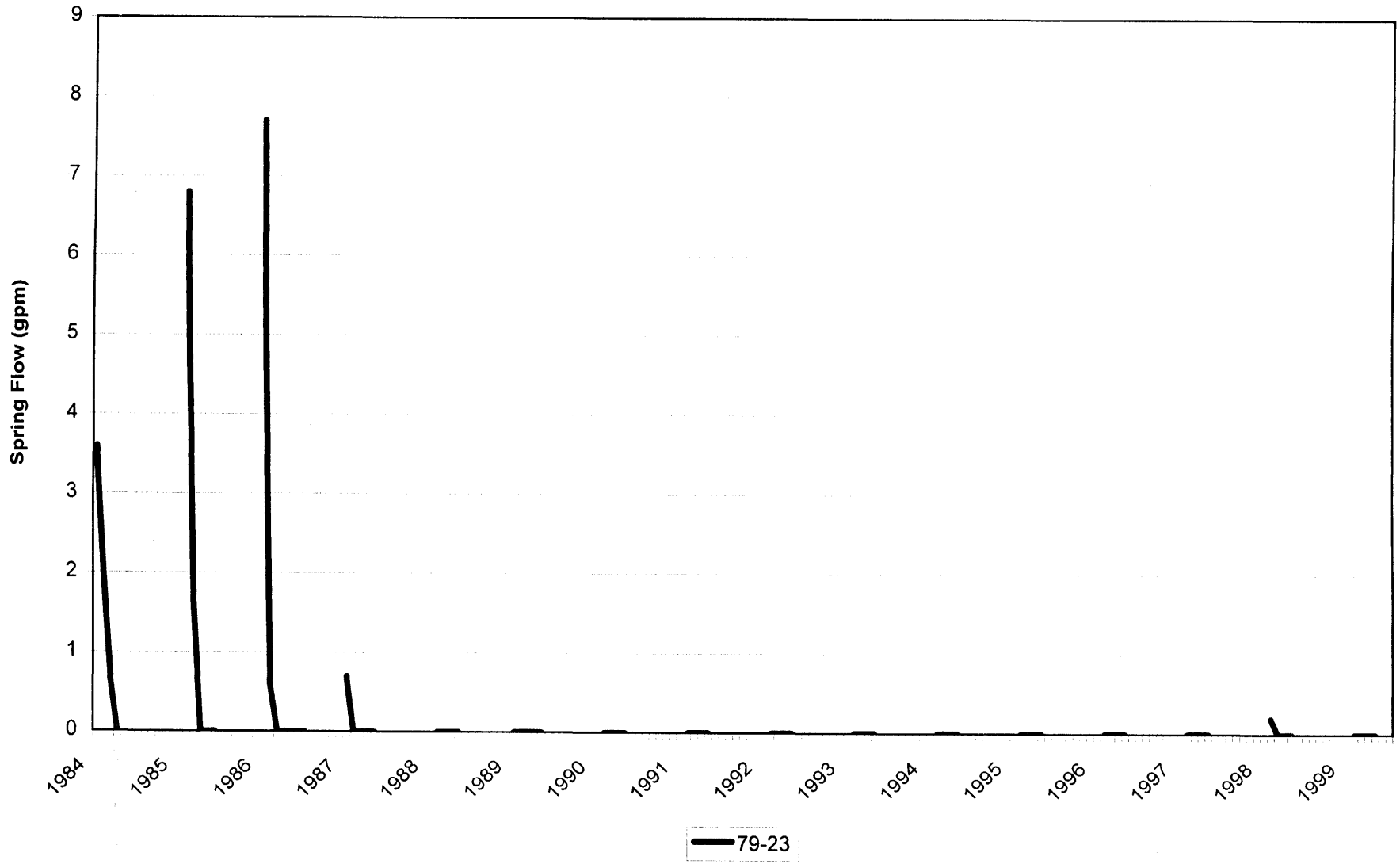


EAST MOUNTAIN SPRINGS
Spring: 79-23 vs. Precipitation

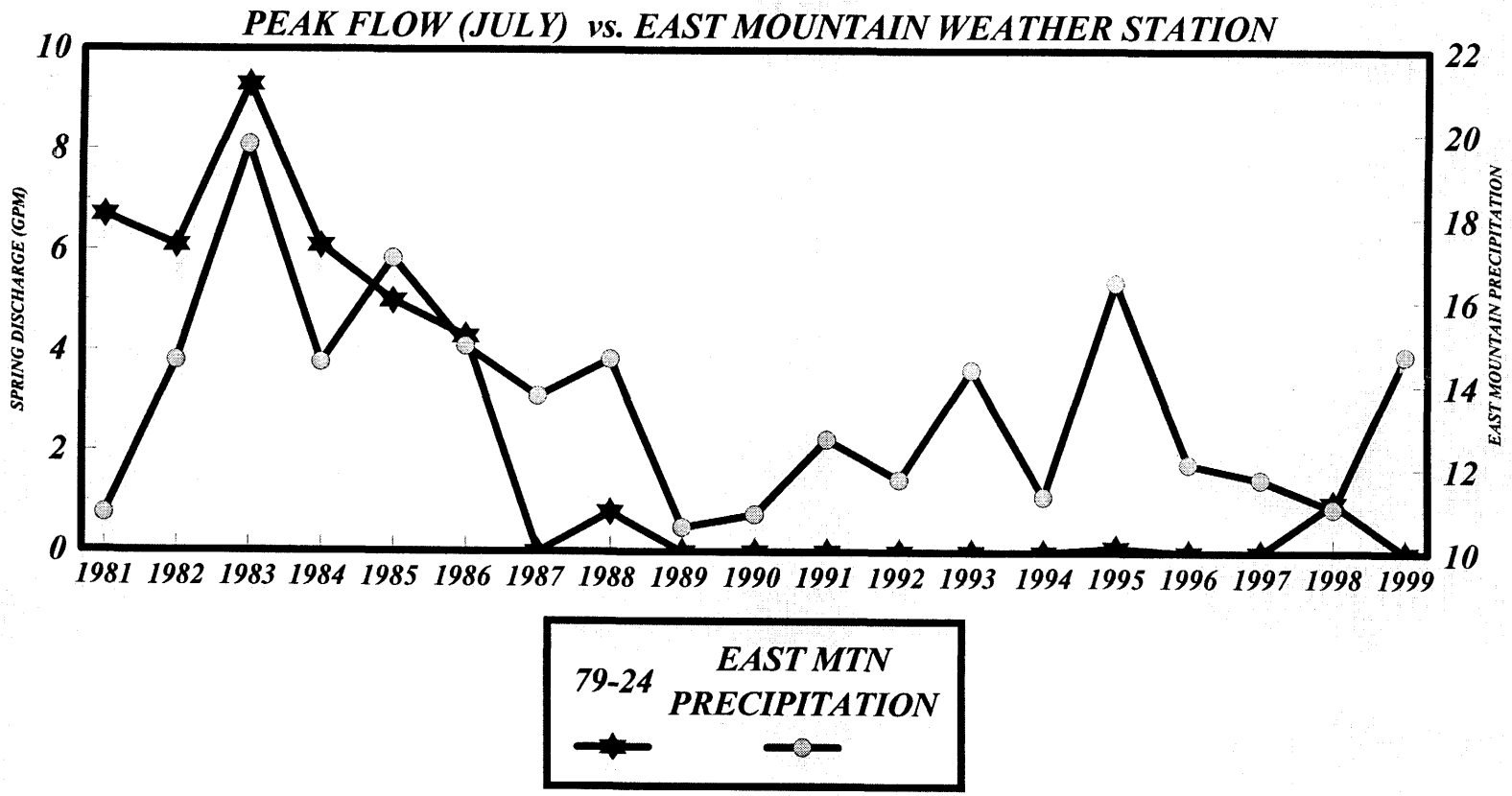
PEAK FLOW (JULY) vs. EAST MOUNTAIN WEATHER STATION



East Mountain Springs 79-23

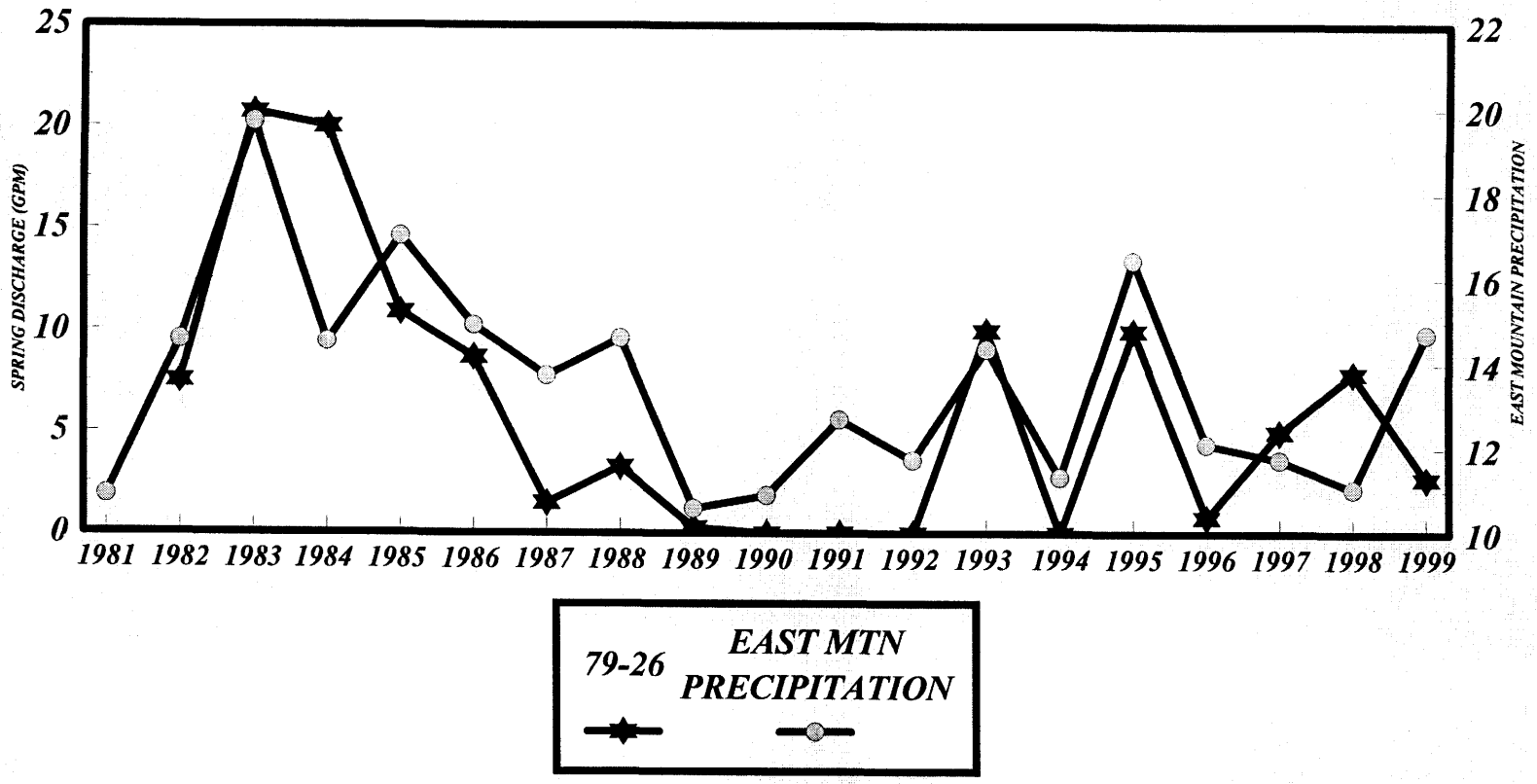


EAST MOUNTAIN SPRINGS
Spring: 79-24
vs. Precipitation

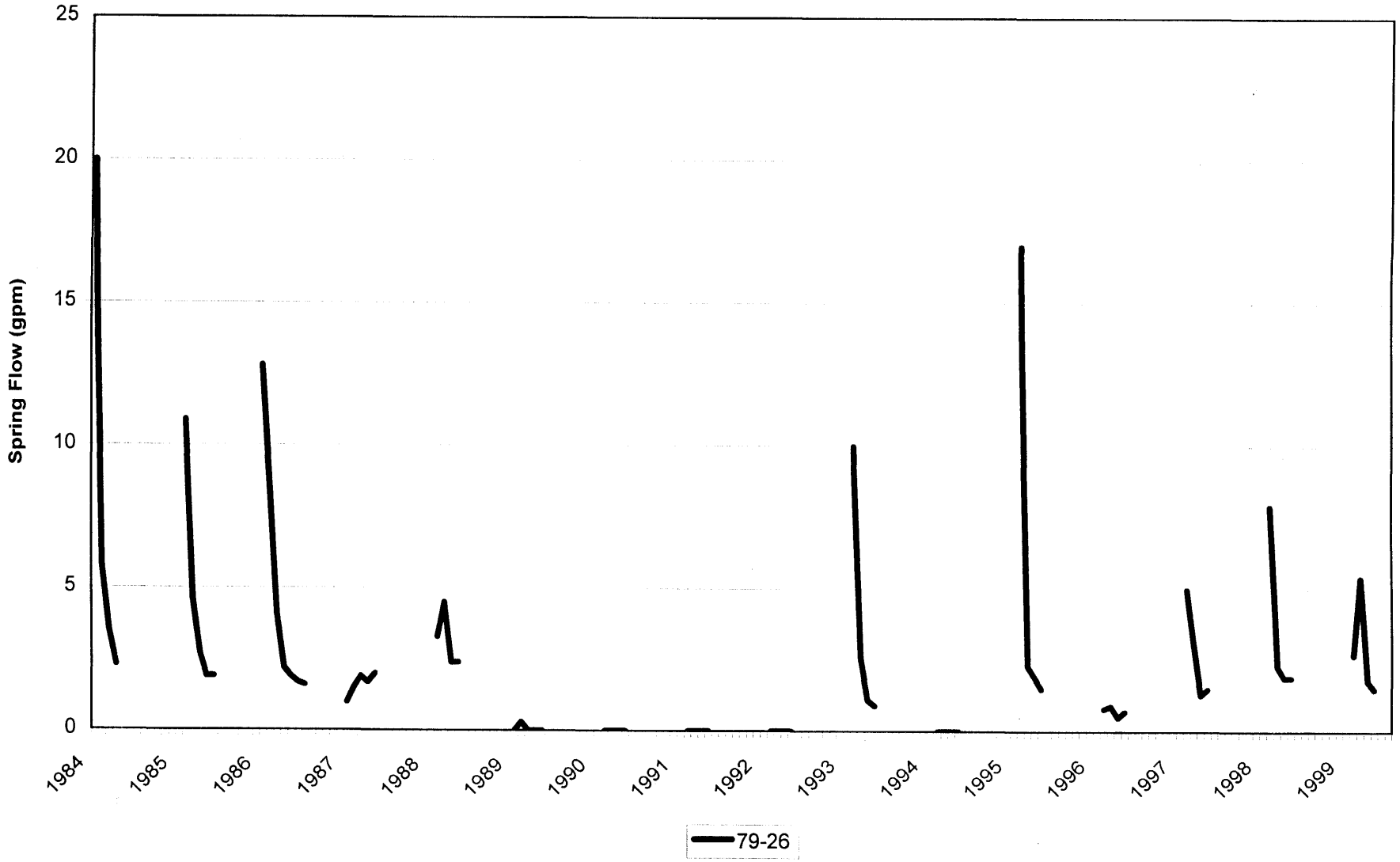


EAST MOUNTAIN SPRINGS
Spring: 79-26 vs. Precipitation

PEAK FLOW (JULY) vs. EAST MOUNTAIN WEATHER STATION

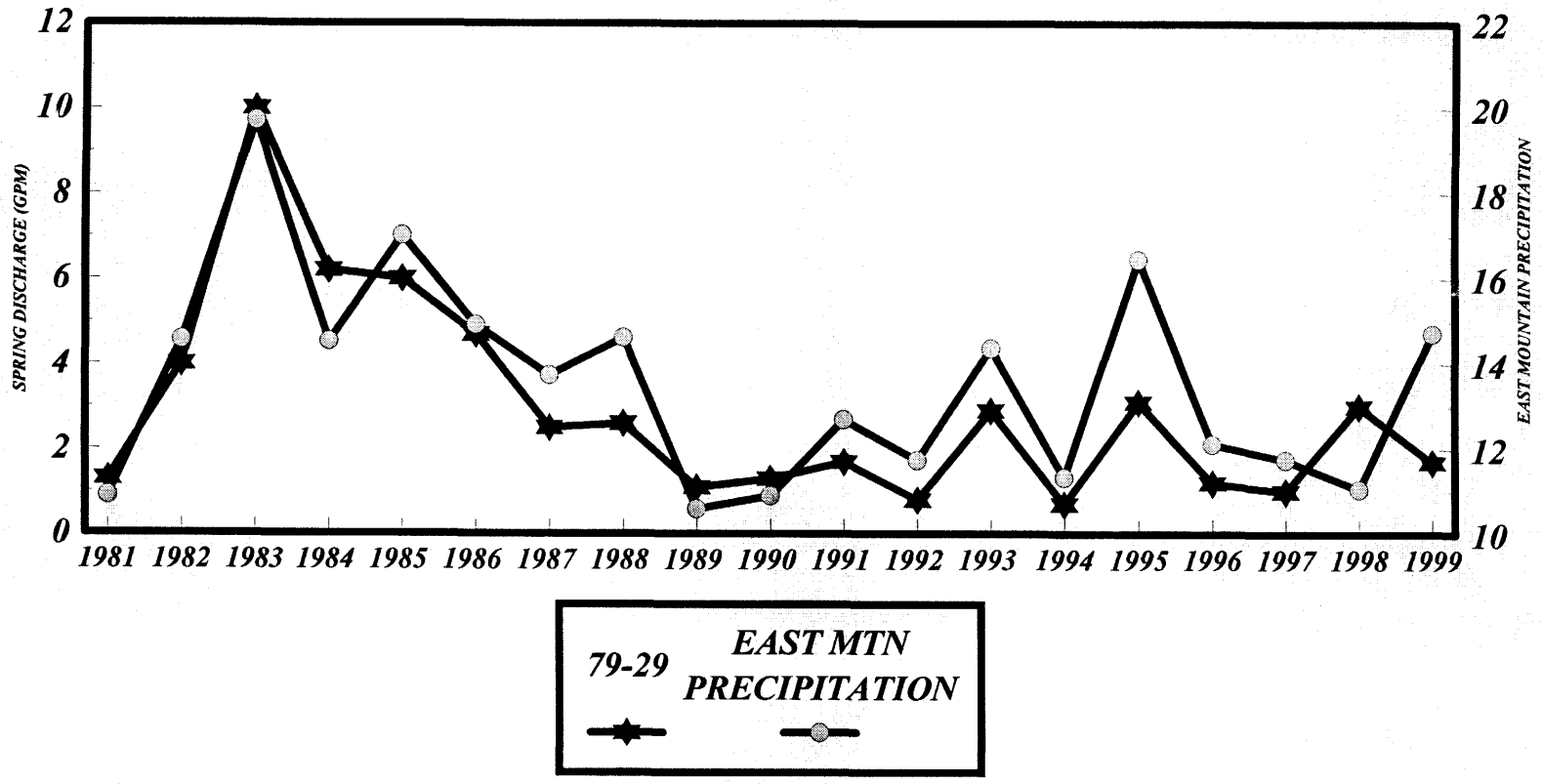


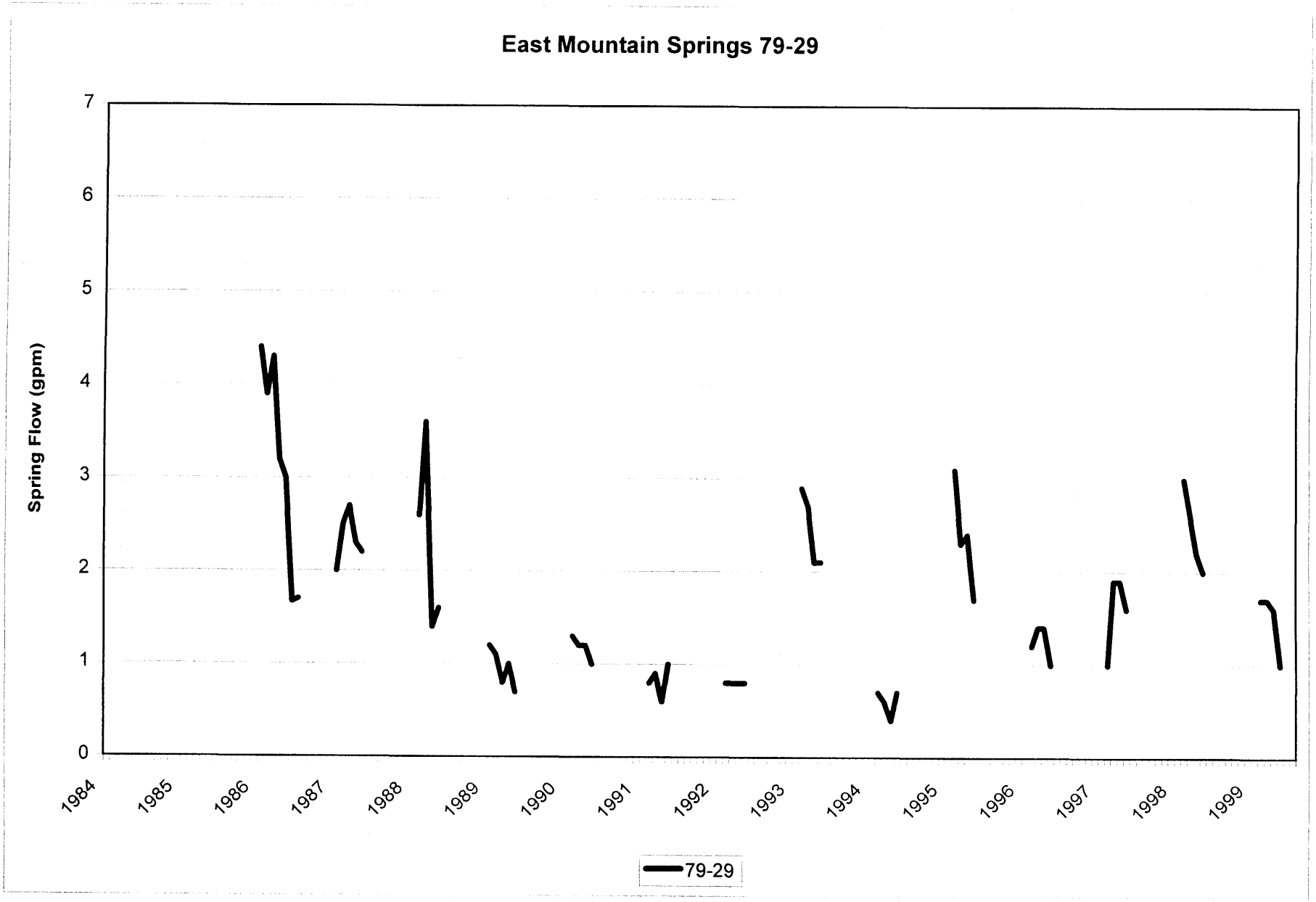
East Mountain Springs 79-26



EAST MOUNTAIN SPRINGS
Spring: 79-29 vs. Precipitation

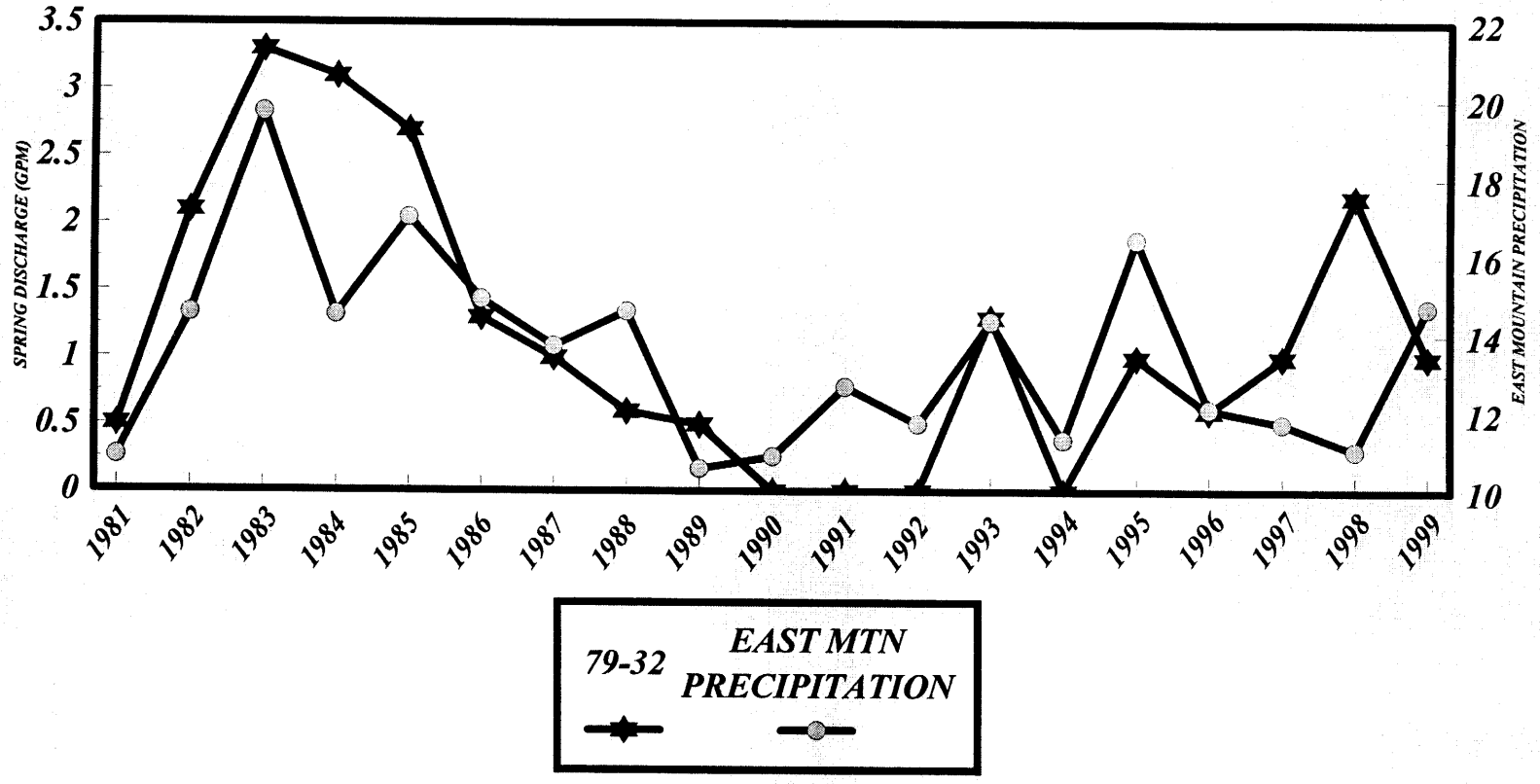
PEAK FLOW (JULY) vs. EAST MOUNTAIN WEATHER STATION




East Mountain Springs 79-29
Spring Flow (gpm)
0
1
2
3
4
5
6
7
1984
1985
1986
1987
1988
1989
1990
1991
1992
1993
1994
1995
1996
1997
1998
1999
79-29

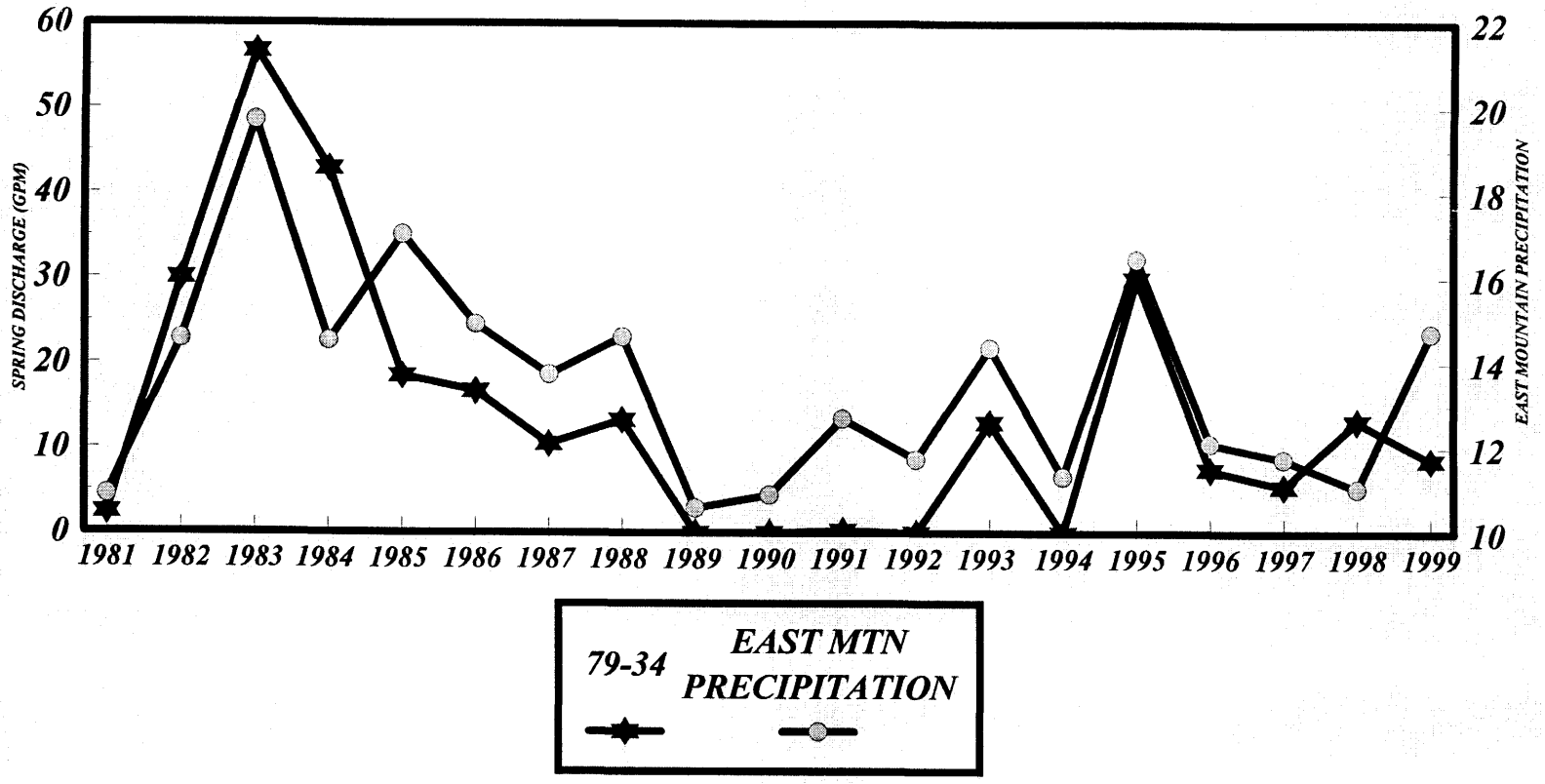
EAST MOUNTAIN SPRINGS
Spring: 79-32 vs. Precipitation

PEAK FLOW (JULY) vs. EAST MOUNTAIN WEATHER STATION



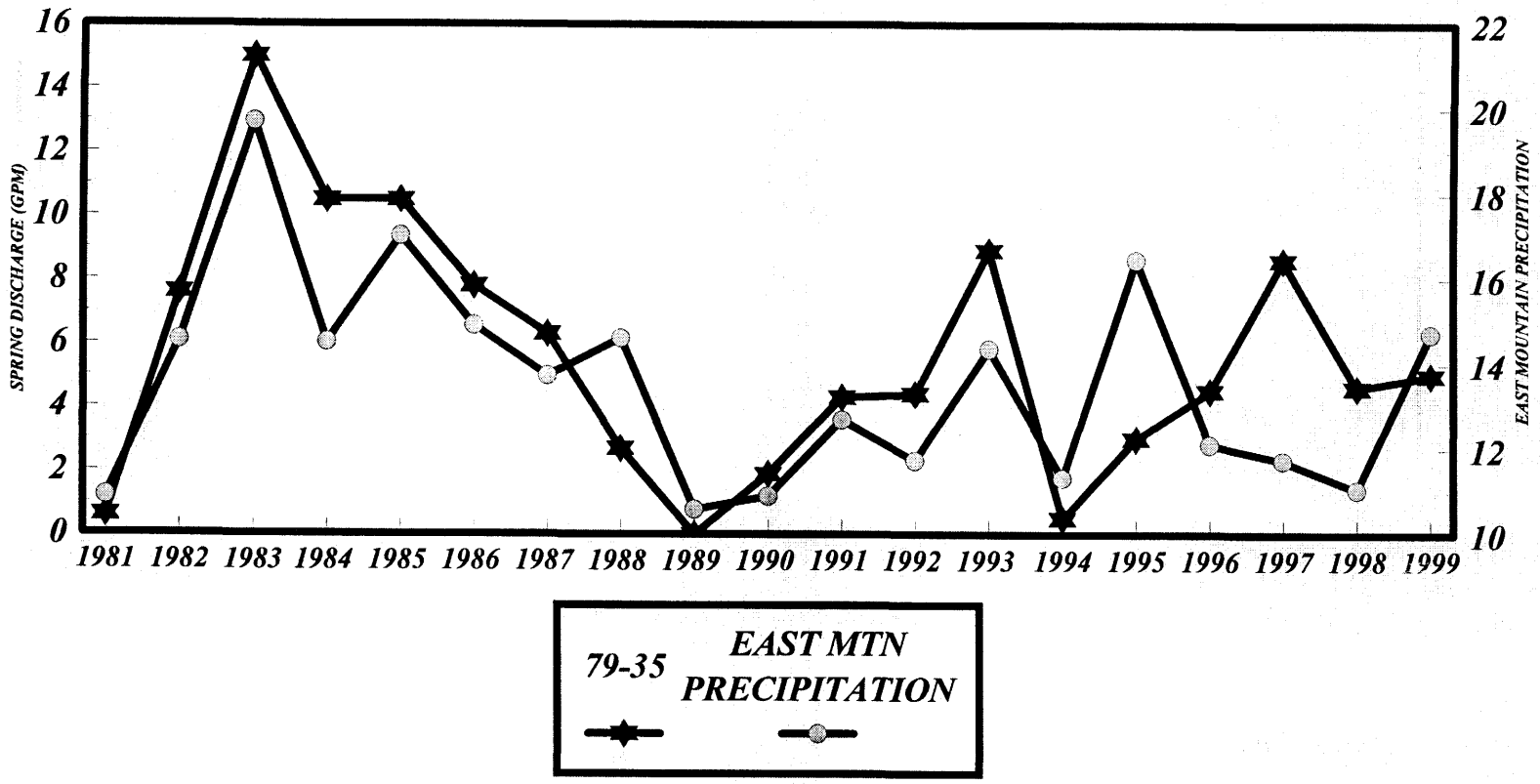
EAST MOUNTAIN SPRINGS
Spring: 79-34 vs. Precipitation

PEAK FLOW (JULY) vs. EAST MOUNTAIN WEATHER STATION

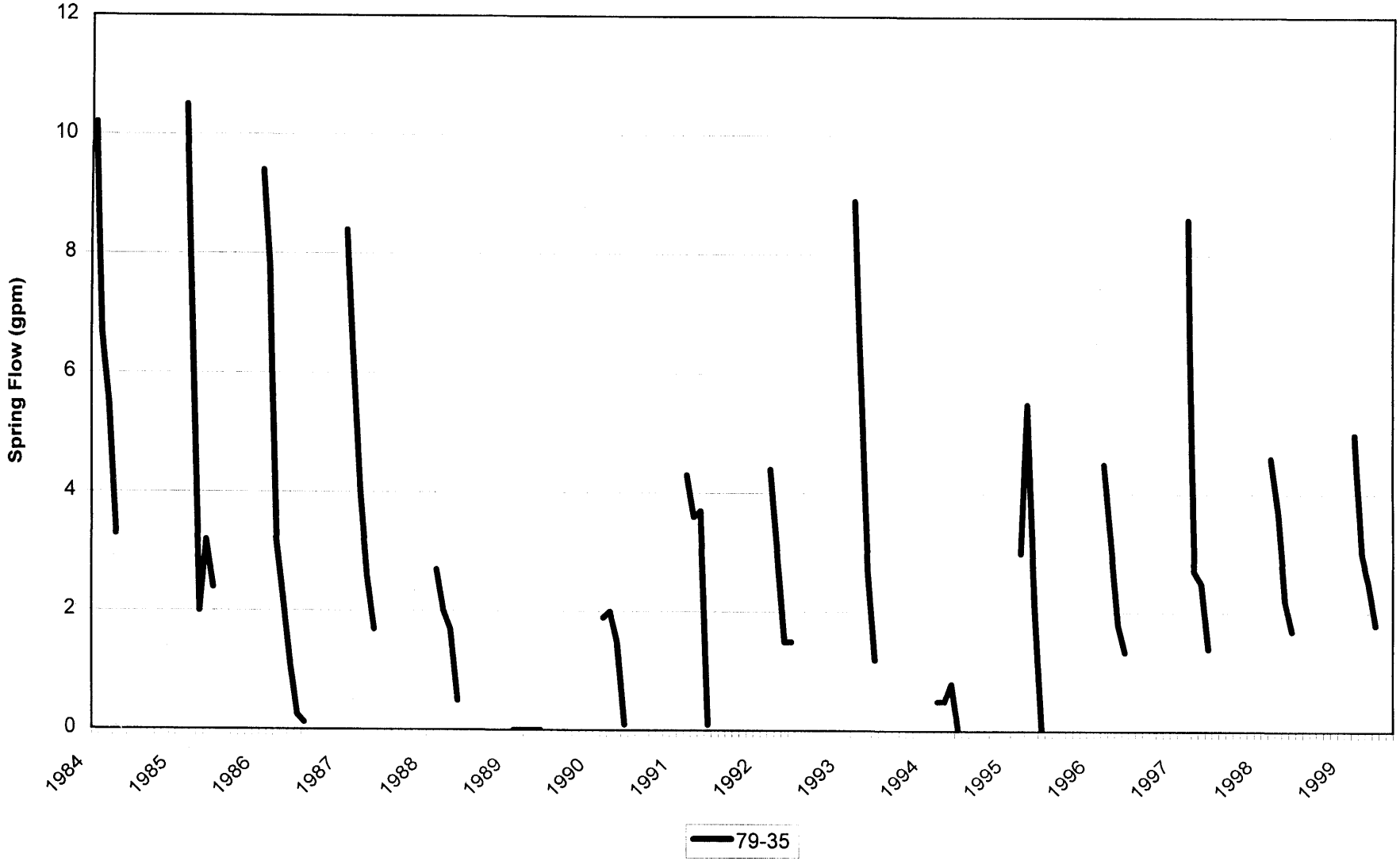


EAST MOUNTAIN SPRINGS
Spring: 79-35 vs. Precipitation

PEAK FLOW (JULY) vs. EAST MOUNTAIN WEATHER STATION

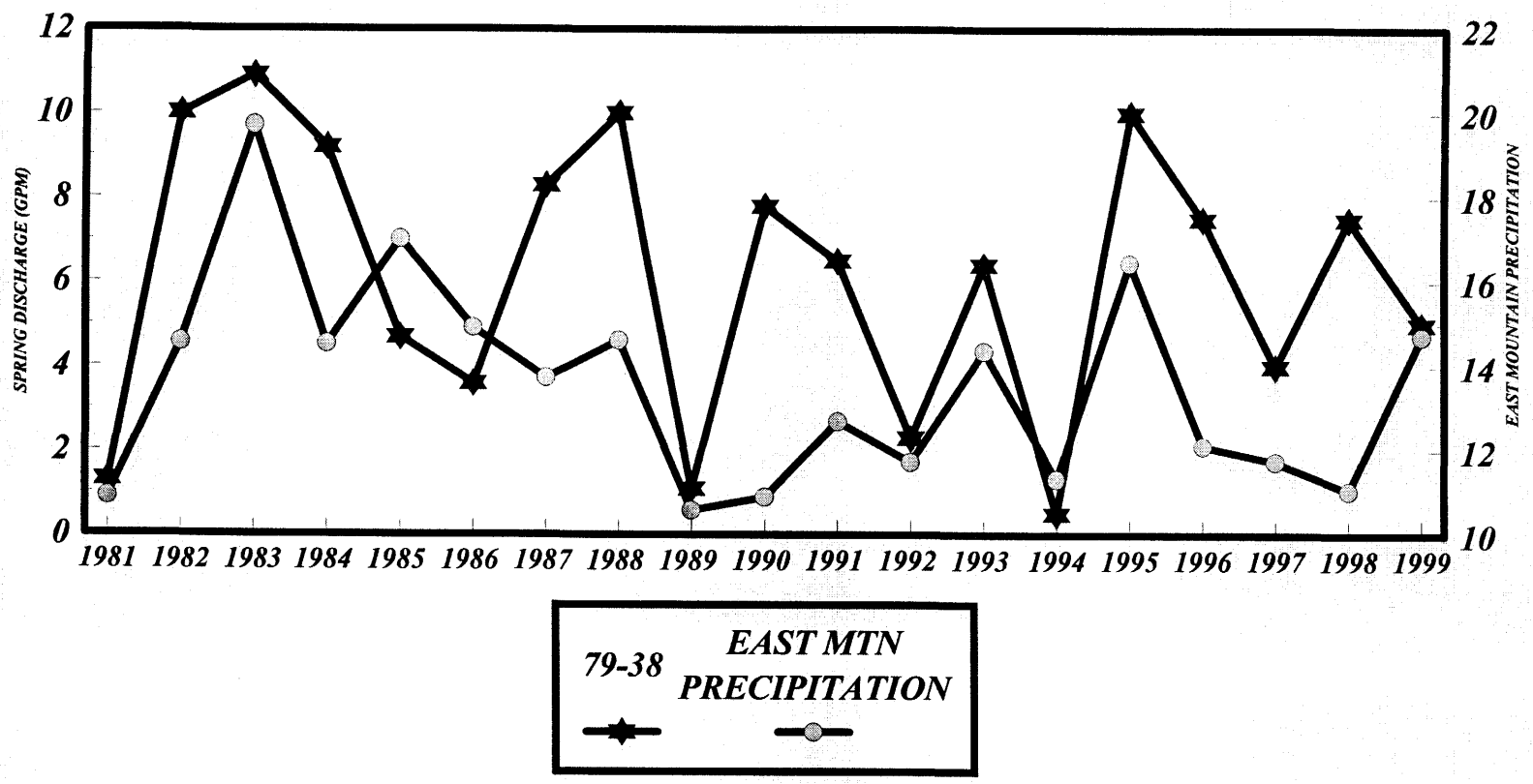


East Mountain Springs 79-35



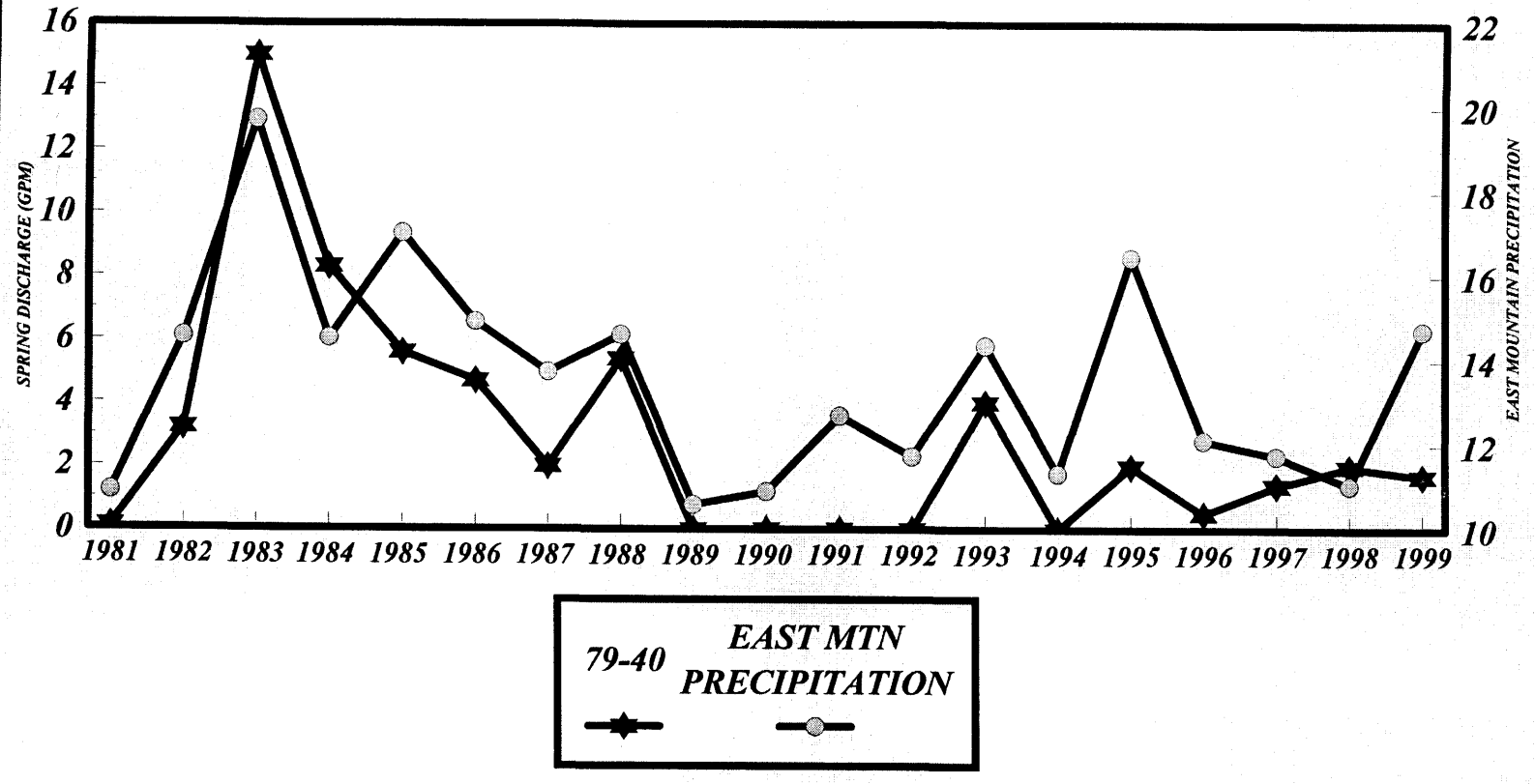
EAST MOUNTAIN SPRINGS
Spring: 79-38 vs. Precipitation

PEAK FLOW (JULY) vs. EAST MOUNTAIN WEATHER STATION



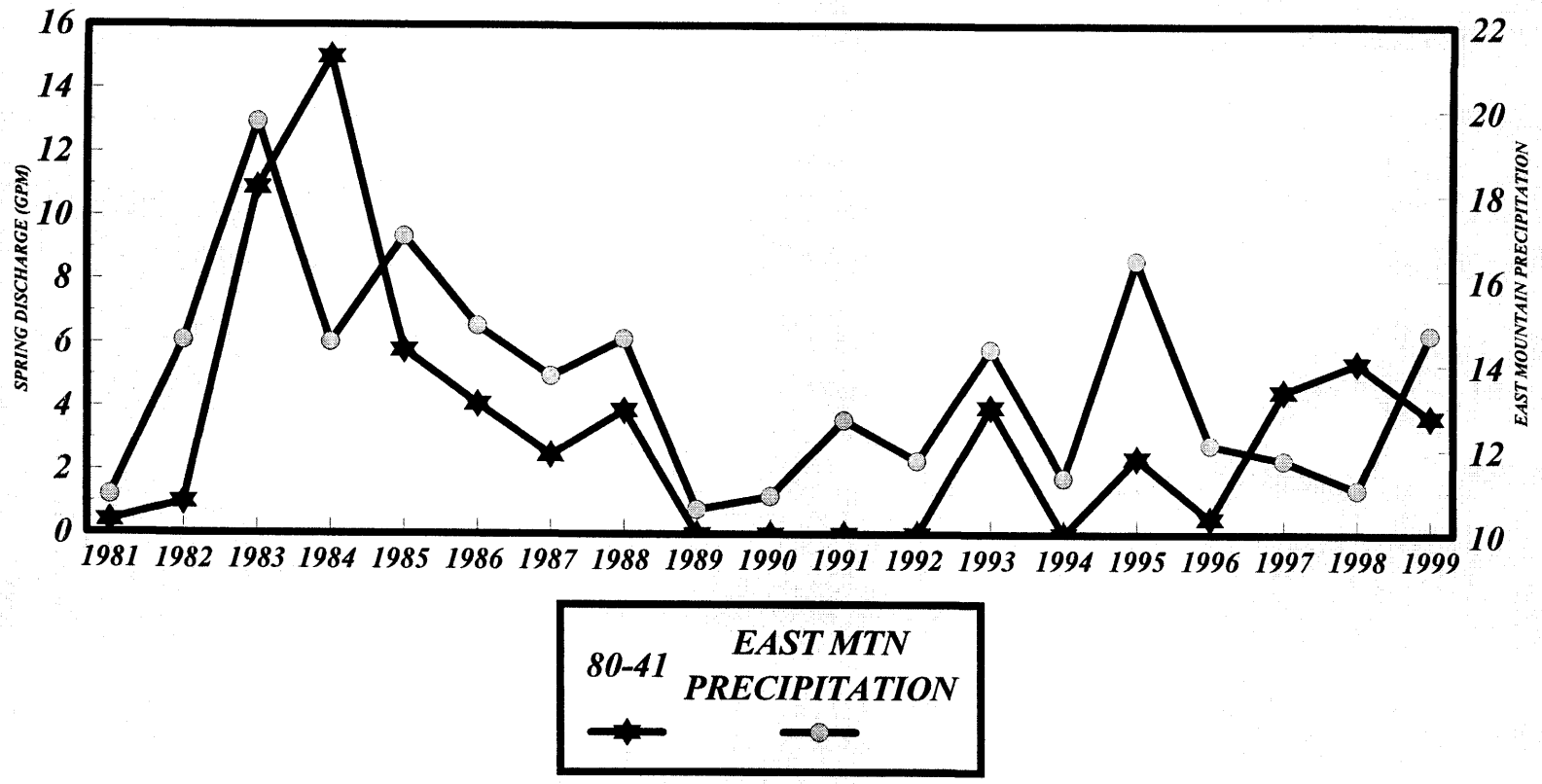
EAST MOUNTAIN SPRINGS
Spring: 79-40 vs. Precipitation

PEAK FLOW (JULY) vs. EAST MOUNTAIN WEATHER STATION



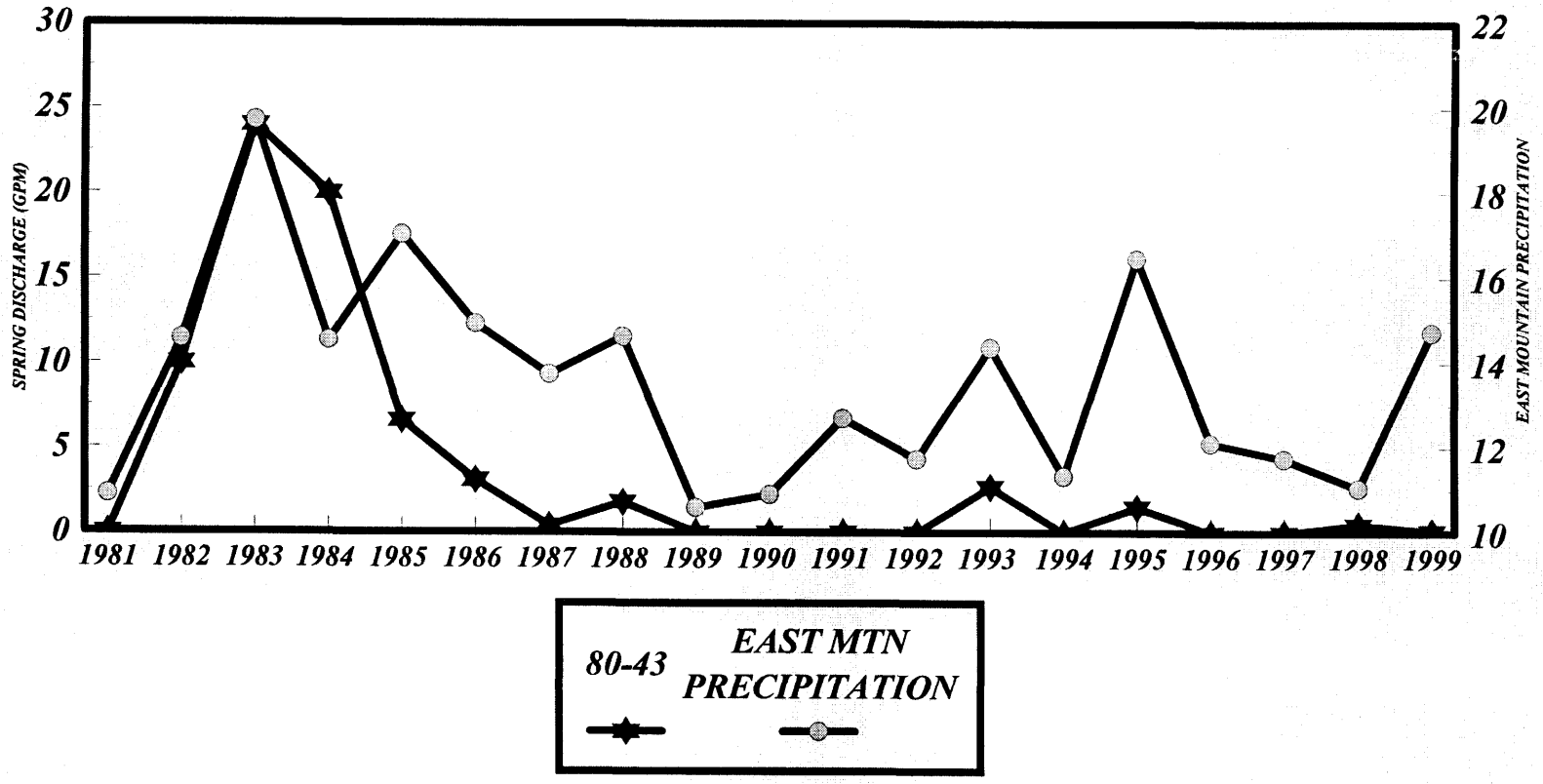
EAST MOUNTAIN SPRINGS
Spring: 80-41 vs. Precipitation

PEAK FLOW (JULY) vs. EAST MOUNTAIN WEATHER STATION



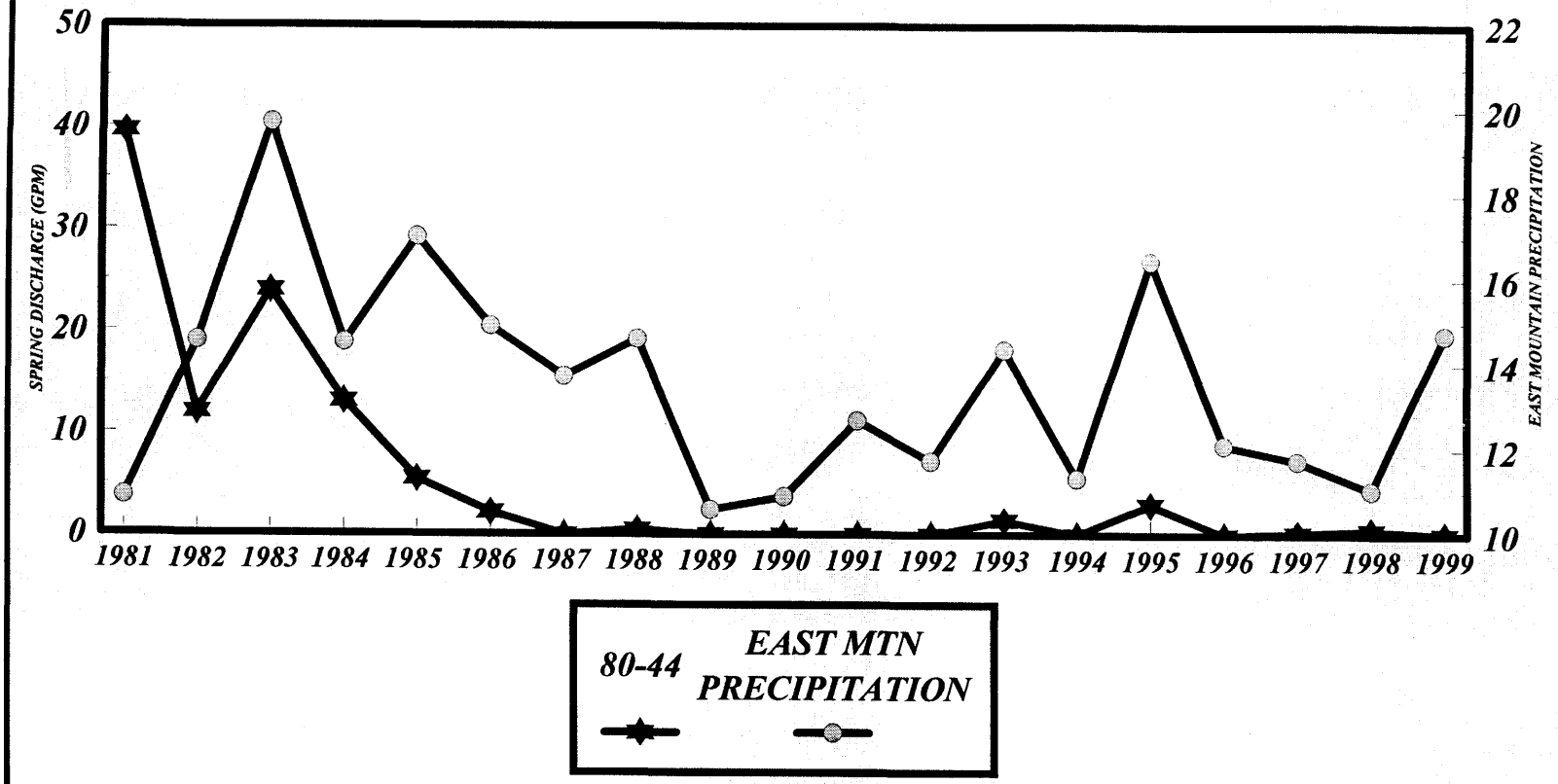
EAST MOUNTAIN SPRINGS
Spring: 80-43 vs. Precipitation

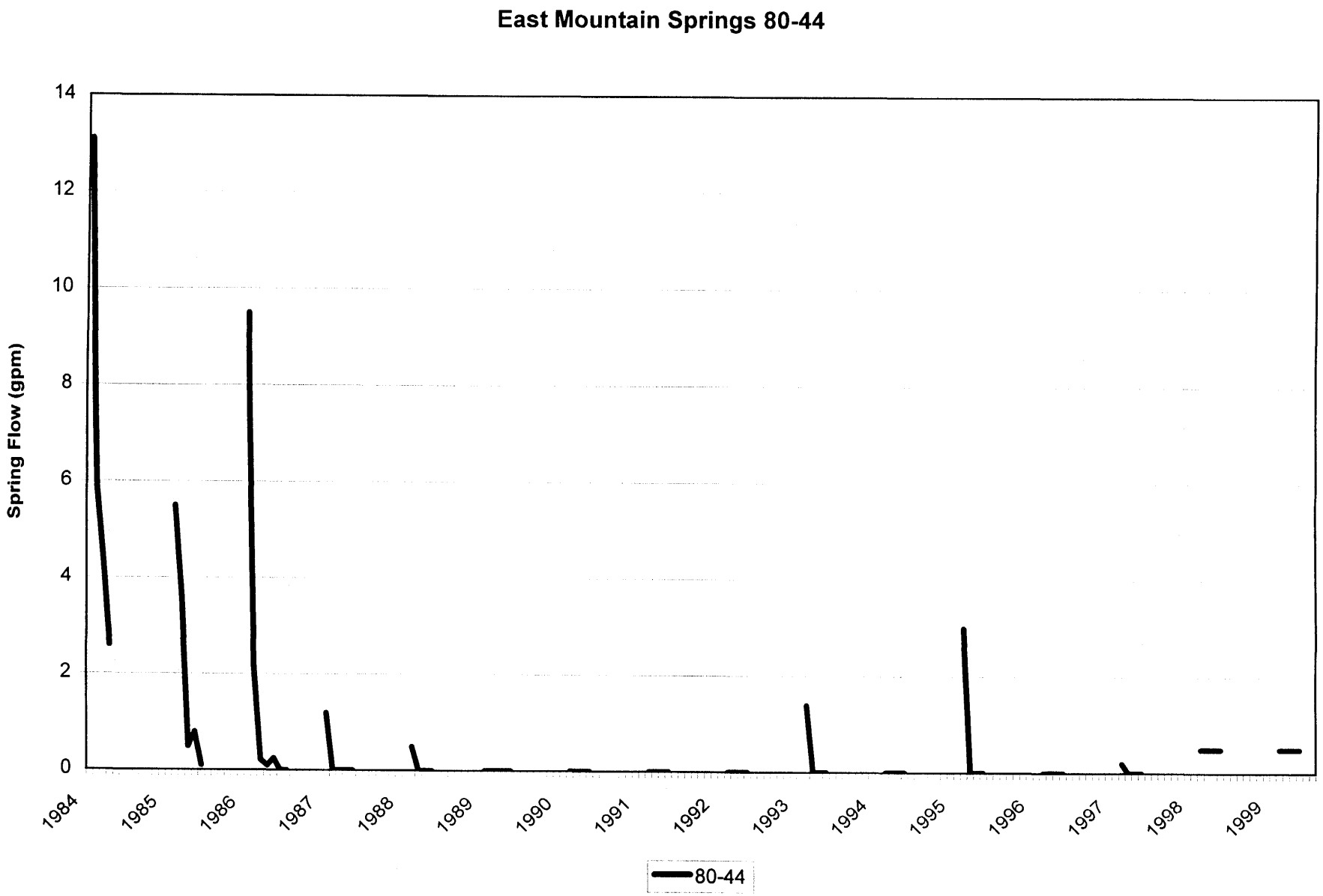
PEAK FLOW (JULY) vs. EAST MOUNTAIN WEATHER STATION



EAST MOUNTAIN SPRINGS
Spring: 80-44 vs. Precipitation

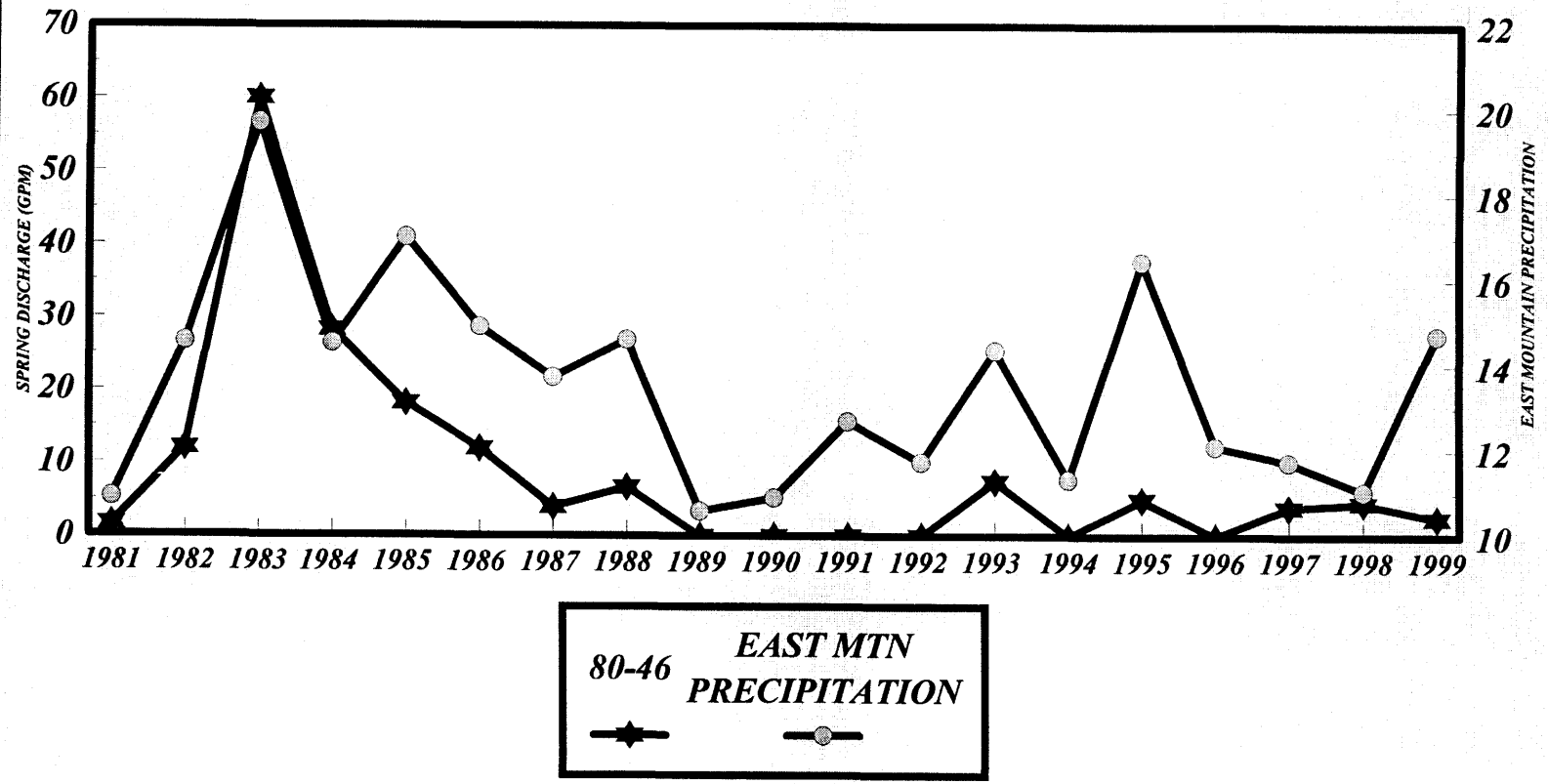
PEAK FLOW (JULY) vs. EAST MOUNTAIN WEATHER STATION



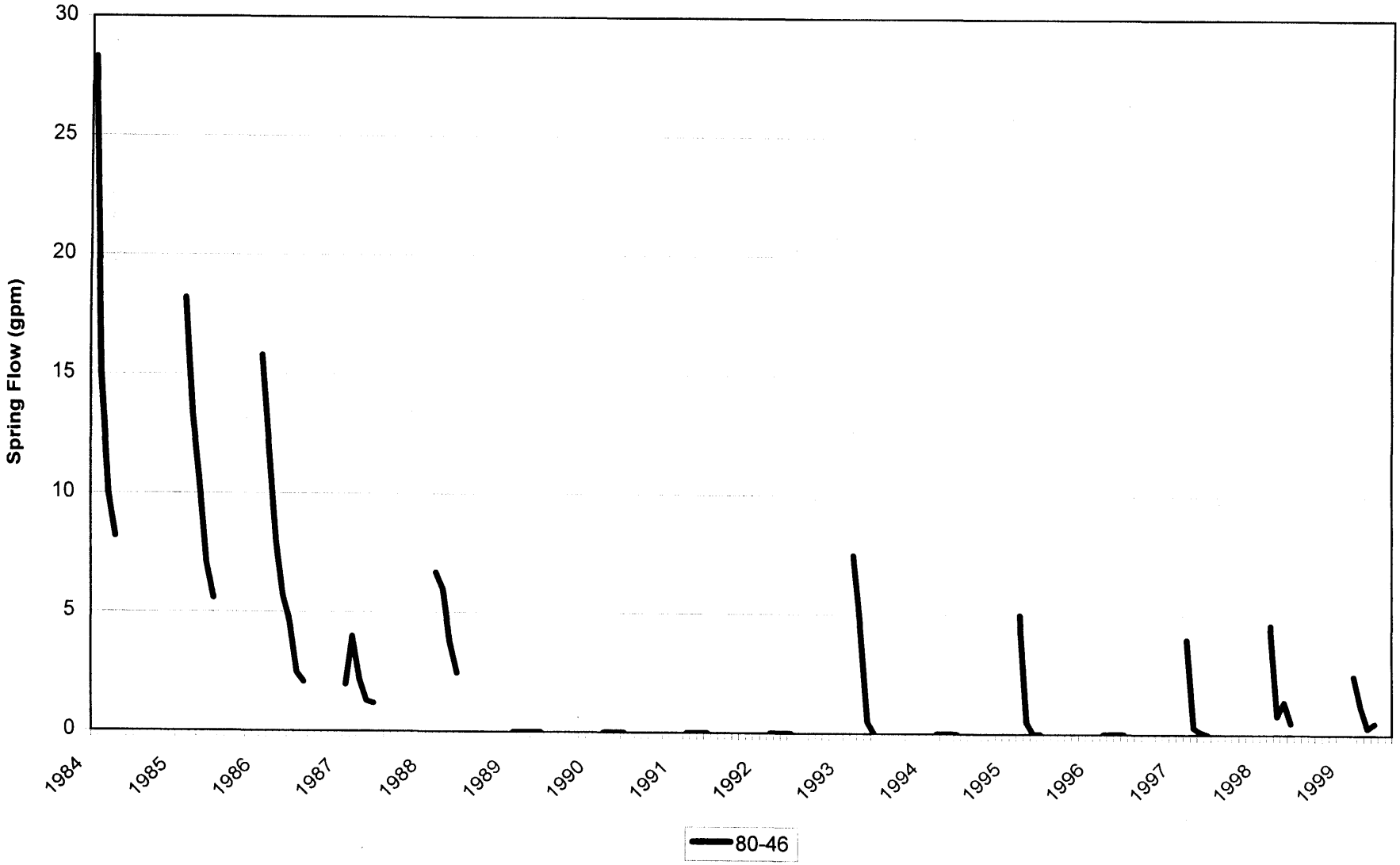

East Mountain Springs 80-44
Spring Flow (gpm)
14
12
10
8
6
4
2
0
1984
1985
1986
1987
1988
1989
1990
1991
1992
1993
1994
1995
1996
1997
1998
1999
80-44

EAST MOUNTAIN SPRINGS
Spring: 80-46 vs. Precipitation

PEAK FLOW (JULY) vs. EAST MOUNTAIN WEATHER STATION

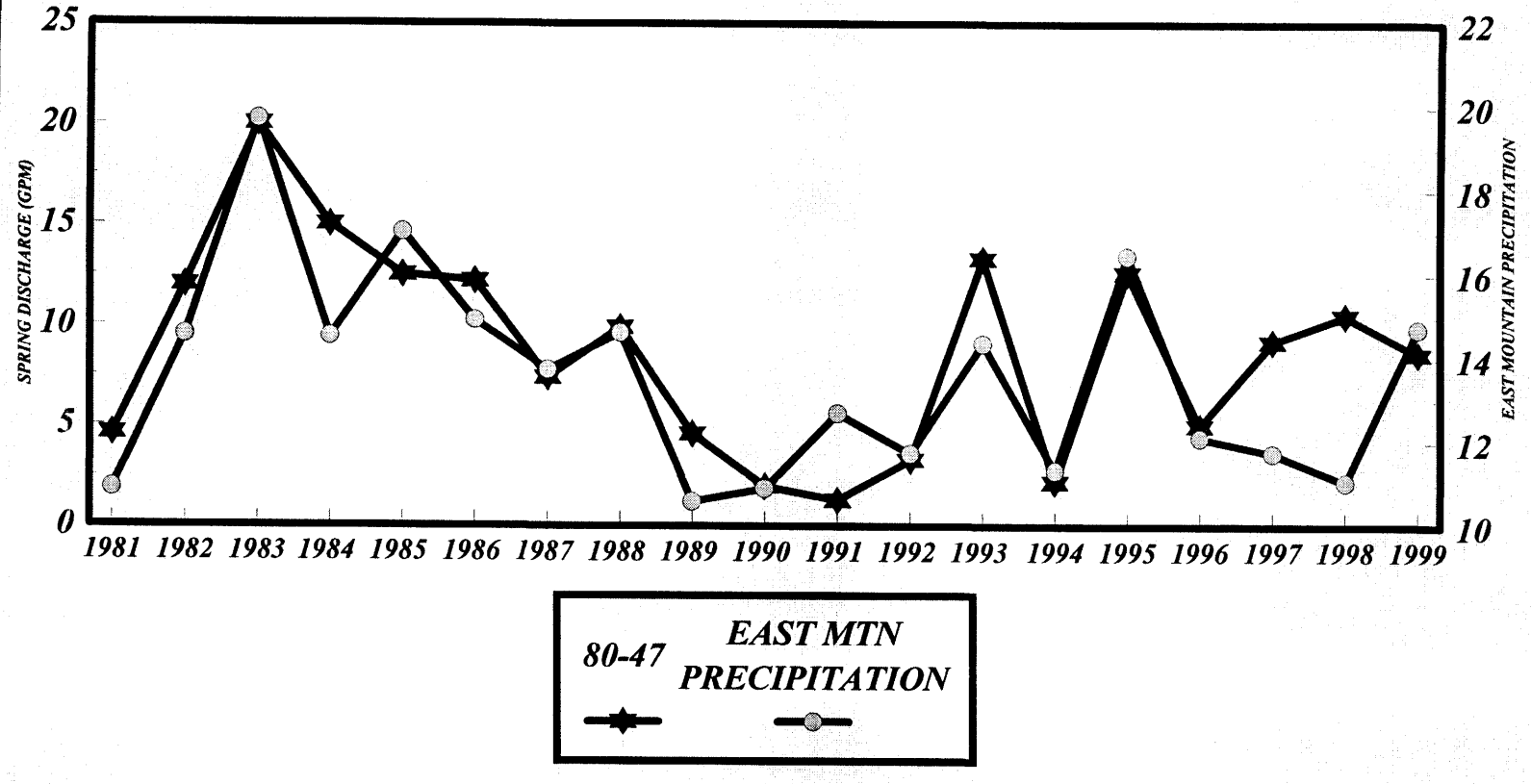


East Mountain Springs 80-46



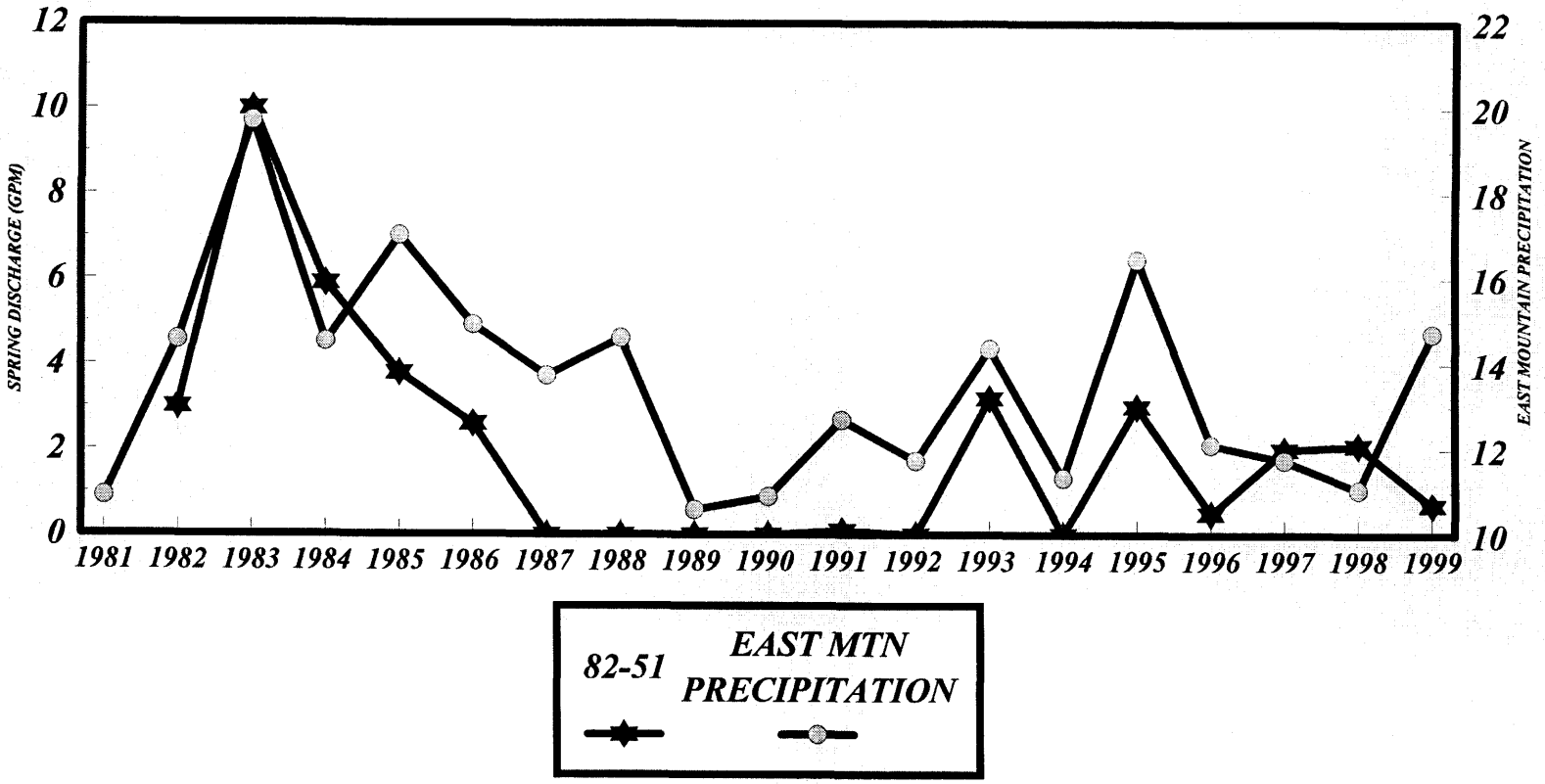
EAST MOUNTAIN SPRINGS
Spring: 80-47 vs. Precipitation

PEAK FLOW (JULY) vs. EAST MOUNTAIN WEATHER STATION



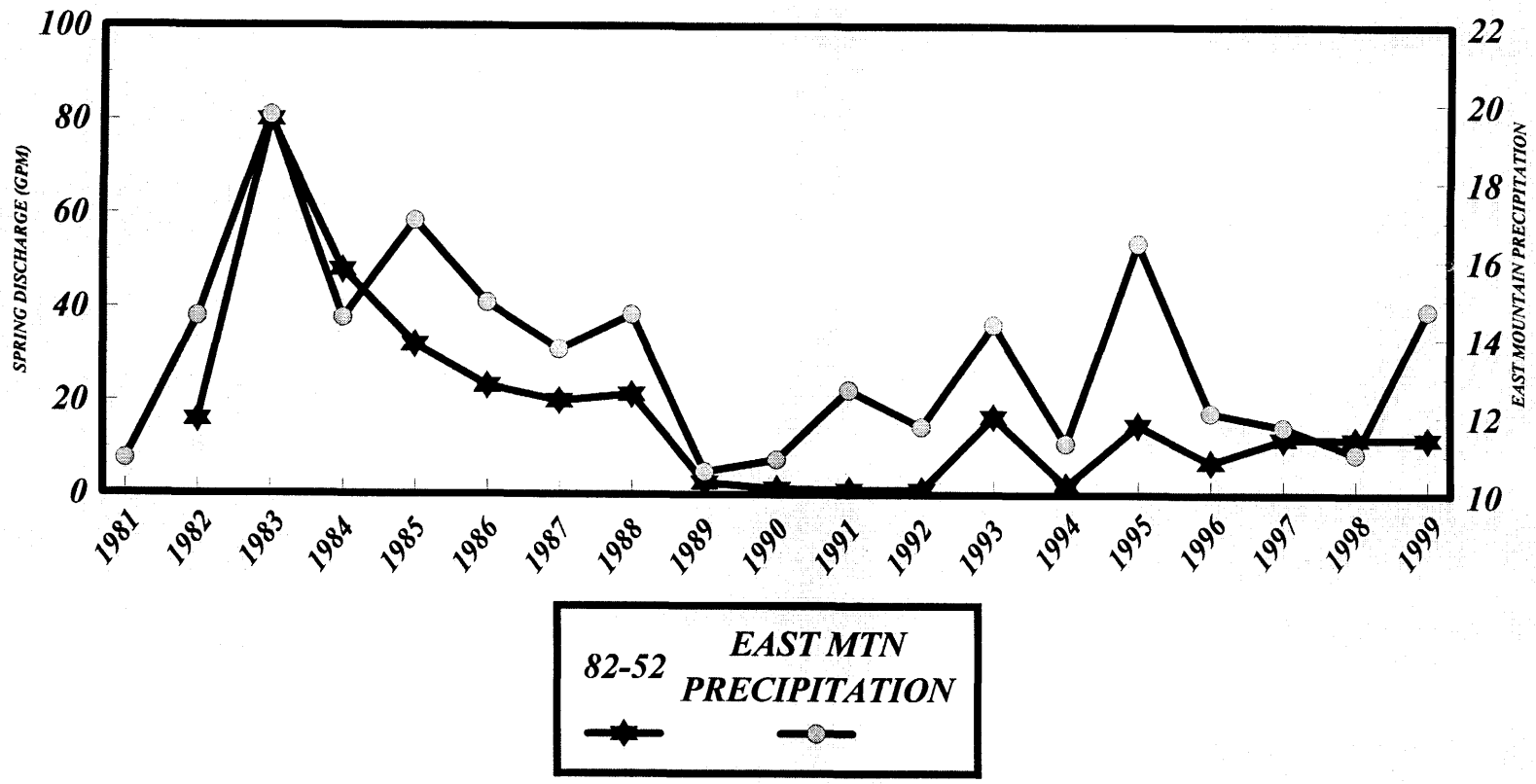
EAST MOUNTAIN SPRINGS
Spring: 82-51 vs. Precipitation

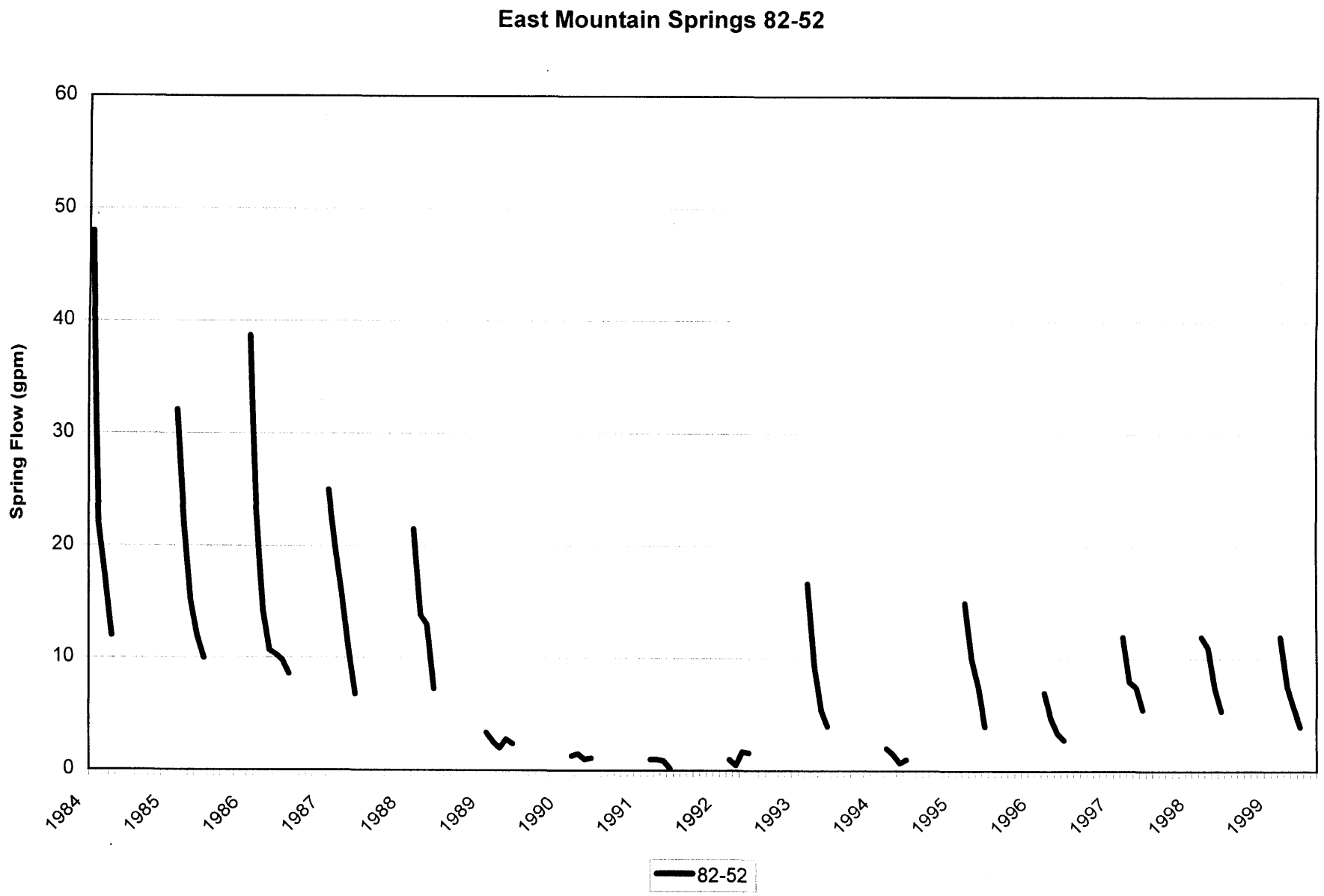
PEAK FLOW (JULY) vs. EAST MOUNTAIN WEATHER STATION



EAST MOUNTAIN SPRINGS
Spring: 82-52 vs. Precipitation

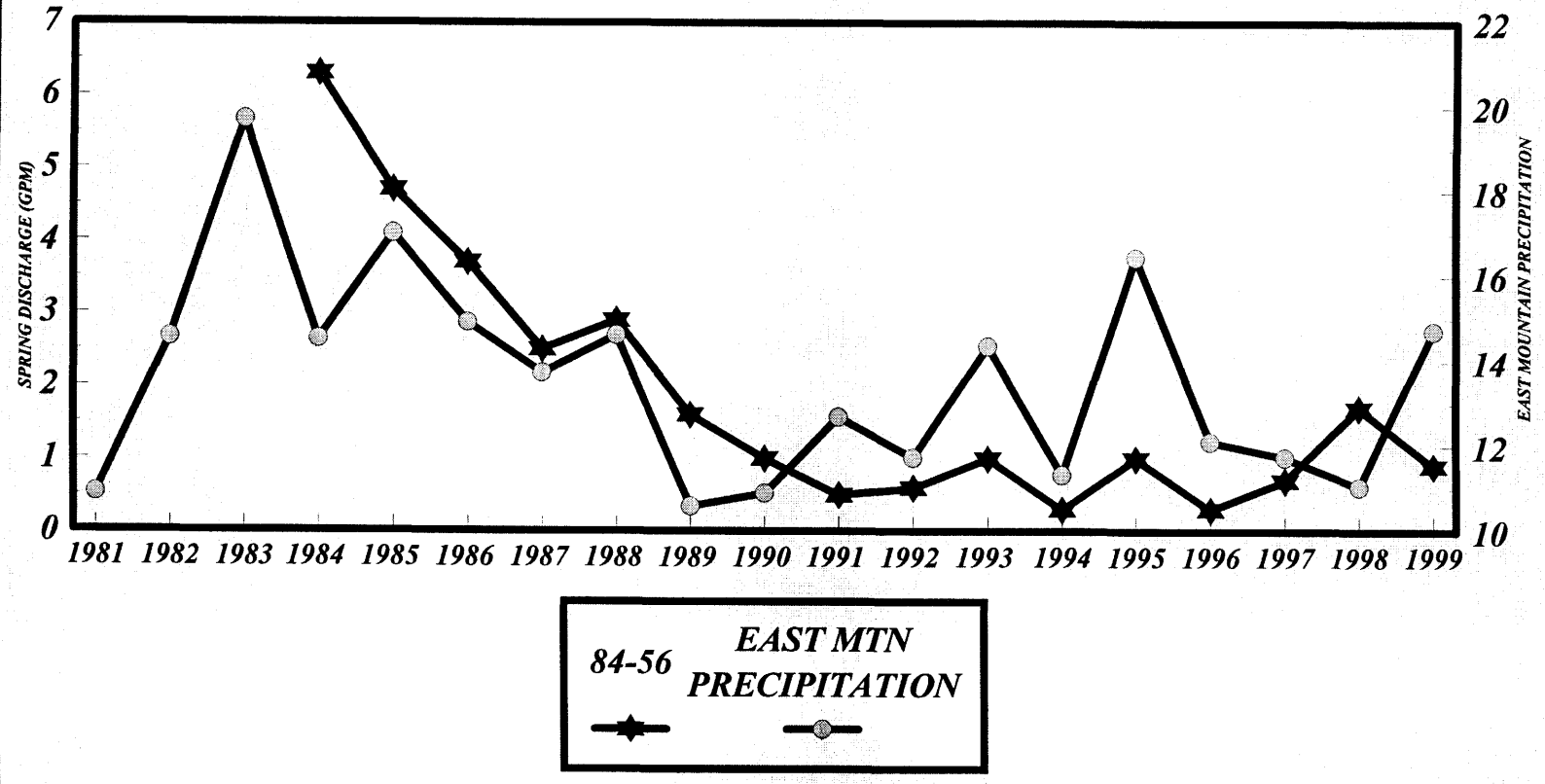
PEAK FLOW (JULY) vs. EAST MOUNTAIN WEATHER STATION



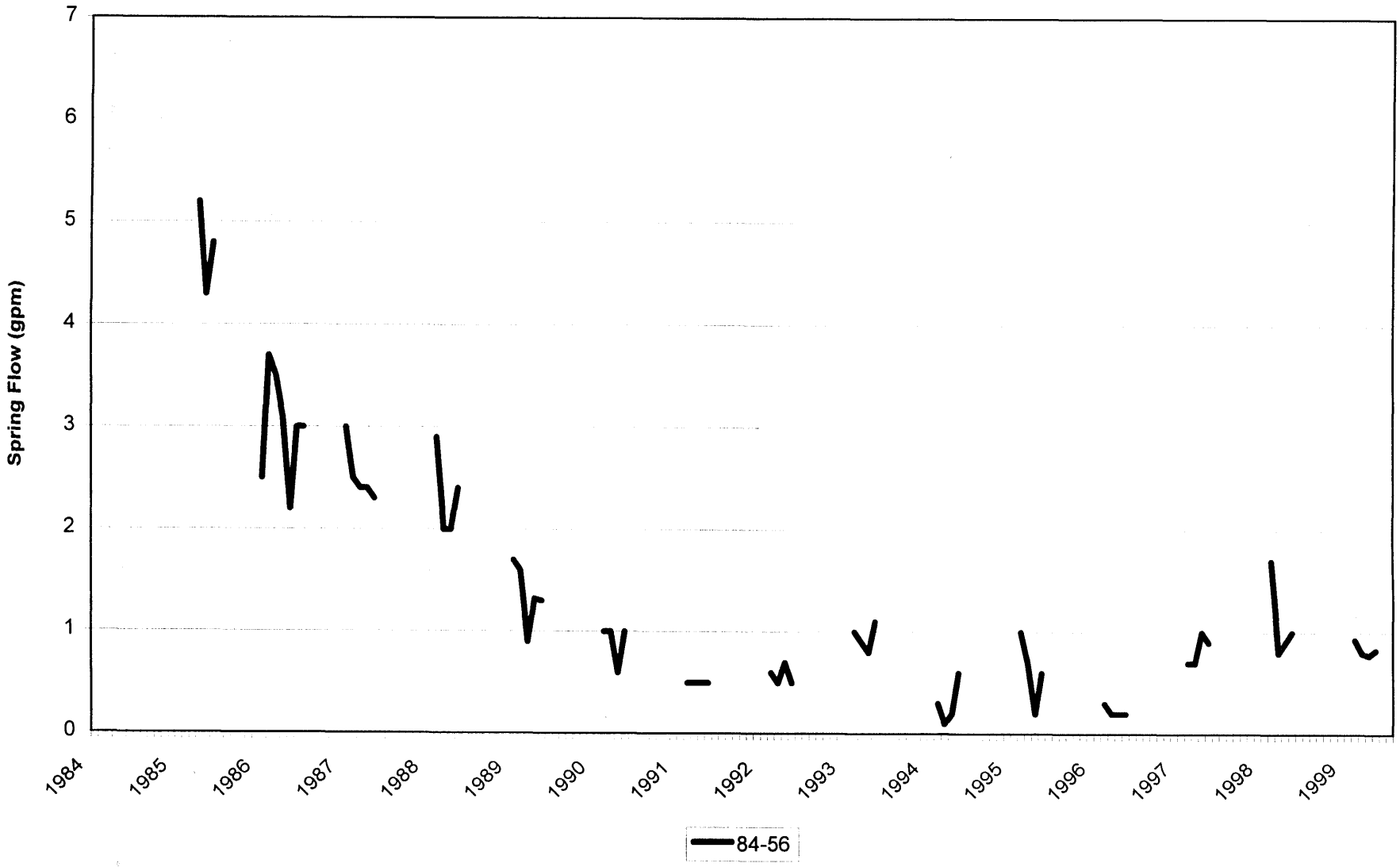

East Mountain Springs 82-52
Spring Flow (gpm)
60
50
40
30
20
10
0
1984
1985
1986
1987
1988
1989
1990
1991
1992
1993
1994
1995
1996
1997
1998
1999
82-52

EAST MOUNTAIN SPRINGS
Spring: 84-56 vs. Precipitation

PEAK FLOW (JULY) vs. EAST MOUNTAIN WEATHER STATION



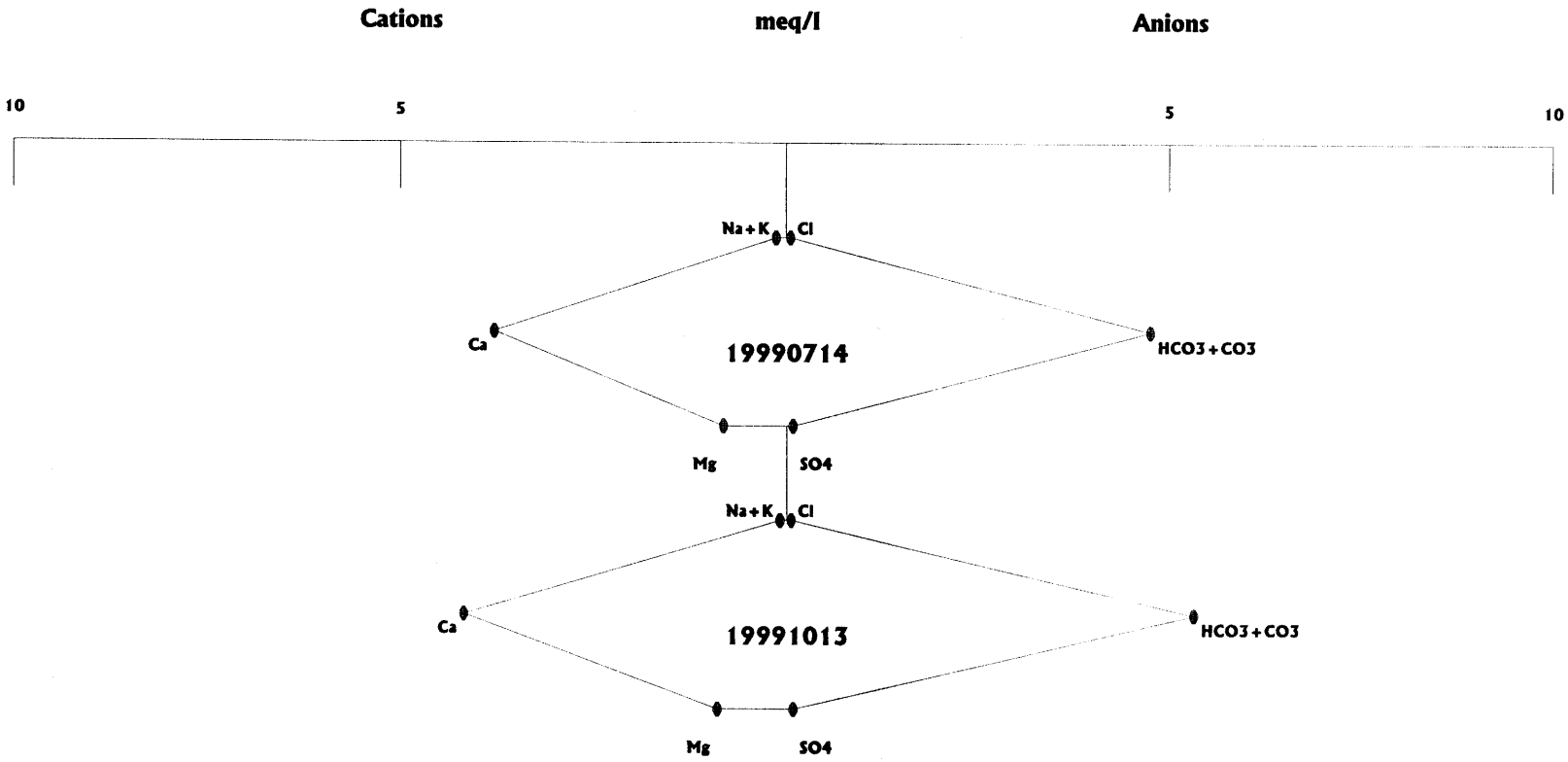
East Mountain Springs 84-56



EAST MOUNTAIN SPRINGS
STIFF DIAGRAMS
FLAGSTAFF LIMESTONE

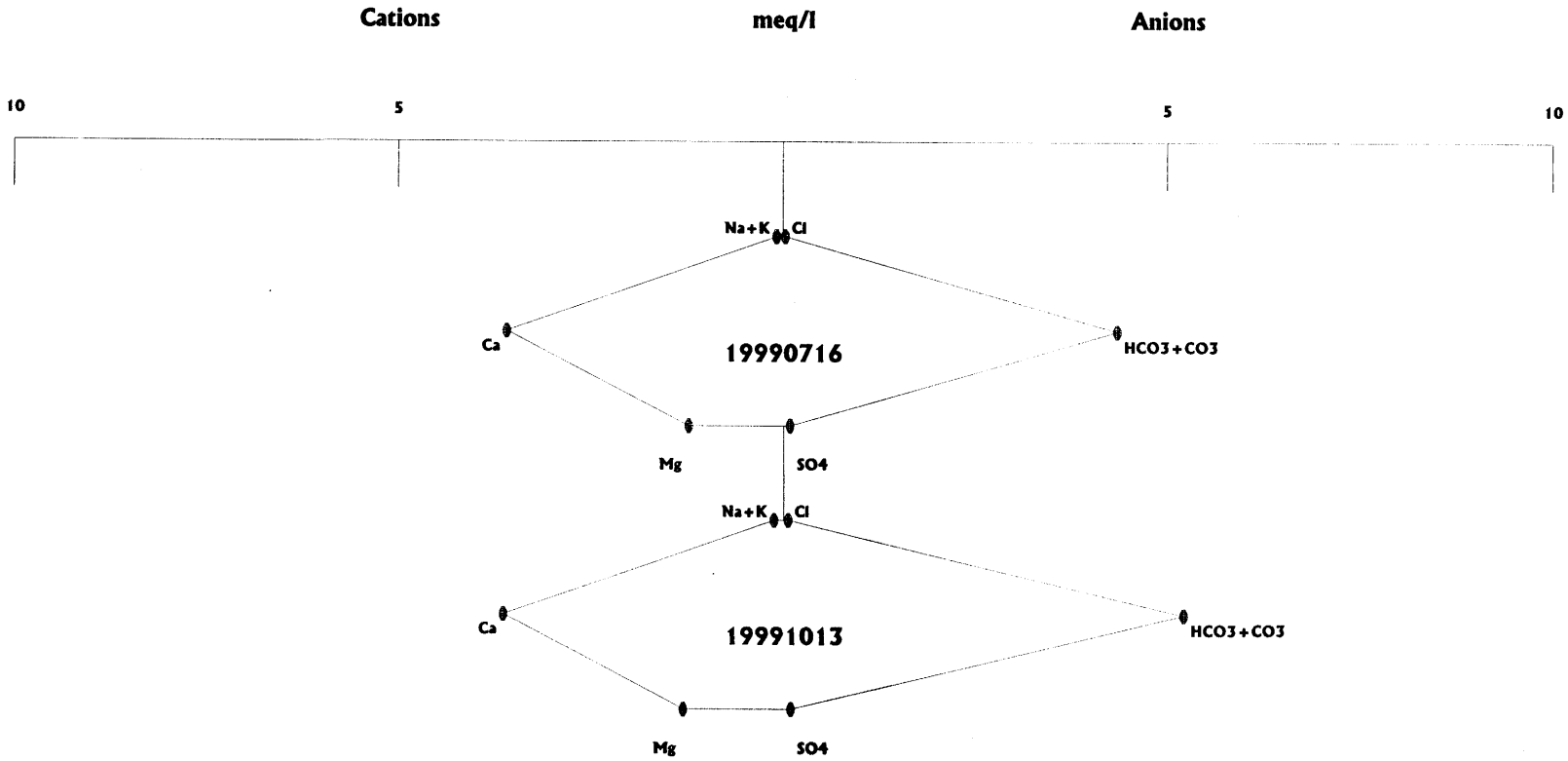
EAST MOUNTAIN SPRINGS

SHEBA SPRINGS



EAST MOUNTAIN SPRINGS

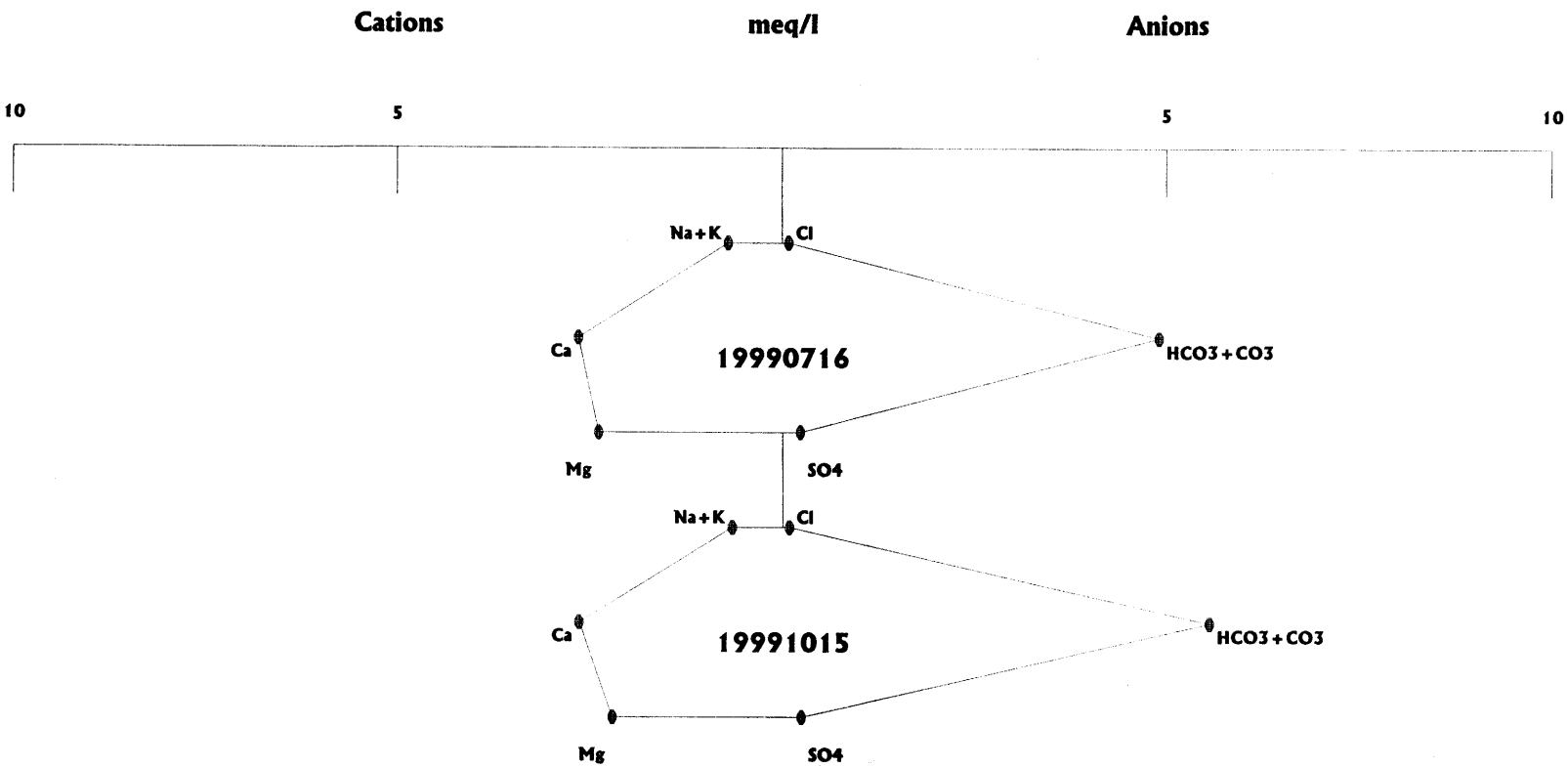
EMS 79-35



EAST MOUNTAIN SPRINGS
STIFF DIAGRAMS
NORTH HORN FORMATION

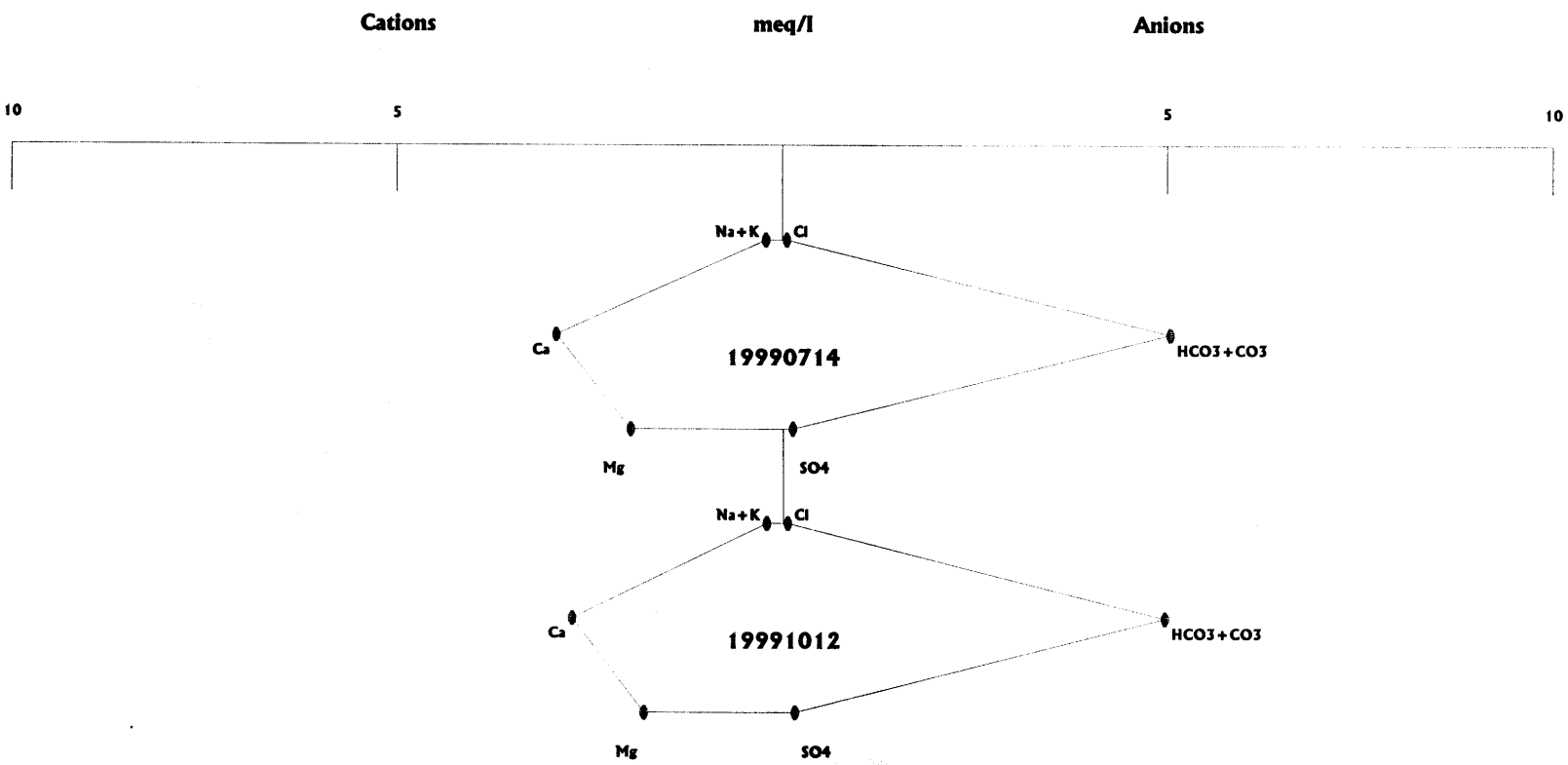
EAST MOUNTAIN SPRINGS

BURNT TREE



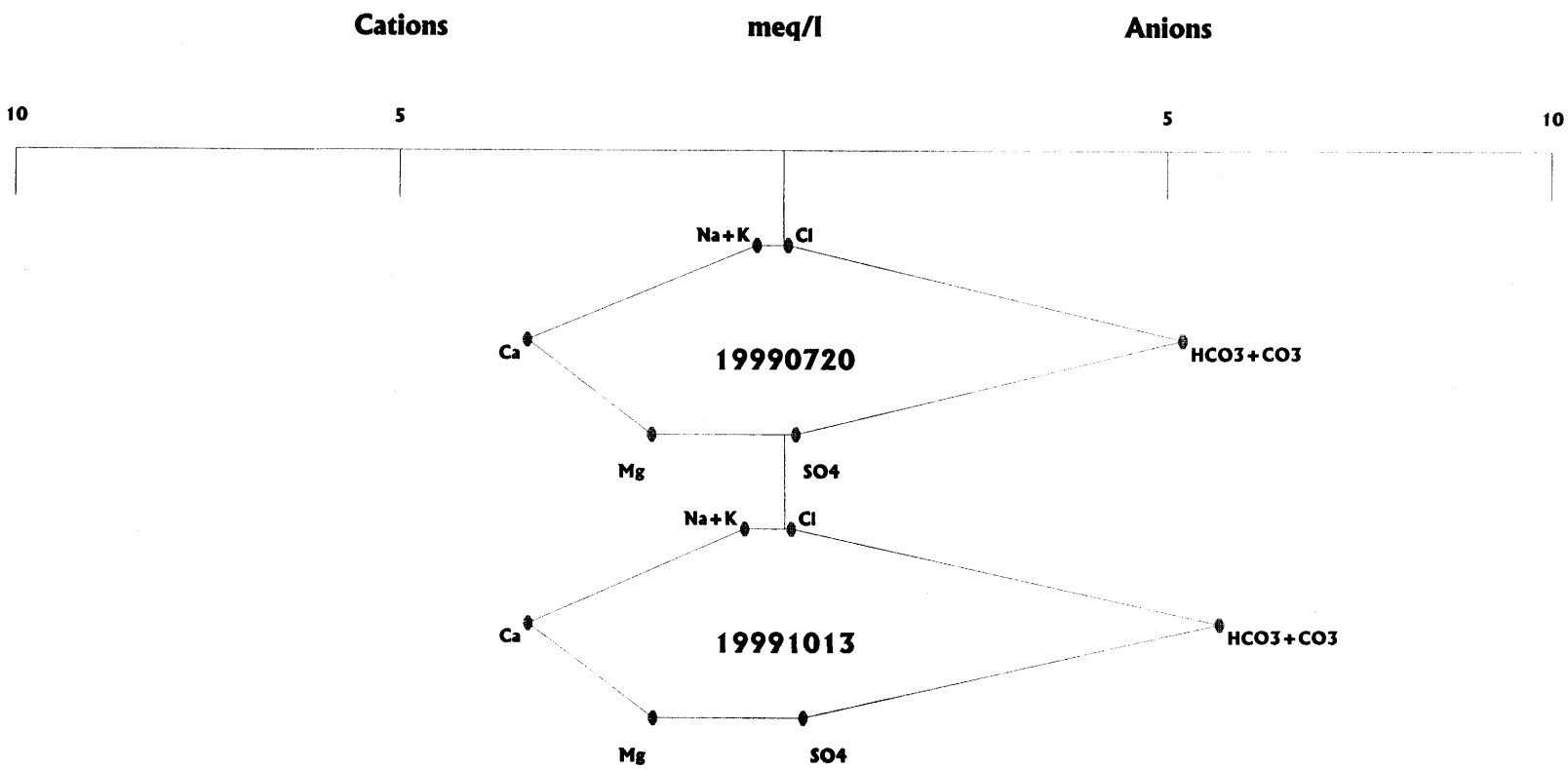
EAST MOUNTAIN SPRINGS

ELK SPRING



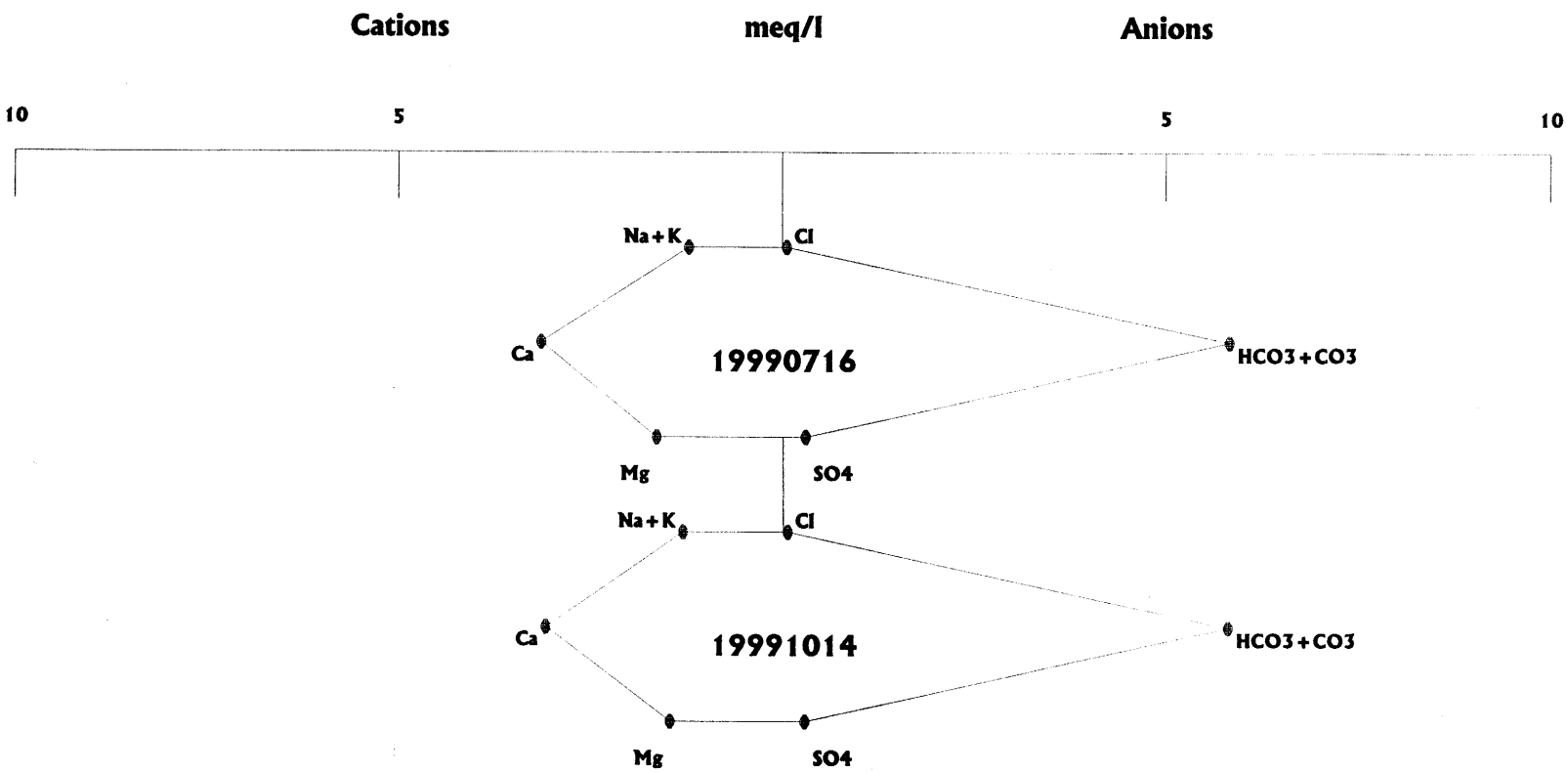
EAST MOUNTAIN SPRINGS

TEDS TUB



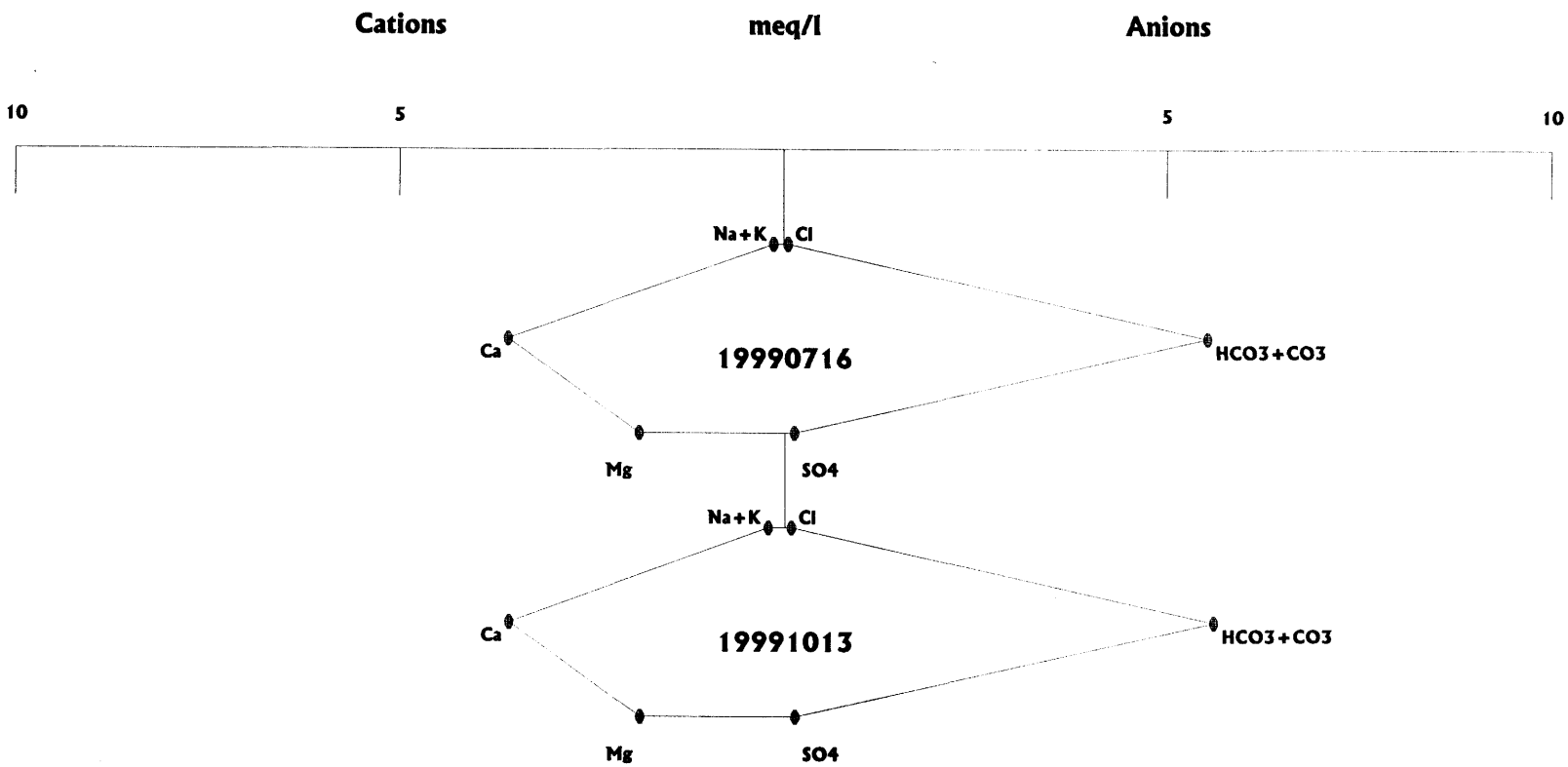
EAST MOUNTAIN SPRINGS

EMS 79-02



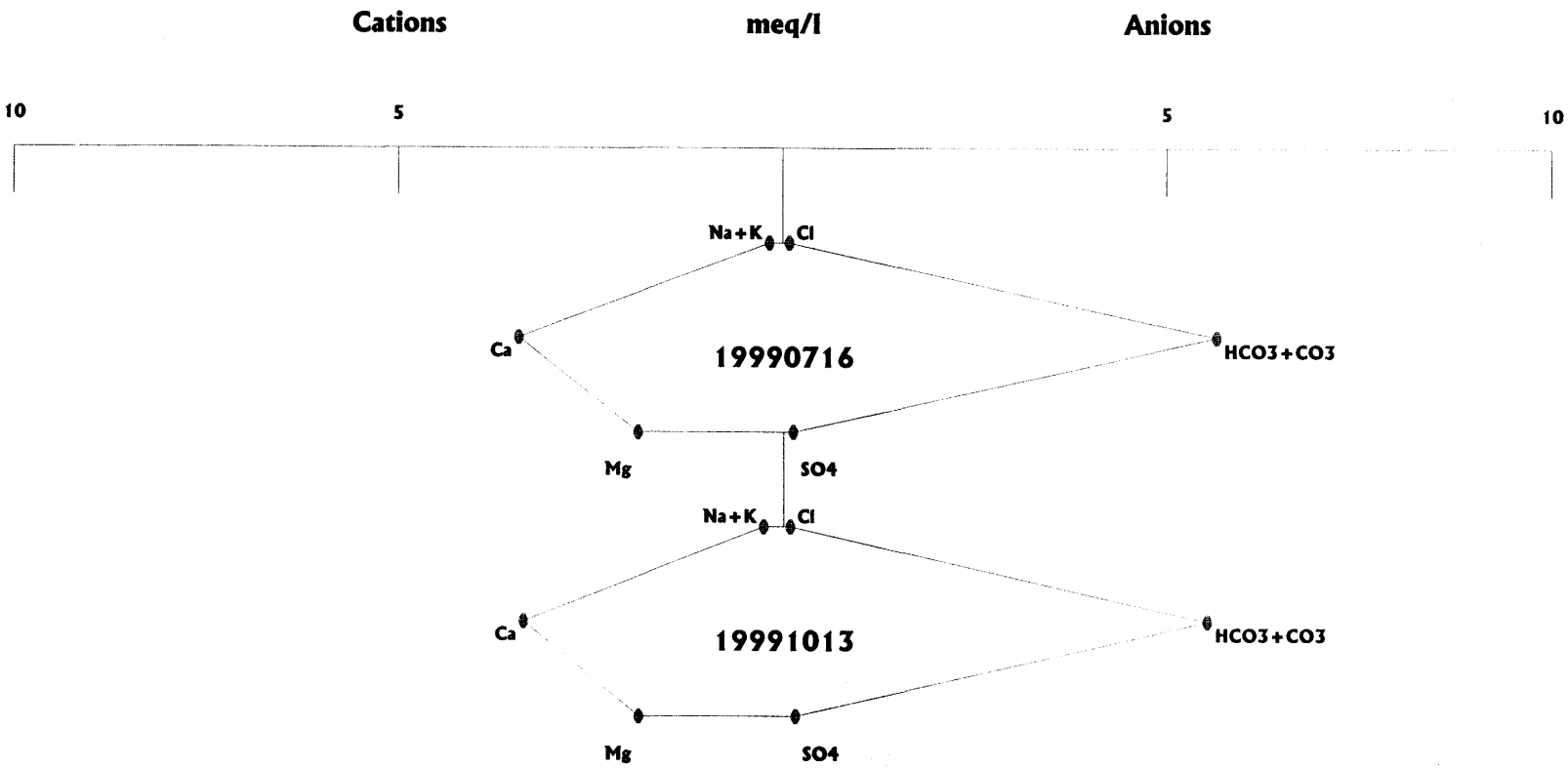
EAST MOUNTAIN SPRINGS

EMS 79-10



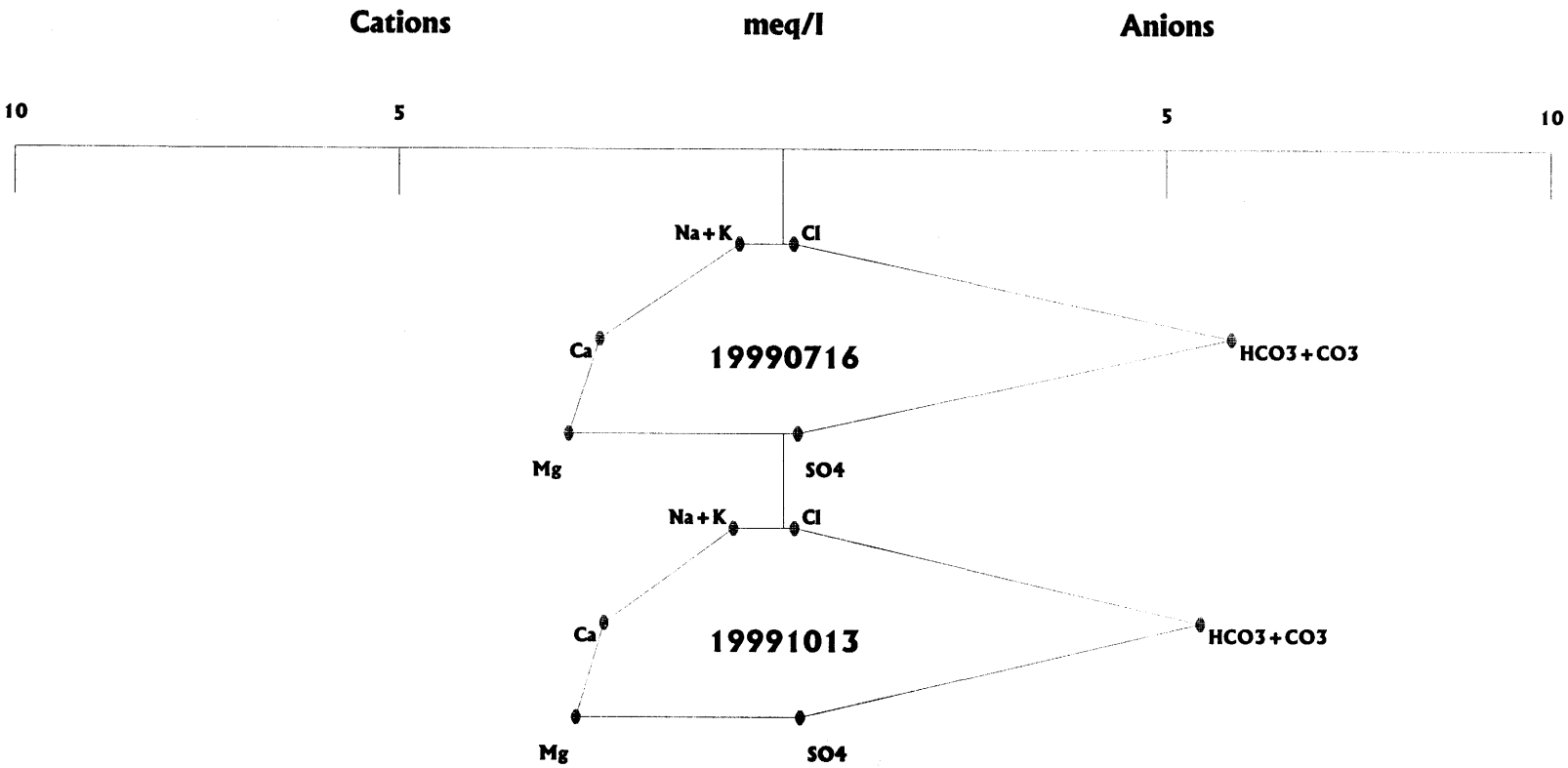
EAST MOUNTAIN SPRINGS

EMS 79-15



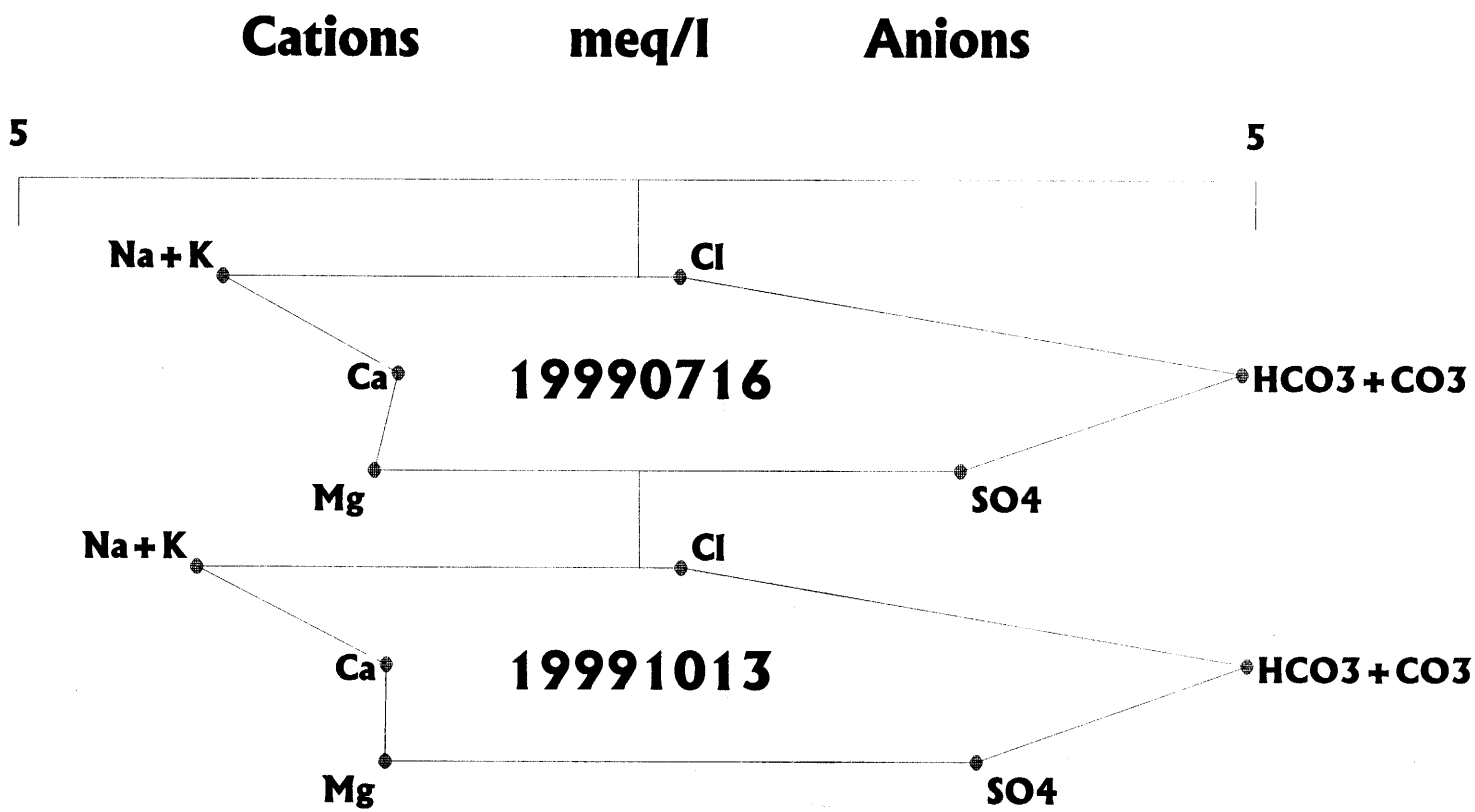
EAST MOUNTAIN SPRINGS

EMS 79-26



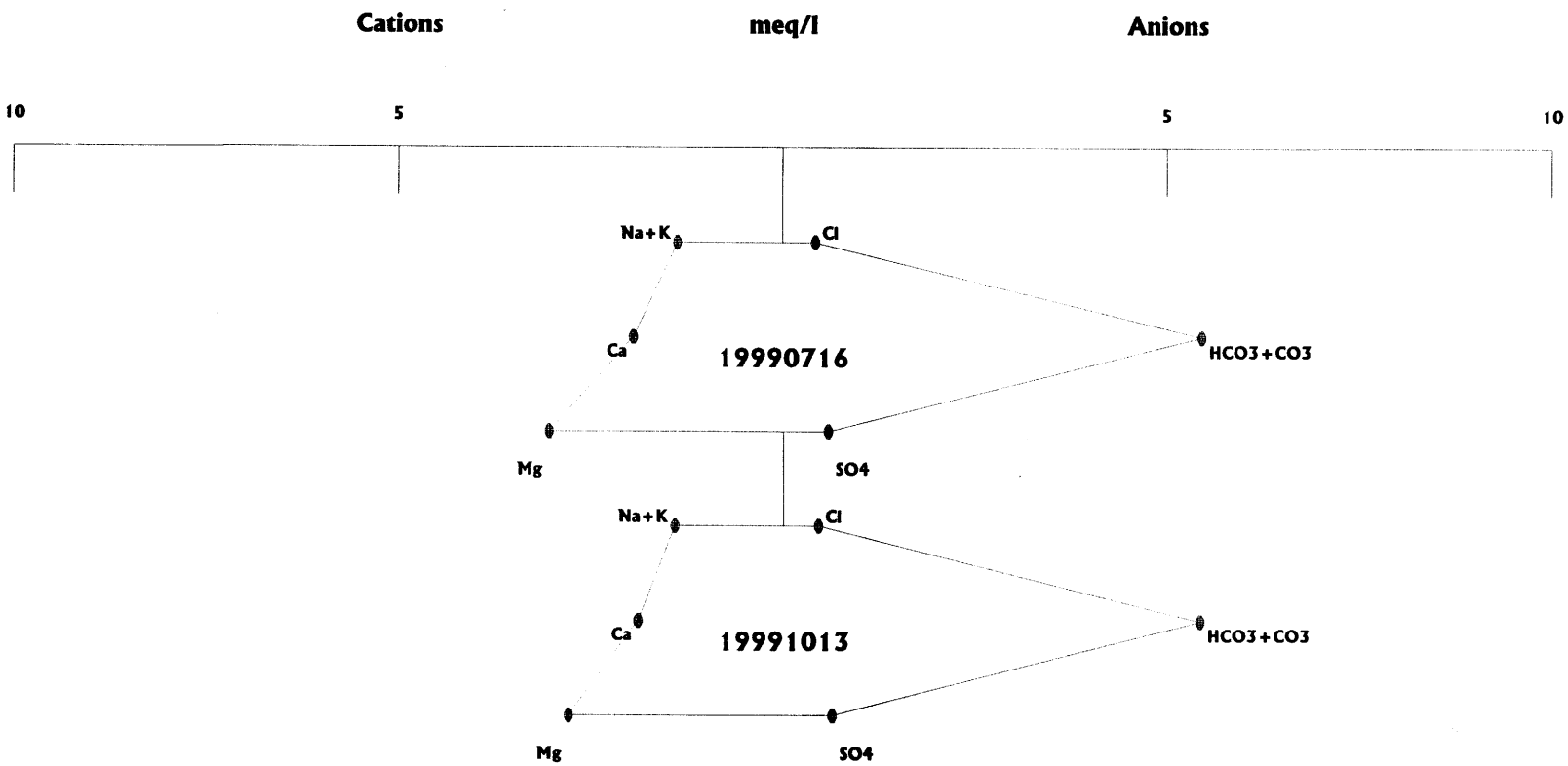
EAST MOUNTAIN SPRINGS

EMS 79-28



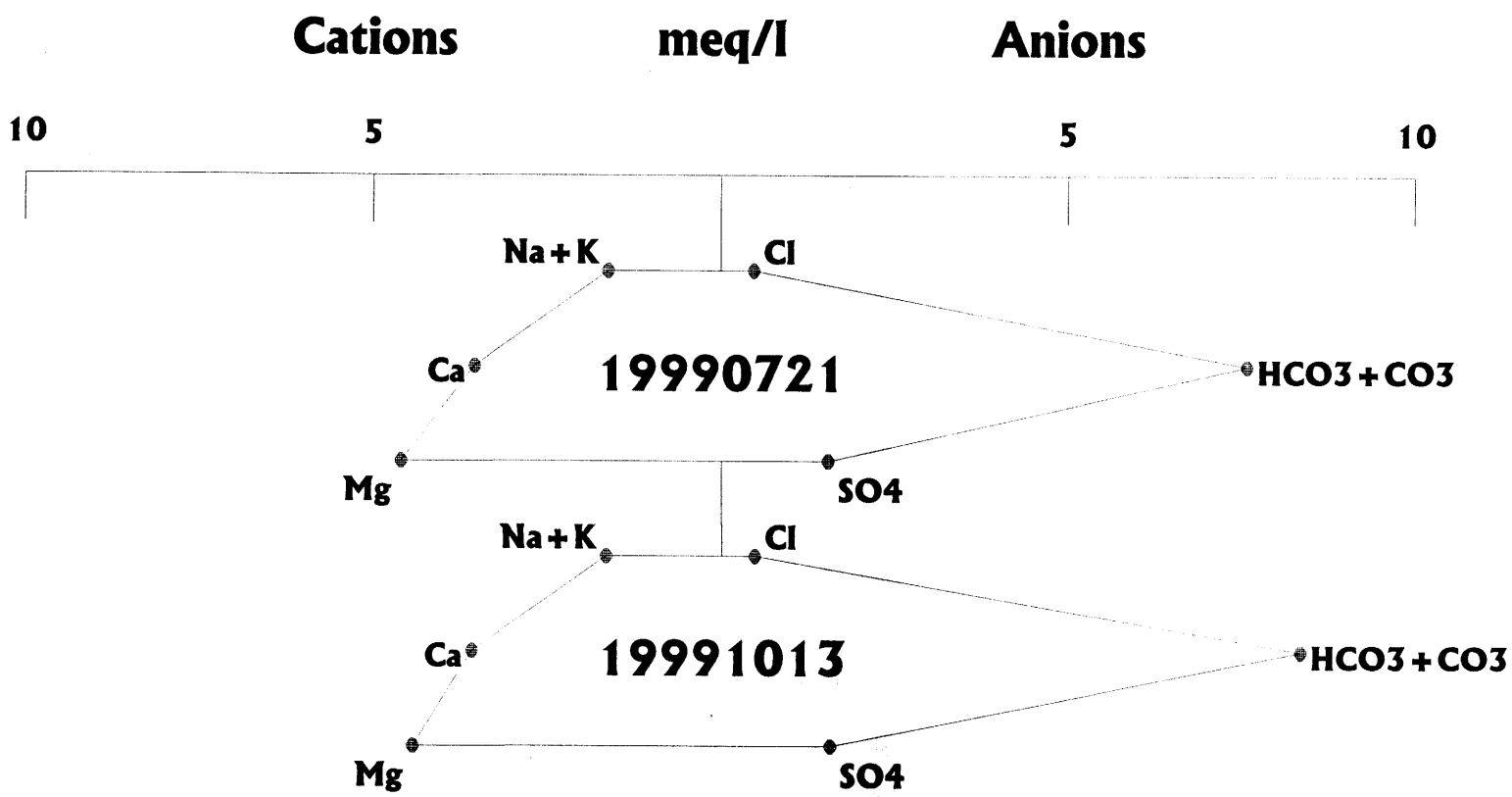
EAST MOUNTAIN SPRINGS

EMS 79-29



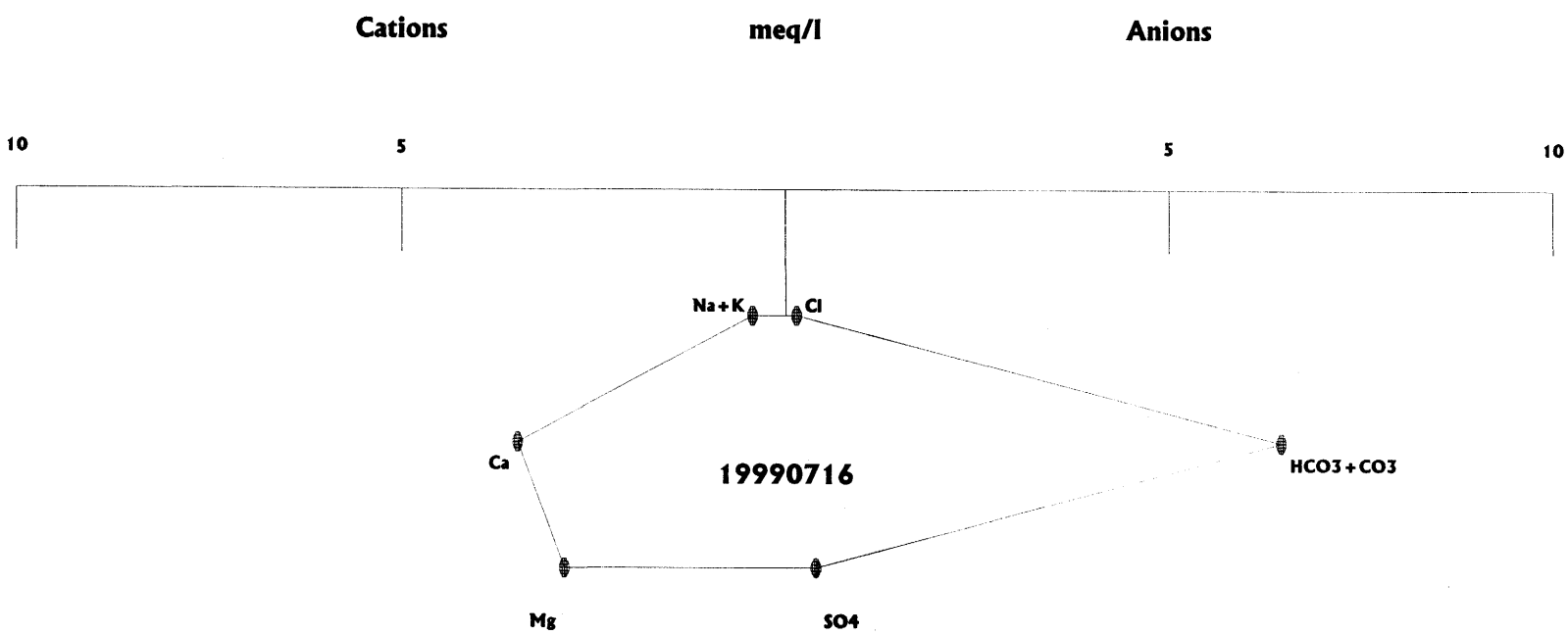
EAST MOUNTAIN SPRINGS

EMS 79-32



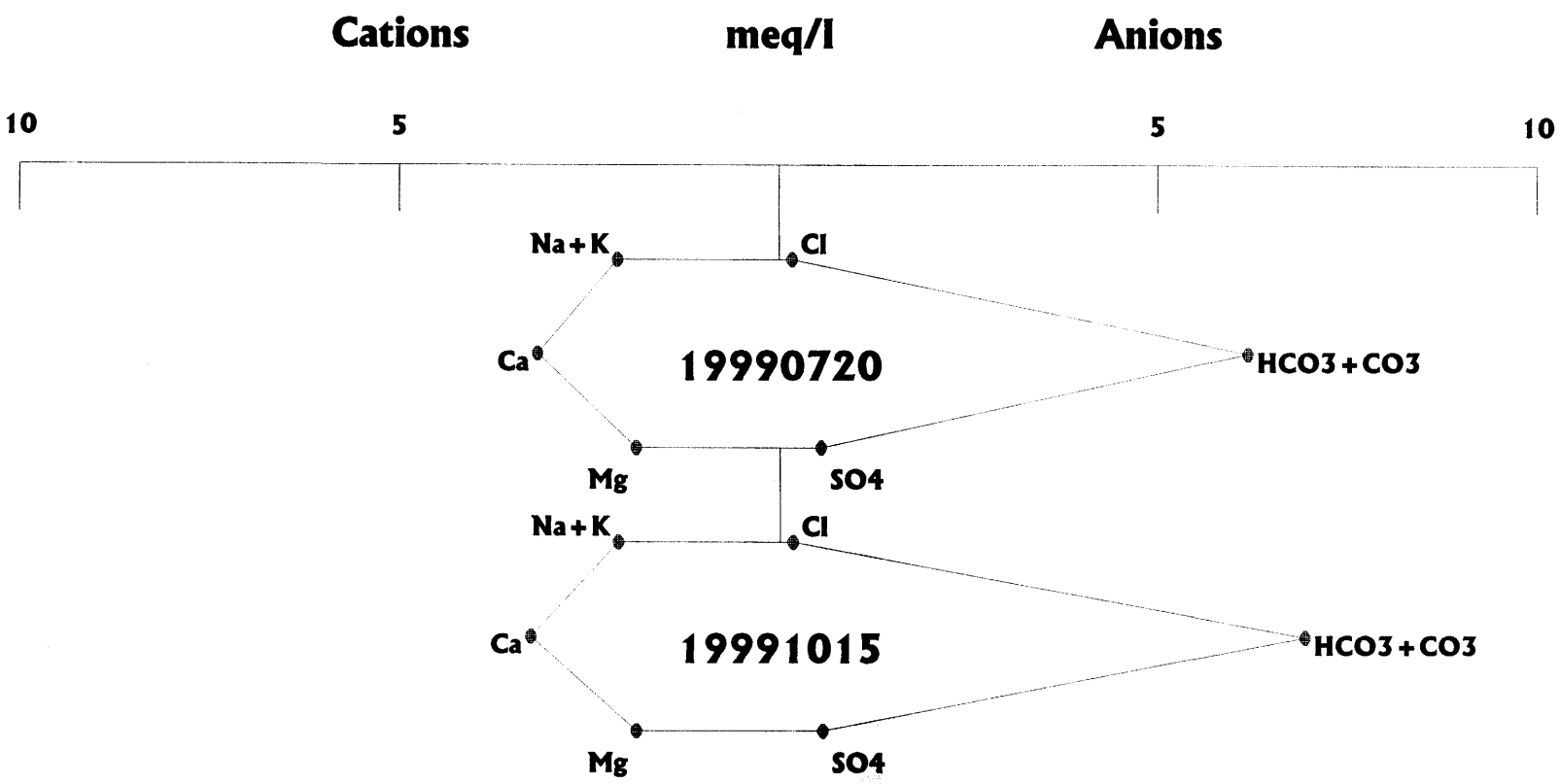
EAST MOUNTAIN SPRINGS

EMS 79-34



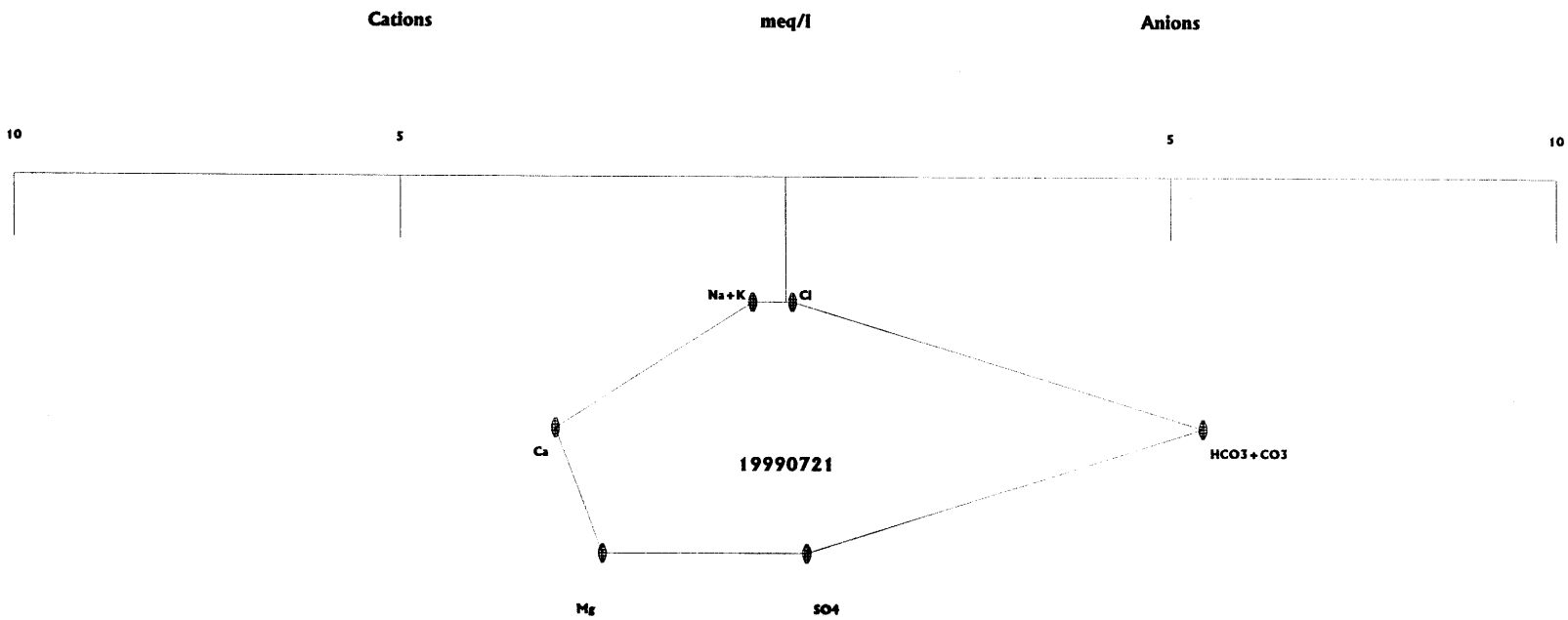
EAST MOUNTAIN SPRINGS

EMS 79-38



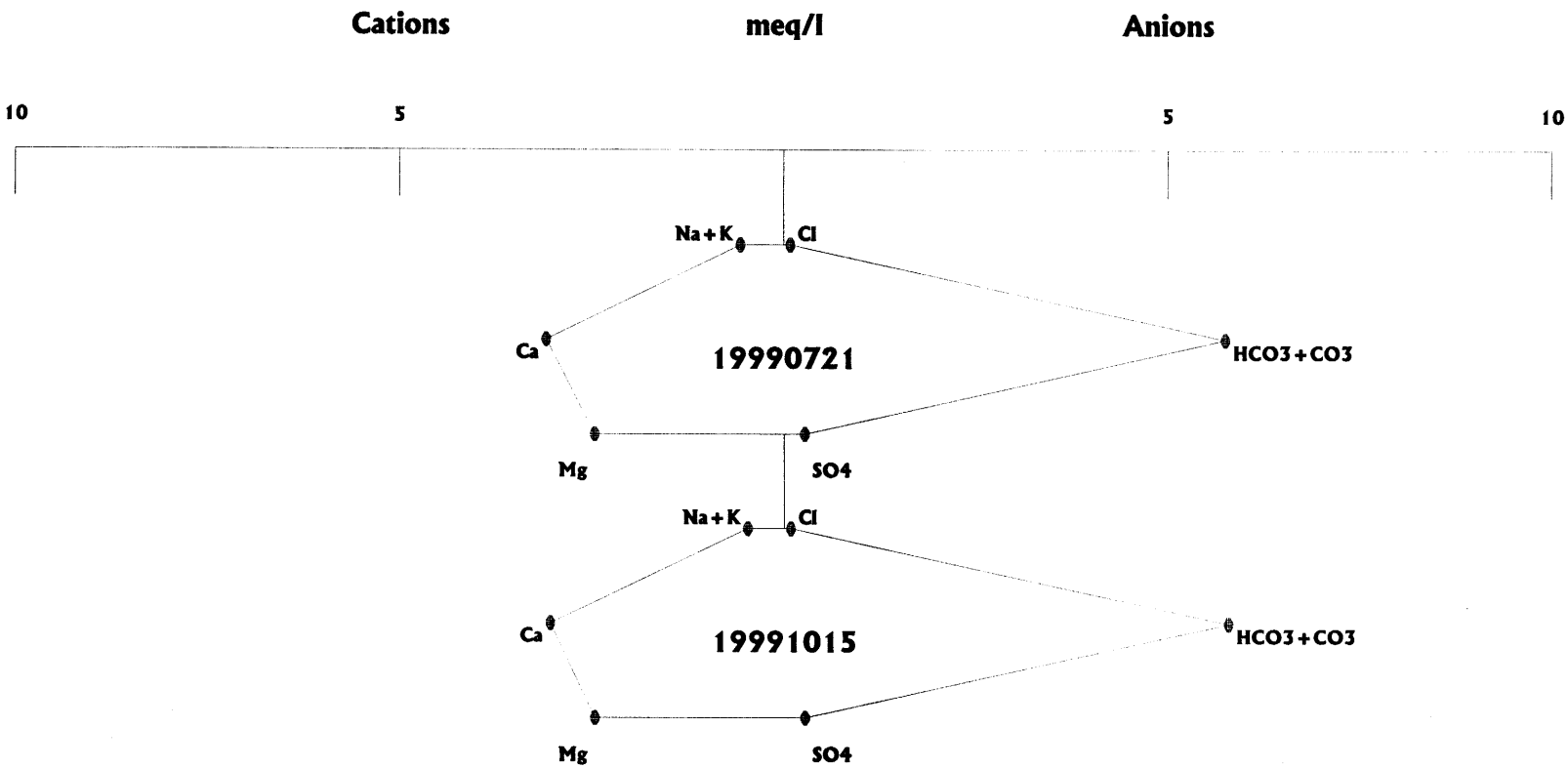
EAST MOUNTAIN SPRINGS

EMS 80-46



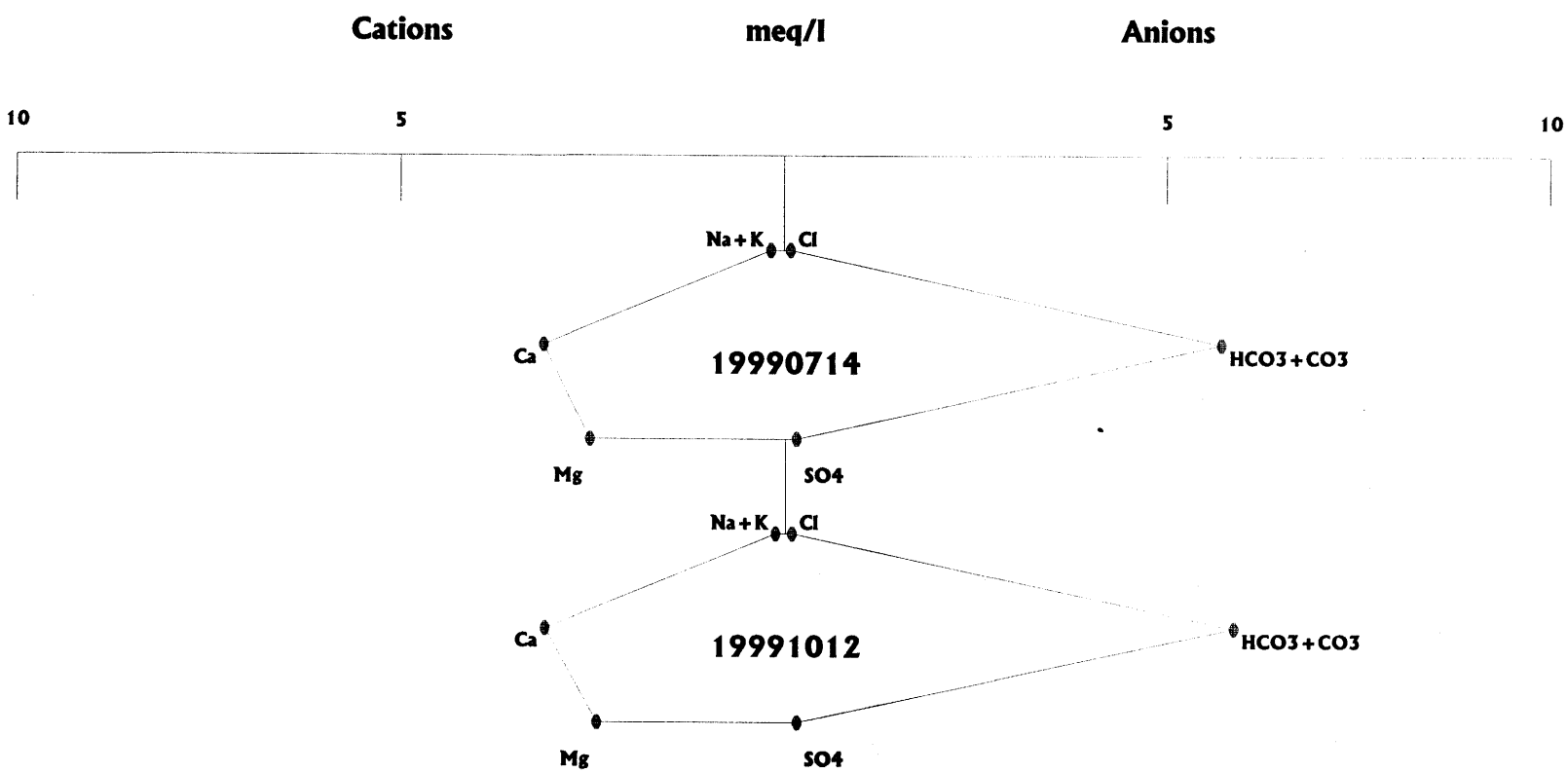
EAST MOUNTAIN SPRINGS

EMS 80-47



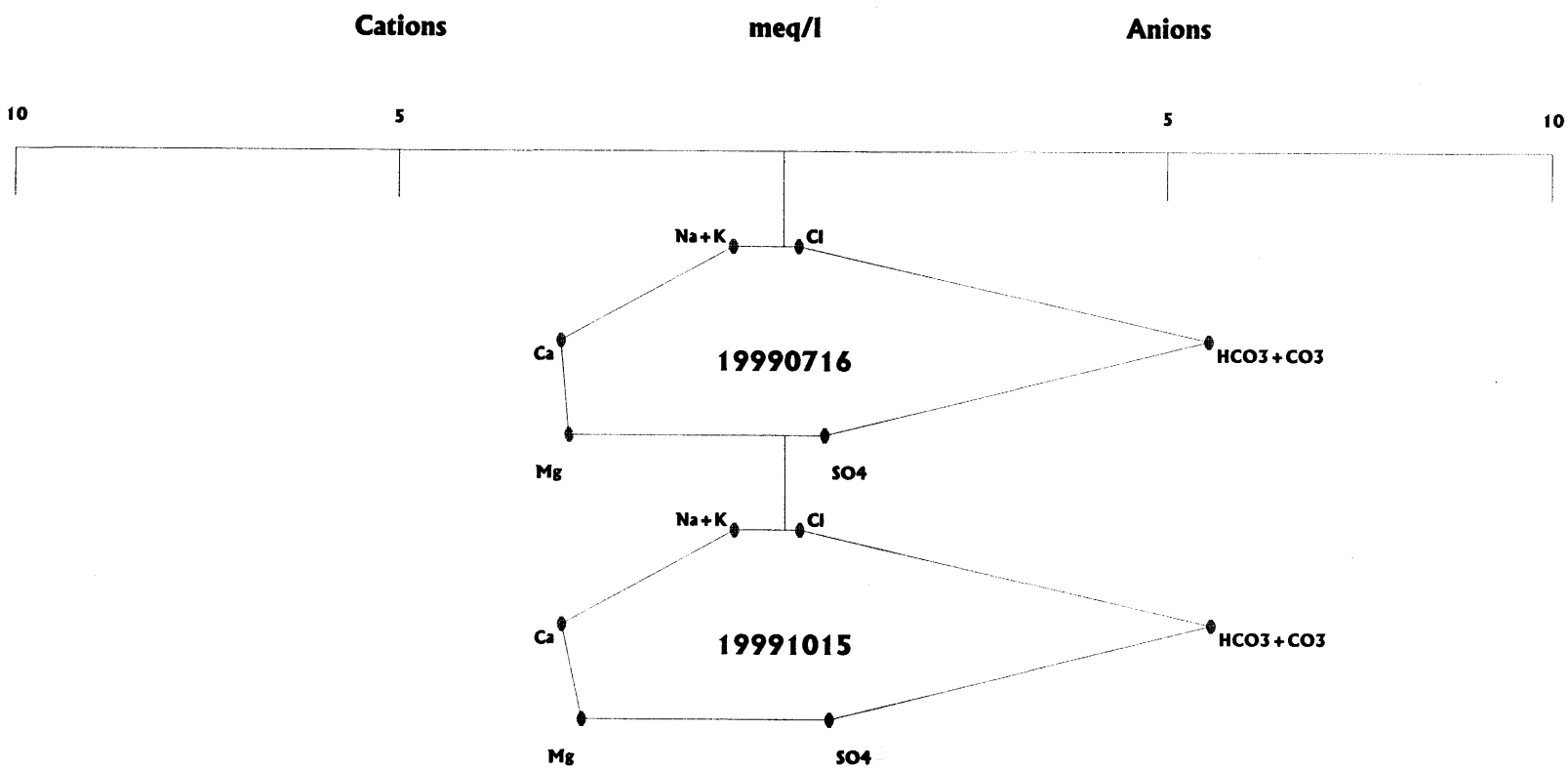
EAST MOUNTAIN SPRINGS

EMS 80-48



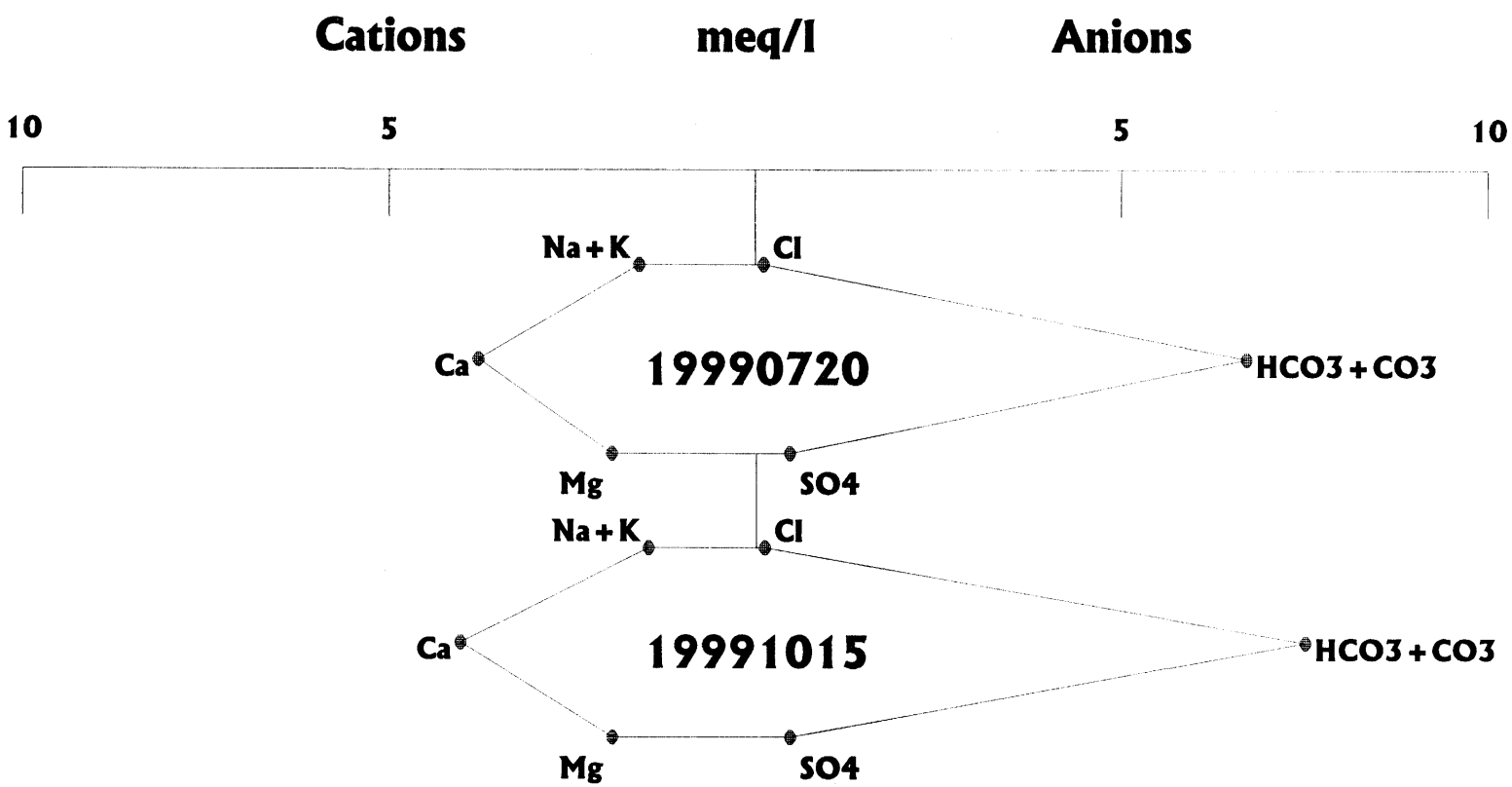
EAST MOUNTAIN SPRINGS

EMS 84-56



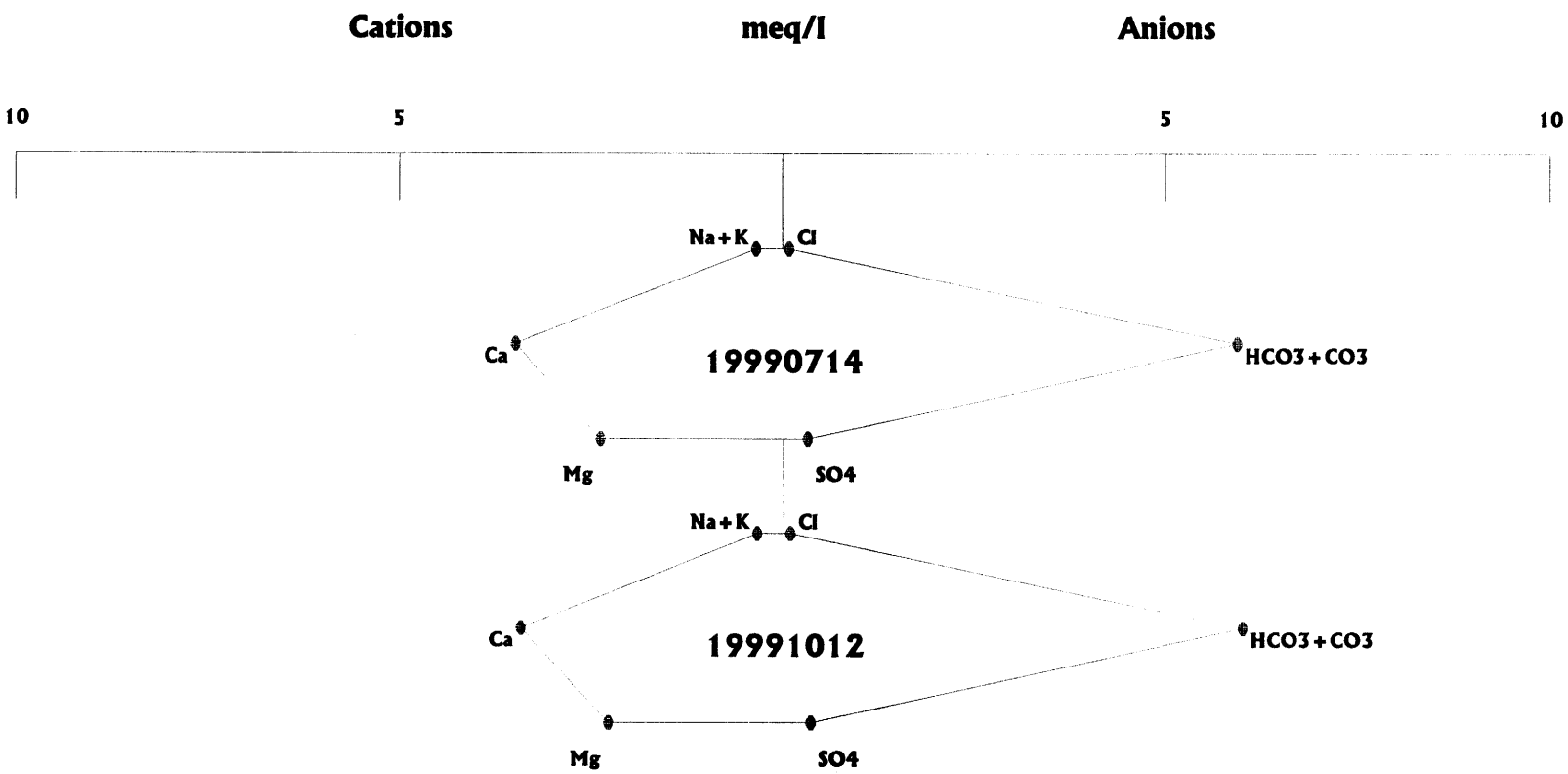
EAST MOUNTAIN SPRINGS

EMS 89-60



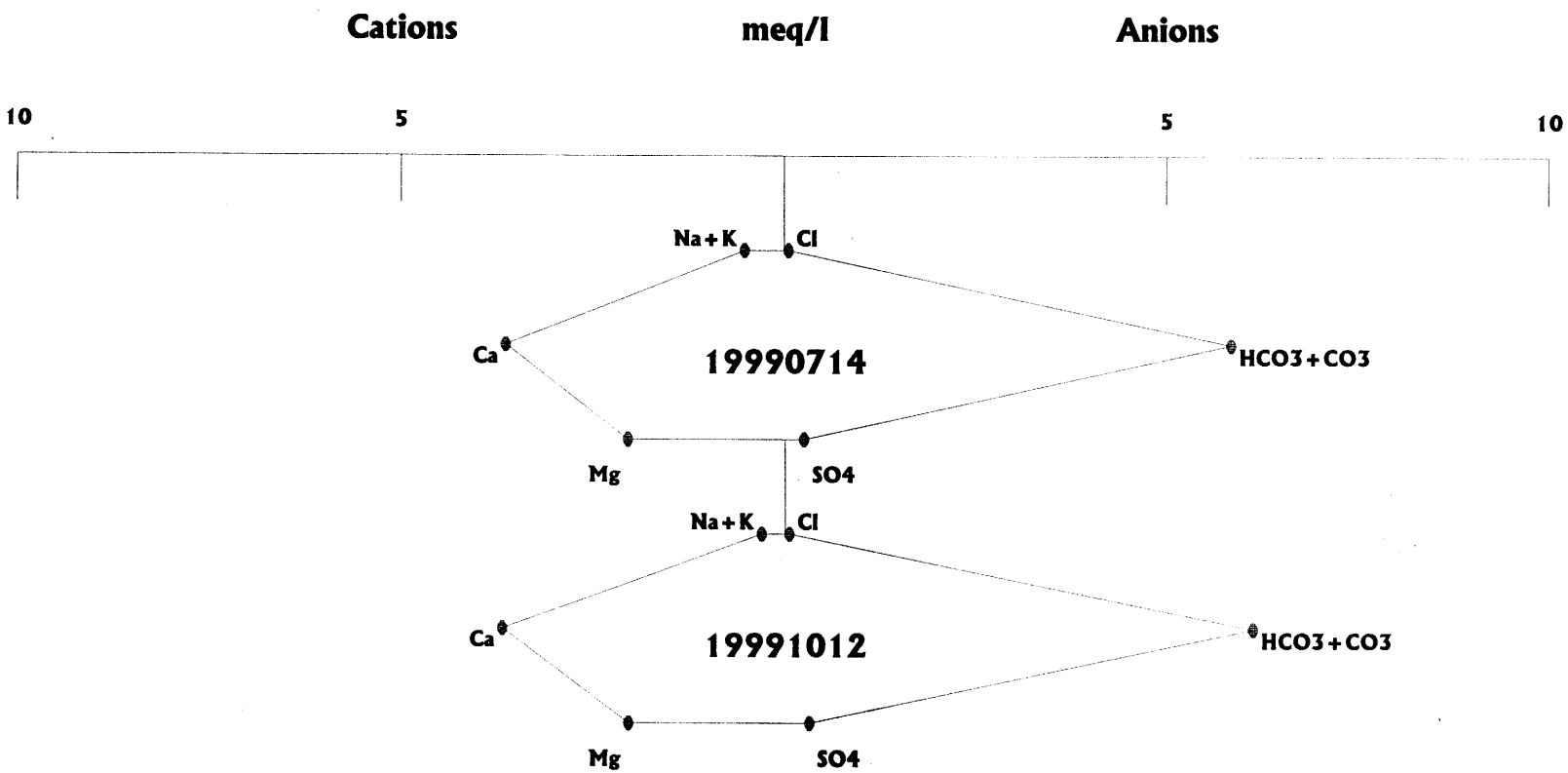
EAST MOUNTAIN SPRINGS

EMS 89-61



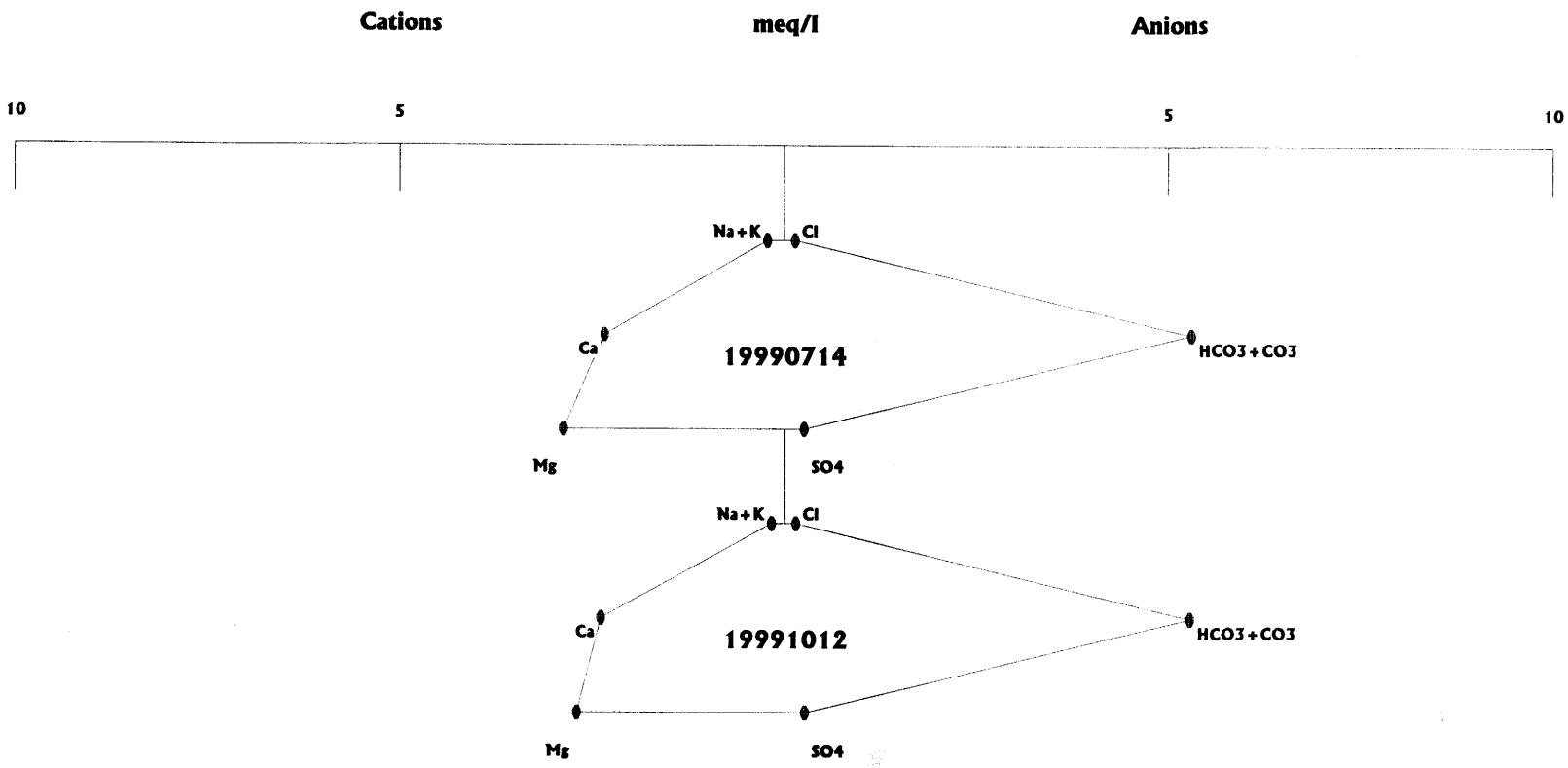
EAST MOUNTAIN SPRINGS

EMS 89-65



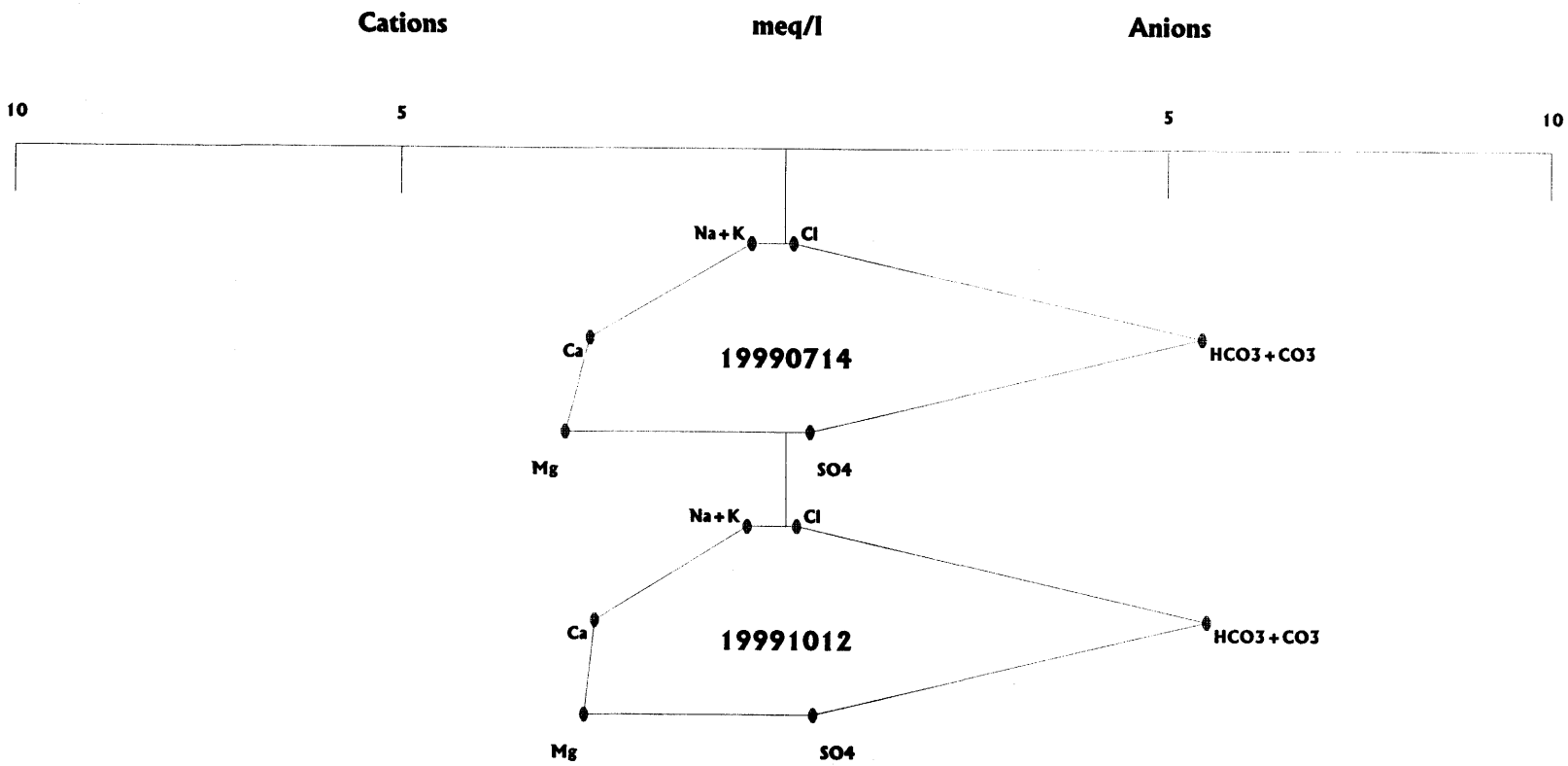
EAST MOUNTAIN SPRINGS

EMS 89-66



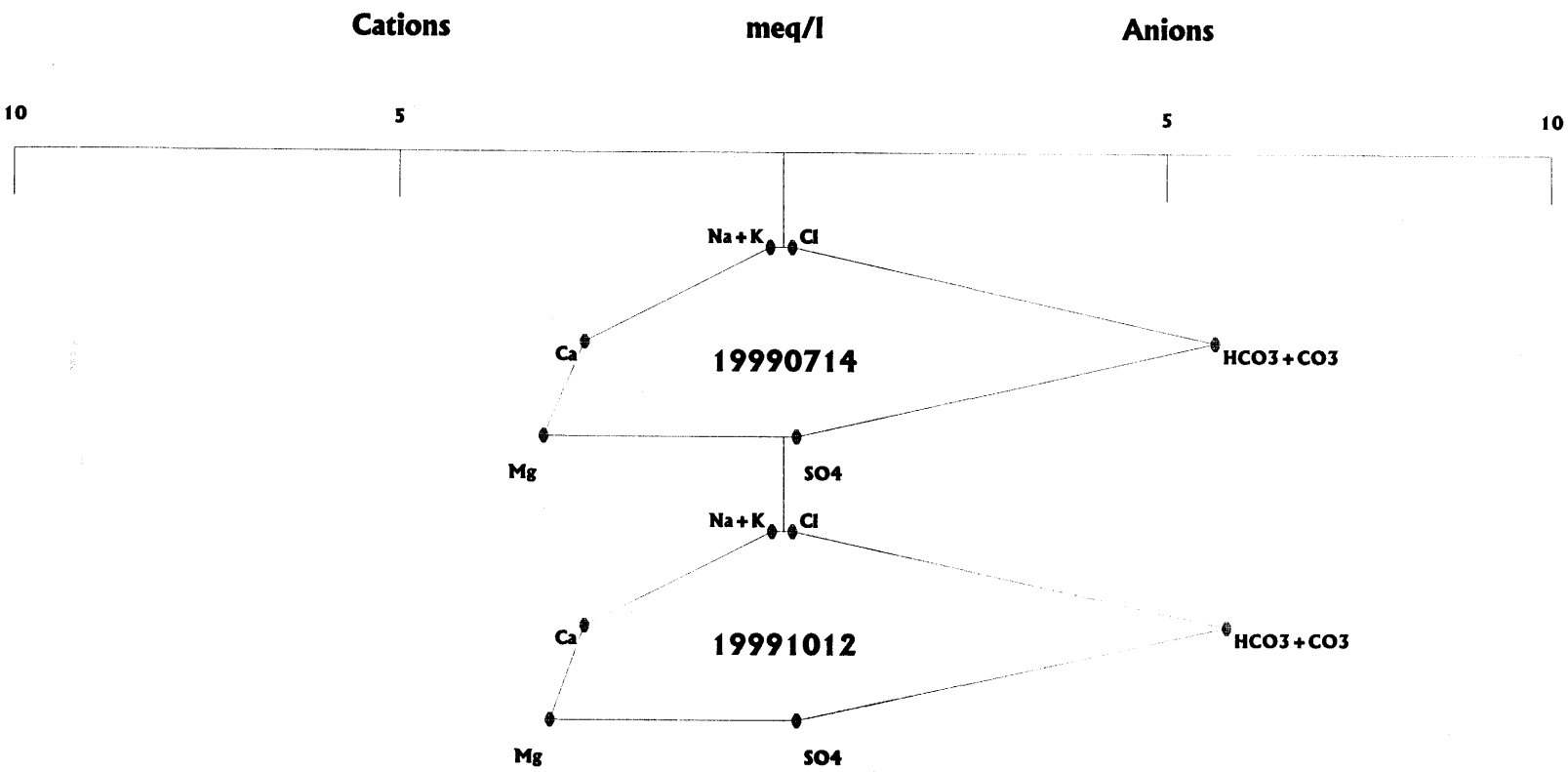
EAST MOUNTAIN SPRINGS

EMS 89-67



EAST MOUNTAIN SPRINGS

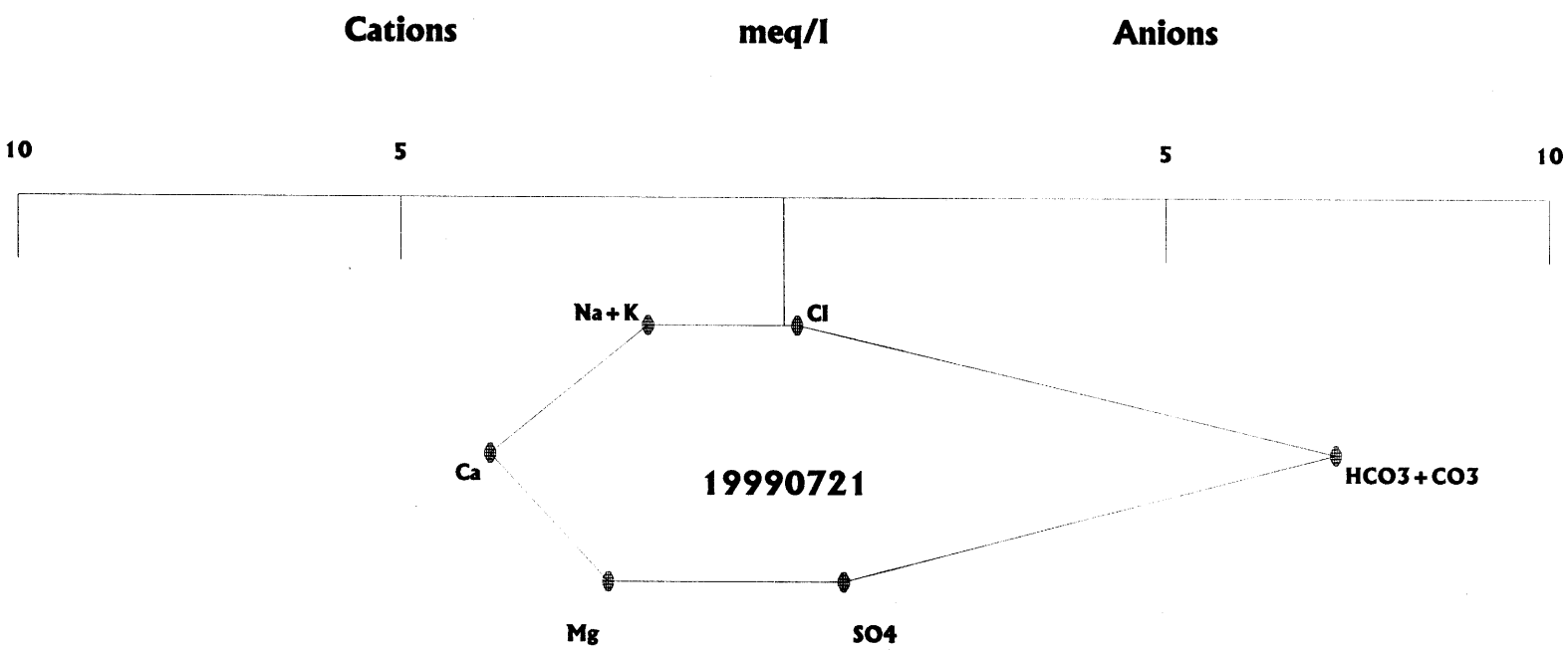
EMS 89-68



EAST MOUNTAIN SPRINGS
STIFF DIAGRAMS
PRICE RIVER FORMATION

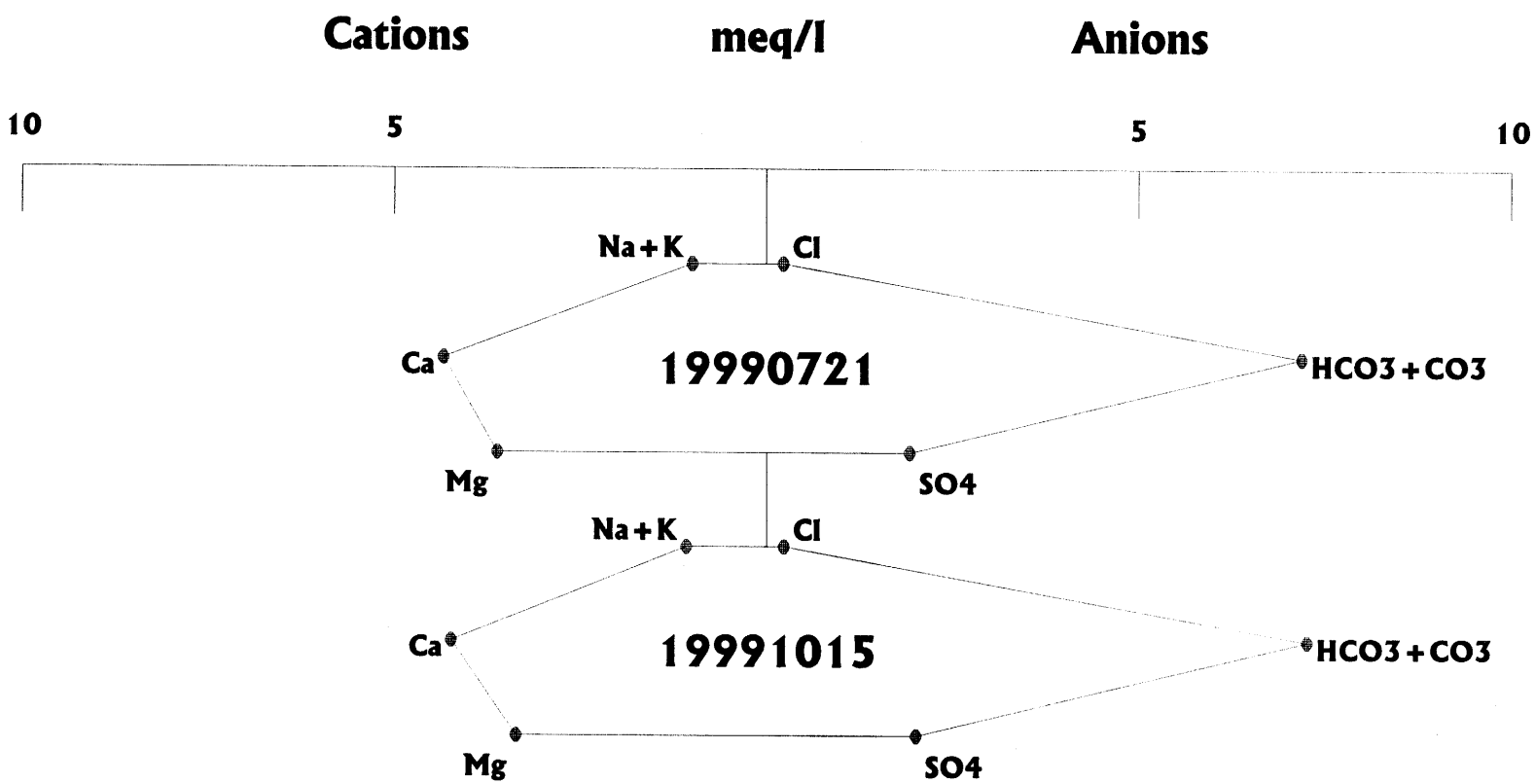
EAST MOUNTAIN SPRINGS

EMS 79-40



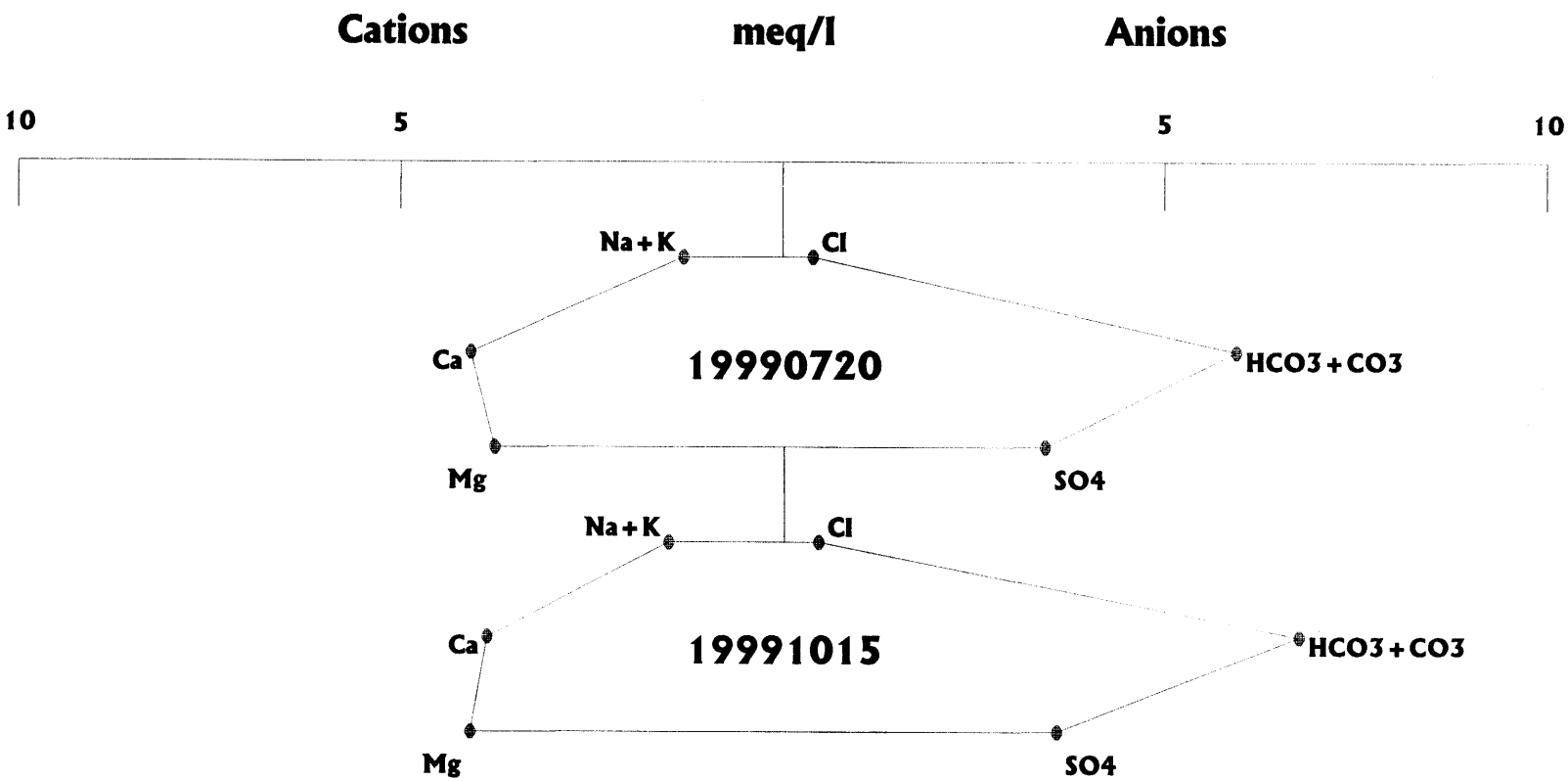
EAST MOUNTAIN SPRINGS

EMS 80-41



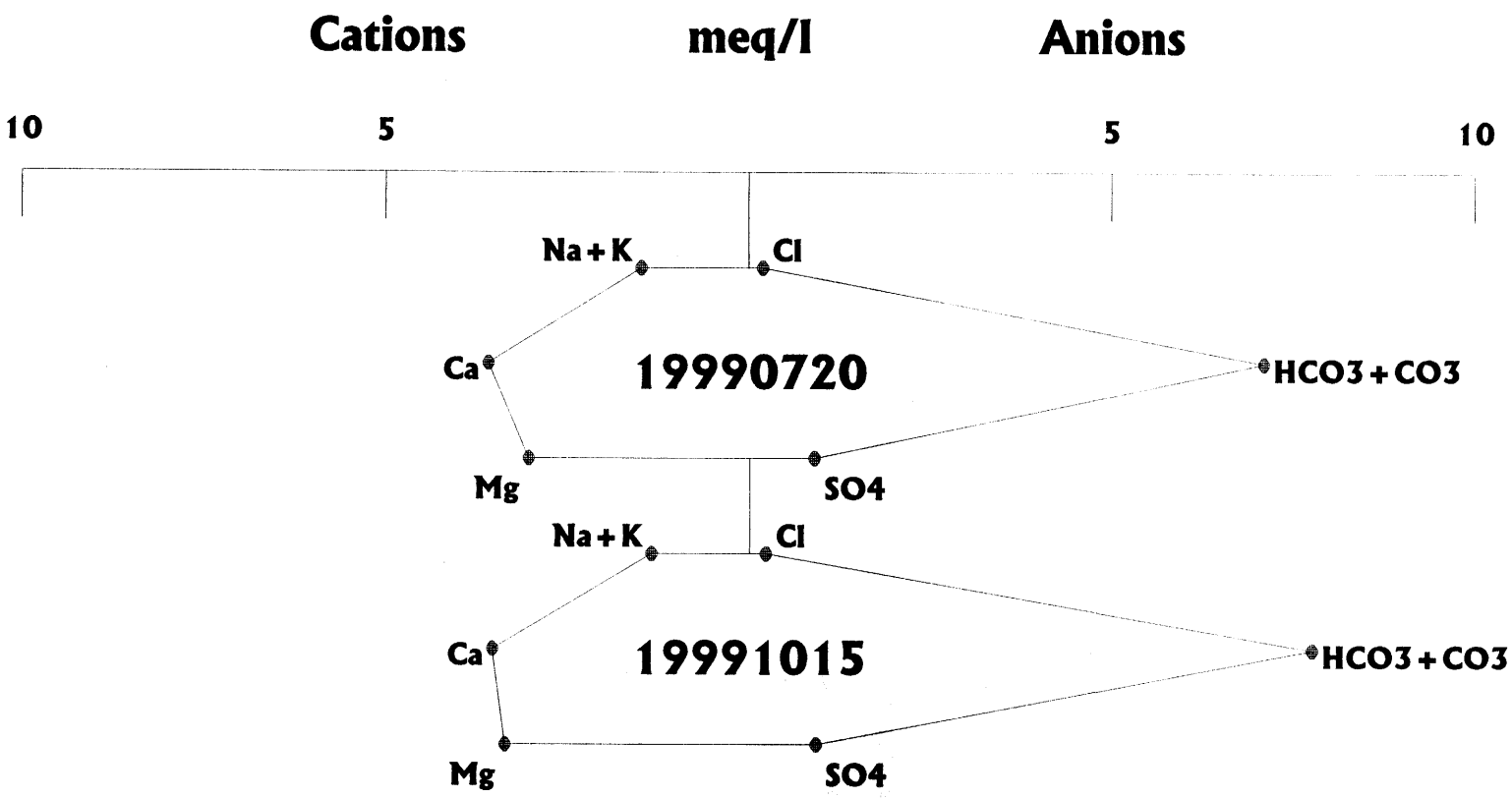
EAST MOUNTAIN SPRINGS

EMS 82-51



EAST MOUNTAIN SPRINGS

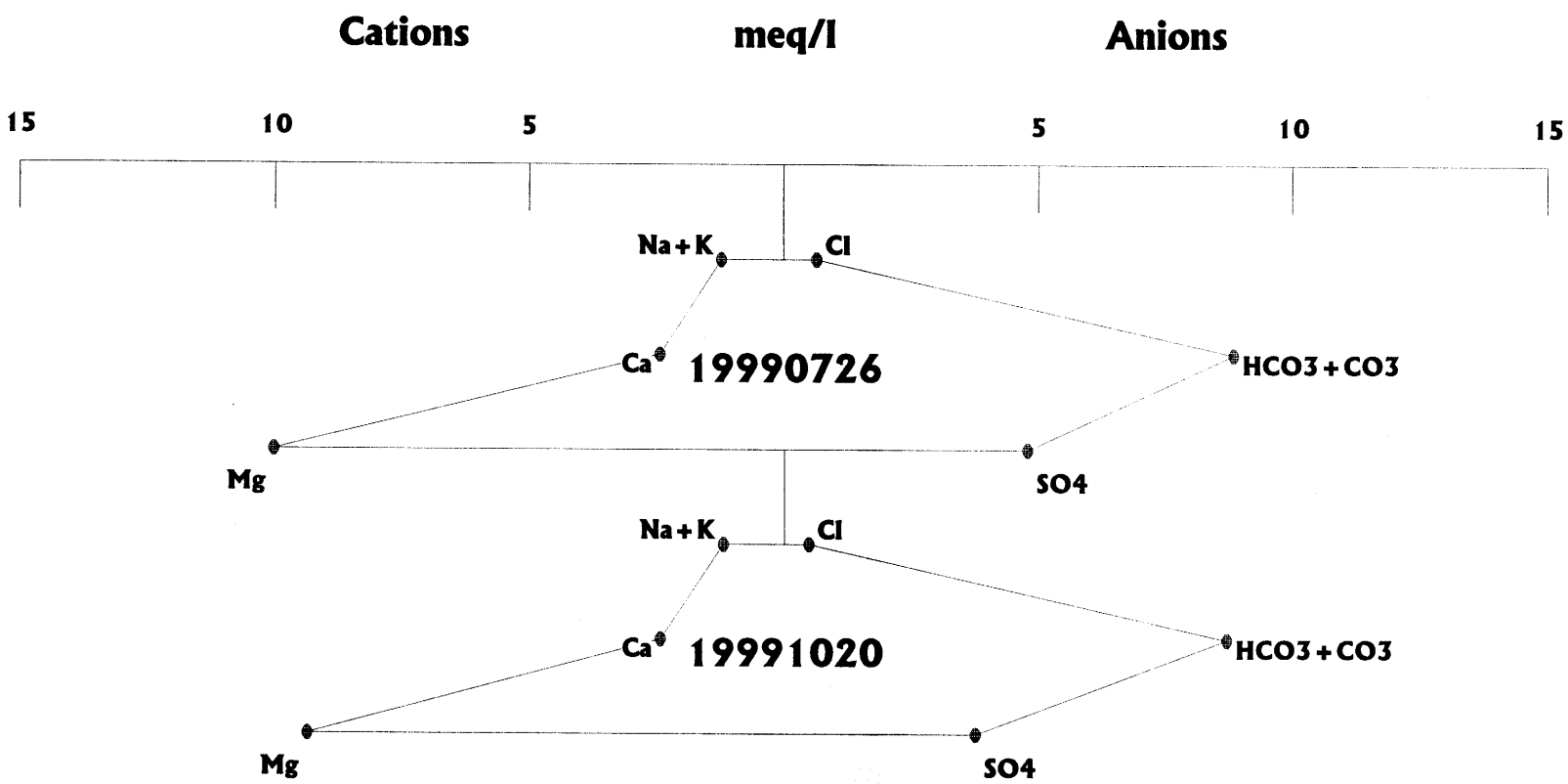
EMS 82-52



EAST MOUNTAIN SPRINGS
STIFF DIAGRAMS
BLACKHAWK FORMATION

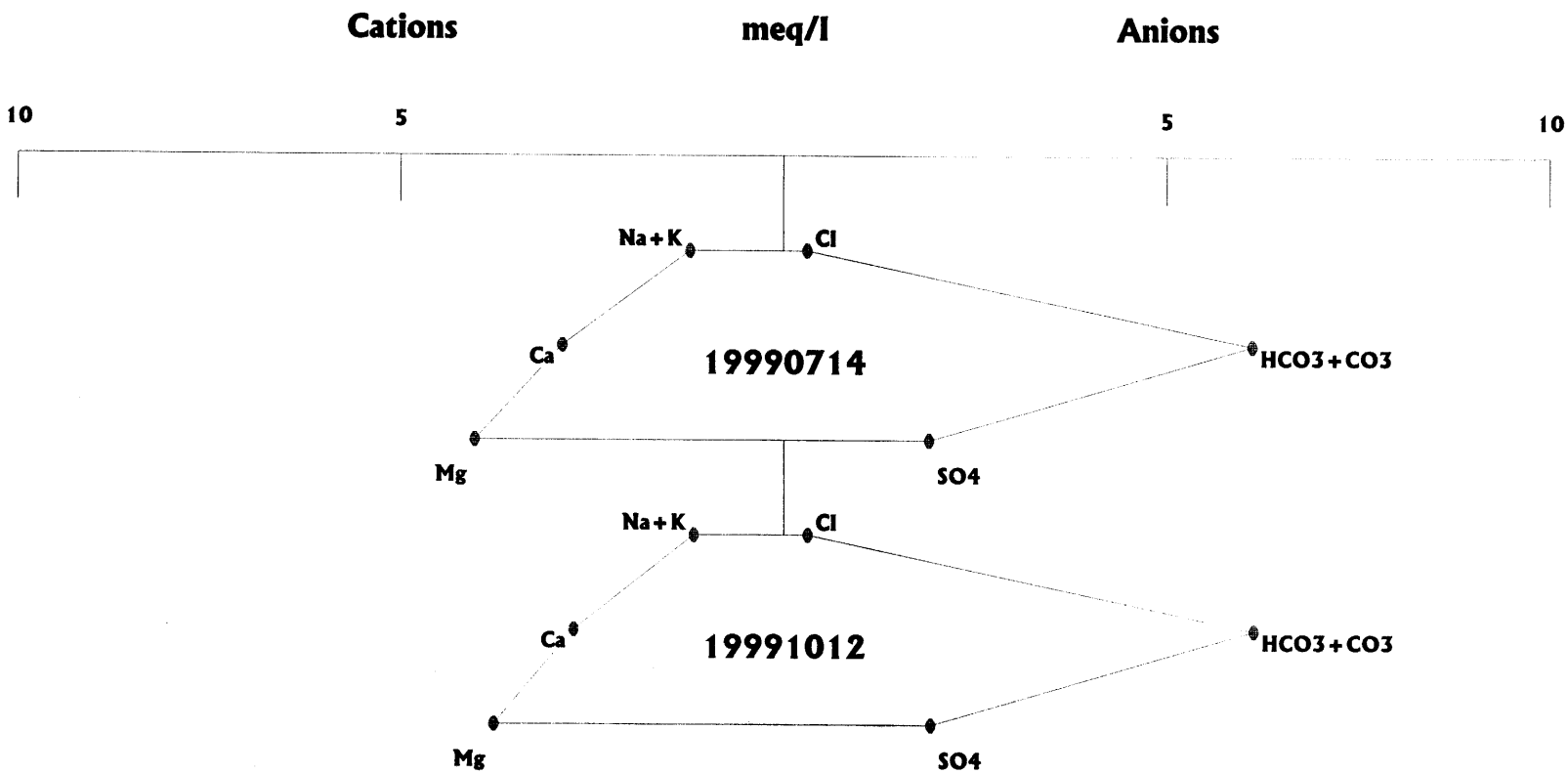
EAST MOUNTAIN SPRINGS

EMS 80-50



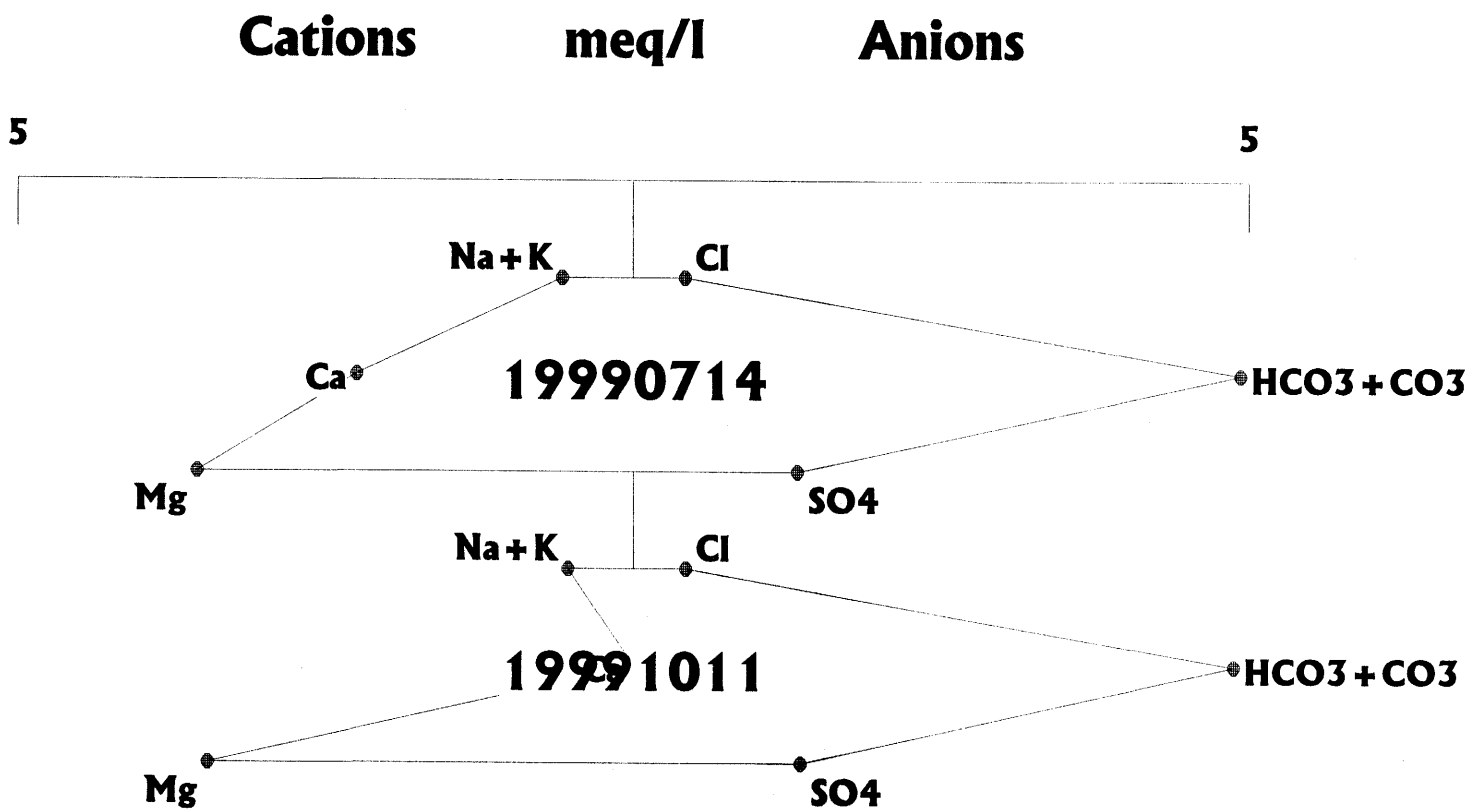
EAST MOUNTAIN SPRINGS

EMS 91-72



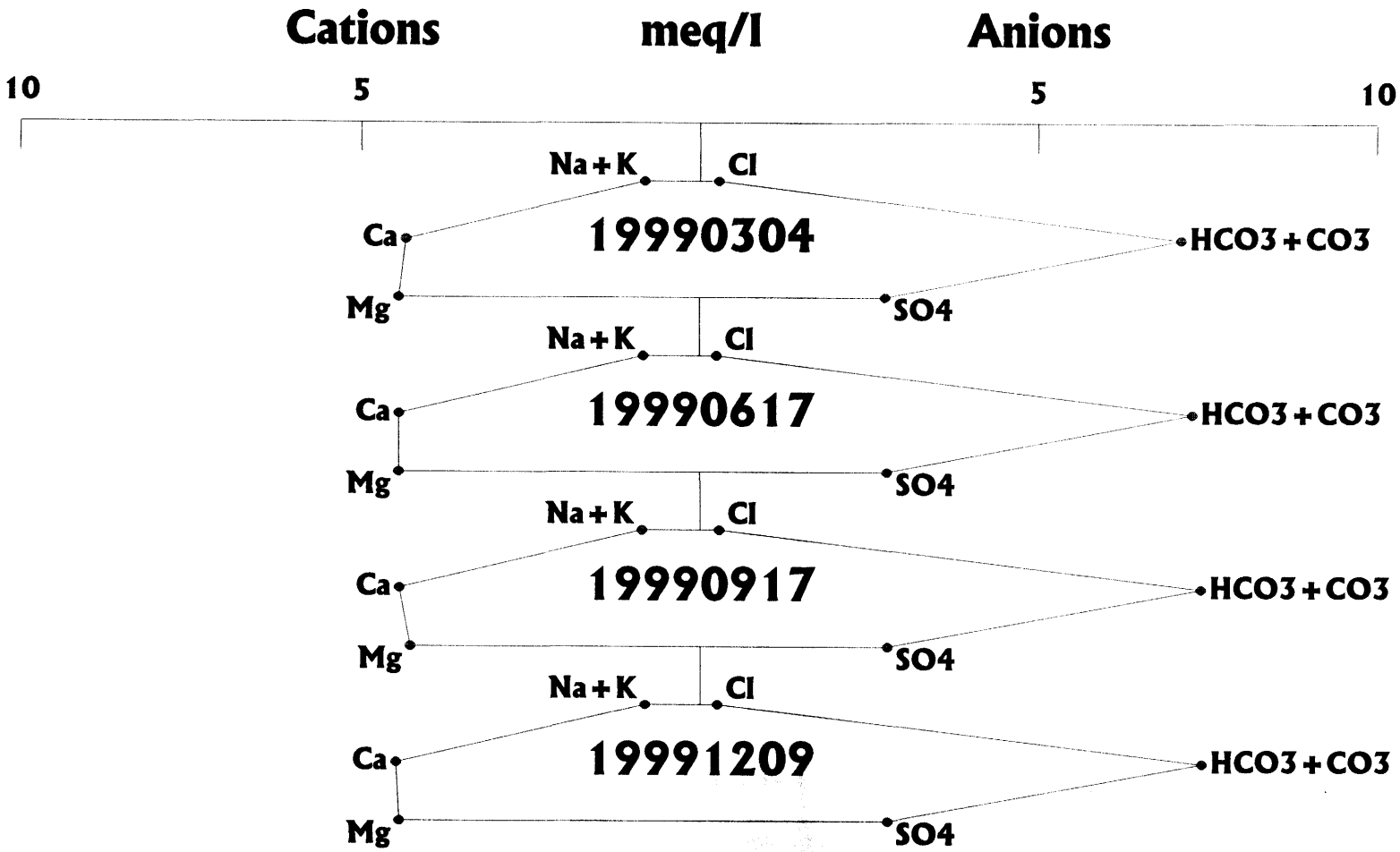
EAST MOUNTAIN SPRINGS

EMS 91-73

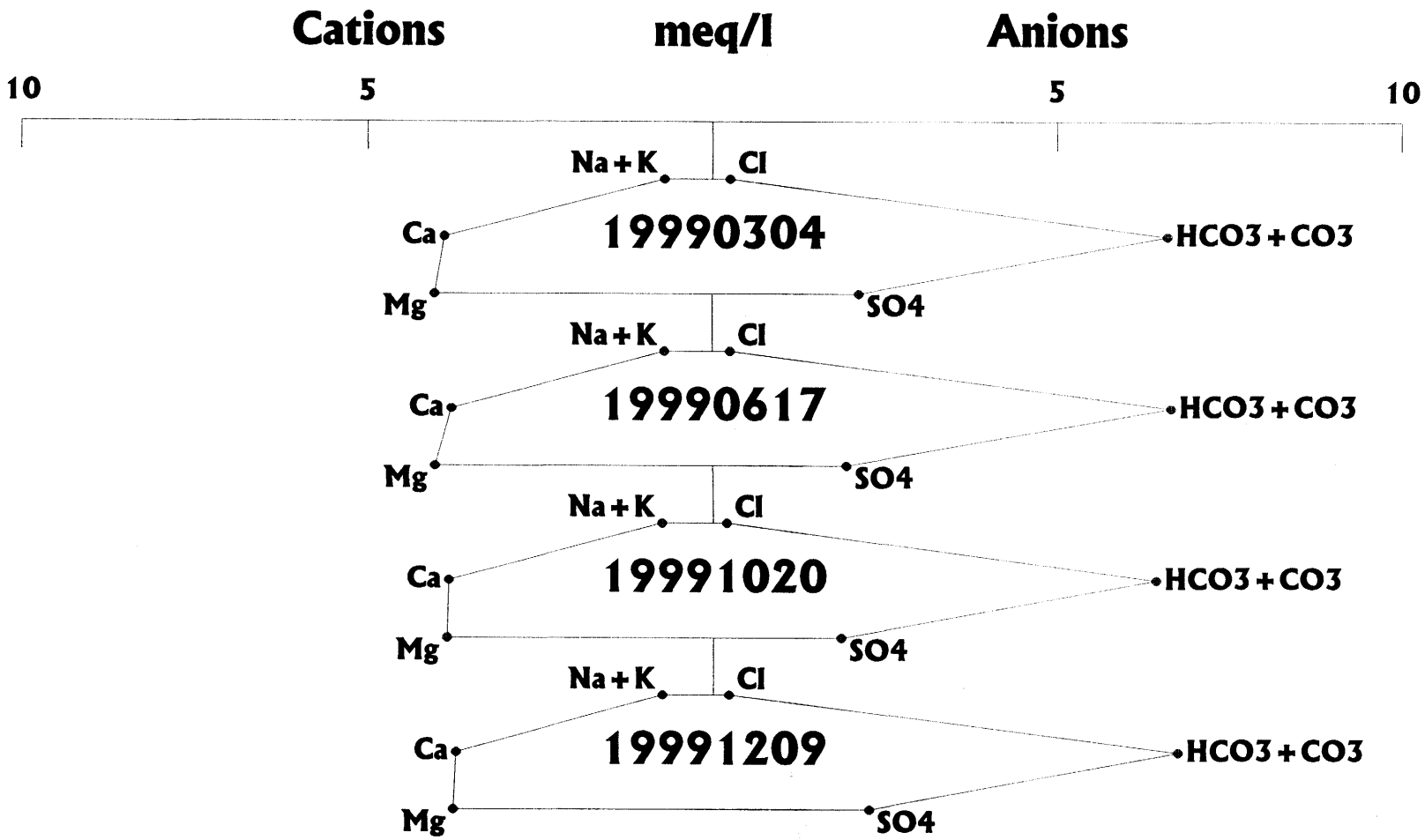


EAST MOUNTAIN SPRINGS
STIFF DIAGRAMS
RILDA CANYON ALLUVIUM

EAST MOUNTAIN SPRINGS
RILDA METER 2



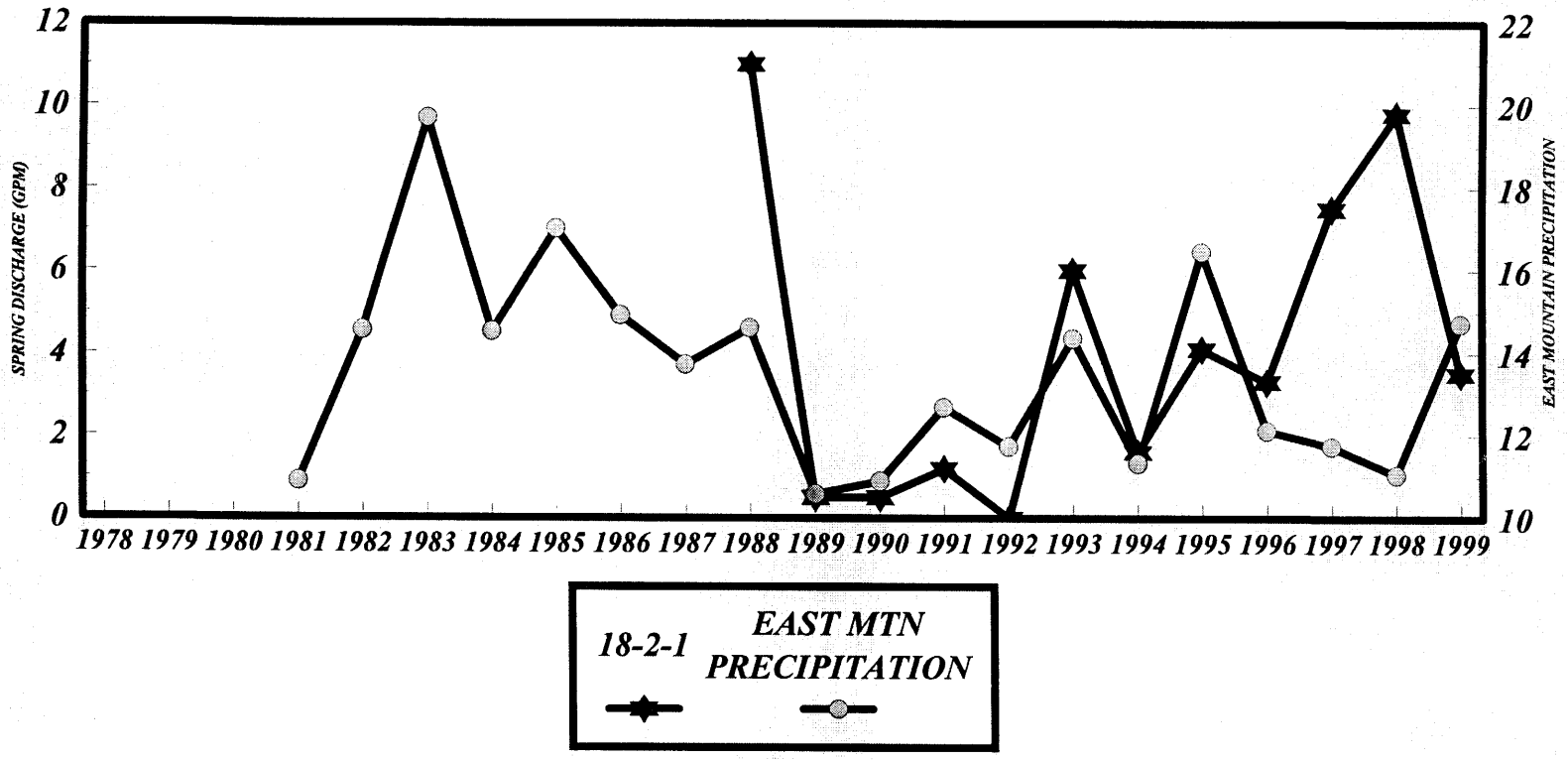
EAST MOUNTAIN SPRINGS
RILDA METER 3



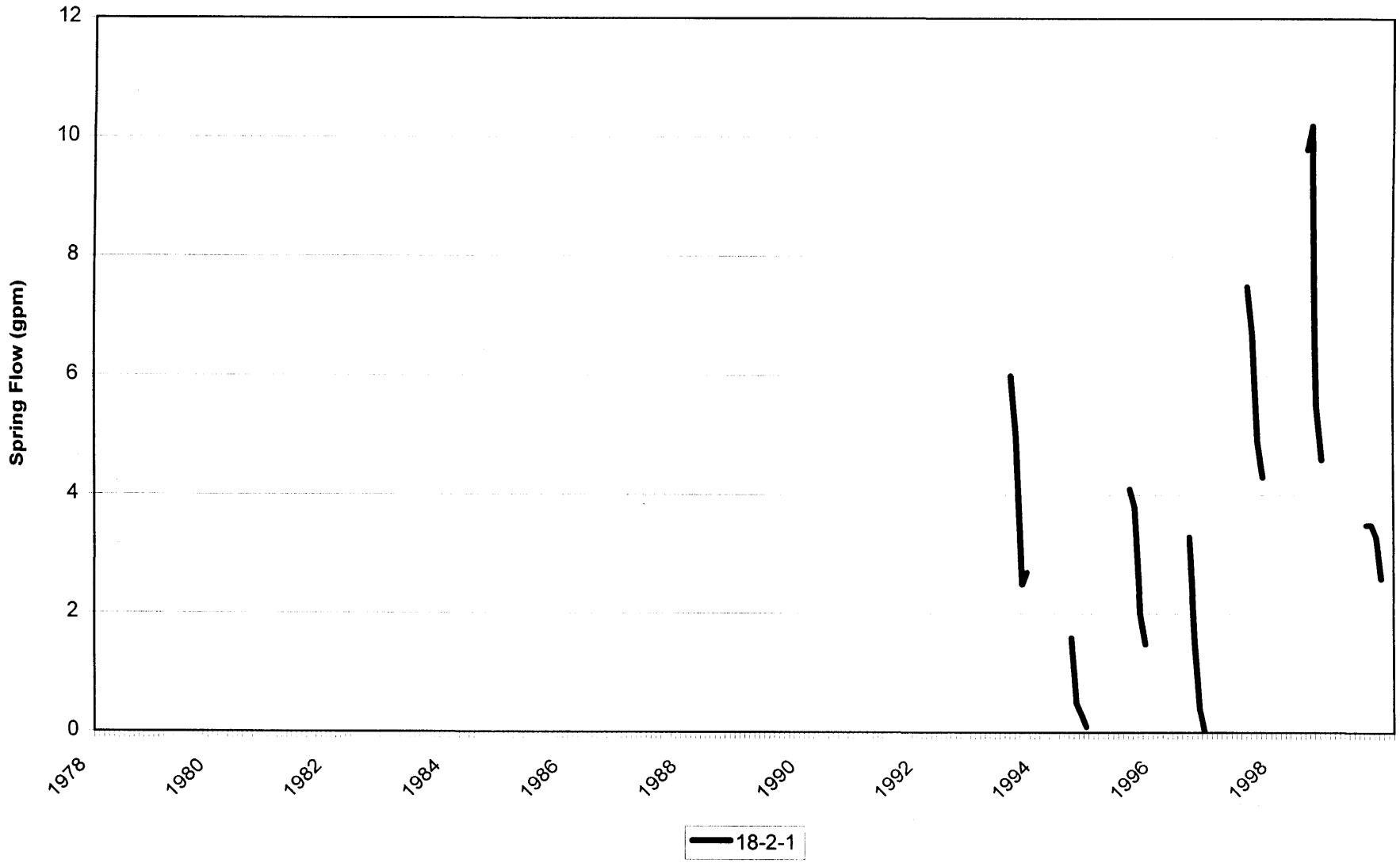
APPENDIX I

1999

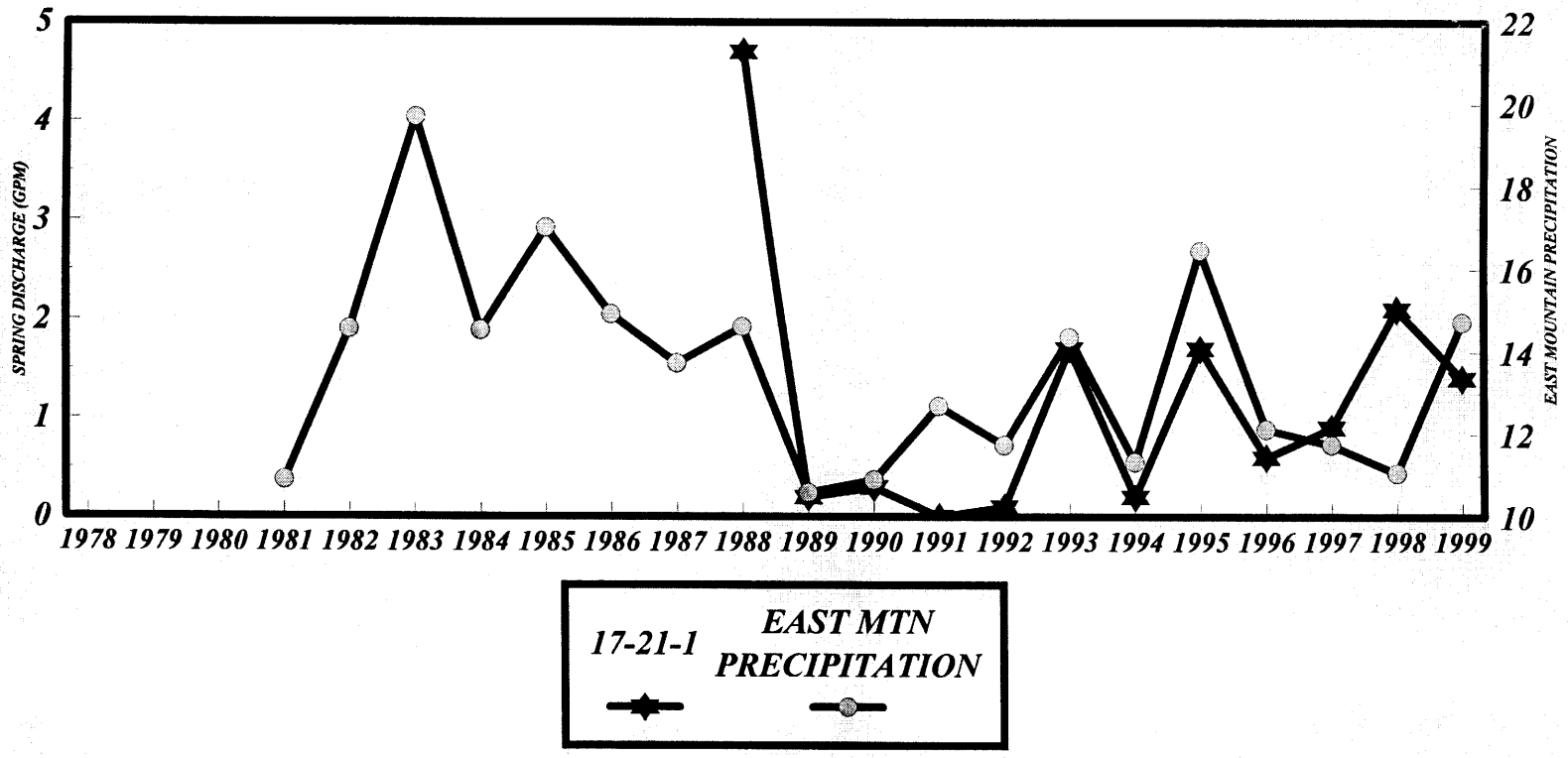
TRAIL MOUNTAIN SPRINGS
Spring 18-2-1 vs. Precipitation
PEAK FLOW (JULY) vs. EAST MOUNTAIN WEATHER STATION



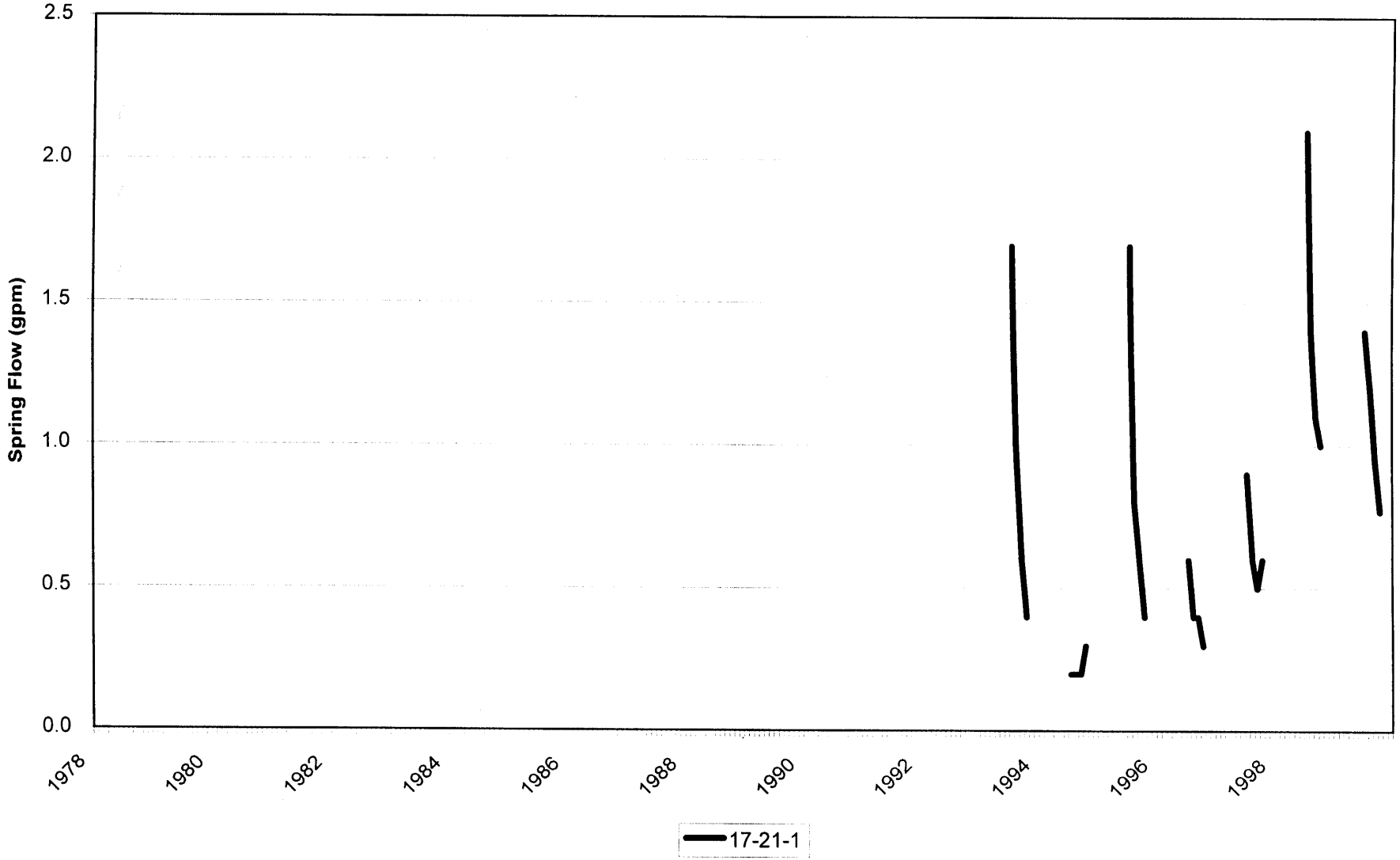
Trail Mountain Springs: 18-2-1



TRAIL MOUNTAIN SPRINGS
Spring 17-21-1 vs. Precipitation
PEAK FLOW (JULY) vs. EAST MOUNTAIN WEATHER STATION

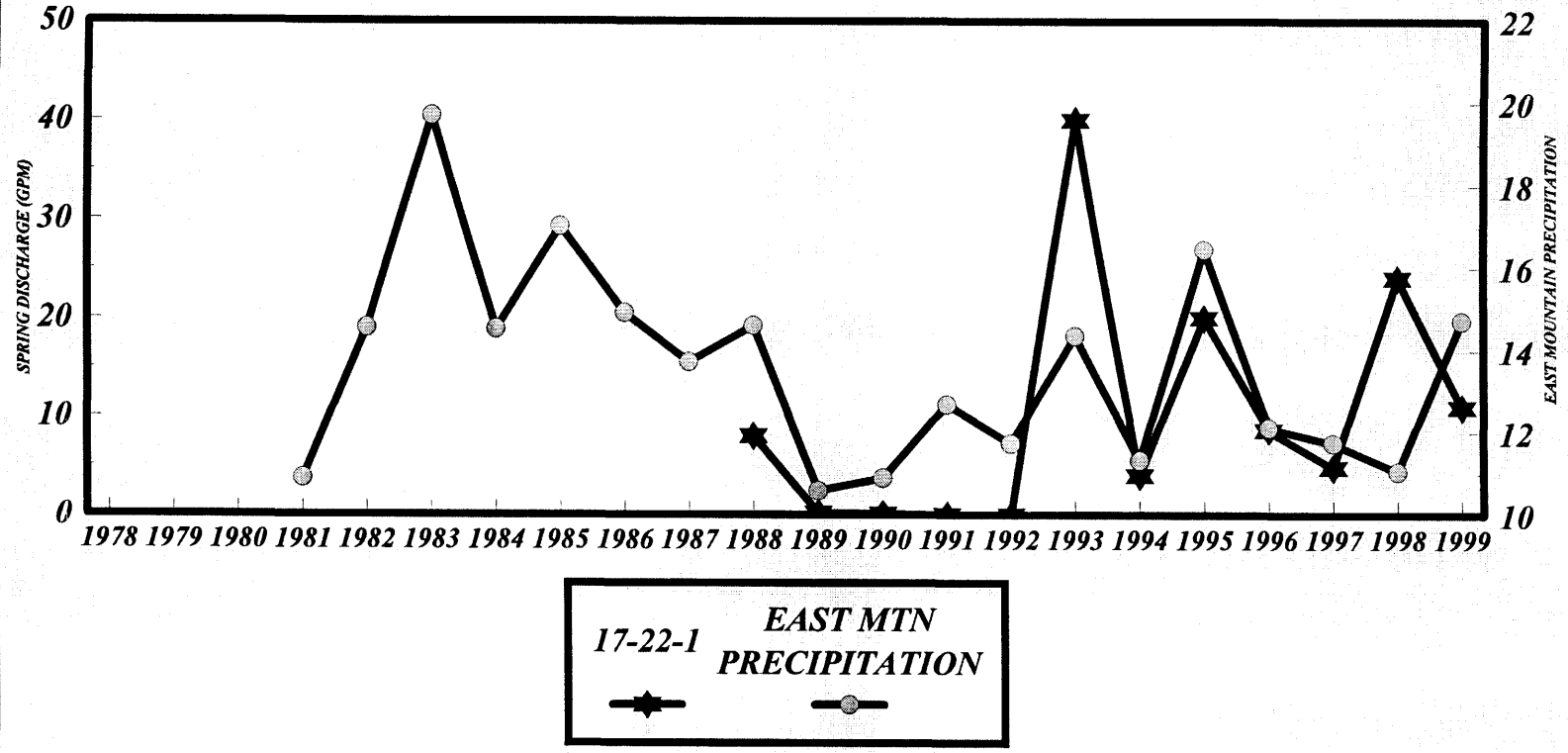


Trail Mountain Springs: 17-21-1

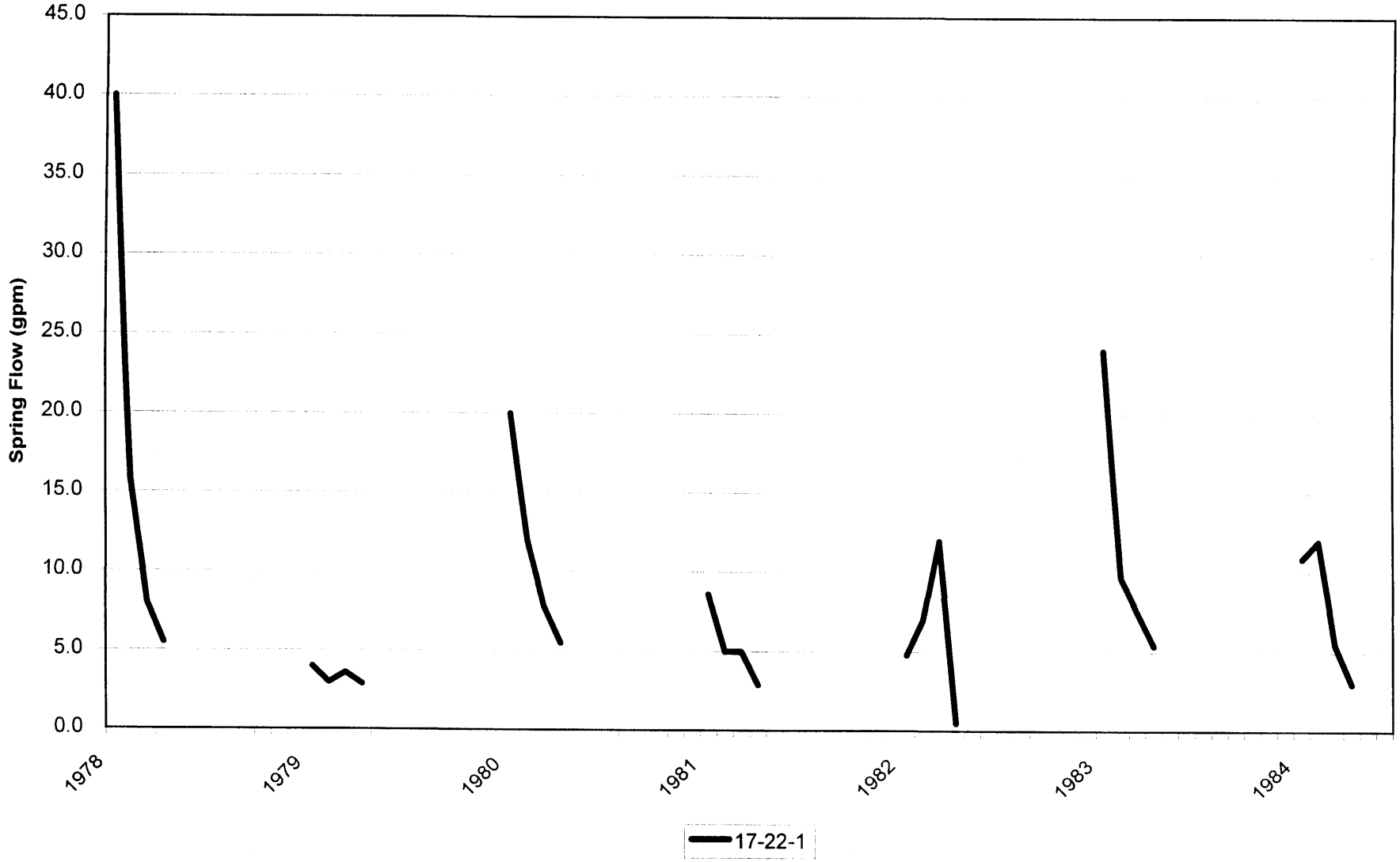


TRAIL MOUNTAIN SPRINGS
Spring 17-22-1 vs. Precipitation

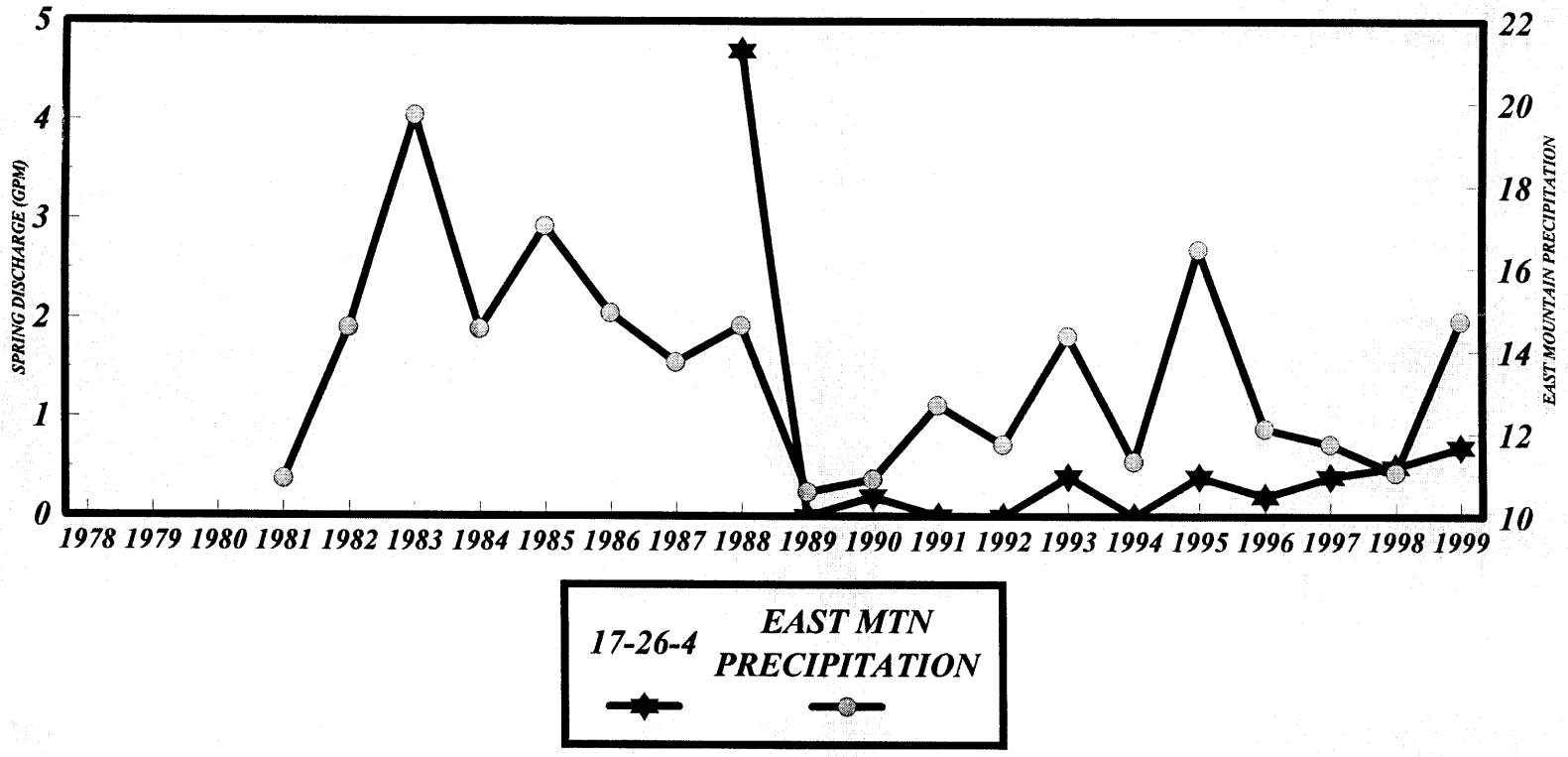
PEAK FLOW (JULY) vs. EAST MOUNTAIN WEATHER STATION



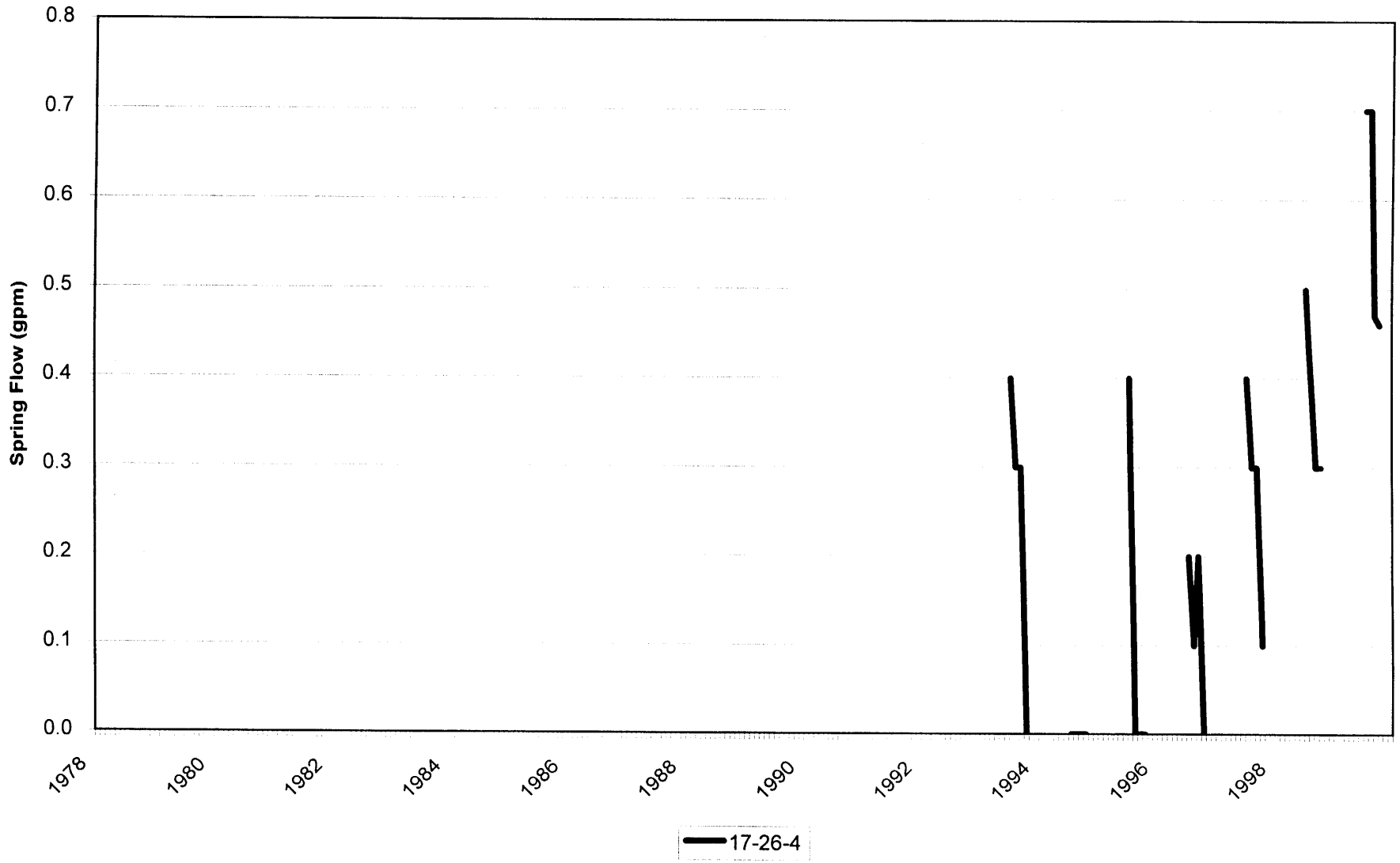
Trail Mountain Springs: 17-22-1



TRAIL MOUNTAIN SPRINGS
Spring 17-26-4 vs. Precipitation
PEAK FLOW (JULY) vs. EAST MOUNTAIN WEATHER STATION

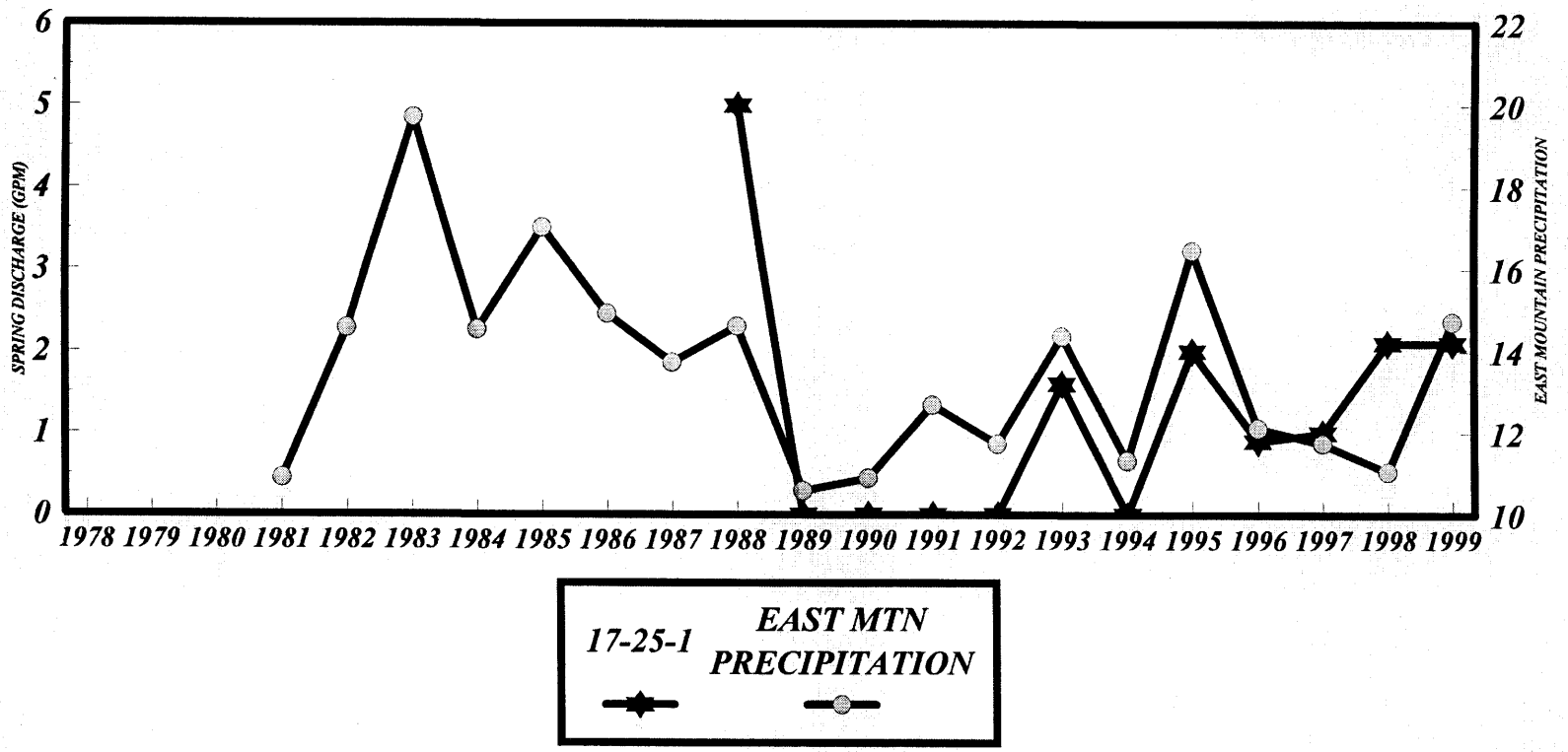


Trail Mountain Springs: 17-26-4

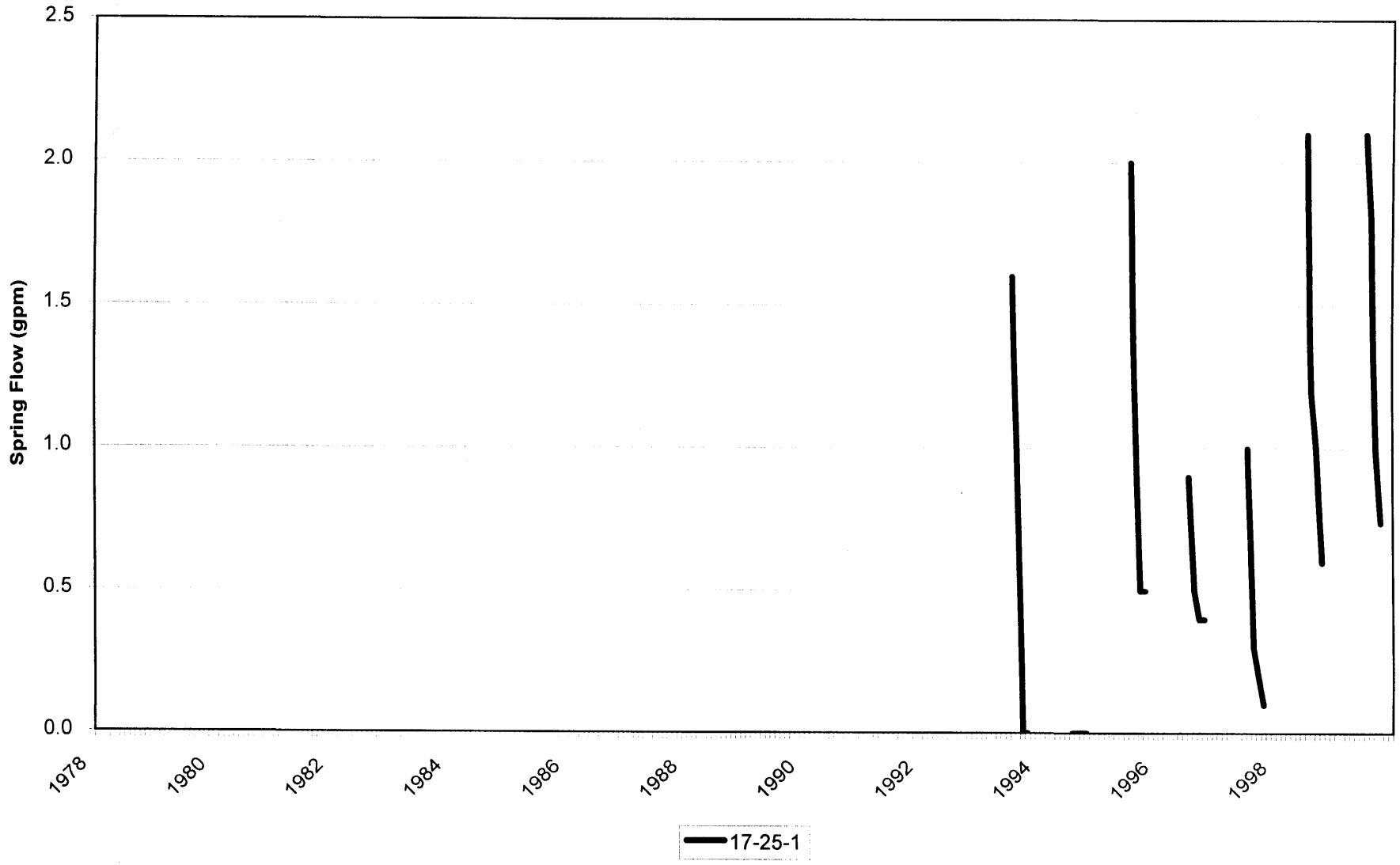


TRAIL MOUNTAIN SPRINGS
Spring 17-25-1 vs. Precipitation

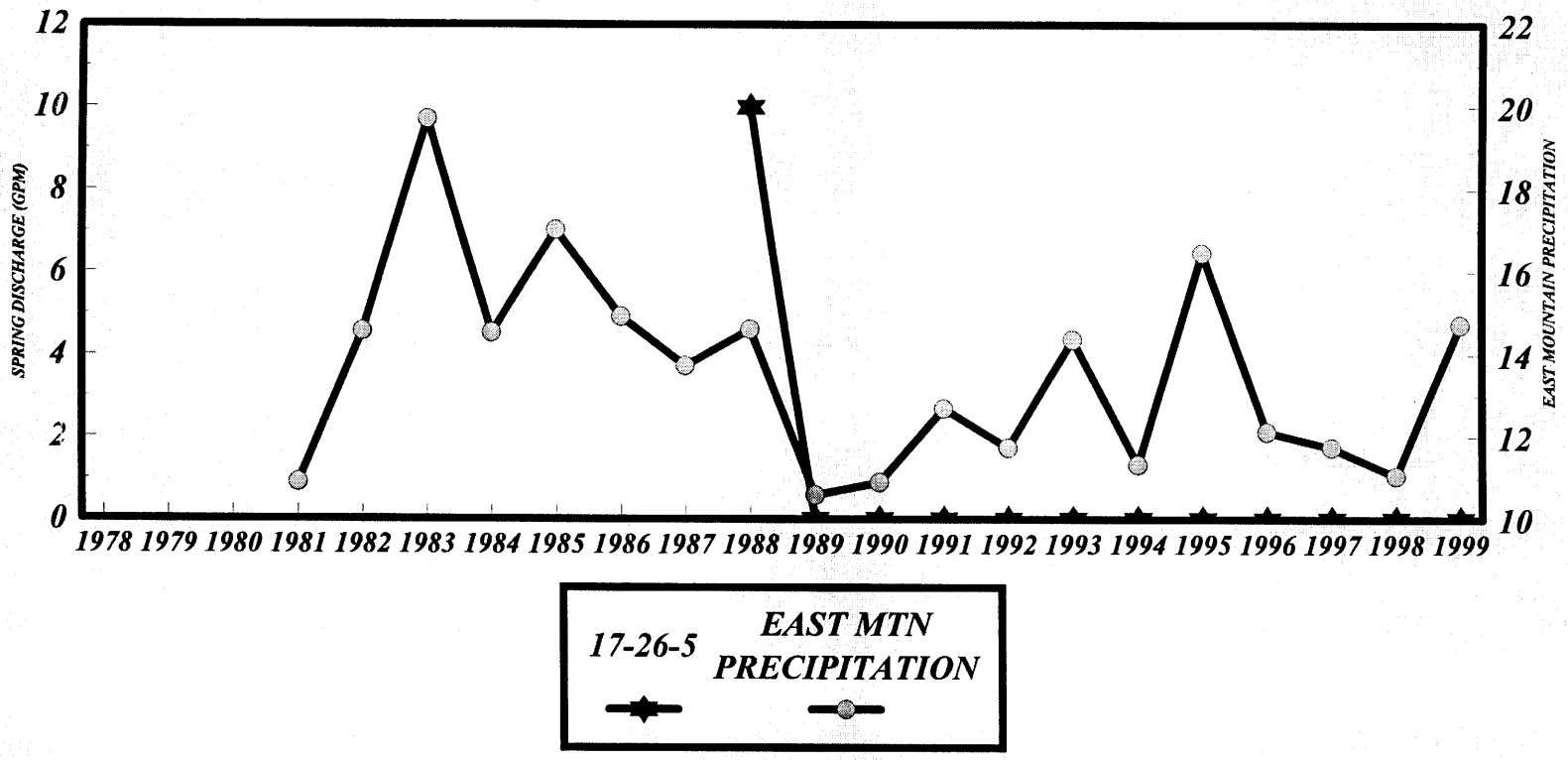
PEAK FLOW (JULY) vs. EAST MOUNTAIN WEATHER STATION



Trail Mountain Springs: 17-25-1

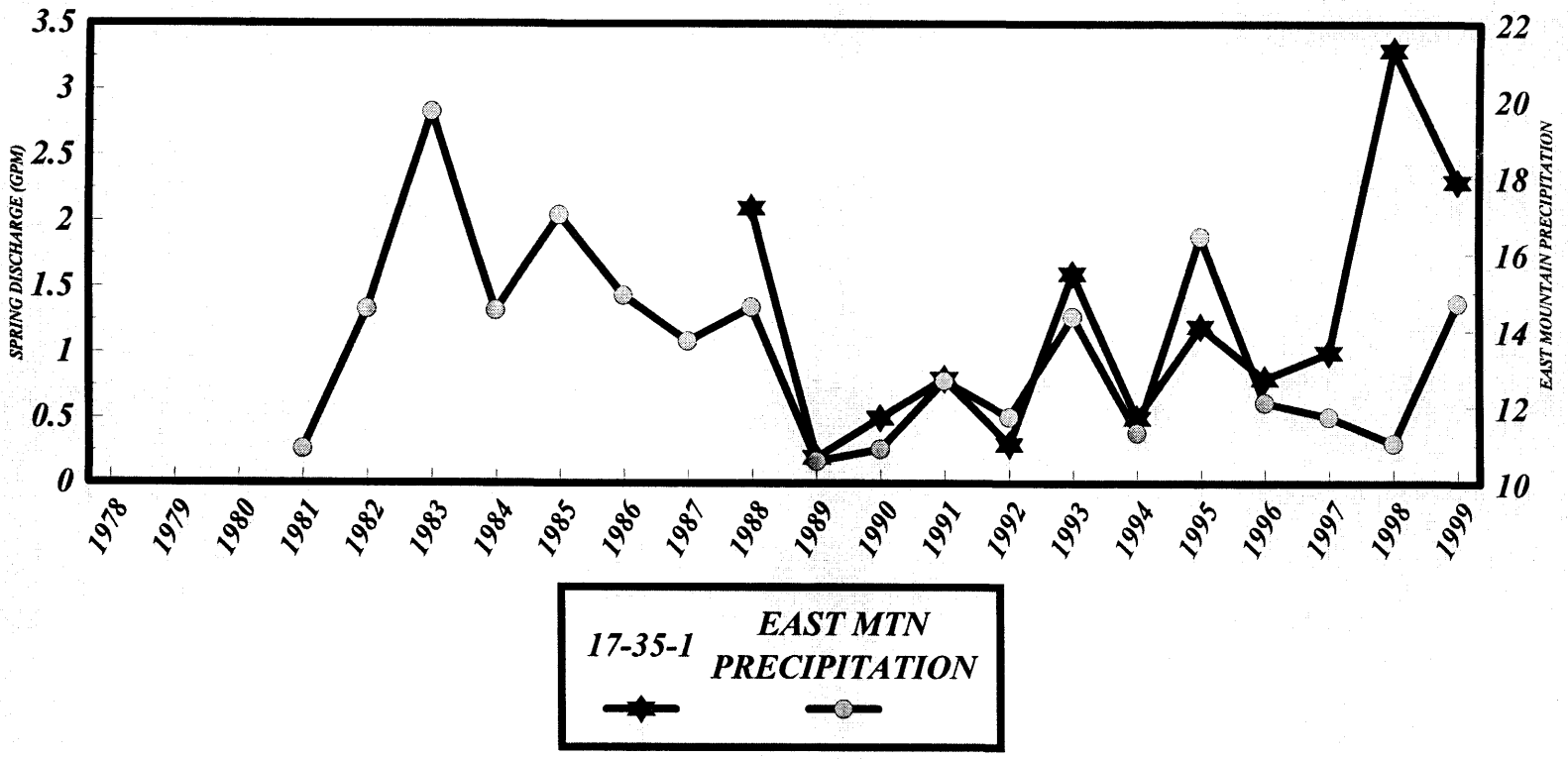


TRAIL MOUNTAIN SPRINGS
Spring 17-26-5 vs. Precipitation
PEAK FLOW (JULY) vs. EAST MOUNTAIN WEATHER STATION

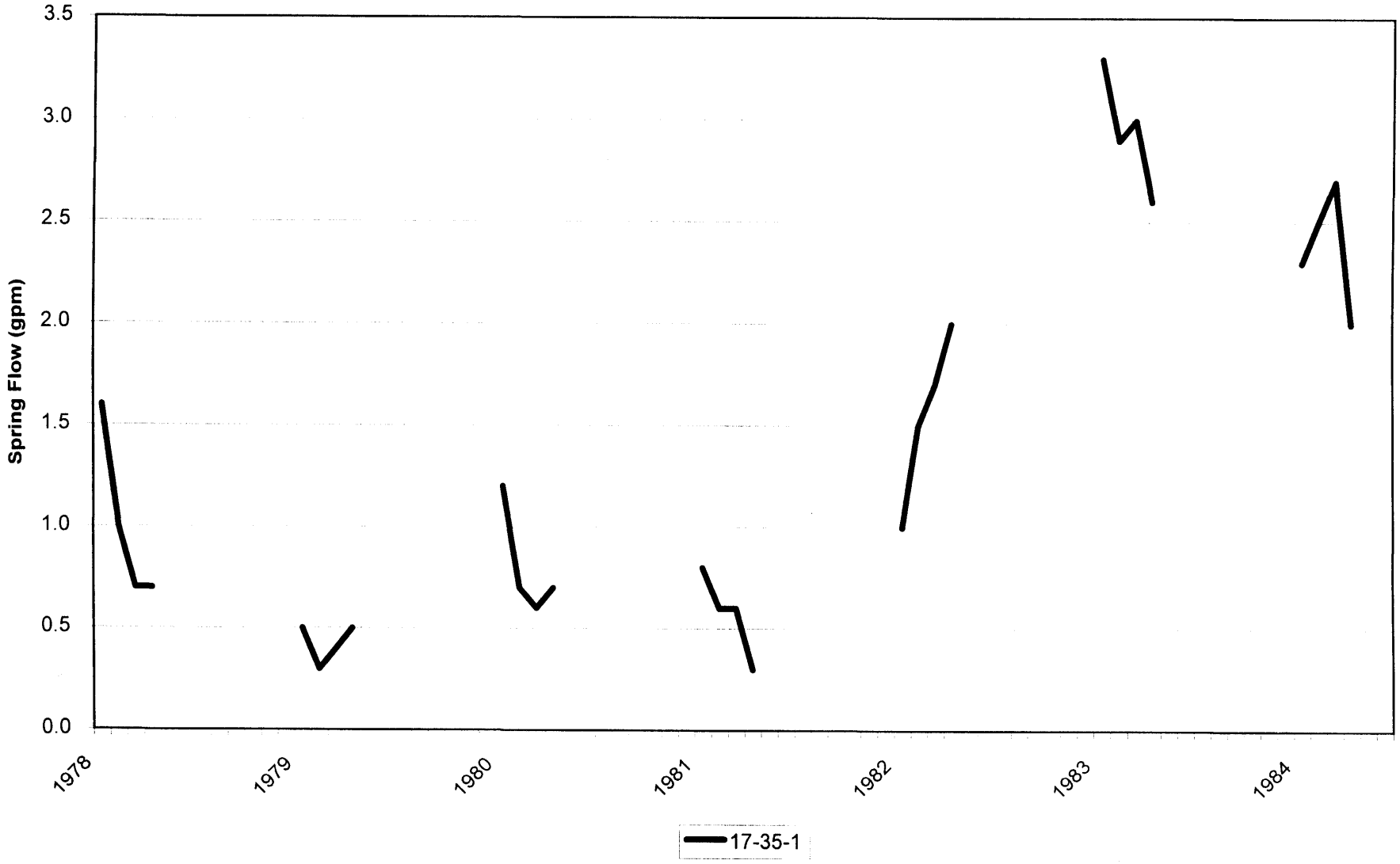


Trail Mountain Springs: 17-26-5

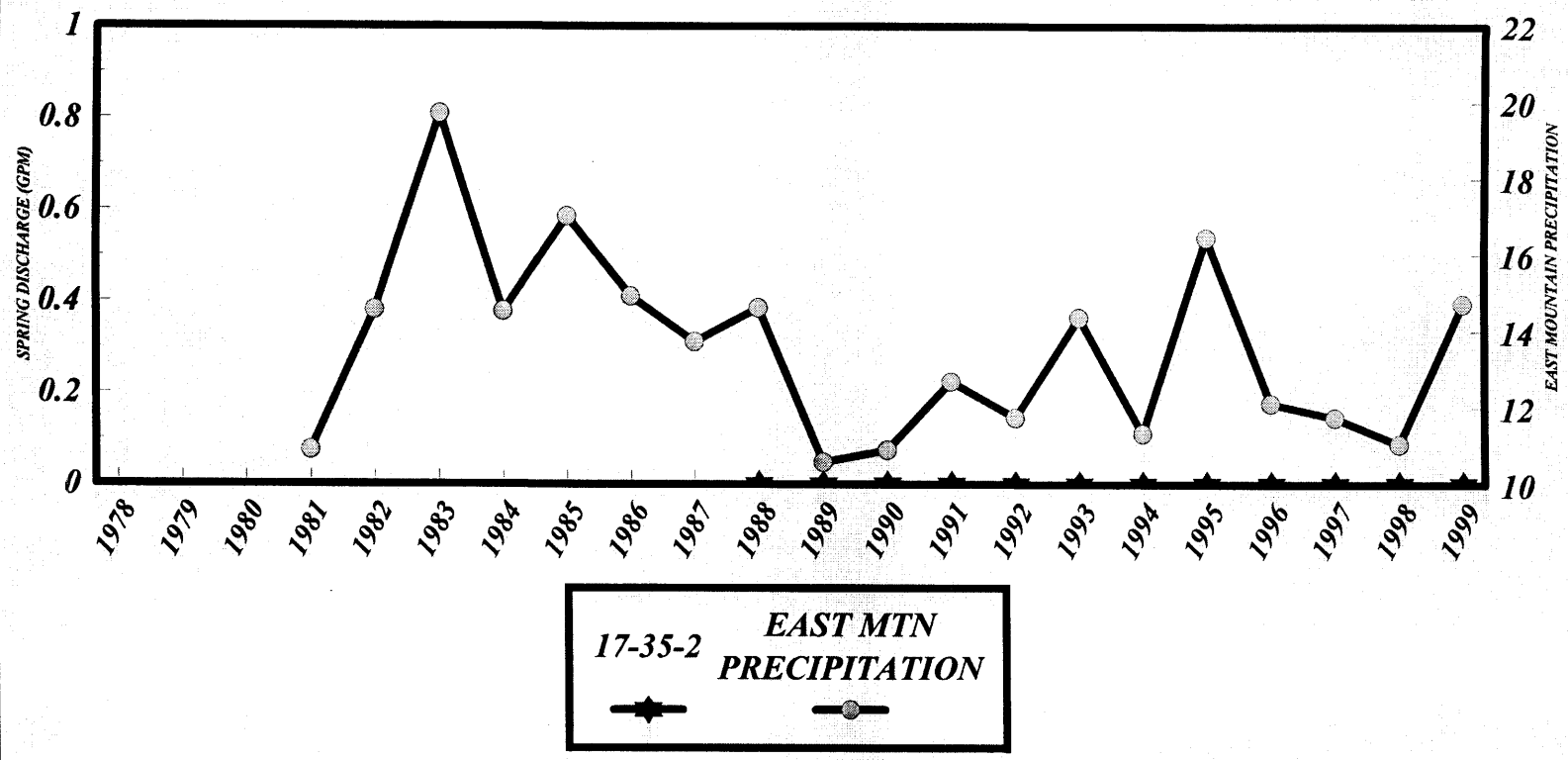
TRAIL MOUNTAIN SPRINGS
Spring 17-35-1 vs. Precipitation
PEAK FLOW (JULY) vs. EAST MOUNTAIN WEATHER STATION



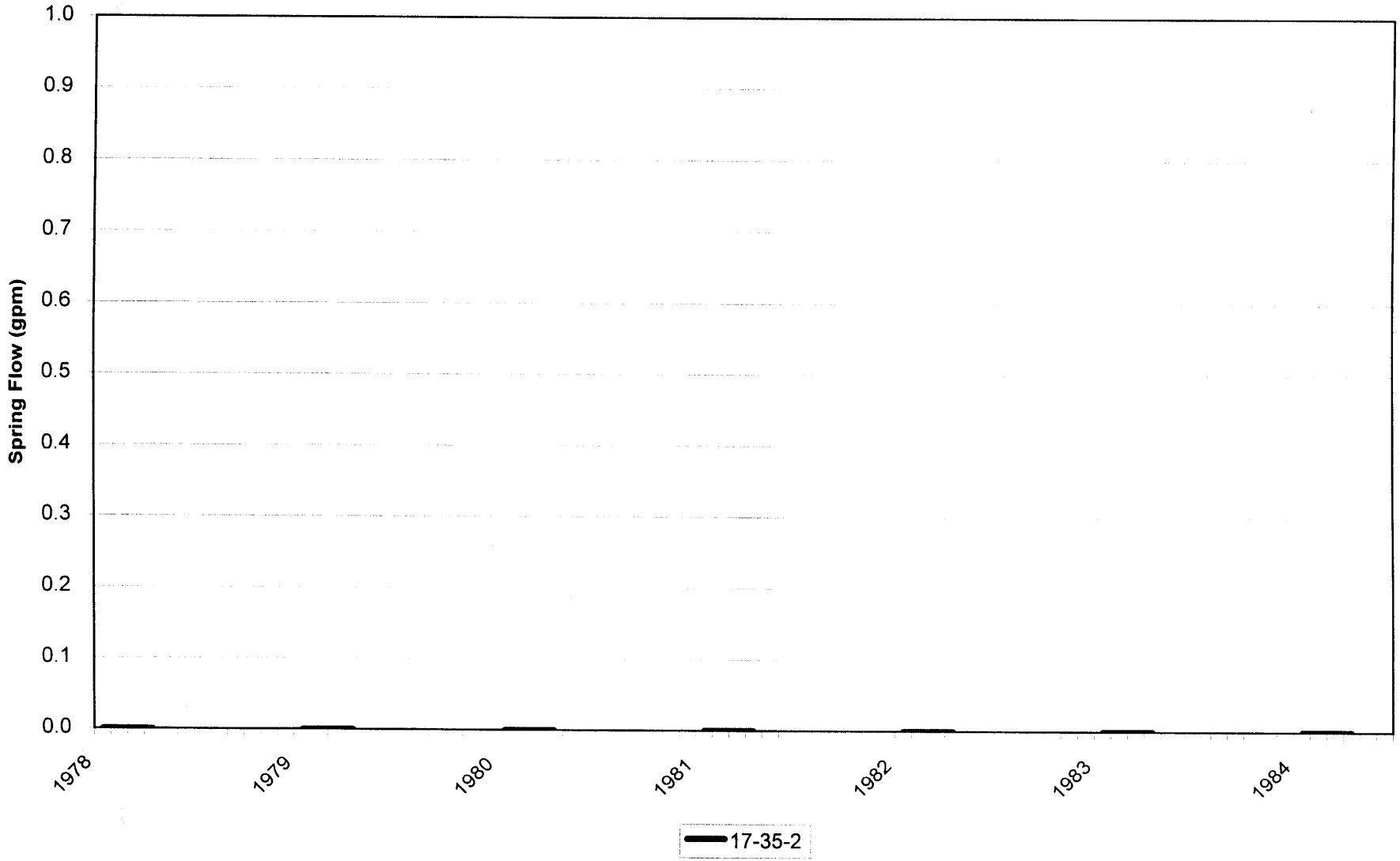
Trail Mountain Springs: 17-35-1



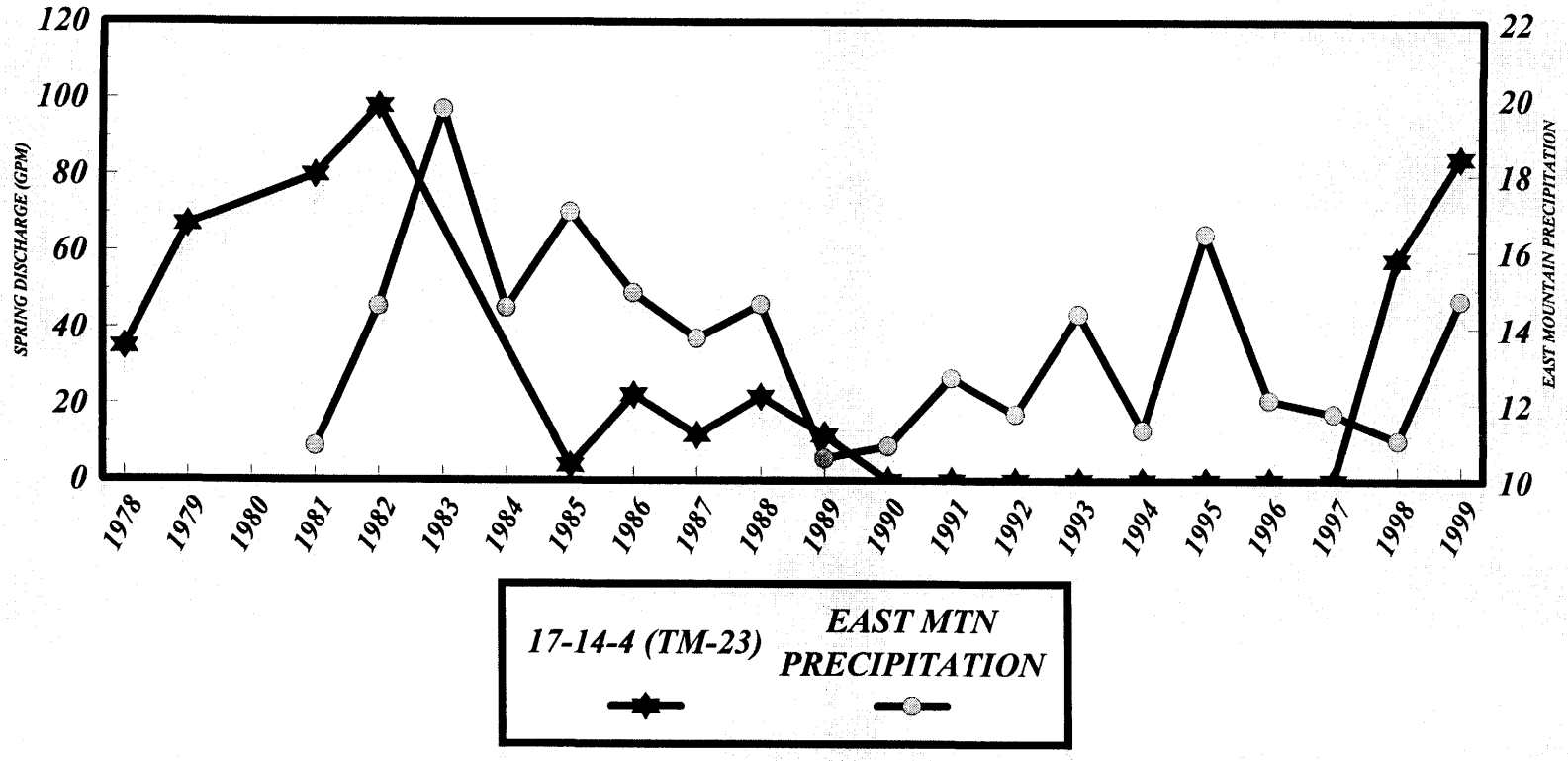
TRAIL MOUNTAIN SPRINGS
Spring 17-35-2 vs. Precipitation
PEAK FLOW (JULY) vs. EAST MOUNTAIN WEATHER STATION



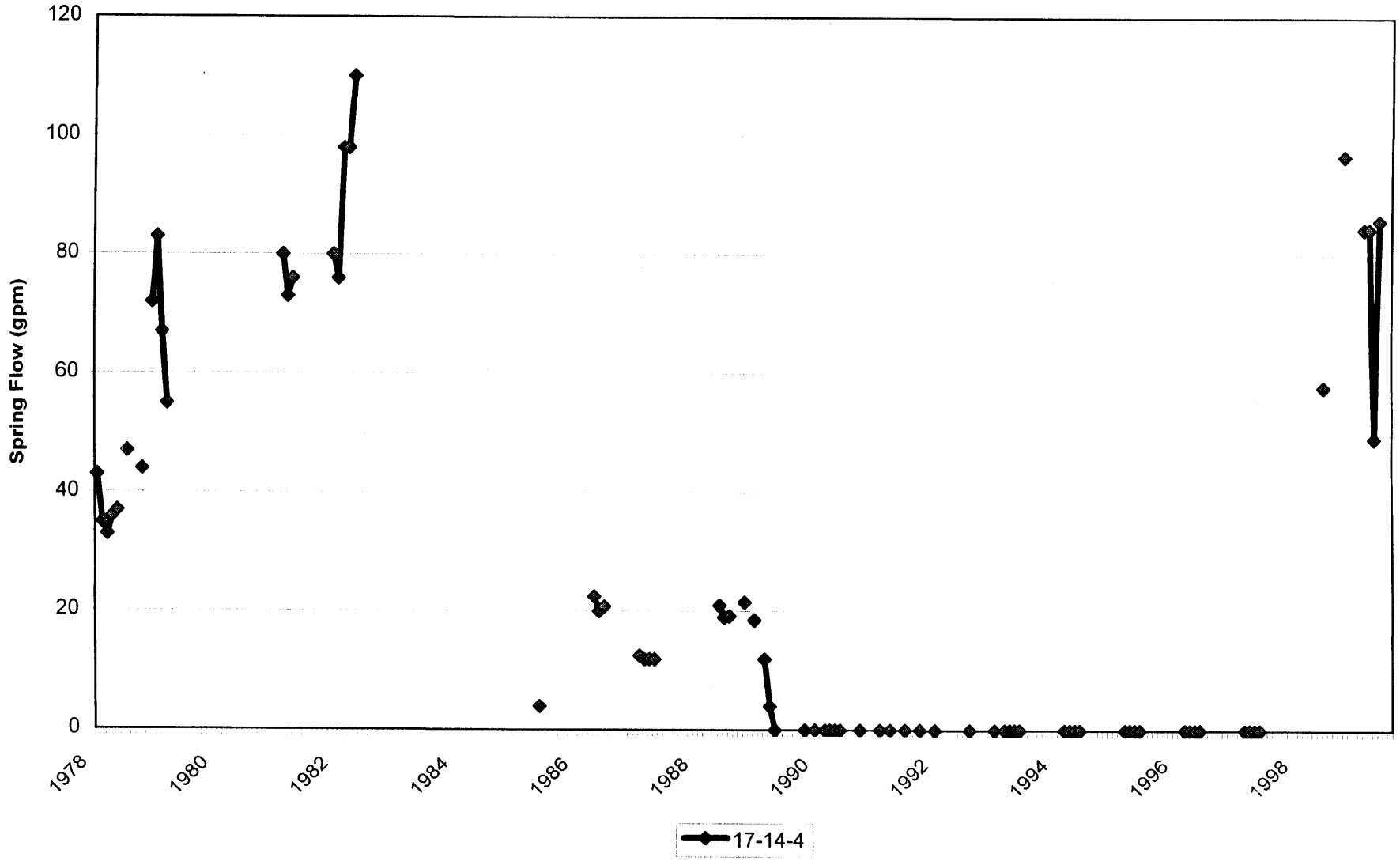
Trail Mountain Springs: 17-35-2



TRAIL MOUNTAIN SPRINGS
Spring 17-14-4 vs. Precipitation
PEAK FLOW (JULY) vs. EAST MOUNTAIN WEATHER STATION



Trail Mountain Springs: 17-14-4



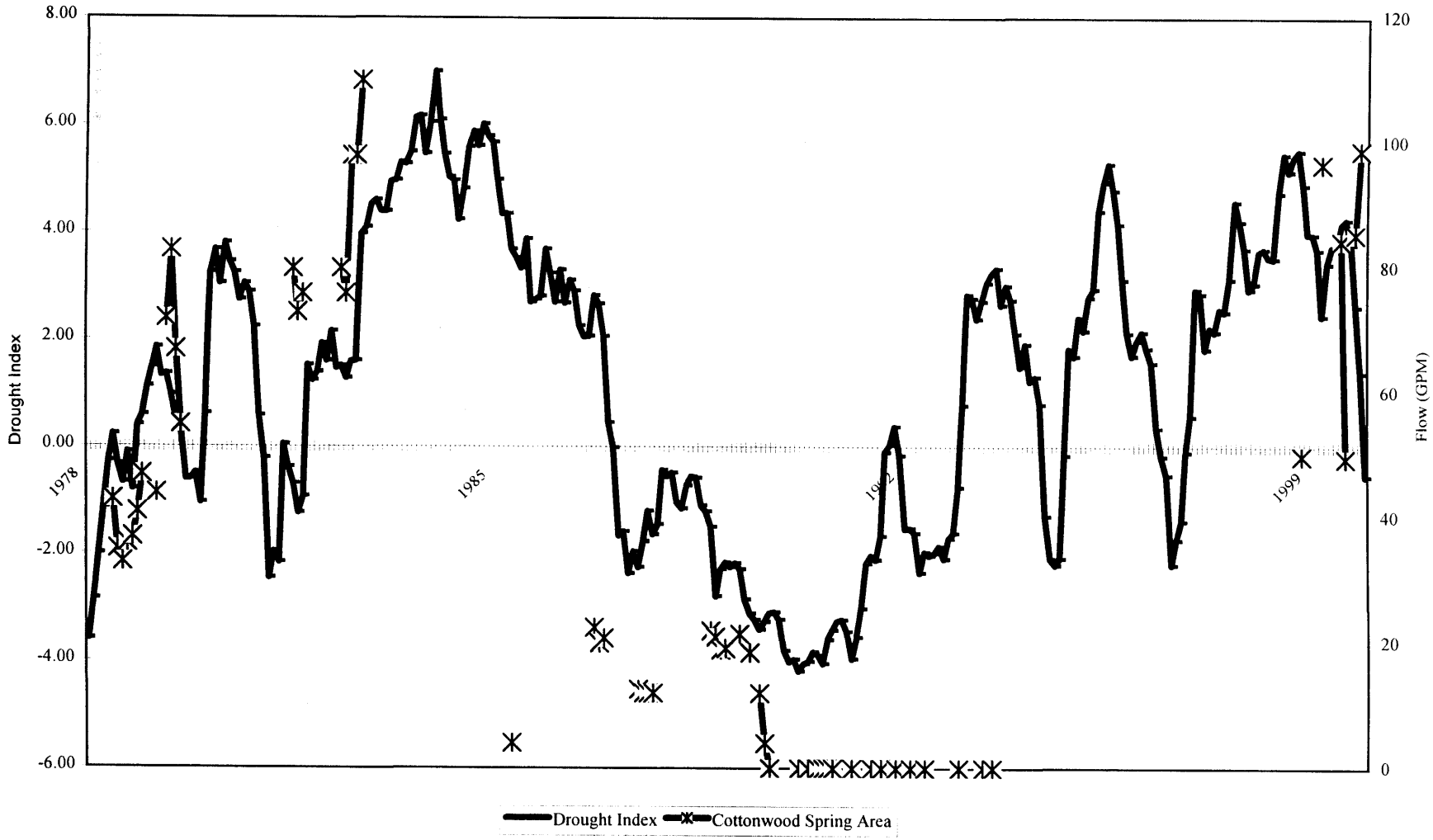
Cottnwood Spring Flow Data

Date	Flow (GPM)	Source	Flow (GPM)	Source	Flow (GPM)	Source	Flow (GPM)	Source	Flow (GPM)
06/08/1978	43	USGS							
06/28/1978	41	USGS							
07/10/1978	35	USGS							
07/27/1978	33	USGS							
08/09/1978	33	USGS							
09/06/1978	36	USGS							
10/09/1978	37	USGS							
10/13/1978	38	USGS							
10/22/1978	41	USGS							
12/22/1978	47	USGS							
03/06/1979	44	USGS							
05/31/1979	72	USGS							
06/12/1979	83	USGS							
07/06/1979	67	USGS							
07/19/1979	64	USGS							
08/28/1979	55	USGS							
07/14/1981	80	USGS							
07/30/1981	76	USGS							
08/20/1981	73	USGS							
09/24/1981	76	USGS							
05/20/1982	80	USGS							
06/23/1982	76	USGS							
07/17/1982	98	USGS							
08/10/1982	98	USGS							
09/08/1982	110	USGS							
10/28/1985			4	JBR					
09/30/1986					22.5	TMCC			
10/20/1986					20	TMCC			
11/11/1986					20.8	TMCC			
06/30/1987					12.6	TMCC			
07/15/1987					12	TMCC			
08/31/1987							12	BCCC	
09/25/1987							12	BCCC	
06/30/1988							0	BCCC	
09/20/1988							22	BCCC	
10/31/1988							21	BCCC	
11/29/1988							19	BCCC	
12/07/1988							19.2	BCCC	
03/13/1989							21.5	BCCC	
05/25/1989							18.5	BCCC	
07/19/1989							12	BCCC	
08/25/1989							4	BCCC	
09/17/1989							0	BCCC	
03/01/1990							0	BCCC	
05/28/1990							0	BCCC	
07/24/1990							0	BCCC	
08/23/1990							0	BCCC	
09/28/1990							0	BCCC	
10/26/1990							0	BCCC	
02/28/1991							0	BCCC	
06/17/1991							0	BCCC	
08/23/1991							0	BCCC	
11/25/1991							0	BCCC	
02/25/1992							0	BCCC	
05/13/1992							0	BCCC	
12/15/1992									0
05/19/1993									0
07/21/1993									0
07/01/1994									0
07/01/1995									0
07/01/1996									0
07/01/1997									0
11/02/1998									57.8
03/26/1999									96.7
07/13/1999									84.4
08/30/1999									49.2
10/06/1999									85.5
11/10/1999									98.89

Sources:
1981- USGS
1982- USGS
1985- JBR
1986- TMCC
1988- BCCC
1989- BCCC
1990- BCCC
1991- BCCC
1992- BCCC
1993-1999 EW

Palmer Drought Index vs. Cottonwood Spring Area Flow

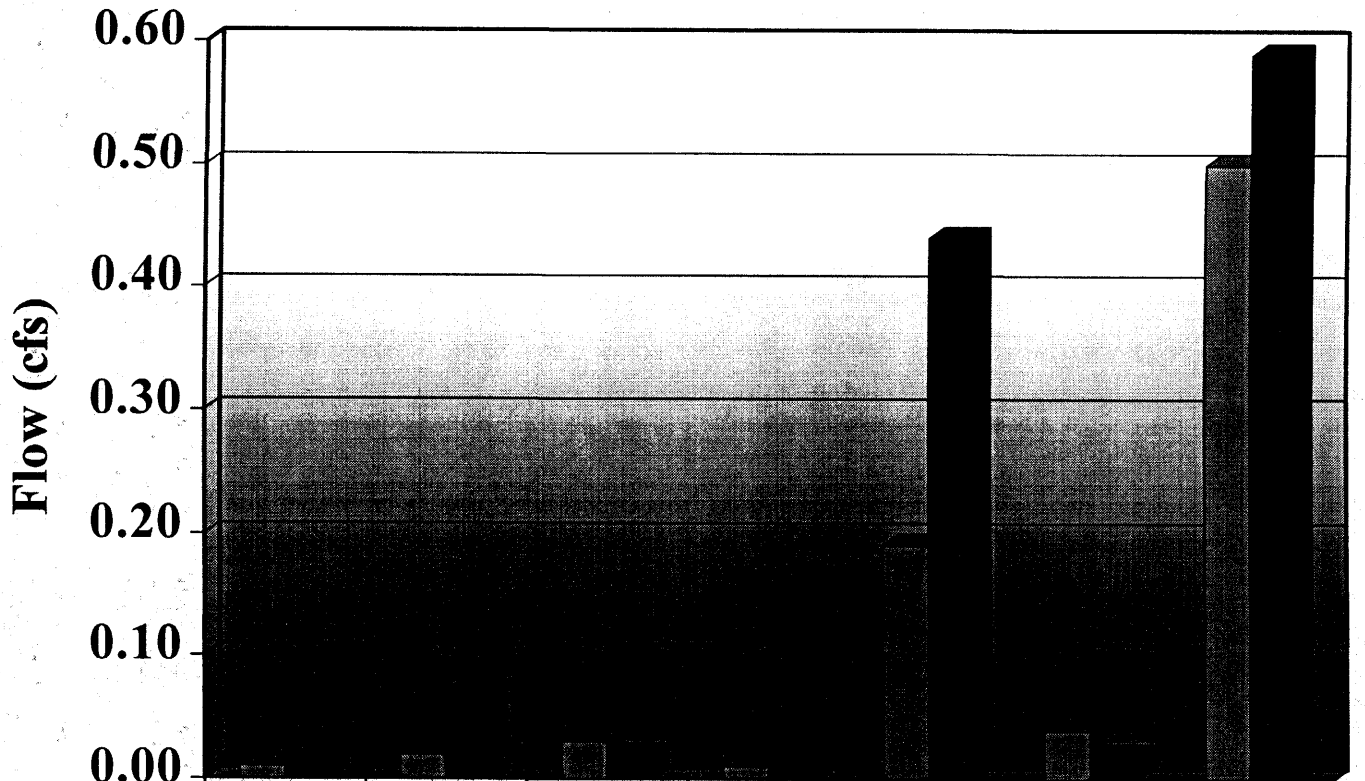
(Palmer Data Region 4 & 5 Average)



Cottonwood Canyon Creek

Flow Data Comparison

USGS August 1979* Energy West November 1998



	@ Mill Canyon	Dairy Canyon	@91-72	Trail Canyon	Cottonwood Creek-TM-23	Roans Canyon	Cottonwood Creek - Below Roans
USGS-1979	0.01	0.02	0.03	0.01	0.19	0.04	0.50
EW-11/1998	0.03	0.07	0.02	0.007	0.44	0.02	0.59

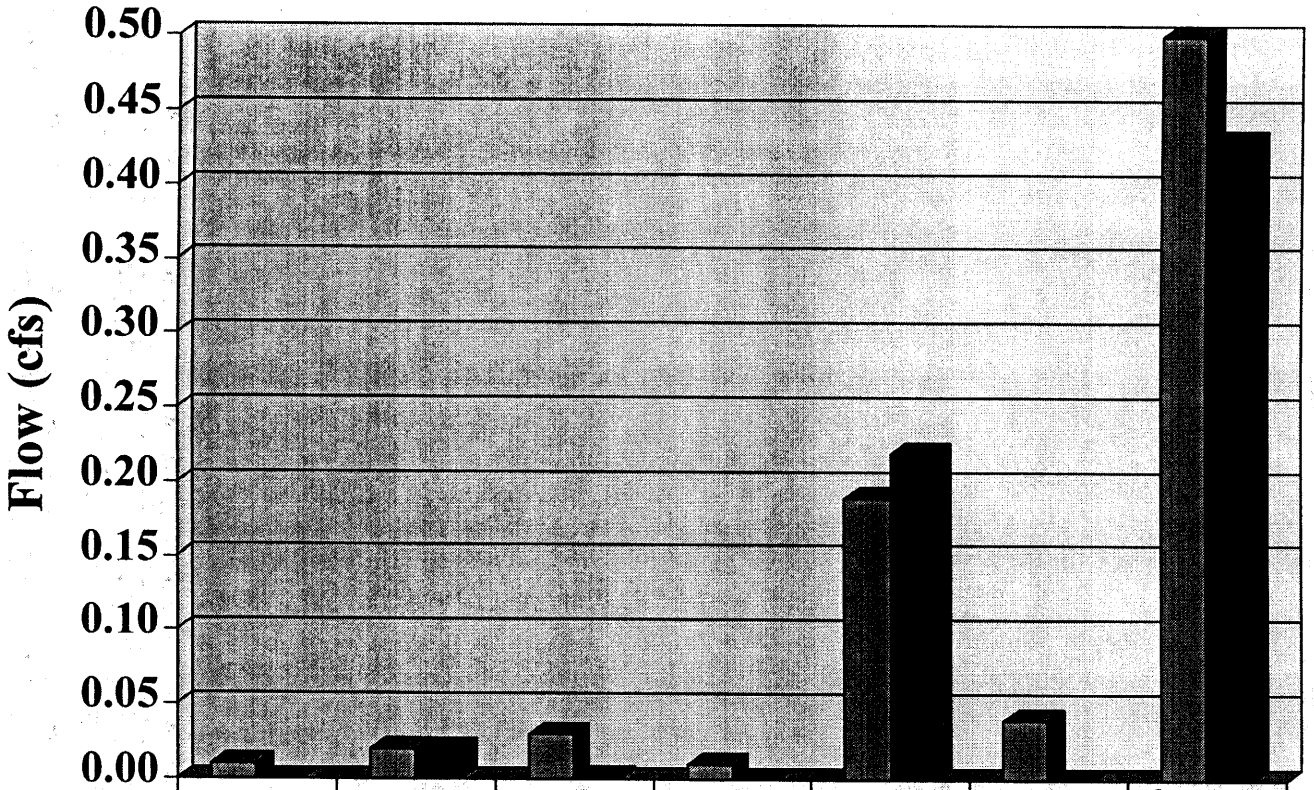
* USGS Open File Report 81-539

Cottonwood Spring Area Flow = 57.8 GPM/0.13 CFS

Cottonwood Canyon Creek

Flow Data Comparison

USGS August 1979* Energy West March 1999



	@ Mill Canyon	Dairy Canyon	@91-72	Trail Canyon	Cottonwood Creek-TM-23	Roans Canyon	Cottonwood Creek - Below Roans
USGS-1979	0.01	0.02	0.03	0.01	0.19	0.04	0.50
EW-03/1999	0	0.02	0.0015	0	0.22	0	0.43

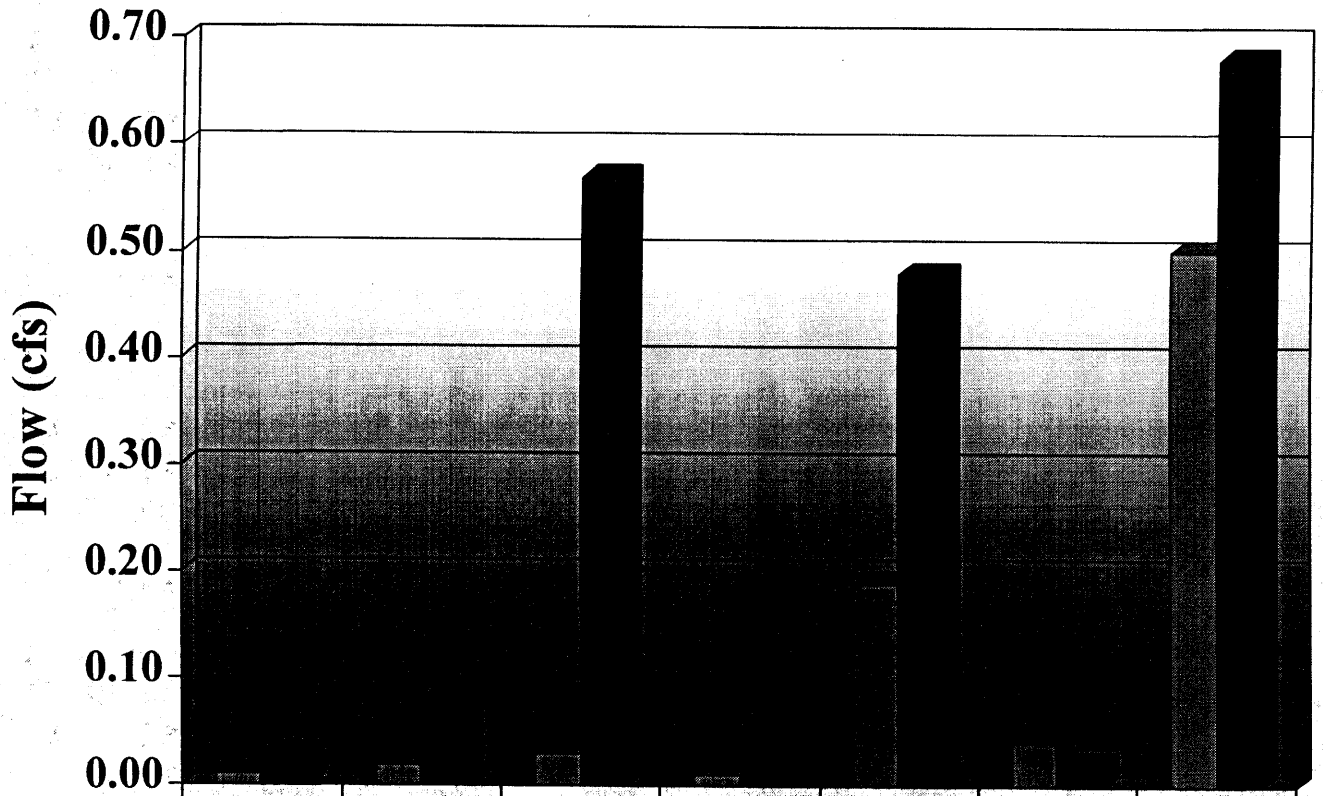
* USGS Open File Report 81-539

Cottonwood Spring Area Flow =96.7 GPM/0.22 CFS

Cottonwood Canyon Creek

Flow Data Comparison

USGS August 1979* Energy West July 1999



	@ Mill Canyon	Dairy Canyon	@91-72	Trail Canyon	Cottonwood Creek-TM-23	Roans Canyon	Cottonwood Creek - Below Roans
USGS-1979	0.01	0.02	0.03	0.01	0.19	0.04	0.50
EW-07/1999	0.03	0.08	0.57	0.008	0.48	0.02	0.68

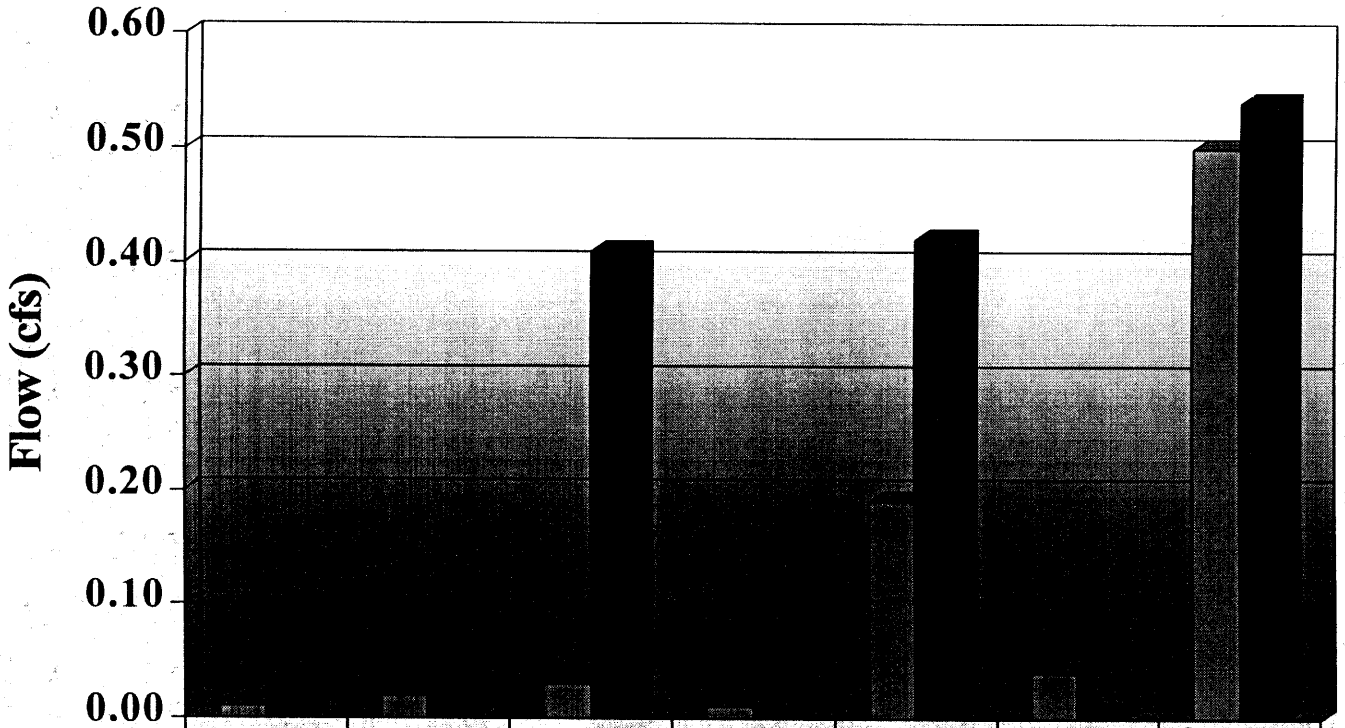
* USGS Open File Report 81-539

Cottonwood Spring Area Flow = 84.4 GPM/0.19 CFS

Cottonwood Canyon Creek

Flow Data Comparison

USGS August 1979* Energy West August 1999



	@ Mill Canyon	Dairy Canyon	@91-72	Trail Canyon	Cottonwood Creek-TM-23	Roans Canyon	Cottonwood Creek - Below Roans *
USGS-1979	0.01	0.02	0.03	0.01	0.19	0.04	0.50
EW-08/1999	0.03	0.04	0.41	0.002	0.42	0.005	0.54

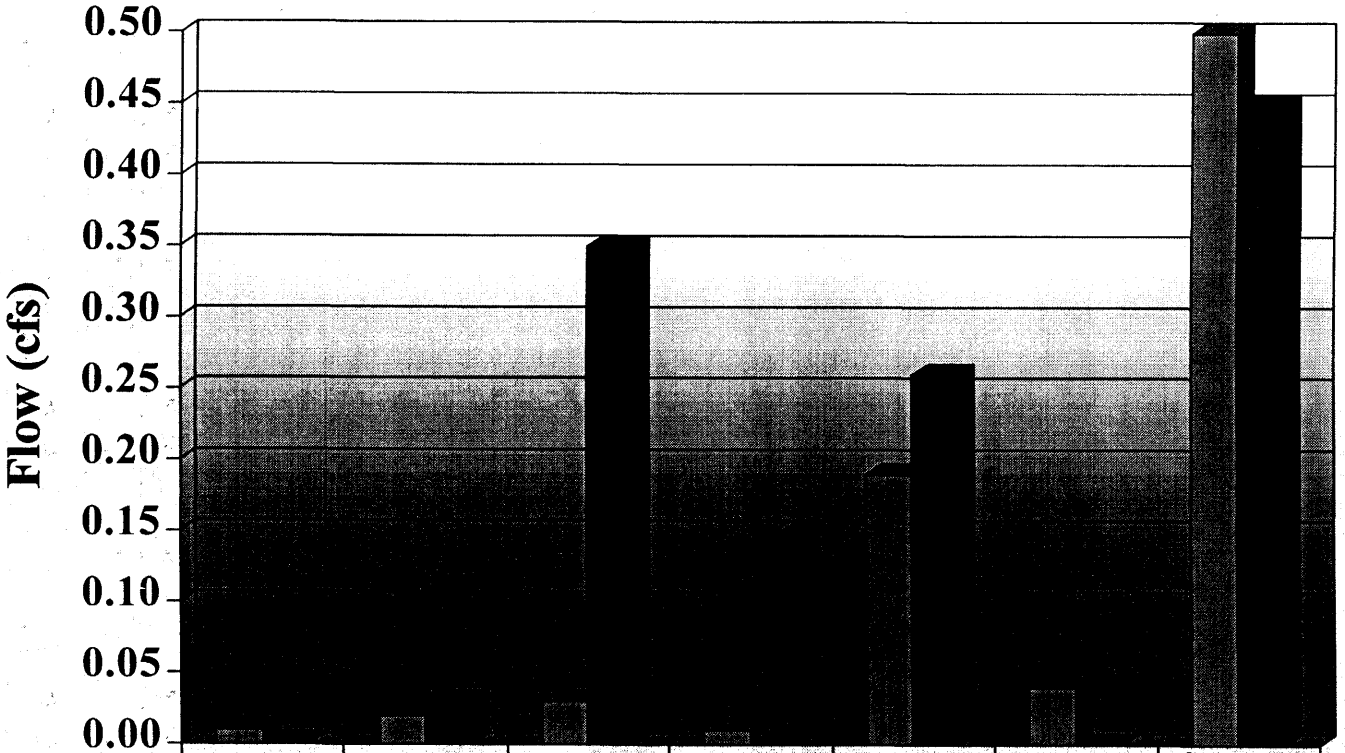
Cottonwood Spring Area Flow = 49.6 GPM/0.11 CFS

* Difficulty Sealing Weir @ Below Roans Site

Cottonwood Canyon Creek

Flow Data Comparison

USGS August 1979* Energy West October 1999



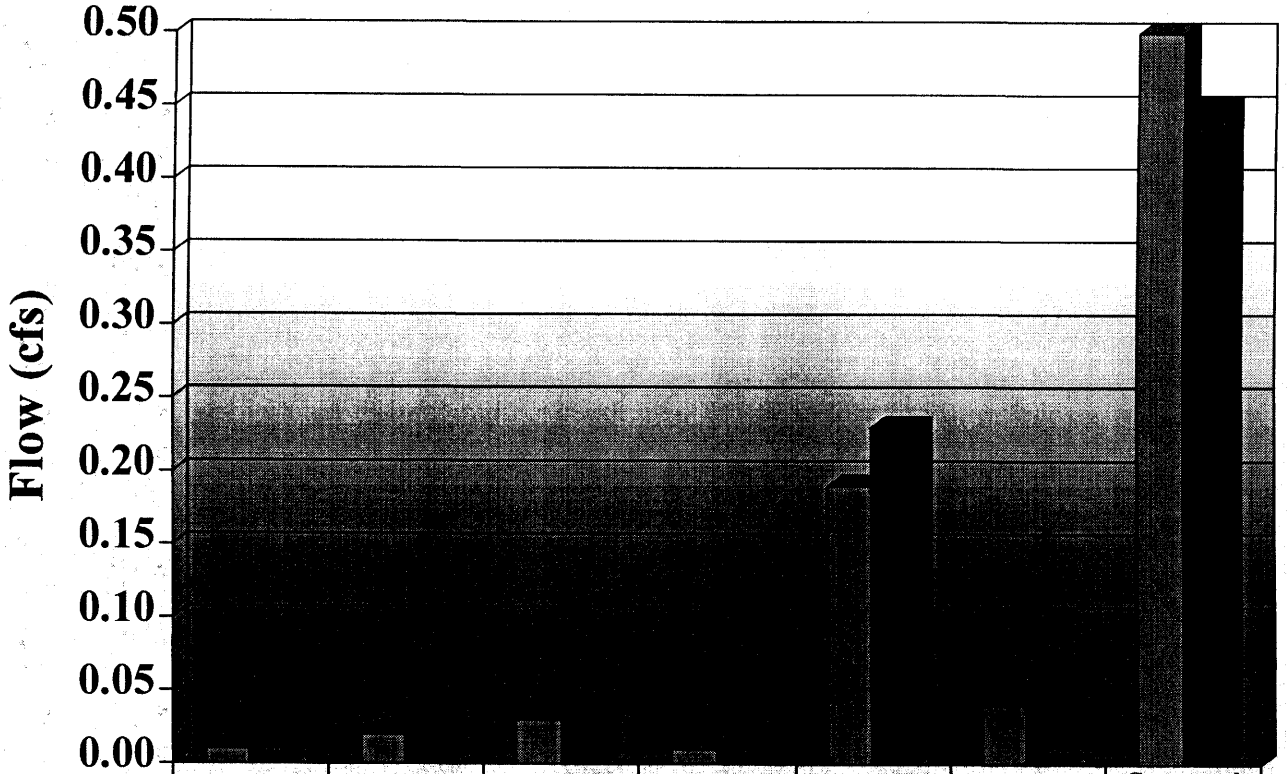
	@ Mill Canyon	Dairy Canyon	@91-72	Trail Canyon	Cottonwood Creek-TM-23	Roans Canyon	Cottonwood Creek - Below Roans
USGS-1979	0.01	0.02	0.03	0.01	0.19	0.04	0.50
EW-10/1999	0.002	0.03	0.35	0	0.26	0	0.45

Cottonwood Spring Area Flow = 85.5 GPM/0.19 CFS

Cottonwood Canyon Creek

Flow Data Comparison

USGS August 1979* Energy West November 1999



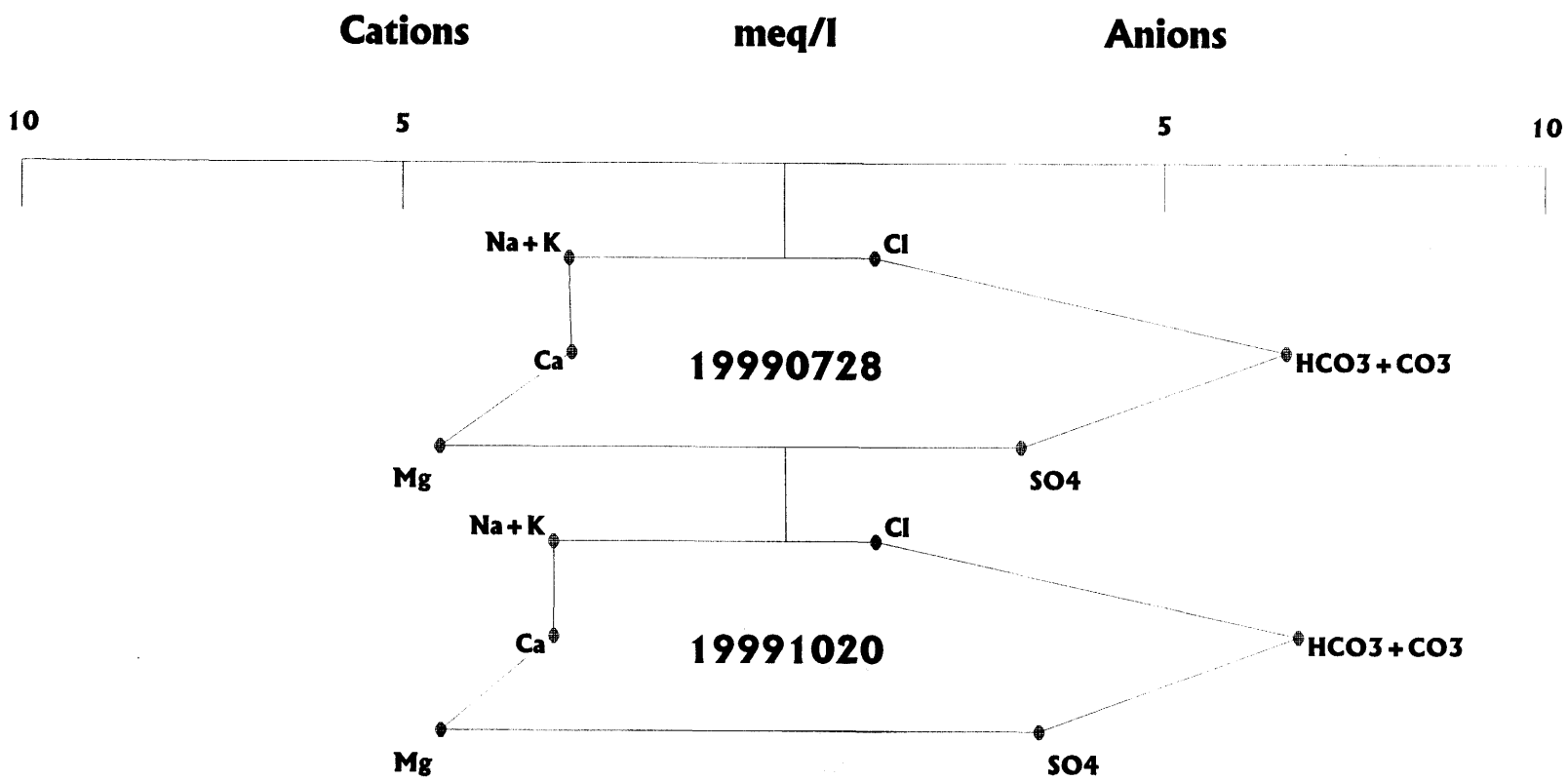
	@ Mill Canyon	Dairy Canyon	@91-72	Trail Canyon	Cottonwood Creek-TM-23	Roans Canyon	Cottonwood Creek - Below Roans
USGS-1979	0.01	0.02	0.03	0.01	0.19	0.04	0.50
EW-11/1999	0	0.04	0.04	0	0.23	0	0.45

Cottonwood Spring Area Flow = 98.89 GPM/0.22 CFS

TRAIL MOUNTAIN SPRINGS
STIFF DIAGRAMS
NORTH HORN FORMATION

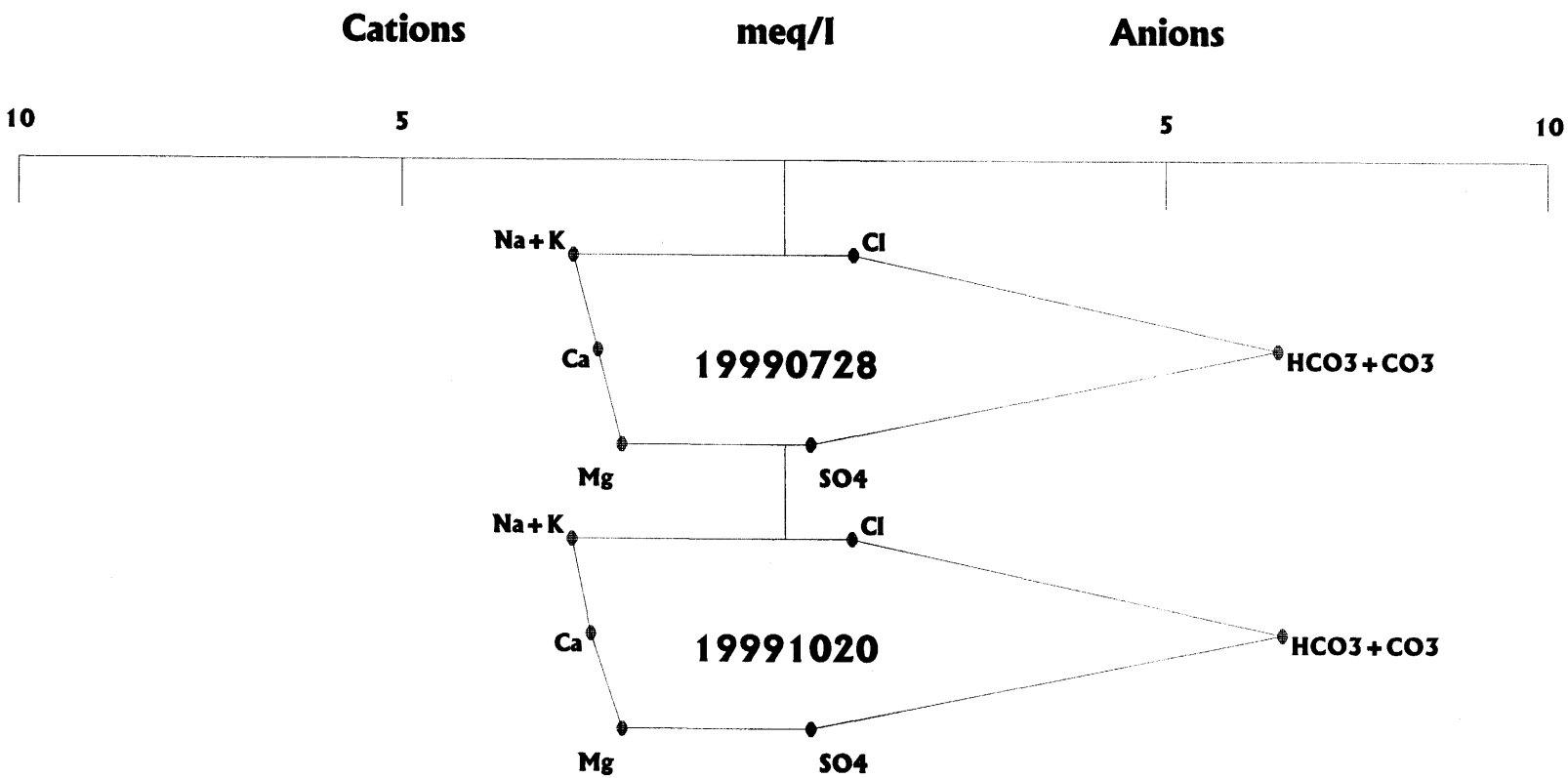
TRAIL MOUNTAIN SPRINGS

18-2-1



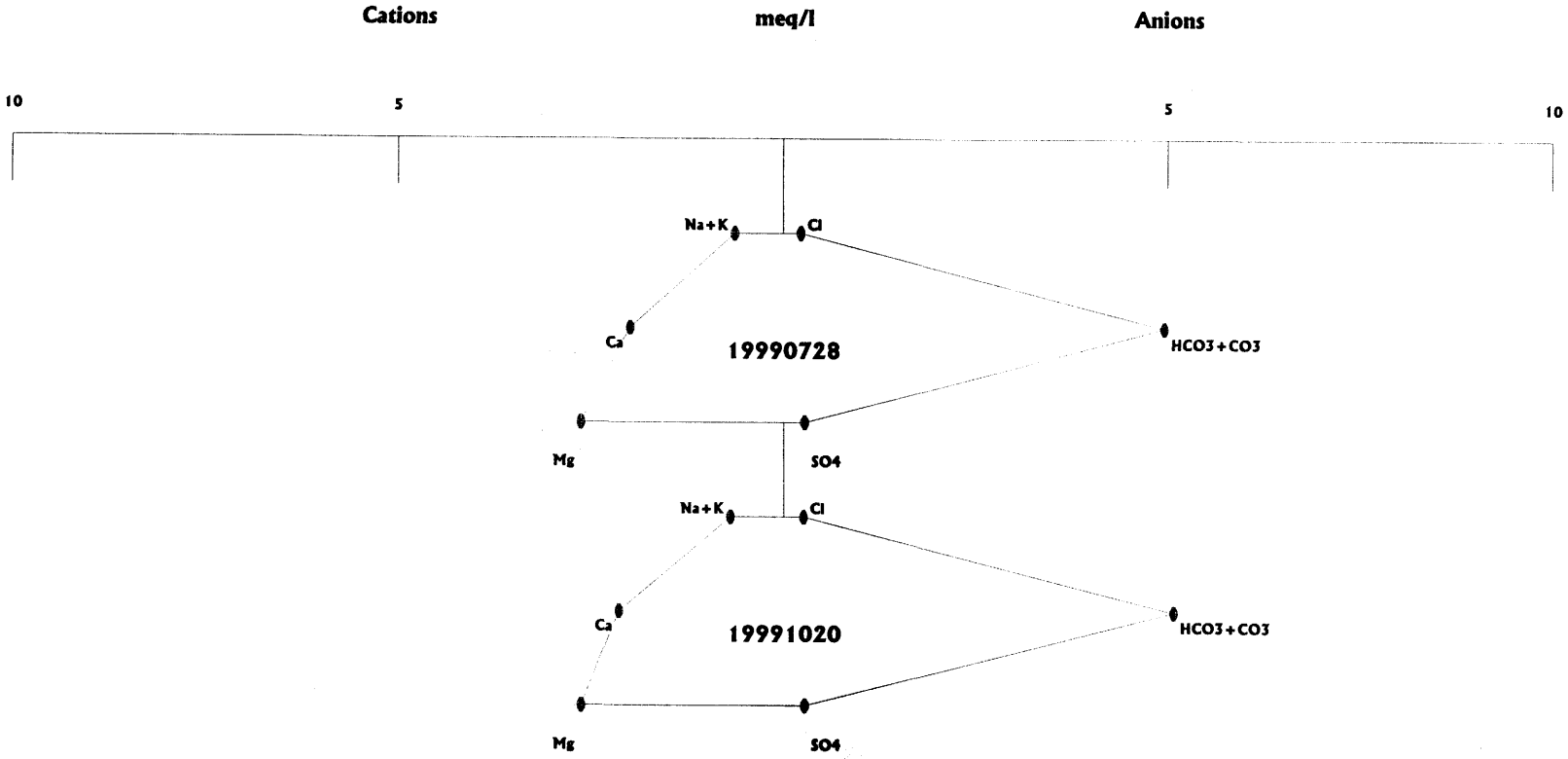
TRAIL MOUNTAIN SPRINGS

17-21-1



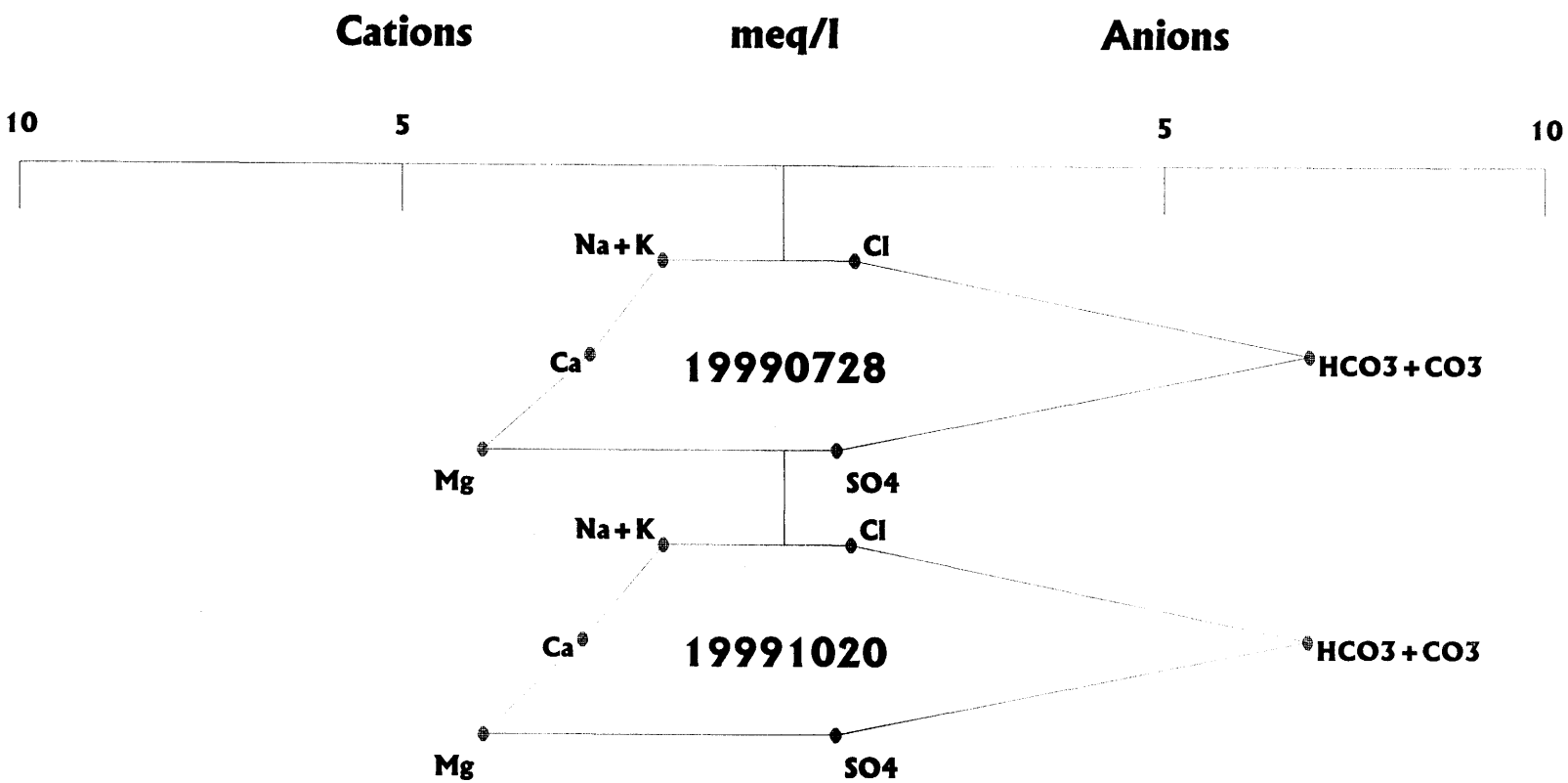
TRAIL MOUNTAIN SPRINGS

17-22-1



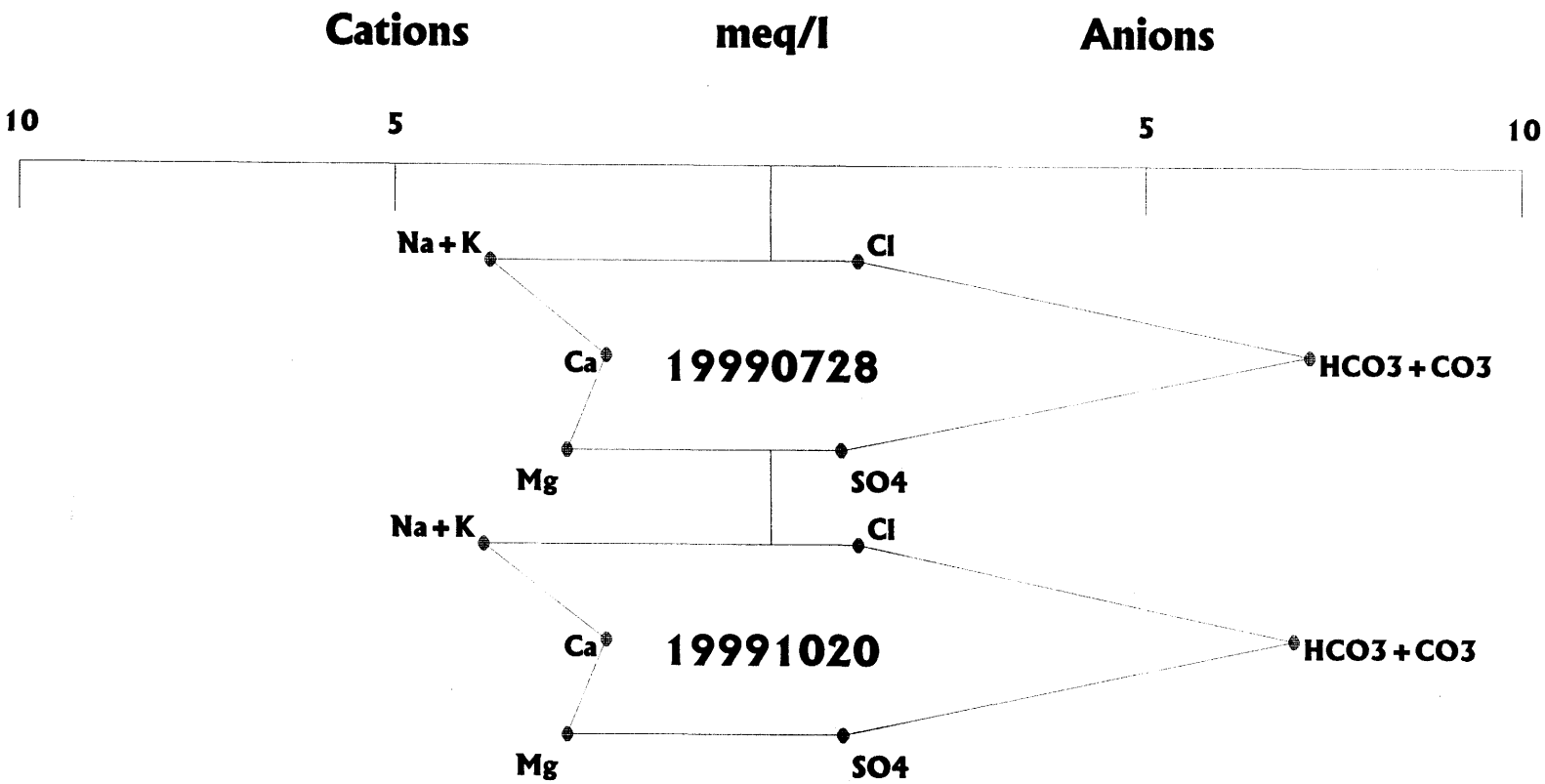
TRAIL MOUNTAIN SPRINGS

17-26-4



TRAIL MOUNTAIN SPRINGS

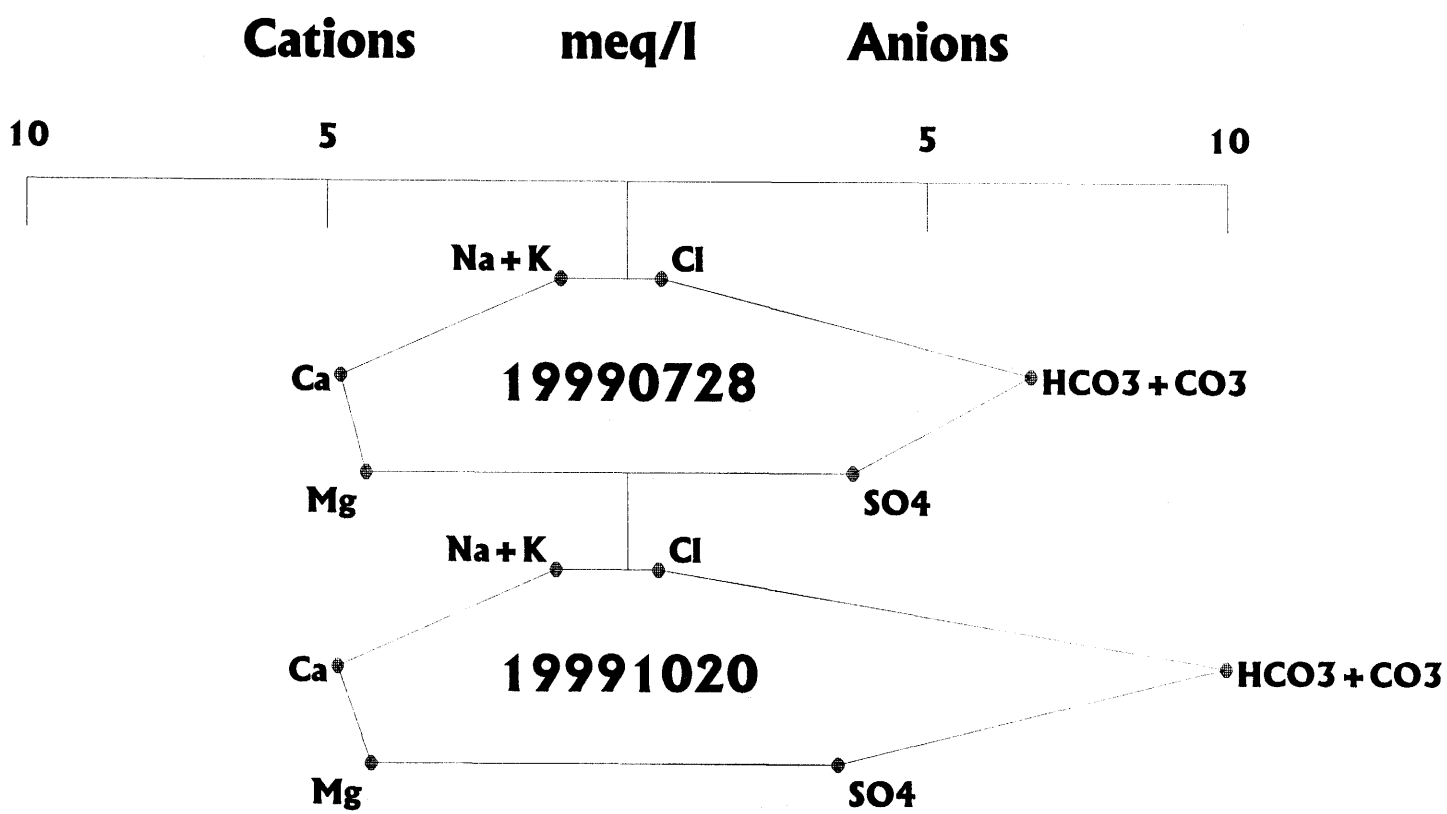
17-35-1



TRAIL MOUNTAIN SPRINGS
STIFF DIAGRAMS
PRICE RIVER FORMATION

TRAIL MOUNTAIN SPRINGS

17-25-1

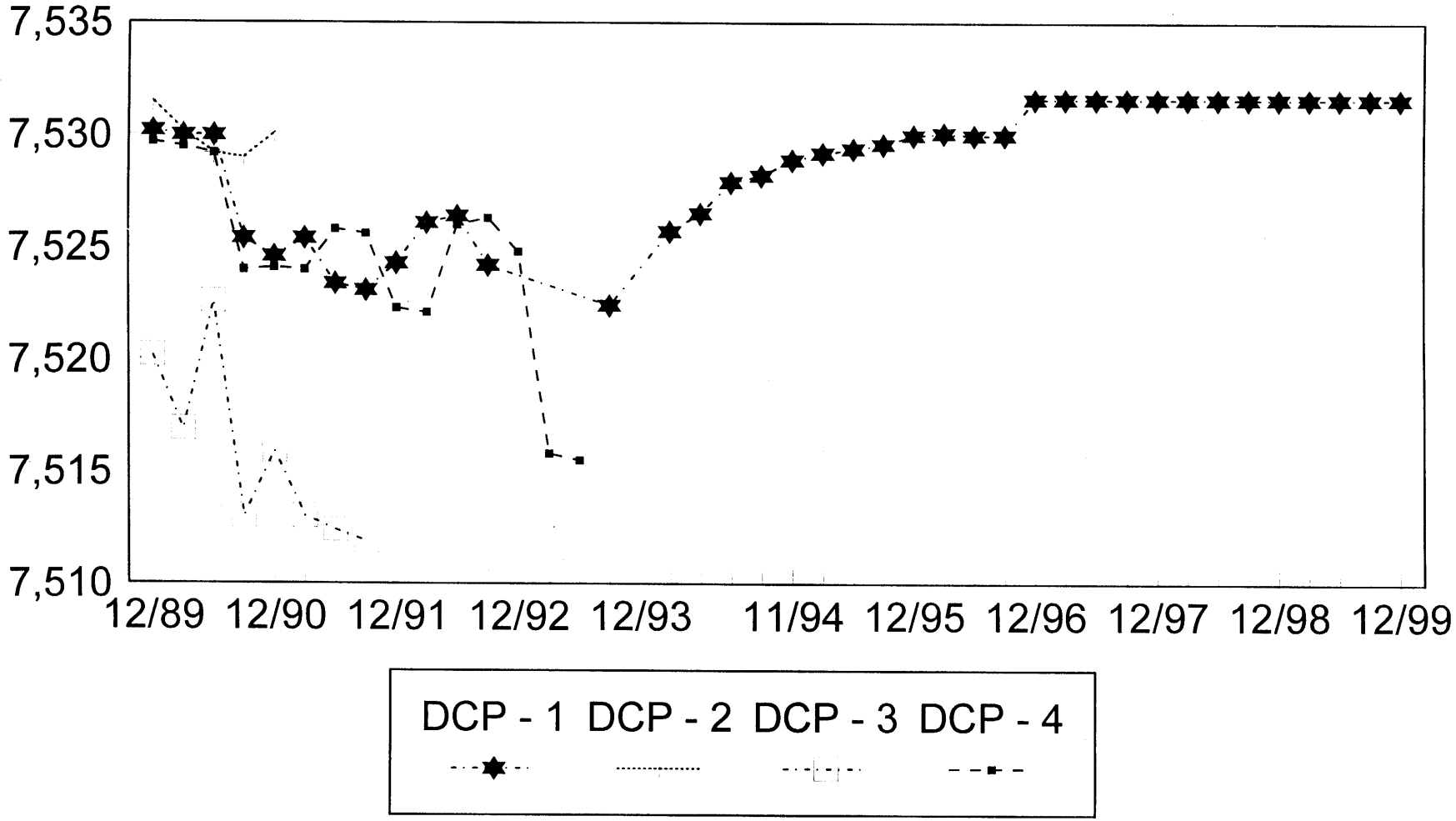


APPENDIX J

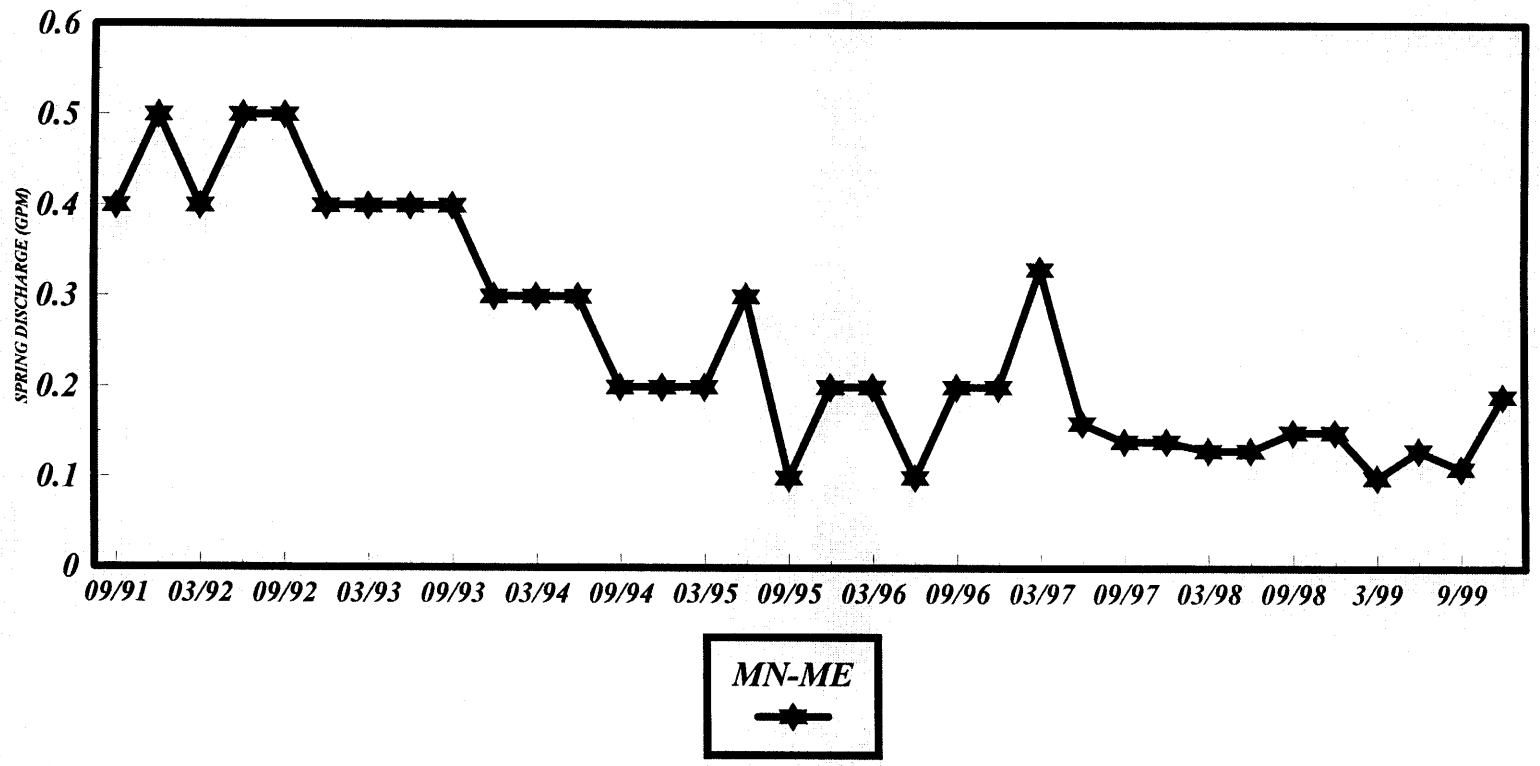
1999

DEER CREEK MINE

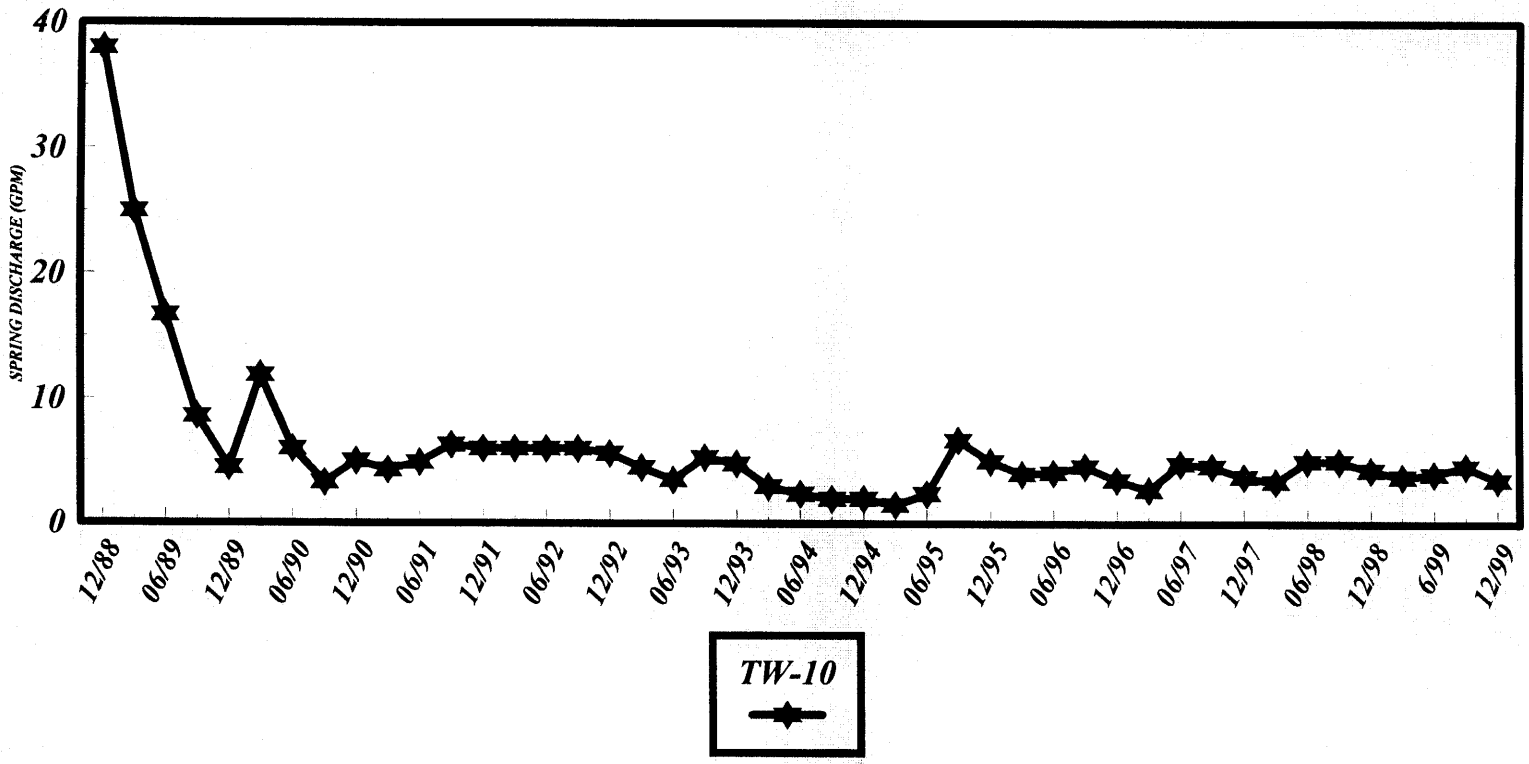
IN-MINE MONITORING WELLS
PIEZOMETRIC DATA



Deer Creek In-Mine Monitoring
Main North - Main East

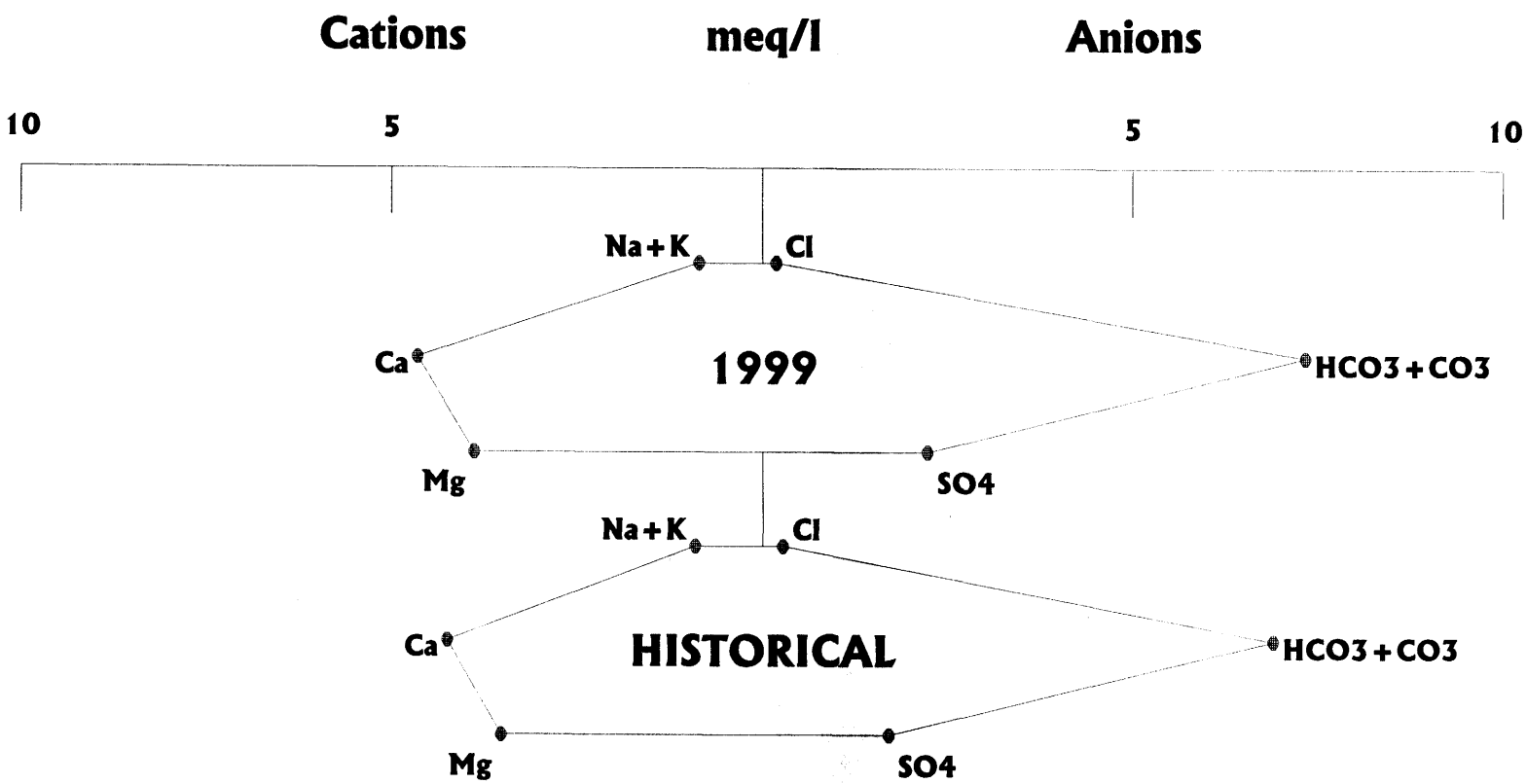


Deer Creek In-Mine Monitoring
3rd North xc-65 (TW-10)

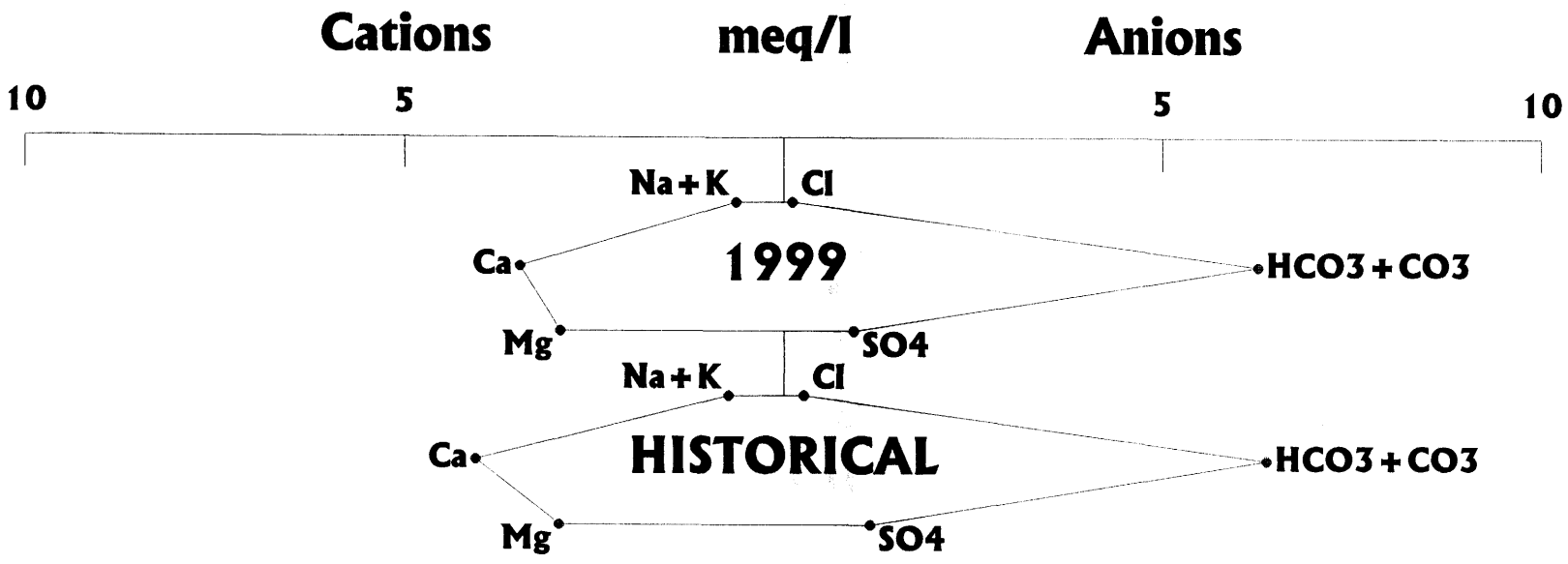


DEER CREEK IN-MINE

MN-ME



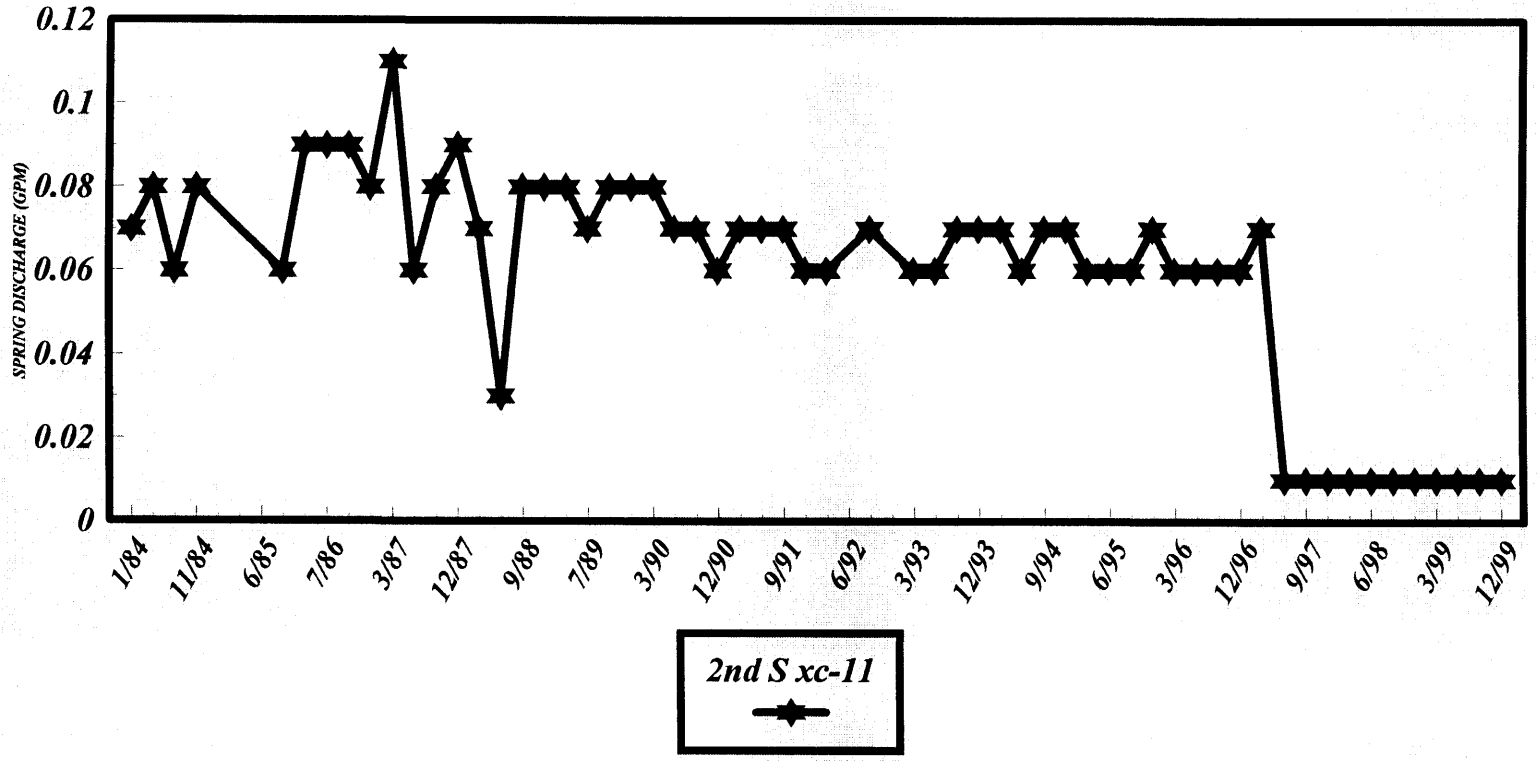
DEER CREEK IN-MINE
TW-10



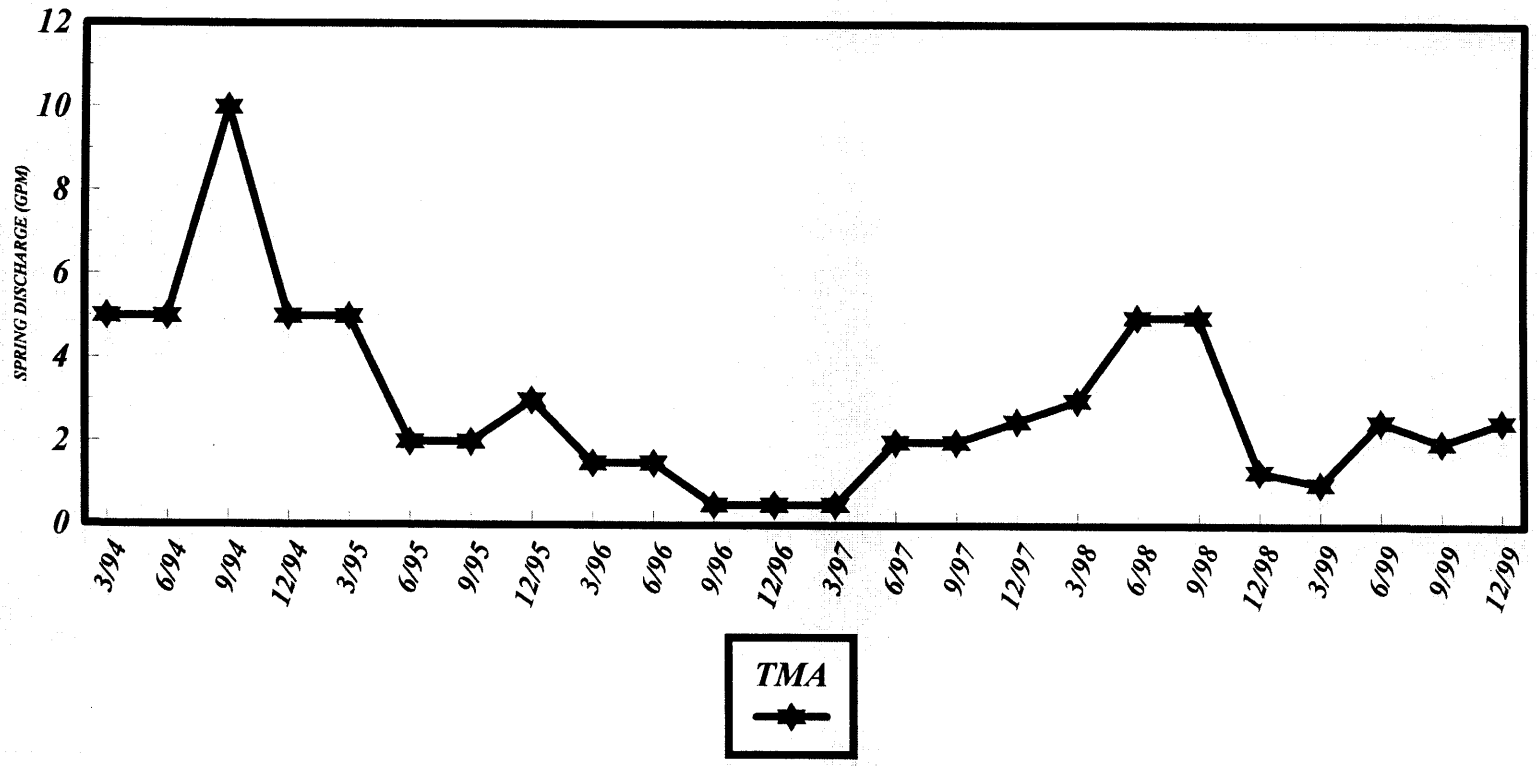
APPENDIX K

1999

Wilberg/Cottonwood In-Mine Monitoring
2nd South xc-11

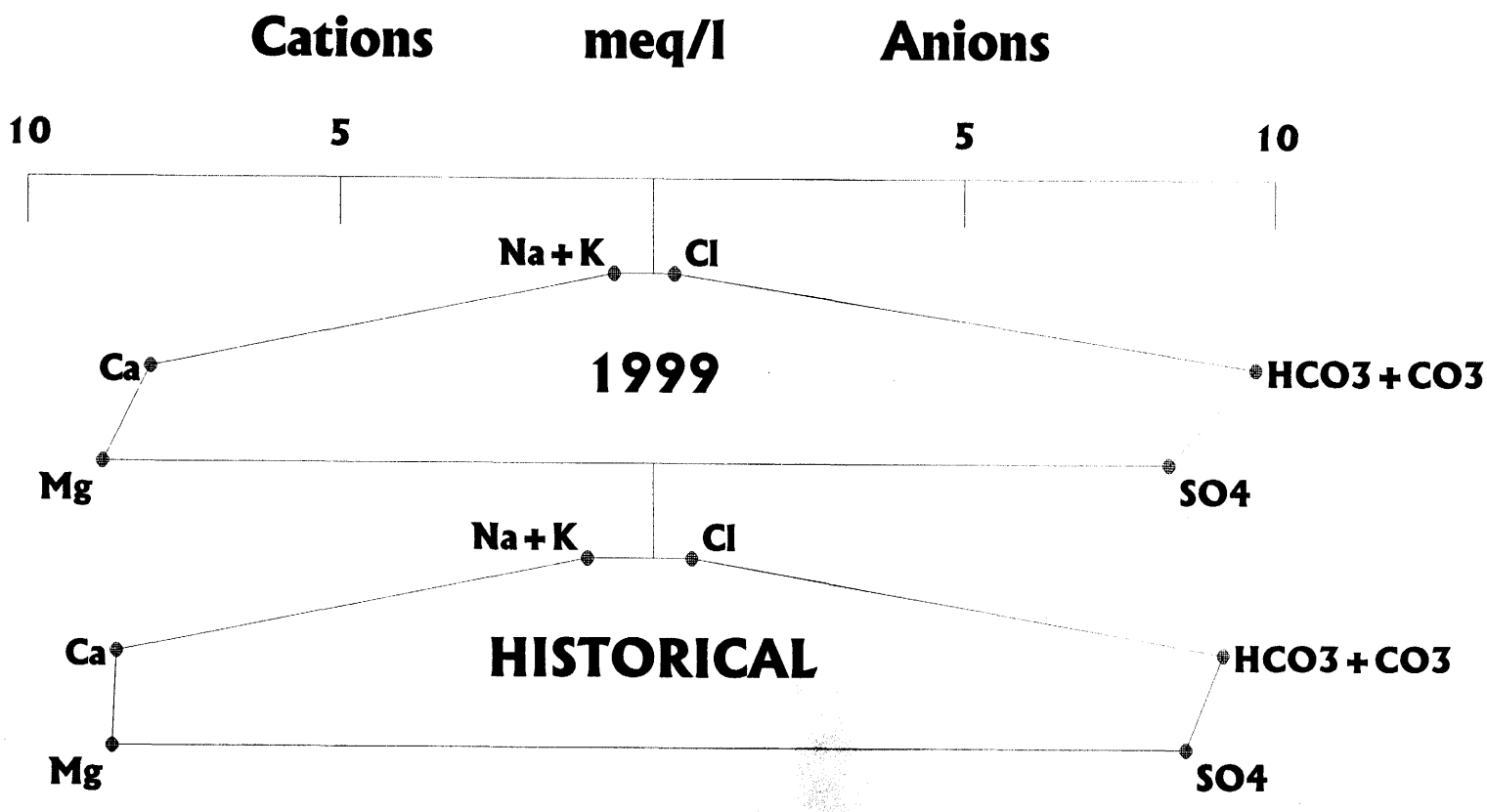


Wilberg/Cottonwood In-Mine Monitoring
TMA



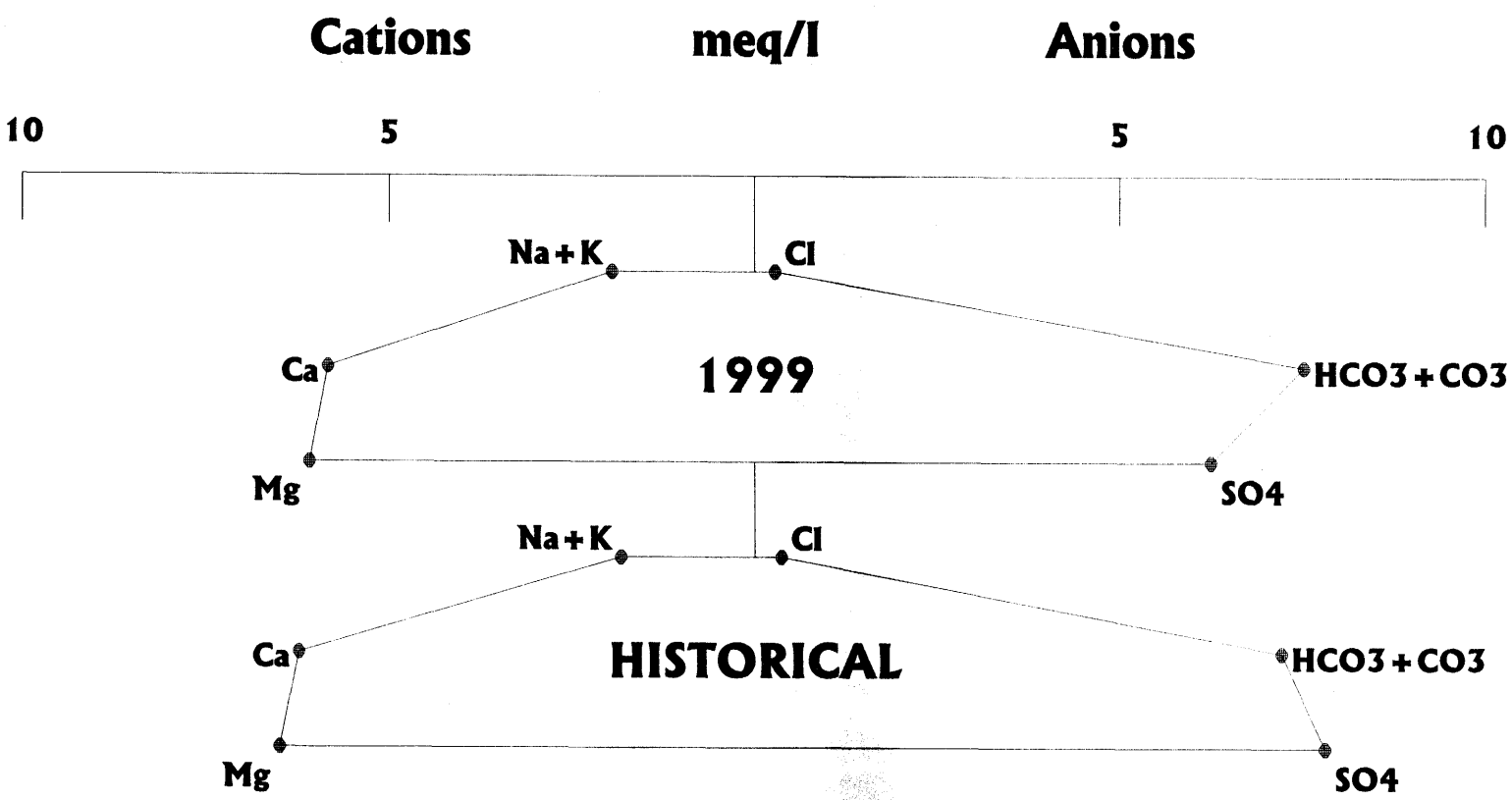
COTTONWOOD IN-MINE

2S X - 11



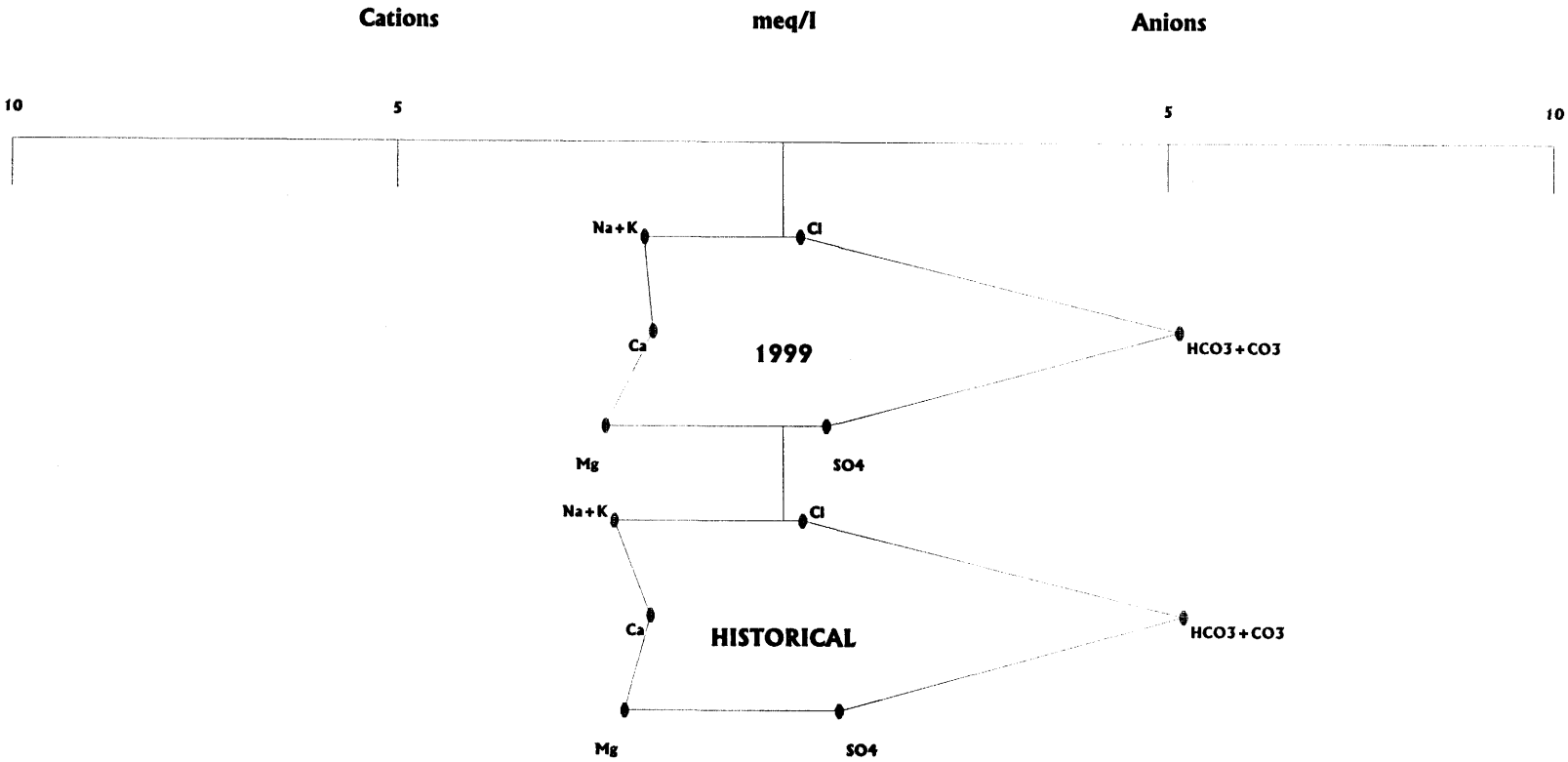
COTTONWOOD IN-MINE

TMA X - 32



TRAIL MOUNTAIN

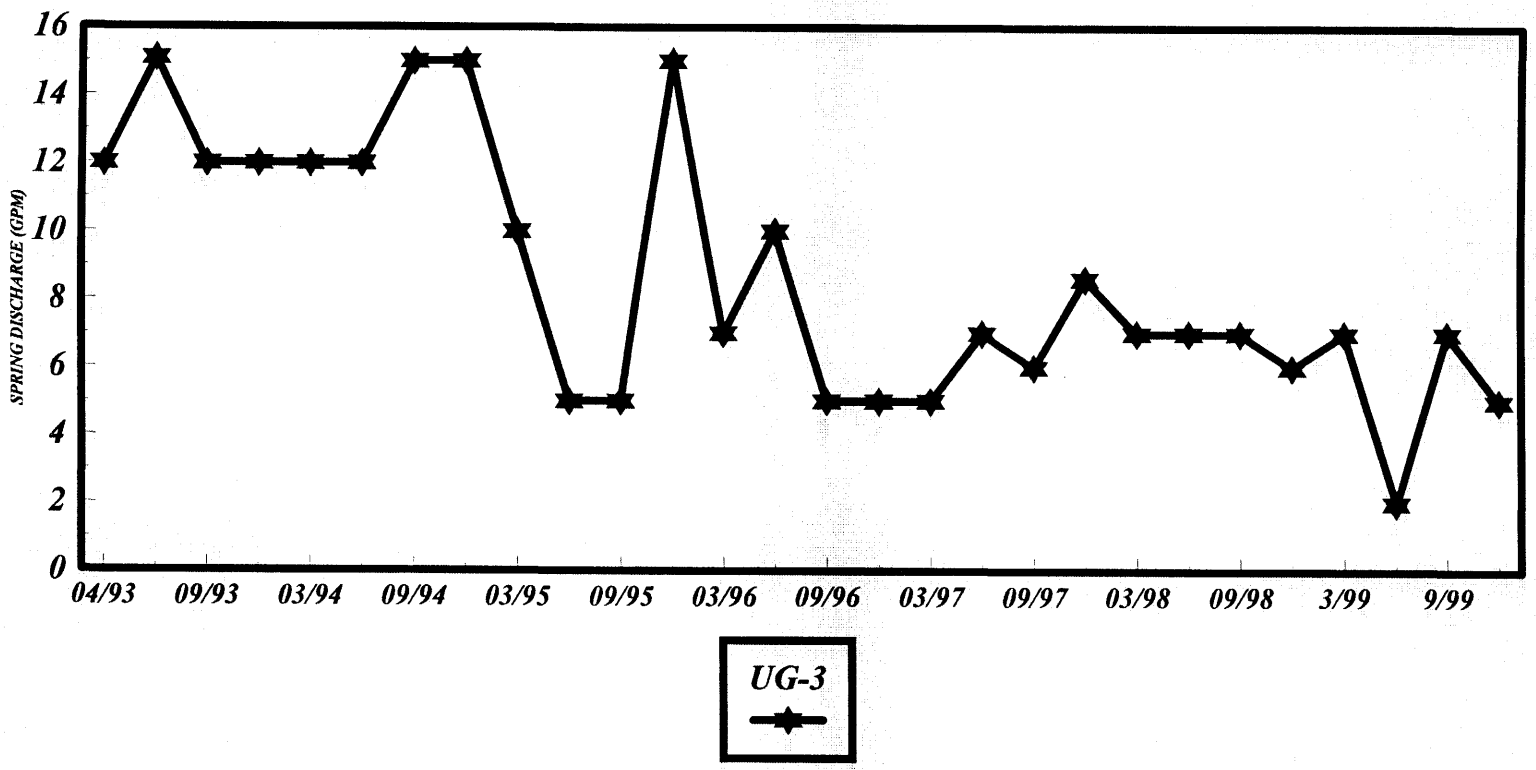
UG-3



APPENDIX L

1999

Trail Mountain In-Mine Monitoring
UG-3



APPENDIX M

1999

PACIFICORP
TECHNICAL SERVICES - HYDROLOGIC MONITORING

SURFACE PIEZOMETRIC DATA
COTTONWOOD CANYON

	EM-31		CCCW-1A		CCCW-1S		CCCW-2A		CCCW-3A		CCCW-3S U		CCCW-3S L		TM-1B		TM-3	
Collar Elevation	7417.8		7843.2		7844.5		8133.9		8369.7		8367.6		8366.0		7295.0 EST		6750.0 EST	
Date	Reading	Level	Reading	Level	Reading	Level	Reading	Level	Reading	Level	Reading	Level	Reading	Level	Reading	Level	Reading	Level
01/30/1998	-53.3	7364.6	IA		IA		IA		IA		IA		IA		-23.7	7271.3	-115.3	6634.7
02/26/1998	IA		IA		IA		IA		IA		IA		IA		-23.7	7271.3	-128.1	6621.9
03/25/1998	-53.3	7364.6	-89.2	7754.1	-191.3	7653.2	IA		IA		IA		IA		-23.7	7271.3	-133.5	6616.5
04/29/1998	-54.4	7363.5	-90.6	7752.6	-191.5	7653.0	-15.7	8118.2	-45.0	8324.8	-65.8	8301.8	-609.4	7756.7	-23.7	7271.3	-139.0	6611.1
05/27/1998	-53.9	7363.9	-88.4	7754.8	-191.2	7653.3	-14.4	8119.5	-40.4	8329.3	-62.4	8305.2	-609.3	7756.8	-23.7	7271.3	-141.9	6608.1
06/23/1998	-54.5	7363.3	-80.0	7763.3	-189.9	7654.6	-13.2	8120.7	-37.9	8331.8	-59.0	8308.6	-609.3	7756.7	-23.7	7271.3	-143.6	6606.5
07/30/1998	-55.1	7362.7	-88.8	7754.4	-189.7	7654.8	-12.8	8121.1	-39.1	8330.6	-60.8	8306.8	-609.3	7756.7	-23.7	7271.3	-145.9	6604.2
08/03/1998	-55.4	7362.4	-90.8	7752.4	-189.4	7655.1	-13.5	8120.4	-40.8	8328.9	-62.4	8305.2	-609.2	7756.8	-23.7	7271.3	-147.2	6602.8
09/30/1998	-55.2	7362.6	-91.4	7751.8	-189.1	7655.4	-14.0	8119.9	-41.2	8328.6	-62.9	8304.7	-609.0	7757.1	-23.7	7271.3	-147.8	6602.2
10/30/1998	-54.8	7363.0	-91.8	7751.4	-189.1	7655.4	-15.2	8118.7	-41.1	8328.6	-62.9	8304.7	-608.9	7757.1	-23.7	7271.3	-149.6	6600.5
11/09/1998	-54.9	7362.9	-91.1	7752.1	-188.8	7655.7	-14.5	8119.4	-41.2	8328.5	-62.8	8304.8	-608.6	7757.4	-23.9	7271.1	-149.5	6600.5
12/01/1998	-55.0	7362.8	-91.1	7752.1	-189.0	7655.5	-14.5	8119.4	-41.1	8328.6	-62.9	8304.7	-609.0	7757.1	-23.9	7271.1	-150.7	6599.4
01/11/1999	-54.3	7363.5	-88.1	7755.1	-188.7	7655.8	-14.7	8119.2	-40.5	8329.3	-62.6	8304.9	-608.8	7757.2	-23.9	7271.1	-151.8	6598.2
02/01/1999	-53.4	7364.4	-83.3	7760.0	-188.8	7655.7	-14.4	8119.4	-40.2	8329.6	-62.5	8305.0	-608.8	7757.2	-23.8	7271.2	-152.6	6597.4
03/01/1999	-53.5	7364.3	-85.5	7757.7	-188.4	7656.1	-14.5	8119.4	-40.3	8329.4	-62.8	8304.7	-608.8	7757.2	-23.8	7271.2	-152.9	6597.1
04/05/1999	-54.1	7363.7	-88.4	7754.8	-188.4	7656.1	-14.6	8119.3	-41.3	8328.4	-63.1	8304.4	-608.6	7757.4	-23.8	7271.2	-152.4	6597.6
05/04/1999	-54.0	7363.8	-90.0	7753.2	-188.2	7656.3	-14.6	8119.3	-42.0	8327.7	-63.7	8303.9	-608.5	7757.5	-23.8	7271.2	-153.1	6596.9
06/07/1999	-54.4	7363.5	-87.5	7755.7	-188.3	7656.2	-13.8	8120.1	-39.2	8330.6	-61.4	8306.2	-608.8	7757.2	-24.0	7271.0	-154.1	6595.9
07/23/1999	-55.3	7362.5	-93.8	7749.4	-188.3	7656.2	-13.8	8120.1	-39.1	8330.6	-61.4	8306.2	-609.2	7756.9	-23.8	7271.2	-155.0	6595.0
08/27/1999	-55.4	7362.4	-92.3	7751.0	-188.2	7656.3	-13.9	8120.0	-40.0	8329.8	-62.6	8305.0	-608.2	7757.8	-24.0	7271.0	-155.6	6594.4
09/03/1999	-55.2	7362.6	-92.1	7751.1	-187.8	7656.7	-13.9	8119.9	-40.6	8329.2	-62.7	8304.8	-608.8	7757.2	-24.0	7271.0	-155.5	6594.5
11/17/1999	-55.4	7362.4	-99.0	7744.2	-187.5	7657.0	-14.8	8119.1	-42.2	8327.5	-64.2	8303.4	-609.0	7757.1	-24.0	7271.0	-153.9	6596.1
12/03/1999	-55.3	7362.6	-99.6	7743.6	-187.7	7656.8	-14.9	8119.0	-42.3	8327.4	-64.3	8303.2	-608.9	7757.1	-24.0	7271.0	-153.9	6596.1

PACIFICORP
TECHNICAL SERVICES - HYDROLOGIC MONITORING

SURFACE PIEZOMETRIC DATA
RILDA CANYON

	Rilda Canyon (EM-47)		P - 1		P - 4		P - 5		P - 6		P - 7	
Collar Elevation	8,059.0		7,516.8		7,579.3		7,564.8		7,615.5		7,634.9	
Date	Reading	Level	Reading	Level	Reading	Level	Reading	Level	Reading	Level	Reading	Level
01/15/1998	Inaccessible		22.9	7,493.9	DAMP		8.3	7,556.6	44.8	7,590.1	40.6	7,594.3
02/23/1998	Inaccessible		Inaccessible		Inaccessible		Inaccessible		Inaccessible		Inaccessible	
03/11/1998	Inaccessible		Inaccessible		Inaccessible		Inaccessible		Inaccessible		Inaccessible	
04/14/1998	Inaccessible		22.7	7,494.1	DAMP		8.0	7,556.8	45.2	7,589.7	41.6	7,593.3
05/15/1998	204.9	7,854.1	21.5	7,495.3	DAMP		6.8	7,558.0	39.7	7,595.2	23.5	7,611.4
06/02/1998			21.4	7,495.4	DAMP		6.8	7,558.0	39.1	7,595.8	22.4	7,612.5
06/08/1998	203.6	7,855.4										
07/06/1998	203.0	7,856.0	22.6	7,494.2	DAMP		8.0	7,556.8	39.0	7,595.9	23.2	7,611.7
08/17/1998	205.0	7,854.0	23.0	7,493.8	DAMP		8.0	7,556.8	39.2	7,595.7	24.4	7,610.5
09/14/1998	206.8	7,852.2	23.0	7,493.8	DAMP		7.5	7,557.3	40.0	7,594.9	27.0	7,607.9
10/01/1998	207.4	7,851.6	22.9	7,493.9	DAMP		7.8	7,557.0	41.4	7,593.5	34.4	7,600.5
11/04/1998	210.4	7,848.6	22.8	7,494.0	DAMP		7.9	7,556.9	43.0	7,591.9	35.0	7,599.9
12/03/1998	210.5	7,848.5	22.8	7,494.0	DAMP		8.0	7,556.8	43.4	7,591.5	36.0	7,598.9
01/12/1999	210.2	7,848.8	22.7	7,494.1	DAMP		8.1	7,556.7	44.1	7,590.8	39.5	7,595.4
02/02/1999	Inaccessible		22.7	7,494.1	DAMP		8.2	7,556.6	44.6	7,590.3	41.2	7,593.7
03/03/1999	Inaccessible		22.6	7,494.2	DAMP		8.1	7,556.7	45.3	7,589.6	42.4	7,592.5
04/05/1999	Inaccessible		22.2	7,494.6	DAMP		8.1	7,556.7	45.2	7,589.7	42.2	7,592.7
05/11/1999	205.6	7,853.4	22.0	7,494.8	DAMP		7.6	7,557.2	44.7	7,590.3	40.1	7,594.8
06/07/1999	203.3	7,855.7	21.9	7,494.9	DAMP		7.6	7,557.2	40.1	7,594.8	24.0	7,610.9
07/26/1999	202.0	7,857.1	22.3	7,494.5	DAMP		4.7	7,560.1	39.1	7,595.8	23.5	7,611.4
08/12/1999	202.4	7,856.6	22.5	7,494.3	DAMP		7.9	7,556.9	39.2	7,595.7	23.4	7,611.5
09/03/1999	204.9	7,854.1	22.6	7,494.2	DAMP		7.8	7,557.0	39.6	7,595.3	25.3	7,609.6
10/05/1999	206.0	7,853.0	22.9	7,493.9	DAMP		7.9	7,557.0	41.3	7,593.6	30.2	7,604.7
11/17/1999	207.9	7,851.1	22.4	7,494.4	DAMP		8.0	7,556.8	44.6	7,590.3	40.7	7,594.2
12/9./1999	208.1	7,850.9	22.3	7,494.5	DAMP		7.5	7,557.3	45.3	7,589.6	42.8	7,592.2
01/11/2000	Inaccessible		22.3	7,494.6	DAMP		8.0	7,556.8	45.9	7,589.0	44.3	7,590.6

PACIFICORP
TECHNICAL SERVICES - HYDROLOGIC MONITORING

DEER CREEK IN -MINE PIEZOMETRIC DATA

	DCP - 1 3rd N. xc-8		DCP - 2 3rd N. xc-29		DCP - 3 3rd N. xc-55		DCP - 4 1st WM xc-29	
Elevation	7530		7567		7577		7529	
DRILL DEPTH	155.4		170.5		148.9		169.6	
Date	Reading	Level	Reading	Level	Reading	Level	Reading	Level
03-05-91	-4.6	7525.4	**		-63.5	7513.0	-5.0	7524.0
06-13-91	-6.6	7523.4			-64.1	7512.4	-3.2	7525.8
09-05-91	-6.9	7523.1			-64.6	7511.9	-3.4	7525.6
12-31-91	-5.7	7524.3			***		-6.7	7522.3
03-20-92	-3.9	7526.1					-7.0	7522.1
06-26-92	-3.6	7526.4					-3.0	7526.0
09-11-92	-5.8	7524.2					-2.7	7526.3
12-09-92	*						-4.2	7524.8
03-17-93	*						-13.2	7515.8
06-23-93	*						-13.6	7515.5
08-04-93	-7.6	7522.4					****	
Dec inaccessible (casing damaged)								
02-04-94	-4.4	7525.7						
03-31-94	-3.6	7526.5						
06-24-94	-2.2	7527.9						
09-02-94	-1.8	7528.2						
11-15-94	-1.1	7528.9						
03-17-95	-0.8	7529.2						
06-17-95	-0.6	7529.4						
09-27-95	-0.4	7529.6						
12-15-95	0.0	7530.0						
03/29/1996	0.1	7530.1						
06/19/1996	0.0	7530.0						
09/30/1996	0.0	7530.0						
12/12/1996	1.6	7531.6						
03/27/1997	1.6	7531.6						
06/30/1997	1.6	7531.6						
09/25/1997	1.6	7531.6						
12/09/1997	1.6	7531.6						
03/30/1998	1.6	7531.6						
06/22/1998	1.6	7531.6						
09/23/1998	1.6	7531.6						
12/22/1998	1.6	7531.6						
03/29/1999	1.6	7531.6						
06/25/1999	1.6	7531.6						
09/29/1999	1.6	7531.6						
12/13/1999	1.6	7531.6						

* Area inaccessible

** Monitoring discontinued, hole caved @ 38'

*** Monitoring discontinued, entry used to access to 8th East

**** Monitoring discontinued, area sealed

PACIFICORP
TECHNICAL SERVICES - HYDROLOGIC MONITORING

WASTE ROCK DISPOSAL WELLS DATA

	DEER CREEK DCWR1		WILBERG\COTTONWOOD WCWR1		
* Collar Elevation	6313.4	Elevations Adjusted 12/90		6774.5	
Date	**Reading**	**Level**	**Date**	**Reading**	**Level**
04/02/1996	-5.2	6308.2	12/22/1996	-42.1	6732.4
06/13/1996	-6.4	6307.0	03/12/1997	-42.2	6732.3
09/30/1996	-6.3	6307.1	06/30/1997	-40.04	6734.5
12/16/1996	-5.5	6307.9	09/30/1997	-41.66	6732.8
03/21/1997	-4.7	6308.8	12/18/1997	-43.88	6730.6
06/26/1997	-5.7	6307.7	03/20/1998	-46	6728.5
09/16/1997	-6.8	6306.6	06/15/1998	-48.49	6726.0
12/15/1997	-6.1	6307.3	09/03/1998	-50.6	6723.9
03/17/1998	-7.5	6305.9	12/10/1998	-41.88	6732.6
06/09/1998	-7.0	6306.4	03/01/1999	-42.4	6732.1
09/15/1998	-6.2	6307.2	06/09/1999	-47.48	6727.0
12/07/1998	-6.0	6307.4	09/09/1999	-50.04	6724.5
03/04/1999	-6.0	6307.4	12/08/1999	-51.34	6723.2
06/17/1999	-7.5	6305.9			
09/09/1999	-7.5	6305.9			
12/14/1999	-7.8	6305.6			

Redrilled and replaced casing 5-6-97

PACIFICORP
TECHNICAL SERVICES - HYDROLOGIC MONITORING

COTTONWOOD CANYON CREEK FLOW & QUALITY

SW-1

	<----------		Field Measurements			------->		
Date	Time	Temp. (oC)	Flow GPM	pH	Cond. (uS)	Dis. Oxygen	Weather	Comments
01/21/1998	1230		5				clear40's	
02/16/1998	1215		INACCESSIBLE SNOW				cloudy30's	
03/20/1998	1130		INACCESSIBLE SNOW				clear40's	
04/13/1998	1050		80				snow30's	
05/28/1998	923		2240				cloudy40's	
06/11/1998	1130	5.2	2240	7.56	468	8.7	pc60's	
07/08/1998	1523		1225				clear80's	
08/19/1998	1401		250				sunny80's	
09/03/1998	1000	8.9	300	7.4	469	7.5	clear80's	
10/02/1998	1146		390				ptcloudy60's	
11/03/1998	1028		270				ptcloudy50's	
12/09/1998	1452	-1.4	200	7.07	525	8	clear'30s	
01/05/1999	1034		200				clear30's	
02/01/1999	1433		200				clear30's	
03/01/1999	1059	3.1	210	7.92	549	6.1	clear40's	
04/07/1999	1108		200				cloudy40's	
05/05/1999	1345		320				ptcloudy50's	
06/08/1999	1058	6.6	1100	7.92	453	7.9	ptcloudy60's	
07/16/1999	1455		310				cloudy70's	
08/03/1999	1319		300				cloudy60's	
09/02/1999	1308	10.6	235	8.13	449	6.6	ptcloudy60's	
10/04/1999	1403		200				clear70's	
11/01/1999	1314		200				clear60's	
12/06/1999	1306	-0.4	200	7.44	499	10.8	clear30's	
01/11/2000	1043		195				cloudy40's	

PACIFICORP
TECHNICAL SERVICES - HYDROLOGIC MONITORING

COTTONWOOD CANYON CREEK FLOW & QUALITY

SW-2

	<----------		Field Measurements			------->		
Date	Time	Temp. (oC)	Flow GPM	pH	Cond. (uS)	Dis. Oxygen	Weather	Comments
01/27/1998	1306		60				clear40's	
02/16/1998	1230		100				cloudy30's	
03/20/1998	1147	6.4	180	8.78	1280	8.4	clear40's	
04/13/1998	1101		100				snow30's	
05/28/1998	933		2240				cloudy40's	
06/11/1998	1203	6.6	2450	7.97	532	8.6	ptcloudy60's	
07/08/1998	1528		1240				clear80's	
08/19/1998	1409		270				sunny80's	
09/03/1998	1101	12.6	320	8	869	7.1	clear80's	
10/02/1998	1200		430				ptcloudy60's	
11/03/1998	1037		590				ptcloudy50's	
12/10/1998	1037	4.9	355	7.84	961	7.2	clear30's	
01/05/1999	1043		395				clear30's	
02/01/1999	1451		330				clear30's	
03/01/1999	1118	8.3	830	8.17	1054	6.1	clear40's	
04/07/1999	1113		446				cloudy40's	
05/05/1999	1350		520				ptcloudy50's	
06/08/1999	1114	6.2	1200	8.17	467	7.9	ptcloudy60's	
07/16/1999	1459		790				cloudy70's	
08/03/1999	1324		335				cloudy60's	
09/02/1999	1320	12	625	8.4	924	6.5	cloudy60's	
10/04/1999	1416		238				clear70's	
11/01/1999	1318		239				clear60's	
12/06/1999	1348	-0.4	203	7.44	571	11.5	clear30's	
01/11/2000	1059		320				cloudy40's	

PACIFICORP
TECHNICAL SERVICES - HYDROLOGIC MONITORING

COTTONWOOD CANYON CREEK FLOW & QUALITY

SW-3

	<----------		Field Measurements ---			------->		
Date	Time	Temp. (oC)	Flow GPM	pH	Cond. (uS)	Dis. Oxygen	Weather	Comments
01/27/1998	1320		60				clear40's	
02/16/1998	1240		75				cloudy30's	
03/20/1998	1205	7	200	8.91	1298	8.2	clear40's	
04/13/1998	1115		175				snow30's	
05/28/1998	944		2500				cloudy40's	
06/11/1998	1220	6.9	2500	7.97	533	8.9	ptcloudy60's	
07/08/1998	1540		1300				clear80's	
08/19/1998	1422		395				sunny80's	
09/03/1998	1133	15.1	350	8.19	907	6.6	clear80's	
10/02/1998	1218		480				ptcloudy60's	
11/03/1998	1057		600				ptcloudy50's	
12/10/1998	1102	0.1	370	8.19	1107	7.6	clear30's	
01/05/1999	1054		405				clear30's	
02/01/1999	1500		340				clear30's	
03/01/1999	1142	6.4	835	8.36	1026	5.9	clear40's	
04/07/1999	1122		450				cloudy40's	
05/05/1999	1400		523				ptcloudy50's	
06/08/1999	1142	9	1255	8.42	621	7.6	ptcloudy60's	
07/16/1999	1512		800				cloudy70's	
08/03/1999	1337		341				cloudy60's	
09/02/1999	1348	14.8	634	8.69	881	6.2	cloudy60's	
10/04/1999	1426		243				clear70's	
11/01/1999	1330		245				clear60's	
12/06/1999	1417	0.5	209	8.55	1122	10.6	clear30's	
01/11/2000	1105		328				cloudy40's	

PACIFICORP
TECHNICAL SERVICES - HYDROLOGIC MONITORING

COTTONWOOD CANYON CREEK
@ USGS FLUME
CCC01

	<----------		Field Measurements ---------->						
Date	Time	Temp. (°C)	Flow ft.	GPM	pH	Cond. (uS)	Dis. Oxygen	Weather	Comments
01/27/1998	1310			117				clear40's	
02/16/1998	1235			80				cloudy30's	
03/20/1998	1155	7		218	8.94	1202	7.8	clear40's	
04/13/1998	1110			100				snow30's	
05/28/1998	939			2500				cloudy40's	Over capacity
06/11/1998	1212	7		2500	7.94	535	8.9	ptcloudy60's	
07/08/1998	1532			1000 est.				clear80's	flume repair
08/19/1998	1414			200				sunny80's	flume repair
09/03/1998	1114	14		325	8.25	913	6.8	clear80's	flume repair
10/02/1998	1210			477				ptcloudy60's	
11/03/1998	1043			599				ptcloudy50's	
12/10/1998	1044	2		365	8.29	1097	7.2	clear30's	
01/05/1999	1050			400				clear30's	
02/01/1999	1454			339				clear30's	
03/01/1999	1131	7		834	8.52	1001	5.7	clear40's	
04/07/1999	1117			448				cloudy40's	
05/05/1999	1354			522				ptcloudy50's	
06/08/1999	1126	8		1253	8.27	454		ptcloudy60's	
07/16/1999	1431			798				cloudy70's	
08/03/1999	1330			339				cloudy60's	
09/02/1999	1336	13		631	8.61	888		cloudy60's	
10/04/1999	1421			241				clear70's	
11/01/1999	1323			241				clear60's	
12/06/1999	1359	2		207	7.64	632	11.2	clear30's	

PACIFICORP
TECHNICAL SERVICES - HYDROLOGIC MONITORING

UN-NAMED DRAINAGE OFF STRAIGHT CANYON CREEK

T-19

	<----------		Field Measurements			------->		
Date	Time	Temp. (oC)	Flow GPM	pH	Cond. (uS)	Dis. Oxygen	Weather	Comments
01/27/1998	1331		No Flow				clear40's	
02/16/1998	1300		No Flow				cloudy30's	
03/20/1998	1210		No Flow				clear40's	
04/13/1998	955		120				snow30's	
05/28/1998	845		175				cloudy40's	
06/11/1998	1047	6.6	300	8.1	716	8.4	ptcloudy60's	
07/08/1998	1417		200				clear80's	
08/19/1998	1434		200				sunny80's	
09/03/1998	1252	15.9	150	8.35	688	6.8	clear80's	
10/02/1998	1251		160				ptcloudy60's	
11/03/1998	1101		200				ptcloudy50's	
12/09/1998	1354	-1.5	150	7.7	900	8.2	clear30's	
01/05/1999	1010		150				clear30's	
02/01/1999	1327		Frozen				snow30's	
03/01/1999	955	-1	170	7.53	841	5.9	clear40's	
04/07/1999	1044		190				cloudy40's	
05/05/1999	1322		400				ptcloudy50's	
06/08/1999	954	6.7	375	8	784	7.6	ptcloudy60's	
07/16/1999	1431		170				cloudy70's	
08/03/1999	1344		170				cloudy60's	
09/02/1999	1159	14.3	120	8.07	852	5.6	ptcloudy60's	
10/04/1999	1240		75				clear70's	
11/01/1999	1235		85				clear60's	
12/06/1999	1203	-0.3	75	7.76	976	10.7	clear30's	
01/10/2000	1348		Frozen				cloudy40's	

PACIFICORP
TECHNICAL SERVICES - HYDROLOGIC MONITORING

DEER CREEK FLOW & QUALITY

ABOVE THE MINE - DCR01

	<----------	Field Measurements ------>						
Date	Time	Temp. (°C)	Flow ft.	GPM	pH	Cond. (uS)	Weather	Comments
01/15/1998	950			Frozen			snow30's	
02/23/1998	1038			INACCESSIBLE SNOW			ltsnow30's	
03/11/1998	1000			INACCESSIBLE SNOW			clear30's	
04/13/1998	1056			Dry			cloudy30's	
05/27/1998	1140			1422			clear60's	
06/09/1998	1054	3.1		1227	7.67	491	cloudy60's	
07/06/1998	1355			499			ptcloudy80's	
08/17/1998	1420			296			cloudy80's	
09/15/1998	915	5.5		117	7.78	524	clear70's	
10/01/1998	1437			101			cloudy70's	
11/10/1998	833			90			clear30's	
12/07/1998	1446			Frozen			clear30's	
01/12/1999	1145			Frozen			clear30's	
02/02/1999	1347			Frozen			cloudy30's	
03/04/1999	859			Frozen			ptcloudy40's	
04/13/1999	1440			Frozen			clear50's	
05/10/1999	1509			556			ptcloudy50's	
06/14/1999	1425	9.8		675	7.93	456	sunny80's	
07/26/1999	1148			252			cloudy80's	
08/12/1999	1220			252			ptcloudy70's	
09/13/1999	1429	6.9		134	7.83	503	clear70's	
10/05/1999	1508			101			clear70's	
11/17/1999	1447			Frozen			ptcloudy50's	
12/09/1999	1243			Frozen			cloudy20's	
01/17/2000	948			Frozen			ptcloudy40's	

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TECHNICAL SERVICES - HYDROLOGIC MONITORING

DEER CREEK FLOW & QUALITY

@ PERMIT BOUNDARY - DCR04

	<----------	Field Measurements ------>						
Date	Time	Temp. (°C)	Flow ft.	GPM	pH	Cond. (uS)	Weather	Comments
01/15/1998	1010			Frozen			snow30's	
02/23/1998	1040			INACCESSIBLE SNOW			ltsnow30's	
03/11/1998	1010			INACCESSIBLE SNOW			clear30's	
04/13/1998	1105			Dry			cloudy30's	
05/27/1998	1150			1819			clear60's	
06/09/1998	1153	7		1819	8.04	715	cloudy60's	
07/06/1998	1410			1819			ptclody80's	
08/17/1998	1430			248			cloudy80's	
09/15/1998	938	9.6		904	8.14	828	clear70's	
10/01/1998	1445			904			cloudy70's	
11/10/1998	844			1934			clear30's	
12/07/1998	1455	5		817	8.02	919	clear30's	
01/12/1999	1153			817			clear30's	
02/02/1999	1356			1934			cloudy30's	
03/04/1999	905	8.5		994	8.15	852	ptcloudy40's	
04/13/1999	1446			994			clear50's	
05/10/1999	1518			2420			ptcloudy50's	
06/14/1999	1458	11.1		1596	7.77	645	sunny80's	
07/26/1999	1155			1934			cloudy80's	
08/12/1999	1229			1183			ptcloudy70's	
09/13/1999	1445	11.2		1183	8.17	691	clear70's	
10/05/1999	1516			817			clear70's	
11/17/1999	1455			2112			ptcloudy50's	
12/09/1999	1305	6.4		1282	8.07	793	cloudy20's	
01/17/2000	1000			1384			ptcloudy40's	

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TECHNICAL SERVICES - HYDROLOGIC MONITORING

DEER CREEK FLOW & QUALITY

BELOW THE MINE - DCR06

	<----------	Field Measurements ------>						
Date	Time	Temp. (oC)	Flow ft.	GPM	pH	Cond. (uS)	Weather	Comments
01/15/1998	1015			Dry			snow30's	
02/23/1998	1050			200			ltsnow30's	
03/11/1998	1025	3		300	8.33	1755	clear30's	
04/14/1998	1110			400			cloudy30's	
05/27/1998	1155			1800			clear60's	
06/09/1998	1203	7.9		1800	8.22	917	cloudy60's	
07/06/1998	1419			1800			clear80's	
08/17/1998	1440			280			cloudy80's	
09/15/1998	951	9.2		940	8.11	837	clear70's	
10/01/1998	1456			900			cloudy70's	
11/10/1998	902			1800			clear30's	
12/07/1998	1520	0.3		800	7.67	935	clear30's	
01/12/1999	1200			800			clear30's	
02/02/1999	1404			1923			cloudy30's	
03/04/1999	930	5.1		996	8.17	913	ptcloudy40's	
04/13/1999	1453			995			clear50's	
05/10/1999	1525			2425			ptcloudy50's	
06/14/1999	1515	14.6		1600	8.24	727	sunny80's	
07/26/1999	1203			1940			cloudy80's	
08/12/1999	1235			1190			ptcloudy70's	
09/13/1999	1500	14.8		1190	8.47	710	clear70's	
10/05/1999	1524			820			clear70's	
11/17/1999	1504			2115			ptcloudy50's	
12/09/1999	1329	3.8		1290	7.87	857	cloudy20's	
01/17/2000	1010			1390			ptcloudy40's	

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TECHNICAL SERVICES - HYDROLOGIC MONITORING

GRIMES WASH FLOW & QUALITY

RIGHT FORK - GWR01

	<-----	Field Measurements ------->						
Date	Time	Temp. (°C)	Flow ft.	GPM	pH	Cond. (uS)	Weather	Comments
01/29/1998	954		no flow				clear40's	
02/16/1998	1115		no flow				cloudy30's	
03/20/1998	1110		no flow				clear40's	
04/13/1998	1139		no flow				snow30's	
05/28/1998	1000			5			clear60's	
06/11/1998	1245		no flow				rain60's	
07/08/1998	1100		no flow				clear80's	
08/19/1998	1455		no flow				sunny80's	
09/03/1998	1412		no flow				clear80's	
10/02/1998	1325		no flow				ptcloudy60's	
11/03/1998	1247		no flow				ptcloudy50's	
12/10/1998	1115		no flow				clear30's	
01/05/1999	1116		no flow				clear30's	
02/01/1999	1510		no flow				clear30's	
03/03/1999	1035		no flow				cloudy50's	
04/07/1999	1250		no flow				cloudy40:s	
05/05/1999	1421		no flow				ptcloudy50's	
06/08/1999	1209		no flow				ptcloudy60's	
07/23/1999	1115		no flow				sunny70's	
08/03/1999	1420		no flow				cloudy60's	
09/02/1999	1400		no flow				cloudy60's	
10/04/1999	1430		no flow				clear70's	
11/01/1999	1339		no flow				clear60's	
12/06/1999	1430		no flow				clear30's	
01/11/2000	1110		no flow				cloudy40's	

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TECHNICAL SERVICES - HYDROLOGIC MONITORING

GRIMES WASH FLOW & QUALITY

LEFT FORK - GWR02

	<-----	Field Measurements ------->						
Date	Time	Temp. (°C)	Flow ft.	GPM	pH	Cond. (uS)	Weather	Comments
01/29/1998	950			Frozen			clear40's	
02/16/1998	1120			Frozen			cloudy30's	
03/20/1998	1115			No Flow			clear40's	
04/13/1998	1145			Damp			snow30's	
05/28/1998	1003		0.86	729			clear60's	
06/11/1998	1250	6.3	0.46	180	7.92	643	rain60's	
07/08/1998	1114			81			clear80's	
08/19/1998	1501			67			sunny80's	
09/03/1998	1425	19.9		50	8.7	529	clear80's	
10/02/1998	1330			28			ptcloudy60's	
11/03/1998	1258			20			ptcloudy50's	
12/10/1998	1125			Frozen			clear30's	
01/05/1999	1122			15.2			clear30's	
02/01/1999	1514			Frozen			clear30's	
03/03/1999	1041			Frozen			cloudy50's	
04/07/1999	1257			Dry			cloudy40's	
05/05/1999	1426			Dry			ptcloudy50's	
06/08/1999	1221	9.6		54.5	7.95	745	ptcloudy60's	
07/23/1999	1123			40			sunny70's	
08/03/1999	1430			40			cloudy60's	
09/02/1999	1407	12.5		59	8.53	545	cloudy60's	
10/04/1999	1442			45			clear70's	
11/01/1999	1342			20			clear60's	
12/06/1999	1440			Frozen			clear30's	
01/11/2000	1119			Frozen			cloudy40's	

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TECHNICAL SERVICES - HYDROLOGIC MONITORING

GRIMES WASH FLOW & QUALITY

BELOW THE MINE - GWR03
** FLOW INCLUDES MINE DISCHARGE

	<-----	Field Measurements ------->						
Date	Time	Temp. (°C)	Flow ft.	GPM	pH	Cond. (uS)	Weather	Comments
01/29/1998	1010			75**			clear40's	
02/16/1998	1130			75**			cloudy30's	
03/20/1998	1120	3.6		80**	8.55	2210	clear40's	
04/13/1998	1150			75**			snow30's	
05/28/1998	1005			750est.			clear60's	
06/11/1998	1303	8.3		280	7.97	1060	rain60's	
07/08/1998	1120			165			clear 80's	
08/19/1998	1507			91			sunny80's	
09/03/1998	1503	14.2		584	7.87	1158	clear80's	
10/02/1998	1339			47			ptcloudy60's	
11/03/1998	1306			71			ptcloudy50's	
12/10/1998	1136	2.4		63	7.82	1598	clear30's	
01/05/1999	1156			49.2			clear30's	
02/01/1999	1519			35			clear30's	
03/03/1999	1053	3.4		80	7.84	1537	cloudy50's	
04/07/1999	1305			53			cloudy40's	
05/05/1999	1433			74			ptcloudy50's	
06/08/1999	1245	9.9		80	8.21	1298	ptcloudy60's	
07/23/1999	1129			349			sunny70's	
08/03/1999	1436			367			cloudy60's	
09/02/1999	1426	11.4		112	8.32	1133	cloudy60's	
10/04/1999	1451			320			clear70's	
11/01/1999	1402			349			clear60's	
12/06/1999	1443	0.8		30	7.72	1511	clear30's	
01/11/2000	1123			45			cloudy40's	

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TECHNICAL SERVICES - HYDROLOGIC MONITORING

HUNTINGTON CREEK FLOW & QUALITY

HUNTINGTON CREEK - HCC01

	<----------		Field Measurements		---------->			
Date	Time	Temp. (oC)	Flow CFS	pH	Cond. (uS)	Dis. Oxygen	Weather	Comments
01/11/1995	1004	2	18	8.56	460	6.2	cloudy 20's	
02/16/1995	920	0	18	8.91	521	4.8	overcast 30's	
03/29/1995	1530	4	22	8.57	441	3.8	snowing 20's	
04/26/1995	1020	5	29	8.44	423	10.3	clear 60's	
05/08/1995	927	4	78	8.71	414	11.2	clear 70's	
06/30/1995	1120	10	490	8.10	314	7.4	clear 70's	
07/21/1995	1221	13	128	8.30			clear 80's	
08/30/1995	1436	15	68	8.78	306	9.1	clear 70's	
09/18/1995	1125	12	104	8.76	287	6.6	clear 70's	
10/31/1995	1018	7	76	8.77	281	8.4	rain 40's	
11/30/1995	1437	4	28	8.77	392	7.1	clear 30's	
12/14/1995	1426	4	29	8.81	400	9.2	clear 30's	
01/31/1996	906	1.8	25	8.68	392	8.7	snow 20's	
02/26/1996	1055	2.1	24	8.71	381	7.2	snow 30's	
03/29/1996	1553	8.1	28	8.83	423	8.8	pc 40's	
06/12/1996	1220	12.3	284	8.72	276	7.7	clear 80's	
09/11/1996	1049	10.7	102	8.89	274	11.6	rain 70's	
12/04/1996	856	0.8	31	8.91	435	11.2	clear20's	
03/19/1997	1106	4.2	141	8.53	315	9.6	clear50's	
06/24/1997	921	9.9	166	8.52	316	6.5	clear70's	
09/16/1997	923	10.2	115	8.43	283	7.4	clear70's	
12/04/1997	947	1.6	33	8.97	431	8.4	clear20's	
03/11/1998	1035	-1	34	8.28	463	8.9	clear30's	
06/09/1998	1212	5.4	383	8.11	312	9.2	cloudy60's	
09/15/1998	1010	7.9	66	8.26	335	7.5	clear70's	
12/02/1998	1037	0.2	34	7.32	428	8.4	clear40:s	
03/03/1999	1419	3.5	26	7.77	419	6.4	cloudy50's	
06/17/1999	1425	11.3	427	7.83	266	6.2	ptcloudy70's	
09/14/1999	840	6.3	116	7.97	280	6.3	cloudy60's	
12/09/1999	1335	-1.2	20	8.34	452	9.4	cloudy20's	

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TECHNICAL SERVICES - HYDROLOGIC MONITORING

HUNTINGTON CREEK FLOW & QUALITY

HUNTINGTON CREEK - HCC02

	<----------		Field Measurements			------->		
Date	Time	Temp. (oC)	Flow CFS	pH	Cond. (uS)	Dis. Oxygen	Weather	Comments
01/31/1996	912	1.8	25	8.92	392	8	snow 20's	
02/26/1996	1158	2.3	24	8.89	398	7.8	snow 30's	
03/29/1996	1601	9.1	28	8.78	428	9.1	pc 40's	
06/12/1996	1230	11.9	284	8.78	279	7.7	clear80's	
09/11/1996	1102	10.8	102	8.89	268	11.7	rain 70's	
12/04/1996	909	0.8	31	8.86	435	11.5	clear20's	
03/19/1997	1115	4.8	141	8.51	318	9.6	clear50's	
06/24/1997	930	10	166	8.52	309	6.2	clear70's	
09/16/1997	934	9.4	115	8.37	284	7.6	clear70's	
12/04/1997	956	0.8	33	8.65	433	8.3	clear20's	
03/11/1998	1046	-0.6	34	8.47	565	8	clear30's	
06/09/1998	1220	5.7	383	8.05	316	9.2	cloudy60's	
09/15/1998	1021	8.3	66	8.24	355	7.8	clear70's	
12/02/1998	1051	0.8	34	7.69	438	7.9	clear40:s	
03/03/1999	1432	3.9	26	7.85	453	6.4	cloudy50's	
06/17/1999	1442	11.1	427	8.02	268	7.2	ptcloudy70's	
09/14/1999	850	6	116	8.01	287	6.2	cloudy60's	
12/09/1999	1348	-0.1	20	7.99	534	10.9	cloudy20's	

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TECHNICAL SERVICES - HYDROLOGIC MONITORING

HUNTINGTON CREEK FLOW & QUALITY

HUNTINGTON CREEK - HCC04

	<----------		Field Measurements			------->		
Date	Time	Temp. (oC)	Flow CFS	pH	Cond. (uS)	Dis. Oxygen	Weather	Comments
01/31/1996	917	1.6	25	8.81	449	8.4	snow 20's	
02/26/1996	1119	2.1	24	8.68	398	7.8	snow 30's	
03/29/1996	1612	8.1	28	8.82	423	8.8	pc 40's	
06/12/1996	1240	12.4	284	8.84	286	7.8	clear80's	
09/11/1996	1116	10.9	102	8.88	282	11.8	rain 70's	
12/04/1996	922	0.8	31	8.82	523	11.5	clear20's	
03/19/1997	1125	5.2	141	8.54	342	9.5	clear50's	
06/24/1997	939	10.4	166	8.5	329	6.5	clear70's	
09/16/1997	946	9.7	115	8.38	303	7.6	clear70's	
12/04/1997	1009	0.8	33	8.79	523	8.5	clear20's	
03/11/1998	1058	0.5	34	8.45	602	8.5	clear30's	
06/09/1998	1229	8.15	383	8.15	331	8.7	cloudy60's	
09/15/1998	1032	8.8	66	8.33	378	8.5	clear70's	
12/02/1998	1105	1.3	34	8.01	515	7.9	clear40:s	
03/03/1999	1451	4.6	26	8.21	506	6	cloudy50's	
06/17/1999	1455	11.1	427	8.16	272	6.1	ptcloudy70's	
09/14/1999	900	6.1	116	8.13	294	6	cloudy60's	
12/09/1999	1401	-1.3	20	8.48	624	9.6	cloudy20's	

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TECHNICAL SERVICES - HYDROLOGIC MONITORING

MEETINGHOUSE CANYON
MHC01

	<---------- Field Measurements			---------->				
Date	Time	Temp. (oC)	Flow ft.	GPM	pH	Cond. (uS)	Weather	Comments
01/15/1998	1027			Frozen			snow30's	
02/23/1998	1055			INACCESSIBLE SNOW			ltsnow30's	
03/11/1998	1030			INACCESSIBLE SNOW			clear30's	
04/14/1998	1128			Dry			cloudy 30's	
05/27/1998	1113			3700			clear60's	over capacity
06/09/1998	1006	4.1		1870	8.1	394	cloudy60's	
07/06/1998	1332			942			ptcloudy80's	
08/17/1998	1350			276			cloudy80's	
09/14/1998	1512	13.3		218	8.24	394	ptcloudy80's	
10/01/1998	1411			155			cloudy70's	
11/09/1998	1455			117			snow30's	
12/02/1998	1014	0.4		92	7.03	463	clear40:s	
01/12/1999	1137			Frozen			clear30's	
02/02/1999	1339			Frozen			cloudy30's	
03/03/1999	1403			Frozen			cloudy50's	
04/12/1999	1453			Dry			ptcloudy 50's	
05/10/1999	1402			339			ptcloudy50's	
06/17/1999	1400	11.8		1336	7.63	349	ptcloudy70's	
07/26/1999	1213			365			cloudy80's	
08/12/1999	1203			365			ptcloudy70's	
09/13/1999	1348	12.3		145	7.74	372	clear70's	
10/05/1999	1446			117			clear70's	
11/17/1999	1436			Frozen			ptcloudy50's	
12/08/1999	1352			Frozen			clear30's	

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TECHNICAL SERVICES - HYDROLOGIC MONITORING

MILL FORK CANYON FLOW & QUALITY

MILL FORK CANYON ABOVE MINE (MFA1)

<----------		Field Measurements				----------	-------->		
Date	Time	Temp. (oC)	Flow ft.	GPM	pH	Cond. (uS)	Dis. Oxygen	Weather	Comments
01/15/1998	1330			INACCESSIBLE SNOW				snow30's	
02/23/1998	900			INACCESSIBLE SNOW				ltsnow30's	
03/11/1998	940			INACCESSIBLE SNOW				clear30's	
04/14/1998	945			Dry				cloudy30's	
05/27/1998	1004			800				clear60's	
06/08/1998	1058	4		900	7.40	401	8.4	cloudy60's	
07/06/1998	1000			900				clear80's	
08/17/1998	935			700				cloudy80's	
09/14/1998	951	6.1		150	7.87	413	7.5	ptcloudy70's	
10/01/1998	1331			15				cloudy70's	
11/04/1998	1345			Dry				clear50's	
12/03/1998	930			Dry				clear40:s	
01/12/1999	1057			Dry				clear30's	
02/02/1999	1151			Dry				cloudy30's	
03/03/1999	1129			Dry				cloudy50's	
04/12/1999	1339			Dry				ptcloudy50's	
05/10/1999	1016			Dry				cloudy40's	
06/11/1999	958	3		1500	7.80	383	6.2	clear70's	
07/26/1999	829			150				cloudy80's	
08/12/1999	947			100				ptcloudy70's	
09/13/1999	1200			Dry				clear70s	
10/05/1999	954			Dry				clear70's	
11/17/1999	1416			Dry				clear70's	
12/08/1999	1300			Dry				clear30's	
01/12/2000	1323			INACCESSIBLE				clear40's	
								ptcloudy40's	

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TECHNICAL SERVICES - HYDROLOGIC MONITORING

MILL FORK CANYON FLOW & QUALITY

MILL FORK CANYON BELOW MINE (MFB2)

		<---------- Field Measurements				----------	-------->		
Date	Time	Temp. (oC)	Flow ft.	GPM	pH	Cond. (uS)	Dis. Oxygen	Weather	Comments
01/15/1998	1331			INACCESSIBLE SNOW				snow30's	
02/23/1998	901			INACCESSIBLE SNOW				ltsnow30's	
03/11/1998	940			INACCESSIBLE SNOW				clear30's	
04/14/1998	950			Dry				cloudy30's	
05/27/1998	1020			136				clear60's	
06/08/1998	1126	4		1000	8.16	438	8.8	cloudy60's	
07/06/1998	947			1000				clear80's	
08/17/1998	949			970				cloudy80's	
09/14/1998	1014	6.5		160	7.95	560	7.7	ptcloudy70's	
10/01/1998	1349			120				cloudy70's	
11/04/1998	1410			75				clear50's	
11/23/1998	855	1		60	7.27	614	7.7	ptcloudy40:s	
12/03/1998	943	0		60	7.37	587	8.5	clear30's	
01/12/1999	1104			Frozen				clear30's	
02/02/1999	1157			Frozen				cloudy30's	
03/03/1999	1137			Frozen				cloudy50's	
04/12/1999	1353			Frozen				ptcloudy50's	
05/10/1999	1045			27				cloudy40's	
06/11/1999	1023	4		1600	7.92	413	7.1	clear70's	
07/26/1999	844			200				cloudy80's	
08/12/1999	1000			160				ptcloudy70's	
09/13/1999	1305	10		67	7.87	536	6.1	clear70's	
10/05/1999	1006			75				clear70's	
11/17/1999	1421			33				ptcloudy50's	
12/08/1999	1312			Frozen				clear30's	
01/12/2000	1333			Frozen				clear40's	

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TECHNICAL SERVICES - HYDROLOGIC MONITORING

RILDA CANYON FLOW & QUALITY

RILDA CANYON - FLUME #1(RCF1)

	<----- Field Measurements ------>							
			Flow			Cond.		
Date	Time	Temp. (oC)	ft.	GPM	pH	(uS)	Weather	Comments
04-17-89	1120		DRY				PC 60's	
01/15/1998	1130			INACCESSIBLE SNOW			snow30's	
02/23/1998	910			INACCESSIBLE SNOW			ltsnow30's	
03/11/1998	935			INACCESSIBLE SNOW			clear30's	
04/14/1998	835			INACCESSIBLE SNOW			cloudy30's	
05/15/1998	1108			512			cloudy40's	
06/08/1998	1207	3.6		2347	8.09	424	ptcloudy60's	
07/06/1998	1045			1240			clear80's	
08/17/1998	1035			101			ptcloudy80's	
09/14/1998	1115	8.8		152	7.95	400	ptcloudy70's	
10/01/1998	1105			117			clear60's	
11/04/1998	1130			95			clear50's	
12/03/1998	1030	0.1		50	7.86	444	clear40;s	
01/12/1999	915			Frozen			ptcloudy30's	
02/02/1999	1200			INACCESSIBLE SNOW			cloudy30's	
03/03/1999	1153			INACCESSIBLE SNOW			cloudy50's	
04/12/1999	1355			INACCESSIBLE SNOW			ptcloudy50's	
05/11/1999	1330			499			clear50's	
06/11/1999	1200	8.3		1303	8.01	382	clear70's	
07/26/1999	1010			296			cloudy80's	
08/12/1999	1045			252			ptcloudy70's	
09/16/1999	1334	8.5		101	7.85	372	cloudy70's	
10/05/1999	1049			78			clear70's	
11/17/1999	1254			Frozen			ptcloudy50's	
12/09/1999	951			Frozen			cloudy20's	
01/12/2000	1338			INACCESSIBLE SNOW			clear40's	

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TECHNICAL SERVICES - HYDROLOGIC MONITORING

RILDA CANYON FLOW & QUALITY

RILDA CANYON - LEFT FORK (RCLF1)

	<-----	Field Measurements ------>						
Date	Time	Temp. (oC)	Flow ft.	GPM	pH	Cond. (uS)	Weather	Comments
01/15/1998	1145			Dry			snow30's	
02/23/1998	910			INACCESSIBLE SNOW			ltsnow30's	
03/11/1998	935			INACCESSIBLE SNOW			clear30's	
04/14/1998	840			Dry			cloudy30's	
05/15/1998	1120			160			cloudy40's	
06/08/1998	1250	3.9		175	8.2	511	rain40's	
07/06/1998	1200			100			clear80's	
08/17/1998	1211			10			cloudy80's	
09/14/1998	1215	8.9		2.6	8.22	536	ptcloudy70's	
10/01/1998	1251			0.86			clear60's	
11/04/1998	1214			2.6			clear50's	
12/03/1998	1110			Dry			clear40:s	
01/12/1999	952			Dry			ptcloudy30's	
02/02/1999	1204			INACCESSIBLE SNOW			cloudy30's	
03/03/1999	1153			INACCESSIBLE SNOW			cloudy50's	
04/12/1999	1400			Dry			ptcloudy50's	
05/10/1999	1127			38			cloudy40's	
06/11/1999	1305	7.3		165	7.99	534	clear70's	
07/26/1999	910			12			cloudy80's	
08/12/1999	1124			11			ptcloudy70's	
09/16/1999	1400			Dry			cloudy70's	
10/05/1999	1119			Dry			clear70's	
11/17/1999	1319			Dry			ptcloudy50's	
12/08/1999	1320			Dry			clear30's	
01/12/2000	1345			INACCESSIBLE SNOW			clear40's	

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TECHNICAL SERVICES - HYDROLOGIC MONITORING

RILDA CANYON FLOW & QUALITY

RILDA CANYON - LEFT FORK (RCLF2)

	<-----	Field Measurements ------>						
Date	Time	Temp. (oC)	Flow ft.	GPM	pH	Cond. (uS)	Weather	Comments
01/15/1998	1145			Dry			snow30's	
02/23/1998	910			INACCESSIBLE SNOW			ltsnow30's	
03/11/1998	935			INACCESSIBLE SNOW			clear30's	
04/14/1998	845			Dry			cloudy30's	
05/15/1998	1146			150			cloudy40's	
06/08/1998	1304	4		165	8.9	513	rain40's	High in sediment
07/06/1998	1210			95			clear80's	
08/17/1998	1100			9			cloudy80's	
09/14/1998	1243	8.8		3	8.13	567	ptcloudy70's	
10/01/1998	1255			0.8			clear60's	
11/04/1998	1217			1.7			clear50's	
12/03/1998	1130			Frozen			clear40's	
01/12/1999	942			Frozen			ptcloudy30's	
02/02/1999	1212			INACCESSIBLE SNOW			cloudy30's	
03/03/1999	1153			INACCESSIBLE SNOW			cloudy50's	
04/12/1999	1409			Dry			ptcloudy50's	
05/10/1999	1118			37.5			cloudy40's	
06/11/1999	1300	8		160	7.95	539	clear70's	
07/26/1999	942			10			cloudy80's	
08/12/1999	1132			9.2			ptcloudy70's	
09/16/1999	1416			Dry			cloudy70's	
10/05/1999	1123			Dry			clear70's	
11/17/1999	1324			Dry			ptcloudy50's	
12/08/1999	1325			Dry			clear30's	

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TECHNICAL SERVICES - HYDROLOGIC MONITORING

RILDA CANYON FLOW & QUALITY

RILDA CANYON - FLUME #2 (RCF2)

	<-----	Field Measurements ------>						
Date	Time	Temp. (oC)	Flow ft.	GPM	pH	Cond. (uS)	Weather	Comments
01/15/1998	1145			Dry			snow30's	
02/23/1998	910			INACCESSIBLE SNOW			ltsnow30's	
03/11/1998	935			INACCESSIBLE SNOW			clear30's	
04/14/1998	906			Dry			cloudy30's	
05/15/1998	1204			608			cloudy40's	
06/08/1998	1310	3.3		3657	8.32	433	rain40's	water cloudy
07/06/1998	1232			1522			ptcloudy80's	
08/17/1998	1230			244			ptcloudy80's	
09/14/1998	1320	8.9		209	8.12	398	ptcloudy70's	
10/01/1998	1257			103			clear60's	
11/04/1998	1424			Dry			clear50's	
12/03/1998	1130			Frozen			clear40;s	
01/12/1999	1003			Frozen			ptcloudy30's	
02/02/1999	1230			Frozen			cloudy30's	
03/03/1999	1220			Frozen			cloudy50's	
04/12/1999	1418			Dry			ptcloudy50's	
05/10/1999	1133			608			cloudy40's	
06/15/1999	1355	9.5		3474	7.9	388	cloudy70's	
07/26/1999	1043			339			cloudy80's	
08/12/1999	1138			300			ptcloudy70's	
09/16/1999	1430			55.36			cloudy70's	
10/05/1999	1140			36			clear70's	
11/17/1999	1335			Dry			ptcloudy50's	
12/08/1999	1330			Dry			clear30's	

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TECHNICAL SERVICES - HYDROLOGIC MONITORING

RILDA CANYON FLOW & QUALITY

RILDA CANYON - FLUME #3 (RCF3)

	<----------		Field Measurements			---------->			
Date	Time	Temp. (oC)	Flow ft.	GPM	pH	Cond. (uS)	Dis. Oxygen	Weather	Comments
01/15/1998	1215			INACCESSIBLE SNOW				snow30's	
02/23/1998	910			INACCESSIBLE SNOW				ltsnow30's	
03/11/1998	935			INACCESSIBLE SNOW				clear30's	
04/14/1998	923			209				cloudy30's	
05/15/1998	1210			1104				cloudy40's	
06/08/1998	1327	3.5		3657	8.22	441	9	rain40's	
07/06/1998	1239			1766				ptcloudy80's	
08/17/1998	1246			251				ptcloudy80's	
09/14/1998	1330	9		262	7.85	469	7.2	ptcloudy80's	
10/01/1998	1303			262				clear60's	
11/04/1998	1430			131				clear50's	
12/03/1998	1324	2.5		146	7.5	620	7.4	clear40;s	
01/12/1999	1013			176				clear30's	
02/02/1999	1240			161				cloudy30's	
03/03/1999	1242	4.5		176	7.72	732	5.8	cloudy50's	
04/12/1999	1424			161				ptcloudy50's	
05/10/1999	1136			709				cloudy40's	
06/15/1999	1424	9.3		3500	8.05	391	6.9	cloudy70's	
07/26/1999	1047			380				cloudy80's	
08/12/1999	1142			339				ptcloudy70's	
09/16/1999	1439	8.9		120	7.5	572	6.1	cloudy70's	
10/05/1999	1147			120				clear70's	
11/17/1999	1346			95				ptcloudy50's	
12/09/1999	1108	2.1		90	7.6	747	10.7	cloudy20's	
01/12/2000	1400			70				clear40's	

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RILDA CANYON FLOW & QUALITY

RILDA CANYON - WEIR #4 (RCW4)

	<----------	Field Measurements				----------	-------->		
Date	Time	Temp. (oC)	Flow ft.	GPM	pH	Cond. (uS)	Dis. Oxygen	Weather	Comments
01/15/1998	1315			129.1				snow30's	
02/23/1998	910			INACCESSIBLE SNOW				ltsnow30's	
03/11/1998	930	0.8		157	7.75	806	8.3	clear30's	
04/14/1998	940			193.4				cloudy30's	
05/15/1998	1218			1040				cloudy40's	
06/08/1998	1354	3.9		5317	8.36	453	9.3	rain40's	
07/06/1998	1310			1726				ptcloudy80's	Weir filled in with silt
08/17/1998	1320			433				ptcloudy80's	
09/14/1998	1444	9.3		358.6	8.26	568	7	ptcloudy80's	
10/01/1998	1316			280.4				cloudy70's	
11/04/1998	1436			193.4				clear50's	
12/03/1998	1420	1.2		183.9	7.95	696	8.1	clear40;s	
01/12/1999	1046			Frozen				clear30's	
02/02/1999	1319			157				cloudy30's	
03/03/1999	1340	3		157	8.07	698	6	cloudy50's	
04/12/1999	1435			125.1				ptcloudy50's	
05/10/1999	1142			840				cloudy40's	
06/15/1999	1540	8.8		3550	8.21	411	6.8	cloudy70's	
07/26/1999	1128			551				cloudy80's	
08/12/1999	1148			464.8				ptcloudy70's	
09/16/1999	1522	7.9		183.9	8.25	648	5.6	cloudy70's	
10/05/1999	1323			157				clear70's	
11/17/1999	1410			174.7				ptcloudy50's	
12/08/1999	1339			Frozen				clear30's	

EAST MOUNTAIN SPRINGS DISCHARGE

1999

Spring	Date Sampled	Flow (GPM)	Temp. C	Date Sampled	Flow (GPM)	Temp. C	Seasonal Net Change %
Sheba	07/13/1999	6.1	5.5	10/12/1999	1.8	7.3	-70.49
Elk Spring	07/13/1999	309.0	4.4	10/11/1999	73.0	4.5	-76.38
Burnt Tree	07/14/1999	5.0	5.5	10/14/1999	6.0	6.8	20.00
Jerk Water							
Pine Springs							
Pine Sp. Trough							
Ted's Tub	07/19/1999	30.0	4.4	10/12/1999	8.6	4.7	-71.33
79-1							
79-2	07/14/1999	2.2	5.2	10/14/1999	1.7	5.8	-22.73
79-3							
79-4							
79-5							
79-6							
79-7							
79-8							
79-9							
79-10	07/14/1999	20.0	5.6	10/12/1999	6.3	5.9	-68.50
79-11							
79-12	07/19/1999	0.1	est., sheet flow	10/12/1999	dry		
79-13							
79-14							
79-15	07/14/1999	15.0	5.3	10/12/1999	3.8	6.2	-74.67
79-16							
79-17							
79-18							
79-19							
79-20							
79-21							
79-22							
79-23	07/19/1999		dry	10/14/1999	dry		
79-24	07/19/1999		dry	10/14/1999	dry		
79-25							
79-26	07/14/1999	2.7	5.6	10/12/1999	1.5	5.9	-44.44
79-27							
79-28	07/14/1999	1.4	5.4	10/12/1999	1.2	6.5	-14.29
79-29	07/14/1999	1.7	4.4	10/12/1999	1.0	4.8	-41.18
79-30							
79-31							
79-32	07/20/1999	1.0	10.3	10/12/1999	0.6	7.7	-42.00
79-33							
79-34	07/14/1999	8.6	5.0	10/12/1999	est., sheet flow		
79-35	07/14/1999	5.0	4.8	10/12/1999	1.8	5.2	-64.00
79-36							
79-37							
79-38	07/19/1999	5.0	5.4	10/14/1999	2.0	4.9	-60.00
79-39							
79-40	07/20/1999	1.7	4.3	10/14/1999	dry		
80-41	07/20/1999	3.7	3.7	10/14/1999	1.3	3.7	-64.86

EAST MOUNTAIN SPRINGS DISCHARGE

1999

Spring	Date Sampled	Flow (GPM)	Temp. C	Date Sampled	Flow (GPM)	Temp. C	Seasonal Net Change %
80-42							
80-43	07/14/1999	0.1	est., sheet flow	10/14/1999	dry		
80-44	07/20/1999	0.1	est., sheet flow	10/14/1999	est., sheet flow		
80-45							
80-46	07/20/1999	2.5	5.0	10/14/1999	est., sheet flow		
80-47	07/20/1999	8.6	4.3	10/14/1999	5.0		-41.86
80-48	07/13/1999	5.3	6.6	10/11/1999	2.1	6.4	-60.38
80-49							
80-50	07/26/1999	2.8	7.5	10/19/1999	0.6	8.1	-77.50
82-51	07/19/1999	0.7	6.3	10/14/1999	0.1	9.3	-80.00
82-52	07/19/1999	12.0	4.4	10/14/1999	4.0	3.6	-66.67
84-53							
84-54							
84-55							
84-56	07/14/1999	0.9	5.2	10/14/1999	0.8	5.2	-10.75
85-57							
86-58							
86-59							
89-60	07/19/1999	12.0	6.8	10/14/1999	1.2	5.3	-90.00
89-61	07/13/1999	150.0	4.5	10/11/1999	30.0	4.8	-80.00
89-62							
89-63							
89-64							
89-65	07/13/1999	3.0	4.8	10/11/1999	0.6	6.0	-80.33
89-66	07/13/1999	4.2	4.7	10/11/1999	0.8	6.9	-80.24
89-67	07/13/1999	12.0	4.9	10/11/1999	3.8	4.3	-68.33
89-68	07/13/1999	2.5	6.4	10/11/1999	0.9	7.6	-65.60
89-69							
89-70							
89-71							
91-72	07/13/1999	10.0	8.7	10/11/1999	9.2	8.3	-8.00
91-73	07/13/1999	0.9	8.3	10/11/1999	1	8.2	8.70

TOTAL FLOW FOR JULY **632.0** **160.6**

(W\OUT 80-50, 91-72 & 73)

Net Change - Average -53.42

Net Change - By Volume -74.59

TOTAL FOR JULY 1998 = 826.6 GPM

JULY 1999 31 % LOWER THAN JULY 1998

EAST MOUNTAIN

SPRING DISCHARGE RECESSION STUDY

YEAR 1999

SPRING		JUL	AUG	SEP	OCT
79-10	Flow (GPM)	20.0	14.0	7.5	6.3
	Temp. (C)	5.6	5.8	5.8	5.9
SHEBA	Flow (GPM)	6.1	3.9	2.7	1.8
SPRINGS	Temp. (C)	5.5	6.5	7.0	7.3
ELK	Flow (GPM)	309.0	138.0	103.0	73.0
SPRING	Temp. (C)	4.4	4.6	4.6	4.5
79-35	Flow (GPM)	5.0	3.0	2.5	1.8
	Temp. (C)	4.8	4.7	5.3	5.2
79-26	Flow (GPM)	2.7	5.4	1.8	1.5
	Temp. (C)	5.6	5.9	5.7	5.9
79-29	Flow (GPM)	1.7	1.7	1.6	1.0
	Temp. (C)	4.4	4.8	4.9	4.8
84-56	Flow (GPM)	0.9	0.8	0.8	0.8
	Temp. (C)	5.2	5.3	5.7	5.2
80-44	Flow (GPM)	est. < 0.5 gpm	st.<0.5gpm	<0.5gpm	<0.5gpm
	Temp. (C)				
80-46	Flow (GPM)	2.5	1.2	0.3	<0.5gpm
	Temp. (C)	5.0	5.5	7.9	
BURNT	Flow (GPM)	5.0	5.0	5.5	6.0
TREE	Temp. (C)	5.5	6.7	6.9	6.8
79-23	Flow (GPM)	dry	dry	dry	dry
	Temp. (C)				
82-52	Flow (GPM)	12.0	7.6	5.7	4.0
	Temp. (C)	4.4	4.6	4.9	3.6

TRAIL MOUNTAIN

SPRING DISCHARGE RECESSION STUDY

YEAR 1999

SPRING		JUL	AUG	SEP	OCT	Seasonal Net Change %
T-6	Flow (GPM)	3.5	3.5	3.3	2.6	-25.7
18-2-1	Temp. (C)	9	8	8	8	
T-8	Flow (GPM)	1.4	1.2	1.0	0.8	-45.0
17-21-1	Temp. (C)	7	7	8	7	
T-9	Flow (GPM)	10.9	12.0	5.5	3.0	-72.5
17-22-1	Temp. (C)	7	7	7	7	
T-10	Flow (GPM)	0.7	0.7	0.5	0.5	-34.3
17-26-4	Temp. (C)	6	6	7	6	
T-14	Flow (GPM)	2.1	1.8	1.0	0.7	-64.8
17-25-1	Temp. (C)	8	9	9	7	
T-14A	Flow (GPM)	DAMP	DAMP	DAMP	DAMP	
17-26-5	Temp. (C)					
T-15	Flow (GPM)	2.3	2.5	2.7	2.0	-13.0
17-35-1	Temp. (C)	10	10	11	9	
T-16	Flow (GPM)	DAMP	DAMP	DAMP	DAMP	
17-35-2	Temp. (C)					
TM-23*	Flow (GPM)	84.4	84.4	49.2**	85.8	1.7
	Temp. (C)	NA	NA	NA	NA	

JULY TOTAL **105.3**

OCTOBER TOTAL **95.37**

Net Change - Average -36.23

Net Change - By Volume -9.43

TOTAL FOR JULY 1998 = 99.6

JULY 1999 5.7% HIGHER THAN JULY 1998

* Gain-Loss : November 10, 1999 98.89 gpm

** Difficulty Sealing Weir @ Below Roans Site

PACIFICORP
TECHNICAL SERVICES - HYDROLOGIC MONITORING
DEER CREEK MINE / DISCHARGE

PERMIT # 0023604-002
(DCD)

Quality					Quantity	
Date	Time	GPM	Temp. (°C)	Comments	Month	Gallons/day
01/12/1998	956	500	11		January	1,413,662
02/09/1998	1100	670	10		February	1,253,160
03/04/1998	915	667	10		March	1,294,746
04/01/1998	1447	1627	12	Split with State Health	April	1,502,880
04/29/1998	1350	1725	13	Split with State Health	May	2,481,306
05/11/1998	1345	1686	12	Sampled at come-along access	June	1,975,824
06/04/1998	1205	752	11	Flow readings varied alot	July	1,860,248
07/13/1998	1410	2450	13	State Health analyzed parameters	August	2,068,444
07/28/1998	1500	200	13		September	2,211,456
08/10/1998	1630	2039	12		October	2,059,386
09/17/1998	1415	2431	16		November	1,382,736
10/09/1998	1425	2059	11		December	1,468,335
11/05/1998	1515	1509	9		January	1,932,852
12/08/1998	1405	784	8		February	1,420,509
01/06/1999	1440	1647	9		March	1,626,643
02/09/1999	1305	1980	11		April	1,843,488
03/08/1999	1050	1000	9		May	2,043,592
04/11/1999	1120	1960	9		June	1,642,608
04/13/1999	920	1804	7		July	1,646,895
05/10/1999	945	1431	7		August	2,129,667
06/15/1999	1120	451	12		September	2,017,157
07/08/1999	935	508	12		October	2,016,279
08/05/1999	1545	2598	12		November	2,105,088
09/07/1999	1625	8984	11		December	1,635,004
10/07/1999	1050	1836	9			
10/20/1999	1457	1074	13			
11/09/1999	1345	1230	10			
12/08/1999	1500	1523	8			

PACIFICORP
TECHNICAL SERVICES - HYDROLOGIC MONITORING

OLIPHANT MINE - STRAIGHT CANYON

(T-18)
Quality

Date	Time	GPM	Temp. (°C)	pH	Cond. (uS)	Oxygen	Quantity Dis. Gallons/day
03/25/1996	1440	1.1	4	8.74	589	5.9	1,584
06/10/1996	1230	0.27	18	9.07	559	6.9	389
09/04/1996	1357	0.15	19	9.06	596	8.8	216
12/13/1996	1624	1.3	11	8.8	542	14.7	1,858
03/21/1997	1013	0.1	7	8.43	558	9.6	180
06/23/1997	955	Damp					
09/08/1997	1200	Damp					
12/05/1997	1055	Dry					
03/20/1998	1215	Dry					
06/11/1998	1115	0.5	no sample sheet flow				
09/03/1998	1331	0.6	12	7.39	615	5.9	864
10/02/1998	1312	0.51					
11/03/1998	1146	0.51					
12/09/1998	1410	0.52	3	6.94	575	8.3	749
03/01/1999	1022	0.5	7	7.41	554	5.7	720
06/08/1999	1016	0.5	9	7.32	555	7.2	720
09/02/1999	1252	0.5	10	7.4	568	5.7	720
12/06/1999	1249	0.43	5	7.35	569	9.8	619

PACIFICORP
TECHNICAL SERVICES - HYDROLOGIC MONITORING

TRAIL MOUNTAIN MINE - COTTONWOOD CANYON
PERMIT # UTG040003-002
(TRAIL MOUNTAIN MINE DISCHARGE to COTTONWOOD CANYON CREEK)

		Quality				Quantity
Date	Time	GPM	Temp. (^{o}C)	Comments	Month	Gallons/day
01/09/1998	1010	150	12.5		January	283.802
02/09/1998	1328	150	9.8		February	285.641
03/04/1998	1240	120	8.6		March	316.297
04/01/1998	1352	120	12	Split with State Health	April	319.529
04/29/1998	1255	200	14.3	Split with State Health	May	377.046
05/11/1998	1520	200	12		June	405.419
06/04/1998	1425	No Discharge			July	607.021
06/29/1998	1220	300	15.5	Intermittent Discharge	August	219.768
07/13/1998	1515	190	18.8		September	464.973
07/28/1998	1325	60	17.5	State Heath analyzed parameter	October	493.459
08/10/1998	1055	30	16.5		November	553.529
09/02/1998	1450	20	18.3		December	503.515
09/17/1998	1300	460	18.6		January	457.108
10/09/1998	1110	420	14		February	435.467
10/28/1998	1005	240	15	Split with State Health	March	540,069
11/10/1998	1020	120	11.6		April	657,800
12/08/1998	940	280	10.6		May	456,002
01/08/1999	930	140	10.8		June	465.758
01/19/1999	1115	180	12.2		July	513.331
02/09/1999	1455	70	13.8		August	350.706
02/16/1999	1555	650	11		September	317.830
03/08/1999	1320	210	11.5		October	316.648
03/25/1999	1020	12	13.3		November	297.238
04/11/1999	1345	220	11.9		December	372.089
04/13/1999	1050	220	12.5			
05/10/1999	1045	160	11.1			
05/24/1999	1130	180	14.8			
06/15/1999	1540	600	15.2			
06/25/1999	835	300	15			
07/07/1999	1410	600	15.7			
08/05/1999	1715	160	18.6			
09/07/1999	1110	480	14.3			
09/17/1999	1125	140	14.6			
10/07/1999	1515	360	13.1			
10/20/1999	1355	100	15.3			
11/09/1999	1455	350	12.8			
12/08/1999	940	400	10.6			

PACIFICORP
TECHNICAL SERVICES - HYDROLOGIC MONITORING

WILBERG MINE - GRIMES WASH
PERMIT # 0022896-001A
(WMDO1)
Left Fork Grimes Wash

Date	Time	Quality GPM	Quality Temp. (°C)	Comments	Month	Quantity Gallons/day
01/21/1998	1251	45	12	Split with State Health	January	116,314
02/09/1998	1303	73	8		February	76,852
03/04/1998	1130	46	8		March	63,758
04/01/1998	1315	8.57	10	Split with State Health	April	87,497
04/29/1998	1215	71.8	11	Split with State Health	May	265,745
05/12/1998	1015	60	9		June	378,400
06/04/1998	1510	47.8	10		July	272,600
07/13/1998	1550	6.17	7		August	48,758
07/28/1998	1402	26	15	Split with State Health	September	146,373
08/10/1998	1240	17.1	12		October	3
09/09/1998	1410	0.25	17		November	102,895
09/17/1998	1236	516	15		December	141,278
10/09/1998	1225			No discharge	January	114,630
10/28/1998				No discharge	February	45,757
11/05/1998				No discharge	March	104,456
12/08/1998	1140	286	7		April	176,019
01/08/1999	1050	4.6	8		May	187,599
02/10/1999	1430	10	9		June	164,732
03/08/1999	1250	2	9		July	213,347
04/11/1999	1240	309	8		August	260,349
04/13/1999	1020	2.3	9		September	231,801
05/10/1999	1220	309	8		October	168,774
06/15/1999	1405	6.7	12		November	89,377
07/07/1999	1525	349	12		December	12,807
08/05/1999	1650	309	11			
09/07/1999	1225	2.1	14			
10/07/1999	1435	1.36	11			
10/20/1999	1315	300	13			
11/09/1999	1540	290	9			
12/08/1999	1030	6	7			

PACIFICORP
TECHNICAL SERVICES - HYDROLOGIC MONITORING

WILBERG MINE - MILLER CANYON
PERMIT # 0022896-004A

Miller Canyon Breakout
(MILLER)

		Quality				Quantity
Date	Time	GPM	Temp. (^{O}C)	Comments	Month	Gallons/day
01/27/1998	1315	Dry			January	No Discharge
02/09/1998	1345	Dry			February	No Discharge
03/04/1998	1255	Dry			March	No Discharge
04/20/1998	1030	Dry			April	No Discharge
05/11/1998	1550	Dry			May	No Discharge
06/04/1998	1440	Dry			June	No Discharge
07/28/1998	1435	Dry			July	No Discharge
08/10/1998	1000	Dry			August	No Discharge
09/02/1998	1415	Dry			September	No Discharge
10/28/1998	930	Dry			October	No Discharge
11/10/1998	943	Dry			November	No Discharge
12/08/1998	1010	Dry			December	No Discharge
01/08/1999	1021	Dry			January	No Discharge
02/09/1999	1420	Dry			February	No Discharge
03/08/1999	1300	Dry			March	No Discharge
04/11/1999	1248	Dry			April	No Discharge
05/10/1999	1110	Dry			May	No Discharge
06/15/1999	1500	Dry			June	No Discharge
07/22/1999	1455	Dry			July	No Discharge
08/05/1999	1740	Dry			August	No Discharge
09/07/1999	1000	Dry			September	No Discharge
10/07/1999	1435	Dry			October	No Discharge
11/09/1999	1410	Dry			November	No Discharge
12/08/1999	910	Dry			December	No Discharge

PACIFICORP
TECHNICAL SERVICES - HYDROLOGIC MONITORING

DEER CREEK IN-MINE QUALTIY & LONG TERM FLOW

QUALITY

Date	Location	Time	Temp. (°C)	GPM
12/09/1997	TW-10	930	7.3	3.75
03/30/1998	MAIN N.-MAIN E.	1115	7.4	0.13
03/30/1998	TW-10	1045	7.3	3.36
06/22/1998	MAIN N.-MAIN E.	1015	8.1	0.13
06/22/1998	TW-10	950	7.5	5
06/24/1998	5th North XC-14	1000	10.2	0.5
09/23/1998	TW-10	1215	6	5
09/23/1998	MAIN N.-MAIN E.	1245	7.5	0.15
12/22/1998	TW-10	835	7.5	4.3
12/22/1998	MAIN N.-MAIN E.	410	6	0.15
03/29/1999	TW-10	930	7.5	3.75
03/29/1999	MAIN N.-MAIN E.	1000	6.2	0.1
06/25/1999	TW-10	810	7.1	4
06/25/1999	MAIN N.-MAIN E.	830	7.7	0.13
09/29/1999	TW-10	1000	7.1	4.62
09/29/1999	MAIN N.-MAIN E.	1035	7.4	0.11
12/13/1999	TW-10	930	6	3.5
12/13/1999	MAIN N.-MAIN E.	1100	6	0.19

Site #1 Main North - Main West
Site #2 3rd North XC-65 2R, TW-10

LONG TERM FLOW (GPM)

Date	Site #1	Site #2
06/22/1998	0.13	5
09/23/1998	0.15	5
12/22/1998	0.15	4.3
03/29/1999	0.1	3.75
06/25/1999	0.13	4
09/29/1999	0.11	4.62
12/13/1999	0.19	3.5

PACIFICORP
TECHNICAL SERVICES - HYDROLOGIC MONITORING

TRAIL MOUNTAIN IN-MINE QUALTIY & LONG TERM FLOW

Date	Location	QUALITY Time	Temp. (oC)	GPM
06/19/1996	UG-3	1245	11	10.00
09/25/1996	UG-3	1530	11.3	5.00
12/03/1996	UG-3	1415	11.5	5.00
03/11/1997	UG-3	1410	14	5.00
06/26/1997	UG-3	1140	10	7.0
09/24/1997	UG-3	1040	12	6
12/22/1997	UG-3	1135	4.1	8.6
03/25/1998	UG-3	820	6.1	7
06/12/1998	UG-3	1030	10.5	7
09/28/1998	UG-3	1200	10.3	7
12/08/1998	UG-3	1330	4.5	6
03/31/1999	UG-3	1040	5.7	7
06/21/1999	UG-3	1420	11.6	2
10/22/1999	UG-3	815	12.1	7
12/08/1999	UG-3	1320	5.6	5

Date	LONG TERM FLOW (GPM) UG-2	UG-3
06/12/1998		7.00
09/28/1998		7.00
12/08/1998		6.00
03/31/1999		7.00
06/21/1999		2
10/22/1999		7
12/08/1999		5

* UG-2 Monitoring Discontinued, insufficient flow

PACIFICORP
TECHNICAL SERVICES - HYDROLOGIC MONITORING

WILBERG-COTTONWOOD IN-MINE QUALTIY & LONG TERM FLOW

QUALITY					LONG TERM FLOW (GPM)			
Date	Location	Time	Temp. (°C)	GPM	Date	Site #1	Site #2	Site #3
03/11/1997	TMA @ 32	1432	12	0.50	06/12/1998	<0.1	5.00	
06/26/1997	2nd S XC-11	1325	7	0.01	09/28/1998	<0.1	5.00	
06/26/1997	TMA @ 32	1305	12	2.00	12/08/1998	<0.1	1.30	
09/24/1997	2nd S XC-11	940	14.3	0.01	06/21/1999	<0.1	2.50	
09/24/1997	TMA @ 32	1010	12.3	2.00	10/22/1999	<0.1	2.00	
12/22/1997	2nd S XC-11	1225	6.7	0.01	12/08/1999	<0.1	2.50	
12/22/1997	TMA @ 32	1210	13.7	2.50				
03/25/1998	2nd S XC-11	745	6.9	<0.1				
03/25/1998	TMA @ 32	810	13.5	3.00				
06/12/1998	2nd S XC-11	1130	8.6	<0.1				
06/12/1998	TMA @ 32	1200	14	5.00				
09/28/1998	2nd S XC-11	1414	8	<0.1				
09/28/1998	TMA @ 32	1300	13.8	5.00				
12/08/1998	2nd S XC-11	1400	6.7	<0.1				
12/08/1998	TMA @ 32	1400	12.5	1.30				
03/31/1999	2nd S XC-11	1420	6.2	<0.1				
03/31/1999	TMA @ 32	1410	13.8	1.00				
06/21/1999	2nd S XC-11	1330	9	<0.1				
06/21/1999	TMA @ 32	1400	12.2	2.50				
10/22/1999	2nd S XC-11	720	10.6	<0.1				
10/22/1999	TMA @ 32	800	14.1	2.00				
12/08/1999	2nd S XC-11	1240	10	<0.1				
12/08/1999	TMA @ 32	1310	14.2	2.50				

Site #1 2nd South cross cut 11
Site #2 TMA cross cut 32-33 #3
* sampling hose plugged

PACIFICORP
TECHNICAL SERVICES - HYDROLOGIC MONITORING

Sediment Pond Analysis

Cottonwood Canyon Creek
Permit # 0022896-002A

Date	Time	GPM	Temp. (°C)	Weather	Comments
Jan.-Dec., 1986		no discharge			
Jan.-Dec., 1987		no discharge			
Jan.-Dec., 1988		no discharge			
Jan.-Dec., 1989		no discharge			
Jan.-Dec., 1990		no discharge			
Jan.-Dec., 1991		no discharge			
Jan.-Dec., 1992		no discharge			
Jan.-Dec., 1993		no discharge			
Jan.-Dec., 1994		no discharge			
Jan.-Dec., 1995		no discharge			
Jan.-Dec., 1996		no discharge			
Jan.-Dec.,1997		no discharge			
Jan.-Dec.,1998		no discharge			
Jan.-Dec.,1999		no discharge			

PACIFICORP
TECHNICAL SERVICES - HYDROLOGIC MONITORING

Sediment Pond Analysis

Deer Creek
Permit # 0023604-001

Date	Time	GPM	Temp. (°C)	Weather	Comments
01/23/1998	1100	25	0	clear30's	Prec. event. <10y/24 hr.Snow melting
02/09/1998	1150	20	1	clear30's	Prec. event. <10y/24 hr.Snow melting
03/04/1998	1025	20	1	clear30's	
04/01/1998	1500	30	3	cloudy40's	split with state health
05/11/1998	1410	38	7	pc50's	
06/04/1998	1145	45	11	cloudy50's	
07/13/1998	1425	6	13	sunny90's	
07/28/1998	1520	32	15	sunny90's	
08/10/1998	1620	31	15	cloudy80's	
09/09/1998	1120	38	13	clear80's	
09/17/1998	1350	45	13	sunny80's	
10/09/1998	1410	54	6	sunny60's	
10/28/1998	1110	97	6	sunny50's	split with state health
11/05/1998	1445	54	3	clear40's	
12/08/1998	1335	54	-1	pc20's	
12/15/1998	1515	54	1	pc30's	split with state health
01/06/1999	1420	2	5	clear 30's	
02/09/1999	1325	17	1	cloudy 40's	Prec-Event snow melt
03/08/1999	1005	20	2	pc 30's	
04/11/1999	1050	59	3	clear40's	
04/13/1999	910	54	2	pc40's	No lab samples taken
05/10/1999	925	79	5	pc40's	
06/15/1999	1055	85	11	sunny70's	
07/08/1999	1000	38	14	sunny70's	
08/05/1999	1530	50	14	cloudy70's	
09/07/1999	1600	63	11	sunny80's	
10/07/1999	1035	79	5	sunny40's	
10/20/1999	1444	74	8	clear50's	split with state health
11/09/1999	1335	79	2	sunny50's	
12/07/1999	1425	45	1	cloudy30's	Prec-Event snow

PACIFICORP
TECHNICAL SERVICES - HYDROLOGIC MONITORING

Sediment Pond Analysis

Des-Bee-Dove
Permit # 0023591-001

Date	Time	GPM	Temp. (°C)	Weather	Comments
Jan.-Feb.97		no discharge			
3-12-97	957	80.0	1	clear40's	Opened valve to decant pond.
Apr.-Jun.97	1020	no discharge		pc40's	
07/14/1997	1150	5.0	21	clear80's	Opened valve to decant pond.
August 1998	1430	no discharge			
09/18/1997	1030	40.0	17	clear50's	Opened valve to decant pond.
Oct. - Dec 98	830	no discharge			
Jan. - Apr. 99	1400	no discharge			
March-June 99	1020	no discharge			
Jul-Aug 99	1420	no discharge			
09/07/1999	1445	15.0	17	sunny80's	
Oct.-Dec 99	1020	no discharge			

PACIFICORP
TECHNICAL SERVICES - HYDROLOGIC MONITORING

Sediment Pond Analysis

Trail Mountain Mine
Permit # UTG040003-001

Date	Time	GPM	Temp. (°C)	Weather	Comments
01/23/1998	1139	20	5	clear30's	Prec. Event <10y/24HSnow melting
02/17/1998	1200	50	1.8	cloudy30's	Prec. Event <10y/24HSnow melting
03/04/1998	1230	40	4.6	clear30's	Prec. Event <10y/24HSnow melting
04/13/1998	1025	5	3.4	snow30's	Prec. Event <10y/24H
05/11/1998	1530	60	8.2	pc50's	Discharge Duration 1 Day
06/04/1998	1420	no discharge		cloudy50's	
07/01/1998		no discharge			No discharge 7/1/98-7/31/98
08/01/1998		no discharge			No discharge8/1/98-8/31/98
09/02/1998	1515	37.5	14.8		Prec. Event
10/09/1998	1125	1.76	8.2	sunny60's	
10/28/1998	1025	30	5.6	sunny50's	Split with state health
11/10/1998	1020	120	11.6	sunny30's	Prec.Event <10y24H
12/08/1998		no discharge			
01/08/1999	1000	1.5	-0.6	clear 20's	
02/17/1999	1135	10	0	pc 40's	Prec-Event snow melt
03/08/1999		No Discharge		pc 30's	
04/11/1999	1405	13	4.4	clear40's	
05/10/1999	1125	0.67	2.2	cloudy30's	
06/15/1999		No Discharge		pc80's	
07/07/1999	1445	12	16.8	cloudy60's	Prec-Event rain
08/05/1999	1730	12	15.4	cloudy70's	
09/07/1999	1055	7.5	12.9	sunny70's	
10/07/1999	1505	2.4	9.2	sunny60's	
11/09/1999		No Discharge		sunny50's	
12/08/1999		No Discharge		sunny20's	

PACIFICORP
TECHNICAL SERVICES - HYDROLOGIC MONITORING

Sediment Pond Analysis

Wilberg Mine
Permit # 0022896-003A

Date	Time	GPM	Temp. (°C)	Weather	Comments
01/12/1998	1146	33	2	ltsnow30's	Prec. event.<10y/24hr.
01/21/1998	1251	35	2	clear30's	Split with State Health
02/09/1998	1247	30	1	clear30's	Prec. event.<10y/24hr.Snow melting
03/04/1998	1115	38	2	clear30's	
04/01/1998	1327	32	5	cloudy40's	Split with State Health
05/12/1998	1000	27	7	cloudy40's	
06/04/1998	1445	39	11	pt cloudy	Prec. event. ,<10y/24hr.
07/28/1998	1350	21	17	sunny90's	
08/10/1998	1105	31	4	cloudy80's	
09/09/1998	1400	53	14	clear80's	
09/17/1998	1225	17	14	sunny80's	
10/09/1998	1200	14	8	sunny60's	
10/28/1998	930	83	6	sunny50's	Split with State Health
11/05/1998	1205	24	3	clear40's	
12/08/1998	1030	22	-1	pc20's	
12/15/1998	1640	24	3	pc30's	Split with State Health
01/08/1999	1025	37	0	clear 30's	
02/09/1999	1420	25	3	cloudy 40's	Pric-Event snow melt
03/08/1999	1230	35	2	pc 30's	
04/11/1999	1220	25	3	clear40's	
04/13/1999	1005	30	5	pc40's	No lab samples taken
05/10/1999	1155	16	5	pc30's	
06/15/1999	1335	19	12	pc80's	
07/07/1999	1510	10	17	cloudy60's	
08/05/1999	1635	10	14	cloudy70's	
09/07/1999	1200	36	10	sunny80's	
10/07/1999	1420	30	8	sunny60's	
10/20/1999	1330	32	8	clear50's	Split with State Health
11/09/1999	1530	33	3	sunny50's	
12/08/1999	1015	29	0	sunny20's	

ENERGY WEST MINING COMPANY
EAST MOUNTAIN PRECIPITATION
HISTORICAL COMPARISON

MONTH	1981	1982	1983	1984	1985	1986	1987	1988	1989	1990	1991	1992	1993	1994	1995	1996	1997	1998	1999	MIN	MEAN	MAX	ST DEV
OCT	1.28	1.93	0.38	0.76	3.27	1.15	1.57	2.77	0.61	0.28	0.48	0.49	1.57	2.23	1.86	0.18	1.50	0.24	3.01	0.18	1.34	3.27	0.95
NOV	0.39	0.53	2.90	2.43	0.97	2.38	0.39	1.91	0.43	0.39	0.26	1.07	0.57	1.12	1.42	0.46	1.63	0.84	1.08	0.26	1.11	2.90	0.78
DEC	0.05	0.97	1.39	2.42	1.67	0.87	0.16	1.29	1.56	0.16	0.66	0.07	1.53	0.14	0.65	0.64	1.66	0.23	0.00	0.00	0.85	2.42	0.70
JAN	0.29	3.22	1.30	0.27	0.49	0.30	1.37	1.42	1.00	0.74	0.34	0.61	4.10	0.32	1.37	1.39	2.49	0.97	0.75	0.27	1.20	4.10	1.02
FEB	0.52	0.14	1.81	0.65	0.59	2.10	1.37	0.00	0.68	2.08	0.39	1.73	2.34	1.35	0.66	1.18	1.56	3.34	0.34	0.00	1.20	3.34	0.86
MAR	2.77	1.67	1.98	1.22	1.77	1.43	1.65	0.99	1.03	1.75	2.34	2.39	2.01	0.34	0.79	2.23	0.00	0.71	0.07	0.00	1.43	2.77	0.78
APR	0.64	0.00	0.92	0.50	1.35	1.05	1.16	2.08	0.26	1.03	0.59	0.56	0.33	2.65	3.75	0.21	0.40	0.81	2.82	0.00	1.11	3.75	0.99
MAY	0.87	0.45	0.71	0.22	1.73	0.38	1.77	1.03	0.47	0.26	1.83	2.19	0.72	0.36	2.29	1.14	0.91	0.37	0.36	0.22	0.95	2.29	0.66
JUN	0.11	0.09	0.61	1.18	0.28	0.53	0.58	0.81	0.43	0.67	0.21	0.95	0.19	0.39	1.19	0.30	0.15	0.04	1.21	0.04	0.52	1.21	0.38
JUL	0.57	1.86	1.27	1.90	2.47	0.87	2.49	0.45	1.19	0.88	1.01	0.85	0.04	0.10	0.34	0.58	0.15	0.78	2.08	0.04	1.05	2.49	0.75
AUG	0.85	1.10	4.83	2.33	0.12	2.24	1.16	0.96	2.44	1.03	1.48	0.48	0.82	0.83	1.52	0.35	1.30	0.57	2.24	0.12	1.40	4.83	1.05
SEP	2.55	2.61	1.62	0.64	2.31	1.63	0.06	0.91	0.49	1.62	3.11	0.35	0.14	1.49	0.62	3.46	2.43	2.16	0.78	0.06	1.53	3.46	1.01
TOTAL	10.90	14.57	19.71	14.53	17.02	14.92	13.73	14.62	10.59	10.90	12.69	11.74	14.37	11.33	16.46	12.12	11.75	11.05	14.73	10.59	13.57	19.71	2.39

ENERGY WEST MINING COMPANY EAST MOUNTAIN WEATHER STATION 1999 WATER YEAR					
DATE	TIME	PRECIPITATION			
10/21/98	10:33 AM	Start			
10/23/98	4:20 AM	Stop	0.96		
10/23/98	8:51 AM	Start			
10/23/98	12:58 PM	Stop	0.04		
10/24/98	9:19 PM	Start			
10/26/98	5:06 AM	Stop	1.02		
10/26/98	9:06 AM	Start			
10/27/98	8:08 PM	Stop	0.69		
10/30/98	11:19 AM	Start			
10/30/98	2:13 PM	Stop	0.19		
10/31/98	11:07 AM	Start			
10/31/98	12:20 PM	Stop	0.11		
				3.01	Inches-Oct-98
11/02/98	1:25 PM	Start			
11/02/98	5:48 PM	Stop	0.34		
11/06/98	4:52 AM	Start			
11/06/98	12:12 PM	Stop	0.10		
11/07/98	5:17 AM	Start			
11/07/98	11:40 AM	Stop	0.05		
11/07/98	11:15 PM	Start			
11/08/98	8:55 AM	Stop	0.06		
11/13/98	5:01 AM	Start			
11/13/98	8:13 PM	Stop	0.46		
11/17/98	8:42 AM	Start			
11/17/98	8:16 PM	Stop	0.08		
				1.08	Inches-Nov-98
12/01/98	12:00 AM	Start			
12/31/98	11:59 PM	Stop	0.00		
				0.00	Inches-Dec-98
01/20/99	9:05 AM	Start			
01/20/99	3:48 PM	Stop	0.10		
01/20/99	8:05 PM	Start			
01/21/99	12:29 PM	Stop	0.32		
01/24/99	5:13 AM	Start			
01/24/99	12:53 PM	Stop	0.04		
01/26/99	2:10 AM	Start			
01/26/99	12:00 PM	Stop	0.07		
01/27/99	10:51 AM	Start			
01/27/99	6:47 PM	Stop	0.22		
				0.75	Inches-Jan-99
02/04/99	7:21 AM	Start			
02/05/99	9:27 AM	Stop	0.15		
02/09/99	2:22 PM	Start			
02/10/99	3:56 AM	Stop	0.19		
				0.34	Inches-Feb-99

ENERGY WEST MINING COMPANY EAST MOUNTAIN WEATHER STATION 1999 WATER YEAR				
DATE	TIME	PRECIPITATION		
03/09/99	11:29 AM	Start		
03/10/99	1:00 AM	Stop	0.07	
				0.07 Inches-Mar-99
04/03/99	9:09 AM	Start		
04/04/99	12:26 PM	Stop	0.61	
04/21/99	7:47 AM	Start		
04/21/99	1:22 PM	Stop	0.06	
04/22/99	7:37 AM	Start		
04/22/99	12:35 PM	Stop	0.06	
04/22/99	6:35 PM	Start		
04/23/99	4:39 AM	Stop	0.06	
04/23/99	4:44 AM	Start		
04/23/99	11:52 AM	Stop	0.59	
04/23/99	2:25 PM	Start		
04/24/99	4:54 AM	Stop	0.14	
04/24/99	6:07 AM	Start		
04/24/99	9:48 PM	Stop	0.25	
04/24/99	11:59 PM	Start		
04/25/99	1:35 PM	Stop	0.25	
04/25/99	5:33 PM	Start		
04/25/99	11:00 PM	Stop	0.08	
04/28/99	10:56 AM	Start		
04/28/99	9:24 PM	Stop	0.35	
04/28/99	11:32 PM	Start		
04/29/99	2:47 AM	Stop	0.16	
04/29/99	3:53 AM	Start		
04/30/99	8:17 PM	Stop	0.21	
				2.82 Inches-Apr-99
05/24/99	9:06 PM	Start		
05/25/99	9:01 AM	Stop	0.05	
05/26/99	12:26 PM	Start		
05/26/99	7:15 PM	Stop	0.28	
05/27/99	9:56 AM	Start		
05/27/99	5:11 PM	Stop	0.04	
				0.36 Inches-May-99
06/02/99	2:26 AM	Start		
06/02/99	2:53 PM	Stop	0.40	
06/04/99	1:19 PM	Start		
06/05/99	2:01 AM	Stop	0.20	
06/06/99	11:54 AM	Start		
06/07/99	12:21 AM	Stop	0.06	
06/16/99	7:14 AM	Start		
06/16/99	12:47 PM	Stop	0.20	
06/16/99	10:18 PM	Start		
06/17/99	3:41 AM	Stop	0.08	

ENERGY WEST MINING COMPANY EAST MOUNTAIN WEATHER STATION 1999 WATER YEAR				
DATE	TIME	PRECIPITATION		
06/17/99	7:02 AM	Start		
06/17/99	9:16 AM	Stop	0.28	
				1.21 Inches-Jun-99
07/06/99	6:42 AM	Start		
07/06/99	2:44 PM	Stop	0.09	
07/07/99	1:31 AM	Start		
07/07/99	5:23 AM	Stop	0.05	
07/08/99	3:31 AM	Start		
07/08/99	8:06 AM	Stop	0.53	
07/13/99	11:51 PM	Start		
07/14/99	1:08 PM	Stop	0.45	
07/21/99	12:52 AM	Start		
07/21/99	9:16 AM	Stop	0.12	
07/24/99	12:32 AM	Start		
07/24/99	6:43 AM	Stop	0.08	
07/29/99	1:15 PM	Start		
07/30/99	1:18 AM	Stop	0.12	
07/30/99	5:33 AM	Start		
07/30/99	9:47 AM	Stop	0.44	
07/31/99	1:42 AM	Start		
07/31/99	2:11 PM	Stop	0.20	
				2.08 Inches-Jul-99
08/04/99	7:07 AM	Start		
08/04/99	11:10 AM	Stop	0.11	
08/05/99	11:21 AM	Start		
08/05/99	7:50 PM	Stop	0.63	
08/06/99	9:05 AM	Start		
08/07/99	2:37 AM	Stop	0.34	
08/10/99	10:41 AM	Start		
08/10/99	2:36 PM	Stop	0.11	
08/10/99	5:07 PM	Start		
08/10/99	9:38 PM	Stop	0.21	
08/20/99	3:16 PM	Start		
08/21/99	1:42 AM	Stop	0.28	
08/24/99	1:23 PM	Start		
08/24/99	9:47 PM	Stop	0.11	
08/27/99	9:00 AM	Start		
08/27/99	2:51 PM	Stop	0.21	
08/30/99	8:10 AM	Start		
08/30/99	5:45 PM	Stop	0.25	
				2.2 Inches-Aug-99
09/10/99	12:09 PM	Start		
09/10/99	9:50 PM	Stop	0.13	
09/14/99	9:38 AM	Start		
09/14/99	2:57 PM	Stop	0.12	

ENERGY WEST MINING COMPANY EAST MOUNTAIN WEATHER STATION 1999 WATER YEAR			
DATE	TIME	PRECIPITATION	
09/14/99	6:48 PM	Start	
09/15/99	4:28 AM	Stop	0.40
09/19/99	8:29 AM	Start	
09/19/99	4:44 PM	Stop	0.13

0.8 Inches-Sep-99

EAST MOUNTAIN TEMPERATURES - HISTORICAL SUMMARY

	OCTOBER SUMMARY	
	HIGH	LOW
AVG.	47.8	31.6
MAX.	71.8	54.9
MIN.	11.6	4.3

	NOVEMBER SUMMARY	
	HIGH	LOW
AVG.	35.1	21.7
MAX.	55.8	44.0
MIN.	9.0	-4.8

	DECEMBER SUMMARY	
	HIGH	LOW
AVG.	28.7	14.5
MAX.	55.9	41.8
MIN.	-2.6	-17.6

	JANUARY SUMMARY	
	HIGH	LOW
AVG.	29.6	15.2
MAX.	54.0	34.9
MIN.	2.0	-15.2

	FEBRUARY SUMMARY	
	HIGH	LOW
AVG.	33.2	16.8
MAX.	56.3	40.0
MIN.	-2.3	-14.7

	MARCH SUMMARY	
	HIGH	LOW
AVG.	39.2	20.9
MAX.	64.6	47.3
MIN.	7.4	-6.6

	APRIL SUMMARY	
	HIGH	LOW
AVG.	46.0	26.7
MAX.	69.4	51.9
MIN.	12.7	-0.3

	MAY SUMMARY	
	HIGH	LOW
AVG.	54.9	34.8
MAX.	79.4	56.6
MIN.	15.8	1.8

	JUNE SUMMARY	
	HIGH	LOW
AVG.	67.3	44.9
MAX.	90.9	74.1
MIN.	27.7	13.1

	JULY SUMMARY	
	HIGH	LOW
AVG.	74.1	52.6
MAX.	92.4	69.9
MIN.	48.5	20.4

	AUGUST SUMMARY	
	HIGH	LOW
AVG.	72.6	52.2
MAX.	94.7	70.5
MIN.	47.4	31.8

	SEPTEMBER SUMMARY	
	HIGH	LOW
AVG.	62.5	43.2
MAX.	85.6	65.0
MIN.	31.6	20.0

HISTORICAL SUMMARY		
PARAMETER	DATE	TEMP
AVERAGE HIGH	NA	49.2
MAXIMUM HIGH	08-Aug-96	94.7
AVG. MAX. HIGH	NA	72.6
MINIMUM HIGH	22-Dec-91	-2.6
AVG. MIN. HIGH	NA	17.4
AVERAGE LOW	NA	31.3
MAXIMUM LOW	28-Jun-93	74.1
AVG. MAX. LOW	NA	54.2
MINIMUM LOW	22-Dec-90	-17.6
AVG. MIN. LOW	NA	2.7

EAST MOUNTAIN TEMPERATURES- 1999 WATER YEAR

	Oct-98	SUMMARY
	HIGH	LOW
AVG.	49.3	35.0
MAX.	63.9	46.6
MIN.	31.9	24.0

	Nov-98	SUMMARY
	HIGH	LOW
AVG.	38.7	24.0
MAX.	52.0	35.6
MIN.	21.8	-2.3

	Dec-98	SUMMARY
	HIGH	LOW
AVG.	32.6	19.7
MAX.	48.7	37.4
MIN.	9.8	-3.3

	Jan-99	SUMMARY
	HIGH	LOW
AVG.	36.2	24.1
MAX.	44.7	32.9
MIN.	21.8	14.2

	Feb-99	SUMMARY
	HIGH	LOW
AVG.	38.3	21.0
MAX.	50.3	31.1
MIN.	21.8	2.4

	Mar-99	SUMMARY
	HIGH	LOW
AVG.	47.3	27.6
MAX.	58.0	37.6
MIN.	28.4	11.5

	Apr-99	SUMMARY
	HIGH	LOW
AVG.	43.6	27.4
MAX.	66.0	45.8
MIN.	26.3	11.0

	May-99	SUMMARY
	HIGH	LOW
AVG.	54.8	34.1
MAX.	73.5	51.4
MIN.	16.9	1.8

	Jun-99	SUMMARY
	HIGH	LOW
AVG.	68.5	47.2
MAX.	80.8	59.6
MIN.	43.9	23.3

	Jul-99	SUMMARY
	HIGH	LOW
AVG.	75.8	55.3
MAX.	86.8	61.9
MIN.	61.3	48.6

	Aug-99	SUMMARY
	HIGH	LOW
AVG.	70.9	52.4
MAX.	79.7	60.8
MIN.	63.3	45.7

	Sep-99	SUMMARY
	HIGH	LOW
AVG.	62.3	43.4
MAX.	73.5	53.5
MIN.	43.7	24.2

1999 SUMMARY		
PARAMETER	DATE	TEMP
AVG. HIGH	#N/A	51.5
MAX. HIGH	07/06/1999	86.8
MIN. HIGH	12/21/1998	9.8
AVG. LOW	#N/A	34.3
MAX. LOW	07/02/1999	61.9
MIN. LOW	12/22/1998	-3.3

ENERGY WEST MINING COMPANY EAST MOUNTAIN WEATHER STATION 1999 WATER YEAR				
DATE	TIME	HIGH	LOW	
10/01/98	5:07 AM		45.4	Low
10/01/98	11:35 AM	59.1		High
10/02/98	4:31 PM	62.8		High
10/02/98	7:25 PM		46.6	Low
10/03/98	1:25 PM	50.5		High
10/03/98	7:57 PM		32.7	Low
10/04/98	12:52 PM	32.6		High
10/04/98	5:47 PM		26.0	Low
10/05/98	3:57 AM		24.0	Low
10/05/98	1:24 PM	41.5		High
10/06/98	3:28 AM		33.8	Low
10/06/98	4:51 PM	52.5		High
10/07/98	6:38 AM		36.3	Low
10/07/98	4:14 PM	57.1		High
10/08/98	5:06 AM		40.0	Low
10/08/98	4:16 PM	61.4		High
10/09/98	7:03 AM		40.9	Low
10/09/98	6:05 PM	62.5		High
10/10/98	7:58 AM		40.9	Low
10/10/98	3:48 PM	57.4		High
10/11/98	6:59 AM		35.9	Low
10/11/98	4:20 PM	58.1		High
10/12/98	5:34 AM		40.3	Low
10/12/98	2:44 PM	62.3		High
10/13/98	7:18 AM		44.0	Low
10/13/98	4:06 PM	63.3		High
10/14/98	7:14 AM		43.7	Low
10/14/98	5:44 PM	63.9		High
10/15/98	2:33 PM	53.8		High
10/15/98	8:15 PM		30.7	Low
10/16/98	5:54 AM		26.2	Low
10/16/98	12:19 PM	31.9		High
10/17/98	4:26 AM		28.6	Low
10/17/98	2:39 PM	47.3		High
10/18/98	6:48 AM		27.3	Low
10/18/98	3:49 PM	46.8		High
10/19/98	4:16 AM		32.4	Low
10/19/98	2:11 PM	52.2		High
10/20/98	5:58 AM		39.4	Low
10/20/98	3:33 PM	49.5		High
10/21/98	10:03 AM	44.3		High
10/21/98	2:51 PM		35.6	Low
10/22/98	4:46 AM		34.3	Low
10/22/98	10:58 AM	41.7		High
10/23/98	3:50 AM		34.0	Low

ENERGY WEST MINING COMPANY EAST MOUNTAIN WEATHER STATION 1999 WATER YEAR				
DATE	TIME	HIGH	LOW	
10/23/98	2:04 PM	48.3		High
10/24/98	4:16 AM		34.4	Low
10/24/98	11:16 AM	46.5		High
10/25/98	6:25 AM	37.7		High
10/25/98	11:58 PM		33.9	Low
10/26/98	4:28 PM	39.1		High
10/26/98	7:23 PM		34.6	Low
10/27/98	3:33 AM		34.3	Low
10/27/98	10:21 AM	41.9		High
10/28/98	6:15 AM		32.8	Low
10/28/98	1:33 PM	40.4		High
10/29/98	3:48 AM		33.6	Low
10/29/98	10:05 AM	37.7		High
10/30/98	6:59 AM		30.3	Low
10/30/98	10:10 AM	38.5		High
10/31/98	5:04 AM		31.2	Low
10/31/98	11:53 AM	45.0		High
11/01/98	4:06 AM		31.4	Low
11/01/98	10:07 AM	39.5		High
11/02/98	1:35 PM	37.3		High
11/02/98	6:48 PM		25.4	Low
11/03/98	6:25 AM	34.0		High
11/03/98	3:45 PM		23.0	Low
11/04/98	2:34 AM		21.0	Low
11/04/98	9:06 AM	37.3		High
11/05/98	9:12 AM	37.1		High
11/05/98	7:41 PM		22.8	Low
11/06/98	8:08 AM	31.3		High
11/06/98	5:20 PM		15.5	Low
11/07/98	1:33 AM		15.4	Low
11/07/98	8:12 AM	31.8		High
11/08/98	4:35 AM	30.4		High
11/08/98	6:11 PM		15.8	Low
11/09/98	6:22 AM	21.8		High
11/09/98	6:48 PM		14.3	Low
11/10/98	2:57 AM		12.9	Low
11/10/98	7:35 AM	28.7		High
11/11/98	6:02 AM	25.4		High
11/11/98	4:56 PM		15.7	Low
11/12/98	12:57 AM		16.1	Low
11/12/98	5:28 AM	33.6		High
11/13/98	1:07 AM		30.6	Low
11/13/98	7:00 AM	51.4		High
11/14/98	8:20 AM	52.0		High

	Oct-98	SUMMARY
	HIGH	LOW
AVG.	49.3	35.0
MAX.	63.9	46.6
MIN.	31.9	24.0

ENERGY WEST MINING COMPANY EAST MOUNTAIN WEATHER STATION 1999 WATER YEAR				
DATE	TIME	HIGH	LOW	
11/14/98	6:44 PM		32.6	Low
11/15/98	6:47 AM	48.8		High
11/15/98	4:40 PM		33.9	Low
11/16/98	8:25 AM	47.7		High
11/16/98	7:09 PM		32.4	Low
11/17/98	6:12 AM	42.7		High
11/17/98	6:59 PM		23.1	Low
11/18/98	5:34 AM	34.3		High
11/18/98	4:36 PM		20.4	Low
11/19/98	5:33 AM	34.0		High
11/19/98	12:55 PM		18.0	Low
11/20/98	12:30 AM		21.3	Low
11/20/98	7:48 AM	33.5		High
11/21/98	12:25 AM		22.5	Low
11/21/98	6:29 AM	37.5		High
11/22/98	12:49 AM		27.1	Low
11/22/98	6:59 AM	43.2		High
11/23/98	6:10 AM	45.3		High
11/23/98	1:33 PM		33.6	Low
11/24/98	6:04 AM	43.3		High
11/24/98	6:36 PM		31.9	Low
11/25/98	1:16 AM		32.9	Low
11/25/98	7:45 AM	47.6		High
11/26/98	6:48 AM	48.5		High
11/26/98	3:26 PM		34.6	Low
11/27/98	1:42 AM		32.5	Low
11/27/98	6:29 AM	45.3		High
11/28/98	12:32 AM		35.6	Low
11/28/98	6:46 AM	43.4		High
11/29/98	7:18 AM	39.4		High
11/29/98	2:23 PM		30.9	Low
11/30/98	8:27 AM	34.4		High
11/30/98	7:58 PM		-2.3	Low
12/01/98	6:26 AM		26.5	Low
12/01/98	10:12 AM	37.3		High
12/02/98	3:50 AM		29.0	Low
12/02/98	9:49 AM	42.4		High
12/03/98	11:28 AM	42.9		High
12/03/98	7:15 PM		27.9	Low
12/04/98	10:04 AM	37.5		High
12/04/98	7:32 PM		15.9	Low
12/05/98	10:56 AM	18.8		High
12/05/98	5:02 PM		7.5	Low
12/06/98	11:05 AM	17.6		High

	Nov-98	SUMMARY
	HIGH	LOW
AVG.	38.7	24.0
MAX.	52.0	35.6
MIN.	21.8	-2.3

ENERGY WEST MINING COMPANY EAST MOUNTAIN WEATHER STATION 1999 WATER YEAR				
DATE	TIME	HIGH	LOW	
12/06/98	7:16 PM		8.7	Low
12/07/98	5:42 AM		5.5	Low
12/07/98	12:11 PM	17.9		High
12/08/98	3:33 AM		10.2	Low
12/08/98	9:08 AM	19.4		High
12/09/98	3:51 AM		12.7	Low
12/09/98	9:35 AM	21.1		High
12/10/98	2:41 AM		12.0	Low
12/10/98	10:26 AM	29.1		High
12/11/98	3:00 AM		25.4	Low
12/11/98	10:33 AM	44.1		High
12/12/98	10:26 AM	39.6		High
12/12/98	5:54 PM		29.7	Low
12/13/98	8:12 AM	38.5		High
12/13/98	6:32 PM		23.4	Low
12/14/98	12:45 AM		22.1	Low
12/14/98	8:07 AM	36.8		High
12/15/98	1:09 AM		28.9	Low
12/15/98	11:01 AM	42.2		High
12/16/98	2:20 AM		37.4	Low
12/16/98	11:01 AM	47.8		High
12/17/98	3:57 AM		35.8	Low
12/17/98	11:19 AM	48.7		High
12/18/98	1:37 AM	37.1		High
12/18/98	6:25 PM		30.0	Low
12/19/98	8:58 AM	37.1		High
12/19/98	8:13 PM		14.3	Low
12/20/98	8:19 AM	23.0		High
12/20/98	4:15 PM		7.5	Low
12/21/98	5:05 AM		-1.8	Low
12/21/98	12:50 PM	9.8		High
12/22/98	12:01 PM		-3.3	Low
12/22/98	11:16 AM	10.6		High
12/23/98	3:14 AM		5.3	Low
12/23/98	9:35 AM	19.6		High
12/24/98	4:01 AM		13.0	Low
12/24/98	10:33 AM	30.1		High
12/25/98	3:08 AM		18.8	Low
12/25/98	9:46 AM	33.4		High
12/26/98	12:55 AM		24.0	Low
12/26/98	9:07 AM	37.5		High
12/27/98	9:31 AM	32.6		High
12/27/98	3:31 PM		22.0	Low
12/28/98	10:35 AM	39.0		High
12/28/98	7:15 PM		32.6	Low

ENERGY WEST MINING COMPANY
EAST MOUNTAIN WEATHER STATION
1999 WATER YEAR

DATE	TIME	HIGH	LOW	
12/29/98	4:07 AM		30.3	Low
12/29/98	12:01 PM	43.3		High
12/30/98	11:51 AM	42.4		High
12/30/98	5:10 PM		31.2	Low
12/31/98	9:01 AM	34.6		High
12/31/98	6:44 PM		27.6	Low
01/01/99	12:23 PM	37.6		High
01/01/99	5:10 PM		25.7	Low
01/02/99	10:02 AM	31.0		High
01/02/99	5:25 PM		20.1	Low
01/03/99	4:37 AM		16.7	Low
01/03/99	12:53 PM	28.2		High
01/04/99	2:50 AM		17.2	Low
01/04/99	2:04 PM	38.6		High
01/05/99	10:30 AM	39.1		High
01/05/99	4:44 PM		32.9	Low
01/06/99	5:36 AM		31.7	Low
01/06/99	11:50 AM	44.7		High
01/07/99	10:30 AM	40.1		High
01/07/99	9:45 PM		27.3	Low
01/08/99	11:09 AM	29.8		High
01/08/99	4:59 PM		18.7	Low
01/09/99	5:40 AM		20.9	Low
01/09/99	11:08 AM	36.6		High
01/10/99	5:15 AM		27.2	Low
01/10/99	11:06 AM	40.9		High
01/11/99	5:21 AM		30.0	Low
01/11/99	8:22 AM	41.4		High
01/12/99	12:24 PM	35.7		High
01/12/99	7:46 PM		24.9	Low
01/13/99	10:30 AM	38.1		High
01/13/99	5:23 PM		25.5	Low
01/14/99	3:02 AM		27.9	Low
01/14/99	12:06 PM	44.2		High
01/15/99	11:26 AM	38.8		High
01/15/99	10:16 PM		25.0	Low
01/16/99	2:25 AM		23.1	Low
01/16/99	11:03 AM	36.1		High
01/17/99	5:22 AM		27.2	Low
01/17/99	10:40 AM	38.6		High
01/18/99	7:35 AM	42.1		High
01/18/99	9:52 PM		32.4	Low
01/19/99	9:49 AM	42.5		High
01/19/99	10:12 PM		28.6	Low

	Dec-98	SUMMARY
	HIGH	LOW
AVG.	32.6	19.7
MAX.	48.7	37.4
MIN.	9.8	-3.3

ENERGY WEST MINING COMPANY EAST MOUNTAIN WEATHER STATION 1999 WATER YEAR				
DATE	TIME	HIGH	LOW	
01/20/99	10:02 AM	33.6		High
01/20/99	9:56 PM		22.6	Low
01/21/99	8:05 AM	21.8		High
01/21/99	9:00 PM		18.4	Low
01/22/99	4:58 AM		14.2	Low
01/22/99	9:54 AM	30.8		High
01/23/99	2:15 AM		28.2	Low
01/23/99	8:06 AM	37.4		High
01/24/99	2:44 AM		30.8	Low
01/24/99	10:16 AM	36.8		High
01/25/99	3:34 AM		30.9	Low
01/25/99	11:15 AM	38.7		High
01/26/99	5:52 AM		22.1	Low
01/26/99	11:36 AM	32.2		High
01/27/99	5:21 AM		14.9	Low
01/27/99	11:42 AM	27.0		High
01/28/99	6:35 AM		16.8	Low
01/28/99	11:58 AM	31.7		High
01/29/99	5:35 AM		19.7	Low
01/29/99	12:31 PM	34.5		High
01/30/99	11:41 AM	37.9		High
01/30/99	9:37 PM		22.0	Low
01/31/99	11:11 AM	35.6		High
01/31/99	6:51 PM		22.4	Low
02/01/99	10:44 AM	33.6		High
02/01/99	7:31 PM		17.1	Low
02/02/99	4:21 AM		17.7	Low
02/02/99	12:12 PM	35.4		High
02/03/99	10:19 AM	43.6		High
02/03/99	7:20 PM		28.2	Low
02/04/99	9:55 AM	38.5		High
02/04/99	7:12 PM		26.4	Low
02/05/99	9:03 AM	37.1		High
02/05/99	8:42 PM		23.4	Low
02/06/99	2:03 AM		21.9	Low
02/06/99	8:11 AM	35.8		High
02/07/99	3:34 AM		24.9	Low
02/07/99	9:15 AM	37.3		High
02/08/99	6:48 AM	44.2		High
02/08/99	9:33 PM		29.8	Low
02/09/99	2:43 AM		29.3	Low
02/09/99	8:40 AM	45.2		High
02/10/99	1:43 AM	33.2		High
02/10/99	8:42 PM		2.4	Low

	Jan-99	SUMMARY
	HIGH	LOW
AVG.	36.2	24.1
MAX.	44.7	32.9
MIN.	21.8	14.2

ENERGY WEST MINING COMPANY EAST MOUNTAIN WEATHER STATION 1999 WATER YEAR				
DATE	TIME	HIGH	LOW	
02/11/99	6:01 AM		2.4	Low
02/11/99	11:08 AM	21.8		High
02/12/99	2:06 AM		20.4	Low
02/12/99	8:57 AM	33.6		High
02/13/99	3:21 AM		27.1	Low
02/13/99	10:56 AM	40.9		High
02/14/99	2:21 AM		26.0	Low
02/14/99	10:32 AM	40.1		High
02/15/99	2:18 AM		23.6	Low
02/15/99	10:12 AM	39.9		High
02/16/99	3:21 AM		25.5	Low
02/16/99	10:26 AM	38.3		High
02/17/99	6:18 AM	38.9		High
02/17/99	7:17 PM		26.0	Low
02/18/99	2:10 AM		20.7	Low
02/18/99	7:27 AM	35.8		High
02/19/99	7:10 AM	32.6		High
02/19/99	8:16 PM		14.4	Low
02/20/99	4:17 AM		17.3	Low
02/20/99	10:16 AM	35.0		High
02/21/99	11:04 AM	36.4		High
02/21/99	7:59 PM		12.2	Low
02/22/99	2:57 AM		12.0	Low
02/22/99	11:29 AM	34.2		High
02/23/99	2:44 AM		20.0	Low
02/23/99	10:24 AM	39.8		High
02/24/99	2:36 AM		26.6	Low
02/24/99	9:47 AM	46.1		High
02/25/99	11:14 AM	46.9		High
02/25/99	7:04 PM		20.0	Low
02/26/99	2:45 AM		19.8	Low
02/26/99	9:51 AM	34.8		High
02/27/99	1:22 AM		20.9	Low
02/27/99	9:01 AM	41.7		High
02/28/99	12:51 AM		31.1	Low
02/28/99	11:39 AM	50.3		High
03/01/99	8:43 AM	47.0		High
03/01/99	11:06 PM		29.9	Low
03/02/99	3:02 AM		27.0	Low
03/02/99	8:42 AM	45.9		High
03/03/99	2:58 AM		29.6	Low
03/03/99	7:59 AM	47.2		High
03/04/99	8:53 AM	37.7		High
03/04/99	11:59 PM		15.4	Low

	Feb-99	SUMMARY
	HIGH	LOW
AVG.	38.3	21.0
MAX.	50.3	31.1
MIN.	21.8	2.4

ENERGY WEST MINING COMPANY EAST MOUNTAIN WEATHER STATION 1999 WATER YEAR				
DATE	TIME	HIGH	LOW	
03/05/99	5:13 AM		11.5	Low
03/05/99	7:53 AM	28.4		High
03/06/99	3:55 AM		18.2	Low
03/06/99	8:59 AM	40.9		High
03/07/99	6:51 AM	37.9		High
03/07/99	11:27 PM		17.0	Low
03/08/99	3:39 AM		17.8	Low
03/08/99	9:34 AM	39.1		High
03/09/99	5:31 AM	40.1		High
03/09/99	11:58 AM		16.2	Low
03/10/99	4:32 AM		18.2	Low
03/10/99	10:39 AM	39.7		High
03/11/99	7:58 AM	39.0		High
03/11/99	9:15 PM		22.3	Low
03/12/99	7:36 AM	37.4		High
03/12/99	4:47 PM		23.4	Low
03/13/99	3:42 AM		26.2	Low
03/13/99	10:39 AM	48.9		High
03/14/99	3:17 AM		30.1	Low
03/14/99	8:25 AM	50.2		High
03/15/99	2:54 AM		34.1	Low
03/15/99	8:45 AM	51.6		High
03/16/99	2:17 AM		34.1	Low
03/16/99	10:09 AM	53.8		High
03/17/99	2:10 AM		34.2	Low
03/17/99	10:21 AM	55.5		High
03/18/99	2:37 AM		34.6	Low
03/18/99	9:12 AM	55.7		High
03/19/99	2:58 AM		36.6	Low
03/19/99	9:49 AM	57.9		High
03/20/99	8:57 AM	53.5		High
03/20/99	10:59 PM		31.5	Low
03/21/99	3:35 AM		29.1	Low
03/21/99	11:29 AM	52.1		High
03/22/99	2:30 AM		29.9	Low
03/22/99	10:57 AM	50.1		High
03/23/99	2:17 AM		32.7	Low
03/23/99	7:48 AM	47.2		High
03/24/99	2:32 AM		32.2	Low
03/24/99	11:29 AM	54.6		High
03/25/99	3:31 AM		36.4	Low
03/25/99	11:14 AM	55.7		High
03/26/99	10:47 AM	54.4		High
03/26/99	7:34 PM		37.6	Low
03/27/99	9:06 AM	43.9		High

ENERGY WEST MINING COMPANY EAST MOUNTAIN WEATHER STATION 1999 WATER YEAR				
DATE	TIME	HIGH	LOW	
03/27/99	7:57 PM		30.7	Low
03/28/99	2:56 AM		29.3	Low
03/28/99	11:58 AM	42.7		High
03/29/99	3:33 AM		31.1	Low
03/29/99	12:23 PM	56.6		High
03/30/99	3:02 AM		36.0	Low
03/30/99	2:05 PM	58.0		High
03/31/99	10:04 AM	45.3		High
03/31/99	9:23 PM		23.0	Low
		30.0	30.0	
04/01/99	6:44 AM	34.5		High
04/01/99	6:31 PM		11.0	Low
04/02/99	2:02 AM		11.2	Low
04/02/99	8:32 AM	26.3		High
04/03/99	2:53 AM		15.4	Low
04/03/99	6:25 AM	32.6		High
04/04/99	8:39 AM	32.8		High
04/04/99	7:48 PM		16.3	Low
04/05/99	3:34 AM		19.2	Low
04/05/99	7:35 AM	38.0		High
04/06/99	1:16 AM		23.0	Low
04/06/99	10:09 AM	45.5		High
04/07/99	9:45 AM	47.4		High
04/07/99	4:49 PM		21.4	Low
04/08/99	11:12 AM	45.4		High
04/08/99	8:12 PM		25.1	Low
04/09/99	7:57 AM	29.0		High
04/09/99	6:49 PM		12.3	Low
04/10/99	11:24 AM	36.6		High
04/10/99	4:38 PM		22.5	Low
04/11/99	3:55 AM		23.3	Low
04/11/99	9:32 AM	43.3		High
04/12/99	2:06 AM		33.8	Low
04/12/99	12:07 PM	52.7		High
04/13/99	8:59 AM	48.3		High
04/13/99	7:14 PM		30.7	Low
04/14/99	11:03 AM	43.4		High
04/14/99	6:09 PM		24.7	Low
04/15/99	8:49 AM	41.5		High
04/15/99	5:55 PM		24.6	Low
04/16/99	2:47 AM		25.5	Low
04/16/99	8:49 AM	43.8		High
04/17/99	1:45 AM		34.0	Low
04/17/99	12:22 PM	59.2		High
04/18/99	1:38 AM		43.9	Low

	Mar-99	SUMMARY
	HIGH	LOW
AVG.	47.3	27.6
MAX.	58.0	37.6
MIN.	28.4	11.5

ENERGY WEST MINING COMPANY EAST MOUNTAIN WEATHER STATION 1999 WATER YEAR				
DATE	TIME	HIGH	LOW	
04/18/99	10:49 AM	61.3		High
04/19/99	2:59 AM		45.8	Low
04/19/99	12:53 PM	66.0		High
04/20/99	9:05 AM	54.0		High
04/20/99	5:48 PM		31.9	Low
04/21/99	3:38 AM	38.2		High
04/21/99	4:22 PM		28.1	Low
04/22/99	7:41 AM	36.2		High
04/22/99	1:03 PM		30.4	Low
04/23/99	8:08 AM	45.4		High
04/23/99	2:41 PM		32.8	Low
04/24/99	5:06 AM	44.9		High
04/24/99	4:15 PM		27.8	Low
04/25/99	7:47 AM	41.2		High
04/25/99	11:35 AM		34.3	Low
04/26/99	10:24 AM	49.3		High
04/26/99	5:17 PM		39.7	Low
04/27/99	1:54 AM		39.8	Low
04/27/99	7:24 AM	49.9		High
04/28/99	6:42 AM	47.7		High
04/28/99	7:57 PM		32.8	Low
04/29/99	6:51 AM	31.7		High
04/29/99	5:54 PM		28.8	Low
04/30/99	9:38 AM	41.4		High
04/30/99	3:27 PM		30.9	Low
05/01/99	4:03 AM		1.8	Low
05/01/99	9:48 AM	16.9		High
05/02/99	5:43 AM		7.9	Low
05/02/99	12:16 PM	26.9		High
05/03/99	12:45 PM		19.4	Low
05/03/99	7:01 PM	38.5		High
05/04/99	7:24 AM		23.0	Low
05/04/99	3:40 PM	29.9		High
05/05/99	7:16 AM		18.1	Low
05/05/99	7:17 PM	37.9		High
05/06/99	8:19 AM		23.6	Low
05/06/99	7:13 PM	53.8		High
05/07/99	4:30 AM		35.2	Low
05/07/99	7:34 PM	64.1		High
05/08/99	8:25 AM		41.7	Low
05/08/99	4:50 PM	67.5		High
05/09/99	1:37 AM	50.9		High
05/09/99	7:23 PM		35.4	Low
05/10/99	7:04 AM		21.5	Low

	Apr-99	SUMMARY
	HIGH	LOW
AVG.	43.6	27.4
MAX.	66.0	45.8
MIN.	26.3	11.0

ENERGY WEST MINING COMPANY EAST MOUNTAIN WEATHER STATION 1999 WATER YEAR				
DATE	TIME	HIGH	LOW	
05/10/99	4:47 PM	33.2		High
05/11/99	4:56 AM		21.3	Low
05/11/99	5:13 PM	48.8		High
05/12/99	3:55 AM		32.8	Low
05/12/99	6:31 PM	57.9		High
05/13/99	8:54 AM		35.5	Low
05/13/99	6:11 PM	57.3		High
05/14/99	7:55 AM		31.7	Low
05/14/99	6:47 PM	52.4		High
05/15/99	6:10 AM		34.3	Low
05/15/99	4:33 PM	47.9		High
05/16/99	5:40 AM		29.4	Low
05/16/99	2:27 PM	42.0		High
05/17/99	3:43 AM		27.1	Low
05/17/99	4:41 PM	58.4		High
05/18/99	5:19 AM		38.7	Low
05/18/99	6:00 PM	67.4		High
05/19/99	5:52 AM		45.0	Low
05/19/99	3:11 PM	65.8		High
05/20/99	5:03 AM		42.8	Low
05/20/99	6:05 PM	68.5		High
05/21/99	7:44 AM		46.6	Low
05/21/99	7:08 PM	70.5		High
05/22/99	5:55 AM		47.4	Low
05/22/99	8:06 PM	73.5		High
05/23/99	7:02 AM		51.4	Low
05/23/99	4:34 PM	70.3		High
05/24/99	5:47 AM		43.0	Low
05/24/99	6:38 PM	64.3		High
05/25/99	5:46 AM		39.0	Low
05/25/99	4:52 PM	61.1		High
05/26/99	5:44 AM		43.5	Low
05/26/99	2:32 PM	61.0		High
05/27/99	3:55 AM		43.6	Low
05/27/99	2:28 PM	62.3		High
05/28/99	5:02 AM		46.3	Low
05/28/99	3:08 PM	66.4		High
05/29/99	4:27 AM		47.7	Low
05/29/99	2:58 PM	64.1		High
05/30/99	4:36 AM		42.4	Low
05/30/99	4:01 PM	65.4		High
05/31/99	1:03 AM	53.5		High
05/31/99	8:05 AM		38.7	Low
06/01/99	8:08 AM		39.4	Low

	May-99	SUMMARY
	HIGH	LOW
AVG.	54.8	34.1
MAX.	73.5	51.4
MIN.	16.9	1.8

ENERGY WEST MINING COMPANY EAST MOUNTAIN WEATHER STATION 1999 WATER YEAR				
DATE	TIME	HIGH	LOW	
06/01/99	1:45 PM	68.2		High
06/02/99	12:52 AM	49.3		High
06/02/99	4:34 PM		35.6	Low
06/03/99	12:59 AM		34.1	Low
06/03/99	10:26 AM	57.0		High
06/04/99	7:06 AM	51.2		High
06/04/99	8:42 PM		25.7	Low
06/05/99	2:36 AM		23.3	Low
06/05/99	12:27 PM	43.9		High
06/06/99	3:41 AM		37.9	Low
06/06/99	10:30 AM	55.0		High
06/07/99	1:41 AM		42.0	Low
06/07/99	1:23 PM	66.5		High
06/08/99	2:31 AM		43.0	Low
06/08/99	1:27 PM	67.9		High
06/09/99	2:36 AM		40.4	Low
06/09/99	10:59 AM	63.5		High
06/10/99	1:38 PM	61.0		High
06/10/99	7:08 PM		42.5	Low
06/11/99	2:10 AM		40.1	Low
06/11/99	10:44 AM	63.5		High
06/12/99	12:22 AM		48.7	Low
06/12/99	11:35 AM	69.5		High
06/13/99	12:52 AM		50.3	Low
06/13/99	12:23 PM	75.2		High
06/14/99	2:20 AM		53.8	Low
06/14/99	11:30 AM	74.2		High
06/15/99	4:10 AM		52.0	Low
06/15/99	12:47 PM	77.4		High
06/16/99	1:38 AM		52.9	Low
06/16/99	8:43 AM	71.5		High
06/17/99	4:07 AM		47.6	Low
06/17/99	11:42 AM	61.1		High
06/18/99	3:33 AM		49.3	Low
06/18/99	12:40 PM	72.1		High
06/19/99	1:56 AM		55.7	Low
06/19/99	12:59 PM	77.7		High
06/20/99	5:28 AM		55.8	Low
06/20/99	10:57 AM	78.2		High
06/21/99	8:13 AM	69.4		High
06/21/99	3:52 PM		50.8	Low
06/22/99	2:03 AM		49.7	Low
06/22/99	10:47 AM	73.9		High
06/23/99	3:32 AM		51.6	Low
06/23/99	11:01 AM	73.8		High

ENERGY WEST MINING COMPANY EAST MOUNTAIN WEATHER STATION 1999 WATER YEAR				
DATE	TIME	HIGH	LOW	
06/24/99	3:23 AM		57.1	Low
06/24/99	3:05 PM	80.8		High
06/25/99	3:48 AM		59.6	Low
06/25/99	1:13 PM	78.5		High
06/26/99	2:33 AM		57.3	Low
06/26/99	1:08 PM	77.2		High
06/27/99	4:13 AM		54.9	Low
06/27/99	2:05 PM	75.0		High
06/28/99	3:10 AM		56.1	Low
06/28/99	1:43 PM	77.6		High
06/29/99	4:03 AM		55.2	Low
06/29/99	1:58 PM	72.1		High
06/30/99	4:01 AM		54.2	Low
06/30/99	1:35 PM	73.6		High
07/01/99	3:43 AM		60.6	Low
07/01/99	10:41 AM	83.3		High
07/02/99	8:14 AM	83.1		High
07/02/99	6:36 PM		61.9	Low
07/03/99	8:47 AM	84.6		High
07/03/99	8:03 PM		57.2	Low
07/04/99	1:44 AM		54.0	Low
07/04/99	10:55 AM	81.9		High
07/05/99	2:01 AM		58.7	Low
07/05/99	10:39 AM	84.3		High
07/06/99	11:54 AM	86.8		High
07/06/99	4:50 PM		56.2	Low
07/07/99	8:10 AM	75.6		High
07/07/99	7:38 PM		54.3	Low
07/08/99	8:17 AM	69.2		High
07/08/99	7:48 PM		54.2	Low
07/09/99	2:19 AM		55.1	Low
07/09/99	10:39 AM	75.7		High
07/10/99	2:04 AM		57.0	Low
07/10/99	11:16 AM	80.1		High
07/11/99	10:09 AM	76.3		High
07/11/99	8:42 PM		55.3	Low
07/12/99	2:09 AM		54.1	Low
07/12/99	10:12 AM	80.9		High
07/13/99	8:24 AM	80.1		High
07/13/99	7:40 PM		55.4	Low
07/14/99	3:56 AM	62.3		High
07/14/99	3:49 PM		48.6	Low
07/15/99	9:43 AM	70.8		High
07/15/99	2:34 PM		53.2	Low

	Jun-99	SUMMARY
	HIGH	LOW
AVG.	68.5	47.2
MAX.	80.8	59.6
MIN.	43.9	23.3

ENERGY WEST MINING COMPANY EAST MOUNTAIN WEATHER STATION 1999 WATER YEAR				
DATE	TIME	HIGH	LOW	
07/16/99	8:35 AM	69.7		High
07/16/99	5:45 PM		50.7	Low
07/17/99	10:13 AM	71.1		High
07/17/99	2:59 PM		55.8	Low
07/18/99	9:36 AM	75.0		High
07/18/99	6:46 PM		52.7	Low
07/19/99	5:09 AM	67.9		High
07/19/99	1:40 PM		50.6	Low
07/20/99	10:06 AM	74.3		High
07/20/99	5:00 PM		55.9	Low
07/21/99	5:30 AM	72.5		High
07/21/99	4:20 PM		51.2	Low
07/22/99	9:25 AM	75.0		High
07/22/99	6:17 PM		59.5	Low
07/23/99	10:07 AM	81.7		High
07/23/99	7:32 PM		60.1	Low
07/24/99	5:54 AM	76.8		High
07/24/99	7:37 PM		55.8	Low
07/25/99	10:30 AM	78.0		High
07/25/99	2:15 PM		60.9	Low
07/26/99	8:59 AM	73.2		High
07/26/99	10:48 AM		58.3	Low
07/27/99	8:00 AM	79.0		High
07/27/99	5:05 PM		54.7	Low
07/28/99	10:37 AM	79.9		High
07/28/99	7:23 PM		56.9	Low
07/29/99	6:34 AM	74.0		High
07/29/99	5:13 PM		52.7	Low
07/30/99	6:34 AM	61.3		High
07/30/99	2:50 PM		50.6	Low
07/31/99	6:25 AM	64.7		High
07/31/99	1:39 PM		50.7	Low
08/01/99	9:47 AM	74.6		High
08/01/99	3:35 PM		57.9	Low
08/02/99	3:14 PM	79.7		High
08/02/99	10:36 PM		60.8	Low
08/03/99	1:17 PM	65.7		High
08/03/99	8:47 PM		52.6	Low
08/04/99	3:49 AM		49.4	Low
08/04/99	3:48 PM	69.0		High
08/05/99	1:02 PM	63.3		High
08/05/99	7:04 PM		49.9	Low
08/06/99	3:33 AM		47.5	Low
08/06/99	2:00 PM	67.2		High

	Jul-99	SUMMARY
	HIGH	LOW
AVG.	75.8	55.3
MAX.	86.8	61.9
MIN.	61.3	48.6

ENERGY WEST MINING COMPANY EAST MOUNTAIN WEATHER STATION 1999 WATER YEAR				
DATE	TIME	HIGH	LOW	
08/07/99	2:52 AM		50.9	Low
08/07/99	12:37 PM	71.5		High
08/08/99	5:00 AM		55.9	Low
08/08/99	12:01 PM	73.9		High
08/09/99	5:38 AM		53.0	Low
08/09/99	3:34 PM	74.9		High
08/10/99	10:48 AM	64.7		High
08/10/99	6:37 PM		47.5	Low
08/11/99	2:25 AM		45.7	Low
08/11/99	2:06 PM	65.4		High
08/12/99	3:56 AM		51.0	Low
08/12/99	2:43 PM	68.1		High
08/13/99	2:54 AM		52.1	Low
08/13/99	3:52 PM	76.6		High
08/14/99	12:02 PM	73.6		High
08/14/99	7:35 PM		51.4	Low
08/15/99	12:34 AM		49.9	Low
08/15/99	2:45 PM	74.3		High
08/16/99	4:02 AM		51.3	Low
08/16/99	1:05 PM	70.8		High
08/17/99	4:02 AM		52.3	Low
08/17/99	1:37 PM	74.7		High
08/18/99	2:12 AM		55.2	Low
08/18/99	4:09 PM	77.7		High
08/19/99	3:01 AM		54.0	Low
08/19/99	10:24 AM	70.5		High
08/20/99	4:07 AM		52.3	Low
08/20/99	10:33 AM	67.2		High
08/21/99	2:43 AM		51.3	Low
08/21/99	1:04 PM	63.5		High
08/22/99	3:12 AM		53.0	Low
08/22/99	11:46 AM	73.1		High
08/23/99	4:26 AM		57.1	Low
08/23/99	1:06 PM	76.9		High
08/24/99	1:55 PM	70.6		High
08/24/99	3:45 PM		55.9	Low
08/25/99	9:11 AM	68.8		High
08/25/99	2:42 PM		54.5	Low
08/26/99	3:23 AM		55.5	Low
08/26/99	12:21 PM	74.4		High
08/27/99	11:46 AM	70.3		High
08/27/99	7:33 PM		51.2	Low
08/28/99	2:52 AM		49.4	Low
08/28/99	1:47 PM	66.8		High
08/29/99	2:41 AM		54.8	Low

ENERGY WEST MINING COMPANY
EAST MOUNTAIN WEATHER STATION
1999 WATER YEAR

DATE	TIME	HIGH	LOW	
08/29/99	3:05 PM	74.5		High
08/30/99	9:14 AM	68.3		High
08/30/99	7:02 PM		51.4	Low
08/31/99	4:05 AM		50.7	Low
08/31/99	1:06 PM	66.6		High
09/01/99	11:18 AM	63.8		High
09/01/99	9:09 PM		46.3	Low
09/02/99	4:03 AM		43.9	Low
09/02/99	9:34 AM	56.7		High
09/03/99	2:13 AM		44.7	Low
09/03/99	7:18 AM	60.1		High
09/04/99	2:00 AM		34.2	Low
09/04/99	10:54 AM	60.5		High
09/05/99	2:06 AM		42.1	Low
09/05/99	10:11 AM	68.8		High
09/06/99	1:48 AM		50.8	Low
09/06/99	9:40 AM	71.5		High
09/07/99	10:47 AM	69.1		High
09/07/99	8:45 PM		53.0	Low
09/08/99	1:42 AM		49.5	Low
09/08/99	9:56 AM	73.5		High
09/09/99	9:38 AM	68.8		High
09/09/99	8:06 PM		52.2	Low
09/10/99	8:33 AM	70.5		High
09/10/99	6:39 PM		43.5	Low
09/11/99	6:34 AM	62.8		High
09/11/99	5:39 PM		45.6	Low
09/12/99	8:15 AM	67.6		High
09/12/99	7:56 PM		49.0	Low
09/13/99	1:13 AM		49.0	Low
09/13/99	10:07 AM	71.5		High
09/14/99	7:08 AM	64.5		High
09/14/99	6:36 PM		41.7	Low
09/15/99	7:19 AM	60.0		High
09/15/99	6:26 PM		42.3	Low
09/16/99	5:15 AM	59.5		High
09/16/99	7:06 PM		40.8	Low
09/17/99	6:24 AM	62.1		High
09/17/99	5:14 PM		46.9	Low
09/18/99	4:40 AM	64.3		High
09/18/99	4:34 PM		46.7	Low
09/19/99	5:43 AM	56.5		High
09/19/99	1:42 PM		38.2	Low
09/20/99	5:35 AM	56.7		High

	Aug-99	SUMMARY
	HIGH	LOW
AVG.	70.9	52.4
MAX.	79.7	60.8
MIN.	63.3	45.7

ENERGY WEST MINING COMPANY EAST MOUNTAIN WEATHER STATION 1999 WATER YEAR				
DATE	TIME	HIGH	LOW	
09/20/99	3:44 PM		40.1	Low
09/21/99	6:41 AM	60.4		High
09/21/99	4:59 PM		45.3	Low
09/22/99	6:25 AM	63.9		High
09/22/99	3:42 PM		45.2	Low
09/23/99	6:59 AM	63.4		High
09/23/99	1:25 PM		44.5	Low
09/24/99	6:43 AM	64.4		High
09/24/99	5:41 PM		49.4	Low
09/25/99	7:54 AM	67.6		High
09/25/99	6:06 PM		53.5	Low
09/26/99	4:24 AM	57.4		High
09/26/99	3:53 PM		39.0	Low
09/27/99	8:29 AM	43.7		High
09/27/99	5:40 PM		24.2	Low
09/28/99	10:21 AM	44.0		High
09/28/99	4:36 PM		27.7	Low
09/29/99	1:38 AM		31.7	Low
09/29/99	8:25 AM	53.4		High
09/30/99	3:14 AM		42.6	Low
09/30/99	10:15 AM	61.0		High

	Sep-99	SUMMARY
	HIGH	LOW
AVG.	62.3	43.4
MAX.	73.5	53.5
MIN.	43.7	24.2

APPENDIX N

1999

PACIFICORP
ENERGY WEST
HYDROLOGIC MONITORING PROGRAM
DEER CREEK, WILBERG/COTTONWOOD, DES-BEE-DOVE and TRAIL MOUNTAIN MINES

I. MONITORING LOCATIONS

A. **Surface Water Hydrology** (see Map HM-1 for East Mountain / Map 7-1 and 7-2 for Trail Mountain locations listed below)

1. **Cottonwood Creek Drainage System**

a. Cottonwood Canyon Creek

(1) SW-1 - Above Trail Mtn. Mine
(Approximately 5000 feet upstream from the inlet culvert for the disturbed area.) 2150 feet South, 2000 feet East of the Northwest corner of Section 24, Township 17 South, Range 6 East.

(2) SW-2 - Below Trail Mtn. Mine
(Approximately 200 feet downstream from the outlet culvert for the disturbed area.) 1300 feet South, 1750 feet West of the Northeast corner of Section 25, Township 17 South, Range 6 East.

(3) CCC01 - USGS Flume:
(Approximately 7800 feet downstream from the outlet culvert for the disturbed area.)1500 feet North, 200 feet East of the Southwest corner of Section 31, Township 17 South, Range 7 East.

(4) SW-3 - Below Trail Mtn. Mine
(Approximately 3800 feet above confluence with Straight Canyon) 2400 feet South, 2400 feet East of the Northeast corner of Section 6, Township 18 South, Range 6 East.

b. Unnamed Drainage off Straight Canyon

(1) T-19
(Approximately 200 feet upstream from the from confluence with Straight Canyon) 2500 feet South, 1100 feet East of the Northeast corner of Section 3, Township 18 South, Range 6 East

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(1) GWR01 - Right Fork:
(Approximately 1500 feet upstream from the inlet culvert for the disturbed area.) 550 feet North, 1500 feet West of the Southwest corner of Section 22, Township 17 South, Range 7 East.

(2) GWR02 - Left Fork:
(Approximately 50 feet upstream from the inlet culvert for the disturbed area.) 200 feet South, 2350 feet East of the Northwest corner of Section 27, Township 17 South, Range 7 East.

(3) GWR03 - Below the mine:
(Approximately 500 feet downstream from the outlet culvert below the disturbed area.) 1770 feet South, 1820 feet West of the Northeast corner of Section 27, Township 17 South, Range 7 East.

2. Huntington Creek Drainage System

a. Huntington Creek

(1) HCC01 - Above Deer Creek Confluence:
1400 feet north, 2200 feet west of the southeast corner of Section 36, Township 16 South, Range 7 East.

(2) HCC02 - Below Deer Creek Confluence:
300 feet north, 300 feet west of the southwest corner of Section 31, Township 16 South, Range 8 East.

(3) HCC03 - Below Huntington Power Plant:
2500 feet north, 1500 feet east of the southeast corner of Section 6, Township 17 South, Range 8 East.

(4) HCC04 - @ Research Farm*
800 feet north, 200 feet east of the southwest corner of Section 5, Township 17 South, Range 8 East.

* Not listed on map due to scale.

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b. Deer Creek

(1) DCR01 - Above the mine:
(Approximately 600 feet upstream from the mine facility.) 200 feet North, 800 feet West of the Southeast corner of Section 10, Township 17 South, Range 7 East.

(2) DCR04 - Near C1/C2 Belt Intersection:
(Approximately 5,000 feet downstream from the mine facility.) 300 feet North, 2000 feet East of the Southeast corner of Section 2, Township 17 South, Range 7 East.

(3) DCR06 - @ Huntington Creek Confluence:
(Approximately 15,000 feet downstream from the facility) 1400 feet north, 1100 feet east of the southeast corner of Section 36, Township 16 South, Range 7 East.

c. Meetinghouse Canyon - South Fork:
(Approximately 200 feet upstream from the north and south convergence.) 800 feet North, 1500 feet East of the Southwest corner of Section 35, Township 16 South, Range 7 East.

d. Rilda Canyon:

(1) RCF-1 - Rilda Canyon - Right Fork:
(Approximately 4000 feet upstream from the Right and Left fork convergence.) 400 feet South, 200 feet West of the Northeast corner of Section 30, Township 16 South, Range 7 East.

(2) RCLF1 - Rilda Canyon - Left Fork, below Rilda Canyon Portals: (Approximately 200 feet upstream from the Right and Left fork convergence.) 2400 feet North, 2100 feet West of the Southeast corner of Section 29, Township 16 South, Range 7 East.

(3) RCLF2 - Rilda Canyon - Left Fork, above Rilda Canyon Portals: (Approximately 1600 feet upstream from the Right and Left fork convergence.) 1600 feet North, 2300 feet West of the Southwest corner of Section 29, Township 16 South, Range 7 East.

(4) RCF2 - Rilda Canyon - Above NEWUA springs: 2500 feet South, 400 feet West of the Northeast corner of Section 29, Township 16 South, Range 7 East.

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(5) RCF3 - Rilda Canyon - Below NEWUA springs: 2550 feet South, 1000 feet East of the Northeast corner of Section 28, Township 16 South, Range 7 East.

(6) RCW4 - Rilda Canyon: (Approximately 1000 feet upstream from the confluence with Huntington Creek.) 850 feet North, 1900 feet West of the Southeast corner of Section 26, Township 16 South, Range 7 East.

e. Mill Fork Canyon:

(1) MFA01 - Mill Fork Canyon - Above Old Mine: (Approximately 2000 feet above old mine portals @ end of USFS development road.) 100 feet North, 1500 feet West of the Southeast corner of Section 17, Township 16 South, Range 7 East.

(2) MFB02 - Mill Fork Canyon - Above Huntington Creek Confluence: (Approximately 200 feet above confluence with Huntington Creek @ culvert outfall.) 100 feet South, 1900 feet East of the Northwest corner of Section 22, Township 16 South, Range 7 East.

3. Reclamation Monitoring: Following stage 1 final reclamation backfilling and grading monitoring will be conducted at points immediately above and below the last sediment pond(s).

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B. Groundwater Hydrology

1. East Mountain Springs (see maps HM-4 and HM-5)

Burnt Tree *	80-41
Elk Spring *	80-43
Sheba Springs *	80-44*
Ted's Tub	80-46*
79-2	80-47
79-10 *	80-48
79-15	80-50
79-23 *	82-51
79-24	82-52*
79-26 *	84-56*
79-28 (Flag Lake)	89-60(Alpine Spring)
79-29 *	89-61
79-32	89-65
79-34	89-66
79-35 *	89-67
79-38	89-68
79-40	Rilda Canyon-(Meters 2&3)

* Recession Study Springs (Flow August & September)

2. Trail Mountain Springs (see Trail Mountain Spring Map 7-1)

T-6
T-8
T-9
T-10
T-14
T-15
T-16

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3. **Piezometric Data**
   a. Surface
      (1) Rilda Canyon (see Map HM-1 for locations)
         P1
         P5
         P6
         P7
         EM-47
      (2) Cottonwood Canyon Creek (see Map HM-1 for locations)
         EM-31
         CCCW-1A
         CCCW-1S
         CCCW-2A
         CCCW-3A
         CCCW-3S U
         CCCW-3S L
         TM-1B
         TM-3
   b. Underground: In-Mine
      (1) Deer Creek Mine (Refer to Annual Hydrologic Reports for Locations : HM-2)
4. **In-Mine Water Locations**
   a. Deer Creek Mine (Refer to Annual Hydrologic Reports for Locations : HM-2)
   b. Wilberg/Cottonwood Mines (Refer to Annual Hydrologic Reports for Locations : HM-3)
   c. Trail Mountain Mine (Refer to Annual Hydrologic Reports for Locations : PLATE 7-3)
5. **Waste Rock Wells** (see Map HM-1 for locations)
   a. Deer Creek
   b. Cottonwood

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6. UPDES Monitoring Locations

a. Deer Creek Mine
UPDES UT0023604
001- Sediment Pond
002- Mine Discharge

b. Des-Bee-Dove Mines
UPDES UTG040022
001- Sediment Pond

c. Wilberg/Cottonwood Mines
UPDES UT0022896
001- Mine Discharge @ Grimes Wash
002- Sediment Pond Discharge @ Cottonwood Canyon
003- Sediment Pond @ Mine Facilities
004- Mine Discharge @ Miller Canyon
005- Sediiment Pond Discharge @ Waste Rock Site

d. Trail Mountain Mine
UPDES UT0023728
001- Sediment Pond
002- Mine Discharge

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II. MONITORING SCHEDULE (see attached monitoring table)

A. Field Measurements

Field Measurements collected during quality sampling: Listed below are the sites which will be monitored by PacifiCorp - Energy West in accordance with the guidelines established by DOGM; i.e.,

- Date and Time
- Flow
- pH
- Temperature
- Conductivity
- Dissolved oxygen (perennial streams only)

Surface Monitoring

Surface monitoring locations will be field monitored quarterly for all field parameters.

1. **Cottonwood Canyon Creek**
   - a. (1) SW-1
     (2) SW-2
     (3) Cottonwood Canyon Creek - USGS Flume
     (4) SW-3
   - b. Grimes Wash
     (1) GWR01
     (2) GWR02
     (3) GWR03
   - c. Straight Canyon
     (1) T-18 (Oliphant Mine Discharge)
     (2) T-19 (Unnamed Side Drainage)
2. **Huntington Canyon Drainage**
   - a. Deer Creek
     (1) DCR01
     (2) DCR04
     (3) DCR06

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b. Huntington Creek
   (1) HCC01
   (2) HCC02
   (3) HCC04

   Flow in Huntington Creek is measured only at HCC01 by Utah Power , and will be reported in the Annual Hydrologic Report.

c. Meetinghouse Canyon - South Fork

d. Rilda Canyon
   (1) RCF1*
   (2) RCLF 1
   (3) RCLF 2
   (4) RCF2
   (5) RCF3
   (6) RCW4

   * Baseline flow will be measured adjacent to EM-163

e. Mill Fork Canyon
   (1) MFA01
   (2) MFB02

Groundwater Monitoring

1. East Mountain Springs (see monitoring location list)
2. Trail Mountain Springs (see monitoring location list)

   East/Trail Mountain Springs will be field monitored during the months of July and October. In addition, the East Mountain Recession Study Springs (denoted by asterisks in the Monitoring Location section) and Trail Mountain Springs will be field monitored for flow only from July through October. Rilda Canyon Springs - NEWUA (meters 2 & 3) will be field monitored monthly depending upon access.
3. In-Mine
   a. Deer Creek
   b. Wilberg/Cottonwood
   c. Trail Mountain

   In-mine locations will be field monitored quarterly for all field parameters except pH, conductivity, and dissolved oxygen.

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4. Piezometric Wells
   a. Surface
   Piezometric surface wells will be field monitored for level only on a monthly basis depending upon access.
   (1) Rilda Canyon (see Map HM-1 for locations)
      P1
      P5
      P6
      P7
      EM-47
   (2) Cottonwood Canyon Creek (see Map HM-1 for locations)
      EM-31
      CCCW-1A
      CCCW-1S
      CCCW-2A
      CCCW-3A
      CCCW-3S U
      CCCW-3S L
      TM-1B
      TM-3

5. Waste Rock Wells
   a. Deer Creek
   b. Cottonwood

UPDES Monitoring

1. Deer Creek
2. Des-Bee-Dove
3. Wilberg/Cottonwood
4. Trail Mountain

UPDES sites will be monitored as speicfied in the individual permits.

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B. Quality Sampling (Laboratory Measurements)

1. **Surface Water Hydrology:** 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 Quality (see Table #1). Quarterly sampling was initiated during March 1988 and will continue throughout the year; i.e., June, September, and December. Baseline analysis was performed in 1996 and will be repeated every five years thereafter.

   a. **Cottonwood Creek Drainage**
      - (1)Cottonwood Canyon Creek
        - (a) SW-1
        - (b) SW-2
        - (c) SW-3
      - (2)Grimes Wash
        - (a)GWR01
        - (b)GWR02
        - (c)GWR03
      - (3) Straight Canyon
        - (a) T-18
        - (b) T-19

   b. **Huntington Creek Drainage**
      - (1) Deer Creek
        - (a) DCR01
        - (b) DCR04
        - (c) DCR06
      - (2) Huntington Creek
        - (a) HCC01
        - (b) HCC02
        - (c) HCC04
      - (3) Meetinghouse Canyon - South Fork: MCH01
      - (4) Rilda Canyon
        - (a) RCF1
        - (b) RCF3
        - (c) RCW4

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(5) Mill Fork Canyon*
(a) MFA01
(b) MFB02
* Mill Fork Canyon Baseline Sampling Will Be Conducted From 4th Quarter 1998 Through 4th Quarter 2000

2. Groundwater Hydrology

a. East/Trail Mountain Springs: Water samples will be collected and analyzed during the months of July and October. Rilda Canyon Springs (NEWUA: Meters 2 & 3) monitored for quality quarterly. Parameters analyzed are those listed in the DOGM Guidelines for Groundwater Water Quality (see Table #2).

b. In-Mine: Two water samples will be collected and analyzed per mine quarterly. Parameters analyzed are those listed in the DOGM Guidelines for Groundwater Water Quality (see Table #2).

c. Wells: TM-1B will be sampled quarterly. Parameters analyzed are those listed in the DOGM Guidelines for Groundwater Water Quality (see Table #2).

d. Waste Rock Wells: One water sample will be collected and analyzed per location quarterly. Parameters analyzed are those listed in the DOGM Guidelines for Groundwater Water Quality (see Table #2).

Baseline analysis was performed in 1996 and will be repeated every five years thereafter.

3. UPDES Monitoring Sites

a. Deer Creek Mine
b. Des-Bee-Dove Mines
c. Wilberg/Cottonwood Mines
d. Trail Mountain Mine

UPDES sites will be monitored as speicfied in the individual permits.

III. ANNUAL REPORTS

All data collected regarding the hydrology of East/Trail Mountain will be summarized by the applicant in an annual Hydrologic Monitoring Report. Copies of the report will be submitted to the OSM; U.S. Forest Service; and the Utah State Division of Oil, Gas and Mining. In addition, any raw data collected will be submitted to the Utah State Division of Oil, Gas and Mining on a quarterly basis.

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TABLE 1
SURFACE WATER (UPDES Monitoring) BASELINE, OPERATIONAL, POSTMINING WATER QUALITY PARAMETER LIST

Field Measurements:

*	-	Water Level or Flow
*	-	pH
*	-	Specific Conductivity (umhos/cm)
*	-	Dissolved Oxygen (ppm) (Perennial Streams Only)
*	-	Temperature

Laboratory Measurements: (mg/l)

#	*	-	Total Settleable Solids (UPDES Only)
#	*	-	Total Suspended Solids
	*	-	Total Dissolved Solids
	*	-	Total Hardness ($CaCO_3$)
		-	Acidity ($CaCO_3$)
		-	Aluminum (Al) - Dissolved
		-	Arsenic (As) - Dissolved
		-	Boron (B) - Dissolved (Waste Rock Sites Only)
	*	-	Carbonate (CO_3^{-2})
	*	-	Bicarbonate (HCO_3^-)
		-	Cadmium (Cd) - Dissolved
	*	-	Calcium (Ca) - Dissolved
	*	-	Chloride (Cl^-)
		-	Copper (Cu) - Dissolved
	*	-	Iron (Fe) - Total & Dissolved
		-	Lead (Pb) - Dissolved
	*	-	Magnesium (Mg) - Dissolved
	*	-	Manganese (Mn) - Total & Dissolved
		-	Molybdenum (Mo) - Dissolved
		-	Nitrogen: Ammonia (NH_3) - reported as N
		-	Nitrite (NO_2) - reported as N
		-	Nitrate (NO_3^-) - reported as N
	*	-	Potassium (K) - Dissolved
	*	-	Oil & Grease (UPDES & Above & Below Mine Sites Only)
		-	Ortho Phosphate (PO_4^{-3}) - reported as P
		-	Selenium (Se) - Dissolved (Waste Rock Sites Only)
	*	-	Sodium (Na) - Dissolved
	*	-	Sulfate (SO_4^{-2})
		-	Zinc (Zn) - Dissolved
	*	-	Cation-Anion Balance

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TABLE 2
GROUND WATER BASELINE, OPERATIONAL, POSTMINING WATER QUALITY PARAMETER LIST

Field Measurements:

*	-	Water Level or Flow
*	-	pH
*	-	Specific Conductivity (umhos/cm)
*	-	Temperature

Laboratory Measurements: (mg/l)

*	-	Total Dissolved Solids
*	-	Total Hardness ($CaCO_3$)
	-	Acidity ($CaCO_3$)
	-	Aluminum (Al) - Dissolved
	-	Arsenic (As) - Dissolved
	-	Boron (B) - Dissolved (Waste Rock Sites Only)
*	-	Carbonate (CO_3^{-2})
*	-	Bicarbonate (HCO_3^-)
	-	Cadmium (Cd) - Dissolved
*	-	Calcium (Ca) - Dissolved
*	-	Chloride (Cl^-)
	-	Copper (Cu) - Dissolved
*	-	Iron (Fe) - Total & Dissolved
	-	Lead (Pb) - Dissolved
*	-	Magnesium (Mg) - Dissolved
*	-	Manganese (Mn) - Total & Dissolved
	-	Molybdenum (Mo) - Dissolved
	-	Nitrogen: Ammonia (NH_3) - reported as N
	-	Nitrite (NO_2) - reported as N
	-	Nitrate (NO_3^-) - reported as N
*	-	Potassium (K) - Dissolved
	-	Ortho Phosphate (PO_4^{-3}) reported as P
	-	Selenium (Se) - Dissolved (Waste Rock Sites Only)
*	-	Sodium (Na) - Dissolved
*	-	Sulfate (SO_4^{-2})
	-	Zinc (Zn) - Dissolved
*	-	Cation-Anion Balance

* Operational - Baseline

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WATER SAMPLE DOCUMENTATION

The following information will be included on the lab sheets:

1. Sample time and date
2. Individual taking sample
3. Field parameters (except in-mine)
   - Temperature
   - Flow
   - pH (units)
   - Conductivity (umhos/cm)
   - Dissolved Oxygen (PPM), depending on location
4. Precipitation date if applicable
5. Date and time each parameter is analyzed at the lab

ANALYTICAL METHOD AND DETECTION LIMIT

Parameter	MRL	UNITS	Method
Acidity	10	mg/l $CaCO_3$	D1067-92
Alkalinity, Bicarbonate	5	mg/l HCO_3^-	SM2320-B
Alkalinity, Carbonate	5	mg/l CO_3^{-2}	SM2320-B
Alkalinity, Total	5	mg/l $CaCO_3$	EPA 310.1
Aluminum	1	mg/l	EPA 202.1
Anions	----	meq/l	----------
Arsenic	.01	mg/l	EPA 206.2
Barium	1	mg/l	EPA 208.1
Boron	.1	mg/l	EPA 212.3
Cadmium	.01	mg/l	EPA 213.1
Calcium	1	mg/l	EPA 215.1
Cations	----	meq/l	----------
Chloride	1	mg/l	SM4500 C1-B
Chromium	0.1	mg/l	EPA 218.1
Conductivity	1	umhos/cm	SM2510-B
Copper	0.1	mg/l	EPA 220.1
Fluoride	0.1	mg/l	SM4500 F-C
Hardness, Total	----	mg/l $CaCO_3$	SM2340-B
Iron	0.1	mg/l	EPA 236.1
Iron, Dissolved	0.1	mg/l	EPA 236.1
Lead	0.1	mg/l	EPA 239.1
Magnesium	1	mg/l	EPA 242.1
Manganese	0.1	mg/l	EPA 243.1
Mercury	.0002	mg/l	EPA 245.1
Nickel	0.1	mg/l	EPA 249.1
Nitrogen, Ammonia	0.5	mg/l	EPA 350.3
Nitrogen, Nitrate	0.1	mg/l	EPA 353.3
Nitrogen, Nitrite	0.01	mg/l	EPA 354.1
Oil & Grease	2	mg/l	SM5520-B
Oxygen, Dissolved	----	mg/l	EPA 360.1
pH	----	Units	EPA 150.1
Phosphorus, Total	.05	mg/l	SM4500- P-E
Potassium	1	mg/l	EPA 258.1
Selenium	.01	mg/l	EPA 270.2
Sodium	1	mg/l	EPA 273.1
Solids, Settleable	.5	ml/l	EPA 160.5
Solids, Total Dissolved	10	mg/l	EPA 160.1
Solids, Total Suspended	5	mg/l	EPA 160.2
Sulfate	5	mg/l	EPA 375.4
Sulfide	1	mg/l	EPA 376.1
Turbidity	.1	NTU	EPA 180.1
Zinc	.01	mg/l	EPA 289.1

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DEER CREEK/COTTONWOOD-WILBERG/DES-BEE-DOVE/TRAIL MOUNTAIN MINES

SURFACE HYDROLOGY - OPERATIONAL SAMPLING (Table 1)

Drainage System	Drainage	Location	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Cottonwood Creek Drainage System	*Cottonwood Canyon Creek*	SW1	Flow	Flow	Operational	Flow	Flow	Operational	Flow	Flow	Operational	Flow	Flow	Operational
		SW2	Flow	Flow	Operational	Flow	Flow	Operational	Flow	Flow	Operational	Flow	Flow	Operational
		CCC01	Flow	Flow	Field	Flow	Flow	Field	Flow	Flow	Field	Flow	Flow	Field
		SW3	Flow	Flow	Operational	Flow	Flow	Operational	Flow	Flow	Operational	Flow	Flow	Operational
	Grimes Wash	GWR01	Flow	Flow	Operational	Flow	Flow	Operational	Flow	Flow	Operational	Flow	Flow	Operational
		GWR02	Flow	Flow	Operational	Flow	Flow	Operational	Flow	Flow	Operational	Flow	Flow	Operational
		GWR03	Flow	Flow	Operational	Flow	Flow	Operational	Flow	Flow	Operational	Flow	Flow	Operational
	Straight Canyon	T-19	Flow	Flow	Operational	Flow	Flow	Operational	Flow	Flow	Operational	Flow	Flow	Operational
Huntington Drainage System	*Deer Creek*	DCR01	Flow	Flow	Operational	Flow	Flow	Operational	Flow	Flow	Operational	Flow	Flow	Operational
		DCR04	Flow	Flow	Operational	Flow	Flow	Operational	Flow	Flow	Operational	Flow	Flow	Operational
		DCR06	Flow	Flow	Operational	Flow	Flow	Operational	Flow	Flow	Operational	Flow	Flow	Operational
	Huntington Creek	HCC01	Flow *	Flow *	Operational*	Flow *	Flow *	Operational*	Flow *	Flow *	Operational*	Flow *	Flow *	Operational*
		HCC02			Operational*			Operational*			Operational*			Operational*
		HCC04			Operational*			Operational*			Operational*			Operational*
		* Flow in Huntington Creek is measured @ HCC01 by Utah Power, and will be reported in the Annual Hydrologic Report												
	Meetinghouse Canyon	MCH01	Flow	Flow	Operational	Flow	Flow	Operational	Flow	Flow	Operational	Flow	Flow	Operational
	Rilda Canyon	RCF1*	Flow	Flow	Operational	Flow	Flow	Operational	Flow	Flow	Operational	Flow	Flow	Operational
		RCLF1	Flow	Flow	Field	Flow	Flow	Field	Flow	Flow	Field	Flow	Flow	Field
		RCLF2	Flow	Flow	Field	Flow	Flow	Field	Flow	Flow	Field	Flow	Flow	Field
		RCF2	Flow	Flow	Field	Flow	Flow	Field	Flow	Flow	Field	Flow	Flow	Field
		RCF3	Flow	Flow	Operational	Flow	Flow	Operational	Flow	Flow	Operational	Flow	Flow	Operational
		RCW4	Flow	Flow	Operational	Flow	Flow	Operational	Flow	Flow	Operational	Flow	Flow	Operational
		* Baseline flow will be measured adjacent to EM-163												
	Mill Fork Canyon	MFA01	Flow	Flow	Baseline	Flow	Flow	Baseline	Flow	Flow	Baseline	Flow	Flow	Baseline
		MFB02	Flow	Flow	Baseline	Flow	Flow	Baseline	Flow	Flow	Baseline	Flow	Flow	Baseline
		Mill Fork Canyon Baseline Sampling Will Be Conducted From 4th Quarter 1998 Through 4th 2000 Quarter												

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DEER CREEK/COTTONWOOD-WILBERG/DES-BEE-DOVE/TRAIL MOUNTAIN MINES

GROUNDWATER HYDROLOGY - OPERATIONAL SAMPLING (Table 2)

Groundwater Type			Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Springs	*East Mountain*								Operational	Flow *	Flow *	Operational		
										* Recession Springs				
	East Mountain-Rilda Canyon		Flow	Flow	Operational	Flow	Flow	Operational	Flow	Flow	Operational	Flow	Flow	Operational
	Trail Mountain								Operational	Flow	Flow	Operational		
In-Mine	*Cottonwood*				Operational			Operational			Operational			Operational
	Deer Creek				Operational			Operational			Operational			Operational
	Trail Mountain				Operational			Operational			Operational			Operational
	Oliphant	T-18			Operational			Operational			Operational			Operational
Wells	*Cottonwood Waste Rock Well*				Operational			Operational			Operational			Operational
	Cottonwood Canyon Wells		Level	Level	Level	Level	Level	Level	Level	Level	Level	Level	Level	Level
	(includes Straight Canyon TM-3)													
	Deer Creek Waste Rock Well				Operational			Operational			Operational			Operational
	Deer Creek In-Mine Well				Level			Level			Level			Level
	Rilda Canyon Wells		Level	Level	Level	Level	Level	Level	Level	Level	Level	Level	Level	Level
	Trail Mountain (TM-1B)		Level	Level	Operational	Level	Level	Operational	Level	Level	Operational	Level	Level	Operational

UPDES SAMPLING - (Table 1)

			Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Mine Water Discharge	*Cottonwood*	WMD01	Operational	Operational	Operational	Operational	Operational	Operational	Operational	Operational	Operational	Operational	Operational	Operational
		Miller	Operational	Operational	Operational	Operational	Operational	Operational	Operational	Operational	Operational	Operational	Operational	Operational
	Deer Creek	DCD	Operational	Operational	Operational	Operational	Operational	Operational	Operational	Operational	Operational	Operational	Operational	Operational
	Trail Mountain	TMD	Operational	Operational	Operational	Operational	Operational	Operational	Operational	Operational	Operational	Operational	Operational	Operational
Sediment Pond Discharge	*Cottonwood*	3 Outfalls	Operational	Operational	Operational	Operational	Operational	Operational	Operational	Operational	Operational	Operational	Operational	Operational
	Deer Creek	1 Outfall	Operational	Operational	Operational	Operational	Operational	Operational	Operational	Operational	Operational	Operational	Operational	Operational
	Des-Bee-Dove	1 Outfall	Operational	Operational	Operational	Operational	Operational	Operational	Operational	Operational	Operational	Operational	Operational	Operational
	Trail Mtn	1 Outfall	Operational	Operational	Operational	Operational	Operational	Operational	Operational	Operational	Operational	Operational	Operational	Operational

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DEER CREEK/COTTONWOOD-WILBERG/DES-BEE-DOVE/TRAIL MOUNTAIN MINES

SURFACE HYDROLOGY - BASELINE SAMPLING (Table 1) - 2001

Drainage System	Drainage	Location	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Cottonwood Creek Drainage System	*Cottonwood Canyon Creek*	SW1	Flow	Flow	Baseline	Flow	Flow	Baseline	Flow	Flow	Baseline	Flow	Flow	Baseline
		SW2	Flow	Flow	Baseline	Flow	Flow	Baseline	Flow	Flow	Baseline	Flow	Flow	Baseline
		CCC01	Flow	Flow	Field	Flow	Flow	Field	Flow	Flow	Field	Flow	Flow	Field
		SW3	Flow	Flow	Baseline	Flow	Flow	Baseline	Flow	Flow	Baseline	Flow	Flow	Baseline
	Grimes Wash	GWR01	Flow	Flow	Baseline	Flow	Flow	Baseline	Flow	Flow	Baseline	Flow	Flow	Baseline
		GWR02	Flow	Flow	Baseline	Flow	Flow	Baseline	Flow	Flow	Baseline	Flow	Flow	Baseline
		GWR03	Flow	Flow	Baseline	Flow	Flow	Baseline	Flow	Flow	Baseline	Flow	Flow	Baseline
	Straight Canyon	T-19	Flow	Flow	Baseline	Flow	Flow	Baseline	Flow	Flow	Baseline	Flow	Flow	Baseline
Huntington Drainage System	*Deer Creek*	DCR01	Flow	Flow	Baseline	Flow	Flow	Baseline	Flow	Flow	Baseline	Flow	Flow	Baseline
		DCR04	Flow	Flow	Baseline	Flow	Flow	Baseline	Flow	Flow	Baseline	Flow	Flow	Baseline
		DCR06	Flow	Flow	Baseline	Flow	Flow	Baseline	Flow	Flow	Baseline	Flow	Flow	Baseline
	Huntington Creek	HCC01	Flow *	Flow *	Baseline*	Flow *	Flow *	Baseline*	Flow *	Flow *	Baseline*	Flow *	Flow *	Baseline*
		HCC02			Baseline*			Baseline*			Baseline*			Baseline*
		HCC04			Baseline*			Baseline*			Baseline*			Baseline*
	Meetinghouse Canyon	MCH01	Flow	Flow	Baseline	Flow	Flow	Baseline	Flow	Flow	Baseline	Flow	Flow	Baseline
	Rilda Canyon	RCF1*	Flow	Flow	Baseline	Flow	Flow	Baseline	Flow	Flow	Baseline	Flow	Flow	Baseline
		RCLF1	Flow	Flow	Field	Flow	Flow	Field	Flow	Flow	Field	Flow	Flow	Field
		RCLF2	Flow	Flow	Field	Flow	Flow	Field	Flow	Flow	Field	Flow	Flow	Field
		RCF2	Flow	Flow	Field	Flow	Flow	Field	Flow	Flow	Field	Flow	Flow	Field
		RCF3	Flow	Flow	Baseline	Flow	Flow	Baseline	Flow	Flow	Baseline	Flow	Flow	Baseline
		RCW4	Flow	Flow	Baseline	Flow	Flow	Baseline	Flow	Flow	Baseline	Flow	Flow	Baseline
	Mill Fork Canyon	MFA01	Flow	Flow	Baseline	Flow	Flow	Baseline	Flow	Flow	Baseline	Flow	Flow	Baseline
		MFB02	Flow	Flow	Baseline	Flow	Flow	Baseline	Flow	Flow	Baseline	Flow	Flow	Baseline

* Flow in Huntington Creek is measured @ HCC01 by Utah Power, and will be reported in the Annual Hydrologic Report

* Baseline flow will be measured adjacent to EM-163

PACIFICORP

ENERGY WEST MINING COMPANY

HYDROLOGIC MONITORING PROGRAM

DEER CREEK/COTTONWOOD-WILBERG/DES-BEE-DOVE/TRAIL MOUNTAIN MINES

GROUNDWATER HYDROLOGY - BASELINE SAMPLING (Table 2) - 2001

Groundwater Type			Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Springs	*East Mountain*								Baseline	Flow *	Flow *	Baseline		
										* Recession Springs				
	East Mountain-Rilda Canyon		Flow	Flow	Baseline	Flow	Flow	Baseline	Flow	Flow	Baseline	Flow	Flow	Baseline
	Trail Mountain								Baseline	Flow	Flow	Baseline		
In-Mine	*Cottonwood*				Baseline			Baseline			Baseline			Baseline
	Deer Creek				Baseline			Baseline			Baseline			Baseline
	Trail Mountain				Baseline			Baseline			Baseline			Baseline
	Oliphant	T-18			Baseline			Baseline			Baseline			Baseline
Wells	*Cottonwood Waste Rock Well*				Baseline			Baseline			Baseline			Baseline
	Cottonwood Canyon Wells		Level	Level	Level	Level	Level	Level	Level	Level	Level	Level	Level	Level
	(includes Straight Canyon TM-3)													
	Deer Creek Waste Rock Well				Baseline			Baseline			Baseline			Baseline
	Deer Creek In-Mine Well				Level			Level			Level			Level
	Rilda Canyon Wells		Level	Level	Level	Level	Level	Level	Level	Level	Level	Level	Level	Level
	Trail Mountain (TM-1B)		Level	Level	Baseline	Level	Level	Baseline	Level	Level	Baseline	Level	Level	Baseline

UPDES SAMPLING - (Table 1)

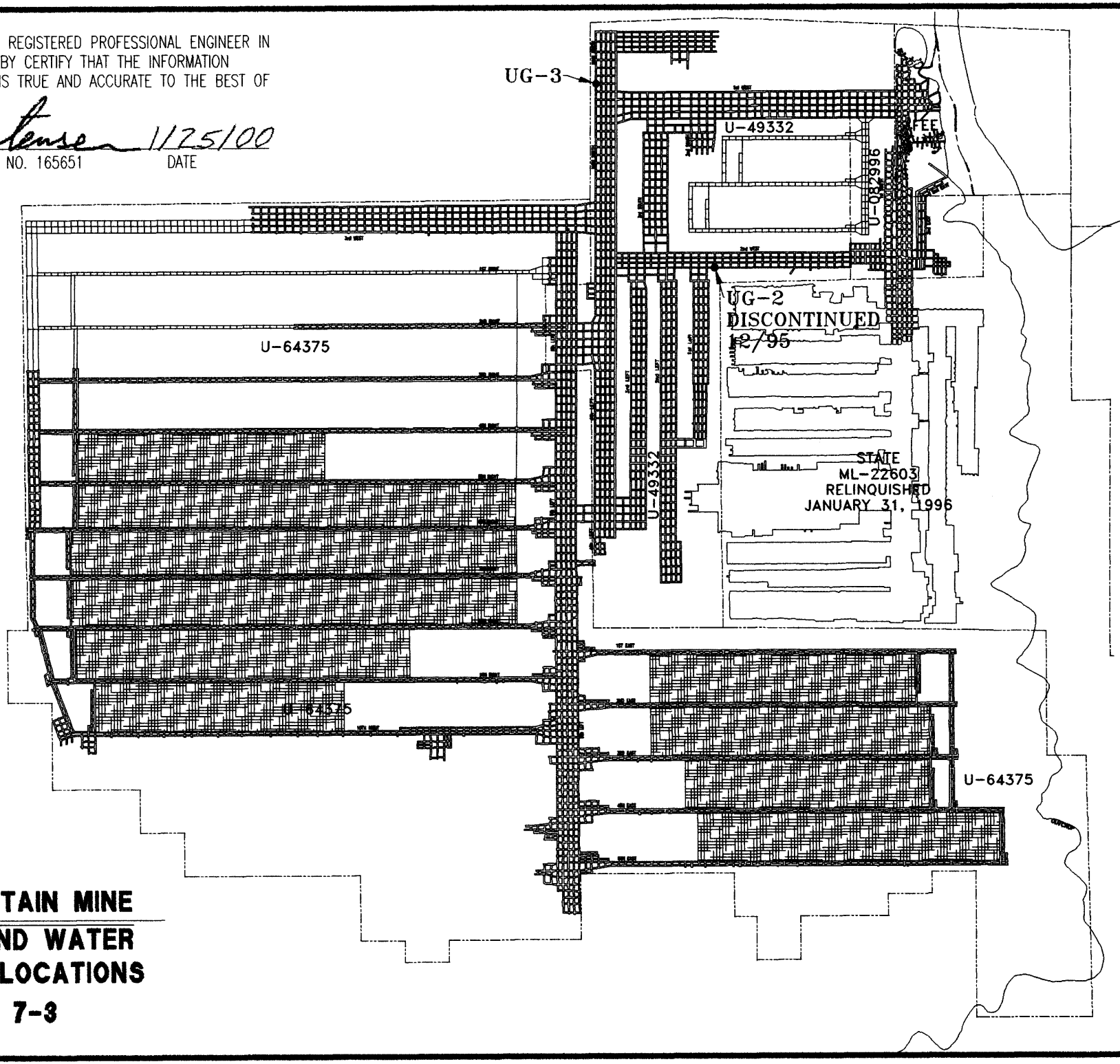
			Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Mine Water Discharge	*Cottonwood*	WMD01	Operational	Operational	Operational	Operational	Operational	Operational	Operational	Operational	Operational	Operational	Operational	Operational
		Miller	Operational	Operational	Operational	Operational	Operational	Operational	Operational	Operational	Operational	Operational	Operational	Operational
	Deer Creek	DCD	Operational	Operational	Operational	Operational	Operational	Operational	Operational	Operational	Operational	Operational	Operational	Operational
	Trail Mountain	TMD	Operational	Operational	Operational	Operational	Operational	Operational	Operational	Operational	Operational	Operational	Operational	Operational
Sediment Pond Discharge	*Cottonwood*	3 Outfalls	Operational	Operational	Operational	Operational	Operational	Operational	Operational	Operational	Operational	Operational	Operational	Operational
	Deer Creek	1 Outfall	Operational	Operational	Operational	Operational	Operational	Operational	Operational	Operational	Operational	Operational	Operational	Operational
	Des-Bee-Dove	1 Outfall	Operational	Operational	Operational	Operational	Operational	Operational	Operational	Operational	Operational	Operational	Operational	Operational
	Trail Mtn	1 Outfall	Operational	Operational	Operational	Operational	Operational	Operational	Operational	Operational	Operational	Operational	Operational	Operational

I, JOHN CHRISTENSEN BEING A REGISTERED PROFESSIONAL ENGINEER IN THE STATE OF UTAH, DO HEREBY CERTIFY THAT THE INFORMATION CONTAINED ON THIS DRAWING IS TRUE AND ACCURATE TO THE BEST OF MY KNOWLEDGE AND BELIEF.

John Christensen 11/25/00

JOHN CHRISTENSEN NO. 165651 DATE

LICENSED PROFESSIONAL ENGINEER
JOHN CHRISTENSEN
No. 165651
STATE OF UTAH



SCALE: 1"=2000'

ENERGY WEST Mining Co.

TRAIL MOUNTAIN MINE
UNDERGROUND WATER MONITORING LOCATIONS
PLATE 7-3