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DATA EVALUATION REPORT
BELDEN AREA

Eagle Mine Site
Minturn, Colorado

December 1, 1997

EAGLE MINE
DATA EVALUATION REPORT

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1.0 INTRODUCTION

This Data Evaluation Report (DER) provides an evaluation of the effects of waste rock piles on surface and ground water quality in the Belden area at the Eagle Mine site (Site). This evaluation is based on data collected during two full seasons of surface and ground water monitoring. Viacom International Inc. (Viacom) agreed to conduct this evaluation pursuant to the Eagle Mine Superfund Site - Operable Unit No. 1 Partial Consent Decree, Civil Action No. 95-N-2360 (D. Colo.) (CD, June 12, 1996). This DER is a required deliverable listed in CD Appendix B, Final Statement of Work - Part A, Tasks 1, 3A, and 4.

The DER integrates data from three separate tasks described in the CD. These tasks and their stated objectives are as follows:

- Part A. Task 1 - Storm Event/Snowmelt Surface Water Monitoring - characterize rainfall and snowmelt runoff water quality from the waste rock piles in the vicinity of Belden and Rock Creek to assess the effects of runoff from these areas on Eagle River water quality.

- Part A. Task 3A - Waste Rock Monitoring Wells/Monitoring at Belden - estimate metals loading to the Eagle River via ground water seepage flow from the waste rock piles above Belden.

- Part A. Task 4 - Testing of Gilman/Belden Area Waste Rock Piles - assess the potential of each of the major waste rock piles to contribute metals loading to the Eagle River.

Monitoring plans for the above tasks were completed and submitted to the U.S. Environmental Protection Agency (EPA) Region VIII and the Colorado Department of Public Health and Environment (CDPHE) for review and approval, in partial satisfaction of an EPA Administrative Order for Remedial Action, EPA Docket No. CERCLA-VIII-94-19, issued July 7, 1994 and amended May 30, 1995 (EPA, 1994). The monitoring plans and approval dates are listed below:

- Storm Event/Snowmelt Surface Water Runoff Monitoring Plan (Dames & Moore, 1995a); approved May 18, 1995.

- Final Installation and Monitoring Plan for Belden Ground Water Monitoring Wells (Dames & Moore, 1995b); approved May 24, 1995.

- Work Plan for Waste Rock Pile Testing, Eagle Mine, Minturn, Colorado, as amended (Dames & Moore, 1995c); approved February 7, 1996.

Preliminary interpretations of the data collected during the first full season of ground water and surface water runoff monitoring were submitted to EPA/CDPHE in Preliminary Data Interpretation Reports (PDIRs):

- PDIR No. 2-Belden Ground Water Monitoring Program, dated November 15, 1996 (Dames & Moore, 1996a)

- PDIR No. 3-Belden Storm Event/Snowmelt Surface Water Runoff Monitoring, dated November 27, 1996 (Dames & Moore, 1996b)

A formal PDIR No.1 Belden Waste Rock Pile Testing was not prepared. Instead, a summary of the waste rock pile test data was submitted to EPA/CDPHE in a November 7, 1996 letter (Dames & Moore, 1996c). EPA and CDPHE comments on PDIR No.2, PDIR No. 3, and the letter summarizing the waste rock data are contained in the February 12, 1997 letter from EPA (EPA, 1997a). Response to EPA/CDPHE comments were issued in a May 9, 1997 letter (Dames & Moore, 1997a). Where appropriate, these responses are incorporated into the DER.

The DER is divided into four sections. Section 2.0 discusses data collection activities; Section 3.0 provides data evaluation; and Section 4.0 provides conclusions. The data are provided in the appendices.

2.0 DATA COLLECTION ACTIVITIES

2.1 WASTE ROCK

Data collection activities conducted to assess the potential of each major waste rock pile to produce metals began with a field reconnaissance of the Belden and Gilman areas of the Site to identify and describe the major waste rock piles and identify sample locations, for the collection of waste rock material for lab testing. These activities were conducted pursuant to the Work Plan for Waste Rock Pile Testing (Dames & Moore, 1995c) and are briefly described in the following subsections.

2.1.1 Field Reconnaissance, Mapping, and Sample Site Selection

Color aerial photographs of the Gilman and Belden areas taken in September 1985 were reviewed to locate and delineate the major waste rock piles. A field reconnaissance and mapping effort was conducted July 22-23, 1996 by Dames & Moore, Eagle Engineering Services, Inc., CDPHE, and Morrison Knudson personnel to confirm the areal extent of the piles delineated from the aerial photographs, to identify additional piles that required testing, and to determine sample locations. Additional piles delineated during the field reconnaissance included a waste rock pile below Adit No. 7 and a pile below the Crossbeam adit/mine.

To best represent the variability of each waste rock pile, two to eight discrete sampling locations were selected per pile. The number of sample locations selected depended on the size and shape of the pile and pile accessibility. In general, the sample locations were equally distributed on each pile to best characterize the surface area of the accessible portions of the piles. The sample locations selected during the reconnaissance and the location of each waste rock pile in relation to the nearest adit are listed in Table 2.2-1.

Table 2.2-1
Waste Rock Pile Sample Locations

Waste Rock Pile (WP)	Adit	Sample Locations
WP-1	Belden Fan	Four total - two upper and two lower on either side of pile
WP-2	St. Joe	Three total - one from below portal and two near toe (one in unstained area and one in stained area)
WP-3	Not known	Two total - one upper and one near toe
WP-4	Iron Mask-east	Four total - two upper and two lower on either side of pile
WP-5	Iron Mask-west	Five total - two each on top and both sides of cribbing and one low below lower cribbing
WP-6	Polar Accidental	Four total - one upper and one lower of each (2) type of material
WP-7	Chief Incline	Three total - on top bench
WP-8	No. 1 Shaft	Eight total - three on upper bench and five on lower bench
WP-9/WP-10	Ben Butler	Combined into one pile, two upper and two lower
WP-11	Chief Incline	Six total - two in erosion gullies at top of pile and four from Adit 8 road
WP-12	Uncle Sam	Two total - one upper and one lower
WP-13	Rocky Point	Four total - N. peak, S. peak, main central slope, southern slope
WP-14	Newhouse	Seven total - locations flagged during reconnaissance
Adit 7	Adit 7	Two total - one in stained area and one in unstained area below Adit 7
Crossbeam	Crossbeam	Four total - two lower on either side of outcrop and two upper

The majority of the waste rock piles are located in areas of poor access on very steep, marginally stable slopes. Due to difficulties encountered accessing some sample locations with field equipment, the following locations identified during the reconnaissance were either not sampled or were relocated:

- WP-5 - the lower sample location was relocated above the lower cribbing
- WP-7 - samples were collected from the lower bench
- WP-13 - the main central slope location was not sampled
- Crossbeam - the upper two locations were not sampled.

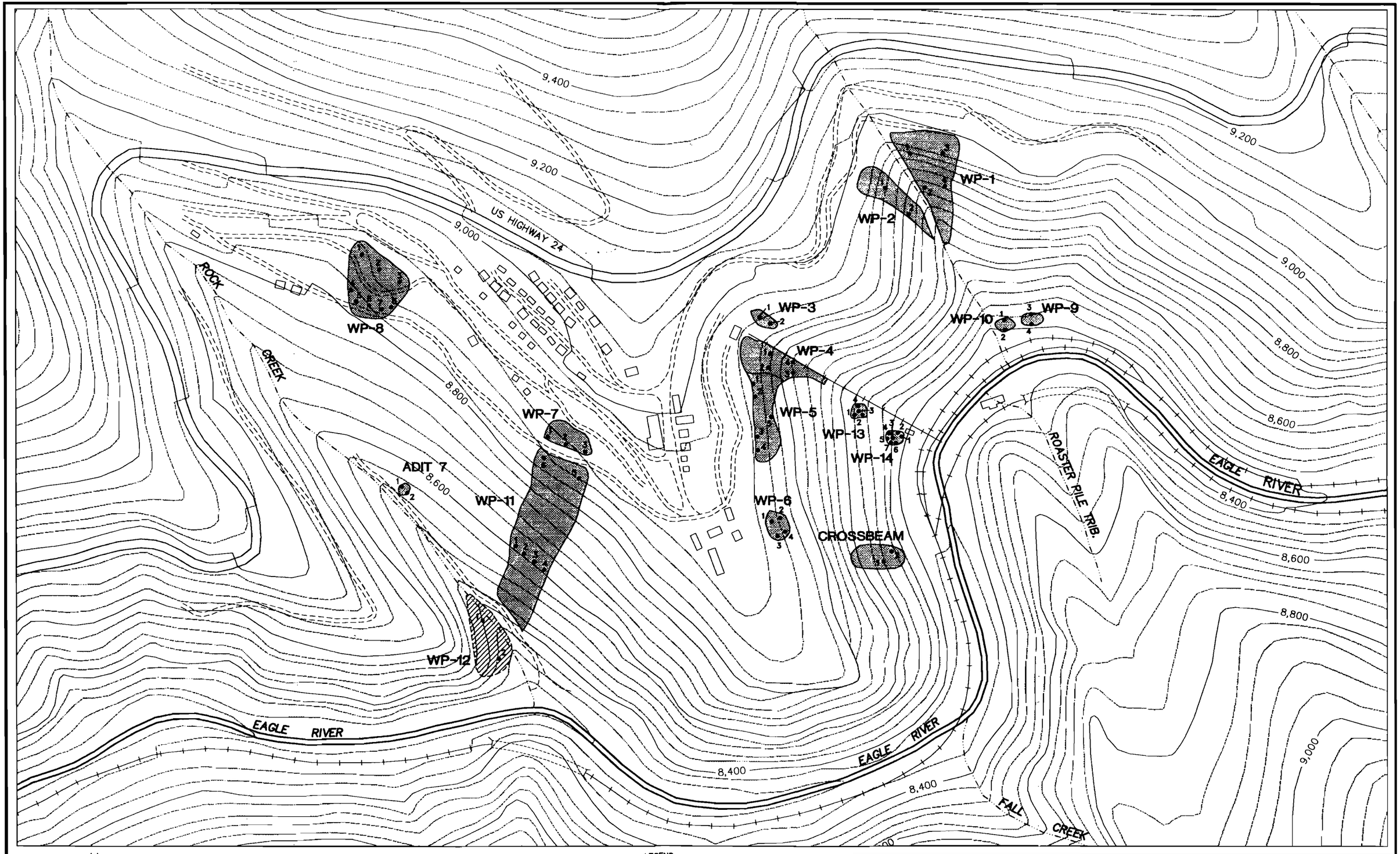
The major waste rock piles and the sample locations are shown of Figure 2.1-1. In the 1985 aerial photography, WP-12 appears near the base of Rock Creek. This pile has since been moved, but the 1985 outline of the pile is shown on Figure 2.1-1.

2.2.1 Sample Collection Methods

A sampling program was conducted August 19-23, 1996 to collect bulk waste rock samples for acid generation potential tests, grain size analysis, and column leach tests. Sample material was collected from backhoe or hand-excavated trenches at the locations selected during the field reconnaissance and during the sampling program. Waste rock material was collected from backhoe trenches at the following locations:

- WP-5 - two trenches at top on both sides of cribbing
- WP-7 - all sample locations
- WP-8 - all sample locations
- WP-11 - four locations from Adit 8 road
- WP-12 - both locations.

The trenches were excavated through the pile to the contact with underlying material or until refusal. Once a cut was opened, a channel sample representing materials from top to bottom was collected with a stainless steel spoon or trowel. Collected material was placed in sealable plastic bags and clean five-gallon plastic containers.



LEGEND

1 TEST PIT LOCATION

BW-4 WASTE ROCK PILE

DRAWING SCALE	1"=300'	
		DATE
DESIGNED BY:	-	-
DRAWN BY:	S. JACOBSON	7/96
CHECKED BY:	-	-
APPROVED BY:	-	-
FILE:	WRP-TPTS.DWG	

Dames & Moore

VIACOM INTERNATIONAL INC.
Eagle Mine — Minturn, Colorado

Waste Rock Pile
Test Pit Locations

JOB NO. 12330-099-030

REVISION

FIGURE NO. **2.1-1**

Approximately one pound of waste rock material was collected at each sampling location for acid generation potential testing. At every third sample location, or at a minimum of one per pile, 80 pounds of 6-inch minus waste rock material were collected for grain size distribution tests. A minimum of 510 pounds of waste rock material were collected from the following waste rock piles:

- WP-7
- WP-8
- WP-9/WP-10
- WP-11
- WP-12
- WP-14.

The bulk samples were archived pending the results of the acid generation potential tests. According to the Work Plan for Waste Rock Pile Testing, column leach tests were to be conducted on 25 percent of the sampled piles. Based on information gained from the acid generation tests, EPA and CPDHE agreed to forego the column leach testing.

2.2 SURFACE WATER

This section provides a summary of activities associated with surface water quality and runoff data collection as part of the overall evaluation of potential water quality impacts associated with the waste rock piles at the Site. The Storm Event/Snowmelt Surface Water Runoff Monitoring Plan for the Belden/Gilman Area, Eagle Mine Site (Dames & Moore, 1995a) (Monitoring Plan) specifies the methods, procedures, and locations for surface water runoff monitoring, and provides the basis for data presented herein.

The runoff monitoring program commenced on July 17, 1995 pursuant to the UAO. The program consisted of monitoring rainfall and sampling surface water runoff from waste rock piles in the Belden and Rock Creek areas of the Site. Snowmelt-runoff sampling was conducted during March and April of 1996 and 1997. Rainfall-runoff sampling was conducted from July through September in 1995, and from May through September in 1996, and 1997.

2.2.1 Sample Locations and Parameters

Twelve runoff monitoring locations were identified in the Monitoring Plan (ten automatic sampling stations and two manual sampling stations). Automatic samplers were first installed in July 1995 at seven tributary monitoring locations in the vicinity of Belden and Rock Creek. Three stream gages equipped with automatic samplers were installed on the Eagle River in the same area in August 1995. High discharge in the Eagle River precluded installation of these stations in July 1995. Automatic samplers were utilized during the summer months in 1995, 1996, and 1997 to sample rainfall-induced surface water runoff. The samplers were removed in October of each year and re-installed at the same locations in May, following the snowmelt period.

Two additional surface runoff monitoring locations were designated for collecting samples manually when qualified personnel are present during runoff events. In addition, all snowmelt runoff samples were collected manually in March or April. The 12 runoff monitoring locations are shown in Figure 2.2-2.

The monitoring network was designed to measure rainfall near and runoff from the principle waste rock piles located in the Belden and Gilman areas. Most of the waste rock piles were deposited on steep hillsides (>50 percent slope) and extend down slope towards the Belden and Rock Creek areas of the Site. Surface runoff from WP-1 and WP-2 potentially flows to an Un-named tributary (Station T-4R) of the Eagle River at Belden. Surface runoff in the Roaster Pile Drainage, formerly occupied by roaster material, potentially flows to the Eagle River at Belden (Station T-6R). Surface runoff from WP-3, WP-4, and WP-14 potentially flows to the Tramway tributary (Station T-TR) which enters the Eagle River at Belden. Surface runoff from WP-7 and WP-11 potentially flows to a previously constructed seep collection sump (Station SR-3) in the Rock Creek drainage. Surface runoff from WP-8 (Station SR-4) potentially flows to Rock Creek, a tributary to the Eagle River downstream of Belden. An additional flow monitoring station was installed in May 1996, designated as SR-4A, to measure run-on into the WP-8 area.

Surface water runoff from WP-9/WP-10 potentially flows to a low-lying area adjacent to the railroad tracks (Station SR-1) before entering the Un-named tributary near its mouth. Surface runoff from the loading dock/Belden buildings and WP-13 potentially flows along the railroad tracks before entering the Eagle River through a culvert (Station SR-2).

Three locations on the Eagle River were established as follows: Station E-3R (above Belden); Station E-5R (below Belden upstream of Fall Creek); and Station E-11R (downstream of Belden and Rock Creek). Sampling stations were established at each of these locations to monitor rainfall- and snowmelt-runoff volume and quality. Surface water runoff samples were analyzed for the parameters listed in Table 2.2-2.

Table 2.2-2
Storm Water Runoff Analytical Constituents

Constituent	Analytical Method	Reporting Limit (mg/l)
Flow	Field	0.1 cfs or 1 gpm
pH	Field	0.1 Standard Unit
Specific Conductance	Field	5 umhos/cm
Temperature	Field	0.5 C
Alkalinity	Titrimetric, 310.1	1
Suspended Solids	Gravimetric, 160.2	2
Sulfate	Ion Chrom., 300.1	0.1
Arsenic, Dissolved and Total Rec.	GFAA, 206.2	0.005
Cadmium, Dissolved and Total Rec.	GFAA, 213.2	0.0001
Calcium, Dissolved	AE, ICP, 200.7	0.1
Copper, Dissolved and Total Rec.	GFAA, 220.2	0.001
Lead, Dissolved and Total Rec.	GFAA, 239.2	0.001
Iron, Dissolved and Total Rec.	AE, ICP, 200.7	0.03
Magnesium, Dissolved	AE, ICP, 200.7	0.1
Manganese, Dissolved and Total Rec.	AE, ICP, 200.7	0.005
Zinc, Dissolved and Total Rec.	AE, ICP, 200.7	0.005

AE = Atomic Emission
GFAA = Graphite Furnace Atomic Absorption
ICP = Inductively Coupled Plasma

2.2.2 Rainfall Recording

Rainfall-induced surface water runoff in the Belden and Rock Creek areas was monitored from May through September. The monitoring was conducted through the use of continuous rainfall recorders, automatic samplers, and daily site observations of rainfall totals and runoff conditions. In addition, weather conditions were monitored utilizing NEXRAD Doppler radar images and National Weather Service extended weather forecasts for Minturn, Colorado, for real-time assessment of rainfall conditions and forecasting purposes, respectively.

Each morning, the Site observer would read and record the storage gage rainfall total at rainfall Stations RF-1 (Gilman) and RF-2 (Belden). If the approximate 24-hour total was 0.1 inch or greater (the minimum rainfall typically required to generate Site runoff), the observer then inspected all automatic samplers to determine if samples were collected. This information was reported to the project hydrologist to determine if sampling personnel should be mobilized to the Site for sample collection and processing, and to provide further instructions for the disposition of automatically collected samples.

Two continuous recording rain gauges were operated at the Site to measure rainfall during ice-free periods. Continuous recording rain gauges were centrally located to measure rainfall intensity on a ridge top in Gilman (Station RF-1) and in Belden Canyon (Station RF-2). Station RF-1 was located on the rooftop of Building 403 in Gilman at elevation 9,000 feet mean sea level (ft-msl). Station RF-2 was located at the streamgage at Station E-5R in Belden at elevation 8,400 ft-msl. Station RF-1 represents regional rainfall coverage near Gilman, which is near the majority of the relevant waste rock piles. Station RF-2 represents localized rainfall in Belden Canyon superimposed upon the regional pattern, and provides coverage for the lower waste rock piles in Belden and the lower Roaster Pile Drainage.

Rainfall was measured using a tipping bucket rain gauge at each location. Rainfall occurring over a five-minute interval was processed (totalized) and recorded with a data logger for later retrieval. This rainfall intensity data was used to document rainfall and to evaluate the temporal distribution of runoff conditions at the Site.

2.2.3 Streamflow Monitoring

This section describes the methods utilized to measure or estimate streamflow in tributaries and in the Eagle River near Belden. The discharge for each sampled tributary runoff event was used to calculate load and to assess the relative potential for transport of metals. For snowmelt-runoff samples, discharge was measured directly or was estimated at the time of sampling. During the rainfall-runoff period, peak stage height was measured at monitored tributaries using crest stage gages. In May 1996, 60 degree v-notch weir plates were installed at tributary Stations T-4R, T-6R, SR-4, and SR-4A, and in July 1996 a 90 degree v-notch weir was installed at the culvert outlet at Station T-10R. The weirs were used in conjunction with crest gages to measure peak flows, and runoff hydrographs for each monitored event were empirically derived using methods described in Section 3.2.2.

Continuous recording stream gages were installed at Stations E-3R, E-5R, and E-11R in August 1995. These gages consist of 12-inch or 15-inch diameter galvanized steel stilling wells with enclosures and access platforms which were anchored to the right bank of the river at each location. A float and potentiometer measure stage height, while a Campbell Scientific Inc. data logger processes and records the 15-minute average stage height data for later retrieval. The gages were operated during ice-free periods from April through October.

2.2.4 Snowmelt-Runoff Sampling

Snowmelt monitoring at Site tributaries took place between February and May in 1996 and 1997. As outlined in the Monitoring Plan, snowmelt samples were collected manually since automatic samplers would not function during freezing conditions. For this reason, only grab samples were collected during the snowmelt season. The Monitoring Plan specified that at least two discrete snowmelt-runoff events be sampled at each location.

As part of the snowmelt monitoring program, the Site observer collected daily maximum and minimum temperature data at the Site from February through May. These data were transferred to the project hydrologist weekly for review to estimate relative snow ripening conditions at the Site. In addition, results from snow surveys conducted in March at the CTP were used to assess relative snow-water equivalent conditions at the Site. The Site observer also inspected monitoring locations

for the presence of snowmelt runoff daily and, if present, recorded estimates of flow. These data were also transferred to the project hydrologist and used to document snowmelt conditions in the Belden and Rock Creek areas of the Site.

2.2.5 Rainfall-Runoff Sampling

Automatic samplers installed on each of the seven tributaries were configured to activate according to the initiation of flow in the case of ephemeral tributaries, or based on an increase in stage for perennial tributaries (Stations T-6R and T-10R). Once activated, up to 24 discrete samples were collected at either two-minute or five-minute intervals, depending on the preset lag time for the watershed.

A water sampler control program was developed to activate and control automatic samplers at the three Eagle River monitoring stations. A programmable data logger was used to activate samplers based on a pre-defined rainfall threshold. Once activated, the program delays sample collection for a pre-defined time period equal to the estimated travel time for runoff to reach each respective river station from the Site tributaries. When sampling begins, up to 24 discrete samples were collected at six minute intervals or, if the stage changes more than 0.1 feet during a sampling episode, samples were collected at three minute intervals.

Subsequent to each sampling event, the continuous five-minute rainfall records were reviewed to determine the rainfall distribution and to estimate the temporal distribution of runoff. If the runoff event met the program criteria and sufficient water was collected, samples of the rising limb of the discharge hydrograph are composited (R), and samples representing the entire runoff event were also composited (C). In this fashion, the quality of water in the first flush of runoff is characterized by the R sample. In any event, a minimum of one sample was collected for each valid rainfall-runoff event, designated as a storm composite (C) sample.

2.3 GROUND WATER

Four monitoring wells were installed on the northeast bank of the Eagle River in the Belden area. The wells were positioned to intercept ground water moving to the Eagle River from suspected recharge areas where water chemistry may be impacted by snowmelt or rainfall runoff from

upgradient waste rock piles. The monitoring wells were constructed, installed, and developed in accordance with the Final Installation and Monitoring Plan for Belden Ground Water Monitoring Wells (Dames & Moore, 1995b) (Installation and Monitoring Plan) and the procedures described in Section 2.3.2 of this DER.

Data were collected from the wells from July 1995 to September 1997. Where possible, storm event and snowmelt runoff from the waste rock piles was sampled concurrently with ground water from wells to allow identification of potential sources and evaluation of potential loading to the Eagle River from the waste rock piles in the Belden area.

2.3.1 Well Locations

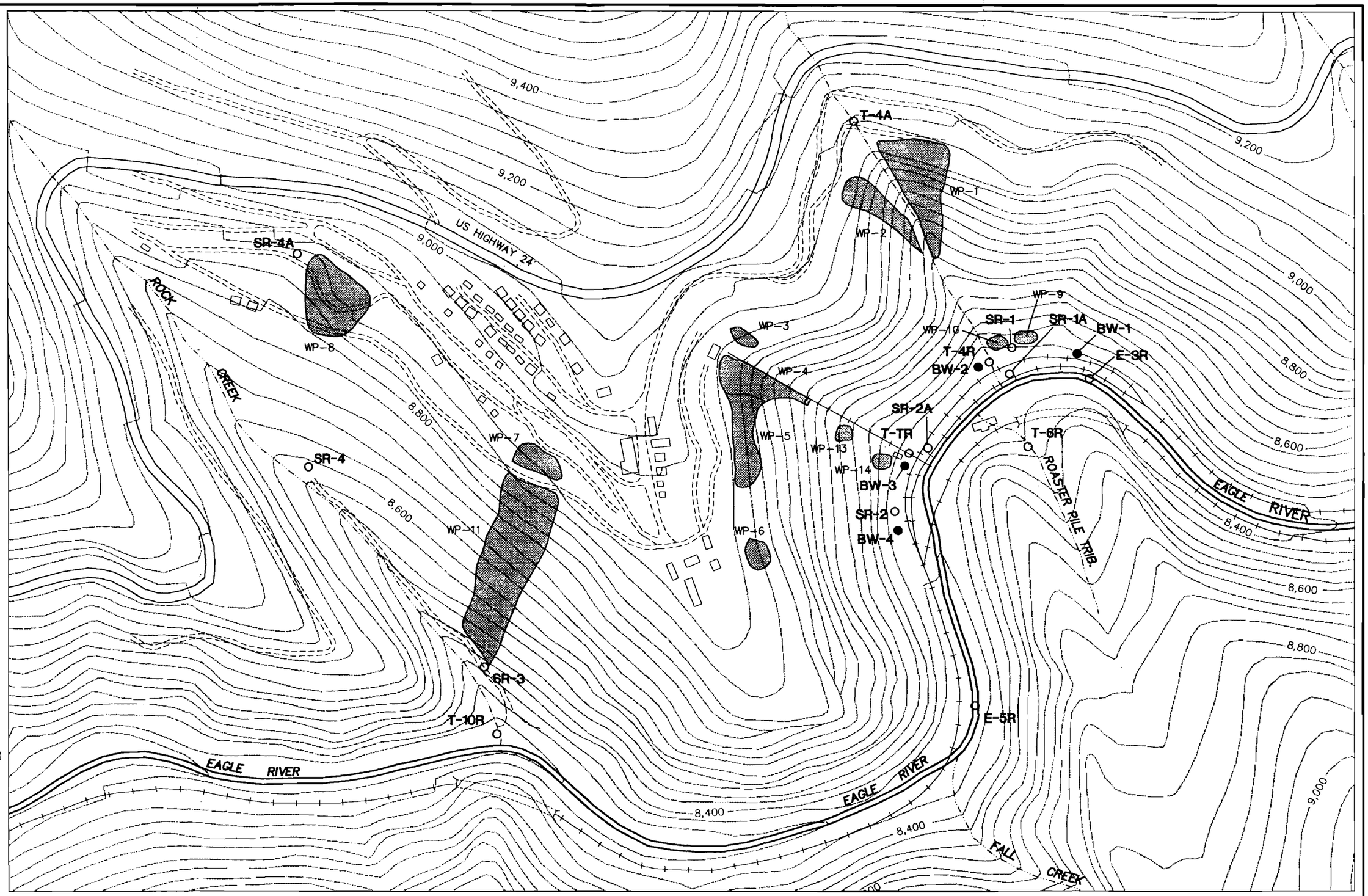
A reconnaissance of the Belden area was performed in October 1994 to identify appropriate monitoring well locations. The wells were located to monitor ground water in those areas that could be receiving recharge from waste rock piles (Figure 2.2-2). All well locations were inspected and approved by EPA. A list of the well locations and the conditions they were intended to monitor follows:

- Upgradient well (BW-1) - monitors ground water level and ground water quality upgradient of the Belden waste rock piles at a location approximately 400 feet upgradient of the Un-named tributary.

- Un-named tributary well (BW-2) - monitors ground water level and ground water quality downgradient of the mouth of the Un-named tributary near Ben Butler Adit. WP-1, WP-2, and WP-9/WP-10 are located in the watershed drained by the Un-named tributary.

- Tramway tributary well (BW-3) - monitors ground water levels and ground water quality downgradient of the mouth of Tramway tributary. WP-3, WP-4, WP-5, WP-13, and WP-14 are located in the Tramway tributary watershed.

- Downgradient well (BW-4) - monitors ground water levels and ground water quality at the Eagle River canyon bedrock constriction 500 feet downgradient of the mouth of the Tramway tributary.



LEGEND

BW-4 ● GROUND-WATER MONITORING WELL

SR-2 ○ SURFACE WATER STATION

WP-14 WASTE ROCK PILE

DRAWING SCALE	1"=300'	
		DATE
DESIGNED BY:	–	–
DRAWN BY:	S. JACOBSON	7/96
CHECKED BY:	–	–
APPROVED BY:	–	–
FILE:	WRP-SWR.DWG	

Dames & Moore

VIACOM INTERNATIONAL INC.
Eagle Mine – Minturn, Colorado

Storm Water Runoff / Belden Well Monitoring Locations

JOB NO. 12330-099-030

REVISION

FIGURE NO. 2.2-2

2.3.2 Well Installation

The wells were installed in the Belden area on July 11, 1995 to a depth that would approximate the annual high-water surface elevation of the Eagle River. The annual high-water surface elevation was determined visually for each well by identifying the highest level of stained rocks along the Eagle River. Just prior to drilling, a hand-level was used to estimate the difference in elevation between the drill site and the high-water level.

The wells were drilled by Layne Environmental Services using an AP 1000 drilling rig. Water levels and lithologies encountered were documented on boring logs by a Dames & Moore geologist. Monitoring wells were constructed with 2-inch diameter, flush-threaded, Schedule 40 polyvinyl chloride (PVC) casing and factory slotted screen with slot sizes of 0.010-inch. The PVC well casing was finished below ground surface to minimize damage by snow removal and railroad equipment. A flush-mount protective steel vault was placed over the PVC pipe and cemented in. An expandable rubber seal with a padlock was installed in the 2-inch diameter casing. Boring logs and well completion diagrams are included in PDIR No. 2 (Dames & Moore, 1996a).

Cuttings from the drill holes indicate that the shallow subsurface materials in the Belden area consist of indistinct layers of rock fragments in a matrix of light brown silt, rock fragments with very little matrix silts, alternating with layers made up predominantly of silt. The rock fragments are interpreted to be quartzite, granite, limestone rock talus and mine waste rock; the silt matrix material is probably fines washed in from the surrounding rock slopes and from waste rock piles. Pyrite and limonite (iron oxide) were observed in BW-2 and BW-3 cuttings. Wood chips, indicative of fill materials, were recovered from boreholes BW-3 and BW-4. Bedrock was not drilled in any of the boreholes.

An instrument survey of the top of each well (horizontal and vertical) and the adjacent low-water river elevation was performed on November 7, 1996. Table 2.3-1 shows the total well depth compared to the surveyed (November 1996) low-water elevation and the visually estimated high-water river elevation.

Table 2.3-1
Wells Depths Compared to Eagle River Level

Well	T.O.C. Elevation (ft-msl)	Well Depth (feet)	Bottom Well Elevation (ft-msl)	Est. High-Low River Elevation (ft-msl)
BW-1	8385.18	5.74	8379.44	8377-8379
BW-2	8381.43	8.26	8373.17	8369-8371
BW-3	8375.58	9.67	8365.91	8361-8363
BW-4	8370.05	11.84	8358.21	8360-8362

T.O.C. = top of casing; all elevations in feet above mean sea level.

The Installation and Monitoring Plan requires that the wells monitor the saturated interval in the upper 5 to 10 feet of the shallowest ground water unit encountered, not to exceed a depth approximating the annual high-water elevation of the river. Note that the bottom well elevations are close to the high-water river level in all cases except BW-4, which was drilled about four feet deeper.

2.3.3 Permeability Testing

Field permeability tests were performed in September 1996 to estimate the in situ hydraulic conductivity of the screened interval in the wells. Hydraulic conductivity was assessed by introducing potable water into the wells and measuring the amount of water lost to the surrounding materials, over a known time period. The details of the procedure can be found in PDIR No. 2. Hydraulic conductivity results for the Belden wells are summarized in Table 2.3-2.

Table 2.3-2
Hydraulic Conductivity, Belden Wells

Well	Hydraulic Conductivity	
	(ft/yr)	(ft/day)
BW-1	580	1.6
BW-2	30,000	82
BW-3	3500	10
BW-4	380	1.0

2.3.4 Water Level and Specific Conductance Measurement

Water level and specific conductance were measured quarterly during July 1995 to September 1997 in conjunction with the Site-wide ground water monitoring program. Measurements were also made during snowmelt periods and coincident with at least two rainfall events sampled as part of the Storm Event/Snowmelt Surface Water Monitoring Program. Wells found to be dry during quarterly sampling events were monitored periodically during the spring snowmelt period and after major rainfall events for increases in water level. Measurements were also made opportunistically by field personnel visiting the Belden area for other Site-related tasks.

Water levels were measured using a Solinst water level tape. On March 28, 1997, a Solinst Model #3001 Levelogger was suspended in BW-4. The Levelogger is a miniature, fully submersible, self-contained data logger and pressure transducer which automatically records water level data on pre-set time intervals. Output from the Levelogger was used to estimate the lag period between a rainfall event and the expected ground water arrival time at BW-4. This lag time prediction was used to guide well sampling times.

If the water column was high enough, measurements of conductivity and temperature were made in situ inside the well casing. Otherwise, these measurements were made on water bailed from the well.

2.3.5 Sample Collection

The four Belden wells were sampled quarterly in conjunction with the Site-wide ground water monitoring program. Samples were also collected during the spring snowmelt period and coincidently with rainfall runoff sampling performed as part of the Storm Event/Snowmelt Surface Water Monitoring Program. Ground water samples were collected at the Belden wells after selected rainfall events. An estimate of the lag period between a rainfall event and the expected ground water arrival time was developed by conducting three-day water level survey at BW-4 following a September 1995 rainfall event. A lag period estimate of 36 hours was used during 1995 and 1996 to guide sampling times. After May 1997, a lag period of 24 hours was used based on the water level information produced by the Levelogger installed in BW-4.

Prior to sample collection, the wells were evacuated using a bailer. If the well rapidly recharged, evacuation continued until the water temperature, pH, and conductivity stabilized (less than 10 percent difference between two successive readings), or until at least three well bore volumes were removed, whichever was first. Temperature, pH, and conductivity were measured after evacuation of each bore volume. If well recovery was insufficient to meet the three well bore volume requirement, the well was evacuated to dryness and allowed to recover before sampling. After the wells were evacuated, they were sampled using disposable bailers. If well recovery was slow, the well was sampled as soon as a sufficient volume of water was available for all the necessary analyses. Ground water samples were analyzed for the dissolved constituents listed in Table 2.2-1.

3.0 DATA EVALUATION

3.1 WASTE ROCK

A sampling program was conducted to collect bulk waste rock samples for grain size analysis, acid generation potential tests, and metals analysis. The results of these tests and field observations made during the sample collection program are discussed in the following subsections.

3.1.1 Field Observations

The information gained from the field effort can be divided into four main categories:

- Location of the waste rock piles in relation to existing drainage systems and apparent source of the waste rock (i.e., nearest shaft or adit)
- Estimates of the volume of waste rock present at each pile
- Average slope of the waste rock piles at the locations sampled
- Waste rock material and type of mineralization.

This information is listed for each pile on Table 3.1-1. The volume estimates were calculated using the average depth of the excavations advanced at each sampling location and therefore should be considered as gross estimates. The average slopes of the waste rock piles were calculated using inclinometer measurements taken at the sample locations. Logs of the profile trenches are provided in Appendix A.

Table 3.1-1
Waste Rock Pile Field Information

Waste Rock Pile	Nearest Adit or Shaft	Drainage System	Estimated Volume (cubic yards)	Average Slope (degrees)	Petrology/ Mineralogy
WP-1	Belden Fan	Un-named tributary	13,800	37	Galena, sphalerite, pyrite, limestone
WP-2	St. Joe	Un-named tributary	6,370	36	Galena, pyrite, limestone, quartzite
WP-3	Unknown	Tramway tributary	820	29	Granite, limestone
WP-4	Mask	Tramway tributary	6,570	34	Pyrite, limestone
WP-5	Mask	Tramway tributary	7,990	37	Copper, galena, pyrite, sphalerite, limestone, quartzite
WP-6	Polar Accidental	None	1,180	32	Limestone, quartzite
WP-7	Chief Incline	Rock Creek	5,280	37	Galena, pyrite, sphalerite, limestone, quartzite
WP-8	No. 1 Shaft	Rock Creek	15,790	34	Pyrite, sphalerite, limestone, granite, quartzite
WP-9/ WP-10	Ben Butler	SR-1	1,840	38	Pyrite, limestone, quartzite
WP-11	Chief Incline	Rock Creek	37,220	49	Copper, galena, pyrite, limestone, quartzite

Table 3.1-1
Waste Rock Pile Field Information

Waste Rock Pile	Nearest Adit or Shaft	Drainage System	Estimated Volume (cubic yards)	Average Slope (degrees)	Petrology/ Mineralogy
WP-12	Uncle Sam	Rock Creek	Not Calculated[1]	10	Copper, galena, pyrite, limestone quartzite
WP-13	Rocky Pt.	Tramway tributary	790	48	Copper, pyrite, limestone, quartzite
WP-14	Newhouse	SR-2	580	31	Pyrite, limestone, granite, quartzite
Adit 7	Adit 7	Rock Creek	486	43	Copper, pyrite, limestone, quartzite
Crossbeam	Crossbeam	None	3,470	36	Biotite, pyrite, granite, quartzite

[1] WP-12 does not exist as a surface feature.

3.1.2 Analytical Results

Grain size distribution tests, acid generation potential tests, and metals analyses were conducted on samples collected from each waste rock pile. The results of these tests are discussed in the following subsections.

3.1.2.1 Grain Size Distribution Tests

American Society for Testing and Materials Method D 422 was used to approximate the grain size of the minus 6-inch portion of material collected from every third sample location or, at a minimum, one location per pile. Gradation curves are presented in Appendix A. The percentage of the plus 6-inch material was estimated in the field during excavation of the profile trenches. The plus 6-inch

material estimates are volume estimates because physical limitations and safety constraints did not permit weighing the plus 6-inch material during sample collection. Therefore, the plus 6-inch material volume estimates are not combined with the grain size test results that were calculated on a weight basis.

Based on the results of the grain size tests, the waste rock pile samples can be grouped into categories based on particle size. These categories, the major grain size fraction, and the percentage of plus 6-inch material are listed on Table 3.1-2.

Table 3.1-2
Waste Rock Pile Particle Size Comparison

Particle Size Category	Waste Rock Pile Sample	Percent Grain Size	Percent Plus 6-inch
Silt or clay	WP3-1	53 % -#200	0
	WP14-2	55.2 % -#200	33
Fine sand to silt or clay	WP2-1	50.7% -#100	2
	WP7-2	53.2% -#60	10 to 30
	WP8-6	52.2% -#60	Less than 5
	WP11-2	52.2% -#40	5
Medium sand to silt or clay	WP12-1	51.5% -#10	45
Medium sand to gravel	WP1-1	54.5% +#20	5
	WP4-1	51.6 % +#20	0
	WP5-1	53.9% +#20	Less than 5
	WP14-6	55.1% +#20	1
Coarse sand to gravel	WP10-1	52% +#10	35
	Crossbeam2	51.7% +#10	10
Gravel	WP6-2	67.1% +#4	10
	WP8-1	53.6% +#4	0
	WP11-6	50.9% +#4	2
	WP13-4	60.7% +#4	17
	Adit 7-1	52.9% +#4	5

3.1.2.2 Metals Results

The potential of each major waste rock pile to liberate metals depends on many factors, including material permeability, solute availability, oxidation conditions, and total metals content. To determine metal content in the waste rock material, each waste rock sample collected was crushed to pass #60 mesh and tested for sulfide and the following metals: arsenic, cadmium, calcium, copper, iron, lead, magnesium, manganese, and zinc.

Table 3.1-3 is a list of mean metal concentrations on a pile specific basis. Although the waste rock samples were analyzed for nine metals, only the mean concentrations of selected metals are provided on Table 3.1-3. All metals and sulfide results are provided in Appendix A.

Table 3.1-3
Waste Rock Pile Mean Metal Concentrations (mg/kg)*

Waste Rock Pile	Arsenic	Cadmium	Iron	Lead	Manganese	Zinc
WP-1	781	91	131,175	17,225	9,683	20,475
WP-2	632	52	94,633	16,847	7,503	10,023
WP-3	2,060	40	136,000	39,050	7,750	8,665
WP-4	752	162	110,850	9,605	20,700	38,200
WP-5	1,346	225	169,800	18,340	39,080	57,040
WP-6	950	2.8	103,975	1,878	1,085	94,946
WP-7	850	66	70,067	10,910	4,563	10,240
WP-8	710	35	109,913	6,388	7,566	6,558
WP-9/WP-10	141	20	36,925	2,556	1,641	3,644
WP-11	146	25	31,850	7,962	3,020	5,547
WP-12	123	10	34,950	12,020	1,004	1,900
WP-13	585	0.87	73,900	1,643	1,650	655
WP-14	802	12	127,343	3,901	3,743	3,607
Adit 7	116	0.76	25,750	5,230	348	673
Crossbeam	53	8.8	33,650	790	3,205	1,490

* One-half of the detection limit was used for nondetects when calculating mean concentrations.

The highest mean metal concentrations were observed at WP-3 and WP-5 and the lowest mean metal concentrations were observed at waste rock piles Adit 7 and Crossbeam. As indicated on Table 3.1-2, WP-3 contains more than 50 percent silt or clay size material, WP-5 contains more than 50 percent medium sand to gravel size material, and Adit 7 and Crossbeam contain more than 50 percent coarse sand to gravel size material. The metals and grain size data indicate that the highest mean metal concentrations were generally found in waste rock piles with finer grain material, which is expected because more surface area per volume is exposed in the finer fraction.

3.1.2.3 Acid Generation Potential Tests

Maximum potential acidity and neutralization potential tests were conducted to determine the acid forming capacity of the waste rock by balancing the material's acidity (as total or pyritic sulfur) against its neutralization potential (as calcium carbonate). The results of these tests were evaluated by two separate techniques. These techniques are contained in Laboratory Methods Applicable to Overburdens and Minesoils (EPA, 1978) and Technical Document, Acid Mine Drainage Prediction (EPA, 1994).

In accordance with Laboratory Methods Applicable to Overburdens and Minesoils, acid-base accounts were developed from the test results. According to test specifications, material having a an acid-base account of five (5.0) tons of calcium carbonate equivalent or more per 1,000 tons of material can, when in contact with water, potentially generate acid rock drainage. Furthermore, according to the above reference, materials that have a pH of less than 4.0 can potentially generate acid regardless of the acid-base account. The acid-base account and pH of each sample collected are listed on Table 3.1-4.

TABLE 3.1-4
WASTE ROCK PILE ACID-BASE ACCOUNTS AND NEUTRALIZATION POTENTIAL/ACID POTENTIAL RATIOS

Waste Rock Pile	Sample ID	Max. Potential Acidity (t CaCO3/kt)	Neutralization Potential (t CaCO3/kt)	Acid-Base Account	pH	Neutralization Potential/Acid Potential
1	WP1-1	51.2	423	-371.8	7.41	8.3
	WP1-2	22.8	191	-168.2	7.62	8.4
	WP1-3	116	564	-448	7.15	4.9
	WP1-4	86.2	559	-472.8	7.18	6.5
2	WP2-1	105	418	-313	6.06	4.0
	WP2-2	109	378	-269	6.66	3.5
	WP2-3	67.5	129	-61.5	5.59	1.9
3	WP3-1	68.4	72.8	-4.4	6.70	1.1
	WP3-2	70.6	69.4	1.2	6.88	1.0
4	WP4-1	279	473	-194	6.70	1.7
	WP4-2	96.9	718	-621.1	7.83	7.4
	WP4-3	180	279	-99	6.51	1.6
	WP4-4	89.1	436	-346.9	7.51	4.9
5	WP5-1	106	413	-307	7.22	3.9
	WP5-2	75.3	272	-196.7	7.08	3.6
	WP5-3	353	154	199	5.03	0.4
	WP5-4	48.1	186	-137.9	7.79	3.9
	WP5-5	71.9	520	-448.1	6.44	7.2
6	WP6-1	21.2	401	-379.8	4.16	18.9
	WP6-2	10.3	2.2	8.1	5.32	0.2
	WP6-3	26.5	<0.1	26.5	3.70	0.0
	WP6-4	15.3	28.4	-13.1	6.58	1.9
7	WP7-1	77.2	91.8	-14.6	5.62	1.2
	WP7-2	<0.3	317	-317	6.66	NA
	WP7-3	64.4	354	-289.6	7.21	5.5
8	WP8-1	204	720	-516	6.67	3.5
	WP8-2	115	371	-256	6.01	3.2
	WP8-3	261	486	-225	5.87	1.9
	WP8-4	208	181	27	7.16	0.9
	WP8-5	189	3	186	4.51	0.0
	WP8-6	182	3	179	4.23	0.0
	WP8-7	149	734	-585	7.17	4.9
	WP8-8	137	589	-452	7.59	4.3
9 & 10	WP10-1	51.2	<0.1	51.2	3.56	0.0
	WP10-2	50.6	246	-195.4	6.85	4.9
	WP10-3	55	<0.1	55	3.59	0.0
	WP10-4	23.4	89.2	-65.8	4.27	3.8
11	WP11-1	33.4	36.5	-3.1	6.42	1.1
	WP11-2	38.4	201	-162.6	6.82	5.2
	WP11-3	7	265	-258	7.65	37.9
	WP11-4	36.2	307	-270.8	7.52	8.5
	WP11-5	46.6	837	-790.4	8.06	18.0
	WP11-6	57.5	462	-404.5	7.78	8.0
12	WP12-1	13.1	10.8	2.3	5.78	0.8
	WP12-2	58.1	2	56.1	3.35	0.0
13	WP13-1	82.2	60.8	21.4	5.31	0.7
	WP13-3	40	<0.1	40	4.24	0.0
	WP13-4	35.6	<0.1	35.6	3.24	0.0
14	WP14-1	409	<0.1	409	2.04	0.0
	WP14-2	195	<0.1	195	2.91	0.0
	WP14-3	70.3	18.7	51.6	5.35	0.3
	WP14-4	242	<0.1	242	2.35	0.0
	WP14-5	57.5	25	32.5	4.91	0.4
	WP14-6	35.6	9.4	26.2	6.06	0.3
	WP14-7	53.1	2.7	50.4	3.79	0.1
Adit 7	Adit7-1	22.8	<0.1	22.8	4.42	0.0
	Adit7-2	14.4	6.4	8	5.57	0.4
Crossbeam	Crossbeam-1	1.5	42.2	-40.7	7.16	28.1
	Crossbeam-2	1.1	9.4	-8.3	5.57	8.5

Based on this evaluation technique, the acid-base accounts for WP-1, WP-2, WP-3, WP-4, WP-5, WP-7, WP-11, and Crossbeam are less than 5.0, indicating minimum or no potential to generate acid. The remainder of the waste rock piles have some potential to generate acid and are discussed in more detail later in this section.

The Technical Document, Acid Mine Drainage Prediction, contains the following two techniques for evaluating acid generation potential (AGP) test results:

- Calculate the net neutralization potential by subtracting the acid production potential from the neutralization potential. If the difference is negative, potential exists for the tested material to form acid. Prediction of the acid potential when the net neutralization potential is between -20 to 20 is more difficult.

- Calculate the ratio of the neutralization potential and acid production potential. Ratios of 1:1 or less are more likely to generate acid. A zone of uncertainty exists for ratios between 3:1 and 1:1.

In the first technique, net neutralization potential is calculated using the reverse mathematical equation used to calculate the acid-base accounts previously discussed; therefore, data were not evaluated using this method. The ratios of the neutralization potentials to acid production potentials were calculated and are shown on Table 3.1-4. The results of this evaluation technique are summarized as follows:

- WP-1, WP-2, WP-5, WP-7, WP-11, and Crossbeam have little or no potential to generate acid

- Portions of WP-8, WP-10, WP-12, WP-13, WP-14, and Adit 7 are likely to generate acid

- WP-3, WP-4, and WP-6 are in a zone of uncertainty where acid generation potential is difficult to predict.

Both evaluation techniques (acid-base accounts and neutralization potential/acid potential ratios) indicate that the following piles have the potential to generate acid: WP-6, WP-8, WP-9/WP-10

(sampled jointly as one pile), WP-12, WP-13, WP-14, and Adit 7. These waste rock piles are discussed in more detail in the following paragraphs.

WP-6: WP-6 is located on the outskirts of the Town of Gilman. Four samples were collected from WP-6. Two of the samples show a net potential to generate acid. A grain size distribution analysis of a sample collected from WP-6 indicates that 67 percent of the material sampled is gravel sized suggesting that this pile is less likely to release metals than finer material.

WP-8: WP-8 is located downslope from the Number 1 shaft. This large pile is benched. Three samples were collected from the upper bench and five samples were collected from the lower bench. Test results indicate that the upper bench material has minimum or no net potential to generate acid, but three of the five samples collected from the lower bench indicate a net potential to generate acid. Calcium and magnesium concentrations of samples collected from the upper bench are considerably greater than samples collected from the lower bench, suggesting that much of the upper bench material is dolomite. The lower bench material is finer grained than the upper bench material, containing more than twice as much material passing the #200 mesh sieve.

WP-9/WP-10: WP-9/WP-10 were combined for sampling purposes. Four samples were collected from the combined piles. Results indicate that the two downhill samples have little or no net potential to generate acid, but the two uphill samples have net acid generation potential. A grain size distribution test on material from this pile indicates that half of the material is coarse sand to gravel sized and thus is less likely to release metals than finer grained piles.

WP-12: Material from WP-12, in lower Rock Creek Canyon, was used as backfill during the construction of the Rock Creek culvert. Two backhoe pits, one upper and one lower, were excavated at the former location of WP-12 and samples were collected. Results of both samples indicate a net potential to generate acid.

WP-13: WP-13 is located below Rocky Point adit. Three samples were collected from WP-13 and all results indicate the net potential to generate acid. Two of the three samples have no neutralization potential. A grain-size distribution test on sample WP13-4 indicates that more than half of the material is gravel sized and, therefore, is less likely to release metals than finer material.

WP-14: WP-14 is process waste and includes some roaster material. All seven samples collected from this pile indicate a net potential to generate acid. Three of the samples collected show no neutralization potential. Grain-size distribution tests indicate that 65 to 85 percent of the material is medium sand size and smaller and, therefore, is more likely to release metals than coarser material.

Adit 7: Two samples were collected from the pile outside Adit 7 in upper Rock Creek Canyon. Results from both samples indicate net potential to generate acid. More than 50 percent of the material in the Adit 7 pile is the gravel sized and, therefore, is less likely to release metals than finer material.

3.1.3 Waste Rock Summary

Based on the information collected to date, the four piles with the greatest acid generation potential are WP-8, WP-10, WP-13, and WP-14. The potential impact to the Eagle River from the other piles tested is low because of the following:

- Minimum or no potential to generate acid (WP-1, WP-2, WP-3, WP-4, WP-5, WP-7, WP-11, Crossbeam)
- Size of the pile and size of the material in the pile (WP-6, WP-12, Adit 7)
- Lack of an identifiable pathway to the Eagle River (WP-6, WP-12).

3.2 SURFACE WATER

This section describes the results of precipitation and runoff monitoring at the Site for the period of data collection (July 1995 through September 1997). This 2½-year period covers approximately three rainfall-runoff seasons (June through September - 1995, 1996, and 1997) and two snowmelt-runoff seasons (March through May - 1996 and 1997).

3.2.1 Precipitation Evaluation

Rainfall data were collected at the two Site rainfall recording stations from 1995 to 1997. These gages were installed in April or May and removed in October each year, except 1995 when the gages were installed in July. The daily total rainfall values at Stations RF-1 and RF-2 for the period are presented in Appendix D. The gages were operated only during ice-free periods at the Site, which generally extends from May through September. However, some data may include snow during the early and late seasons (May and October). Available monthly total precipitation data are summarized for Station RF-1 (Gilman) in Table 3.2-1.

TABLE 3.2-1
Precipitation (Inches) and Temperature (Deg.F) Data

Month	Station RF-1 Precipitation (1995)	Station RF-1 Precipitation (1996)	Station RF-1 Precipitation (1997)	Vail Station Mean Precip. (1985-96)	Vail Station Mean Temp. (1985-95)
January	NA	NA	NA	1.59	17.1
February	NA	NA	NA	2.98	21.3
March	NA	NA	NA	1.89	30.6
April	NA	NA	NA	2.50	37.5
May	NA	0.75P	2.71P	1.25	46.3
June	NA	1.12	1.25	1.37	54.5
July	0.22P	1.23	1.00	2.34	58.5
August	1.17	0.46	2.68	1.46	58.3
September	2.18	2.81	1.63	1.75	50.3
October	0.48P	0.22P	0.59P	1.24	39.6
November	NA	NA	NA	1.77	25.4
December	NA	NA	NA	1.36	16.3
Jun-Sep Total		**5.62**	**6.56**	**6.92**	**37.3**

P - partial data
NA - no data available

3.2.1.1 Comparison to Long-Term Data

Site precipitation data is available during the summer months for 2 ½ years. The nearest long-term climatological station which can be used for comparison to Site precipitation data for evaluation of moisture conditions during the monitoring program is in Vail, Colorado. The Vail station is located approximately eight miles north of Gilman at an elevation of 8,225 ft-MSL and has been in operation since 1985. The Vail station provides a reasonable representation of average seasonal precipitation conditions at Gilman and are useful for comparison purposes. Data for the Vail station are also summarized in Table 3.2-1, including rainfall and temperature data.

Review of the precipitation data from Vail indicated that 56 percent (12.1 inches) of the annual precipitation occurred during the winter months (November through April). Data also shows that the average temperature was below freezing during most of this period and precipitation was principally in the form of snowfall. The remaining 44 percent (9.4 inches) was rainfall or, during May and October, a mixture of rain and snow. The Vail data is consistent with data collected and observations made in the Belden and Gilman areas of the Site during the monitoring program. When average temperatures were below freezing (i.e. the five month period from November through March) little or no runoff occurred in the waste rock pile tributaries. This is generally the period of snowfall accumulation in the subject watersheds.

Depending on the aspect of each subject drainage area, snow can begin to melt in March, particularly on south-facing slopes in the Gilman/Belden area. Snowmelt is typically well underway in April and ends sometime in May in the subject tributaries. The volume and intensity of snowmelt runoff is a function of the available snowpack, watershed size and aspect, and ambient air temperature. The snowmelt-runoff process and associated data collected during the study period is described in detail for each tributary in Section 3.2.2.

3.2.1.2 Snowpack Conditions

Snow surveys were conducted at established snow courses on the Consolidated Tailings Pile (CTP) to measure snow water equivalent. The results of CTP snow surveys conducted during the first half

of March for the years 1992 through 1997 are shown in Figure 3.2-1. These data indicated that 1996 had the highest early March snowpack at the CTP for the period of record. Site snowpack was similar in 1995 and 1997, and both years were above normal. This information can generally be translated to the Belden and Rock Creek areas of the Site for use in predicting the potential volume and timing of snowmelt-runoff.

3.2.1.3 Rainfall Conditions

During the rainfall-runoff months June through September, the total Site rainfall was lower in 1996 (5.62 inches) than in 1997 (6.56 inches). Both of these rainfall totals were lower than the average Vail station totals for the summer period (see Table 3.2-1).

A plot showing the available 24-hour precipitation total for Station RF-1 is provided in Figure 3-2-2. The period of record extends from July to October in 1995, and from May to October in 1996 and 1997. These data show lower rainfall at the Site in May 1996 as compared to May 1997. Some of the precipitation measured in May and October was in the form of snow. Site rainfall totals were similar in June and July for both years, but July totals were lower than normal based on Vail station records. August 1996 was drier than normal and August 1997 was wetter than normal when compared to Vail station data. September rainfall was above normal in 1995 and 1996 compared to Vail station data.

Precipitation is principally in the form of rainfall from June through September each year at the Site. The waste rock pile runoff monitoring program was designed to measure surface water runoff during this period irrespective of rainfall intensity or volume. Automatic samplers were configured to initiate sample collection whenever runoff was present and to log the time at which runoff (sample collection) occurred at each monitoring location. Therefore, the rainfall intensity or volume which generated runoff can be determined from the rainfall recorder and the automatic sampler data.

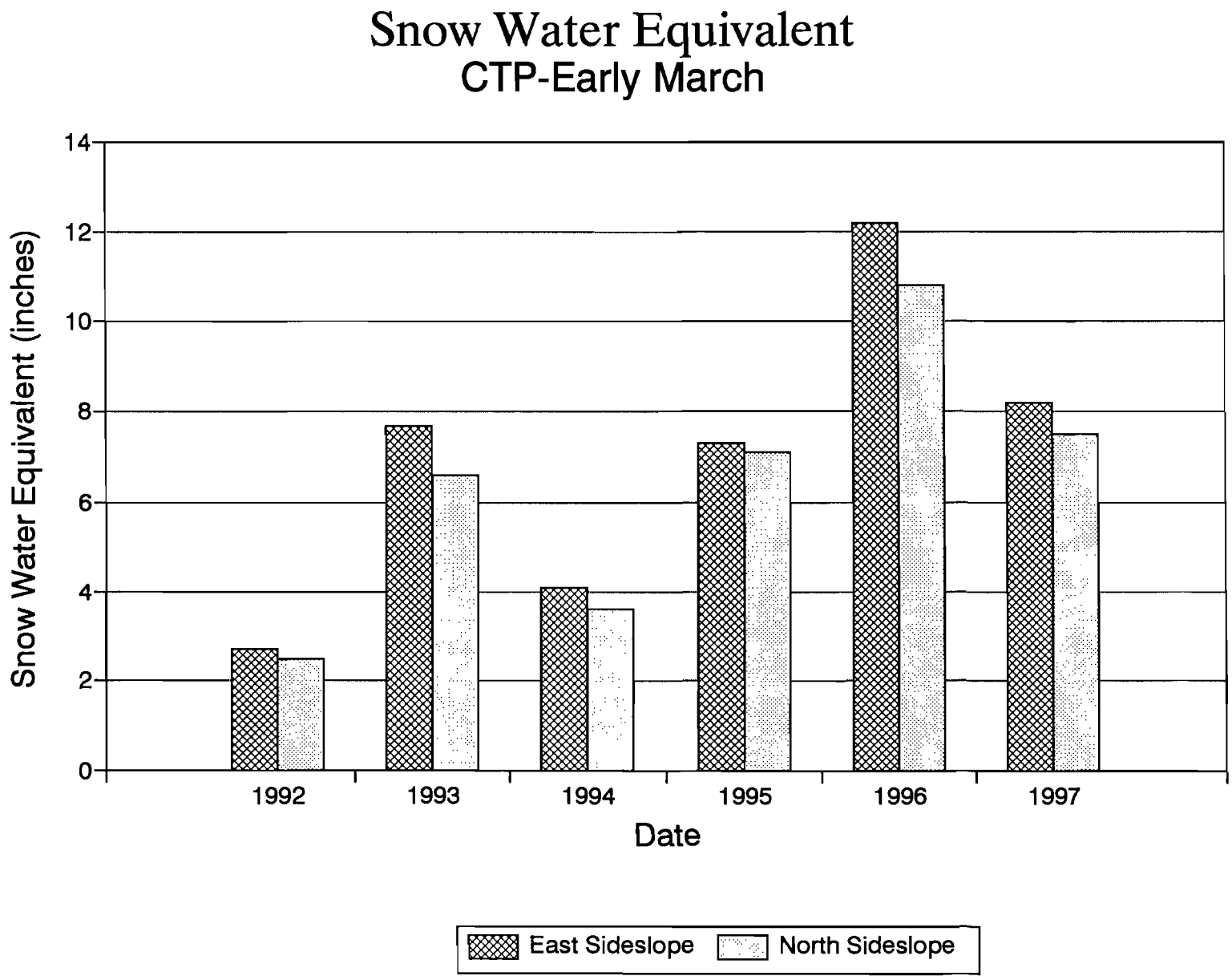

Snow Water Equivalent
CTP-Early March
Snow Water Equivalent (inches)
14
12
10
8
6
4
2
0
1992
1993
1994
1995
1996
1997
Date
East Sideslope
North Sideslope

Figure 3-2-1

Daily Precipitation Total
Station RF-1 (Gilman)

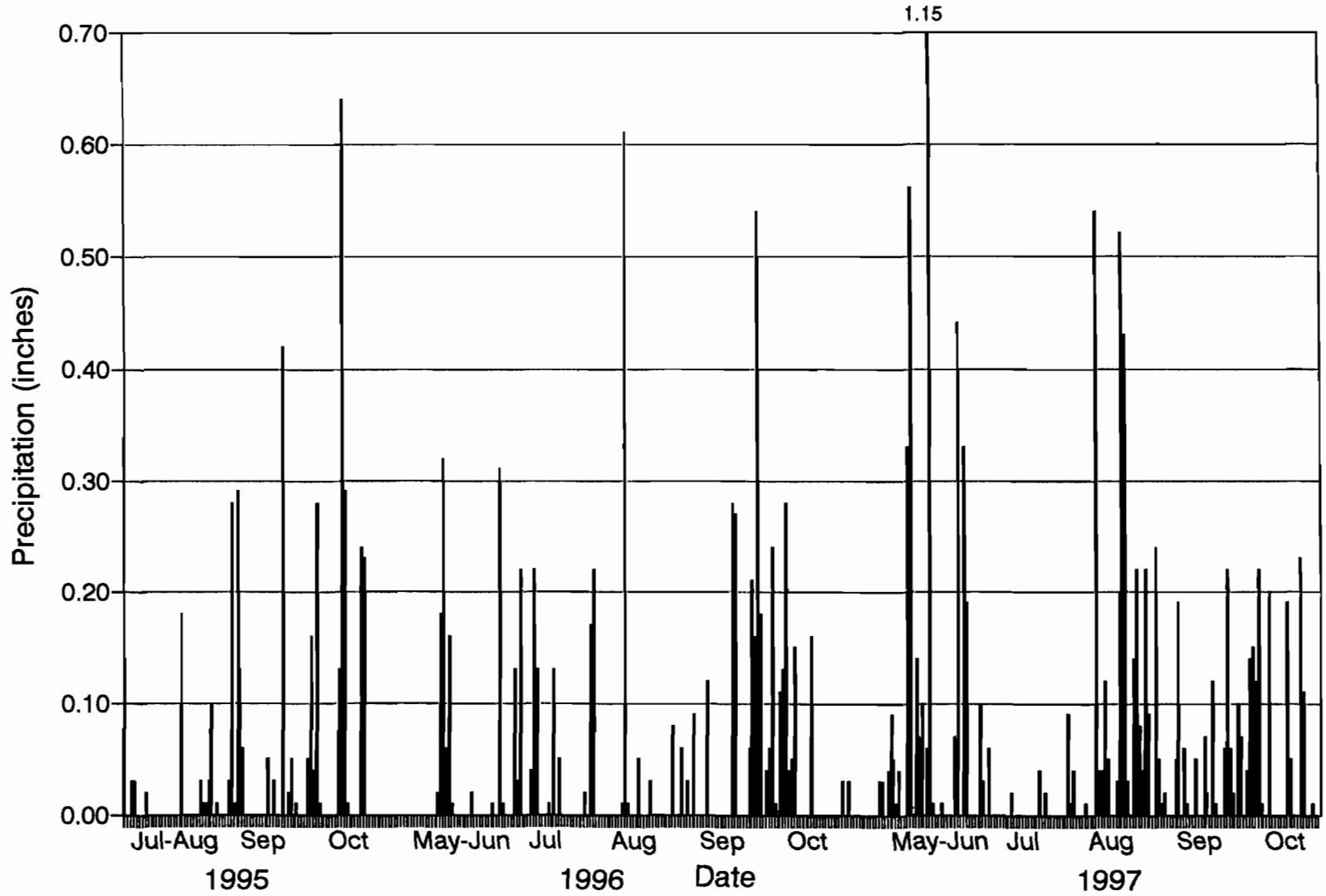


Figure 3-2-2

A summary of the equivalent rainfall intensity measured (in inches per hour) for each rainfall-runoff event is presented in Table 3.2-2. As shown, most of the rainfall-induced runoff events occurred in August or September during the three year study period. Only one runoff event was measured in May, June, or July. The minimum rainfall intensity required to generate runoff was 0.24 inches per hour (in/hr) and the maximum recorded was 1.56 in/hr. On the runoff event days, the majority of rainfall often occurred over a one-hour period.

Table 3.2-2
Site Rainfall Runoff Events - Station RF-1 Rainfall Data

Event Date	Maximum Intensity (Inch/Hr)	Hourly Total (Inches)	Daily Total (Inches)	Stations Sampled
03-Aug-95	0.48	0.10	0.18	E-3R, E-5R, T-6R
23-Aug-95	0.24	0.14	0.29	SR-4, T-10R
08-Sep-95	0.48	0.24	0.42	E-3R, E-5R, E-11R, SR-3, SR-4, T-4R, T-6R, T-10R, T-TR
20-Sep-95	0.24	0.13	0.28	SR-3, T-4R, T-6R, T-10R
29-Sep-95	0.24	0.12	0.64	SR-3, T-4R, T-6R, T-10R, T-TR
29-Jul-96	1.56	0.49	0.61	E-3R, E-11R, SR-4, T-4R, T-10R, T-TR
12-Sep-96	0.24	0.08	0.21	E-11R, SR-4
14-Sep-96	0.36	0.25	0.54	E-5R, SR-4, T-4R, T-6R, T-10R, T-TR
24-Sep-96	0.36	0.09	0.28	SR-4, T-10R
29-May-97	1.08	0.25	1.15	E-5R, E-11-R, SR-3, SR-4, T-4R
10-Jun-97	0.48	0.18	0.33	SR-4
27-Jul-97	0.60	0.39	0.54	E-3R, E-5R, SR-4, T-4R, T-6R, T-10R, T-TR
05-Aug-97	1.32	0.21	0.52	E-3R, E-5R, T-4R, T-6R, T-TR
09-Aug-97	0.60	0.12	0.14	SR-3, T-10R
17-Aug-97	0.60	0.23	0.24	E-3R, E-5R, SR-3, T-4R, T-10R, T-TR

Example rainfall distribution for nine events generating runoff at one or more monitored Site tributaries is shown in Figure 3-2-3; three events each for 1995, 1996, and 1997. Two primary factors determined whether or not runoff was generated from Site tributaries: (1) rainfall intensity; and (2) antecedent soil moisture conditions. Recognizing that abstractions from rainfall depend on antecedent conditions that exist at the time a rainstorm occurs, under dry to average soil moisture conditions (Soil Conservation Service [SCS] Antecedent Conditions I and II), an equivalent rainfall intensity of 0.36 inch/hour or greater was typically required to generate runoff from Site tributaries. However, during higher soil moisture conditions (SCS Antecedent Condition III), runoff can occur with equivalent rainfall intensity as low as 0.24 inch/hour. All of these soil moisture conditions were observed at some point during the study period.

Variables which influence the volume of runoff generated include rainfall intensity, antecedent moisture conditions, and the hydrologic characteristics of each watershed. Data indicate that generation of runoff was highly variable among the monitored tributaries due to the variance in these factors. The aerial distribution of rainfall also had a significant effect on runoff location. For example, an intense rainstorm centered over the canyon area of Belden on May 29, 1997, caused runoff in the Un-named tributary but not in the adjacent Tramway tributary. In general, however, when rainfall intensity-duration was greater than 0.24 inch/hour for approximately 20 minutes or longer, runoff was typically generated at most of the tributary stations at the Site. This was the case on September 8, 1995, July 29, 1996, and July 27, 1997.

The 5-minute total rainfall measure at Station RF-1 over the study period is shown in Figure 3-2-4. These data illustrate that the frequency of rainfall intensity greater than 0.36 in/hr was relatively low, and few rainfall intensities exceeded 0.48 in/hr. These data also show that the duration of high intensity rainfall was short, typically 10 minutes or less.

3.2.2 Tributary Evaluation

The tributaries evaluated as part of the storm event/snowmelt surface water runoff monitoring program include both ephemeral and perennial tributaries to the Eagle River, and runoff ditches in the Belden area. The hydrologic characteristics and water quality results for each monitored tributary are described below.

Selected Runoff Events
5-Minute Total Rainfall-Station RF-1

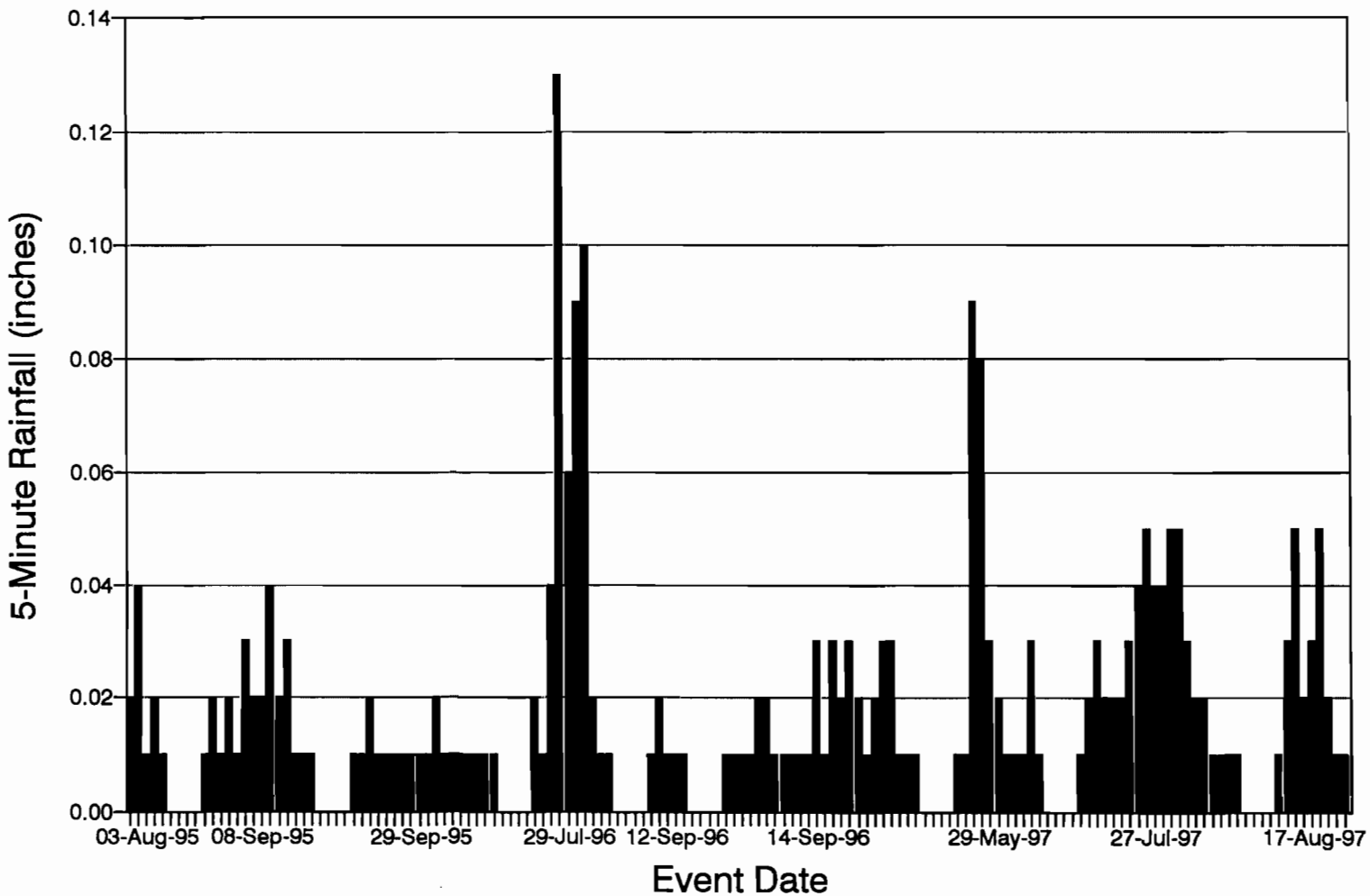


Figure 3-2-3

Rainfall Station RF-1

5-Minute Rainfall - 1995 through 1997

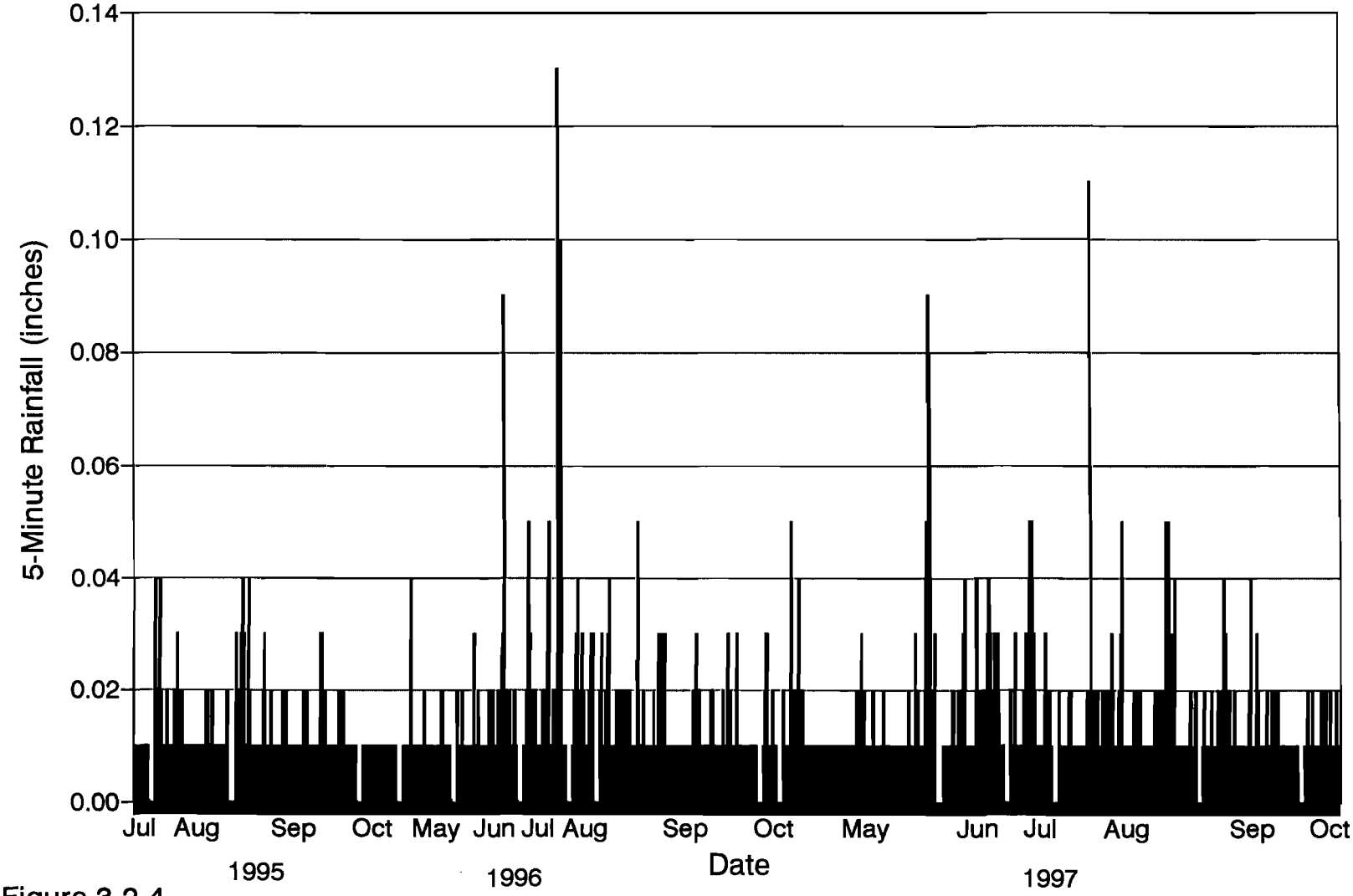


Figure 3-2-4

A drainage area reconnaissance was performed in the Belden/Gilman area in June 1995 to document the hydrologic characteristics of each tributary containing waste rock, pursuant to the Monitoring Plan. Hydrologic characteristics computed based on the field survey data included drainage area, hydraulic length, average slope, travel time, and time of concentration. A summary of this information is provided in Table 3.2-3. As monitoring data were collected, the actual lag time for each watershed event was measured. The range in measured lag time presented in Table 3.2-3 is defined as the duration between the maximum rainfall intensity and the time runoff reached and activated the automatic sampler. The range of measured values for each station illustrates the high variability in rainfall-runoff response, primarily attributable to non-uniform distribution of rainfall in the watershed.

Table 3.2-3

Tributary Hydrologic Characteristics

Station	Drainage Area (Acres)	Hydraulic Length (feet)	Average Slope (Percent)	Time of Concentration (Tc) (minutes)	Lag Time* (T_L) (minutes)	Measured Lag Time (minutes)
T-4R	14.9	965	59	5	3	5-20
T-6R	67.8	3,273	22	15	9	6-14
T-TR	31.0	1,535	53	5	3	6-22
T-10R	978	11,860	24	30	18	5-25
SR-3	5.3	739	65	2	1.2	7-14
SR-4	27.3	855	40	6	4	4-21

* Assuming $T_L = 0.6T_C$

Based on the reconnaissance, it was determined that continuous measurement of discharge was not practical at most tributary locations because of excessive sedimentation or velocity gradients. Therefore, stream discharge was determined for each of the tributary runoff events using the measured instantaneous flows, measured peak flows, and by empirical methods.

The watershed characteristics, peak crest stage height, and channel cross-sectional area were used to develop initial estimates of peak flow for each tributary event in 1995 using the Rational Method. However, measured data from the area indicated that the Rational Method overestimated flow for

the small tributary drainages, sometimes by as much as an order of magnitude. In addition, the relatively small rainfall amounts, steep slopes, and small contributing drainage area of the tributaries precluded the effective use of several other empirical methods in estimating runoff flows, including the SCS Curve Number methodology.

To overcome this problem, sharp-crested 60° V-notch weir plates were installed at tributary Stations T-4R, T-6R, SR-4, and SR-4A for direct measurement of flows. A sharp-crested 90° V-notch weir was installed at Station T-10R to accommodate the larger flow volumes associated with Rock Creek. A crest-stage gage installed at each location was used to measure peak stage for each event, and the following weir rating equation was utilized to calculate peak discharge:

$Q = 0.79 * H^{5/2}$ for 60° weirs, and
$Q = 1.38 * H^{5/2}$ for 90° weirs
where;
Q = discharge in cubic meters per second
H = stage height in meters

The runoff hydrograph was computed using the rainfall distributions measured for each runoff event, and the Santa Barbara Urban Hydrograph (SBUH) Procedure was selected for hydrograph computations. This method is provided as an option in TR-55 model (Hydrology for Small Watersheds). The SBUH model was selected for its feature that allows a rainfall loss rate to be specified by the user which in turn allows relatively small precipitation depths to be used. In this model, the user enters the rainfall distribution, drainage area, time of concentration, and constant infiltration loss rate. The percentage of impervious area and depression storage losses can also be specified. The model generates an instantaneous and final design hydrograph for the event. This procedure was employed to generate storm runoff hydrographs for each of the sampled tributary runoff events.

The model-generated peak flows were compared to measured peak stage and discharge, and observations of high water marks made in the field at the time of sampling to assess the reasonableness of the computed discharge values. Model parameters were then adjusted as required to calibrate the model according to actual measured data for each event. The empirically-derived storm hydrograph ordinates were used to apply flow values to each of the discrete tributary samples.

The estimated or measured flows for each tributary event are shown with the analytical results in Appendix B.

3.2.2.1 Un-named Tributary - Stations T-4A and T-4R

The Un-named tributary is an ephemeral tributary with a total drainage area at sampling location T-4R of approximately 108 acres (see Figure 2.2-2). This tributary has its confluence with the Eagle River at the upstream end of Belden. WP-1 and WP-2 occupy the lower portion of the watershed.

The Un-named tributary is steep with an average slope of approximately 60 percent. The upper portion of the watershed above U.S. Highway 24 consists of an aspen and coniferous forest covering approximately 69 acres, or 64 percent of the total watershed area. The hillslope immediately below U.S. Highway 24 is mostly vegetated with mixed grass and shrubs covering approximately 24 acres. A road constructed during mining operations to access the Belden Fan building bisects the lower portion of the watershed just below U.S. Highway 24. WP-1 and WP-2 were deposited on each side of the drainage below the Belden Fan access road.

A run on control ditch was installed in the Belden Fan road during 1989 to direct surface runoff away from the top of WP-1 and WP-2 and into the Un-named tributary. The drainage area below the runoff control ditch is approximately 15 acres in size and is occupied by WP-1 and WP-2. This area is very steep (>60 percent slopes) and consists mostly of colluvium and waste rock. Near the mouth, the Un-named tributary cascades through rock rubble associated with the sheer cliffs of Belden Canyon before entering the Eagle River.

Monitoring stations were established just above the Belden Fan road (Station T-4A) and near the mouth (Station T-4R) to measure runoff upstream and downstream of the WP-1/WP-2 area. Flow in the Un-named tributary was ephemeral during the study period as shown in Figure 3-2-5. There was no flow observed during the winter between November and February. Flow was derived from snowmelt beginning in March and extending through May each year. During this period, water flows down the principal channel from the forested area above U.S. Highway 24, through a culvert beneath U.S. Highway 24, and continues flowing between WP-1 and WP-2 before entering the Eagle River on the upstream end of Belden. Snowmelt-runoff flows near the mouth at Station T-4R peaked at an estimated 164 gpm in May 1996 and at 323 gpm in May 1997. Following

Tributary Runoff
Station T-4R

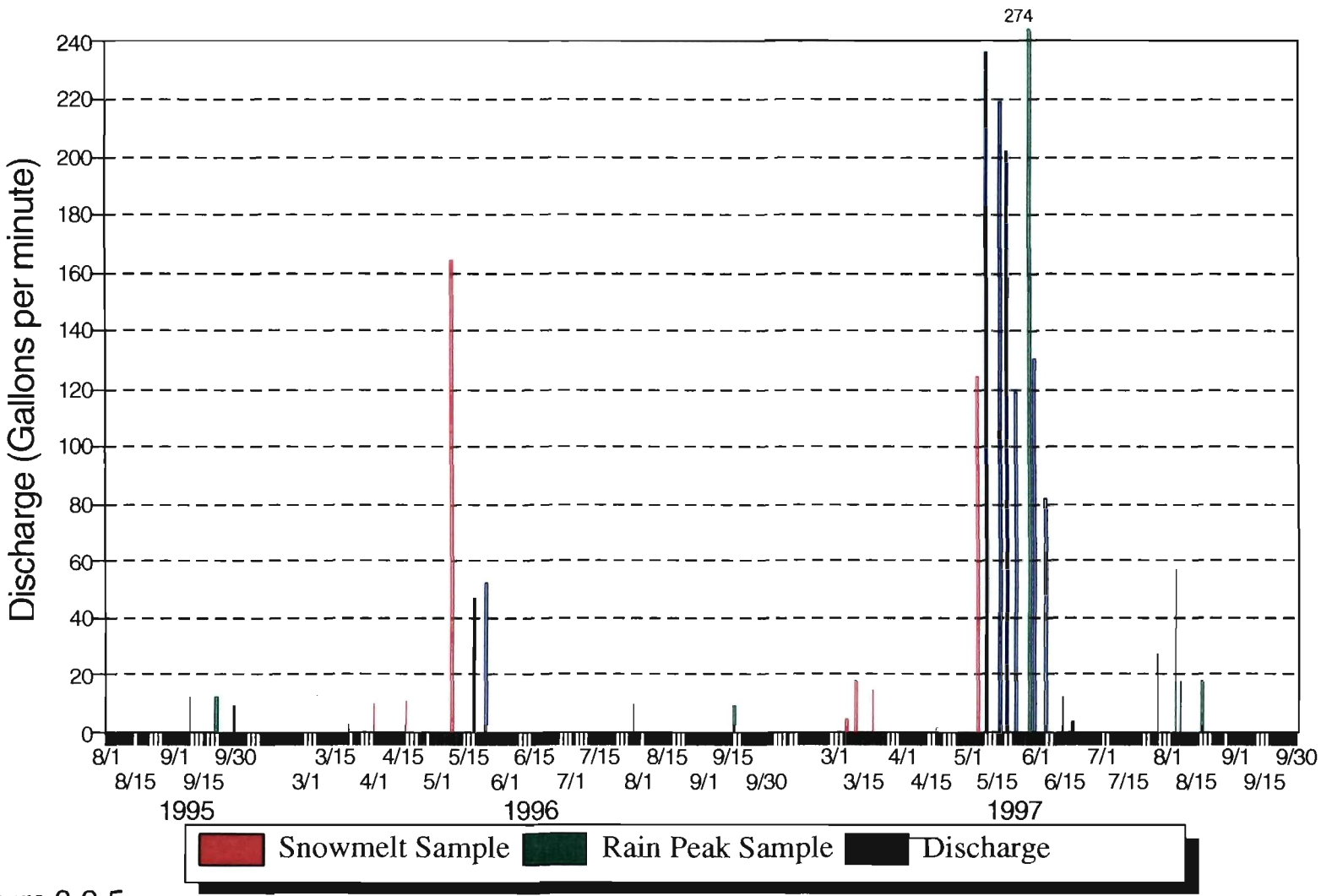


Figure 3-2-5

snowmelt, the Un-named tributary became dry until rainfall of sufficient intensity or volume to generate runoff occurred.

Water was present at the upper Station T-4A only during the snowmelt period. Once the snow in the forested area above U.S. Highway 24 melted (sometime in May), Station T-4A became dry and remained dry throughout the summer and winter months, regardless of rainfall intensity or duration. Data indicate that the forested area above and the hillslope immediately below U.S. Highway 24 only contributed runoff to the Un-named tributary during the snowmelt period and did not contribute runoff during rainfall events. Most of this area is vegetated with less exposed soil and rock than the lower canyon area, and interception and infiltration rates are higher. Likewise, field observations indicate there was no surface runoff in the runon control ditch during the sampling program, and inspection of channel conditions suggest there has been no flow in the ditch since it was installed.

During months when precipitation was dominated by rainfall, typically June through September, the only area contributing rainfall-runoff to the Un-named tributary was the lower 15 acres, or 14 percent of the watershed. This area is generally steeper than the upper vegetated watershed and is dominated by rock outcrop and colluvium in the canyon, in addition to the unvegetated surfaces of WP-1 and WP-2. During summer rainstorm events, runoff emanates from sheet and rill flow from WP-1 and WP-2, and from colluvium and impervious rock in the lower portion of the drainage.

A summary of monitoring results for Stations T-4A and T-4R is presented in Table 3.2-4. The instantaneous streamflow measured during snowmelt-runoff sampling and the flow measured at Station T-4R as a result of rainfall-runoff are presented. The measured dissolved zinc concentration and event load are also provided. Results for other parameters are discussed at the conclusion of Section 3.2.2 and are provided in Appendix B.

Results indicate that discharge during the snowmelt period was generally greater than the discharge during most rainfall-runoff events. The Un-named tributary represents a relatively larger drainage area extending to higher elevations where seasonal storage of snow and the associated melt-off during spring are a significant component of the seasonal hydrology. The same is true for perennial tributaries T-6R and T-10R as discussed below. Peak streamflow in these tributaries typically occurred during May when the bulk of the snowpack stored in the upper portions of each watershed melts.

Table 3-2-4
Stations T-4A and T-4R Runoff Event Summary

Station	Event Date	Stream Discharge			Peak Discharge (gpm)	Diss. Zinc Concentration		Zinc Load Composite (lbs/hr)
		Snowmelt (gpm)	Rainfall-Comp. (gpm)	Rainfall-Rise (gpm)		Composite (mg/l)	Rising Limb (mg/l)	
T-4A	21-Mar-96	3				0.019		0.00003
	01-Apr-96	11				0.018		0.00010
	16-Apr-96	18				0.014		0.00013
	07-May-96	101				0.018		0.00091
	19-Mar-97	5				0.017		0.00004
	17-Apr-97	2				0.016		0.00002
	06-May-97	75			300	0.020		0.00075
T-4R	08-Sep-95		4	9	13	5.0	4.1	0.010
	20-Sep-95		5		13	7.6		0.019
	29-Sep-95		3		9	5.8		0.009
	21-Mar-96	3				16.0		0.024
	01-Apr-96	10				12.0		0.060
	16-Apr-96	11				10.0		0.055
	07-May-96	164				2.3		0.189
	29-Jul-96		4		10	1.9		0.004
	14-Sep-96		3	1	9	4.0	4.7	0.006
*	07-Mar-97	5				14.0		0.035
	11-Mar-97	18				14.0		0.126
	19-Mar-97	15				14.0		0.105
	17-Apr-97	2				12.0		0.012
	06-May-97	124			323	5.3		0.329
	29-May-97		149		274	3.1		0.231
	27-Jul-97		10	16	27	2.9	3.9	0.015
	05-Aug-97		23		57	4.4		0.051
	17-Aug-97		10	16	18	3.3	5.6	0.017

* Station T-4

Table 3-2-5
Station T-TR Runoff Event Summary

Station	Event Date	Stream Discharge			Discharge Peak (gpm)	Diss. Zinc Concentration		Zinc Load Composite (lbs/hr)
		Snowmelt (gpm)	Rainfall-Comp. (gpm)	Rainfall-Rise (gpm)		Composite (mg/l)	Rising Limb (mg/l)	
T-TR	08-Sep-95		31		49	170		2.64
	29-Sep-95		9		18	130		0.59
	13-Feb-96	11				53		0.29
	21-Mar-96	1				52		0.03
	01-Apr-96	15				51		0.38
	29-Jul-96		229		319	110		12.60
	14-Sep-96		29	37	54	100	100	1.45
	07-Mar-97	7				36		0.13
	11-Mar-97	9				72		0.32
	19-Mar-97	2				72		0.07
	27-Jul-97		10	12	22	94	100	0.47
	05-Aug-97		58		130	32		0.93
	17-Aug-97		16		27	98		0.78

A total of seven runoff events were sampled at Station T-4A during the study period, all of which were snowmelt events. Dissolved zinc concentration and load were relatively low at upstream Station T-4A. These concentrations were very consistent during both the 1996 and 1997 snowmelt periods ranging from 0.014 to 0.020 mg/l. These data indicate background levels of zinc for the drainage reflecting a constant bedrock source material.

Dissolved zinc concentration increased between Stations T-4A and T-4R as water passes between WP-1 and WP-2 and enters Belden Canyon. The discharge through this reach remained relatively constant during most of the snowmelt period and the increase in zinc load was caused primarily by an increase in concentration. Peak loads during the study period were associated with peak snowmelt runoff in early May during both 1996 and 1997.

A total of 17 runoff events were sampled at Station T-4R. Dissolved zinc concentrations were higher during the early snowmelt-runoff period ranging from 10 to 16 mg/l, suggesting added mobilization of metals through erosional processes or relatively more contribution by interflow from snow melt traveling through the waste rock piles. Concentrations were significantly lower during rainfall-runoff events, ranging from 1.9 to 7.6 mg/l. The Un-named tributary did not exhibit significantly higher dissolved zinc concentrations during the rising limb of the discharge hydrograph under rainfall-runoff conditions. These data indicate that additional metal accumulation through acid generation processes during dry periods may not be significant in this drainage and additional metal mobilization did not occur during the "first flush" of runoff.

3.2.2.2 Tramway Tributary - Station T-TR

The Tramway tributary is also an ephemeral tributary with a total potential drainage area at the mouth (sampling location T-TR) of approximately 31 acres (see Figure 2.2-2). This tributary has its confluence with the Eagle River in the center of Belden. WP-3, WP-4, and WP-5 occupy the upper portion of the Tramway watershed and potentially contribute runoff to Station T-TR. Field reconnaissance indicates that runoff from WP-14 could also potentially enter the lower Tramway drainage just upstream of the mouth.

Based on the runoff volumes measured it appears that the actual area contributing runoff is less than 31 acres, and that the WP-6 area may not contribute runoff to the principal Tramway drainage

channel. Flows indicate that the actual contributing drainage area is about 15 to 20 acres, similar to the Un-named tributary at Station T-4R.

The Tramway tributary is also steep with an average slope of approximately 53 percent. Runon control ditches were installed in 1989 that effectively divert surface runoff away from the top of WP-3, WP-4, and WP-5 and into the principal Tramway drainage. Field observations indicate there was no surface runoff in the runon control ditch during the sampling program, and inspection of channel conditions suggest there has been no flow in the ditch since it was installed.

The drainage area below the runoff control ditch is approximately 15 acres in size. This area consists mostly of colluvium and waste rock. About one-half way down the drainage (below WP-4) the channel is constricted by the rock "notch" of the Belden Canyon cliffs before continuing down the Tramway to the mouth.

A runoff monitoring station was established at the mouth of the Tramway tributary (Station T-TR). Flow in the Tramway tributary was also ephemeral during the study period. There was no flow observed during the winter between November and February, with the exception of a warm period in February 1996 when a snowmelt runoff event occurred. Unlike the Un-named tributary, the Tramway drainage area does not extend above U.S. Highway 24 and, accordingly, exhibits significantly different seasonal hydrology.

Snowmelt-runoff is limited to the snowpack accumulated in the immediate Tramway watershed; no runoff is contributed from areas upstream of U.S. Highway 24. This factor, combined with the more southerly aspect of the Tramway watershed and direct exposure to solar radiation resulted in less runoff being generated during the snowmelt period than in the Un-named tributary. In fact, the snowmelt runoff duration only extended into early April during 1996 and into March in 1997 and runoff volume was low relative to the Un-named tributary. Snowmelt flows at Station T-TR peaked at an estimated 15 gpm in April 1996 and at 9 gpm in March 1997. Following snowmelt, the Tramway tributary became dry until rainfall of sufficient intensity or volume to generate runoff occurred.

During the summer months when precipitation was dominated by rainfall, typically June through September, rainfall-runoff emanates from sheet and rill flow from the waste rock and from the

impervious rock surfaces in the lower portion of the watershed. Flows measured at Station T-TR as a result of rainfall and snowmelt runoff are presented in Table 3.2-5. This table shows each of the snowmelt and rainfall events sampled, along with the discharge measured during snowmelt-runoff and the discharge estimated during rainfall-runoff. These results indicate that discharge at T-TR was greater for the rainfall-runoff samples than for the snowmelt-runoff samples. The highest discharge measured was caused by a rainfall-runoff event on July 29, 1996 with a peak estimated flow of 319 gpm.

A total of 13 runoff events were sampled at Station T-TR during the study period. Dissolved zinc concentrations ranged from 32 to 170 mg/l in Tramway tributary runoff. The dissolved zinc load was relatively low for snowmelt-runoff samples because of the low discharge. Higher concentrations and loads were measured during rainfall-runoff events. Sedimentation rates were extremely high in this drainage, preventing collection of sufficient sample volume for comparison of the rising limb of the hydrograph "first flush" with the storm composite sample in all but two samples. However, these two samples showed no significant difference in dissolved zinc concentration indicating minimal accumulation of metal precipitates during dry periods.

3.2.2.3 WP-11 Hillside Runoff - Station SR-3

The hillside occupied by WP-11 in the lower Rock Creek area has a contributing drainage area of approximately 5.3 acres (see Figure 2.2-2). This hillside is very steep with an average slope of approximately 65 percent. A run on control ditch was installed in 1989 at the top of the hillslope to direct runoff away from WP-11. Thus, much of the runoff from this area emanates from the surface of waste rock rather than from upstream areas. Except for extreme rainfall events, runoff from this area does not enter the Eagle River but instead enters a collection basin originally constructed to collect mine seepage.

Several gulleys have formed in WP-11 and a large portion of the runoff is concentrated in a large natural depression along the southwest side of the pile. During summer rainstorm events, runoff emanates from sheet and rill flow from WP-11 and from gulleys and adjacent colluvium in the lower portion of the drainage. A monitoring station (Station SR-3) was established in the collection basin at the toe of the WP-11 hillslope near the Rock Creek access road representing runoff from WP-11. Flow at Station SR-3 was intermittent, occurring briefly during snowmelt and following intense rainstorms.

There was no flow observed at Station SR-3 during the winter between November and March. This hillslope is north-facing and collects a seasonal snowpack which is prone to avalanche, as observed in 1996. Under these conditions, much of the snow is deposited at the toe of the hillslope. The WP-11 hillslope did not receive sufficient solar radiation to initiate snowmelt-runoff until late April or May during both 1996 and 1997. These factors, along with the relatively small drainage area, dictate that snowmelt-runoff volume and duration are minimal from this area.

A summary of monitoring results for Station SR-3 is presented in Table 3.2-6. Snowmelt-runoff flows at Station SR-3 were low, ranging from 1 to 4 gpm. These results show that discharge during the snowmelt period was generally lower than discharge during rainfall-runoff events. Following snowmelt, the WP-11 hillside became dry until rainfall of sufficient intensity or volume to generate runoff occurred.

A total of 10 runoff events were sampled at Station SR-3. Dissolved zinc concentrations during snowmelt ranged widely from a low of 0.4 mg/l to 23 mg/l. Concentrations were relatively consistent for rainfall-runoff samples ranging from 3.9 to 8.0 mg/l. The dissolved zinc load was quite low at Station SR-3 because of the relatively low runoff volume generated by the WP-11 area.

Sedimentation rates were high during intense rainfall-runoff events at Station SR-3 due to the amount of exposed soil and hillslope gradient. Even so, samples were collected during the rising limb of the discharge hydrograph for two rainfall-runoff events to evaluate "first flush" metal concentrations. These results show that there was little difference in concentration indicating that additional metal accumulation through acid generation processes during dry periods may not be significant in this drainage and additional metal mobilization did not occur during the "first flush" of runoff.

3.2.2.4 WP-8 Hillside Runoff - Stations SR-4A and SR-4

The hillslope occupied by WP-8 includes a contributing drainage area of about 27 acres. This area covers a segment of U.S. Highway 24, portions of the Town of Gilman including building structures and roads, and vegetated hillslopes. It is believed that the forested area above U.S. Highway 24 does not contribute significant runoff to the WP-8 hillslope.

Table 3-2-6
Station SR-3 Runoff Event Summary

Station	Event Date	Stream Discharge			Discharge	Diss. Zinc Concentration		Zinc Load
		Snowmelt (gpm)	Rainfall-Comp. (gpm)	Rainfall-Rise (gpm)	Peak (gpm)	Composite (mg/l)	Rising Limb (mg/l)	Composite (lbs/hr)
SR-3	08-Sep-95		7	17	22	5.9	6.2	0.021
	20-Sep-95		17		27	6.4		0.054
	29-Sep-95		2		9	8.0		0.008
	07-May-96	2				5.4		0.005
	15-May-96	1				23.0		0.012
	17-Apr-97	1				0.4		0.000
	06-May-97	4				4.2		0.008
	29-May-97		12		36	6.5		0.039
	09-Aug-97		3	5	9	3.9	3.6	0.006
	17-Aug-97		22		36	5.1		0.056

Table 3-2-8
Stations SR-4A and SR-4 Runoff Event Summary

Station	Event Date	Stream Discharge			Discharge	Diss. Zinc Concentration		Zinc Load
		Snowmelt (gpm)	Rainfall-Comp. (gpm)	Rainfall-Rise (gpm)	Peak (gpm)	Composite (mg/l)	Rising Limb (mg/l)	Composite (lbs/hr)
SR-4A	17-Apr-97	5				25		0.06
	06-May-97	14				7		0.05
SR-4	23-Aug-95		15	50	99	140	390	1.05
	08-Sep-95		52	82	148	190	490	4.94
	10-Apr-96	50				210		5.25
	16-Apr-96	21				170		1.79
	07-May-96	105				210		11.03
	29-Jul-96		100	278	642	500	560	25.00
	12-Sep-96		14		37	410		2.87
	14-Sep-96		12	42	87	51	100	0.31
	24-Sep-96		18		50	70		0.63
	11-Mar-97	6				400		1.20
	17-Apr-97	24				180		2.16
	06-May-97	119				180		10.71
	29-May-97		72		158	48		1.73
	10-Jun-97		27		125	83		1.12
	11-Jun-97		27		125	82		1.11
	27-Jul-97		45	112	179	230	840	5.18

A run on diversion ditch was installed at the top of WP-8 in 1989 to divert runoff from a portion of the Town of Gilman, including the No. 1 Shaft building, away from the top of WP-8. Runoff from these areas enters a culvert which extends downslope along the north side of WP-8. Runoff from U.S. Highway 24 also passes through this culvert. Downslope of WP-8, runoff fans out into several small gulleys across the hillslope before concentrating on the old Rock Creek access road. Runoff from this area enters Rock Creek further downstream near the Adit No.8 access road.

A runoff monitoring station (Station SR-4) was established on the old Rock Creek access road near the mouth of the WP-8 hillslope drainage area, approximately 200 feet above its confluence with Rock Creek. Thus, runoff was monitored at a point just upstream of Rock Creek. Additionally, a flow monitoring station was established at the inlet of the run on diversion culvert which passes along the north side of WP-8. This station, designated as Station SR-4A, represents runoff from U.S. Highway 24 and from the No.1 Shaft building and immediate vicinity. Station SR-4A is essentially upgradient of WP-8 representing run on to the hillslope area.

The flow at Station SR-4 is essentially ephemeral and was driven by snowmelt and rainfall events, although small base flows (1-2 gpm) were present late into the fall months. The results of discharge monitoring at Station SR-4 are shown in Figure 3-2-6.

A comparison of the flow monitoring results for Stations SR-4A and SR-4 is provided in Table 3.2-7. Baseflow measurements on days when there was a diurnal fluctuation in streamflow during the monitoring period (occurring under certain snowmelt conditions) were not included in the analysis. These data show that under baseflow conditions, Station SR-4A contributed an average of 35 percent of the flow measured at Station SR-4. Values ranged from 81 percent in May to zero percent in late summer and fall. During summer and fall, flows at Station SR-4 recede to very low ranging from 2 to 4 gpm with little or no flow contributed from upstream sources (Station SR-4A). The baseflow at Station SR-4 likely emanates from shallow ground water in the soil mantle of the hillslope downgradient of WP-8.

Tributary Runoff
Station SR-4

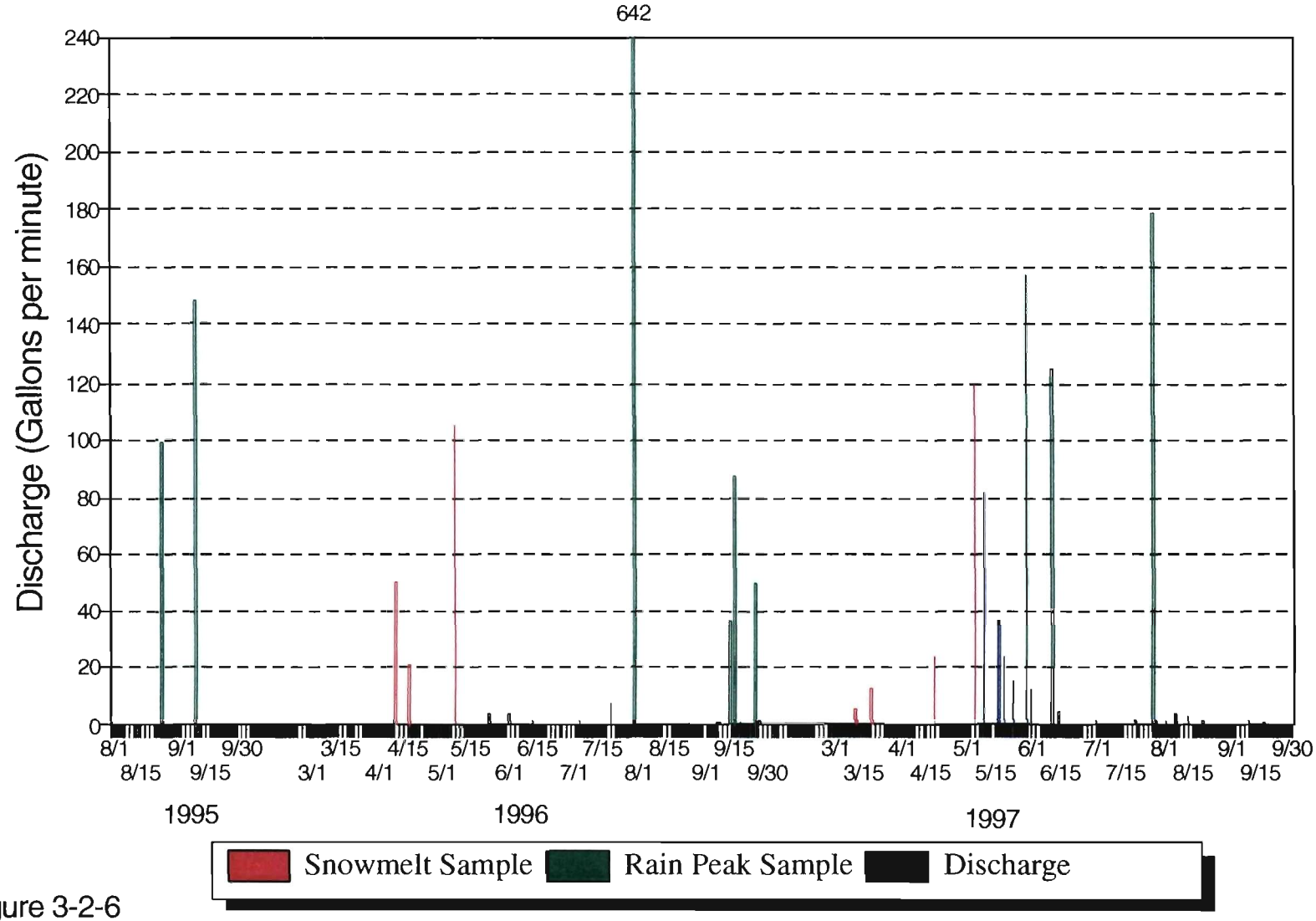


Figure 3-2-6

During runoff conditions, Station SR-4A contributed an average of 80 percent of the flow measured at Station SR-4 near the mouth. Values ranged from 67 percent during snowmelt runoff to 100 percent during rainfall-runoff conditions. These data indicate that approximately 80 percent of the rainfall-runoff measured at Station SR-4 comes from the area above WP-8 including U.S. Highway 24 and possibly the Town of Gilman. The maximum flows measured at Station SR-4 resulted from intense summer rainstorms with a maximum peak flow of over 600 gpm on July 29, 1996.

Two snowmelt runoff events were sampled at upstream Station SR-4A in 1997. Dissolved zinc concentrations were low at Station SR-4A relative to Station SR-4, ranging from 7 to 25 mg/l (Table 3.2-8). Dissolved zinc concentrations increased between Stations SR-4A and SR-4 as water flows past WP-8. The flow and dissolved zinc load also increase from the top to the bottom of the WP-8 hillside. Peak dissolved zinc loads during the study period were associated with peak flows. Maximum loads were measured during peak snowmelt-runoff and during large rainstorm events.

A total of sixteen runoff event samples were collected from Station SR-4 during the study period. Of these, six were snowmelt-runoff samples and 10 were rainfall-runoff samples. Flows ranged from 6 gpm during early snowmelt-runoff in March to over 600 gpm during an intense summer rainstorm on July 29, 1996. Dissolved zinc concentrations varied nearly an order of magnitude ranging from 51 to 500 mg/l in storm composite samples. There was no significant difference in concentration between snowmelt-runoff and rainfall-runoff samples at Station SR-4.

Samples were collected during both the rising limb of the discharge hydrograph and the storm composite for five rainfall-runoff events. The rising limb samples typically contained higher dissolved zinc concentrations than the storm composite samples, particularly following extended dry periods. Most of the rising limb samples exhibited concentrations two to three times higher than the surrogate storm composite samples. Runoff from the WP-8 hillside shows a "first flush" phenomenon indicating that additional metal accumulation through acid generation processes during dry periods and subsequent metal mobilization during the initial stages of runoff occur in this drainage.

Table 3.2-7
Flow Comparison - Stations SR-4A and SR-4

Date	Station SR-4A (gpm)	Station SR-4 (gpm)	Ratio (percent)
03-Jul-96 (peak flow)	20	18	111
30-Jul-96 (peak flow)	480	642	75
16-Sep-96 (peak flow)	78	87	90
25-Sep-96 (peak flow)	34	50	68
22-May-97 (base flow)	13	16	81
22-May-97 (peak flow)	29	43	67
30-May-97 (peak flow)	151	158	96
13-Jun-97 (base flow)	2	5	40
13-Jun-97 (peak flow)	125	125	100
18-Jul-97 (base flow)	1	2	50
18-Jul-97 (peak flow)	3	13	23
28-Jul-97 (base flow)	1	2	50
27-Jul-97 (peak flow)	138	179	77
07-Aug-97 (base flow)	1	4	25
06-Aug-97 (peak flow)	78	108	72
19-Aug-97 (base flow)	0	2	0
19-Aug-97 (peak flow)	87	92	95
14-Oct-97 (base flow)	0	4	0
14-Oct-97 (peak flow)	29	32	91
Average (base flow)			35
Average (peak flow)			80

3.2.2.5 Roaster Pile Drainage - Station T-6R

The Roaster Pile Drainage is a perennial tributary to the Eagle River in Belden. The source of water emanates from springs in the lower portion of the watershed. The total drainage area at Station T-6R near the mouth is approximately 68 acres. Over 50 percent of the watershed is heavily forested in Lodgepole Pine and it appears unlikely that this area contributes significant runoff to the Roaster Pile Drainage. The lower portion of the watershed was formerly occupied by roaster tailings which were removed in 1989 and 1990. By comparison, this area is sparsely vegetated with numerous exposed boulders and rock outcrop, and contributes proportionately greater runoff volume at Station T-6R.

A hydrograph depicting discharge measured at Station T-6R is presented in Figure 3-2-7. This hydrograph covers the runoff monitoring period March through September in 1996 and 1997, and the latter part of the season in 1995 when monitoring started. During the summer and fall periods, baseflow in the Roaster Pile Drainage is typically less than 50 gpm. Peak flows occur each year in May as a result of snowmelt runoff and ranged from 400 to 450 gpm in 1996 and 1997.

Although no waste rock is present in the Roaster Pile Drainage, a runoff monitoring station was established near the mouth to document its contribution relative to other tributaries in Belden. Runoff sampling results for Station T-6R are summarized in Table 3.2-9. Eleven runoff event samples were collected at Station T-6R during the study period, of which four were snowmelt-runoff samples. Dissolved zinc concentrations ranged from 4.2 to 14 mg/l in runoff samples, with no discernable difference in concentration between snowmelt- and rainfall-runoff samples.

Samples were collected during the rising limb of the discharge hydrograph for four rainfall-runoff events. The resulting dissolved zinc concentrations were essentially the same as the storm composite concentrations, indicating that additional metals are not mobilized during the early "first flush" of runoff. Because the concentrations were relatively consistent in Station T-6R runoff samples, the higher dissolved zinc loads were associated with the greatest discharge. However, none of the runoff event loads exceeded one lb/hr in the Roaster Pile Drainage.

Tributary Runoff
Station T-6R

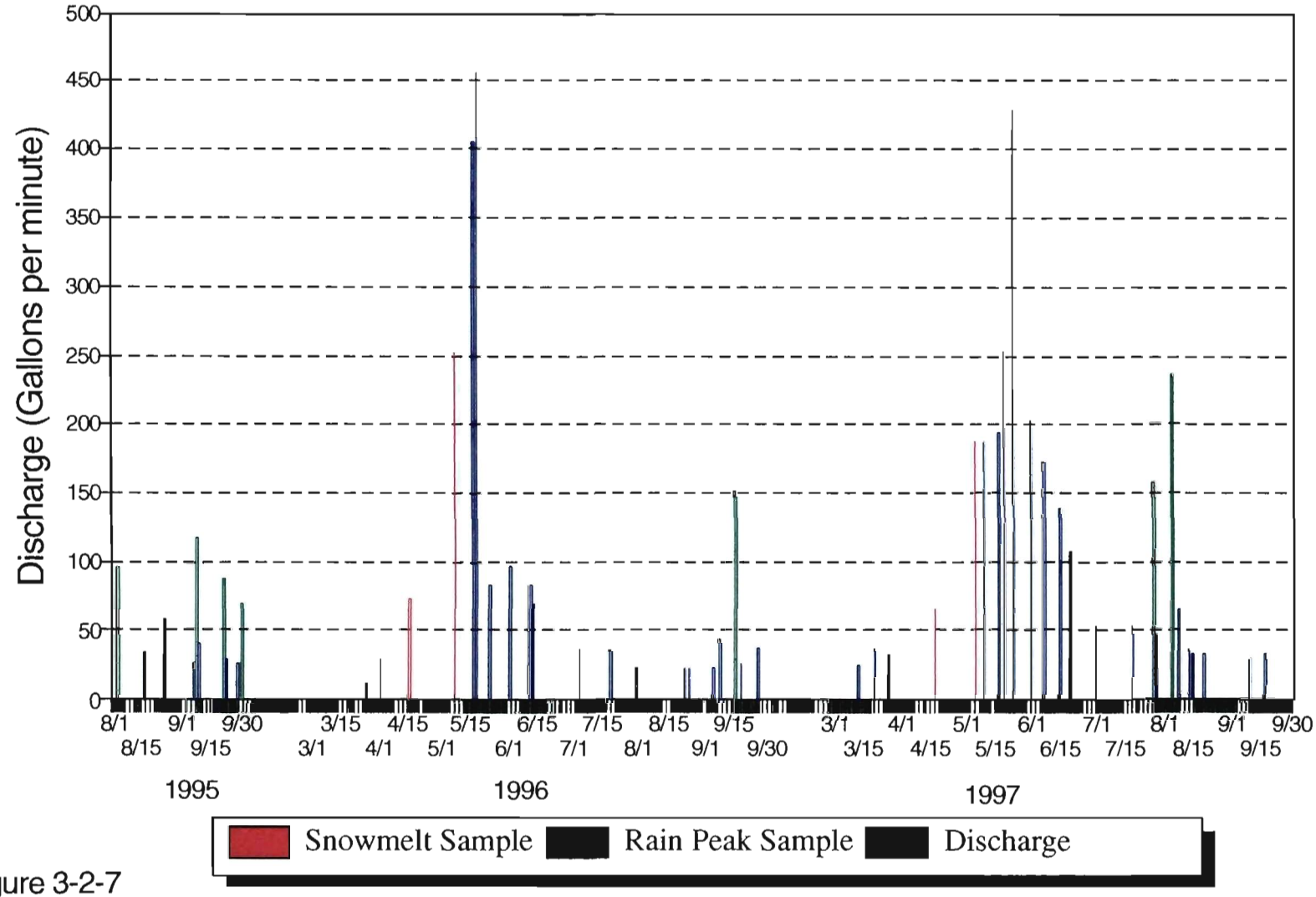


Figure 3-2-7

Table 3-2-9
Station T-6R Runoff Event Summary

Station	Event Date	Stream Discharge			Discharge Peak (gpm)	Diss. Zinc Concentration		Zinc Load Composite (lbs/hr)
		Snowmelt (gpm)	Rainfall-Comp. (gpm)	Rainfall-Rise (gpm)		Composite (mg/l)	Rising Limb (mg/l)	
T-6R	03-Aug-95		49	75	96	14.0	11.0	0.34
	08-Sep-95		65	92	117	11.0	11.0	0.36
	20-Sep-95		66		88	7.4		0.24
	29-Sep-95		45		70	7.0		0.16
	16-Apr-96	73				5.8		0.21
	07-May-96	252				5.4		0.68
	14-Sep-96		101	117	151	7.0	6.1	0.35
	17-Apr-97	65				4.2		0.14
	06-May-97	187				4.8		0.45
	27-Jul-97		97	100	158	6.3	6.6	0.31
	05-Aug-97		157		236	4.7		0.37

Table 3-2-10
Stations T-10B and T-10R Runoff Event Summary

Station	Event Date	Stream Discharge			Discharge Peak (gpm)	Diss. Zinc Concentration		Zinc Load Composite (lbs/hr)
		Snowmelt (gpm)	Rainfall-Comp. (gpm)	Rainfall-Rise (gpm)		Composite (mg/l)	Rising Limb (mg/l)	
T-10B	10-Apr-96	202				79		7.98
	17-Apr-97	21				94		0.99
T-10R	23-Aug-95		287		350	18.0		2.58
	08-Sep-95		239	278	319	30.0	72.0	3.59
	20-Sep-95		233		296	15.0		1.75
	29-Sep-95		148		188	16.0		1.18
	10-Apr-96	1,796				11.0		9.88
	16-Apr-96	898				13.0		5.84
	07-May-96	2,470				9.3		11.49
	29-Jul-96		718	907	1,150	35.0	10.0	12.57
	14-Sep-96		215	323	397	13.0	25.0	1.40
	24-Sep-96		157		263	11.0		0.86
	11-Mar-97	529				5.9		1.56
	17-Apr-97	460				13.0		2.99
	06-May-97	1,420				16.0		11.36
	27-Jul-97		489		517	35.0		8.56
	09-Aug-97		413	427	529	6.8	15.0	1.40
	17-Aug-97		346		340	18.0		3.11

3.2.2.6 Rock Creek - Stations T-10B and T-10R

Rock Creek is also a perennial tributary to the Eagle River with its confluence approximately one mile downstream of Belden. Its drainage area is approximately 978 acres in size and includes mostly forested area upstream of U.S. Highway 24. The average slope of Rock Creek is approximately 24 percent. Below U.S. Highway 24 Rock Creek passes the Eagle Mine area including hillslopes occupied by WP-8 and WP-11. Rock Creek enters a culvert extending approximately 1,500 feet upstream of the mouth and remains in the culvert to its confluence with the Eagle River.

Runoff from the WP-8 hillslope area (Station SR-4) enters the abandoned Rock Creek channel adjacent to the culvert and continues downstream approximately 500 feet before joining Rock Creek through a second culvert inlet. Further downstream, runoff from WP-11 (Station SR-3) does not enter Rock Creek (which flows in the culvert) but instead flows down the Rock Creek access road and into the Eagle River during extreme runoff events. Thus, the only waste rock runoff which contributes to Rock Creek is that from Station SR-4.

A runoff monitoring station was established at the mouth of Rock Creek (Station T-10R) to document runoff conditions upstream of the culvert, including the WP-8 hillside. In addition, seepage from the Eagle Mine enters the lower reach of Rock Creek and this seepage contributes metal load to the Eagle River. Therefore, a second monitoring station was established in the abandoned Rock Creek channel immediately upstream of the lowermost culvert inlet which represents combined mine seepage, runoff from Station SR-4, and runoff from the hillslopes downstream of Station SR-4.

The results of discharge monitoring in Rock Creek are presented as a hydrograph in Figure 3-2-8. This hydrograph covers the runoff monitoring period March through September in 1996 and 1997, and includes the latter part of 1995. Accumulation of snow during the winter months is significant in the Rock Creek drainage, which results in a large seasonal change in flow. Streamflow in Rock Creek begins to increase in March and April from winter baseflow conditions as a result of snowmelt in the lower portion of the watershed. Peak snowmelt-runoff occurs in May or June each year with flows in excess of 3,500 gpm. Streamflow recedes throughout the summer months to less than 250 gpm by September. Although the highest flows measured in Rock Creek were the result of snowmelt-runoff, summer rainstorm events can also increase the discharge from Rock Creek.

Tributary Runoff
Station T-10R

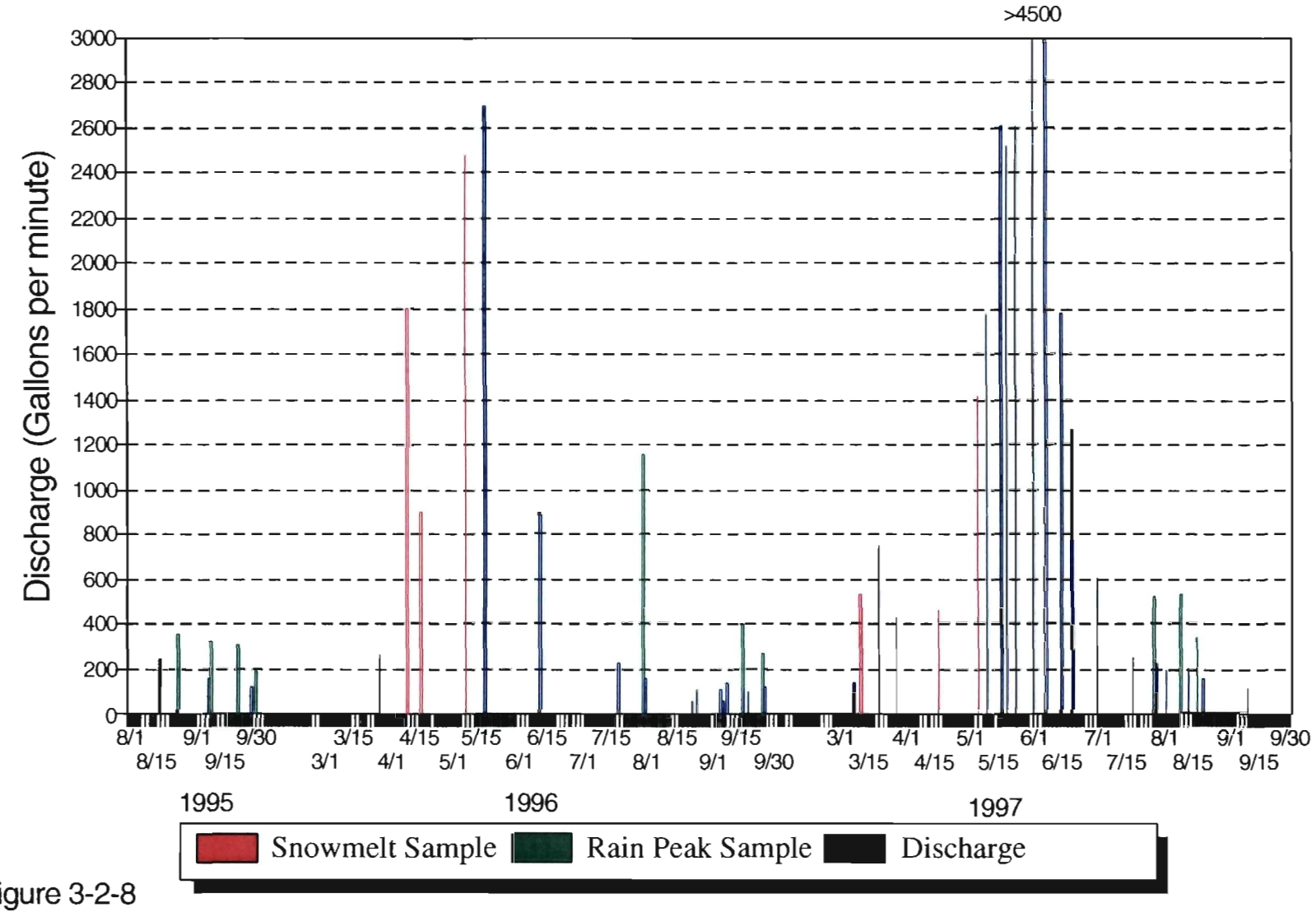


Figure 3-2-8

The results of runoff sampling in Rock Creek are summarized in Table 3.2-10. Two snowmelt-runoff events were sampled at Station T-10B, the abandoned Rock Creek channel, to document the combined load entering Rock Creek from Station SR-4, mine seepage, and diffuse runoff from the immediate area. In April 1996, Station T-10B contributed 81 percent of the dissolved zinc load to Rock Creek and on April 17, 1997 Station T-10B contributed 33 percent. Of these totals 66 and 100 percent, respectively, were contributed by snowmelt runoff from Station SR-4.

A total of 16 runoff event samples were collected at Station T-10R, of which six were snowmelt-runoff samples. The runoff samples at Station T-10R represent the combined dissolved zinc concentrations contributed by mine seepage and by storm water runoff. Thus, the flows and loads measured are total values from all sources in Rock Creek. Dissolved zinc concentrations ranged from a low of 5.9 mg/l during early spring snowmelt runoff in March 1997 to 35 mg/l during large rainfall-runoff events which occurred in July 1996 and July 1997. Maximum dissolved zinc loads were associated with peak flows in Rock Creek during both snowmelt and rainfall-runoff events.

3.2.2.7 Stations SR-1 and SR-2

Manual runoff sampling locations were established near the base of the WP-9/WP-10 area in Belden (Station SR-1) and in a runoff ditch along the railroad tracks in Belden (Station SR-2). Runoff from the WP-10 area was not observed during the monitoring period. However, small flows from the WP-9 area (designated as Station SR-1A) were sampled during snowmelt-runoff in 1997. These snowmelt flows emanate from the toe of WP-9 and enter a culvert beneath the railroad tracks. There was no rainfall-runoff observed from this area. Flows at Station SR-1A were very low and estimated at 1 gpm for all three samples collected as shown in Table 3.2-11. Dissolved zinc concentrations ranged between 8 and 51 mg/l, and loads were also low because of the small discharge.

Surface runoff from the loading dock in Belden, including the WP-14 area, was sampled at Station SR-2 before entering a culvert beneath the railroad tracks (Table 3.2-12). A total of five runoff events sample were collected, of which one was a rainfall-runoff sample. Because of the relatively small contributing drainage area, flows were low ranging from 1 to 9 gpm at Station SR-2. Dissolved zinc concentrations ranged from 3.5 to 59 mg/l and loads were relatively low.

Table 3-2-11
Station SR-1A Runoff Event Summary

Station	Event Date	Stream Discharge			Discharge Peak (gpm)	Diss. Zinc Concentration		Zinc Load Composite (lbs/hr)
		Snowmelt (gpm)	Rainfall-Comp. (gpm)	Rainfall-Rise (gpm)		Composite (mg/l)	Rising Limb (mg/l)	
SR-1A	19-Mar-97	1				51		0.026
	17-Apr-97	1				21		0.011
	06-May-97	1				8		0.004

Table 3-2-12
Stations SR-2 and SR-2A Runoff Event Summary

Station	Event Date	Stream Discharge			Discharge Peak (gpm)	Diss. Zinc Concentration		Zinc Load Composite (lbs/hr)
		Snowmelt (gpm)	Rainfall-Comp. (gpm)	Rainfall-Rise (gpm)		Composite (mg/l)	Rising Limb (mg/l)	
SR-2A	21-Mar-96	2				5.8		0.006
	11-Mar-97	6				12.0		0.036
	19-Mar-97	6				46.0		0.138
SR-2	21-Mar-96	2				3.5		0.004
	01-Apr-96	1				4.3		0.002
	11-Mar-97	5				4.2		0.011
	19-Mar-97	9				33.0		0.149
	06-Aug-97		2			59.0		0.059

A secondary runoff location (Station SR-2A) located along the railroad tracks upstream of Station SR-2 and the Tramway tributary was sampled three times during the snowmelt-runoff period. Station SR-2A was sampled to distinguish between runoff water quality upstream from the loading dock/WP-14 area and the concentrate loadout building. Results show that flows were essentially the same at Stations SR-2A and SR-2 during each sampling event, with the exception of the March 19, 1997 event when flows increased from 6 to 9 gpm between these two stations. Dissolved zinc concentrations, however, decreased between Stations S-2A and SR-2 during each of paired sampling events. These data suggest that the loading dock/WP-14 area did not contribute to an increase in dissolved zinc concentration in runoff along the railroad tracks in Belden.

3.2.2.8 Tributary Summary

Rainfall-runoff samples were collected from tributary locations for a total of five events during 1995, four events during 1996, and six events during 1997 (see Table 3.2-2). All monitored tributary locations except Station T-4A experienced runoff on September 8, 1995, and all tributary locations except Stations T-4A and SR-3 experienced runoff on July 29, 1996, September 14, 1996, and July 27, 1997. Other rainstorm events generated runoff at fewer stations, illustrating a highly variable distribution of rainfall intensity and associated runoff.

Personnel were not present to monitor manual Stations SR-1 and SR-2 during most of the rainfall events. Inspection of Station SR-1 immediately following each rainfall event indicated that little or no runoff had occurred. Residual rainfall-runoff was sampled at Station SR-2 following the August 5, 1997 event.

As shown in Table 3.2-2, tributary runoff is proportional to rainfall intensity and duration. Rainfall events with higher intensity and longer duration generally produced runoff at a larger number of tributaries at the Site. The largest rainfall-runoff events measured occurred on September 8, 1995, on July 29 and September 14, 1996, and on May 29 and July 27, 1997. Other events were of lower intensity and/or shorter duration, resulting in runoff at fewer locations.

Runoff did not occur at all tributary stations during snowmelt events. As discussed in the Monitoring Plan, this was anticipated due to factors such as topographical aspect, elevation, distribution of snowpack, and temperature gradients. For example, on February 13, 1996 runoff was

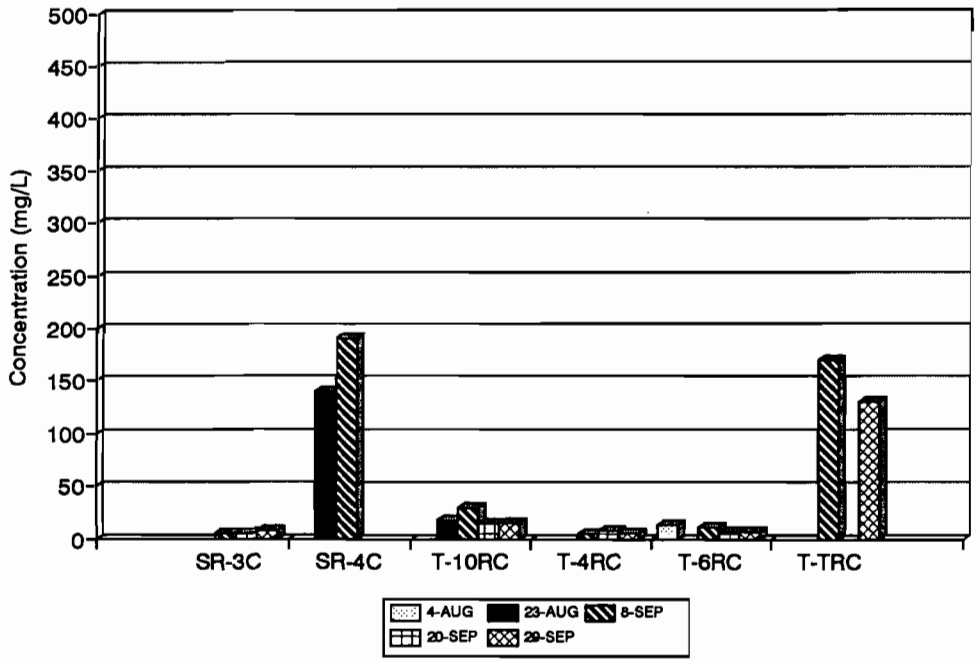
occurring only at Station T-TR, and snow was completely melted in this drainage with no runoff occurring by April 16, 1996 or by April 17, 1997. Tributary stations with larger drainage areas encompassing higher elevations, forest cover, or with less southern aspect, such as Stations SR-4, T-4R, and T-6R, exhibited snowmelt runoff into early May in 1996 and in 1997. Accommodating these spatial and temporal factors, snowmelt-runoff samples were collected at each monitoring location at some point during both the 1996 and 1997 snowmelt seasons.

The metal concentrations measured for each tributary runoff event are presented graphically by metal in Appendix E and all data are provided in Appendix B. The data plots are structured to show the respective metal concentration for each tributary station event measured during the 2 ½ year study period. All rainfall-runoff samples, except Station SR-2, were collected using automatic samplers with the capability of capturing up to 24 discrete samples at equal time intervals. A sample representing the entire runoff event was composited for all station-events according to a sample compositing algorithm developed based on each rainfall event distribution. When sufficient volume was collected, a separate sample was composited representing the rising limb of the discharge hydrograph to measure first flush constituent concentrations. All snowmelt-runoff samples were collected manually.

Dissolved metal concentrations were quite low at Stations T-4R and T-6R, with the exception of dissolved iron at Station T-6R. Higher dissolved metal concentrations were measured in runoff from Stations SR-4 (WRP-8 hillside) and T-TR (Tramway drainage). Dissolved cadmium, copper, and manganese concentrations in tributary runoff were typically less than 0.1 mg/l, 0.5 mg/l, and 10 mg/l, respectively, with the exception of Stations SR-4 and T-TR. Dissolved iron and lead concentrations in tributary runoff were typically less than 0.2 mg/l and 0.05 mg/l, respectively, with the exception of Stations T-6R and T-TR. These results indicate that of the seven tributaries monitored, the majority (five) have relatively low dissolved metal concentrations in runoff.

Samples collected during the rising limb of the discharge hydrograph sometimes exhibited higher dissolved metal concentrations than samples composited over the entire storm event. For example, Station SR-4 showed a dissolved zinc concentration in the initial runoff (first flush) of 490 mg/l compared to 190 mg/l average during the September 8, 1995 storm period and 840 mg/l versus 230 mg/l during the July 27, 1997 runoff event (Figures 3-2-9 through 3-2-14). However, most other tributaries did not exhibit significantly higher metal concentrations during the "first flush" of runoff.

Dissolved Zinc - 1995
Tributary Rainfall-Runoff (Composite)



Total Recoverable Zinc - 1995
Tributary Rainfall-Runoff (Composite)

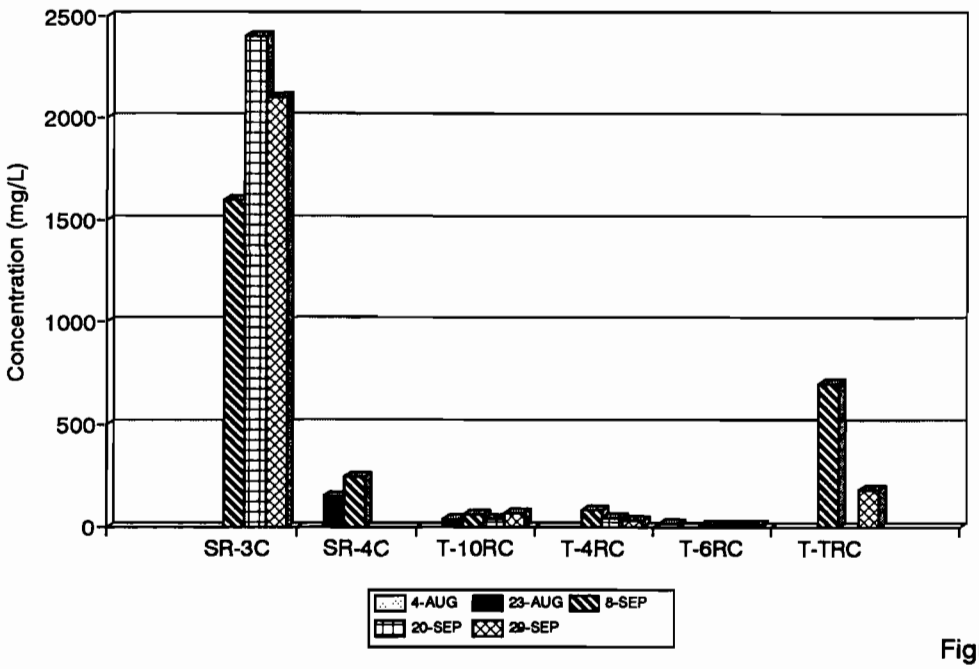
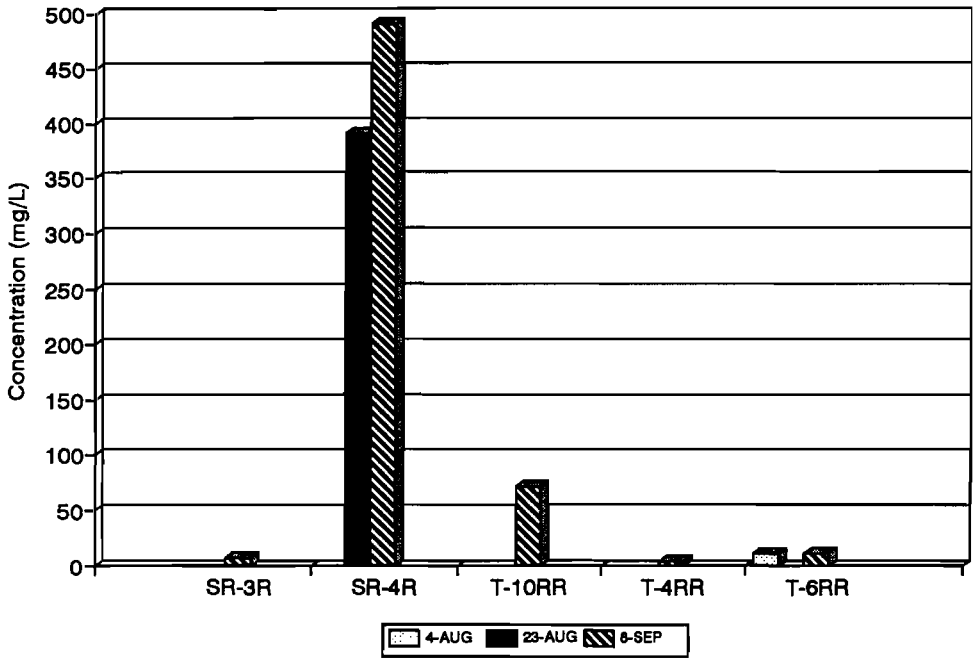


Figure 3-2-9

Dissolved Zinc - 1995
Tributary Rainfall-Runoff (Rising Limb)



Total Recoverable Zinc - 1995
Tributary Rainfall-Runoff (Rising Lirnb)

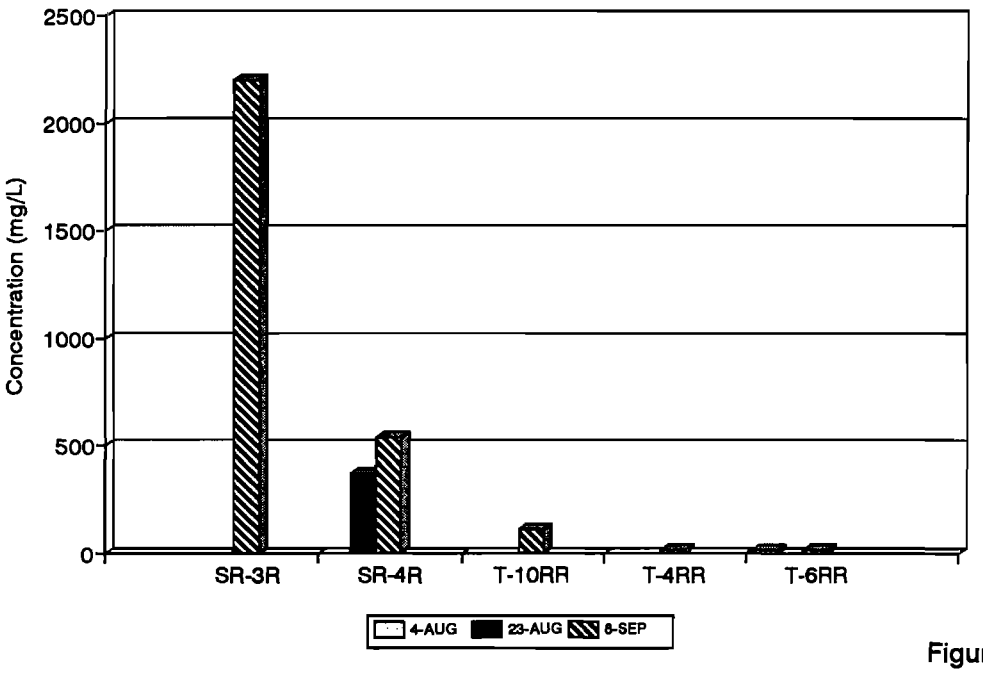
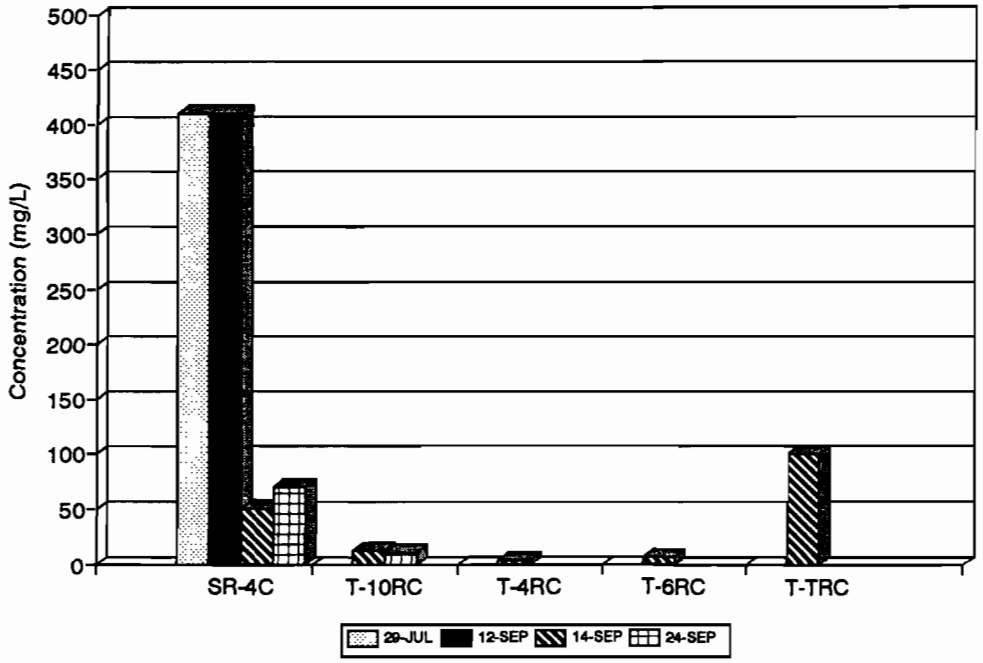


Figure 3-2-10

Dissolved Zinc - 1996
Tributary Rainfall-Runoff (Composite)



Total Recoverable Zinc - 1996
Tributary Rainfall-Runoff (Composite)

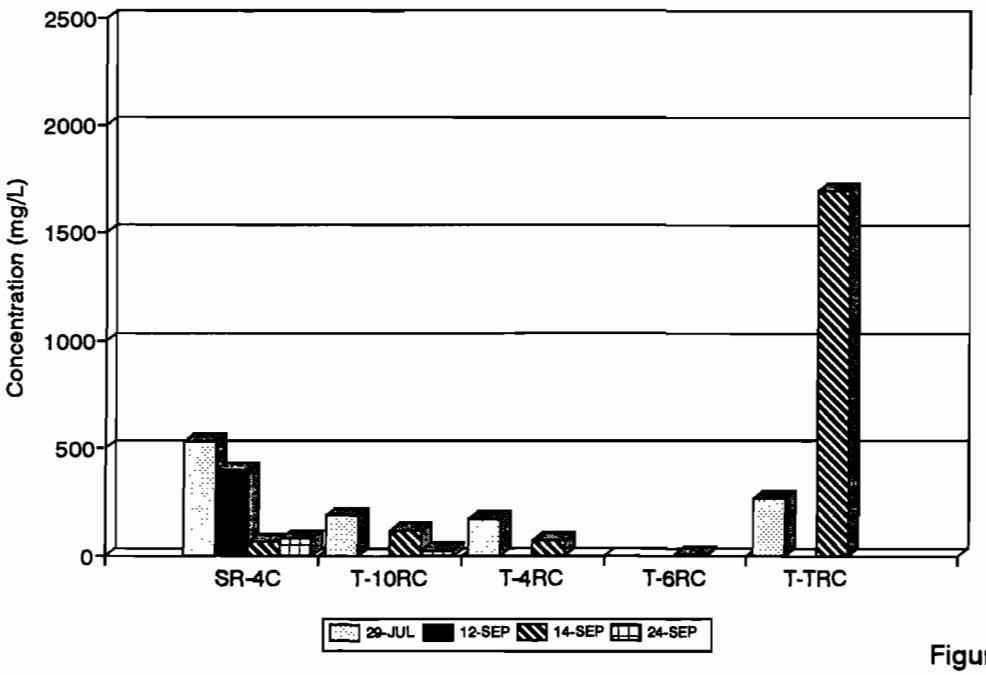
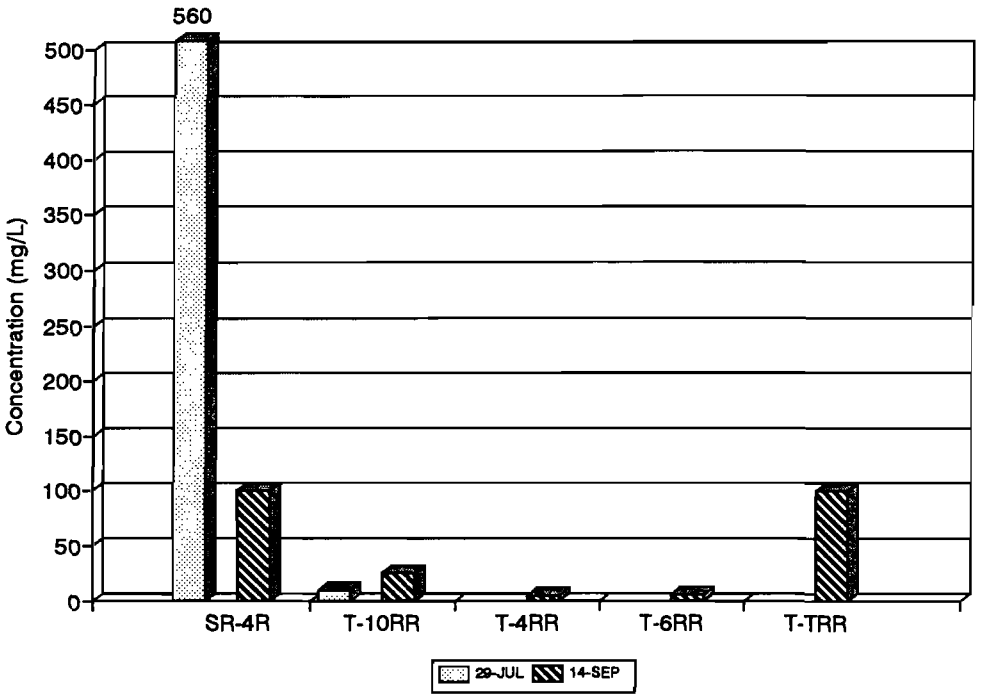


Figure 3-2-11

Dissolved Zinc - 1996
Tributary Rainfall-Runoff (Rising Limb)



Total Recoverable Zinc - 1996
Tributary Rainfall-Runoff (Rising Limb)

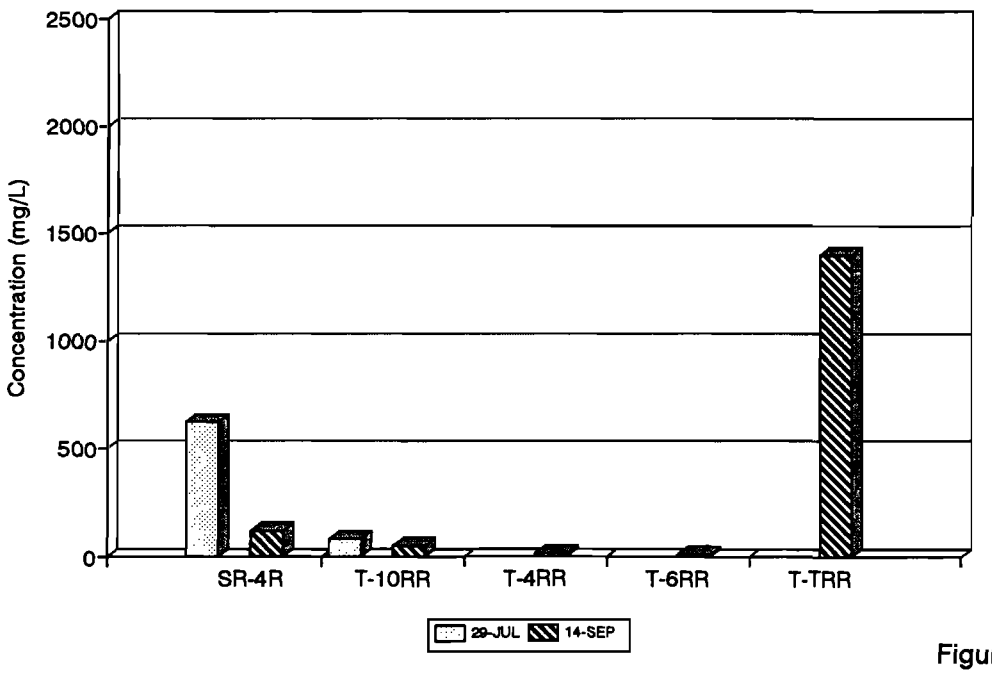
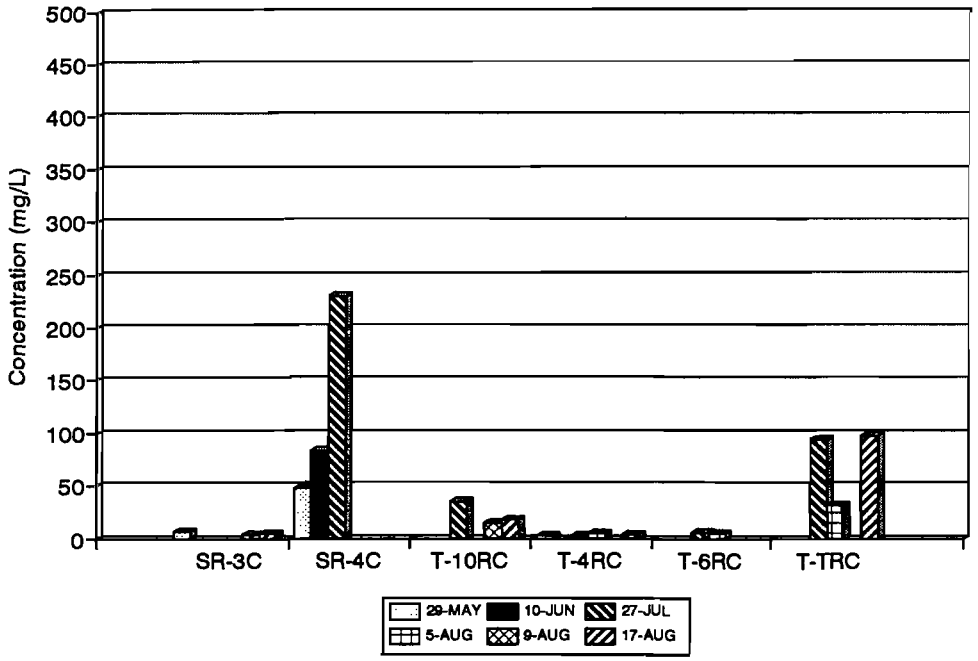


Figure 3-2-12

Dissolved Zinc - 1997
Tributary Rainfall-Runoff (Composite)



Total Recoverable Zinc - 1997
Tributary Rainfall-Runoff (Composite)

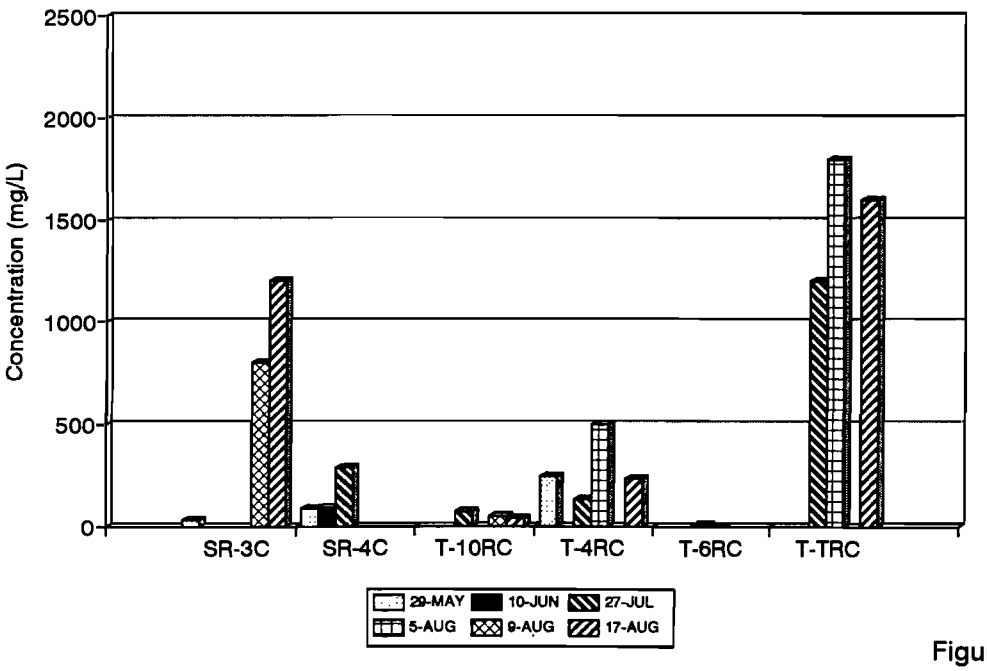
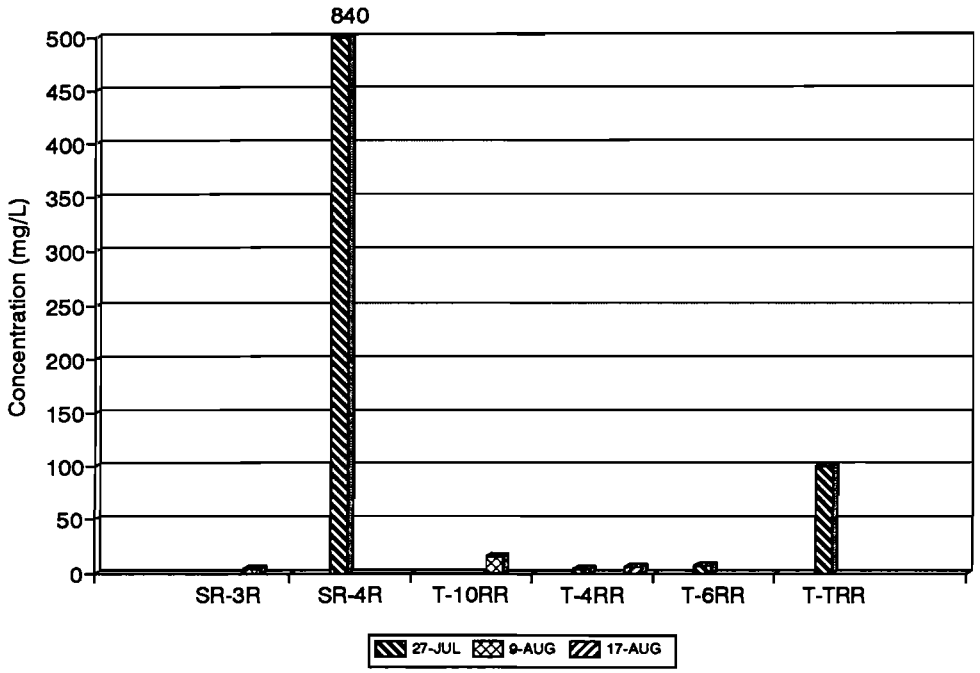


Figure 3-2-13

Dissolved Zinc - 1997
Tributary Rainfall-Runoff (Rising Limb)



Total Recoverable Zinc - 1997
Tributary Rainfall-Runoff (Rising Limb)

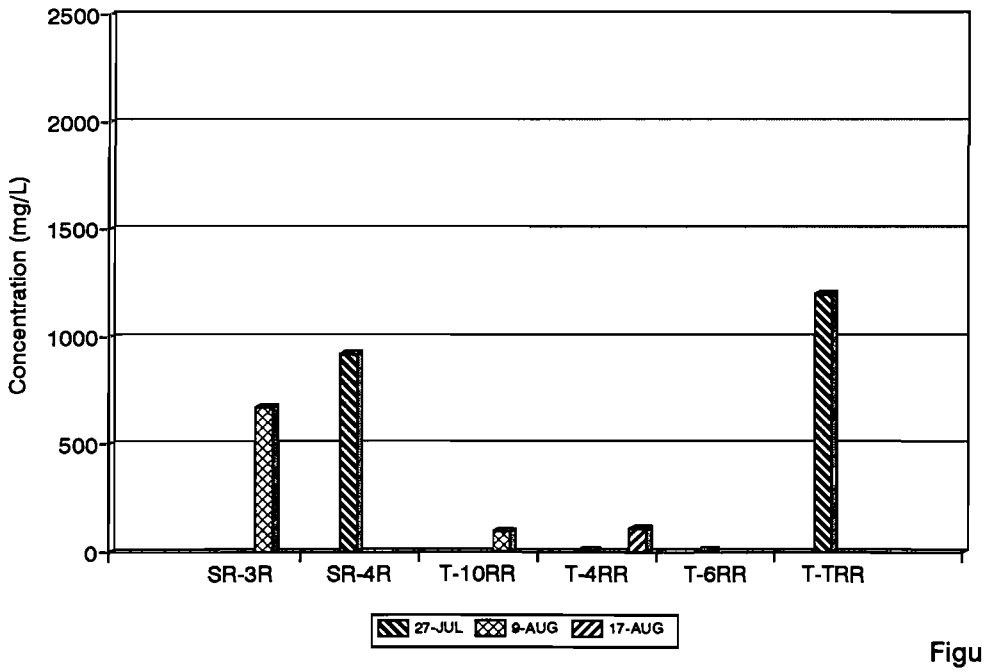


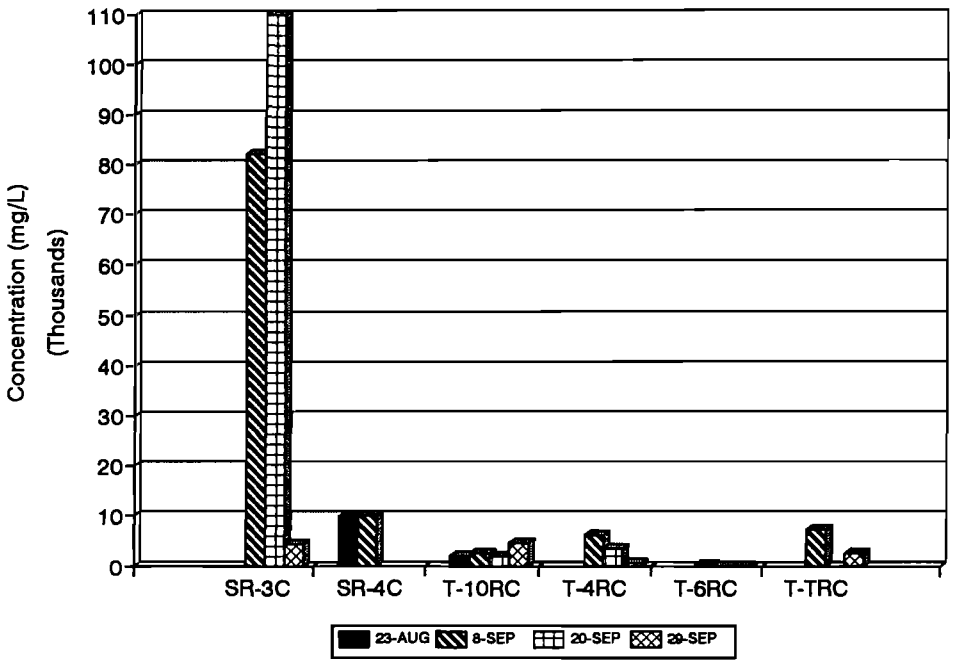
Figure 3-2-14

Dissolved arsenic was not detected in 122 of the 126 tributary runoff samples analyzed during the study. Total recoverable arsenic concentrations were detected at Stations SR-3, T-TR, and T-4R, but these concentrations were always associated with suspended solid concentrations in excess of 4,500 mg/l and typically over 10,000 mg/l. The same was true for other total recoverable metal concentrations in tributary runoff.

Total recoverable metal concentrations were typically higher than the dissolved metal concentrations in runoff samples. In most instances, this difference was associated with sediment suspended in the sample. Stations SR-3 and T-TR typically exhibit high sedimentation rates with suspended solid concentrations in excess of 100,000 mg/l in some samples (Figures 3-2-15 through 3-2-17). The effect of high sediment concentration on water quality results was demonstrated by relatively high alkalinities of 2,500 mg/l measured in a September 14, 1996 runoff sample from Station T-TR (suspended solids = 90,000 mg/l) and 4,600 mg/l measured in an August 17, 1997 runoff sample from Station SR-3 (suspended solids = 270,000 mg/l). According to the laboratory analyst, the alkalinity determination was influenced by sediment in the sample. These data also suggest a significant source of alkalinity in the waste rock contributing runoff to Station T-TR Tramway tributary (WP-4 and WP-5) and Station SR-3 (WP-11 hillside).

The effects of sediment are also illustrated in total metal concentration results. For example, at Station SR-3 on September 20, 1995 the total recoverable zinc concentration was 2,400 mg/l and the dissolved zinc concentration was 6.4 mg/l (see Figure 3-2-10). Only 0.3 percent of the zinc was in dissolved form in this sample indicating 99.7 percent was particulate zinc. As documented by the high suspended solid concentration of 110,000 mg/l, most of the zinc was in the form of insoluble sediment. At Station T-TR on August 5, 1997 the total recoverable zinc concentration was 1,800 mg/l and the dissolved zinc concentration was 32 mg/l, indicating that 98.2 percent was particulate zinc. At Station T-4R on August 5, 1997 the total recoverable zinc concentration was 500 mg/l and the dissolved zinc concentration was 4.4 mg/l, indicating that 99.1 percent of the zinc was particulate. These data serve to illustrate that the majority of metals mobilized in these tributaries during rainfall-runoff events are in particulate form and are not dissolved. Metal solubility is very important when considering the potential impact associated with waste rock pile runoff because aquatic life is not likely impacted by the particulate metals.

Suspended Solids - 1995
Tributary Rainfall-Runoff (Composite)



Suspended Solids - 1995
Tributary Rainfall-Runoff (Rising Limb)

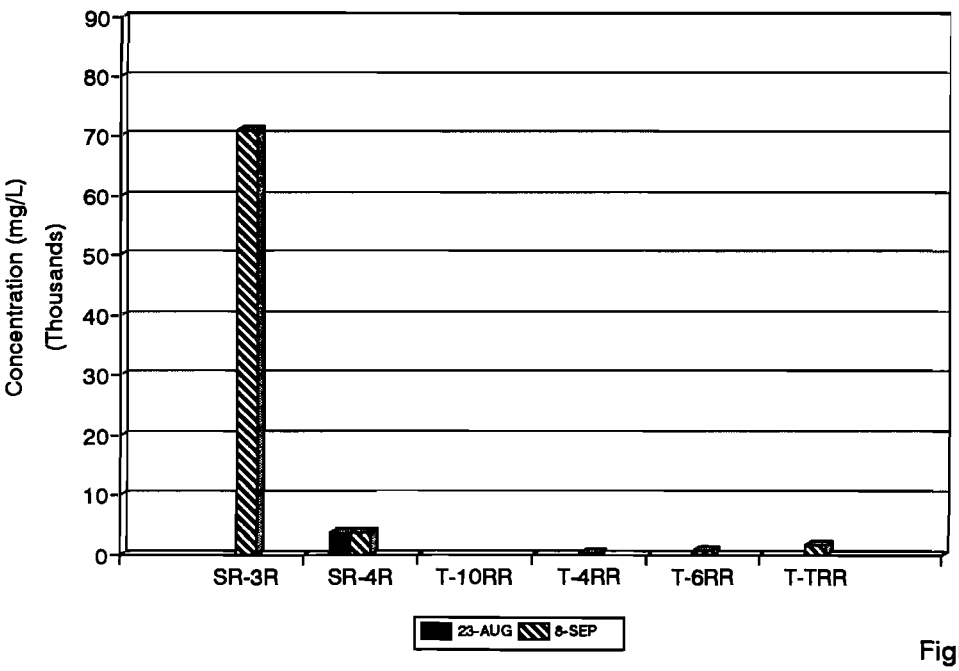
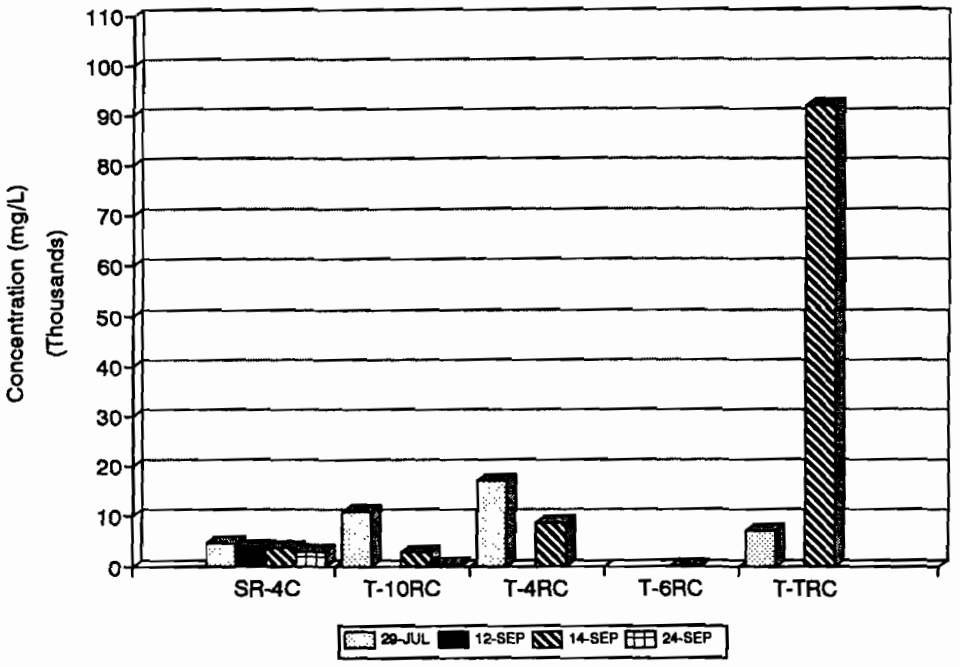


Figure 3-2-15

Suspended Solids - 1996
Tributary Rainfall-Runoff (Composite)



Suspended Solids - 1996
Tributary Rainfall-Runoff (Rising Limb)

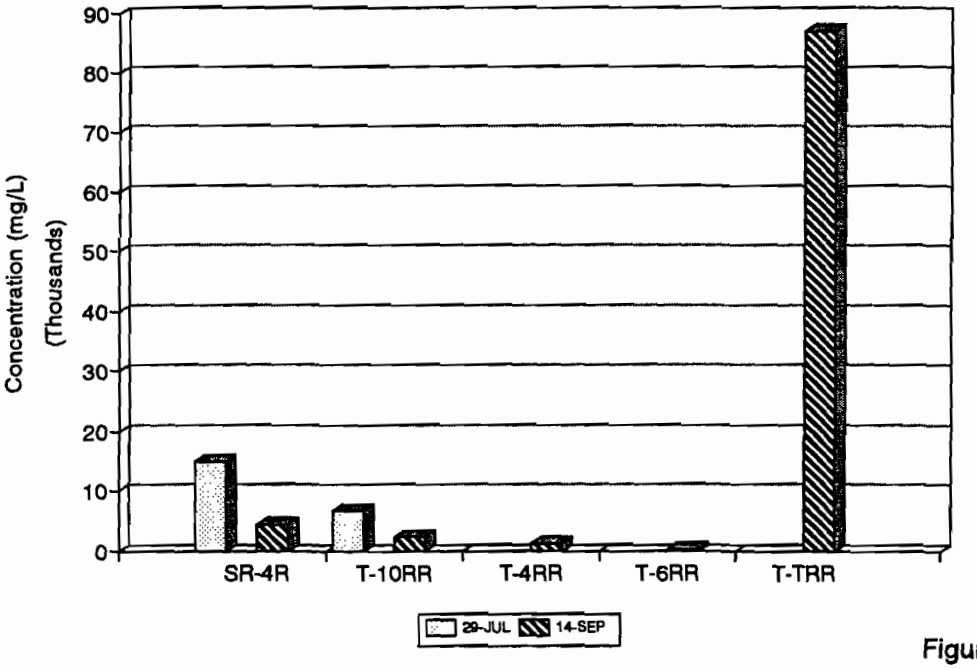
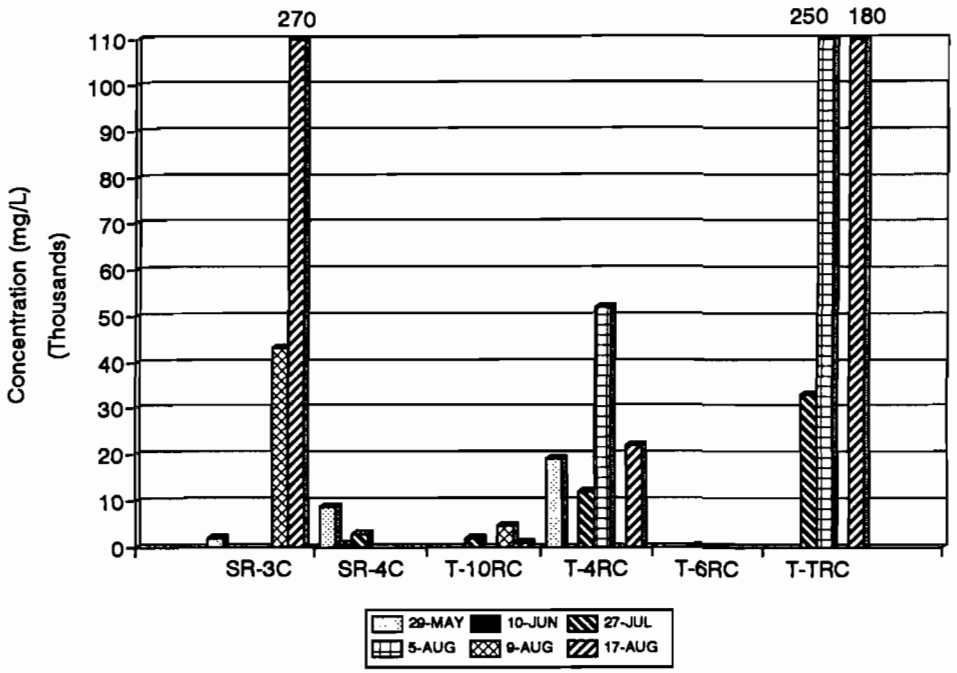


Figure 3-2-16

Suspended Solids - 1997
Tributary Rainfall-Runoff (Composite)



Suspended Solids - 1997
Tributary Rainfall-Runoff (Rising Limb)

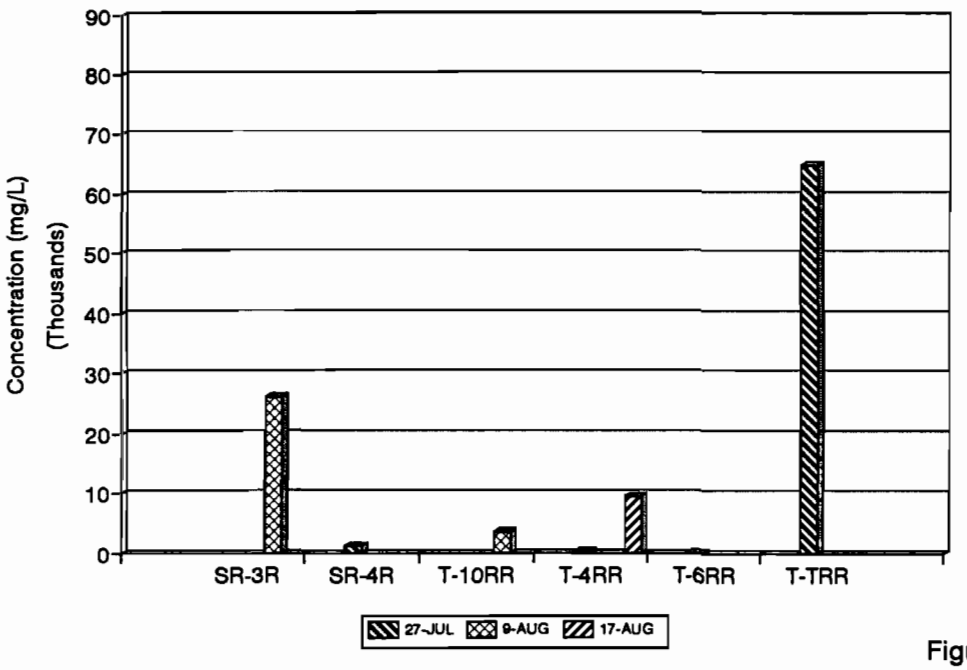


Figure 3-2-17

To compare the metal solubility characteristics of each monitored tributary the ratio of dissolved to total recoverable zinc was calculated for each sample. These data are summarized in Table 3.2-13. The range of ratios measured is presented, in percent, along with the average dissolved/total recoverable zinc ratios for rainfall-runoff and snowmelt-runoff samples. The ratios have a broader range and are generally lower for tributaries with neutral pH such as Stations T-4R, T-TR, SR-3, and T-10R. These tributaries have a lower percentage of dissolved zinc relative to particulate zinc, suggesting that source material has a lower acid generation potential and metals are in particulate form mobilized through erosional processes. The ratios are much higher for tributaries Stations T-6R and SR-4, which have lower pH. These stations have a higher percentage of zinc in the dissolved fraction suggesting source material with higher acid generation potential.

Table 3.2-13
Percentage of Zinc in Dissolved Form

Station	Diss. vs Total Zinc Ratio Range	Average Zinc Ratio Rainfall-Runoff	Average Zinc Ratio Snowmelt-Runoff
T-4R	0.9 to 100	13	86
T-TR	2 to 95	19	46
SR-3	0.3 to 100	3	56
T-10R	11 to 100	36	87
T-6R	85 to 100	99	100
SR-4	55 to 100	87	97

The average zinc ratios were greater for snowmelt-runoff samples than for rainfall-runoff samples at all stations, indicating a higher percentage of zinc is dissolved in snowmelt-runoff. This is due in part to lower total recoverable zinc concentrations in snowmelt-runoff. Flow velocities are typically lower, there is no rainfall impact dislodging soil particles, and there is generally less erosion that takes place during snowmelt than during rainfall-runoff events. On average, less than 20 percent of the zinc was in dissolved form under rainfall-runoff conditions at Stations T-4R, T-TR, and SR-3.

The distribution of metal concentrations in snowmelt-runoff among tributary stations in the Belden and Rock Creek areas was similar to the rainfall-runoff results. Zinc concentrations measured in tributary snowmelt-runoff samples are presented in Figures 3-2-18 and 3-2-19 for 1996 and 1997, respectively. These data show low concentrations at all tributary stations relative to Stations SR-4 and T-TR.

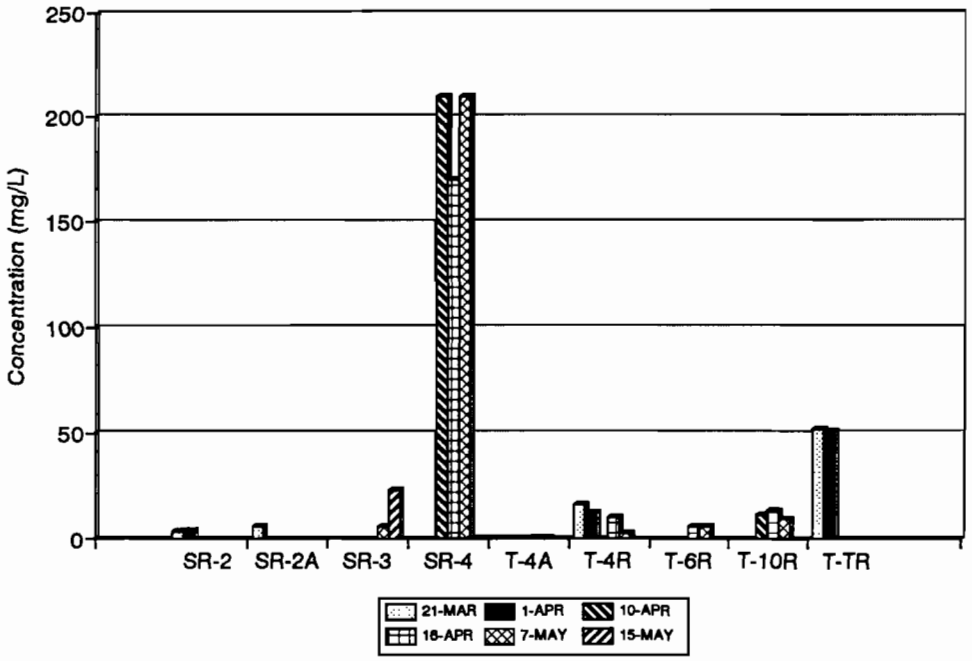
Total recoverable metal concentrations were significantly lower in snowmelt-runoff samples compared to rainfall-runoff samples, often by as much as an order of magnitude. Suspended solid concentrations were also lower in snowmelt samples. These data indicate less erosion and subsequent suspension of sediment during snowmelt periods as compared to rainfall-runoff periods. Without the erosional affects of raindrop impact, less sediment is dislodged and entrained in the water column. Flow and associated velocity may also be lower during snowmelt periods than during rainfall-runoff periods, resulting in less erosion and sedimentation.

Most dissolved metal concentrations were lower in snowmelt-runoff samples as compared to rainfall-runoff samples. Dissolved cadmium, copper, and manganese concentrations in tributary runoff were typically less than 0.1 mg/l, 0.5 mg/l, and 5 mg/l, respectively, with the exception of Stations SR-4 and T-TR. Dissolved iron and lead concentrations were typically less than 0.2 mg/l and 0.05 mg/l, respectively, with the exception of Stations T-6R and T-TR. As with the rainfall-runoff results, the snowmelt-runoff results indicate that of the seven tributaries monitored, the majority (five) have relatively low dissolved metal concentrations in runoff. Higher dissolved metal concentrations were detected at Stations SR-4 and T-TR.

3.2.3 Eagle River Evaluation

This section presents the results of Eagle River water quality monitoring during snowmelt and rainfall-runoff events. The three Eagle River locations monitored to measure the effects of waste rock pile runoff on water quality include Station E-3R (above Belden), Station E-5R (below Belden), and Station E-11R (below Rock Creek). The river reach between Stations E-3R and E-5R, referred to as the Belden reach, in downstream order includes tributary Stations T-4R, T-6R (roaster pile), and T-TR. Surface runoff from Stations SR-1 and SR-2 also enters the Eagle River in the Belden reach. The river reach between Stations E-5R and E-11R, referred to as the Rock Creek reach,

Dissolved Zinc - 1996
Tributary Snowmelt-Runoff



Total Recoverable Zinc - 1996
Tributary Snowmelt-Runoff

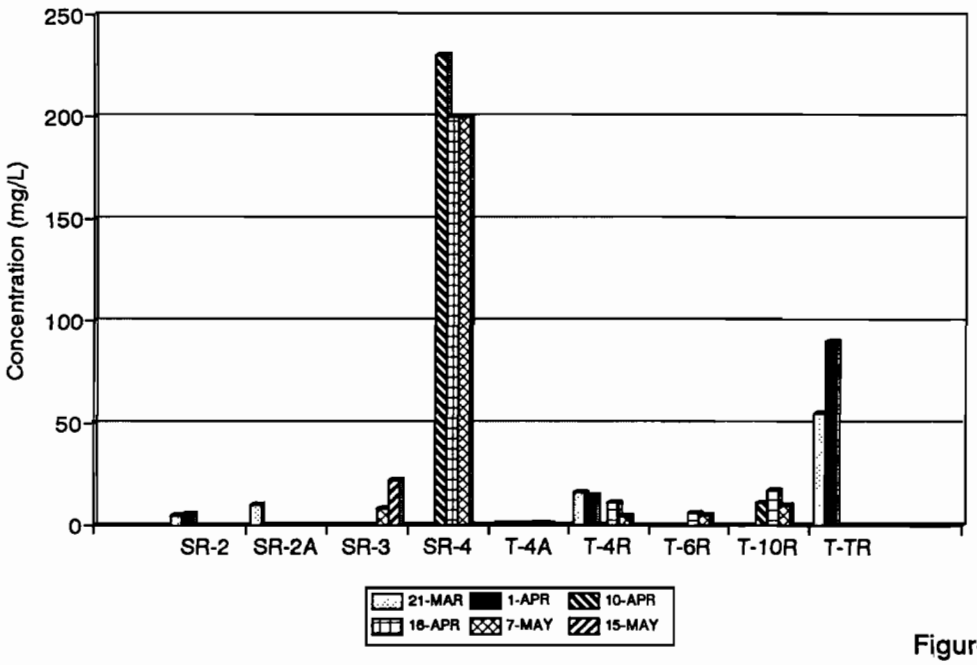
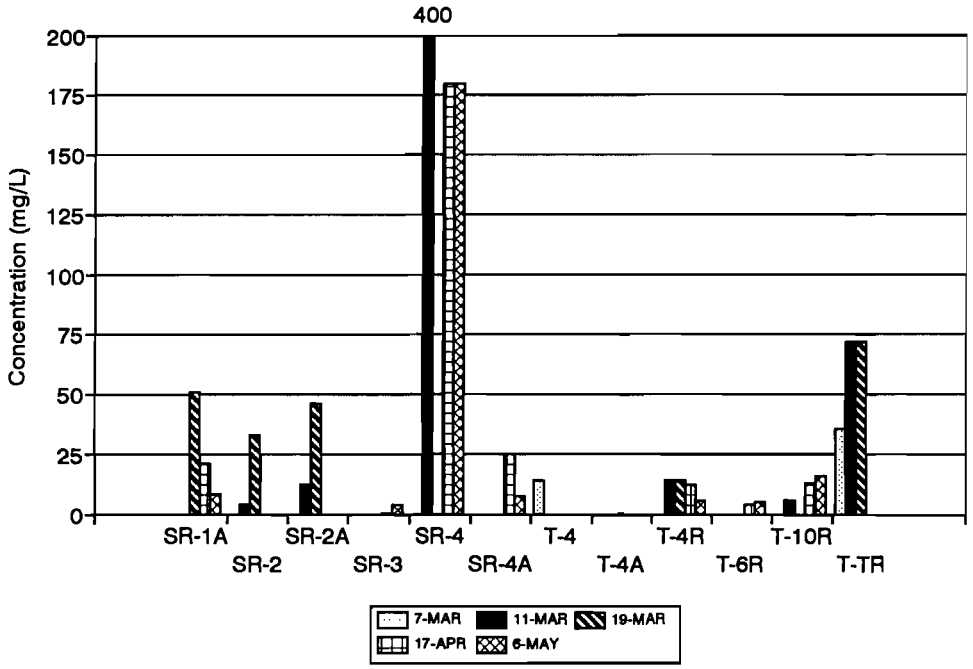


Figure 3-2-18

Dissolved Zinc - 1997
Tributary Snowmelt-Runoff



Total Recoverable Zinc - 1997
Tributary Snowmelt-Runoff

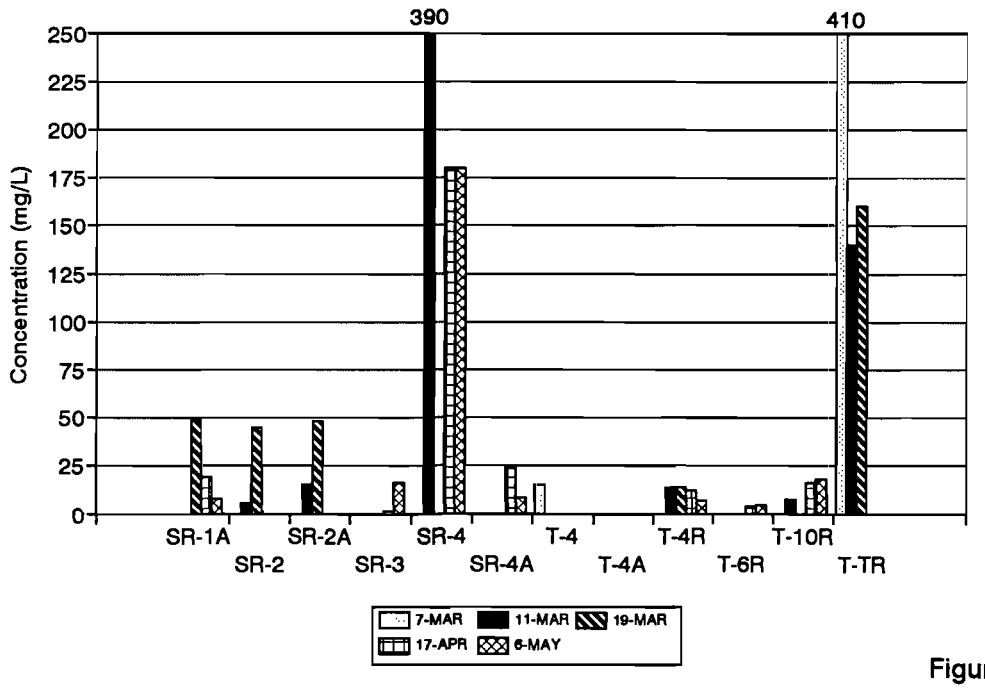


Figure 3-2-19

includes Stations SR-3, SR-4, and T-10R (Rock Creek). The three Eagle River stations were monitored for both snowmelt and rainfall-runoff.

3.2.3.1 Eagle River Hydrology

Continuous recording stream gages were installed at Stations E-3R, E-5R, and E-11R in July 1995 to monitor streamflow conditions and to establish platforms for event-based automated water quality sampling. These gages were operated during ice-free periods from April to October. River stage height was recorded at 15-minute intervals during baseline (non rainfall-runoff) periods and at 6-minute intervals during rainfall-runoff periods. The stage-discharge relationship was defined for each gage based on 17 to 19 direct discharge measurements taken over the study period. Discharge rating curves were developed for each gaging station and a power equation was used to calculate discharge.

These discharge ratings were revised periodically based on additional direct measurements. The ratings for Station E-3R only required minor revisions over the study period. The Station E-5R stilling well shifted downward during the winter 1996/97, and the 1997 stage height data were corrected by a factor of -0.25 feet to accommodate the discharge rating. The Station E-11R gage also exhibited a downward shift during the spring runoff period (May-June) in both 1996 and 1997, and stage height data were corrected accordingly. The final discharge rating curve used for each gage is presented in Appendix B. The discharge ratings are valid for the range of flows measured, or from approximately 30 cfs to 300 cfs. Resulting discharge data at each gaging station are plotted for each month of the study period in Appendix C.

As indicated on the plots, the stage-discharge relationship is not defined for discharges in excess of 300 cfs because no means exist to measure high flows at the gages. Discharge for runoff events which occurred when river flows were greater than 300 cfs was estimated for Stations E-3R, E-5R, and E-11R by utilizing the continuous record at downstream gaging station E-12A, where the stage-discharge relationship has been defined for high flows.

The mean daily discharge hydrograph for Station E-5R covering the 2 ½-year period is shown in Figure 3-2-20. Eagle River streamflow begins to increase from winter low-flow conditions in April

Eagle River Mean Daily Discharge
Station E-5R

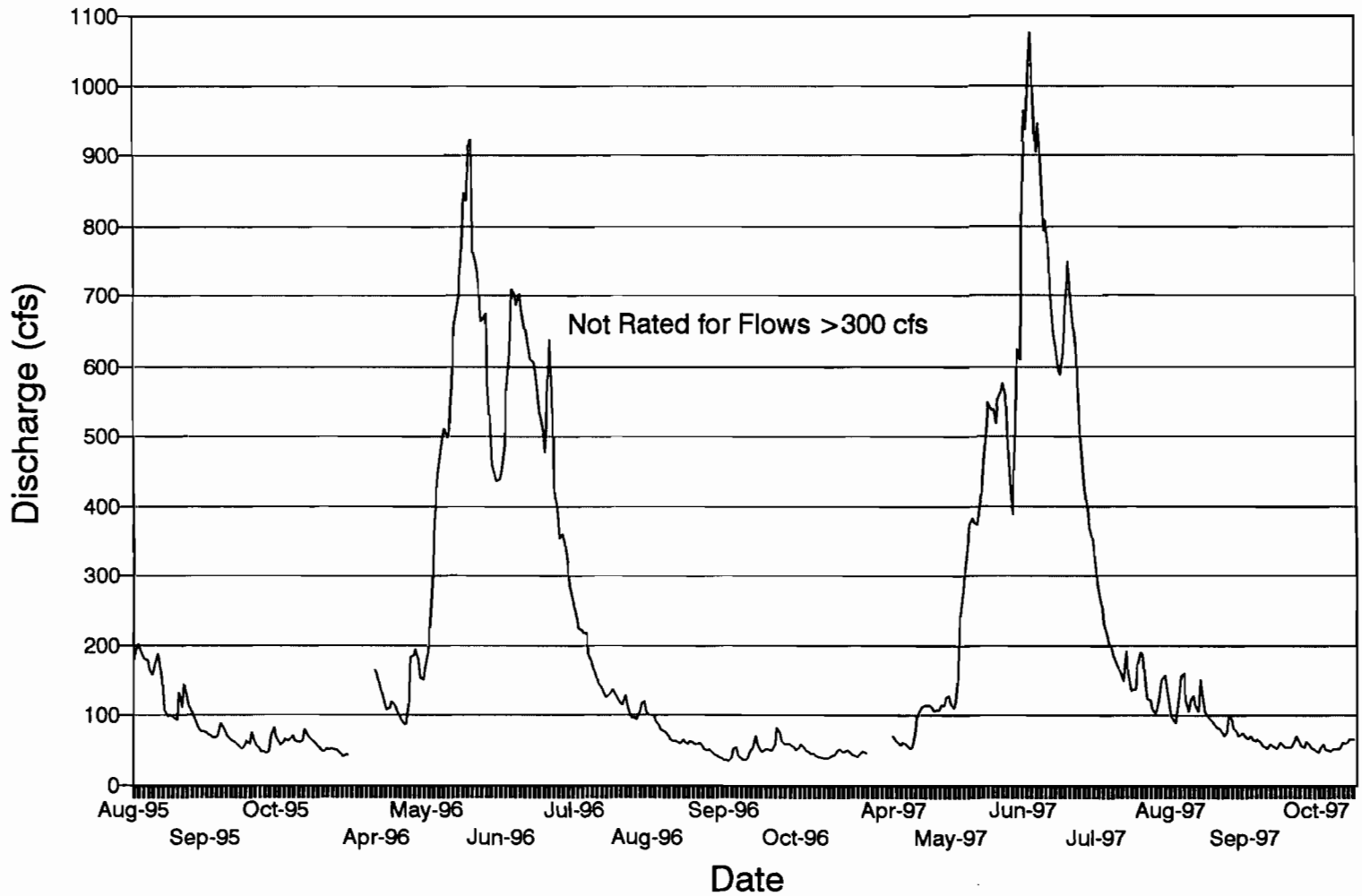


Figure 3-2-20

each year. Peak flows resulting from basin-wide snowmelt-runoff occur in May or June. As indicated on the plot, the stage-discharge relationship is not defined for discharges in excess of 300 cfs because no means exist to measure high flows at the gages. The river maintains a gradual streamflow recession from July through October each year, with the exception of occasional flow increases caused by rainfall-runoff events. Overall, Eagle River streamflow was greater throughout 1997 as compared to 1996 and 1995.

3.2.3.2 Rainfall-Runoff Conditions

During rainfall-runoff events, the Eagle River automatic samplers were activated based on pre-defined rainfall thresholds developed from site-specific tributary rainfall-runoff information. Travel times for runoff to reach each of the Eagle River stations from the monitored tributaries were estimated based on site-specific empirical data. Data used to develop the river lag times include lag time measurements for the respective tributaries and in-situ velocity measurements of the river at Stations E-3R, E-5R, and E-11R. Lag times used to delay activation of the river samplers are listed in Table 3.2-14.

Table 3.2-14
Estimated Time Parameters (minutes)

Station	Time of Concentration (Tc)	Lag Time (T_L)	Final Lag Used
E-3R		5	5
T-4R	5	3	
T-6R	15	9	
T-6R to E-5R	Travel Time =	12	
T-TR	5	3	
E-5R		21	15
SR-4	6	4	
SR-4 to T-10R	Travel Time =	5	
T-10R to E-11R		35	
E-11R		44	40

* Assuming lag time (T_L) = $0.6T_C$

The lag times used for river sample collection were reduced slightly from those calculated to assure samples are collected at the onset of runoff at each Eagle River station. These lag times are believed to be reasonably conservative based on empirical data collected from the Site. That is, sufficient lag is provided to assure samples are not collected before runoff from the tributaries reaches the respective river stations, and the duration of river sample collection is long enough (2+ hours) to assure that most runoff is sampled. Measured data suggest the duration of rainfall-runoff from monitored tributaries is typically less than one hour.

The hydrologic response of the Eagle River to five selected rainfall-runoff events is illustrated in Figures 3-2-21 through 3-2-25. These plots show the streamflow hydrograph measured during sampling events at the Eagle River stations. Each plot includes the 15-minute average discharge and covers the 24-hour period approximately 12 hours before and 12 hours after tributary runoff. The time at which samples were collected from the Eagle River station is noted with an "S", whereas the period over which tributary runoff occurred is noted between vertical bars "| |".

For the September 8, 1995 event, tributary runoff started at approximately 0300 and ended within one-hour. River sample times lag behind tributary runoff to assure tributary runoff was sampled as described above. These data show an increase in Eagle River discharge of approximately five cfs between 0300 and 0400. Samples were collected during this initial rising limb of the discharge hydrograph. The increase in discharge occurred at Station E-3R indicating that the increase in flow was caused by runoff upstream from the Site. Surface water runoff from waste rock tributaries showed little or no effect on Eagle River streamflow during the event.

Other rainfall-runoff events were sampled in a similar fashion (see Figures 3-2-22 through 3-2-25). Eagle River samples were collected on the initial rising limb of the river discharge hydrograph because that was the period at which tributary rainfall-runoff occurred and the runoff duration was one hour or less following rainfall events. In each instance, the increase in river flow was associated with runoff upstream of the Site (Station E-3R) and the volume of runoff from Site tributaries was too small to detect in the river.

September 8, 1995 Runoff Event
Eagle River Discharge

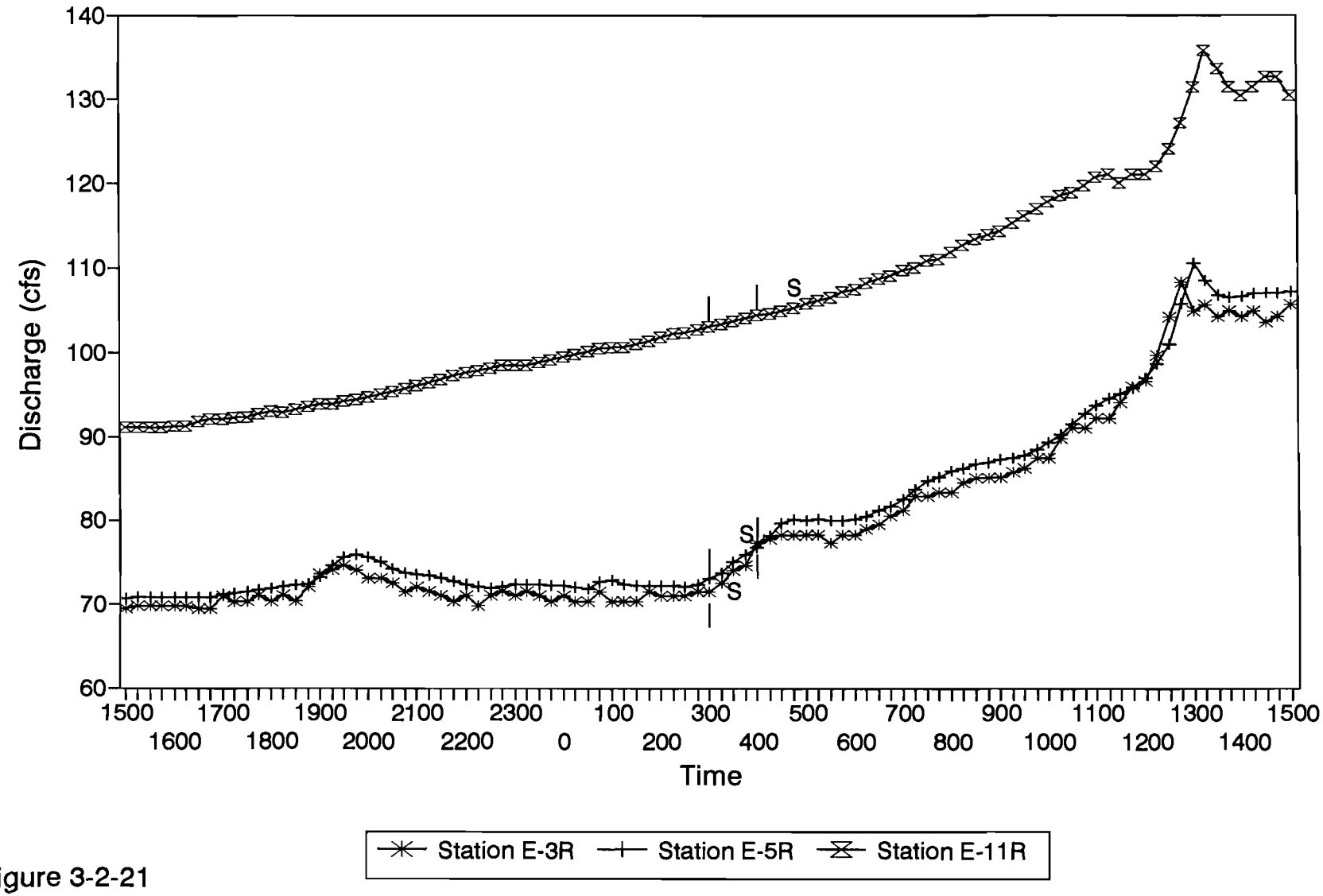


Figure 3-2-21

July 29, 1996 Runoff Event
Eagle River Discharge

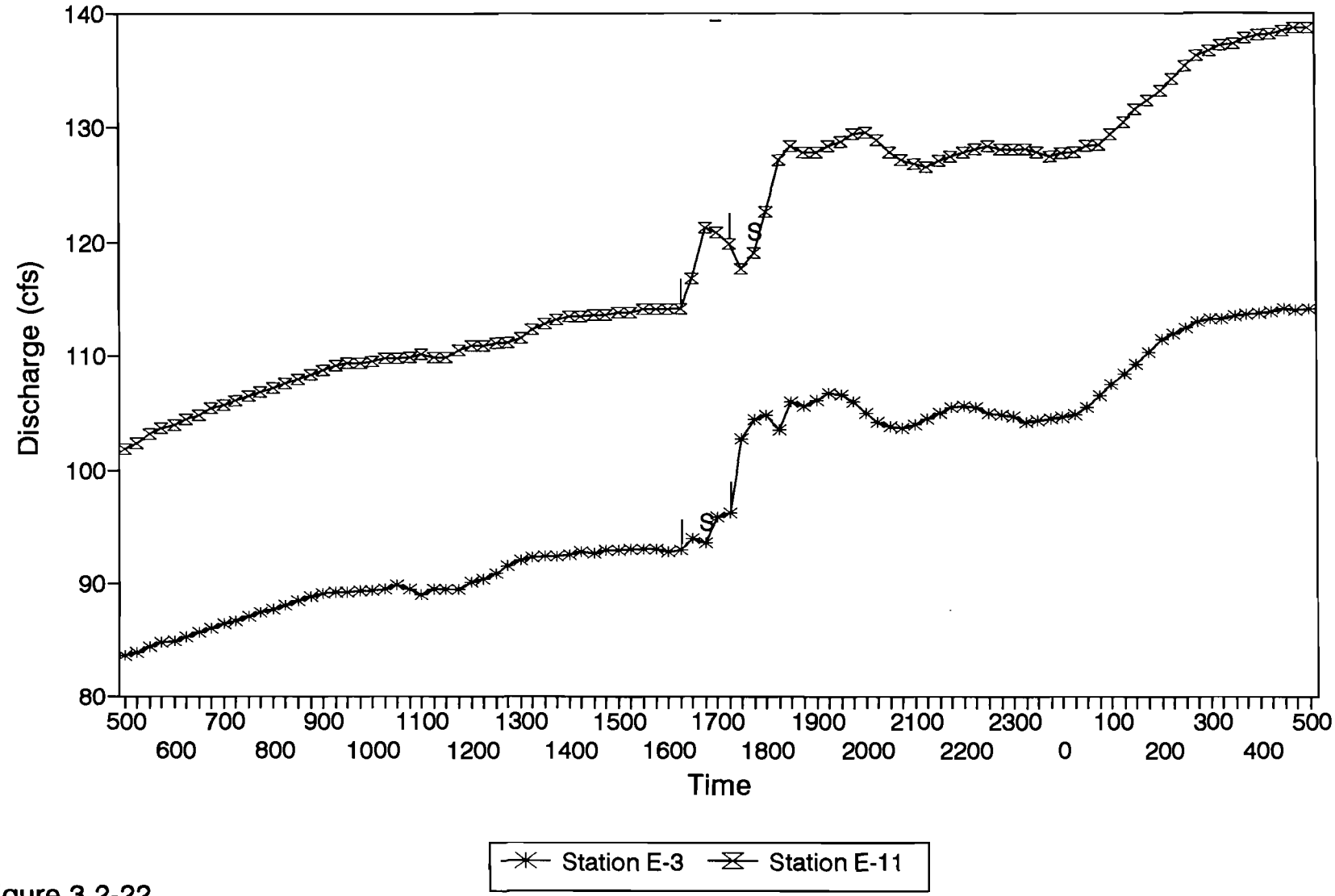


Figure 3-2-22

July 27, 1997 Runoff Event
Eagle River Discharge

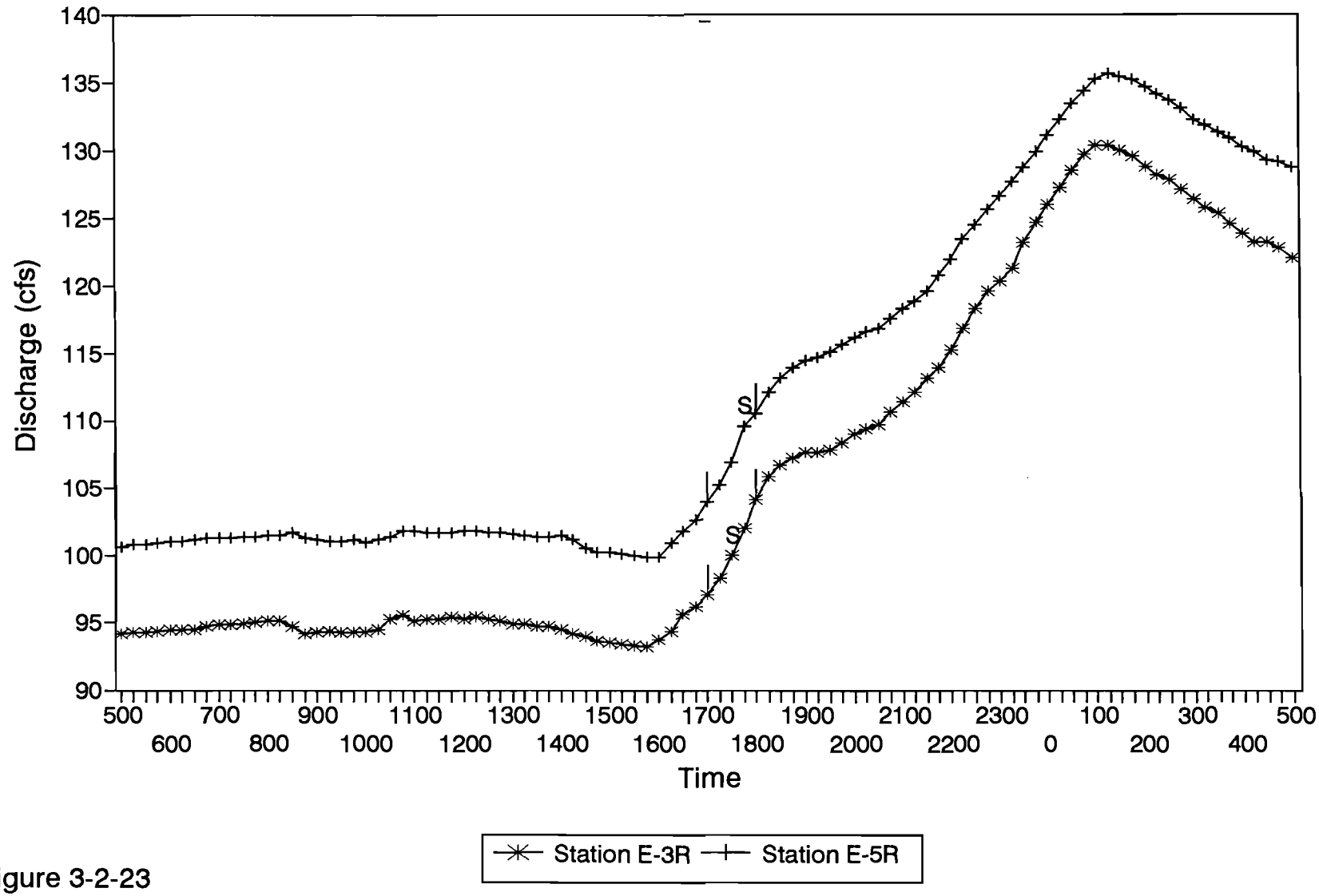


Figure 3-2-23

August 5, 1997 Runoff Event
Eagle River Discharge

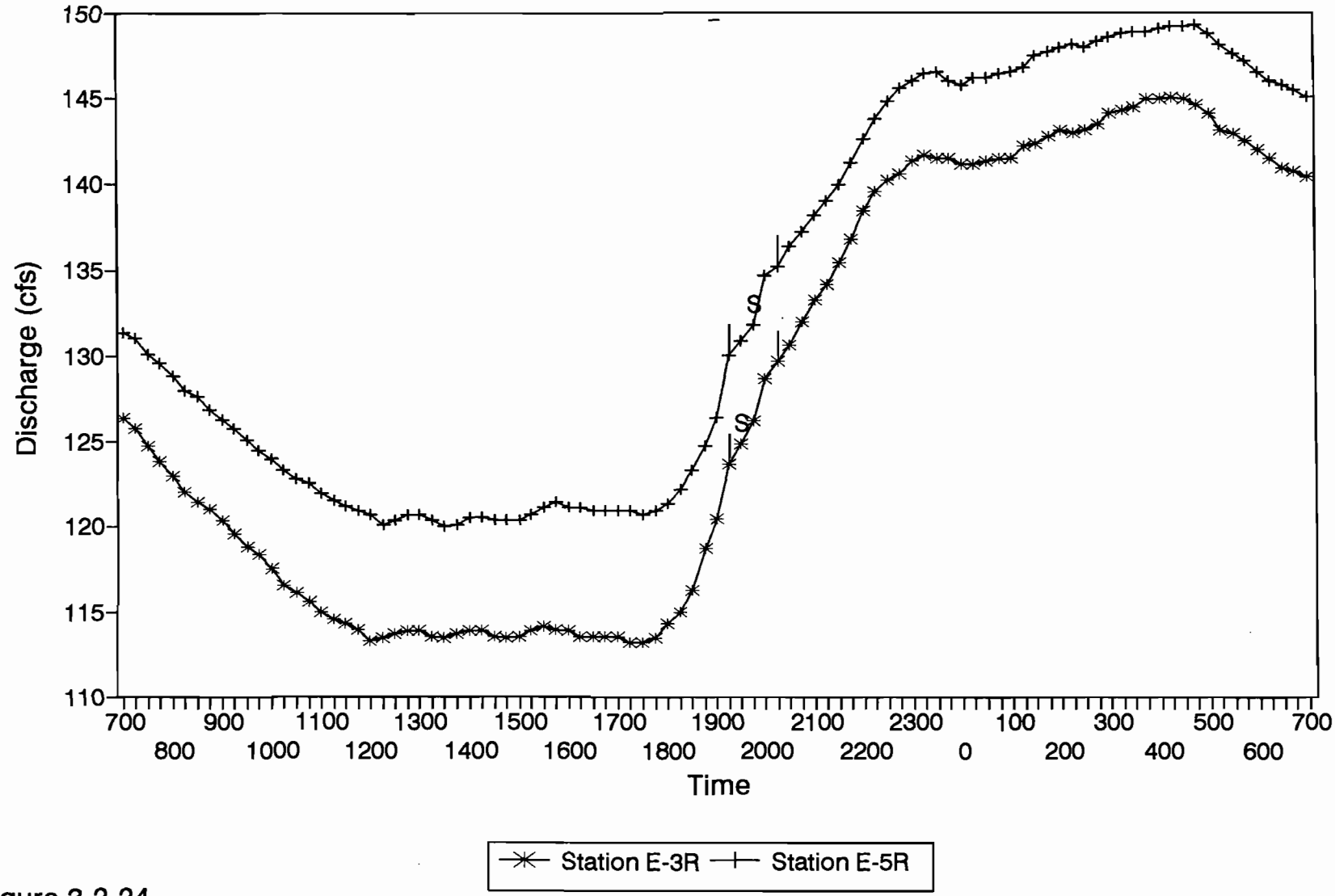


Figure 3-2-24

August 17, 1997 Runoff Event
Eagle River Discharge

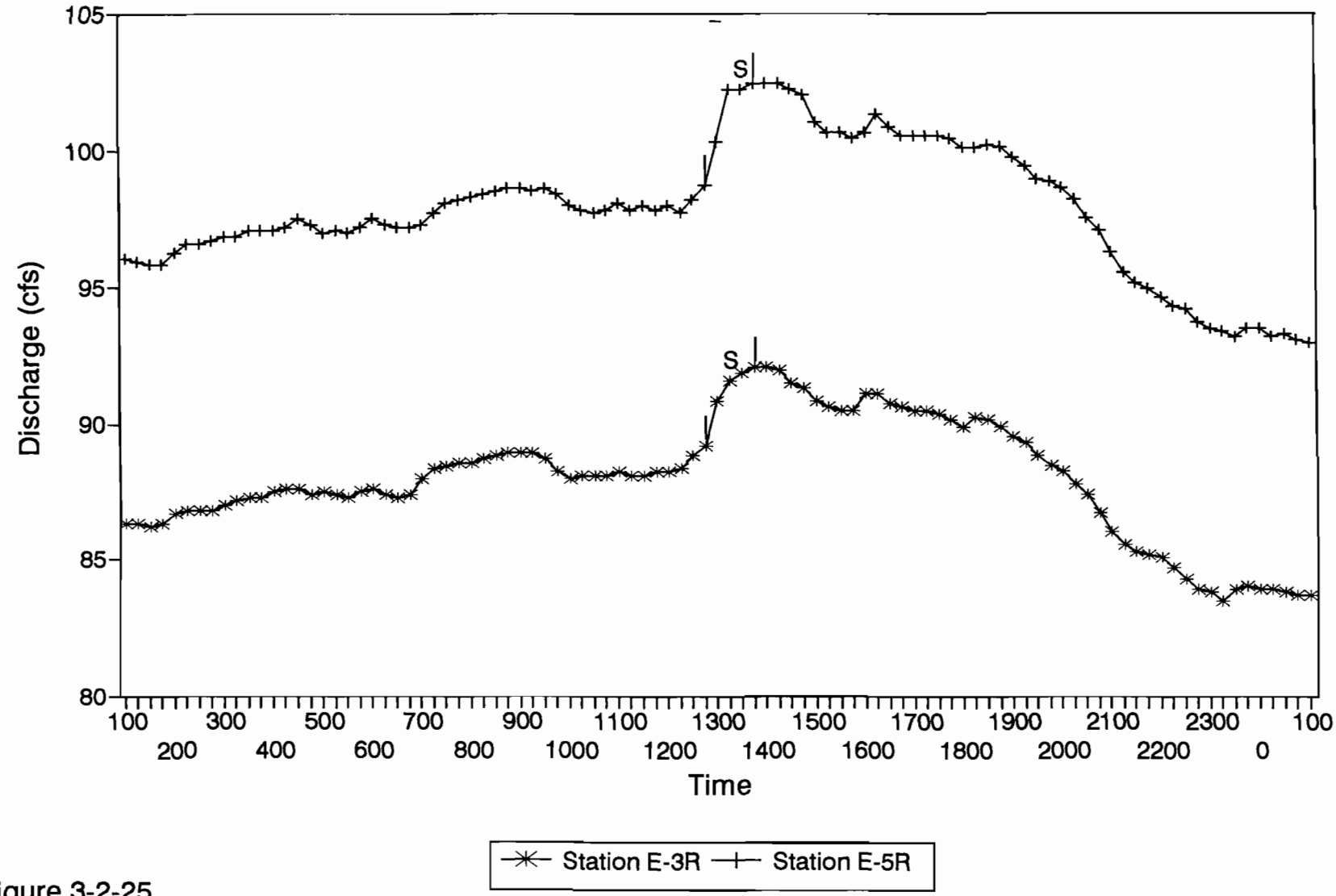


Figure 3-2-25

Streamflow monitoring data also indicate that in most instances, peak flows in the Eagle River following basin-wide rainfall-runoff events lag behind Belden and Rock Creek area runoff by at least four hours. This longer lag associated with the river is the result of greater travel times caused by a much larger drainage area for the river (approximately 150 square miles) versus the drainage area for the Site tributaries (approximately one square mile) following rainfall events. Therefore, runoff from the Belden/Rock Creek areas typically only contributed to the rising limb of the Eagle River discharge hydrograph during larger basin-wide rainstorms. With the exception of the August 17, 1997 event, peak flows on the river occurred after Site runoff was already past each river monitoring location.

3.2.3.3 Rainfall-Runoff Water Quality

Eagle River rainfall-runoff samples were collected during two events in 1995, three events in 1996, and five events in 1997. A list of the Eagle River stations sampled and one-hour rainfall total for each of these runoff events are provided in Table 3.2-2.

Samples were collected from Stations E-3R, E-5R, and E-11R during rainfall-runoff events by utilizing automatic samplers controlled by a water sampler control (WSC) program as described in the Monitoring Plan. Each river location has a unique WSC program which specifies a rainfall intensity threshold that must be met or exceeded to activate the program and a pre-defined lag time that must be met before sample collection begins. Once the samplers are activated, up to 24 discrete samples are collected at six-minute intervals. Sample collection at three-minute intervals is initiated if the river exceeds a pre-defined stage change threshold. The latter feature is used to document water quality changes resulting from a rapid rise or fall in river stage.

The rainfall intensity threshold used to activate the river samplers was refined as additional Site tributary hydrological data were gathered. Tributary response to rainfall events suggest that an equivalent rainfall intensity of 0.05 inch per 10-minutes to 0.07 inch per 10-minutes (0.30 to 0.42 in/hr) was typically required to generate tributary runoff. The optimum rainfall intensity response factor (0.30 to 0.42 in/hr) was used for the river stations depending on the anticipated antecedent moisture conditions in the tributary watersheds. In most cases, these rainfall thresholds were successful in activating the river samplers during events which were large enough to contribute tributary runoff to the river without activating the river samplers during non-tributary runoff rainfall events.

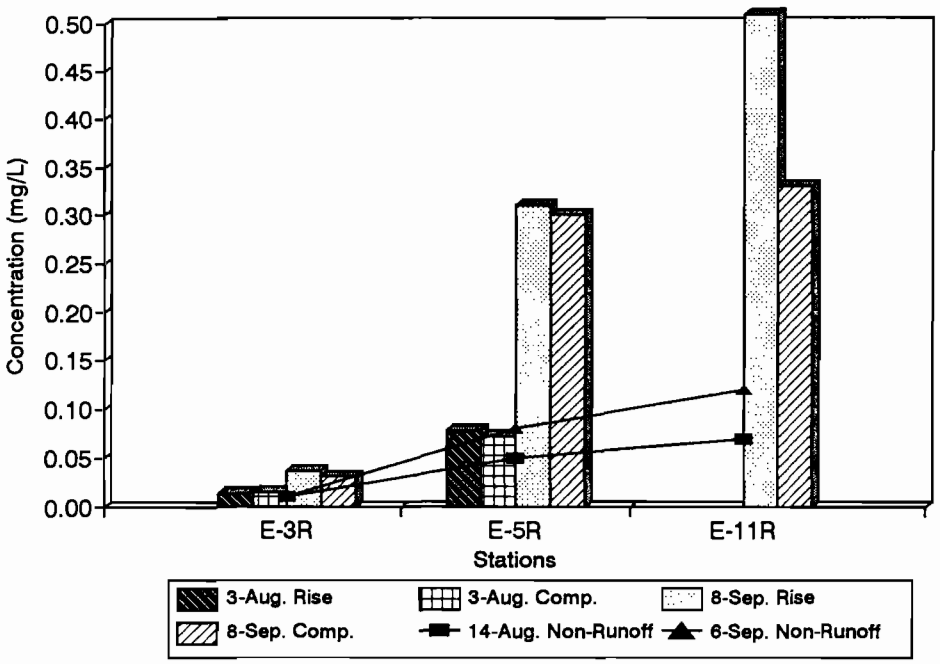
Water quality results for rainfall-runoff sampling at the three Eagle River stations are provided in Appendix B, along with graphical presentation of dissolved and total recoverable metal concentrations. Dissolved and total recoverable zinc concentrations measured in the Eagle River during selected rainfall-runoff events are shown in Figures 3-2-26 through 3-2-28 for 1995 to 1997, respectively. Each bar represents the concentration measured during either the first 30 minutes of runoff (the rising limb of the discharge hydrograph), or the concentration for a sample composited over the duration of the runoff event. In addition, where data are available lines are plotted which represent concentrations measured at each station during non-runoff periods for comparison purposes.

Zinc concentrations during rainfall-runoff typically exceeded baseline (non-runoff) concentrations at most stations. However, Eagle River dissolved zinc concentrations during tributary rainfall-runoff were relatively low (0.51 mg/l or less) during all three rainfall-runoff seasons. Zinc concentrations were significantly lower during runoff in 1997 as compared to 1995 and 1996. As with the baseline concentrations during non-runoff periods, zinc concentrations during tributary runoff increase between Stations E-3R and E-5R and between Stations E-5R and E-11R. However, dissolved zinc concentrations were 0.31 mg/l or less at Station E-5R and 0.51 mg/l or less at Station E-11R for all rainfall-runoff samples.

Data show that zinc concentrations increased upstream from the Site at Station E-3R during events on September 8, 1995 and July 29, 1996, particularly for total recoverable zinc. Samples collected during runoff events show that zinc concentrations can increase upstream of the Site at Station E-3R due to other metal sources in the Eagle River basin not associated with the Site.

Dissolved zinc concentrations did not change appreciably at Station E-5R during the August 3, 1995 runoff event, when compared to the August 14, 1995 non-runoff concentration. These data indicate that runoff from the Roaster Pile Drainage (T-6R) did not affect Eagle River zinc concentrations during this event. Zinc concentration increases above non-runoff values were measured at Stations E-5R and E-11R during the September 8, 1995 event and, to a lesser degree, at Station E-5R during the September 14, 1996 and July 27, 1997 runoff events. Maximum zinc concentrations were measured at Station E-11R during the September 8, 1995, July 29, 1996, and August 9, 1997 runoff events. However, as previously mentioned, the 1997 concentrations were lower and did not exceed 0.21 mg/l dissolved zinc at Station E-11R, which is considered relatively low.

Dissolved Zinc - 1995
Eagle River Rainfall-Runoff Events



Total Recoverable Zinc - 1995
Eagle River Rainfall-Runoff Events

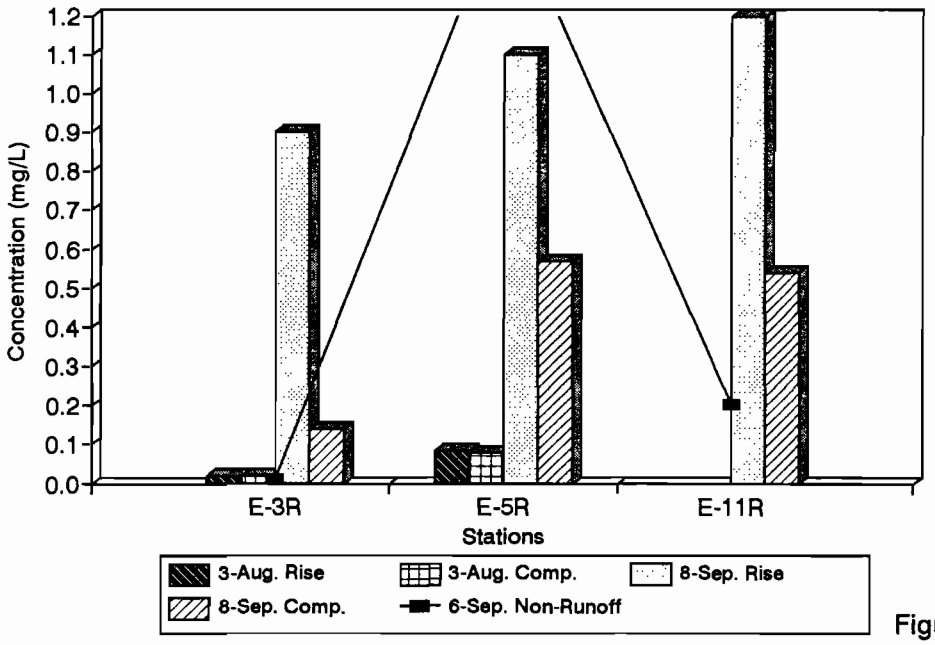
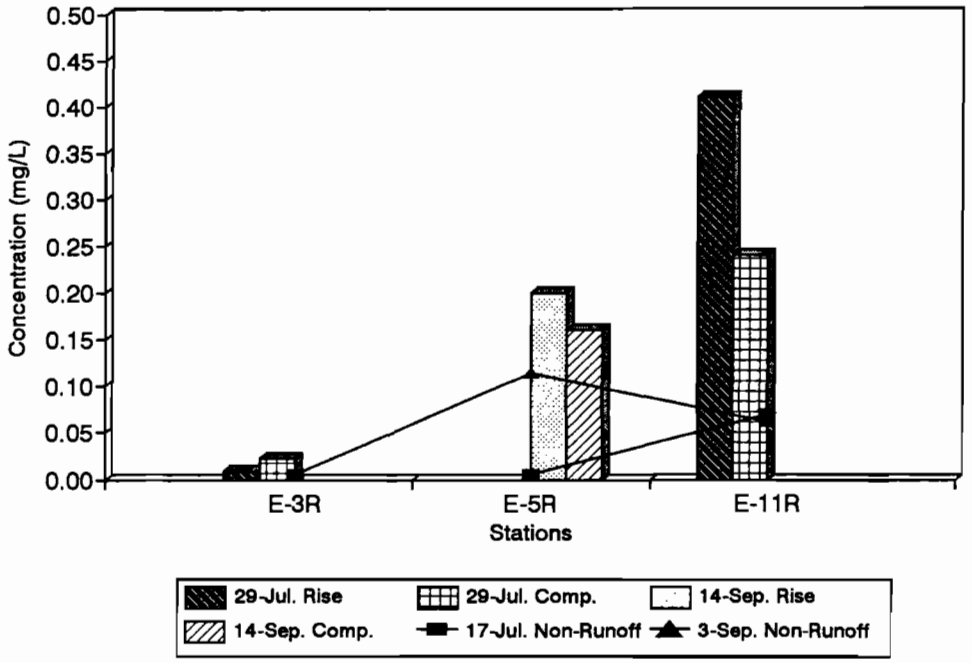


Figure 3-2-26

Dissolved Zinc - 1996
Eagle River Rainfall-Runoff Events



Total Recoverable Zinc - 1996
Eagle River Rainfall-Runoff Events

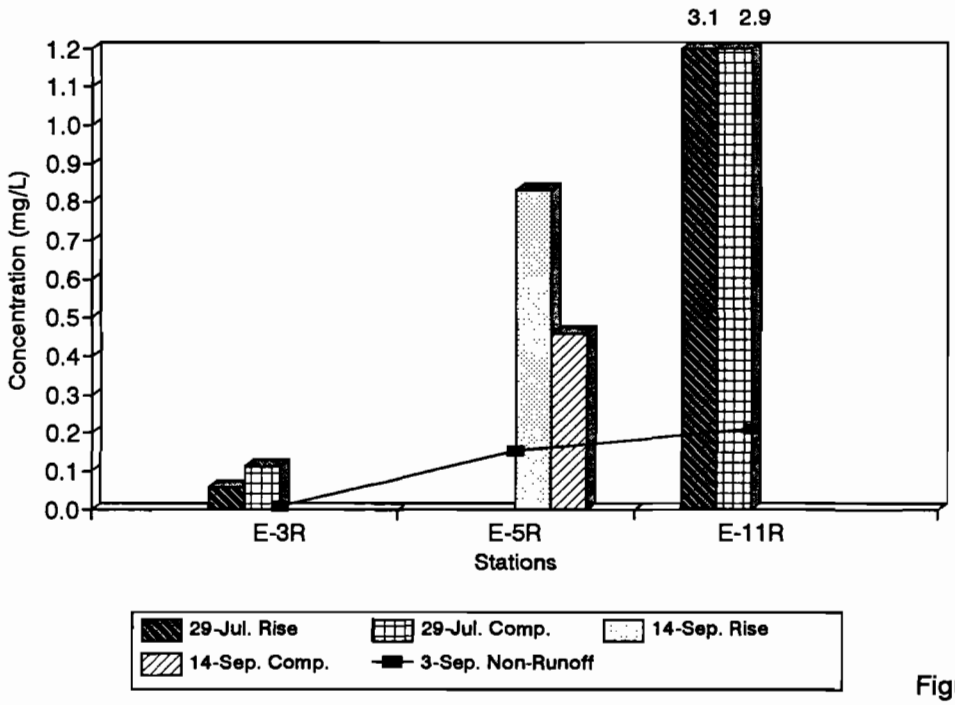
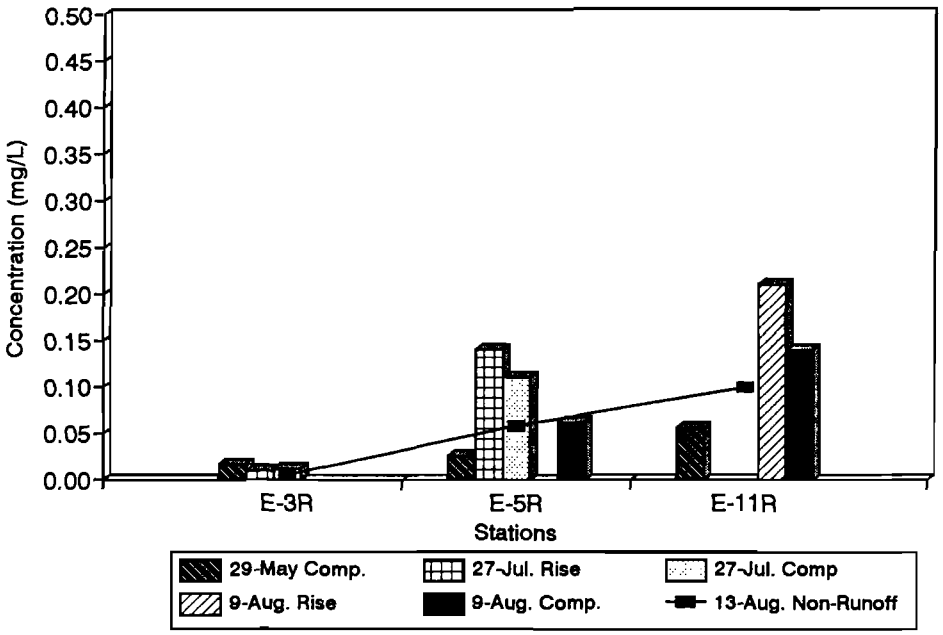


Figure 3-2-27

Dissolved Zinc - 1997
Eagle River Rainfall-Runoff Events



Total Recoverable Zinc - 1997
Eagle River Rainfall-Runoff Events

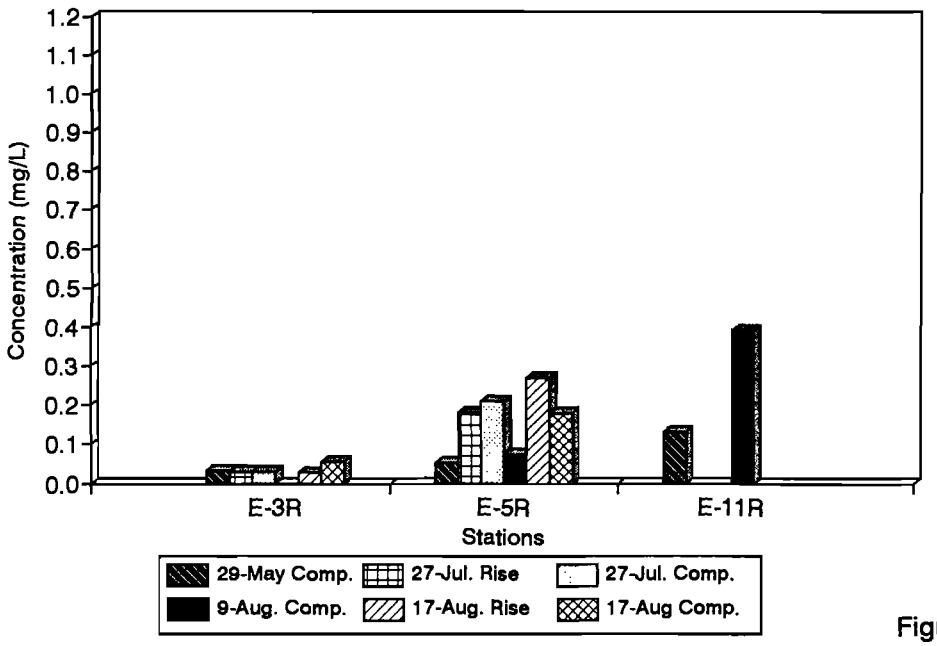


Figure 3-2-28

Samples collected during the first 30 minutes of runoff (rising limb) typically exhibited higher concentrations than storm composite samples. This characteristic was most apparent at Station E-11R which is downstream of all Site tributary runoff. The difference between baseline (non-runoff) and runoff dissolved zinc concentrations was also greatest at Station E-11R.

Total recoverable zinc concentrations were higher than dissolved zinc concentrations, particularly at Station E-3R during the September 8, 1995 runoff event (see Figure 3-2-26). During this event, most of the increase in total recoverable zinc (above baseline concentration) was not caused by runoff from Site tributaries. These data suggest the presence of a significant source of zinc upstream of the Site during rainfall-runoff conditions. The Site also contributed total recoverable zinc to the Eagle River during most rainfall-runoff events.

Dissolved and total recoverable concentrations for other metals during Eagle River rainfall-runoff events are shown graphically in Appendix E. Dissolved arsenic concentrations were below detection limits in all Eagle River rainfall-runoff samples. Total recoverable arsenic was detected above non-runoff concentrations in the rising limb sample at Station E-5R during two events: September 8, 1995 and September 14, 1996; and at Station E-11R during the July 29, 1996 runoff event.

Dissolved and total recoverable cadmium concentrations were detected at upstream Station E-3R during several rainfall-runoff events. Dissolved cadmium concentrations typically increased downstream at Stations E-5R and E-11R but remained relatively low (0.002 mg/l or less) during rainfall-runoff periods. Dissolved cadmium concentrations increased primarily between Stations E-3R and E-5R, with only minor contributions detected from the Rock Creek drainage (represented by Station E-11R). Dissolved cadmium concentrations were slightly greater than baseline concentrations during the runoff events sampled.

Dissolved copper and iron concentrations were also low in most river samples (<0.008 mg/l and <0.16 mg/l, respectively). However, concentrations were elevated upstream of the Site at Station E-3R during both the September 8, 1995 and July 29, 1996 runoff events, suggesting a source of both copper and iron unrelated to the Site. In fact, dissolved iron concentrations were the highest upstream from the Site (Station E-3R) during runoff events on August 3, 1995, September 8, 1995 and July 29, 1996. By comparison, runoff results from Stations E-5R and E-11R indicate only minor

contributions of dissolved copper and iron from Site tributaries. Total recoverable copper and iron concentrations were above baseline levels during all rainfall-runoff events. While the data indicates that runoff from the Site contributes total recoverable copper and iron to the Eagle River, these concentration increases may also be attributed to chemical precipitation of dissolved copper or iron from upstream (i.e., off-site) sources.

Both dissolved and total recoverable lead were detected in rainfall-runoff samples collected upstream from the Site at Station E-3R. Dissolved and total recoverable lead concentrations also increased above baseline levels at Stations E-5R and E-11R during most of the rainfall-runoff events sampled, indicating tributary runoff contributions. While dissolved lead concentrations were less than 0.011 mg/l for all rainfall-runoff events sampled, a maximum total recoverable lead concentration of 0.89 mg/l was measured during the July 29, 1996 runoff event at Station E-11R.

Dissolved and total recoverable manganese concentrations were also detected at upstream Station E-3R during runoff events, and generally increased with distance downstream at Stations E-5R and E-11R indicating contributions from tributary runoff. However, dissolved manganese concentrations in Eagle River runoff samples were less than 0.3 mg/l for all sampled events. Manganese exhibited similar characteristics to other soluble metals such as cadmium and zinc. Concentrations increased above baseline levels during most runoff events, and samples collected during the first 30 minutes of runoff (rising limb) usually had higher concentrations.

3.2.3.4 Snowmelt-Runoff Water Quality

The Eagle River was sampled during four snowmelt-runoff events in 1996 and five snowmelt-runoff events in 1997 (Table 3.2-15). Snowmelt-runoff from waste rock tributaries typically occurs from March through early May as described in Section 3.2.1. Snowmelt-runoff monitoring results are provided in Appendix B. A graphical display of the measured concentration for each metal is presented in Appendix E. All river samples collected from Stations E-3R, E-5R, and E-11R were grab samples collected when snowmelt-runoff was occurring in one or more Site tributaries. Discharge was estimated based on the Station E-12A stream gage record for Eagle River samples collected during the onset of the snowmelt period (March) because of ice cover conditions.

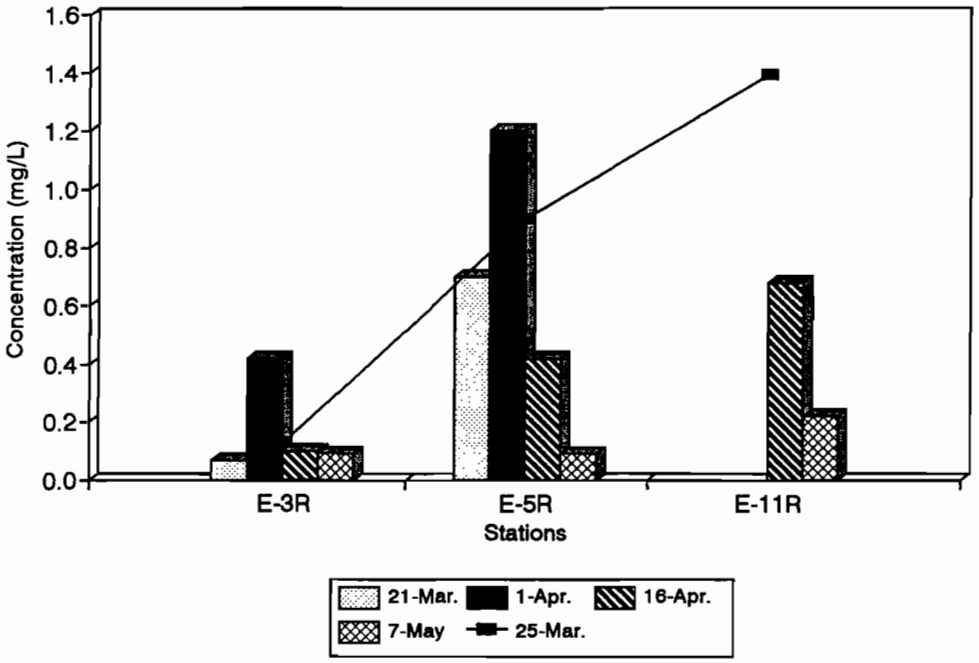
TABLE 3.2-15
Snowmelt-Runoff Events Sampled

Sample Date	Stations Sampled
13-Feb-96	T-TR
21-Mar-96	E-3R, E-5R, SR-2, SR-2A, T-4A, T-4R, T-TR
01-Apr-96	E-3R, E-5R, SR-2, T-4R, T-TR
10-Apr-96	SR-4, T-10R, T-10B
16-Apr-96	E-3R, E-5R, E-11R, SR-4, T-4A, T-4R, T-6R, T-10R
07-May-96	E-3R, E-5R, E-11R, SR-3, SR-4, T-4A, T-4R, T-6R, T-10R
15-May-96	SR-3
07-Mar-97	E-3R, E-5R, T-4, T-TR
11-Mar-97	E-3R, E-5R, E-11R, T-4R, T-TR, SR-2, SR-4, T-10R
19-Mar-97	E-3R, E-5R, SR-1A, T-4, T-TR, SR-2
17-Apr-97	E-3R, E-5R, E-11R, SR-1A, T-4R, T-6R, SR-3, SR-4, T-10R, T-10B
06-May-97	E-3R, E-5R, E-11R, SR-1A, T-4R, T-6R, SR-3, SR-4, T-10R

In most cases, the river stations sampled were those necessary to provide data to bracket (upstream and downstream) the tributaries generating runoff. For example, snowmelt-runoff was only occurring at Stations T-4R and/or T-TR on March 21, 1996 and April 1, 1996, and March 7, 1997. Only Stations E-3R and E-5R were sampled on these dates because no runoff was occurring in the Rock Creek area (represented by Station E-11R). On April 16 and May 7, 1996, and on March 11, April 17, and May 6, 1997 all tributaries were generating snowmelt-runoff except the tributaries at Stations T-TR and/or SR-3. All three Eagle River stations were sampled on these dates to document overall snowmelt-runoff water quality conditions.

The 1996 and 1997 Eagle River snowmelt-runoff results for zinc are shown in Figures 3-2-29 and 3-2-30, respectively. Included are the concentrations for each sampled runoff event, in addition to the concentrations measured during routine river sampling episodes on March 25, 1996 (Figure 3-2-29) and March 26, 1997 (Figure 3-2-30). These data are plotted as lines to illustrate the variability in the Eagle River of zinc concentrations which can occur, even when there is little or no runoff from Site tributaries.

Dissolved Zinc - 1996
Eagle River Snowmelt-Runoff Events



Total Recoverable Zinc - 1996
Eagle River Snowmelt-Runoff Events

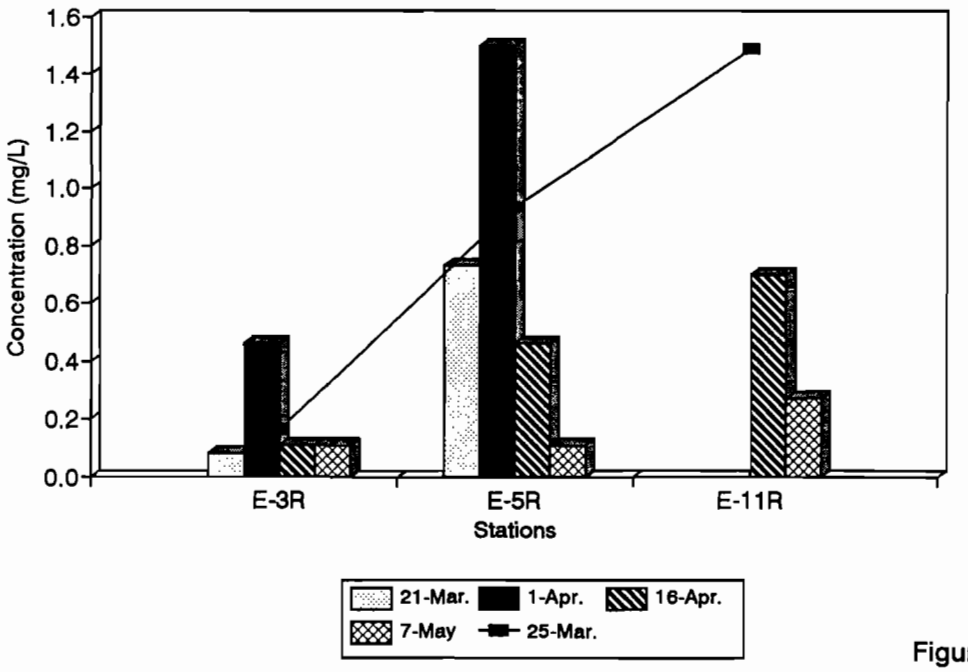
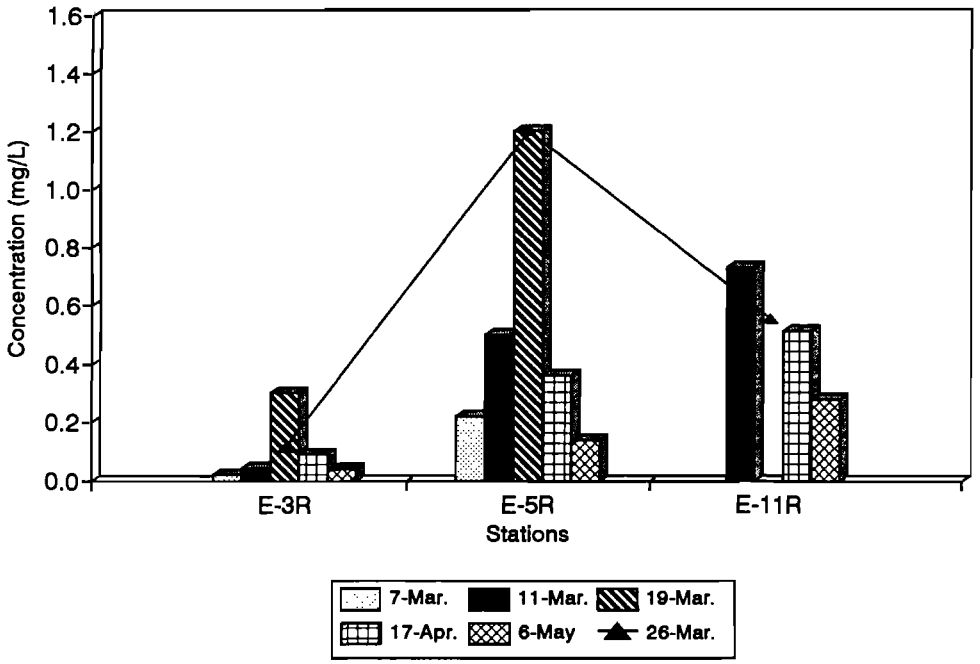


Figure 3-2-29

Dissolved Zinc - 1997
Eagle River Snowmelt-Runoff Events



Total Recoverable - 1997
Eagle River Snowmelt-Runoff Events

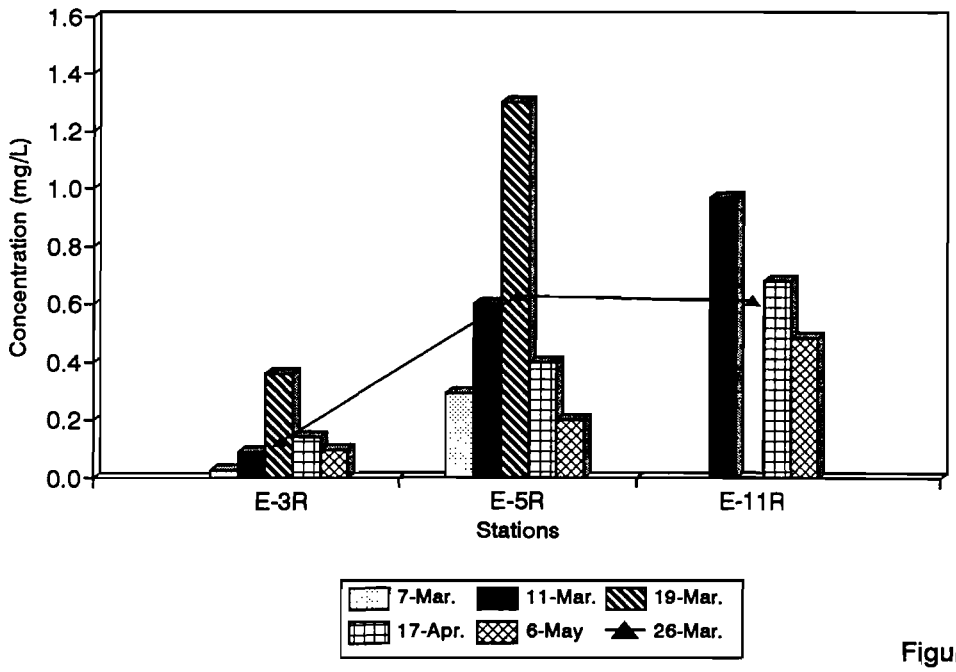


Figure 3-2-30

Zinc concentrations increased in March and April between Stations E-3R and E-5R, when runoff was occurring from Stations T-4R and T-TR. From early to mid-March the Eagle River zinc concentrations increased at Station E-5R indicating additional snowmelt sources. During this period, only minor zinc increases were measured at Station E-11R because little runoff was occurring in the Rock Creek area. A maximum dissolved zinc concentration of 1.2 mg/l was measured at Station E-5R both on April 1, 1996 and on March 19, 1997. The fact that peak concentrations measured were the same in both 1996 and 1997 snowmelt periods suggest that the timing of sampling to measure the maximum snowmelt-runoff contribution was quite good and that these data may be reasonably representative of extremes for the two snowmelt periods monitored.

The peak river snowmelt-runoff metal concentrations coincided with high concentrations upstream of the Site at Station E-3R (see Figures 3-2-29 and 3-2-30). Dissolved zinc concentrations at Station E-3R were 0.42 mg/l on April 1, 1996 and 0.30 mg/l on March 19, 1997. Both of these measured concentrations exceed water quality standards for the Eagle River. These data suggest a significant source of metals exists upstream of the Site that contributes high dissolved metal concentrations to the Eagle River.

By mid-April in both 1996 and 1997, snowmelt runoff had started in the Rock Creek area. This temporal change in the location of runoff is illustrated by the measured Eagle River zinc concentrations. Of the snowmelt-runoff events sampled, the mid-April sampling events represent runoff from most monitored Site tributaries. These results show a steady increase in zinc concentrations between Stations E-3R and E-11R. Additional increases in Eagle River zinc concentrations were shown downstream at Station E-11R in April and May, whereas only small increases are shown between Stations E-3R and E-5R in May during both 1996 and 1997. By early May, runoff had nearly stopped in the Belden area and concentrations receded from peak conditions and were much lower at all Eagle River stations during both 1996 and 1997 snowmelt seasons. By mid-May, snowmelt runoff from Site tributaries was completed.

Unlike the rainfall-runoff samples where particulate metals make up the largest fraction and dissolved concentrations are relatively low, the dissolved and total recoverable metal concentrations were very similar in snowmelt-runoff samples. At Station E-5R, for example, for the nine snowmelt runoff samples collected, an average of 85 percent of the zinc was in dissolved form. These data indicate that nearly all of the zinc in the Eagle River is in dissolved form during the snowmelt-runoff

period, suggesting sources other than tributary runoff. Dissolved zinc concentrations were approximately two times higher in snowmelt samples as compared to rainfall-runoff samples collected from the Eagle River, whereas total recoverable zinc concentrations were of similar magnitude for the two sampling periods.

Cadmium and manganese concentrations show a similar pattern to zinc in Eagle River snowmelt-runoff samples. Concentrations of soluble metals detected in snowmelt-runoff samples were generally higher than those measured in rainfall-runoff samples, with dissolved cadmium 0.0032 mg/l or less and dissolved manganese 0.47 mg/l or less. As with zinc, cadmium and manganese concentrations were relatively high upstream at Station E-3R. Copper and iron concentrations were also relatively high in the Eagle River upstream from the Site at Station E-3R, and snowmelt-runoff from Site tributaries did not result in significant increases in copper or iron concentrations.

3.2.4 Loading Analysis

In an effort to quantify potential metal load sources, a loading analysis has been conducted for the waste rock pile tributary runoff and the Eagle River runoff data. This analysis uses dissolved zinc as the parameter for assessing runoff load source contributions. Dissolved zinc is relatively soluble in the Eagle River and its tributaries and has been used in the past to successfully quantify metal load sources at the Site. In addition, dissolved zinc is a conservative metal which is used for Site compliance in the RAP. Although total recoverable metals exist in tributary and Eagle River runoff, these concentrations are primarily associated with suspended sediment entrained in the water column through erosional processes during rainfall-runoff events. Data suggest that some of the highest metal concentrations are present during the spring runoff period when most of the soluble metals such as cadmium, manganese, and zinc are in the dissolved form. In addition, total recoverable metal concentrations are generally of lesser concern for the Eagle River aquatic environment.

3.2.4.1 Tributary Load

An assessment of dissolved zinc loading during each tributary event was conducted to provide a direct comparison of the relative magnitude of each tributary load contribution. Two of the monitored tributaries are perennial and four of the monitored tributaries are ephemeral. At perennial tributary Stations T-6R and T-10R baseflow estimates were taken from direct measurements during

non-runoff conditions. For rainfall-runoff events, this baseflow component was added to each hydrograph ordinate computed by the model to calculate the total discharge for each sample collected, typically every 5 minutes. The 5-minute discharge for each discrete sample was averaged to obtain the average weighted discharge for both rising-limb and storm composite samples. These discharge values are shown in the water quality data printouts in Appendix B.

Associated with the baseflow at Stations T-6R and T-10R are metal concentrations which translate into a base metal load. The baseline discharge and metal concentration measured during non-runoff periods were used to compute a base metal load for the two perennial tributaries. The base load was subtracted from the event load for the perennial tributaries before calculating the final rainfall-runoff event load.

The dissolved zinc load for each tributary rainfall-runoff event was calculated by summing the five-minute (or other interval depending on sample collection frequency) zinc loads for the duration of the runoff event. If a base load was present it was subtracted from each 5-minute load before calculating the total event load. If both rising-limb and storm composite samples were taken, loads were calculated separately using the concentration results from each respective sample and the rising limb and storm composite loads were then summed to determine a discharge-weighted total event load.

The duration of the runoff event, discharge, and concentration were used to determine the total metal load delivered for each event. Because of the fact that tributary rainfall-runoff duration was typically one hour or less and some of the tributaries have continuous flow while others are ephemeral, units of lbs/day are not appropriate for comparing relative waste rock pile tributary loads. Therefore, each total event load was divided by the event duration adjusted to 60 minutes to provide comparative load data in pounds per hour (lbs/hr).

Observations of Site tributary snowmelt-runoff suggest that peak snowmelt occurs during the period of the day when temperatures are highest, typically between the hours of 1:00 p.m. and 5:00 p.m, and cooler temperatures curtail snowmelt-runoff during other hours of the day. A unit of lbs/hr appears reasonably conservative since peak flows were targeted and sampled during this period and samples likely represent some of the highest snowmelt-event flows. For tributary snowmelt-runoff events, the zinc load was also calculated in lbs/hr using a cfs-mg/l conversion factor of 0.225.

Tributary rainfall-runoff dissolved zinc load in lbs/hr are presented graphically in Figures 3-2-31 through 3-2-33 for 1995, 1996, and 1997, respectively. These plots indicate that the dissolved zinc load was small (0.5 lbs/hr or less) at Stations SR-3 (WP-11 hillside), T-4R (Un-named tributary), and T-6R (Roaster Pile Drainage) during all rainfall-runoff events measured. Data indicate that dissolved zinc concentrations are relatively low in runoff from these tributaries, or the rainfall-runoff discharge is relatively small in volume or short in duration, resulting in a small zinc load. For these reasons there was often only a small zinc load, if any, reaching the Eagle River from these tributaries.

The highest dissolved zinc loads were measured from Stations SR-4 (WP-8 Hillside) and T-TR (WP-4 and WP-5). Rainfall-runoff zinc loads typically exceeded one lb/hr from these tributaries. Although Station SR-4 is hydraulically connected to Rock Creek (Station T-10R), it appears that some of the Station SR-4 load does not reach the mouth of Rock Creek because Station T-10R loads were lower than Station SR-4 loads for every rainfall-runoff event measured. These data indicate, however, that Station SR-4 could account for most of the dissolved zinc load in Rock Creek under rainfall-runoff conditions.

The Tramway Tributary (Station T-TR) also exhibited rainfall-runoff event dissolved zinc loads in excess of one lb/hr, with an elevated load resulting from an intense rainstorm on July 29, 1996. Over the three rainfall-runoff seasons, however, Station T-TR event loads were generally lower than Station SR-4 loads and were less than five lbs/hr.

During snowmelt-runoff conditions, tributary dissolved zinc loads were generally lower than those measured during rainfall-runoff conditions (Figures 3-2-34 and 3-2-35). There was a similar distribution of loads among tributary stations, with Stations SR-3, T-4R, and T-6R having small loads relative to Station SR-4. Station T-TR exhibited significantly lower dissolved zinc load during snowmelt runoff (0.5 lbs/hr or less) as compared to rainfall-runoff because of the small runoff flow volumes.

Data indicate that the majority of dissolved zinc load measured in Rock Creek (Station T-10R) during the Site snowmelt-runoff period can be attributed to runoff from the WP-8 hillside (Station SR-4). Unlike conditions during rainfall-runoff, however, a loss of dissolved zinc load was not measured between Stations SR-4 and T-10R during snowmelt periods.

Dissolved Zinc Load
Tributary Rainfall-Runoff - 1995

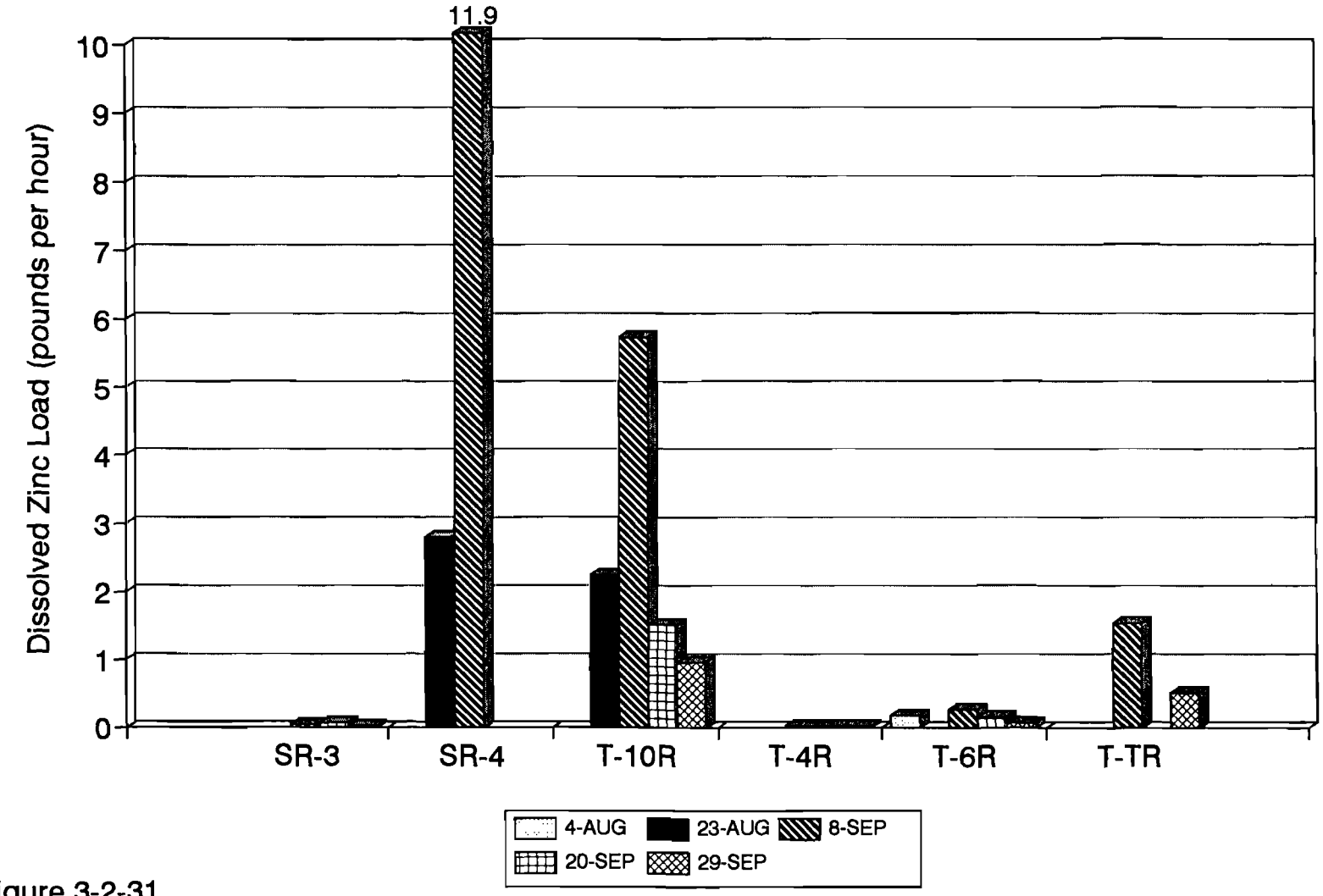


Figure 3-2-31

Dissolved Zinc Load
Tributary Rainfall-Runoff - 1996

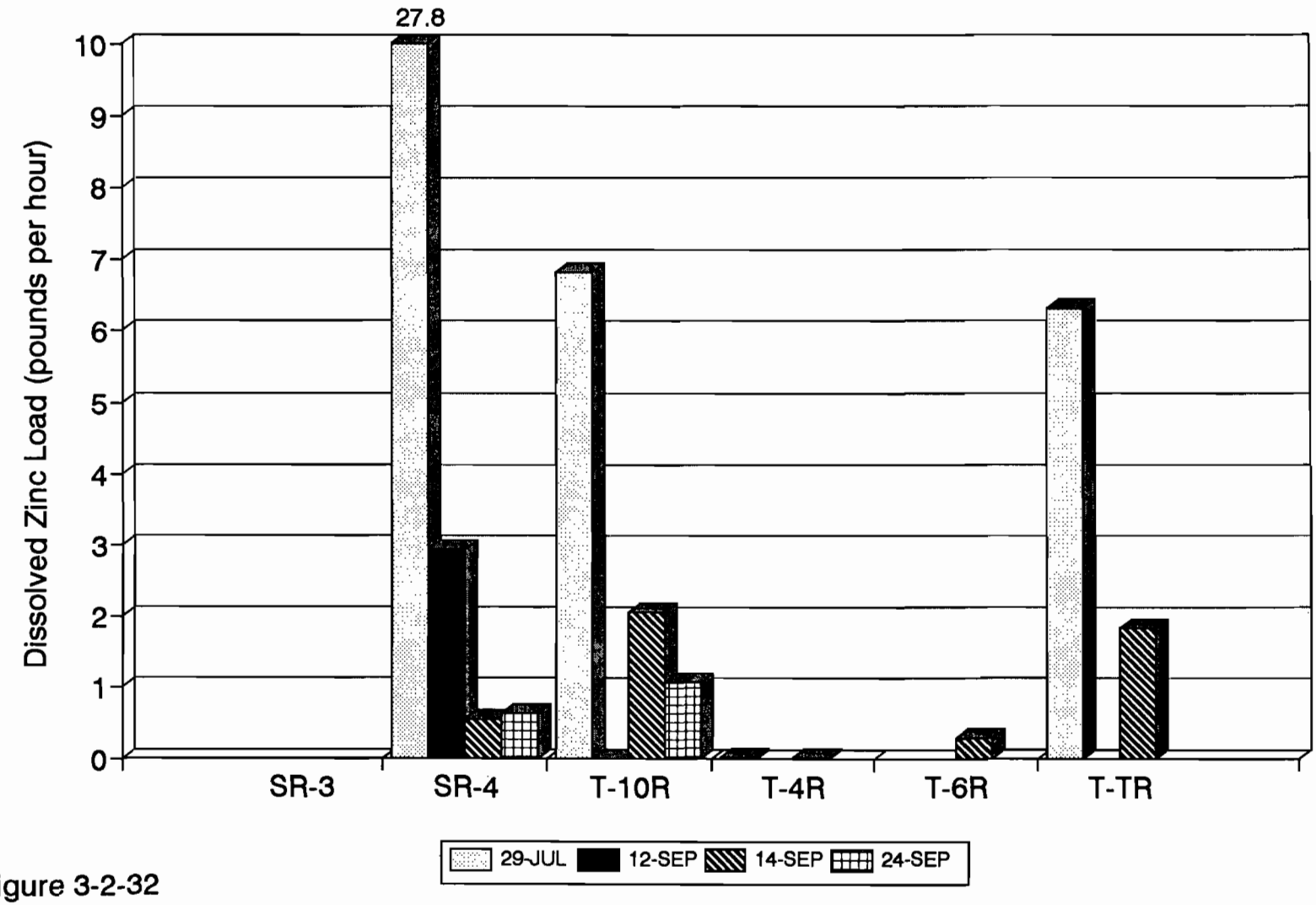


Figure 3-2-32

Dissolved Zinc Load
Tributary Rainfall-Runoff - 1997

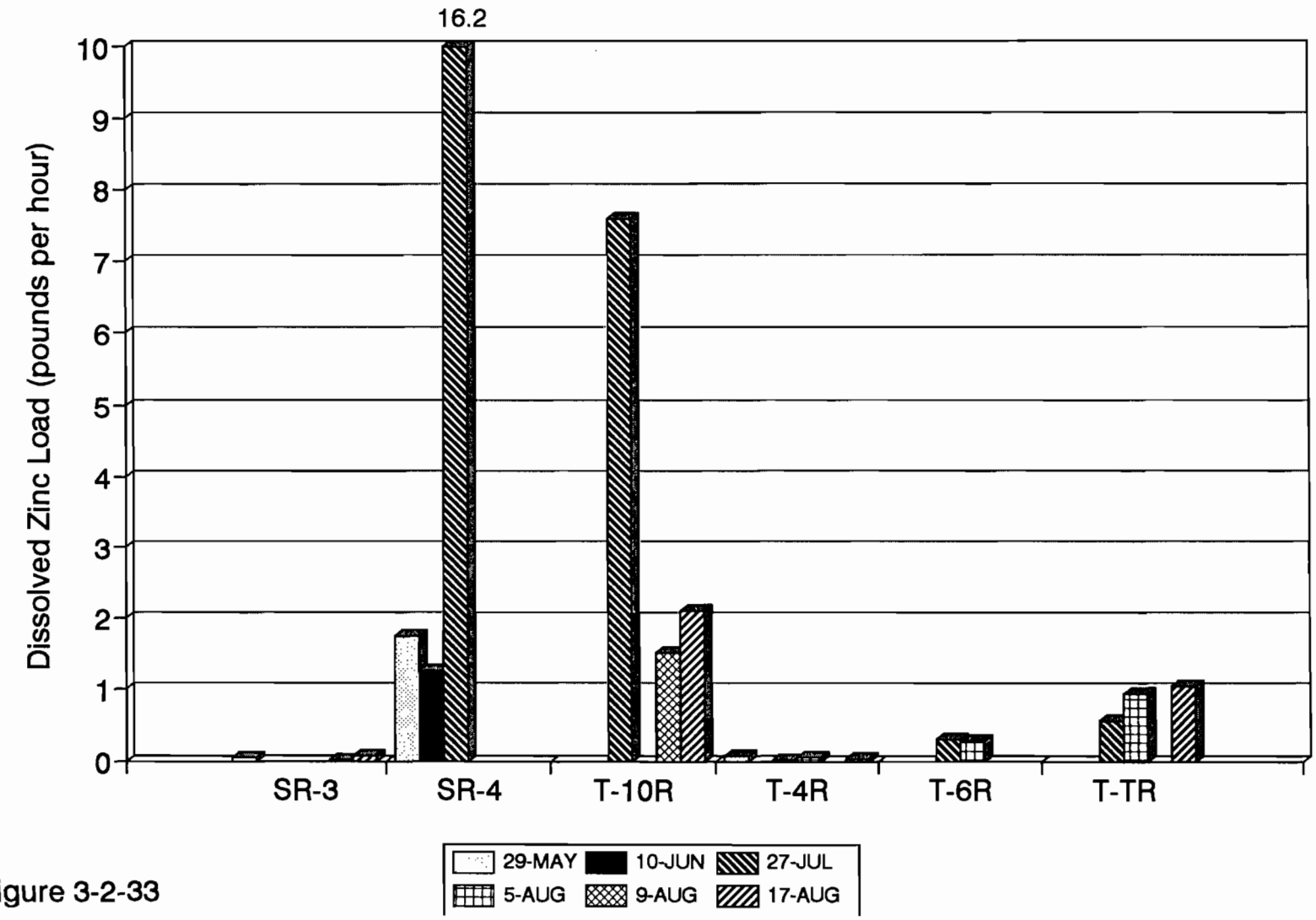


Figure 3-2-33

Dissolved Zinc Load
Tributary Snowmelt-Runoff - 1996

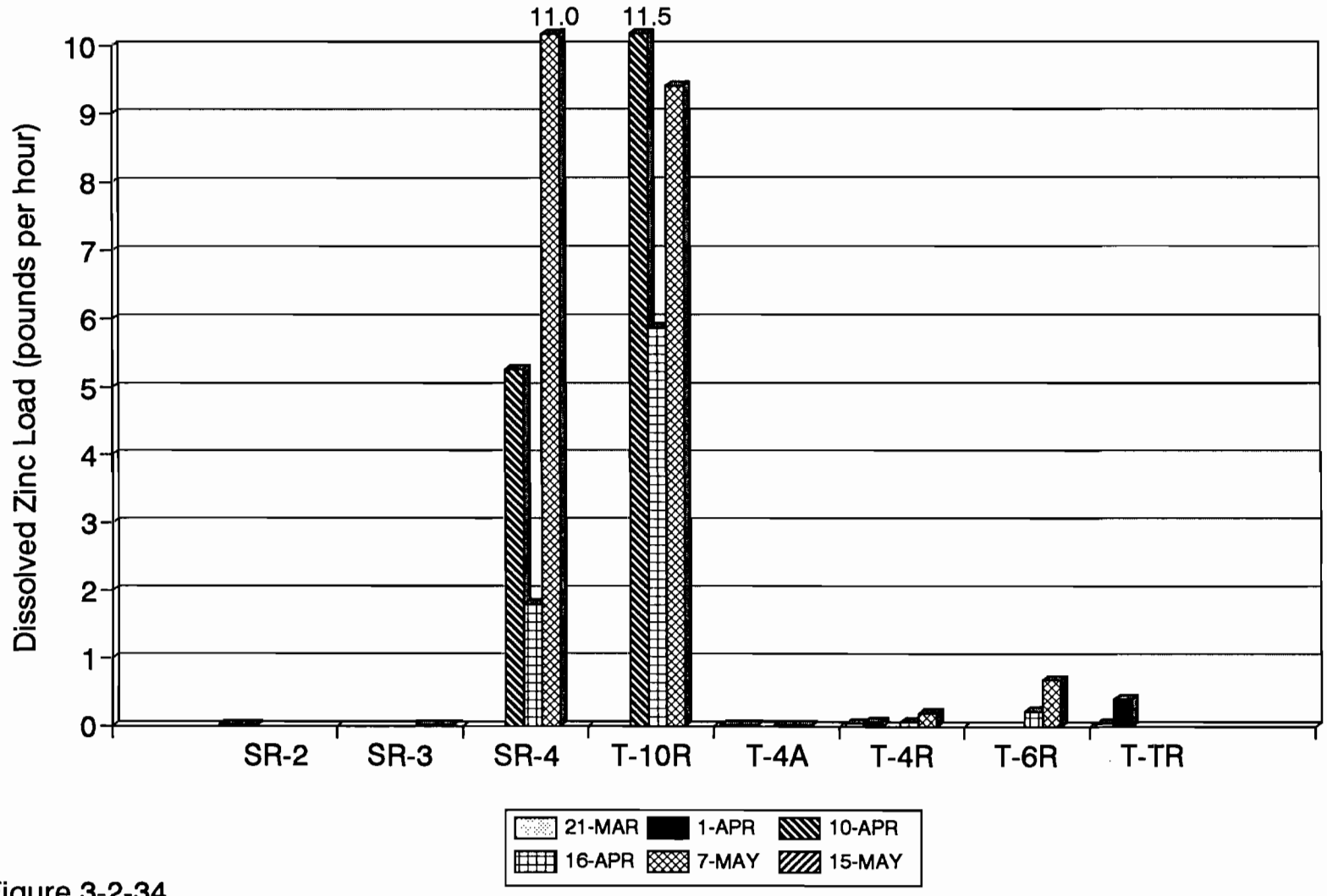


Figure 3-2-34

Dissolved Zinc Load
Tributary Snowmelt-Runoff - 1997

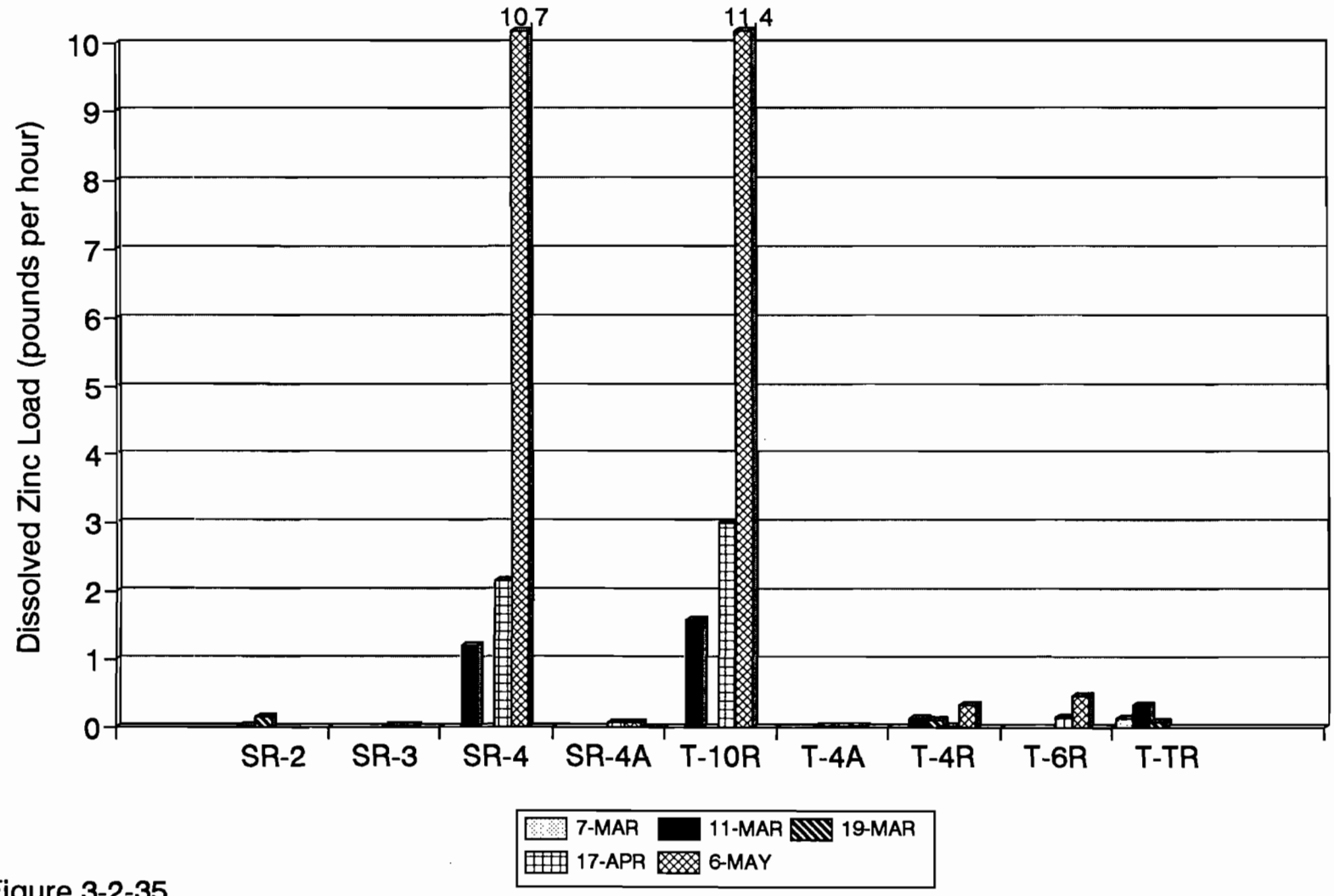


Figure 3-2-35

3.2.4.2 Eagle River Load

Eagle River loading conditions during runoff events were assessed in a similar fashion as the perennial tributaries. Utilizing the discharge ratings established for the stream gages at each Eagle River station and the stage height measured for each discrete sample collected (typically every 6 minutes), the discharge for each discrete sample collected by the automatic sampler was calculated. The 6-minute discharge for each discrete sample was averaged to obtain the average weighted discharge for both rising-limb and storm composite samples. These discharge values are shown in the water quality data printouts in Appendix B.

Eagle River flows are continuous and a dissolved zinc load is carried by the river at all times. Non-runoff loads carried by the river are comprised of the river load entering the Site, perennial tributary loads, and ground water loads. Under these conditions, river flows and loads are relatively stable leading up to the rainfall-runoff event and the baseload in the river can be predicted with reasonable accuracy. Eagle River base loads were estimated for rainfall-runoff events based on concentrations measured during non-runoff conditions for the same month in which the runoff event occurred and the discharge recorded at the gage immediately prior to the rainfall-runoff event. To assess the Eagle River load attributable to waste rock tributary rainfall-runoff, this base load was subtracted from the total load measured to obtain the event load in lbs/hr.

The dissolved zinc load for each sampled Eagle River rainfall-runoff event was calculated by summing the six-minute (or other interval depending on sample collection frequency) zinc loads for the duration of the runoff event. The base load was subtracted from each 6-minute load before calculating the total event load. If both rising-limb and storm composite samples were taken, loads were calculated separately using the concentration results from each respective sample, and the rising limb and storm composite loads were then summed to determine a discharge-weighted total event load.

During the snowmelt-runoff period, the river flow and load can change from day to day because snowmelt-runoff is continuous relative to short-duration rainfall-runoff. Under snowmelt conditions, it is assumed that the load carried by the river is representative of overall runoff conditions both upstream and within the Site, and base loads from unidentified sources are also in a state of flux due to continuous recharge conditions (non-steady state). For these events, the load was calculated from

direct measurements of concentration and discharge using a conversion factor of 0.225 to obtain load in lbs/hr.

To evaluate Eagle River loading conditions, the river was separated into two distinct reaches representing the principle tributary inflows. The Belden reach covers the river segment between Stations E-3R and E-5R and includes Stations T-4R, T-6R, and T-TR. Surface runoff Stations SR-1 and SR-2 are also in the Belden reach. The Rock Creek reach covers the river segment between Stations E-5R and E-11R and includes Station T-10R (Rock Creek) and surface runoff monitoring Stations SR-3 and SR-4. Rainfall-runoff loading in these two Eagle River reaches is discussed below.

3.2.4.3 Belden Reach

Rainfall-Runoff Load

The dissolved zinc load accounting for the Belden reach during six rainfall-runoff events sampled are shown in Table 3.2-16. Runoff events included are those dates where samples were collected at both Stations E-3R and E-5R to bracket all inflows. The load calculated for each tributary in the reach is also provided. The table shows total event load in lbs/hr, the estimated base load at the time of the runoff event, and the measured runoff load. The measured runoff load is the load contributed by tributary rainfall-runoff and does not include baseload. The total event load is computed by adding the base load to the runoff load. In this fashion, the percentage of load contributed by tributary runoff versus baseflow is compared.

The unaccounted load was the load that was not measured during the sampling event, calculated as the difference between Stations E-3R and E-5R minus the tributary load. Unaccounted load could include ground water inflow and diffuse runoff from Site areas, particularly the banks of the river and railroad bed material that were not measured.

Table 3-2-16

Dissolved Zinc Load Accounting
Belden Reach (Stations E-3R to E-5R)
Rainfall-Runoff Event Samples

Dames & Moore 30-Nov-97

Event Date	Station	Sample Time	Entered River?	Total Event Load (lbs/hr)	Estimated Base Load (lbs/hr)	Measured Runoff Load (lbs/hr)	Base Load Contribution (%)	Runoff Load Contribution (%)
03-Aug-95	E-3R	2016-2146	-----	0.374	0.191	0.183	6.9%	6.6%
	T-4R	-----	-----	Not Measured				
	T-6R	2006-2141	Yes	0.318	0.157	0.161	5.6%	5.8%
	T-TR	-----	-----	Not Measured				
	E-5R	2015-2151	-----	2.787	2.059	0.728	-----	-----
	Unaccounted Sources			2.095	1.711	0.384	61.4%	13.8%
	Total						73.9%	26.1%
08-Sep-95	E-3R	0251-0431	-----	0.323	0.080	0.243	1.6%	4.9%
	T-4R	0309-0419	Yes	0.008	0.000	0.008	0.0%	0.2%
	T-6R	0309-0359	Yes	0.354	0.088	0.266	1.8%	5.4%
	T-TR	0309-0327	Yes	1.532	0.000	1.532	0.0%	31.0%
	E-5R	0325-0425	-----	4.940	1.330	3.610	-----	-----
	Unaccounted Sources			2.723	1.162	1.561	23.5%	31.6%
	Total						26.9%	73.1%
14-Sep-96	E-3R*	-----	-----	0.300	0.100	0.200	5.1%	10.2%
	T-4R	1925-2055	Yes	0.005	0.000	0.005	0.0%	0.3%
	T-6R	1927-2037	Yes	0.336	0.056	0.280	2.9%	14.3%
	T-TR	1946-2017	Yes	1.836	0.000	1.836	0.0%	93.5%
	E-5R	1950-2142	-----	1.963	1.308	0.655	-----	-----
	Unaccounted Sources			-0.514	1.152	-1.666	58.7%	0.0%
	Total						66.6%	33.4%
27-Jul-97	E-3R	1648-1811	-----	0.227	0.107	0.120	3.9%	4.3%
	T-4R	1649-1809	Yes	0.012	0.000	0.012	0.0%	0.4%
	T-6R	1704-1749	Yes	0.397	0.083	0.314	3.0%	11.3%
	T-TR	1813-1839	No	0.566	0.000	0.566	0.0%	0.0%
	E-5R	1715-1826	-----	2.769	1.318	1.451	-----	-----
	Unaccounted Sources			2.133	1.128	1.005	40.7%	36.3%
	Total						47.6%	52.4%
05-Aug-97	E-3R	1905-2004	-----	0.237	0.138	0.099	7.0%	5.0%
	T-4R	1859-1939	Yes	0.051	0.000	0.051	0.0%	2.6%
	T-6R	1907-1927	Yes	0.368	0.083	0.285	4.2%	14.5%
	T-TR	1916-1938	Yes	0.936	0.000	0.936	0.0%	47.5%
	E-5R	1925-2012	-----	1.971	1.618	0.353	-----	-----
	Unaccounted Sources			0.379	1.397	-1.018	70.9%	0.0%
	Total						82.1%	17.9%
17-Aug-97	E-3R	1250-1355	-----	0.295	0.101	0.194	3.9%	7.6%
	T-4R	1243-1338	Yes	0.025	0.000	0.025	0.0%	1.0%
	T-6R*	-----	Yes	0.383	0.083	0.300	3.2%	11.7%
	T-TR	1510-1540	No	1.054	0.000	1.054	0.0%	0.0%
	E-5R	1350-1410	-----	2.559	1.279	1.280	-----	-----
	Unaccounted Sources			1.856	1.095	0.761	42.8%	29.7%
	Total						50.0%	50.0%
Summary (Average %)	E-3R						4.7%	6.4%
	T-4R						0.0%	0.9%
	T-6R						3.5%	10.5%
	T-TR						0.0%	34.4%
	E-5R						-----	-----
	Unaccounted Sources						49.7%	18.6%
	Total						57.9%	42.1%

* Load estimated from measured data

The base dissolved zinc load contribution represents the baseline load carried by the river and tributaries prior to the runoff event. Unaccounted sources also contribute a base load. The base load during runoff events at the upstream river Station E-3R ranged from 1.6 to 7.0 percent and averaged 4.7 percent for the events sampled. Dissolved zinc load at Station E-3R increased during runoff events to an average contribution of 6.4 percent with a maximum contribution of 10.2 percent to Station E-5R. These data indicate that dissolved zinc sources upstream of the Site contribute load to the Eagle River during runoff events. The base load at perennial tributary Station T-6R ranged from 1.8 to 5.6 percent and averaged 3.5 percent. At Station T-6R, dissolved zinc load also increased during runoff to an average of 10.5 percent of the total load at Station E-5R.

During rainfall-runoff conditions, Station T-4R (WP-1 and WP-2) did not have a base load and runoff contributions to Station E-5R ranged from 0.2 to 2.6 percent. The average dissolved zinc load contribution was only 0.9 percent from Station T-4R which was significantly lower than the base load contributed by the Roaster Pile Drainage (Station T-6R) during non-runoff periods.

The Tramway Tributary (Station T-TR) shows highly variable load contributions. During rainfall-runoff events on July 27 and August 17, 1997 field data indicate that runoff did not reach the river but collected upstream of the box culvert in the sample basin. Although the dissolved zinc load monitored on July 27 and August 17, 1997 was about 0.5 to 1.0 lbs/hr, flow duration and volume was insufficient for the runoff to reach the Eagle River and there was no load contribution from Station T-TR. During other rainfall-runoff events, dissolved zinc load contributions ranged from an estimated 31.0 to 93.5 percent. However, load accounting indicates that a portion of this dissolved zinc load was removed from the water column before reaching Station E-5R in the Belden reach during the September 14, 1996 and August 5, 1997 runoff events. Accounting for this loss, the average dissolved zinc load contributed by Station T-TR during rainfall-runoff events was actually less than 34.4 percent.

The unaccounted load was calculated by difference to determine the amount of load not accounted for in monitored surface water sources. During the six rainfall-runoff events, the base load (non-runoff) contribution from unaccounted sources ranged from 23.5 to 70.9 percent. These data show that a significant portion of the dissolved zinc load measured during runoff conditions, or an average of 49.7 percent, is base load from unaccounted sources. Unaccounted runoff load contributions ranged from zero (factoring in the losses described above) to 36.3 percent, with an average

contribution of 18.6 percent. This unaccounted dissolved zinc load was significantly less than the unaccounted base load contribution (49.1 percent). These data suggest that unaccounted load contributions from rainfall events in the Belden reach are a small portion of the total event dissolved zinc load.

Overall, rainfall-runoff monitoring indicates that more than half (58 percent) of the dissolved zinc load contribution during rainfall-runoff events is attributable to base load. That is, the majority of load is already present in the river prior to Site runoff. Site tributary runoff in the Belden reach contributed approximately 42 percent of the total event dissolved zinc load during rainfall-runoff events.

Snowmelt-Runoff Load

Peak snowmelt runoff loads in the Eagle River typically occur between March and May each year. Data indicated that river dissolved metal concentrations during this period and are generally higher than under rainfall-runoff conditions. To evaluate load sources during this period, a load accounting exercise was conducted similar to that presented for the rainfall runoff. The dissolved zinc load results from snowmelt runoff monitoring are summarized in Table 3.2-17 for four events in 1996 and five events in 1997. Shown are the Eagle River and tributary stations sampled by event. Both the Belden reach and the Rock Creek reach are shown where data are available.

During the early part of the snowmelt season in 1996, tributary sampling in the Belden reach indicated that less than two percent of the dissolved zinc load at Station E-5R was contributed by Site tributaries (March 21, 1996 event). Approximately 9.6 percent was contributed by upstream sources above Station E-3R, and over 88 percent was contributed by unaccounted sources. A similar distribution of dissolved zinc load was measured on April 1, 1996 with less than four percent of the dissolved zinc load at Station E-5R contributed by Site tributaries. The largest contribution from any Site tributary in the Belden reach was 7.7 percent from Station T-6R on May 7, 1996. These data show that the Belden tributaries did not contribute appreciable dissolved zinc snowmelt-runoff loads to the Eagle River in 1996.

Table 3-2-17

Dissolved Zinc Load Accounting
Snowmelt-Runoff Event Samples

1996

Event Date	Station	Total Load (lbs/hr)	Percent Contribution (%)
21-Mar-96	E-3R	0.551	9.6%
	T-4R	0.024	0.4%
	T-6R**	0.050	0.9%
	T-TR	0.026	0.5%
	SR-2	0.004	0.1%
	E-5R	5.733	-----
	Unaccounted	5.079	88.6%
01-Apr-96	E-3R*	5.103	34.6%
	T-4R	0.060	0.4%
	T-6R**	0.050	0.3%
	T-TR	0.383	2.6%
	SR-2	0.002	0.0%
	E-5R*	14.742	-----
	Unaccounted	9.143	62.0%
16-Apr-96	E-3*	2.475	22.8%
	T-4R	0.055	0.5%
	T-6R	0.212	2.0%
	E-5R*	10.868	-----
	Unaccounted	8.125	74.8%
	E-5R	10.868	56.4%
	SR-4	1.789	9.3%
	T-10R***	4.061	21.1%
	E-11R	19.278	-----
	Unaccounted	2.561	13.3%
07-May-96	E-3R	8.681	97.8%
	T-4R	0.189	2.1%
	T-6R	0.682	7.7%
	E-5R	8.880	-----
	Unaccounted	-0.672	-7.6%
	E-5R	8.880	38.9%
	SR-3	0.005	0.0%
	SR-4	11.050	48.4%
	T-10R***	0.459	2.0%
	E-11R	22.820	-----
	Unaccounted	2.425	10.6%

1997

Event Date	Station	Total Load (lbs/hr)	Percent Contribution (%)
07-Mar-97	E-3R*	0.177	9.9%
	T-4R	0.035	2.0%
	T-6R**	0.063	3.5%
	T-TR	0.126	7.0%
	E-5R*	1.792	-----
	Unaccounted	1.391	77.6%
11-Mar-97	E-3R*	0.346	8.5%
	T-4R	0.126	3.1%
	T-6R**	0.063	1.5%
	T-TR	0.325	8.0%
	SR-2	0.011	0.3%
	E-5R*	4.073	-----
	Unaccounted	3.203	78.6%
	E-5R*	4.073	59.3%
	SR-4	1.203	17.5%
	T-10R***	0.361	5.3%
	E-11R*	6.866	-----
	Unaccounted	1.229	17.9%
19-Mar-97	E-3R*	2.673	24.8%
	SR-1A	0.026	0.2%
	T-4R	0.105	1.0%
	T-6R**	0.089	0.8%
	T-TR	0.072	0.7%
	SR-2	0.149	1.4%
	E-5R*	10.800	-----
	Unaccounted	7.686	71.2%
17-Apr-97	E-3	1.253	21.3%
	SR-1A	0.011	0.2%
	T-4R	0.012	0.2%
	T-6R	0.137	2.3%
	E-5R	5.889	-----
	Unaccounted	4.476	76.0%
	E-5R	5.889	58.6%
	SR-3	0.000	0.0%
	SR-4	2.165	21.6%
	T-10R***	0.832	8.3%
	E-11R	10.041	-----
	Unaccounted	1.155	11.5%
06-May-97	E-3*	2.176	28.0%
	SR-1A	0.004	0.1%
	T-4R	0.329	4.2%
	T-6R	0.450	5.8%
	E-5R*	7.781	-----
	Unaccounted	4.822	62.0%
06-May-97	E-5R*	7.781	39.5%
	SR-3	0.008	0.0%
	SR-4	10.734	54.4%
	T-10R***	0.651	3.3%
	E-11R*	19.719	-----
	Unaccounted	0.544	2.8%

Average Percent Contribution

Belden Reach		
E-3R	(w/o 7-May-96 event)	19.9%
SR-1A		0.2%
T-4R		1.5%
T-6R		2.8%
T-TR		3.7%
SR-2		0.3%
Unaccounted Sources		64.8%
Rock Creek Reach		
E-5R		50.5%
SR-4		30.2%
SR-3		0.0%
T-10R		8.0%
Unaccounted Sources		11.2%

* flow estimated from Station E-12A gage record
** load estimated from measured data
*** Station SR-4 load removed

The 1997 snowmelt runoff data show slightly greater dissolved zinc load contributions from Site tributaries in the Belden reach. However, the largest load contribution measured was from Station T-TR on March 11, 1997 and was only 8.0 percent of the total load at Station E-5R. Other Belden tributaries had small dissolved zinc loads with no individual contributions exceeding five percent during the 1997 snowmelt-runoff period.

A large portion of the dissolved zinc load at Station E-5R was contributed from sources upstream of the Site during the snowmelt period. Dissolved zinc load contributions from sources upstream of the Site ranged from a low of 10 percent in March to over 90 percent on May 7, 1996. These upstream zinc loads were at least one order of magnitude greater than any Site tributary contribution during most snowmelt-runoff events. This factor is not surprising because numerous historic and active mining features exist throughout the upper Eagle River Basin upstream of the Site which contribute metals to the Eagle River during snowmelt runoff events.

The other principal source of dissolved zinc load during the snowmelt period came from unaccounted sources. These unaccounted snowmelt loads were greater in magnitude than the unaccounted base loads previously estimated for the rainfall-runoff sampling period. Unaccounted load source contributions in the Belden reach ranged from 62.0 percent in April 1996 and May 1997 to 88.6 percent in March 1996. Unaccounted sources make up the majority of the dissolved zinc load in the Belden reach.

The average percent contribution of dissolved zinc load for the various sources in the Belden reach is shown in Table 3.2-17. Of the tributaries, average snowmelt-runoff load contributions ranged from 1.5 percent for Station T-4R to 3.7 percent for Station T-TR. The average contribution for upstream sources (Station E-3R) was 19.9 percent. The remaining 64.8 percent was contributed by unaccounted sources within the Belden reach.

3.2.4.4 Rock Creek Reach

Rainfall-Runoff Load

The dissolved zinc load accounting for the Rock Creek reach during four rainfall-runoff events sampled are shown in Table 3.2-18. Runoff events included are those dates where samples were collected at Station E-11R, which represents runoff from all Site tributaries. The load calculated for each tributary in the reach is also provided where available. The table shows total event load in lbs/hr, the estimated base load at the time of the runoff event, and the measured runoff load. The

Table 3-2-18

Dissolved Zinc Load Accounting
Rock Creek Reach (Stations E-5R to E-11R)
Rainfall-Runoff Event Samples

Dames & Moore 30-Nov-97

Event Date	Station	Sample Time	Entered River?	Total Event Load (lbs/hr)	Estimated Base Load (lbs/hr)	Measured Runoff Load (lbs/hr)	Base Load Contribution (%)	Runoff Load Contribution (%)
08-Sep-95	E-5R	0325-0425	-----	4.940	1.330	3.610	21.2%	57.5%
	SR-4	0307-0337	Yes*	11.934	0.000	11.934	0.0%	190.2%
	SR-3	0309-0339	No	0.028	0.000	0.028	0.0%	0.4%
	T-10R	0319-0414	Yes	5.996	0.266	5.730	4.2%	91.3%
	E-11R	0336-0536	-----	6.275	2.804	3.471	-----	-----
	Unaccounted Sources			-4.661	1.208	-5.869	19.3%	0.0%
	Total						44.7%	55.3%
29-Jul-96	E-3R	1610-1733	-----	0.348	0.105	0.243	1.5%	3.4%
	T-4R	1632-1657	Yes	0.004	0.000	0.004	0.0%	0.1%
	T-TR	1618-1630	Yes	6.305	0.000	6.305	0.0%	89.4%
	SR-4	1635-1745	Yes*	27.781	0.000	27.781	0.0%	393.8%
	SR-3	-----	-----	Not Measured	-----	-----	-----	-----
	T-10R	1637-1714	Yes	6.949	0.146	6.803	2.1%	96.4%
	E-11R	1659-1821	-----	7.054	1.796	5.258	-----	-----
	Unaccounted Sources			-6.552	1.545	-8.097	21.9%	0.0%
	Total						25.5%	74.5%
12-Sep-96	E-5R	-----	-----	Not Measured	-----	-----	-----	-----
	SR-4**	1337-1402	Yes	3.151	0.218	2.933	6.2%	83.3%
	SR-3	-----	-----	Not Measured	-----	-----	-----	-----
	T-10R	-----	-----	Not Measured	-----	-----	-----	-----
	E-11R	1415-1502	-----	3.521	0.572	2.949	-----	-----
	Unaccounted Sources			0.370	0.354	0.016	10.1%	0.5%
	Total						16.2%	83.8%
09-Aug-97	E-5R	1520-1736	-----	1.419	1.344	0.075	26.3%	1.5%
	SR-4	-----	-----	Not Measured	-----	-----	-----	-----
	SR-3	1455-1529	No	0.008	0.000	0.008	0.0%	0.2%
	T-10R	1456-1529	Yes	2.510	0.998	1.512	19.5%	29.5%
	E-11R	1524-1629	-----	5.117	3.240	1.877	-----	-----
	Unaccounted Sources			1.188	0.898	0.290	17.5%	5.7%
	Total						63.3%	36.8%

* Part of runoff load entered river via Rock Creek

** Includes base load from T-10R, measured on September 4, 1996

measured runoff load is the load contributed by tributary rainfall-runoff and does not include baseload. In this fashion, the percentage of load contributed by tributary runoff versus baseflow can be compared.

The unaccounted load is the load that was not measured during the sampling event, calculated as the difference between Stations E-5R and E-11R minus the tributary load. Unaccounted load could include ground water inflow and diffuse runoff from Site areas, particularly the banks of the river and the railroad bed material that were not measured.

The base dissolved zinc load contribution represents the baseline load carried by the river and tributaries prior to the runoff event. For the Rock Creek reach, this is represented by Station E-5R for the September 8, 1995 event and the August 9, 1997 event, and by Station E-3R for the July 29, 1996 event. Rock Creek also carries a base load of dissolved zinc.

The base load during runoff events at the upstream river Station E-5R ranged from 21.2 to 26.3 percent for the two events. The base load at perennial tributary Station T-10R ranged from 2.1 to 19.5 percent of the total load measured at Station E-11R. Unaccounted base load sources contributed from 10.1 to 21.9 percent of the dissolved zinc load at Station E-11R. These data show a smaller proportion of the base load was contributed by unaccounted sources in the Rock Creek reach as compared to the Belden reach during rainfall-runoff events.

Dissolved zinc load in the Rock Creek reach (Station E-11R) increased during runoff events. Nearly all of the runoff load contribution was attributable to Station T-10R, which incorporates runoff from Station SR-4. Data indicates that over 90 percent of the runoff load contribution at Station E-11R comes from Rock Creek, and that Station SR-4 (WP-8 Hillside) can account for all of the Rock Creek runoff load. Station SR-3 did not contribute appreciable dissolved zinc load to the Eagle River.

Unaccounted runoff load contributions were low in the Rock Creek reach ranging from zero to 5.7 percent during the August 9, 1997 event. In fact, data indicate a loss of dissolved zinc load totaling 5.9 lbs/hr during the September 8, 1995 event and 8.1 lbs/hr during the July 29, 1996 event. These data suggest the potential for loss to the bed region (chemical precipitation) in the Eagle River and between Stations SR-4 and T-10R.

Overall, rainfall-runoff monitoring indicates that less than about 25 percent of the dissolved zinc load during rainfall-runoff events is attributable to base load in the Rock Creek reach. Another 25 percent is generally attributable to runoff upstream at Station E-5R. The remaining 50 percent of the runoff load contributed to Station E-11R is attributable to runoff at Station SR-4 during the rainfall-runoff events measured in the Rock Creek reach.

Snowmelt-Runoff Load

The dissolved zinc load results from snowmelt runoff monitoring in the Rock Creek reach are summarized in Table 3.2-17 for the four events in 1996 and five events in 1997. Shown are the Eagle River and tributary stations sampled by event. Both the Belden reach and Rock Creek reach are shown where data are available.

During the snowmelt season, dissolved zinc load in the Rock Creek reach from upstream sources (Station E-5R) ranged from 38.7 percent to 59.4 percent, with an average of 50.4 percent for the five events sampled. The largest load contributions came from Station SR-4 ranging from 9.3 percent in April 1996 to 54.4 percent in May 1997. As previously mentioned, Station SR-4 is tributary to Rock Creek. Thus, the loads presented for Station T-10R were reduced by the load measured at Station SR-4 to assess relative source contributions. On average, Station SR-4 contributed 30.2 percent of the dissolved zinc load to Station E-11R under snowmelt-runoff conditions.

The remaining runoff sources to Station T-10R are upstream areas below Station SR-4 (the old Rock Creek channel). Runoff from this area was sampled on April 10, 1996 and on April 17, 1997 and results show a dissolved zinc contribution to Rock Creek of 27.6 percent. On average, remaining contributions to Station E-11R from Station T-10R ranged from 2.0 percent to 21.1 percent and averaged 8.0 percent for the snowmelt events sampled.

Results show that the average unaccounted dissolved zinc load in the Rock Creek reach was 11.4 percent during the snowmelt runoff period. This percentage is much lower than that shown for the Belden reach (64.6 percent), indicating that unaccounted sources contribute small dissolved zinc loads to the Eagle River in the Rock Creek reach relative to the Belden reach during snowmelt runoff. These unaccounted sources also show a smaller percent contribution during the snowmelt period relative to the rainfall-runoff period in the Rock Creek reach.

3.2.5 Surface Water Summary

A storm event/snowmelt surface water runoff monitoring program was conducted at the Belden and Rock Creek areas of the Site from 1995 to 1997. The objective of this program was to document runoff hydrology and water quality from waste rock piles in the Belden and Gilman areas and any effects this runoff may have on Eagle River water quality.

The results of this study indicate that surface water runoff from the waste rock piles from snowmelt and rainfall events can contribute to the increase metal concentration and load in the Eagle River. However, sources other than the waste rock piles often contribute a greater percentage of the metal concentration and load in the Eagle River than waste rock pile runoff. Dissolved zinc concentrations were higher in the Eagle River during snowmelt-runoff than during rainfall-runoff conditions.

A continuous base metal load enters the Eagle River from unaccounted sources. Monitoring results indicate that during intense rainfall-runoff events, metal contribution from waste rock pile tributaries can increase metal concentration and load in the Eagle River for short periods of time. During most rainfall-runoff events, the duration of waste rock tributary runoff was one hour or less. Under these conditions, the dissolved zinc load carried by the Eagle River can increase by as much as 100 percent.

Rainfall statistics from Vail, Colorado (the closest long-term rainfall station) are provided in Table 3.2-19, which show the frequency (number of days) rainfall exceeds certain daily total amounts or thresholds. The Vail data indicate that the average number of days per month (during the rainfall season May though September) that rainfall was greater than or equal to 0.2 inches in 24 hours is three days. Monitoring data indicated that an equivalent rainfall intensity of 0.24 to 0.42 inches per hour is required to generate runoff from Site tributaries during the rainfall-runoff season. Runoff monitoring at the Site indicates that the type of rainfall required to generate runoff only occurs on one to three days each month.

Table 3.2-19
Site Rainfall-Runoff Events Measured

Month	Maximum Number of Rainfall-Runoff Event Days 1995 -1997	Range in Event Daily Rainfall (Station RF-1) (inches)	Vail Station No. of Days with Precip. >=0.2 inches	Vail Station No. of Days with Precip. >=0.5 inches
May	1	1.15	2.5	0.25
June	2	0.19 - 0.33	2.3	0.55
July	1	0.54 - 0.61	4.4	1.5
August	3	0.14 - 0.52	2.7	0.33
September	3	0.21 - 0.64	3.4	0.62
Average	**2**	**NA**	**3.1**	**0.65**

Conservatively assuming that there are three Site runoff-days each month over the five month rainfall season, this would result in 15 Site rainfall-runoff days each year. Data indicate that the average dissolved zinc load at downstream Station E-11R during rainfall-runoff is about 5.5 lbs/hr times 2 hours or 11 lbs/day. The average dissolved zinc base load at Station E-11R during the summer rainfall season for the study period was about 42 lb/day (Dames & Moore, 1996d). On an annual basis, therefore, rainfall-runoff from the waste rock pile tributaries could contribute a maximum of 11 lbs/day x 15 days, or 165 pounds of dissolved zinc at Station E-11R. On an annual basis, the base (non-runoff) load at Station E-11R was 42 lbs/day x 365 days, or 15,330 pounds of dissolved zinc. Therefore, rainfall-runoff from the Belden/Gilman area waste rock pile tributaries contributed less than 2 percent of the dissolved zinc load at Station E-11R on an annual basis. Thus, over 98 percent of the dissolved zinc load at Station E-11R each year was from sources other than waste rock pile tributary runoff.

The average percentage contribution of dissolved zinc load for all stations monitored is summarized for rainfall-runoff and snowmelt-runoff in Table 3.2-20.

Table 3.2-20
Average Dissolved Zinc Runoff Load Contribution (percent)

Station	Rainfall-Runoff	Snowmelt-Runoff
E-3R	6%	20%
T-4R	0.9%	2%
T-6R	10%	3%
T-TR	34%	4%
SR-1A	0%	0.2%
SR-2	0%	0.3%
Belden Unaccounted	19%	65%
SR-3	0%	0%
SR-4	NA	30%
T-10R	75%	8%
Rock Creek Unaccounted	6%	11%

Dissolved zinc loads contributed by sources upstream of the Site were greater during the snowmelt-runoff period, averaging 20 percent of the total load in the Belden reach. Surface runoff loads from Station T-4R and surface runoff stations SR-1, SR-2, and SR-3 were low and these location did not contribute appreciable dissolved zinc loads to the Eagle River. Rainfall-runoff loads from Station T-6R (Roaster Pile Drainage) were moderate showing a ten percent contribution, but snowmelt-runoff loads were low.

Stations T-TR and SR-4 contributed metal loads to the Eagle River during the study period. However, a portion of the dissolved zinc load delivered at these runoff monitoring locations during rainstorms on July 29 and September 14, 1996 and on August 5, 1997 did not reach the Eagle River stations monitored. These data indicate that losses occur, possibly through chemical precipitation to the bed region. Rainfall-runoff from the Site contributed less than two percent of the annual dissolved zinc load at downstream Station E-11R.

The largest source of dissolved zinc load in the Belden reach was from unaccounted sources during the snowmelt-runoff period. These data suggest that unaccounted sources contributed as much as 65 percent of the dissolved zinc load to the Eagle River at Station E-5R. The largest source of dissolved zinc load in the Rock Creek reach was surface runoff from WP-8 hillside. Runoff from this area can account for the majority of dissolved zinc load in Rock Creek during runoff conditions, which contributed as much as 75 percent of the load at Station E-11R during runoff conditions.

3.3 GROUND WATER

The four monitoring wells installed in the Belden area were periodically visited during the period July 1995 to September 1997 to measure water levels and specific conductance.

3.3.1 Ground Water Levels

An in situ water level measuring device was installed in well BW-4 in March 1997. Available water level measurements are presented graphically in Figures 3.3-1 through 3.3-4 and are discussed below.

- **Well BW-1**

  Upgradient monitoring well BW-1 is located upstream of the Tip Top Mine and upstream of all sampled waste rock piles and tributaries. The well is dry for most of the year, containing water only during spring snowmelt periods. In 1996, the spring pulse of ground water arrived between April 2 and April 12, 1996. In 1997, the spring pulse arrived between March 12 and March 20. In both cases, the ground-water pulse occurred in advance of the Spring flow increase in the river.

  From the data collected, snowmelt typically generates about a 3-foot high water column in the well, and is short-lived, lasting only until early June. Significant rainfall events in September 1995, July 1996, and July 1997 either failed to generate a water level increase in well BW-1, or the pulse was so brief that it was not observed.

Ground Water Elevation
BW-1

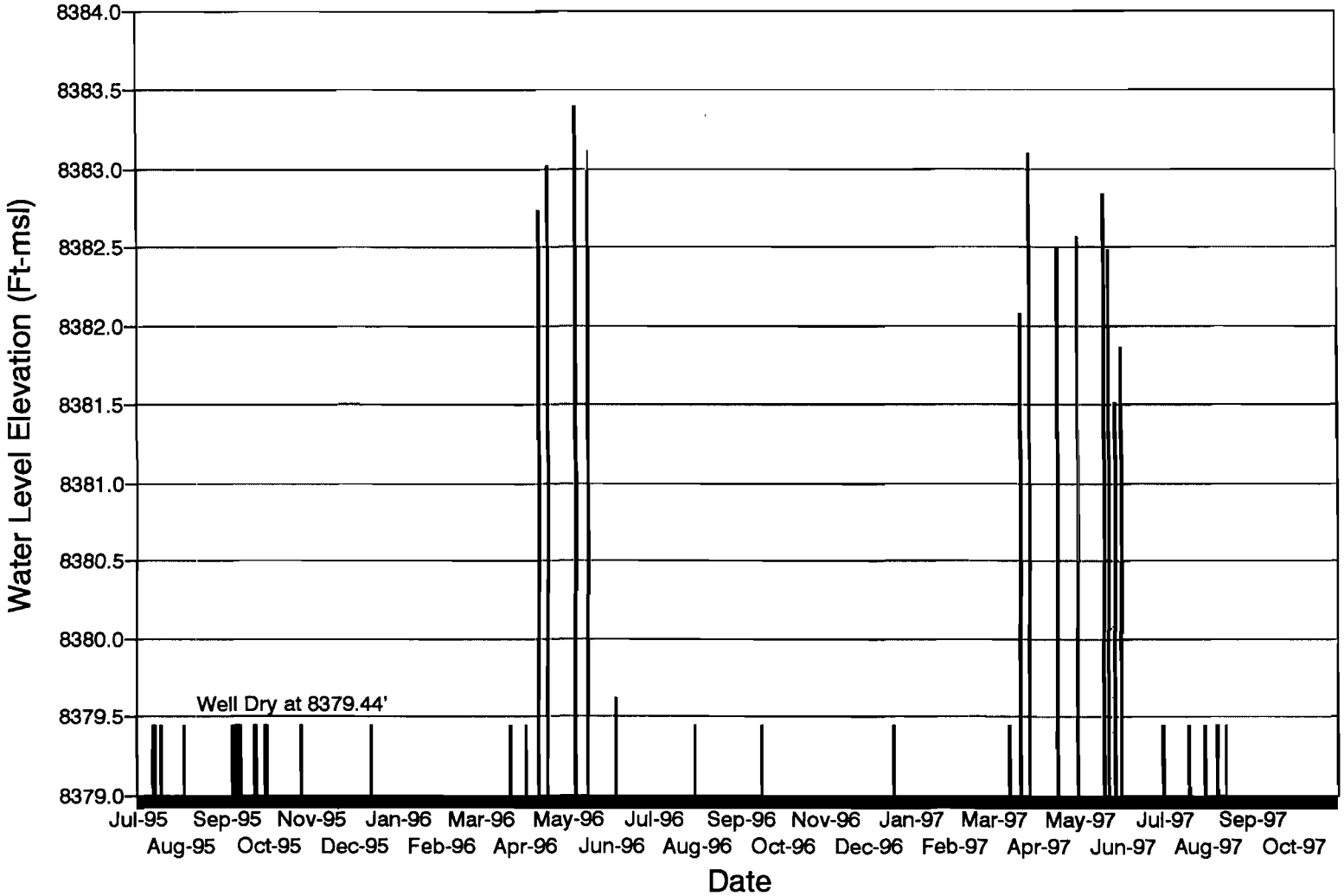


Figure 3-3-1

Ground Water Elevation
BW-2

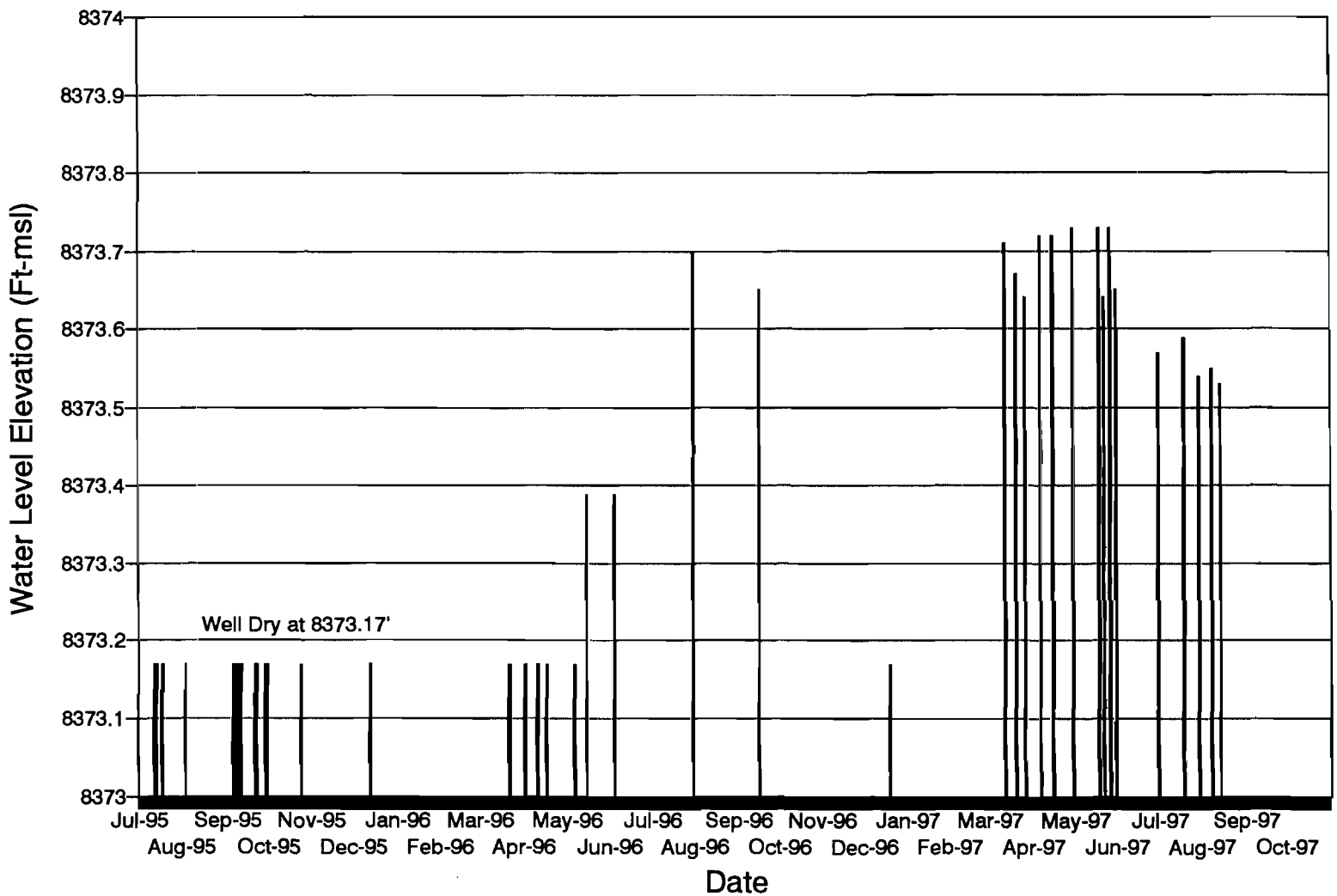


Figure 3-3-2

Ground Water Elevation
BW-3

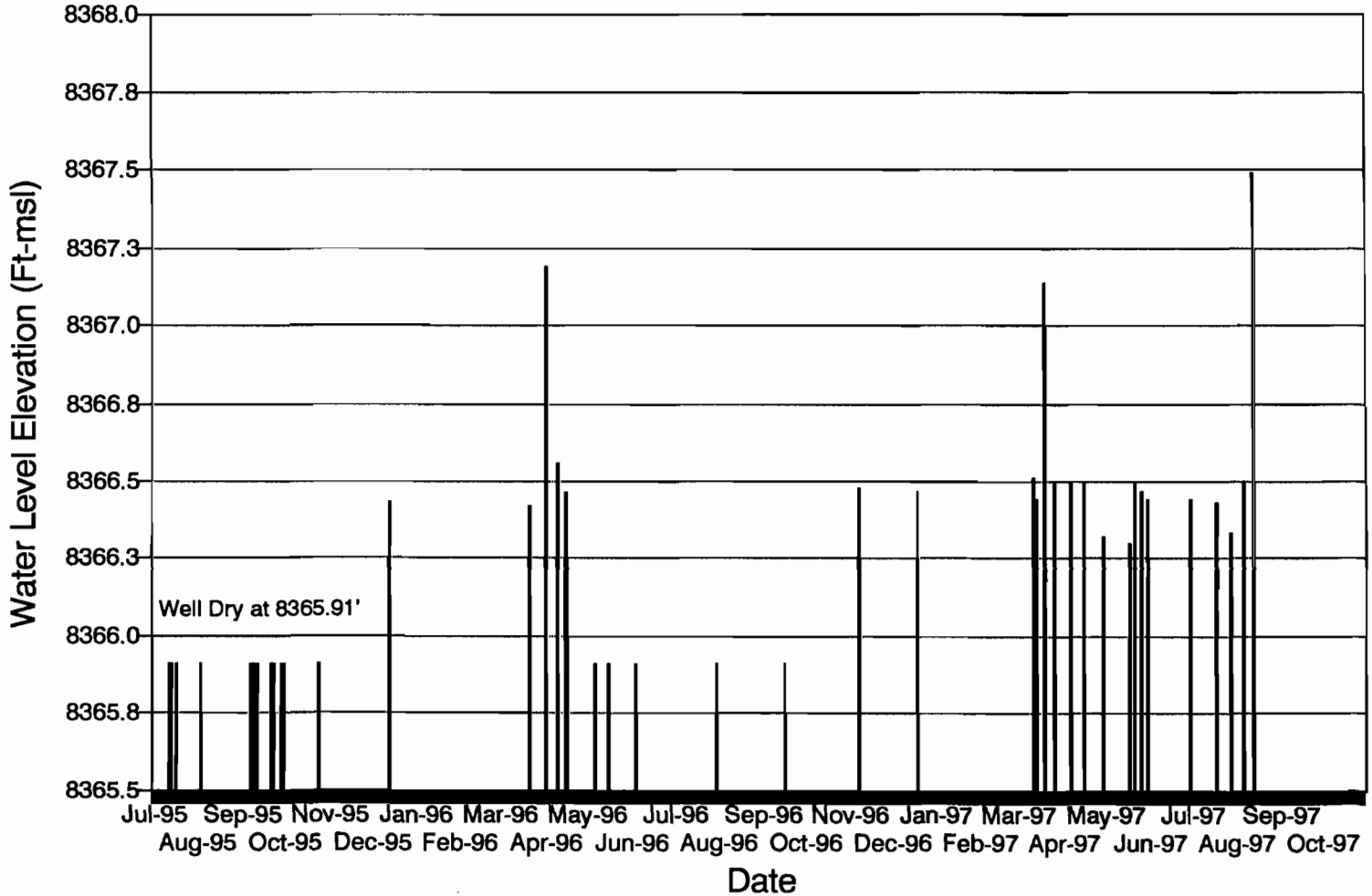


Figure 3-3-3

Ground Water Elevation
BW-4

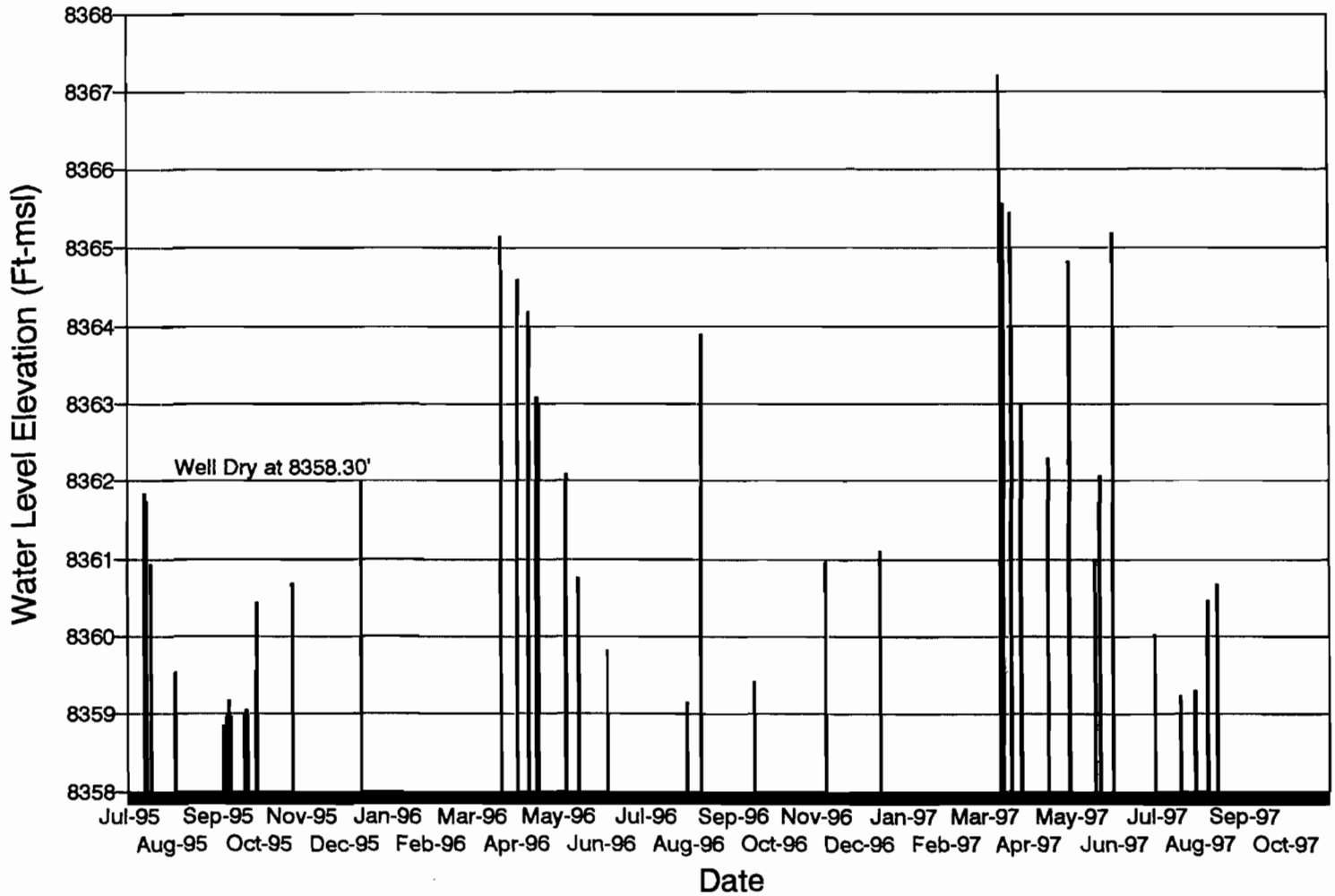


Figure 3-3-4

- **Well BW-2**

Well BW-2 is located downgradient from the Ben Butler and Tip Top Mines, WP-9/WP-10, and the Un-named tributary. The well was dry until May 1996, but since that time has consistently contained between 4 and 6 inches of water (as measured above the bottom of the well). No significant water level increases associated with snowmelt events or rainfall have been observed to date.

Based on the water-level information, well BW-2 monitors the very top of the shallow aquifer in the talus and material below the Un-named tributary. During years of low-precipitation, it is expected that the well will be dry as the static water level would fall below the bottom of the well (total well depth roughly approximates the high-water river elevation). Well BW-2 permeability test results indicate that the hydraulic conductivity over the screened interval (82 ft/day) is one to two orders of magnitude higher than the other Belden wells.

- **Well BW-3**

Well BW-3 is located downgradient of the Tramway drainage. The well is dry for much of the year but contains water periodically. Water was present in the well from December 1995 through April 1996 and from November 1996 through August 1997. The increase in ground water level in the usually dry months of November and December is not readily explainable.

When the well contains water, the water column is generally about 6 inches high, as measured from the bottom of the well. Peak ground-water levels occurred in April 1996, August 1996 and March 1997, indicating that water level in the well responds to both rainfall events and spring snowmelt.

- **Well BW-4**

A measurable quantity of water has been present in well BW-4 since it was installed in July 1995. Well BW-4 experiences seasonal water level fluctuations, having the highest water levels during spring snowmelt. In 1996, the spring ground water pulse arrived at well BW-4

in mid-March and continued to mid-May. In 1997, the spring pulse arrived April 21 and continued to mid-May. The start dates and durations are comparable to measured increase in stage on the Eagle River at Station E-12A.

Water level in well BW-4 responded to most rainfall events in 1997. Detailed hydrographs, showing well response on one-half hour intervals, are presented in Appendix F.

3.3.2 Specific Conductance

Specific conductance measurements were made in the Belden wells periodically from July 1995 to September 1997. Available specific conductance measurements, corrected to 25 degrees C, are presented graphically on Figures 3.3-5 through 3.3-8, and are discussed below.

- **Well BW-1**

  Specific conductance measurements at well BW-1 ranged from about 1,000 to 2,000 micromhos/centimeter (µmhos/cm) as shown in Figure 3.3-5 with no discernable temporal trend. The specific conductance of well BW-1 water was considerably higher than that measured at Un-named tributary (Station T-4R), located downstream of the well near the Ben Butler Mine. Specific conductance measurements at the nearest downstream well, BW-2, did not exceed 1,100 umhos/cm.

- **Well BW-2**

  Specific conductance measurements taken at well BW-2, located downgradient of the mouth of the Un-named tributary, varied from 250 umhos/cm to 1,050 umhos/cm, as shown in Figure 3.3-6. The higher measurements occur in July, August, and September probably due to a loss of dilution from snowmelt recharge. The average specific conductance at well BW-2 (620 µmhos/cm) was approximately half of the average specific conductance at well BW-1 (1470 µmhos/cm) but very similar to measurements for Un-named tributary (Station T-4R).

Specific Conductivity
BW-1

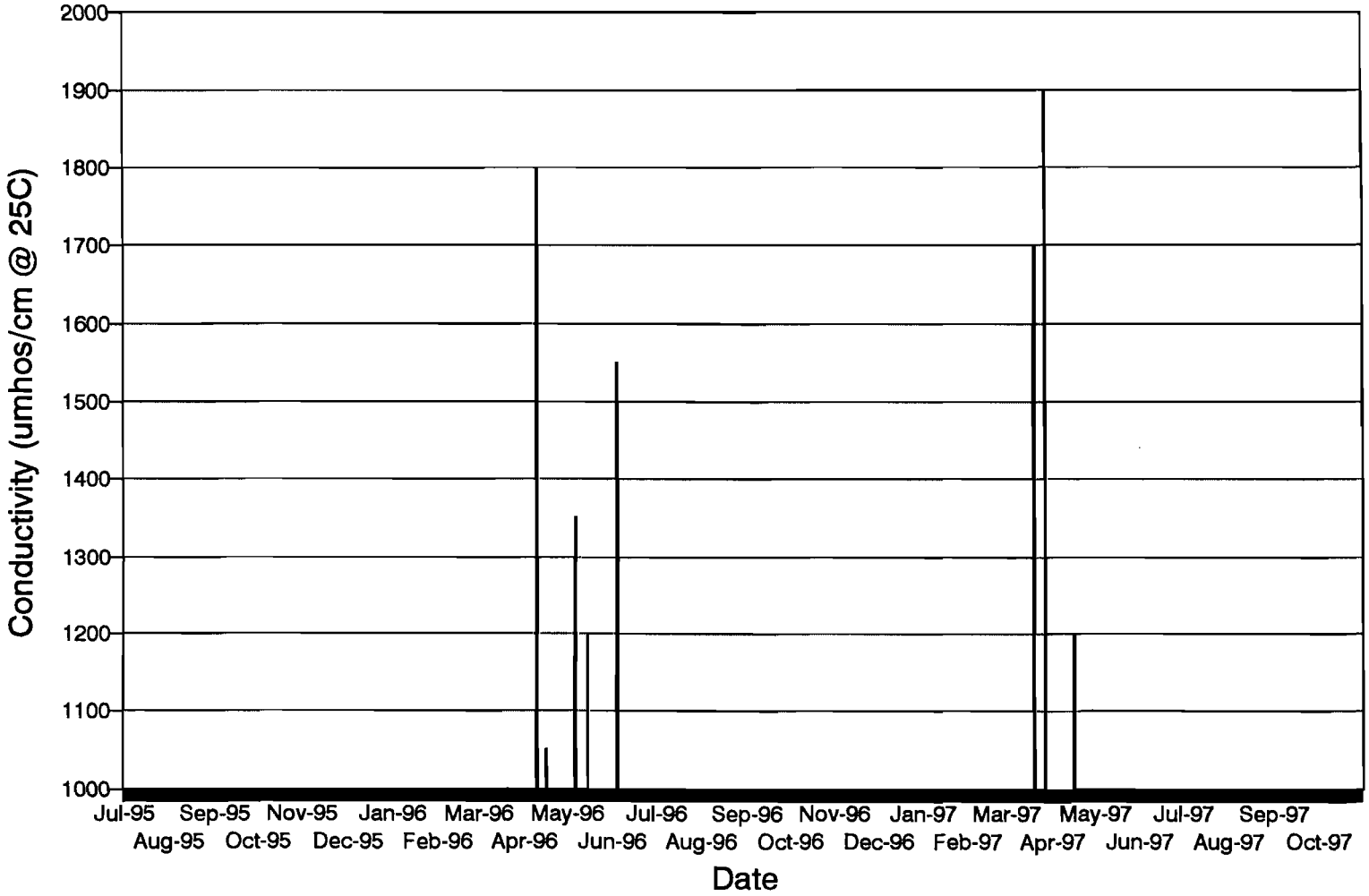


Figure 3-3-5

Specific Conductivity
BW-2

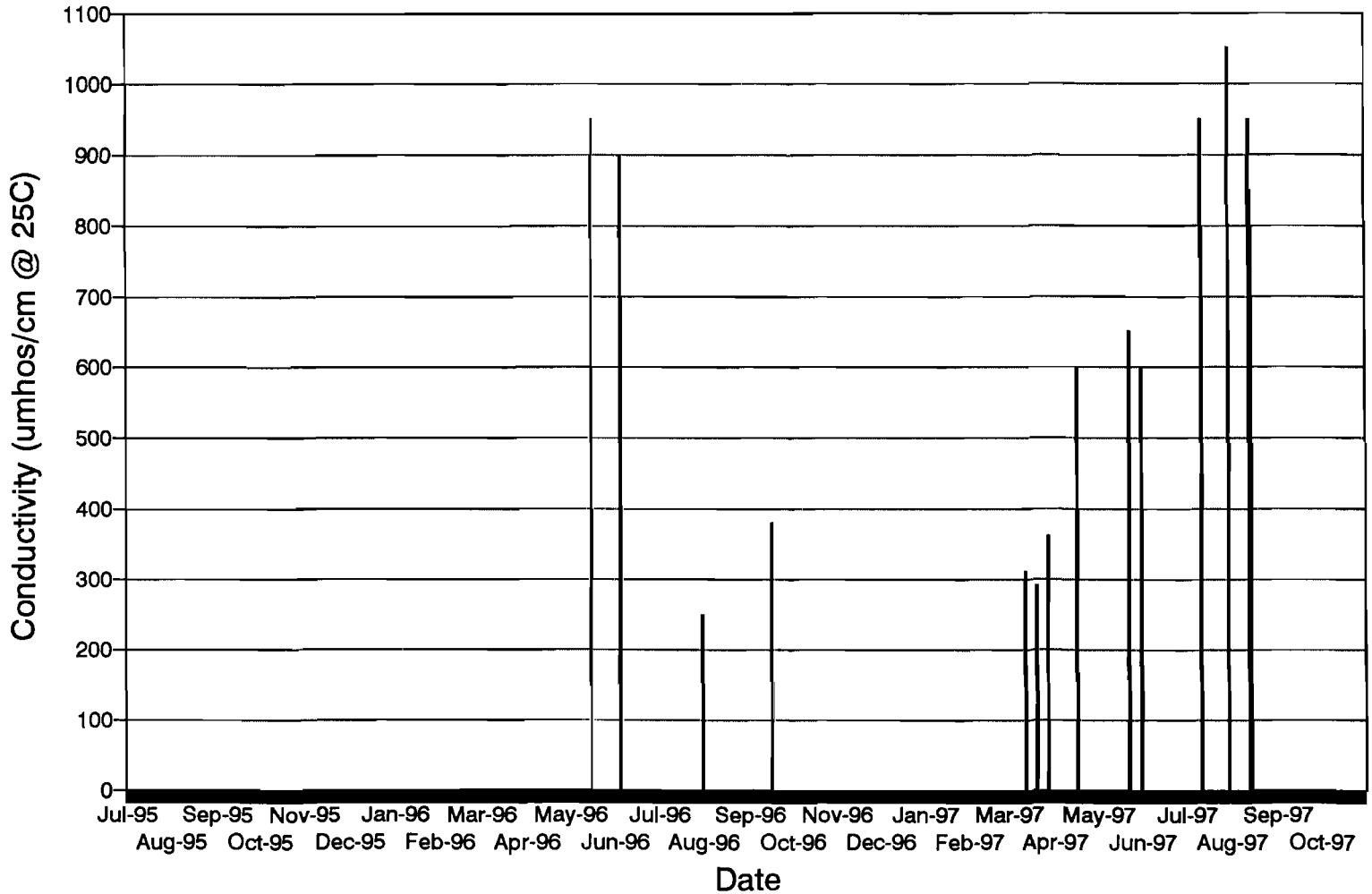


Figure 3-3-6

Specific Conductivity
BW-3

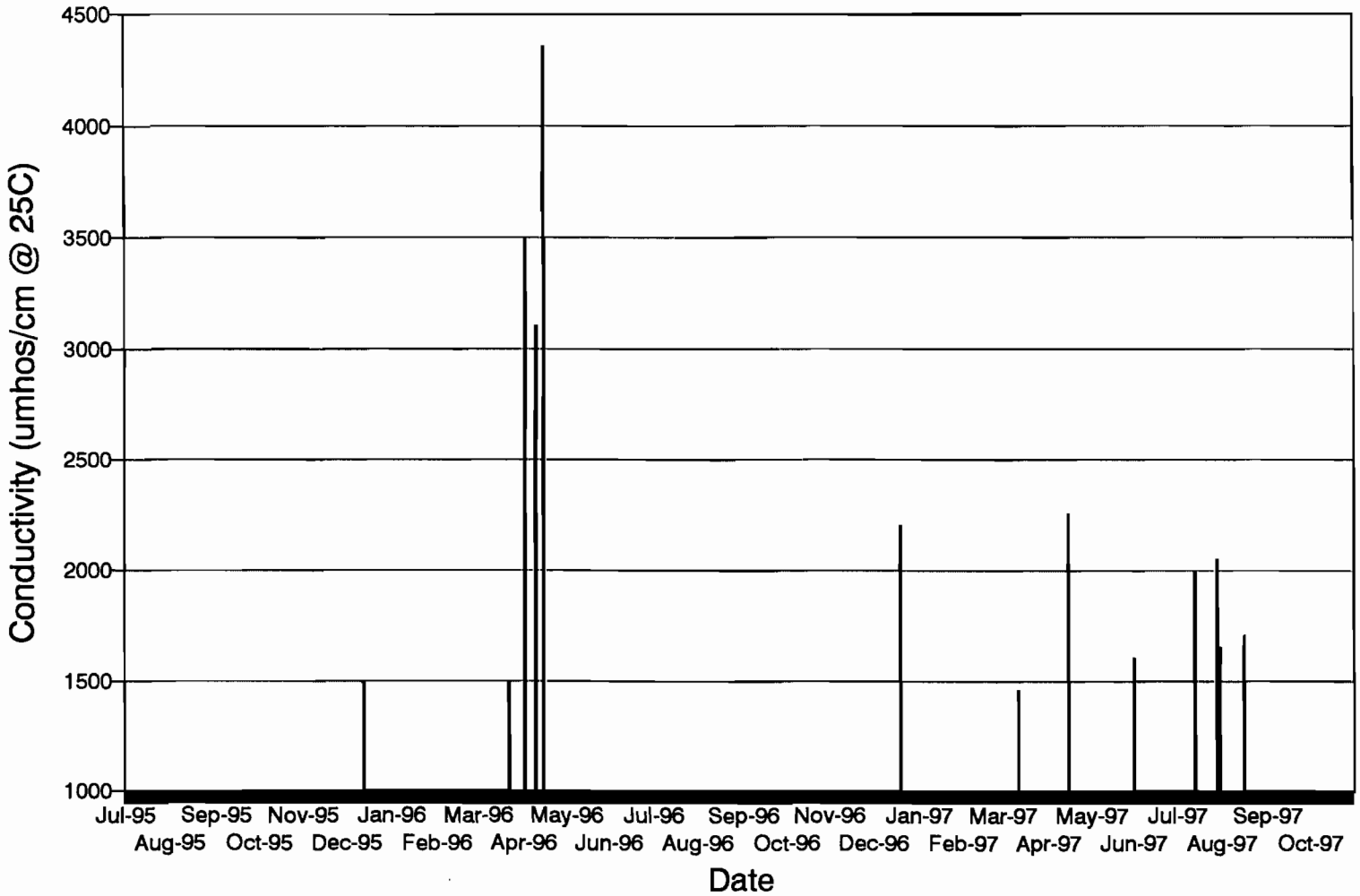


Figure 3-3-7

Specific Conductivity
BW-4

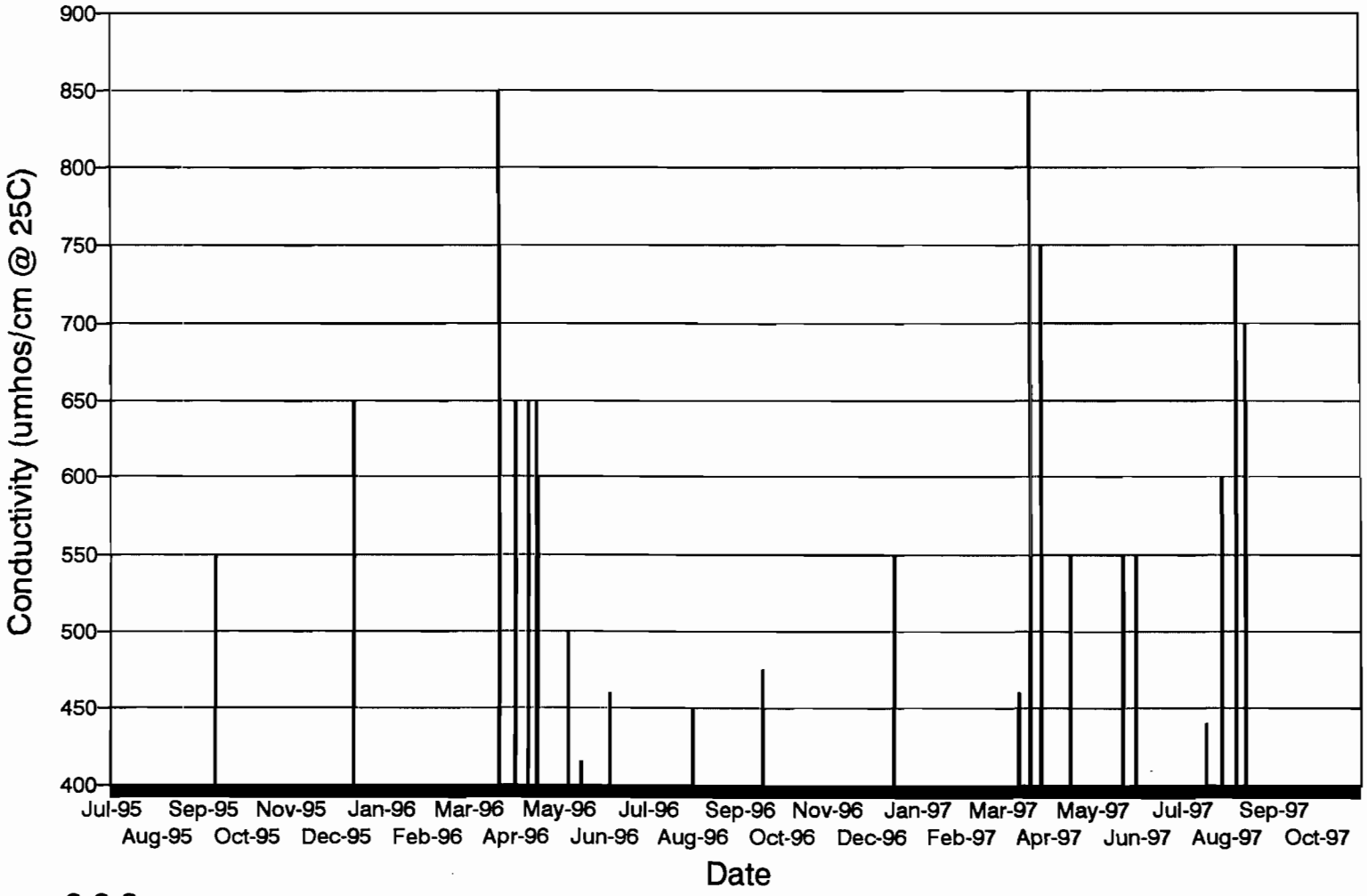


Figure 3-3-8

- **Well BW-3**

  Well BW-3 is located downgradient from the mouth of Tramway tributary (Station T-TR). Specific conductance measurements in well BW-3 were higher than specific conductance measurements of surface water at Station T-TR. The average specific conductance at well BW-3 was 2,220 µmhos/cm, as shown in Figure 3.3-7. The BW-3 well maintained the highest specific conductance readings of any of the four Belden wells.

- **Well BW-4**

  Well BW-4 is located approximately 500 feet downgradient of the tramway at Belden, near the loading dock. The specific conductance of ground water in well BW-4 was lower than the specific conductance in well BW-3. The average specific conductance at well BW-4 (590 µmhos/cm), as shown in Figure 3.3-8 is similar to that at well BW-2 (620 µmhos/cm), but less than the average specific conductance at well BW-1 (1,470 µmhos/cm) and well BW-3 (2,220 µmhos/cm). Well BW-4 is screened to approximately two feet below the low-water elevation of the river, thus the conductance measurements may be indicative of a shallow mixing zone near the river on the Belden side.

3.3.3 Ground Water Chemistry

In this section, the water chemistry test results for each Belden well are compared to nearby surface water runoff sample results and to seep results which characterize mine water quality. Well sample results are contained in Appendix B.

- **Well BW-1**

  Well BW-1 is located 250 feet upgradient from the mouth of Un-named tributary, the tributary that drains the watershed containing WP-1, WP-2, and WP-9/WP-10 near the Ben Butler and Tip Top Mines. Table 3.3-1 presents sample results for well BW-1 compared to results from surface water samples collected at Station T-4R downgradient of the well location. Well BW-1 is the designated upgradient well and as such there are no upgradient

ground water or tributary surface water results available for comparison. Sample results from the nearby Tip Top Mine (sample identification S-TT) are provided for comparison.

Table 3.3-1
Range of Analytical Results for BW-1, T-4R, and Tip Top Mine (5-TT)

Parameter	BW-1 (n = 5)	T-4R (n = 17)	S-TT[3] (n=12)
pH	3.1 - 4.8	5.7 - 7.7	2.9 - 4.6
Sp. Conductance[1]	1050 - 1900	315 - 900	2850 - 5000
Alkalinity	<5	<5 - 700	<1 - 2
Dissolved Sulfate[2]	940 - 2050	120 - 540	3000 - 4700
Dissolved Arsenic	<0.005	<0.005 - 0.008	NA
Dissolved Cadmium	0.04 - 0.13	0.012 - 0.066	0.05 - 0.13
Dissolved Copper	2.2 - 5.2	<0.001 - 0.6	1.05 - 3.9
Dissolved Iron	16 - 44	<0.01 - 0.41	270 - 453
Dissolved Lead	0.37 - 1.9	0.009 - 0.33	<0.001 - 0.07
Dissolved Manganese	4.8 - 18	0.016 - 1.1	110 - 200
Dissolved Zinc	12 - 48	1.9 - 16	72 - 130

Units: sp. conductance = µmhos/cm; alkalinity, sulfate, and metals = mg/L
[1] n = 8 for BW-1
[2] T-4R sulfate reported as total sulfate
[3] S-TT results are 1996 monthly sample results, Eagle Mine Annual Report (Dames & Moore, 1997b)

Sulfate and concentrations of most metals measured in well BW-1 are higher than measured concentrations at Station T-4R. The ground water is also higher in specific conductance and more acidic than Station T-4R results. These sample results indicate that ground water moving into the Belden area during spring snowmelt is mineralized, more so than would be indicated by surface runoff contributions. Ground-water chemistry in the well BW-1 area

is probably dominated by dissolution of sulfides from local and upgradient mineralized subsurface materials, that is, river channel fill and railroad grade fill composed of mine waste rock and rock talus. Surface water runoff from mined and mineralized upstream watersheds may contribute to ground-water mineralization; however, this impact is expected to be small.

- **Well BW-2**

Well BW-2 is located at the mouth of the Un-named tributary (Station T-4R). The water level in well BW-2 did not rise high enough to permit collection of a sample. Based on specific conductance measurements alone, BW-2 ground water is less mineralized than upgradient well BW-1 but is considerably more mineralized than river water. Specific conductance measurements are similar to those measured at Station T-4R. Taking into account the observed measured hydraulic conductivity in the screened interval, well BW-2 water chemistry may be a diluted form of well BW-1-type water.

- **Well BW-3**

Well BW-3 is located near the mouth of Tramway tributary (Station T-TR). Table 3.3-2 presents sample results for well BW-3, well BW-4, Station T-TR at the mouth of the Tramway Tributary, and Eagle Mine seep water sample results (sample identification S-NT, Newhouse Tunnel).

Well BW-3 contains water infrequently and only two samples have been collected. The March 1997 sample contained lower concentrations of copper, iron, and other metals compared to the April 1996 sample. Given the relative lack of information for well BW-3, the following comparison should be viewed as preliminary.

Table 3.3-2 indicates that ground water in the area of well BW-3 contains higher concentrations of copper and zinc, when compared to surface water runoff from the major upgradient drainage. The 1996 BW-3 sample exhibited essentially no alkalinity and was more acidic than the results at the nearby Station T-TR. Similar to well BW-1, a mineralized source other than surface water runoff is indicated by the comparison to the runoff water chemistry. Comparing well BW-3 results to mine seep chemistry (Station S-NT), the results

are similar for pH, specific conductivity, alkalinity, sulfate, cadmium, copper, lead, and zinc suggesting mine seepage as a potential source of mineralized ground water at well BW-3.

Table 3.3-2
Range of Analytical Results for BW-3, BW-4, T-TR, and S-NT

Parameter	BW-3[2] (n = 2)	BW-4 (n = 12)	T-TR (n = 13)	S-NT (n = 4)
pH	2.8	4.6 - 5.8	4.8 - 7.0	2.8 - 3.2
Sp. Conductance[1]	1,500 - 4,400	415 - 850	600 - 6,500	2,300 - 3,300
Alkalinity[3]	<5	4 - 24	6 - 2500	<5
Dissolved Sulfate[4]	3,400	48 - 250	2,300 - 8,200	2,200 - 3,300
Dissolved Arsenic	<0.005 - 0.007	<0.005	<0.005 - 0.078	NA
Dissolved Cadmium	0.63 - 1.5	0.0135 - 0.20	0.26 - 1.0	0.35 - 0.61
Dissolved Copper	0.03 - 12.0	0.032 - 0.713	0.008 - 1.7	8.4 - 12.0
Dissolved Iron	0.02 - 49	<0.001 - 0.13	< 0.01 - 6.6	180 - 227
Dissolved Lead	0.13 - 0.83	0.002 - 0.11	0.033 - 1.5	0.218 - 0.403
Dissolved Manganese	5.6 - 51	0.10 - 1.5	1.3 - 21	74 - 101
Dissolved Zinc	110 - 460	5.50 - 36	32 - 170	107 - 227

Units: sp. conductance = µmhos/cm; alkalinity, sulfate, and metals = mg/L
[1] n = 13 for well BW-3
[2] Spring 1997 sample missing sulfate, alkalinity, and pH due to small sample volume
[3] n = 5 for well BW-4
[4] T-TR sulfate results are total sulfate; n=3 for well BW-4
[5] 1996 monthly results for S-NT, Eagle Mine Annual Report (Dames & Moore, 1997b)

Potential surface sources include waste rock piles in the lower portion of the Tramway tributary watershed (WP-13). Precipitation, the bulk of which is snowmelt, could mobilize sulfate and metals from these surface sources. Mineralized subsurface material potentially includes railgrade fill. Ground water and the infiltration of precipitation would tend to leach sulfate and metals from mineralized subsurface materials.

- **Well BW-4**

Well BW-4 is the furthest downstream well in the Belden area, located approximately 500 feet downgradient of Tramway tributary (Station T-TR). Table 3.3-2 presents sample results for well BW-4, well BW-3, Station T-TR at the mouth of the Tramway tributary, and Eagle Mine seep water sample results (sample identification S-NT, Newhouse Tunnel).

Reviewing the results presented in Table 3.3-2, sulfate and most metal concentrations at well BW-4 are lower than measured concentrations at Station T-TR and mine water seep S-NT. Because the well is completed to the river level, dilution effects are possible. Comparing average well BW-4 results to averages for the two other sampled Belden wells (Table 3.3-3), alkalinity is higher and metal concentrations are lower than measured concentrations at wells BW-1 and BW-3.

Table 3.3-3
Averaged Results for BW-1, BW-3, and BW-4

Parameter	BW-1 (n = 5)	BW-3 (n = 2)	BW-4 (n = 12)
pH	3.6	2.8	5.3
Sp. Conductance[1]	1,469	1850	666
Alkalinity[2]	< 5	< 5	10.6
Dissolved Sulfate[3]	1,378	3400	443
Dissolved Arsenic	< 0.005	0.005	< 0.005
Dissolved Cadmium	0.06	1.06	0.08
Dissolved Copper	3.4	6	0.238
Dissolved Iron	25.8	24.5	0.052
Dissolved Lead	1.1	0.48	0.049
Dissolved Manganese	9.4	28.3	1.05
Dissolved Zinc	22	285	17

Units: sp. conductance = µmhos/cm; alkalinity, sulfate, and metals = mg/L
[1] n = 8 for well BW-1, N=13 for well BW-3; and n = 12 for well BW-4
[2] n = 6 for well BW-4
[3] n = 5 for well BW-4

In diluted environments, metal ratios can be used in an attempt to track sources. The average dissolved copper to dissolved zinc ratio for well BW-4 samples is 1.4 percent, intermediate between T-TR runoff which is low in copper (copper : zinc ratio 0.7 percent) and Newhouse Tunnel samples which are copper-rich (copper : zinc ratio 8.6 percent). It is concluded that copper concentrations would be much higher in the well BW-4 samples if mine seepage was having a major effect on water chemistry, even with river dilution. Given that recharge from the very steep canyon walls above the well location is probably low, it is believed that water chemistry at well BW-4 is dominated by ground water from upgradient fill areas. The well targeted a natural mixing zone where a constriction in the river channel bedrock would tend to bring mineralized ground water in contact with the relatively unmineralized baseflow of the river.

The water chemistry in the well BW-4 area may be influenced by the Eagle River since the total depth of well BW-4 is 2.24 feet below the surveyed low-water river elevation (see Table 2.1-1). Water chemistry at well BW-4 is thought to be representative of the subsurface mixing zone where ground water and river water meet in Belden channel fill material.

3.3.4 Belden Ground Water Dissolved Zinc Loading Estimates

Using the classic Darcian equation, ground-water discharge rates are calculated for four distinct segments of the Belden reach using water level measurements and hydraulic conductivity results from the wells. Potential zinc loads are then derived by multiplying the discharge estimates by the dissolved zinc results.

Solving for Q (discharge) in the equation Q=KIA, where:

K = hydraulic conductivity, in ft/day

I = hydraulic gradient; the difference in hydraulic head (h_0-h_1), divided by the flowpath distance (L), in ft/ft (dimensionless)

A = cross-sectional area, in ft^2

For K, the results from the field permeability tests are used (see Table 2.2-1). For the hydraulic gradient term I, the difference between the water level in the well and the surveyed low-water river elevation was divided by the distance from the well to the river. Two scenarios were considered, a baseline, non-runoff scenario and a snowmelt scenario. The baseline case incorporates the average water level for the study period; data are available for wells BW-2 and BW-4 to calculate baseline discharge. To represent water levels during snowmelt events, the maximum recorded water level was used (wells BW-1, BW-3, and BW-4).

The cross-sectional area term A was defined by (1) the vertical difference in feet between the maximum water level (snowmelt) or average water level (baseline) in the well and the low-water river elevation, and (2) laterally by determining the mid-point distance to adjacent wells and summing the two distances (in feet). For wells BW-1 and BW-4, the mid-point distance to the only adjacent well was doubled to estimate a lateral segment length.

Using the above assumptions, Q (discharge) is calculated to be:

- segment BW-1 395 ft^3/day (snowmelt)
- segment BW-2 10,445 ft^3/day (baseline)
- segment BW-3 3,318 ft^3/day (snowmelt)
- segment BW-4 151 ft^3/day (snowmelt) and 0.46 ft^3/day (baseline)

Supporting calculations are in Appendix F.

To estimate dissolved zinc load in pounds per day (lbs Zn/day) discharge is converted to cubic feet per second (cfs), then multiplied by the dissolved zinc concentration (in mg/L), and a conversion factor of 5.4. Dissolved zinc concentrations used are those that are representative of baseline or snowmelt conditions for each well. For the baseline case, the average dissolved zinc concentration for all samples collected was used. Given the above assumptions, the potential instantaneous dissolved zinc loads are calculated to be:

- segment BW-1 0.7 lbs zn/day (snowmelt) maximum zinc 48 mg/L

- segment BW-2 6.5 lbs zn/day (baseline) estimated average zinc 10 mg/L

- segment BW-3 59 lbs zn/day (snowmelt) average zinc 285 mg/L

- segment BW-4 0.34 lbs zn/day (snowmelt) maximum zinc 36 mg/L
  0.0005 lbs zn/day (baseline) average zinc 17 mg/L

The loading estimate for segment BW-2 is based on an assumed dissolved zinc concentration of 10 mg/L. Sample results for well BW-2 are unavailable, but the average specific conductance reading of 620 μmhos/cm allows a rough estimation of a dissolved zinc value. Well BW-4 samples with specific conductance measurements of 600 - 650 μmhos/cm contained between 8 and 11 mg/L zinc.

These loads are designated as "potential" since they are based on measured and assumed conditions in the vicinity of the wells. The complex ground water flow patterns and adsorption/desorption processes that occur in the saturated and unsaturated channel fill materials are not known. Thus, it cannot be determined based on these estimates if the zinc loads actually reach the Eagle River.

3.3.5 Ground Water Summary

The stated objective of the Belden area ground water monitoring program was to estimate metals loading to the Eagle River attributable to ground-water seepage flow from the waste rock piles. Baseline and seasonal estimates of metal loading (dissolved zinc) to the Eagle River were made using well sample results, water level measurements, and hydraulic conductivity information. The data indicate that ground water loading was highest during spring snowmelt in March and April. The chemistry of the surface water runoff from waste rock pile watershed and well water is not similar, therefore, this season ground water metal loading is not attributable to seepage flow from waste rock piles. A summary of the groundwater evaluation is provided as follows:

- The Belden wells monitor water quality in saturated river channel fill and railroad grade fill materials. Based on the drill logs, the fill material consists of rock talus, mine waste rock, and silt washed in from adjacent hillsides. Pyrite and wood chips were encountered at depth.

- Hydraulic conductivity results vary over several orders of magnitude indicating that the channel fill materials are quite heterogeneous. Ground water moving through slowly permeable strata is more likely to be mineralized due to long residence time and little

dilution. Ground water in high-permeability strata is likely to be diluted and less mineralized. Since the more mineralized ground water occurs in the low-permeability materials, the permeability may be the limiting factor on metal loading to the river.

- The borehole logs indicate that the silt content of near-surface channel fill materials is high, indicating that direct vertical infiltration to ground water is slow. Thus, the primary form of ground water recharge in the Belden area is likely snowmelt in low-lying areas, recharging the thicker accumulations of permeable talus and waste rock. Conversely, snowmelt and rainfall from the steep slopes above Belden is funneled to narrow channels, and then to the river. Surface water from these short-term high volume events it thought to contribute little to overall ground water recharge.

- The water chemistry in any given well is believed to be controlled by (1) the dissolution of sulfides from mineralized subsurface and surface sources located upgradient from the well, (2) the amount of available dilution from the river and/or relatively unmineralized infiltration (precipitation), and (3) the permeability of the subsurface materials in which the well is completed.

- The information collected from the Belden wells is in large part dictated by well depth. Wells BW-1, BW-2, and BW-3 were completed above river level as prescribed in the Installation and Monitoring Plan. The wells are dry for portions of the year and some responded only during Spring snowmelt and major rainfall events. As such, field measurements and water sample results are collected sporadically and give only a brief and possibly distorted picture of the overall hydrologic regime. Wells with a very short water column are difficult to develop properly, yielding parameter levels that change with time (e.g., BW-2 and BW-3). Conversely, well BW-4 is permanently wet and is well-developed for sampling, and can be monitored for responses to individual precipitation events. However, due to its depth and location, it monitors the zone of mixed ground water, ostensibly mixed Belden area ground water and Eagle River base flow.

- None of the wells was advanced to bedrock. Without bedrock depths the saturated thickness of the aquifer is unknown, thus the estimate of the cross-sectional area used in the ground-water discharge calculations cannot be verified.

4.0 CONCLUSIONS

This report covers an evaluation of the composition of mine waste rock in the vicinity of Belden and Gilman and the potential for transport of metals from these materials to the Eagle River. Included is an analysis of the chemical and physical characteristic of each waste rock pile, and potential trace metal transport mechanisms including surface water and ground-water pathways. Ground water quality and hydrology were evaluated in the Belden area to assess potential ground water contributions to the Eagle River. Surface water drainages in the vicinity of the waste rock piles were monitored for hydrologic characteristics and water quality during rainfall and snowmelt runoff events.

The Eagle River was sampled to document water quality conditions during these runoff events. Because there are documented metal load sources in the study area which affect Eagle River water quality that are unrelated to Belden area mine waste rock, such as Eagle Mine seepage and upstream loading from unknown sources, quantification of these sources was required to properly evaluate the effects of the waste rock piles on Eagle River water quality.

The following conclusions have been taken from this evaluation:

- Of the 14 waste rock piles tested, seven piles show minimal or no potential to generate acid and three piles have a low probability of affecting Eagle River water quality because of their coarse grain size or proximity to the Eagle River.

- Four waste rock piles have the potential to generate acid thereby liberating metals, including WP-8, WP-10, WP-13, and WP-14. Of these, only WP-8 has an identified surface water pathway. Potential ground water pathways to the Eagle River may exist for WP-10, WP-13, and WP-14.

- Metal concentrations measured in surface runoff from tributaries occupied by waste rock piles were elevated. However, of the five tributary areas monitored, only Stations T-TR and SR-4 showed potential to affect Eagle River water quality. Runoff from other monitored waste rock pile tributaries showed little or no affect on Eagle River water quality.

- During rainfall-runoff, tributaries in the Belden reach contributed an average of 20 percent to the increased dissolved zinc load measured at Station E-5R. In the Rock Creek reach, Station SR-4 (WP-8 hillside) contributed up to an average of 75 percent to the increased dissolved zinc load measured at Eagle River Station E-11R during rainfall runoff.

- Rainfall-runoff dissolved zinc loads contributed by upstream sources and by unaccounted sources were minimal ranging from 6.4 to 18.4 percent, respectively.

- The combined dissolved zinc load from the Site during rainfall-runoff periods constitutes less than two percent of the annual dissolved zinc load measured at Station E-11R.

- During snowmelt periods, Belden reach tributary areas contributed an average of 9 percent to the dissolved zinc load measured at Station E-5R. Rock Creek waste rock pile tributary areas contributed an average of 38 percent, of which Station SR-4 contributed an average of 30 percent to the dissolved zinc load measured at Station E-11R during snowmelt runoff.

- Under snowmelt conditions, an average of 20 percent of the dissolved zinc load measured at Station E-5R was contributed by unknown sources upstream of the Belden reach.

- Unaccounted sources contributed an average of 65 percent and 11 percent of the dissolved zinc load in the Belden and Rock Creek reaches during the snowmelt period, respectively.

- Available data from the Belden ground water wells indicates that these wells had elevated concentrations of metals.

- Ground water loading estimates, based on well hydraulics and well sample results, indicate that the well BW-3 area (Belden loading dock/Belden buildings) had the highest potential to affect Eagle River water quality in the Belden reach. However, limited data from well BW-3 allow an assessment of the potential impact for snowmelt conditions only.

- The Belden ground water loading estimates are less than the unaccounted loads estimated for the storm event/snowmelt surface water results. This difference is attributable, in part, to the design of the ground water monitoring program which focused on periodic loading from waste rock pile tributary runoff instead of overall Belden ground water conditions.

5.0 REFERENCES

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Dames & Moore, 1995b. Final Installation and Monitoring Plan for Belden Ground Water Monitoring Wells.

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Dames & Moore, 1996b. Eagle Mine Site Preliminary Data Interpretation Report No. 3 - Belden Storm Event / Snowmelt Surface Water Runoff Monitoring, November 1996.

Dames & Moore, 1996c. Letter dated November 7, 1996 to U.S. EPA Regarding Eagle Mine Remedial Program Waste Rock Pile Testing Program - Preliminary Information.

Dames & Moore, 1996d. Eagle River Water Quality Report - 1996. December 1996.

Dames & Moore, 1997a. Letter dated May 9, 1997 to U.S. EPA Regarding Eagle Mine Site - Response to Comments.

Dames & Moore, 1997b. Eagle Mine Annual Site Monitoring and Activities Report - 1996. March 1997.

U.S. Department of the Interior, Water and Power Resources Service, 1974. Earth Manual. A Water Resources Technical Publication.

U.S. Environmental Protection Agency, 1978. Field and Laboratory Methods Applicable to Overburdens and Minesoils. EPA / 600 / 2-78 / 054

U.S. Environmental Protection Agency, 1983. Methods for Chemical Analysis of Water and Wastes. EPA-600/4-79-020.

U.S. Environmental Protection Agency, 1994. Technical Document, Acid Mine Drainage Prediction. EPA 530-R-94-036.

Appendix A

Gene - The rubber
band broke on your
copying. The mail room
doesn't know what pat
to copy. I'm sorry
so I don't know either. Plse
call them when you get

in to tell them
mail room - X6823

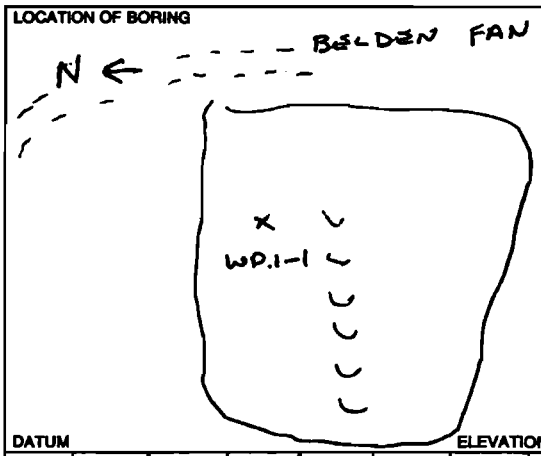
Kherb

APPENDIX A

Waste Rock Testing Data

Dames & Moore

LOCATION OF BORING



DATUM ELEVATION

JOB NO.	CLIENT	LOCATION
	VIACOM	

DRILLING METHOD:

BORING NO. WP 1-1

SHEET 1 OF 1

SAMPLING METHOD: PICK AX & SHOVEL

DRILLING

	START	FINISH
TIME		1100
DATE		8/19

WATER LEVEL				
TIME				
DATE				
CASING DEPTH				

SAMPLER TYPE	INCHES DRIVEN / INCHES RECOVERED	DEPTH OF CASING	SAMPLE NO. / SAMPLE DEPTH	BLOWS/FT. SAMPLER	NUMBER OF RINGS	DEPTH IN FEET	SOIL GRAPH	SURFACE CONDITIONS: MINE GRAVELS & SOIL
						0		0-18" - YELLOW BROWN, SILTS & GRAVELS, VF TO VCOARSE GRAINED, UNCONS., MOD WELL GRADED, DRY, GRAVELS TO 6" REDDISH & YELLOW STAIN, PYRITE
						1		
						2		
						3		18-30" - MEDIUM BROWN SILTS & GRAVELS VF TO V COARSE GRAINED, UNCONS, MODERATE GRADING, DRY, GRAVELS TO 2", ORANGE STAIN, TR: SPHALERITE PYRITE
						4		
						5		
						6		30-48" - MEDIUM BROWN SILTY GRAVEL, V COARSE, UNCONS., POORLY GRADED, DRY, GRAVELS TO 4", ORANGE STAIN. TR SPHALERITE, PYRITE
						7		
						8		TD TRENCH @ 1100 8/19/96
						9		
						0		32° SLOPE
						1		5% OF PILE PROFILE >6"
						2		HOLE WIDTH 24"
						3		
						4		
						5		
						6		
						7		
						8		
						9		
						0		

DRILLING CONTR. _____

CHK'D BY _____

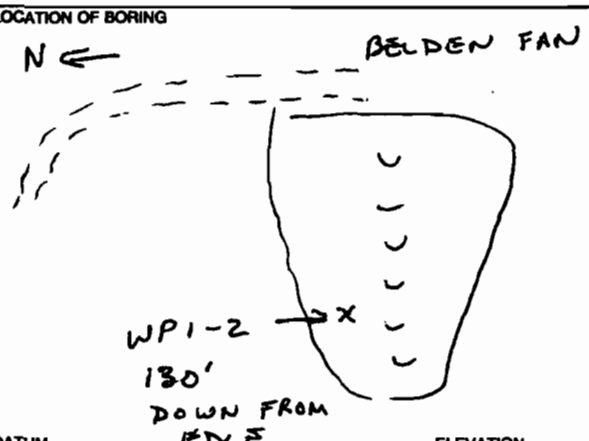
DATE _____

BY _____

No. 267936

625.1 (5) (REV. 11-80)

LOCATION OF BORING



DATUM ELEVATION

JOB NO.	CLIENT	LOCATION

DRILLING METHOD:

SAMPLING METHOD: PICK & SHOVEL

BORING NO. WP1-2

SHEET 1 OF 1

					DRILLING START	DRILLING FINISH
WATER LEVEL					TIME	TIME
TIME						1150
DATE					DATE	DATE
CASING DEPTH					8/19	8/19

SURFACE CONDITIONS:

SAMPLER TYPE	INCHES DRIVEN / INCHES RECOVERED	DEPTH OF CASING	SAMPLE NO. / SAMPLE DEPTH	BLOWS/FT. SAMPLER	NUMBER OF RINGS	DEPTH IN FEET	SOIL GRAPH	
						0		0-8" GRAVELLY CLAY - LIGHT YELLOW BROWN, STIFF, MOD PLASTICITY, GRAVELS TO 3", IRON STAINED, TRACE INTERBATED WHITE CLAY, TR: SPHALERITE, PYRITE
						1		
						2		
						3		8-27" SILTY GRAVEL W/ CLAY, MEDIUM YELLOW BROWN, NO PLASTICITY, GRAVELS TO 4", HEAVY Fe STAIN, ABUNDANT WHITE GRAY CLAY (MOD TO LOW PLASTICITY) CHRYSTOLINE DOLOMITE W/ SPHALERITE + GALENA MINERALIZATION, SL. MOIST
						4		
						5		
						6		27-48" GRAVEL/COBBLES - GRANITIC + METAMORPHOSED LIMESTONE, 2-6" Fe STAIN
						7		
						8		48-52" ~~GRAVEL~~ COBBLES 4-8" LIMESTONE FE STAIN, TR SPHALERITE, SL MOIST
						9		TD 52" @ 1150 hrs 8/19/96
						0		
						1		36° SLOPE
						2		15% OF MATERIAL > 6" TO 4½'
						3		HOLE WIDTH 20"
						4		
						5		
						6		
						7		
						8		
						9		
						0		

DRILLING CONTR. _____

No.267937

BY _____ DATE _____ CHK'D BY _____

625.1 (3) (REV. 11-80)

LOCATION OF BORING	JOB NO.	CLIENT	LOCATION

DRILLING METHOD:	BORING NO. WP1-3
	SHEET 1 OF 1
SAMPLING METHOD:	DRILLING
	START TIME 11:00 / FINISH TIME
	START DATE 8-9-96 / FINISH DATE

WATER LEVEL				
TIME				
DATE				
CASING DEPTH				

DATUM ELEVATION

SAMPLER TYPE	INCHES DRIVEN / INCHES RECOVERED	DEPTH OF CASING	SAMPLE NO. / SAMPLE DEPTH	BLOWS/FT. SAMPLER	NUMBER OF RINGS	DEPTH IN FEET	SOIL GRAPH
						0	
						1	
						2	
						3	
						4	
						5	
						6	
						7	
						8	
						9	
						0	
						1	
						2	
						3	
						4	
						5	
						6	
						7	
						8	
						9	
						0	

SURFACE CONDITIONS:

Dig Profile along Drainage on upper South Side of Waste Rock Pile #1

Profile ~ 5' DEEP.

0-1' - light Brown, Sandy gravels up to 3" - No large gravels (>6")

1'-3' - grading from Dark brown to Reddish Brown Moist. Medium to large grained with gravels to ~3" (Some Interbedded gray)

3'-5' - Reddish Brown & Yellow Brown, Fine to Medium grain Matrix with gravels to 3" - Some yellowish soils @ ~4' Pyritic - Eroded.

Sample Profile: Collect Sample along Existing Profile.

No Cobbles > 6" Encountered along Profile.

Slope ~ 40°

Top of Profile ~ 2' Below Top of high point of Pile.

Bottom of Profile @ 5' (Near Bottom of Pile) Hit a Few Roots.

DRILLING CONTR. _____ CHK'D BY _____ DATE _____ BY _____

No. 267916

625.1 (3) (REV. 11-90)

BORING & WELL LOG

LOCATION OF BORING	JOB NO.	CLIENT	LOCATION

DRILLING METHOD:

SAMPLING METHOD:

BORING NO. WTAM WP1-4

SHEET OF

					DRILLING	
					START	FINISH
WATER LEVEL					TIME	TIME
TIME					12:00	
DATE					DATE	DATE
CASING DEPTH					8-19-96	

DATUM ELEVATION

DRILLING CONTR.

No.267917

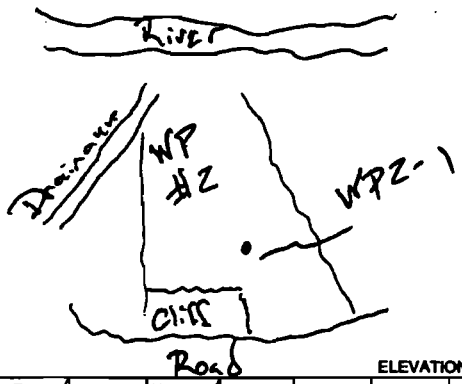
SAMPLER TYPE	INCHES DRIVEN / INCHES RECOVERED	DEPTH OF CASING	SAMPLE NO. / SAMPLE DEPTH	BLOWS/FT. SAMPLER	NUMBER OF RINGS	DEPTH IN FEET	SOIL GRAPH	SURFACE CONDITIONS:
						0		Dug Profile approx. ½ way Down on South
						1		Side of Waste Rock Pile #1
								Dug Profile adjacent to Drainage.
						2		
						3		0-1.5'- gravels & cobbles - cobbles to 8"
								- Mostly Limestone - Some Sphalarite
						4		& Pyrite. Dry.
						5		1.5'-5'- Reddish Brown & yellowish Red
						6		Dirt. Medium to coarse grained
								Matrix with some limestone gravels (Up to 3")
						7		Moist. Iron Staining Throughout.
						8		@ 5' Hit Refusal - HARD Clayey Material with Some
								larger cobbles. (Near Bottom of Pile).
						9		Sample Profile - Collect Sample along entire
						0		Profile.
						1		Slope of Pile ~ 38° - Top of Trench at
						2		@ or Near high Point of Pile.
						3		0-1.5'- Sample had about 50%
						4		large 3"-4" cobbles - No cobbles
								over 6"-
						5		1.5'-5'- Sample Mostly Medium to
								Coarse grained Red Soils.
						6		Iron stained. Some 1"-2" gravels
						7		
						8		
						9		
						0		

BY DATE CHK'D BY

625.1 (3) (REV. 11-80)

Dames & Moore

LOCATION OF BORING



JOB NO.	CLIENT	LOCATION

DRILLING METHOD:

SAMPLING METHOD:

BORING NO. WPZ-1

SHEET 1 OF 1

					DRILLING START	DRILLING FINISH
WATER LEVEL						
TIME					TIME 1625	TIME
DATE					DATE 8-21-96	DATE
CASING DEPTH						

DATUM ELEVATION

SURFACE CONDITIONS: Slope ≈ 40 - 45°

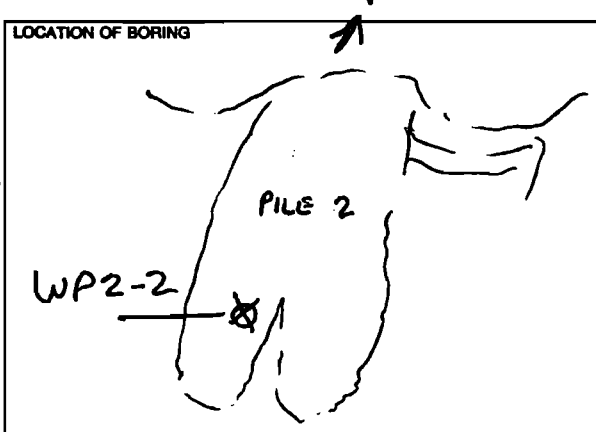
SAMPLER TYPE	INCHES DRIVEN / INCHES RECOVERED	DEPTH OF CASING	SAMPLE NO. / SAMPLE DEPTH	BLOWS/FT. SAMPLER	NUMBER OF RINGS	DEPTH IN FEET	SOIL GRAPH	
						0		Dug Profile Into Slope of WP#2.
						1		Profile 6' DEEP x 2' across
						2		0-2½' - Sandy on Surface, light brown &
						3		Yellow, Small gravels, Pyrite.
								- Just below Surface - Becoming Moist -
						4		Clayey, Medium to Coarse grained
								Pyrite, galena, & Iron Stained,
						5		gravels to 4" >5%
								Few 1 to 2% large > 6" cobbles In
						6		Profile
						7		2½' - 4½' - Clayey, Sandy Material,
								Medium to Coarse grained
						8		Mixed Reddish brown, Yellow Brown &
								light gray, Pyrite & Iron Staining throughout
						9		Moist
						0		4½' - 6' - Dark Brown Sand, Poorly graded,
								Few gravels trace Iron Staining, (Banded)
						1		No Mineralization, Moist.
						2		Collect 2 - Buckets for 80 lb sample.
						3		
						4		
						5		
						6		
						7		
						8		
						9		
						0		

DRILLING CONTR. _____ CHK'D BY _____ DATE _____

No. 267535

625.1 (5) (REV. 11-80)

LOCATION OF BORING



JOB NO.	CLIENT	LOCATION
12330-030	VIACOM	TRIB 4

DRILLING METHOD:

BORING NO. WP2-2

SHEET 1 OF 1

SAMPLING METHOD: PICK + SHOVEL

					DRILLING	
					START	FINISH
WATER LEVEL					TIME	TIME
TIME						0855
DATE					DATE	DATE
CASING DEPTH						8-23-96

DATUM ELEVATION

SURFACE CONDITIONS:

SAMPLER TYPE	INCHES DRIVEN / INCHES RECOVERED	DEPTH OF CASING	SAMPLE NO. / SAMPLE DEPTH	BLOWS/FT. SAMPLER	NUMBER OF RINGS	DEPTH IN FEET	SOIL GRAPH	
						0		0-8" SILTY SAND/GRAVEL - MED ORANGE BROWN, MOD WELL GRADED, VF TO 2", LIMESTONE + QUARTZITE, HEAVY Fe STAIN IN POCKETS, DRY
						1		
						2		
						3		8"- 3.5' SILTY GRAVEL - MED BROWN LESS WELL GRADED VF TO 4", LIMESTONE + QUARTZITE, TR: GALENA + PYRITE, Fe STAIN THROUGHOUT, SL MOIST
						4		
						5		
						6		TD 4.0' IN SOIL 3.5-4.0' DARK - MED BROWN SILT SOIL
						7		SLOPE 36°
						8		TRENCH ~~DEP~~ WIDTH 14"
						9		<5% OF MATERIAL > 6"
						0		
						1		COLLECT 1# BAGGIE
						2		
						3		
						4		
						5		
						6		
						7		
						8		
						9		
						0		

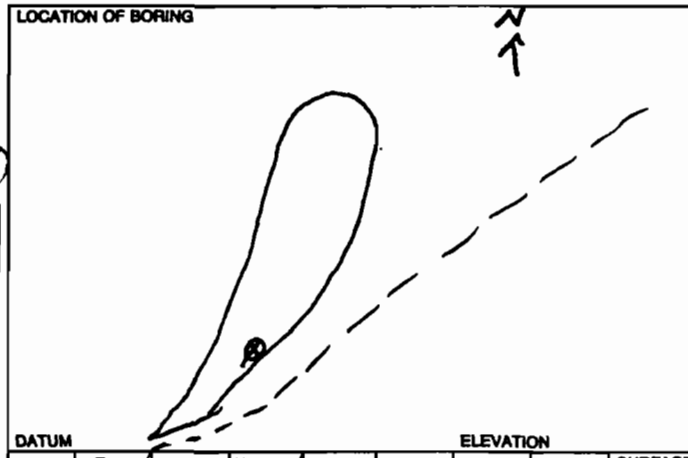
DRILLING CONTR. _____

No.267928

BY _____ DATE _____ CHK'D BY _____

625.1 (7) (REV. 11-80)

LOCATION OF BORING



DATUM ELEVATION

JOB NO.	CLIENT	LOCATION
12330-099-030	Viacom	WP2-3

DRILLING METHOD: Hand excavation

BORING NO.

SHEET 1 OF 1

SAMPLING METHOD:

DRILLING

					START	FINISH
WATER LEVEL					TIME	TIME
TIME						
DATE					DATE	DATE 8/23/96
CASING DEPTH						

SURFACE CONDITIONS: Limestone gravel

SAMPLER TYPE	INCHES DRIVEN / INCHES RECOVERED	DEPTH OF CASING	SAMPLE NO. / SAMPLE DEPTH	BLOWS/FT. SAMPLER	NUMBER OF RINGS	DEPTH IN FEET	SOIL GRAPH	
						0		0-2in - limestone gravel
						1		2in. - 3ft. - light brown to brown sandy ~~gritty~~ clay w/limestone gravel (1/2"); some gray; sulfur; minor Fe staining minor quartzite; gray clay v. stiff. (lime)
						2		
						3		3-5ft.-brownish yellow ~~sandy silt~~ sandy clay; pyritic; sulfur; moist; soft
						4		
						5		TD = 5ft Slope = 36°
						6		Excavation 16in wide < 170 > 6in.
						7		
						8		
						9		
						0		
						1		
						2		
						3		
						4		
						5		
						6		
						7		
						8		
						9		
						0		

DRILLING CONTR. _____

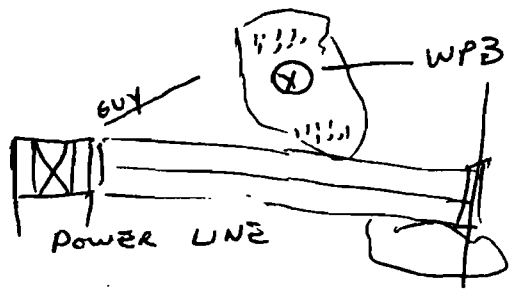
No. 267864

BY Jean Gracitone DATE _____ CHK'D BY _____

825.1 (3) (REV. 11-80)

Dames & Moore

LOCATION OF BORING



JOB NO.	CLIENT	LOCATION
12330-030	VIACOM	GILMAN

DRILLING METHOD:

SAMPLING METHOD: PICK + SHOVEL

BORING NO. WP-3-1

SHEET 1 OF 1

					DRILLING START TIME	DRILLING FINISH TIME
WATER LEVEL						
TIME						1420
DATE					DRILLING START DATE	DRILLING FINISH DATE
CASING DEPTH						8-19-91

DATUM ELEVATION

SURFACE CONDITIONS:

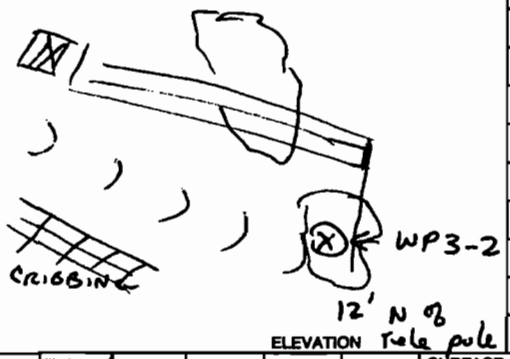
SAMPLER TYPE	INCHES DRIVEN / INCHES RECOVERED	DEPTH OF CASING	SAMPLE NO. / SAMPLE DEPTH	BLOWS/FT. SAMPLER	NUMBER OF RINGS	DEPTH IN FEET	SOIL GRAPH	
						0		0-7" BROWN-YELLOW SILT & GRAVEL - MOD WELL GRADED, NO PLASTICITY, DRY, ROASTER GRAVELS MANTLING SURFACE HEAVY FE STAIN GRAVELS TO 3"
						1		
						2		
						3		7-24" SILTY GRAVEL - MEDIUM BROWN, MODERATE GRADING, VF - COARSE GRAVEL (2") MOTTLED FE STAIN, ALTERED GRANITE & LIMESTONE, DRY
						4		
						5		24-36" GRAVELLY SILT - MOTTLED YELLOW BROWN AND GRAY/WHITE, DRY, LO PLASTICITY FE STAIN, VF - CRS GR, GRAVEL TO 1"
						6		
						7		
						8		TD 1420 @ 48" IN SOIL - MED DARK BROWN SILTY GRAVEL, (COLLUVIUM) VF - COARSE GR. DRY TRACE LIMONITE (Fe) STAIN
						9		
						0		COLLECT ~ 80# CALLED WP3-1 0-3' 1420 hrs
						1		
						2		EXCAVATION 28" WIDE
						3		SLOPE = 33°
						4		NO MATERIAL > 6"
						5		
						6		
						7		
						8		
						9		
						0		

DRILLING CONTR. _____

No.267938

BY _____ DATE _____ CHK'D BY _____

825.1 (5) (REV. 11-80)

LOCATION OF BORING	JOB NO.	CLIENT	LOCATION
	12330-030	VIACOM	GILMAN

DRILLING METHOD:	
SAMPLING METHOD:	PICK + SHOVEL
BORING NO.	WP-3-2
SHEET	1 OF 1
DRILLING START TIME	
DRILLING FINISH TIME	1500
DRILLING START DATE	
DRILLING FINISH DATE	8-19-96

WATER LEVEL				
TIME				
DATE				
CASING DEPTH				

DATUM ELEVATION

SURFACE CONDITIONS:

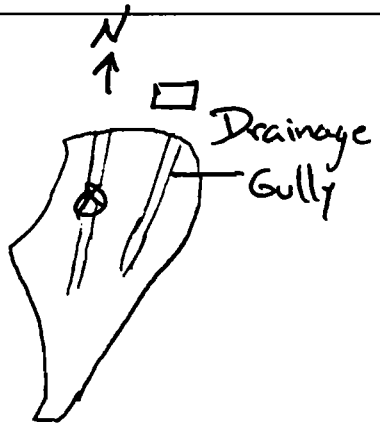
SAMPLER TYPE	INCHES DRIVEN / INCHES RECOVERED	DEPTH OF CASING	SAMPLE NO. / SAMPLE DEPTH	BLOWS/FT. SAMPLER	NUMBER OF RINGS	DEPTH IN FEET	SOIL GRAPH	
						0		0-6' GRAVELLY SILT - LITE YELLOW BROWN, VF - COARSE GR, GRAVEL TO 1½". HEAVY LIMONITE (Fe) STAIN, DRY
						1		
						2		TRACE: WOOD, LIMONITE ABUNDANT
						3		6-36" GRAVELLY SILT - AS ABOVE GRAVEL SIZE INCR. TO 3"
						4		TD 36" REFUSAL @ IRON SAND
						5		
						6		COLLECT #2 SAMPLE COMPOSITED IN 1 GALLON BAGGIE
						7		EXCAVATION 24" WIDE
						8		SLOPE 25°
						9		NO MATERIAL > 6"
						0		
						1		
						2		
						3		
						4		
						5		
						6		
						7		
						8		
						9		
						0		

DRILLING CONTR. _____ CHK'D BY _____ DATE _____

No. 267939

625.1 (3) (REV. 11-90)

LOCATION OF BORING



JOB NO.	CLIENT	LOCATION
12330-099-030	Viacom	WP4-1

DRILLING METHOD: Hand excavation

BORING NO.

SHEET 1 OF 1

SAMPLING METHOD:

DRILLING

					START	FINISH
WATER LEVEL					TIME	TIME
TIME						
DATE					DATE	DATE 8/19/96
CASING DEPTH						

DATUM

ELEVATION

SURFACE CONDITIONS:

SAMPLER TYPE	INCHES DRIVEN / INCHES RECOVERED	DEPTH OF CASING	SAMPLE NO. / SAMPLE DEPTH	BLOWS/FT. SAMPLER	NUMBER OF RINGS	DEPTH IN FEET	SOIL GRAPH
						0	
				12-21 galena?		1	
						2	
						3	
						4	
						5	
						6	
						7	
						8	
						9	
						0	
						1	
						2	
						3	
						4	
						5	
						6	
						7	
						8	
						9	
						0	

0-12 in - fine gr., brown sand
12-21 in - drk gray, coarse sand to fine gravel, dark
21-25 in - Fe staining, pyritic

25-37 in. dark brown; coarse
37 in-56 in - coarse to fine gravel; drk brown
44-56 in - more yellow brown w/Fe stain

Refusal @ 56 in.

36° slope
Profile = 8 in wide
0% > 6 in.

DRILLING CONTR. _____

No.267918

BY Dan Linicome CHK'D BY _____ DATE _____

GEO-1 (3) (REV. 11-90)

LOCATION OF BORING

JOB NO.	CLIENT	LOCATION
12330-099-030	Viacom	WP4-2

DRILLING METHOD: Hand excavation

BORING NO.

SHEET 1 OF 1

SAMPLING METHOD:

DRILLING

					START	FINISH
WATER LEVEL					TIME	TIME
TIME						
DATE					DATE	DATE 8/24/96
CASING DEPTH						

DATUM ELEVATION

SAMPLER TYPE	INCHES DRIVEN / INCHES RECOVERED	DEPTH OF CASING	SAMPLE NO. / SAMPLE DEPTH	BLOWS/FT. SAMPLER	NUMBER OF RINGS	DEPTH IN FEET	SOIL GRAPH	SURFACE CONDITIONS:
						0		
						1		0-14in brown fine gr. sand; minor Fe; minor 1/4 in
						2		14in. - 22in dark gray and yellow brown; Fe staining, brittle sand to coarse gravel
						3		22in - 28in - brown fine grained sand; pyrite galena
						4		28in. - 34in dark gray sand, gravel; minor white sand or precipitate
						5		34in - 56in brown gravelly sand, 1/2 in gravel
						6		56in = refusal
						7		14 in wide profile
						8		3:1 slope
						9		0% > 6in
						0		
						1		
						2		
						3		
						4		
						5		
						6		
						7		
						8		
						9		
						0		

DRILLING CONTR. _____ CHK'D BY _____ DATE _____

No. 67519

625.1 (5) (REV. 11-90)

Dames & Moore

LOCATION OF BORING	JOB NO.	CLIENT	LOCATION
NEAR TOE OF PILE 4, WEST SIDE	12330-099-03a	VIACOM	WP 4

N ↑

CRIBBING

WP4-3

DATUM ELEVATION

DRILLING METHOD:	BORING NO.
	WP4-3
SAMPLING METHOD: PICK & SHOVEL	SHEET 1 OF 1

					DRILLING	
					START	FINISH
WATER LEVEL					TIME	TIME 0935
TIME						
DATE					DATE	DATE 8/20/96
CASING DEPTH						

SAMPLER TYPE	INCHES DRIVEN / INCHES RECOVERED	DEPTH OF CASING	SAMPLE NO. / SAMPLE DEPTH	BLOWS/FT. SAMPLER	NUMBER OF RINGS	DEPTH IN FEET	SOIL GRAPH	SURFACE CONDITIONS:
						0		0-7" GRAVELLY SILT - MED BROWN, MOD WELL GRADED, VF - CRS GRN, GRVL TO COMPACTED, DRY, LIMESTONE, Fe STAIN
						1		
						2		7-22" GRAVEL - ROASTED LIMESTONE, 1-6" UNCOMPACTED, HEAVY Fe STAIN, ABUN PYRITE FINES, SL MOIST
						3		
						4		22-54" (4.5') SILTY GRAVEL - LIMESTONE, 1- MOD. COMPACTED, SL. MOIST, HEAVY Fe STAIN, PYRITE FINES,
						5		
						6		TD 4.5' @ 0935 8/20/96
						7		33% SLOPE
						8		LESS THAN 5% OF ROCK >6 INCHES
						9		TRENCH WIDTH 14"
						0		
						1		
						2		
						3		
						4		
						5		
						6		
						7		
						8		
						9		
						0		

DRILLING CONTR. _____

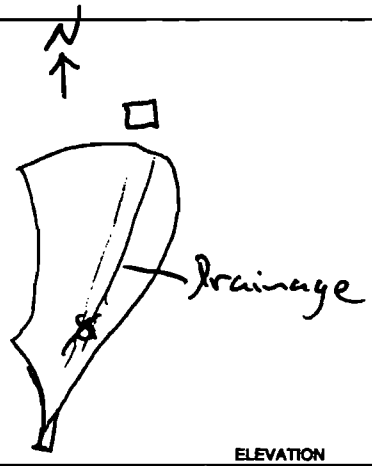
No267941

BY _____ DATE _____ CHK'D BY _____

826.1 (3) (REV. 11-80)

Dames & Moore

LOCATION OF BORING



JOB NO.	CLIENT	LOCATION
12330-099-030	Viacom	WP4-4

DRILLING METHOD: Hand excavation

BORING NO.

SHEET 1 OF 1

SAMPLING METHOD:

					DRILLING	
					START	FINISH
WATER LEVEL					TIME	TIME
TIME						
DATE					DATE	DATE 8/20/96
CASING DEPTH						

DATUM ELEVATION

SURFACE CONDITIONS:

SAMPLER TYPE	INCHES DRIVEN / INCHES RECOVERED	DEPTH OF CASING	SAMPLE NO. / SAMPLE DEPTH	BLOWS/FT. SAMPLER	NUMBER OF RINGS	DEPTH IN FEET	SOIL GRAPH	
						0		0-3in. - brown soil; 3in.-5.5in - brown gravelly sand w/white precipitate; 5.5in - 9.5in - Fe stained; pyritic
						1		sandy gravel w/soft yellow brown material
								9.5 - 21.5in - 1/2 - 3/4 in gray gravel, some yellow coated
						2		21.5 - 25in. - 1-2in. gray gravel limestone
						3		25in - 37in. light & drk brown sand, Fe stained @ base; pyr
								37in - TD - brwn to reddish brown sandy gravel, 1/2 in.
						4		gravel; Fe staining; minor drk gray to black
								4.5 ft = refusal
						5		34% slope
								< 19, > 6in
						6		
						7		
						8		
						9		
						0		
						1		
						2		
						3		
						4		
						5		
						6		
						7		
						8		
						9		
						0		

DRILLING CONTR. _____

No. 267832

CHK'D BY _____

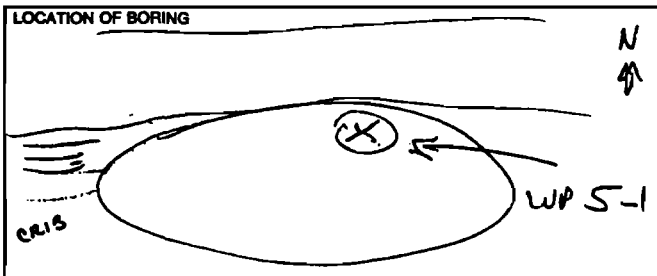
DATE _____

BY _____

625.1 (3) (REV. 11-80)

Dames & Moore

LOCATION OF BORING



1ST BACKHOE SITE, FAR EAST TOP OF PILE

DATUM ELEVATION

JOB NO.	CLIENT	LOCATION
12330-030	VIACOM	GILMAN

DRILLING METHOD:

SAMPLING METHOD:

BORING NO. WP 5-1

SHEET 1 OF 1

					DRILLING	
					START	FINISH
WATER LEVEL					TIME	TIME 1505
TIME						
DATE					DATE	DATE 8/20/96
CASING DEPTH						

SAMPLER TYPE	INCHES DRIVEN / INCHES RECOVERED	DEPTH OF CASING	SAMPLE NO. / SAMPLE DEPTH	BLOWS/FT. SAMPLER	NUMBER OF RINGS	DEPTH IN FEET	SOIL GRAPH	SURFACE CONDITIONS:
						0		
						1		0 - 2.5' SILTY GRAVEL - LT BROWN, WELL GRADED VF TO COBBLY (>6"), SOME ROASTER MATERIAL, DRY TRACE PYRITE
						2		
						3		2.5 - 3.5' GRAVEL - DARK BROWN ORANGE, ~~WE~~ MOD POOR GRADING, 1/4" TO 4" SILTY, SL MOIST, Fe STAINING, PYRITE
						4		
						5		
						6		3.5 - 5.5' SILTY GRAVEL - DARK BROWN ORANGE MOD WELL GRADED, VF TO COARSE GR, (4"), Fe STAINING, TR PYRITE
						7		
						8		PILE SLOPE 36°
						9		LESS THAN 5% in > 6" SIZE
						0		EXCAVATION WIDTH 46"
						1		
						2		TD 5.5'
						3		
						4		
						5		
						6		
						7		
						8		
						9		
						0		

DRILLING CONTR. _____

No.267946

BY _____ DATE _____ CHK'D BY _____

628.1 (3) (REV. 11-80)

Dames & Moore

LOCATION OF BORING	JOB NO.	CLIENT	LOCATION

DRILLING METHOD: Back Hoe	BORING NO. WPS-2
SAMPLING METHOD:	SHEET 1 OF 1
	DRILLING START TIME 1520 / FINISH TIME
	DATE 8-20-96 / FINISH DATE

WATER LEVEL				
TIME			—	
DATE				
CASING DEPTH				

DATUM ELEVATION

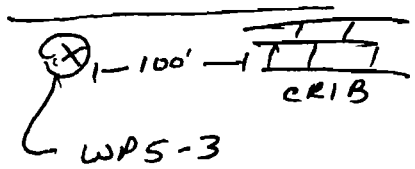
SURFACE CONDITIONS: Slope @ Profile Area ~ 40°

SAMPLER TYPE	INCHES DRIVEN / INCHES RECOVERED	DEPTH OF CASING	SAMPLE NO. / SAMPLE DEPTH	BLOWS/FT. SAMPLER	NUMBER OF RINGS	DEPTH IN FEET	SOIL GRAPH	
						0		Dug Pit with Backhoe to Make Profile -
						1		
						2		Profile 5'5" Deep.
						3		<5% Greater than 6"
						4		0-6" - gray Black - Rooster material - Sandy Matrix Medium to Coarse grained
						5		6"-3' grades Into Reddish Brown & Brown Material. Sandy. gravels to 1/2" Iron Staining. Pyrite Remnants
						6		
						7		
						8		3' - Sandy layer ~1' - Fine to Medium grained, No gravels - Some Minor Iron Staining
						9		
						0		4'-5'5" Black with White Residue Material From Furnace. Some Interlayered Brownish yellow Baked Material. Iron Stained
						1		
						2		
						3		Collect 1 x 1 gallon Bag Sample. along Entire Profile.
						4		
						5		Excavation 38" Wide.
						6		
						7		
						8		
						9		
						0		

DRILLING CONTR. _____ CHK'D BY _____ DATE _____ BY _____

No. 287851

625.1 (3) (REV. 11-80)

LOCATION OF BORING	JOB NO.	CLIENT	LOCATION
	12330-030	VIACOM	GILMAN

DRILLING METHOD:	BORING NO. WP 5-3
	SHEET 1 OF 1
SAMPLING METHOD: BACKHOE & SHOVEL	DRILLING
	START / FINISH

					START TIME	FINISH TIME
WATER LEVEL						
TIME						1545
DATE					DATE	DATE 8-20-96
CASING DEPTH						

DATUM ELEVATION

SAMPLER TYPE	INCHES DRIVEN / INCHES RECOVERED	DEPTH OF CASING	SAMPLE NO. / SAMPLE DEPTH	BLOWS/FT. SAMPLER	NUMBER OF RINGS	DEPTH IN FEET	SOIL GRAPH
						0	
						1	
						2	
						3	
						4	
						5	
						6	
						7	
						8	
						9	
						0	
						1	
						2	
						3	
						4	
						5	
						6	
						7	
						8	
						9	
						0	

SURFACE CONDITIONS:

0-2' SILTY GRAVEL - ORANGE BROWN
WELL GRADED, VF - 3", COMPACTED,
LIMESTONE + DOLOMITE, V HEAVY PYRITE
STAINING DRY

2-6.5' GRAVELLY COBBLES - DARK BROWN
ROASTER MATERIAL, MOD WELL GRADED
SILTY, VF TO - V COARSE (12")
LIMESTONE + QUARTZITE, PYRITE,
GALENA, SPALERITE., MODERATE
Fe STAIN, SL MOIST. CU MINS

TD 6.5'

33° SLOPE

~ 15% ROCKS > 6"

HOLE WIDTH 3'

DRILLING CONTR. _____ BY _____ CHK'D BY _____ DATE _____

No.267834

625.1 (3) (REV. 11-80)

LOCATION OF BORING

JOB NO.	CLIENT	LOCATION

DRILLING METHOD:

SAMPLING METHOD:

BORING NO. WPS-4

SHEET 1 OF 1

					DRILLING	
					START	FINISH
WATER LEVEL					TIME 1610	TIME
TIME						
DATE					DATE 8-20-96	DATE
CASING DEPTH						

DATUM ELEVATION

SAMPLER TYPE	INCHES DRIVEN / INCHES RECOVERED	DEPTH OF CASING	SAMPLE NO. / SAMPLE DEPTH	BLOWS/FT. SAMPLER	NUMBER OF RINGS	DEPTH IN FEET	SOIL GRAPH
						0	
						1	
						2	
						3	
						4	
						5	
						6	
						7	
						8	
						9	
						0	
						1	
						2	
						3	
						4	
						5	
						6	
						7	
						8	
						9	
						0	

SURFACE CONDITIONS:

Dug Profile with Backhoe Into Slope From Top.

Profile 4' Deep.

- approx 5% > 6" - Not collected In Sample.

- 0'-1' light Brown, Sandy Matrix, Medium to Coarse grained, gravels to 3". Dry. No Mineralization.

1' to TD - light Brown & Brownish yellow - gravels to 4" throughout - approx 5% > 6" - Pyrite, IRON Staining throughout. Dry to Sl. Moist Some Foundry/Furnace Material Near Base of Profile. Black - IRON Stained

Collect 1x1 gallon Bag Sample.

DRILLING CONTR. _____

CHK'D BY _____

DATE _____

BY _____

No. 267835

825.1 (3) (REV. 11-90)

LOCATION OF BORING

JOB NO.	CLIENT	LOCATION

DRILLING METHOD:

SAMPLING METHOD:

BORING NO. WPS-5

SHEET 1 OF 1

					DRILLING	
					START	FINISH
WATER LEVEL					TIME	TIME
TIME					1025	
DATE					DATE	DATE
CASING DEPTH					8-23-96	

DATUM ELEVATION

SAMPLER TYPE	INCHES DRIVEN / INCHES RECOVERED	DEPTH OF CASING	SAMPLE NO. / SAMPLE DEPTH	BLOWS/FT. SAMPLER	NUMBER OF RINGS	DEPTH IN FEET	SOIL GRAPH	SURFACE CONDITIONS:
								gravels (to 3") limestone & Some Roasted Material
						0		Slope 40° - (general slope of Pile.
						1		Dug Profile Into Steep Drainage area Just above OD Rotten Cribbing
						2		Profile 4'5" Deep x 16" WIDE.
						3		
						4		0 - 12" - light gray & Brown Sandy gravel Dry, limestone, Iron staining - Minor,
						5		12"-24"
						6		Sandy Material Brown & REDDISH Brown, Some gravels Dry, Pyrite & Copper Mineralization, Iron Staining
						7		
						8		24" - 31" - gray gravelly Sand, limestone gravels to 4" - Dry, gray limey sand Matrix Medium to Coarse grained - Minor Pyrite & COOKED Material
						9		
						0		31" - 4'5" (TD) - Mix of yellowish Brown & gray gravelly Sand, Limestone gravels to 3" - Dry, Pyrite & Copper Mineralization Some COOKED Material. Iron Stained.
						1		
						2		
						3		Collected 1x 1 gallon Bag Sample less than 5% of Material > 6"
						4		
						5		
						6		
						7		
						8		
						9		
						0		

DRILLING CONTR. _____

No.267833

BY _____ DATE _____ CHK'D BY _____

625.1 (3) (REV. 11-80)

LOCATION OF BORING	JOB NO.	CLIENT	LOCATION WP6-1
	DRILLING METHOD:		BORING NO. WP6-1
			SHEET OF
	SAMPLING METHOD:		DRILLING START / FINISH

					START TIME	FINISH TIME
WATER LEVEL					1650	
TIME						
DATE					8-19-96	DATE
CASING DEPTH						

DATUM ELEVATION

SAMPLER TYPE	INCHES DRIVEN / INCHES RECOVERED	DEPTH OF CASING	SAMPLE NO. / SAMPLE DEPTH	BLOWS/FT. SAMPLER	NUMBER OF RINGS	DEPTH IN FEET	SOIL GRAPH	SURFACE CONDITIONS:
								Slope ~ 30°(±) Mostly large cobbles/waste Very angular.
						0		Dug Profile Into Slope of Pile on East / upper part of Pile - Surface Color light brownish yellow.
						1		Dug Profile to 3.5' - Hit Refusal from large limestone Boulders.
						2		
						3		approx 10% - Sample Material over 6" along Profile
						4		
						5		0-1.5' - light brown to brown Sandy Matrix Fine to Coarse grained In matrix abundant gravels to 3". Mostly limestone - Some Slag - Roasted Material In top 8".
						6		
						7		1.5'-2.5' - limestone cobbles & brown Sandy Matrix. Moist. HARD with Many cobbles & gravel to 3"
						8		
						9		
						0		2.5-3.5' - grading to Red (IRON Stained Material many ~(10%) cobbles over 6" & many cobbles to 3"
						1		
						2		Hit Resual @ 3.5' From large limestone Boulder.
						3		
						4		Sample Profile. - Collect 1 gallon Bag From Entire Profile except collecting Nothing > 6".
						5		
						6		0'-2' - Collected Constant Profile with Some gravel to 3"
						7		2'-3' - Missed Some Sample @ 2 Boulders > 6" (6.5" & 7".)
						8		3-5'. Reddish Material gravels to 3"
						9		
						0		

DRILLING CONTR. _____ BY _____ DATE _____ CHK'D BY _____

No. 267042

625.1 (3) (REV. 11-80)

LOCATION OF BORING

JOB NO.	CLIENT	LOCATION

DRILLING METHOD:

SAMPLING METHOD:

BORING NO. WP6-2

SHEET OF

DRILLING

	START	FINISH
TIME	1745	TIME
DATE	8-19-96	DATE

WATER LEVEL				
TIME				
DATE				
CASING DEPTH				

DATUM

ELEVATION

DRILLING CONTR.

No.267847

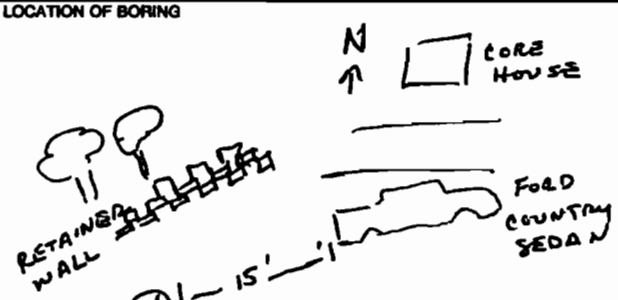
SAMPLER TYPE	INCHES DRIVEN / INCHES RECOVERED	DEPTH OF CASING	SAMPLE NO. / SAMPLE DEPTH	BLOWS/FT. SAMPLER	NUMBER OF RINGS	DEPTH IN FEET	SOIL GRAPH	SURFACE CONDITIONS:
								Small cobbles 3" to > 1' with a Coarse grained Sand Matrix.
						0		Slope ~ 30°
						1		approx 10% of material greater than 6" Did not Collect anything greater than 6" In Sample.
						2		
						3		Dug Profile to 4' cut Into Slope to Collect Sample.
						4		Abundant 2' gravel which kept falling into hole. Hit Refusal @ 4'
						5		
						6		0 - 2'. light brown grading to ~~dark~~ brown. Dry @ Surface. Moist @ 2' limestone cobbles to 3" some larger
						7		
						8		2' - 4' yellowish Brown & REDDish Brown Material Coarse grained Matrix. Mostly 1" & 2" gravels with Some larger cobbles.
						9		- Slag / Roasted Material Throughout Profile.
						0		
						1		- Collected 8 x 5 gallons buckets From Entire Profile.
						2		
						3		approx 4" along Profile Not collected Rock > 6" located There
						4		
						5		
						6		
						7		
						8		
						9		
						0		

BY ____ DATE ____ CHK'D BY ____

625.1 (3) (REV. 11-80)

Dames & Moore

LOCATION OF BORING



JOB NO.	CLIENT	LOCATION
12330-030	VIACOM	GILMAN

DRILLING METHOD:

BORING NO. WP6-3

SHEET 1 OF 1

SAMPLING METHOD: PICK + SHOVEL

DRILLING

					START	FINISH
WATER LEVEL					TIME	TIME 1725
TIME						
DATE					DATE	DATE 8-19-96
CASING DEPTH						

DATUM ELEVATION

SAMPLER TYPE	INCHES DRIVEN / INCHES RECOVERED	DEPTH OF CASING	SAMPLE NO. / SAMPLE DEPTH	BLOWS/FT. SAMPLER	NUMBER OF RINGS	DEPTH IN FEET	SOIL GRAPH
						0	
						1	
						2	
						3	
						4	
						5	
						6	
						7	
						8	
						9	
						0	
						1	
						2	
						3	
						4	
						5	
						6	
						7	
						8	
						9	
						0	

SURFACE CONDITIONS:

0-8" SILTY GRAVEL - LT YELLOW BROWN MOD GRADED, VF - V COARSE GRAVELS TO 4", DRY, LIMESTONE & QUARTZITE UNCONSOLIDATED

8-24" GRAVEL - MED BROWN, SL. MOIST POORLY GRADED, V COARSE GRAVEL/COBBLES TO 8", LIMESTONE & QUARTZITE TRACE: LIMONITE (Fe) STAIN IN INTERSTITIAL SILTS.

24-30" SILT - DARK BROWN, ORGANIC RICH, NO PLASTICITY, NO Fe/SOY ODOR, SL. MOIST

TD 2.5' @ 1725 hrs 8-19-96

32° SLOPE

5-10% OF PILE > 6"

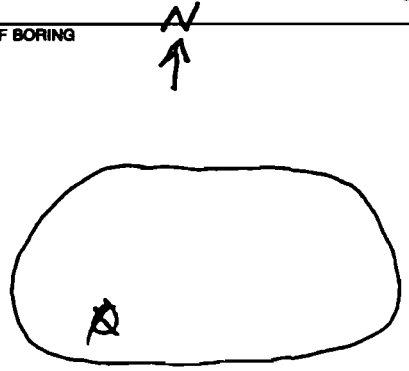
EXCAVATION 18" WIDE

DRILLING CONTR. _____ BY _____ DATE _____ CHK'D BY _____

No. 267940

625.1 (3) (REV. 11-80)

LOCATION OF BORING



JOB NO.	CLIENT	LOCATION
12330-099030	Viacom	WP6-4

DRILLING METHOD: Hand excavate

0-18 in.

BORING NO.

SHEET 1 OF 1

SAMPLING METHOD:

					DRILLING	
					START	FINISH
WATER LEVEL					TIME	TIME
TIME						
DATE					DATE	DATE 8/19/96
CASING DEPTH						

DATUM

ELEVATION

SURFACE CONDITIONS: 1/4 gravel to boulders

SAMPLER TYPE	INCHES DRIVEN / INCHES RECOVERED	DEPTH OF CASING	SAMPLE NO. / SAMPLE DEPTH	BLOWS/FT. SAMPLER	NUMBER OF RINGS	DEPTH IN FEET	SOIL GRAPH	
						0		
						1		0-12 in. 1/4 gravel to 1/2 in. gravel; minor Fe staining
						2		12 in - 18 in. black organic mix w/ brown soil; moist
						3		>18 in. refusal in quartzite and limestone boulders
						4		34% slope
						5		12 in wide profile 5% > 6 in.
						6		
						7		
						8		
						9		
						0		
						1		
						2		
						3		
						4		
						5		
						6		
						7		
						8		
						9		
						0		

DRILLING CONTR.

No.267920

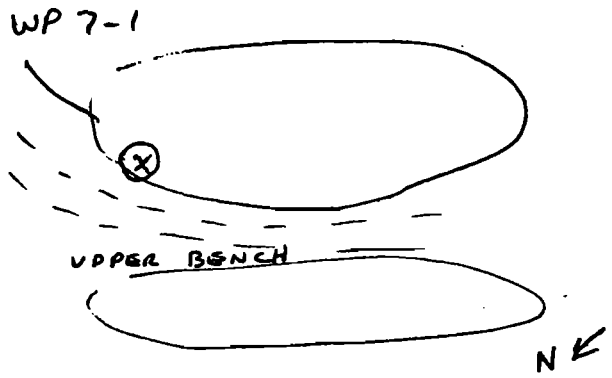
BY Dan Lincicome

CHK'D BY

DATE

626.1 (9) (REV. 11-80)

LOCATION OF BORING



JOB NO.	CLIENT	LOCATION
12330-030	VIACOM	GILMAN

DRILLING METHOD:

SAMPLING METHOD: BACKHOE

BORING NO. WP7-1

SHEET 1 OF 1

						DRILLING START	DRILLING FINISH
WATER LEVEL						TIME	TIME
TIME							1305
DATE						DATE	DATE
CASING DEPTH							8/20/96

DATUM ELEVATION

SAMPLER TYPE	INCHES DRIVEN / INCHES RECOVERED	DEPTH OF CASING	SAMPLE NO. / SAMPLE DEPTH	BLOWS/FT. SAMPLER	NUMBER OF RINGS	DEPTH IN FEET	SOIL GRAPH
						0	
						1	
						2	
						3	
						4	
						5	
						6	
						7	
						8	
						9	
						0	
						1	
						2	
						3	
						4	
						5	
						6	
						7	
						8	
						9	
						0	

SURFACE CONDITIONS:

0-7" SILTY GRAVEL - LIGHT BROWN, WELL GRADED, COMPACTED, VF - BOULDERS TO 1 FOOT, DRY, ABUND Fe STAIN, SPHALERITE, PYRITE, LIMESTONE & QUARTZITE

7" - 4'7" - COBBLES - LIMESTONE, GRAY, 1" - 1 FOOT, LOOSE, POORLY GRADED MOIST, HEAVY FE STAIN, PYRITE GALENA

4'7" - 7.0' SILTY CLAY - ORANGE BROWN, MOD PLASTICITY, VF - FINE, HEAVY Fe STAIN, MOIST

PILE SLOPE 40°

EST 30% OF ROCK > 6"

EXCAVATION WIDTH 40"

DRILLING CONTR. _____

CHK'D BY _____

DATE _____

BY _____

No. 267544

625.1 (3) (REV. 11-80)

LOCATION OF BORING

JOB NO.	CLIENT	LOCATION

DRILLING METHOD: Back-HOE

SAMPLING METHOD:

BORING NO. WP7-2

SHEET 1 OF 1

					DRILLING	
					START	FINISH
WATER LEVEL					TIME	TIME
TIME					1310.	
DATE					DATE	DATE
CASING DEPTH					8-20-96	

DATUM ELEVATION

SAMPLER TYPE	INCHES DRIVEN / INCHES RECOVERED	DEPTH OF CASING	SAMPLE NO. / SAMPLE DEPTH	BLOWS/FT. SAMPLER	NUMBER OF RINGS	DEPTH IN FEET	SOIL GRAPH	SURFACE CONDITIONS:
								Slope =
						0		Dug Profile Using Backhoe -
						1		WP7-2 located on upper Bench
								in Middle of Pile #7.
						2		Profile ~7' DEEP
						3		
								0'-2'- Brown & light Brown Sandy Soil.
						4		Gravels (limestone) to 5" Dry, No
								Mineralization, or stain.
						5		
								2'-3'- Yellowish Brown, Sandy Matrix,
						6		gravels to 4" - Iron staining on gravels.
								Moist, ~~Clayey~~ ~~Moi~~ becoming Clayey @
						7		3'.
						8		3'-4'- Clayey Material, Black (Furnace Material)
								& Brownish yellow Clay, Soft, Moist
						9		Some ~~Sandy~~ Sand, Few gravels.
						0		4'-7'- Firm Clay, ~~&~~ Brownish yellow, & Brown,
						1		Dry, Sandy, Few gravels. ~~No Staining~~
								~~or Mineralization~~ - Trace Iron Staining
						2		& Mineralization.
						3		Collect 80 lb Sample In 2 Buckets
								&
						4		Collect 3½ Buckets For Bulk
								Sample of Pile.
						5		
						6		
						7		
						8		
						9		
						0		

DRILLING CONTR. _____

No.267850

CHK'D BY _____

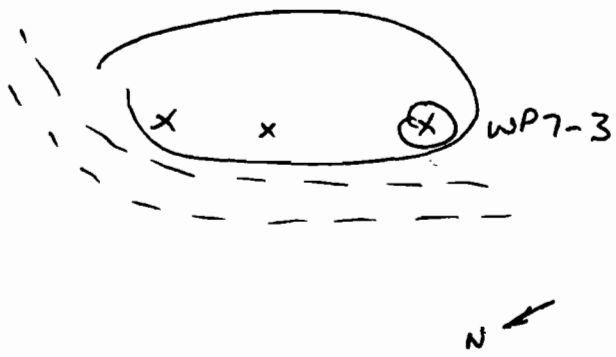
DATE _____

BY _____

625.1 (3) (REV. 11-80)

Barnes & Moore

LOCATION OF BORING



JOB NO.	CLIENT	LOCATION
12330-030	VIACOM	GILMAN

DRILLING METHOD:

BORING NO. WP 7-3

SHEET 1 OF 1

SAMPLING METHOD: BACKHOE & SHOVEL

DRILLING

	START	FINISH
TIME		1345
DATE		

WATER LEVEL				
TIME				
DATE				
CASING DEPTH				

DATUM ELEVATION

SURFACE CONDITIONS:

SAMPLER TYPE	INCHES DRIVEN / INCHES RECOVERED	DEPTH OF CASING	SAMPLE NO. / SAMPLE DEPTH	BLOWS/FT. SAMPLER	NUMBER OF RINGS	DEPTH IN FEET	SOIL GRAPH	
						0		0-18" SILTY GRAVEL - MED BROWN, ORANGE, GRAY, COMPACTED, VF TO 2" GRAVEL, 2-4" BEDDING, HEAVY Fe STAIN, BYRITE GALENA
						1		
						2		1.5 - 3.0' COBBLES LIMESTONE, 2" TO 12" GRAY, TRACE PYRITE, MOIST
						3		
						4		3.0 - 7.5' SILTY CLAY, ORANGE BROWN, LOW PLASTICITY, HEAVY Fe STAIN, PYRITE, MOIST
						5		
						6		TO 7.5'
						7		PILE SLOPE 34°
						8		~ 10% OF MATERIAL > 6"
						9		EXCAVATION WIDTH 48"
						0		
						1		
						2		
						3		
						4		
						5		
						6		
						7		
						8		
						9		
						0		

DRILLING CONTR. _____

No. 267945

CHK'D BY _____

DATE _____

625.1 (3) (REV. 11-60)

Dames & Moore

LOCATION OF BORING	JOB NO.	CLIENT	LOCATION

DRILLING METHOD:

SAMPLING METHOD:

BORING NO. WP8-1

SHEET OF

DRILLING

	START	FINISH
TIME	0920.	TIME
DATE	8-20-96	DATE

WATER LEVEL				
TIME				
DATE				
CASING DEPTH				

DATUM ELEVATION

DRILLING CONTR.

No.267843

SAMPLER TYPE	INCHES DRIVEN / INCHES RECOVERED	DEPTH OF CASING	SAMPLE NO. / SAMPLE DEPTH	BLOWS/FT. SAMPLER	NUMBER OF RINGS	DEPTH IN FEET	SOIL GRAPH
						0	
						1	
						2	
						3	
						4	
						5	
						6	
						7	
						8	
						9	
						0	
						1	
						2	
						3	
						4	
						5	
						6	
						7	
						8	
						9	
						0	

SURFACE CONDITIONS:

Dig Profile Using Backhoe Into Pile From upper Road location located ON South west upper corner.

Slope @ Profile location. - 34°

Profile 5.5' Deep.

0-1' yellow/Red Sandy Matrix with gravels to 3" Wet. Grading to all Red/Iron Stained

1'-3' - Mustard yellow & gray clayey, very soft, wet. Baked or Furnace Material? with Interbedded Red & yellow gravels to 8" gray Material Mineralized. (Sphalerite?) (No grains larger than 6" In pile

3'-4' gray Clayey Material with limestone gravels.

4'-5.5'. Reddish Brown and gray Material Clayey Material. gravels to 3" throughout. Some Roasted & Furnace Material. gray & Black. Iron Staining on most gravels throughout. Matrix medium to coarse grained.

Collect 80 lb Sample. From Entire Profile

+

Collect 1 Bucket For Bulk Sample.

BY DATE CHK'D BY

625.1 (3) (REV. 11-80)

Dames & Moore

LOCATION OF BORING	JOB NO.	CLIENT	LOCATION

DRILLING METHOD:

SAMPLING METHOD:

BORING NO. WP8-2

SHEET 1 OF 1

						DRILLING START	DRILLING FINISH
WATER LEVEL						TIME —	TIME 10:55
TIME							
DATE						DATE 8-20-96	DATE
CASING DEPTH							

DATUM ELEVATION

SAMPLER TYPE	INCHES DRIVEN / INCHES RECOVERED	DEPTH OF CASING	SAMPLE NO. / SAMPLE DEPTH	BLOWS/FT. SAMPLER	NUMBER OF RINGS	DEPTH IN FEET	SOIL GRAPH	SURFACE CONDITIONS:
								Slope = 39°
						0		Dig Profile using Back hoe Into Slope of Pile #8 -
						1		Profile locate ON Upper Road Of Pile IN Middle.
						2		Profile is 5'8" Deep & 7' Into Pile.
						3		0-1' - Brown Sandy - Medium to Coarse grain gravels to 3" - Dry
						4		
						5		1'-2.5' Brownish yellow - Clayey Matrix with about 10% gravels >2" - NONE >6"
						6		
						7		2.5'-3.5' - gray limestone gravels to 5" with white precipitate, IRON STAINED
						8		- Brown Sandy Matrix with Interpedded
						9		Brwish yellow clayey material - Some Baked & Furnace Material. Moist
						0		3.5'-4.5' Brownish yellow Matrix with limestone gravels & Baked Material,
						1		BAKED Material Black - Fine grained
						2		low Density Material, Moist.
						3		4.5'-TD. - gray Cryptalline quartzite & limestone
						4		gravels - with gray medium to Coarse grained Matrix - ~5% >6"
						5		Majority 3"-4" gravels.
						6		IRON Staining on gravels - Some Fresh. Moist.
						7		Collect 1 gallon Composite Sample From
						8		Entire profile.
						9		+ Collect 1 bucket towards Bulk Sample
						0		

DRILLING CONTR. ____ CHK'D BY ____ DATE ____ BY ____

No. 267844

625.1 (3) (REV. 11-80)

LOCATION OF BORING	JOB NO.	CLIENT	LOCATION

DRILLING METHOD:

SAMPLING METHOD:

BORING NO. WP8-3

SHEET OF

DRILLING

	START	FINISH
TIME	1030	
DATE	8-20-96.	

WATER LEVEL				
TIME				
DATE				
CASING DEPTH				

DATUM ELEVATION

DRILLING CONTR.

No.267845

SAMPLER TYPE	INCHES DRIVEN / INCHES RECOVERED	DEPTH OF CASING	SAMPLE NO. / SAMPLE DEPTH	BLOWS/FT. SAMPLER	NUMBER OF RINGS	DEPTH IN FEET	SOIL GRAPH	SURFACE CONDITIONS: Slope.
								gray - limestone gravels - gravels to 5" - Course grained Matrix
						0		
						1		Dug Profile Using Backhoe - Profile locate along upper Road - Southernmost Profile of the Three on upper Road.
						2		
						3		Profile ~ 6'3" Deep - Cut into Slope of Pile #8
						4		
						5		0-2'- gray & light gray - limestone gravels to 3" - gray & light gray & Brown Sandy Matrix. Medium to Coarse grained.
						6		
						7		2'-3'- Yellowish Brown (mustard yellow) Clayey Material very Soft, wet. - Pyrite Mineralization & Some Pockets of Eroded galena. Few gravels - Some Reddish Brown Iron Staining.
						8		
						9		
						0		
						1		3'-5.5'- Interbedded hard Clayey Materials Brownish yellow & Red (Iron Stained) Medium to Coarse grained. Some Eroded Mineralization.
						2		
						3		
						4		5.5'-TD Reddish Brown & gray Matrix Sandy, medium to Coarse grained Some gravels to 3". Iron Stained Moist.
						5		
						6		
						7		Collected 1 gallon Bag Sample + 1 Bucket towards Bulk Sample
						8		Approx 6" of Profile Not collected. hard Consolidated Layer.
						9		NO Rocks > 6" In Profile.
						0		

BY DATE CHK'D BY

625.1 (3) (REV. 11-80)

Dames & Moore

LOCATION OF BORING	JOB NO.	CLIENT	LOCATION WP8
	DRILLING METHOD:		BORING NO. WP8-4
			SHEET 1 OF 1
	SAMPLING METHOD:		DRILLING
			START / FINISH
	WATER LEVEL		TIME 1115 / TIME —
	TIME		
	DATE		DATE 8-20-96 / DATE
	CASING DEPTH		

DATUM ELEVATION

SAMPLER TYPE	INCHES DRIVEN / INCHES RECOVERED	DEPTH OF CASING	SAMPLE NO. / SAMPLE DEPTH	BLOWS/FT. SAMPLER	NUMBER OF RINGS	DEPTH IN FEET	SOIL GRAPH	SURFACE CONDITIONS: Slope ~ 24°
						0		Dug Profile Into WP #8 Using Backhoe.
						1		Profile 5'6" Deep.
						2		
						3		Profile Contains Few gravels - None > 6"
						4		0-1' Brown to light Brown Sandy Matrix. gravels (limestone) to 3" -
						5		
						6		1'-TD - Clayey Material, Moist, Sandy In Some areas, Few gravels, Reddish
						7		Brown & yellow Brown, Iron Staining, Evidence of Pyrite Mineralization, (oxidized pyrite
						8		- Some Roasted (Black) Material Throughout.
						9		@ 5' white Sandy Material - hard Surface
						0		But Crumbles ~~easily~~ Easily, Crystaline.
						1		Collect 1 gallon Bag Sample
						2		+ 1 Bucket For Bulk Sample.
						3		
						4		
						5		
						6		
						7		
						8		
						9		
						0		

DRILLING CONTR. _____ CHK'D BY _____ DATE _____ BY _____

No. 267848

625.1 (5) (REV. 11-80)

LOCATION OF BORING

JOB NO.	CLIENT	LOCATION

DRILLING METHOD:

BORING NO. WP8-5

SHEET OF

SAMPLING METHOD:

DRILLING

					START	FINISH
WATER LEVEL					TIME	TIME
TIME					1055	
DATE					DATE	DATE
CASING DEPTH					8-20-96	

DATUM ELEVATION

DRILLING CONTR.

No.267846

SAMPLER TYPE	INCHES DRIVEN / INCHES RECOVERED	DEPTH OF CASING	SAMPLE NO. / SAMPLE DEPTH	BLOWS/FT. SAMPLER	NUMBER OF RINGS	DEPTH IN FEET	SOIL GRAPH
						0	
						1	
						2	
						3	
						4	
						5	
						6	
						7	
						8	
						9	
						0	
						1	
						2	
						3	
						4	
						5	
						6	
						7	
						8	
						9	
						0	

SURFACE CONDITIONS:

Slope. 29°.

Dug Pofile Using Backhoe -

Profile 5'3" DEEP Dug Into Slope of WP #8

- located along lower Road of Pile - 2nd Profile of 5 From ~~North~~ West.

0-5'3" - Clayey Mix of Material through - Soft, Wet, Few gravel. NONE >6" Reddish Brown & yellowish Brown Some Evidence of Ended Pyrite Material - Roasted / Furnace Material / Black located at 3' - Medium grained low Density. Dry.

Collect 1 Pound Sample In Gallon Bag + Collect 1 1/2 Buckets For Column leach Bulk Sample.

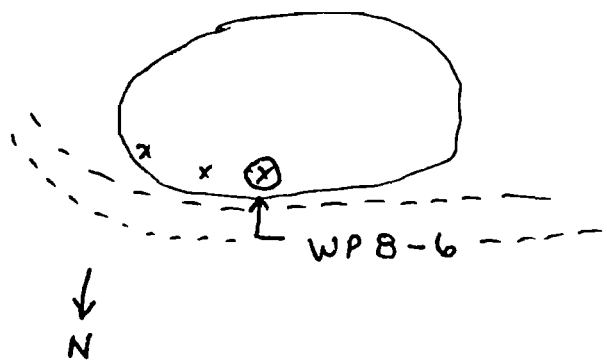
No Rocks >6" In Profile.

BY ____ CHK'D BY ____ DATE ____

625.1 (3) (REV. 11-90)

Dames & Moore

LOCATION OF BORING



JOB NO.	CLIENT	LOCATION
12330-030	VIACOM	

DRILLING METHOD:

BORING NO. WP 8-6

SHEET 1 OF 1

SAMPLING METHOD: BACKHOE

DRILLING

					START	FINISH
WATER LEVEL					TIME	TIME 1115
TIME						
DATE					DATE	DATE 8/20
CASING DEPTH						

DATUM ELEVATION

SAMPLER TYPE	INCHES DRIVEN / INCHES RECOVERED	DEPTH OF CASING	SAMPLE NO. / SAMPLE DEPTH	BLOWS/FT. SAMPLER	NUMBER OF RINGS	DEPTH IN FEET	SOIL GRAPH	SURFACE CONDITIONS:
						0		0 - 3.5', CLAYEY SILT - ORANGE BROWN, VF TO COBBLY (½" - > 1'), CHARCOAL, ABUNDANT PYRITE FINES, MOIST & LIMESTONE & QUARTZ
						1		
						2		
						3		3.5 - 7.0' GRAVELLY SILT - YELLOW, RED & BROWN, VF TO 8", WELL GRADED, LIMESTONE & QUARTZITE, MOIST, GRAVELS ARE WEATHERED / ROTTEN, PYRITE MINS, V. SULFUR ?
						4		
						5		
						6		PILE ANGLE 37°
						7		EXCAVATION WIDTH 4'
						8		~ LESS THAN 5% OF PILE > 6"
						9		
						0		
						1		
						2		
						3		
						4		
						5		
						6		
						7		
						8		
						9		
						0		

DRILLING CONTR. _____

No. 267942

CHK'D BY _____

DATE _____ BY _____

625.1 (3) (REV. 11-80)

Barnes & Moore

LOCATION OF BORING	JOB NO.	CLIENT	LOCATION

DRILLING METHOD:

SAMPLING METHOD:

BORING NO. WP8-7

SHEET 1 OF 1

					DRILLING	
					START	FINISH
WATER LEVEL					TIME	TIME
TIME					1150	
DATE					DATE	DATE
CASING DEPTH					8-20-96	

DATUM

ELEVATION

DRILLING CONTR.

No.267849

SAMPLER TYPE	INCHES DRIVEN / INCHES RECOVERED	DEPTH OF CASING	SAMPLE NO. / SAMPLE DEPTH	BLOWS/FT. SAMPLER	NUMBER OF RINGS	DEPTH IN FEET	SOIL GRAPH	SURFACE CONDITIONS:
								Slope ≈ 40°
						0		Dug Profile with Backhoe Into Slope of WP#8
						1		
						2		Took Profile [redacted] left of Trench to [redacted] Drawing (See Photos).
						3		Profile ≈ 5' [redacted]
						4		
						5		0-2'- gray Sandy Matrix - [redacted] large gravel & [redacted]s.
						6		gravels to 5" - Few >3". >6" in SIZE. gravel are
						7		lime stone.
						8		2'-3½'- Small gravel layer - ½" - Sandy Brown Matrix, Med Coarse grained
						9		
						0		3½-5' - Fine gray Sandy layer, Furnace Material? - Metallic luster grades
						1		into larger gravels - gravels to 3"
						2		with gray Sandy Matrix. Some
						3		lenses of yellow Brown Sandy Material (Pyrite) Iron Stained throughout.
						4		Collected Sample along Entire Profile. Discard 3 Rocks > 6" From Profile.
						5		Collected 1 x 1 gallons Sample
						6		+ 1½ Buckets [redacted] Bulk Sample
						7		
						8		
						9		
						0		

BY ____ DATE ____ CHK'D BY ____

625.1 (9) (REV. 11-80)

LOCATION OF BORING	JOB NO.	CLIENT	LOCATION
	12330-030	VIACOM	GILMAN

DRILLING METHOD:	BORING NO. WP 8-8
SAMPLING METHOD: BACKHOE	SHEET 1 OF 1
	DRILLING START TIME / FINISH TIME
	DRILLING START DATE / FINISH DATE 8-20

WATER LEVEL				
TIME				
DATE				
CASING DEPTH				

DATUM ELEVATION

SAMPLER TYPE	INCHES DRIVEN / INCHES RECOVERED	DEPTH OF CASING	SAMPLE NO. / SAMPLE DEPTH	BLOWS/FT. SAMPLER	NUMBER OF RINGS	DEPTH IN FEET	SOIL GRAPH	SURFACE CONDITIONS:
						0		
						1		0 - 2.0' SILTY GRAVEL - MED BROWN, WELL GRADED, VF - 4" COARSE, NO PLAST, Fe STAINING, DRY LIMESTONE + GRANITE
						2		
						3		2 - 3.0' GRAVEL - GRAY LIMESTONE POORLY GRADED, 1" - 3", TR: FE STAIN DRY TR: PYRITE
						4		
						5		3.0 - 4.5' INTERBEDDED SILTY GRAVEL + GRAVEL - WELL GRADED, VF - 3", DRY TR: Fe STAIN GRAY/BROWN
						6		
						7		4.5 - 9.0' GRAVEL - GRAY LIMESTONE + QUARTZITE POORLY GRADED, 1" - 4", DRY TR: Fe STAIN DRY
						8		
						9		7.0 - 7.5' SILTY GRAVEL - MOD WELL GRADED GRAY/BROWN, VF - 5" TR: Fe STAIN DRY
						0		
						1		
						2		
						3		
						4		
						5		
						6		
						7		
						8		
						9		
						0		

DRILLING CONTR. _____ CHK'D BY _____ DATE _____ BY _____

No. 267943

625.1 (5) (REV. 11-80)

LOCATION OF BORING

JOB NO.	CLIENT	LOCATION
12330-030	YIACOM	BEN BUTLER / TIP

DRILLING METHOD:

SAMPLING METHOD: BACKHOE & SHOVEL

BORING NO. WP 10-1

SHEET 1 OF 1

					DRILLING START	DRILLING FINISH
WATER LEVEL					TIME	TIME
TIME						1230
DATE					DATE	DATE
CASING DEPTH						8-21-96

DATUM ELEVATION

SAMPLER TYPE	INCHES DRIVEN / INCHES RECOVERED	DEPTH OF CASING	SAMPLE NO. / SAMPLE DEPTH	BLOWS/FT. SAMPLER	NUMBER OF RINGS	DEPTH IN FEET	SOIL GRAPH	SURFACE CONDITIONS:
						0		
						1		0-1.0' SILTY COBBLES - LITE YELLOW GRAY, MOD WELL GRADED, VF TO 6", LIMESTONE & QTZITE, TR Fe STAIN, PYRITE MIN., DRY
						2		
						3		1.0-3.5' GRAVEL/BOULDERS - LITE GRAY, POORLY GRADED, COARSE TO 16", LIMESTONE PYRITE MINERALIZATION, DRY
						4		
						5		3.5 - 7.5' SILTY COBBLES - LITE YELLOW GRAY, MODERATE GRADED, VF - 8", LIMESTONE & QTZITE, MODERATE SULPUR IN PILE (GOOD YELLOW SHOW), PYRITE MINERALS, SL. MOIST
						6		
						7		
						8		30-40% of MATERIAL > 6"
						9		5' WIDE EXCAVATION
						0		42° SLOPE
						1		COLLECT 2.5 x 5 gal BULK
						2		1 - 1 gal BAGGIE
						3		
						4		
						5		
						6		
						7		
						8		
						9		
						0		

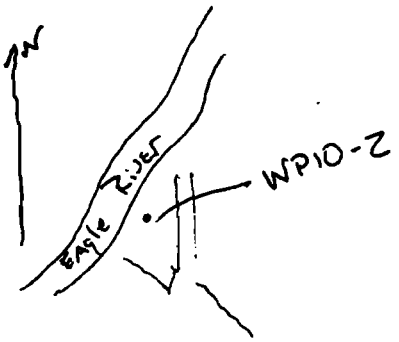
DRILLING CONTR. _____

No.267924

BY _____ DATE _____ CHK'D BY _____

625.1 (9) (REV. 11-80)

LOCATION OF BORING



JOB NO.	CLIENT	LOCATION

DRILLING METHOD:

SAMPLING METHOD:

BORING NO. WP10-2

SHEET 1 OF 1

					DRILLING	
					START	FINISH
WATER LEVEL					TIME 1255	TIME
TIME						
DATE					DATE 8-21-96	DATE
CASING DEPTH						

DATUM ELEVATION

SAMPLER TYPE	INCHES DRIVEN / INCHES RECOVERED	DEPTH OF CASING	SAMPLE NO. / SAMPLE DEPTH	BLOWS/FT. SAMPLER	NUMBER OF RINGS	DEPTH IN FEET	SOIL GRAPH
						0	
						1	
						2	
						3	
						4	
						5	
						6	
						7	
						8	
						9	
						0	
						1	
						2	
						3	
						4	
						5	
						6	
						7	
						8	
						9	
						0	

SURFACE CONDITIONS:

Slope =

Dug Profile with Back hoe Into Base of WP#10

Profile - 6½' DEEP

0 - 20" - Silty, gravels & Cobbles, well/moderately graded - Fine to Coarse grained quartzite & limestone, Pyrite Mineralization, Slightly Moist, light yellow gray

20" - TD - Rust colored, Brown, gravels and cobbles, Fine to coarse grained Matrix Dark orange Brown, Heavy Iron Staining, limestone & quartzite.

Collected 1 x 1 gallon Bag + 2½ Buckets toward Bulk Sample of Pile.

5% of Material >6" Not Collected in Sample.

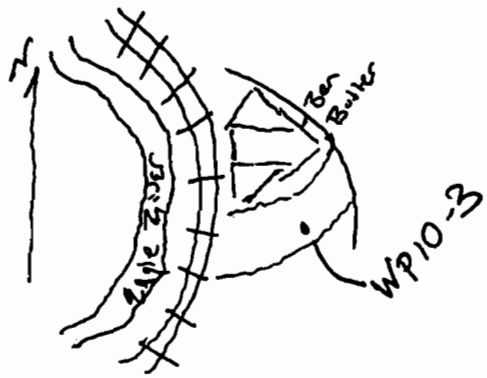
DRILLING CONTR. _____ BY _____ DATE _____ CHK'D BY _____

No. 267872

625.1 (3) (REV. 11-90)

Dames & Moore

LOCATION OF BORING



JOB NO.	CLIENT	LOCATION

DRILLING METHOD:

SAMPLING METHOD: Shovel & Pick-

BORING NO. WP10-3

SHEET 1 OF 1

					DRILLING	
					START	FINISH
WATER LEVEL					TIME	TIME
TIME					1410	
DATE					DATE	DATE
CASING DEPTH					8-21-96	

DATUM ELEVATION

SAMPLER TYPE	INCHES DRIVEN / INCHES RECOVERED	DEPTH OF CASING	SAMPLE NO. / SAMPLE DEPTH	BLOWS/FT. SAMPLER	NUMBER OF RINGS	DEPTH IN FEET	SOIL GRAPH
						0	
						1	
						2	
						3	
						4	
						5	
						6	
						7	
						8	
						9	
						0	
						1	
						2	
						3	
						4	
						5	
						6	
						7	
						8	
						9	
						0	

SURFACE CONDITIONS:

Slope = 35-40°
Excavator width = 3'

Dug Profile to ~4' (Couldn't go any deeper - Hole Caving in -

0-4'. Surface Materials - limestone - very weathered - Sulfur Staining. Some Pyrite very weathered.
From 1" to Base of Profile Sandy gravels & Cobbles

~ 5-10% > 6" Not Collected in Sample

Matrix light gray to gray. Course grained Some layers & Pockets of yellowish orange sandy material very soft. Iron Stained.
- Pyrite Mineralization throughout Profile.

gravels to 3" throughout -

Collect - 1 x 1 gallon Bag Sample
+
2 ½ Buckets for Bulk Sample of Entire Profile.

DRILLING CONTR. _____

No.267934

BY _____ DATE _____ CHK'D BY _____

825.1 (3) (REV. 11-80)

LOCATION OF BORING

JOB NO.	CLIENT	LOCATION
	VIACOM	BB / TT

DRILLING METHOD: PICK

BORING NO. WP10-4

SHEET 1 OF 1

SAMPLING METHOD: PICK + SHOVEL

					DRILLING	
					START	FINISH
WATER LEVEL					TIME	TIME 1400
TIME						
DATE					DATE	DATE 8-21-96
CASING DEPTH						

DATUM ELEVATION

SAMPLER TYPE	INCHES DRIVEN / INCHES RECOVERED	DEPTH OF CASING	SAMPLE NO. / SAMPLE DEPTH	BLOWS/FT. SAMPLER	NUMBER OF RINGS	DEPTH IN FEET	SOIL GRAPH
						0	
						1	
						2	
						3	
						4	
						5	
						6	
						7	
						8	
						9	
						0	
						1	
						2	
						3	
						4	
						5	
						6	
						7	
						8	
						9	
						0	

SURFACE CONDITIONS: TD 4.5'

0-8" SILTY COBBLES - LTBRN/GRAY, MOD WELL GRADED, VF TO 8" CONSOLIDATED, LIMESTONE + QUARTZ, FE STAIN ON LARGER ROCK SURFACES DRY, ~~NO OTHER~~ MINERALIZATION SL. PYRITE

8" - 4.5'
COBBLY SILT - LT YELLOW BROWN POOR GRADING, VF - 10", LIMESTONE, HEAVY SULFUR STAIN AND FE STAIN, ABUND. PYRITE / MARCASITE, SL MOIST

TD 4.5'

35° SLOPE

~ 10% OF MATERIALS > 6"

EXCAVATION WIDTH 1.0'

SAMP 1 gal DAGGER
2.5 X 5 gal BUCKET
COMP.
BULK

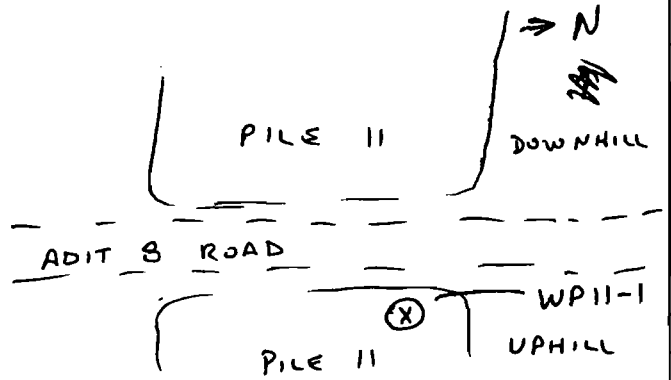
DRILLING CONTR. _____ CHK'D BY _____ DATE _____ BY _____

N0267975

625.1 (3) (REV. 11-80)

Dames & Moore

LOCATION OF BORING



JOB NO.	CLIENT	LOCATION
12330-030	VIACOM	ROCK CREEK

DRILLING METHOD:

BORING NO. WP 11-1

SHEET 1 OF 1

SAMPLING METHOD:

DRILLING

					START	FINISH
WATER LEVEL					TIME	TIME
TIME						0905
DATE					DATE	DATE
CASING DEPTH						8-21-96

DATUM ELEVATION

SURFACE CONDITIONS: ROCK

SAMPLER TYPE	INCHES DRIVEN / INCHES RECOVERED	DEPTH OF CASING	SAMPLE NO. / SAMPLE DEPTH	BLOWS/FT. SAMPLER	NUMBER OF RINGS	DEPTH IN FEET	SOIL GRAPH	
						0		0-14" SILTY GRAVEL - LIGHT ORANGE BROWN,
						1		WELL GRADED, VF - V COARSE, COMPACTE
								GRAVEL TO 4", LIMESTONE W/ Fe
						2		STAIN, NO MINERALIZATION, DRY
						3		14" - 6' 7" BOULDERS/GRAVEL - LIGHT YELLOW BROW
								GRAY, POORLY GRADED, V COARSE
						4		(1" - 16"), LIMESTONE W/ Fe
								STAIN OCCASIONALLY ON ROCK FACES,
						5		NO MINERALIZATION, DRY
						6		6' 7" - 9.0' SILTY COBBLES - DARK RED BROW
								MOD GRADED, VF - V CRS (TO 5")
						7		SOME BLACK ROASTER TYPE FINES,
								LIMESTONE, NO MINERALIZATION, SL.
						8		MOIST
						9		41° SLOPE
						0		50-60% OF X SECTION > 6"
						1		EXCAVATION WIDTH 60"
						2		COLLECT 2-5 GAL FOR BULK
								1-1 GAL FOR BAGGIE
						3		
						4		
						5		
						6		
						7		
						8		
						9		
						0		

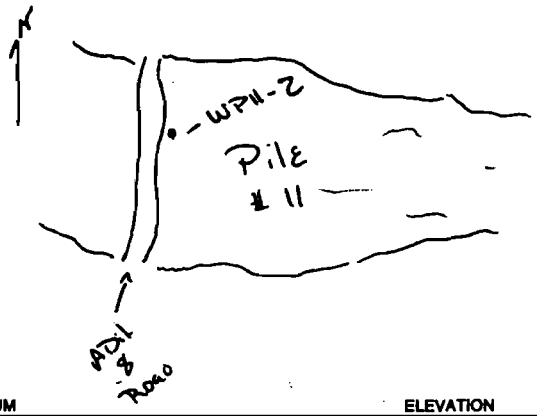
DRILLING CONTR. _____ BY _____ DATE _____ CHK'D BY _____

No.267921

625.1 (3) (REV. 11-80)

Dames & Moore

LOCATION OF BORING



JOB NO.	CLIENT	LOCATION

DRILLING METHOD:

BORING NO. WP11-2

SHEET 1 OF 1

SAMPLING METHOD: Back-Hoe & Shovel.

DRILLING

WATER LEVEL					START TIME	FINISH TIME
TIME					0935.	
DATE					DATE 8-21-96	DATE
CASING DEPTH						

DATUM ELEVATION

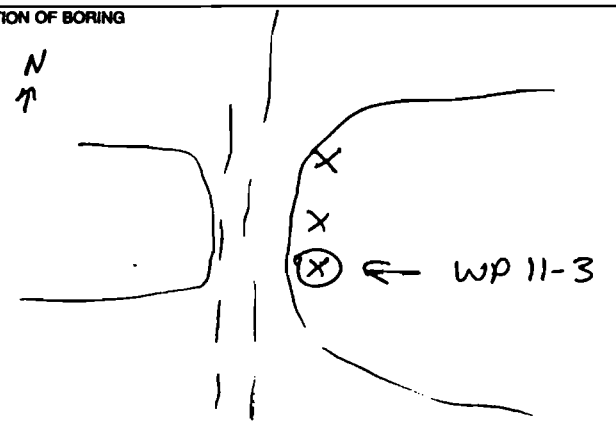
SAMPLER TYPE	INCHES DRIVEN / INCHES RECOVERED	DEPTH OF CASING	SAMPLE NO. / SAMPLE DEPTH	BLOWS/FT. SAMPLER	NUMBER OF RINGS	DEPTH IN FEET	SOIL GRAPH	SURFACE CONDITIONS: Slope = 50°
						0		Dug Profile using Backhoe into WP#1
						1		From Adit #8 Road.
						2		Profile located 2" in from North
								Edge of Pile
						3		Profile 6' 5" Tall.
						4		0-2'- Silty Cobbles & gravel, Iron Staining
						5		Copper Mineralization, and Some
								Pyrite tenses. Dry
						6		
						7		2'-4 1/2'- Sandy Clay Material, Brownish yellow
								and Reddish Brown, Soft Medium to Coarse
						8		grained, Moist. - Pyrite, Copper Mineralization
								Some Iron staining - Some large >6" boulders
						9		4 1/2'-6 1/2'- Reddish Brown, Clayey Material
						0		Firm, moist, Iron staining, Pyrite & Copper
								Cobbles & Boulders > 6" throughout.
						1		5% of Profile greater than 6" - Not collected
						2		In Sample
						3		Collect 80 lb Sample
						4		+
								Collect 2 Buckets toward Bulk Sample
						5		
						6		
						7		
						8		
						9		
						0		

DRILLING CONTR. _____ CHK'D BY _____ DATE _____

No. 67531

625.1 (3) (REV. 11-80)

LOCATION OF BORING



JOB NO.	CLIENT	LOCATION
12370-070	VIACOM	ROCK CK

DRILLING METHOD:

BORING NO. WP 11-3

SHEET 1 OF 1

SAMPLING METHOD: BACKHOE/SHOVEL

					DRILLING START	DRILLING FINISH
WATER LEVEL					TIME	TIME
TIME						0945
DATE					DATE	DATE
CASING DEPTH						8/21/96

DATUM ELEVATION

SAMPLER TYPE	INCHES DRIVEN / INCHES RECOVERED	DEPTH OF CASING	SAMPLE NO. / SAMPLE DEPTH	BLOWS/FT. SAMPLER	NUMBER OF RINGS	DEPTH IN FEET	SOIL GRAPH	SURFACE CONDITIONS:
						0		0 - 1' SILTY COBBLES/GRAVEL - GRAY/ORANGE,
						1		MOD. POOR GRADED, VF TO V COARSE (3")
								LIMESTONE + QUARTZITE, COPPER MINS,
						2		SL. FE STAIN, DRY
						3		1-2' SILTY GRAVEL - ORANGE BROWN, POORLY
								GRADED, VF TO COARSE (2"), LIMESTONE
						4		PYRITE, HEAVY FE STAIN, SL MOIST
						5		2-1' SILTY BOULDERS/COBBLES - RED BROWN
								POORLY GRADED, VF TO V COARSE (12")
						6		LIME STONE + QUARTZITE, CU MINS,
								TR PYRITE, HEAVY FE STAIN ON SURFACES,
						7		SL MOIST
						8		43° SLOPE
						9		10% OF MATERIAL > 6" SIZE
						0		
								EXCAVATION 4' WIDE
						1		
						2		COLLECT 2 - 5 gal FOR BULK
								1 - 1 gal BAGGIE
						3		
						4		
						5		
						6		
						7		
						8		
						9		
						0		

DRILLING CONTR. _____

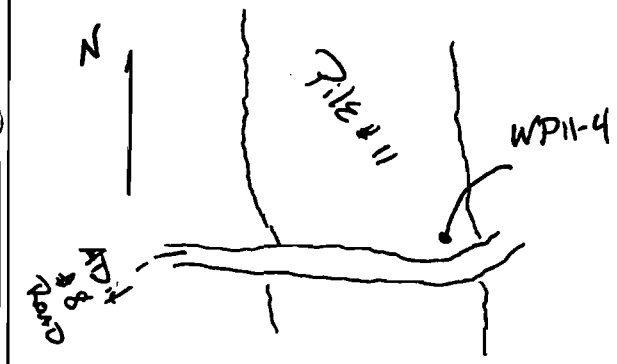
No.267922

BY _____ DATE _____ CHK'D BY _____

625.1 (3) (REV. 11-80)

Barnes & Moore

LOCATION OF BORING



JOB NO.	CLIENT	LOCATION

DRILLING METHOD:

SAMPLING METHOD: Backhoe & Shovel

BORING NO. WP11-4

SHEET 1 OF 1

DRILLING

START TIME	FINISH TIME
1005	
DATE 8-21-96	DATE

WATER LEVEL				
TIME				
DATE				
CASING DEPTH				

DATUM ELEVATION

SAMPLER TYPE	INCHES DRIVEN / INCHES RECOVERED	DEPTH OF CASING	SAMPLE NO. / SAMPLE DEPTH	BLOWS/FT. SAMPLER	NUMBER OF RINGS	DEPTH IN FEET	SOIL GRAPH
						0	
						1	
						2	
						3	
						4	
						5	
						6	
						7	
						8	
						9	
						0	
						1	
						2	
						3	
						4	
						5	
						6	
						7	
						8	
						9	
						0	

SURFACE CONDITIONS:

Slope = 54°

Dug Profile Into slope of WP#1 From ADit #8 ROAD using Backhoe.

Profile 5'5" DEEP

— top ~1" HARD Crusty layer Sandy, light Brown, gravels to 2" - limestone. Dry

1"-1½' Sandy Material - yellowish Brown, Medium to Coarse grained, IRON Stained, NO Mineralization

- gray Sandy gravel layer, 2" gravels, Some Galena,

1½' - Base — Brown, Sandy gravels and cobbles IRON Stained, NO Mineralization, Moist.

Collected 1 x 1 gallon Bag

2 Buckets toward Bulk Sample.

10% greater than 6" Not Collected in Sample.

DRILLING CONTR. _____

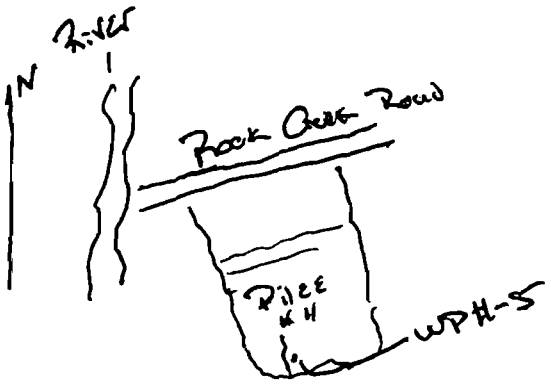
CHK'D BY _____

DATE _____

No. 267533

625.1 (9) (REV. 11-80)

LOCATION OF BORING



JOB NO.	CLIENT	LOCATION

DRILLING METHOD:

SAMPLING METHOD:

BORING NO. WP11-5

SHEET OF

DRILLING

	START	FINISH
TIME	1305	TIME
DATE	8-22-96	DATE

WATER LEVEL				
TIME				
DATE				
CASING DEPTH				

DATUM ELEVATION

SAMPLER TYPE	INCHES DRIVEN / INCHES RECOVERED	DEPTH OF CASING	SAMPLE NO. / SAMPLE DEPTH	BLOWS/FT. SAMPLER	NUMBER OF RINGS	DEPTH IN FEET	SOIL GRAPH	SURFACE CONDITIONS:
								Slope of Profile ~ 65-70°
						0		Dug Profile Into Slope of Very DEEP
								Drainage on Upper South Section
						1		of WP #11
						2		Surface of Pile - light gray & gray lime
						3		Stone gravels with gray Sandy Matrix.
						4		Profile - Homogeneous Section of Sandy
								gravels - gravels limestone, Sand medium
						5		to coarse grained - Minor Pyrite
								Mineralization, IRON Staining throughout.
						6		Dry, Brown, to light Brown & gray
								Near Base of Profile - (± 6') Increased
						7		amount of larger lime stone gravels - (3-4")
						8		<5% >6" Rocks in Profile
								- Not collected In sample
						9		Excavation 7' DEEP
						0		17" WIDE.
						1		- Collected 1x 1 gallon Bag Sample &
								1x 1 5 gallon Bucket For Bulk
						2		Sample of PILE.
						3		
						4		
						5		
						6		
						7		
						8		
						9		
						0		

DRILLING CONTR. _____

No.267876

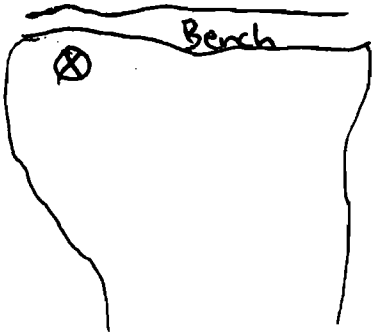
BY _____ DATE _____ CHK'D BY _____

625.1 (3) (REV. 11-80)

Dames & Moore

LOCATION OF BORING

N ←



JOB NO.	CLIENT	LOCATION
12330-099-030	Viacom	WP11-6

DRILLING METHOD: Hand excavation

BORING NO.

SHEET 1 OF 1

SAMPLING METHOD:

DRILLING

					START	FINISH
WATER LEVEL					TIME	TIME
TIME						
DATE					DATE	DATE 8/22/96
CASING DEPTH						

DATUM ELEVATION

SURFACE CONDITIONS: Limestone gravel w/ limestone matrix

SAMPLER TYPE	INCHES DRIVEN / INCHES RECOVERED	DEPTH OF CASING	SAMPLE NO. / SAMPLE DEPTH	BLOWS/FT. SAMPLER	NUMBER OF RINGS	DEPTH IN FEET	SOIL GRAPH	
						0		0-16in - Limestone gravel w/ limestone matrix; minor Fe staining
						1		16in-23in. - yellow and brownish yellow limestone; Fe staining - sulfur
						2		23in - TD 2' Limestone gravel w/ limestone matrix; gravels: ½ in. - 3in.; minor Fe staining; some 2in. quartzite; minor sulfur
						3		
						4		
						5		TD = 5 ft Excavation width = 12in. 38° slope 29% > 4in.
						6		
						7		
						8		
						9		
						0		
						1		
						2		
						3		
						4		
						5		
						6		
						7		
						8		
						9		
						0		

DRILLING CONTR. _____

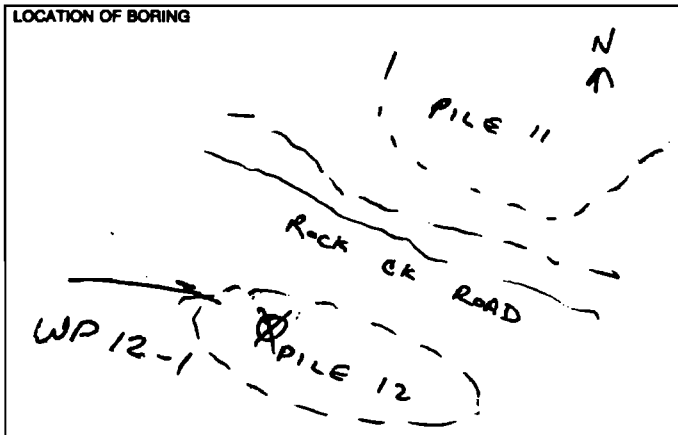
BY Jean Crilcombe CHK'D BY _____ DATE _____

No. 267802

625.1 (3) (REV. 11-80)

Dames & Moore

LOCATION OF BORING



DATUM ELEVATION

JOB NO.	CLIENT	LOCATION
12330-030	VIACOM	ROCK CK

DRILLING METHOD:

SAMPLING METHOD:

BORING NO. WP 12-1

SHEET 1 OF 1

					DRILLING	
					START	FINISH
WATER LEVEL					TIME	TIME
TIME						10 10
DATE					DATE	DATE
CASING DEPTH						8-21-96

SAMPLER TYPE	INCHES DRIVEN / INCHES RECOVERED	DEPTH OF CASING	SAMPLE NO. / SAMPLE DEPTH	BLOWS/FT. SAMPLER	NUMBER OF RINGS	DEPTH IN FEET	SOIL GRAPH	SURFACE CONDITIONS:
						0		0-1.0' SILTY GRAVEL/COBBLES - MEDIUM BROWN
						1		WELL GRADED, VF - V.CRSE (6")
								LIMESTONE & QUARTZITE, TR Fe
						2		STAIN, DRY
						3		10-~~4~~8.0' SILTY BOULDERS - MEDIUM BROWN
								MOD. GRADED, VF - EXTREMELY CRS (2.5')
						4		LIMESTONE & QUARTZITE, TR: Fe STAIN
								SULFUR ON LIME SURFACES, DRY TO
						5		SL. MOIST
						6		SLOPE ~ 8°
						7		40-50% OF MATERIAL > 6"
						8		EXCAVATION: 8' x 5.5'
						9		
						0		
						1		COLLECT 5 5-gal FOR BULK
								2 5-gal FOR BOX
						2		
						3		
						4		
						5		
						6		
						7		
						8		
						9		
						0		

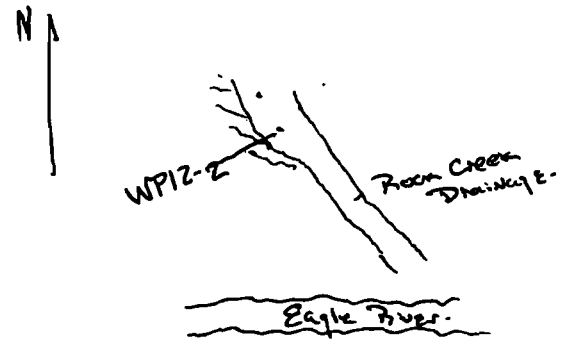
DRILLING CONTR. _____

No.267923

BY _____ DATE _____ CHK'D BY _____

625.1 (2) (REV. 11-80)

LOCATION OF BORING



JOB NO.	CLIENT	LOCATION

DRILLING METHOD:

BORING NO. WP12-2

SHEET 1 OF 1

SAMPLING METHOD: Back Hoe & Shovel.

DRILLING

	START	FINISH
TIME	1125	TIME
DATE	8-21-96	DATE

WATER LEVEL				
TIME				
DATE				
CASING DEPTH				

DATUM ELEVATION

SAMPLER TYPE	INCHES DRIVEN / INCHES RECOVERED	DEPTH OF CASING	SAMPLE NO. / SAMPLE DEPTH	BLOWS/FT. SAMPLER	NUMBER OF RINGS	DEPTH IN FEET	SOIL GRAPH
						0	
						1	
						2	
						3	
						4	
						5	
						6	
						7	
						8	
						9	
						0	
						1	
						2	
						3	
						4	
						5	
						6	
						7	
						8	
						9	
						0	

SURFACE CONDITIONS:

Slope = 12°

Dug 4 1/2' Pit into Pile on West Side of Rock Creek Drainage

0'-2 1/2' - Brown & light Brown Sandy gravels & Cobbles - Trace Iron Staining, No Mineralization visible. Dry, becoming Moist @ 2'

2 1/2' - 3' - yellow / yellow Brown Sandy Material. Pyrite, Some galena - Iron Stained & copper. Medium to Coarse grained with gravels & cobbles

3' - 4 1/2 - gray, Sand & clayey Material. Some silt, gravels to 3". Some Pockets of Yellow (Broken Pyrite) Soft, Moist. Iron Staining.

15% of Material greater than 6" - Not Collected as part of Samples.

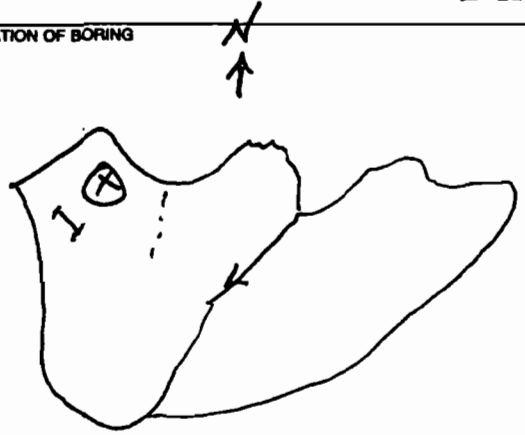
Collected 1x 1 gallon Bag Sample + 5 Buckets labeled Bulk Sample of Pile #12

DRILLING CONTR. _____ CHK'D BY _____ DATE _____ BY _____

No. 267932

625.1 (3) (REV. 11-90)

LOCATION OF BORING



JOB NO.	CLIENT	LOCATION
12330-099-030	Viacom	WP 13-1

DRILLING METHOD: Hand excavation

BORING NO.

SHEET 1 OF 1

SAMPLING METHOD:

DRILLING

	START	FINISH
TIME		
DATE		8/22/96

WATER LEVEL				
TIME				
DATE				
CASING DEPTH				

DATUM

ELEVATION

SURFACE CONDITIONS: Brown gravelly sand

SAMPLER TYPE	INCHES DRIVEN / INCHES RECOVERED	DEPTH OF CASING	SAMPLE NO. / SAMPLE DEPTH	BLOWS/FT. SAMPLER	NUMBER OF RINGS	DEPTH IN FEET	SOIL GRAPH	
						0		Homogeneous
								0 – 36 in – sandy gravel – brownish yellow. Fe
						1		staining; gravel ½ – 3 in. quartzite;
								Cu mineralization; minor coated material
						2		
						3		Refusal @ 3 ft
								Slope = 54°
						4		Excavation width = 10 in.
								5% > 6 in diameter
						5		
						6		
						7		
						8		
						9		
						0		
						1		
						2		
						3		
						4		
						5		
						6		
						7		
						8		
						9		
						0		

DRILLING CONTR.

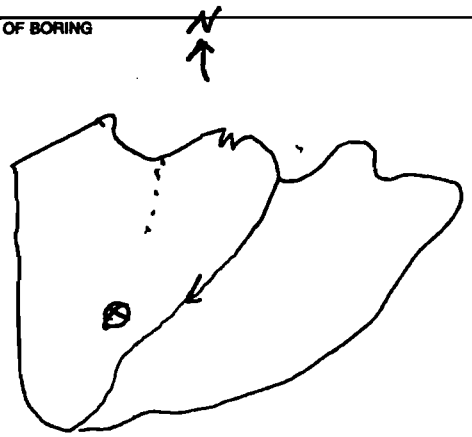
No.267860

BY Dean Lincicome CHK'D BY

DATE

625.1 (3) (REV. 11-80)

LOCATION OF BORING



JOB NO.	CLIENT	LOCATION
2330-099-030	Viacom	WP 13-3

DRILLING METHOD: Hand excavation

BORING NO.

SHEET 1 OF 1

SAMPLING METHOD:

DRILLING

					START	FINISH
WATER LEVEL					TIME	TIME
TIME						
DATE					DATE	DATE 8/22/96
CASING DEPTH						

DATUM

ELEVATION

SURFACE CONDITIONS: Brown sand and quartzite cobbles + boulders

SAMPLER TYPE	INCHES DRIVEN / INCHES RECOVERED	DEPTH OF CASING	SAMPLE NO. / SAMPLE DEPTH	BLOWS/FT. SAMPLER	NUMBER OF RINGS	DEPTH IN FEET	SOIL GRAPH	
						0		Homogeneous; brown silt + sand w/ quartzite gravel;
						1		some quartzite gravels appear coated; No major mineralization; minor Cu mineralization
						2		
						3		minor Fe stain @ 3ft.
						4		TD = 41 in.
						5		Excavation 18 in. wide slope = 43° 5% > 6 in.
						6		
						7		
						8		
						9		
						0		
						1		
						2		
						3		
						4		
						5		
						6		
						7		
						8		
						9		
						0		

DRILLING CONTR. _____

CHK'D BY _____

DATE _____

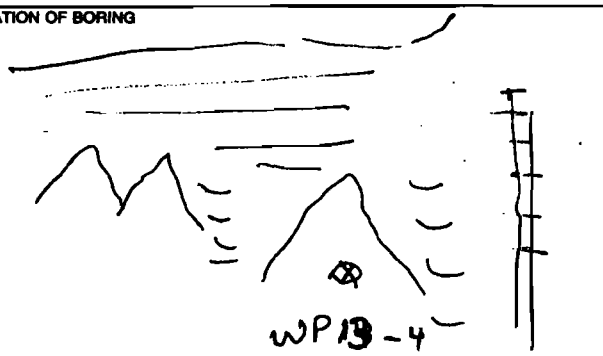
BY _____

No. 267001

625.1 (3) (REV. 11-90)

Dames & Moore

LOCATION OF BORING



1ST PILE W. OF GULLEY BY RAIL STRUCTURES

JOB NO.	CLIENT	LOCATION
12330-030	VIACOM	BERDEN

DRILLING METHOD:

SAMPLING METHOD: PICK + SHOVEL

BORING NO. WP13-4

SHEET 1 OF 1

					DRILLING START TIME	DRILLING FINISH TIME
WATER LEVEL						
TIME						0945
DATE					DRILLING DATE	DRILLING DATE
CASING DEPTH						8-22-96

DATUM ELEVATION

SURFACE CONDITIONS:

SAMPLER TYPE	INCHES DRIVEN / INCHES RECOVERED	DEPTH OF CASING	SAMPLE NO. / SAMPLE DEPTH	BLOWS/FT. SAMPLER	NUMBER OF RINGS	DEPTH IN FEET	SOIL GRAPH	
						0		0-11" SILTY GRAVEL/COBBLES - LT TO MED YELLOW BROWN, MOD WELL GRADED, VF TO 3", FE STAIN IN PARTS, LIMESTONE & QUARTZITE COMPACTED, DRY TRACE: PYRITE
						1		
						2		
						3		11"-2' GRAVELS/BOULDERS - LITE GRAY BROWN MOD POORLY GRADED, COARSE TO V. COARSE (1 W/ MINOR FINES, LIMESTONE, SULFUR ON ROCK FACES IN PARTS, OCC. FE STAIN, DRY. NO OTHER MINERALIZATION
						4		
						5		
						6		2.0-3.5' SILTY COBBLES - MEDIUM BROWN WELL GRADED, VF TO V COARSE (6") OCC. WEATHERED PYRITE W/ HEAVY FE STAIN, MOIST
						7		
						8		
						9		3.5-4.5 SILTY SAND - MEDIUM BROWN POORLY GRADED, VF TO F GR (SOME ½ GRAVEL) ← LIMESTONE, MOIST NO MINERALIZATION/STAIN LOOKS LIKE DIRT
						0		
						1		
						2		TD 4.5' ENCOUNTER REFUSAL @ BIG ROCK
						3		SLOPE 48°
						4		20" HOLE WIDTH
						5		15-20% OF MATERIAL > 6"
						6		COLLECT 2 x 5 gal BUCKETS (90%)
						7		
						8		
						9		
						0		

DRILLING CONTR. _____

No.267926

BY _____ DATE _____ CHK'D BY _____

625.1 (9) (REV. 11-80)

Dames & Moore

LOCATION OF BORING

N

Pyrites Bldg

JOB NO.	CLIENT	LOCATION
12330-099-030	Viacom	WP14-1

DRILLING METHOD: Hand excavation

BORING NO.

SHEET 1 OF 1

SAMPLING METHOD:

					DRILLING START	DRILLING FINISH
WATER LEVEL					TIME	TIME
TIME						
DATE					DATE	DATE 8/20/96
CASING DEPTH						

DATUM

ELEVATION

SURFACE CONDITIONS: Pyrite

SAMPLER TYPE	INCHES DRIVEN / INCHES RECOVERED	DEPTH OF CASING	SAMPLE NO. / SAMPLE DEPTH	BLOWS/FT. SAMPLER	NUMBER OF RINGS	DEPTH IN FEET	SOIL GRAPH	
						0		0-1ft pyrite
						1		12in - 17in yellow boy 17in - 36in - brown & yellow brown sand size material
						2		Fe stained, pyritic
						3		refusal on cribbing @ 3ft.
						4		18% slope
						5		18 in wide profile 0% > 6in.
						6		
						7		
						8		
						9		
						0		
						1		
						2		
						3		
						4		
						5		
						6		
						7		
						8		
						9		
						0		

DRILLING CONTR.

No. 267914

CHK'D BY

DATE

BY

625.1 (5) (REV. 11-80)

Dames & Moore

LOCATION OF BORING

JOB NO.	CLIENT	LOCATION
22330-099-030	Viacom	WP14-2

DRILLING METHOD: Hand excavation

BORING NO.

SHEET 1 OF 1

SAMPLING METHOD:

DRILLING

					START TIME	FINISH TIME
WATER LEVEL						
TIME						
DATE					DATE	DATE 8/20/96
CASING DEPTH						

DATUM ELEVATION

SURFACE CONDITIONS: Fine tailings or roaster material

SAMPLER TYPE	INCHES DRIVEN / INCHES RECOVERED	DEPTH OF CASING	SAMPLE NO. / SAMPLE DEPTH	BLOWS/FT. SAMPLER	NUMBER OF RINGS	DEPTH IN FEET	SOIL GRAPH	
						0		
						1		
						2		0-2 ft brwn to dark gray fine grained tails or roaster material, very pyritic
						3		2-3 ft brownish yellow; Fe stain; majority greater than 6in in diameter; limestone and quartzite
						4		
						5		Refusal @ 3 ft.
						6		33% greater than 6in diameter 30% slope 18in wide profile
						7		
						8		
						9		
						0		
						1		
						2		
						3		
						4		
						5		
						6		
						7		
						8		
						9		
						0		

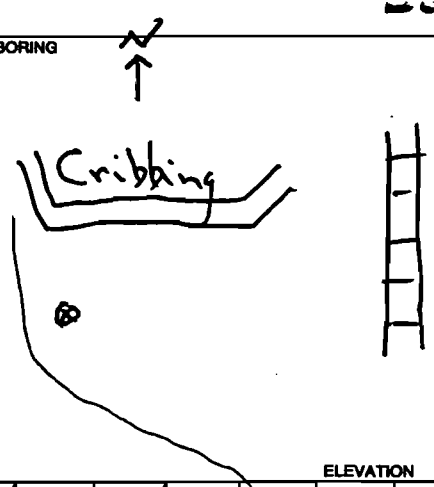
DRILLING CONTR. _____

No.267915

BY Dan Lincicome DATE _____ CHK'D BY _____

623.1 (3) (REV. 11-80)

LOCATION OF BORING



JOB NO.	CLIENT	LOCATION
12330-099-030	Vicom	WP14-3

DRILLING METHOD: Hand excavation

BORING NO.

SHEET 1 OF 1

SAMPLING METHOD:

DRILLING

					START	FINISH
WATER LEVEL					TIME	TIME
TIME						
DATE					DATE	DATE 8/20/96
CASING DEPTH						

DATUM ELEVATION

SURFACE CONDITIONS: Colluvium and cobble & boulder wasteroek

SAMPLER TYPE	INCHES DRIVEN / INCHES RECOVERED	DEPTH OF CASING	SAMPLE NO. / SAMPLE DEPTH	BLOWS/FT. SAMPLER	NUMBER OF RINGS	DEPTH IN FEET	SOIL GRAPH	
						0		0-1.5ft - hodgepodge; pyritic; sand size to ¼ in.; Fe staining; brown, yellow, brownish yellow; yellowish red
						1		1.5 to TD - dark gray, fine grained, tails or coarser material.
						2		Base = yellow sand size material
						3		
						4		Refusal @ 3.5 ft on boulder
						5		Excavation 18 in. wide
						6		16% slope
						7		190 > 6 in
						8		
						9		
						0		
						1		
						2		
						3		
						4		
						5		
						6		
						7		
						8		
						9		
						0		

DRILLING CONTR. _____

CHK'D BY _____

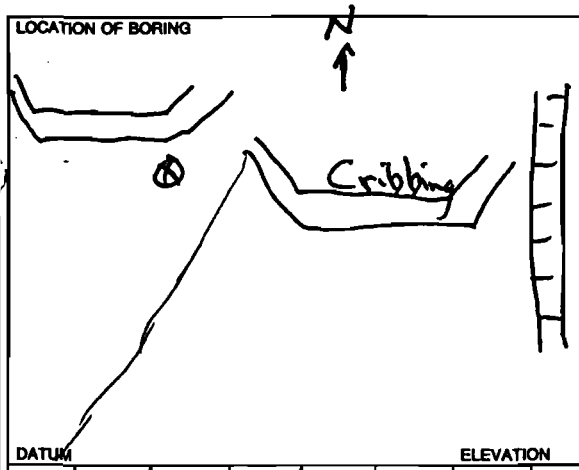
DATE _____

BY Jay Lindsey

No. 267853

623.1 (3) (REV. 11-90)

LOCATION OF BORING



JOB NO.	CLIENT	LOCATION
12330-099-030	Viacom	W114-4

DRILLING METHOD: Hand excavation

BORING NO.

SHEET 1 OF 1

SAMPLING METHOD:

DRILLING

					START	FINISH
WATER LEVEL					TIME	TIME
TIME						
DATE					DATE	DATE 8/20/96
CASING DEPTH						

DATUM ELEVATION

SURFACE CONDITIONS: Waste rock

SAMPLER TYPE	INCHES DRIVEN / INCHES RECOVERED	DEPTH OF CASING	SAMPLE NO. / SAMPLE DEPTH	BLOWS/FT. SAMPLER	NUMBER OF RINGS	DEPTH IN FEET	SOIL GRAPH	
						0		0-32 in. - brownish yellow to yellow sand size material; Fe staining; pyritic; minor ½ in gravel top 3 in.
						1		
						2		32-52 in - gray sand size material w/quartzite cobbles; minor yellow boy; wet
						3		
						4		Refusal @ 52 in.
						5		excavation 10 in. wide
						6		39% slope
						7		19° > 6 in
						8		
						9		
						0		
						1		
						2		
						3		
						4		
						5		
						6		
						7		
						8		
						9		
						0		

DRILLING CONTR. _____

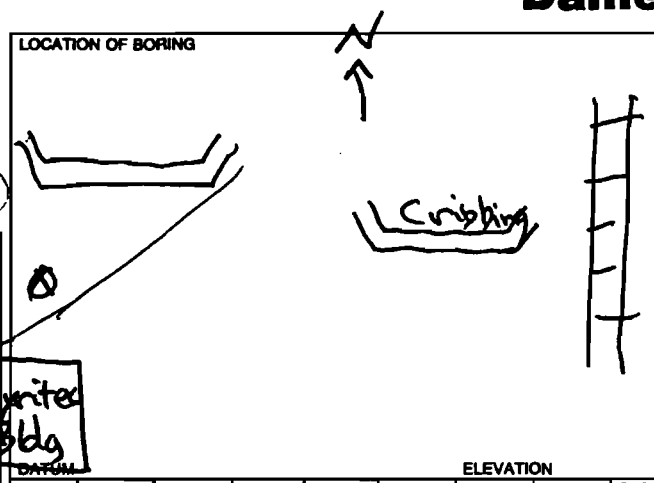
No.267854

BY Dan Lincicome CHK'D BY _____ DATE _____

625.1 (3) (REV. 11-80)

Dames & Moore

LOCATION OF BORING



DATUM

ELEVATION

JOB NO.	CLIENT	LOCATION
12330-099-030	Vincom	WP14-5

DRILLING METHOD: Hand excavation

BORING NO.

SHEET 1 OF 1

SAMPLING METHOD:

DRILLING

					START TIME	FINISH TIME
WATER LEVEL						
TIME						
DATE					DATE	DATE 8/2/96
CASING DEPTH						

SURFACE CONDITIONS: Sand & quartzite and granite boulder

SAMPLER TYPE	INCHES DRIVEN / INCHES RECOVERED	DEPTH OF CASING	SAMPLE NO. / SAMPLE DEPTH	BLOWS/FT. SAMPLER	NUMBER OF RINGS	DEPTH IN FEET	SOIL GRAPH	
						0		0-20 in. - brown sandy material w/clay and quartzite gravels; Fe staining
						1		
						2		20 in. to TD - brownish yellow sandy gravel; Fe staining; minor gray limestone; pyritic; moist; light green precipitate on quartzite
						3		
						4		Refusal on boulder @ 42 in
						5		20 in. wide excavation 34° slope 190 lin.
						6		
						7		
						8		
						9		
						0		
						1		
						2		
						3		
						4		
						5		
						6		
						7		
						8		
						9		
						0		

DRILLING CONTR.

No. 207857

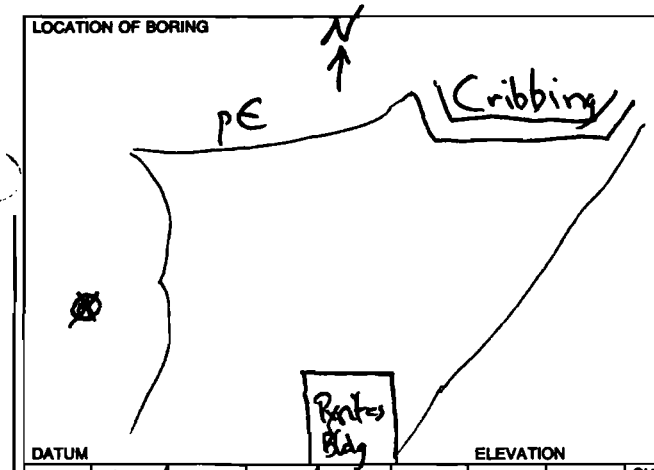
CHK'D BY

DATE

BY

025.1 (3) (REV. 11-90)

LOCATION OF BORING



JOB NO.	CLIENT	LOCATION
12330-049-030	Viacom	WP 14-6

DRILLING METHOD: Hand excavation

BORING NO.

SHEET 1 OF 1

SAMPLING METHOD:

					DRILLING	
					START	FINISH
WATER LEVEL					TIME	TIME
TIME						
DATE					DATE	DATE 8/21/90
CASING DEPTH						

DATUM

ELEVATION

SURFACE CONDITIONS: Sand and gravel; pyritic

SAMPLER TYPE	INCHES DRIVEN / INCHES RECOVERED	DEPTH OF CASING	SAMPLE NO. / SAMPLE DEPTH	BLOWS/FT. SAMPLER	NUMBER OF RINGS	DEPTH IN FEET	SOIL GRAPH	
						0		0-18 in. brown, brownish yellow sand w/ granite gravel, Fe staining; pyritic
						1		
						2		18 in. to TD – mottled dark brown to dark gray fine grained rooster and yellow sand w/ granite (coarse); pyritic
						3		
						4		Refusal @ 40 in.
						5		Slope = 34°
						6		Excavation width = 18 in.
						7		1% > 6 in.
						8		
						9		
						0		
						1		
						2		
						3		
						4		
						5		
						6		
						7		
						8		
						9		
						0		

DRILLING CONTR.

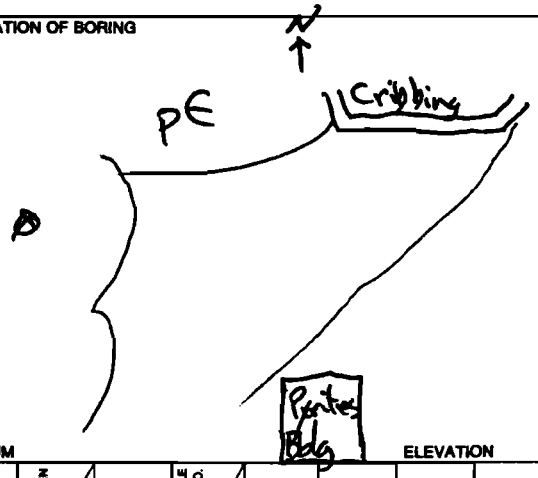
No.267855

BY Dan Lincicome CHK'D BY DATE

825.1 (3) (REV. 11-80)

Dames & Moore

LOCATION OF BORING



DATUM

ELEVATION

JOB NO.	CLIENT	LOCATION
12330-099-030	Viacom	WP14-7

DRILLING METHOD: Hand excavation

BORING NO.

SHEET 1 OF 1

SAMPLING METHOD:

					DRILLING START	DRILLING FINISH
WATER LEVEL					TIME	TIME
TIME						
DATE					DATE	DATE 8/21/96
CASING DEPTH						

SAMPLER TYPE	INCHES DRIVEN / INCHES RECOVERED	DEPTH OF CASING	SAMPLE NO. / SAMPLE DEPTH	BLOWS/FT. SAMPLER	NUMBER OF RINGS	DEPTH IN FEET	SOIL GRAPH	SURFACE CONDITIONS:
						0		0-12in brown sand w/ yellow boy and coarse granite and quartzite; pyritic
						1		
						2		12in to TD - brown to reddish brown sand and silt w/ coarse granite and white precipitate (minor)
						3		
						4		Refusal @ 40 in Excavation width = 10 in 44° slope 0% > 6 in
						5		
						6		
						7		
						8		
						9		
						0		
						1		
						2		
						3		
						4		
						5		
						6		
						7		
						8		
						9		
						0		

DRILLING CONTR. _____

No. 267856

BY Dan Lindquist CHK'D BY _____ DATE _____

625.1 (3) (REV. 11-80)

Barnes & Moore

LOCATION OF BORING

JOB NO.	CLIENT	LOCATION

DRILLING METHOD:

SAMPLING METHOD:

BORING NO.: ADIT #7-1

SHEET: 1 OF 1

					DRILLING	
					START	FINISH
WATER LEVEL					TIME	TIME
TIME					1435	
DATE					DATE	DATE
CASING DEPTH					8-22-96	

DATUM ELEVATION

SURFACE CONDITIONS: Slope ~40° - Raining!

SAMPLER TYPE	INCHES DRIVEN / INCHES RECOVERED	DEPTH OF CASING	SAMPLE NO. / SAMPLE DEPTH	BLOWS/FT. SAMPLER	NUMBER OF RINGS	DEPTH IN FEET	SOIL GRAPH	
						0		Dug Profile Into Slope of Waste Rock Pile Below ADIT #7
						1		
						2		Profile 5' DEEP x 1.5 FEET WIDE
						3		0-6" - Brown & Reddish Brown Sandy Material, Iron Stained, HARD. Few Quartzite & limestone gravels.
						4		
						5		6" - 18" - yellow Sandy Material with quartzite and limestone gravels to 5" - Pyrite Mineralization, Medium to Coarse grained. - Some Iron Staining
						6		
						7		
						8		18" - 60" (TD) - light Reddish Brown Sandy gravel grading to a Dark Reddish Brown Quartzite & limestone gravels throughout. Iron Staining, Minor Pyrite Mineralization Minor Copper Mineralization. Medium to coarse grained Matrix. Moist.
						9		
						0		
						1		
						2		5% of Material > 6" - Not collected as Part of Sample.
						3		Collect 1 x 1 gallon Bag Sample & 2 x 5 gallon Buckets For 80 lb Sample.
						4		
						5		
						6		
						7		
						8		
						9		
						0		

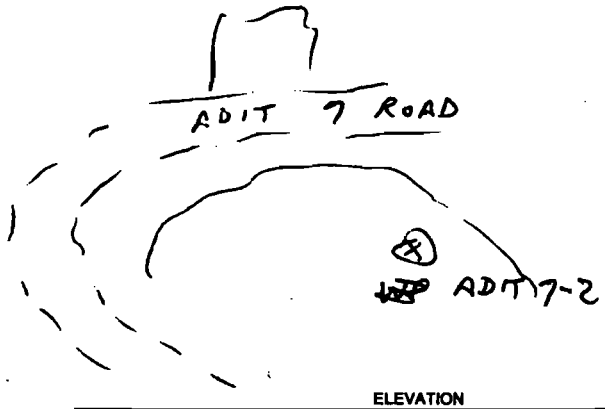
DRILLING CONTR. _____ CHK'D BY _____ DATE _____ BY _____

No.267832

625.1 (3) (REV. 11-80)

Dames & Moore

LOCATION OF BORING



JOB NO.	CLIENT	LOCATION

DRILLING METHOD:

BORING NO. ADIT 7-2

SHEET OF

SAMPLING METHOD:

DRILLING

					START	FINISH
WATER LEVEL					TIME	TIME 1430
TIME						
DATE					DATE	DATE 8-22
CASING DEPTH						

DATUM ELEVATION

SURFACE CONDITIONS:

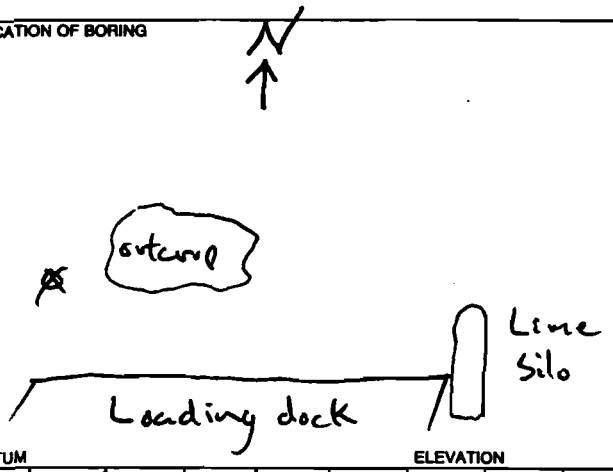
SAMPLER TYPE	INCHES DRIVEN / INCHES RECOVERED	DEPTH OF CASING	SAMPLE NO. / SAMPLE DEPTH	BLOWS/FT. SAMPLER	NUMBER OF RINGS	DEPTH IN FEET	SOIL GRAPH	
						0		0-4" SILT/SAND/GRAVEL - ORANGE BROWN, CONSOLIDATED, MOD WELL GRADED DRY VF TO 3", HEAVY FE STAIN CU MINS LIMESTONE/
						1		
						2		
						3		4"-5.5' GRAVELS/ COBBLES LIMESTONE/ QUARTZ 1" TO 8" POORLY GRADED
						4		
						5		TD 5.5'
						6		SLOPE 46°
						7		15% OF FINES 20"
						8		15"
						9		COL. 1" SAND
						0		
						1		
						2		
						3		
						4		
						5		
						6		
						7		
						8		
						9		
						0		

DRILLING CONTR. _____ BY _____ CHK'D BY _____ DATE _____

No.267927

625.1 (3) (REV. 11-80)

LOCATION OF BORING



JOB NO.	CLIENT	LOCATION
12330-099-030	Viacom	Cossbeam 1

DRILLING METHOD: Hand excavation

BORING NO.

SHEET 1 OF 1

SAMPLING METHOD:

DRILLING

					START	FINISH
WATER LEVEL					TIME	TIME
TIME						
DATE					DATE	DATE 8/21/96
CASING DEPTH						

DATUM ELEVATION

SAMPLER TYPE	INCHES DRIVEN / INCHES RECOVERED	DEPTH OF CASING	SAMPLE NO. / SAMPLE DEPTH	BLOWS/FT. SAMPLER	NUMBER OF RINGS	DEPTH IN FEET	SOIL GRAPH	SURFACE CONDITIONS: Colluvium
						0		med. Homogeneous: brown sand w/coarser granite and quartzite: boulders of quartzite and granite; pyrite assoc. w/boulders, but not sand; appears to be colluvium
						1		
						2		
						3		
						4		Refusal @ 4ft.
						5		Excavation 1ft. wide
						6		Slope = 41°
						7		5% >6in.
						8		
						9		
						0		
						1		
						2		
						3		
						4		
						5		
						6		
						7		
						8		
						9		
						0		

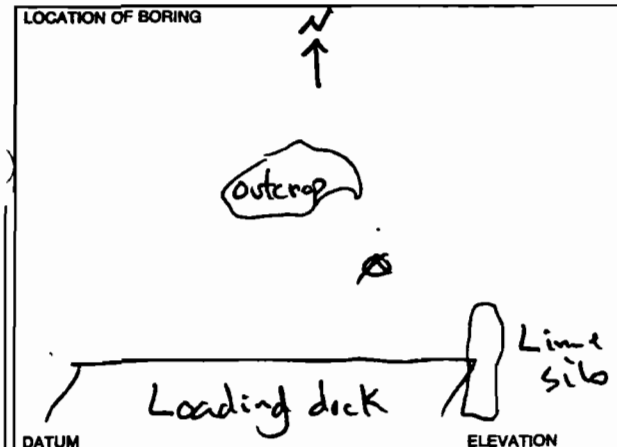
DRILLING CONTR.

No.267859

BY Dean Lincicome CHK'D BY DATE

Dames & Moore

LOCATION OF BORING



DATUM ELEVATION

JOB NO.	CLIENT	LOCATION
62330-099-030	Viacom	Crossbeam 2

DRILLING METHOD: Hand excavation

BORING NO.

SHEET 1 OF 1

SAMPLING METHOD:

DRILLING

					START	FINISH
WATER LEVEL					TIME	TIME
TIME						
DATE					DATE	DATE 8/21/96
CASING DEPTH						

SURFACE CONDITIONS: Colluvium

SAMPLER TYPE	INCHES DRIVEN / INCHES RECOVERED	DEPTH OF CASING	SAMPLE NO. / SAMPLE DEPTH	BLOWS/FT. SAMPLER	NUMBER OF RINGS	DEPTH IN FEET	SOIL GRAPH	
						0		0-10in. - brown sandy gravel; slide material; Fe staining; 1-3in. gravel = granite and quartzite; minor pyrite on gravel
						1		10in. - 2ft. - boulders - quartzite + granite; some biotite rich
						2		2ft - TD brown gravelly sand w/clay
						3		
						4		TD = 52 in.
						5		31° slope
						6		Excavation 2ft. wide
						7		16% > 6in.
						8		
						9		
						0		
						1		
						2		
						3		
						4		
						5		
						6		
						7		
						8		
						9		
						0		

DRILLING CONTR. _____

No. 267858

BY Jan Lindsome CHK'D BY _____ DATE _____

625.1 (3) (REV. 11-80)

GRAIN SIZE ANALYSIS

3 Inch to -200 Sieve

ASTM D 422

MECHANICAL ANALYSIS - SIEVE TEST DATA
ASTM D 422

CLIENT Dames & Moore

JOB NO. 2001-06

BORING NO.
DEPTH
SAMPLE NO. WP1-1
SOIL DESCR.

SAMPLED
DATE TESTED 9-20-96 ARH
WASH SIEVE Yes
DRY SIEVE No

MOISTURE DATA

HYGROSCOPIC Yes

NATURAL No

Wt. Wet Soil & Pan	(g)	94.79
Wt. Dry Soil & Pan	(g)	93.55
Wt. Lost Moisture	(g)	1.24
Wt. of Pan Only	(g)	3.88
Wt. of Dry Soil	(g)	89.67
Moisture Content	%	1.4

Wt. Hydrom. Sample Wet (g)	211.86
Wt. Hydrom. Sample Dry (g)	208.97

WASH SIEVE ANALYSIS

Wt. Total Sample Wet (g)	3462.33
Weight of + #10 Before Washing (g)	1733.60
Weight of + #10 After Washing (g)	1665.81
Weight of - #10 Wet (g)	1728.73
Weight of - #10 Dry (g)	1772.02
Wt. Total Sample Dry (g)	3437.83

Calc. Wt. "W" (g)	405.42
Calc. Mass + #10	196.45

Sieve Number (Size)	Pan Weight (g)	Indiv. Wt. + Pan (g)	Indiv. Wt. Retain.	Cum. Wt. Retain.	Cum. % Retain.	% Finer By Wt.
3"	0.00	0.00	0.00	0.00	0.0	100.0
1 1/2"	0.00	324.92	324.92	324.92	9.5	90.5
3/4"	0.00	634.02	634.02	958.94	27.9	72.1
3/8"	0.00	398.80	398.80	1357.74	39.5	60.5
#4	0.00	183.44	183.44	1541.18	44.8	55.2
#10	0.00	124.63	124.63	1665.81	48.5	51.5
#20	3.68	27.99	24.31	24.31	54.5	45.5
#40	3.63	30.81	27.18	51.49	61.2	38.8
#60	3.63	23.31	19.68	71.17	66.0	34.0
#100	3.70	22.30	18.60	89.77	70.6	29.4
#200	3.71	26.44	22.73	112.50	76.2	23.8

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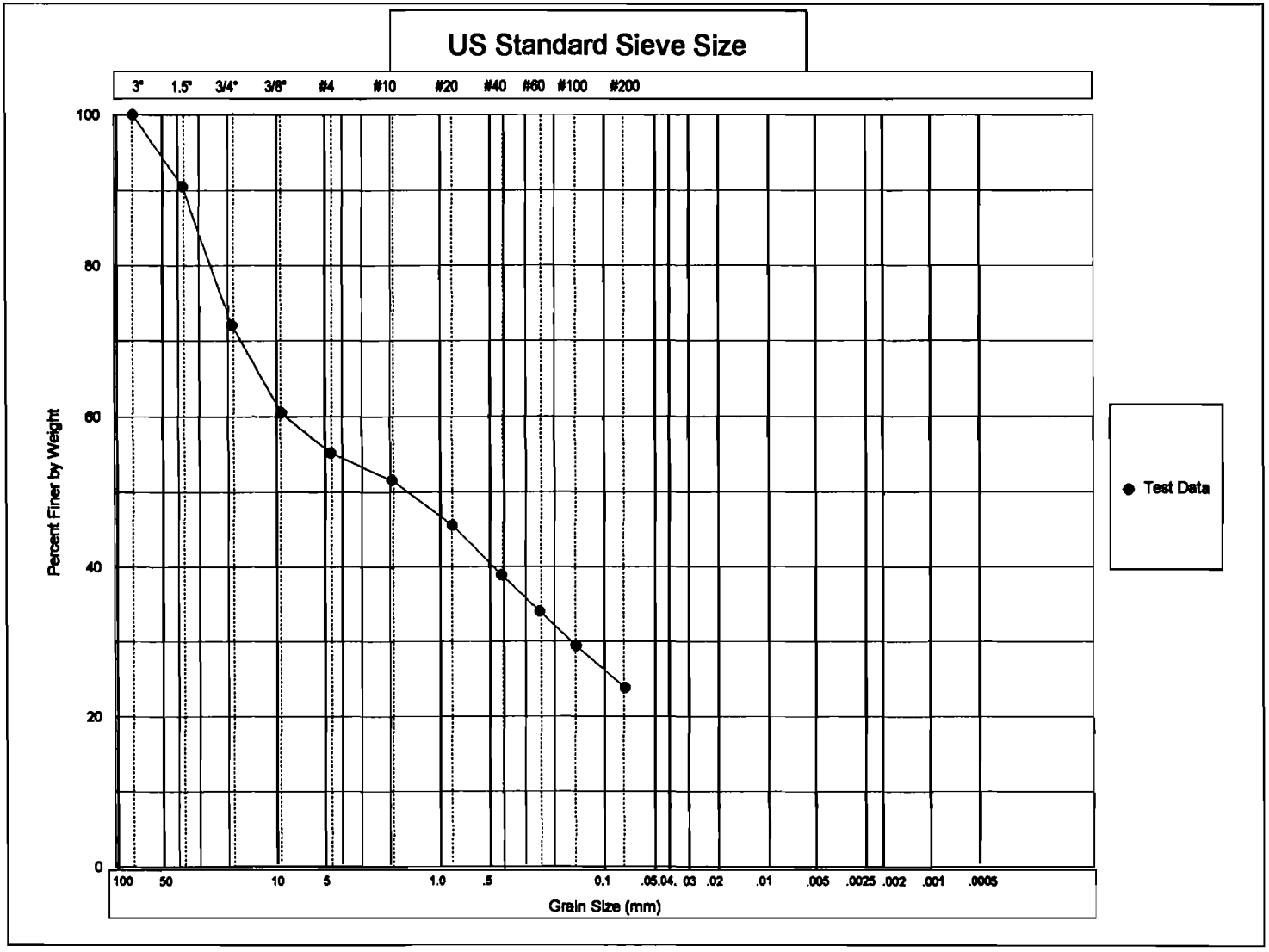
Data checked by: [illegible] Date: 9-23-96
FileName:DMMOWP11

ADVANCED TERRA TESTING, INC.



COBBLES	GRAVEL		SAND			SILT OR CLAY
	COARSE	FINE	CRS	MEDIUM	FINE	

USCS

COBBLES TO BOULDERS	PEBBLE GRAVEL				SAND			SILT	CLAY
	COARSE	MED	FINE	GRAN	COARSE	MED	FINE		

WENTWORTH

Client: Dames & Moore Boring No.: Depth: Sample No.: WP1-1 Job Number: 2001-06

Classification:_____

Advanced Terra Testing, Inc.

MECHANICAL ANALYSIS - SIEVE TEST DATA
ASTM D 422

CLIENT Dames & Moore

JOB NO. 2001-06

BORING NO.
DEPTH
SAMPLE NO. WP2-1
SOIL DESCR.

SAMPLED
DATE TESTED 9-17-96 ARH
WASH SIEVE Yes
DRY SIEVE No

MOISTURE DATA

HYGROSCOPIC Yes

NATURAL No

Wt. Wet Soil & Pan	(g)	165.36
Wt. Dry Soil & Pan	(g)	160.89
Wt. Lost Moisture	(g)	4.47
Wt. of Pan Only	(g)	8.20
Wt. of Dry Soil	(g)	152.69
Moisture Content	%	2.9

Wt. Hydrom. Sample Wet (g)	227.24
Wt. Hydrom. Sample Dry (g)	220.78

WASH SIEVE ANALYSIS

Wt. Total Sample Wet (g)	3398.50
Weight of + #10 Before Washing (g)	1280.20
Weight of + #10 After Washing (g)	929.97
Weight of - #10 Wet (g)	2118.30
Weight of - #10 Dry (g)	2398.32
Wt. Total Sample Dry (g)	3328.29
Calc. Wt. "W" (g)	306.38
Calc. Mass + #10	85.61

Sieve Number (Size)	Pan Weight (g)	Indiv. Wt. + Pan (g)	Indiv. Wt. Retain.	Cum. Wt. Retain.	Cum. % Retain.	% Finer By Wt.
3"	0.00	0.00	0.00	0.00	0.0	100.0
1 1/2"	0.00	94.62	94.62	94.62	2.8	97.2
3/4"	0.00	259.25	259.25	353.87	10.6	89.4
3/8"	0.00	225.24	225.24	579.11	17.4	82.6
#4	0.00	182.66	182.66	761.77	22.9	77.1
#10	0.00	168.20	168.20	929.97	27.9	72.1
#20	2.29	11.24	8.95	8.95	30.9	69.1
#40	2.29	19.14	16.85	25.80	36.4	63.6
#60	2.30	20.97	18.67	44.47	42.5	57.5
#100	2.28	23.17	20.89	65.36	49.3	50.7
#200	2.29	29.66	27.37	92.73	58.2	41.8

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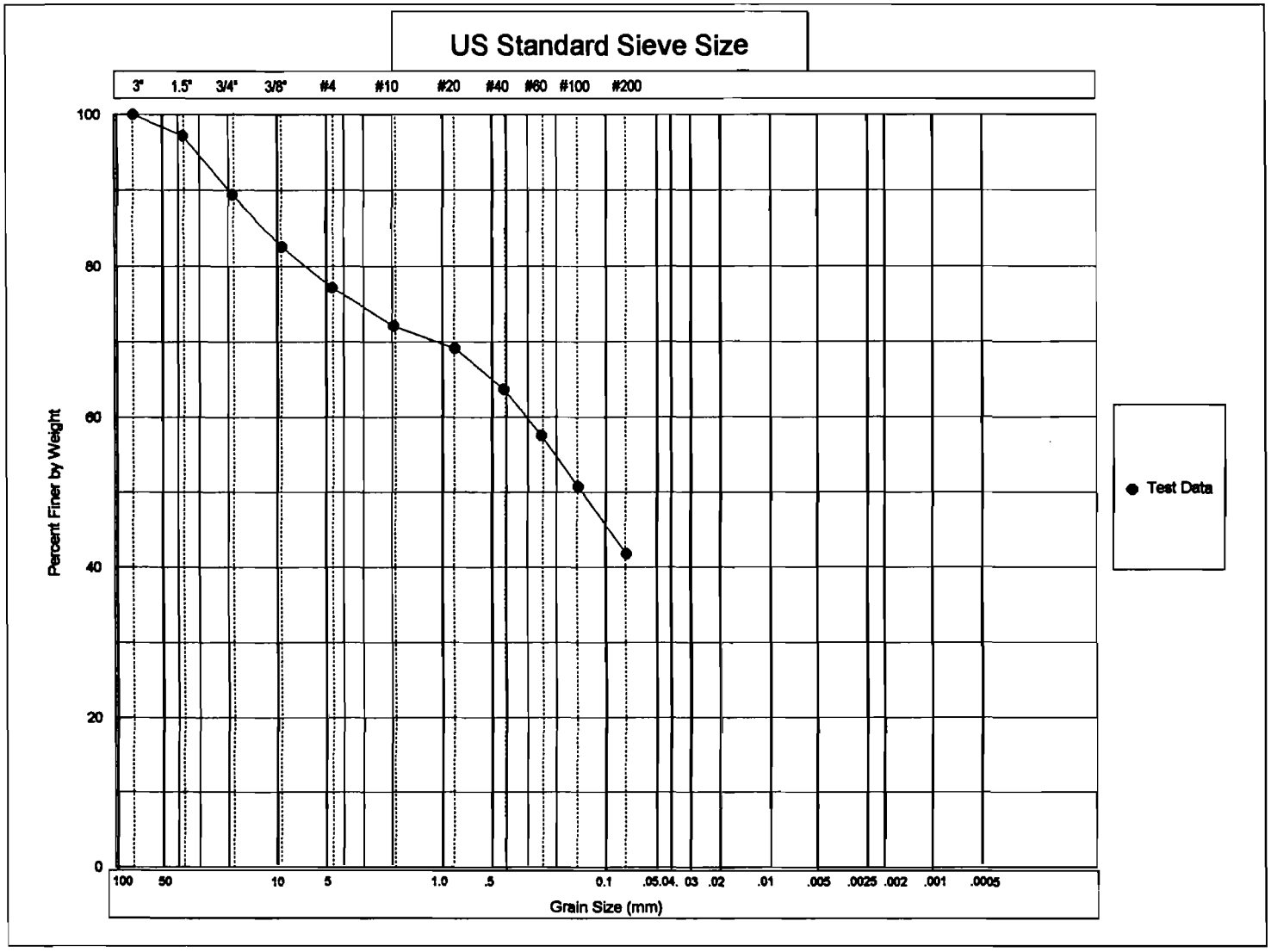
Data checked by: DSR Date: 9-20-96
FileName:DMMOWP21

ADVANCED TERRA TESTING, INC.



COBBLES	GRAVEL		SAND			SILT OR CLAY
	COARSE	FINE	CRS	MEDIUM	FINE	

USCS

COBBLES TO BOULDERS	PEBBLE GRAVEL				SAND			SILT	CLAY
	COARSE	MED	FINE	GRAN	COARSE	MED	FINE		

WENTWORTH

Client: Dames & Moore Boring No.: Depth: Sample No.: WP2-1 Job Number: 2001-06

Classification:_____

Advanced Terra Testing, Inc.

MECHANICAL ANALYSIS - SIEVE TEST DATA
ASTM D 422

CLIENT Dames & Moore

JOB NO. 2001-06

BORING NO.
DEPTH
SAMPLE NO. WP3-1
SOIL DESCR.

SAMPLED
DATE TESTED 9-20-96 ARH
WASH SIEVE Yes
DRY SIEVE No

MOISTURE DATA

HYGROSCOPIC Yes

NATURAL No

Wt. Wet Soil & Pan	(g)	119.45
Wt. Dry Soil & Pan	(g)	118.56
Wt. Lost Moisture	(g)	0.89
Wt. of Pan Only	(g)	3.90
Wt. of Dry Soil	(g)	114.66
Moisture Content	%	0.8

Wt. Hydrom. Sample Wet (g)	379.70
Wt. Hydrom. Sample Dry (g)	376.78

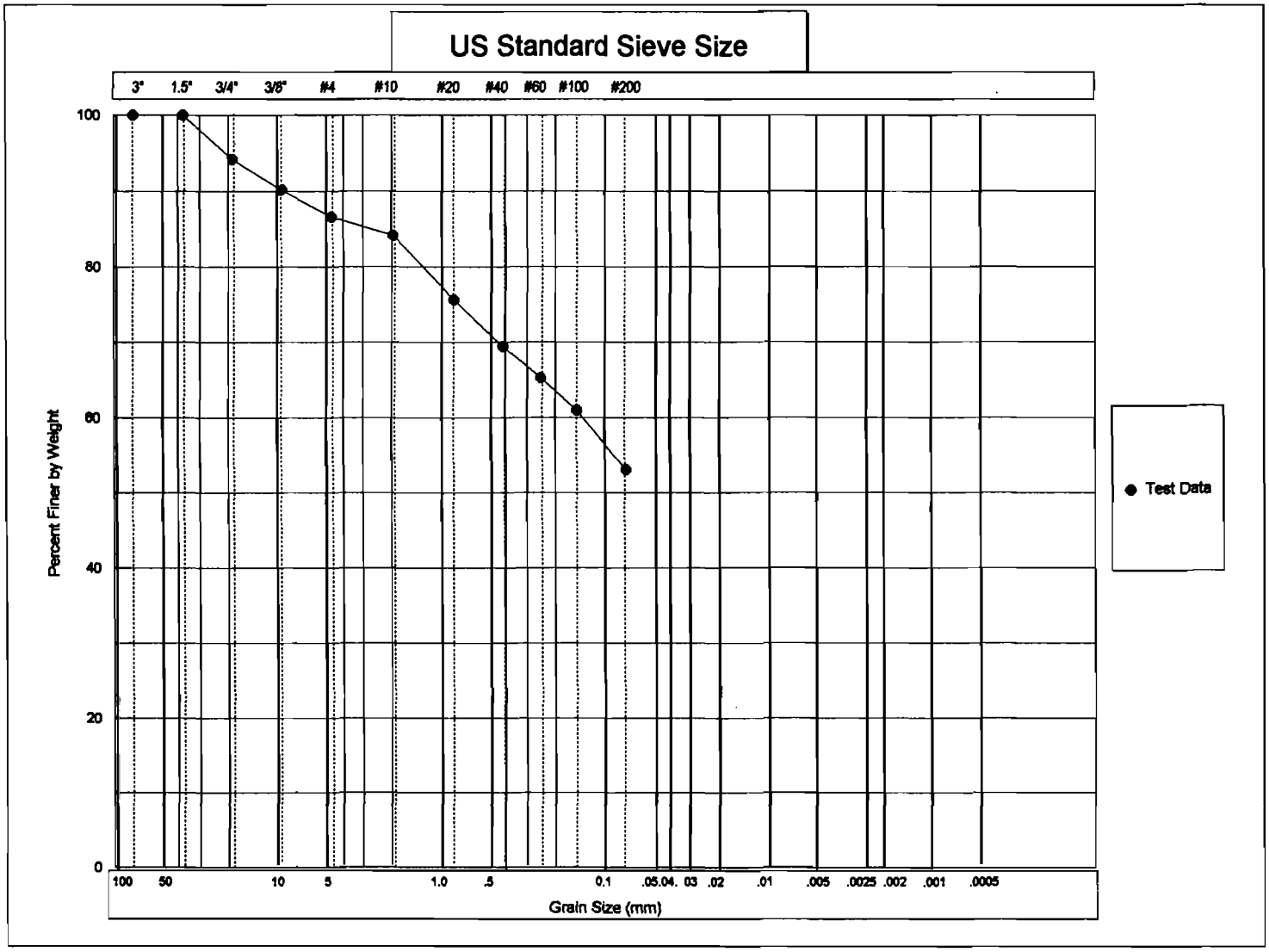
WASH SIEVE ANALYSIS

Wt. Total Sample Wet (g)	1822.82
Weight of + #10 Before Washing (g)	309.92
Weight of + #10 After Washing (g)	287.61
Weight of - #10 Wet (g)	1512.90
Weight of - #10 Dry (g)	1523.39
Wt. Total Sample Dry (g)	1811.00
Calc. Wt. "W" (g)	447.91
Calc. Mass + #10	71.13

Sieve Number (Size)	Pan Weight (g)	Indiv. Wt. + Pan (g)	Indiv. Wt. Retain.	Cum. Wt. Retain.	Cum. % Retain.	% Finer By Wt.
3"	0.00	0.00	0.00	0.00	0.0	100.0
1 1/2"	0.00	0.00	0.00	0.00	0.0	100.0
3/4"	0.00	104.44	104.44	104.44	5.8	94.2
3/8"	0.00	74.79	74.79	179.23	9.9	90.1
#4	0.00	63.78	63.78	243.01	13.4	86.6
#10	0.00	44.60	44.60	287.61	15.9	84.1
#20	3.71	41.66	37.95	37.95	24.4	75.6
#40	3.83	31.76	27.93	65.88	30.6	69.4
#60	3.66	22.31	18.65	84.53	34.8	65.2
#100	3.63	23.09	19.46	103.99	39.1	60.9
#200	3.62	38.93	35.31	139.30	47.0	53.0

Data entered by: NAA Date: 9-23-96
Data checked by: [illegible] Date: 9-23-96
FileName:DMMOWP31

ADVANCED TERRA TESTING, INC.



COBBLES	GRAVEL		SAND			SILT OR CLAY
	COARSE	FINE	CRS	MEDIUM	FINE	

USCS

COBBLES TO BOULDERS	PEBBLE GRAVEL				SAND			SILT	CLAY
	COARSE	MED	FINE	GRAN	COARSE	MED	FINE		

WENTWORTH

Client: Dames & Moore Boring No.: Depth: Sample No.: WP3-1 Job Number: 2001-06

Classification:_____

Advanced Terra Testing, Inc.

MECHANICAL ANALYSIS - SIEVE TEST DATA
ASTM D 422

CLIENT Dames & Moore

JOB NO. 2001-06

BORING NO.
DEPTH
SAMPLE NO. WP4-1
SOIL DESCR.

SAMPLED
DATE TESTED 9-24-96 DPM
WASH SIEVE Yes
DRY SIEVE No

MOISTURE DATA

HYGROSCOPIC Yes

NATURAL No

Wt. Wet Soil & Pan	(g)	120.02
Wt. Dry Soil & Pan	(g)	118.99
Wt. Lost Moisture	(g)	1.03
Wt. of Pan Only	(g)	3.77
Wt. of Dry Soil	(g)	115.22
Moisture Content	%	0.9

Wt. Hydrom. Sample Wet (g)	224.21
Wt. Hydrom. Sample Dry (g)	222.22

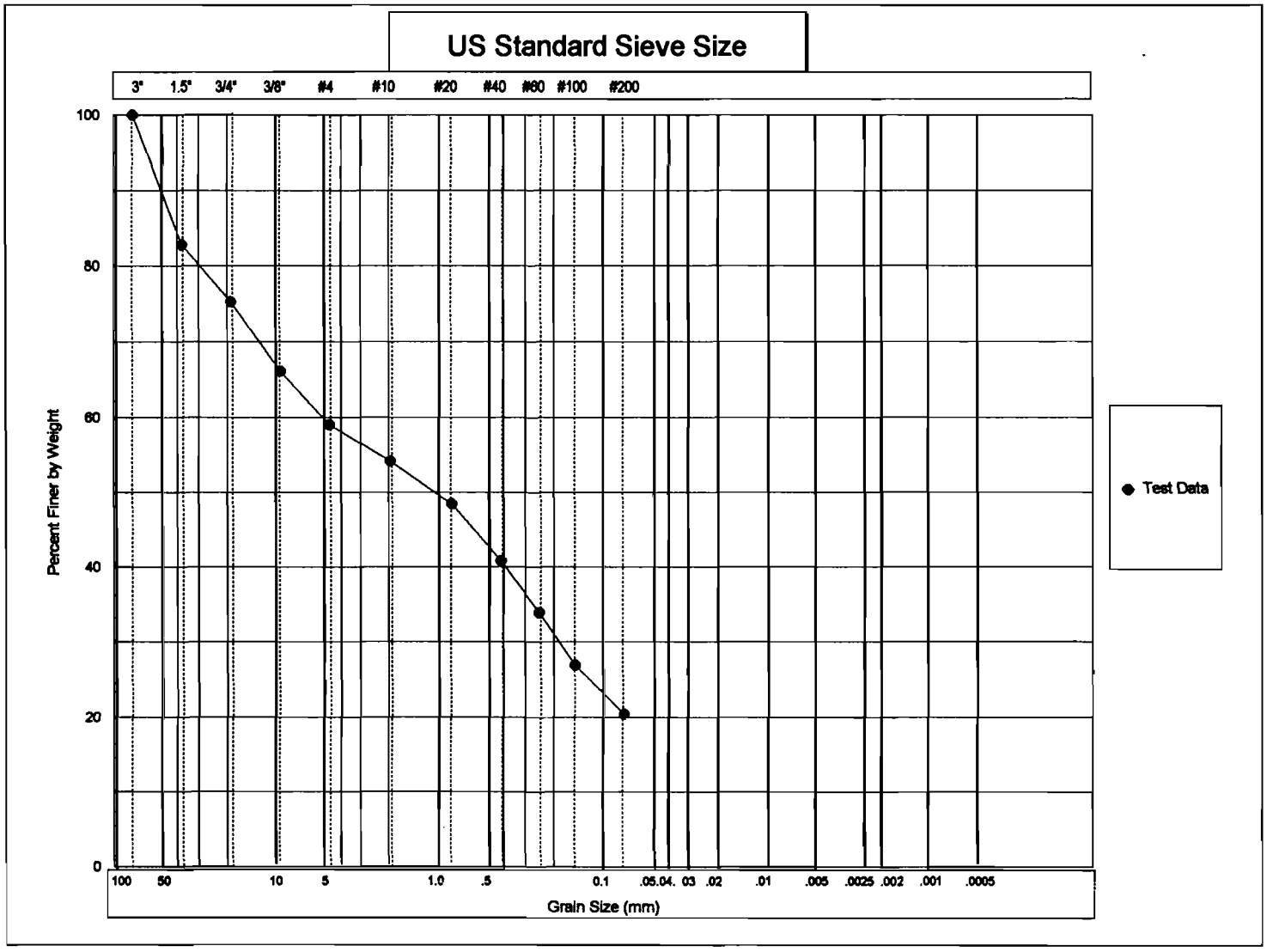
WASH SIEVE ANALYSIS

Wt. Total Sample Wet (g)	4348.03
Weight of + #10 Before Washing (g)	2082.85
Weight of + #10 After Washing (g)	1983.71
Weight of - #10 Wet (g)	2265.18
Weight of - #10 Dry (g)	2343.37
Wt. Total Sample Dry (g)	4327.08
Calc. Wt. "W" (g)	410.34
Calc. Mass + #10	188.12

Sieve Number (Size)	Pan Weight (g)	Indiv. Wt. + Pan (g)	Indiv. Wt. Retain.	Cum. Wt. Retain.	Cum. % Retain.	% Finer By Wt.
3"	0.00	0.00	0.00	0.00	0.0	100.0
1 1/2"	0.00	745.38	745.38	745.38	17.2	82.8
3/4"	0.00	324.94	324.94	1070.32	24.7	75.3
3/8"	0.00	396.06	396.06	1466.38	33.9	66.1
#4	0.00	307.01	307.01	1773.39	41.0	59.0
#10	0.00	210.32	210.32	1983.71	45.8	54.2
#20	3.67	27.11	23.44	23.44	51.6	48.4
#40	3.95	35.27	31.32	54.76	59.2	40.8
#60	3.68	32.06	28.38	83.14	66.1	33.9
#100	3.69	32.23	28.54	111.68	73.1	26.9
#200	3.68	30.45	26.77	138.45	79.6	20.4

Data entered by: NAA Date: 9-25-96
Data checked by: [illegible] Date: 9-26-96
FileName:DMMOWP41

ADVANCED TERRA TESTING, INC.



COBBLES	GRAVEL		SAND			SILT OR CLAY
	COARSE	FINE	CRS	MEDIUM	FINE	

USCS

COBBLES TO BOULDERS	PEBBLE GRAVEL				SAND			SILT	CLAY
	COARSE	MED	FINE	GRAN	COARSE	MED	FINE		

WENTWORTH

Client: Dames & Moore Boring No.: Sample No.: WP4-1

Depth: Job Number: 2001-06

Classification:_____

Advanced Terra Testing, Inc.

MECHANICAL ANALYSIS - SIEVE TEST DATA
ASTM D 422

CLIENT Dames & Moore

JOB NO. 2001-06

BORING NO.
DEPTH
SAMPLE NO. WP5-1
SOIL DESCR.

SAMPLED
DATE TESTED 9-17-96 ARH
WASH SIEVE Yes
DRY SIEVE No

MOISTURE DATA

HYGROSCOPIC Yes

NATURAL No

Wt. Wet Soil & Pan	(g)	238.05
Wt. Dry Soil & Pan	(g)	235.59
Wt. Lost Moisture	(g)	2.46
Wt. of Pan Only	(g)	8.19
Wt. of Dry Soil	(g)	227.40
Moisture Content	%	1.1

Wt. Hydrom. Sample Wet (g)	271.46
Wt. Hydrom. Sample Dry (g)	268.55

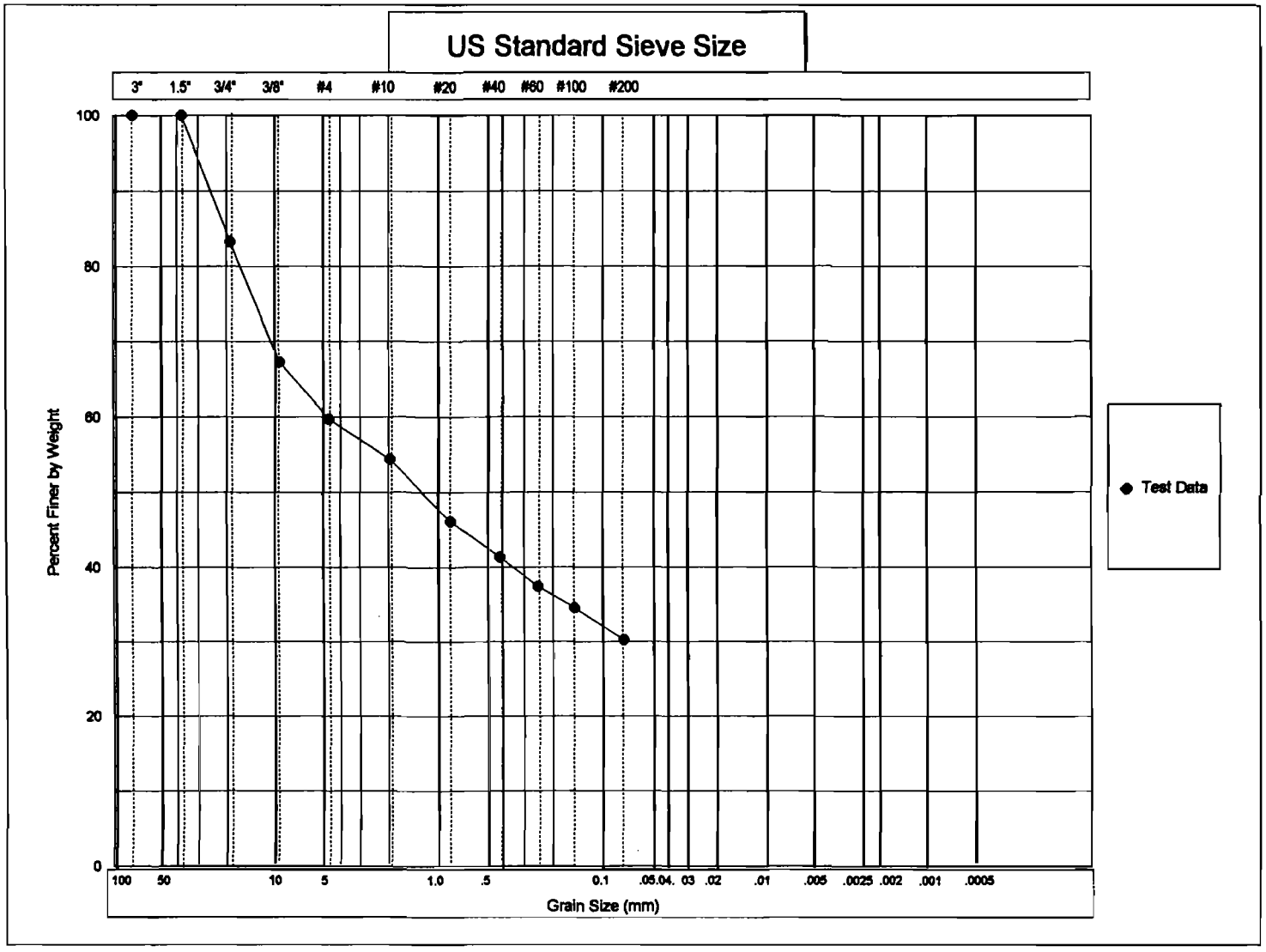
WASH SIEVE ANALYSIS

Wt. Total Sample Wet (g)	4401.40
Weight of + #10 Before Washing (g)	2138.80
Weight of + #10 After Washing (g)	1997.51
Weight of - #10 Wet (g)	2262.60
Weight of - #10 Dry (g)	2378.16
Wt. Total Sample Dry (g)	4375.67
Calc. Wt. "W" (g)	494.12
Calc. Mass + #10	225.57

Sieve Number (Size)	Pan Weight (g)	Indiv. Wt. + Pan (g)	Indiv. Wt. Retain.	Cum. Wt. Retain.	Cum. % Retain.	% Finer By Wt.
3"	0.00	0.00	0.00	0.00	0.0	100.0
1 1/2"	0.00	0.00	0.00	0.00	0.0	100.0
3/4"	0.00	735.67	735.67	735.67	16.8	83.2
3/8"	0.00	694.95	694.95	1430.62	32.7	67.3
#4	0.00	334.95	334.95	1765.57	40.3	59.7
#10	0.00	231.94	231.94	1997.51	45.7	54.3
#20	2.83	43.59	40.76	40.76	53.9	46.1
#40	3.68	27.03	23.35	64.11	58.6	41.4
#60	3.72	23.44	19.72	83.83	62.6	37.4
#100	3.64	17.88	14.24	98.07	65.5	34.5
#200	3.64	24.92	21.28	119.35	69.8	30.2

Data entered by: NAA Date: 9-20-96
Data checked by: DM Date: 9-23-96
FileName:DMMOWP51

ADVANCED TERRA TESTING, INC.



COBBLES	GRAVEL		SAND			SILT OR CLAY
	COARSE	FINE	CRS	MEDIUM	FINE	

USCS

COBBLES TO BOULDERS	PEBBLE GRAVEL				SAND			SILT	CLAY
	COARSE	MED	FINE	GRAN	COARSE	MED	FINE		

WENTWORTH

Client: Dames & Moore Boring No.: Depth: Sample No.: WP5-1 Job Number: 2001-06

Classification:_____ Advanced Terra Testing, Inc.

MECHANICAL ANALYSIS - SIEVE TEST DATA
ASTM D 422

CLIENT Dames & Moore

JOB NO. 2001-06

BORING NO.
DEPTH
SAMPLE NO. WP6-2
SOIL DESCR.

SAMPLED
DATE TESTED 9-17-96 ARH
WASH SIEVE Yes
DRY SIEVE No

MOISTURE DATA

HYGROSCOPIC Yes

NATURAL No

Wt. Wet Soil & Pan	(g)	63.96
Wt. Dry Soil & Pan	(g)	62.60
Wt. Lost Moisture	(g)	1.36
Wt. of Pan Only	(g)	8.54
Wt. of Dry Soil	(g)	54.06
Moisture Content	%	2.5

Wt. Hydrom. Sample Wet (g)	109.37
Wt. Hydrom. Sample Dry (g)	106.69

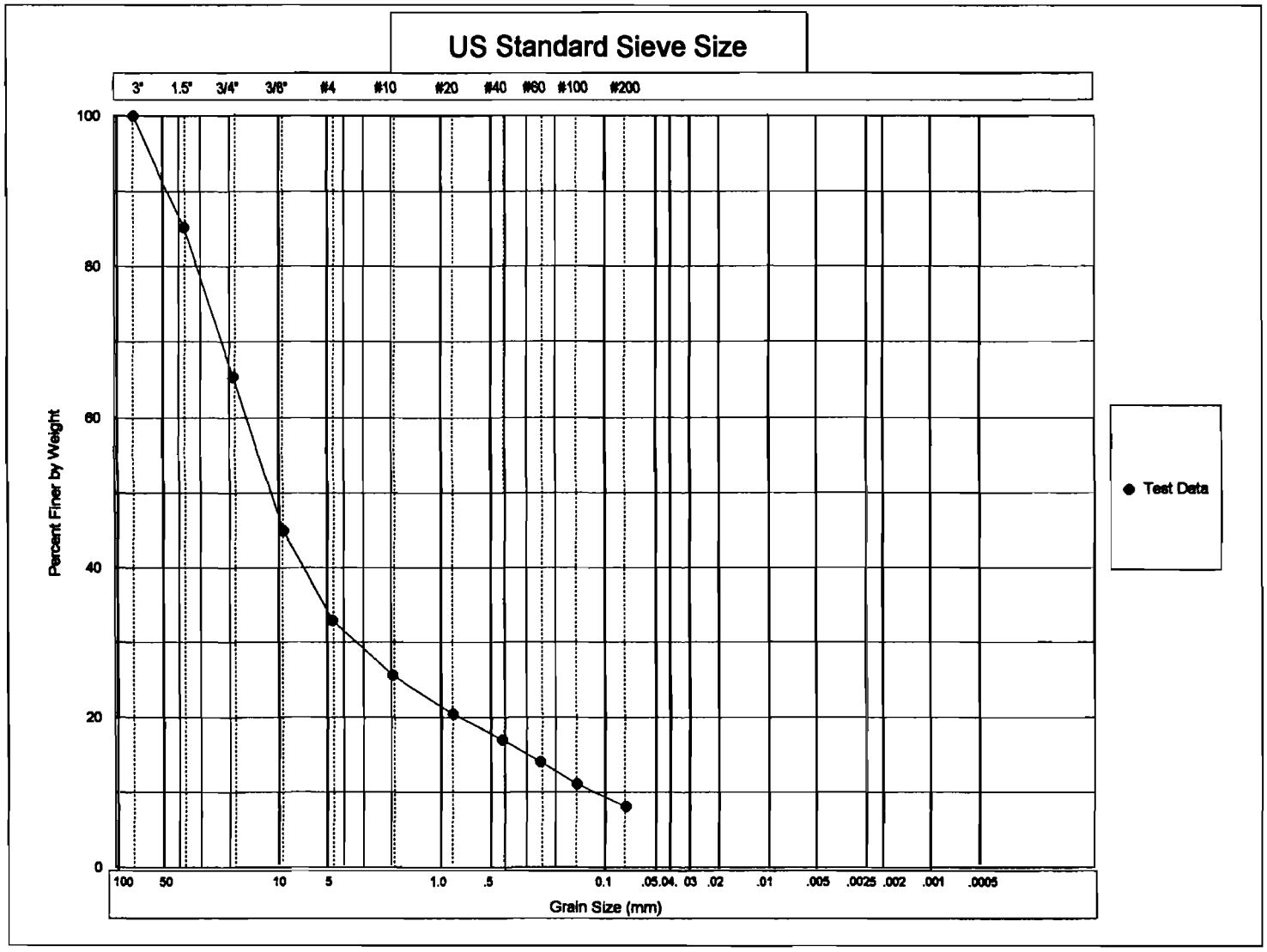
WASH SIEVE ANALYSIS

Wt. Total Sample Wet (g)	3646.20
Weight of + #10 Before Washing (g)	2863.70
Weight of + #10 After Washing (g)	2697.07
Weight of - #10 Wet (g)	782.50
Weight of - #10 Dry (g)	925.84
Wt. Total Sample Dry (g)	3622.91
Calc. Wt. "W" (g)	417.47
Calc. Mass + #10	310.79

Sieve Number (Size)	Pan Weight (g)	Indiv. Wt. + Pan (g)	Indiv. Wt. Retain.	Cum. Wt. Retain.	Cum. % Retain.	% Finer By Wt.
3"	0.00	0.00	0.00	0.00	0.0	100.0
1 1/2"	0.00	536.34	536.34	536.34	14.8	85.2
3/4"	0.00	719.48	719.48	1255.82	34.7	65.3
3/8"	0.00	738.52	738.52	1994.34	55.0	45.0
#4	0.00	435.40	435.40	2429.74	67.1	32.9
#10	0.00	267.33	267.33	2697.07	74.4	25.6
#20	1.59	22.99	21.40	21.40	79.6	20.4
#40	1.59	16.01	14.42	35.82	83.0	17.0
#60	1.55	14.06	12.51	48.33	86.0	14.0
#100	1.60	13.98	12.38	60.71	89.0	11.0
#200	1.59	13.94	12.35	73.06	91.9	8.1

Data entered by: NAA Date: 9-20-96
Data checked by: DSA Date: 9-20-96
FileName:DMMOWP62

ADVANCED TERRA TESTING, INC.



COBBLES	GRAVEL		SAND			SILT OR CLAY
	COARSE	FINE	CRS	MEDIUM	FINE	

USCS

COBBLES TO BOULDERS	PEBBLE GRAVEL				SAND			SILT	CLAY
	COARSE	MED	FINE	GRAN	COARSE	MED	FINE		

WENTWORTH

Client: Dames & Moore Boring No.: Depth: Sample No.: WP6-2 Job Number: 2001-06

Classification:_____

Advanced Terra Testing, Inc.

MECHANICAL ANALYSIS - SIEVE TEST DATA
ASTM D 422

CLIENT Dames & Moore

JOB NO. 2001-06

BORING NO.
DEPTH
SAMPLE NO. WP7-2
SOIL DESCR.

SAMPLED
DATE TESTED 9-20-96 AH
WASH SIEVE Yes
DRY SIEVE No

MOISTURE DATA

HYGROSCOPIC Yes

NATURAL No

Wt. Wet Soil & Pan	(g)	150.78
Wt. Dry Soil & Pan	(g)	145.44
Wt. Lost Moisture	(g)	5.34
Wt. of Pan Only	(g)	8.22
Wt. of Dry Soil	(g)	137.22
Moisture Content	%	3.9

Wt. Hydrom. Sample Wet (g)	198.88
Wt. Hydrom. Sample Dry (g)	191.43

WASH SIEVE ANALYSIS

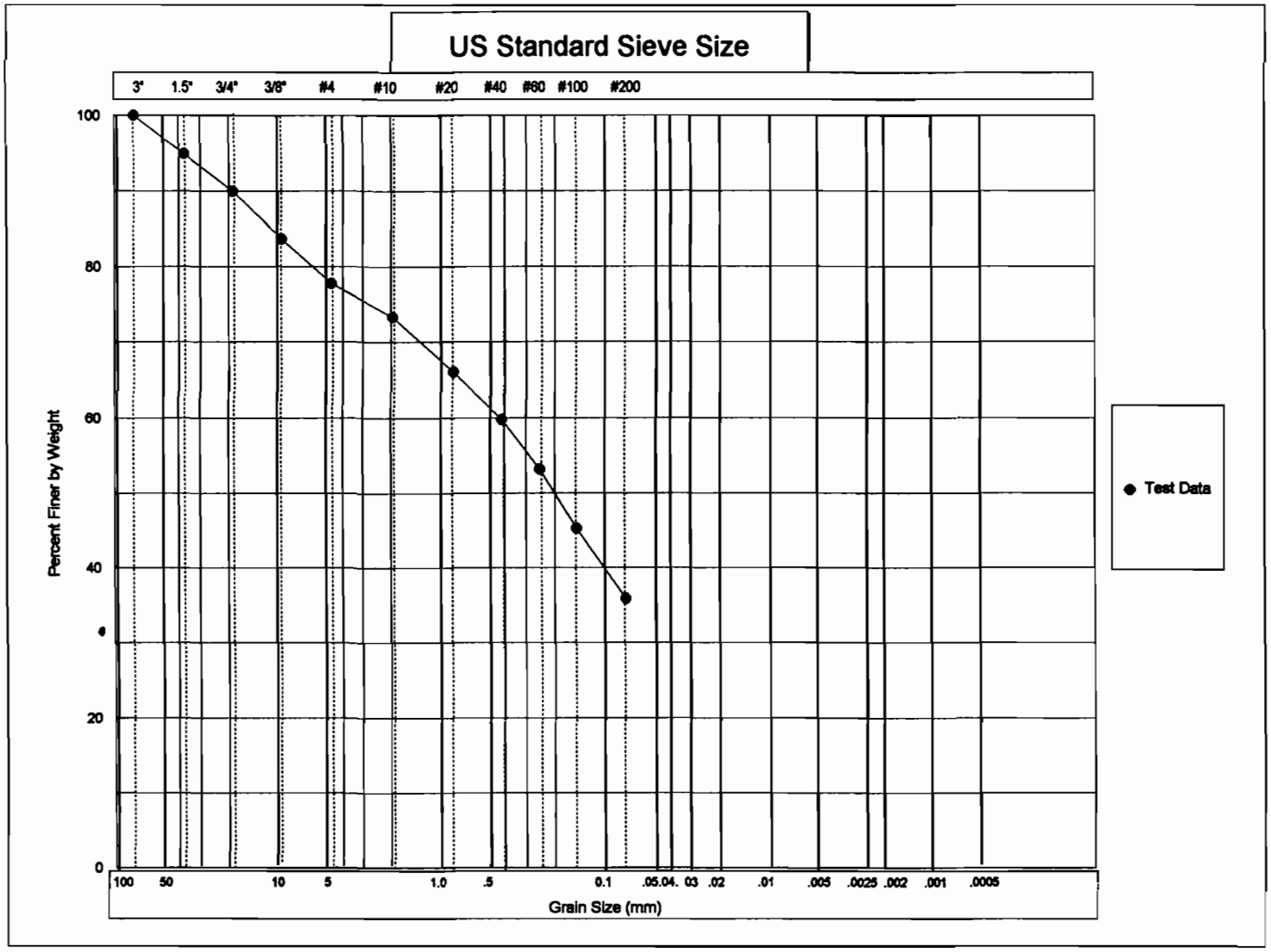
Wt. Total Sample Wet (g)	4683.70
Weight of + #10 Before Washing (g)	1404.20
Weight of + #10 After Washing (g)	1214.98
Weight of - #10 Wet (g)	3279.50
Weight of - #10 Dry (g)	3338.79
Wt. Total Sample Dry (g)	4553.77

Calc. Wt. "W" (g)	261.09
Calc. Mass + #10	69.66

Sieve Number (Size)	Pan Weight (g)	Indiv. Wt. + Pan (g)	Indiv. Wt. Retain.	Cum. Wt. Retain.	Cum. % Retain.	% Finer By Wt.
3"	0.00	0.00	0.00	0.00	0.0	100.0
1 1/2"	0.00	231.79	231.79	231.79	5.1	94.9
3/4"	0.00	224.85	224.85	456.64	10.0	90.0
3/8"	0.00	289.61	289.61	746.25	16.4	83.6
#4	0.00	264.31	264.31	1010.56	22.2	77.8
#10	0.00	204.42	204.42	1214.98	26.7	73.3
#20	3.40	22.13	18.73	18.73	33.9	66.1
#40	3.79	20.50	16.71	35.44	40.3	59.7
#60	3.67	20.77	17.10	52.54	46.8	53.2
#100	3.52	24.24	20.72	73.26	54.7	45.3
#200	3.67	28.20	24.53	97.79	64.1	35.9

Data entered by: NAA Date: 9-23-96
Data checked by: ac Date: 9-23-96
FileName:DMMOWP72

ADVANCED TERRA TESTING, INC.



COBBLES	GRAVEL		SAND			SILT OR CLAY
	COARSE	FINE	CRS	MEDIUM	FINE	

USCS

COBBLES TO BOULDERS	PEBBLE GRAVEL				SAND			SILT	CLAY
	COARSE	MED	FINE	GRAN	COARSE	MED	FINE		

WENTWORTH

Client: Dames & Moore Boring No.: Depth: Sample No.: WP7-2 Job Number: 2001-06

Classification:_____ Advanced Terra Testing, Inc.

MECHANICAL ANALYSIS - SIEVE TEST DATA
ASTM D 422

CLIENT Dames & Moore

JOB NO. 2001-06

BORING NO.
DEPTH
SAMPLE NO. WP8-1
SOIL DESCR.

SAMPLED
DATE TESTED 9-24-96 DPM
WASH SIEVE Yes
DRY SIEVE No

MOISTURE DATA

HYGROSCOPIC Yes

NATURAL No

Wt. Wet Soil & Pan	(g)	166.95
Wt. Dry Soil & Pan	(g)	160.24
Wt. Lost Moisture	(g)	6.71
Wt. of Pan Only	(g)	8.50
Wt. of Dry Soil	(g)	151.74
Moisture Content	%	4.4

Wt. Hydrom. Sample Wet (g)	261.27
Wt. Hydrom. Sample Dry (g)	250.21

WASH SIEVE ANALYSIS

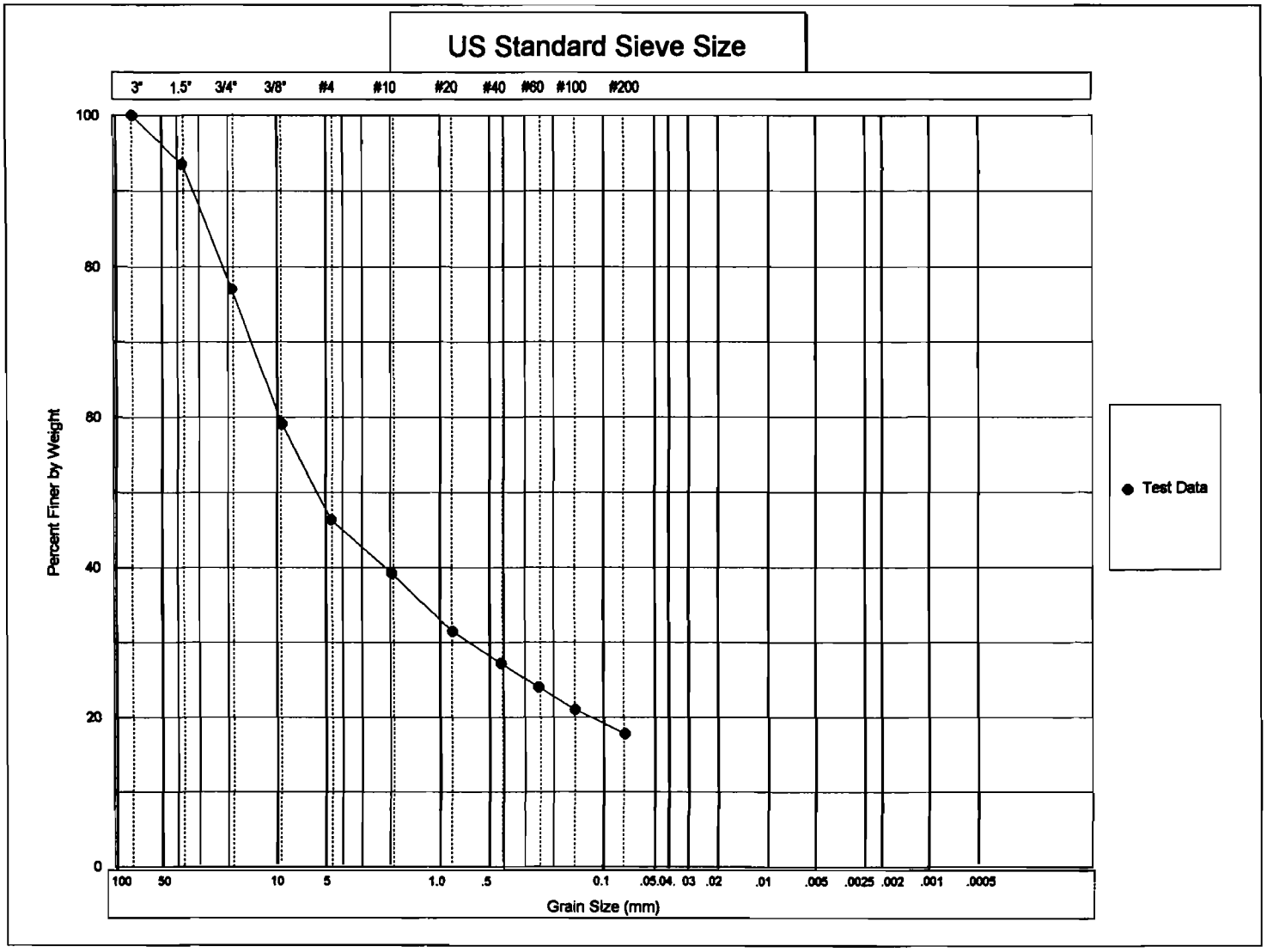
Wt. Total Sample Wet (g)	4751.20
Weight of + #10 Before Washing (g)	2956.30
Weight of + #10 After Washing (g)	2834.77
Weight of - #10 Wet (g)	1794.90
Weight of - #10 Dry (g)	1835.27
Wt. Total Sample Dry (g)	4670.04

Calc. Wt. "W" (g)	636.67
Calc. Mass + #10	386.47

Sieve Number (Size)	Pan Weight (g)	Indiv. Wt. + Pan (g)	Indiv. Wt. Retain.	Cum. Wt. Retain.	Cum. % Retain.	% Finer By Wt.
3"	0.00	0.00	0.00	0.00	0.0	100.0
1 1/2"	0.00	301.92	301.92	301.92	6.5	93.5
3/4"	0.00	771.22	771.22	1073.14	23.0	77.0
3/8"	0.00	838.73	838.73	1911.87	40.9	59.1
#4	0.00	593.16	593.16	2505.03	53.6	46.4
#10	0.00	329.74	329.74	2834.77	60.7	39.3
#20	3.65	53.40	49.75	49.75	68.5	31.5
#40	3.99	31.29	27.30	77.05	72.8	27.2
#60	3.64	24.04	20.40	97.45	76.0	24.0
#100	3.63	22.48	18.85	116.30	79.0	21.0
#200	3.74	24.84	21.10	137.40	82.3	17.7

Data entered by: NAA Date: 9-25-96
Data checked by: cal Date: 9-26-96
FileName:DMMOWP81

ADVANCED TERRA TESTING, INC.



COBBLES	GRAVEL		SAND			SILT OR CLAY
	COARSE	FINE	CRS	MEDIUM	FINE	

USCS

COBBLES TO BOULDERS	PEBBLE GRAVEL				SAND			SILT	CLAY
	COARSE	MED	FINE	GRAN	COARSE	MED	FINE		

WENTWORTH

Client: Dames & Moore Boring No.: Sample No.: WP8-1

Depth: Job Number: 2001-06

Classification:_____

Advanced Terra Testing, Inc.

MECHANICAL ANALYSIS - SIEVE TEST DATA
ASTM D 422

CLIENT Dames & Moore

JOB NO. 2001-06

BORING NO.
DEPTH
SAMPLE NO. WP8-6
SOIL DESCR.

SAMPLED
DATE TESTED 9-17-96 ARH
WASH SIEVE Yes
DRY SIEVE No

MOISTURE DATA

HYGROSCOPIC Yes

NATURAL No

Wt. Wet Soil & Pan	(g)	186.25
Wt. Dry Soil & Pan	(g)	174.90
Wt. Lost Moisture	(g)	11.35
Wt. of Pan Only	(g)	8.22
Wt. of Dry Soil	(g)	166.68
Moisture Content	%	6.8

Wt. Hydrom. Sample Wet (g)	271.35
Wt. Hydrom. Sample Dry (g)	254.05

WASH SIEVE ANALYSIS

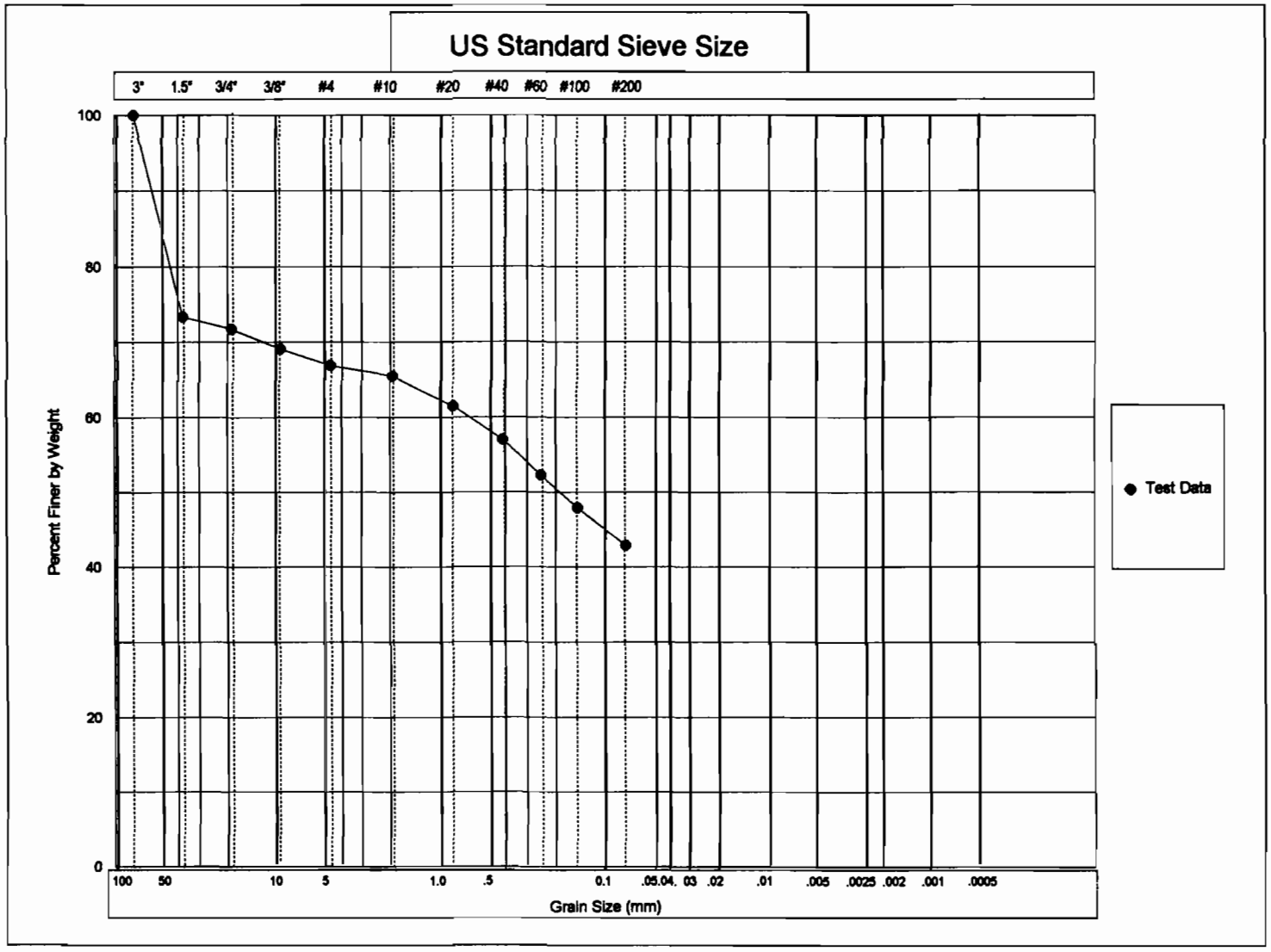
Wt. Total Sample Wet (g)	8993.20
Weight of + #10 Before Washing (g)	3158.20
Weight of + #10 After Washing (g)	2967.41
Weight of - #10 Wet (g)	5835.00
Weight of - #10 Dry (g)	5641.63
Wt. Total Sample Dry (g)	8609.04

Calc. Wt. "W" (g)	387.68
Calc. Mass + #10	133.63

Sieve Number (Size)	Pan Weight (g)	Indiv. Wt. + Pan (g)	Indiv. Wt. Retain.	Cum. Wt. Retain.	Cum. % Retain.	% Finer By Wt.
3"	0.00	0.00	0.00	0.00	0.0	100.0
1 1/2"	0.00	2291.50	2291.50	2291.50	26.6	73.4
3/4"	0.00	141.48	141.48	2432.98	28.3	71.7
3/8"	0.00	226.66	226.66	2659.64	30.9	69.1
#4	0.00	188.77	188.77	2848.41	33.1	66.9
#10	0.00	119.00	119.00	2967.41	34.5	65.5
#20	2.31	18.11	15.80	15.80	38.5	61.5
#40	2.30	19.57	17.27	33.07	43.0	57.0
#60	2.29	20.83	18.54	51.61	47.8	52.2
#100	2.31	18.93	16.62	68.23	52.1	47.9
#200	2.29	21.83	19.54	87.77	57.1	42.9

Data entered by: NAA Date: 9-20-96
Data checked by: BSR Date: 9-20-96
FileName:DMM0WP86

ADVANCED TERRA TESTING, INC.



COBBLES	GRAVEL		SAND			SILT OR CLAY
	COARSE	FINE	CRS	MEDIUM	FINE	

USCS

COBBLES TO BOULDERS	PEBBLE GRAVEL				SAND			SILT	CLAY
	COARSE	MED	FINE	GRAN	COARSE	MED	FINE		

WENTWORTH

Client: Dames & Moore Boring No.: Depth: Sample No.: WP8-6 Job Number: 2001-06

Classification:_____ Advanced Terra Testing, Inc.

MECHANICAL ANALYSIS - SIEVE TEST DATA
ASTM D 422

CLIENT Dames & Moore

JOB NO. 2001-06

BORING NO.
DEPTH
SAMPLE NO. WP10-1
SOIL DESCR.

SAMPLED
DATE TESTED 9-24-96 DPM
WASH SIEVE Yes
DRY SIEVE No

MOISTURE DATA

HYGROSCOPIC Yes

NATURAL No

Wt. Wet Soil & Pan	(g)	157.47
Wt. Dry Soil & Pan	(g)	155.53
Wt. Lost Moisture	(g)	1.94
Wt. of Pan Only	(g)	8.16
Wt. of Dry Soil	(g)	147.37
Moisture Content	%	1.3

Wt. Hydrom. Sample Wet	(g)	239.48
Wt. Hydrom. Sample Dry	(g)	236.37

WASH SIEVE ANALYSIS

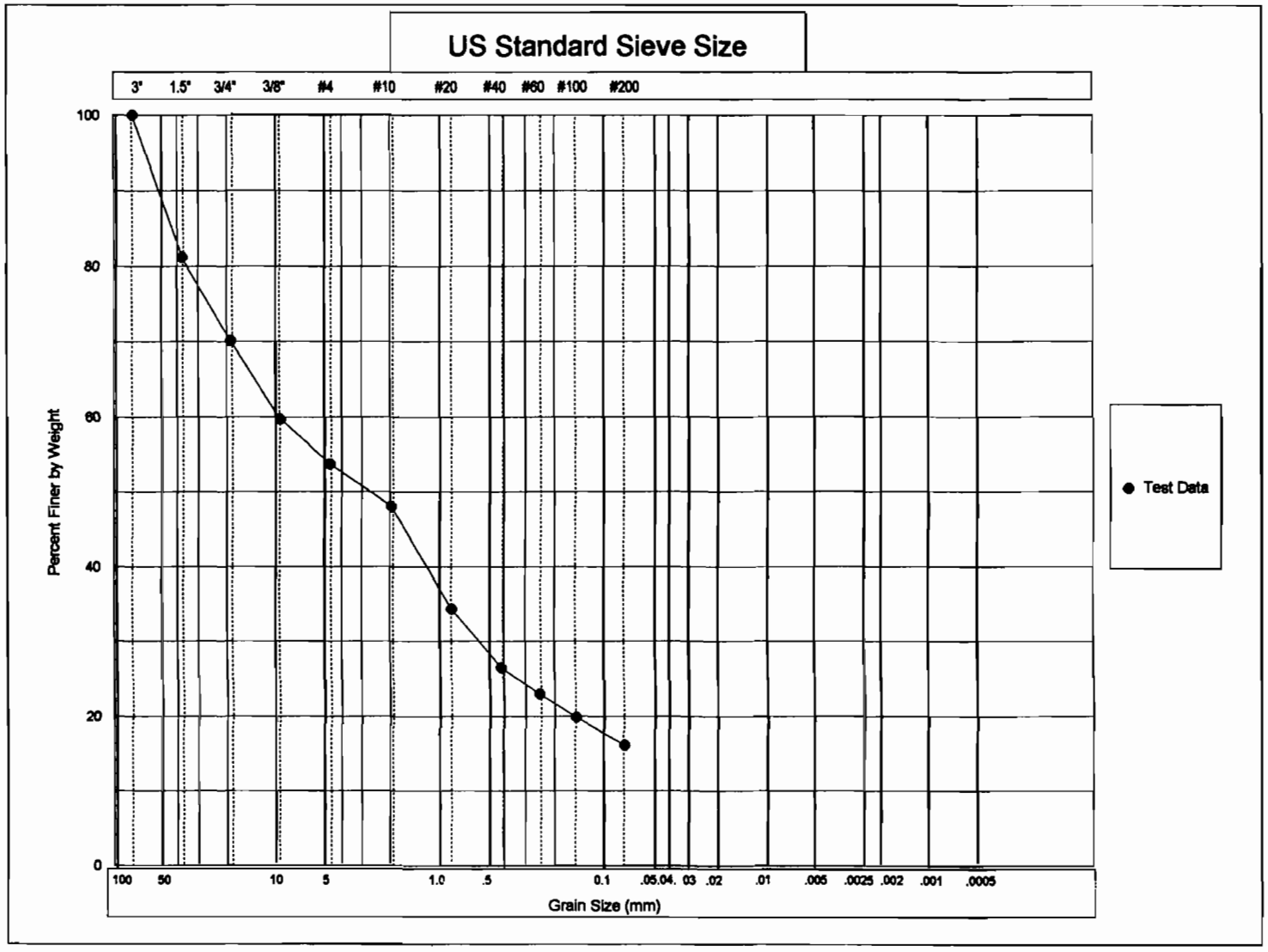
Wt. Total Sample Wet	(g)	3676.30
Weight of + #10 Before Washing	(g)	1988.70
Weight of + #10 After Washing	(g)	1899.59
Weight of - #10 Wet	(g)	1687.60
Weight of - #10 Dry	(g)	1753.63
Wt. Total Sample Dry	(g)	3653.22

Calc. Wt. "W"	(g)	492.41
Calc. Mass + #10		256.04

Sieve Number (Size)	Pan Weight (g)	Indiv. Wt. + Pan (g)	Indiv. Wt. Retain.	Cum. Wt. Retain.	Cum. % Retain.	% Finer By Wt.
3"	0.00	0.00	0.00	0.00	0.0	100.0
1 1/2"	0.00	686.13	686.13	686.13	18.8	81.2
3/4"	0.00	406.30	406.30	1092.43	29.9	70.1
3/8"	0.00	380.21	380.21	1472.64	40.3	59.7
#4	0.00	218.68	218.68	1691.32	46.3	53.7
#10	0.00	208.27	208.27	1899.59	52.0	48.0
#20	3.72	70.88	67.16	67.16	65.6	34.4
#40	3.77	42.80	39.03	106.19	73.6	26.4
#60	3.62	20.80	17.18	123.37	77.1	22.9
#100	3.57	19.17	15.60	138.97	80.2	19.8
#200	3.72	22.21	18.49	157.46	84.0	16.0

Data entered by: NAA Date: 9-25-96
Data checked by: [illegible] Date: 9-26-96
FileName:DMMOP101

ADVANCED TERRA TESTING, INC.



COBBLES	GRAVEL		SAND			SILT OR CLAY
	COARSE	FINE	CRS	MEDIUM	FINE	

USCS

COBBLES TO BOULDERS	PEBBLE GRAVEL				SAND			SILT	CLAY
	COARSE	MED	FINE	GRAN	COARSE	MED	FINE		

WENTWORTH

Client: Dames & Moore Boring No.: Sample No.: WP10-1

Depth: Job Number: 2001-06

Classification:_____

Advanced Terra Testing, Inc.

MECHANICAL ANALYSIS - SIEVE TEST DATA
ASTM D 422

CLIENT Dames & Moore

JOB NO. 2001-06

BORING NO. WP11-2
DEPTH
SAMPLE NO.
SOIL DESCR.

SAMPLED
DATE TESTED 9-25-96 AM
WASH SIEVE Yes
DRY SIEVE No

MOISTURE DATA

HYGROSCOPIC Yes

NATURAL No

Wt. Wet Soil & Pan	(g)	88.94
Wt. Dry Soil & Pan	(g)	86.10
Wt. Lost Moisture	(g)	2.84
Wt. of Pan Only	(g)	3.72
Wt. of Dry Soil	(g)	82.38
Moisture Content	%	3.4

Wt. Hydrom. Sample Wet (g)	245.31
Wt. Hydrom. Sample Dry (g)	237.13

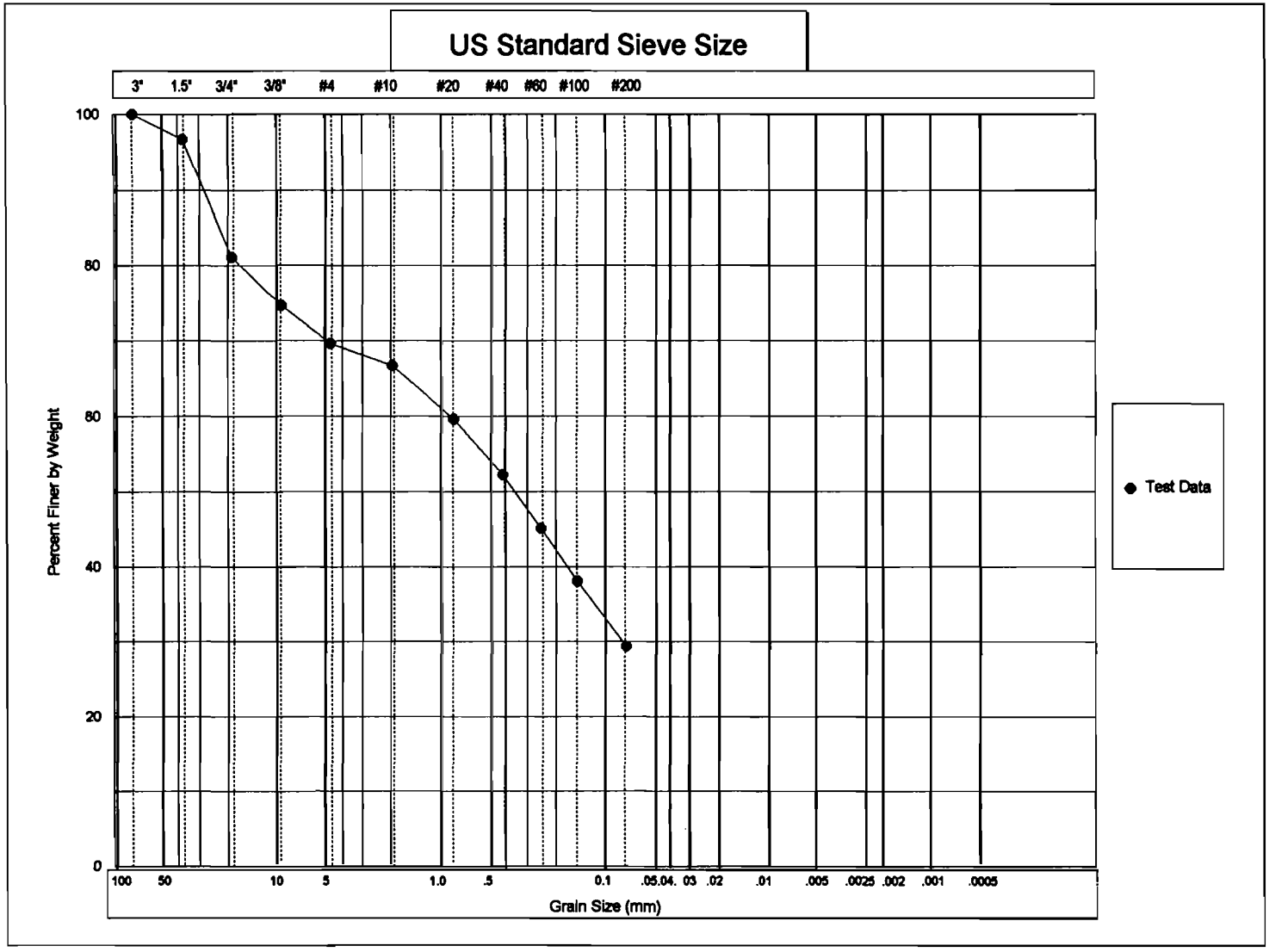
WASH SIEVE ANALYSIS

Wt. Total Sample Wet (g)	4575.00
Weight of + #10 Before Washing (g)	3000.40
Weight of + #10 After Washing (g)	1489.07
Weight of - #10 Wet (g)	1574.60
Weight of - #10 Dry (g)	2983.09
Wt. Total Sample Dry (g)	4472.16
Calc. Wt. "W" (g)	355.51
Calc. Mass + #10	118.37

Sieve Number (Size)	Pan Weight (g)	Indiv. Wt. + Pan (g)	Indiv. Wt. Retain.	Cum. Wt. Retain.	Cum. % Retain.	% Finer By Wt.
3"	0.00	0.00	0.00	0.00	0.0	100.0
1 1/2"	0.00	150.19	150.19	150.19	3.4	96.6
3/4"	0.00	695.12	695.12	845.31	18.9	81.1
3/8"	0.00	286.45	286.45	1131.76	25.3	74.7
#4	0.00	223.46	223.46	1355.22	30.3	69.7
#10	0.00	133.85	133.85	1489.07	33.3	66.7
#20	3.75	29.03	25.28	25.28	40.4	59.6
#40	3.71	30.06	26.35	51.63	47.8	52.2
#60	3.61	28.81	25.20	76.83	54.9	45.1
#100	3.62	28.48	24.86	101.69	61.9	38.1
#200	3.69	34.94	31.25	132.94	70.7	29.3

Data entered by: NAA Date: 9-26-96
Data checked by: [illegible] Date: 9-26-96
FileName:DMMOP112

ADVANCED TERRA TESTING, INC.



COBBLES	GRAVEL		SAND			SILT OR CLAY
	COARSE	FINE	CRS	MEDIUM	FINE	

USCS

COBBLES TO BOULDERS	PEBBLE GRAVEL				SAND			SILT	CLAY
	COARSE	MED	FINE	GRAN	COARSE	MED	FINE		

WENTWORTH

Client: Dames & Moore Boring No.: WP11-2 Sample No.:

Depth: Job Number: 2001-06

Classification:_____

Advanced Terra Testing, Inc.

MECHANICAL ANALYSIS - SIEVE TEST DATA
ASTM D 422

CLIENT Dames & Moore

JOB NO. 2001-06

BORING NO.
DEPTH
SAMPLE NO. WP11-6
SOIL DESCR.

SAMPLED
DATE TESTED 9-24-96 DPM
WASH SIEVE Yes
DRY SIEVE No

MOISTURE DATA

HYGROSCOPIC Yes

NATURAL No

Wt. Wet Soil & Pan	(g)	245.47
Wt. Dry Soil & Pan	(g)	243.79
Wt. Lost Moisture	(g)	1.68
Wt. of Pan Only	(g)	8.36
Wt. of Dry Soil	(g)	235.43
Moisture Content	%	0.7

Wt. Hydrom. Sample Wet (g)	335.10
Wt. Hydrom. Sample Dry (g)	332.73

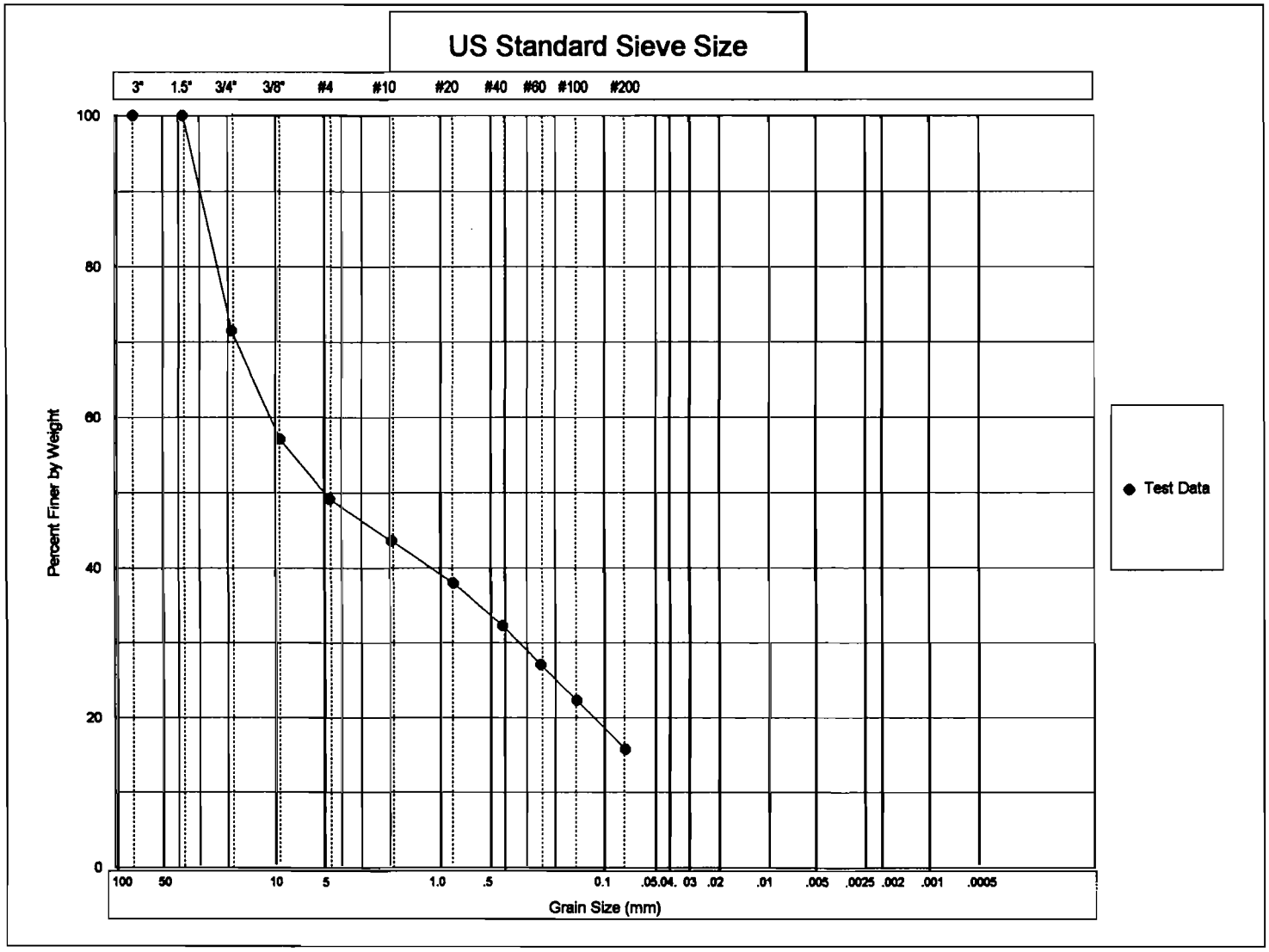
WASH SIEVE ANALYSIS

Wt. Total Sample Wet (g)	2460.90
Weight of + #10 Before Washing (g)	1419.70
Weight of + #10 After Washing (g)	1383.85
Weight of - #10 Wet (g)	1041.20
Weight of - #10 Dry (g)	1069.42
Wt. Total Sample Dry (g)	2453.27
Calc. Wt. "W" (g)	763.28
Calc. Mass + #10	430.55

Sieve Number (Size)	Pan Weight (g)	Indiv. Wt. + Pan (g)	Indiv. Wt. Retain.	Cum. Wt. Retain.	Cum. % Retain.	% Finer By Wt.
3"	0.00	0.00	0.00	0.00	0.0	100.0
1 1/2"	0.00	0.00	0.00	0.00	0.0	100.0
3/4"	0.00	698.62	698.62	698.62	28.5	71.5
3/8"	0.00	353.58	353.58	1052.20	42.9	57.1
#4	0.00	195.29	195.29	1247.49	50.9	49.1
#10	0.00	136.36	136.36	1383.85	56.4	43.6
#20	3.70	46.58	42.88	42.88	62.0	38.0
#40	3.72	46.60	42.88	85.76	67.6	32.4
#60	3.70	44.27	40.57	126.33	73.0	27.0
#100	3.71	39.64	35.93	162.26	77.7	22.3
#200	3.83	53.94	50.11	212.37	84.2	15.8

Data entered by: NAA Date: 9-25-96
Data checked by: [illegible] Date: 9-26-96
FileName:DMMOP116

ADVANCED TERRA TESTING, INC.



COBBLES	GRAVEL		SAND			SILT OR CLAY
	COARSE	FINE	CRS	MEDIUM	FINE	

USCS

COBBLES TO BOULDERS	PEBBLE GRAVEL				SAND			SILT	CLAY
	COARSE	MED	FINE	GRAN	COARSE	MED	FINE		

WENTWORTH

Client: Dames & Moore Boring No.: Sample No.: WP11-6

Depth: Job Number: 2001-06

Classification:_____

Advanced Terra Testing, Inc.

MECHANICAL ANALYSIS - SIEVE TEST DATA
ASTM D 422

CLIENT Dames & Moore

JOB NO. 2001-06

BORING NO.
DEPTH
SAMPLE NO. WP12-1
SOIL DESCR.

SAMPLED
DATE TESTED 9-20-96 ARH
WASH SIEVE Yes
DRY SIEVE No

MOISTURE DATA

HYGROSCOPIC Yes

NATURAL No

Wt. Wet Soil & Pan	(g)	49.08
Wt. Dry Soil & Pan	(g)	47.01
Wt. Lost Moisture	(g)	2.07
Wt. of Pan Only	(g)	3.76
Wt. of Dry Soil	(g)	43.25
Moisture Content	%	4.8

Wt. Hydrom. Sample Wet (g)	179.18
Wt. Hydrom. Sample Dry (g)	171.00

WASH SIEVE ANALYSIS

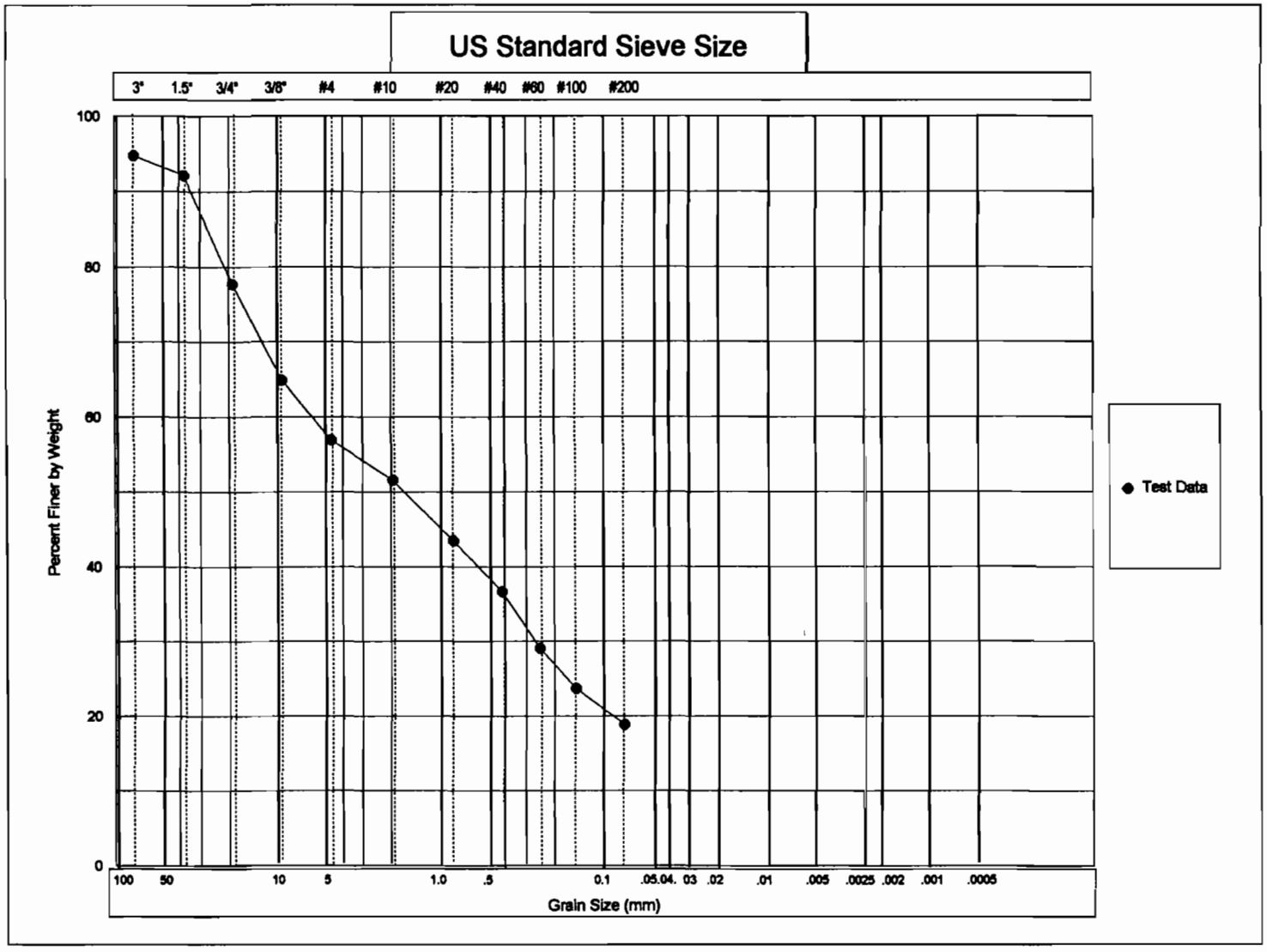
Wt. Total Sample Wet (g)	11259.00
Weight of + #10 Before Washing (g)	5700.00
Weight of + #10 After Washing (g)	5326.44
Weight of - #10 Wet (g)	5559.00
Weight of - #10 Dry (g)	5661.59
Wt. Total Sample Dry (g)	10988.03

Calc. Wt. "W" (g)	331.87
Calc. Mass + #10	160.87

Sieve Number (Size)	Pan Weight (g)	Indiv. Wt. + Pan (g)	Indiv. Wt. Retain.	Cum. Wt. Retain.	Cum. % Retain.	% Finer By Wt.
3"	0.00	584.13	584.13	584.13	5.3	94.7
1 1/2"	0.00	276.48	276.48	860.61	7.8	92.2
3/4"	0.00	1588.48	1588.48	2449.09	22.3	77.7
3/8"	0.00	1412.73	1412.73	3861.82	35.1	64.9
#4	0.00	868.31	868.31	4730.13	43.0	57.0
#10	0.00	596.31	596.31	5326.44	48.5	51.5
#20	2.29	28.91	26.62	26.62	56.5	43.5
#40	2.30	24.88	22.58	49.20	63.3	36.7
#60	2.30	27.62	25.32	74.52	70.9	29.1
#100	2.23	20.24	18.01	92.53	76.4	23.6
#200	2.30	18.50	16.20	108.73	81.2	18.8

Data entered by: NAA Date: 9-23-96
Data checked by: [illegible] Date: 9-23-96
FileName:DMMOWP12

ADVANCED TERRA TESTING, INC.



COBBLES	GRAVEL		SAND			SILT OR CLAY
	COARSE	FINE	CRS	MEDIUM	FINE	

USCS

COBBLES TO BOULDERS	PEBBLE GRAVEL				SAND			SILT	CLAY
	COARSE	MED	FINE	GRAN	COARSE	MED	FINE		

WENTWORTH

Client: Dames & Moore Boring No.: Depth: Sample No.: WP12-1 Job Number: 2001-06

Classification:_____ Advanced Terra Testing, Inc.

MECHANICAL ANALYSIS - SIEVE TEST DATA
ASTM D 422

CLIENT Dames & Moore

JOB NO. 2001-06

BORING NO.
DEPTH
SAMPLE NO. WP13-4
SOIL DESCR.

SAMPLED
DATE TESTED 9-22-96 CAL
WASH SIEVE Yes
DRY SIEVE No

MOISTURE DATA

HYGROSCOPIC Yes

NATURAL No

Wt. Wet Soil & Pan	(g)	220.44
Wt. Dry Soil & Pan	(g)	211.28
Wt. Lost Moisture	(g)	9.16
Wt. of Pan Only	(g)	8.12
Wt. of Dry Soil	(g)	203.16
Moisture Content	%	4.5

Wt. Hydrom. Sample Wet (g)	244.15
Wt. Hydrom. Sample Dry (g)	233.62

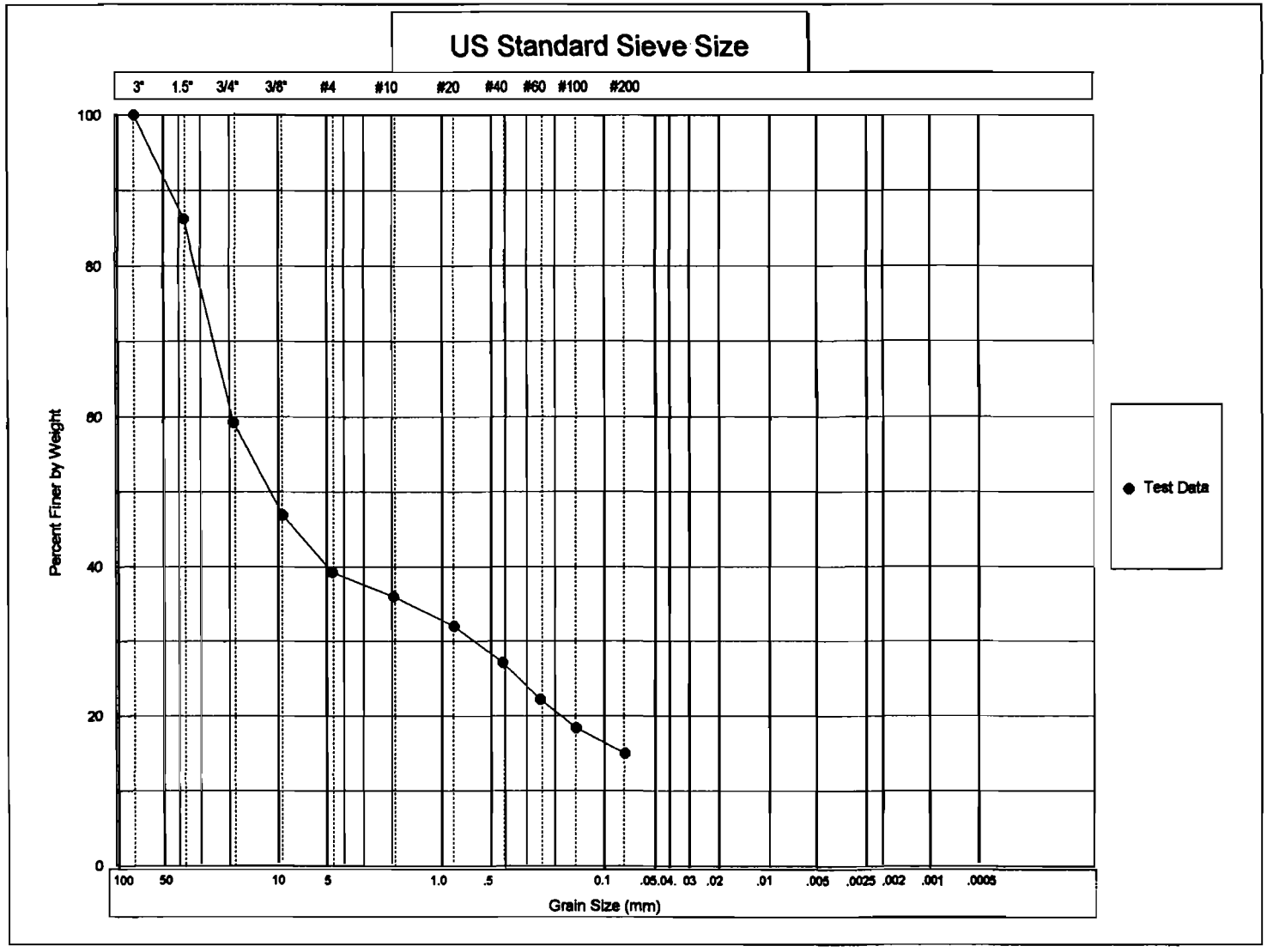
WASH SIEVE ANALYSIS

Wt. Total Sample Wet (g)	4427.00
Weight of + #10 Before Washing (g)	3001.00
Weight of + #10 After Washing (g)	2789.04
Weight of - #10 Wet (g)	1426.00
Weight of - #10 Dry (g)	1567.29
Wt. Total Sample Dry (g)	4356.33
Calc. Wt. "W" (g)	649.34
Calc. Mass + #10	415.73

Sieve Number (Size)	Pan Weight (g)	Indiv. Wt. + Pan (g)	Indiv. Wt. Retain.	Cum. Wt. Retain.	Cum. % Retain.	% Finer By Wt.
3"	0.00	0.00	0.00	0.00	0.0	100.0
1 1/2"	0.00	600.27	600.27	600.27	13.8	86.2
3/4"	0.00	1177.32	1177.32	1777.59	40.8	59.2
3/8"	0.00	536.66	536.66	2314.25	53.1	46.9
#4	0.00	331.55	331.55	2645.80	60.7	39.3
#10	0.00	143.24	143.24	2789.04	64.0	36.0
#20	3.73	29.71	25.98	25.98	68.0	32.0
#40	3.67	35.26	31.59	57.57	72.9	27.1
#60	3.62	35.80	32.18	89.75	77.8	22.2
#100	3.74	28.56	24.82	114.57	81.7	18.3
#200	3.70	25.62	21.92	136.49	85.0	15.0

Data entered by: NAA Date: 9-23-96
Data checked by: [illegible] Date: 9-23-96
FileName:DMM0WP34

ADVANCED TERRA TESTING, INC.



COBBLES	GRAVEL		SAND			SILT OR CLAY
	COARSE	FINE	CRS	MEDIUM	FINE	

USCS

COBBLES TO BOULDERS	PEBBLE GRAVEL				SAND			SILT	CLAY
	COARSE	MED	FINE	GRAN	COARSE	MED	FINE		

WENTWORTH

Client: Dames & Moore Boring No.: Depth: Sample No.: WP13-4 Job Number: 2001-06

Classification:_____ Advanced Terra Testing, Inc.

MECHANICAL ANALYSIS - SIEVE TEST DATA
ASTM D 422

CLIENT Dames & Moore

JOB NO. 2001-06

BORING NO.
DEPTH
SAMPLE NO. WP14-2
SOIL DESCR.

SAMPLED
DATE TESTED 9-20-96 ARH
WASH SIEVE Yes
DRY SIEVE No

MOISTURE DATA

HYGROSCOPIC Yes

NATURAL No

Wt. Wet Soil & Pan	(g)	196.75
Wt. Dry Soil & Pan	(g)	191.12
Wt. Lost Moisture	(g)	5.63
Wt. of Pan Only	(g)	8.45
Wt. of Dry Soil	(g)	182.67
Moisture Content	%	3.1

Wt. Hydrom. Sample Wet (g)	210.62
Wt. Hydrom. Sample Dry (g)	204.32

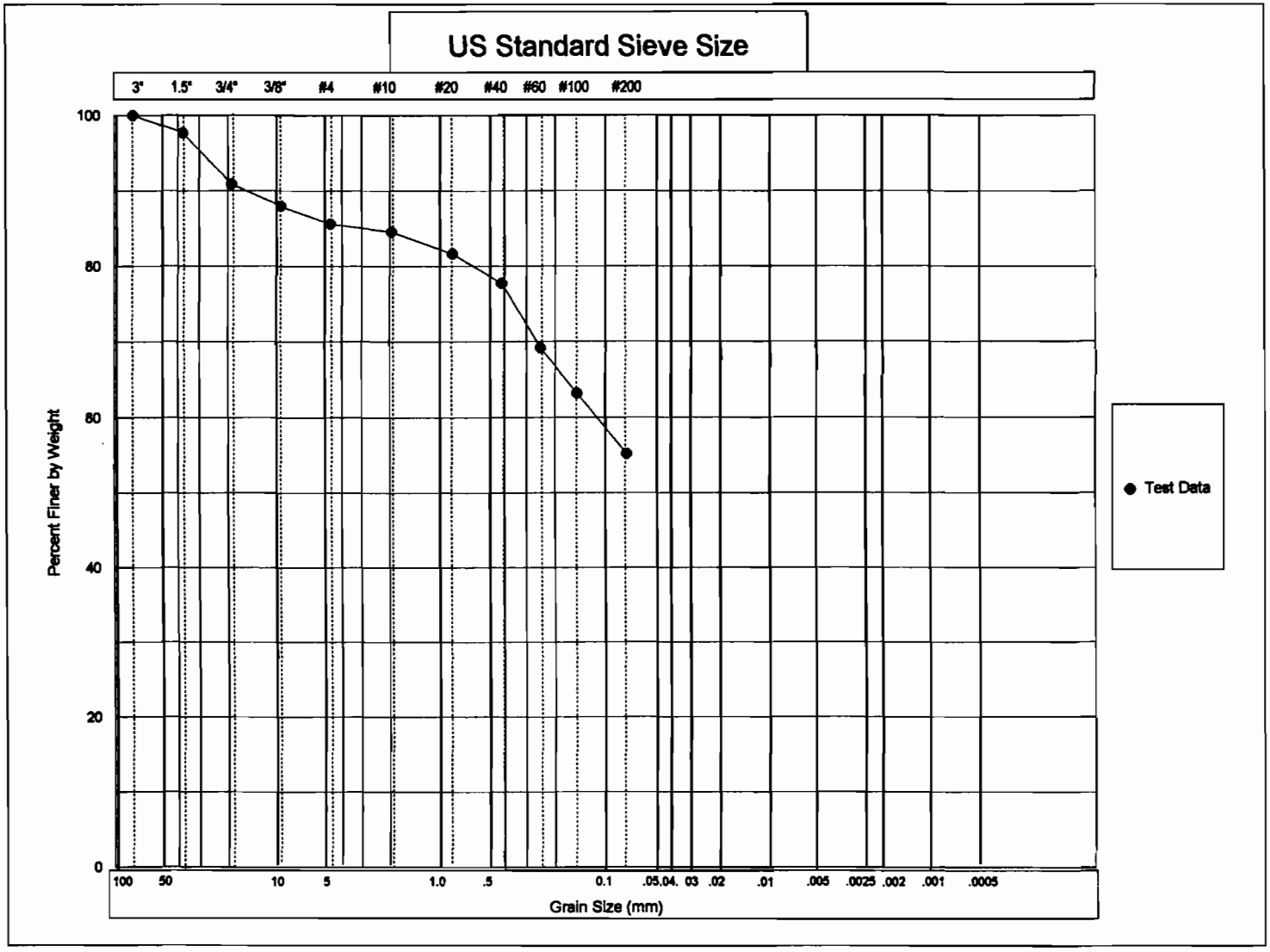
WASH SIEVE ANALYSIS

Wt. Total Sample Wet (g)	2832.70
Weight of + #10 Before Washing (g)	470.80
Weight of + #10 After Washing (g)	428.45
Weight of - #10 Wet (g)	2361.90
Weight of - #10 Dry (g)	2332.37
Wt. Total Sample Dry (g)	2760.82
Calc. Wt. "W" (g)	241.86
Calc. Mass + #10	37.53

Sieve Number (Size)	Pan Weight (g)	Indiv. Wt. + Pan (g)	Indiv. Wt. Retain.	Cum. Wt. Retain.	Cum. % Retain.	% Finer By Wt.
3"	0.00	0.00	0.00	0.00	0.0	100.0
1 1/2"	0.00	63.72	63.72	63.72	2.3	97.7
3/4"	0.00	187.10	187.10	250.82	9.1	90.9
3/8"	0.00	82.89	82.89	333.71	12.1	87.9
#4	0.00	65.34	65.34	399.05	14.5	85.5
#10	0.00	29.40	29.40	428.45	15.5	84.5
#20	3.72	10.51	6.79	6.79	18.3	81.7
#40	3.67	13.25	9.58	16.37	22.3	77.7
#60	3.74	24.33	20.59	36.96	30.8	69.2
#100	3.84	18.46	14.62	51.58	36.8	63.2
#200	3.69	23.01	19.32	70.90	44.8	55.2

Data entered by: NAA Date: 9-23-96
Data checked by: [illegible] Date: 9-23-96
FileName:DMMOWP42

ADVANCED TERRA TESTING, INC.



COBBLES	GRAVEL		SAND			SILT OR CLAY
	COARSE	FINE	CRS	MEDIUM	FINE	

USCS

COBBLES TO BOULDERS	PEBBLE GRAVEL				SAND			SILT	CLAY
	COARSE	MED	FINE	GRAN	COARSE	MED	FINE		

WENTWORTH

Client: Dames & Moore Boring No.: Depth: Sample No.: WP14-2 Job Number: 2001-06

Classification:_____ Advanced Terra Testing, Inc.

MECHANICAL ANALYSIS - SIEVE TEST DATA
ASTM D 422

CLIENT Dames & Moore

JOB NO. 2001-06

BORING NO.
DEPTH
SAMPLE NO. WP14-6
SOIL DESCR.

SAMPLED
DATE TESTED 9-20-96 ARH
WASH SIEVE Yes
DRY SIEVE No

MOISTURE DATA

HYGROSCOPIC Yes

NATURAL No

Wt. Wet Soil & Pan	(g)	243.20
Wt. Dry Soil & Pan	(g)	240.47
Wt. Lost Moisture	(g)	2.73
Wt. of Pan Only	(g)	8.35
Wt. of Dry Soil	(g)	232.12
Moisture Content	%	1.2

Wt. Hydrom. Sample Wet (g)	248.70
Wt. Hydrom. Sample Dry (g)	245.81

WASH SIEVE ANALYSIS

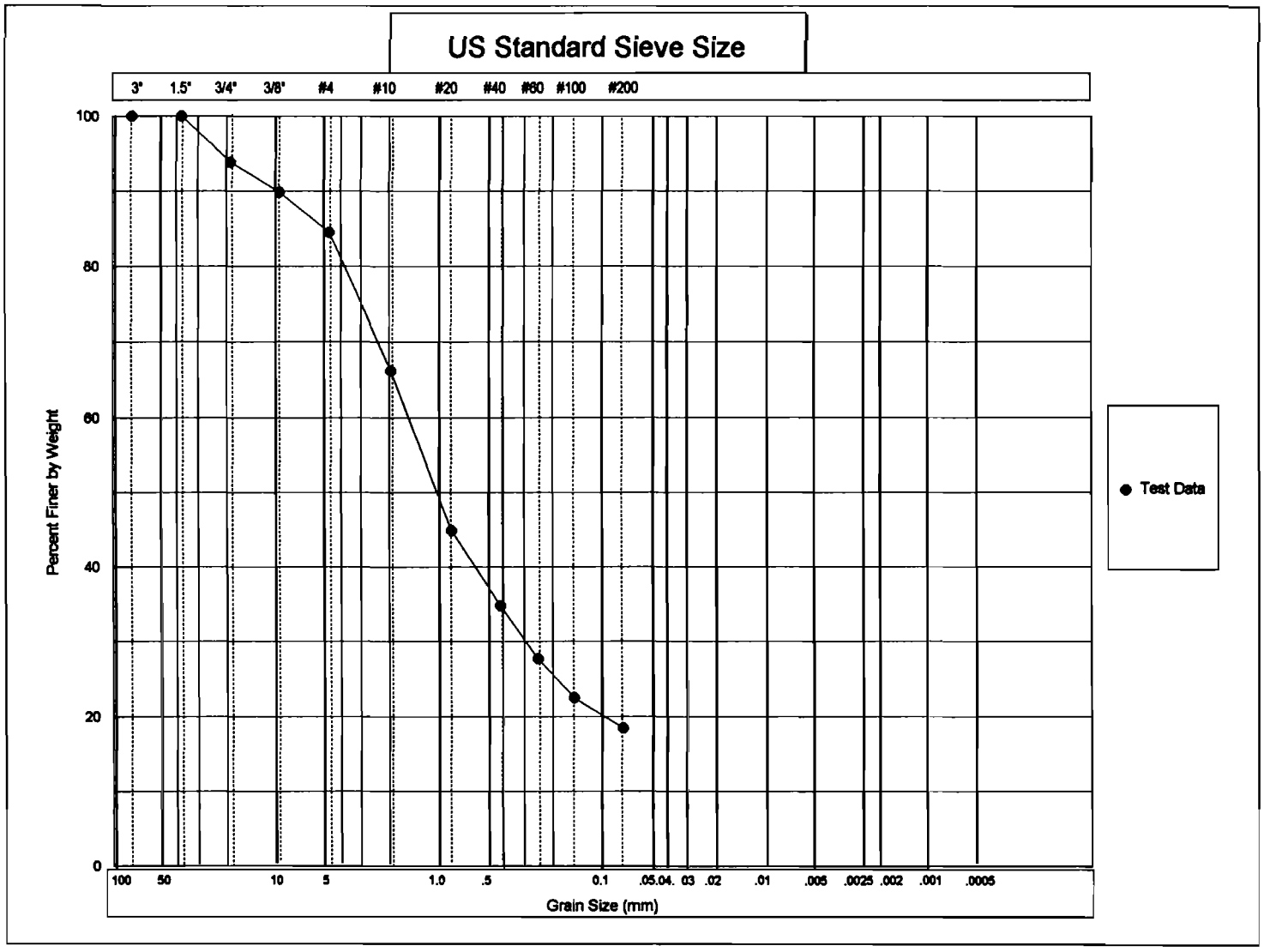
Wt. Total Sample Wet (g)	1840.50
Weight of + #10 Before Washing (g)	703.60
Weight of + #10 After Washing (g)	617.19
Weight of - #10 Wet (g)	1136.90
Weight of - #10 Dry (g)	1209.09
Wt. Total Sample Dry (g)	1826.28

Calc. Wt. "W" (g)	371.28
Calc. Mass + #10	125.48

Sieve Number (Size)	Pan Weight (g)	Indiv. Wt. + Pan (g)	Indiv. Wt. Retain.	Cum. Wt. Retain.	Cum. % Retain.	% Finer By Wt.
3"	0.00	0.00	0.00	0.00	0.0	100.0
1 1/2"	0.00	0.00	0.00	0.00	0.0	100.0
3/4"	0.00	111.80	111.80	111.80	6.1	93.9
3/8"	0.00	73.57	73.57	185.37	10.2	89.8
#4	0.00	97.30	97.30	282.67	15.5	84.5
#10	0.00	334.52	334.52	617.19	33.8	66.2
#20	3.67	82.69	79.02	79.02	55.1	44.9
#40	3.88	41.40	37.52	116.54	65.2	34.8
#60	3.74	30.39	26.65	143.19	72.4	27.6
#100	3.82	22.98	19.16	162.35	77.5	22.5
#200	3.91	18.93	15.02	177.37	81.6	18.4

Data entered by: NAA Date: 9-23-96
Data checked by: [illegible] Date: 9-23-96
FileName:DMM0WP14

ADVANCED TERRA TESTING, INC.



COBBLES	GRAVEL		SAND			SILT OR CLAY
	COARSE	FINE	CRS	MEDIUM	FINE	

USCS

COBBLES TO BOULDERS	PEBBLE GRAVEL				SAND			SILT	CLAY
	COARSE	MED	FINE	GRAN	COARSE	MED	FINE		

WENTWORTH

Client: Dames & Moore Boring No.: Depth: Sample No.: WP14-6 Job Number: 2001-06

Classification:_____

Advanced Terra Testing, Inc.

MECHANICAL ANALYSIS - SIEVE TEST DATA
ASTM D 422

CLIENT Dames & Moore

JOB NO. 2001-06

BORING NO.
DEPTH
SAMPLE NO. ADIT7-1
SOIL DESCR.

SAMPLED
DATE TESTED 9-22-96 CAL
WASH SIEVE Yes
DRY SIEVE No

MOISTURE DATA

HYGROSCOPIC Yes

NATURAL No

Wt. Wet Soil & Pan	(g)	83.70
Wt. Dry Soil & Pan	(g)	83.29
Wt. Lost Moisture	(g)	0.41
Wt. of Pan Only	(g)	3.68
Wt. of Dry Soil	(g)	79.61
Moisture Content	%	0.5

Wt. Hydrom. Sample Wet (g)	240.74
Wt. Hydrom. Sample Dry (g)	239.51

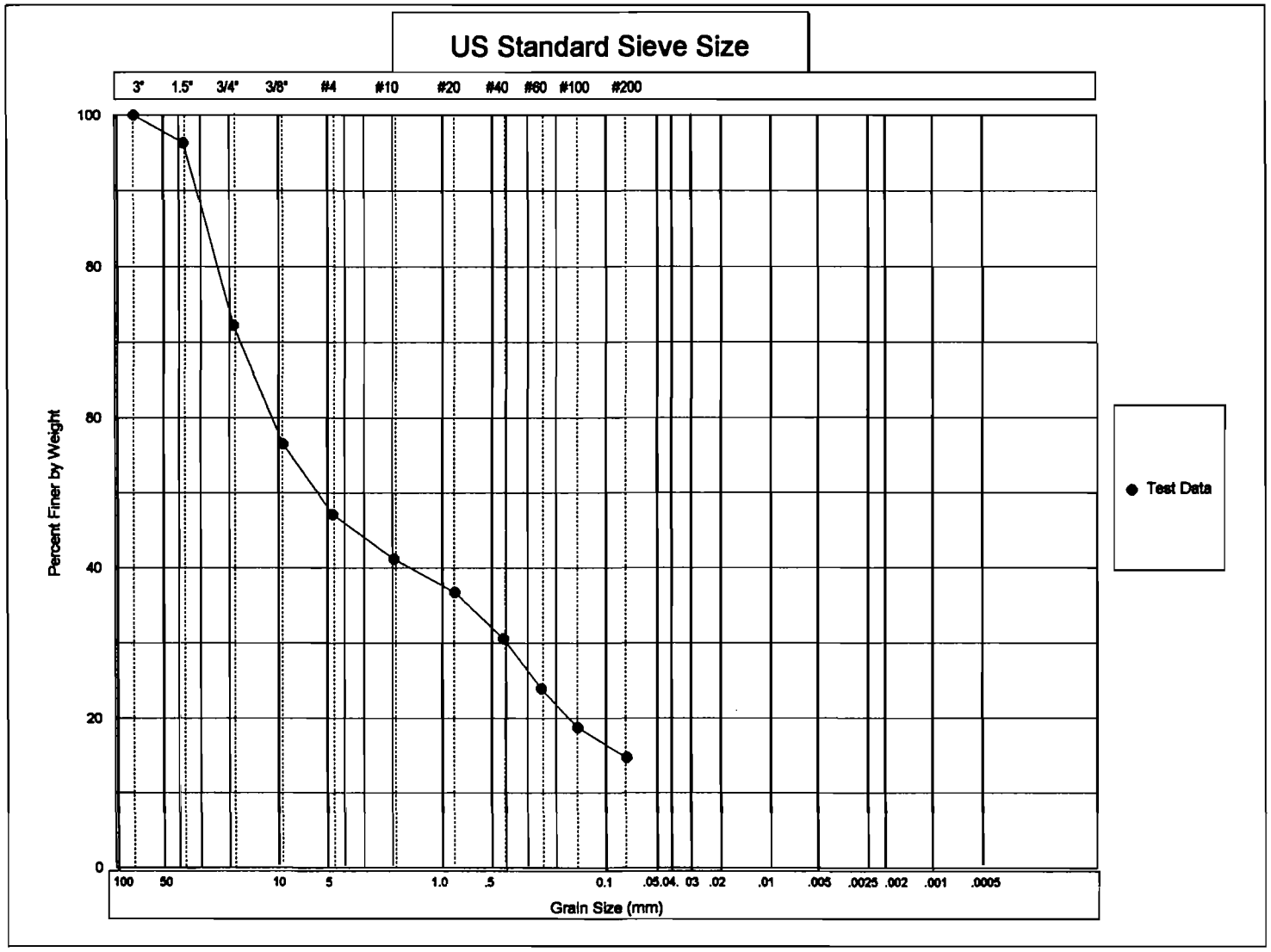
WASH SIEVE ANALYSIS

Wt. Total Sample Wet (g)	3631.00
Weight of + #10 Before Washing (g)	2206.90
Weight of + #10 After Washing (g)	2131.81
Weight of - #10 Wet (g)	1424.10
Weight of - #10 Dry (g)	1491.51
Wt. Total Sample Dry (g)	3623.32
Calc. Wt. "W" (g)	581.83
Calc. Mass + #10	342.33

Sieve Number (Size)	Pan Weight (g)	Indiv. Wt. + Pan (g)	Indiv. Wt. Retain.	Cum. Wt. Retain.	Cum. % Retain.	% Finer By Wt.
3"	0.00	0.00	0.00	0.00	0.0	100.0
1 1/2"	0.00	134.62	134.62	134.62	3.7	96.3
3/4"	0.00	872.14	872.14	1006.76	27.8	72.2
3/8"	0.00	569.61	569.61	1576.37	43.5	56.5
#4	0.00	341.42	341.42	1917.79	52.9	47.1
#10	0.00	214.02	214.02	2131.81	58.8	41.2
#20	3.70	29.57	25.87	25.87	63.3	36.7
#40	3.73	39.28	35.55	61.42	69.4	30.6
#60	3.62	42.41	38.79	100.21	76.1	23.9
#100	3.68	34.21	30.53	130.74	81.3	18.7
#200	3.71	26.93	23.22	153.96	85.3	14.7

Data entered by: NAA Date: 9-23-96
Data checked by: [illegible] Date: 9-23-96
FileName:DMMOIT71

ADVANCED TERRA TESTING, INC.



COBBLES	GRAVEL		SAND			SILT OR CLAY
	COARSE	FINE	CRS	MEDIUM	FINE	

USCS

COBBLES TO BOULDERS	PEBBLE GRAVEL				SAND			SILT	CLAY
	COARSE	MED	FINE	GRAN	COARSE	MED	FINE		

WENTWORTH

Client: Dames & Moore Boring No.: Depth: Sample No.: ADIT7-1 Job Number: 2001-06

Classification:_____ Advanced Terra Testing, Inc.

MECHANICAL ANALYSIS - SIEVE TEST DATA
ASTM D 422

CLIENT Dames & Moore

JOB NO. 2001-06

BORING NO.
DEPTH
SAMPLE NO. Crossbeam 2
SOIL DESCR.

SAMPLED
DATE TESTED 9-25-96 AM
WASH SIEVE Yes
DRY SIEVE No

MOISTURE DATA

HYGROSCOPIC Yes

NATURAL No

Wt. Wet Soil & Pan	(g)	64.28
Wt. Dry Soil & Pan	(g)	63.62
Wt. Lost Moisture	(g)	0.66
Wt. of Pan Only	(g)	3.70
Wt. of Dry Soil	(g)	59.92
Moisture Content	%	1.1

Wt. Hydrom. Sample Wet (g)	263.50
Wt. Hydrom. Sample Dry (g)	260.63

WASH SIEVE ANALYSIS

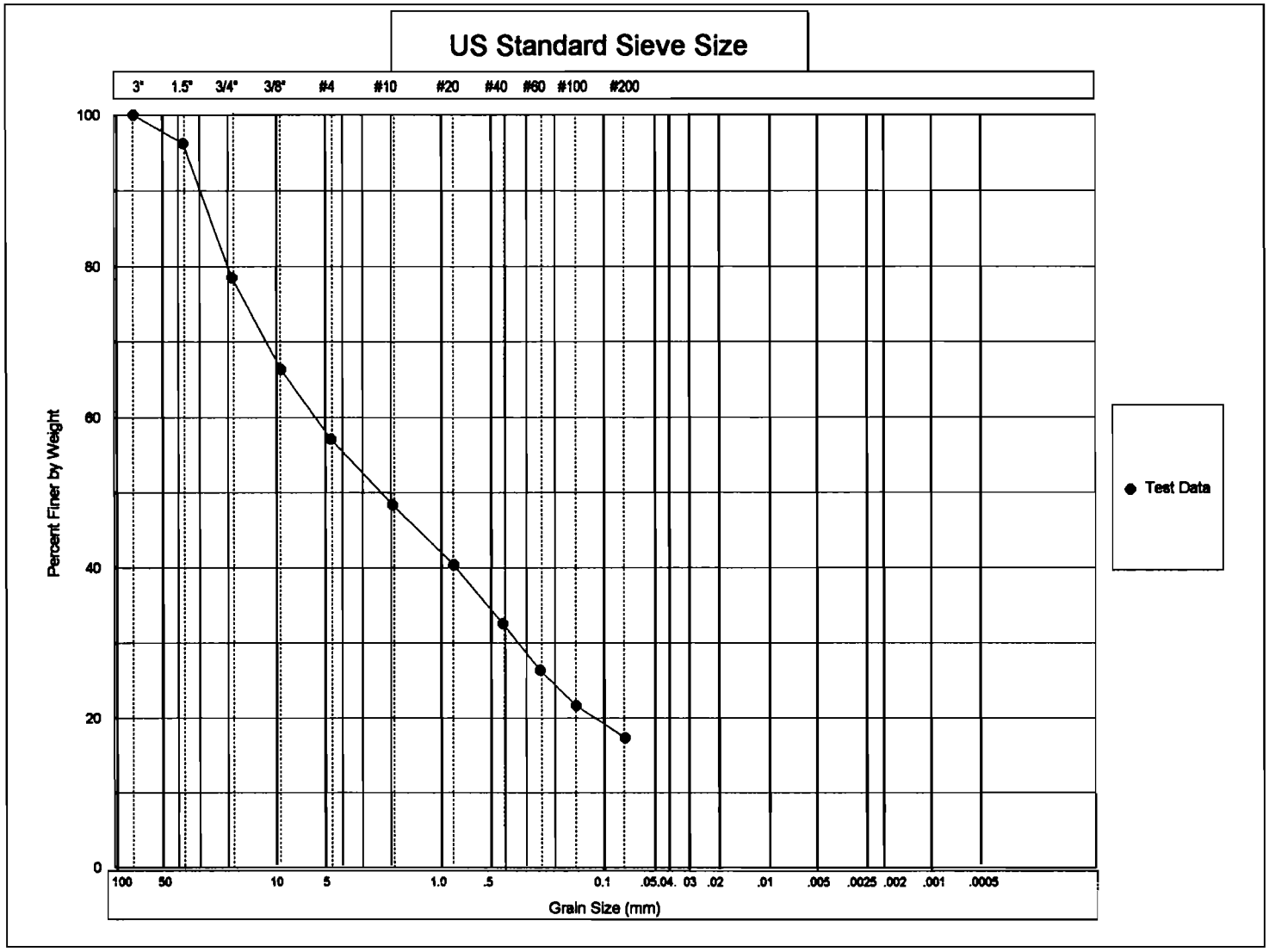
Wt. Total Sample Wet (g)	3894.60
Weight of + #10 Before Washing (g)	2142.10
Weight of + #10 After Washing (g)	2001.89
Weight of - #10 Wet (g)	1752.50
Weight of - #10 Dry (g)	1872.09
Wt. Total Sample Dry (g)	3873.98

Calc. Wt. "W" (g)	539.33
Calc. Mass + #10	278.70

Sieve Number (Size)	Pan Weight (g)	Indiv. Wt. + Pan (g)	Indiv. Wt. Retain.	Cum. Wt. Retain.	Cum. % Retain.	% Finer By Wt.
3"	0.00	0.00	0.00	0.00	0.0	100.0
1 1/2"	0.00	145.58	145.58	145.58	3.8	96.2
3/4"	0.00	685.16	685.16	830.74	21.4	78.6
3/8"	0.00	473.99	473.99	1304.73	33.7	66.3
#4	0.00	356.21	356.21	1660.94	42.9	57.1
#10	0.00	340.95	340.95	2001.89	51.7	48.3
#20	3.65	46.69	43.04	43.04	59.7	40.3
#40	3.66	45.54	41.88	84.92	67.4	32.6
#60	3.69	37.01	33.32	118.24	73.6	26.4
#100	3.71	29.42	25.71	143.95	78.4	21.6
#200	3.71	27.14	23.43	167.38	82.7	17.3

Data entered by: NAA Date: 9-26-96
Data checked by: cal Date: 9-26-96
FileName:DMM0CB2

ADVANCED TERRA TESTING, INC.



COBBLES	GRAVEL		SAND			SILT OR CLAY
	COARSE	FINE	CRS	MEDIUM	FINE	

USCS

COBBLES TO BOULDERS	PEBBLE GRAVEL				SAND			SILT	CLAY
	COARSE	MED	FINE	GRAN	COARSE	MED	FINE		

WENTWORTH

Client: Dames & Moore Boring No.: Sample No.: Crossbeam 2

Depth: Job Number: 2001-06

Classification:_____

Advanced Terra Testing, Inc.

CORE LABORATORIES

LABORATORY TEST RESULTS

Job Number: 962534 Date: 11/05/96

CUSTOMER: Dames & Moore PROJECT: EAGLE WASTE ROCK ATTN: Dan Lincicome

Customer Sample ID: WP1-1
Date Sampled.....:
Time Sampled.....:
Sample Matrix.....: Soil

Laboratory Sample ID: 962534-24
Date Received.....: 09/13/96
Time Received.....: 13:10

TEST METHOD	PARAMETER/TEST DESCRIPTION	SAMPLE RESULT	REPORTING LIMIT	UNITS	DATE	TECH
3.2.2	pH, Solid	7.41	0.01	pH Units	09/27/96	sgm
SW-846 3050	Acid Digestion: Solids, Solid	Complete			09/19/96	lmt
SW-846 6010A	Arsenic (As), Solid	1540	10	mg/Kg	10/10/96	gag
SW-846 6010A	Cadmium (Cd), Solid	82.5	0.5	mg/Kg	10/10/96	gag
SW-846 6010A	Calcium (Ca), Solid	94800	100	mg/Kg	10/10/96	gag
SW-846 6010A	Copper (Cu), Solid	279	5	mg/Kg	10/10/96	gag
SW-846 6010A	Iron (Fe), Solid	163000	300	mg/Kg	10/10/96	gag
SW-846 6010A	Lead (Pb), Solid	26000	30	mg/Kg	10/10/96	gag
SW-846 6010A	Magnesium (Mg), Solid	52400	100	mg/Kg	10/10/96	gag
SW-846 6010A	Manganese (Mn), Solid	11800	10	mg/Kg	10/10/96	gag
SW-846 6010A	Zinc (Zn), Solid	17400	50	mg/Kg	10/10/96	gag
SW-846 9030A	Sulfide, Solid	20	10	mg/Kg	10/10/96	lmt
ASTM D4239	AGP (from Total Sulfur), Solid	51.2	0.3	t CaCO3/kt	09/24/96	* sl
EPA 600 3.2.3	Acid Neutralization Potential, Solid	423	0.1	t CaCO3/kt	10/01/96	sgm

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CORE LABORATORIES

LABORATORY TEST RESULTS

Job Number: 962534

Date: 11/05/96

CUSTOMER: Dames & Moore

PROJECT: EAGLE WASTE ROCK

ATTN: Dan Lincicome

Customer Sample ID: WP1-2
Date Sampled.....:
Time Sampled.....:
Sample Matrix.....: Soil

Laboratory Sample ID: 962534-3
Date Received.....: 09/13/96
Time Received.....: 13:10

TEST METHOD	PARAMETER/TEST DESCRIPTION	SAMPLE RESULT	REPORTING LIMIT	UNITS	DATE	TECH
3.2.2	pH, Solid	7.62	0.01	pH Units	09/27/96	sgm
SW-846 3050	Acid Digestion: Solids, Solid	Complete			09/19/96	lmt
SW-846 6010A	Arsenic (As), Solid	660	10	mg/Kg	10/03/96	smh
SW-846 6010A	Cadmium (Cd), Solid	84.1	0.5	mg/Kg	10/03/96	smh
SW-846 6010A	Calcium (Ca), Solid	33700	100	mg/Kg	10/03/96	smh
SW-846 6010A	Copper (Cu), Solid	467	5	mg/Kg	10/03/96	smh
SW-846 6010A	Iron (Fe), Solid	155000	300	mg/Kg	10/03/96	smh
SW-846 6010A	Lead (Pb), Solid	12800	30	mg/Kg	10/03/96	smh
SW-846 6010A	Magnesium (Mg), Solid	19300	100	mg/Kg	10/03/96	smh
SW-846 6010A	Manganese (Mn), Solid	4620	1	mg/Kg	10/03/96	smh
SW-846 6010A	Zinc (Zn), Solid	16800	50	mg/Kg	10/03/96	smh
SW-846 9030A	Sulfide, Solid	10	10	mg/Kg	10/04/96	lmt
ASTM D4239	AGP (from Total Sulfur), Solid	22.8	0.3	t CaCO3/kt	09/24/96	* sl
EPA 600 3.2.3	Acid Neutralization Potential, Solid	191	0.1	t CaCO3/kt	10/01/96	sgm

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CORE LABORATORIES

LABORATORY TEST RESULTS

Job Number: 962534

Date: 11/05/96

CUSTOMER: Dames & Moore

PROJECT: EAGLE WASTE ROCK

ATTN: Dan Lincicome

Customer Sample ID: WP1-3
Date Sampled.....:
Time Sampled.....:
Sample Matrix.....: Soil

Laboratory Sample ID: 962534-22
Date Received.....: 09/13/96
Time Received.....: 13:10

TEST METHOD	PARAMETER/TEST DESCRIPTION	SAMPLE RESULT	REPORTING LIMIT	UNITS	DATE	TECH
3.2.2	pH, Solid	7.15	0.01	pH Units	09/27/96	sgm
SW-846 3050	Acid Digestion: Solids, Solid	Complete			09/19/96	lmt
SW-846 6010A	Arsenic (As), Solid	600	10	mg/Kg	10/10/96	gag
SW-846 6010A	Cadmium (Cd), Solid	111	0.5	mg/Kg	10/10/96	gag
SW-846 6010A	Calcium (Ca), Solid	120000	100	mg/Kg	10/10/96	gag
SW-846 6010A	Copper (Cu), Solid	442	5	mg/Kg	10/10/96	gag
SW-846 6010A	Iron (Fe), Solid	113000	300	mg/Kg	10/10/96	gag
SW-846 6010A	Lead (Pb), Solid	18700	30	mg/Kg	10/10/96	gag
SW-846 6010A	Magnesium (Mg), Solid	71800	100	mg/Kg	10/10/96	gag
SW-846 6010A	Manganese (Mn), Solid	4210	1	mg/Kg	10/10/96	gag
SW-846 6010A	Zinc (Zn), Solid	27000	50	mg/Kg	10/10/96	gag
SW-846 9030A	Sulfide, Solid	120	10	mg/Kg	10/10/96	lmt
ASTM D4239	AGP (from Total Sulfur), Solid	116	0.3	t $CaCO_3$/kt	09/24/96	* sl
EPA 600 3.2.3	Acid Neutralization Potential, Solid	564	0.1	t $CaCO_3$/kt	10/01/96	sgm

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CORE LABORATORIES

LABORATORY TEST RESULTS

Job Number: 962534 Date: 11/05/96

CUSTOMER: Dames & Moore PROJECT: EAGLE WASTE ROCK ATTN: Dan Lincicome

Customer Sample ID: WP1-4
Date Sampled.....:
Time Sampled.....:
Sample Matrix.....: Soil

Laboratory Sample ID: 962534-59
Date Received.....: 09/13/96
Time Received.....: 13:10

TEST METHOD	PARAMETER/TEST DESCRIPTION	SAMPLE RESULT	REPORTING LIMIT	UNITS	DATE	TECH
3.2.2	pH, Solid	7.18	0.01	pH Units	09/27/96	sgm
SW-846 3050	Acid Digestion: Solids, Solid	Complete			09/24/96	lmt
SW-846 6010A	Arsenic (As), Solid	323	5	mg/Kg	10/11/96	gag
SW-846 6010A	Cadmium (Cd), Solid	87.9	0.2	mg/Kg	10/11/96	gag
SW-846 6010A	Calcium (Ca), Solid	98000	50	mg/Kg	10/11/96	gag
SW-846 6010A	Copper (Cu), Solid	310	2	mg/Kg	10/11/96	gag
SW-846 6010A	Iron (Fe), Solid	93700	200	mg/Kg	10/11/96	gag
SW-846 6010A	Lead (Pb), Solid	11400	20	mg/Kg	10/11/96	gag
SW-846 6010A	Magnesium (Mg), Solid	62800	50	mg/Kg	10/11/96	gag
SW-846 6010A	Manganese (Mn), Solid	18100	5	mg/Kg	10/11/96	gag
SW-846 6010A	Zinc (Zn), Solid	20700	20	mg/Kg	10/11/96	gag
SW-846 9030A	Sulfide, Solid	120	10	mg/Kg	10/18/96	lmt
ASTM D4239	AGP (from Total Sulfur), Solid	86.2	0.3	t CaCO3/kt	09/24/96	* sl
EPA 600 3.2.3	Acid Neutralization Potential, Solid	559	0.1	t CaCO3/kt	10/10/96	pjm

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CORE LABORATORIES

LABORATORY TEST RESULTS

Job Number: 962534

Date: 11/05/96

CUSTOMER: Dames & Moore

PROJECT: EAGLE WASTE ROCK

ATTN: Dan Lincicome

Customer Sample ID: WP2-1
Date Sampled.....:
Time Sampled.....:
Sample Matrix.....: Soil

Laboratory Sample ID: 962534-19
Date Received.....: 09/13/96
Time Received.....: 13:10

TEST METHOD	PARAMETER/TEST DESCRIPTION	SAMPLE RESULT	REPORTING LIMIT	UNITS	DATE	TECH
3.2.2	pH, Solid	6.06	0.01	pH Units	09/27/96	sgm
SW-846 3050	Acid Digestion: Solids, Solid	Complete			09/19/96	lmt
SW-846 6010A	Arsenic (As), Solid	910	10	mg/Kg	10/03/96	smh
SW-846 6010A	Cadmium (Cd), Solid	57.5	0.5	mg/Kg	10/03/96	smh
SW-846 6010A	Calcium (Ca), Solid	94800	100	mg/Kg	10/03/96	smh
SW-846 6010A	Copper (Cu), Solid	212	5	mg/Kg	10/03/96	smh
SW-846 6010A	Iron (Fe), Solid	114000	300	mg/Kg	10/03/96	smh
SW-846 6010A	Lead (Pb), Solid	19700	30	mg/Kg	10/03/96	smh
SW-846 6010A	Magnesium (Mg), Solid	49700	100	mg/Kg	10/03/96	smh
SW-846 6010A	Manganese (Mn), Solid	8690	1	mg/Kg	10/03/96	smh
SW-846 6010A	Zinc (Zn), Solid	10000	50	mg/Kg	10/03/96	smh
SW-846 9030A	Sulfide, Solid	140	10	mg/Kg	10/04/96	lmt
ASTM D4239	AGP (from Total Sulfur), Solid	105	0.3	t CaCO3/kt	09/24/96	* sl
EPA 600 3.2.3	Acid Neutralization Potential, Solid	418	0.1	t CaCO3/kt	10/01/96	sgm

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CORE LABORATORIES

LABORATORY TEST RESULTS

Job Number: 962534 Date: 11/05/96

CUSTOMER: Dames & Moore PROJECT: EAGLE WASTE ROCK ATTN: Dan Lincicome

Customer Sample ID: WP2-2
Date Sampled.....:
Time Sampled.....:
Sample Matrix.....: Soil

Laboratory Sample ID: 962534-53
Date Received.....: 09/13/96
Time Received.....: 13:10

TEST METHOD	PARAMETER/TEST DESCRIPTION	SAMPLE RESULT	REPORTING LIMIT	UNITS	DATE	TECH
3.2.2	pH, Solid	6.66	0.01	pH Units	09/27/96	sgm
SW-846 3050	Acid Digestion: Solids, Solid	Complete			09/24/96	lmt
SW-846 6010A	Arsenic (As), Solid	435	5	mg/Kg	10/11/96	gag
SW-846 6010A	Cadmium (Cd), Solid	67.2	0.2	mg/Kg	10/11/96	gag
SW-846 6010A	Calcium (Ca), Solid	70700	50	mg/Kg	10/11/96	gag
SW-846 6010A	Copper (Cu), Solid	251	2	mg/Kg	10/11/96	gag
SW-846 6010A	Iron (Fe), Solid	79000	200	mg/Kg	10/11/96	gag
SW-846 6010A	Lead (Pb), Solid	21000	20	mg/Kg	10/11/96	gag
SW-846 6010A	Magnesium (Mg), Solid	41600	50	mg/Kg	10/11/96	gag
SW-846 6010A	Manganese (Mn), Solid	9240	5	mg/Kg	10/11/96	gag
SW-846 6010A	Zinc (Zn), Solid	14300	20	mg/Kg	10/11/96	gag
SW-846 9030A	Sulfide, Solid	160	10	mg/Kg	10/18/96	lmt
ASTM D4239	AGP (from Total Sulfur), Solid	109	0.3	t CaCO3/kt	09/24/96	* sl
EPA 600 3.2.3	Acid Neutralization Potential, Solid	378	0.1	t CaCO3/kt	10/10/96	pjm

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CORE LABORATORIES

LABORATORY TEST RESULTS

Job Number: 962534 Date: 11/05/96

CUSTOMER: Dames & Moore PROJECT: EAGLE WASTE ROCK ATTN: Dan Lincicome

Customer Sample ID: WP2-3
Date Sampled.....:
Time Sampled.....:
Sample Matrix.....: Soil

Laboratory Sample ID: 962534-2
Date Received.....: 09/13/96
Time Received.....: 13:10

TEST METHOD	PARAMETER/TEST DESCRIPTION	SAMPLE RESULT	REPORTING LIMIT	UNITS	DATE	TECH
3.2.2	pH, Solid	5.59	0.01	pH Units	09/27/96	sgm
SW-846 3050	Acid Digestion: Solids, Solid	Complete			09/19/96	lmt
SW-846 6010A	Arsenic (As), Solid	550	20	mg/Kg	10/02/96	smh
SW-846 6010A	Cadmium (Cd), Solid	32	1	mg/Kg	10/02/96	smh
SW-846 6010A	Calcium (Ca), Solid	36700	200	mg/Kg	10/02/96	smh
SW-846 6010A	Copper (Cu), Solid	150	10	mg/Kg	10/02/96	smh
SW-846 6010A	Iron (Fe), Solid	90900	300	mg/Kg	10/02/96	smh
SW-846 6010A	Lead (Pb), Solid	9840	6	mg/Kg	10/02/96	smh
SW-846 6010A	Magnesium (Mg), Solid	15500	200	mg/Kg	10/02/96	smh
SW-846 6010A	Manganese (Mn), Solid	4580	2	mg/Kg	10/02/96	smh
SW-846 6010A	Zinc (Zn), Solid	5770	10	mg/Kg	10/02/96	smh
SW-846 9030A	Sulfide, Solid	20	10	mg/Kg	10/04/96	lmt
ASTM D4239	AGP (from Total Sulfur), Solid	67.5	0.3	t CaCO3/kt	09/24/96	* sl
EPA 600 3.2.3	Acid Neutralization Potential, Solid	129	0.1	t CaCO3/kt	10/01/96	sgm

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CORE LABORATORIES

LABORATORY TEST RESULTS

Job Number: 962534

Date: 11/05/96

CUSTOMER: Dames & Moore

PROJECT: EAGLE WASTE ROCK

ATTN: Dan Lincicome

Customer Sample ID: WP3-1
Date Sampled.....:
Time Sampled.....:
Sample Matrix.....: Soil

Laboratory Sample ID: 962534-50
Date Received.....: 09/13/96
Time Received.....: 13:10

TEST METHOD	PARAMETER/TEST DESCRIPTION	SAMPLE RESULT	REPORTING LIMIT	UNITS	DATE	TECH
3.2.2	pH, Solid	6.70	0.01	pH Units	09/27/96	sgm
SW-846 3050	Acid Digestion: Solids, Solid	Complete			09/24/96	lmt
SW-846 6010A	Arsenic (As), Solid	1280	5	mg/Kg	10/11/96	gag
SW-846 6010A	Cadmium (Cd), Solid	11.7	0.2	mg/Kg	10/11/96	gag
SW-846 6010A	Calcium (Ca), Solid	13700	50	mg/Kg	10/11/96	gag
SW-846 6010A	Copper (Cu), Solid	242	2	mg/Kg	10/11/96	gag
SW-846 6010A	Iron (Fe), Solid	114000	300	mg/Kg	10/11/96	gag
SW-846 6010A	Lead (Pb), Solid	40600	30	mg/Kg	10/11/96	gag
SW-846 6010A	Magnesium (Mg), Solid	6880	50	mg/Kg	10/11/96	gag
SW-846 6010A	Manganese (Mn), Solid	5000	10	mg/Kg	10/11/96	gag
SW-846 6010A	Zinc (Zn), Solid	4530	50	mg/Kg	10/11/96	gag
SW-846 9030A	Sulfide, Solid	20	10	mg/Kg	10/18/96	lmt
ASTM D4239	AGP (from Total Sulfur), Solid	68.4	0.3	t CaCO3/kt	09/24/96	* sl
EPA 600 3.2.3	Acid Neutralization Potential, Solid	72.8	0.1	t CaCO3/kt	10/07/96	pjm

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CORE LABORATORIES

LABORATORY TEST RESULTS

Job Number: 962534

Date: 11/05/96

CUSTOMER: Dames & Moore

PROJECT: EAGLE WASTE ROCK

ATTN: Dan Lincicome

Customer Sample ID: WP3-2
Date Sampled.....:
Time Sampled.....:
Sample Matrix.....: Soil

Laboratory Sample ID: 962534-8
Date Received.....: 09/13/96
Time Received.....: 13:10

TEST METHOD	PARAMETER/TEST DESCRIPTION	SAMPLE RESULT	REPORTING LIMIT	UNITS	DATE	TECH
3.2.2	pH, Solid	6.88	0.01	pH Units	09/27/96	sgm
SW-846 3050	Acid Digestion: Solids, Solid	Complete			09/19/96	lmt
SW-846 6010A	Arsenic (As), Solid	2840	10	mg/Kg	10/03/96	smh
SW-846 6010A	Cadmium (Cd), Solid	68.6	0.5	mg/Kg	10/03/96	smh
SW-846 6010A	Calcium (Ca), Solid	10900	100	mg/Kg	10/03/96	smh
SW-846 6010A	Copper (Cu), Solid	461	5	mg/Kg	10/03/96	smh
SW-846 6010A	Iron (Fe), Solid	158000	300	mg/Kg	10/03/96	smh
SW-846 6010A	Lead (Pb), Solid	37500	30	mg/Kg	10/03/96	smh
SW-846 6010A	Magnesium (Mg), Solid	4800	100	mg/Kg	10/03/96	smh
SW-846 6010A	Manganese (Mn), Solid	10500	10	mg/Kg	10/03/96	smh
SW-846 6010A	Zinc (Zn), Solid	12800	50	mg/Kg	10/03/96	smh
SW-846 9030A	Sulfide, Solid	20	10	mg/Kg	10/04/96	lmt
ASTM D4239	AGP (from Total Sulfur), Solid	70.6	0.3	t CaCO3/kt	09/24/96	* sl
EPA 600 3.2.3	Acid Neutralization Potential, Solid	69.4	0.1	t CaCO3/kt	10/01/96	sgm

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CORE LABORATORIES

LABORATORY TEST RESULTS

Job Number: 962534

Date: 11/05/96

CUSTOMER: Dames & Moore

PROJECT: EAGLE WASTE ROCK

ATTN: Dan Lincicome

Customer Sample ID: WP4-1
Date Sampled.....:
Time Sampled.....:
Sample Matrix.....: Soil

Laboratory Sample ID: 962534-27
Date Received.....: 09/13/96
Time Received.....: 13:10

TEST METHOD	PARAMETER/TEST DESCRIPTION	SAMPLE RESULT	REPORTING LIMIT	UNITS	DATE	TECH
3.2.2	pH, Solid	6.70	0.01	pH Units	09/27/96	sgm
SW-846 3050	Acid Digestion: Solids, Solid	Complete			09/19/96	lmt
SW-846 6010A	Arsenic (As), Solid	850	10	mg/Kg	10/10/96	gag
SW-846 6010A	Cadmium (Cd), Solid	241	0.5	mg/Kg	10/10/96	gag
SW-846 6010A	Calcium (Ca), Solid	71400	100	mg/Kg	10/10/96	gag
SW-846 6010A	Copper (Cu), Solid	472	5	mg/Kg	10/10/96	gag
SW-846 6010A	Iron (Fe), Solid	159000	600	mg/Kg	10/10/96	gag
SW-846 6010A	Lead (Pb), Solid	17400	60	mg/Kg	10/10/96	gag
SW-846 6010A	Magnesium (Mg), Solid	46900	100	mg/Kg	10/10/96	gag
SW-846 6010A	Manganese (Mn), Solid	28200	20	mg/Kg	10/10/96	gag
SW-846 6010A	Zinc (Zn), Solid	58900	100	mg/Kg	10/10/96	gag
SW-846 9030A	Sulfide, Solid	150	10	mg/Kg	10/10/96	lmt
ASTM D4239	AGP (from Total Sulfur), Solid	279	0.3	t CaCO3/kt	09/24/96	* sl
EPA 600 3.2.3	Acid Neutralization Potential, Solid	473	0.1	t CaCO3/kt	10/01/96	sgm

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CORE LABORATORIES

LABORATORY TEST RESULTS

Job Number: 962534 Date: 11/05/96

CUSTOMER: Dames & Moore PROJECT: EAGLE WASTE ROCK ATTN: Dan Lincicome

Customer Sample ID: WP4-2
Date Sampled.....:
Time Sampled.....:
Sample Matrix.....: Soil

Laboratory Sample ID: 962534-25
Date Received.....: 09/13/96
Time Received.....: 13:10

TEST METHOD	PARAMETER/TEST DESCRIPTION	SAMPLE RESULT	REPORTING LIMIT	UNITS	DATE	TECH
3.2.2	pH, Solid	7.83	0.01	pH Units	09/27/96	sgm
SW-846 3050	Acid Digestion: Solids, Solid	Complete			09/19/96	lmt
SW-846 6010A	Arsenic (As), Solid	339	5	mg/Kg	10/10/96	gag
SW-846 6010A	Cadmium (Cd), Solid	114	0.2	mg/Kg	10/10/96	gag
SW-846 6010A	Calcium (Ca), Solid	158000	1000	mg/Kg	10/10/96	gag
SW-846 6010A	Copper (Cu), Solid	172	2	mg/Kg	10/10/96	gag
SW-846 6010A	Iron (Fe), Solid	57400	300	mg/Kg	10/10/96	gag
SW-846 6010A	Lead (Pb), Solid	3760	30	mg/Kg	10/10/96	gag
SW-846 6010A	Magnesium (Mg), Solid	89500	50	mg/Kg	10/10/96	gag
SW-846 6010A	Manganese (Mn), Solid	10600	10	mg/Kg	10/10/96	gag
SW-846 6010A	Zinc (Zn), Solid	29200	50	mg/Kg	10/10/96	gag
SW-846 9030A	Sulfide, Solid	130	10	mg/Kg	10/10/96	lmt
ASTM D4239	AGP (from Total Sulfur), Solid	96.9	0.3	t CaCO3/kt	09/24/96	* sl
EPA 600 3.2.3	Acid Neutralization Potential, Solid	718	0.1	t CaCO3/kt	10/01/96	sgm

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CORE LABORATORIES

LABORATORY TEST RESULTS

Job Number: 962534

Date: 11/05/96

CUSTOMER: Dames & Moore

PROJECT: EAGLE WASTE ROCK

ATTN: Dan Lincicome

Customer Sample ID: WP4-3
Date Sampled.....:
Time Sampled.....:
Sample Matrix.....: Soil

Laboratory Sample ID: 962534-37
Date Received.....: 09/13/96
Time Received.....: 13:10

TEST METHOD	PARAMETER/TEST DESCRIPTION	SAMPLE RESULT	REPORTING LIMIT	UNITS	DATE	TECH
3.2.2	pH, Solid	6.51	0.01	pH Units	09/27/96	sgm
SW-846 3050	Acid Digestion: Solids, Solid	Complete			09/19/96	lmt
SW-846 6010A	Arsenic (As), Solid	800	10	mg/Kg	10/10/96	gag
SW-846 6010A	Cadmium (Cd), Solid	170	0.5	mg/Kg	10/10/96	gag
SW-846 6010A	Calcium (Ca), Solid	46900	100	mg/Kg	10/10/96	gag
SW-846 6010A	Copper (Cu), Solid	381	5	mg/Kg	10/10/96	gag
SW-846 6010A	Iron (Fe), Solid	120000	600	mg/Kg	10/10/96	gag
SW-846 6010A	Lead (Pb), Solid	8210	60	mg/Kg	10/10/96	gag
SW-846 6010A	Magnesium (Mg), Solid	27900	100	mg/Kg	10/10/96	gag
SW-846 6010A	Manganese (Mn), Solid	22400	20	mg/Kg	10/10/96	gag
SW-846 6010A	Zinc (Zn), Solid	40600	100	mg/Kg	10/10/96	gag
SW-846 9030A	Sulfide, Solid	90	10	mg/Kg	10/10/96	lmt
ASTM D4239	AGP (from Total Sulfur), Solid	180	0.3	t CaCO3/kt	09/24/96	* sl
EPA 600 3.2.3	Acid Neutralization Potential, Solid	279	0.1	t CaCO3/kt	10/02/96	dme

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CORE LABORATORIES

LABORATORY TEST RESULTS

Job Number: 962534

Date: 11/05/96

CUSTOMER: Dames & Moore

PROJECT: EAGLE WASTE ROCK

ATTN: Dan Lincicome

Customer Sample ID: WP4-4
Date Sampled.....:
Time Sampled.....:
Sample Matrix.....: Soil

Laboratory Sample ID: 962534-16
Date Received.....: 09/13/96
Time Received.....: 13:10

TEST METHOD	PARAMETER/TEST DESCRIPTION	SAMPLE RESULT	REPORTING LIMIT	UNITS	DATE	TECH
3.2.2	pH, Solid	7.51	0.01	pH Units	09/27/96	sgm
SW-846 3050	Acid Digestion: Solids, Solid	Complete			09/19/96	lmt
SW-846 6010A	Arsenic (As), Solid	1020	10	mg/Kg	10/03/96	smh
SW-846 6010A	Cadmium (Cd), Solid	122	0.5	mg/Kg	10/03/96	smh
SW-846 6010A	Calcium (Ca), Solid	86800	100	mg/Kg	10/03/96	smh
SW-846 6010A	Copper (Cu), Solid	390	5	mg/Kg	10/03/96	smh
SW-846 6010A	Iron (Fe), Solid	107000	300	mg/Kg	10/03/96	smh
SW-846 6010A	Lead (Pb), Solid	9050	30	mg/Kg	10/03/96	smh
SW-846 6010A	Magnesium (Mg), Solid	47700	100	mg/Kg	10/03/96	smh
SW-846 6010A	Manganese (Mn), Solid	21600	10	mg/Kg	10/03/96	smh
SW-846 6010A	Zinc (Zn), Solid	24100	50	mg/Kg	10/03/96	smh
SW-846 9030A	Sulfide, Solid	<10	10	mg/Kg	10/04/96	lmt
ASTM D4239	AGP (from Total Sulfur), Solid	89.1	0.3	t CaCO3/kt	09/24/96	* sl
EPA 600 3.2.3	Acid Neutralization Potential, Solid	436	0.1	t CaCO3/kt	10/01/96	sgm

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CORE LABORATORIES

LABORATORY TEST RESULTS

Job Number: 962534

Date: 11/05/96

CUSTOMER: Dames & Moore

PROJECT: EAGLE WASTE ROCK

ATTN: Dan Lincicome

Customer Sample ID: WP5-1
Date Sampled.....:
Time Sampled.....:
Sample Matrix.....: Soil

Laboratory Sample ID: 962534-56
Date Received.....: 09/13/96
Time Received.....: 13:10

TEST METHOD	PARAMETER/TEST DESCRIPTION	SAMPLE RESULT	REPORTING LIMIT	UNITS	DATE	TECH
3.2.2	pH, Solid	7.22	0.01	pH Units	09/27/96	sgm
SW-846 3050	Acid Digestion: Solids, Solid	Complete			09/24/96	lmt
SW-846 6010A	Arsenic (As), Solid	842	5	mg/Kg	10/11/96	gag
SW-846 6010A	Cadmium (Cd), Solid	117	0.2	mg/Kg	10/11/96	gag
SW-846 6010A	Calcium (Ca), Solid	69500	50	mg/Kg	10/11/96	gag
SW-846 6010A	Copper (Cu), Solid	246	2	mg/Kg	10/11/96	gag
SW-846 6010A	Iron (Fe), Solid	117000	300	mg/Kg	10/11/96	gag
SW-846 6010A	Lead (Pb), Solid	6680	30	mg/Kg	10/11/96	gag
SW-846 6010A	Magnesium (Mg), Solid	43300	50	mg/Kg	10/11/96	gag
SW-846 6010A	Manganese (Mn), Solid	30000	10	mg/Kg	10/11/96	gag
SW-846 6010A	Zinc (Zn), Solid	38800	50	mg/Kg	10/11/96	gag
SW-846 9030A	Sulfide, Solid	110	10	mg/Kg	10/18/96	lmt
ASTM D4239	AGP (from Total Sulfur), Solid	106	0.3	t CaCO3/kt	09/24/96	* sl
EPA 600 3.2.3	Acid Neutralization Potential, Solid	413	0.1	t CaCO3/kt	10/10/96	pjm

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CORE LABORATORIES

LABORATORY TEST RESULTS

Job Number: 962534

Date: 11/05/96

CUSTOMER: Dames & Moore

PROJECT: EAGLE WASTE ROCK

ATTN: Dan Lincicome

Customer Sample ID: WP5-2
Date Sampled.....:
Time Sampled.....:
Sample Matrix.....: Soil

Laboratory Sample ID: 962534-46
Date Received.....: 09/13/96
Time Received.....: 13:10

TEST METHOD	PARAMETER/TEST DESCRIPTION	SAMPLE RESULT	REPORTING LIMIT	UNITS	DATE	TECH
3.2.2	pH, Solid	7.08	0.01	pH Units	09/27/96	sgm
SW-846 3050	Acid Digestion: Solids, Solid	Complete			09/24/96	lmt
SW-846 6010A	Arsenic (As), Solid	380	10	mg/Kg	10/11/96	gag
SW-846 6010A	Cadmium (Cd), Solid	328	0.5	mg/Kg	10/11/96	gag
SW-846 6010A	Calcium (Ca), Solid	40100	100	mg/Kg	10/11/96	gag
SW-846 6010A	Copper (Cu), Solid	378	5	mg/Kg	10/11/96	gag
SW-846 6010A	Iron (Fe), Solid	106000	600	mg/Kg	10/11/96	gag
SW-846 6010A	Lead (Pb), Solid	4320	3	mg/Kg	10/11/96	gag
SW-846 6010A	Magnesium (Mg), Solid	22300	100	mg/Kg	10/11/96	gag
SW-846 6010A	Manganese (Mn), Solid	31000	20	mg/Kg	10/11/96	gag
SW-846 6010A	Zinc (Zn), Solid	76500	100	mg/Kg	10/11/96	gag
SW-846 9030A	Sulfide, Solid	110	10	mg/Kg	10/18/96	lmt
ASTM D4239	AGP (from Total Sulfur), Solid	75.3	0.3	t CaCO3/kt	09/24/96	* sl
EPA 600 3.2.3	Acid Neutralization Potential, Solid	272	0.1	t CaCO3/kt	10/10/96	pjm

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LABORATORY TEST RESULTS

Job Number: 962534

Date: 11/05/96

CUSTOMER: Dames & Moore

PROJECT: EAGLE WASTE ROCK

ATTN: Dan Lincicome

Customer Sample ID: WP5-3
Date Sampled.....:
Time Sampled.....:
Sample Matrix.....: Soil

Laboratory Sample ID: 962534-28
Date Received.....: 09/13/96
Time Received.....: 13:10

TEST METHOD	PARAMETER/TEST DESCRIPTION	SAMPLE RESULT	REPORTING LIMIT	UNITS	DATE	TECH
3.2.2	pH, Solid	5.03	0.01	pH Units	09/27/96	sgm
SW-846 3050	Acid Digestion: Solids, Solid	Complete			09/19/96	lmt
SW-846 6010A	Arsenic (As), Solid	1930	20	mg/Kg	10/10/96	gag
SW-846 6010A	Cadmium (Cd), Solid	313	1	mg/Kg	10/10/96	gag
SW-846 6010A	Calcium (Ca), Solid	6600	200	mg/Kg	10/10/96	gag
SW-846 6010A	Copper (Cu), Solid	1310	10	mg/Kg	10/10/96	gag
SW-846 6010A	Iron (Fe), Solid	296000	600	mg/Kg	10/10/96	gag
SW-846 6010A	Lead (Pb), Solid	20100	60	mg/Kg	10/10/96	gag
SW-846 6010A	Magnesium (Mg), Solid	18600	200	mg/Kg	10/10/96	gag
SW-846 6010A	Manganese (Mn), Solid	52600	20	mg/Kg	10/10/96	gag
SW-846 6010A	Zinc (Zn), Solid	83900	100	mg/Kg	10/10/96	gag
SW-846 9030A	Sulfide, Solid	130	10	mg/Kg	10/10/96	lmt
ASTM D4239	AGP (from Total Sulfur), Solid	353	0.3	t CaCO3/kt	09/24/96	* sl
EPA 600 3.2.3	Acid Neutralization Potential, Solid	154	0.1	t CaCO3/kt	10/01/96	sgm

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CORE LABORATORIES

LABORATORY TEST RESULTS

Job Number: 962534

Date: 11/05/96

CUSTOMER: Dames & Moore

PROJECT: EAGLE WASTE ROCK

ATTN: Dan Lincicome

Customer Sample ID: WP5-4
Date Sampled.....:
Time Sampled.....:
Sample Matrix.....: Soil

Laboratory Sample ID: 962534-38
Date Received.....: 09/13/96
Time Received.....: 13:10

TEST METHOD	PARAMETER/TEST DESCRIPTION	SAMPLE RESULT	REPORTING LIMIT	UNITS	DATE	TECH
3.2.2	pH, Solid	7.79	0.01	pH Units	09/27/96	sgm
SW-846 3050	Acid Digestion: Solids, Solid	Complete			09/19/96	lmt
SW-846 6010A	Arsenic (As), Solid	2400	10	mg/Kg	10/11/96	gag
SW-846 6010A	Cadmium (Cd), Solid	90.6	0.5	mg/Kg	10/11/96	gag
SW-846 6010A	Calcium (Ca), Solid	36300	100	mg/Kg	10/11/96	gag
SW-846 6010A	Copper (Cu), Solid	324	5	mg/Kg	10/11/96	gag
SW-846 6010A	Iron (Fe), Solid	201000	600	mg/Kg	10/11/96	gag
SW-846 6010A	Lead (Pb), Solid	47700	60	mg/Kg	10/11/96	gag
SW-846 6010A	Magnesium (Mg), Solid	19900	100	mg/Kg	10/11/96	gag
SW-846 6010A	Manganese (Mn), Solid	46300	20	mg/Kg	10/11/96	gag
SW-846 6010A	Zinc (Zn), Solid	31900	100	mg/Kg	10/11/96	gag
SW-846 9030A	Sulfide, Solid	30	10	mg/Kg	10/10/96	lmt
ASTM D4239	AGP (from Total Sulfur), Solid	48.1	0.3	t CaCO3/kt	09/24/96	* sl
EPA 600 3.2.3	Acid Neutralization Potential, Solid	186	0.1	t CaCO3/kt	10/02/96	dme

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CORE LABORATORIES

LABORATORY TEST RESULTS

Job Number: 962534 Date: 11/05/96

CUSTOMER: Dames & Moore PROJECT: EAGLE WASTE ROCK ATTN: Dan Lincicome

Customer Sample ID: WP5-5
Date Sampled.....:
Time Sampled.....:
Sample Matrix.....: Soil

Laboratory Sample ID: 962534-31
Date Received.....: 09/13/96
Time Received.....: 13:10

TEST METHOD	PARAMETER/TEST DESCRIPTION	SAMPLE RESULT	REPORTING LIMIT	UNITS	DATE	TECH
3.2.2	pH, Solid	6.44	0.01	pH Units	09/27/96	sgm
SW-846 3050	Acid Digestion: Solids, Solid	Complete			09/19/96	lmt
SW-846 6010A	Arsenic (As), Solid	1180	10	mg/Kg	10/10/96	gag
SW-846 6010A	Cadmium (Cd), Solid	275	0.5	mg/Kg	10/10/96	gag
SW-846 6010A	Calcium (Ca), Solid	67300	100	mg/Kg	10/10/96	gag
SW-846 6010A	Copper (Cu), Solid	445	5	mg/Kg	10/10/96	gag
SW-846 6010A	Iron (Fe), Solid	129000	600	mg/Kg	10/10/96	gag
SW-846 6010A	Lead (Pb), Solid	12900	60	mg/Kg	10/10/96	gag
SW-846 6010A	Magnesium (Mg), Solid	37800	100	mg/Kg	10/10/96	gag
SW-846 6010A	Manganese (Mn), Solid	35500	20	mg/Kg	10/10/96	gag
SW-846 6010A	Zinc (Zn), Solid	54100	100	mg/Kg	10/10/96	gag
SW-846 9030A	Sulfide, Solid	60	10	mg/Kg	10/10/96	lmt
ASTM D4239	AGP (from Total Sulfur), Solid	71.9	0.3	t CaCO3/kt	09/24/96	* sl
EPA 600 3.2.3	Acid Neutralization Potential, Solid	520	0.1	t CaCO3/kt	10/01/96	sgm

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LABORATORY TEST RESULTS

Job Number: 962534 Date: 11/05/96

CUSTOMER: Dames & Moore PROJECT: EAGLE WASTE ROCK ATTN: Dan Lincicome

Customer Sample ID: WP6-1
Date Sampled.....:
Time Sampled.....:
Sample Matrix.....: Soil

Laboratory Sample ID: 962534-30
Date Received.....: 09/13/96
Time Received.....: 13:10

TEST METHOD	PARAMETER/TEST DESCRIPTION	SAMPLE RESULT	REPORTING LIMIT	UNITS	DATE	TECH
3.2.2	pH, Solid	4.16	0.01	pH Units	09/27/96	sgm
SW-846 3050	Acid Digestion: Solids, Solid	Complete			09/19/96	lmt
SW-846 6010A	Arsenic (As), Solid	580	10	mg/Kg	10/10/96	gag
SW-846 6010A	Cadmium (Cd), Solid	3.6	0.5	mg/Kg	10/10/96	gag
SW-846 6010A	Calcium (Ca), Solid	370	50	mg/Kg	10/29/96	smh
SW-846 6010A	Copper (Cu), Solid	178	5	mg/Kg	10/10/96	gag
SW-846 6010A	Iron (Fe), Solid	101000	300	mg/Kg	10/10/96	gag
SW-846 6010A	Lead (Pb), Solid	1370	3	mg/Kg	10/10/96	gag
SW-846 6010A	Magnesium (Mg), Solid	180	50	mg/Kg	10/29/96	smh
SW-846 6010A	Manganese (Mn), Solid	1420	1	mg/Kg	10/10/96	gag
SW-846 6010A	Zinc (Zn), Solid	699	5	mg/Kg	10/10/96	gag
SW-846 9030A	Sulfide, Solid	30	10	mg/Kg	10/10/96	lmt
ASTM D4239	AGP (from Total Sulfur), Solid	21.2	0.3	t CaCO3/kt	09/24/96	* sl
EPA 600 3.2.3	Acid Neutralization Potential, Solid	401	0.1	t CaCO3/kt	10/01/96	sgm

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CORE LABORATORIES

LABORATORY TEST RESULTS

Job Number: 962534

Date: 11/05/96

CUSTOMER: Dames & Moore

PROJECT: EAGLE WASTE ROCK

ATTN: Dan Lincicome

Customer Sample ID: WP6-2
Date Sampled.....:
Time Sampled.....:
Sample Matrix.....: Soil

Laboratory Sample ID: 962534-9
Date Received.....: 09/13/96
Time Received.....: 13:10

TEST METHOD	PARAMETER/TEST DESCRIPTION	SAMPLE RESULT	REPORTING LIMIT	UNITS	DATE	TECH
3.2.2	pH, Solid	5.32	0.01	pH Units	09/27/96	sgm
SW-846 3050	Acid Digestion: Solids, Solid	Complete			09/19/96	lmt
SW-846 6010A	Arsenic (As), Solid	629	5	mg/Kg	10/03/96	smh
SW-846 6010A	Cadmium (Cd), Solid	0.8	0.2	mg/Kg	10/03/96	smh
SW-846 6010A	Calcium (Ca), Solid	440	50	mg/Kg	10/03/96	smh
SW-846 6010A	Copper (Cu), Solid	139	2	mg/Kg	10/03/96	smh
SW-846 6010A	Iron (Fe), Solid	56100	200	mg/Kg	10/03/96	smh
SW-846 6010A	Lead (Pb), Solid	1680	2	mg/Kg	10/03/96	smh
SW-846 6010A	Magnesium (Mg), Solid	170	50	mg/Kg	10/03/96	smh
SW-846 6010A	Manganese (Mn), Solid	246	0.5	mg/Kg	10/03/96	smh
SW-846 6010A	Zinc (Zn), Solid	264	2	mg/Kg	10/03/96	smh
SW-846 9030A	Sulfide, Solid	<10	10	mg/Kg	10/04/96	lmt
ASTM D4239	AGP (from Total Sulfur), Solid	10.3	0.3	t CaCO3/kt	09/24/96	* sl
EPA 600 3.2.3	Acid Neutralization Potential, Solid	2.2	0.1	t CaCO3/kt	09/30/96	sgm

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CORE LABORATORIES

LABORATORY TEST RESULTS

Job Number: 962534 Date: 11/05/96

CUSTOMER: Dames & Moore PROJECT: EAGLE WASTE ROCK ATTN: Dan Lincicome

Customer Sample ID: WP6-3
Date Sampled.....:
Time Sampled.....:
Sample Matrix.....: Soil

Laboratory Sample ID: 962534-39
Date Received.....: 09/13/96
Time Received.....: 13:10

TEST METHOD	PARAMETER/TEST DESCRIPTION	SAMPLE RESULT	REPORTING LIMIT	UNITS	DATE	TECH
3.2.2	pH, Solid	3.70	0.01	pH Units	09/27/96	sgm
SW-846 3050	Acid Digestion: Solids, Solid	Complete			09/19/96	lmt
SW-846 6010A	Arsenic (As), Solid	1440	10	mg/Kg	10/11/96	gag
SW-846 6010A	Cadmium (Cd), Solid	<0.5	0.5	mg/Kg	10/11/96	gag
SW-846 6010A	Calcium (Ca), Solid	200	200	mg/Kg	10/29/96	smh
SW-846 6010A	Copper (Cu), Solid	410	5	mg/Kg	10/11/96	gag
SW-846 6010A	Iron (Fe), Solid	162000	300	mg/Kg	10/11/96	gag
SW-846 6010A	Lead (Pb), Solid	3190	3	mg/Kg	10/11/96	gag
SW-846 6010A	Magnesium (Mg), Solid	200	100	mg/Kg	10/11/96	gag
SW-846 6010A	Manganese (Mn), Solid	835	1	mg/Kg	10/11/96	gag
SW-846 6010A	Zinc (Zn), Solid	1530	5	mg/Kg	10/11/96	gag
SW-846 9030A	Sulfide, Solid	20	10	mg/Kg	10/10/96	lmt
ASTM D4239	AGP (from Total Sulfur), Solid	26.5	0.3	t CaCO3/kt	09/24/96	* sl
EPA 600 3.2.3	Acid Neutralization Potential, Solid	<0.1	0.1	t CaCO3/kt	10/07/96	pjm

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CORE LABORATORIES

LABORATORY TEST RESULTS

Job Number: 962534 Date: 11/05/96

CUSTOMER: Dames & Moore PROJECT: EAGLE WASTE ROCK ATTN: Dan Lincicome

Customer Sample ID: WP6-4
Date Sampled.....:
Time Sampled.....:
Sample Matrix.....: Soil

Laboratory Sample ID: 962534-51
Date Received.....: 09/13/96
Time Received.....: 13:10

TEST METHOD	PARAMETER/TEST DESCRIPTION	SAMPLE RESULT	REPORTING LIMIT	UNITS	DATE	TECH
3.2.2	pH, Solid	6.58	0.01	pH Units	09/27/96	sgm
SW-846 3050	Acid Digestion: Solids, Solid	Complete			09/24/96	lmt
SW-846 6010A	Arsenic (As), Solid	1150	5	mg/Kg	10/11/96	gag
SW-846 6010A	Cadmium (Cd), Solid	6.6	0.2	mg/Kg	10/11/96	gag
SW-846 6010A	Calcium (Ca), Solid	11900	50	mg/Kg	10/11/96	gag
SW-846 6010A	Copper (Cu), Solid	493	2	mg/Kg	10/11/96	gag
SW-846 6010A	Iron (Fe), Solid	96800	200	mg/Kg	10/11/96	gag
SW-846 6010A	Lead (Pb), Solid	1270	2	mg/Kg	10/11/96	gag
SW-846 6010A	Magnesium (Mg), Solid	830	50	mg/Kg	10/11/96	gag
SW-846 6010A	Manganese (Mn), Solid	1840	0.5	mg/Kg	10/11/96	gag
SW-846 6010A	Zinc (Zn), Solid	1290	2	mg/Kg	10/11/96	gag
SW-846 9030A	Sulfide, Solid	10	10	mg/Kg	10/18/96	lmt
ASTM D4239	AGP (from Total Sulfur), Solid	15.3	0.3	t CaCO3/kt	09/24/96	* sl
EPA 600 3.2.3	Acid Neutralization Potential, Solid	28.4	0.1	t CaCO3/kt	10/07/96	pjm

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LABORATORY TEST RESULTS

Job Number: 962534 Date: 11/05/96

CUSTOMER: Dames & Moore PROJECT: EAGLE WASTE ROCK ATTN: Dan Lincicome

Customer Sample ID: WP7-1
Date Sampled.....:
Time Sampled.....:
Sample Matrix.....: Soil

Laboratory Sample ID: 962534-52
Date Received.....: 09/13/96
Time Received.....: 13:10

TEST METHOD	PARAMETER/TEST DESCRIPTION	SAMPLE RESULT	REPORTING LIMIT	UNITS	DATE	TECH
3.2.2	pH, Solid	5.62	0.01	pH Units	09/27/96	sgm
SW-846 3050	Acid Digestion: Solids, Solid	Complete			09/24/96	lmt
SW-846 6010A	Arsenic (As), Solid	1420	5	mg/Kg	10/11/96	gag
SW-846 6010A	Cadmium (Cd), Solid	24.6	0.2	mg/Kg	10/11/96	gag
SW-846 6010A	Calcium (Ca), Solid	25100	50	mg/Kg	10/11/96	gag
SW-846 6010A	Copper (Cu), Solid	927	2	mg/Kg	10/11/96	gag
SW-846 6010A	Iron (Fe), Solid	106000	300	mg/Kg	10/11/96	gag
SW-846 6010A	Lead (Pb), Solid	21700	30	mg/Kg	10/11/96	gag
SW-846 6010A	Magnesium (Mg), Solid	10100	50	mg/Kg	10/11/96	gag
SW-846 6010A	Manganese (Mn), Solid	5870	10	mg/Kg	10/11/96	gag
SW-846 6010A	Zinc (Zn), Solid	8140	50	mg/Kg	10/11/96	gag
SW-846 9030A	Sulfide, Solid	30	10	mg/Kg	10/18/96	lmt
ASTM D4239	AGP (from Total Sulfur), Solid	77.2	0.3	t CaCO3/kt	09/24/96	* sl
EPA 600 3.2.3	Acid Neutralization Potential, Solid	91.8	0.1	t CaCO3/kt	10/07/96	pjm

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LABORATORY TEST RESULTS

Job Number: 962534

Date: 11/05/96

CUSTOMER: Dames & Moore

PROJECT: EAGLE WASTE ROCK

ATTN: Dan Lincicome

Customer Sample ID: WP7-2
Date Sampled.....:
Time Sampled.....:
Sample Matrix.....: Soil

Laboratory Sample ID: 962534-23
Date Received.....: 09/13/96
Time Received.....: 13:10

TEST METHOD	PARAMETER/TEST DESCRIPTION	SAMPLE RESULT	REPORTING LIMIT	UNITS	DATE	TECH
3.2.2	pH, Solid	6.66	0.01	pH Units	09/27/96	sgm
SW-846 3050	Acid Digestion: Solids, Solid	Complete			09/19/96	lmt
SW-846 6010A	Arsenic (As), Solid	59	5	mg/Kg	10/10/96	gag
SW-846 6010A	Cadmium (Cd), Solid	125	0.2	mg/Kg	10/10/96	gag
SW-846 6010A	Calcium (Ca), Solid	60400	50	mg/Kg	10/10/96	gag
SW-846 6010A	Copper (Cu), Solid	154	2	mg/Kg	10/10/96	gag
SW-846 6010A	Iron (Fe), Solid	35700	200	mg/Kg	10/10/96	gag
SW-846 6010A	Lead (Pb), Solid	1120	2	mg/Kg	10/10/96	gag
SW-846 6010A	Magnesium (Mg), Solid	35500	50	mg/Kg	10/10/96	gag
SW-846 6010A	Manganese (Mn), Solid	3220	0.5	mg/Kg	10/10/96	gag
SW-846 6010A	Zinc (Zn), Solid	9780	20	mg/Kg	10/10/96	gag
SW-846 9030A	Sulfide, Solid	20	10	mg/Kg	10/10/96	lmt
ASTM D4239	AGP (from Total Sulfur), Solid	<0.3	0.3	t CaCO3/kt	09/24/96	* sl
EPA 600 3.2.3	Acid Neutralization Potential, Solid	317	0.1	t CaCO3/kt	10/01/96	sgm

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LABORATORY TEST RESULTS

Job Number: 962534

Date: 11/05/96

CUSTOMER: Dames & Moore

PROJECT: EAGLE WASTE ROCK

ATTN: Dan Lincicome

Customer Sample ID: WP7-3
Date Sampled.....:
Time Sampled.....:
Sample Matrix.....: Soil

Laboratory Sample ID: 962534-32
Date Received.....: 09/13/96
Time Received.....: 13:10

TEST METHOD	PARAMETER/TEST DESCRIPTION	SAMPLE RESULT	REPORTING LIMIT	UNITS	DATE	TECH
3.2.2	pH, Solid	7.21	0.01	pH Units	09/27/96	sgm
SW-846 3050	Acid Digestion: Solids, Solid	Complete			09/19/96	lmt
SW-846 6010A	Arsenic (As), Solid	1070	5	mg/Kg	10/10/96	gag
SW-846 6010A	Cadmium (Cd), Solid	48.3	0.2	mg/Kg	10/10/96	gag
SW-846 6010A	Calcium (Ca), Solid	88500	50	mg/Kg	10/10/96	gag
SW-846 6010A	Copper (Cu), Solid	404	2	mg/Kg	10/10/96	gag
SW-846 6010A	Iron (Fe), Solid	68500	200	mg/Kg	10/10/96	gag
SW-846 6010A	Lead (Pb), Solid	9910	20	mg/Kg	10/10/96	gag
SW-846 6010A	Magnesium (Mg), Solid	45100	50	mg/Kg	10/10/96	gag
SW-846 6010A	Manganese (Mn), Solid	4600	0.5	mg/Kg	10/10/96	gag
SW-846 6010A	Zinc (Zn), Solid	12800	20	mg/Kg	10/10/96	gag
SW-846 9030A	Sulfide, Solid	10	10	mg/Kg	10/10/96	lmt
ASTM D4239	AGP (from Total Sulfur), Solid	64.4	0.3	t CaCO3/kt	09/24/96	* sl
EPA 600 3.2.3	Acid Neutralization Potential, Solid	354	0.1	t CaCO3/kt	10/02/96	dme

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LABORATORY TEST RESULTS

Job Number: 962534

Date: 11/05/96

CUSTOMER: Dames & Moore

PROJECT: EAGLE WASTE ROCK

ATTN: Dan Lincicome

Customer Sample ID: WP8-1
Date Sampled.....:
Time Sampled.....:
Sample Matrix.....: Soil

Laboratory Sample ID: 962534-4
Date Received.....: 09/13/96
Time Received.....: 13:10

TEST METHOD	PARAMETER/TEST DESCRIPTION	SAMPLE RESULT	REPORTING LIMIT	UNITS	DATE	TECH
3.2.2	pH, Solid	6.67	0.01	pH Units	09/27/96	sgm
SW-846 3050	Acid Digestion: Solids, Solid	Complete			09/19/96	lmt
SW-846 6010A	Arsenic (As), Solid	485	5	mg/Kg	10/03/96	smh
SW-846 6010A	Cadmium (Cd), Solid	25.4	0.2	mg/Kg	10/03/96	smh
SW-846 6010A	Calcium (Ca), Solid	148000	50	mg/Kg	10/03/96	smh
SW-846 6010A	Copper (Cu), Solid	1040	2	mg/Kg	10/03/96	smh
SW-846 6010A	Iron (Fe), Solid	79100	200	mg/Kg	10/03/96	smh
SW-846 6010A	Lead (Pb), Solid	2070	2	mg/Kg	10/03/96	smh
SW-846 6010A	Magnesium (Mg), Solid	79600	50	mg/Kg	10/03/96	smh
SW-846 6010A	Manganese (Mn), Solid	11100	5	mg/Kg	10/03/96	smh
SW-846 6010A	Zinc (Zn), Solid	5650	20	mg/Kg	10/03/96	smh
SW-846 9030A	Sulfide, Solid	280	10	mg/Kg	10/04/96	lmt
ASTM D4239	AGP (from Total Sulfur), Solid	204	0.3	t CaCO3/kt	09/24/96	* sl
EPA 600 3.2.3	Acid Neutralization Potential, Solid	720	0.1	t CaCO3/kt	10/01/96	sgm

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CORE LABORATORIES

LABORATORY TEST RESULTS

Job Number: 962534

Date: 11/05/96

CUSTOMER: Dames & Moore

PROJECT: EAGLE WASTE ROCK

ATTN: Dan Lincicome

Customer Sample ID: WP8-2
Date Sampled.....:
Time Sampled.....:
Sample Matrix.....: Soil

Laboratory Sample ID: 962534-11
Date Received.....: 09/13/96
Time Received.....: 13:10

TEST METHOD	PARAMETER/TEST DESCRIPTION	SAMPLE RESULT	REPORTING LIMIT	UNITS	DATE	TECH
3.2.2	pH, Solid	6.01	0.01	pH Units	09/27/96	sgm
SW-846 3050	Acid Digestion: Solids, Solid	Complete			09/19/96	lmt
SW-846 6010A	Arsenic (As), Solid	430	5	mg/Kg	10/03/96	smh
SW-846 6010A	Cadmium (Cd), Solid	16.0	0.2	mg/Kg	10/03/96	smh
SW-846 6010A	Calcium (Ca), Solid	102000	50	mg/Kg	10/03/96	smh
SW-846 6010A	Copper (Cu), Solid	392	2	mg/Kg	10/03/96	smh
SW-846 6010A	Iron (Fe), Solid	60100	200	mg/Kg	10/03/96	smh
SW-846 6010A	Lead (Pb), Solid	4440	20	mg/Kg	10/03/96	smh
SW-846 6010A	Magnesium (Mg), Solid	42900	50	mg/Kg	10/03/96	smh
SW-846 6010A	Manganese (Mn), Solid	3820	0.5	mg/Kg	10/03/96	smh
SW-846 6010A	Zinc (Zn), Solid	3270	20	mg/Kg	10/03/96	smh
SW-846 9030A	Sulfide, Solid	120	10	mg/Kg	10/04/96	lmt
ASTM D4239	AGP (from Total Sulfur), Solid	115	0.3	t CaCO3/kt	09/24/96	* sl
EPA 600 3.2.3	Acid Neutralization Potential, Solid	371	0.1	t CaCO3/kt	10/01/96	sgm

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CORE LABORATORIES

LABORATORY TEST RESULTS

Job Number: 962534

Date: 11/05/96

CUSTOMER: Dames & Moore

PROJECT: EAGLE WASTE ROCK

ATTN: Dan Lincicome

Customer Sample ID: WP8-3
Date Sampled.....:
Time Sampled.....:
Sample Matrix.....: Soil

Laboratory Sample ID: 962534-45
Date Received.....: 09/13/96
Time Received.....: 13:10

TEST METHOD	PARAMETER/TEST DESCRIPTION	SAMPLE RESULT	REPORTING LIMIT	UNITS	DATE	TECH
3.2.2	pH, Solid	5.87	0.01	pH Units	09/27/96	sgm
SW-846 3050	Acid Digestion: Solids, Solid	Complete			09/24/96	lmt
SW-846 6010A	Arsenic (As), Solid	760	10	mg/Kg	10/11/96	gag
SW-846 6010A	Cadmium (Cd), Solid	50.3	0.5	mg/Kg	10/11/96	gag
SW-846 6010A	Calcium (Ca), Solid	102000	100	mg/Kg	10/11/96	gag
SW-846 6010A	Copper (Cu), Solid	1070	5	mg/Kg	10/11/96	gag
SW-846 6010A	Iron (Fe), Solid	134000	300	mg/Kg	10/11/96	gag
SW-846 6010A	Lead (Pb), Solid	8060	30	mg/Kg	10/11/96	gag
SW-846 6010A	Magnesium (Mg), Solid	55000	100	mg/Kg	10/11/96	gag
SW-846 6010A	Manganese (Mn), Solid	16300	10	mg/Kg	10/11/96	gag
SW-846 6010A	Zinc (Zn), Solid	10500	50	mg/Kg	10/11/96	gag
SW-846 9030A	Sulfide, Solid	250	10	mg/Kg	10/18/96	lmt
ASTM D4239	AGP (from Total Sulfur), Solid	261	0.3	t CaCO3/kt	09/24/96	* sl
EPA 600 3.2.3	Acid Neutralization Potential, Solid	486	0.1	t CaCO3/kt	10/10/96	pjm

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LABORATORY TEST RESULTS

Job Number: 962534 Date: 11/05/96

CUSTOMER: Dames & Moore PROJECT: EAGLE WASTE ROCK ATTN: Dan Lincicome

Customer Sample ID: WP8-4
Date Sampled.....:
Time Sampled.....:
Sample Matrix.....: Soil

Laboratory Sample ID: 962534-54
Date Received.....: 09/13/96
Time Received.....: 13:10

TEST METHOD	PARAMETER/TEST DESCRIPTION	SAMPLE RESULT	REPORTING LIMIT	UNITS	DATE	TECH
3.2.2	pH, Solid	7.16	0.01	pH Units	09/27/96	sgm
SW-846 3050	Acid Digestion: Solids, Solid	Complete			09/24/96	lmt
SW-846 6010A	Arsenic (As), Solid	920	10	mg/Kg	10/11/96	gag
SW-846 6010A	Cadmium (Cd), Solid	64.3	0.5	mg/Kg	10/11/96	gag
SW-846 6010A	Calcium (Ca), Solid	90200	100	mg/Kg	10/11/96	gag
SW-846 6010A	Copper (Cu), Solid	7000	50	mg/Kg	10/11/96	gag
SW-846 6010A	Iron (Fe), Solid	124000	300	mg/Kg	10/11/96	gag
SW-846 6010A	Lead (Pb), Solid	4380	3	mg/Kg	10/11/96	gag
SW-846 6010A	Magnesium (Mg), Solid	21500	100	mg/Kg	10/11/96	gag
SW-846 6010A	Manganese (Mn), Solid	2880	1	mg/Kg	10/11/96	gag
SW-846 6010A	Zinc (Zn), Solid	7160	50	mg/Kg	10/11/96	gag
SW-846 9030A	Sulfide, Solid	20	10	mg/Kg	10/18/96	lmt
ASTM D4239	AGP (from Total Sulfur), Solid	208	0.3	t CaCO3/kt	09/24/96	* sl
EPA 600 3.2.3	Acid Neutralization Potential, Solid	181	0.1	t CaCO3/kt	10/07/96	pjm

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LABORATORY TEST RESULTS

Job Number: 962534

Date: 11/05/96

CUSTOMER: Dames & Moore

PROJECT: EAGLE WASTE ROCK

ATTN: Dan Lincicome

Customer Sample ID: WP8-5
Date Sampled.....:
Time Sampled.....:
Sample Matrix.....: Soil

Laboratory Sample ID: 962534-20
Date Received.....: 09/13/96
Time Received.....: 13:10

TEST METHOD	PARAMETER/TEST DESCRIPTION	SAMPLE RESULT	REPORTING LIMIT	UNITS	DATE	TECH
3.2.2	pH, Solid	4.51	0.01	pH Units	09/27/96	sgm
SW-846 3050	Acid Digestion: Solids, Solid	Complete			09/19/96	lmt
SW-846 6010A	Arsenic (As), Solid	1330	10	mg/Kg	10/03/96	smh
SW-846 6010A	Cadmium (Cd), Solid	13.4	0.5	mg/Kg	10/03/96	smh
SW-846 6010A	Calcium (Ca), Solid	44800	100	mg/Kg	10/03/96	smh
SW-846 6010A	Copper (Cu), Solid	759	5	mg/Kg	10/03/96	smh
SW-846 6010A	Iron (Fe), Solid	181000	300	mg/Kg	10/03/96	smh
SW-846 6010A	Lead (Pb), Solid	16400	30	mg/Kg	10/03/96	smh
SW-846 6010A	Magnesium (Mg), Solid	1000	100	mg/Kg	10/03/96	smh
SW-846 6010A	Manganese (Mn), Solid	663	1	mg/Kg	10/03/96	smh
SW-846 6010A	Zinc (Zn), Solid	1560	5	mg/Kg	10/03/96	smh
SW-846 9030A	Sulfide, Solid	70	10	mg/Kg	10/04/96	lmt
ASTM D4239	AGP (from Total Sulfur), Solid	189	0.3	t CaCO3/kt	09/24/96	* sl
EPA 600 3.2.3	Acid Neutralization Potential, Solid	3.0	0.1	t CaCO3/kt	09/30/96	sgm

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LABORATORY TEST RESULTS

Job Number: 962534 Date: 11/05/96

CUSTOMER: Dames & Moore PROJECT: EAGLE WASTE ROCK ATTN: Dan Lincicome

Customer Sample ID: WP8-6
Date Sampled.....:
Time Sampled.....:
Sample Matrix.....: Soil

Laboratory Sample ID: 962534-12
Date Received.....: 09/13/96
Time Received.....: 13:10

TEST METHOD	PARAMETER/TEST DESCRIPTION	SAMPLE RESULT	REPORTING LIMIT	UNITS	DATE	TECH
3.2.2	pH, Solid	4.23	0.01	pH Units	09/27/96	sgm
SW-846 3050	Acid Digestion: Solids, Solid	Complete			09/19/96	lmt
SW-846 6010A	Arsenic (As), Solid	1010	10	mg/Kg	10/03/96	smh
SW-846 6010A	Cadmium (Cd), Solid	17.6	0.5	mg/Kg	10/03/96	smh
SW-846 6010A	Calcium (Ca), Solid	40800	100	mg/Kg	10/03/96	smh
SW-846 6010A	Copper (Cu), Solid	977	5	mg/Kg	10/03/96	smh
SW-846 6010A	Iron (Fe), Solid	168000	300	mg/Kg	10/03/96	smh
SW-846 6010A	Lead (Pb), Solid	9420	30	mg/Kg	10/03/96	smh
SW-846 6010A	Magnesium (Mg), Solid	1500	100	mg/Kg	10/03/96	smh
SW-846 6010A	Manganese (Mn), Solid	592	1	mg/Kg	10/03/96	smh
SW-846 6010A	Zinc (Zn), Solid	1820	5	mg/Kg	10/03/96	smh
SW-846 9030A	Sulfide, Solid	60	10	mg/Kg	10/04/96	lmt
ASTM D4239	AGP (from Total Sulfur), Solid	182	0.3	t CaCO3/kt	09/24/96	* sl
EPA 600 3.2.3	Acid Neutralization Potential, Solid	3.0	0.1	t CaCO3/kt	09/30/96	sgm

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CORE LABORATORIES

LABORATORY TEST RESULTS

Job Number: 962534 Date: 11/05/96

CUSTOMER: Dames & Moore PROJECT: EAGLE WASTE ROCK ATTN: Dan Lincicome

Customer Sample ID: WP8-7
Date Sampled.....:
Time Sampled.....:
Sample Matrix.....: Soil

Laboratory Sample ID: 962534-35
Date Received.....: 09/13/96
Time Received.....: 13:10

TEST METHOD	PARAMETER/TEST DESCRIPTION	SAMPLE RESULT	REPORTING LIMIT	UNITS	DATE	TECH
3.2.2	pH, Solid	7.17	0.01	pH Units	09/27/96	sgm
SW-846 3050	Acid Digestion: Solids, Solid	Complete			09/19/96	lmt
SW-846 6010A	Arsenic (As), Solid	371	5	mg/Kg	10/10/96	gag
SW-846 6010A	Cadmium (Cd), Solid	43.5	0.2	mg/Kg	10/10/96	gag
SW-846 6010A	Calcium (Ca), Solid	152000	500	mg/Kg	10/10/96	gag
SW-846 6010A	Copper (Cu), Solid	147	2	mg/Kg	10/10/96	gag
SW-846 6010A	Iron (Fe), Solid	73400	200	mg/Kg	10/10/96	gag
SW-846 6010A	Lead (Pb), Solid	3800	20	mg/Kg	10/10/96	gag
SW-846 6010A	Magnesium (Mg), Solid	88600	50	mg/Kg	10/10/96	gag
SW-846 6010A	Manganese (Mn), Solid	16300	5	mg/Kg	10/10/96	gag
SW-846 6010A	Zinc (Zn), Solid	11600	20	mg/Kg	10/10/96	gag
SW-846 9030A	Sulfide, Solid	470	10	mg/Kg	10/10/96	lmt
ASTM D4239	AGP (from Total Sulfur), Solid	149	0.3	t CaCO3/kt	09/24/96	* sl
EPA 600 3.2.3	Acid Neutralization Potential, Solid	734	0.1	t CaCO3/kt	10/15/96	dme

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CORE LABORATORIES

LABORATORY TEST RESULTS

Job Number: 962534

Date: 11/05/96

CUSTOMER: Dames & Moore

PROJECT: EAGLE WASTE ROCK

ATTN: Dan Lincicome

Customer Sample ID: WP8-8
Date Sampled.....:
Time Sampled.....:
Sample Matrix.....: Soil

Laboratory Sample ID: 962534-21
Date Received.....: 09/13/96
Time Received.....: 13:10

TEST METHOD	PARAMETER/TEST DESCRIPTION	SAMPLE RESULT	REPORTING LIMIT	UNITS	DATE	TECH
3.2.2	pH, Solid	7.59	0.01	pH Units	09/27/96	sgm
SW-846 3050	Acid Digestion: Solids, Solid	Complete			09/19/96	lmt
SW-846 6010A	Arsenic (As), Solid	370	10	mg/Kg	10/10/96	gag
SW-846 6010A	Cadmium (Cd), Solid	47.5	0.5	mg/Kg	10/10/96	gag
SW-846 6010A	Calcium (Ca), Solid	124000	100	mg/Kg	10/10/96	gag
SW-846 6010A	Copper (Cu), Solid	470	5	mg/Kg	10/10/96	gag
SW-846 6010A	Iron (Fe), Solid	59700	200	mg/Kg	10/10/96	gag
SW-846 6010A	Lead (Pb), Solid	2530	3	mg/Kg	10/10/96	gag
SW-846 6010A	Magnesium (Mg), Solid	72400	100	mg/Kg	10/10/96	gag
SW-846 6010A	Manganese (Mn), Solid	8870	1	mg/Kg	10/10/96	gag
SW-846 6010A	Zinc (Zn), Solid	10900	20	mg/Kg	10/10/96	gag
SW-846 9030A	Sulfide, Solid	280	10	mg/Kg	10/10/96	lmt
ASTM D4239	AGP (from Total Sulfur), Solid	137	0.3	t CaCO3/kt	09/24/96	* sl
EPA 600 3.2.3	Acid Neutralization Potential, Solid	589	0.1	t CaCO3/kt	10/01/96	sgm

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LABORATORY TEST RESULTS

Job Number: 962534

Date: 11/05/96

CUSTOMER: Dames & Moore

PROJECT: EAGLE WASTE ROCK

ATTN: Dan Lincicome

Customer Sample ID: WP10-1
Date Sampled.....:
Time Sampled.....:
Sample Matrix.....: Soil

Laboratory Sample ID: 962534-13
Date Received.....: 09/13/96
Time Received.....: 13:10

TEST METHOD	PARAMETER/TEST DESCRIPTION	SAMPLE RESULT	REPORTING LIMIT	UNITS	DATE	TECH
3.2.2	pH, Solid	3.56	0.01	pH Units	09/27/96	sgm
SW-846 3050	Acid Digestion: Solids, Solid	Complete			09/19/96	lmt
SW-846 6010A	Arsenic (As), Solid	24	1	mg/Kg	10/03/96	smh
SW-846 6010A	Cadmium (Cd), Solid	0.36	0.05	mg/Kg	10/03/96	smh
SW-846 6010A	Calcium (Ca), Solid	1810	10	mg/Kg	10/03/96	smh
SW-846 6010A	Copper (Cu), Solid	187	0.5	mg/Kg	10/03/96	smh
SW-846 6010A	Iron (Fe), Solid	18300	30	mg/Kg	10/03/96	smh
SW-846 6010A	Lead (Pb), Solid	231	0.3	mg/Kg	10/03/96	smh
SW-846 6010A	Magnesium (Mg), Solid	150	10	mg/Kg	10/03/96	smh
SW-846 6010A	Manganese (Mn), Solid	24.3	0.1	mg/Kg	10/03/96	smh
SW-846 6010A	Zinc (Zn), Solid	60.1	0.5	mg/Kg	10/03/96	smh
SW-846 9030A	Sulfide, Solid	90	10	mg/Kg	10/04/96	lmt
ASTM D4239	AGP (from Total Sulfur), Solid	51.2	0.3	t CaCO3/kt	09/24/96	* sl
EPA 600 3.2.3	Acid Neutralization Potential, Solid	<0.1	0.1	t CaCO3/kt	09/30/96	sgm

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LABORATORY TEST RESULTS

Job Number: 962534 Date: 11/05/96

CUSTOMER: Dames & Moore PROJECT: EAGLE WASTE ROCK ATTN: Dan Lincicome

Customer Sample ID: WP10-2
Date Sampled.....:
Time Sampled.....:
Sample Matrix.....: Soil

Laboratory Sample ID: 962534-43
Date Received.....: 09/13/96
Time Received.....: 13:10

TEST METHOD	PARAMETER/TEST DESCRIPTION	SAMPLE RESULT	REPORTING LIMIT	UNITS	DATE	TECH
3.2.2	pH, Solid	6.85	0.01	pH Units	09/27/96	sgm
SW-846 3050	Acid Digestion: Solids, Solid	Complete			09/24/96	lmt
SW-846 6010A	Arsenic (As), Solid	446	5	mg/Kg	10/11/96	gag
SW-846 6010A	Cadmium (Cd), Solid	78.7	0.2	mg/Kg	10/11/96	gag
SW-846 6010A	Calcium (Ca), Solid	47200	50	mg/Kg	10/11/96	gag
SW-846 6010A	Copper (Cu), Solid	343	2	mg/Kg	10/11/96	gag
SW-846 6010A	Iron (Fe), Solid	88100	200	mg/Kg	10/11/96	gag
SW-846 6010A	Lead (Pb), Solid	8890	20	mg/Kg	10/11/96	gag
SW-846 6010A	Magnesium (Mg), Solid	26500	50	mg/Kg	10/11/96	gag
SW-846 6010A	Manganese (Mn), Solid	6440	5	mg/Kg	10/11/96	gag
SW-846 6010A	Zinc (Zn), Solid	14200	20	mg/Kg	10/11/96	gag
SW-846 9030A	Sulfide, Solid	90	10	mg/Kg	10/18/96	lmt
ASTM D4239	AGP (from Total Sulfur), Solid	50.6	0.3	t CaCO3/kt	09/24/96	* sl
EPA 600 3.2.3	Acid Neutralization Potential, Solid	246	0.1	t CaCO3/kt	10/10/96	pjm

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CORE LABORATORIES

LABORATORY TEST RESULTS

Job Number: 962534 Date: 11/05/96

CUSTOMER: Dames & Moore PROJECT: EAGLE WASTE ROCK ATTN: Dan Lincicome

Customer Sample ID: WP10-3
Date Sampled.....:
Time Sampled.....:
Sample Matrix.....: Soil

Laboratory Sample ID: 962534-33
Date Received.....: 09/13/96
Time Received.....: 13:10

TEST METHOD	PARAMETER/TEST DESCRIPTION	SAMPLE RESULT	REPORTING LIMIT	UNITS	DATE	TECH
3.2.2	pH, Solid	3.59	0.01	pH Units	09/27/96	sgm
SW-846 3050	Acid Digestion: Solids, Solid	Complete			09/19/96	lmt
SW-846 6010A	Arsenic (As), Solid	51	1	mg/Kg	10/10/96	gag
SW-846 6010A	Cadmium (Cd), Solid	0.28	0.05	mg/Kg	10/10/96	gag
SW-846 6010A	Calcium (Ca), Solid	280	10	mg/Kg	10/29/96	smh
SW-846 6010A	Copper (Cu), Solid	196	0.5	mg/Kg	10/10/96	gag
SW-846 6010A	Iron (Fe), Solid	22000	60	mg/Kg	10/10/96	gag
SW-846 6010A	Lead (Pb), Solid	470	0.3	mg/Kg	10/10/96	gag
SW-846 6010A	Magnesium (Mg), Solid	170	10	mg/Kg	10/29/96	smh
SW-846 6010A	Manganese (Mn), Solid	31.2	0.1	mg/Kg	10/10/96	gag
SW-846 6010A	Zinc (Zn), Solid	170	0.5	mg/Kg	10/10/96	gag
SW-846 9030A	Sulfide, Solid	50	10	mg/Kg	10/10/96	lmt
ASTM D4239	AGP (from Total Sulfur), Solid	55.0	0.3	t CaCO3/kt	09/24/96	* sl
EPA 600 3.2.3	Acid Neutralization Potential, Solid	<0.1	0.1	t CaCO3/kt	10/07/96	pjm

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CORE LABORATORIES

LABORATORY TEST RESULTS

Job Number: 962534

Date: 11/05/96

CUSTOMER: Dames & Moore

PROJECT: EAGLE WASTE ROCK

ATTN: Dan Lincicome

Customer Sample ID: WP10-4
Date Sampled.....:
Time Sampled.....:
Sample Matrix.....: Soil

Laboratory Sample ID: 962534-29
Date Received.....: 09/13/96
Time Received.....: 13:10

TEST METHOD	PARAMETER/TEST DESCRIPTION	SAMPLE RESULT	REPORTING LIMIT	UNITS	DATE	TECH
3.2.2	pH, Solid	4.27	0.01	pH Units	09/27/96	sgm
SW-846 3050	Acid Digestion: Solids, Solid	Complete			09/19/96	lmt
SW-846 6010A	Arsenic (As), Solid	42	1	mg/Kg	10/10/96	gag
SW-846 6010A	Cadmium (Cd), Solid	0.40	0.05	mg/Kg	10/10/96	gag
SW-846 6010A	Calcium (Ca), Solid	360	10	mg/Kg	10/29/96	smh
SW-846 6010A	Copper (Cu), Solid	158	0.5	mg/Kg	10/10/96	gag
SW-846 6010A	Iron (Fe), Solid	19300	60	mg/Kg	10/10/96	gag
SW-846 6010A	Lead (Pb), Solid	631	6	mg/Kg	10/10/96	gag
SW-846 6010A	Magnesium (Mg), Solid	240	10	mg/Kg	10/29/96	smh
SW-846 6010A	Manganese (Mn), Solid	69.7	0.1	mg/Kg	10/10/96	gag
SW-846 6010A	Zinc (Zn), Solid	145	0.5	mg/Kg	10/10/96	gag
SW-846 9030A	Sulfide, Solid	50	10	mg/Kg	10/10/96	lmt
ASTM D4239	AGP (from Total Sulfur), Solid	23.4	0.3	t CaCO3/kt	09/24/96	* sl
EPA 600 3.2.3	Acid Neutralization Potential, Solid	89.2	0.1	t CaCO3/kt	10/01/96	sgm

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CORE LABORATORIES

LABORATORY TEST RESULTS

Job Number: 962534

Date: 11/05/96

CUSTOMER: Dames & Moore

PROJECT: EAGLE WASTE ROCK

ATTN: Dan Lincicome

Customer Sample ID: WP11-1
Date Sampled.....:
Time Sampled.....:
Sample Matrix.....: Soil

Laboratory Sample ID: 962534-7
Date Received.....: 09/13/96
Time Received.....: 13:10

TEST METHOD	PARAMETER/TEST DESCRIPTION	SAMPLE RESULT	REPORTING LIMIT	UNITS	DATE	TECH
3.2.2	pH, Solid	6.42	0.01	pH Units	09/27/96	sgm
SW-846 3050	Acid Digestion: Solids, Solid	Complete			09/19/96	lmt
SW-846 6010A	Arsenic (As), Solid	210	5	mg/Kg	10/03/96	smh
SW-846 6010A	Cadmium (Cd), Solid	32.1	0.2	mg/Kg	10/03/96	smh
SW-846 6010A	Calcium (Ca), Solid	8100	50	mg/Kg	10/03/96	smh
SW-846 6010A	Copper (Cu), Solid	154	2	mg/Kg	10/03/96	smh
SW-846 6010A	Iron (Fe), Solid	48300	200	mg/Kg	10/03/96	smh
SW-846 6010A	Lead (Pb), Solid	24100	20	mg/Kg	10/03/96	smh
SW-846 6010A	Magnesium (Mg), Solid	4600	50	mg/Kg	10/03/96	smh
SW-846 6010A	Manganese (Mn), Solid	2580	0.5	mg/Kg	10/03/96	smh
SW-846 6010A	Zinc (Zn), Solid	7380	20	mg/Kg	10/03/96	smh
SW-846 9030A	Sulfide, Solid	140	10	mg/Kg	10/04/96	lmt
ASTM D4239	AGP (from Total Sulfur), Solid	33.4	0.3	t CaCO3/kt	09/24/96	* sl
EPA 600 3.2.3	Acid Neutralization Potential, Solid	36.5	0.1	t CaCO3/kt	09/30/96	sgm

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CORE LABORATORIES

LABORATORY TEST RESULTS

Job Number: 962534

Date: 11/05/96

CUSTOMER: Dames & Moore

PROJECT: EAGLE WASTE ROCK

ATTN: Dan Lincicome

Customer Sample ID: WP11-2
Date Sampled.....:
Time Sampled.....:
Sample Matrix.....: Soil

Laboratory Sample ID: 962534-42
Date Received.....: 09/13/96
Time Received.....: 13:10

TEST METHOD	PARAMETER/TEST DESCRIPTION	SAMPLE RESULT	REPORTING LIMIT	UNITS	DATE	TECH
3.2.2	pH, Solid	6.82	0.01	pH Units	09/27/96	sgm
SW-846 3050	Acid Digestion: Solids, Solid	Complete			09/24/96	lmt
SW-846 6010A	Arsenic (As), Solid	160	2	mg/Kg	10/11/96	gag
SW-846 6010A	Cadmium (Cd), Solid	20.1	0.1	mg/Kg	10/11/96	gag
SW-846 6010A	Calcium (Ca), Solid	42200	20	mg/Kg	10/11/96	gag
SW-846 6010A	Copper (Cu), Solid	126	1	mg/Kg	10/11/96	gag
SW-846 6010A	Iron (Fe), Solid	29900	60	mg/Kg	10/11/96	gag
SW-846 6010A	Lead (Pb), Solid	8200	6	mg/Kg	10/11/96	gag
SW-846 6010A	Magnesium (Mg), Solid	23200	20	mg/Kg	10/11/96	gag
SW-846 6010A	Manganese (Mn), Solid	1730	0.2	mg/Kg	10/11/96	gag
SW-846 6010A	Zinc (Zn), Solid	4310	10	mg/Kg	10/11/96	gag
SW-846 9030A	Sulfide, Solid	230	10	mg/Kg	10/18/96	lmt
ASTM D4239	AGP (from Total Sulfur), Solid	38.4	0.3	t CaCO3/kt	09/24/96	* sl
EPA 600 3.2.3	Acid Neutralization Potential, Solid	201	0.1	t CaCO3/kt	10/11/96	dme

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LABORATORY TEST RESULTS

Job Number: 962534 Date: 11/05/96

CUSTOMER: Dames & Moore PROJECT: EAGLE WASTE ROCK ATTN: Dan Lincicome

Customer Sample ID: WP11-3
Date Sampled.....:
Time Sampled.....:
Sample Matrix.....: Soil

Laboratory Sample ID: 962534-5
Date Received.....: 09/13/96
Time Received.....: 13:10

TEST METHOD	PARAMETER/TEST DESCRIPTION	SAMPLE RESULT	REPORTING LIMIT	UNITS	DATE	TECH
3.2.2	pH, Solid	7.65	0.01	pH Units	09/27/96	sgm
SW-846 3050	Acid Digestion: Solids, Solid	Complete			09/19/96	lmt
SW-846 6010A	Arsenic (As), Solid	118	2	mg/Kg	10/03/96	smh
SW-846 6010A	Cadmium (Cd), Solid	6.0	0.1	mg/Kg	10/03/96	smh
SW-846 6010A	Calcium (Ca), Solid	65200	20	mg/Kg	10/03/96	smh
SW-846 6010A	Copper (Cu), Solid	82	1	mg/Kg	10/03/96	smh
SW-846 6010A	Iron (Fe), Solid	28300	100	mg/Kg	10/03/96	smh
SW-846 6010A	Lead (Pb), Solid	7890	10	mg/Kg	10/03/96	smh
SW-846 6010A	Magnesium (Mg), Solid	32200	20	mg/Kg	10/03/96	smh
SW-846 6010A	Manganese (Mn), Solid	2390	4	mg/Kg	10/03/96	smh
SW-846 6010A	Zinc (Zn), Solid	1400	20	mg/Kg	10/03/96	smh
SW-846 9030A	Sulfide, Solid	80	10	mg/Kg	10/04/96	lmt
ASTM D4239	AGP (from Total Sulfur), Solid	7.0	0.3	t CaCO3/kt	09/24/96	* sl
EPA 600 3.2.3	Acid Neutralization Potential, Solid	265	0.1	t CaCO3/kt	10/01/96	sgm

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LABORATORY TEST RESULTS

Job Number: 962534

Date: 11/05/96

CUSTOMER: Dames & Moore

PROJECT: EAGLE WASTE ROCK

ATTN: Dan Lincicome

Customer Sample ID: WP11-4
Date Sampled.....:
Time Sampled.....:
Sample Matrix.....: Soil

Laboratory Sample ID: 962534-47
Date Received.....: 09/13/96
Time Received.....: 13:10

TEST METHOD	PARAMETER/TEST DESCRIPTION	SAMPLE RESULT	REPORTING LIMIT	UNITS	DATE	TECH
3.2.2	pH, Solid	7.52	0.01	pH Units	09/27/96	sgm
SW-846 3050	Acid Digestion: Solids, Solid	Complete			09/24/96	lmt
SW-846 6010A	Arsenic (As), Solid	99	2	mg/Kg	10/11/96	gag
SW-846 6010A	Cadmium (Cd), Solid	31.5	0.1	mg/Kg	10/11/96	gag
SW-846 6010A	Calcium (Ca), Solid	58700	200	mg/Kg	10/11/96	gag
SW-846 6010A	Copper (Cu), Solid	85	1	mg/Kg	10/11/96	gag
SW-846 6010A	Iron (Fe), Solid	25600	60	mg/Kg	10/11/96	gag
SW-846 6010A	Lead (Pb), Solid	3610	6	mg/Kg	10/11/96	gag
SW-846 6010A	Magnesium (Mg), Solid	31900	20	mg/Kg	10/11/96	gag
SW-846 6010A	Manganese (Mn), Solid	3280	2	mg/Kg	10/11/96	gag
SW-846 6010A	Zinc (Zn), Solid	6910	10	mg/Kg	10/11/96	gag
SW-846 9030A	Sulfide, Solid	70	10	mg/Kg	10/18/96	lmt
ASTM D4239	AGP (from Total Sulfur), Solid	36.2	0.3	t CaCO3/kt	09/24/96	* sl
EPA 600 3.2.3	Acid Neutralization Potential, Solid	307	0.1	t CaCO3/kt	10/10/96	pjm

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CORE LABORATORIES

LABORATORY TEST RESULTS

Job Number: 962534

Date: 11/05/96

CUSTOMER: Dames & Moore

PROJECT: EAGLE WASTE ROCK

ATTN: Dan Lincicome

Customer Sample ID: WP11-5
Date Sampled.....:
Time Sampled.....:
Sample Matrix.....: Soil

Laboratory Sample ID: 962534-6
Date Received.....: 09/13/96
Time Received.....: 13:10

TEST METHOD	PARAMETER/TEST DESCRIPTION	SAMPLE RESULT	REPORTING LIMIT	UNITS	DATE	TECH
3.2.2	pH, Solid	8.06	0.01	pH Units	09/27/96	sgm
SW-846 3050	Acid Digestion: Solids, Solid	Complete			09/19/96	lmt
SW-846 6010A	Arsenic (As), Solid	230	2	mg/Kg	10/03/96	smh
SW-846 6010A	Cadmium (Cd), Solid	48.9	0.1	mg/Kg	10/03/96	smh
SW-846 6010A	Calcium (Ca), Solid	175000	400	mg/Kg	10/03/96	smh
SW-846 6010A	Copper (Cu), Solid	184	1	mg/Kg	10/03/96	smh
SW-846 6010A	Iron (Fe), Solid	37600	100	mg/Kg	10/03/96	smh
SW-846 6010A	Lead (Pb), Solid	2770	10	mg/Kg	10/03/96	smh
SW-846 6010A	Magnesium (Mg), Solid	101000	400	mg/Kg	10/03/96	smh
SW-846 6010A	Manganese (Mn), Solid	7140	4	mg/Kg	10/03/96	smh
SW-846 6010A	Zinc (Zn), Solid	10300	20	mg/Kg	10/03/96	smh
SW-846 9030A	Sulfide, Solid	160	10	mg/Kg	10/04/96	lmt
ASTM D4239	AGP (from Total Sulfur), Solid	46.6	0.3	t CaCO3/kt	09/24/96	* sl
EPA 600 3.2.3	Acid Neutralization Potential, Solid	837	0.1	t CaCO3/kt	10/01/96	sgm

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CORE LABORATORIES

LABORATORY TEST RESULTS

Job Number: 962534 Date: 11/05/96

CUSTOMER: Dames & Moore PROJECT: EAGLE WASTE ROCK ATTN: Dan Lincicome

Customer Sample ID: WP11-6
Date Sampled.....:
Time Sampled.....:
Sample Matrix.....: Soil

Laboratory Sample ID: 962534-48
Date Received.....: 09/13/96
Time Received.....: 13:10

TEST METHOD	PARAMETER/TEST DESCRIPTION	SAMPLE RESULT	REPORTING LIMIT	UNITS	DATE	TECH
3.2.2	pH, Solid	7.78	0.01	pH Units	09/27/96	sgm
SW-846 3050	Acid Digestion: Solids, Solid	Complete			09/24/96	lmt
SW-846 6010A	Arsenic (As), Solid	58	1	mg/Kg	10/11/96	gag
SW-846 6010A	Cadmium (Cd), Solid	11.5	0.05	mg/Kg	10/11/96	gag
SW-846 6010A	Calcium (Ca), Solid	89700	200	mg/Kg	10/11/96	gag
SW-846 6010A	Copper (Cu), Solid	330	0.5	mg/Kg	10/11/96	gag
SW-846 6010A	Iron (Fe), Solid	21400	60	mg/Kg	10/11/96	gag
SW-846 6010A	Lead (Pb), Solid	1200	6	mg/Kg	10/11/96	gag
SW-846 6010A	Magnesium (Mg), Solid	49600	200	mg/Kg	10/11/96	gag
SW-846 6010A	Manganese (Mn), Solid	997	0.1	mg/Kg	10/11/96	gag
SW-846 6010A	Zinc (Zn), Solid	2980	10	mg/Kg	10/11/96	gag
SW-846 9030A	Sulfide, Solid	220	10	mg/Kg	10/18/96	lmt
ASTM D4239	AGP (from Total Sulfur), Solid	57.5	0.3	t CaCO3/kt	09/24/96	* sl
EPA 600 3.2.3	Acid Neutralization Potential, Solid	462	0.1	t CaCO3/kt	10/10/96	pjm

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CORE LABORATORIES

LABORATORY TEST RESULTS

Job Number: 962534

Date: 11/05/96

CUSTOMER: Dames & Moore

PROJECT: EAGLE WASTE ROCK

ATTN: Dan Lincicome

Customer Sample ID: WP12-1
Date Sampled.....:
Time Sampled.....:
Sample Matrix.....: Soil

Laboratory Sample ID: 962534-14
Date Received.....: 09/13/96
Time Received.....: 13:10

TEST METHOD	PARAMETER/TEST DESCRIPTION	SAMPLE RESULT	REPORTING LIMIT	UNITS	DATE	TECH
3.2.2	pH, Solid	5.78	0.01	pH Units	09/27/96	sgm
SW-846 3050	Acid Digestion: Solids, Solid	Complete			09/19/96	lmt
SW-846 6010A	Arsenic (As), Solid	113	2	mg/Kg	10/03/96	smh
SW-846 6010A	Cadmium (Cd), Solid	6.7	0.1	mg/Kg	10/03/96	smh
SW-846 6010A	Calcium (Ca), Solid	3890	20	mg/Kg	10/03/96	smh
SW-846 6010A	Copper (Cu), Solid	78	1	mg/Kg	10/03/96	smh
SW-846 6010A	Iron (Fe), Solid	29300	60	mg/Kg	10/03/96	smh
SW-846 6010A	Lead (Pb), Solid	3340	6	mg/Kg	10/03/96	smh
SW-846 6010A	Magnesium (Mg), Solid	1920	20	mg/Kg	10/03/96	smh
SW-846 6010A	Manganese (Mn), Solid	1420	0.2	mg/Kg	10/03/96	smh
SW-846 6010A	Zinc (Zn), Solid	1180	10	mg/Kg	10/03/96	smh
SW-846 9030A	Sulfide, Solid	10	10	mg/Kg	10/04/96	lmt
ASTM D4239	AGP (from Total Sulfur), Solid	13.1	0.3	t CaCO3/kt	09/24/96	* sl
EPA 600 3.2.3	Acid Neutralization Potential, Solid	10.8	0.1	t CaCO3/kt	09/30/96	sgm

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CORE LABORATORIES

LABORATORY TEST RESULTS

Job Number: 962534

Date: 11/05/96

CUSTOMER: Dames & Moore

PROJECT: EAGLE WASTE ROCK

ATTN: Dan Lincicome

Customer Sample ID: WP12-2
Date Sampled.....:
Time Sampled.....:
Sample Matrix.....: Soil

Laboratory Sample ID: 962534-10
Date Received.....: 09/13/96
Time Received.....: 13:10

TEST METHOD	PARAMETER/TEST DESCRIPTION	SAMPLE RESULT	REPORTING LIMIT	UNITS	DATE	TECH
3.2.2	pH, Solid	3.35	0.01	pH Units	09/27/96	sgm
SW-846 3050	Acid Digestion: Solids, Solid	Complete			09/19/96	lmt
SW-846 6010A	Arsenic (As), Solid	132	5	mg/Kg	10/03/96	smh
SW-846 6010A	Cadmium (Cd), Solid	13.0	0.2	mg/Kg	10/03/96	smh
SW-846 6010A	Calcium (Ca), Solid	3560	50	mg/Kg	10/03/96	smh
SW-846 6010A	Copper (Cu), Solid	147	2	mg/Kg	10/03/96	smh
SW-846 6010A	Iron (Fe), Solid	40600	200	mg/Kg	10/03/96	smh
SW-846 6010A	Lead (Pb), Solid	20700	20	mg/Kg	10/03/96	smh
SW-846 6010A	Magnesium (Mg), Solid	790	50	mg/Kg	10/03/96	smh
SW-846 6010A	Manganese (Mn), Solid	587	0.5	mg/Kg	10/03/96	smh
SW-846 6010A	Zinc (Zn), Solid	2620	20	mg/Kg	10/03/96	smh
SW-846 9030A	Sulfide, Solid	150	10	mg/Kg	10/04/96	lmt
ASTM D4239	AGP (from Total Sulfur), Solid	58.1	0.3	t CaCO3/kt	09/24/96	* sl
EPA 600 3.2.3	Acid Neutralization Potential, Solid	2.0	0.1	t CaCO3/kt	09/30/96	sgm

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LABORATORY TEST RESULTS

Job Number: 962534 Date: 11/05/96

CUSTOMER: Dames & Moore PROJECT: EAGLE WASTE ROCK ATTN: Dan Lincicome

Customer Sample ID: WP13-1
Date Sampled.....:
Time Sampled.....:
Sample Matrix.....: Soil

Laboratory Sample ID: 962534-18
Date Received.....: 09/13/96
Time Received.....: 13:10

TEST METHOD	PARAMETER/TEST DESCRIPTION	SAMPLE RESULT	REPORTING LIMIT	UNITS	DATE	TECH
3.2.2	pH, Solid	5.31	0.01	pH Units	09/27/96	sgm
SW-846 3050	Acid Digestion: Solids, Solid	Complete			09/19/96	lmt
SW-846 6010A	Arsenic (As), Solid	651	5	mg/Kg	10/03/96	smh
SW-846 6010A	Cadmium (Cd), Solid	2.0	0.2	mg/Kg	10/03/96	smh
SW-846 6010A	Calcium (Ca), Solid	40100	50	mg/Kg	10/03/96	smh
SW-846 6010A	Copper (Cu), Solid	881	2	mg/Kg	10/03/96	smh
SW-846 6010A	Iron (Fe), Solid	87200	200	mg/Kg	10/03/96	smh
SW-846 6010A	Lead (Pb), Solid	1450	2	mg/Kg	10/03/96	smh
SW-846 6010A	Magnesium (Mg), Solid	8630	50	mg/Kg	10/03/96	smh
SW-846 6010A	Manganese (Mn), Solid	1560	0.5	mg/Kg	10/03/96	smh
SW-846 6010A	Zinc (Zn), Solid	572	2	mg/Kg	10/03/96	smh
SW-846 9030A	Sulfide, Solid	10	10	mg/Kg	10/04/96	lmt
ASTM D4239	AGP (from Total Sulfur), Solid	82.2	0.3	t CaCO3/kt	09/24/96	* sl
EPA 600 3.2.3	Acid Neutralization Potential, Solid	60.8	0.1	t CaCO3/kt	10/02/96	dme

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LABORATORY TEST RESULTS

Job Number: 962534 Date: 11/05/96

CUSTOMER: Dames & Moore PROJECT: EAGLE WASTE ROCK ATTN: Dan Lincicome

Customer Sample ID: WP13-3
Date Sampled.....:
Time Sampled.....:
Sample Matrix.....: Soil

Laboratory Sample ID: 962534-58
Date Received.....: 09/13/96
Time Received.....: 13:10

TEST METHOD	PARAMETER/TEST DESCRIPTION	SAMPLE RESULT	REPORTING LIMIT	UNITS	DATE	TECH
3.2.2	pH, Solid	4.24	0.01	pH Units	09/27/96	sgm
SW-846 3050	Acid Digestion: Solids, Solid	Complete			09/24/96	lmt
SW-846 6010A	Arsenic (As), Solid	603	5	mg/Kg	10/11/96	gag
SW-846 6010A	Cadmium (Cd), Solid	<0.2	0.2	mg/Kg	10/11/96	gag
SW-846 6010A	Calcium (Ca), Solid	5410	50	mg/Kg	10/11/96	gag
SW-846 6010A	Copper (Cu), Solid	340	2	mg/Kg	10/11/96	gag
SW-846 6010A	Iron (Fe), Solid	72700	200	mg/Kg	10/11/96	gag
SW-846 6010A	Lead (Pb), Solid	1090	2	mg/Kg	10/11/96	gag
SW-846 6010A	Magnesium (Mg), Solid	420	50	mg/Kg	10/11/96	gag
SW-846 6010A	Manganese (Mn), Solid	3020	0.5	mg/Kg	10/11/96	gag
SW-846 6010A	Zinc (Zn), Solid	743	2	mg/Kg	10/11/96	gag
SW-846 9030A	Sulfide, Solid	30	10	mg/Kg	10/18/96	lmt
ASTM D4239	AGP (from Total Sulfur), Solid	40.0	0.3	t CaCO3/kt	09/24/96	* sl
EPA 600 3.2.3	Acid Neutralization Potential, Solid	<0.1	0.1	t CaCO3/kt	10/07/96	pjm

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CORE LABORATORIES

LABORATORY TEST RESULTS

Job Number: 962534 Date: 11/05/96

CUSTOMER: Dames & Moore PROJECT: EAGLE WASTE ROCK ATTN: Dan Lincicome

Customer Sample ID: WP13-4
Date Sampled.....:
Time Sampled.....:
Sample Matrix.....: Soil

Laboratory Sample ID: 962534-17
Date Received.....: 09/13/96
Time Received.....: 13:10

TEST METHOD	PARAMETER/TEST DESCRIPTION	SAMPLE RESULT	REPORTING LIMIT	UNITS	DATE	TECH
3.2.2	pH, Solid	3.24	0.01	pH Units	09/27/96	sgm
SW-846 3050	Acid Digestion: Solids, Solid	Complete			09/19/96	lmt
SW-846 6010A	Arsenic (As), Solid	500	5	mg/Kg	10/03/96	smh
SW-846 6010A	Cadmium (Cd), Solid	0.5	0.2	mg/Kg	10/03/96	smh
SW-846 6010A	Calcium (Ca), Solid	3950	50	mg/Kg	10/03/96	smh
SW-846 6010A	Copper (Cu), Solid	228	2	mg/Kg	10/03/96	smh
SW-846 6010A	Iron (Fe), Solid	61800	200	mg/Kg	10/03/96	smh
SW-846 6010A	Lead (Pb), Solid	2390	2	mg/Kg	10/03/96	smh
SW-846 6010A	Magnesium (Mg), Solid	270	50	mg/Kg	10/03/96	smh
SW-846 6010A	Manganese (Mn), Solid	371	0.5	mg/Kg	10/03/96	smh
SW-846 6010A	Zinc (Zn), Solid	651	2	mg/Kg	10/03/96	smh
SW-846 9030A	Sulfide, Solid	20	10	mg/Kg	10/04/96	lmt
ASTM D4239	AGP (from Total Sulfur), Solid	35.6	0.3	t CaCO3/kt	09/24/96	* sl
EPA 600 3.2.3	Acid Neutralization Potential, Solid	<0.1	0.1	t CaCO3/kt	09/30/96	sgm

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CORE LABORATORIES

LABORATORY TEST RESULTS

Job Number: 962534

Date: 11/05/96

CUSTOMER: Dames & Moore

PROJECT: EAGLE WASTE ROCK

ATTN: Dan Lincicome

Customer Sample ID: WP14-1
Date Sampled.....:
Time Sampled.....:
Sample Matrix.....: Soil

Laboratory Sample ID: 962534-36
Date Received.....: 09/13/96
Time Received.....: 13:10

TEST METHOD	PARAMETER/TEST DESCRIPTION	SAMPLE RESULT	REPORTING LIMIT	UNITS	DATE	TECH
3.2.2	pH, Solid	2.04	0.01	pH Units	09/27/96	sgm
SW-846 3050	Acid Digestion: Solids, Solid	Complete			09/19/96	lmt
SW-846 6010A	Arsenic (As), Solid	830	10	mg/Kg	10/10/96	gag
SW-846 6010A	Cadmium (Cd), Solid	7.4	0.5	mg/Kg	10/10/96	gag
SW-846 6010A	Calcium (Ca), Solid	7400	100	mg/Kg	10/10/96	gag
SW-846 6010A	Copper (Cu), Solid	1680	5	mg/Kg	10/10/96	gag
SW-846 6010A	Iron (Fe), Solid	192000	300	mg/Kg	10/10/96	gag
SW-846 6010A	Lead (Pb), Solid	4850	3	mg/Kg	10/10/96	gag
SW-846 6010A	Magnesium (Mg), Solid	500	100	mg/Kg	10/10/96	gag
SW-846 6010A	Manganese (Mn), Solid	602	1	mg/Kg	10/10/96	gag
SW-846 6010A	Zinc (Zn), Solid	2530	5	mg/Kg	10/10/96	gag
SW-846 9030A	Sulfide, Solid	80	10	mg/Kg	10/10/96	lmt
ASTM D4239	AGP (from Total Sulfur), Solid	409	0.3	t CaCO3/kt	09/24/96	* sl
EPA 600 3.2.3	Acid Neutralization Potential, Solid	<0.1	0.1	t CaCO3/kt	10/07/96	pjm

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LABORATORY TEST RESULTS

Job Number: 962534 Date: 11/05/96

CUSTOMER: Dames & Moore PROJECT: EAGLE WASTE ROCK ATTN: Dan Lincicome

Customer Sample ID: WP14-2
Date Sampled.....:
Time Sampled.....:
Sample Matrix.....: Soil

Laboratory Sample ID: 962534-40
Date Received.....: 09/13/96
Time Received.....: 13:10

TEST METHOD	PARAMETER/TEST DESCRIPTION	SAMPLE RESULT	REPORTING LIMIT	UNITS	DATE	TECH
3.2.2	pH, Solid	2.91	0.01	pH Units	09/27/96	sgm
SW-846 3050	Acid Digestion: Solids, Solid	Complete			09/19/96	lmt
SW-846 6010A	Arsenic (As), Solid	2180	20	mg/Kg	10/11/96	gag
SW-846 6010A	Cadmium (Cd), Solid	12	1	mg/Kg	10/11/96	gag
SW-846 6010A	Calcium (Ca), Solid	7100	200	mg/Kg	10/11/96	gag
SW-846 6010A	Copper (Cu), Solid	680	10	mg/Kg	10/11/96	gag
SW-846 6010A	Iron (Fe), Solid	268000	600	mg/Kg	10/11/96	gag
SW-846 6010A	Lead (Pb), Solid	9030	60	mg/Kg	10/11/96	gag
SW-846 6010A	Magnesium (Mg), Solid	7800	200	mg/Kg	10/11/96	gag
SW-846 6010A	Manganese (Mn), Solid	16000	2	mg/Kg	10/11/96	gag
SW-846 6010A	Zinc (Zn), Solid	7770	10	mg/Kg	10/11/96	gag
SW-846 9030A	Sulfide, Solid	<10	10	mg/Kg	10/10/96	lmt
ASTM D4239	AGP (from Total Sulfur), Solid	195	0.3	t CaCO3/kt	09/24/96	* sl
EPA 600 3.2.3	Acid Neutralization Potential, Solid	<0.1	0.1	t CaCO3/kt	10/07/96	pjm

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CORE LABORATORIES

LABORATORY TEST RESULTS

Job Number: 962534 Date: 11/05/96

CUSTOMER: Dames & Moore PROJECT: EAGLE WASTE ROCK ATTN: Dan Lincicome

Customer Sample ID: WP14-3
Date Sampled.....:
Time Sampled.....:
Sample Matrix.....: Soil

Laboratory Sample ID: 962534-55
Date Received.....: 09/13/96
Time Received.....: 13:10

TEST METHOD	PARAMETER/TEST DESCRIPTION	SAMPLE RESULT	REPORTING LIMIT	UNITS	DATE	TECH
3.2.2	pH, Solid	5.35	0.01	pH Units	09/27/96	sgm
SW-846 3050	Acid Digestion: Solids, Solid	Complete			09/24/96	lmt
SW-846 6010A	Arsenic (As), Solid	1530	10	mg/Kg	10/11/96	gag
SW-846 6010A	Cadmium (Cd), Solid	7.4	0.5	mg/Kg	10/11/96	gag
SW-846 6010A	Calcium (Ca), Solid	8600	100	mg/Kg	10/11/96	gag
SW-846 6010A	Copper (Cu), Solid	575	5	mg/Kg	10/11/96	gag
SW-846 6010A	Iron (Fe), Solid	205000	300	mg/Kg	10/11/96	gag
SW-846 6010A	Lead (Pb), Solid	7150	30	mg/Kg	10/11/96	gag
SW-846 6010A	Magnesium (Mg), Solid	6200	100	mg/Kg	10/11/96	gag
SW-846 6010A	Manganese (Mn), Solid	7200	1	mg/Kg	10/11/96	gag
SW-846 6010A	Zinc (Zn), Solid	4540	5	mg/Kg	10/11/96	gag
SW-846 9030A	Sulfide, Solid	30	10	mg/Kg	10/18/96	lmt
ASTM D4239	AGP (from Total Sulfur), Solid	70.3	0.3	t CaCO3/kt	09/24/96	* sl
EPA 600 3.2.3	Acid Neutralization Potential, Solid	18.7	0.1	t CaCO3/kt	10/07/96	pjm

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CORE LABORATORIES

LABORATORY TEST RESULTS

Job Number: 962534 Date: 11/05/96

CUSTOMER: Dames & Moore PROJECT: EAGLE WASTE ROCK ATTN: Dan Lincicome

Customer Sample ID: WP14-4
Date Sampled.....:
Time Sampled.....:
Sample Matrix.....: Soil

Laboratory Sample ID: 962534-44
Date Received.....: 09/13/96
Time Received.....: 13:10

TEST METHOD	PARAMETER/TEST DESCRIPTION	SAMPLE RESULT	REPORTING LIMIT	UNITS	DATE	TECH
3.2.2	pH, Solid	2.35	0.01	pH Units	09/27/96	sgm
SW-846 3050	Acid Digestion: Solids, Solid	Complete			09/24/96	lmt
SW-846 6010A	Arsenic (As), Solid	488	5	mg/Kg	10/11/96	gag
SW-846 6010A	Cadmium (Cd), Solid	0.8	0.2	mg/Kg	10/11/96	gag
SW-846 6010A	Calcium (Ca), Solid	5050	50	mg/Kg	10/11/96	gag
SW-846 6010A	Copper (Cu), Solid	584	2	mg/Kg	10/11/96	gag
SW-846 6010A	Iron (Fe), Solid	87500	200	mg/Kg	10/11/96	gag
SW-846 6010A	Lead (Pb), Solid	2720	20	mg/Kg	10/11/96	gag
SW-846 6010A	Magnesium (Mg), Solid	520	50	mg/Kg	10/11/96	gag
SW-846 6010A	Manganese (Mn), Solid	182	0.5	mg/Kg	10/11/96	gag
SW-846 6010A	Zinc (Zn), Solid	691	2	mg/Kg	10/11/96	gag
SW-846 9030A	Sulfide, Solid	40	10	mg/Kg	10/18/96	lmt
ASTM D4239	AGP (from Total Sulfur), Solid	242	0.3	t CaCO3/kt	09/24/96	* sl
EPA 600 3.2.3	Acid Neutralization Potential, Solid	<0.1	0.1	t CaCO3/kt	10/07/96	pjm

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LABORATORY TEST RESULTS

Job Number: 962534

Date: 11/05/96

CUSTOMER: Dames & Moore

PROJECT: EAGLE WASTE ROCK

ATTN: Dan Lincicome

Customer Sample ID: WP14-5
Date Sampled.....:
Time Sampled.....:
Sample Matrix.....: Soil

Laboratory Sample ID: 962534-34
Date Received.....: 09/13/96
Time Received.....: 13:10

TEST METHOD	PARAMETER/TEST DESCRIPTION	SAMPLE RESULT	REPORTING LIMIT	UNITS	DATE	TECH
3.2.2	pH, Solid	4.91	0.01	pH Units	09/27/96	sgm
SW-846 3050	Acid Digestion: Solids, Solid	Complete			09/19/96	lmt
SW-846 6010A	Arsenic (As), Solid	287	5	mg/Kg	10/10/96	gag
SW-846 6010A	Cadmium (Cd), Solid	4.0	0.2	mg/Kg	10/10/96	gag
SW-846 6010A	Calcium (Ca), Solid	13500	50	mg/Kg	10/10/96	gag
SW-846 6010A	Copper (Cu), Solid	259	2	mg/Kg	10/10/96	gag
SW-846 6010A	Iron (Fe), Solid	46200	200	mg/Kg	10/10/96	gag
SW-846 6010A	Lead (Pb), Solid	1360	2	mg/Kg	10/10/96	gag
SW-846 6010A	Magnesium (Mg), Solid	4790	50	mg/Kg	10/10/96	gag
SW-846 6010A	Manganese (Mn), Solid	890	0.5	mg/Kg	10/10/96	gag
SW-846 6010A	Zinc (Zn), Solid	1070	2	mg/Kg	10/10/96	gag
SW-846 9030A	Sulfide, Solid	60	10	mg/Kg	10/10/96	lmt
ASTM D4239	AGP (from Total Sulfur), Solid	57.5	0.3	t CaCO3/kt	09/24/96	* sl
EPA 600 3.2.3	Acid Neutralization Potential, Solid	25.0	0.1	t CaCO3/kt	10/07/96	pjm

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CORE LABORATORIES

LABORATORY TEST RESULTS

Job Number: 962534

Date: 11/05/96

CUSTOMER: Dames & Moore

PROJECT: EAGLE WASTE ROCK

ATTN: Dan Lincicome

Customer Sample ID: WP14-6
Date Sampled.....:
Time Sampled.....:
Sample Matrix.....: Soil

Laboratory Sample ID: 962534-41
Date Received.....: 09/13/96
Time Received.....: 13:10

TEST METHOD	PARAMETER/TEST DESCRIPTION	SAMPLE RESULT	REPORTING LIMIT	UNITS	DATE	TECH
3.2.2	pH, Solid	6.06	0.01	pH Units	09/27/96	sgm
SW-846 3050	Acid Digestion: Solids, Solid	Complete			09/24/96	lmt
SW-846 6010A	Arsenic (As), Solid	96	5	mg/Kg	10/11/96	gag
SW-846 6010A	Cadmium (Cd), Solid	1.1	0.2	mg/Kg	10/11/96	gag
SW-846 6010A	Calcium (Ca), Solid	5370	50	mg/Kg	10/11/96	gag
SW-846 6010A	Copper (Cu), Solid	80	2	mg/Kg	10/11/96	gag
SW-846 6010A	Iron (Fe), Solid	48800	200	mg/Kg	10/11/96	gag
SW-846 6010A	Lead (Pb), Solid	445	2	mg/Kg	10/11/96	gag
SW-846 6010A	Magnesium (Mg), Solid	3110	50	mg/Kg	10/11/96	gag
SW-846 6010A	Manganese (Mn), Solid	397	0.5	mg/Kg	10/11/96	gag
SW-846 6010A	Zinc (Zn), Solid	616	2	mg/Kg	10/11/96	gag
SW-846 9030A	Sulfide, Solid	40	10	mg/Kg	10/18/96	lmt
ASTM D4239	AGP (from Total Sulfur), Solid	35.6	0.3	t CaCO3/kt	09/24/96	* sl
EPA 600 3.2.3	Acid Neutralization Potential, Solid	9.4	0.1	t CaCO3/kt	10/07/96	pjm

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CORE LABORATORIES

LABORATORY TEST RESULTS

Job Number: 962534 Date: 11/05/96

CUSTOMER: Dames & Moore PROJECT: EAGLE WASTE ROCK ATTN: Dan Lincicome

Customer Sample ID: WP14-7
Date Sampled.....:
Time Sampled.....:
Sample Matrix.....: Soil

Laboratory Sample ID: 962534-1
Date Received.....: 09/13/96
Time Received.....: 13:10

TEST METHOD	PARAMETER/TEST DESCRIPTION	SAMPLE RESULT	REPORTING LIMIT	UNITS	DATE	TECH
3.2.2	pH, Solid	3.79	0.01	pH Units	09/27/96	sgm
SW-846 3050	Acid Digestion: Solids, Solid	Complete			09/19/96	lmt
SW-846 6010A	Arsenic (As), Solid	200	20	mg/Kg	10/02/96	smh
SW-846 6010A	Cadmium (Cd), Solid	48	1	mg/Kg	10/02/96	smh
SW-846 6010A	Calcium (Ca), Solid	3400	200	mg/Kg	10/02/96	smh
SW-846 6010A	Copper (Cu), Solid	330	10	mg/Kg	10/02/96	smh
SW-846 6010A	Iron (Fe), Solid	43900	100	mg/Kg	10/02/96	smh
SW-846 6010A	Lead (Pb), Solid	1750	6	mg/Kg	10/02/96	smh
SW-846 6010A	Magnesium (Mg), Solid	2800	200	mg/Kg	10/02/96	smh
SW-846 6010A	Manganese (Mn), Solid	933	2	mg/Kg	10/02/96	smh
SW-846 6010A	Zinc (Zn), Solid	8030	10	mg/Kg	10/02/96	smh
SW-846 9030A	Sulfide, Solid	<10	10	mg/Kg	10/04/96	lmt
ASTM D4239	AGP (from Total Sulfur), Solid	53.1	0.3	t CaCO3/kt	09/24/96	* sl
EPA 600 3.2.3	Acid Neutralization Potential, Solid	2.7	0.1	t CaCO3/kt	09/30/96	sgm

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CORE LABORATORIES

LABORATORY TEST RESULTS

Job Number: 962534 Date: 11/05/96

CUSTOMER: Dames & Moore PROJECT: EAGLE WASTE ROCK ATTN: Dan Lincicome

Customer Sample ID: ADH7-1
Date Sampled.....:
Time Sampled.....:
Sample Matrix.....: Soil

Laboratory Sample ID: 962534-49
Date Received.....: 09/13/96
Time Received.....: 13:10

TEST METHOD	PARAMETER/TEST DESCRIPTION	SAMPLE RESULT	REPORTING LIMIT	UNITS	DATE	TECH
3.2.2	pH, Solid	4.42	0.01	pH Units	09/27/96	sgm
SW-846 3050	Acid Digestion: Solids, Solid	Complete			09/24/96	lmt
SW-846 6010A	Arsenic (As), Solid	189	2	mg/Kg	10/11/96	gag
SW-846 6010A	Cadmium (Cd), Solid	0.5	0.1	mg/Kg	10/11/96	gag
SW-846 6010A	Calcium (Ca), Solid	420	20	mg/Kg	10/11/96	gag
SW-846 6010A	Copper (Cu), Solid	40	1	mg/Kg	10/11/96	gag
SW-846 6010A	Iron (Fe), Solid	39400	60	mg/Kg	10/11/96	gag
SW-846 6010A	Lead (Pb), Solid	8930	6	mg/Kg	10/11/96	gag
SW-846 6010A	Magnesium (Mg), Solid	120	20	mg/Kg	10/11/96	gag
SW-846 6010A	Manganese (Mn), Solid	218	0.2	mg/Kg	10/11/96	gag
SW-846 6010A	Zinc (Zn), Solid	914	1	mg/Kg	10/11/96	gag
SW-846 9030A	Sulfide, Solid	30	10	mg/Kg	10/18/96	lmt
ASTM D4239	AGP (from Total Sulfur), Solid	22.8	0.3	t CaCO3/kt	09/24/96	* sl
EPA 600 3.2.3	Acid Neutralization Potential, Solid	<0.1	0.1	t CaCO3/kt	10/07/96	pjm

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LABORATORY TEST RESULTS

Job Number: 962534 Date: 11/05/96

CUSTOMER: Dames & Moore PROJECT: EAGLE WASTE ROCK ATTN: Dan Lincicome

Customer Sample ID: ADIT7-2
Date Sampled.....:
Time Sampled.....:
Sample Matrix.....: Soil

Laboratory Sample ID: 962534-57
Date Received.....: 09/13/96
Time Received.....: 13:10

TEST METHOD	PARAMETER/TEST DESCRIPTION	SAMPLE RESULT	REPORTING LIMIT	UNITS	DATE	TECH
3.2.2	pH, Solid	5.57	0.01	pH Units	09/27/96	sgm
SW-846 3050	Acid Digestion: Solids, Solid	Complete			09/24/96	lmt
SW-846 6010A	Arsenic (As), Solid	43	1	mg/Kg	10/11/96	gag
SW-846 6010A	Cadmium (Cd), Solid	1.02	0.05	mg/Kg	10/11/96	gag
SW-846 6010A	Calcium (Ca), Solid	3660	10	mg/Kg	10/11/96	gag
SW-846 6010A	Copper (Cu), Solid	19.9	0.5	mg/Kg	10/11/96	gag
SW-846 6010A	Iron (Fe), Solid	12100	30	mg/Kg	10/11/96	gag
SW-846 6010A	Lead (Pb), Solid	1530	3	mg/Kg	10/11/96	gag
SW-846 6010A	Magnesium (Mg), Solid	790	10	mg/Kg	10/11/96	gag
SW-846 6010A	Manganese (Mn), Solid	478	0.1	mg/Kg	10/11/96	gag
SW-846 6010A	Zinc (Zn), Solid	432	0.5	mg/Kg	10/11/96	gag
SW-846 9030A	Sulfide, Solid	40	10	mg/Kg	10/18/96	lmt
ASTM D4239	AGP (from Total Sulfur), Solid	14.4	0.3	t CaCO3/kt	09/24/96	* sl
EPA 600 3.2.3	Acid Neutralization Potential, Solid	6.4	0.1	t CaCO3/kt	10/07/96	pjm

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CORE LABORATORIES

LABORATORY TEST RESULTS

Job Number: 962534 Date: 11/05/96

CUSTOMER: Dames & Moore PROJECT: EAGLE WASTE ROCK ATTN: Dan Lincicome

Customer Sample ID: CROSS BEAM 1
Date Sampled.....:
Time Sampled.....:
Sample Matrix.....: Soil

Laboratory Sample ID: 962534-26
Date Received.....: 09/13/96
Time Received.....: 13:10

TEST METHOD	PARAMETER/TEST DESCRIPTION	SAMPLE RESULT	REPORTING LIMIT	UNITS	DATE	TECH
3.2.2	pH, Solid	7.16	0.01	pH Units	09/27/96	sgm
SW-846 3050	Acid Digestion: Solids, Solid	Complete			09/19/96	lmt
SW-846 6010A	Arsenic (As), Solid	68	2	mg/Kg	10/10/96	gag
SW-846 6010A	Cadmium (Cd), Solid	9.9	0.1	mg/Kg	10/10/96	gag
SW-846 6010A	Calcium (Ca), Solid	2300	20	mg/Kg	10/10/96	gag
SW-846 6010A	Copper (Cu), Solid	107	1	mg/Kg	10/10/96	gag
SW-846 6010A	Iron (Fe), Solid	31900	60	mg/Kg	10/10/96	gag
SW-846 6010A	Lead (Pb), Solid	922	0.6	mg/Kg	10/10/96	gag
SW-846 6010A	Magnesium (Mg), Solid	5010	20	mg/Kg	10/10/96	gag
SW-846 6010A	Manganese (Mn), Solid	5110	2	mg/Kg	10/10/96	gag
SW-846 6010A	Zinc (Zn), Solid	1660	10	mg/Kg	10/10/96	gag
SW-846 9030A	Sulfide, Solid	<10	10	mg/Kg	10/10/96	lmt
ASTM D4239	AGP (from Total Sulfur), Solid	1.5	0.3	t CaCO3/kt	09/24/96	* sl
EPA 600 3.2.3	Acid Neutralization Potential, Solid	42.2	0.1	t CaCO3/kt	10/01/96	sgm

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CORE LABORATORIES

LABORATORY TEST RESULTS

Job Number: 962534

Date: 11/05/96

CUSTOMER: Dames & Moore

PROJECT: EAGLE WASTE ROCK

ATTN: Dan Lincicome

Customer Sample ID: CROSS BEAM 2
Date Sampled.....:
Time Sampled.....:
Sample Matrix.....: Soil

Laboratory Sample ID: 962534-15
Date Received.....: 09/13/96
Time Received.....: 13:10

TEST METHOD	PARAMETER/TEST DESCRIPTION	SAMPLE RESULT	REPORTING LIMIT	UNITS	DATE	TECH
3.2.2	pH, Solid	5.57	0.01	pH Units	09/27/96	sgm
SW-846 3050	Acid Digestion: Solids, Solid	Complete			09/19/96	lmt
SW-846 6010A	Arsenic (As), Solid	37	2	mg/Kg	10/03/96	smh
SW-846 6010A	Cadmium (Cd), Solid	7.6	0.1	mg/Kg	10/03/96	smh
SW-846 6010A	Calcium (Ca), Solid	2490	20	mg/Kg	10/03/96	smh
SW-846 6010A	Copper (Cu), Solid	56	1	mg/Kg	10/03/96	smh
SW-846 6010A	Iron (Fe), Solid	35400	60	mg/Kg	10/03/96	smh
SW-846 6010A	Lead (Pb), Solid	657	0.6	mg/Kg	10/03/96	smh
SW-846 6010A	Magnesium (Mg), Solid	7850	20	mg/Kg	10/03/96	smh
SW-846 6010A	Manganese (Mn), Solid	1300	0.2	mg/Kg	10/03/96	smh
SW-846 6010A	Zinc (Zn), Solid	1320	10	mg/Kg	10/03/96	smh
SW-846 9030A	Sulfide, Solid	10	10	mg/Kg	10/04/96	lmt
ASTM D4239	AGP (from Total Sulfur), Solid	1.1	0.3	t CaCO3/kt	09/24/96	* sl
EPA 600 3.2.3	Acid Neutralization Potential, Solid	9.4	0.1	t CaCO3/kt	09/30/96	sgm

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Appendix B

APPENDIX B

Water Quality Data

The tabulations present in this section are a compilation of the analytical data obtained from the sample collection and analysis throughout the period. These data are presented separately by media type. Appropriate data qualifiers have been applied to the quarterly data as required under the EMP.

The qualifiers are defined briefly below:

U - The material was analyzed for, but was not detected above the level of the associated value. The associated value is either the sample quantitation limit or the sample detection limit.

UJ - The results are estimated as being undetected because they are less than five times the amount in any blank.

R - The data are unusable; the analyte may or may not be present.

J - The associated value is an estimated quantity for one or more of the following reasons:

- The reported value is an estimated quantity because of holding time exceedance.
- The reported value is an estimated quantity because of the presence of interference.
- The reported value is an estimated quantity because spiked sample recovery was not within the control limits.
- The reported value is an estimated quantity because GFAA post digestion spike recovery is out of the control limits.
- The reported value is an estimated quantity because the duplicate analysis results were not within the control limits.
- The reported value is an estimated quantity because the MSA correlation coefficient is less than 0.995.

Storm Water Quality Data

Eagle Mine Project

Station ID	Station Description	Date	Time	Stream Discharge (CFS)		Stream Discharge (GPM)		Field pH	Field Temp. Deg.C	Field Spec. Cond. @25C umhos/cm	Field Turbidity NTU	Suspended Solids mg/l	Alkalinity Total mg/l	
E- 3RC	EAGLE RIVER ABOVE BELDEN (COMP.)	8/03/95	21:00	171.00	E			7.8	17.0	120			55	
E- 3RR	EAGLE RIVER ABOVE BELDEN (RISE)	8/03/95	20:30	170.00	E			8.1	18.5	115			55	
E- 5RC	EAGLE RIVER ABV FALL CR. (COMP.)	8/03/95	21:00	177.00	E			8.2	18.0	115			55	
E- 5RR	EAGLE RIVER ABV FALL CR. (RISE)	8/03/95	20:25	177.00	E			8.0	17.0	120			55	
T- 6RC	ROASTER DRAINAGE NR MOUTH (COMP.	8/03/95	20:50			49	E	4.1	17.0	550			5	U
T- 6RR	ROASTER DRAINAGE NR MOUTH (RISE)	8/03/95	20:15			75	E	4.2	17.0	550			5	U
SR- 4C	WRP#8 HILLSIDE AT ADT 8RD (COMP.	8/23/95	22:30			15	E	6.7	14.0	3600		9900	120	
SR- 4R	WRP#8 HILLSIDE AT ADT 8RD (RISE)	8/23/95	22:00			50	E	5.1	14.0	6000		3800	12	
T-10RC	ROCK CREEK AT MOUTH (COMP.)	8/23/95	22:50			287	E	7.4	13.5	1150		2200	180	
E- 3RC	EAGLE RIVER ABOVE BELDEN (COMP.)	9/08/95	03:50	74.90	E			8.0	12.5	120		4	65	
E- 3RR	EAGLE RIVER ABOVE BELDEN (RISE)	9/08/95	03:10	72.40	E			7.9	13.0	125		4	70	
E- 5RC	EAGLE RIVER ABV FALL CR. (COMP.)	9/08/95	04:00	77.30	E			7.4	12.0	140		14	60	
E- 5RR	EAGLE RIVER ABV FALL CR. (RISE)	9/08/95	03:35	76.00	E			7.3	12.0	150		26	60	
E-11RC	EAGLE RIVER ABV BISHOP GU (COMP.	9/08/95	05:00	105.00	E			7.5	10.5	130		12	50	
E-11RR	EAGLE RIVER ABV BISHOP GU (RISE)	9/08/95	04:10	105.00	E			7.6	10.5	150		42	50	
SR- 3C	WRP#11 HILLSIDE RUNOFF (COMP.)	9/08/95	03:10			7	E	7.6	14.0	3000		82000	50	
SR- 3R	WRP#11 HILLSIDE RUNOFF (RISE)	9/08/95	03:10			17	E	7.7	14.5	3050		71000	40	
SR- 4C	WRP#8 HILLSIDE AT ADT 8RD (COMP.	9/08/95	03:20			52	E	6.2	14.0	4500		10000	50	
SR- 4R	WRP#8 HILLSIDE AT ADT 8RD (RISE)	9/08/95	03:10			82	E	5.2	15.0	8500		3800	24	
T- 4RC	UN-NAMED TRIB. NR MOUTH (COMP.)	9/08/95	03:40			4	E	7.3	13.5	900		6300	16	
T- 4RR	UN-NAMED TRIB. NR MOUTH (RISE)	9/08/95	03:20			9	E	7.2	13.0	500		310	5	U
T- 6RC	ROASTER DRAINAGE NR MOUTH (COMP.	9/08/95	03:35			65	E	3.8	12.0	750		450	5	U
T- 6RR	ROASTER DRAINAGE NR MOUTH (RISE)	9/08/95	03:15			92	E	4.4	12.0	750		710	5	U
T-10RC	ROCK CREEK AT MOUTH (COMP.)	9/08/95	03:40			238	E	7.1	12.5	1700		2700	70	
T-10RR	ROCK CREEK AT MOUTH (RISE)	9/08/95	03:25			278	E	7.0	13.0	2600		1600	65	
T-TRC	TRAMWAY TRIBUTARY AT MOUTH (COMP	9/08/95	03:20			31	E	6.6	19.0	3450		7300	24	
SR- 3C	WRP#11 HILLSIDE RUNOFF (COMP.)	9/20/95	20:30			17	E	7.4	7.0	2200		110000	44	
T- 4RC	UN-NAMED TRIB. NR MOUTH (COMP.)	9/20/95	20:15			5	E	6.7	9.0	800		3500	8	
T- 6RC	ROASTER DRAINAGE NR MOUTH (COMP.	9/20/95	20:15			66	E	3.7	11.0	500		98	5	U
T-10RC	ROCK CREEK AT MOUTH (COMP.)	9/20/95	20:20			233	E	7.1	6.5	950		2000	65	

E = estimate

NS = not sampled

Storm Water Quality Data

Eagle Mine Project

Station ID	Station Description	Date	Time	Stream Discharge (CFS)		Stream Discharge (GPM)		Field pH	Field Temp. Deg.C	Field Spec. Cond. @25C umhos/cm	Field Turbidity NTU	Suspended Solids mg/l		Alkalinity Total mg/l	
SR- 3C	WRP#11 HILLSIDE RUNOFF (COMP.)	9/29/95	07:30			2	E	7.4	6.0	2200		4500		44	
T- 4RC	UN-NAMED TRIB. NR MOUTH (COMP.)	9/29/95	07:30			2	E	5.7	13.0	600		550		6	
T- 6RC	ROASTER DRAINAGE NR MOUTH (COMP.	9/29/95	07:30			45	E	3.7	9.0	450		90		5	U
T-10RC	ROCK CREEK AT MOUTH (COMP.)	9/29/95	07:25			148	E	6.6	6.0	1100		4600		65	
T-TRC	TRAMWAY TRIBUTARY AT MOUTH (COMP	9/29/95	07:30			9	E	4.8	11.0	2700		2700		6	
T-TR	TRAMWAY TRIBUTARY AT MOUTH	2/13/96	15:20			11		7.0	.5	1400		5300		10	
E- 3R	EAGLE RIVER ABOVE BELDEN	3/21/96	15:20	36.00	E			8.1	1.5	140		5		78	
E- 5R	EAGLE RIVER ABV FALL CR.	3/21/96	16:40	36.40	E			7.9	1.5	155		7		72	
SR- 2	RUNOFF AT STORM DRAIN INLET	3/21/96	16:35			2		7.0	3.5	170		92		10	
SR- 2A	RUNOFF UPSTREAM OF T-TR	3/21/96	16:00			2		7.1	5.0	125		140		23	
T- 4A	UN-NAMED TRIB. BLW HIWAY 24	3/21/96	14:05			3		8.1	7.0	600		12		180	
T- 4R	UN-NAMED TRIB. NR MOUTH	3/21/96	15:40			3		7.1	5.0	850		9		34	
T-TR	TRAMWAY TRIBUTARY AT MOUTH	3/21/96	16:15			1		5.0	4.5	850		370		6	
E- 3R	EAGLE RIVER ABOVE BELDEN	4/01/96	16:25	54.00	E			6.8	5.0	135		5	U	65	
E- 5R	EAGLE RIVER ABV FALL CR.	4/01/96	17:10	54.60	E			7.1	3.0	140		9		62	
SR- 2	RUNOFF AT STORM DRAIN INLET	4/01/96	16:05			1		6.2	13.5	310		55		12	
T- 4	UN-NAMED TRIB. AT MOUTH	4/01/96	16:35			18		6.6	4.0	500		220		20	
T- 4A	UN-NAMED TRIB. BLW HIWAY 24	4/01/96	18:35			11		7.5	4.0	390		89		120	
T- 4R	UN-NAMED TRIB. NR MOUTH	4/01/96	15:35			10	E	5.9	9.0	600		200		14	
T-TR	TRAMWAY TRIBUTARY AT MOUTH	4/01/96	16:50			15	E	6.5	3.5	600		1300		36	
SR- 4	WRP#8 HILLSIDE AT ADT 8RD	4/10/96	17:20			50	E	5.9	1.0	2200		650		8	
T-10B	OLD R.C. 50' UPSTREAM OF CULVERT	4/10/96	16:55			202	E	6.9	3.0	1750		510		80	
T-10R	ROCK CREEK AT MOUTH	4/10/96	18:05			1796	E	7.1	4.5	465		36		86	
E- 3	EAGLE RIVER ABOVE BELDEN	4/16/96	13:05	110.00				7.3	4.0	105	4.4	6		55	
E- 5	EAGLE RIVER ABV FALL CR.	4/16/96	14:55	115.00				7.0	5.0	100		5		50	
E-11	EAGLE RIVER ABV BISHOP GU	4/16/96	17:15	126.00				7.2	5.0	110	6.9	9		52	
SR- 4	WRP#8 HILLSIDE AT ADT 8RD	4/16/96	16:10			21		5.5	2.0	2400		850		6	
T- 4A	UN-NAMED TRIB. BLW HIWAY 24	4/16/96	11:20			18	E	7.5	4.5	280		4		100	

E = estimate

NS = not sampled

Storm Water Quality Data

Eagle Mine Project

Station ID	Station Description	Date	Time	Stream Discharge (CFS)		Stream Discharge (GPM)		Field pH	Field Temp. Deg.C	Field Spec. Cond. @25C umhos/cm	Field Turbidity NTU	Suspended Solids mg/l		Alkalinity Total mg/l	
T- 4R	UN-NAMED TRIB. NR MOUTH	4/16/96	13:35			11		7.1	5.0	600		9		40	
T- 6R	ROASTER DRAINAGE NR MOUTH	4/16/96	14:10			73		4.0	4.5	280		23		5	U
T-10R	ROCK CREEK AT MOUTH	4/16/96	16:40			898	E	7.0	4.5	600		93		94	
E- 3R	EAGLE RIVER ABOVE BELDEN	5/07/96	11:20	424.00	E			6.8	5.0	120		12		42	
E- 5R	EAGLE RIVER ABV FALL CR.	5/07/96	13:30	429.00	E			7.0	6.0	110		11		54	
E-11R	EAGLE RIVER ABV BISHOP GU	5/07/96	16:10	461.00	E			7.2	9.0	105		32		50	
SR- 3	WRP#11 HILLSIDE RUNOFF	5/07/96	15:30			2		5.9	5.0	435		230		10	
SR- 4	WRP#8 HILLSIDE AT ADT 8RD	5/07/96	15:10			105		3.8	10.5	3250		240		5	U
T- 4A	UN-NAMED TRIB. BLW HIWAY 24	5/07/96	09:55			101		7.2	5.0	195		13		72	
T- 4R	UN-NAMED TRIB. NR MOUTH	5/07/96	11:35			164		7.1	9.0	315		93		88	
T- 6R	ROASTER DRAINAGE NR MOUTH	5/07/96	12:50			252		3.8	13.0	320		120		5	U
T-10R	ROCK CREEK AT MOUTH	5/07/96	15:50			2470	E	6.7	8.0	455		98		74	
SR- 3	WRP#11 HILLSIDE RUNOFF	5/15/96	15:45			1		6.4	17.5	1650		59		10	
E- 3RC	EAGLE RIVER ABOVE BELDEN (COMP.)	7/29/96	16:51	95.70	E			7.6	15.5	130		3	U	60	
E- 3RR	EAGLE RIVER ABOVE BELDEN (RISE)	7/29/96	16:22	93.80	E			7.6	16.0	140		3	U	60	
E-11RC	EAGLE RIVER ABV BISHOP GU (COMP.	7/29/96	17:40	122.00	E			7.2	15.0	150		190		58	
E-11RR	EAGLE RIVER ABV BISHOP GU (RISE)	7/29/96	17:10	119.00	E			7.3	15.0	200		180		60	
SR- 4C	WRP#8 HILLSIDE AT ADT 8RD (COMP.	7/29/96	17:05			100	E	5.7	16.0	7500		4700		40	
SR- 4R	WRP#8 HILLSIDE AT ADT 8RD (RISE)	7/29/96	16:45			278	E	5.5	18.0	8000		15000		76	
T- 4RC	UN-NAMED TRIB. NR MOUTH (COMP.)	7/29/96	16:44			4	E	7.2	17.0	800		17000		190	
T-10RC	ROCK CREEK AT MOUTH (COMP.)	7/29/96	17:00			718	E	6.6	14.5	2550		11000		220	
T-10RR	ROCK CREEK AT MOUTH (RISE)	7/29/96	16:47			907	E	6.6	15.0	1550		6700		280	
T-TRC	TRAMWAY TRIBUTARY AT MOUTH (COMP	7/29/96	16:25			229	E	5.7	16.0	2350		7100		95	
E-11RC	EAGLE RIVER ABV BISHOP GU (COMP.	9/12/96	14:42	44.50	E			7.9	10.0	155		5	U	75	
SR- 4C	WRP#8 HILLSIDE AT ADT 8RD (COMP.	9/12/96	13:50			14	E	5.2	10.0	4300		3900		20	
E- 5RC	EAGLE RIVER ABV FALL CR. (COMP.)	9/14/96	20:50	55.20	E			7.9	12.0	145		18		70	
E- 5RR	EAGLE RIVER ABV FALL CR. (RISE)	9/14/96	20:00	52.90	E			7.4	14.0	145		28		70	
SR- 4C	WRP#8 HILLSIDE AT ADT 8RD (COMP.	9/14/96	20:15			12	E	6.6	11.0	1550		3800		120	
SR- 4R	WRP#8 HILLSIDE AT ADT 8RD (RISE)	9/14/96	19:40			42	E	6.2	11.0	2550		4400		60	
T- 4RC	UN-NAMED TRIB. NR MOUTH (COMP.)	9/14/96	20:10			3	E	7.3	15.0	700		8800		58	

E = estimate

NS = not sampled

Storm Water Quality Data

Eagle Mine Project

Station ID	Station Description	Date	Time	Stream Discharge (CFS)		Stream Discharge (GPM)		Field pH	Field Temp. Deg.C	Field Spec. Cond. @25C umhos/cm	Field Turbidity NTU	Suspended Solids mg/l		Alkalinity Total mg/l	
T- 4RR	UN-NAMED TRIB. NR MOUTH (RISE)	9/14/96	19:35			1	E	7.2	14.0	535		1200		14	
T- 6RC	ROASTER DRAINAGE NR MOUTH (COMP.	9/14/96	20:00			101	E	3.0	14.0	465		120		5	U
T- 6RR	ROASTER DRAINAGE NR MOUTH (RISE)	9/14/96	19:35			117	E	3.0	17.0	440		270		5	U
T-10RC	ROCK CREEK AT MOUTH (COMP.)	9/14/96	19:55			216	E	6.8	12.0	1000		2900		260	
T-10RR	ROCK CREEK AT MOUTH (RISE)	9/14/96	19:35			323	E	6.6	13.0	1350		2400		200	
T-TRC	TRAMWAY TRIBUTARY AT MOUTH (COMP	9/14/96	20:05			29	E	6.9	19.5	4000		92000		2500	
T-TRR	TRAMWAY TRIBUTARY AT MOUTH (RISE	9/14/96	19:50			37	E	7.0	19.0	6500		87000		2500	
SR- 4C	WRP#8 HILLSIDE AT ADT 8RD (COMP.	9/24/96	08:40			18	E	6.4	9.5	1900		3000		30	
T-10RC	ROCK CREEK AT MOUTH (COMP.)	9/24/96	09:05			157	E	7.2	9.0	800		360		150	
E- 3R	EAGLE RIVER ABOVE BELDEN	3/07/97	15:35	35.80	E			7.7	0.0	130		3	U	80	
E- 5R	EAGLE RIVER ABV FALL CR.	3/07/97	16:34	36.20	E			7.4	0.0	135		3	U	75	
T- 4	UN-NAMED TRIB. AT MOUTH	3/07/97	15:55			5	E	6.2	1.0	600		110		26	
T-TR	TRAMWAY TRIBUTARY AT MOUTH	3/07/97	16:00			7		6.5	1.0	1350		13000		550	
E- 3R	EAGLE RIVER ABOVE BELDEN	3/11/97	14:15	35.80	E			7.6	0.0	140		4		80	
E- 5R	EAGLE RIVER ABV FALL CR.	3/11/97	15:50	36.20	E			7.1	0.0	150		7		85	
E-11R	EAGLE RIVER ABV BISHOP GU	3/11/97	17:10	41.80	E			7.1	0.0	165		8		65	
SR- 2	RUNOFF AT STORM DRAIN INLET	3/11/97	15:15			5		4.7	3.0	180		150		5	U
SR- 2A	RUNOFF UPSTREAM OF T-TR	3/11/97	15:00			6		5.3	1.0	260		160		8	
SR- 4	WRP#8 HILLSIDE AT ADT 8RD	3/11/97	16:30			6		4.7	0.0	6000		440		6	
T- 4R	UN-NAMED TRIB. NR MOUTH	3/11/97	14:30			18		6.4	0.0	900		91		36	
T- 6R	ROASTER DRAINAGE NR MOUTH	3/11/97	17:55		NS	25	E	3.3	0.0	340					
T-10R	ROCK CREEK AT MOUTH	3/11/97	16:55			529		6.5	3.0	500		69		95	
T-TR	TRAMWAY TRIBUTARY AT MOUTH	3/11/97	14:45			9		5.8	1.0	1400		2100		30	
E- 3R	EAGLE RIVER ABOVE BELDEN	3/19/97	14:30	39.60	E			7.2	2.0	130		3		65	E
E- 5R	EAGLE RIVER ABV FALL CR.	3/19/97	16:05	40.00	E			7.7	2.0	145		5		60	
SR- 1A	RUNOFF AT CULVERT NEAR SIGNAL	3/19/97	14:45			1	E	2.8	2.0	900		3	U	5	U
SR- 2	RUNOFF AT STORM DRAIN INLET	3/19/97	15:50			9		5.8	12.0	500		310		20	
SR- 2A	RUNOFF UPSTREAM OF T-TR	3/19/97	15:35			6		5.3	6.5	410		65		8	
SR- 4	WRP#8 HILLSIDE AT ADT 8RD	3/19/97	16:20		NS	13		4.9	0.0	3750					
T- 4A	UN-NAMED TRIB. BLW HIWAY 24	3/19/97	17:45			5	E	7.7	5.0	390		12		110	

E = estimate

NS = not sampled

Storm Water Quality Data
Eagle Mine Project

Station ID	Station Description	Date	Time	Stream Discharge (CFS)		Stream Discharge (GPM)		Field pH	Field Temp. Deg.C	Field Spec. Cond. @25C umhos/cm	Field Turbidity NTU	Suspended Solids mg/l		Alkalinity Total mg/l	
T- 4R	UN-NAMED TRIB. NR MOUTH	3/19/97	15:05			15		6.4	5.5	700		53		20	
T-TR	TRAMWAY TRIBUTARY AT MOUTH	3/19/97	15:25			2		6.2	2.0	1100		2500		100	
E- 3	EAGLE RIVER ABOVE BELDEN	4/17/97	13:05	61.20				7.3	6.0	125		3	U	70	
E- 5	EAGLE RIVER ABV FALL CR.	4/17/97	14:55	72.70				6.9	8.0	125		3	U	60	
E-11	EAGLE RIVER ABV BISHOP GU	4/17/97	17:20	87.50				7.6	7.0	120		5		60	
SR- 1A	RUNOFF AT CULVERT NEAR SIGNAL	4/17/97	14:00			1	E	3.0	6.0	385		110		5	U
SR- 3	WRP#11 HILLSIDE RUNOFF	4/17/97	16:00			1	E	7.0	7.5	70		41		8	
SR- 4	WRP#8 HILLSIDE AT ADT 8RD	4/17/97	15:45			24		4.9	6.0	3250		340		5	U
SR- 4 A	WRP#8 RUNON DIVERSION NR SHAFT	4/17/97	11:45			5	E	6.3	1.0	1700		36		130	
SR- 4 B	RUNOFF AT SR-4A FROM 30 IN. CULV	4/17/97	11:55		NS	1	E	6.3	1.0	900					
T- 4A	UN-NAMED TRIB. BLW HIWAY 24	4/17/97	10:40			2	E	6.4	5.0	455		14		120	
T- 4R	UN-NAMED TRIB. NR MOUTH	4/17/97	13:35			2		6.5	8.5	600		3	U	26	
T- 6R	ROASTER DRAINAGE NR MOUTH	4/17/97	14:25			65		3.3	2.0	240		19		5	U
T-10B	OLD ROCK CREEK CHANNEL AT FLUME	4/17/97	15:55			21		5.9	8.5	2600		290		82	
T-10R	ROCK CREEK AT MOUTH	4/17/97	16:40			460		6.7	5.5	550		77		95	
E- 3	EAGLE RIVER ABOVE BELDEN	5/06/97	13:55	248.00	E			7.4	9.0	100		27		54	
E- 5	EAGLE RIVER ABV FALL CR.	5/06/97	16:20	247.00	E			7.1	10.0	105		18		50	
E-11	EAGLE RIVER ABV BISHOP GU	5/06/97	18:05	313.00	E			6.9	7.5	130		39		46	
SR- 1A	RUNOFF AT CULVERT NEAR SIGNAL	5/06/97	14:50			1	E	2.4	6.0	1050		120		5	U
SR- 3	WRP#11 HILLSIDE RUNOFF	5/06/97	17:35			4		7.3	7.0	260		740		22	
SR- 4	WRP#8 HILLSIDE AT ADT 8RD	5/06/97	17:00			119		5.1	6.0	2600		420		5	U
SR- 4 A	WRP#8 RUNON DIVERSION NR SHAFT	5/06/97	12:40			14		7.4	5.5	950		140		160	
SR- 4 B	RUNOFF AT SR-4A FROM 30 IN. CULV	5/06/97	12:35		NS	1	E	7.1	3.5	1200					
SR- 4 D	RUNOFF AT SR-4A 1/2 CULVERT	5/06/97	12:30		NS	12		8.1	6.5	800					
T- 4A	UN-NAMED TRIB. BLW HIWAY 24	5/06/97	12:00			75	E	7.5	14.0	220		27		76	
T- 4R	UN-NAMED TRIB. NR MOUTH	5/06/97	15:10			124		7.7	12.0	490		100		80	
T- 6R	ROASTER DRAINAGE NR MOUTH	5/06/97	14:05			187		2.9	12.5	315		47		5	U
T-10R	ROCK CREEK AT MOUTH	5/06/97	17:45			1420		7.1	6.0	600		120		80	
SR- 4 A	WRP#8 RUNON DIVERSION NR SHAFT	5/09/97	11:00		NS	16									
SR- 2	RUNOFF AT STORM DRAIN INLET	5/22/97			NS	2	E								

E = estimate NS = not sampled

Storm Water Quality Data

Eagle Mine Project

Station ID	Station Description	Date	Time	Stream Discharge (CFS)		Stream Discharge (GPM)		Field pH	Field Temp. Deg.C	Field Spec. Cond. @25C umhos/cm	Field Turbidity NTU	Suspended Solids mg/l		Alkalinity Total mg/l
SR- 4 A	WRP#8 RUNON DIVERSION NR SHAFT	5/22/97	16:15		NS	13			8.0	460				
SR- 4 B	RUNOFF AT SR-4A FROM 30 IN. CULV	5/22/97	16:15		NS	1	E		7.0	900				
SR- 4 D	RUNOFF AT SR-4A 1/2 CULVERT	5/22/97	16:15		NS	5	E		8.0	180				
E- 3RC	EAGLE RIVER ABOVE BELDEN (COMP.)	5/26/97	11:00	517.00	E			7.9				3	UJ	48
E- 5RC	EAGLE RIVER ABV FALL CR. (COMP.)	5/29/97	18:20	606.00	E			7.9	19.0	90		17		40
E-11RC	EAGLE RIVER ABV BISHOP GU (COMP.	5/29/97	18:40	659.00	E			7.7	22.5	85		16		36
SR- 2	RUNOFF AT STORM DRAIN INLET	5/29/97			NS	5	E		8.0	650				
SR- 3C	WRP#11 HILLSIDE RUNOFF (COMP.)	5/29/97	21:20			12	E	6.4	24.5	650		1800		75
SR- 4C	WRP#8 HILLSIDE AT ADT 8RD (COMP.	5/29/97	21:30			72	E	6.4	29.0	1900		8600		75
T- 4RC	UN-NAMED TRIB. NR MOUTH (COMP.)	5/29/97	22:00			149	E	6.8	16.0	340		19000		250
SR- 4 A	WRP#8 RUNON DIVERSION NR SHAFT	5/30/97	18:18		NS	5	E		12.0	1600				
SR- 4 B	RUNOFF AT SR-4A FROM 30 IN. CULV	5/30/97	18:15		NS	1	E		10.0	1050				
SR- 4 D	RUNOFF AT SR-4A 1/2 CULVERT	5/30/97	18:15		NS	3	E		13.0	1050				
T- 4A	UN-NAMED TRIB. BLW HIWAY 24	5/30/97	17:42		NS	300	E		9.0	200				
SR- 4C	WRP#8 HILLSIDE AT ADT 8RD (COMP.	6/10/97	12:30			27	E	6.0	22.5	1800		720		20
SR- 4C	WRP#8 HILLSIDE AT ADT 8RD (COMP.	6/11/97	03:20			27	E	6.0	16.0	1750		1800		38
SR- 4 A	WRP#8 RUNON DIVERSION NR SHAFT	6/13/97	09:48		NS	2	E		10.0	3000				
SR- 4 B	RUNOFF AT SR-4A FROM 30 IN. CULV	6/13/97	09:48		NS	1	E		10.0	1000				
SR- 4 D	RUNOFF AT SR-4A 1/2 CULVERT	6/13/97	09:48		NS	1	E		9.0	1000				
T- 4A	UN-NAMED TRIB. BLW HIWAY 24	6/13/97	08:06		NS	75	E		6.0	205				
SR- 4	WRP#8 HILLSIDE AT ADT 8RD	7/18/97	13:54		NS	2			16.0	9450				
SR- 4 A	WRP#8 RUNON DIVERSION NR SHAFT	7/18/97	15:10		NS	1	E		17.0	1500				
T- 4A	UN-NAMED TRIB. BLW HIWAY 24	7/18/97	07:45		NS	0	DRY							
E- 3RC	EAGLE RIVER ABOVE BELDEN (COMP.)	7/27/97	17:30	101.00	E			6.8	16.0	150		3	U	60
E- 3RR	EAGLE RIVER ABOVE BELDEN (RISE)	7/27/97	17:00	97.90	E			6.8	17.0	140		3		65
E- 5RC	EAGLE RIVER ABV FALL CR. (COMP.)	7/27/97	17:48	110.00	E			7.0	19.5	140		6		60
E- 5RR	EAGLE RIVER ABV FALL CR. (RISE)	7/27/97	17:25	108.00	E			7.0	18.0	145		3	U	65

E = estimate NS = not sampled

Storm Water Quality Data

Eagle Mine Project

Station ID	Station Description	Date	Time	Stream Discharge (CFS)		Stream Discharge (GPM)		Field pH	Field Temp. Deg.C	Field Spec. Cond. @25C umhos/cm	Field Turbidity NTU	Suspended Solids mg/l		Alkalinity Total mg/l	
SR- 4C	WRP#8 HILLSIDE AT ADT 8RD (COMP.	7/27/97	17:27			45	E	5.9	18.5	5000		2800		65	
SR- 4R	WRP#8 HILLSIDE AT ADT 8RD (RISE)	7/27/97	16:57			112	E	4.4	19.0	12500		1200		60	
T- 4RC	UN-NAMED TRIB. NR MOUTH (COMP.)	7/27/97	17:29			10	E	6.6	20.5	850		12000		100	
T- 4RR	UN-NAMED TRIB. NR MOUTH (RISE)	7/27/97	16:59			16	E	6.2	21.0	800		200		10	
T- 6RC	ROASTER DRAINAGE NR MOUTH (COMP.	7/27/97	17:27			97	E	4.1	17.5	485		64		5	U
T- 6RR	ROASTER DRAINAGE NR MOUTH (RISE)	7/27/97	17:14			100	E	4.1	17.0	450		100		5	U
T-10RC	ROCK CREEK AT MOUTH (COMP.)	7/27/97	17:47			489	E	6.7	17.5	1800		1900		200	
T-TRC	TRAMWAY TRIBUTARY AT MOUTH (COMP	7/27/97	18:26			10	E	6.5	21.0	4500		33000		1400	
T-TRR	TRAMWAY TRIBUTARY AT MOUTH (RISE	7/27/97	18:17			12	E	6.5	21.0	3950		65000		1800	
SR- 4 A	WRP#8 RUNON DIVERSION NR SHAFT	7/28/97	15:55		NS	1	E		23.0	1400					
E- 3RC	EAGLE RIVER ABOVE BELDEN (COMP.)	8/05/97	19:34	127.00	E			6.7	19.0	105		3	U	55	
E- 5RC	EAGLE RIVER ABV FALL CR. (COMP.)	8/05/97	19:46	134.00	E			6.8	17.5	105		10		60	
T- 4RC	UN-NAMED TRIB. NR MOUTH (COMP.)	8/05/97	19:19			23	E	6.5	17.5	750		52000		700	
T- 6RC	ROASTER DRAINAGE NR MOUTH (COMP.	8/05/97	19:17			157	E	4.1	18.0	285		180		5	U
T-TRC	TRAMWAY TRIBUTARY AT MOUTH (COMP	8/05/97	19:18			58	E	6.5	25.0	2000		250000		5200	
SR- 2	RUNOFF AT STORM DRAIN INLET	8/06/97	17:10			2		6.0	18.0	800		17000		600	
SR- 4 A	WRP#8 RUNON DIVERSION NR SHAFT	8/07/97	10:05		NS	1	E		10.5	950					
SR- 4 B	RUNOFF AT SR-4A FROM 30 IN. CULV	8/07/97	10:05		NS	1	E		12.5	550					
SR- 4 D	RUNOFF AT SR-4A 1/2 CULVERT	8/07/97	10:05		NS		DRY								
E- 5RC	EAGLE RIVER ABV FALL CR. (COMP.)	8/09/97	15:40	103.00	E			6.7	15.0	100		5	U	60	
E-11RC	EAGLE RIVER ABV BISHOP GU (COMP.	8/09/97	15:55	144.00	E			5.3	13.0	100		23		50	
E-11RR	EAGLE RIVER ABV BISHOP GU (RISE)	8/09/97	15:35	145.00	E			6.0	13.0	105		47		55	
SR- 3C	WRP#11 HILLSIDE RUNOFF (COMP.)	8/09/97	15:11			3	E	6.1	13.0	1200		43000		1300	
SR- 3R	WRP#11 HILLSIDE RUNOFF (RISE)	8/09/97	15:00			5	E	6.2	13.5	1300		26000		1200	
T-10RC	ROCK CREEK AT MOUTH (COMP.)	8/09/97	15:10			413	E	6.3	13.0	950		4600		320	
T-10RR	ROCK CREEK AT MOUTH (RISE)	8/09/97	15:00			427	E	6.1	13.0	1000		3500		220	
E- 3RC	EAGLE RIVER ABOVE BELDEN (COMP.)	8/17/97	13:20	91.50	E			7.0	16.5	125		3	UJ	60	
E- 3RR	EAGLE RIVER ABOVE BELDEN (RISE)	8/17/97	13:00	91.20	E			7.1	17.5	120		3	UJ	55	
E- 5RC	EAGLE RIVER ABV FALL CR. (COMP.)	8/17/97	13:40	102.00	E			7.2	16.0	120		5	J	55	
E- 5RR	EAGLE RIVER ABV FALL CR. (RISE)	8/17/97	13:15	102.00	E			7.3	17.0	115		6	J	54	
SR- 3C	WRP#11 HILLSIDE RUNOFF (COMP.)	8/17/97	13:25			22	E	7.6	15.0	1700		270000		4600	

E = estimate NS = not sampled

Storm Water Quality Data

Eagle Mine Project

Station ID	Station Description	Date	Time	Stream Discharge (CFS)	Stream Discharge (GPM)		Field pH	Field Temp. Deg.C	Field Spec. Cond. @25C umhos/cm	Field Turbidity NTU	Suspended Solids mg/l	Alkalinity Total mg/l
T- 4RC	UN-NAMED TRIB. NR MOUTH (COMP.)	8/17/97	13:10		10	E	7.1	18.0	750		22000	300
T- 4RR	UN-NAMED TRIB. NR MOUTH (RISE)	8/17/97	12:50		16	E	6.9	18.0	700		9500	200
T-10RC	ROCK CREEK AT MOUTH (COMP.)	8/17/97	13:30		346	E	7.2	15.0	1100		970	220
T-TRC	TRAMWAY TRIBUTARY AT MOUTH (COMP	8/17/97	15:25		16	E	6.8	18.0	2700		180000	1200
SR- 4 A	WRP#8 RUNON DIVERSION NR SHAFT	8/19/97	18:45	NS		DRY						

Storm Water Quality Data

Eagle Mine Project

Station ID	Date	Sulfate Dissolved mg/l	Sulfate Total mg/l	Calcium Dissolved mg/l	Magnesium Dissolved mg/l	Arsenic Dissolved mg/l	Arsenic Total Rec. mg/l	Cadmium Dissolved mg/l	Cadmium Total Rec. mg/l	Copper Dissolved mg/l	Copper Total Rec. mg/l
E- 3RC	8/03/95	10 U		15.0	5.0	.005 U	.005 U	.0005 U	.0005 U	.005 U	.005
E- 3RR	8/03/95	10 U		14.0	4.9	.005 U	.005 U	.0005 U	.0005 U	.005	.005
E- 5RC	8/03/95	10 U		14.0	4.9	.005 U	.005 U	.0005 U	.0005 U	.005 U	.005 U
E- 5RR	8/03/95	10 U		14.0	4.9	.005 U	.005 U	.0005 U	.0005 U	.005 U	.005 U
T- 6RC	8/03/95	330		52.0	24.0	.005 U	.018	.0660	.0600	.200	.210
T- 6RR	8/03/95	340		54.0	27.0	.005 U	.005 U	.0560	.0540	.150	.160
SR- 4C	8/23/95		3400	260.0	510.0	.001 U	.270	.3400	.4000	.360	8.700
SR- 4R	8/23/95		6500	360.0	1200.0	.001 U	.086	.9400	.9200	11.000	16.000
T-10RC	8/23/95		720	91.0	120.0	.001 U	.080	.0500	.0920	.021	1.900
E- 3RC	9/08/95		7	17.0	6.1	.005 U	.005 U	.0001	.0002	.004	.013
E- 3RR	9/08/95		7	17.0	6.3	.005 U	.005 U	.0001 U	.0001	.005	.030
E- 5RC	9/08/95		10	17.0	6.4	.005 U	.007	.0016	.0023	.002	.014
E- 5RR	9/08/95		13	17.0	6.7	.005 U	.023	.0018	.0038	.004	.037
E-11RC	9/08/95		14	15.0	6.3	.005 U	.005 U	.0014	.0018	.003	.019
E-11RR	9/08/95		24	16.0	7.9	.005 U	.013	.0020	.0037	.004	.054
SR- 3C	9/08/95		4100	460.0	500.0	.005 U	.005 U	.0200	8.8000	.010	.270
SR- 3R	9/08/95		2500	500.0	370.0	.005 U	18.000	.0320	8.9000	.009	41.000
SR- 4C	9/08/95		3900	270.0	700.0	.005 U	1.000	.4600	.6800	.890	18.000
SR- 4R	9/08/95		9200	360.0	1700.0	.005 U	1.100	1.2000	1.4000	10.000	33.000
T- 4RC	9/08/95		500	150.0	37.0	.005 U	10.000	.0450	.3200	.003	2.500
T- 4RR	9/08/95		250	77.0	21.0	.005 U	.290	.0300	.0500	.009	.430
T- 6RC	9/08/95		380	73.0	22.0	.005 U	.066	.0590	.0600	.260	.400
T- 6RR	9/08/95		390	83.0	26.0	.005 U	.100	.0590	.0550	.230	.570
T-10RC	9/08/95		1000	110.0	180.0	.005 U	.200	.0790	.1500	.026	3.700
T-10RR	9/08/95		1900	130.0	360.0	.005 U	.280	.1800	.3000	.048	5.600
T-TRC	9/08/95		3000	460.0	410.0	.005 U	16.000	1.0000	2.7000	.059	18.000
SR- 3C	9/20/95		2100	470.0	250.0	.005 U	17.000	.0160	7.5000	.004	38.000
T- 4RC	9/20/95		490	150.0	45.0	.005 U	5.200	.0560	.1500	.007	1.200
T- 6RC	9/20/95		240	46.0	16.0	.005 U	.017	.0400	.0360	.200	.240
T-10RC	9/20/95		600	89.0	110.0	.005 U	.220	.0420	.0890	.022	3.200

Storm Water Quality Data
Eagle Mine Project

Station ID	Date	Sulfate Dissolved mg/l	Sulfate Total mg/l	Calcium Dissolved mg/l	Magnesium Dissolved mg/l	Arsenic Dissolved mg/l	Arsenic Total Rec. mg/l	Cadmium Dissolved mg/l	Cadmium Total Rec. mg/l	Copper Dissolved mg/l	Copper Total Rec. mg/l
SR- 3C	9/29/95		1900	510.0	160.0	.005 U	36.000	.0160	8.4000	.007	40.000
T- 4RC	9/29/95		360	110.0	34.0	.005 U	4.200	.0430	.1300	.006	.910
T- 6RC	9/29/95		230	46.0	15.0	.005 U	.016	.0370	.0360	.180	.190
T-10RC	9/29/95		570	78.0	120.0	.005 U	.290	.0410	.1800	.025	7.200
T-TRC	9/29/95		2000	340.0	260.0	.005 U	4.100	.7800	.9000	1.700	6.700
T-TR	2/13/96		1100	420.0	61.0	.078	10.000	.3400	.8500	.068	5.700
E- 3R	3/21/96		15	23.0	8.7	.050 U	.050 U	.0003	.0003	.006	.010
E- 5R	3/21/96		20	23.0	8.8	.005 U	.005 U	.0016	.0019	.009	.014
SR- 2	3/21/96		73	28.0	3.0	.005 U	.060	.0220	.0280	.001 U	.110
SR- 2A	3/21/96		50	16.0	1.6	.005 U	.120	.0240	.0670	.001 U	.140
T- 4A	3/21/96		88	73.0	26.0	.005 U	.005 U	.0001 U	.0002	.001 U	.007
T- 4R	3/21/96		530	120.0	68.0	.005 U	.008	.0660	.0660	.009	.019
T-TR	3/21/96		540	170.0	17.0	.005 U	.460	.3000	.3100	.230	.440
E- 3R	4/01/96		17	19.0	7.5	.005 U	.005 U	.0010	.0012	.014	.025
E- 5R	4/01/96		25	17.0	6.3	.005 U	.005 U	.0032	.0037	.018	.035
SR- 2	4/01/96		140	45.0	5.4	.005 U	.034	.0330	.0380	.013	.110
T- 4	4/01/96		350	68.0	36.0	.005 U	.200	.0520	.0640	.038	.380
T- 4A	4/01/96		47	46.0	17.0	.005 U	.005 U	.0001 U	.0003	.001 U	.007
T- 4R	4/01/96		390	75.0	44.0	.005 U	.200	.0510	.0600	.600	.570
T-TR	4/01/96		420	130.0	22.0	.005 U	1.600	.2600	.4300	.018	1.300
SR- 4	4/10/96		3600	180.0	690.0	.005 U	.017	.4100	.4400	3.900	5.700
T-10B	4/10/96		1800	120.0	320.0	.005 U	.033	.1600	.1900	.130	2.000
T-10R	4/10/96		230	42.0	51.0	.005 U	.005 U	.0220	.0240	.053	.200
E- 3	4/16/96		11	15.0	6.1	.005 U	.005 U	.0003	.0004	.005	.009
E- 5	4/16/96		15	13.0	5.4	.005 U	.005 U	.0015	.0016	.007	.012
E-11	4/16/96		23	17.0	7.3	.005 U	.005 U	.0018	.0020	.011	.022
SR- 4	4/16/96		4200	140.0	550.0	.005 U	.025	.3600	.3900	3.400	5.400
T- 4A	4/16/96		44	39.0	15.0	.005 U	.005 U	.0001 U	.0001 U	.001	.006

Storm Water Quality Data
Eagle Mine Project

Station ID	Date	Sulfate Dissolved mg/l	Sulfate Total mg/l	Calcium Dissolved mg/l	Magnesium Dissolved mg/l	Arsenic Dissolved mg/l	Arsenic Total Rec. mg/l	Cadmium Dissolved mg/l	Cadmium Total Rec. mg/l	Copper Dissolved mg/l	Copper Total Rec. mg/l
T- 4R	4/16/96		420	82.0	47.0	.005 U	.007	.0480	.0480	.016	.058
T- 6R	4/16/96		180	28.0	11.0	.005 U	.008	.0420	.0410	.160	.190
T-10R	4/16/96		370	43.0	59.0	.005 U	.006	.0320	.0340	.049	.620
E- 3R	5/07/96		14	15.0	6.0	.005 U	.005 U	.0006	.0004	.050	.075
E- 5R	5/07/96		9	14.0	5.7	.005 U	.005 U	.0002	.0003	.008	.013
E-11R	5/07/96		12	14.0	6.0	.005 U	.005 U	.0005	.0008	.008	.019
SR- 3	5/07/96		340	62.0	38.0	.005 U	.092	.0280	.0320	.001 U	.078
SR- 4	5/07/96		3500	130.0	560.0	.005 U	.010	.4700	.4400	8.400	8.300
T- 4A	5/07/96		28	26.0	11.0	.005 U	.005 U	.0001 U	.0001 U	.001 U	.009
T- 4R	5/07/96		120	41.0	20.0	.005 U	.066	.0120	.0150	.004	.052
T- 6R	5/07/96		170	28.0	9.7	.005 U	.020	.0270	.0260	.120	.150
T-10R	5/07/96		220	34.0	44.0	.005 U	.005 U	.0180	.0210	.063	.340
SR- 3	5/15/96		1400	220.0	180.0	.005 U	.036	.1500	.1800	.003	.033
E- 3RC	7/29/96		6	17.0	6.2	.005 U	.005 U	.0002	.0004	.004	.013
E- 3RR	7/29/96		7	17.0	6.1	.005 U	.005 U	.0001	.0002	.006	.014
E-11RC	7/29/96		27	16.0	7.5	.005 U	.038	.0016	.0067	.005	.250
E-11RR	7/29/96		43	17.0	9.8	.005 U	.033	.0020	.0075	.008	.340
SR- 4C	7/29/96		9300	380.0	1800.0	.005 U	.700	1.2000	1.4000	1.700	23.000
SR- 4R	7/29/96		11000	380.0	2000.0	.005 U	2.300	1.3000	1.6000	2.400	45.000
T- 4RC	7/29/96		400	130.0	31.0	.005 U	12.000	.0260	.6200	.002	4.900
T-10RC	7/29/96		2000	220.0	340.0	.005 U	1.600	.0980	.4400	.041	19.000
T-10RR	7/29/96		990	120.0	140.0	.005 U	1.200	.0330	.2100	.018	12.000
T-TRC	7/29/96		2300	330.0	190.0	.005 U	9.000	.6000	1.0000	.140	14.000
E-11RC	9/12/96		19	23.0	9.7	.005 U	.005 U	.0008	.0010	.004	.012
SR- 4C	9/12/96		7800	330.0	1600.0	.005 U	.470	1.0000	1.1000	5.800	16.000
E- 5RC	9/14/96		1 U	19.0	7.2	.005 U	.009	.0010	.0016	.001	.010
E- 5RR	9/14/96		1 U	20.0	7.4	.005 U	.011	.0012	.0024	.002	.019
SR- 4C	9/14/96		1100	120.0	170.0	.005 U	.390	.1300	.1800	.055	4.700
SR- 4R	9/14/96		1900	190.0	300.0	.005 U	.370	.2800	.3400	.550	10.000
T- 4RC	9/14/96		430	120.0	35.0	.005 U	8.900	.0390	.2700	.001 U	2.200

Storm Water Quality Data
Eagle Mine Project

Station ID	Date	Sulfate Dissolved mg/l	Sulfate Total mg/l	Calcium Dissolved mg/l	Magnesium Dissolved mg/l	Arsenic Dissolved mg/l	Arsenic Total Rec. mg/l	Cadmium Dissolved mg/l	Cadmium Total Rec. mg/l	Copper Dissolved mg/l	Copper Total Rec. mg/l
T- 4RR	9/14/96		260	70.0	26.0	.005 U	1.100	.0340	.0610	.004	.380
T- 6RC	9/14/96		360	39.0	12.0	.005 U	.025	.0360	.0350	.150	.200
T- 6RR	9/14/96		300	34.0	11.0	.005 U	.110	.0320	.0350	.120	.240
T-10RC	9/14/96		540	91.0	100.0	.005 U	.350	.0360	.3400	.050	10.000
T-10RR	9/14/96		790	97.0	150.0	.005 U	.470	.0760	.1500	.012	1.700
T-TRC	9/14/96		3700	440.0	540.0	.005 U	18.000	.8100	5.4000	.008	27.000
T-TRR	9/14/96		8200	410.0	1400.0	.005 U	15.000	.7800	4.5000	.012	19.000
SR- 4C	9/24/96		1300	100.0	240.0	.005 U	.170	.1700	.2000	.230	5.100
T-10RC	9/24/96		410	66.0	86.0	.005 U	.060	.0300	.0470	.014	1.200
E- 3R	3/07/97		15	23.0	9.4	.005 U	.005 U	.0001 U	.0001 U	.001 UJ	.016 UJ
E- 5R	3/07/97		16	23.0	9.4	.005 U	.005 U	.0006	.0008	.002 UJ	.006
T- 4	3/07/97		420	120.0	60.0	.005 U	.080	.0600	.0650	.002 UJ	.082
T-TR	3/07/97		1200	470.0	41.0	.005 U	4.500	.2600 J	1.5000	.010 U	5.000
E- 3R	3/11/97		14	22.0	9.2	.005 U	.005 U	.0002	.0003	.006 UJ	.013 UJ
E- 5R	3/11/97		18	23.0	9.7	.005 U	.005 U	.0013	.0017	.004 UJ	.014 UJ
E-11R	3/11/97		24	23.0	10.0	.005 U	.005 U	.0021	.0028	.004 UJ	.020 UJ
SR- 2	3/11/97		86	29.0	3.0 J	.005 U	.088	.0260 UJ	.0280 UJ	.094	.310
SR- 2A	3/11/97		140	44.0	4.3	.005 U	.190	.0790 J	.0820 J	.010 UJ	.240
SR- 4	3/11/97		6200	250.0	1200.0	.005 U	.024	.7800 J	.7800 J	8.300	9.700
T- 4R	3/11/97		520	120.0	69.0	.005 U	.110	.0590 J	.0590 J	.001 UJ	.079 J
T- 6R	3/11/97										
T-10R	3/11/97		160	42.0	41.0	.005 U	.007	.0110 J	.0130 J	.013 UJ	.310
T-TR	3/11/97		940	300.0	38.0	.005 U	3.900	.4400 J	.5900 J	.051 J	3.100
E- 3R	3/19/97		15	21.0	8.6	.005 U	.005 U	.0009	.0010	.010	.019
E- 5R	3/19/97		25	22.0	9.4	.005 U	.005 U	.0031	.0033	.013	.026
SR- 1A	3/19/97		530	120.0	25.0	.005 U	.018	.1100	.1000	1.600	1.600
SR- 2	3/19/97		340	79.0	12.0	.005 U	.400	.2400	.2600	.004	.410
SR- 2A	3/19/97		310	68.0	9.8	.005 U	.061	.3200	.3100	.002	.130
SR- 4	3/19/97										
T- 4A	3/19/97		46	46.0	18.0	.005 U	.005 U	.0001 U	.0001	.001	.007

Storm Water Quality Data
Eagle Mine Project

Station ID	Date	Sulfate Dissolved mg/l	Sulfate Total mg/l	Calcium Dissolved mg/l	Magnesium Dissolved mg/l	Arsenic Dissolved mg/l	Arsenic Total Rec. mg/l	Cadmium Dissolved mg/l	Cadmium Total Rec. mg/l	Copper Dissolved mg/l	Copper Total Rec. mg/l
T- 4R	3/19/97		430	110.0	55.0	.005 U	.044	.0660	.0670	.022	.180
T-TR	3/19/97		920	350.0	26.0	.005 U	3.400	.5000	.7000	.006	2.200
E- 3	4/17/97		9	18.0	7.0	.005 U	.005 U	.0004 UJ	.0004	.006 UJ	.012
E- 5	4/17/97		14	18.0	7.0	.005 U	.006	.0010 UJ	.0012	.009	.015
E-11	4/17/97		20	16.0	7.2	.005 U	.005 U	.0014 UJ	.0015	.009	.028
SR- 1A	4/17/97		220	49.0	12.0	.005 U	.065	.0500	.0470	.530	.580
SR- 3	4/17/97		4	2.4	.6	.005 U	.042	.0038 UJ	.0056	.001	.035
SR- 4	4/17/97		3000	120.0	570.0	.005 U	.019	.4800	.3800	4.800	6.100
SR- 4 A	4/17/97		380	120.0	86.0	.005 U	.005 U	.0670	.0640	.013	.052
SR- 4 B	4/17/97										
T- 4A	4/17/97		69	62.0	23.0	.005 U	.005 U	.0001 UJ	.0002	.001	.004
T- 4R	4/17/97		410	95.0	50.0	.005 U	.005 U	.0540	.0550	.009	.020
T- 6R	4/17/97		110	21.0	8.1	.005 U	.009	.0300	.0260	.140	.160
T-10B	4/17/97		2200	130.0	390.0	.005 U	.014	.2400	.2000	.210	5.800
T-10R	4/17/97		340	46.0	67.0	.005 U	.006	.0300	.0270	.056	.950
E- 3	5/06/97		12	16.0	5.7	.005 U	.005 U	.0001 U	.0002	.004	.010 UJ
E- 5	5/06/97		15	15.0	5.6	.005 U	.005 U	.0005	.0007	.009	.016
E-11	5/06/97		17	16.0	6.4	.005 U	.024	.0009	.0017	.012	.054
SR- 1A	5/06/97		570	65.0	24.0	.140	.240	.0320	.0290	4.800	4.600
SR- 3	5/06/97		260	34.0	16.0	.005 U	.490	.0280	.0590	.001 U	.260
SR- 4	5/06/97		3300	130.0	560.0	.005 U	.031	.3700	.3500	4.400	5.500
SR- 4 A	5/06/97		290	100.0	51.0	.005 U	.005 U	.0250	.0300	.006 UJ	.044
SR- 4 B	5/06/97										
SR- 4 D	5/06/97										
T- 4A	5/06/97		42	30.0	12.0	.005 U	.005 U	.0001 U	.0003	.002	.011 UJ
T- 4R	5/06/97		260	74.0	35.0	.005 U	.120	.0260	.0290	.006 UJ	.068
T- 6R	5/06/97		150	27.0	9.0	.005 U	.018	.0280	.0260	.130	.140
T-10R	5/06/97		410	51.0	76.0	.005 U	.008	.0310	.0360	.065	.750
SR- 4 A	5/09/97										
SR- 2	5/22/97										

Storm Water Quality Data
Eagle Mine Project

Station ID	Date	Sulfate Dissolved mg/l	Sulfate Total mg/l	Calcium Dissolved mg/l	Magnesium Dissolved mg/l	Arsenic Dissolved mg/l	Arsenic Total Rec. mg/l	Cadmium Dissolved mg/l	Cadmium Total Rec. mg/l	Copper Dissolved mg/l	Copper Total Rec. mg/l
SR- 4 A	5/22/97										
SR- 4 B	5/22/97										
SR- 4 D	5/22/97										
E- 3RC	5/26/97		5	14.0	5.5	.005 U	.005 U	.0001 U	.0001	.007 UJ	.012
E- 5RC	5/29/97		5	11.0	4.4	.005 U	.005 U	.0002	.0005	.003	.008 UJ
E-11RC	5/29/97		5	11.0	4.2	.005 U	.005 U	.0003	.0005	.003	.010 UJ
SR- 2	5/29/97										
SR- 3C	5/29/97		350	77.0	44.0	.005 U	1.200	.0490	.1100	.001 U	.610
SR- 4C	5/29/97		1500	140.0	290.0	.005 U	.760	.1300	.2100 J	.031 J	6.600
T- 4RC	5/29/97		140	50.0	18.0	.005 U	13.000	.0220 J	.7500 J	.004 J	6.600
SR- 4 A	5/30/97										
SR- 4 B	5/30/97										
SR- 4 D	5/30/97										
T- 4A	5/30/97										
SR- 4C	6/10/97		1600	110.0	300.0	.005 U	.044	.2100	.2200	.650	3.600
SR- 4C	6/11/97		1400	98.0	280.0	.005 U	.130	.2000	.2200	.600	5.100
SR- 4 A	6/13/97										
SR- 4 B	6/13/97										
SR- 4 D	6/13/97										
T- 4A	6/13/97										
SR- 4	7/18/97										
SR- 4 A	7/18/97										
T- 4A	7/18/97										
E- 3RC	7/27/97		6	19.0	6.6 J	.005 U	.005 U	.0001 U	.0001 U	.001	.009 UJ
E- 3RR	7/27/97		6	19.0	6.7 J	.005 U	.005 U	.0001 U	.0001	.002	.010 UJ
E- 5RC	7/27/97		8	19.0	6.6 J	.005 U	.005 U	.0005	.0011	.001 U	.011 UJ
E- 5RR	7/27/97		8	19.0	6.8 J	.005 U	.005 U	.0007	.0008	.001	.011 UJ

Storm Water Quality Data
Eagle Mine Project

Station ID	Date	Sulfate Dissolved mg/l	Sulfate Total mg/l	Calcium Dissolved mg/l	Magnesium Dissolved mg/l	Arsenic Dissolved mg/l	Arsenic Total Rec. mg/l	Cadmium Dissolved mg/l	Cadmium Total Rec. mg/l	Copper Dissolved mg/l	Copper Total Rec. mg/l
SR- 4C	7/27/97		4700	310.0	860.0 J	.005 U	.560	.5800	.6900	1.200	15.000
SR- 4R	7/27/97		14000	370.0	3000.0 J	.005 U	.350	2.1000	2.1000	30.000	38.000
T- 4RC	7/27/97		480	140.0	36.0 J	.005 U	12.000 J	.0400	.4300 J	.003	3.100
T- 4RR	7/27/97		420	120.0	30.0 J	.005 U	.390 J	.0330	.0490	.011	.270
T- 6RC	7/27/97		240	51.0	16.0 J	.005 U	.009	.0350	.0370	.120	.150
T- 6RR	7/27/97		230	49.0	16.0 J	.005 U	.011	.0360	.0340	.110	.150
T-10RC	7/27/97		1100	130.0	220.0 J	.005 U	.240	.1000	.1600	.039	5.200
T-TRC	7/27/97		4700	460.0	920.0 J	.005 U	19.000	.7900	4.4000	.015	9.700
T-TRR	7/27/97		5000	480.0	900.0 J	.005 U	32.000	.7800	4.3000 J	.017	18.000
SR- 4 A	7/28/97										
E- 3RC	8/05/97		5	16.0	5.6 J	.005 U	.005 U	.0001 U	.0001 U	.001	.002
E- 5RC	8/05/97		6	16.0	5.6 J	.005 U	.008	.0006	.0015	.001 U	.014 UJ
T- 4RC	8/05/97		540	170.0	40.0 J	.008	7.800	.0530	1.8000	.008 UJ	6.100
T- 6RC	8/05/97		160	35.0	11.0 J	.005 U	.017	.0240	.0220	.089	.130
T-TRC	8/05/97		2300	480.0	360.0 J	.005 U	9.800	.3400	6.7000	.004	7.400
SR- 2	8/06/97		650	200.0	26.0 J	.005 U	2.400	.3400	1.8000	.012 UJ	8.600
SR- 4 A	8/07/97										
SR- 4 B	8/07/97										
SR- 4 D	8/07/97										
E- 5RC	8/09/97		6	17.0	5.9	.005 U	.005 U	.0003	.0003	.003	.004
E-11RC	8/09/97		9	15.0	5.6	.005 U	.005 U	.0006	.0011	.006 UJ	.030
E-11RR	8/09/97		14	16.0	6.2	.005 U	.006	.0009	.0020	.008 UJ	.056
SR- 3C	8/09/97		1100	370.0	80.0	.005 U	9.200 J	.0270	3.1000	.009 UJ	6.700
SR- 3R	8/09/97		1200	370.0	80.0	.005 U	3.900 J	.0260	2.4000	.006 UJ	3.500
T-10RC	8/09/97		590	110.0	110.0	.005 U	.210 J	.0170	.1200	.016	4.200
T-10RR	8/09/97		750	110.0	150.0	.005 U	.270 J	.0360	.1800	.017	6.400
E- 3RC	8/17/97		6	15.0	5.2	.005 U	.005 U	.0001	.0003	.001 U	.009 UJ
E- 3RR	8/17/97		5	15.0	5.2	.005 U	.005 U	.0002	.0002	.001 U	.008 UJ
E- 5RC	8/17/97		7	16.0	5.8	.005 U	.005 U	.0005	.0006	.001 U	.008 UJ
E- 5RR	8/17/97		7	16.0	5.8	.005 U	.005 U	.0007	.0010	.001 U	.014 UJ
SR- 3C	8/17/97		1600	560.0	120.0	.005 U	16.000	.0180	3.3000	.014	14.000

Station ID	Date	Sulfate Dissolved mg/l	Sulfate Total mg/l	Calcium Dissolved mg/l	Magnesium Dissolved mg/l	Arsenic Dissolved mg/l	Arsenic Total Rec. mg/l	Cadmium Dissolved mg/l	Cadmium Total Rec. mg/l	Copper Dissolved mg/l	Copper Total Rec. mg/l
T- 4RC	8/17/97		420	120.0	35.0	.005 U	14.000	.0460	.7700	.001 U	4.800
T- 4RR	8/17/97		390	100.0	35.0	.005 U	6.600	.0570	.3900	.001 U	2.600
T-10RC	8/17/97		640	84.0	120.0	.006	.200	.0460	.0710	.290	2.900
T-TRC	8/17/97		3300	470.0	480.0	.005 U	24.000	.8400	5.7000	.010 UJ	20.000
SR- 4 A	8/19/97										
SR- 4 A	9/09/97										

Storm Water Quality Data

Eagle Mine Project

Station ID	Date	Iron Dissolved mg/l		Iron Total Rec. mg/l	Lead Dissolved mg/l		Lead Total Rec. mg/l		Manganese Dissolved mg/l	Manganese Total Rec. mg/l	Zinc Dissolved mg/l	Zinc Total Rec. mg/l
E- 3RC	8/03/95	.09		.19	.003	U	.003	U	.023	.025	.015	.018
E- 3RR	8/03/95	.10		.16	.003	U	.003	U	.021	.021	.014	.019
E- 5RC	8/03/95	.08		.16	.003	U	.003	U	.037	.038	.072	.077
E- 5RR	8/03/95	.08		.15	.003	U	.003	U	.042	.042	.078	.082
T- 6RC	8/03/95	2.70		15.00	.130		.330		10.000	9.400	14.000	12.000
T- 6RR	8/03/95	1.90		3.70	.093		.140		8.200	8.200	11.000	11.000
SR- 4C	8/23/95	.01	U	240.00	.003	U	2.000		38.000	43.000	140.000	150.000
SR- 4R	8/23/95	.10		120.00	.006		.800		100.000	98.000	390.000	370.000
T-10RC	8/23/95	.01	U	69.00	.003	U	1.200		8.100	9.800	18.000	35.000
E- 3RC	9/08/95	.16		.37	.001		.009		.029	.046	.031	.140
E- 3RR	9/08/95	.16		.34	.001	U	.001		.033	.046	.037	.900
E- 5RC	9/08/95	.15		1.40	.006		.130		.100	.160	.300	.570
E- 5RR	9/08/95	.14		3.90	.011		.400		.140	.300	.310	1.100
E-11RC	9/08/95	.12		1.00	.008		.081		.140	.180	.330	.540
E-11RR	9/08/95	.11		3.30	.010		.290		.270	.400	.510	1.200
SR- 3C	9/08/95	.01	U	.14	.026		35.000		.220	780.000	5.900	1600.000
SR- 3R	9/08/95	.01		3400.00	.025		240.000		.480	720.000	6.200	2200.000
SR- 4C	9/08/95	.01	U	520.00	.002		7.000		54.000	74.000	190.000	240.000
SR- 4R	9/08/95	.22		480.00	.018		9.000		130.000	150.000	490.000	540.000
T- 4RC	9/08/95	.01	U	700.00	.029		190.000		.510	18.000	5.000	82.000
T- 4RR	9/08/95	.01		34.00	.013		6.700		.220	1.400	4.100	12.000
T- 6RC	9/08/95	4.50		68.00	.140		1.200		7.500	8.200	11.000	11.000
T- 6RR	9/08/95	2.90		130.00	.053		1.800		7.100	8.600	11.000	13.000
T-10RC	9/08/95	.01	U	150.00	.001		3.200		12.000	18.000	30.000	58.000
T-10RR	9/08/95	.01	U	150.00	.006		8.600		25.000	30.000	72.000	110.000
T-TRC	9/08/95	.01	U	1500.00	.180		260.000		21.000	130.000	170.000	700.000
SR- 3C	9/20/95	.01	U	3200.00	.020		440.000		.140	640.000	6.400	2400.000
T- 4RC	9/20/95	.02		320.00	.028		78.000		.890	7.300	7.600	40.000
T- 6RC	9/20/95	2.90		20.00	.099		.390		5.400	5.700	7.400	7.700
T-10RC	9/20/95	.01	U	110.00	.001	U	1.700		7.200	10.000	15.000	37.000

Storm Water Quality Data

Eagle Mine Project

Station ID	Date	Iron Dissolved mg/l		Iron Total Rec. mg/l	Lead Dissolved mg/l		Lead Total Rec. mg/l		Manganese Dissolved mg/l		Manganese Total Rec. mg/l	Zinc Dissolved mg/l	Zinc Total Rec. mg/l
SR- 3C	9/29/95	.01	U	4200.00	.024		490.000		.480		660.000	8.000	2100.000
T- 4RC	9/29/95	.01	U	250.00	.028		68.000		.540		5.400	5.800	32.000
T- 6RC	9/29/95	2.00		15.00	.094		.300		5.400		5.200	7.000	7.000
T-10RC	9/29/95	.01	U	230.00	.001	U	2.800		7.000		20.000	16.000	64.000
T-TRC	9/29/95	.12		350.00	1.100		69.000		20.000		38.000	130.000	180.000
T-TR	2/13/96	6.60		720.00	1.500		170.000		4.900		55.000	53.000	290.000
E- 3R	3/21/96	.08		.34	.001	U	.001	U	.130		.150	.068	.083
E- 5R	3/21/96	.20		.61	.001		.009		.300		.290	.700	.730
SR- 2	3/21/96	.03		9.00	.001		.860		.410		.770	3.500	5.000
SR- 2A	3/21/96	.01	U	16.00	.015		2.200		.290		1.500	5.800	10.000
T- 4A	3/21/96	.01		.64	.001	U	.005		.005	U	.016	.019	.080
T- 4R	3/21/96	.01	U	.77	.029		.160		.150		.180	16.000	16.000
T-TR	3/21/96	.78		38.00	.480		5.900		4.600		6.000	52.000	55.000
E- 3R	4/01/96	.18		.70	.001	U	.013		.300		.300	.420	.460
E- 5R	4/01/96	.32		1.30	.004		.042		.410		.520	1.200	1.500
SR- 2	4/01/96	.02		6.00	.002		.570		.770		1.000	4.300	5.300
T- 4	4/01/96	.01	U	26.00	.014		4.200		.950		1.900	12.000	15.000
T- 4A	4/01/96	.02		3.00	.001	U	.016		.005	U	.057	.018	.120
T- 4R	4/01/96	.02		25.00	.009		2.800		1.100		1.700	12.000	14.000
T-TR	4/01/96	.01	U	150.00	.033		25.000		1.800		14.000	51.000	90.000
SR- 4	4/10/96	.10	U	21.00	.002		.140		45.000		49.000	210.000	230.000
T-10B	4/10/96	.01	U	15.00	.001		.085		17.000		19.000	79.000	84.000
T-10R	4/10/96	.11		1.50	.023		.024		2.300		2.400	11.000	11.000
E- 3	4/16/96	.17		.55	.001		.002		.110		.120	.100	.110
E- 5	4/16/96	.25		.68	.002		.004		.160		.190	.420	.460
E-11	4/16/96	.28		.73	.002		.009		.250		.250	.680	.700
SR- 4	4/16/96	.02		19.00	.004		.180		36.000		41.000	170.000	200.000
T- 4A	4/16/96	.04		.54	.001	U	.002		.005	U	.005	.014	.021

Storm Water Quality Data
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Station ID	Date	Iron Dissolved mg/l		Iron Total Rec. mg/l	Lead Dissolved mg/l		Lead Total Rec. mg/l		Manganese Dissolved mg/l		Manganese Total Rec. mg/l	Zinc Dissolved mg/l	Zinc Total Rec. mg/l
T- 4R	4/16/96	.01	U	.58	.022		.160		.350		.390	10.000	11.000
T- 6R	4/16/96	.78		3.50	.140		.220		3.300		3.600	5.800	6.000
T-10R	4/16/96	.04		3.00	.002		.057		2.800		3.400	13.000	17.000
E- 3R	5/07/96	.40		1.20	.001	U	.003		.120		.140	.091	.110
E- 5R	5/07/96	.18		.78	.001	U	.015		.088		.110	.092	.110
E-11R	5/07/96	.17		1.10	.001	U	.014		.110		.150	.220	.270
SR- 3	5/07/96	.01		56.00	.012		2.400		5.200		5.900	5.400	8.300
SR- 4	5/07/96	5.30		31.00	.033		.076		41.000		40.000	210.000	200.000
T- 4A	5/07/96	.09		1.10	.001	U	.003		.005	U	.013	.018	.035
T- 4R	5/07/96	.04		9.50	.044		2.500		.016		.610	2.300	4.000
T- 6R	5/07/96	.91		16.00	.093		.390		3.400		3.400	5.400	5.000
T-10R	5/07/96	.07		4.50	.003		.140		1.900		1.900	9.300	10.000
SR- 3	5/15/96	.01	U	11.00	.026		.580		29.000		28.000	23.000	22.000
E- 3RC	7/29/96	.12		.47	.002		.029		.020		.048	.023	.110
E- 3RR	7/29/96	.11		.24	.001		.001	U	.019		.024	.009	.059
E-11RC	7/29/96	.08		12.00	.009		.890		.170		.720	.240	2.500
E-11RR	7/29/96	.05		10.00	.010		.820		.300		.760	.410	3.100
SR- 4C	7/29/96	.18		220.00	.008		2.700		110.000		130.000	500.000	530.000
SR- 4R	7/29/96	.30		650.00	.012		7.700		130.000		160.000	560.000	620.000
T- 4RC	7/29/96	.01	U	1100.00	.021		280.000		.120		43.000	1.900	170.000
T-10RC	7/29/96	.01	U	360.00	.008		22.000		19.000		39.000	35.000	190.000
T-10RR	7/29/96	.01	U	330.00	.001	U	4.300		7.300		23.000	10.000	81.000
T-TRC	7/29/96	.01		950.00	.075		120.000		20.000		57.000	110.000	270.000
E-11RC	9/12/96	.12		.30	.003		.009		.150		.160	.310	.440
SR- 4C	9/12/96	.07		180.00	.005		3.500		120.000		120.000	410.000	400.000
E- 5RC	9/14/96	.14		1.30	.006		.160		.076		.130	.160	.460
E- 5RR	9/14/96	.15		1.80	.008		.200		.100		.200	.200	.830
SR- 4C	9/14/96	.01	U	140.00	.005	U	2.100		14.000		20.000	51.000	67.000
SR- 4R	9/14/96	.01	U	140.00	.005	U	2.100		28.000		33.000	100.000	120.000
T- 4RC	9/14/96	.01	U	640.00	.012		180.000		.750		15.000	4.000	70.000

Storm Water Quality Data
Eagle Mine Project

Station ID	Date	Iron Dissolved mg/l	Iron Total Rec. mg/l	Lead Dissolved mg/l	Lead Total Rec. mg/l	Manganese Dissolved mg/l	Manganese Total Rec. mg/l	Zinc Dissolved mg/l	Zinc Total Rec. mg/l
T- 4RR	9/14/96	.02	69.00	.028	18.000	.440	2.300	4.700	15.000
T- 6RC	9/14/96	1.60	19.00	.100	.480	3.900	4.200	7.000	7.300
T- 6RR	9/14/96	1.10	41.00	.090	.920	3.300	4.200	6.100	6.600
T-10RC	9/14/96	.46	150.00	.070	8.600	6.000	33.000	13.000	120.000
T-10RR	9/14/96	.01 U	110.00	.070	22.000	9.600	13.000	25.000	52.000
T-TRC	9/14/96	.02	2300.00	.180	68.000	13.000	310.000	100.000	1700.000
T-TRR	9/14/96	.01 U	1800.00	.140	49.000	11.000	210.000	100.000	1400.000
SR- 4C	9/24/96	.01 U	74.00	.001 U	1.300	20.000	21.000	70.000	80.000
T-10RC	9/24/96	.01 U	29.00	.004	1.700	5.100	5.700	11.000	23.000
E- 3R	3/07/97	.05 UJ	.21	.001 U	.001 U	.036	.042	.022	.024
E- 5R	3/07/97	.07 UJ	.40	.002	.032	.085	.110	.220	.290
T- 4	3/07/97	.01 U	9.60	.023	2.200	.020	.480	14.000	15.000
T-TR	3/07/97	.10 U	330.00	.033	80.000	1.300	33.000	36.000	410.000
E- 3R	3/11/97	.04 UJ	.26	.001 U	.002 J	.081 UJ	.090 UJ	.043 UJ	.089
E- 5R	3/11/97	.08	.55	.001	.025 J	.190 UJ	.200 UJ	.500	.600
E-11R	3/11/97	.08	1.10	.007	.160 J	.250	.280	.730	.970
SR- 2	3/11/97	.07 UJ	15.00	.031	1.300 J	.520	1.000	4.200	5.600
SR- 2A	3/11/97	.01 U	17.00	.050	3.200 J	.360	1.500	12.000	15.000
SR- 4	3/11/97	.10	17.00	.009	.180 J	92.000	91.000	400.000	390.000
T- 4R	3/11/97	.01 U	8.90	.025	2.100 J	.046 J	.380	14.000	14.000
T- 6R	3/11/97								
T-10R	3/11/97	.06	3.50	.002	.170 J	1.700	1.800	5.900	7.200
T-TR	3/11/97	.01 U	290.00	.089	58.000 J	7.100	25.000	72.000	140.000
E- 3R	3/19/97	.11	.53	.001 U	.005	.230	.240	.300	.360
E- 5R	3/19/97	.18	.78	.003	.020	.470	.470	1.200	1.300
SR- 1A	3/19/97	15.00	27.00	.048	.170	13.000	13.000	51.000	49.000
SR- 2	3/19/97	.01 U	36.00	.041	7.200	1.900	3.800	33.000	45.000
SR- 2A	3/19/97	.01 U	8.00	.300	2.500	1.700	2.000	46.000	48.000
SR- 4	3/19/97								
T- 4A	3/19/97	.04	1.10	.001 U	.006	.005 U	.018	.017	.043

Storm Water Quality Data
Eagle Mine Project

Station ID	Date	Iron Dissolved mg/l		Iron Total Rec. mg/l	Lead Dissolved mg/l		Lead Total Rec. mg/l		Manganese Dissolved mg/l		Manganese Total Rec. mg/l	Zinc Dissolved mg/l	Zinc Total Rec. mg/l
T- 4R	3/19/97	.01	U	5.00	.012		1.200		.720		.870	14.000	14.000
T-TR	3/19/97	.01	U	240.00	.062		52.000		4.500		26.000	72.000	160.000
E- 3	4/17/97	.15		.33	.001		.002		.100		.110	.091	.140
E- 5	4/17/97	.22		.46	.002		.005		.170		.170	.360	.400
E-11	4/17/97	.20		.59	.001		.013		.190		.210	.510	.680
SR- 1A	4/17/97	2.10		55.00	.038		.560		3.200		3.200	21.000	19.000
SR- 3	4/17/97	.02		3.50	.006		.700		.033		.320	.400	1.400
SR- 4	4/17/97	.03		11.00	.003		.049		39.000		42.000	180.000	180.000
SR- 4 A	4/17/97	.01	UJ	4.40	.001	U	.012		8.400		8.400	25.000	24.000
SR- 4 B	4/17/97												
T- 4A	4/17/97	.02		.63	.001	U	.004		.005	U	.009	.016	.064
T- 4R	4/17/97	.01	U	.36	.028		.110		.330		.340	12.000	12.000
T- 6R	4/17/97	.65		4.00	.120		.210		2.300		2.300	4.200	4.000
T-10B	4/17/97	.01	U	8.80	.001	U	.130		21.000		22.000	94.000	100.000
T-10R	4/17/97	.06		2.40	.001	U	.053		3.100		3.100	13.000	16.000
E- 3	5/06/97	.13		1.10	.001	U	.012		.047		.099	.039	.096
E- 5	5/06/97	.17		1.00	.001	U	.015	UJ	.087		.130	.140	.200
E-11	5/06/97	.27		4.00	.001	U	.037		.160		.240	.280	.480
SR- 1A	5/06/97	56.00		85.00	.420		.790		4.700		4.600	8.200	7.800
SR- 3	5/06/97	.01		62.00	.007		5.600		2.600		6.400	4.200	16.000
SR- 4	5/06/97	.99		23.00	.006		.210		38.000		37.000	180.000	180.000
SR- 4 A	5/06/97	.01	U	7.60	.001	U	.013		2.800		2.900	7.400	8.400
SR- 4 B	5/06/97												
SR- 4 D	5/06/97												
T- 4A	5/06/97	.09		1.70	.001	U	.008		.005	U	.030	.020	.088
T- 4R	5/06/97	.01		9.60	.046		2.300		.036		.450	5.300	7.100
T- 6R	5/06/97	.61		12.00	.072		.280		3.100		3.100	4.800	4.600
T-10R	5/06/97	.06		5.60	.001	U	.080		3.600		3.600	16.000	18.000
SR- 4 A	5/09/97												
SR- 2	5/22/97												

Storm Water Quality Data
Eagle Mine Project

Station ID	Date	Iron Dissolved mg/l		Iron Total Rec. mg/l	Lead Dissolved mg/l		Lead Total Rec. mg/l		Manganese Dissolved mg/l		Manganese Total Rec. mg/l	Zinc Dissolved mg/l	Zinc Total Rec. mg/l	
SR- 4 A	5/22/97													
SR- 4 B	5/22/97													
SR- 4 D	5/22/97													
E- 3RC	5/26/97	.12		.37	.001	U	.001		.013		.021	.017	.034	
E- 5RC	5/29/97	.14		.90	.001		.006		.020		.058	.025	.052	
E-11RC	5/29/97	.14		.96	.001	U	.009		.026		.066	.056	.130	
SR- 2	5/29/97													
SR- 3C	5/29/97	.01	U	100.00	.009		15.000		5.100		12.000	6.500	33.000	
SR- 4C	5/29/97	.01	U	380.00	.001	U	1.400		19.000		24.000	48.000	88.000	
T- 4RC	5/29/97	.04		1200.00	.056		260.000		.027		53.000	3.100	240.000	
SR- 4 A	5/30/97													
SR- 4 B	5/30/97													
SR- 4 D	5/30/97													
T- 4A	5/30/97													
SR- 4C	6/10/97	.01	U	41.00	.001	U	.350		20.000		21.000	83.000	92.000	
SR- 4C	6/11/97	.01	U	100.00	.001	U	.960		20.000		21.000	82.000	92.000	
SR- 4 A	6/13/97													
SR- 4 B	6/13/97													
SR- 4 D	6/13/97													
T- 4A	6/13/97													
SR- 4	7/18/97													
SR- 4 A	7/18/97													
T- 4A	7/18/97													
E- 3RC	7/27/97	.09		.18	.001	U	.001		.016	J	.021	.012	.031	UJ
E- 3RR	7/27/97	.09		.25	.001	U	.001		.016	J	.027	.009	.031	UJ
E- 5RC	7/27/97	.09		.38	.004	UJ	.036		.050	J	.072	.110	.210	
E- 5RR	7/27/97	.10		.30	.003	UJ	.017	UJ	.056	J	.068	.140	.180	

Storm Water Quality Data

Eagle Mine Project

Station ID	Date	Iron Dissolved mg/l		Iron Total Rec. mg/l	Lead Dissolved mg/l		Lead Total Rec. mg/l	Manganese Dissolved mg/l		Manganese Total Rec. mg/l	Zinc Dissolved mg/l		Zinc Total Rec. mg/l
SR- 4C	7/27/97	.02		210.00	.001	U	3.000	66.000	J	71.000	230.000		290.000
SR- 4R	7/27/97	4.50		180.00	.026		2.300	230.000	J	230.000	840.000		920.000
T- 4RC	7/27/97	.01	U	700.00	.040		190.000	.290	J	25.000	2.900		130.000
T- 4RR	7/27/97	.01	U	33.00	.070		7.500	.220	J	1.700	3.900		10.000
T- 6RC	7/27/97	.77		8.70	.093		.240	4.600	J	4.700	6.300		6.200
T- 6RR	7/27/97	.47		10.00	.088		.270	4.800	J	4.800	6.600		6.300
T-10RC	7/27/97	.01	U	82.00	.001	U	1.300	14.000	J	15.000	35.000		69.000
T-TRC	7/27/97	.01	U	1300.00	.200		280.000	12.000	J	140.000	94.000		1200.000
T-TRR	7/27/97	.01	U	2300.00	.220		210.000	11.000	J	220.000	100.000		1200.000
SR- 4 A	7/28/97												
E- 3RC	8/05/97	.14		.34	.001	U	.001	.014	UJ	.027	UJ	.009	UJ .014
E- 5RC	8/05/97	.14		1.10	.010		.170	.031	UJ	.082		.068	.380
T- 4RC	8/05/97	.41		550.00	.330		170.000	.220		55.000	4.400		500.000
T- 6RC	8/05/97	.41		15.00	.062		.320	3.400		3.400	4.700		4.600
T-TRC	8/05/97	.01	U	870.00	.086		99.000	1.800		130.000	32.000		1800.000
SR- 2	8/06/97	.03		270.00	.062		48.000	7.200		34.000	59.000		450.000
SR- 4 A	8/07/97												
SR- 4 B	8/07/97												
SR- 4 D	8/07/97												
E- 5RC	8/09/97	.14		.25	.001	U	.003	.033		.040	.062		.076
E-11RC	8/09/97	.11		1.60	.004		.078	.071		.130	.140		.390
E-11RR	8/09/97	.10		3.00	.010		.210	.110		.220	.210		.750
SR- 3C	8/09/97	.01	U	690.00	.015		110.000	.440		97.000	3.900		800.000
SR- 3R	8/09/97	.01	U	280.00	.015		46.000	.390		50.000	3.600		670.000
T-10RC	8/09/97	.01	U	61.00	.001	U	2.000	5.300		11.000	6.800		50.000
T-10RR	8/09/97	.01	U	72.00	.002		4.600	7.800		16.000	15.000		94.000
E- 3RC	8/17/97	.11		.24	.001	U	.005	.017		.025	.020		.056
E- 3RR	8/17/97	.12		.24	.001		.002	.017		.023	.011		.029
E- 5RC	8/17/97	.14		.37	.006	UJ	.031	.042		.056	.110		.180
E- 5RR	8/17/97	.14		.46	.007	UJ	.048	.045		.067	.140		.270
SR- 3C	8/17/97	.04		1300.00	.038	UJ	180.000	.160		210.000	5.100		1200.000

Storm Water Quality Data

Eagle Mine Project

Station ID	Date	Iron Dissolved mg/l		Iron Total Rec. mg/l	Lead Dissolved mg/l		Lead Total Rec. mg/l	Manganese Dissolved mg/l	Manganese Total Rec. mg/l	Zinc Dissolved mg/l	Zinc Total Rec. mg/l
T- 4RC	8/17/97	.01	U	970.00	.035		250.000	.470	38.000	3.300	230.000
T- 4RR	8/17/97	.01	U	480.00	.037	UJ	110.000	.670	22.000	5.600	110.000
T-10RC	8/17/97	1.40		45.00	.066	UJ	1.600	7.000	8.000	18.000	36.000
T-TRC	8/17/97	.01	U	2000.00	.250		170.000	16.000	220.000	98.000	1600.000
SR- 4 A	8/19/97										
SR- 4 A	9/09/97										

Ground Water Level Data

Eagle Mine Project

Station ID	Station Description	Date	Time	Water Level Ft-TOC	
BW- 1	BELDEN WELL - SOUTH	7/12/95	12:30		DRY
BW- 1	BELDEN WELL - SOUTH	7/13/95	15:40		DRY
BW- 1	BELDEN WELL - SOUTH	7/17/95	17:15		DRY
BW- 1	BELDEN WELL - SOUTH	8/03/95	17:23		DRY
BW- 1	BELDEN WELL - SOUTH	9/06/95			DRY
BW- 1	BELDEN WELL - SOUTH	9/08/95	15:20		DRY
BW- 1	BELDEN WELL - SOUTH	9/09/95	13:50		DRY
BW- 1	BELDEN WELL - SOUTH	9/10/95	13:30		DRY
BW- 1	BELDEN WELL - SOUTH	9/11/95	09:45		DRY
BW- 1	BELDEN WELL - SOUTH	9/21/95	17:10		DRY
BW- 1	BELDEN WELL - SOUTH	9/22/95	11:50		DRY
BW- 1	BELDEN WELL - SOUTH	9/23/95	08:30		DRY
BW- 1	BELDEN WELL - SOUTH	9/23/95	17:00		DRY
BW- 1	BELDEN WELL - SOUTH	9/29/95	16:15		DRY
BW- 1	BELDEN WELL - SOUTH	9/30/95	07:15		DRY
BW- 1	BELDEN WELL - SOUTH	9/30/95	14:30		DRY
BW- 1	BELDEN WELL - SOUTH	10/25/95	13:45		DRY
BW- 1	BELDEN WELL - SOUTH	12/13/95	10:35		DRY
BW- 1	BELDEN WELL - SOUTH	3/22/96	11:40		DRY
BW- 1	BELDEN WELL - SOUTH	4/02/96			DRY
BW- 1	BELDEN WELL - SOUTH	4/10/96	15:30	2.45	
BW- 1	BELDEN WELL - SOUTH	4/17/96	14:25	2.17	
BW- 1	BELDEN WELL - SOUTH	5/07/96	14:10	1.79	
BW- 1	BELDEN WELL - SOUTH	5/16/96	15:40	2.08	
BW- 1	BELDEN WELL - SOUTH	6/05/96	09:25	5.56	E
BW- 1	BELDEN WELL - SOUTH	7/31/96	10:30		DRY
BW- 1	BELDEN WELL - SOUTH	9/17/96	10:45		DRY
BW- 1	BELDEN WELL - SOUTH	12/20/96			DRY
BW- 1	BELDEN WELL - SOUTH	3/12/97	11:20		DRY
BW- 1	BELDEN WELL - SOUTH	3/20/97	11:15	3.11	
BW- 1	BELDEN WELL - SOUTH	3/27/97	11:30	2.09	
BW- 1	BELDEN WELL - SOUTH	4/16/97	16:45	2.69	
BW- 1	BELDEN WELL - SOUTH	4/30/97	09:20	2.62	
BW- 1	BELDEN WELL - SOUTH	5/19/97	15:00	2.34	
BW- 1	BELDEN WELL - SOUTH	5/22/97	16:45	2.70	
BW- 1	BELDEN WELL - SOUTH	5/27/97		3.67	
BW- 1	BELDEN WELL - SOUTH	5/31/97	10:15	3.32	
BW- 1	BELDEN WELL - SOUTH	6/30/97	15:33		DRY
BW- 1	BELDEN WELL - SOUTH	7/18/97	11:24		DRY
BW- 1	BELDEN WELL - SOUTH	7/29/97	16:58		DRY
BW- 1	BELDEN WELL - SOUTH	8/07/97	13:10		DRY
BW- 1	BELDEN WELL - SOUTH	8/14/97	08:55		DRY
BW- 1	BELDEN WELL - SOUTH	9/10/97	11:00	5.44	DRY
BW- 2	BELDEN WELL - SOUTHMID	7/12/95	12:30		DRY
BW- 2	BELDEN WELL - SOUTHMID	7/13/95	15:40		DRY
BW- 2	BELDEN WELL - SOUTHMID	7/17/95	17:15		DRY
BW- 2	BELDEN WELL - SOUTHMID	8/03/95	17:23		DRY
BW- 2	BELDEN WELL - SOUTHMID	9/06/95			DRY

Station ID	Station Description	Date	Time	Water Level Ft-TOC	
BW- 2	BELDEN WELL - SOUTHMID	9/08/95	15:20		DRY
BW- 2	BELDEN WELL - SOUTHMID	9/09/95	13:55		DRY
BW- 2	BELDEN WELL - SOUTHMID	9/10/95	13:30		DRY
BW- 2	BELDEN WELL - SOUTHMID	9/11/95	09:45		DRY
BW- 2	BELDEN WELL - SOUTHMID	9/21/95	17:10		DRY
BW- 2	BELDEN WELL - SOUTHMID	9/22/95	11:50		DRY
BW- 2	BELDEN WELL - SOUTHMID	9/23/95	08:30		DRY
BW- 2	BELDEN WELL - SOUTHMID	9/23/95	17:00		DRY
BW- 2	BELDEN WELL - SOUTHMID	9/29/95	16:15		DRY
BW- 2	BELDEN WELL - SOUTHMID	9/30/95	07:15		DRY
BW- 2	BELDEN WELL - SOUTHMID	9/30/95	14:30		DRY
BW- 2	BELDEN WELL - SOUTHMID	10/25/95	13:45		DRY
BW- 2	BELDEN WELL - SOUTHMID	12/13/95	10:25		DRY
BW- 2	BELDEN WELL - SOUTHMID	3/22/96	11:50		DRY
BW- 2	BELDEN WELL - SOUTHMID	4/02/96			DRY
BW- 2	BELDEN WELL - SOUTHMID	4/10/96			DRY
BW- 2	BELDEN WELL - SOUTHMID	4/10/96	15:30		DRY
BW- 2	BELDEN WELL - SOUTHMID	4/17/96	13:45		DRY
BW- 2	BELDEN WELL - SOUTHMID	5/07/96			DRY
BW- 2	BELDEN WELL - SOUTHMID	5/16/96	15:30	8.04	E
BW- 2	BELDEN WELL - SOUTHMID	6/05/96	09:15	8.04	E
BW- 2	BELDEN WELL - SOUTHMID	7/31/96	10:35	7.73	
BW- 2	BELDEN WELL - SOUTHMID	9/17/96	10:35	7.78	
BW- 2	BELDEN WELL - SOUTHMID	12/20/96			DRY
BW- 2	BELDEN WELL - SOUTHMID	3/12/97	11:30	7.72	
BW- 2	BELDEN WELL - SOUTHMID	3/20/97	10:00	7.76	
BW- 2	BELDEN WELL - SOUTHMID	3/27/97	10:55	7.79	
BW- 2	BELDEN WELL - SOUTHMID	4/16/97	12:00	7.71	
BW- 2	BELDEN WELL - SOUTHMID	4/30/97	09:10	7.70	
BW- 2	BELDEN WELL - SOUTHMID	5/19/97	15:20	7.70	
BW- 2	BELDEN WELL - SOUTHMID	5/22/97	16:30	7.79	
BW- 2	BELDEN WELL - SOUTHMID	5/27/97		7.71	
BW- 2	BELDEN WELL - SOUTHMID	5/31/97	10:30	7.78	
BW- 2	BELDEN WELL - SOUTHMID	6/30/97	15:30	7.86	
BW- 2	BELDEN WELL - SOUTHMID	7/18/97	11:27	7.84	
BW- 2	BELDEN WELL - SOUTHMID	7/29/97	17:04	7.89	
BW- 2	BELDEN WELL - SOUTHMID	8/07/97	13:00	7.88	
BW- 2	BELDEN WELL - SOUTHMID	8/14/97	08:45	7.90	
BW- 2	BELDEN WELL - SOUTHMID	9/10/97	10:50	9.27	
BW- 3	BELDEN WELL - NORTHMID	7/12/95	12:30		DRY
BW- 3	BELDEN WELL - NORTHMID	7/13/95	15:40		DRY
BW- 3	BELDEN WELL - NORTHMID	7/17/95	17:15		DRY
BW- 3	BELDEN WELL - NORTHMID	8/03/95	17:23		DRY
BW- 3	BELDEN WELL - NORTHMID	9/06/95			DRY
BW- 3	BELDEN WELL - NORTHMID	9/08/95	15:20		DRY
BW- 3	BELDEN WELL - NORTHMID	9/09/95	14:00		DRY
BW- 3	BELDEN WELL - NORTHMID	9/10/95	13:30		DRY
BW- 3	BELDEN WELL - NORTHMID	9/11/95	09:45		DRY

Ground Water Level Data

Eagle Mine Project

Station ID	Station Description	Date	Time	Water Level Ft-TOC
BW- 3	BELDEN WELL - NORTHMID	9/21/95	17:10	DRY
BW- 3	BELDEN WELL - NORTHMID	9/22/95	11:50	DRY
BW- 3	BELDEN WELL - NORTHMID	9/23/95	08:30	DRY
BW- 3	BELDEN WELL - NORTHMID	9/23/95	17:00	DRY
BW- 3	BELDEN WELL - NORTHMID	9/29/95	16:15	DRY
BW- 3	BELDEN WELL - NORTHMID	9/30/95	07:15	DRY
BW- 3	BELDEN WELL - NORTHMID	9/30/95	14:30	DRY
BW- 3	BELDEN WELL - NORTHMID	10/25/95	13:45	DRY
BW- 3	BELDEN WELL - NORTHMID	12/13/95	09:45	9.15
BW- 3	BELDEN WELL - NORTHMID	3/22/96	14:05	9.16
BW- 3	BELDEN WELL - NORTHMID	4/02/96	18:05	8.39
BW- 3	BELDEN WELL - NORTHMID	4/10/96	15:30	9.02
BW- 3	BELDEN WELL - NORTHMID	4/16/96	12:05	9.12
BW- 3	BELDEN WELL - NORTHMID	4/17/96	13:35	9.18
BW- 3	BELDEN WELL - NORTHMID	5/07/96		DRY
BW- 3	BELDEN WELL - NORTHMID	5/16/96	15:20	DRY
BW- 3	BELDEN WELL - NORTHMID	6/05/96	09:05	DRY
BW- 3	BELDEN WELL - NORTHMID	7/31/96	10:50	DRY
BW- 3	BELDEN WELL - NORTHMID	9/17/96	10:20	DRY
BW- 3	BELDEN WELL - NORTHMID	11/08/96		9.10
BW- 3	BELDEN WELL - NORTHMID	12/20/96	16:00	9.11
BW- 3	BELDEN WELL - NORTHMID	3/12/97	13:30	9.07
BW- 3	BELDEN WELL - NORTHMID	3/14/97	10:30	9.14
BW- 3	BELDEN WELL - NORTHMID	3/20/97	11:25	8.44
BW- 3	BELDEN WELL - NORTHMID	3/27/97	10:50	9.09
BW- 3	BELDEN WELL - NORTHMID	4/16/97	11:50	9.08
BW- 3	BELDEN WELL - NORTHMID	4/30/97	09:00	9.26
BW- 3	BELDEN WELL - NORTHMID	5/19/97	15:40	9.28
BW- 3	BELDEN WELL - NORTHMID	5/22/97	16:15	9.09
BW- 3	BELDEN WELL - NORTHMID	5/27/97		9.11
BW- 3	BELDEN WELL - NORTHMID	5/31/97	10:39	9.14
BW- 3	BELDEN WELL - NORTHMID	6/30/97	15:19	9.14
BW- 3	BELDEN WELL - NORTHMID	7/18/97	11:34	9.15
BW- 3	BELDEN WELL - NORTHMID	7/29/97	17:13	9.25
BW- 3	BELDEN WELL - NORTHMID	8/07/97	12:45	9.08
BW- 3	BELDEN WELL - NORTHMID	8/14/97	08:35	8.09
BW- 3	BELDEN WELL - NORTHMID	9/10/97	10:40	DRY
BW- 4	BELDEN WELL - NORTH	7/12/95	12:30	8.20
BW- 4	BELDEN WELL - NORTH	7/13/95	15:40	8.32
BW- 4	BELDEN WELL - NORTH	7/17/95	17:15	9.12
BW- 4	BELDEN WELL - NORTH	8/03/95	17:23	10.51
BW- 4	BELDEN WELL - NORTH	9/06/95		11.22
BW- 4	BELDEN WELL - NORTH	9/08/95	15:20	11.08
BW- 4	BELDEN WELL - NORTH	9/09/95	14:35	10.88
BW- 4	BELDEN WELL - NORTH	9/10/95	13:30	11.00
BW- 4	BELDEN WELL - NORTH	9/11/95	09:45	11.09
BW- 4	BELDEN WELL - NORTH	9/21/95	17:10	11.08
BW- 4	BELDEN WELL - NORTH	9/22/95	11:50	11.01

Station ID	Station Description	Date	Time	Water Level Ft-TOC
BW- 4	BELDEN WELL - NORTH	9/23/95	08:30	11.08
BW- 4	BELDEN WELL - NORTH	9/23/95	17:00	11.08
BW- 4	BELDEN WELL - NORTH	9/29/95	16:15	10.48
BW- 4	BELDEN WELL - NORTH	9/30/95	07:15	9.68
BW- 4	BELDEN WELL - NORTH	9/30/95	14:30	9.56
BW- 4	BELDEN WELL - NORTH	10/25/95	13:45	9.37
BW- 4	BELDEN WELL - NORTH	12/13/95	10:55	8.04
BW- 4	BELDEN WELL - NORTH	3/22/96	13:15	4.90
BW- 4	BELDEN WELL - NORTH	4/02/96	17:40	5.46
BW- 4	BELDEN WELL - NORTH	4/10/96	15:30	5.86
BW- 4	BELDEN WELL - NORTH	4/16/96	11:55	6.97
BW- 4	BELDEN WELL - NORTH	4/17/96	13:25	7.06
BW- 4	BELDEN WELL - NORTH	5/07/96		7.97
BW- 4	BELDEN WELL - NORTH	5/16/96	15:10	9.31
BW- 4	BELDEN WELL - NORTH	6/05/96	09:40	10.23
BW- 4	BELDEN WELL - NORTH	7/31/96	12:20	10.90
BW- 4	BELDEN WELL - NORTH	9/17/96	11:00	10.63
BW- 4	BELDEN WELL - NORTH	11/08/96		9.10
BW- 4	BELDEN WELL - NORTH	12/17/96	13:00	8.96
BW- 4	BELDEN WELL - NORTH	3/12/97	14:15	2.84
BW- 4	BELDEN WELL - NORTH	3/14/97	10:30	4.48
BW- 4	BELDEN WELL - NORTH	3/20/97	10:50	4.61
BW- 4	BELDEN WELL - NORTH	3/27/97	11:30	7.06
BW- 4	BELDEN WELL - NORTH	4/16/97	17:05	7.76
BW- 4	BELDEN WELL - NORTH	4/30/97	10:20	5.22
BW- 4	BELDEN WELL - NORTH	5/19/97	16:00	9.06
BW- 4	BELDEN WELL - NORTH	5/22/97	17:15	7.98
BW- 4	BELDEN WELL - NORTH	5/31/97	10:50	4.85
BW- 4	BELDEN WELL - NORTH	6/30/97	14:35	10.04
BW- 4	BELDEN WELL - NORTH	7/18/97	12:04	10.81
BW- 4	BELDEN WELL - NORTH	7/26/97	16:20	11.03
BW- 4	BELDEN WELL - NORTH	7/29/97	17:15	10.76
BW- 4	BELDEN WELL - NORTH	8/07/97	14:15	9.59
BW- 4	BELDEN WELL - NORTH	8/14/97	09:10	9.38
BW- 4	BELDEN WELL - NORTH	9/10/97	11:20	11.04
BW- 4	BELDEN WELL - NORTH	9/16/97	13:05	11.17

Belden Well Water Quality Data

Eagle Mine Project

Station ID	Station Description	Date	Time	Water Level (FT-TOC)		Field pH	Field Temp. Deg.C	Field Spec. Cond. @25C umhos/cm	Suspended Solids mg/l	Alkalinity Total mg/l	Sulfate Dissolved mg/l
BW- 1	BELDEN WELL - SOUTH	4/10/96	15:30	2.45			2.0	1800			
BW- 1	BELDEN WELL - SOUTH	4/17/96	14:25	2.17		3.4	8.0	1050		5 U	1200
BW- 1	BELDEN WELL - SOUTH	5/07/96	14:10	1.79		3.6	13.0	1350		5 U	1100
BW- 1	BELDEN WELL - SOUTH	5/16/96	15:40	2.08			5.5	1200			
BW- 1	BELDEN WELL - SOUTH	6/05/96	09:25	5.56	E		7.0	1550			
BW- 1	BELDEN WELL - SOUTH	3/20/97	11:15	3.11		4.8	9.5	1700	70	5 U	1600
BW- 1	BELDEN WELL - SOUTH	3/27/97	11:30	2.09		3.1	7.0	1900		1 U	2050
BW- 1	BELDEN WELL - SOUTH	4/16/97	16:45	2.69		3.2	4.0	1200		5 U	940
BW- 1	BELDEN WELL - SOUTH	5/19/97	15:00	2.34				1300			
BW- 1	BELDEN WELL - SOUTH	5/22/97	16:45	2.70			7.0	1000			
BW- 1	BELDEN WELL - SOUTH	5/27/97		3.67			7.0	1350			
BW- 2	BELDEN WELL - SOUTHMID	5/16/96	15:30	8.04	E		8.5	950			
BW- 2	BELDEN WELL - SOUTHMID	6/05/96	09:15	8.04	E		7.0	900			
BW- 2	BELDEN WELL - SOUTHMID	7/31/96	10:35	7.73			12.0	250			
BW- 2	BELDEN WELL - SOUTHMID	9/17/96	10:35	7.78			11.5	380			
BW- 2	BELDEN WELL - SOUTHMID	3/12/97	11:30	7.72			5.0	310			
BW- 2	BELDEN WELL - SOUTHMID	3/20/97	10:00	7.76			4.0	290			
BW- 2	BELDEN WELL - SOUTHMID	3/27/97	10:55	7.79			3.0	360			
BW- 2	BELDEN WELL - SOUTHMID	4/16/97	12:00	7.71			6.0	600			
BW- 2	BELDEN WELL - SOUTHMID	5/19/97	15:20	7.70			6.0	850			
BW- 2	BELDEN WELL - SOUTHMID	5/22/97	16:30	7.79			6.0	650			
BW- 2	BELDEN WELL - SOUTHMID	5/27/97		7.71			10.0	780			
BW- 2	BELDEN WELL - SOUTHMID	5/31/97	10:30	7.78				600			
BW- 2	BELDEN WELL - SOUTHMID	7/18/97	11:27	7.84	NS		12.0	950			
BW- 2	BELDEN WELL - SOUTHMID	7/29/97	17:04	7.89	NS		12.0	1050			
BW- 2	BELDEN WELL - SOUTHMID	8/07/97	13:00	7.88	NS		13.0	950			
BW- 2	BELDEN WELL - SOUTHMID	8/14/97	08:45	7.90	NS		10.5	850			
BW- 2	BELDEN WELL - SOUTHMID	9/10/97	10:50	9.27	NS		12.0	1050			
BW- 3	BELDEN WELL - NORTHMID	12/13/95	09:45	9.15			7.0	1500			
BW- 3	BELDEN WELL - NORTHMID	3/22/96	14:05	9.16			7.0	1500			
BW- 3	BELDEN WELL - NORTHMID	4/02/96	18:05	8.39		2.8	7.5	3500		5 U	3400

N/S = not sampled ** = insufficient sample volume for analysis

Belden Well Water Quality Data

Eagle Mine Project

Station ID	Station Description	Date	Time	Water Level (FT-TOC)		Field pH	Field Temp. Deg.C	Field Cond. @25C umhos/cm	Suspended Solids mg/l		Alkalinity Total mg/l		Sulfate Dissolved mg/l
BW- 3	BELDEN WELL - NORTHMID	4/10/96	15:30	9.02			5.0	3100					
BW- 3	BELDEN WELL - NORTHMID	4/16/96	12:05	9.12			5.0	4350					
BW- 3	BELDEN WELL - NORTHMID	12/20/96	16:00	9.11			6.0	2200					
BW- 3	BELDEN WELL - NORTHMID	3/12/97	13:30	9.07			7.0	1450					
BW- 3	BELDEN WELL - NORTHMID	3/20/97	11:25	8.44									
BW- 3	BELDEN WELL - NORTHMID	3/27/97	10:50	9.09			4.5	2250					
BW- 3	BELDEN WELL - NORTHMID	4/16/97	11:50	9.08			6.5	2250					
BW- 3	BELDEN WELL - NORTHMID	5/19/97	15:40	9.28			5.5	1807					
BW- 3	BELDEN WELL - NORTHMID	5/27/97		9.11			6.0	1656					
BW- 3	BELDEN WELL - NORTHMID	5/31/97	10:39	9.14				1600					
BW- 3	BELDEN WELL - NORTHMID	7/18/97	11:34	9.15	NS		9.0	2000					
BW- 3	BELDEN WELL - NORTHMID	7/29/97	17:13	9.25	NS		9.0	2050					
BW- 3	BELDEN WELL - NORTHMID	8/07/97	12:45	9.08	NS		11.0	1650					
BW- 3	BELDEN WELL - NORTHMID	8/14/97	08:35	8.09	NS		9.0	1700					
BW- 4	BELDEN WELL - NORTH	9/09/95	14:35	10.88		5.8	13.0	550	150		8		
BW- 4	BELDEN WELL - NORTH	12/13/95	10:55	8.04		5.2	5.0	650			4		303
BW- 4	BELDEN WELL - NORTH	3/22/96	13:15	4.90		4.8	6.0	850			2		48
BW- 4	BELDEN WELL - NORTH	4/02/96	17:40	5.46		4.6	7.0	650			5	U	370
BW- 4	BELDEN WELL - NORTH	4/10/96	15:30	5.86			5.0	650					
BW- 4	BELDEN WELL - NORTH	4/16/96	11:55	6.97			5.0	650					
BW- 4	BELDEN WELL - NORTH	4/17/96	13:25	7.06			5.5	600					
BW- 4	BELDEN WELL - NORTH	5/07/96		7.97			8.0	500					
BW- 4	BELDEN WELL - NORTH	5/16/96	15:10	9.31			7.0	415					
BW- 4	BELDEN WELL - NORTH	6/05/96	09:40	10.23		5.4	9.5	460			6		191
BW- 4	BELDEN WELL - NORTH	7/31/96	12:20	10.90		5.5	19.0	450					
BW- 4	BELDEN WELL - NORTH	9/17/96	11:00	10.63		5.4	10.0	475			6		224
BW- 4	BELDEN WELL - NORTH	12/17/96	13:00	8.96		5.8	2.0	550			1	U	262
BW- 4	BELDEN WELL - NORTH	3/12/97	14:15	2.84			3.0	460					
BW- 4	BELDEN WELL - NORTH	3/20/97	10:50	4.61		5.2	6.0	850	290		5	U	520
BW- 4	BELDEN WELL - NORTH	3/27/97	11:30	7.06		5.2	5.0	750			4		460
BW- 4	BELDEN WELL - NORTH	4/16/97	17:05	7.76		5.0	6.0	550			5	U	350
BW- 4	BELDEN WELL - NORTH	5/19/97	16:00	9.06			6.0	469					
BW- 4	BELDEN WELL - NORTH	5/22/97	17:15	7.98			9.0	550					

N/S = not sampled ** = insufficient sample volume for analysis

Belden Well Water Quality Data

Eagle Mine Project

Station ID	Station Description	Date	Time	Water Level (FT-TOC)		Field pH	Field Temp. Deg.C	Field Cond. @25C umhos/cm	Suspended Solids mg/l	Alkalinity Total mg/l		Sulfate Dissolved mg/l
BW- 4	BELDEN WELL - NORTH	5/31/97	10:50	4.85			10.0	550				
BW- 4	BELDEN WELL - NORTH	7/18/97	12:04	10.81	NS		10.5	440				
BW- 4	BELDEN WELL - NORTH	7/26/97	16:20	11.03		6.1	15.0	445		12		177
BW- 4	BELDEN WELL - NORTH	7/29/97	17:15	10.76		5.2	16.0	600	2000	24		
BW- 4	BELDEN WELL - NORTH	8/07/97	14:15	9.59		5.7	17.5	750	1500	20		
BW- 4	BELDEN WELL - NORTH	8/14/97	09:10	9.38	NS		11.0	700				
BW- 4	BELDEN WELL - NORTH	9/10/97	11:20	11.04		5.7	21.0	430		8	UJ	190
BW- 8	DUPLICATE OF BW-4	9/17/96	16:00							7		248

N/S = not sampled ** = insufficient sample volume for analysis

Belden Well Water Quality Data

Eagle Mine Project

Station ID	Date	Sulfate Total mg/l	Calcium Dissolved mg/l	Magnesium Dissolved mg/l	Arsenic Dissolved mg/l	Cadmium Dissolved mg/l	Copper Dissolved mg/l	Iron Dissolved mg/l	Lead Dissolved mg/l	Manganese Dissolved mg/l	Zinc Dissolved mg/l
BW- 1	4/10/96										
BW- 1	4/17/96				.005 U	.0610	3.300	26.00	.790	9.600	20.00
BW- 1	5/07/96				.005 U	.0400	2.200	17.00	1.000	4.800	12.00
BW- 1	5/16/96										
BW- 1	6/05/96										
BW- 1	3/20/97		430	91	.005 U	.1300	3.000	16.00	.370	18.000	48.00
BW- 1	3/27/97				.005 UJ	.0490	5.200	44.10 J	1.990	8.170 J	17.40
BW- 1	4/16/97				.005 U	.0490	3.400	26.00	1.400	6.600	15.00
BW- 1	5/19/97										
BW- 1	5/22/97										
BW- 1	5/27/97										
BW- 2	5/16/96										
BW- 2	6/05/96										
BW- 2	7/31/96										
BW- 2	9/17/96										
BW- 2	3/12/97										
BW- 2	3/20/97										
BW- 2	3/27/97										
BW- 2	4/16/97										
BW- 2	5/19/97										
BW- 2	5/22/97										
BW- 2	5/27/97										
BW- 2	5/31/97										
BW- 2	7/18/97										
BW- 2	7/29/97										
BW- 2	8/07/97										
BW- 2	8/14/97										
BW- 2	9/10/97										
BW- 3	12/13/95										
BW- 3	3/22/96										
BW- 3	4/02/96				.007	1.5000	12.000	49.00	.830	51.000	460.00

Belden Well Water Quality Data

Eagle Mine Project

Station ID	Date	Sulfate Total mg/l	Calcium Dissolved mg/l	Magnesium Dissolved mg/l	Arsenic Dissolved mg/l	Cadmium Dissolved mg/l	Copper Dissolved mg/l	Iron Dissolved mg/l	Lead Dissolved mg/l	Manganese Dissolved mg/l	Zinc Dissolved mg/l
BW- 3	4/10/96										
BW- 3	4/16/96										
BW- 3	12/20/96										
BW- 3	3/12/97										
BW- 3	3/20/97		390	42	.005 U	.6300	.031	.02	.130	5.600	110.00
BW- 3	3/27/97										
BW- 3	4/16/97										
BW- 3	5/19/97										
BW- 3	5/27/97										
BW- 3	5/31/97										
BW- 3	7/18/97										
BW- 3	7/29/97										
BW- 3	8/07/97										
BW- 3	8/14/97										
BW- 4	9/09/95	260	64	20	.005 U	.0220	.042	.01 U	.002	.450	6.10
BW- 4	12/13/95				.005 U	.0330	.243	.03 U	.004	.788	8.54
BW- 4	3/22/96				.005 U	.0550	.713	.13	.017	1.480	14.20 J
BW- 4	4/02/96				.005 U	.0400	.440	.01 U	.004	.820	11.00
BW- 4	4/10/96										
BW- 4	4/16/96										
BW- 4	4/17/96										
BW- 4	5/07/96										
BW- 4	5/16/96										
BW- 4	6/05/96				.005 U	.0135 J	.106	.04	.003 J	.099	5.53
BW- 4	7/31/96		54	17	.005 U	.0190	.110	.01 U	.003	.180	5.50
BW- 4	9/17/96				.005 U	.0176	.091	.03 U	.004	.132	5.93
BW- 4	12/17/96				.005 U	.0210 J	.180	.03 U	.010	.207	6.79
BW- 4	3/12/97										
BW- 4	3/20/97		150	32	.005 U	.0670	.480	.01	.052	1.500	16.00
BW- 4	3/27/97				.005 UJ	.0400	.280	.03 J	.015	.551 J	12.00
BW- 4	4/16/97				.005 U	.0410	.300	.02	.016	.600	12.00
BW- 4	5/19/97										
BW- 4	5/22/97										

Belden Well Water Quality Data

Eagle Mine Project

Station ID	Date	Sulfate Total mg/l	Calcium Dissolved mg/l	Magnesium Dissolved mg/l	Arsenic Dissolved mg/l	Cadmium Dissolved mg/l	Copper Dissolved mg/l	Iron Dissolved mg/l	Lead Dissolved mg/l	Manganese Dissolved mg/l	Zinc Dissolved mg/l
BW- 4	5/31/97										
BW- 4	7/18/97										
BW- 4	7/26/97				.005 U	.0169	.016	.03 U	.012	.063	4.21
BW- 4	7/29/97		92	25 J	.005 U	.2000	.100	.12	.110	1.800 J	36.00
BW- 4	8/07/97	460	140	31 J	.005 U	.0690	.032	.08	.051	.800	13.00
BW- 4	8/14/97										
BW- 4	9/10/97				.005 U	.0190	.018	.03 UJ	.017	.072 J	4.23
BW- 8	9/17/96				.005 U	.0164	.094	.10	.007	.154	5.81

Storm Water QA/AC Data

Eagle Mine Project

Station ID	Station Description	Date	Time	Stream Discharge (CFS)	Stream Discharge (GPM)	Field pH	Field Temp. Deg.C	Field Spec. Cond. @25C umhos/cm	Field Turbidity NTU	Suspended Solids mg/l	Alkalinity Total mg/l
E-RBB	BLANK OF LAB D.I. WATER	9/09/95	09:40							3 U	5 U
NY-25	BLANK OF LAB D.I. WATER	4/03/96	11:30							5 U	5 U
NY-15	BLANK OF LAB D.I. WATER	4/10/96	18:50							5 U	5 U
NY-23	BLANK OF LAB D.I. WATER	4/16/96	17:00							3 U	5 U
NY-29	BLANK OF LAB D.I. WATER	7/29/96	09:40								
TD- 3A	BLANK OF LAB D.I. WATER	3/11/97	17:20							3 U	5 U
TD- 3B	BLANK OF LAB D.I. WATER	3/19/97	19:45							4	5 U
TD- 4	BLANK OF LAB D.I. WATER	4/17/97	15:10							3 U	5 U
TD- 5	BLANK OF LAB D.I. WATER	5/07/97	9:15								5 U
TD- 7	BLANK OF LAB D.I. WATER	7/29/97	12:50							3 U	5 U
AB- 4	BLANK OF LAB D.I. WATER	8/19/97	16:00							3 UJ	5 U
E-11RD	DUPLICATE OF E-11RC	9/08/95	05:10			7.6	11.0	130		16	55
RY-11	DUPLICATE OF E-11	4/16/96	18:05							9	58
CHI-14	DUPLICATE OF SR-3	5/15/96	16:00							32	14
TC- 4	DUPLICATE OF E-5	4/17/97	14:55							3 U	60
TC- 7	DUPLICATE OF T- 4RC	7/27/97	17:35							13000	160

Storm Water Quality Data

Eagle Mine Project

Station ID	Date	Sulfate Dissolved mg/l	Sulfate Total mg/l	Calcium Dissolved mg/l	Magnesium Dissolved mg/l	Arsenic Dissolved mg/l	Arsenic Total Rec. mg/l	Cadmium Dissolved mg/l	Cadmium Total Rec. mg/l	Copper Dissolved mg/l	Copper Total Rec. mg/l
E-RBB	9/09/95		1	.1 U	.1 U	.005 U	.005 U	.0001 U	.0001 U	.001 U	.002
NY-25	4/03/96		10 U	.1 U	.1 U	.005 U	.005 U	.0001 U	.0001 U	.001 U	.004
NY-15	4/10/96		5 U	.1 U	.1 U	.005 U	.005 U	.0001 U	.0005	.001 U	.002
NY-23	4/16/96		5 U	.1 U	.1 U	.005 U	.005 U	.0001 U	.0001 U	.002	.014
NY-29	7/29/96			.1 U	.1 U	.005 U		.0001 U		.001 U	
TD- 3A	3/11/97		5 U	.1 U	.1 U	.005 U	.005 U	.0001 U	.0001 U	.001 U	.002 UJ
TD- 3B	3/19/97		1 U	.1 U	.1 U	.005 U	.005 U	.0002 U	.0001 U	.001 U	.001 U
TD- 4	4/17/97		1 U	.1 U	.1 U	.005 U	.005 U	.0001 U	.0001 U	.005 UJ	.001 U
TD- 5	5/07/97	5 U		.1 U	.1 U			.0001 U		.001 U	
TD- 7	7/29/97		1	.1 U	.1 UJ	.005 U	.005 U	.0001 U	.0001 U	.001 U	.006
AB- 4	8/19/97		1 U	.1 U	.1 U	.005 U	.005 U	.0001 U	.0001 U	.001 U	.005 UJ
E-11RD	9/08/95		14	15.0	6.2	.005 U	.005 U	.0013	.0019	.002	.017
RY-11	4/16/96		22	17.0	7.4	.005 U	.005 U	.0018	.0021	.009	.023
CHI-14	5/15/96		1400	210.0	180.0	.005 U	.030	.1500	.1400	.003	.031
TC- 4	4/17/97		15	18.0	7.3	.005 U	.005 U	.0011 UJ	.0009	.009	.021
TC- 7	7/27/97		490	140.0	36.0 J	.005 U	10.000 J	.0410	.4600 J	.004	2.900

Storm Water Quality Data

Eagle Mine Project

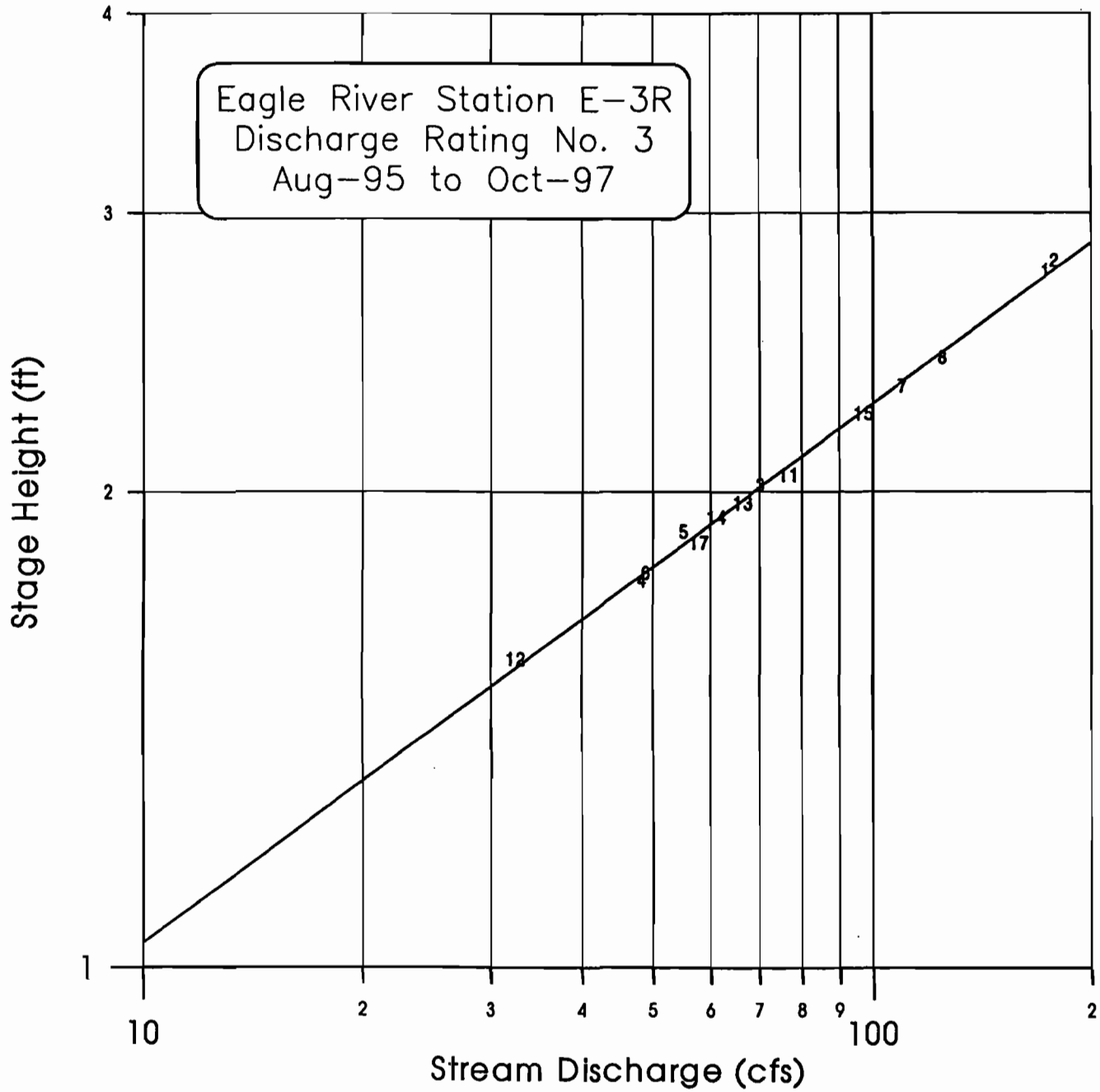
Station ID	Date	Iron Dissolved mg/l		Iron Total Rec. mg/l		Lead Dissolved mg/l		Lead Total Rec. mg/l		Manganese Dissolved mg/l		Manganese Total Rec. mg/l		Zinc Dissolved mg/l		Zinc Total Rec. mg/l	
E-RBB	9/09/95	.01	U	.01	U	.001	U	.001	U	.005	U	.005	U	.005	U	.042	
NY-25	4/03/96	.01	U	.00	U	.001	U	.001	U	.005	U	.005	U	.005	U	.006	
NY-15	4/10/96	.01	U	.01	U	.001	U	.001	U	.005	U	.005	U	.005	U	.012	
NY-23	4/16/96	.01	U	.01	U	.001	U	.001		.006		.005	U	.006		.007	
NY-29	7/29/96	.01	U			.001	U			.005	U			.005	U		
TD- 3A	3/11/97	.01	U	.01	U	.001	U	.001	UJ	.005	U	.005	U	.005	U	.007	
TD- 3B	3/19/97	.01	U	.01	U	.001	U	.001	U	.005	U	.005	U	.005	U	.005	U
TD- 4	4/17/97	.01	U	.01	U	.001	U	.001	U	.005	U	.005	U	.005	U	.005	U
TD- 5	5/07/97	.01	U			.001	U			.005	U			.005	U		
TD- 7	7/29/97	.01	U	.02		.001	U	.003		.005	UJ	.006		.005	U	.080	
AB- 4	8/19/97	.01	U	.01	U	.001	U	.001		.005	U	.005	U	.005	U	.005	U
E-11RD	9/08/95	.12		1.20		.005		.080		.140		.190		.320		.540	
RY-11	4/16/96	.28		.74		.002		.008		.250		.250		.670		.720	
CHI-14	5/15/96	.02		8.90		.026		.520		27.000		27.000		22.000		22.000	
TC- 4	4/17/97	.22		.50		.001		.007		.170		.190		.360		.460	
TC- 7	7/27/97	.03		620.00		.066		170.000		.300	J	25.000		2.900		130.000	

Appendix C

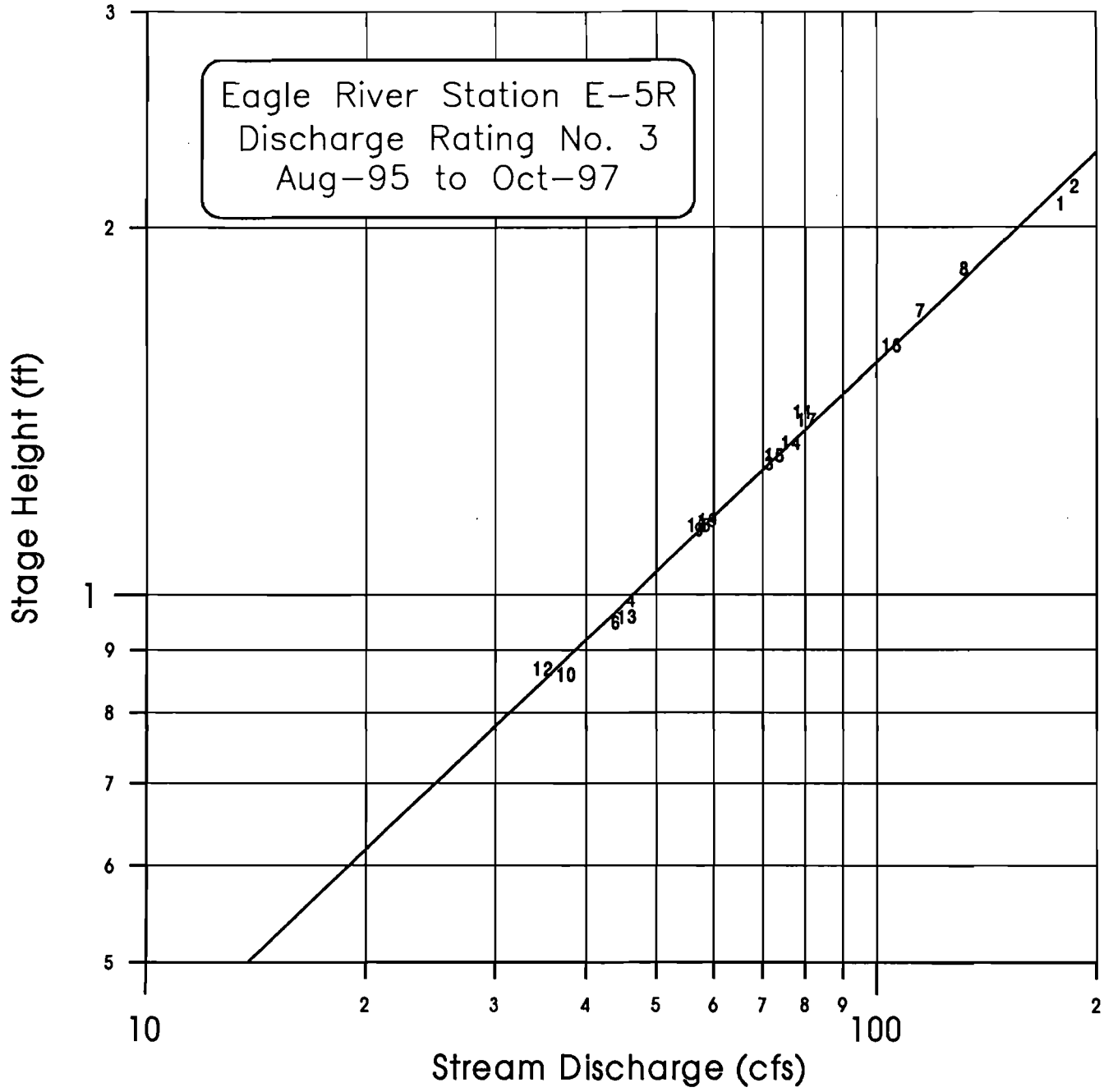
APPENDIX C

Streamflow Data

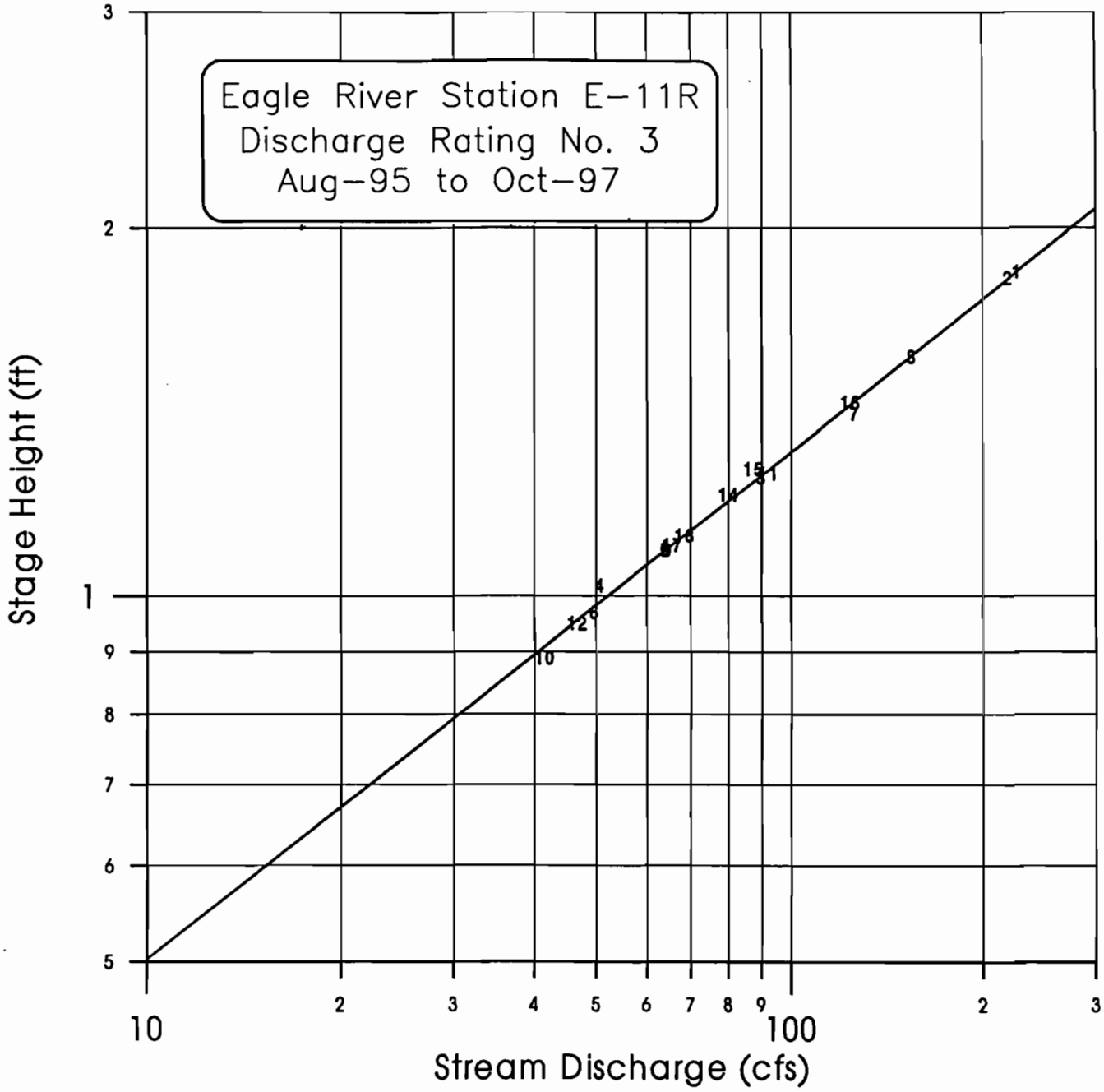
Q = 9.04788 * G.H. ^ 2.92754



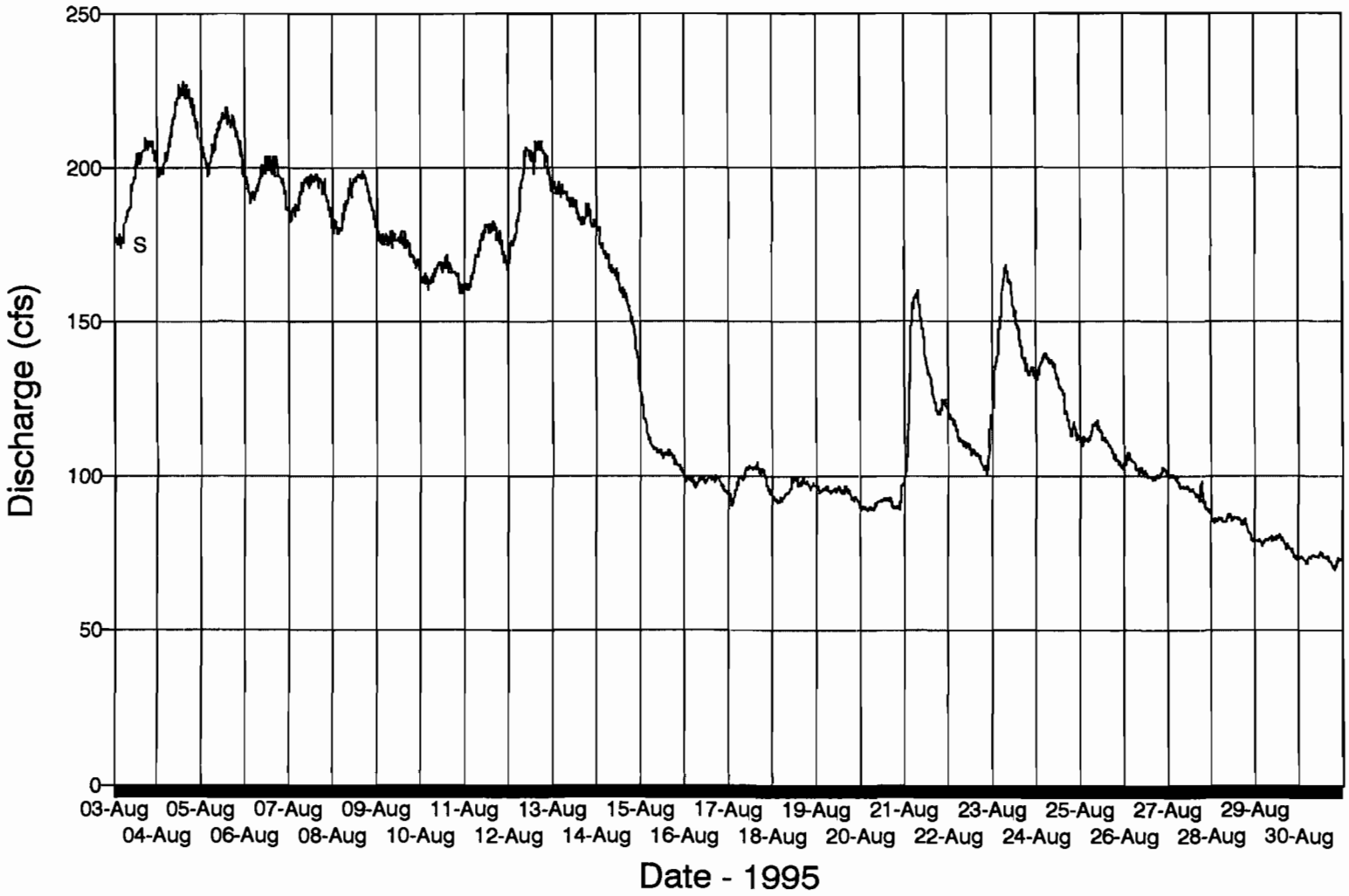
Q = 46.557 * G.H. ^ 1.74339



Q = 52.3249 * G.H.^2.3913



Eagle River E-3R
August 1995



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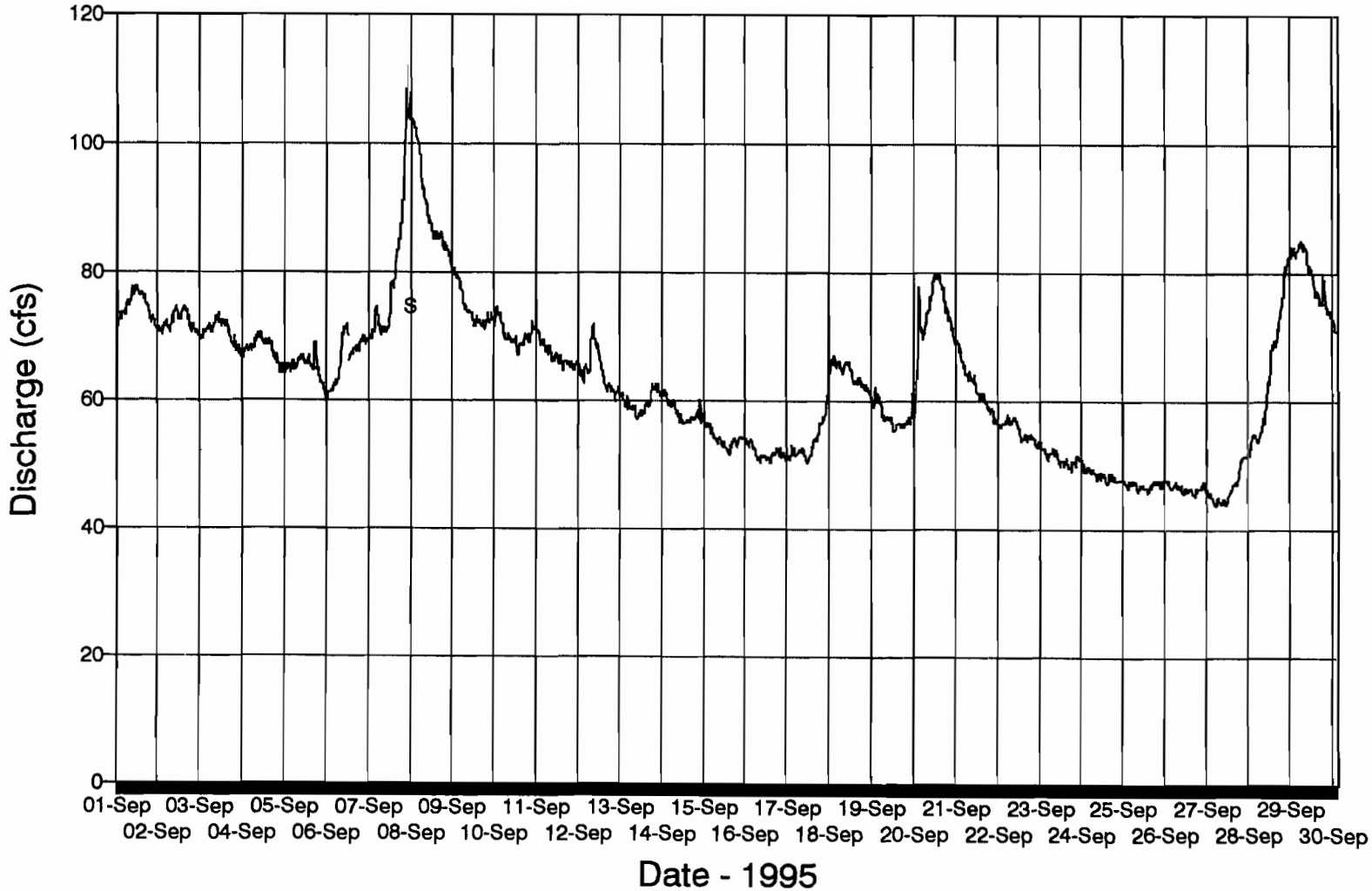
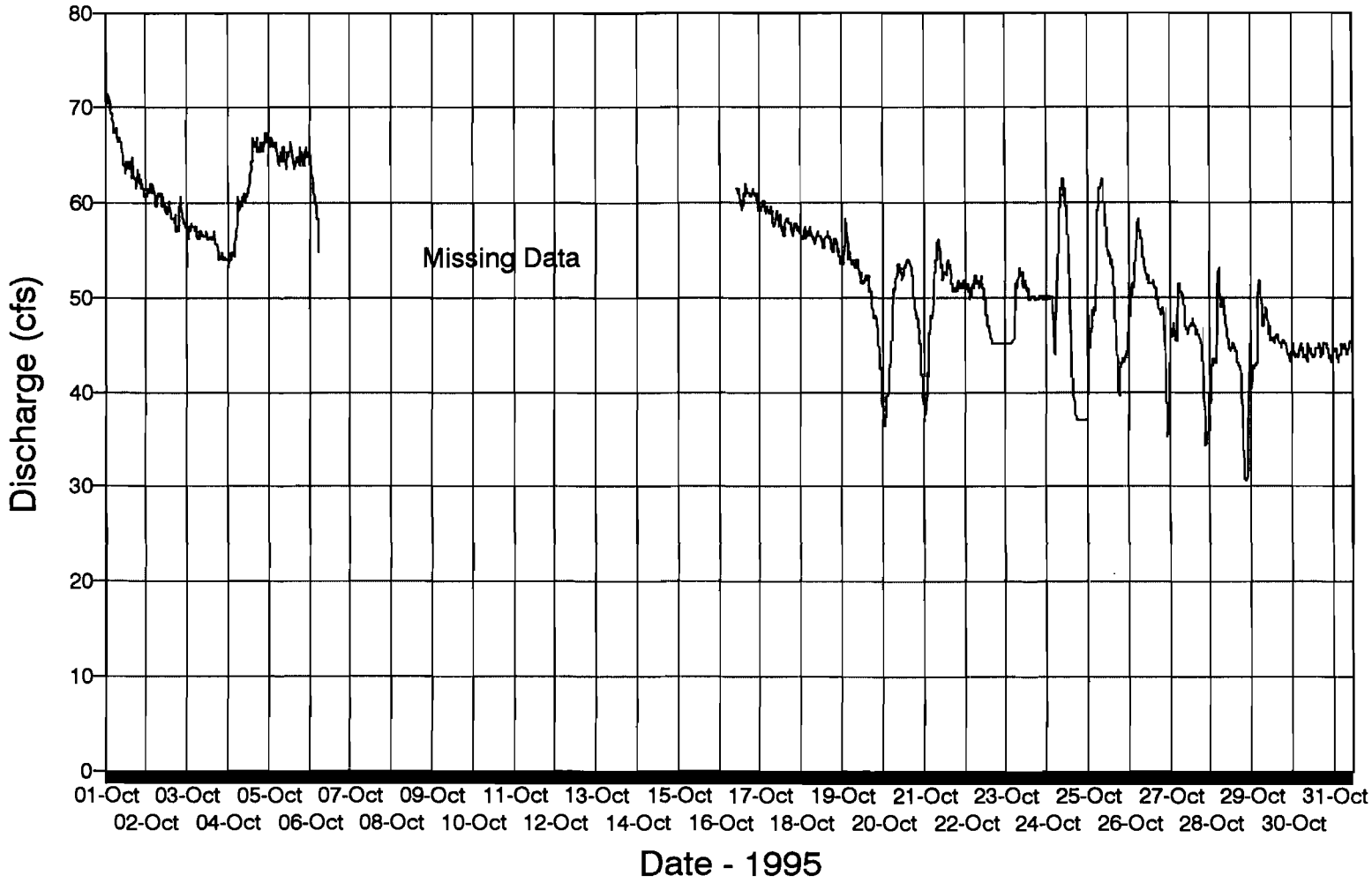
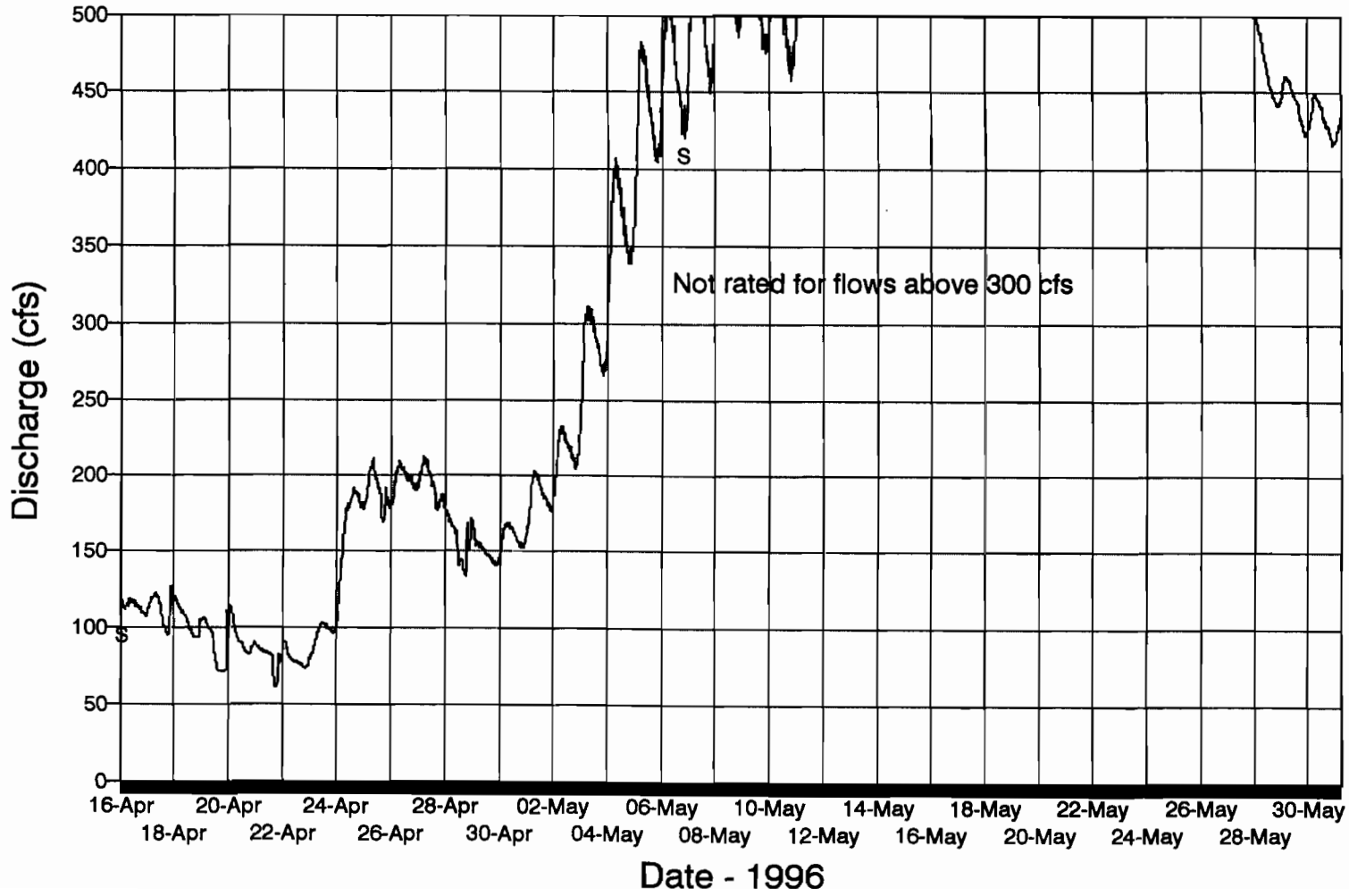
September 1995



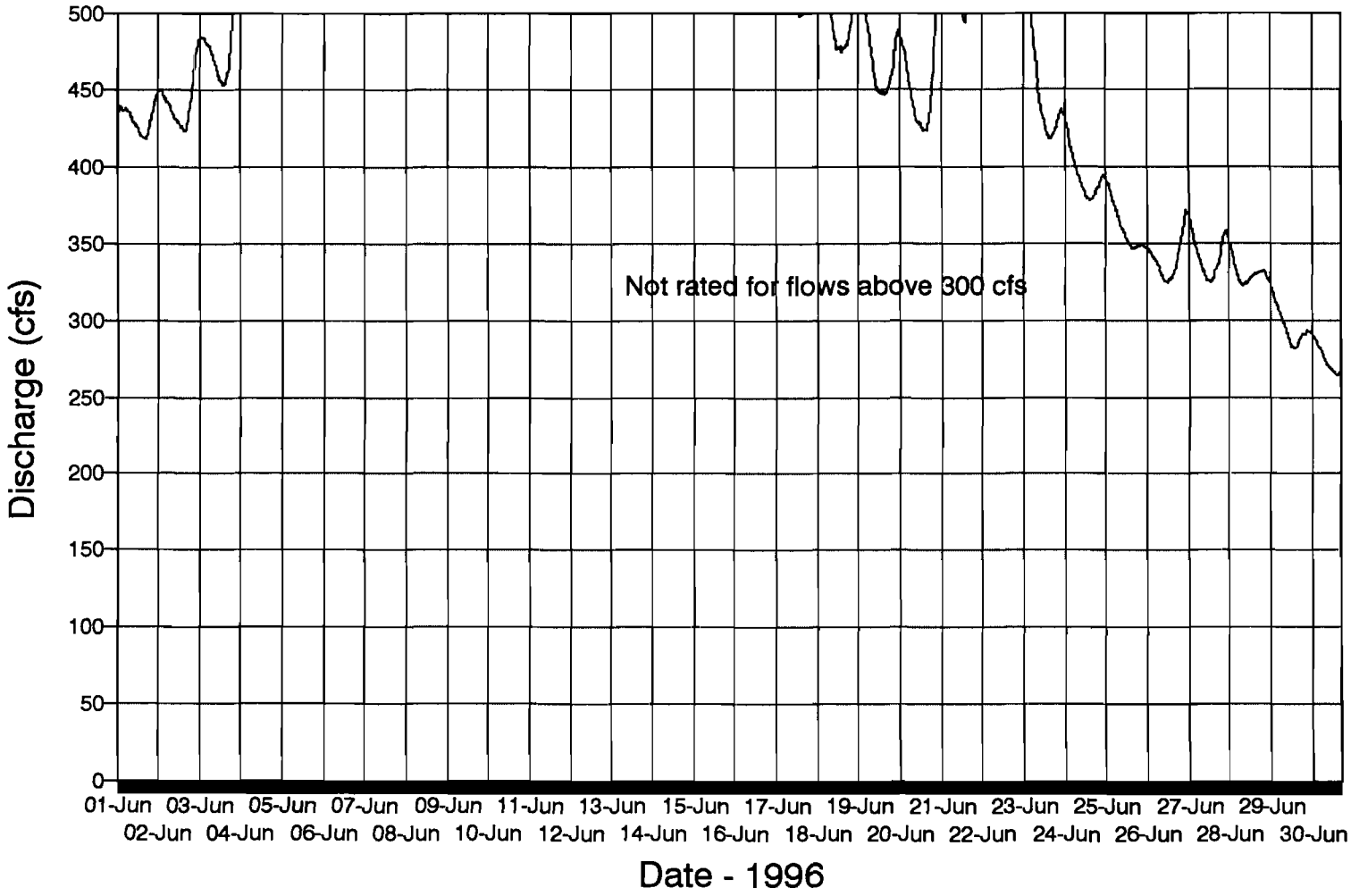
Eagle River E-3R
October 1995



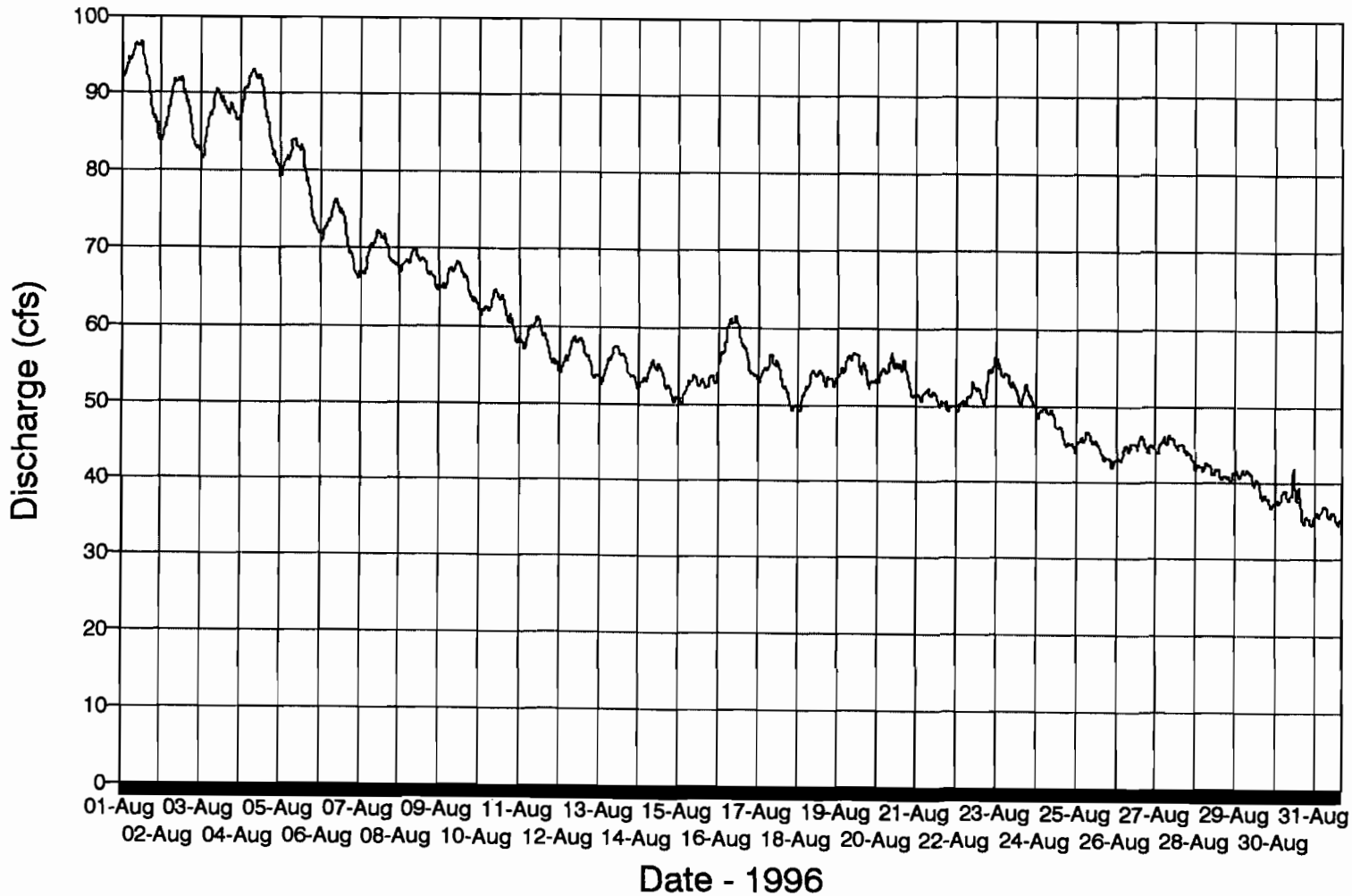
Eagle River Station E-3R
April-May 1996



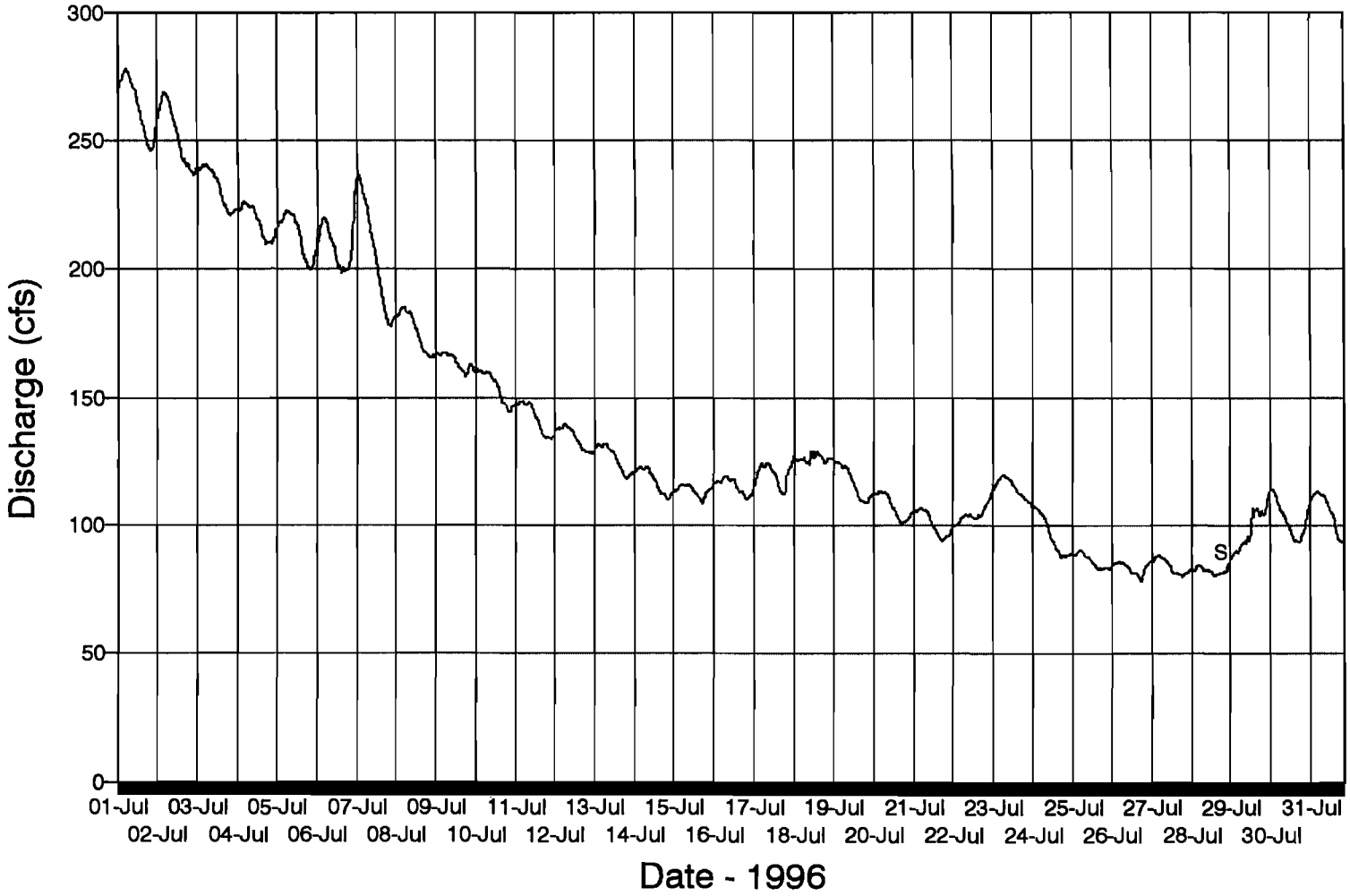
Eagle River Station E-3R
June 1996



Eagle River Station E-3R
August 1996



Eagle River Station E-3R
July 1996



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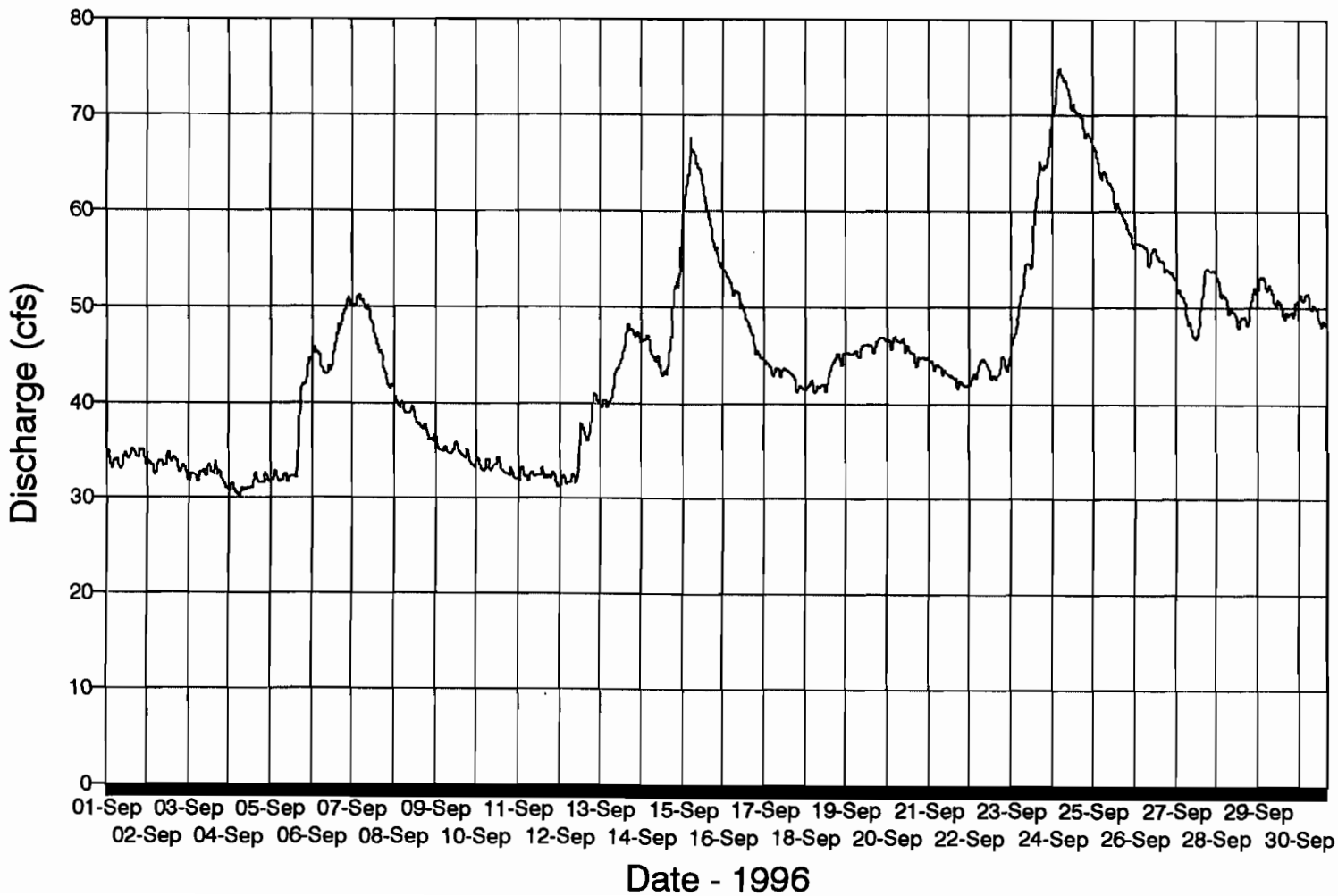
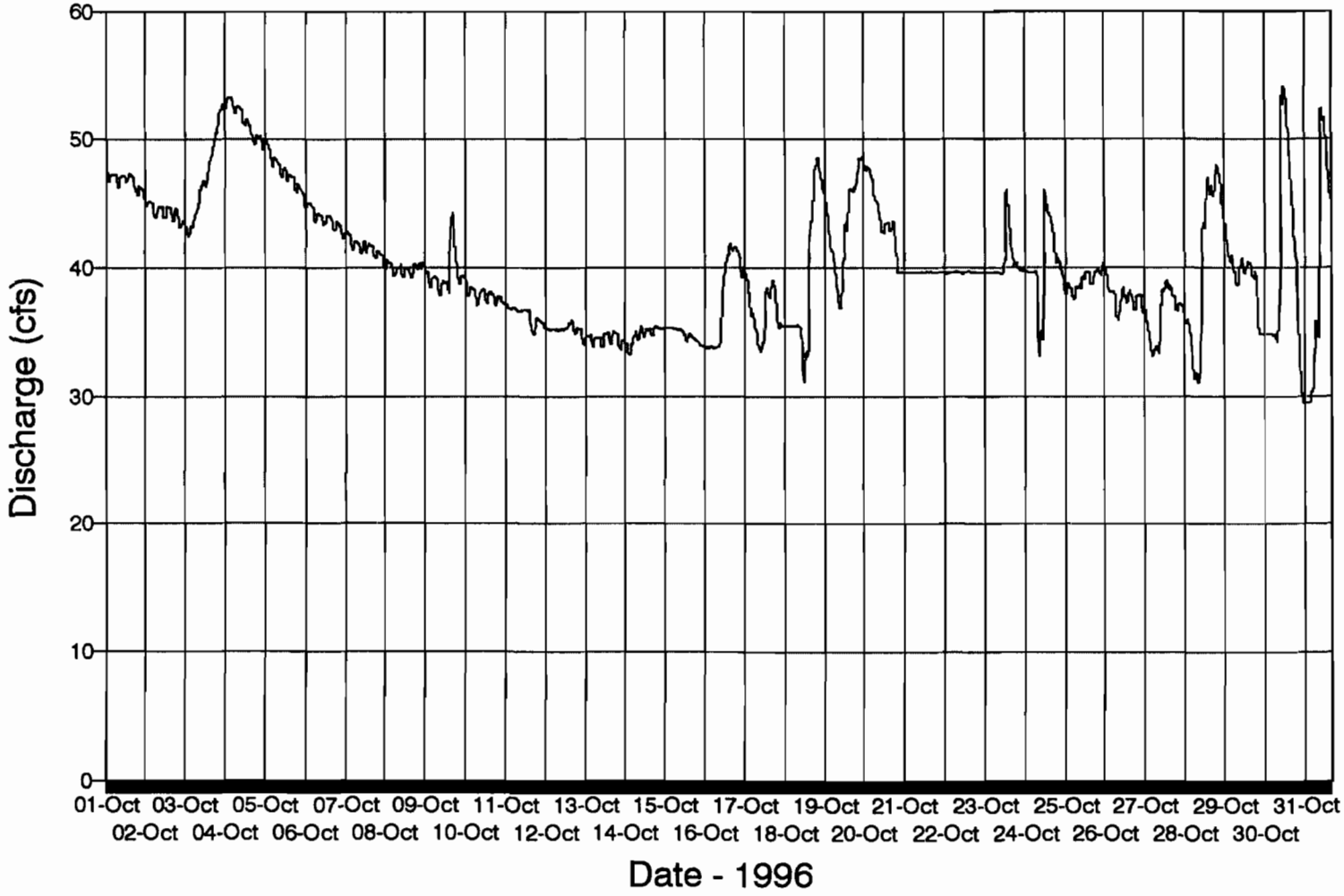
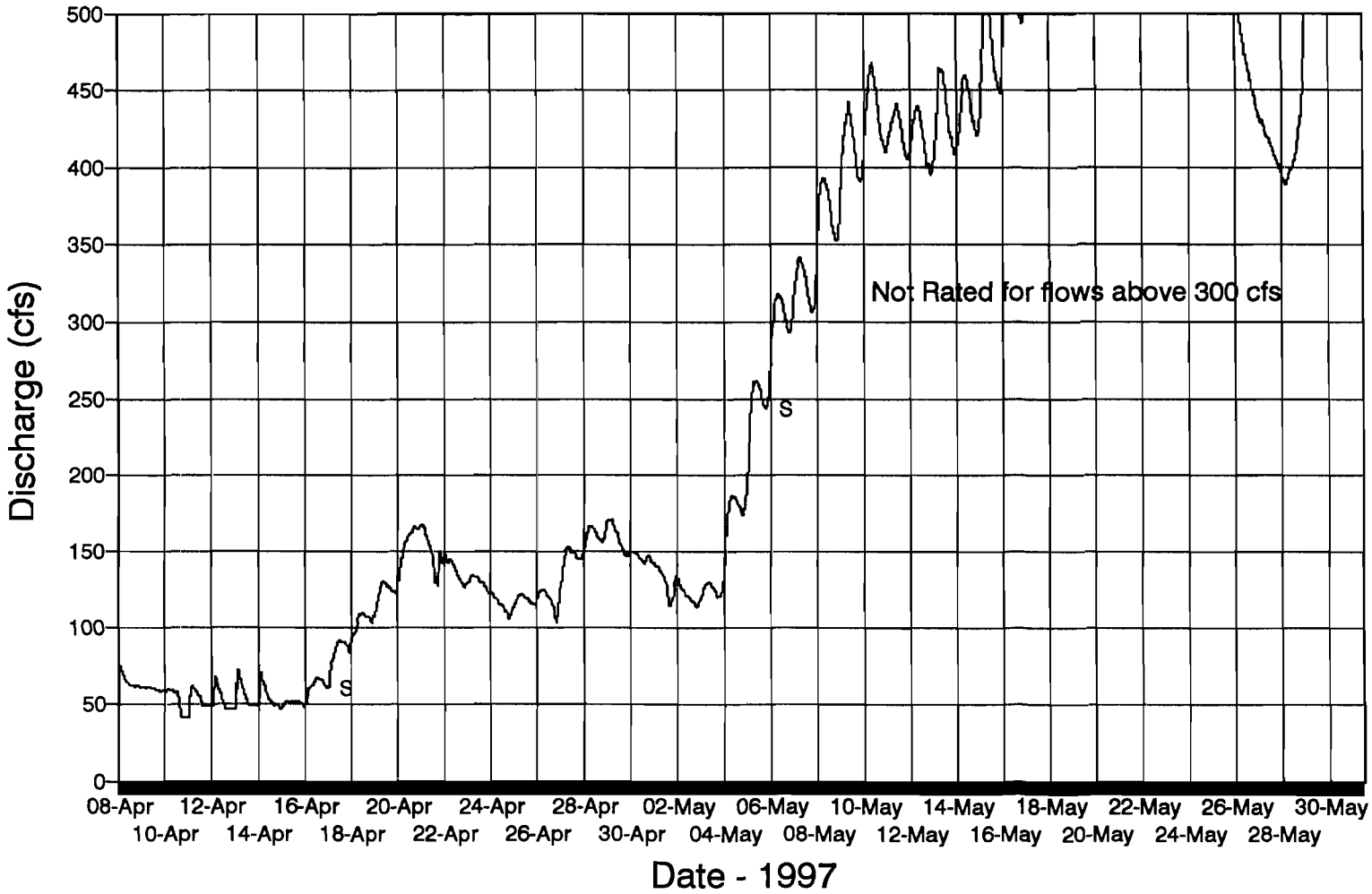


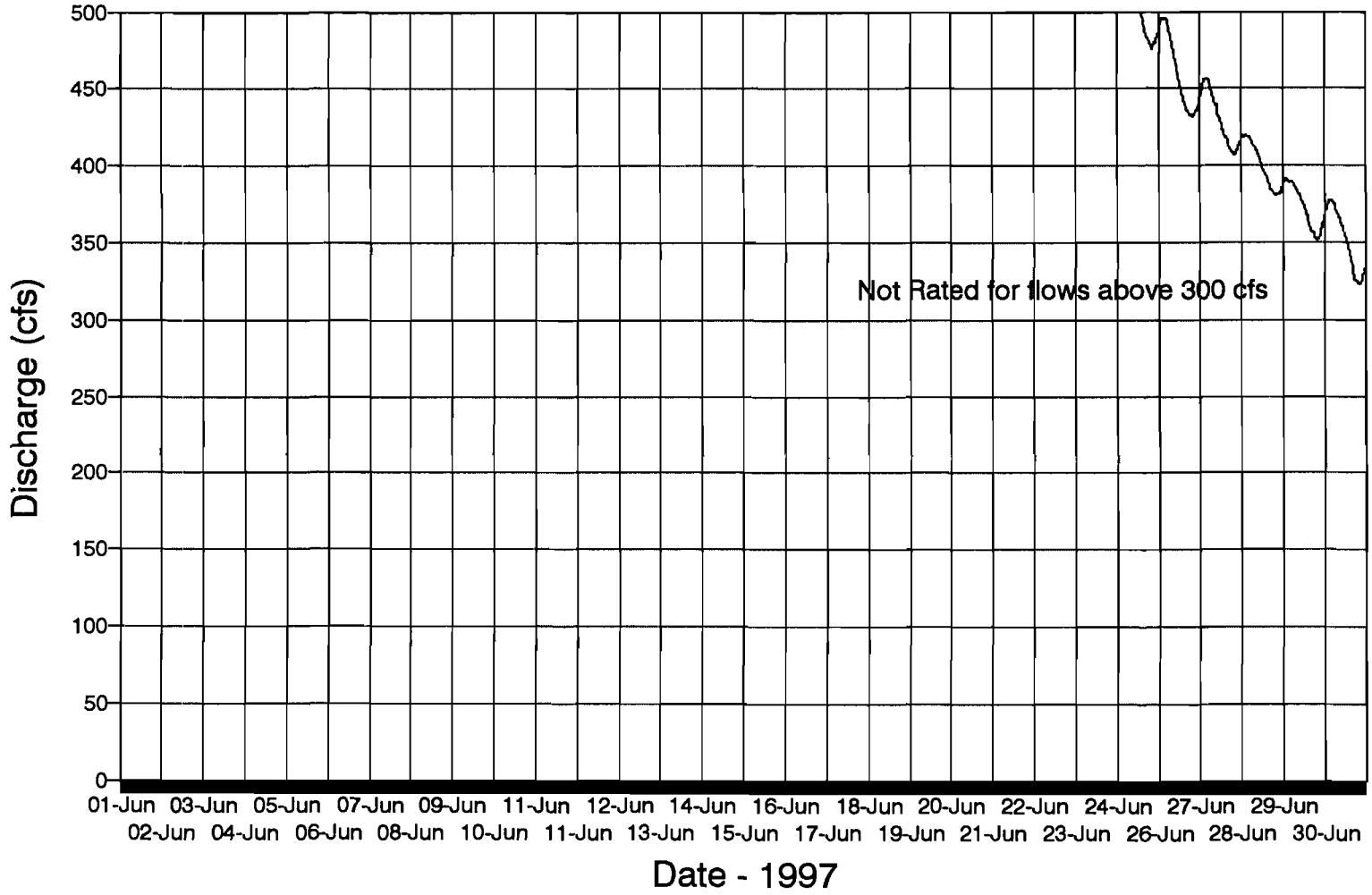
Eagle River Station E-3R
October 1996



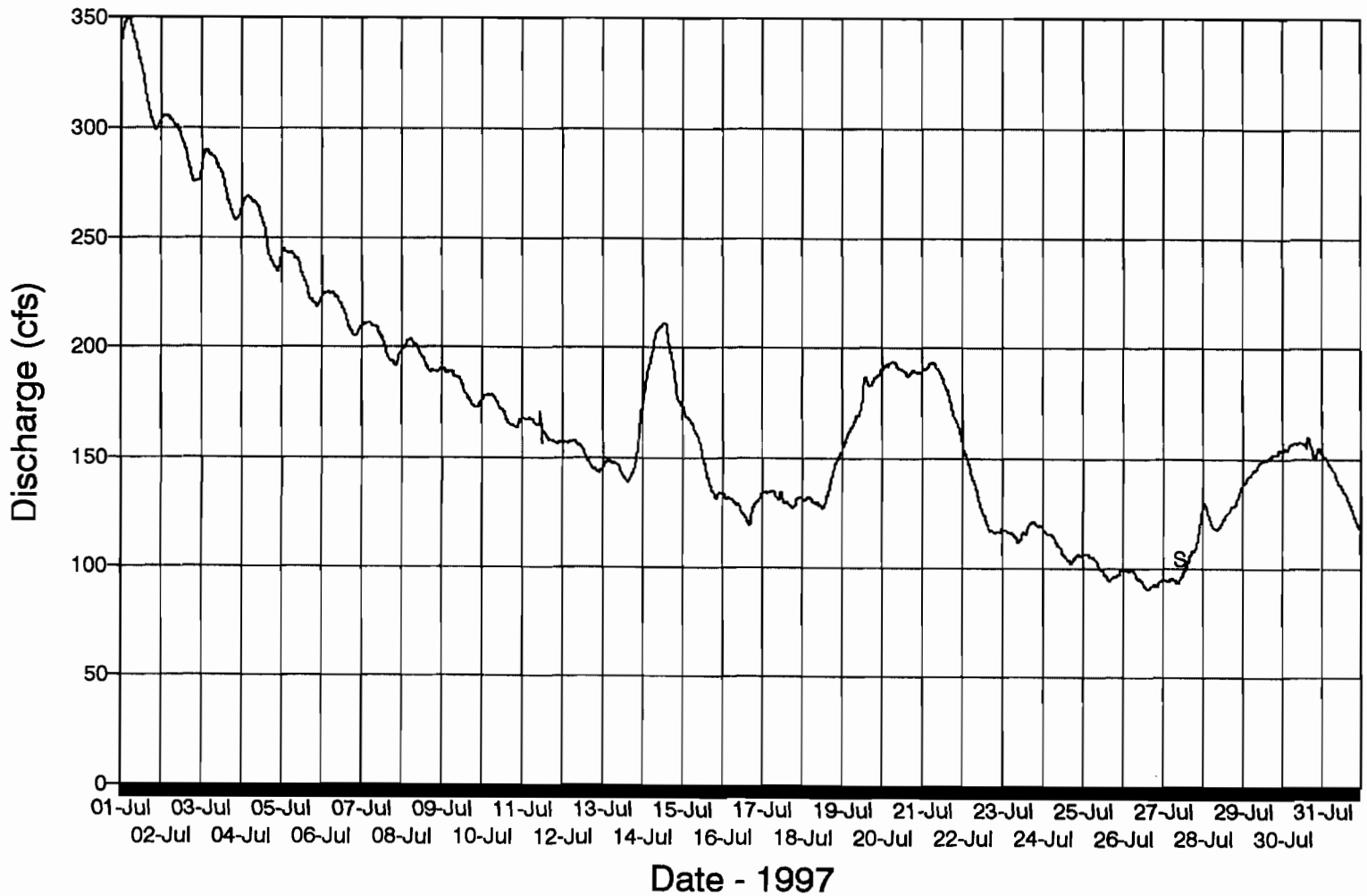
Eagle River Station E-3R
Apr-May 1997



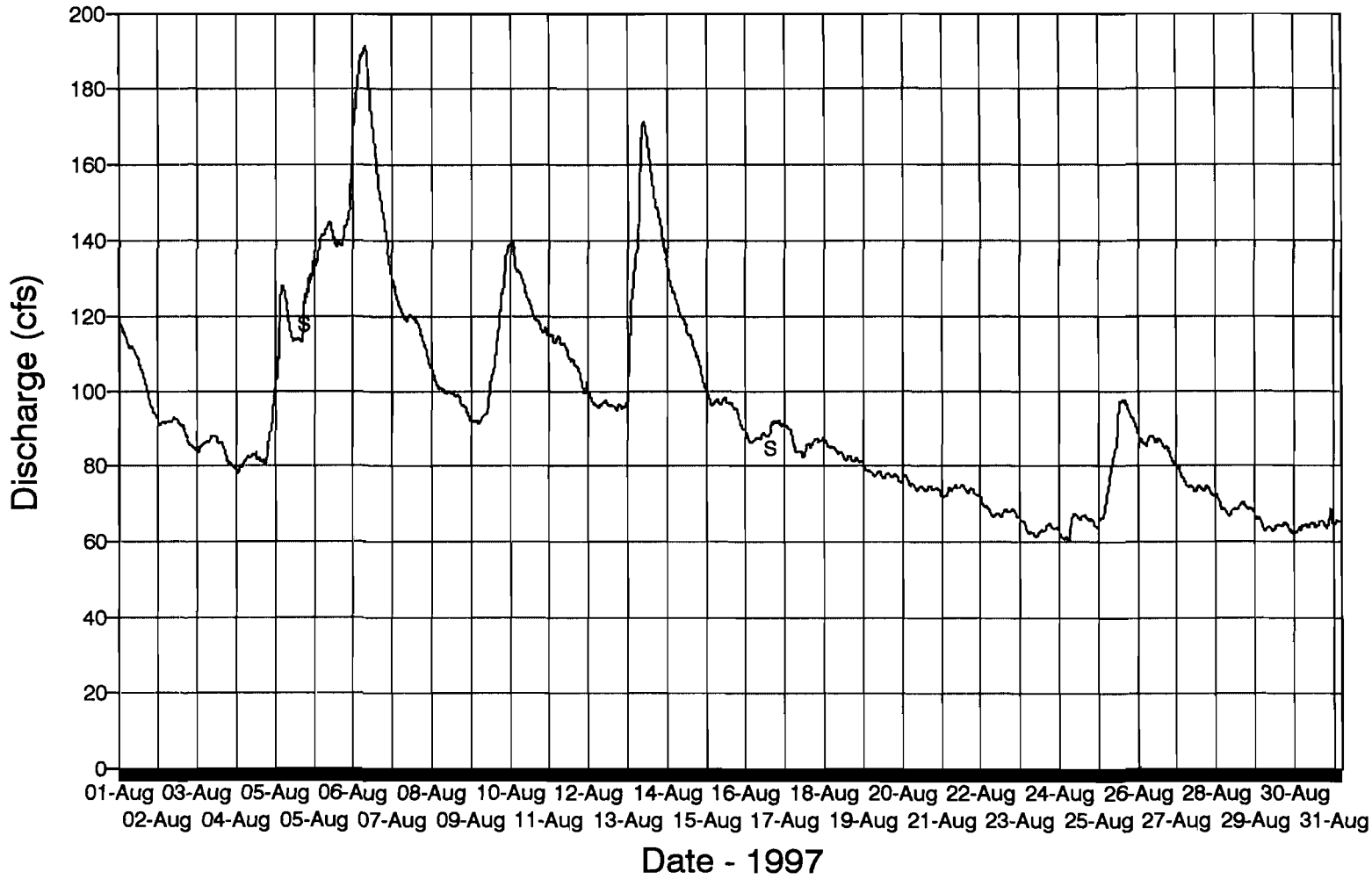
Eagle River Station E-3R
June 1997



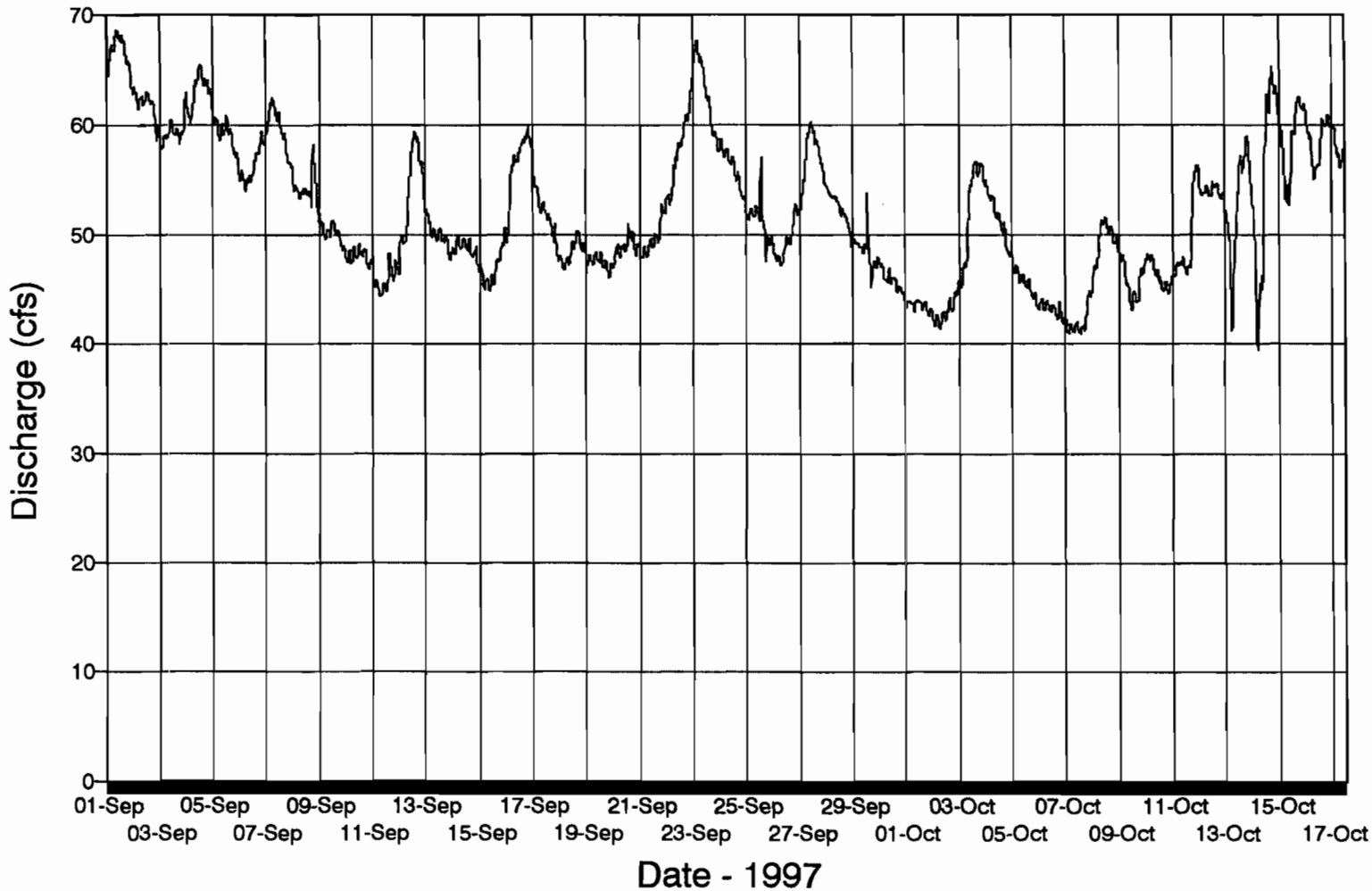
Eagle River Station E-3R
July 1997



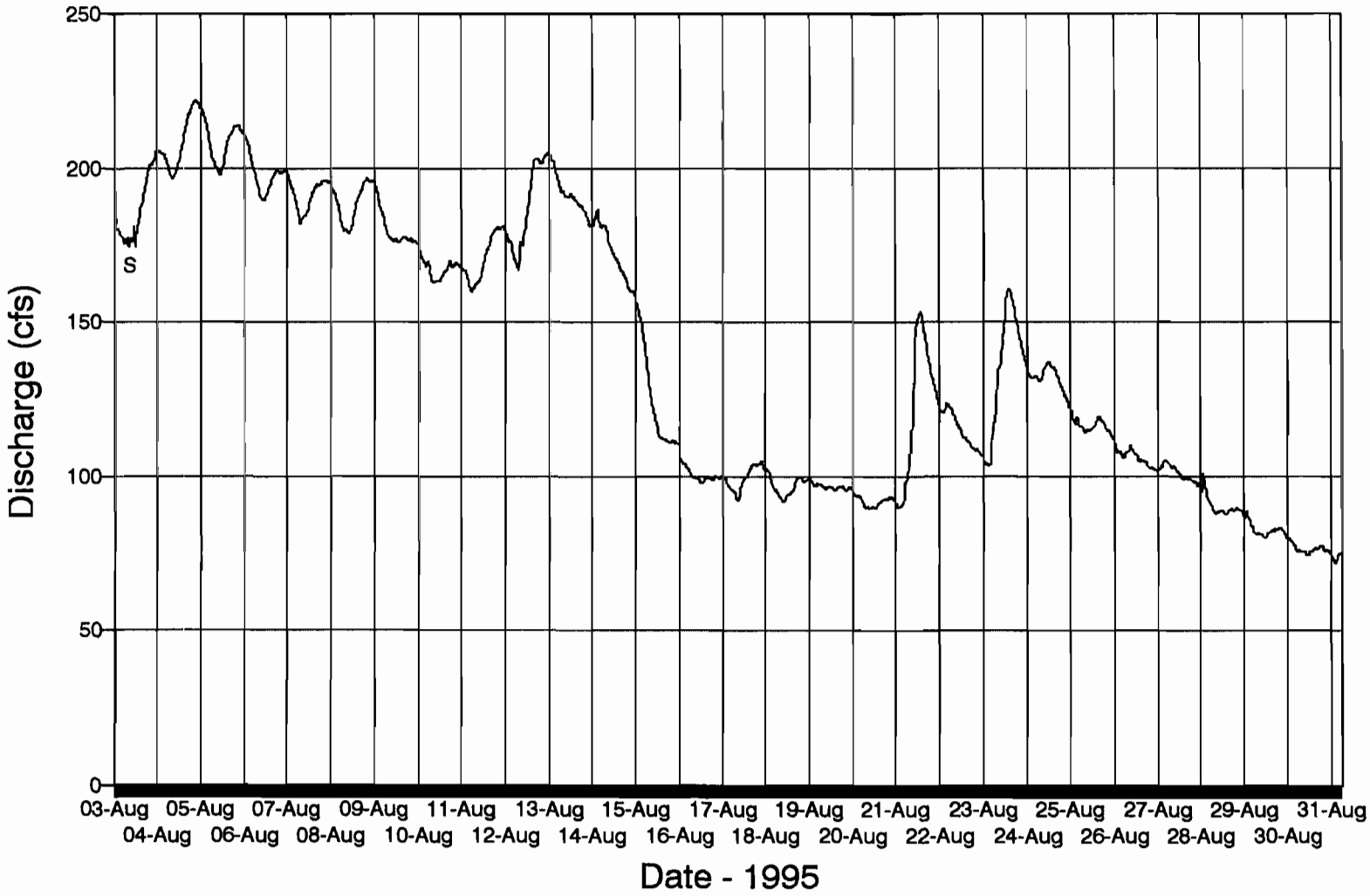
Eagle River Station E-3R
August 1997



Eagle River Station E-3R
Sep-Oct 1997



Eagle River E-5R
August 1995



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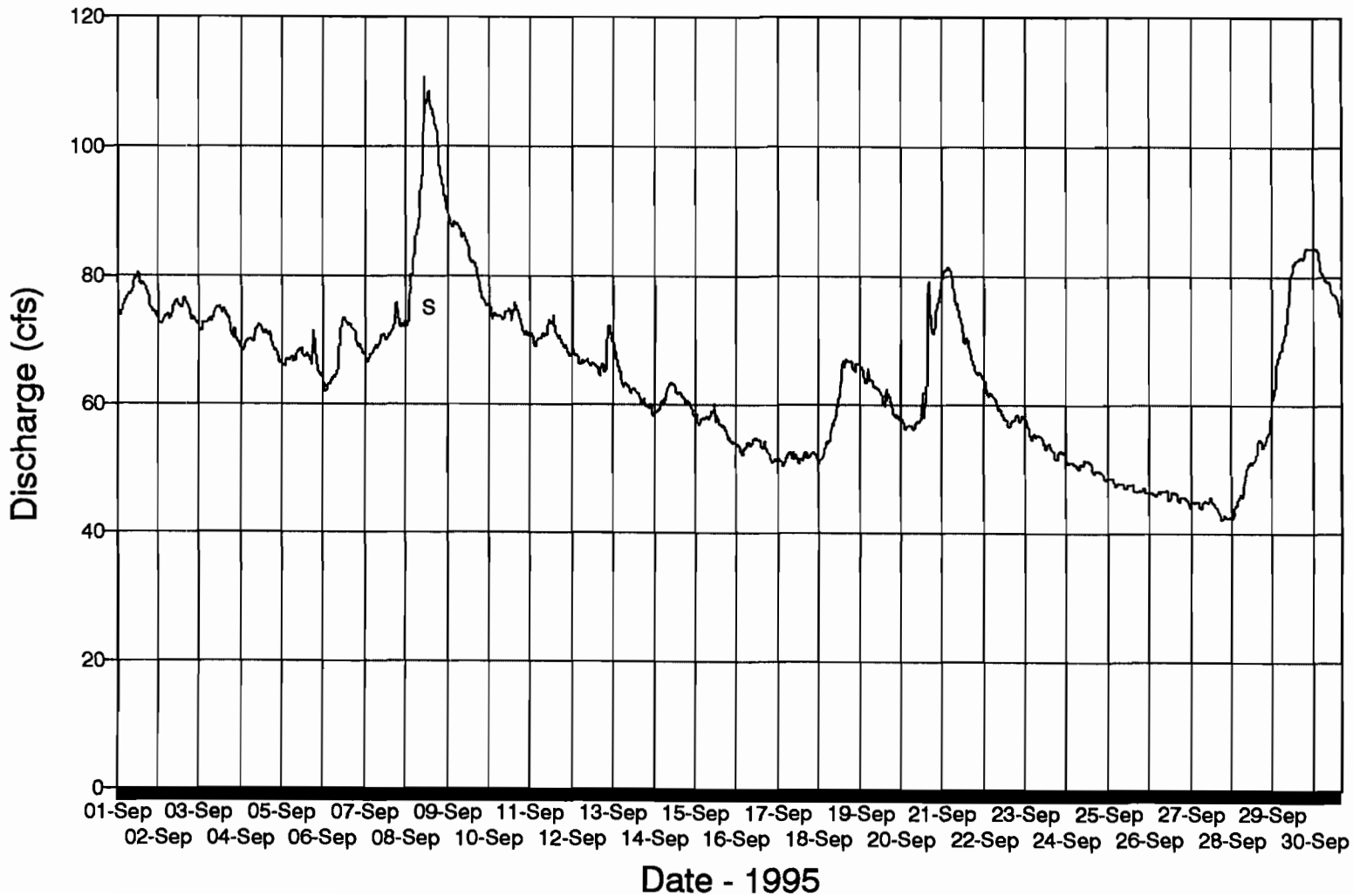

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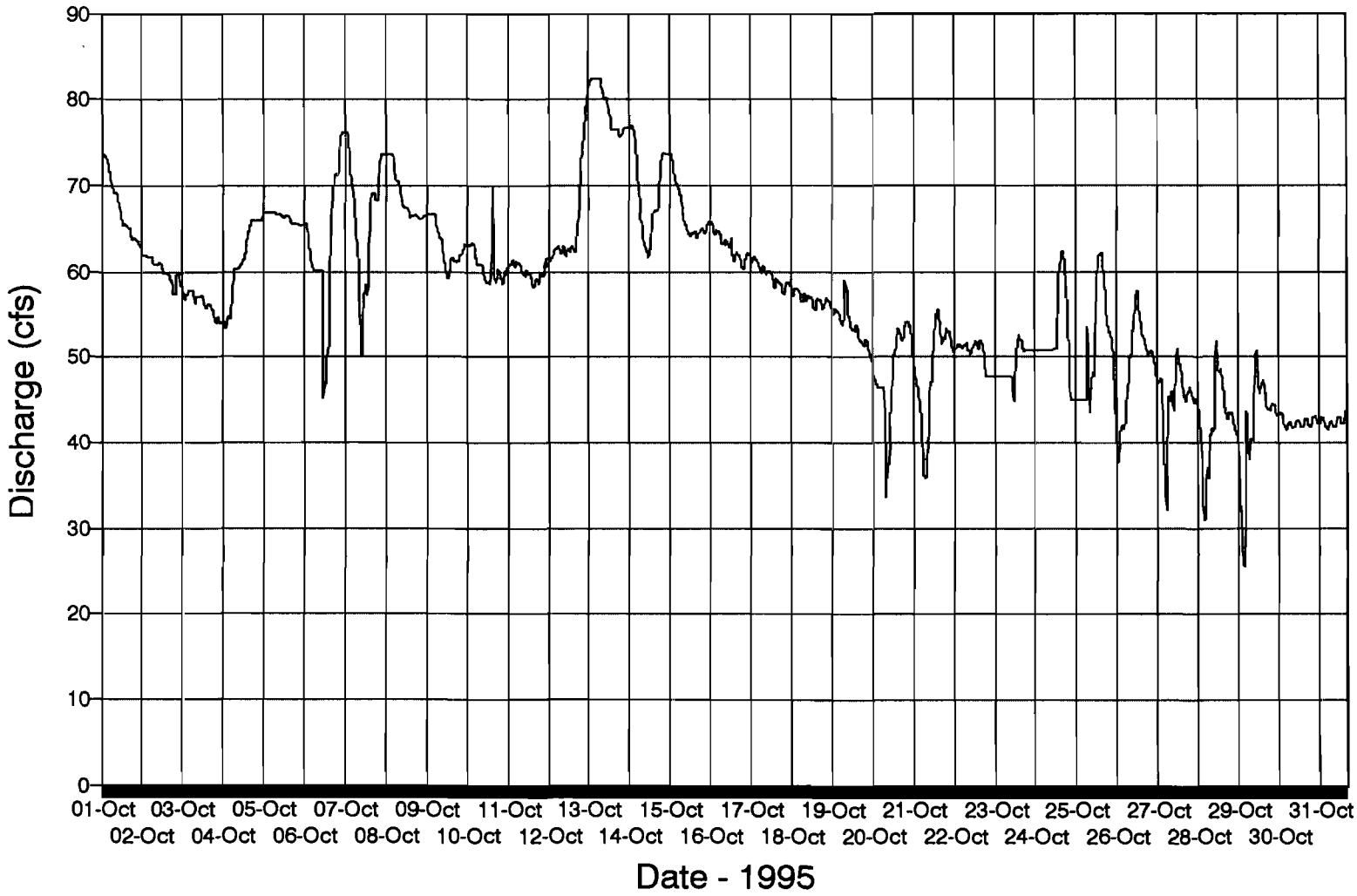

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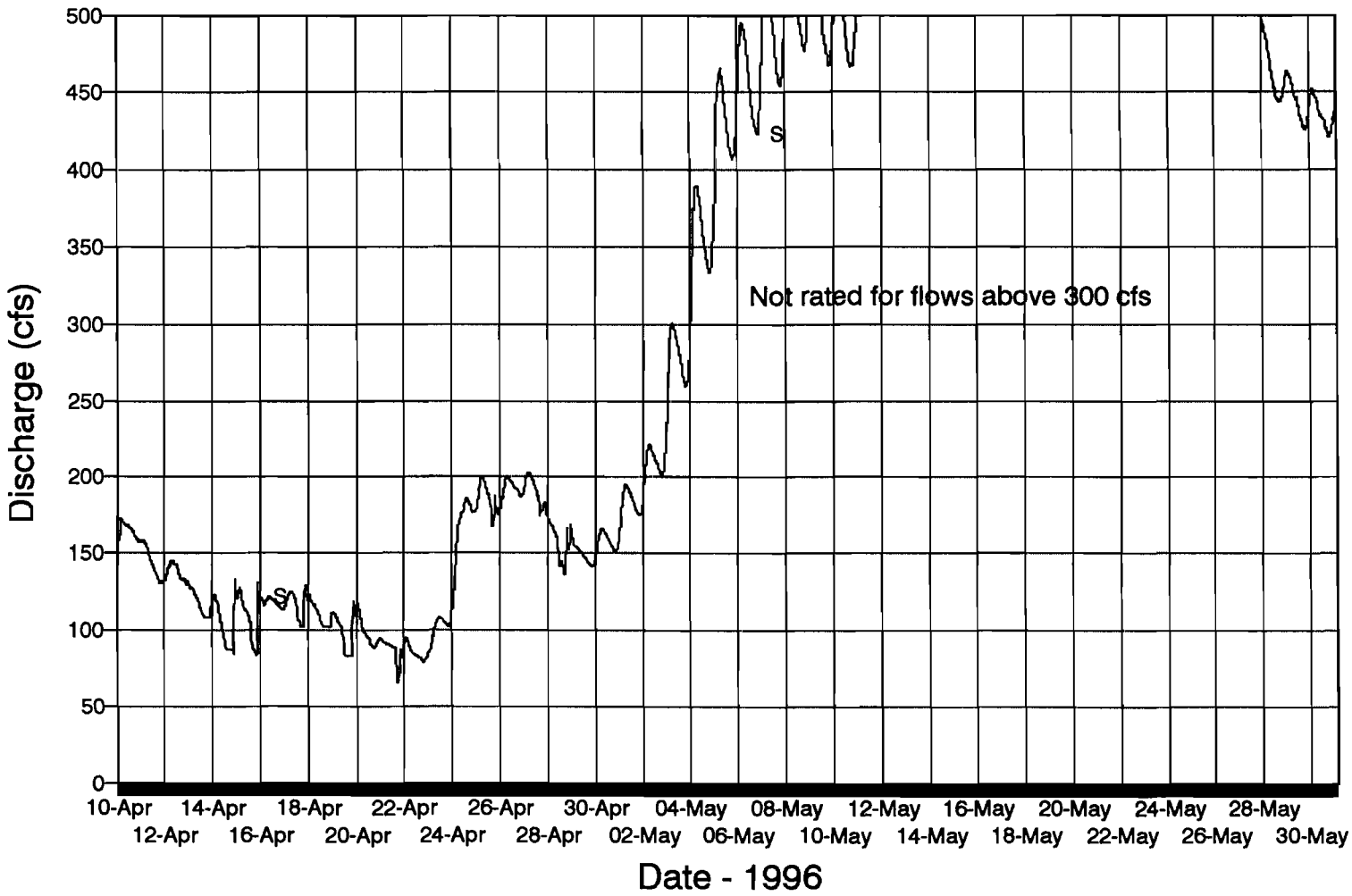

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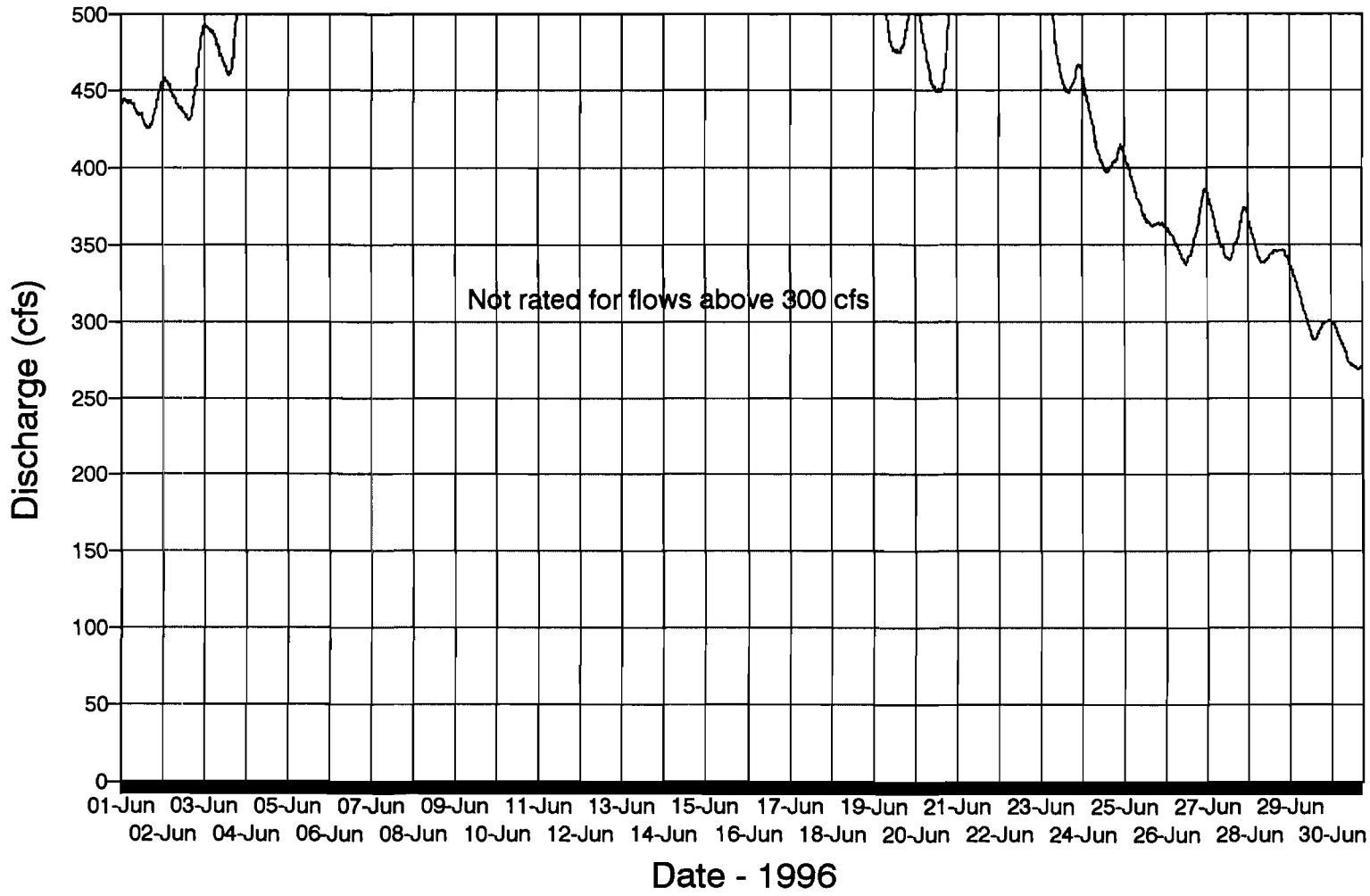

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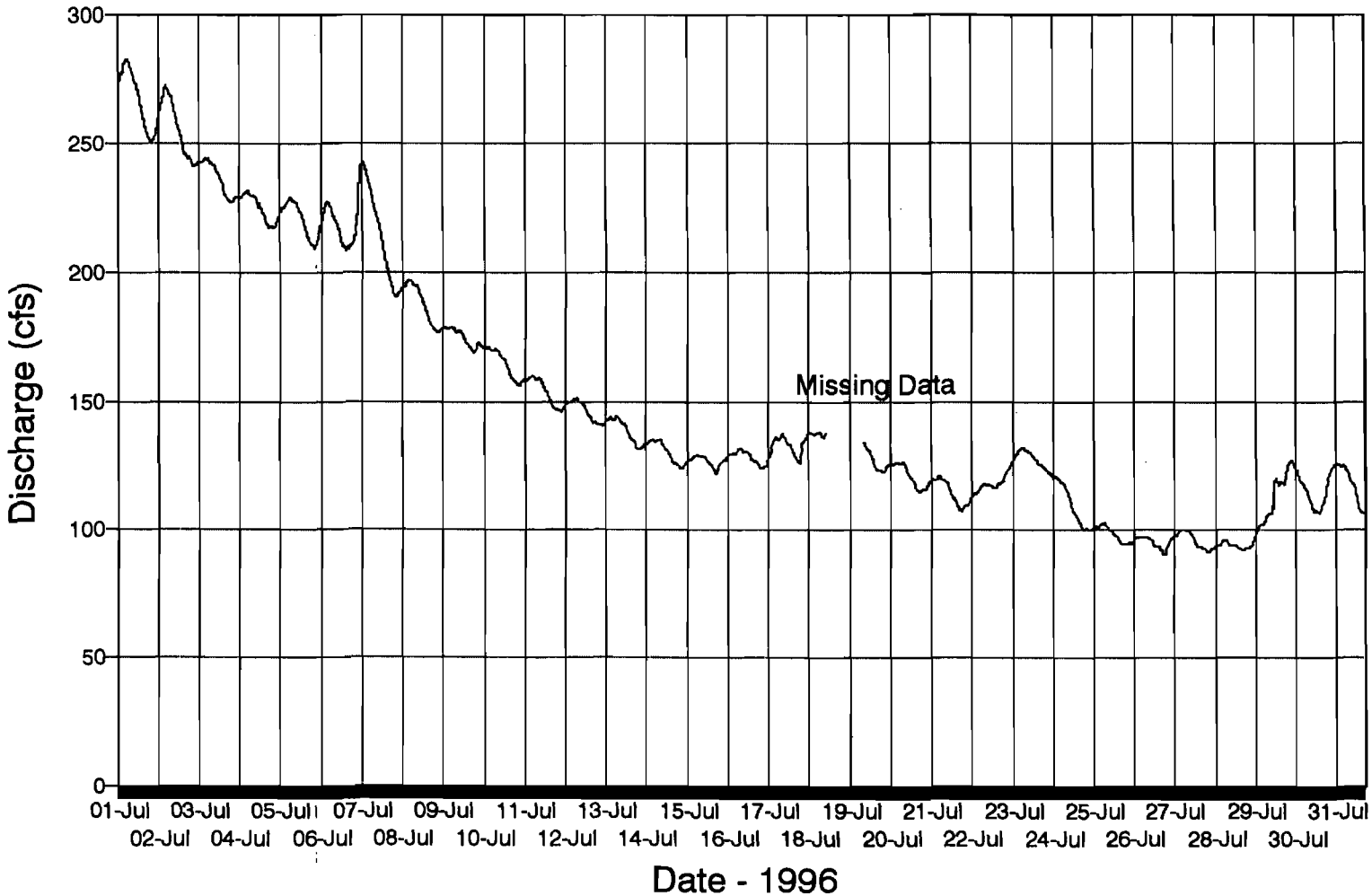

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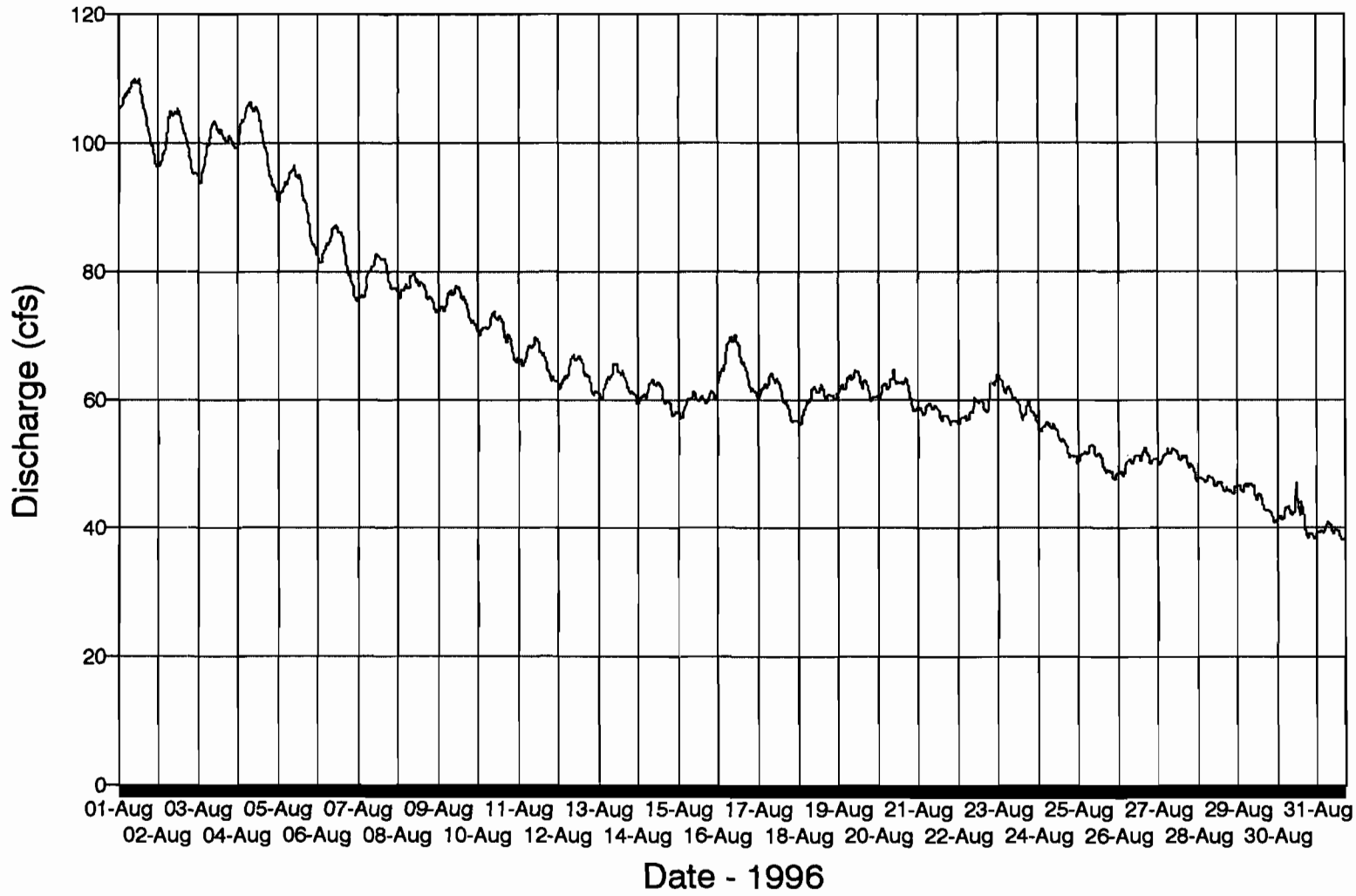
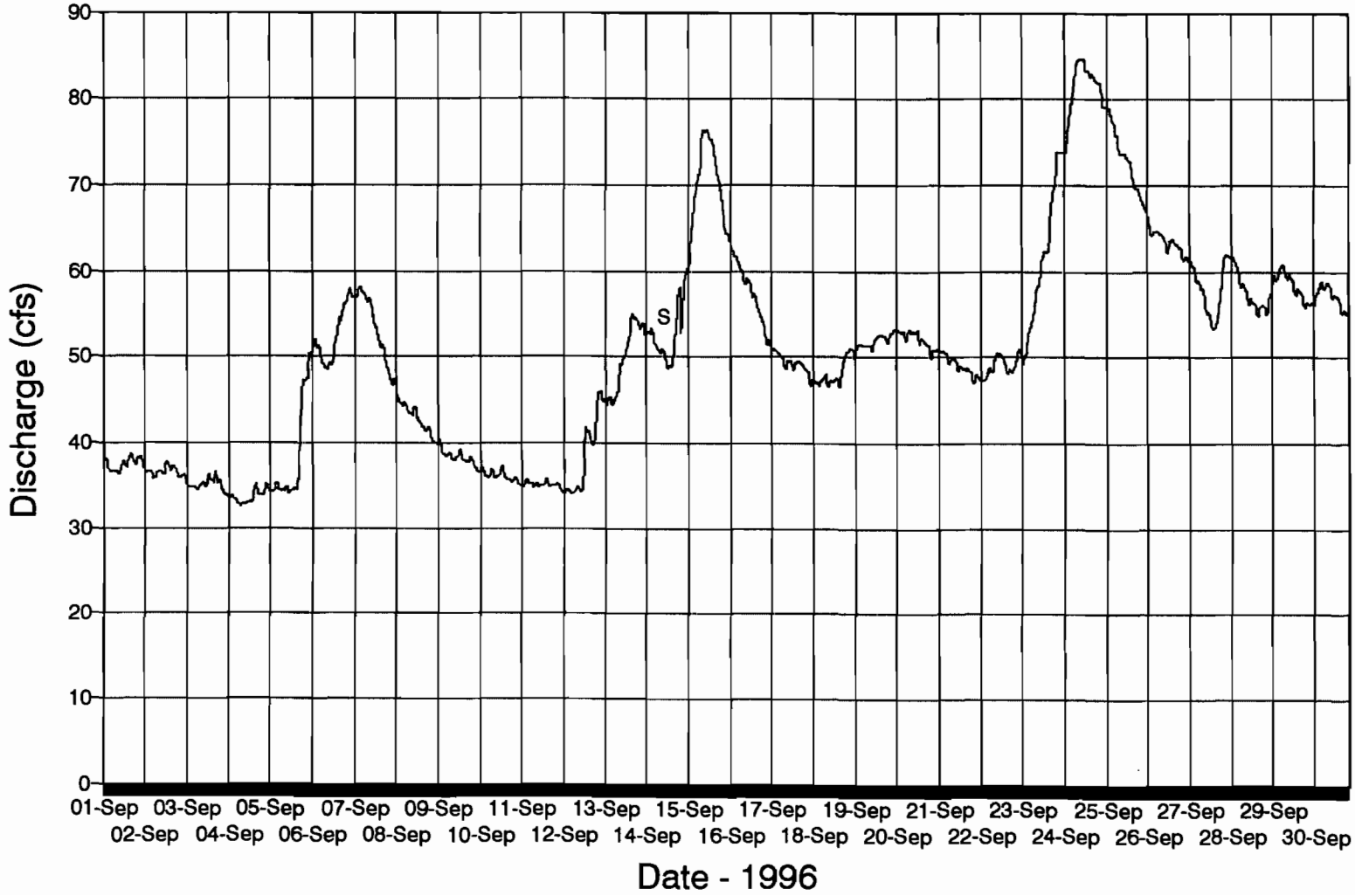
August 1996



Eagle River Station E-5R
September 1996



Eagle River Station E-5R
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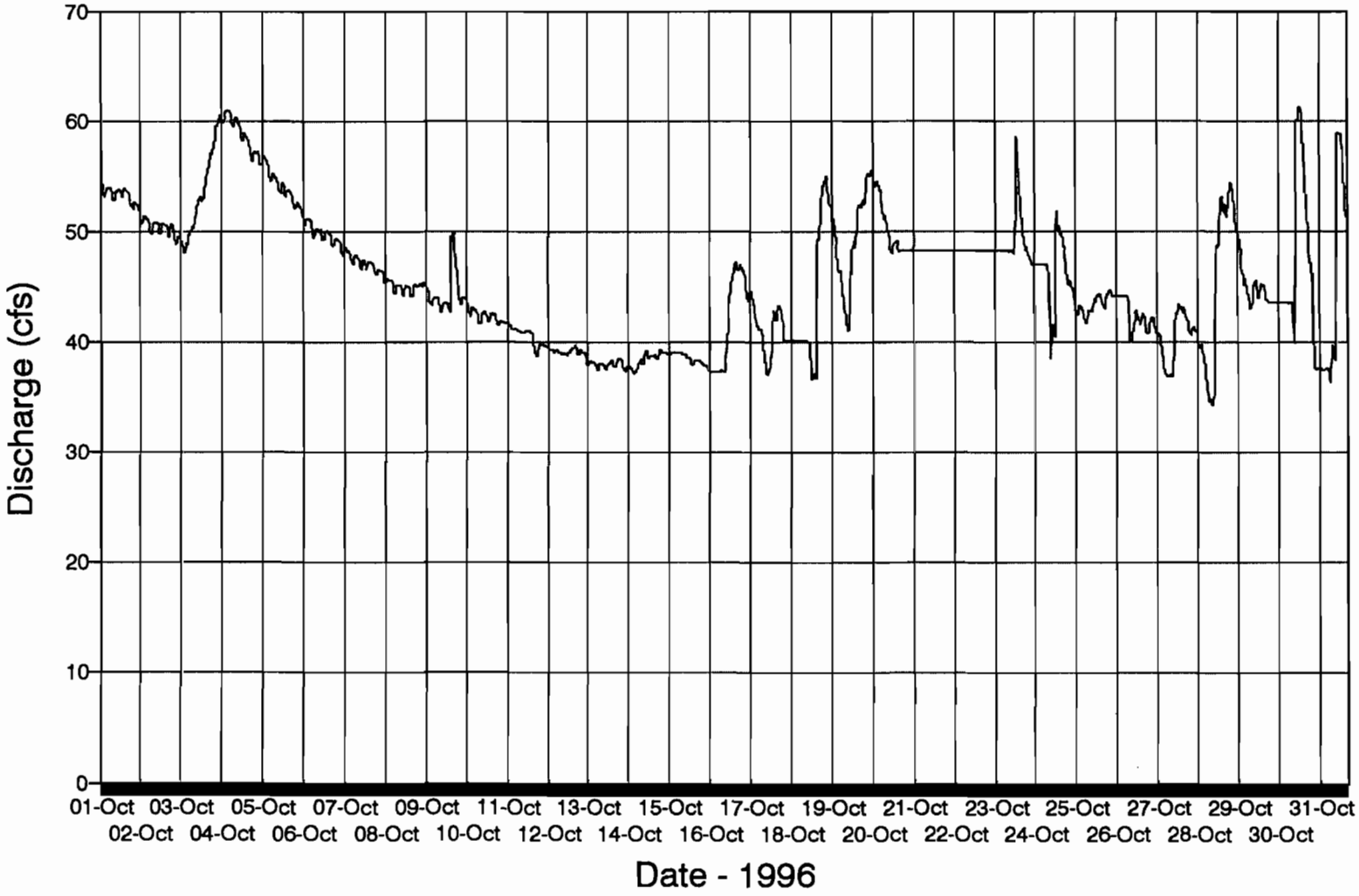

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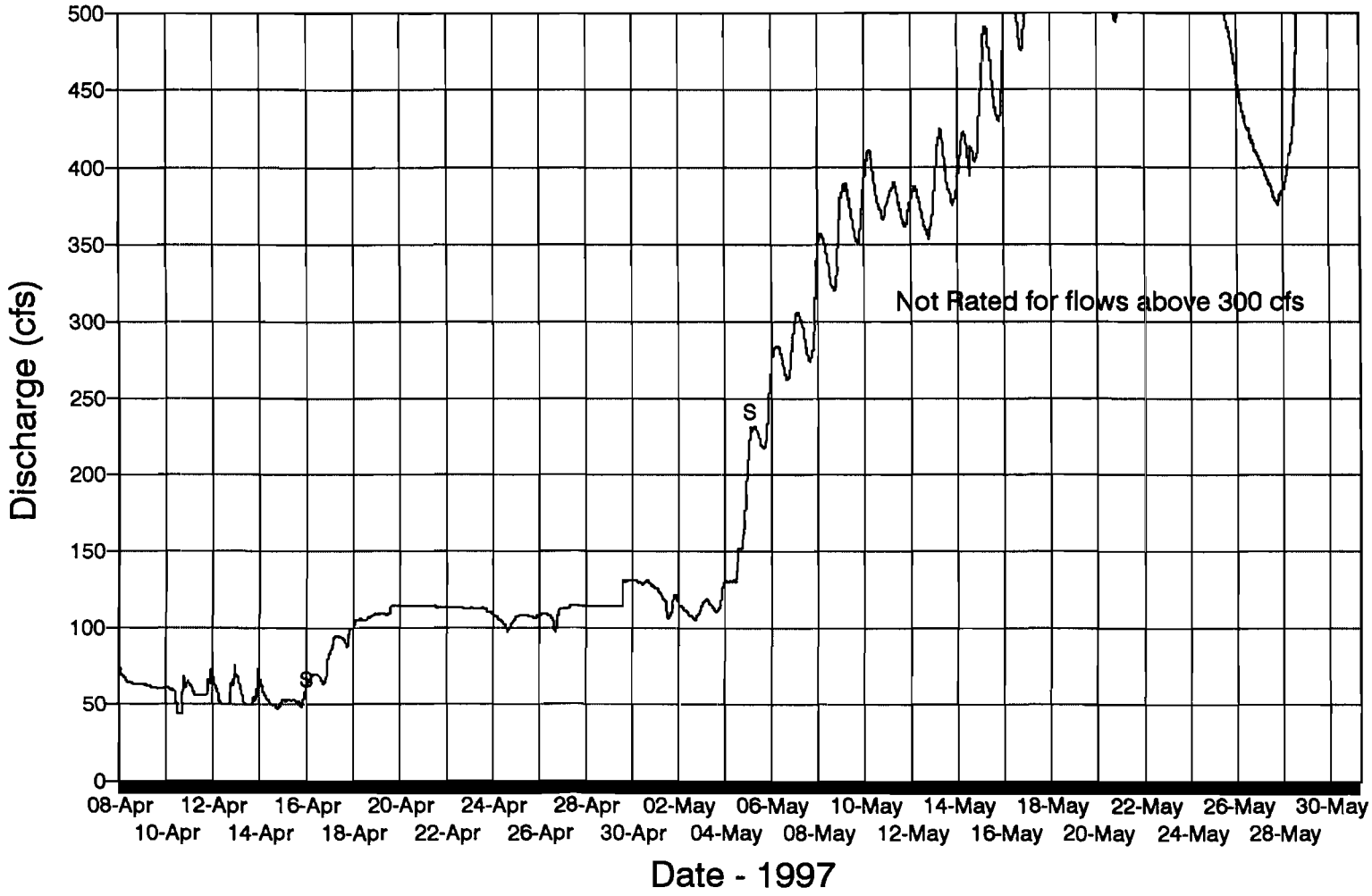
Apr-May 1997



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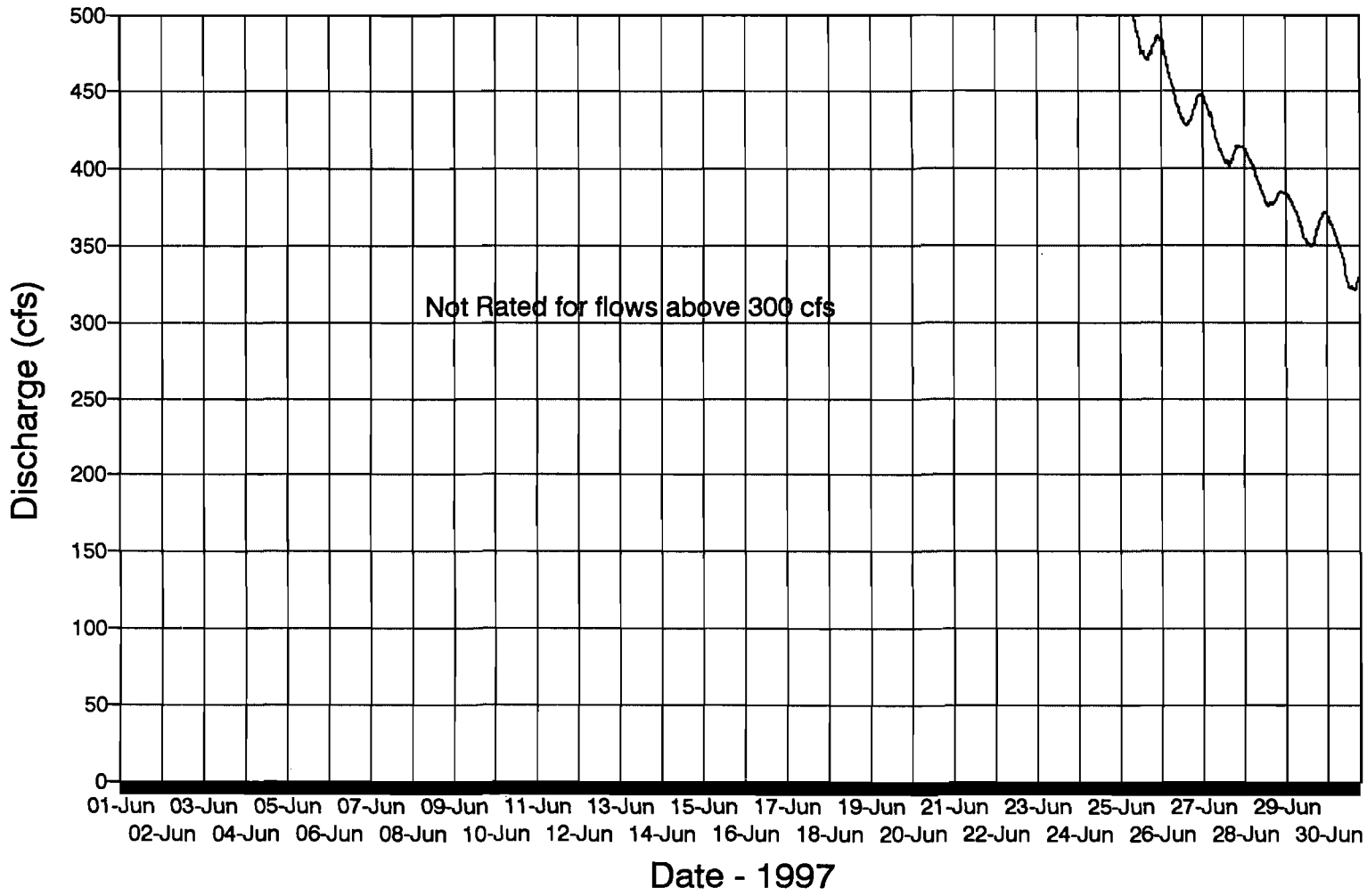

Eagle River Station E-5R
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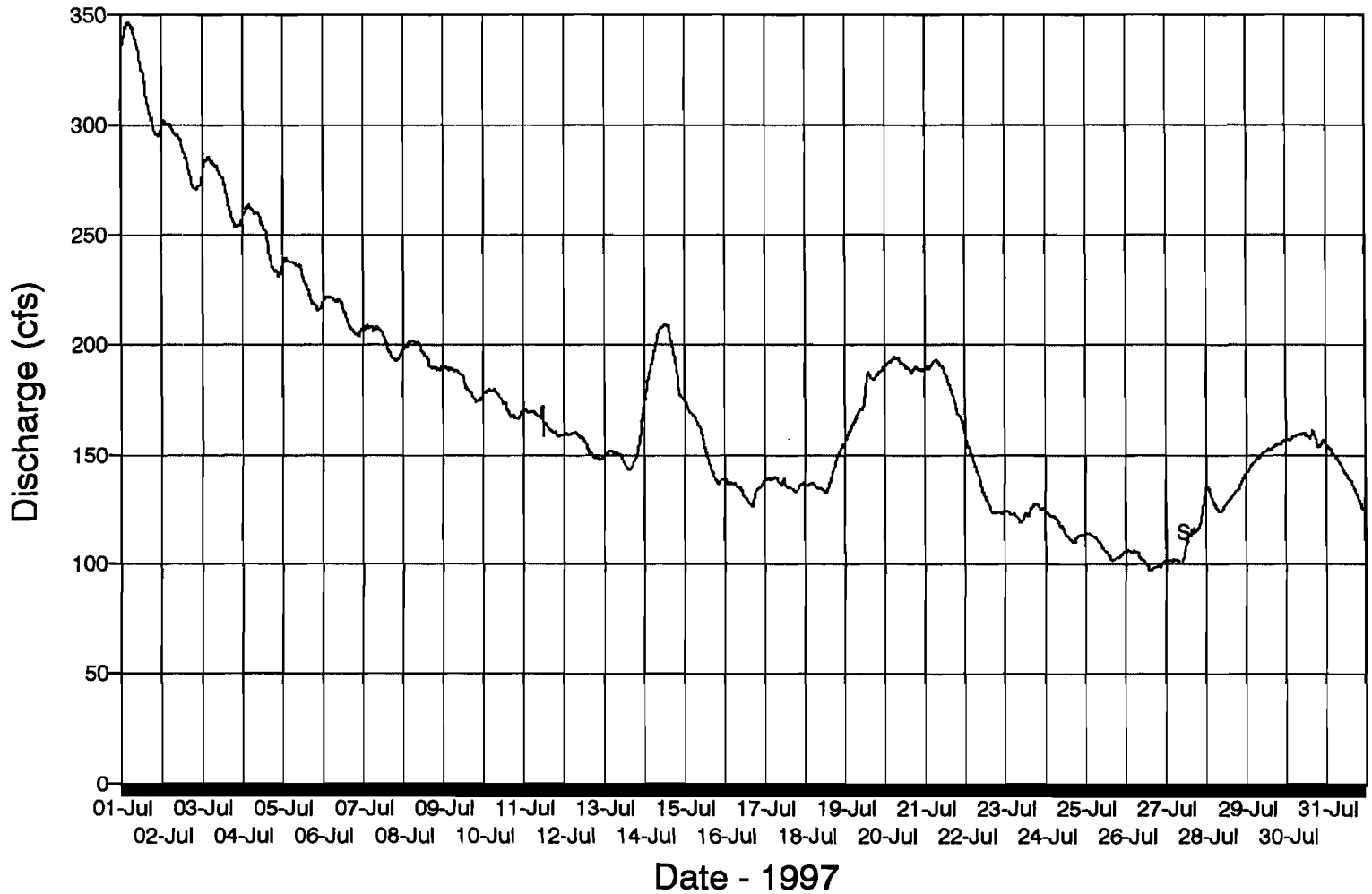

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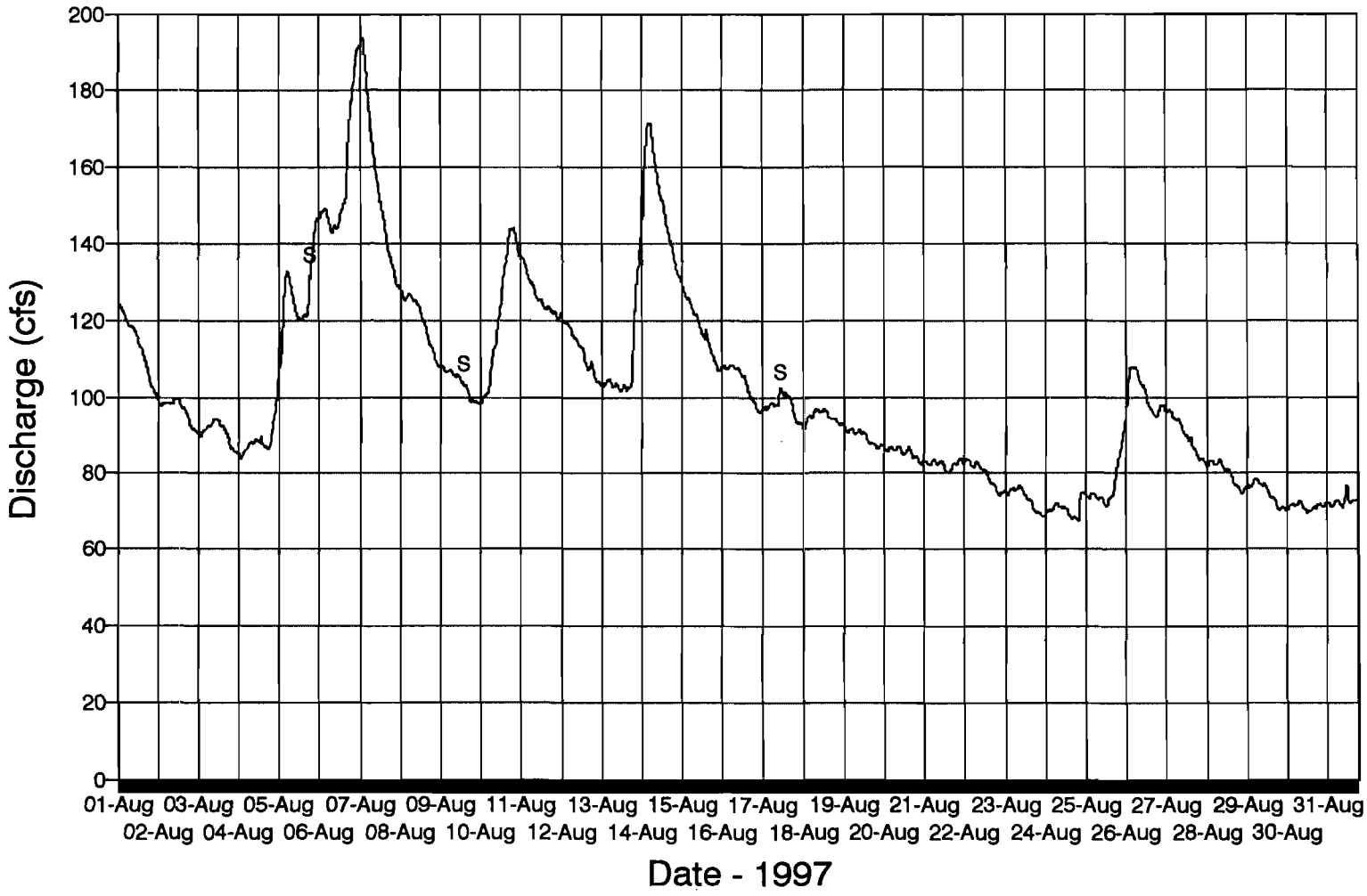
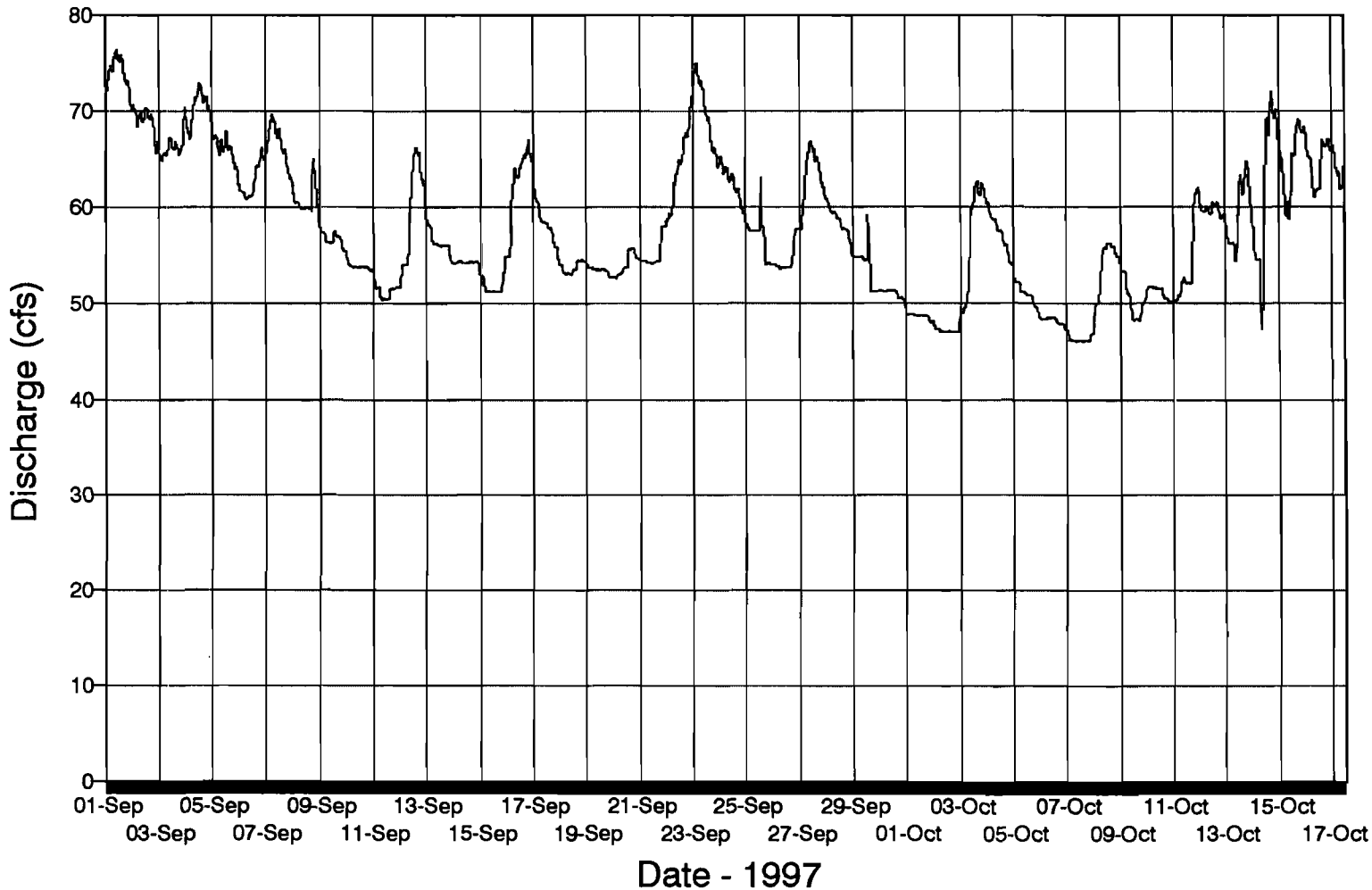
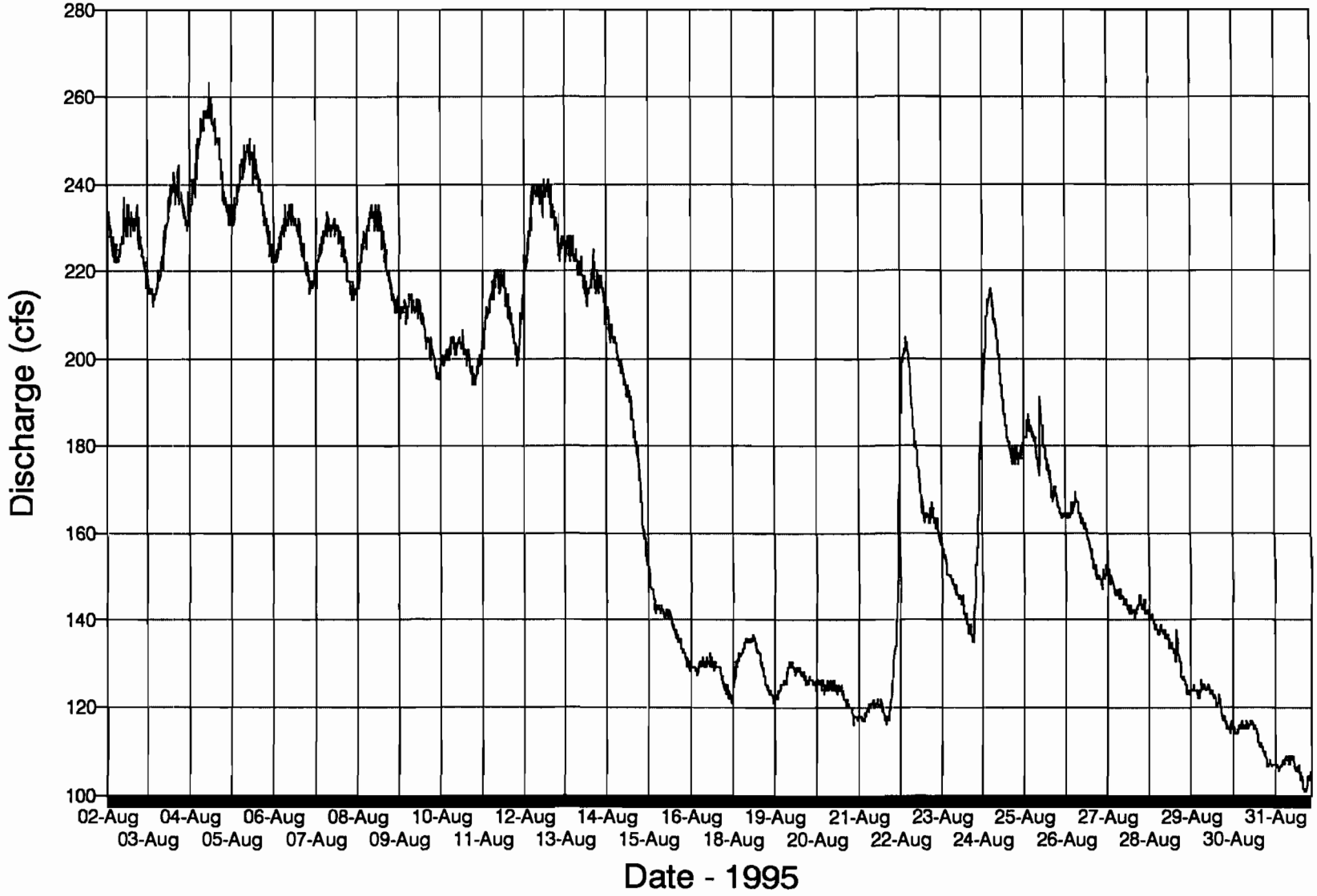


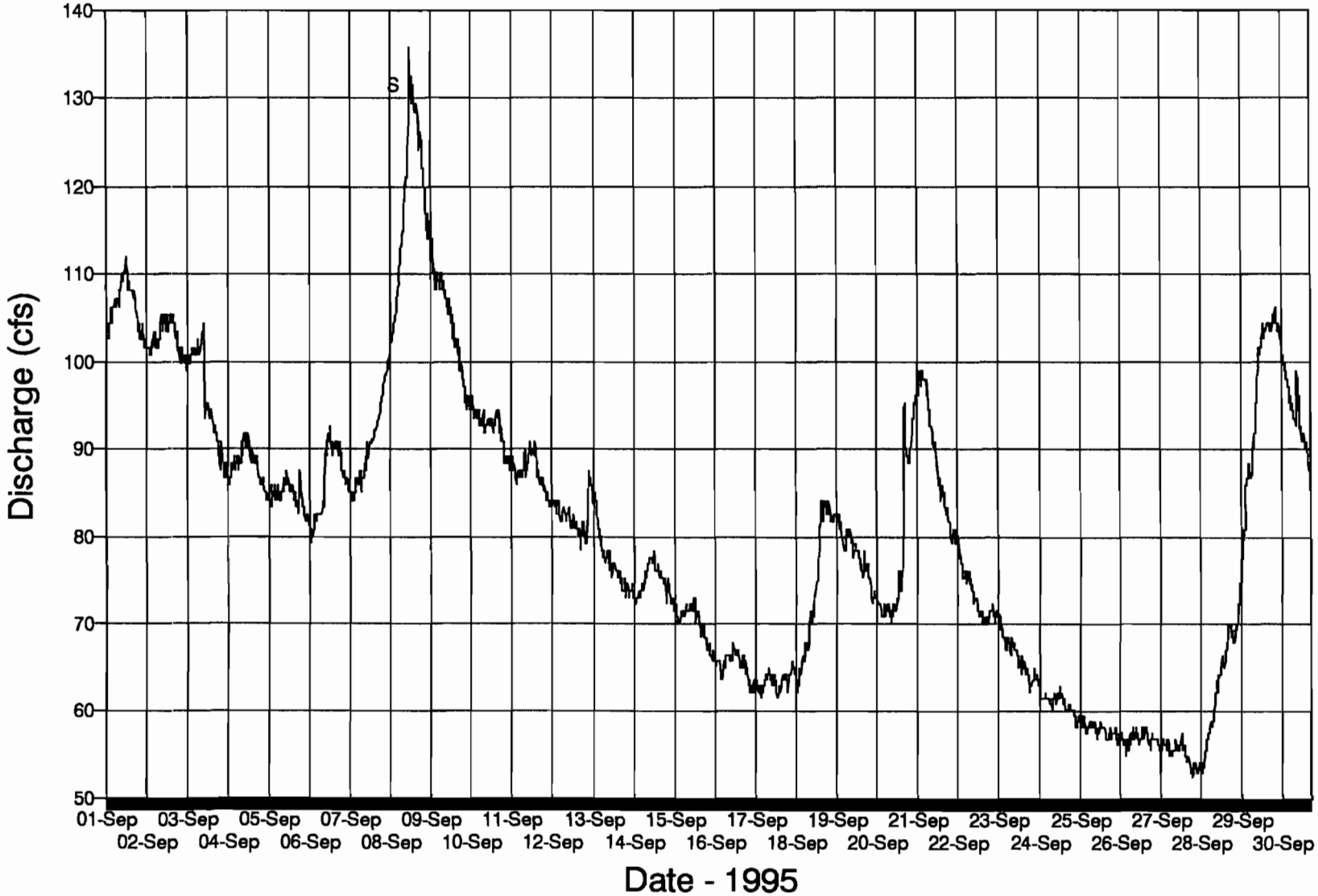
Eagle River Station E-5R
Sep-Oct 1997



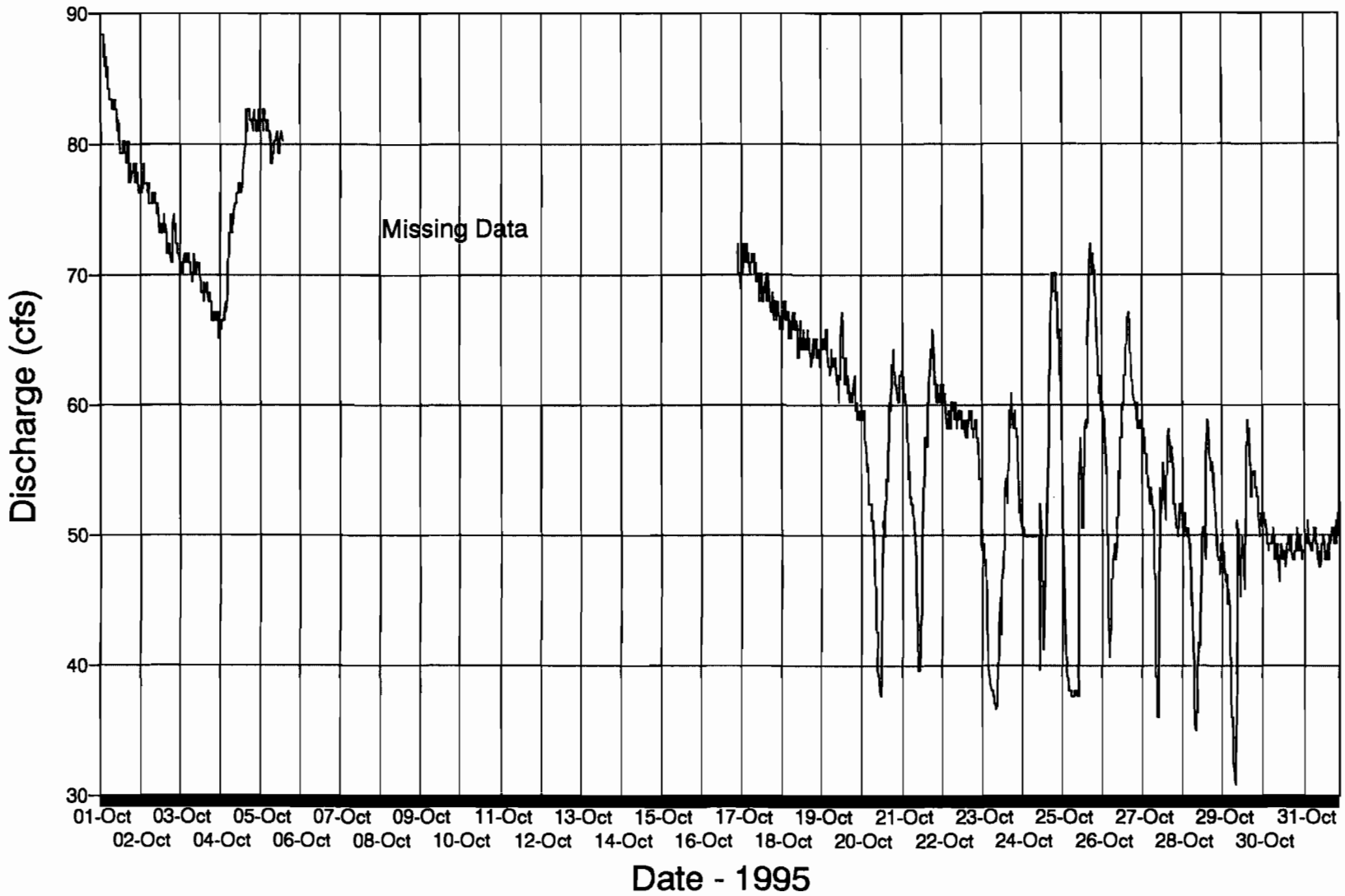
Eagle River E-11R
August 1995



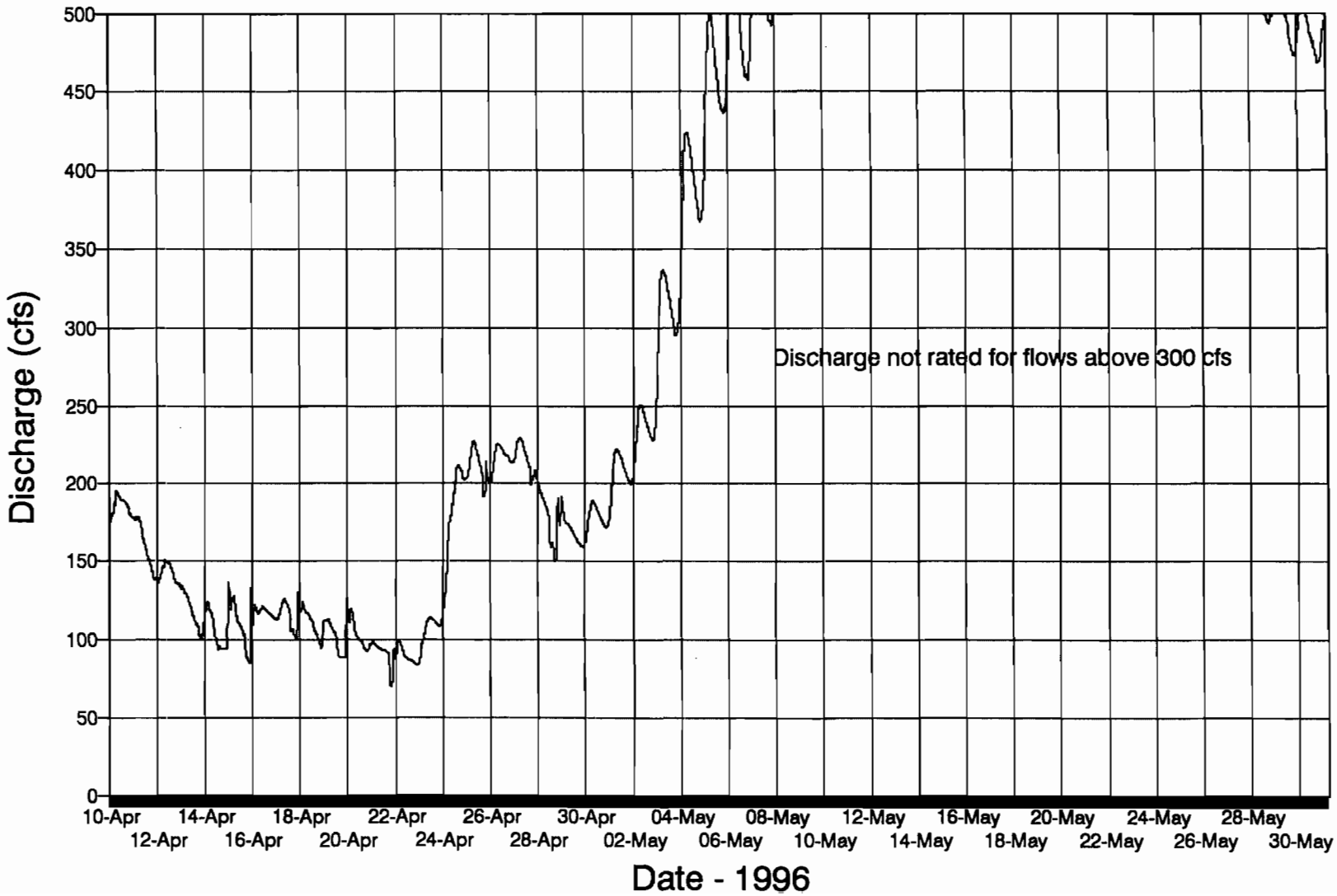
Eagle River E-11R
September 1995



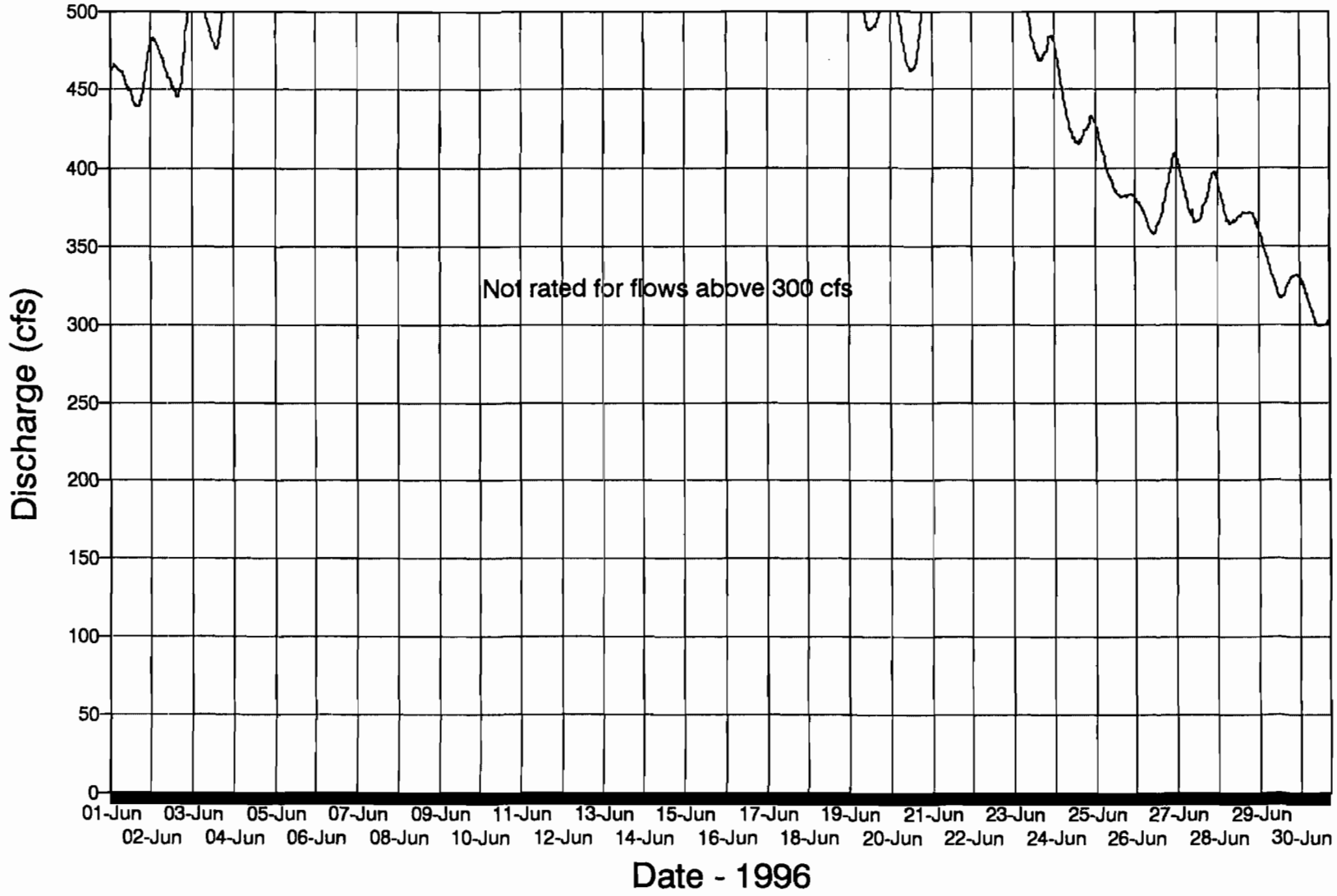
Eagle River E-11R
October 1995



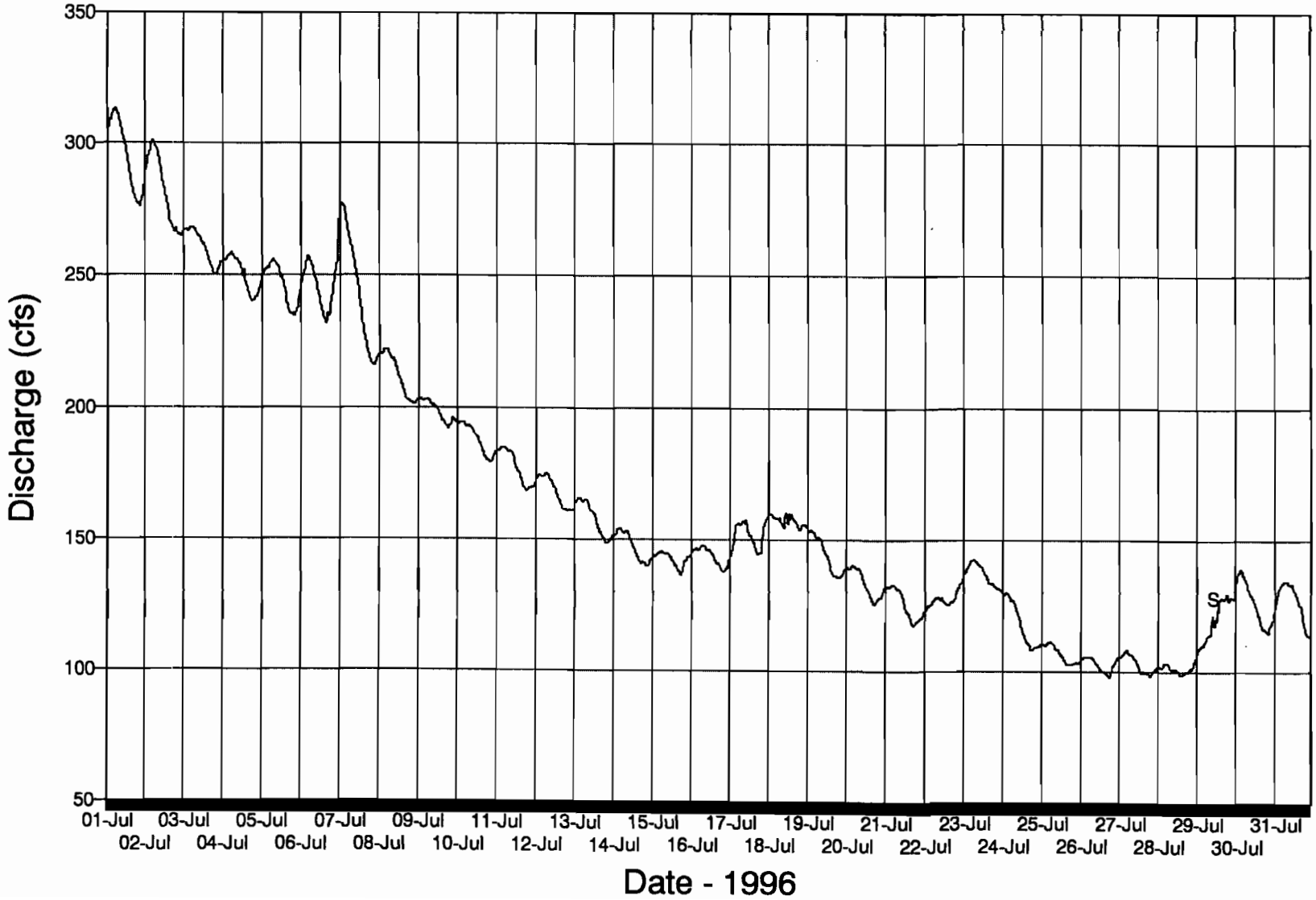
Eagle River E-11R
April-May 1996



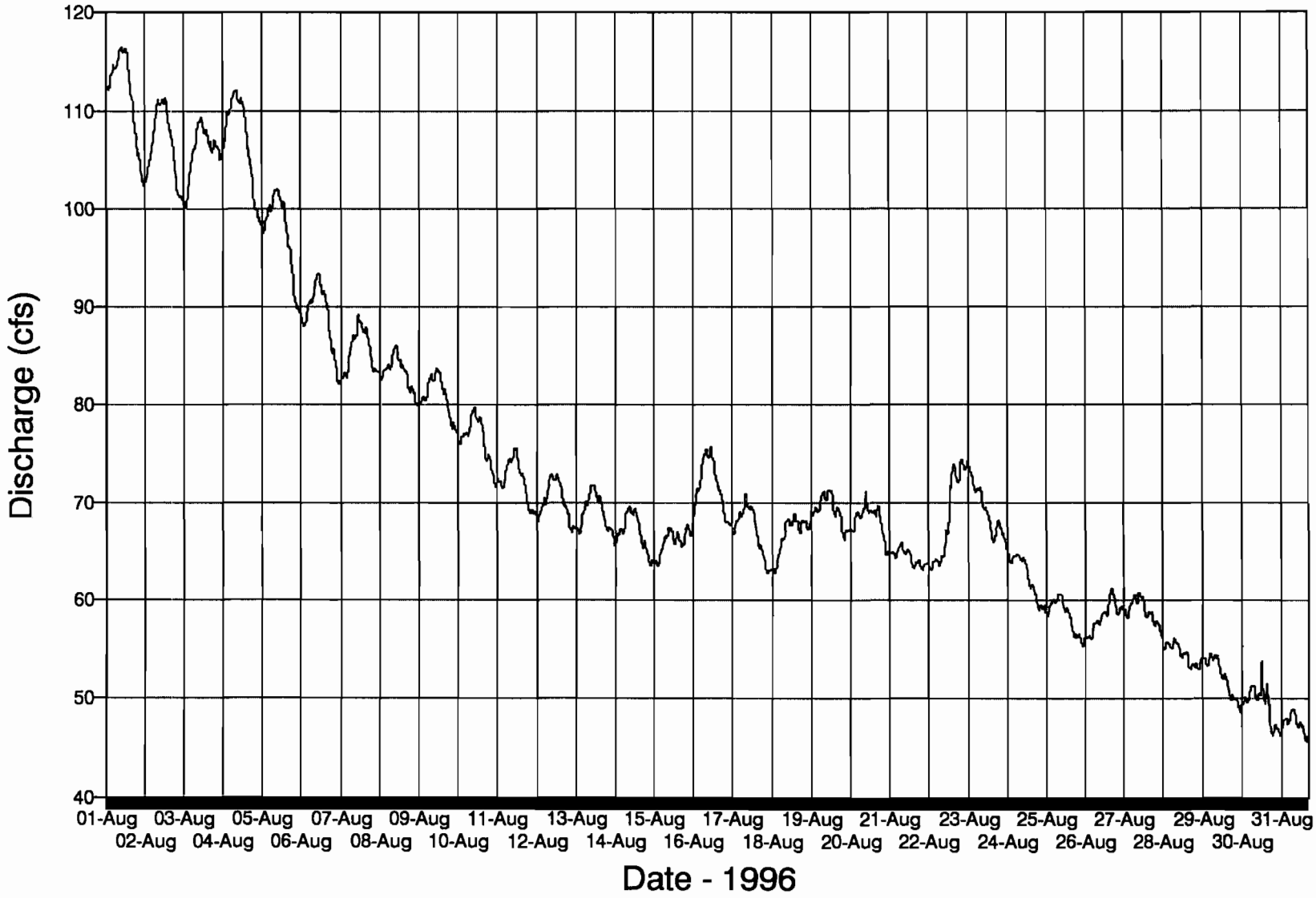
Eagle River E-11R
June 1996



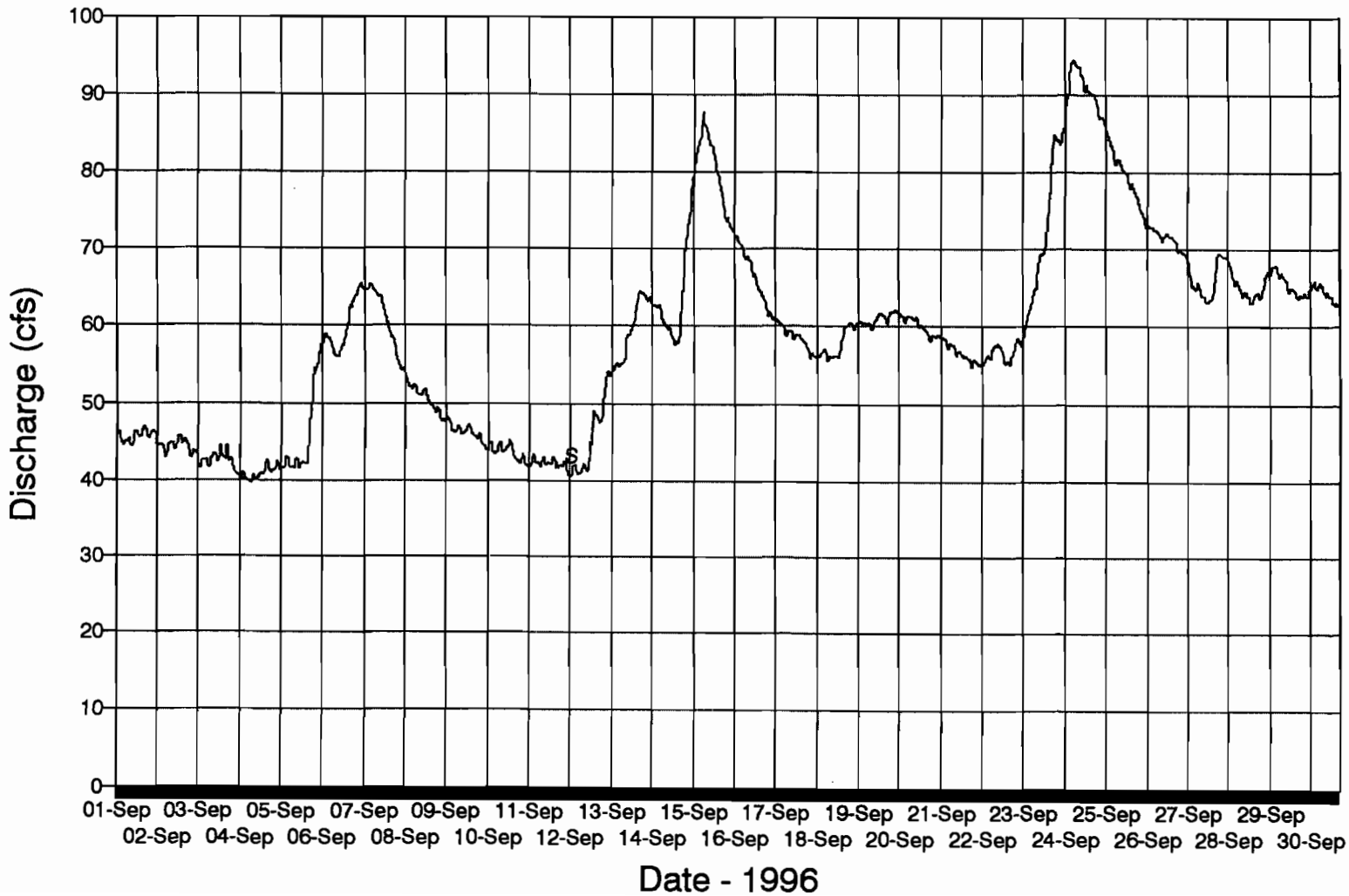
Eagle River E-11R
July 1996



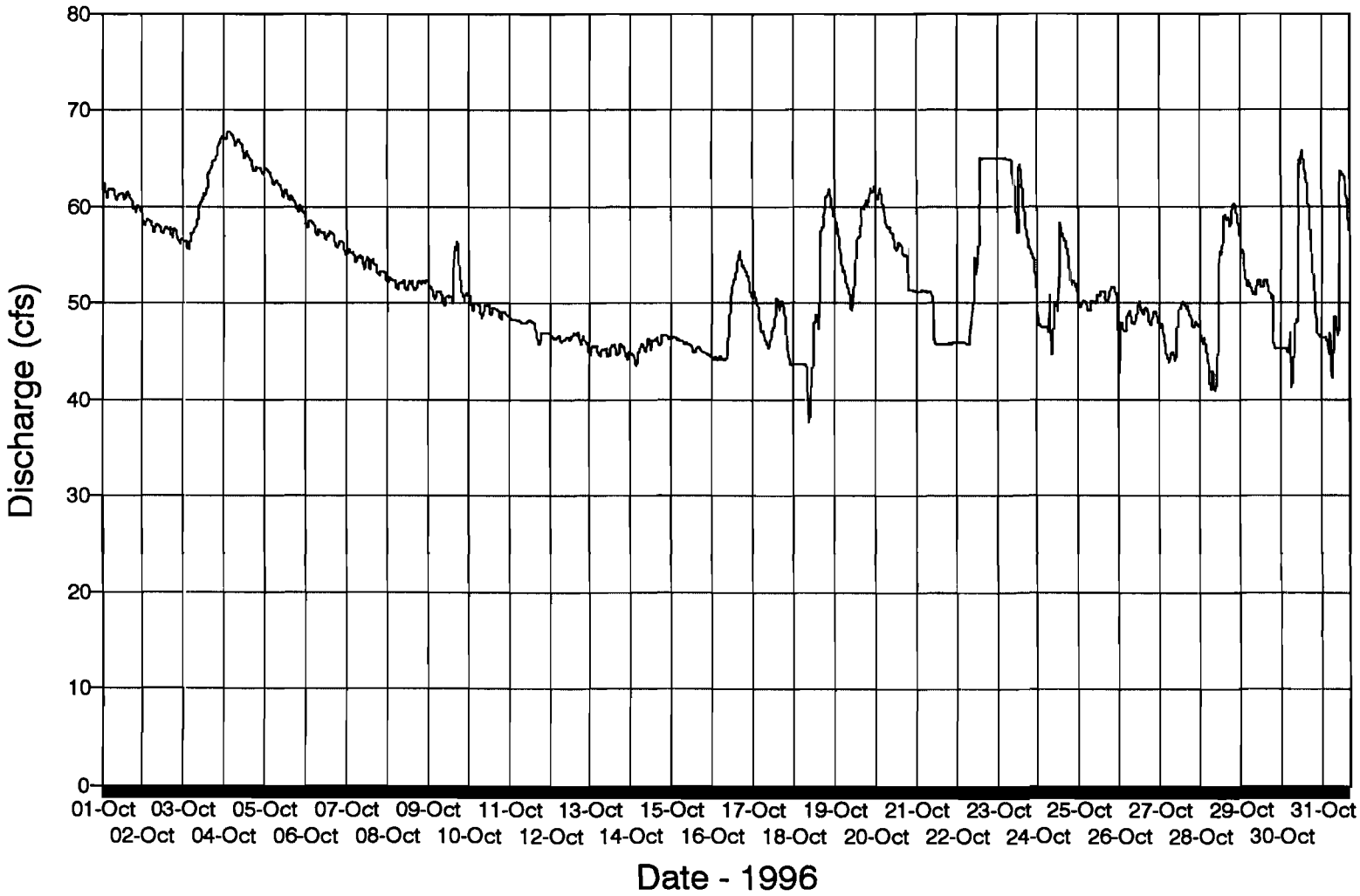
Eagle River E-11R
August 1996



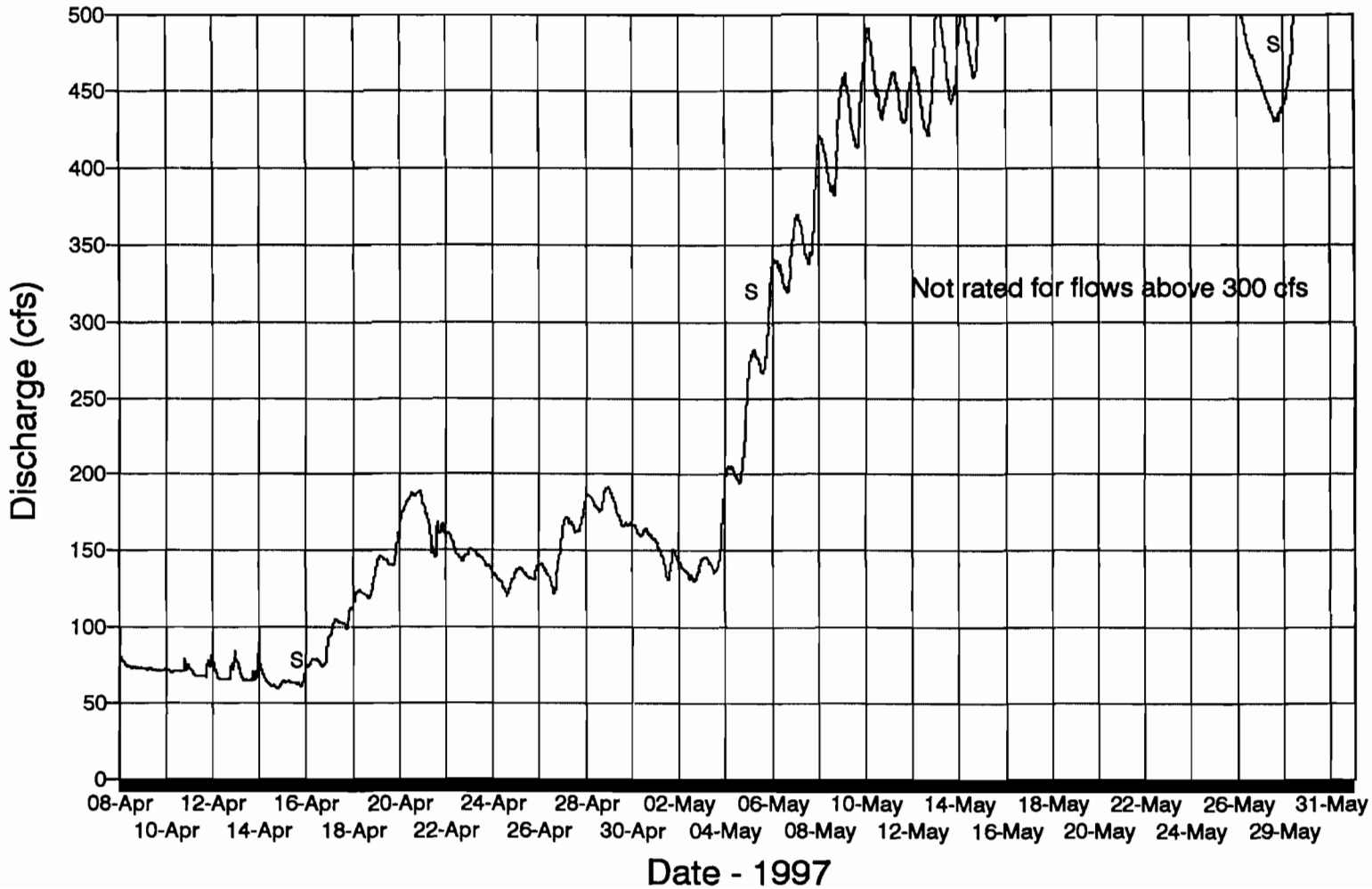
Eagle River Station E-11R
September 1996



Eagle River Station E-11R
October 1996



Eagle River Station E-11R
Apr-May 1997



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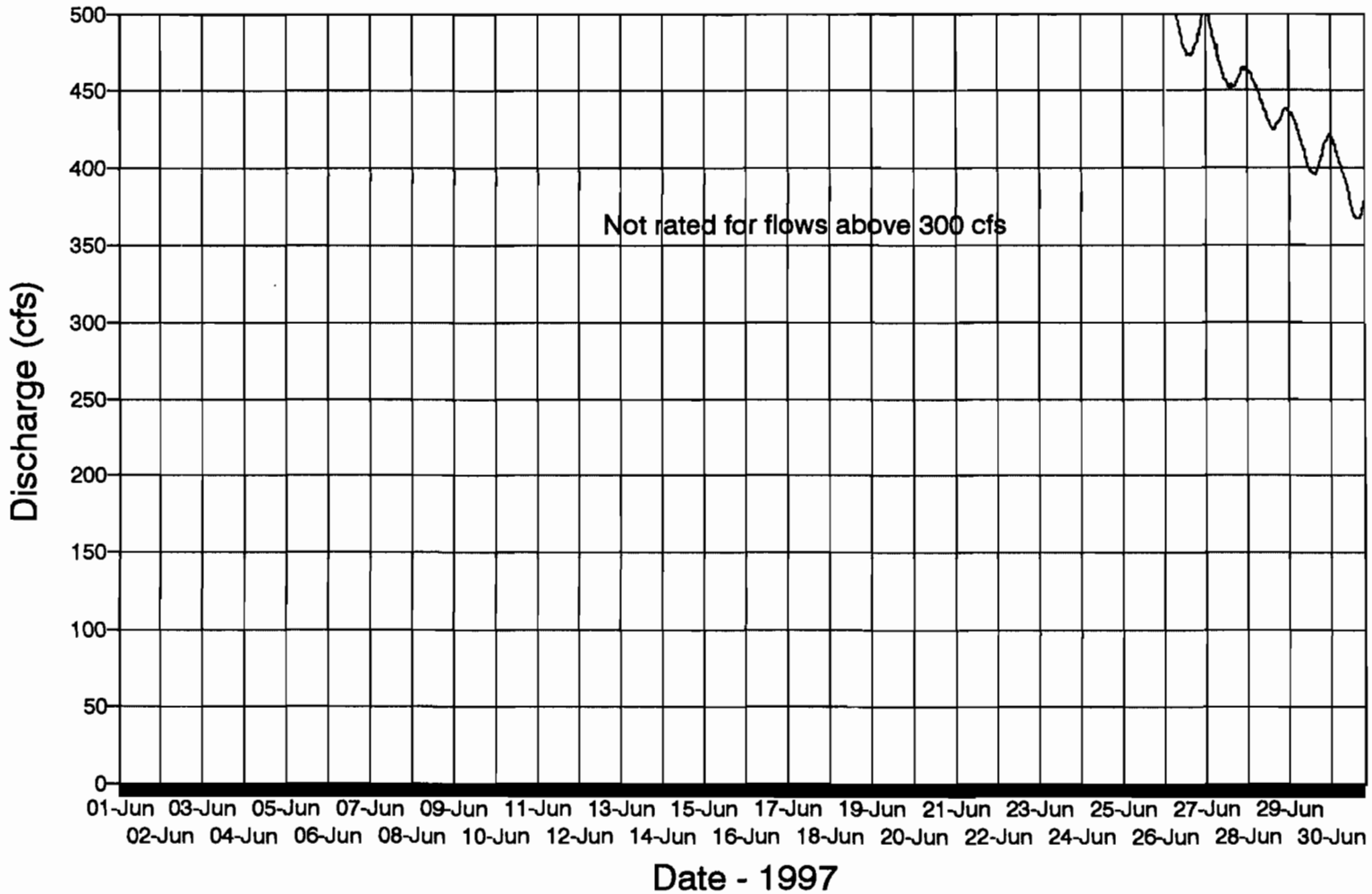

Eagle River Station E-11R
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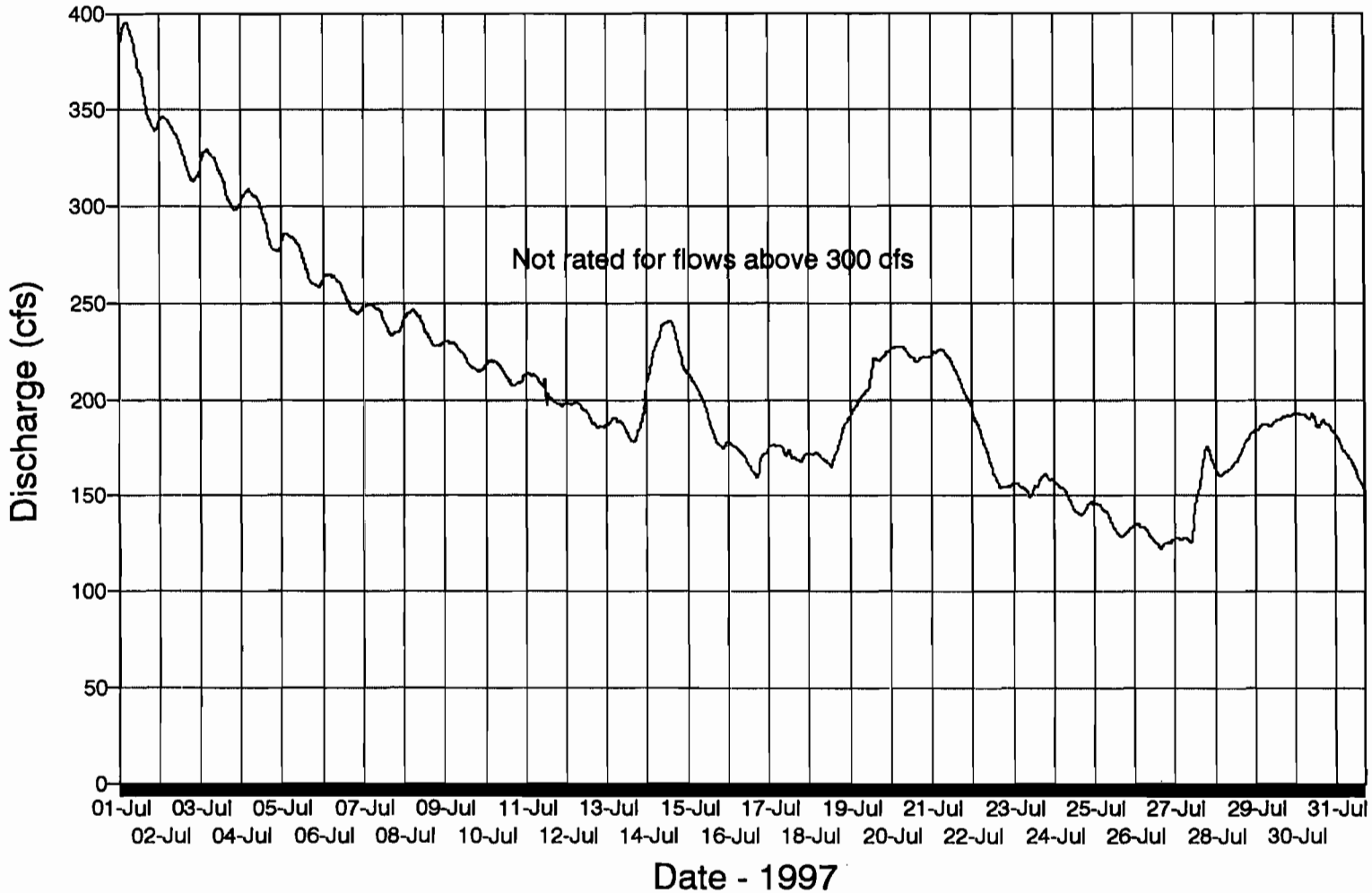
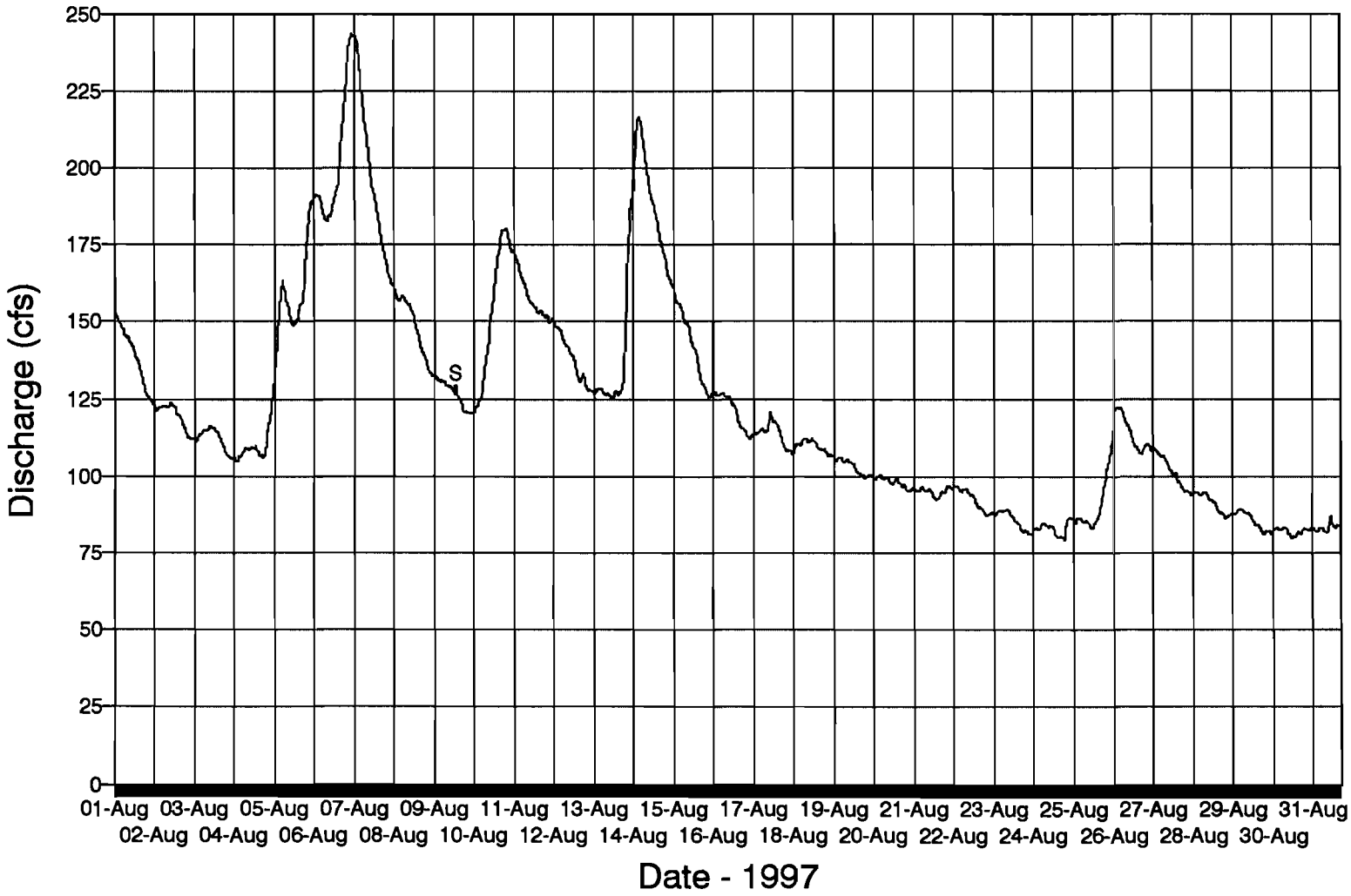
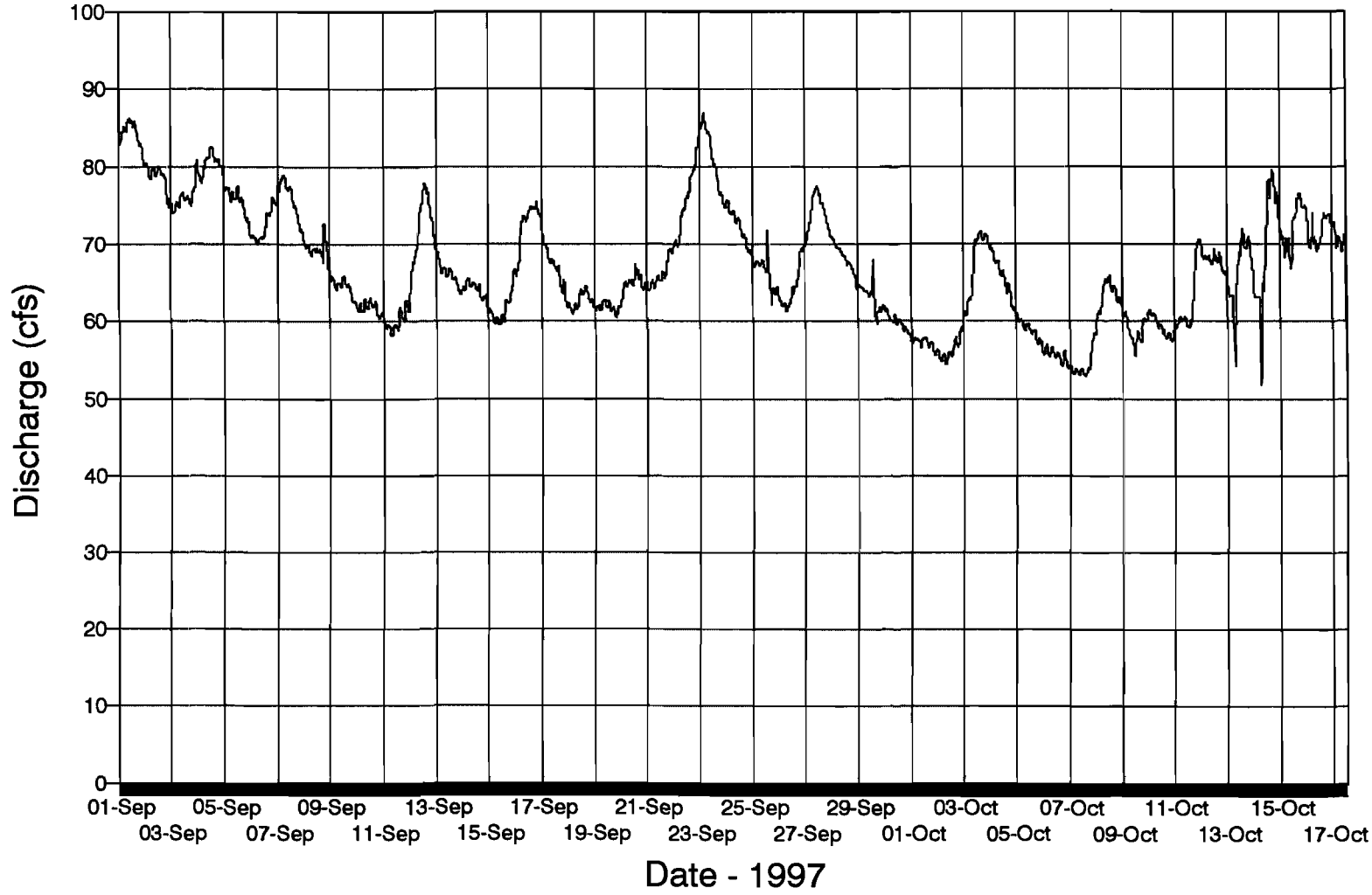


Eagle River Station E-11R
August 1997



Eagle River Station E-11R
Sep-Oct 1997



APPENDIX D

Rainfall Data

1995 Rainfall Summary
Station RF-1 - Gilman Building 403

JULIAN DAY	DATE	DAILY RAINFALL 24-HOUR TOTAL (INCHES)	MONTHLY TOTAL (INCHES)
195	14-Jul-95	0.14	
196	15-Jul-95	0.00	
197	16-Jul-95	0.00	
198	17-Jul-95	0.03	
199	18-Jul-95	0.03	
200	19-Jul-95	0.00	
201	20-Jul-95	0.00	
202	21-Jul-95	0.00	
203	22-Jul-95	0.02	
204	23-Jul-95	0.00	
205	24-Jul-95	0.00	
206	25-Jul-95	0.00	
207	26-Jul-95	0.00	
208	27-Jul-95	0.00	
209	28-Jul-95	0.00	
210	29-Jul-95	0.00	
211	30-Jul-95	0.00	
212	31-Jul-95	0.00	0.22P
213	01-Aug-95	0.00	
214	02-Aug-95	0.00	
215	03-Aug-95	0.18	
216	04-Aug-95	0.00	
217	05-Aug-95	0.00	
218	06-Aug-95	0.00	
219	07-Aug-95	0.00	
220	08-Aug-95	0.00	
221	09-Aug-95	0.00	
222	10-Aug-95	0.03	
223	11-Aug-95	0.01	
224	12-Aug-95	0.01	
225	13-Aug-95	0.03	
226	14-Aug-95	0.10	
227	15-Aug-95	0.00	
228	16-Aug-95	0.01	
229	17-Aug-95	0.00	
230	18-Aug-95	0.00	
231	19-Aug-95	0.00	
232	20-Aug-95	0.03	
233	21-Aug-95	0.28	
234	22-Aug-95	0.01	
235	23-Aug-95	0.29	
236	24-Aug-95	0.13	
237	25-Aug-95	0.06	
238	26-Aug-95	0.00	
239	27-Aug-95	0.00	
240	28-Aug-95	0.00	
241	29-Aug-95	0.00	
242	30-Aug-95	0.00	
243	31-Aug-95	0.00	1.17
244	01-Sep-95	0.00	

1995 Rainfall Summary
Station RF-1 - Gilman Building 403

JULIAN DAY	DATE	DAILY RAINFALL 24-HOUR TOTAL (INCHES)	MONTHLY TOTAL (INCHES)
245	02-Sep-95	0.00	
246	03-Sep-95	0.05	
247	04-Sep-95	0.00	
248	05-Sep-95	0.03	
249	06-Sep-95	0.00	
250	07-Sep-95	0.00	
251	08-Sep-95	0.42	
252	09-Sep-95	0.00	
253	10-Sep-95	0.02	
254	11-Sep-95	0.05	
255	12-Sep-95	0.00	
256	13-Sep-95	0.01	
257	14-Sep-95	0.00	
258	15-Sep-95	0.00	
259	16-Sep-95	0.00	
260	17-Sep-95	0.05	
261	18-Sep-95	0.16	
262	19-Sep-95	0.04	
263	20-Sep-95	0.28	
264	21-Sep-95	0.01	
265	22-Sep-95	0.00	
266	23-Sep-95	0.00	
267	24-Sep-95	0.00	
268	25-Sep-95	0.00	
269	26-Sep-95	0.00	
270	27-Sep-95	0.00	
271	28-Sep-95	0.13	
272	29-Sep-95	0.64	
273	30-Sep-95	0.29	2.18
274	01-Oct-95	0.01	
275	02-Oct-95	0.00	
276	03-Oct-95	0.00	
277	04-Oct-95	0.00	
278	05-Oct-95	0.00	
279	06-Oct-95	0.24	
280	07-Oct-95	0.23	
281	08-Oct-95	0.00	
282	09-Oct-95	0.00	0.48P

P" denotes partial data

1996 Rainfall Summary
Station RF-1 - Gilman Building 403

JULIAN DAY	DATE	DAILY RAINFALL 24-HOUR TOTAL (INCHES)	MONTHLY TOTAL (INCHES)
145	24-May-96	0.02	
146	25-May-96	0.18	
147	26-May-96	0.32	
148	27-May-96	0.06	
149	28-May-96	0.16	
150	29-May-96	0.01	
151	30-May-96	0.00	
152	31-May-96	0.00	0.75P
153	01-Jun-96	0.00	
154	02-Jun-96	0.00	
155	03-Jun-96	0.00	
156	04-Jun-96	0.00	
157	05-Jun-96	0.02	
158	06-Jun-96	0.00	
159	07-Jun-96	0.00	
160	08-Jun-96	0.00	
161	09-Jun-96	0.00	
162	10-Jun-96	0.00	
163	11-Jun-96	0.00	
164	12-Jun-96	0.01	
165	13-Jun-96	0.00	
166	14-Jun-96	0.00	
167	15-Jun-96	0.31	
168	16-Jun-96	0.01	
169	17-Jun-96	0.00	
170	18-Jun-96	0.00	
171	19-Jun-96	0.00	
172	20-Jun-96	0.13	
173	21-Jun-96	0.03	
174	22-Jun-96	0.22	
175	23-Jun-96	0.00	
176	24-Jun-96	0.00	
177	25-Jun-96	0.00	
178	26-Jun-96	0.04	
179	27-Jun-96	0.22	
180	28-Jun-96	0.13	
181	29-Jun-96	0.00	
182	30-Jun-96	0.00	1.12
183	01-Jul-96	0.00	
184	02-Jul-96	0.01	
185	03-Jul-96	0.00	
186	04-Jul-96	0.13	
187	05-Jul-96	0.00	
188	06-Jul-96	0.05	
189	07-Jul-96	0.00	
190	08-Jul-96	0.00	
191	09-Jul-96	0.00	
192	10-Jul-96	0.00	
193	11-Jul-96	0.00	
194	12-Jul-96	0.00	

1996 Rainfall Summary
Station RF-1 - Gilman Building 403

JULIAN DAY	DATE	DAILY RAINFALL 24-HOUR TOTAL (INCHES)	MONTHLY TOTAL (INCHES)
195	13-Jul-96	0.00	
196	14-Jul-96	0.00	
197	15-Jul-96	0.02	
198	16-Jul-96	0.00	
199	17-Jul-96	0.17	
200	18-Jul-96	0.22	
201	19-Jul-96	0.00	
202	20-Jul-96	0.00	
203	21-Jul-96	0.00	
204	22-Jul-96	0.00	
205	23-Jul-96	0.00	
206	24-Jul-96	0.00	
207	25-Jul-96	0.00	
208	26-Jul-96	0.00	
209	27-Jul-96	0.00	
210	28-Jul-96	0.01	
211	29-Jul-96	0.61	
212	30-Jul-96	0.01	
213	31-Jul-96	0.00	1.23
214	01-Aug-96	0.00	
215	02-Aug-96	0.00	
216	03-Aug-96	0.05	
217	04-Aug-96	0.00	
218	05-Aug-96	0.00	
219	06-Aug-96	0.00	
220	07-Aug-96	0.03	
221	08-Aug-96	0.00	
222	09-Aug-96	0.00	
223	10-Aug-96	0.00	
224	11-Aug-96	0.00	
225	12-Aug-96	0.00	
226	13-Aug-96	0.00	
227	14-Aug-96	0.00	
228	15-Aug-96	0.08	
229	16-Aug-96	0.00	
230	17-Aug-96	0.00	
231	18-Aug-96	0.06	
232	19-Aug-96	0.00	
233	20-Aug-96	0.03	
234	21-Aug-96	0.00	
235	22-Aug-96	0.09	
236	23-Aug-96	0.00	
237	24-Aug-96	0.00	
238	25-Aug-96	0.00	
239	26-Aug-96	0.00	
240	27-Aug-96	0.12	
241	28-Aug-96	0.00	
242	29-Aug-96	0.00	
243	30-Aug-96	0.00	
244	31-Aug-96	0.00	0.46

1996 Rainfall Summary
Station RF-1 - Gilman Building 403

JULIAN DAY	DATE	DAILY RAINFALL 24-HOUR TOTAL (INCHES)	MONTHLY TOTAL (INCHES)
245	01-Sep-96	0.00	
246	02-Sep-96	0.00	
247	03-Sep-96	0.00	
248	04-Sep-96	0.00	
249	05-Sep-96	0.28	
250	06-Sep-96	0.27	
251	07-Sep-96	0.00	
252	08-Sep-96	0.00	
253	09-Sep-96	0.00	
254	10-Sep-96	0.00	
255	11-Sep-96	0.06	
256	12-Sep-96	0.21	
257	13-Sep-96	0.16	
258	14-Sep-96	0.54	
259	15-Sep-96	0.18	
260	16-Sep-96	0.00	
261	17-Sep-96	0.04	
262	18-Sep-96	0.06	
263	19-Sep-96	0.24	
264	20-Sep-96	0.01	
265	21-Sep-96	0.00	
266	22-Sep-96	0.11	
267	23-Sep-96	0.13	
268	24-Sep-96	0.28	
269	25-Sep-96	0.04	
270	26-Sep-96	0.05	
271	27-Sep-96	0.15	
272	28-Sep-96	0.00	
273	29-Sep-96	0.00	
274	30-Sep-96	0.00	2.81
275	01-Oct-96	0.00	
276	02-Oct-96	0.00	
277	03-Oct-96	0.16	
278	04-Oct-96	0.00	
279	05-Oct-96	0.00	
280	06-Oct-96	0.00	
281	07-Oct-96	0.00	
282	08-Oct-96	0.00	
283	09-Oct-96	0.00	
284	10-Oct-96	0.00	
285	11-Oct-96	0.00	
286	12-Oct-96	0.00	
287	13-Oct-96	0.00	
288	14-Oct-96	0.03	
289	15-Oct-96	0.00	
290	16-Oct-96	0.03	0.22P

P" denotes partial data

1997 Rainfall Summary
Station RF-1 - Gilman Building 403

JULIAN DAY	DATE	DAILY RAINFALL 24-HOUR TOTAL (INCHES)	MONTHLY TOTAL (INCHES)
130	10-May-97	0.00	
131	11-May-97	0.03	
132	12-May-97	0.03	
133	13-May-97	0.00	
134	14-May-97	0.04	
135	15-May-97	0.09	
136	16-May-97	0.05	
137	17-May-97	0.01	
138	18-May-97	0.04	
139	19-May-97	0.00	
140	20-May-97	0.00	
141	21-May-97	0.33	
142	22-May-97	0.56	
143	23-May-97	0.00	
144	24-May-97	0.14	
145	25-May-97	0.07	
146	26-May-97	0.10	
147	27-May-97	0.00	
148	28-May-97	0.06	
149	29-May-97	1.15	
150	30-May-97	0.01	
151	31-May-97	0.00	2.71P
152	01-Jun-97	0.00	
153	02-Jun-97	0.01	
154	03-Jun-97	0.00	
155	04-Jun-97	0.00	
156	05-Jun-97	0.00	
157	06-Jun-97	0.00	
158	07-Jun-97	0.07	
159	08-Jun-97	0.44	
160	09-Jun-97	0.00	
161	10-Jun-97	0.33	
162	11-Jun-97	0.19	
163	12-Jun-97	0.00	
164	13-Jun-97	0.00	
165	14-Jun-97	0.00	
166	15-Jun-97	0.00	
167	16-Jun-97	0.10	
168	17-Jun-97	0.03	
169	18-Jun-97	0.00	
170	19-Jun-97	0.06	
171	20-Jun-97	0.00	
172	21-Jun-97	0.00	
173	22-Jun-97	0.00	
174	23-Jun-97	0.00	
175	24-Jun-97	0.00	
176	25-Jun-97	0.00	
177	26-Jun-97	0.00	
178	27-Jun-97	0.02	
179	28-Jun-97	0.00	

1997 Rainfall Summary
Station RF-1 - Gilman Building 403

JULIAN DAY	DATE	DAILY RAINFALL 24-HOUR TOTAL (INCHES)	MONTHLY TOTAL (INCHES)
180	29-Jun-97	0.00	
181	30-Jun-97	0.00	1.25
182	01-Jul-97	0.00	
183	02-Jul-97	0.00	
184	03-Jul-97	0.00	
185	04-Jul-97	0.00	
186	05-Jul-97	0.00	
187	06-Jul-97	0.00	
188	07-Jul-97	0.04	
189	08-Jul-97	0.00	
190	09-Jul-97	0.02	
191	10-Jul-97	0.00	
192	11-Jul-97	0.00	
193	12-Jul-97	0.00	
194	13-Jul-97	0.00	
195	14-Jul-97	0.00	
196	15-Jul-97	0.00	
197	16-Jul-97	0.00	
198	17-Jul-97	0.09	
199	18-Jul-97	0.01	
200	19-Jul-97	0.04	
201	20-Jul-97	0.00	
202	21-Jul-97	0.00	
203	22-Jul-97	0.00	
204	23-Jul-97	0.01	
205	24-Jul-97	0.00	
206	25-Jul-97	0.00	
207	26-Jul-97	0.00	
208	27-Jul-97	0.54	
209	28-Jul-97	0.04	
210	29-Jul-97	0.04	
211	30-Jul-97	0.12	
212	31-Jul-97	0.05	1.0
213	01-Aug-97	0.00	
214	02-Aug-97	0.00	
215	03-Aug-97	0.03	
216	04-Aug-97	0.20	
217	05-Aug-97	0.52	
218	06-Aug-97	0.43	
219	07-Aug-97	0.03	
220	08-Aug-97	0.00	
221	09-Aug-97	0.14	
222	10-Aug-97	0.22	
223	11-Aug-97	0.08	
224	12-Aug-97	0.04	
225	13-Aug-97	0.22	
226	14-Aug-97	0.09	
227	15-Aug-97	0.00	
228	16-Aug-97	0.00	
229	17-Aug-97	0.24	

1997 Rainfall Summary
Station RF-1 - Gilman Building 403

JULIAN DAY	DATE	DAILY RAINFALL 24-HOUR TOTAL (INCHES)	MONTHLY TOTAL (INCHES)
230	18-Aug-97	0.05	
231	19-Aug-97	0.01	
232	20-Aug-97	0.02	
233	21-Aug-97	0.00	
234	22-Aug-97	0.00	
235	23-Aug-97	0.00	
236	24-Aug-97	0.05	
237	25-Aug-97	0.19	
238	26-Aug-97	0.00	
239	27-Aug-97	0.06	
240	28-Aug-97	0.01	
241	29-Aug-97	0.00	
242	30-Aug-97	0.00	
243	31-Aug-97	0.05	2.68
244	01-Sep-97	0.00	
245	02-Sep-97	0.00	
246	03-Sep-97	0.07	
247	04-Sep-97	0.02	
248	05-Sep-97	0.00	
249	06-Sep-97	0.12	
250	07-Sep-97	0.01	
251	08-Sep-97	0.00	
252	09-Sep-97	0.00	
253	10-Sep-97	0.06	
254	11-Sep-97	0.22	
255	12-Sep-97	0.06	
256	13-Sep-97	0.02	
257	14-Sep-97	0.00	
258	15-Sep-97	0.10	
259	16-Sep-97	0.07	
260	17-Sep-97	0.00	
261	18-Sep-97	0.04	
262	19-Sep-97	0.14	
263	20-Sep-97	0.15	
264	21-Sep-97	0.12	
265	22-Sep-97	0.22	
266	23-Sep-97	0.01	
267	24-Sep-97	0.00	
268	25-Sep-97	0.00	
269	26-Sep-97	0.20	
270	27-Sep-97	0.00	
271	28-Sep-97	0.00	
272	29-Sep-97	0.00	
273	30-Sep-97	0.00	1.63
274	01-Oct-97	0.00	
275	02-Oct-97	0.19	
276	03-Oct-97	0.05	
277	04-Oct-97	0.00	
278	05-Oct-97	0.00	
279	06-Oct-97	0.00	

1997 Rainfall Summary
Station RF-1 - Gilman Building 403

JULIAN DAY	DATE	DAILY RAINFALL 24-HOUR TOTAL (INCHES)	MONTHLY TOTAL (INCHES)
280	07-Oct-97	0.23	
281	08-Oct-97	0.11	
282	09-Oct-97	0.00	
283	10-Oct-97	0.00	
284	11-Oct-97	0.01	
285	12-Oct-97	0.00	
286	13-Oct-97	0.00	0.59P

P" denotes partial data

1995 Rainfall Summary
Station RF-2 (E-5R) - Belden

JULIAN DAY	DATE	DAILY RAINFALL 24-HOUR TOTAL (INCHES)	MONTHLY TOTAL (INCHES)
215	03-Aug-95	0.20	
216	04-Aug-95	0.00	
217	05-Aug-95	0.00	
218	06-Aug-95	0.00	
219	07-Aug-95	0.00	
220	08-Aug-95	0.00	
221	09-Aug-95	0.00	
222	10-Aug-95	0.02	
223	11-Aug-95	0.01	
224	12-Aug-95	0.01	
225	13-Aug-95	0.03	
226	14-Aug-95	0.10	
227	15-Aug-95	0.00	
228	16-Aug-95	0.00	
229	17-Aug-95	0.00	
230	18-Aug-95	0.00	
231	19-Aug-95	0.00	
232	20-Aug-95	0.03	
233	21-Aug-95	0.33	
234	22-Aug-95	0.01	
235	23-Aug-95	0.32	
236	24-Aug-95	0.10	
237	25-Aug-95	0.06	
238	26-Aug-95	0.00	
239	27-Aug-95	0.00	
240	28-Aug-95	0.00	
241	29-Aug-95	0.00	
242	30-Aug-95	0.00	
243	31-Aug-95	0.00	1.22P
244	01-Sep-95	0.00	
245	02-Sep-95	0.00	
246	03-Sep-95	0.05	
247	04-Sep-95	0.00	
248	05-Sep-95	0.03	
249	06-Sep-95	0.00	
250	07-Sep-95	0.00	
251	08-Sep-95	0.35	
252	09-Sep-95	0.00	
253	10-Sep-95	0.04	
254	11-Sep-95	0.04	
255	12-Sep-95	0.00	
256	13-Sep-95	0.01	
257	14-Sep-95	0.00	
258	15-Sep-95	0.00	
259	16-Sep-95	0.00	
260	17-Sep-95	0.05	
261	18-Sep-95	0.19	
262	19-Sep-95	0.04	
263	20-Sep-95	0.25	

1995 Rainfall Summary
Station RF-2 (E-5R) - Belden

JULIAN DAY	DATE	DAILY RAINFALL 24-HOUR TOTAL (INCHES)	MONTHLY TOTAL (INCHES)
264	21-Sep-95	0.00	
265	22-Sep-95	0.00	
266	23-Sep-95	0.00	
267	24-Sep-95	0.00	
268	25-Sep-95	0.00	
269	26-Sep-95	0.00	
270	27-Sep-95	0.00	
271	28-Sep-95	0.11	
272	29-Sep-95	0.66	
273	30-Sep-95	0.24	2.06
274	01-Oct-95	0.00	
275	02-Oct-95	0.00	
276	03-Oct-95	0.00	
277	04-Oct-95	0.03	
278	05-Oct-95	0.00	
279	06-Oct-95	0.28	
280	07-Oct-95	0.16	
281	08-Oct-95	0.00	
282	09-Oct-95	0.00	0.47P

P" denotes partial data

1996 Rainfall Summary
Station RF-2 (E-5R) - Belden

JULIAN DAY	DATE	DAILY RAINFALL 24-HOUR TOTAL (INCHES)	MONTHLY TOTAL (INCHES)
101	10-Apr-96	0.02	
102	11-Apr-96	0.22	
103	12-Apr-96	0.27	
104	13-Apr-96	0.00	
105	14-Apr-96	0.00	
106	15-Apr-96	0.02	
107	16-Apr-96	0.00	
108	17-Apr-96	0.00	
109	18-Apr-96	0.16	
110	19-Apr-96	0.00	
111	20-Apr-96	0.00	
112	21-Apr-96	0.04	
113	22-Apr-96	0.01	
114	23-Apr-96	0.12	
115	24-Apr-96	0.00	
116	25-Apr-96	0.31	
117	26-Apr-96	0.05	
118	27-Apr-96	0.10	
119	28-Apr-96	0.00	
120	29-Apr-96	0.01	
121	30-Apr-96	0.00	1.33P
122	01-May-96	0.02	
123	02-May-96	0.00	
124	03-May-96	0.00	
125	04-May-96	0.00	
126	05-May-96	0.00	
127	06-May-96	0.00	
128	07-May-96	0.00	
129	08-May-96	0.00	
130	09-May-96	0.00	
131	10-May-96	0.00	
132	11-May-96	0.00	
133	12-May-96	0.00	
134	13-May-96	0.00	
135	14-May-96	0.00	
136	15-May-96	0.00	
137	16-May-96	0.00	
138	17-May-96	0.04	
139	18-May-96	0.00	
140	19-May-96	0.00	
141	20-May-96	0.00	
142	21-May-96	0.00	
143	22-May-96	0.00	
144	23-May-96	0.01	
145	24-May-96	0.01	
146	25-May-96	0.30	
147	26-May-96	0.22	
148	27-May-96	0.04	
149	28-May-96	0.18	

1996 Rainfall Summary
Station RF-2 (E-5R) - Belden

JULIAN DAY	DATE	DAILY RAINFALL 24-HOUR TOTAL (INCHES)	MONTHLY TOTAL (INCHES)
150	29-May-96	0.00	
151	30-May-96	0.00	
152	31-May-96	0.00	0.82
153	01-Jun-96	0.00	
154	02-Jun-96	0.00	
155	03-Jun-96	0.00	
156	04-Jun-96	0.00	
157	05-Jun-96	0.00	
158	06-Jun-96	0.00	
159	07-Jun-96	0.00	
160	08-Jun-96	0.00	
161	09-Jun-96	0.00	
162	10-Jun-96	0.00	
163	11-Jun-96	0.00	
164	12-Jun-96	0.02	
165	13-Jun-96	0.00	
166	14-Jun-96	0.00	
167	15-Jun-96	0.37	
168	16-Jun-96	0.01	
169	17-Jun-96	0.00	
170	18-Jun-96	0.00	
171	19-Jun-96	0.00	
172	20-Jun-96	0.14	
173	21-Jun-96	0.02	
174	22-Jun-96	0.22	
175	23-Jun-96	0.00	
176	24-Jun-96	0.00	
177	25-Jun-96	0.00	
178	26-Jun-96	0.05	
179	27-Jun-96	0.25	
180	28-Jun-96	0.10	
181	29-Jun-96	0.00	
182	30-Jun-96	0.00	1.18
183	01-Jul-96	0.00	
184	02-Jul-96	0.01	
185	03-Jul-96	0.00	
186	04-Jul-96	0.21	
187	05-Jul-96	0.01	
188	06-Jul-96	0.05	
189	07-Jul-96	0.00	
190	08-Jul-96	0.00	
191	09-Jul-96	0.00	
192	10-Jul-96	0.00	
193	11-Jul-96	0.00	
194	12-Jul-96	0.00	
195	13-Jul-96	0.00	
196	14-Jul-96	0.00	
197	15-Jul-96	0.01	
198	16-Jul-96	0.00	

1996 Rainfall Summary
Station RF-2 (E-5R) - Belden

JULIAN DAY	DATE	DAILY RAINFALL 24-HOUR TOTAL (INCHES)	MONTHLY TOTAL (INCHES)
199	17-Jul-96	0.16	
200	18-Jul-96	0.16	
201	19-Jul-96	0.01	
202	20-Jul-96	0.00	
203	21-Jul-96	0.00	
204	22-Jul-96	0.00	
205	23-Jul-96	0.00	
206	24-Jul-96	0.00	
207	25-Jul-96	0.00	
208	26-Jul-96	0.00	
209	27-Jul-96	0.00	
210	28-Jul-96	0.08	
211	29-Jul-96	0.51	
212	30-Jul-96	0.00	
213	31-Jul-96	0.08	1.29
214	01-Aug-96	0.00	
215	02-Aug-96	0.00	
216	03-Aug-96	0.06	
217	04-Aug-96	0.00	
218	05-Aug-96	0.00	
219	06-Aug-96	0.03	
220	07-Aug-96	0.00	
221	08-Aug-96	0.07	
222	09-Aug-96	0.00	
223	10-Aug-96	0.00	
224	11-Aug-96	0.00	
225	12-Aug-96	0.00	
226	13-Aug-96	0.00	
227	14-Aug-96	0.00	
228	15-Aug-96	0.08	
229	16-Aug-96	0.00	
230	17-Aug-96	0.00	
231	18-Aug-96	0.07	
232	19-Aug-96	0.01	
233	20-Aug-96	0.04	
234	21-Aug-96	0.00	
235	22-Aug-96	0.03	
236	23-Aug-96	0.00	
237	24-Aug-96	0.00	
238	25-Aug-96	0.00	
239	26-Aug-96	0.00	
240	27-Aug-96	0.14	
241	28-Aug-96	0.00	
242	29-Aug-96	0.00	
243	30-Aug-96	0.00	
244	31-Aug-96	0.00	0.53
245	01-Sep-96	0.00	
246	02-Sep-96	0.00	
247	03-Sep-96	0.00	

1996 Rainfall Summary
Station RF-2 (E-5R) - Belden

JULIAN DAY	DATE	DAILY RAINFALL 24-HOUR TOTAL (INCHES)	MONTHLY TOTAL (INCHES)
248	04-Sep-96	0.00	
249	05-Sep-96	0.19	
250	06-Sep-96	0.29	
251	07-Sep-96	0.00	
252	08-Sep-96	0.00	
253	09-Sep-96	0.00	
254	10-Sep-96	0.00	
255	11-Sep-96	0.05	
256	12-Sep-96	0.25	
257	13-Sep-96	0.17	
258	14-Sep-96	0.60	
259	15-Sep-96	0.19	
260	16-Sep-96	0.00	
261	17-Sep-96	0.03	
262	18-Sep-96	0.04	
263	19-Sep-96	0.23	
264	20-Sep-96	0.01	
265	21-Sep-96	0.00	
266	22-Sep-96	0.14	
267	23-Sep-96	0.13	
268	24-Sep-96	0.29	
269	25-Sep-96	0.05	
270	26-Sep-96	0.01	
271	27-Sep-96	0.02	
272	28-Sep-96	0.00	
273	29-Sep-96	0.00	
274	30-Sep-96	0.01	2.7
275	01-Oct-96	0.00	
276	02-Oct-96	0.00	
277	03-Oct-96	0.18	
278	04-Oct-96	0.00	
279	05-Oct-96	0.00	
280	06-Oct-96	0.00	
281	07-Oct-96	0.00	
282	08-Oct-96	0.00	
283	09-Oct-96	0.00	
284	10-Oct-96	0.00	
285	11-Oct-96	0.00	
286	12-Oct-96	0.00	
287	13-Oct-96	0.00	
288	14-Oct-96	0.04	
289	15-Oct-96	0.00	
290	16-Oct-96	0.28	0.5P

P" denotes partial data

1997 Rainfall Summary
Station RF-2 (E-5R) - Belden

JULIAN DAY	DATE	DAILY RAINFALL 24-HOUR TOTAL (INCHES)	MONTHLY TOTAL (INCHES)
99	09-Apr-97	0.15	
100	10-Apr-97	0.00	
101	11-Apr-97	0.00	
102	12-Apr-97	0.00	
103	13-Apr-97	0.00	
104	14-Apr-97	0.01	
105	15-Apr-97	0.00	
106	16-Apr-97	0.00	
107	17-Apr-97	0.00	
108	18-Apr-97	0.00	
109	19-Apr-97	0.00	
110	20-Apr-97	0.02	
111	21-Apr-97	0.23	
112	22-Apr-97	0.45	
113	23-Apr-97	0.17	
114	24-Apr-97	0.12	
115	25-Apr-97	0.00	
116	26-Apr-97	0.13	
117	27-Apr-97	0.00	
118	28-Apr-97	0.11	
119	29-Apr-97	0.23	
120	30-Apr-97	0.29	1.91P
121	01-May-97	0.22	
122	02-May-97	0.08	
123	03-May-97	0.00	
124	04-May-97	0.00	
125	05-May-97	0.00	
126	06-May-97	0.00	
127	07-May-97	0.03	
128	08-May-97	0.00	
129	09-May-97	0.00	
130	10-May-97	0.00	
131	11-May-97	0.02	
132	12-May-97	0.03	
133	13-May-97	0.00	
134	14-May-97	0.05	
135	15-May-97	0.19	
136	16-May-97	0.04	
137	17-May-97	0.02	
138	18-May-97	0.03	
139	19-May-97	0.00	
140	20-May-97	0.00	
141	21-May-97	0.36	
142	22-May-97	0.59	
143	23-May-97	0.00	
144	24-May-97	0.12	
145	25-May-97	0.07	
146	26-May-97	0.05	
147	27-May-97	0.00	

1997 Rainfall Summary
Station RF-2 (E-5R) - Belden

JULIAN DAY	DATE	DAILY RAINFALL 24-HOUR TOTAL (INCHES)	MONTHLY TOTAL (INCHES)
148	28-May-97	0.09	
149	29-May-97	1.28	
150	30-May-97	0.00	
151	31-May-97	0.00	3.27
152	01-Jun-97	0.00	
153	02-Jun-97	0.01	
154	03-Jun-97	0.00	
155	04-Jun-97	0.00	
156	05-Jun-97	0.00	
157	06-Jun-97	0.00	
158	07-Jun-97	0.07	
159	08-Jun-97	0.47	
160	09-Jun-97	0.00	
161	10-Jun-97	0.32	
162	11-Jun-97	0.21	
163	12-Jun-97	0.00	
164	13-Jun-97	0.08	
165	14-Jun-97	0.01	
166	15-Jun-97	0.00	
167	16-Jun-97	0.13	
168	17-Jun-97	0.02	
169	18-Jun-97	0.07	
170	19-Jun-97	0.05	
171	20-Jun-97	0.00	
172	21-Jun-97	0.00	
173	22-Jun-97	0.00	
174	23-Jun-97	0.00	
175	24-Jun-97	0.00	
176	25-Jun-97	0.00	
177	26-Jun-97	0.00	
178	27-Jun-97	0.02	
179	28-Jun-97	0.00	
180	29-Jun-97	0.00	
181	30-Jun-97	0.01	1.47
182	01-Jul-97	0.00	
183	02-Jul-97	0.00	
184	03-Jul-97	0.00	
185	04-Jul-97	0.00	
186	05-Jul-97	0.00	
187	06-Jul-97	0.00	
188	07-Jul-97	0.05	
189	08-Jul-97	0.00	
190	09-Jul-97	0.03	
191	10-Jul-97	0.00	
192	11-Jul-97	0.00	
193	12-Jul-97	0.00	
194	13-Jul-97	0.00	
195	14-Jul-97	0.00	
196	15-Jul-97	0.00	

1997 Rainfall Summary
Station RF-2 (E-5R) - Belden

JULIAN DAY	DATE	DAILY RAINFALL 24-HOUR TOTAL (INCHES)	MONTHLY TOTAL (INCHES)
197	16-Jul-97	0.00	
198	17-Jul-97	0.18	
199	18-Jul-97	0.02	
200	19-Jul-97	0.03	
201	20-Jul-97	0.00	
202	21-Jul-97	0.00	
203	22-Jul-97	0.00	
204	23-Jul-97	0.01	
205	24-Jul-97	0.00	
206	25-Jul-97	0.00	
207	26-Jul-97	0.00	
208	27-Jul-97	0.59	
209	28-Jul-97	0.05	
210	29-Jul-97	0.03	
211	30-Jul-97	0.11	
212	31-Jul-97	0.04	1.14
213	01-Aug-97	0.00	
214	02-Aug-97	0.00	
215	03-Aug-97	0.04	
216	04-Aug-97	0.24	
217	05-Aug-97	0.53	
218	06-Aug-97	0.55	
219	07-Aug-97	0.03	
220	08-Aug-97	0.00	
221	09-Aug-97	0.12	
222	10-Aug-97	0.21	
223	11-Aug-97	0.06	
224	12-Aug-97	0.05	
225	13-Aug-97	0.25	
226	14-Aug-97	0.07	
227	15-Aug-97	0.00	
228	16-Aug-97	0.00	
229	17-Aug-97	0.25	
230	18-Aug-97	0.07	
231	19-Aug-97	0.00	
232	20-Aug-97	0.03	
233	21-Aug-97	0.00	
234	22-Aug-97	0.00	
235	23-Aug-97	0.00	
236	24-Aug-97	0.06	
237	25-Aug-97	0.24	
238	26-Aug-97	0.00	
239	27-Aug-97	0.04	
240	28-Aug-97	0.01	
241	29-Aug-97	0.00	
242	30-Aug-97	0.00	
243	31-Aug-97	0.05	2.9
244	01-Sep-97	0.00	
245	02-Sep-97	0.00	

1997 Rainfall Summary
Station RF-2 (E-5R) - Belden

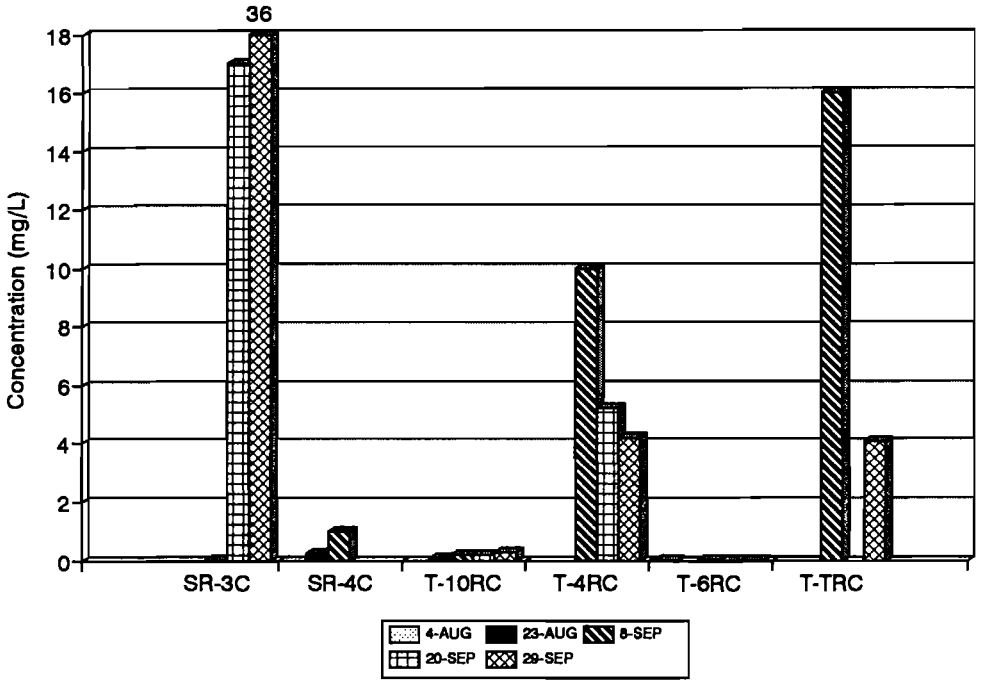
JULIAN DAY	DATE	DAILY RAINFALL 24-HOUR TOTAL (INCHES)	MONTHLY TOTAL (INCHES)
246	03-Sep-97	0.06	
247	04-Sep-97	0.02	
248	05-Sep-97	0.00	
249	06-Sep-97	0.12	
250	07-Sep-97	0.00	
251	08-Sep-97	0.00	
252	09-Sep-97	0.00	
253	10-Sep-97	0.04	
254	11-Sep-97	0.19	
255	12-Sep-97	0.07	
256	13-Sep-97	0.03	
257	14-Sep-97	0.00	
258	15-Sep-97	0.08	
259	16-Sep-97	0.07	
260	17-Sep-97	0.00	
261	18-Sep-97	0.04	
262	19-Sep-97	0.12	
263	20-Sep-97	0.14	
264	21-Sep-97	0.12	
265	22-Sep-97	0.22	
266	23-Sep-97	0.01	
267	24-Sep-97	0.00	
268	25-Sep-97	0.00	
269	26-Sep-97	0.20	
270	27-Sep-97	0.00	
271	28-Sep-97	0.00	
272	29-Sep-97	0.00	
273	30-Sep-97	0.00	1.53
274	01-Oct-97	0.00	
275	02-Oct-97	0.18	
276	03-Oct-97	0.05	
277	04-Oct-97	0.00	
278	05-Oct-97	0.00	
279	06-Oct-97	0.00	
280	07-Oct-97	0.23	
281	08-Oct-97	0.08	
282	09-Oct-97	0.00	
283	10-Oct-97	0.00	
284	11-Oct-97	0.06	
285	12-Oct-97	0.00	
286	13-Oct-97	0.00	
287	14-Oct-97	0.11	
288	15-Oct-97	0.04	0.75P

P" denotes partial data

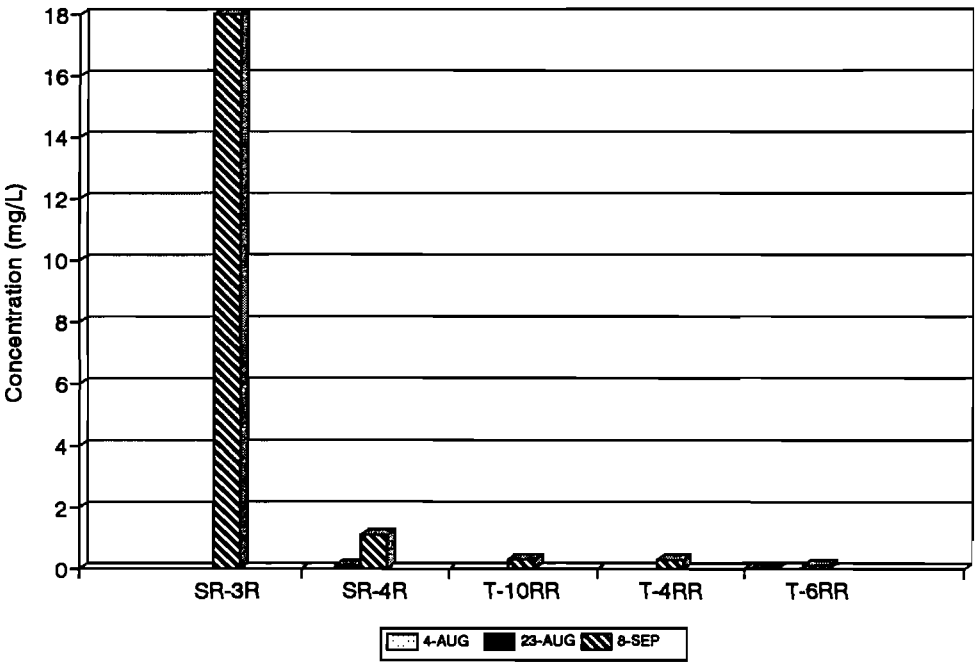
APPENDIX E

Water Quality Plots

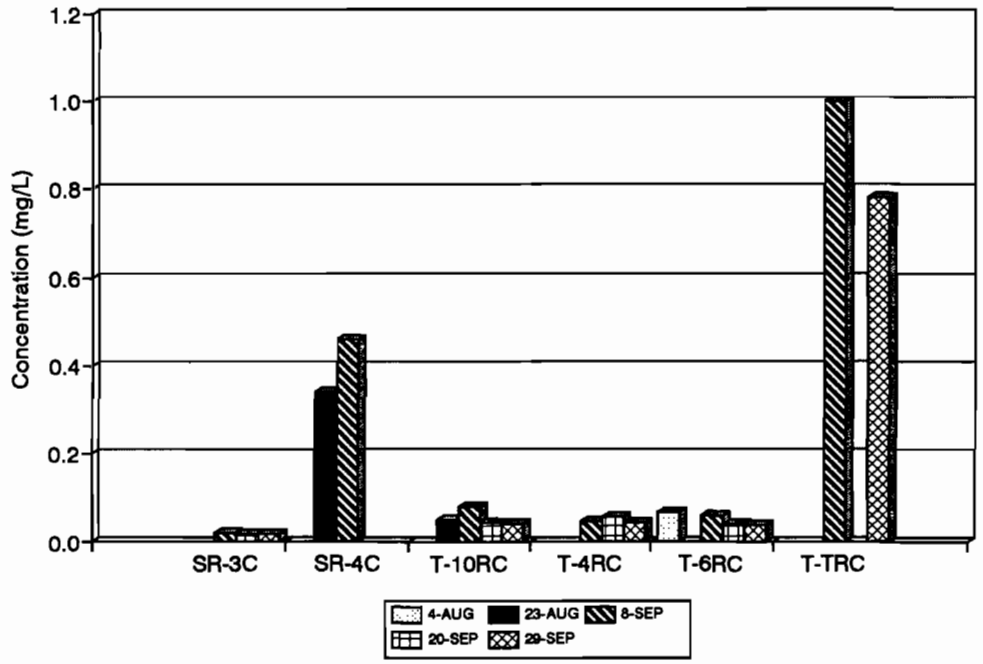
Total Recoverable Arsenic - 1995
Tributary Rainfall-Runoff (Composite)



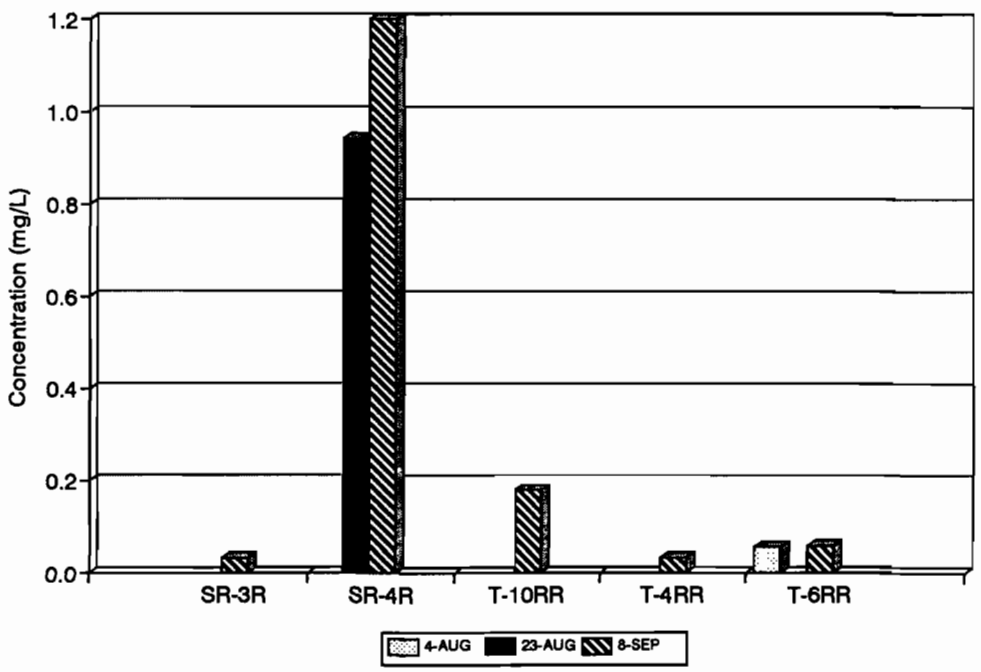
Total Recoverable Arsenic - 1995
Tributary Rainfall-Runoff (Rising Limb)



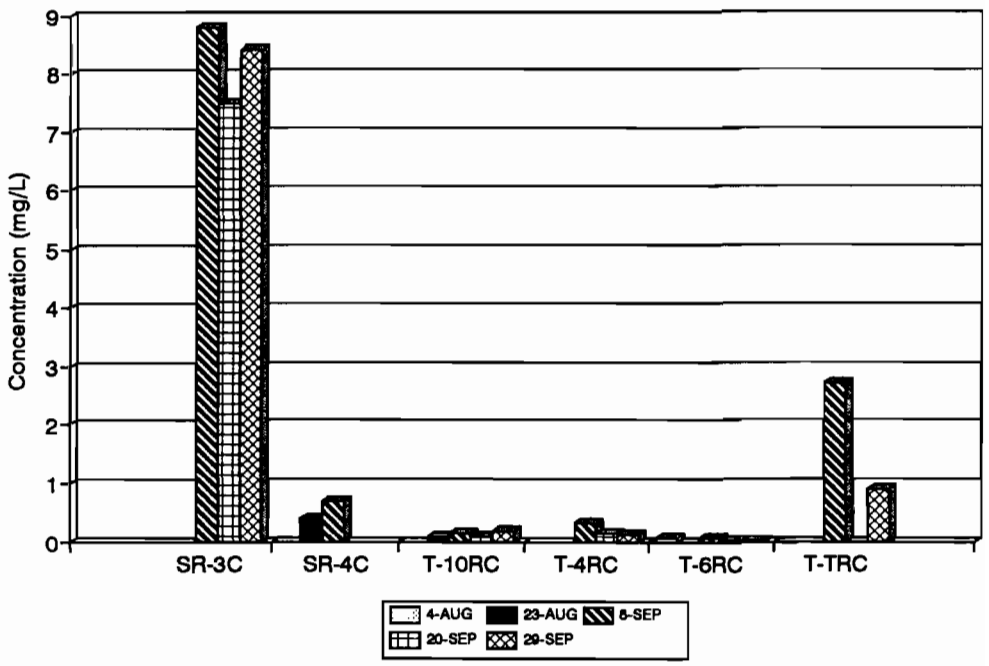
Dissolved Cadmium - 1995
Tributary Rainfall-Runoff (Composite)



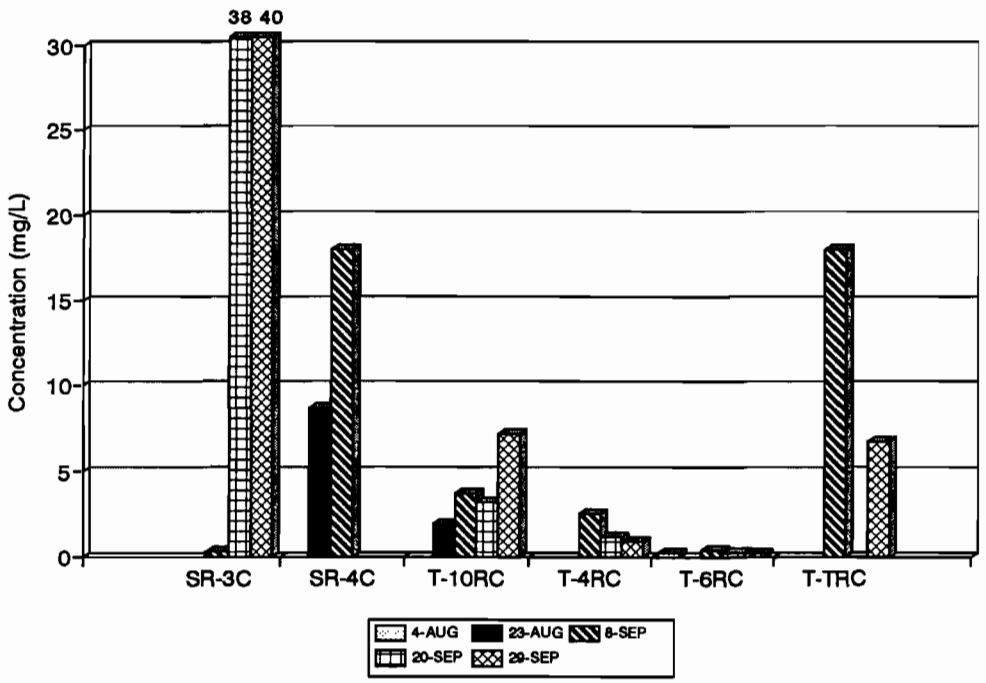
Dissolved Cadmium - 1995
Tributary Rainfall-Runoff (Rising Limb)



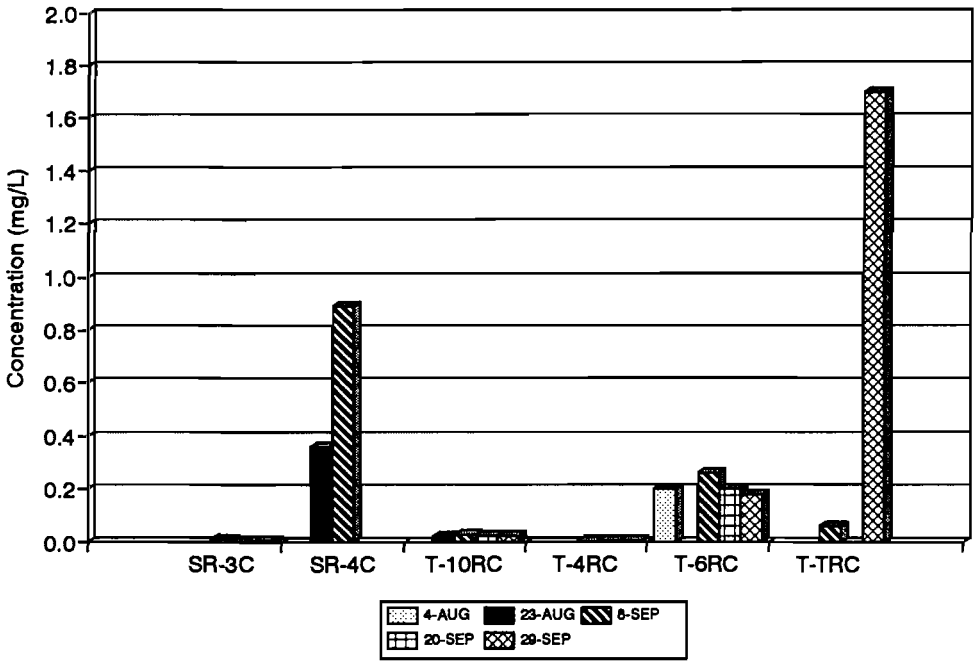
Total Recoverable Cadmium - 1995
Tributary Rainfall-Runoff (Composite)



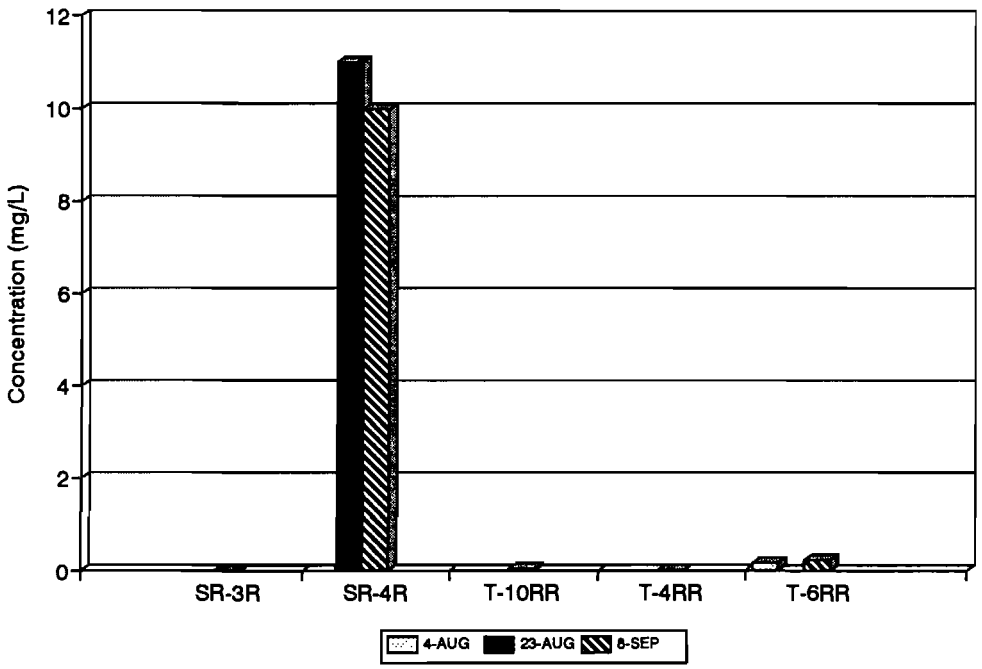
Total Recoverable Copper - 1995
Tributary Rainfall-Runoff (Composite)



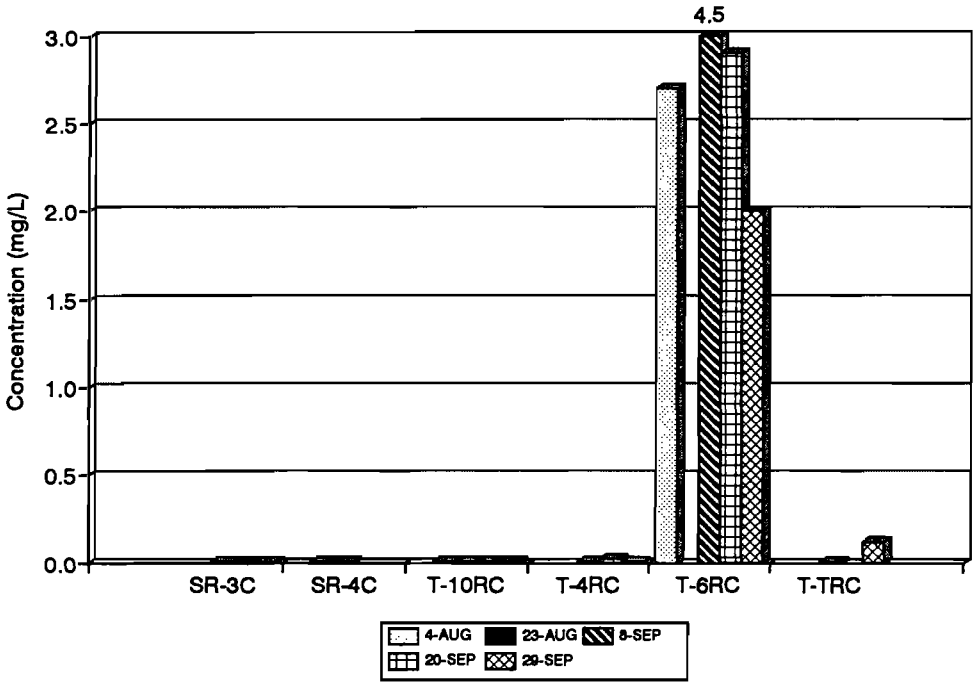
Dissolved Copper - 1995
Tributary Rainfall-Runoff (Composite)



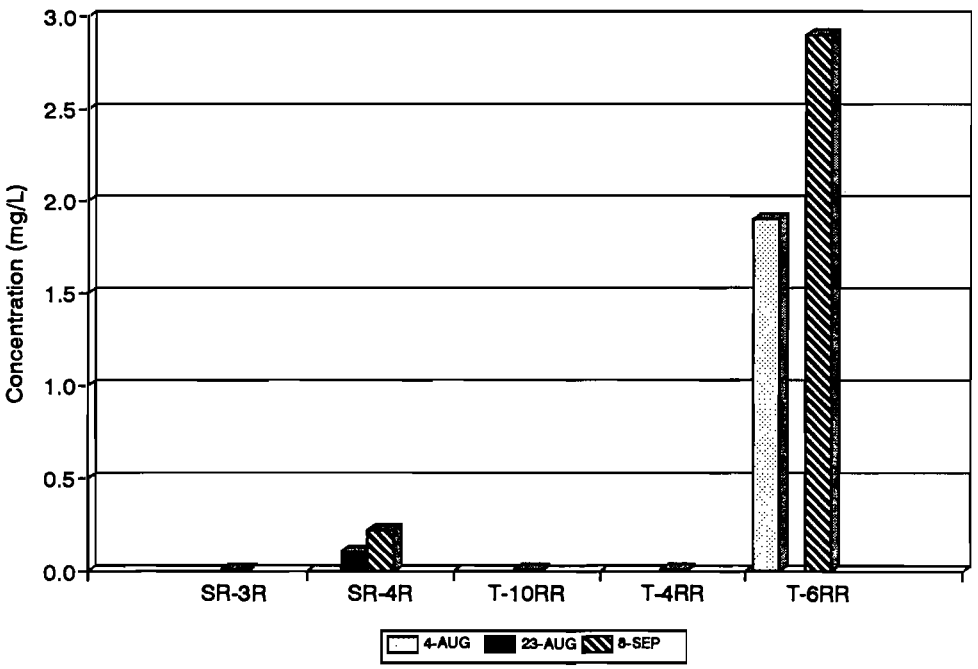
Dissolved Copper - 1995
Tributary Rainfall-Runoff (Rising Limb)



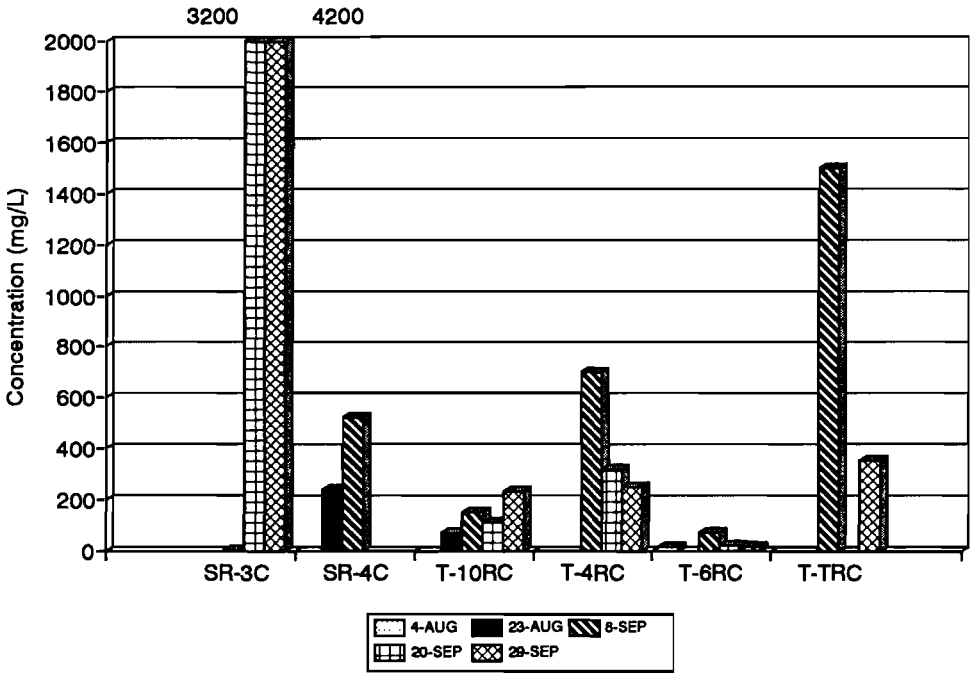
Dissolved Iron - 1995
Tributary Rainfall-Runoff (Composite)



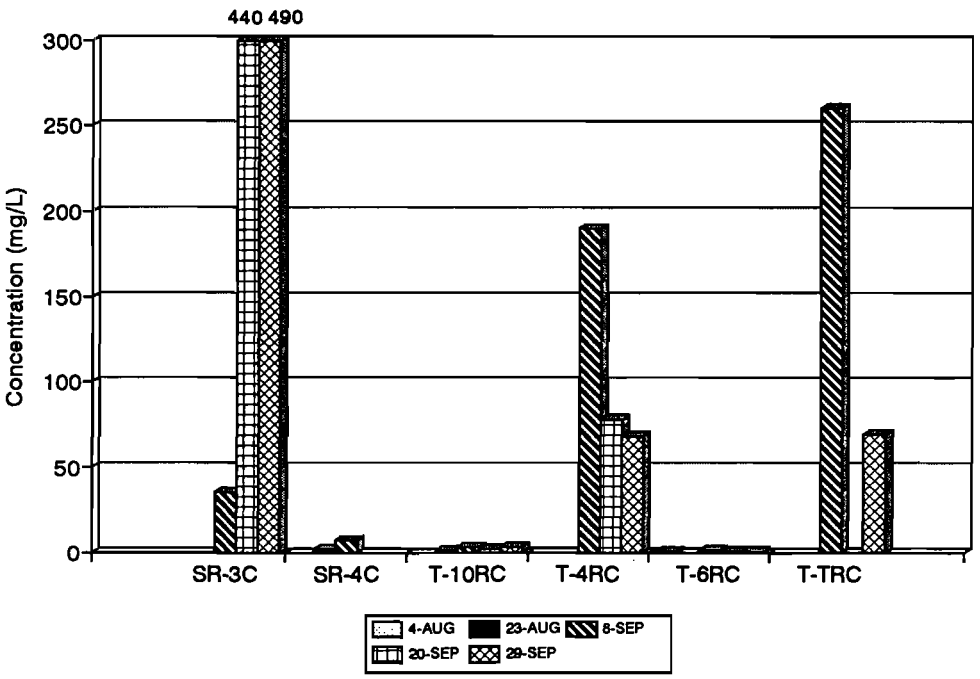
Dissolved Iron - 1995
Tributary Rainfall-Runoff (Rising Limb)



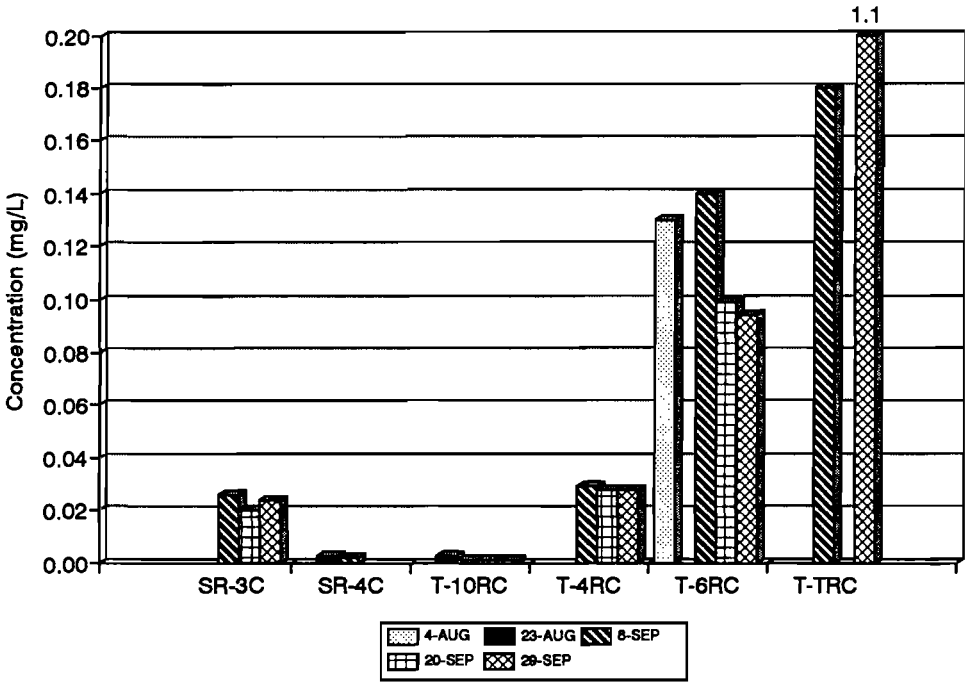
Total Recoverable Iron - 1995
Tributary Rainfall-Runoff (Composite)



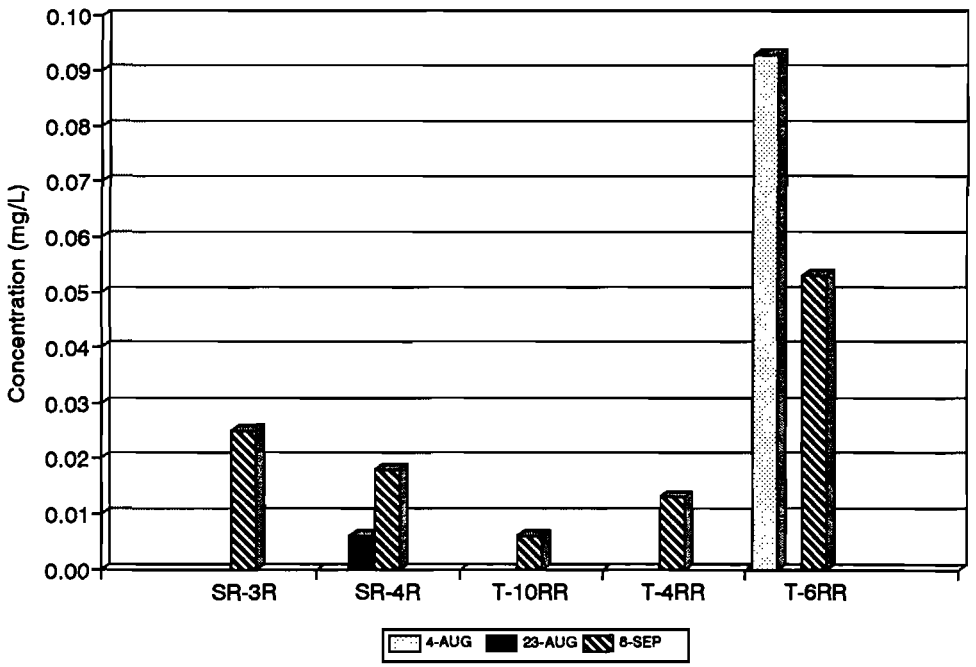
Total Recoverable Lead - 1995
Tributary Rainfall-Runoff (Composite)



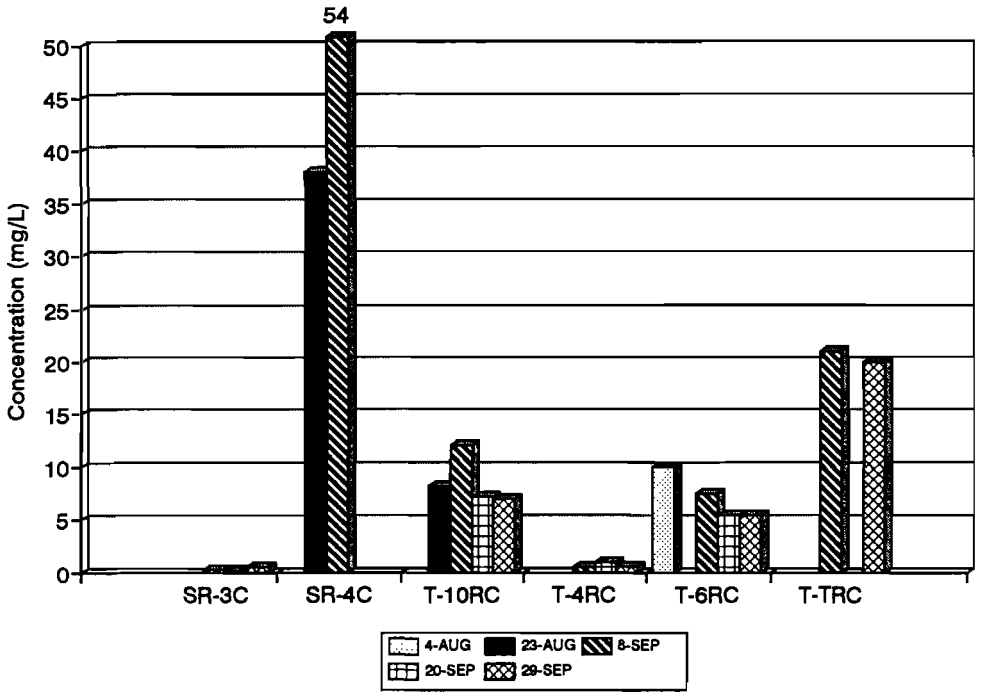
Dissolved Lead - 1995
Tributary Rainfall-Runoff (Composite)



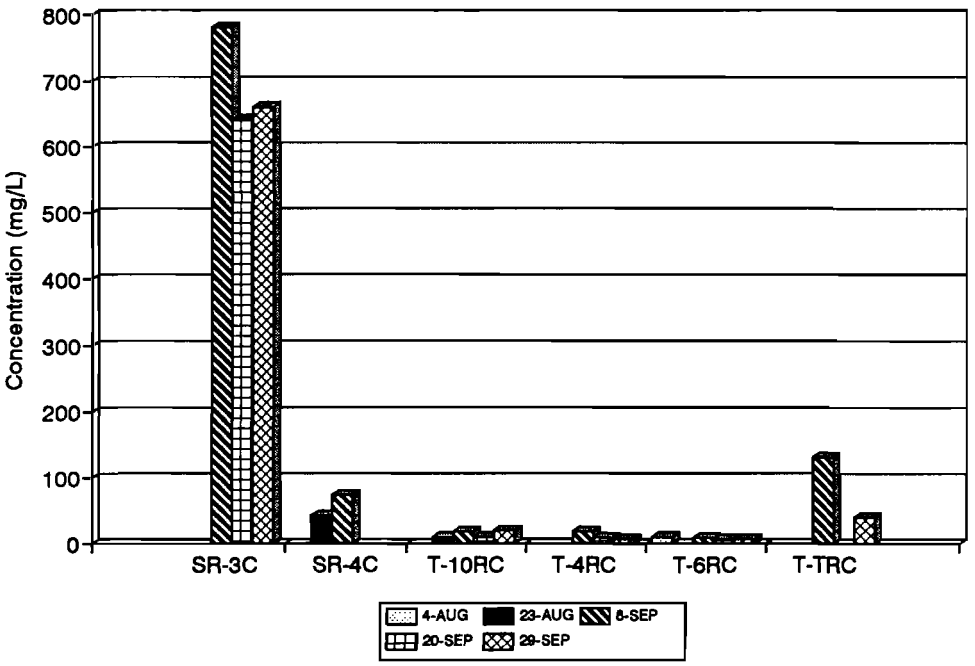
Dissolved Lead - 1995
Tributary Rainfall-Runoff (Rising Limb)



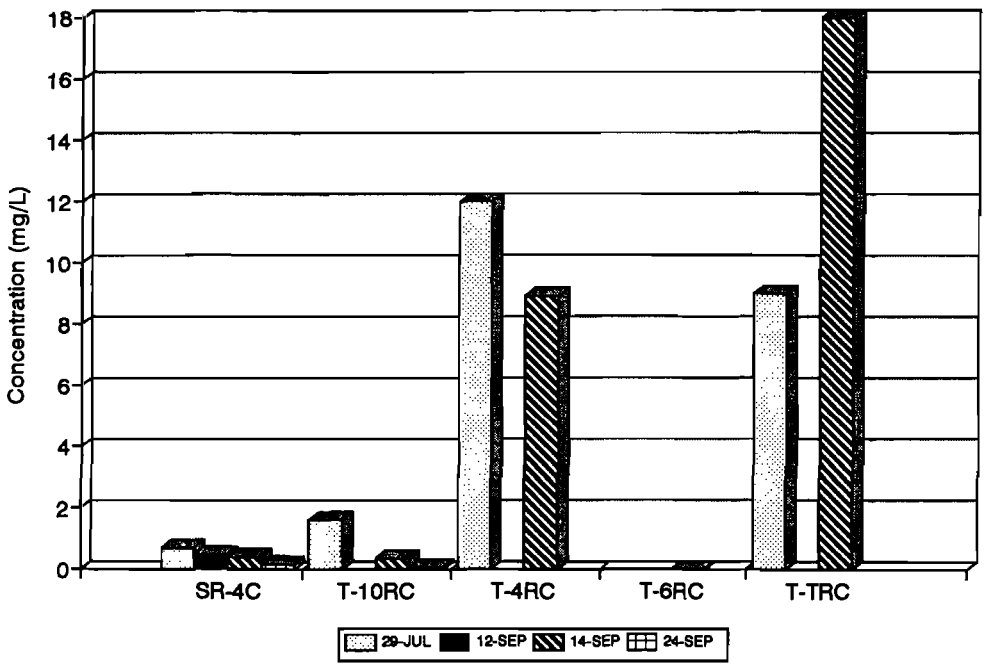
Dissolved Manganese - 1995
Tributary Rainfall-Runoff (Composite)



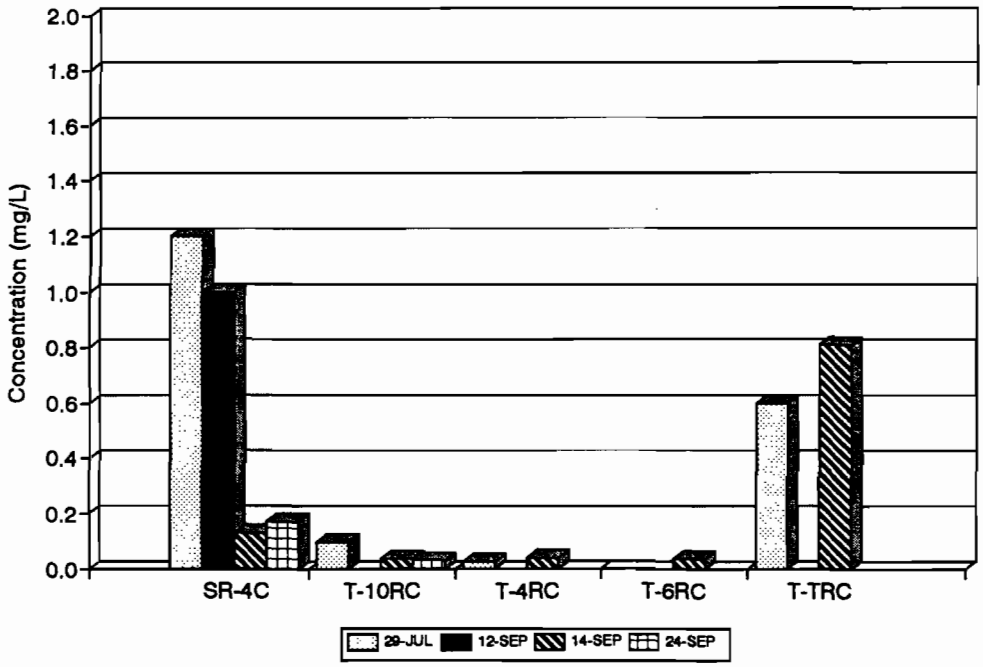
Total Recoverable Manganese - 1995
Tributary Rainfall-Runoff (Composite)



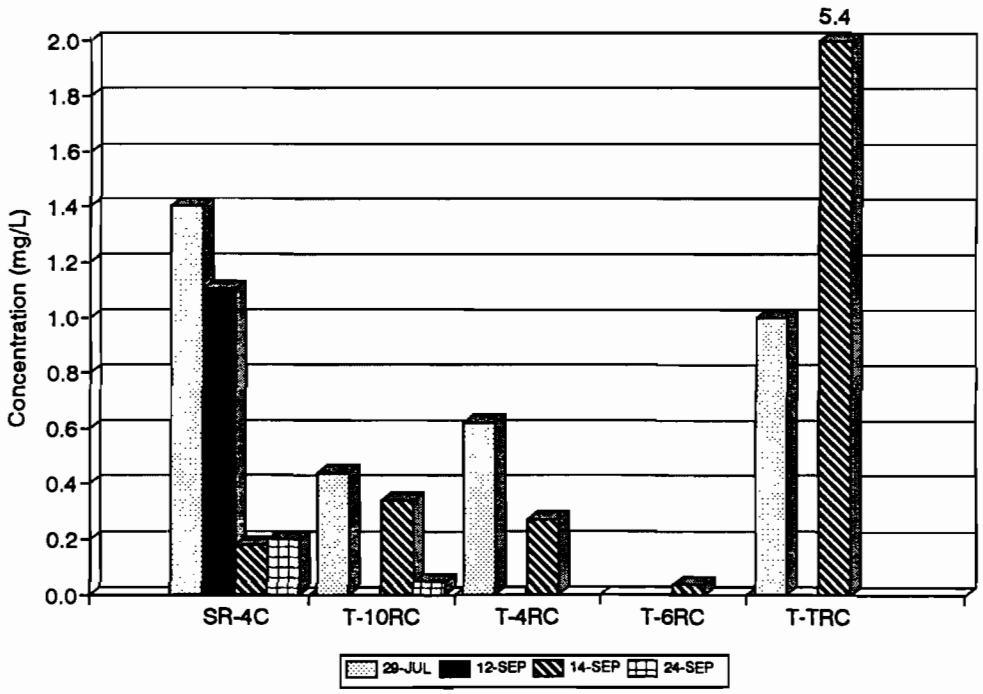
Total Recoverable Arsenic - 1996
Tributary Rainfall-Runoff (Composite)



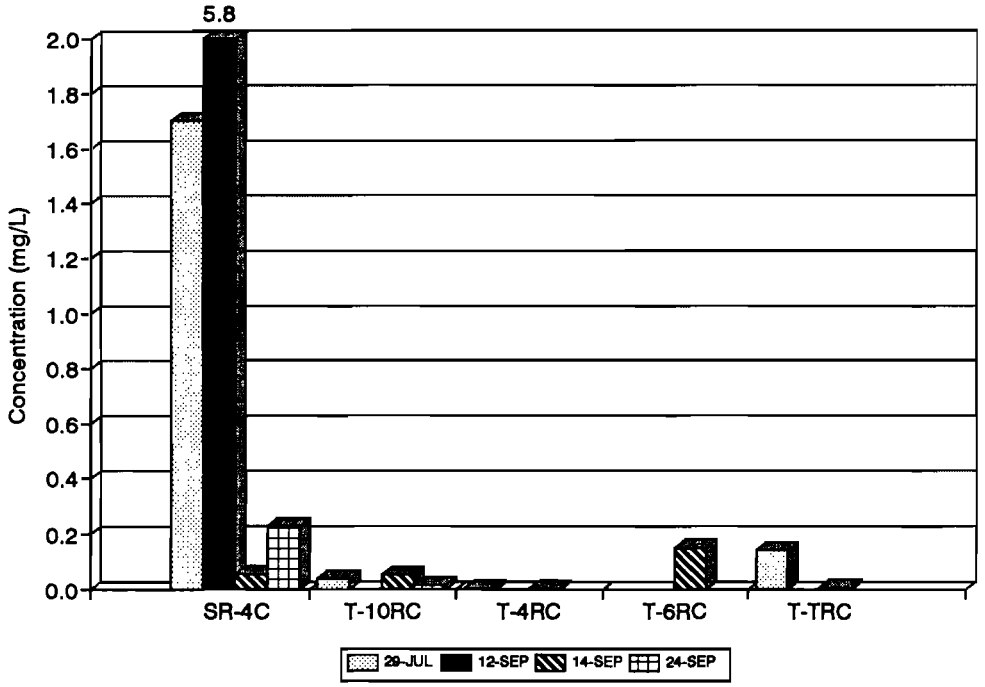
Dissolved Cadmium - 1996
Tributary Rainfall-Runoff (Composite)



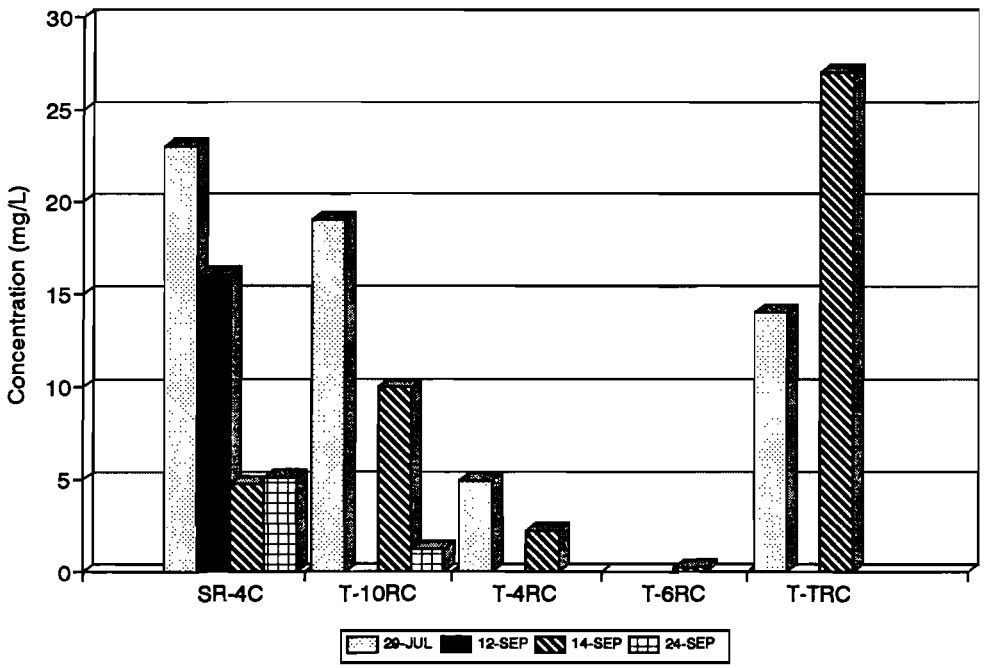
Total Recoverable Cadmium - 1996
Tributary Rainfall-Runoff (Composite)



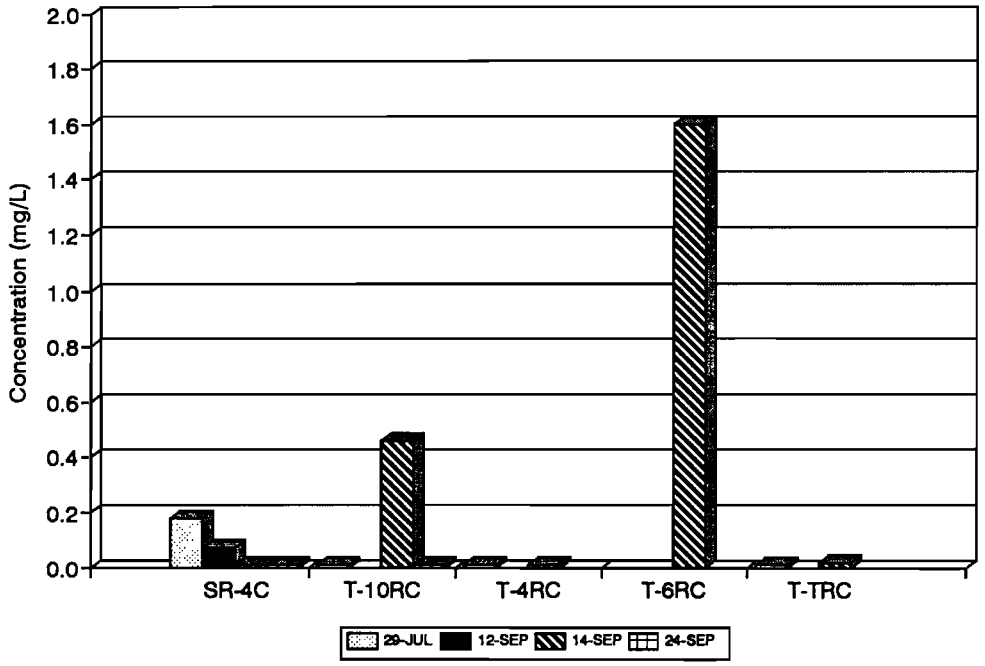
Dissolved Copper - 1996
Tributary Rainfall-Runoff (Composite)



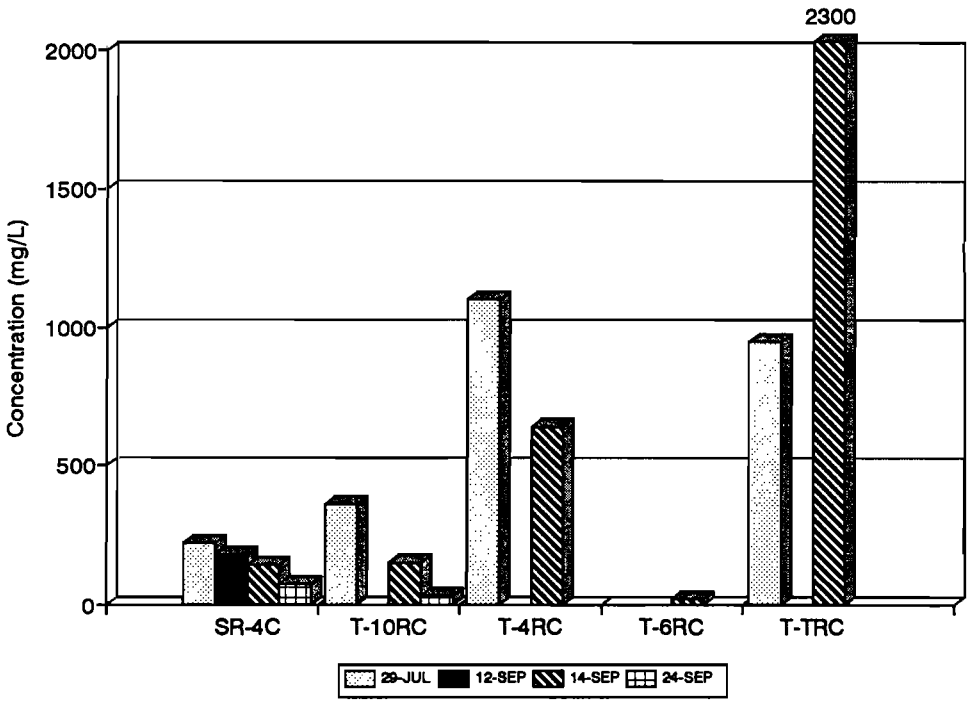
Total Recoverable Copper - 1996
Tributary Rainfall-Runoff (Composite)



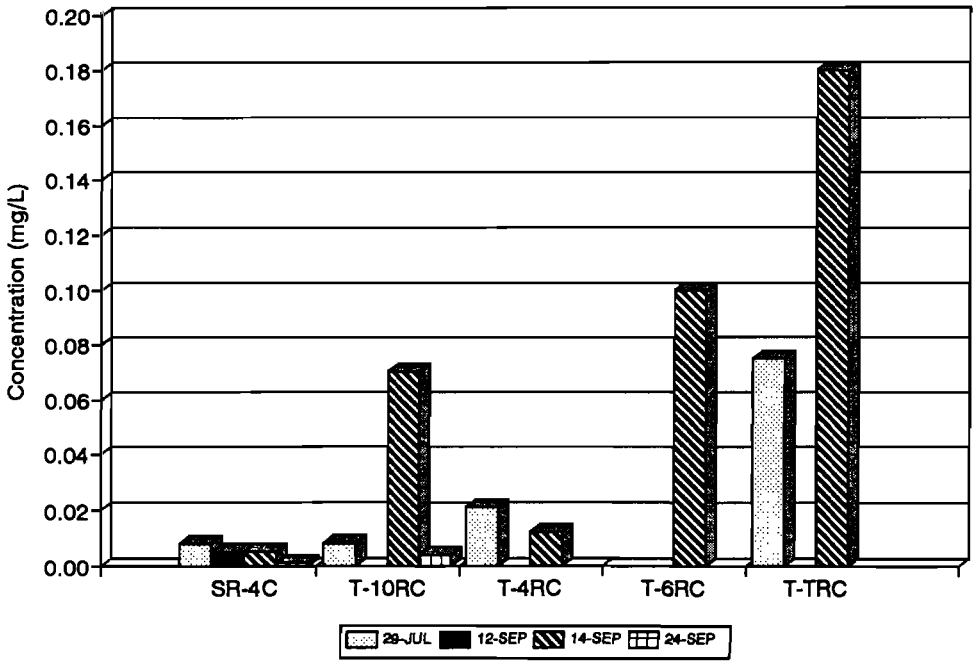
Dissolved Iron - 1996
Tributary Rainfall-Runoff (Composite)



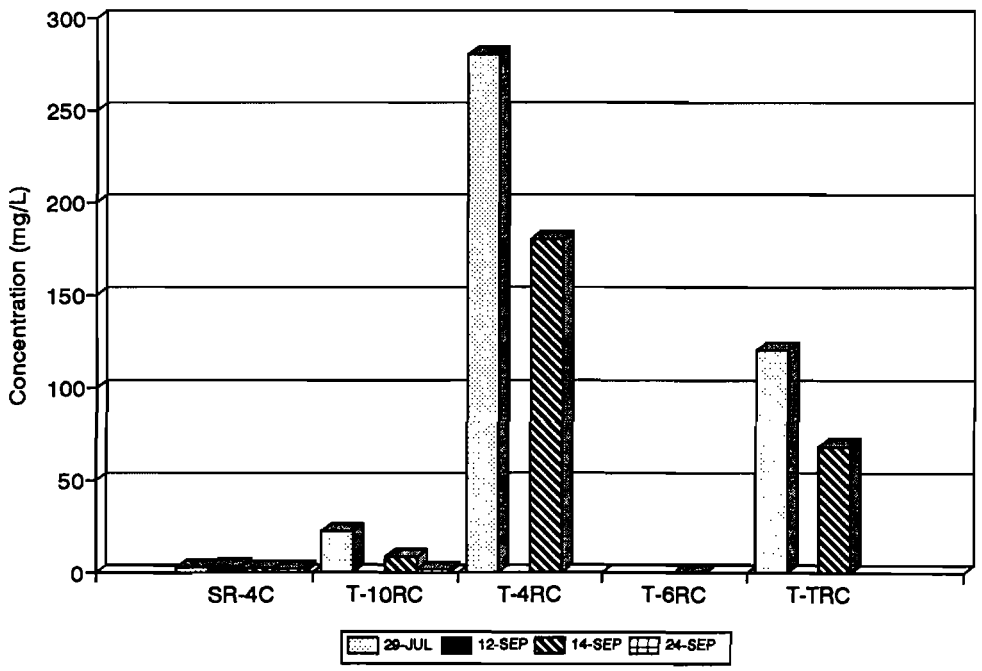
Total Recoverable Iron - 1996
Tributary Rainfall-Runoff (Composite)



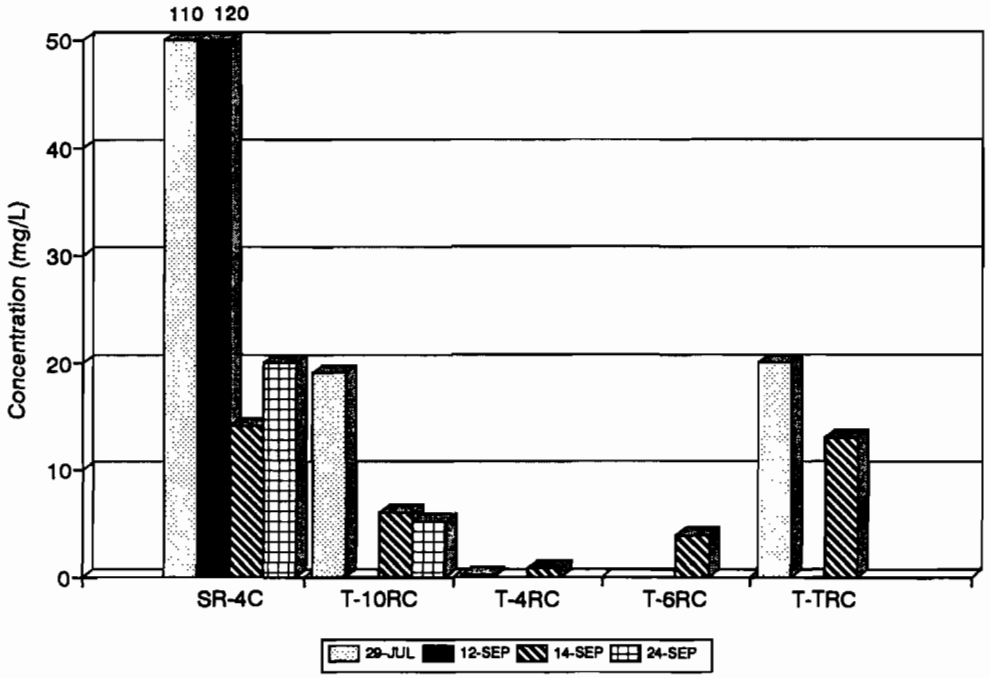
Dissolved Lead - 1996
Tributary Rainfall-Runoff (Composite)



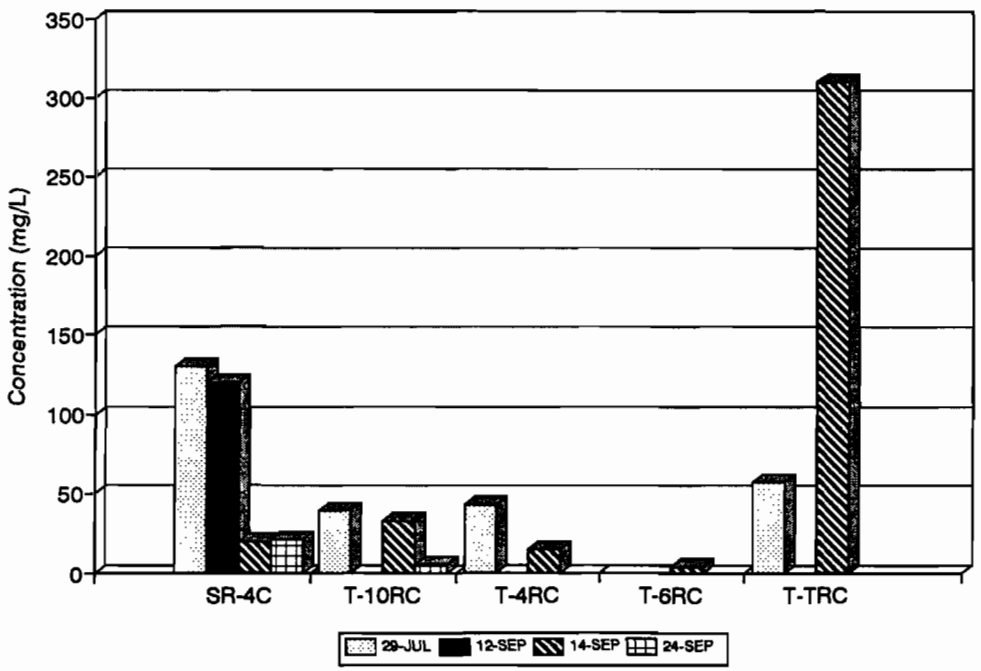
Total Recoverable Lead - 1996
Tributary Rainfall-Runoff (Composite)



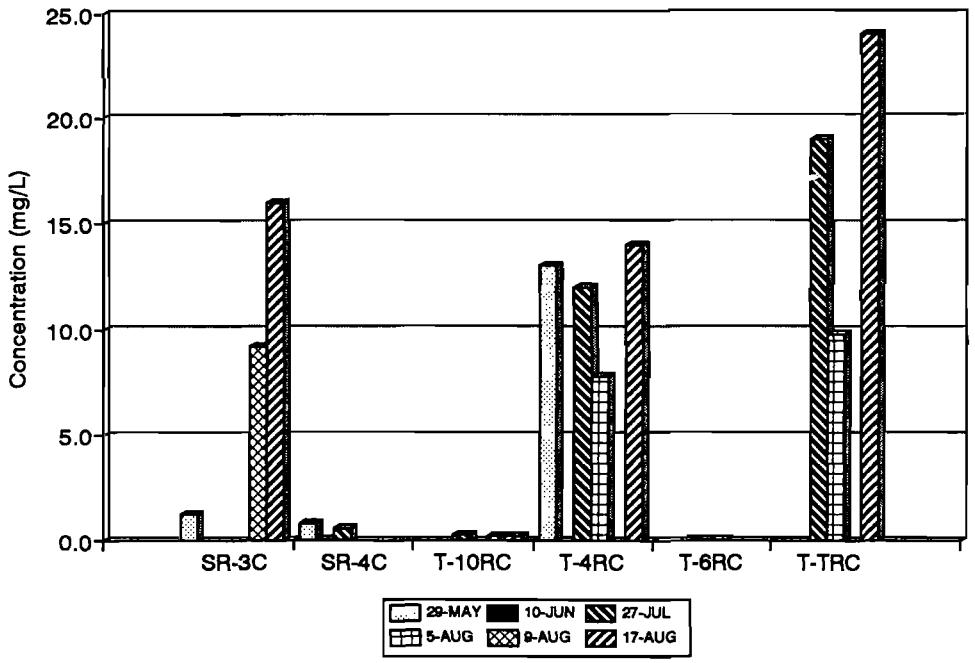
Dissolved Manganese - 1996
Tributary Rainfall-Runoff (Composite)



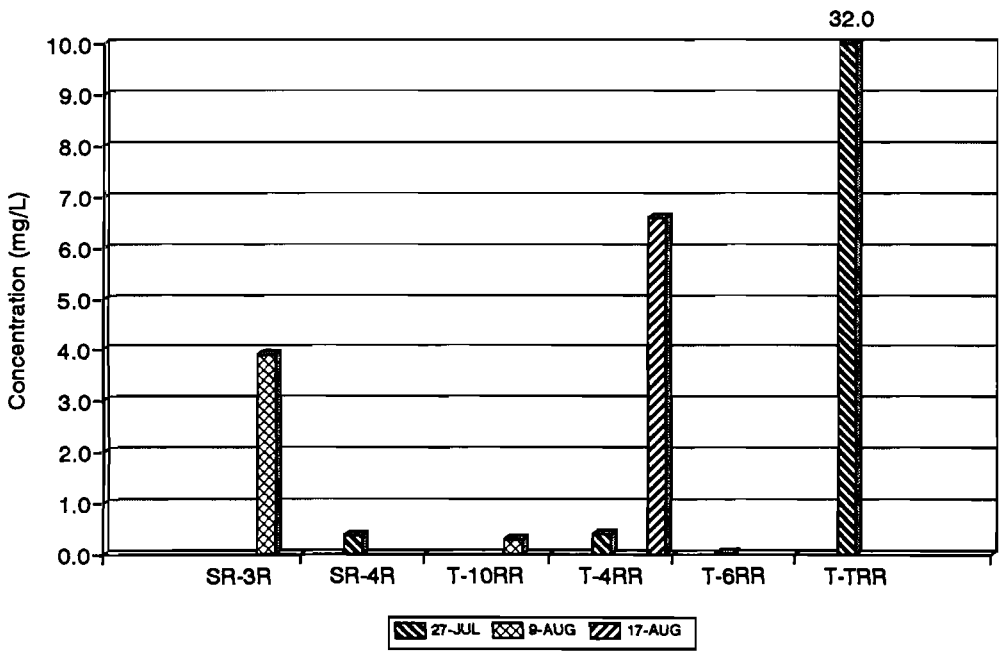
Total Recoverable Manganese - 1996
Tributary Rainfall-Runoff (Composite)



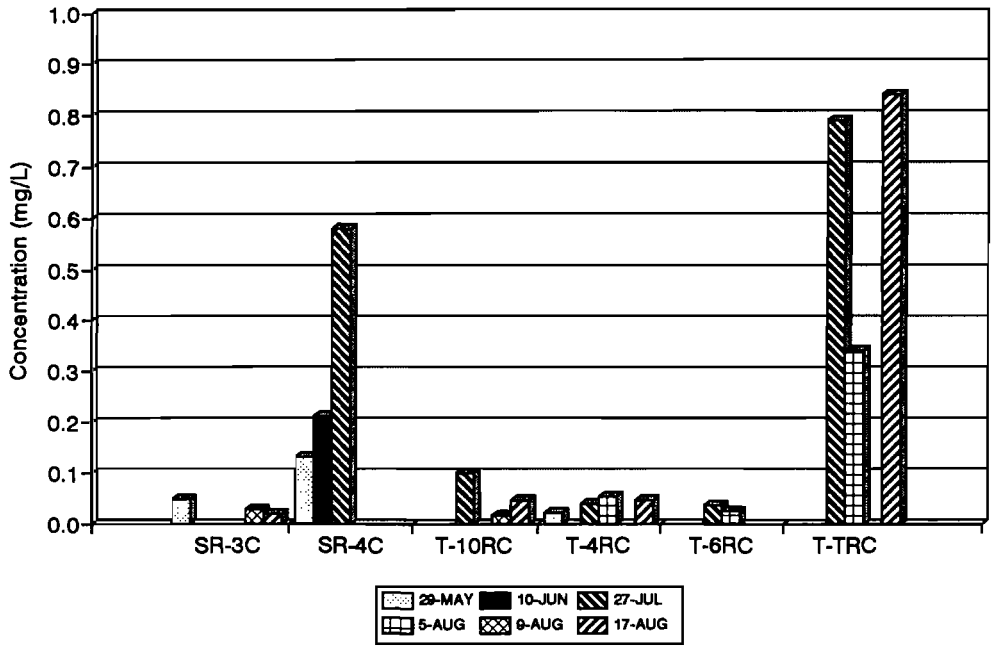
Total Recoverable Arsenic - 1997
Tributary Rainfall-Runoff (Composite)



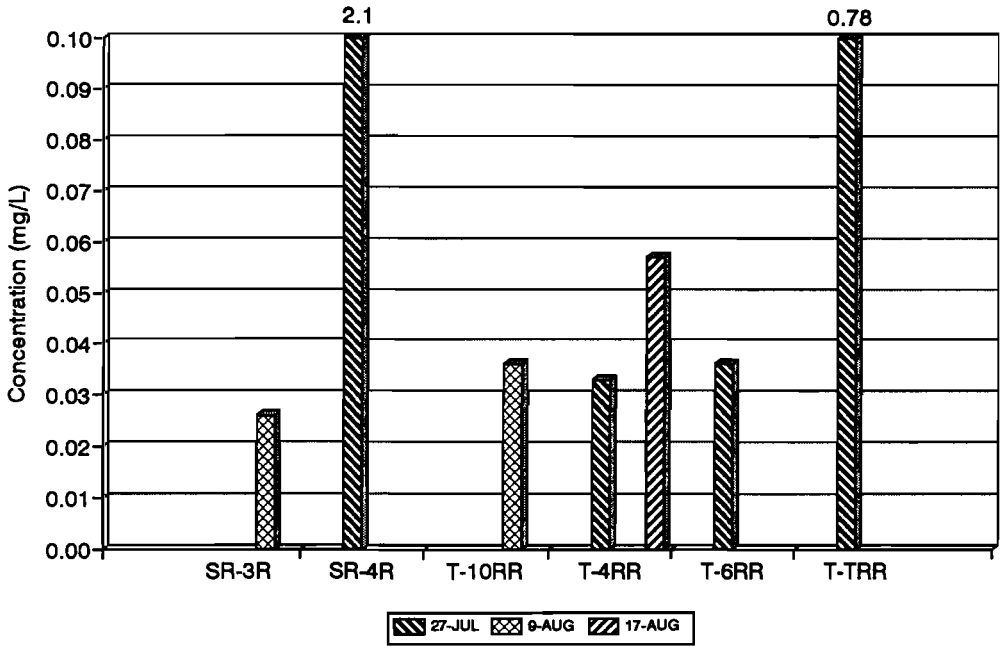
Total Recoverable Arsenic - 1997
Tributary Rainfall-Runoff (Rising Limb)



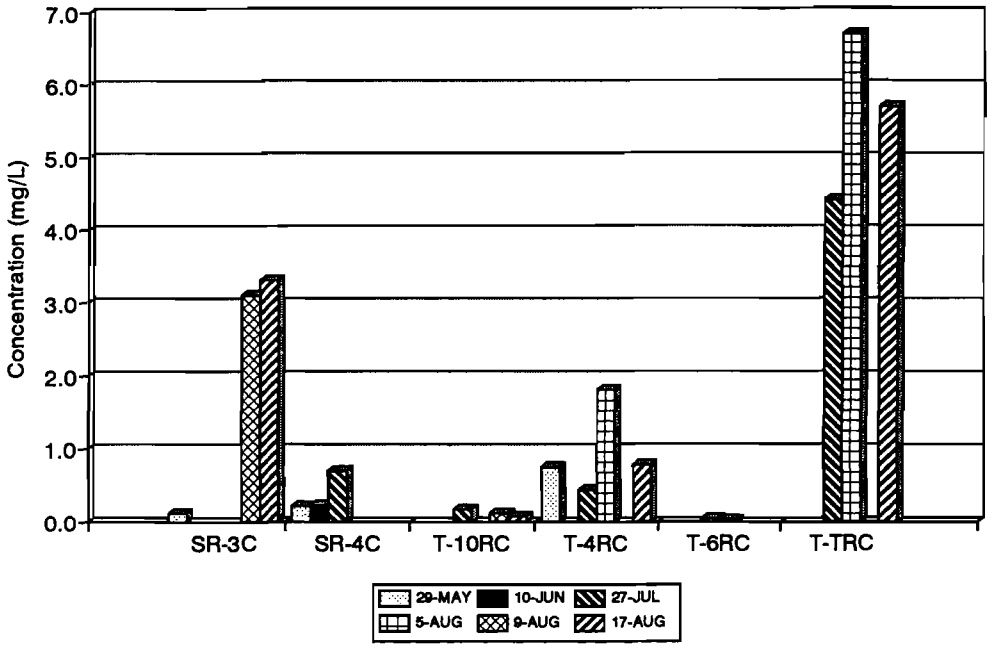
Dissolved Cadmium - 1997
Tributary Rainfall-Runoff (Composite)



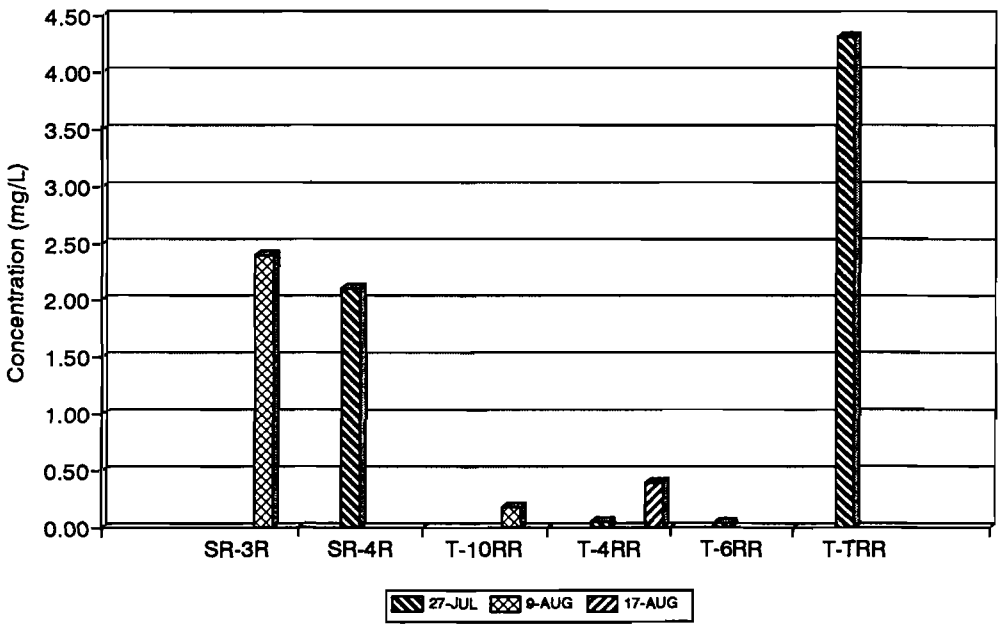
Dissolved Cadmium - 1997
Tributary Rainfall-Runoff (Rising Limb)



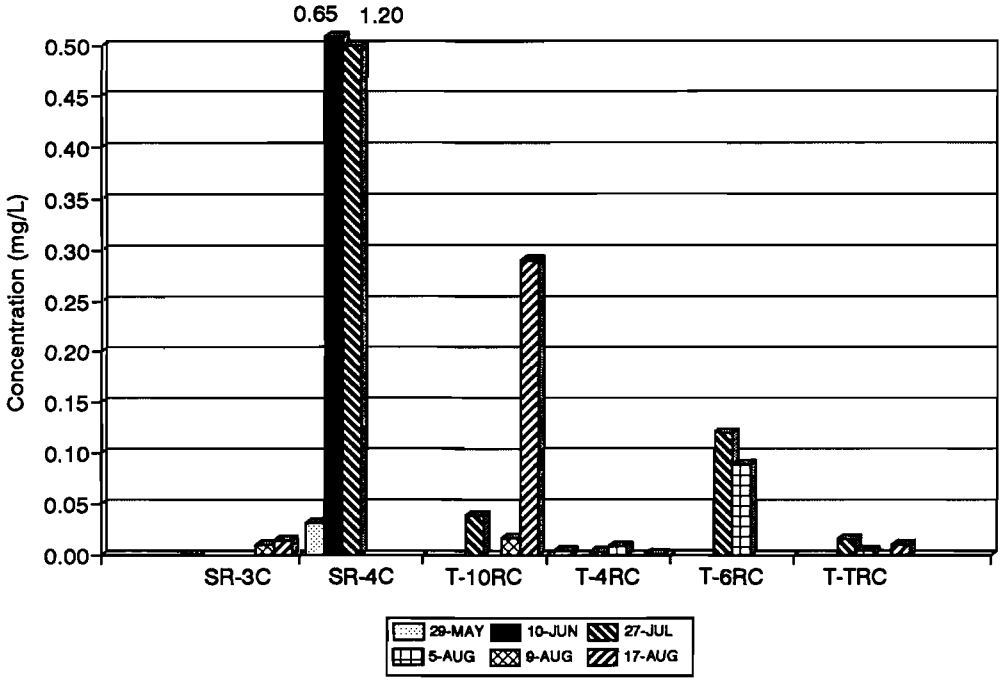
Total Recoverable Cadmium - 1997
Tributary Rainfall-Runoff (Composite)



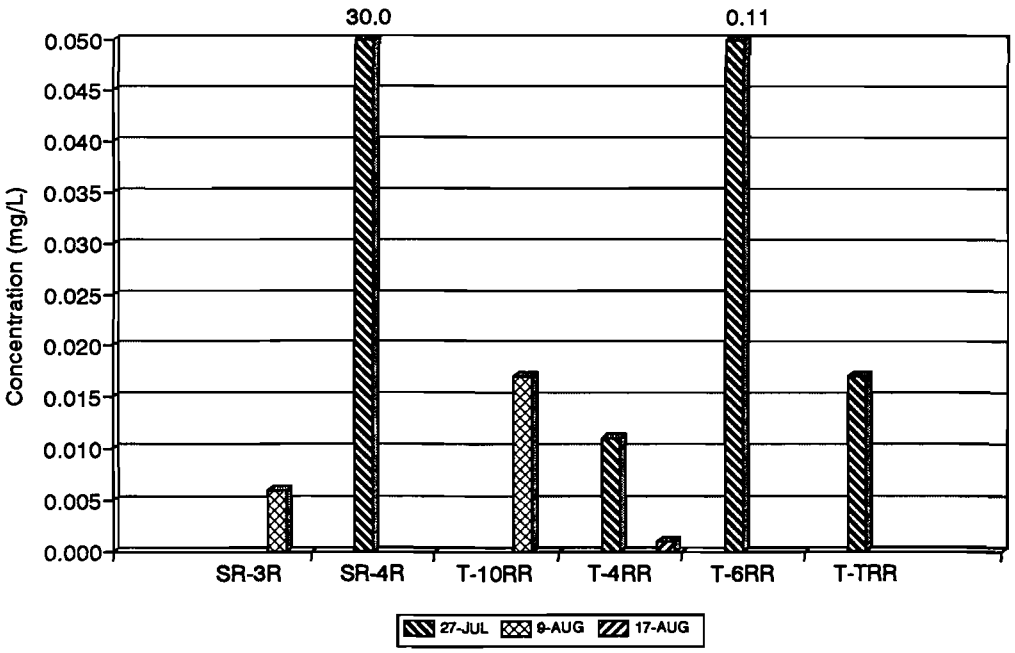
Total Recoverable Cadmium - 1997
Tributary Rainfall-Runoff (Rising Limb)



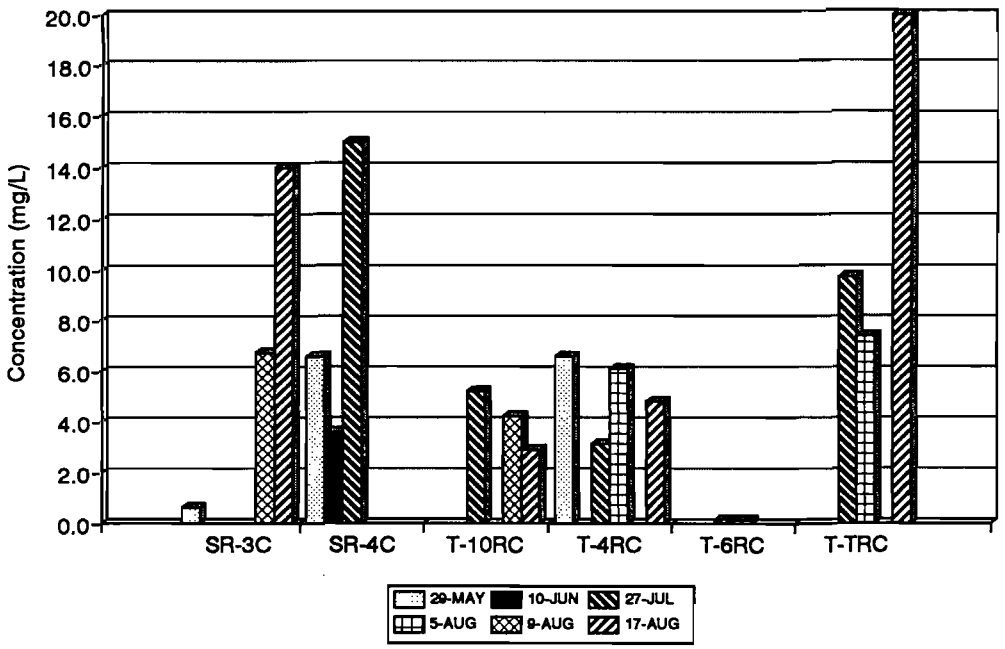
Dissolved Copper - 1997
Tributary Rainfall-Runoff (Composite)



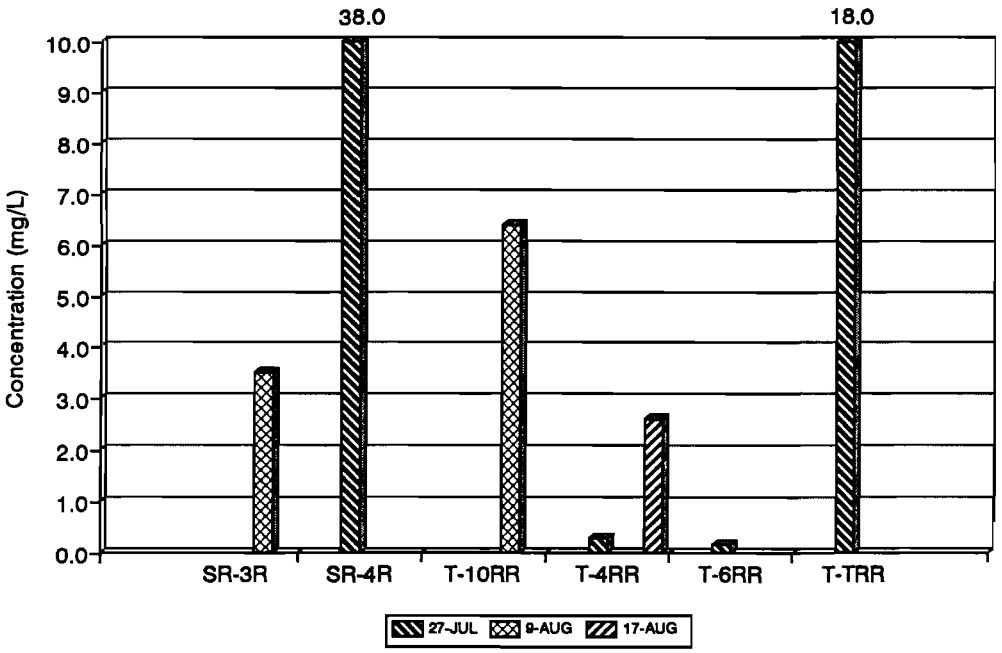
Dissolved Copper - 1997
Tributary Rainfall-Runoff (Rising Limb)



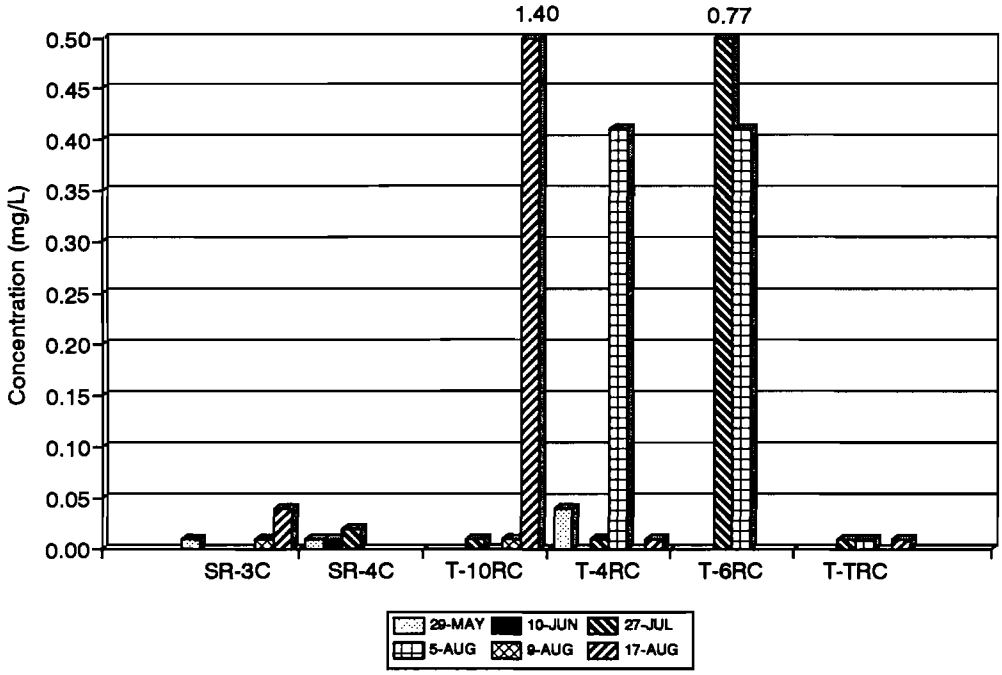
Total Recoverable Copper - 1997
Tributary Rainfall-Runoff (Composite)



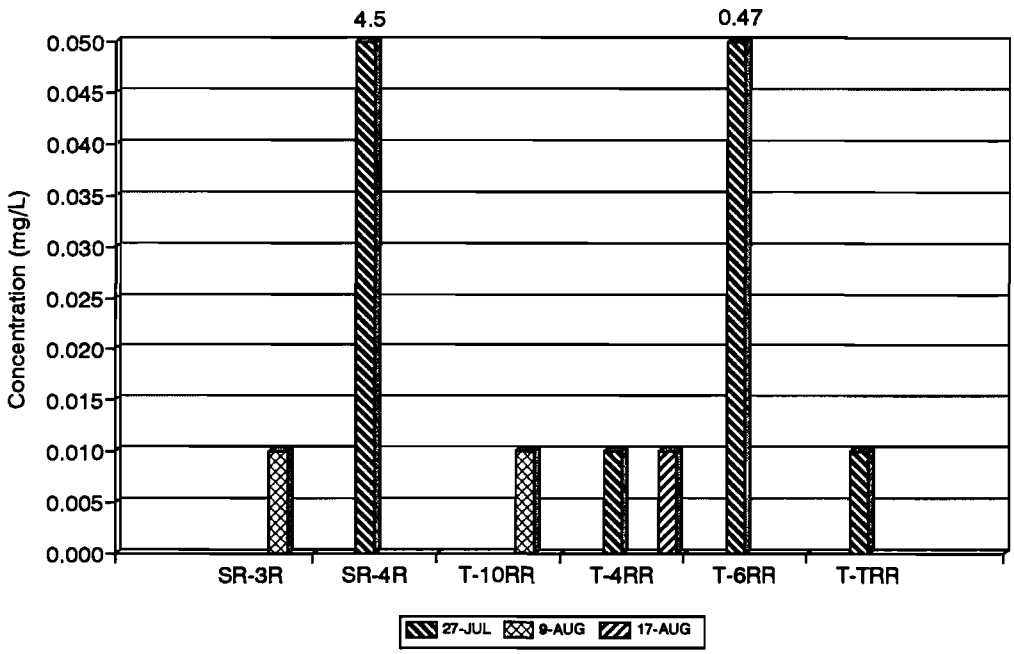
Total Recoverable Copper - 1997
Tributary Rainfall-Runoff (Rising Limb)



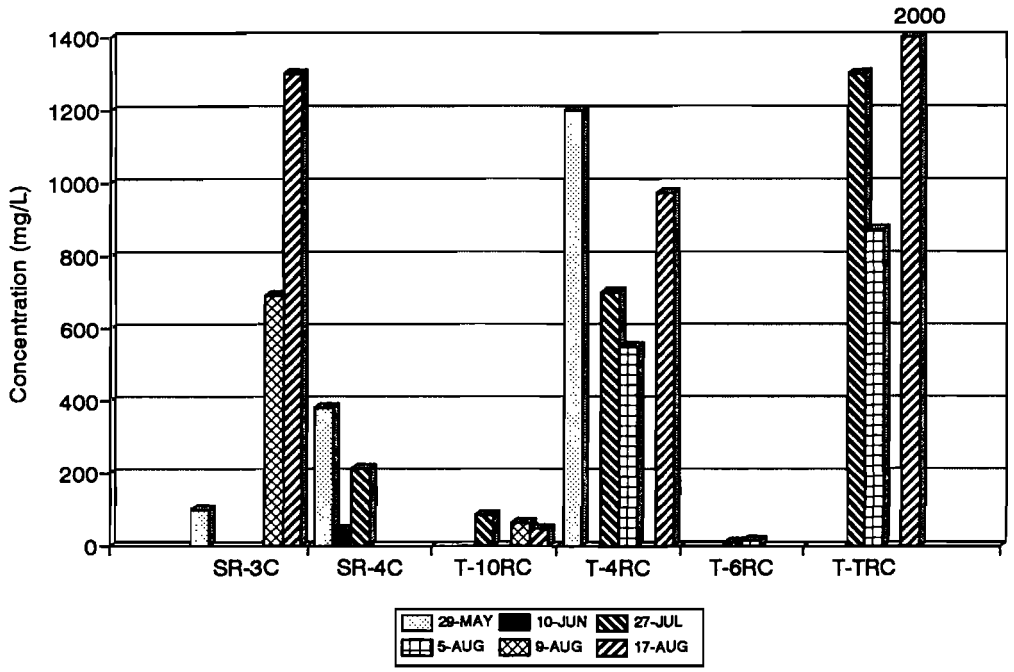
Dissolved Iron - 1997
Tributary Rainfall-Runoff (Composite)



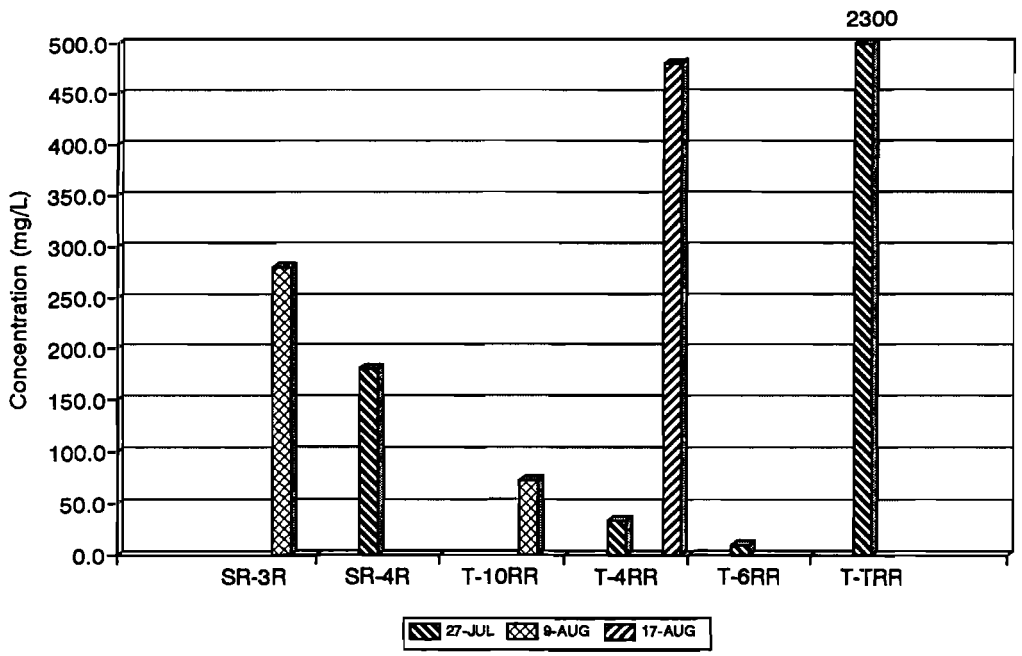
Dissolved Iron - 1997
Tributary Rainfall-Runoff (Rising Limb)



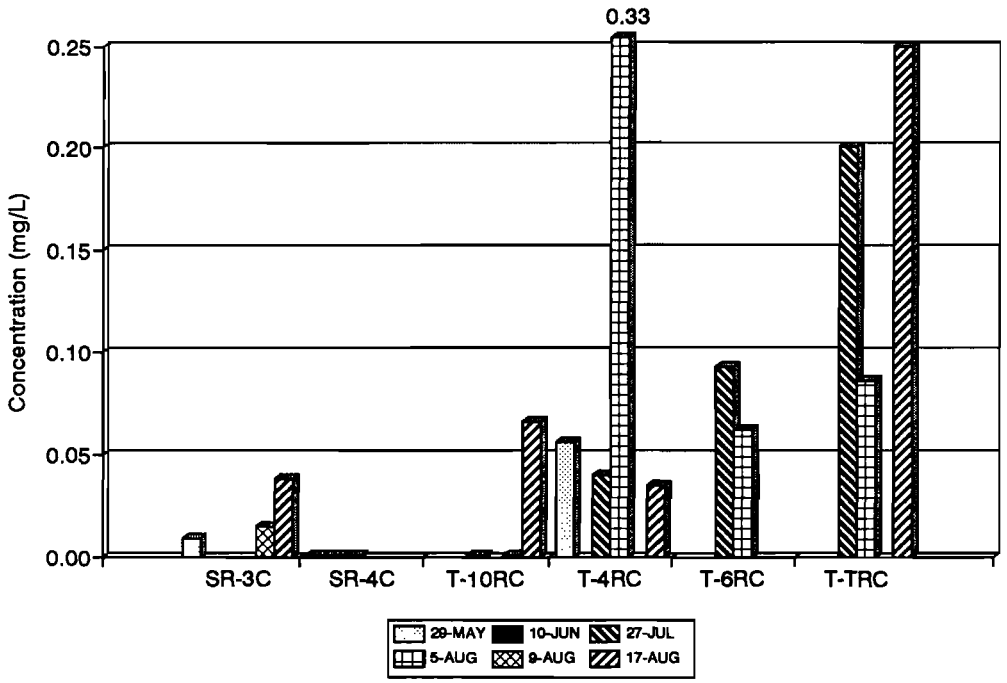
Total Recoverable Iron - 1997
Tributary Rainfall-Runoff (Composite)



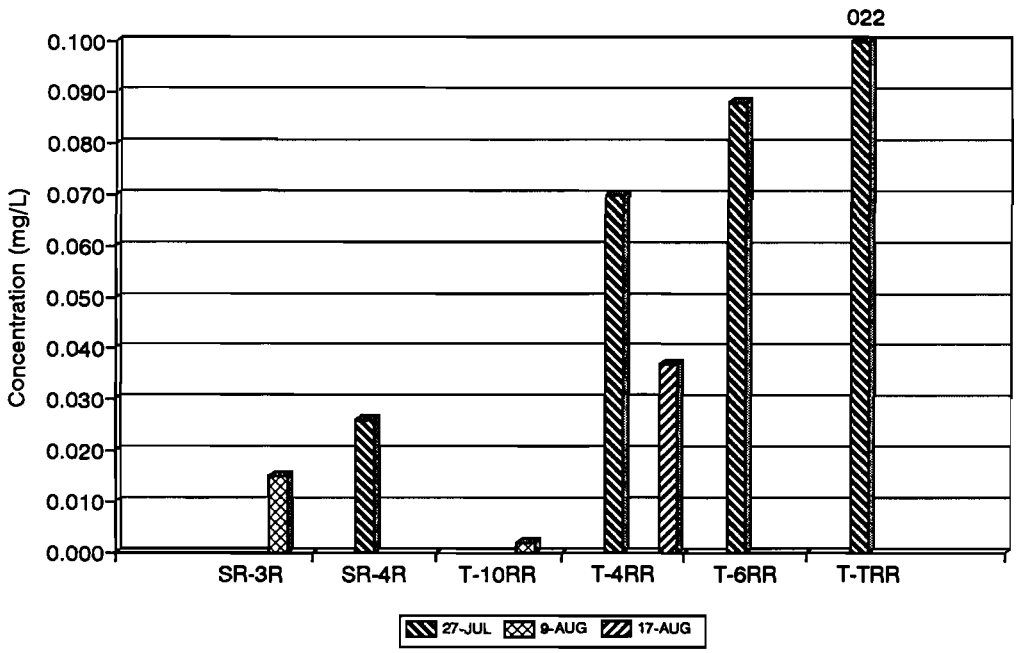
Total Recoverable Iron - 1997
Tributary Rainfall-Runoff (Rising Limb)



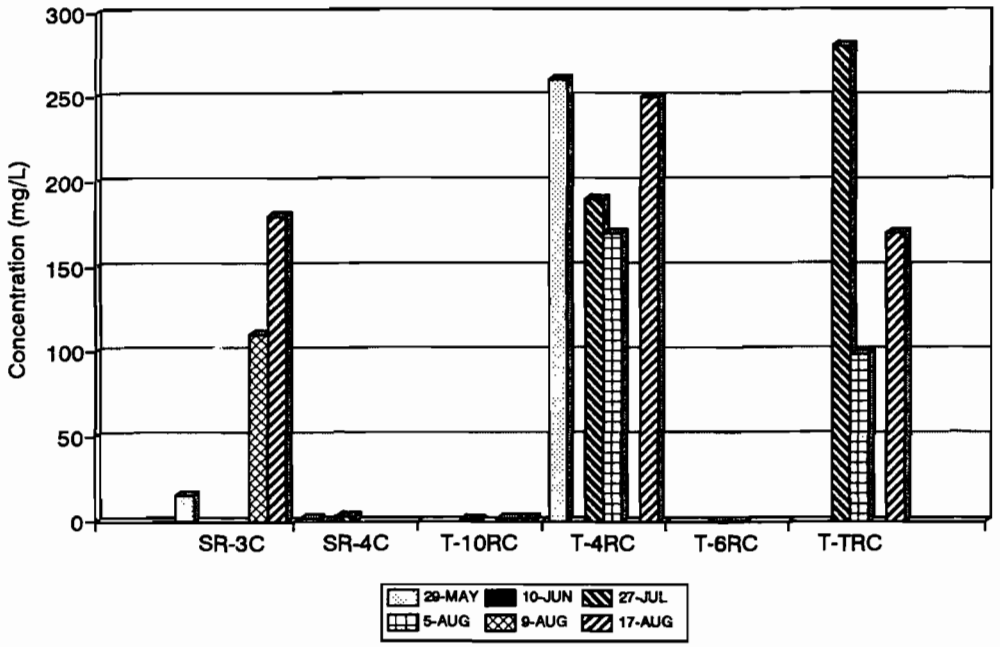
Dissolved Lead - 1997
Tributary Rainfall-Runoff (Composite)



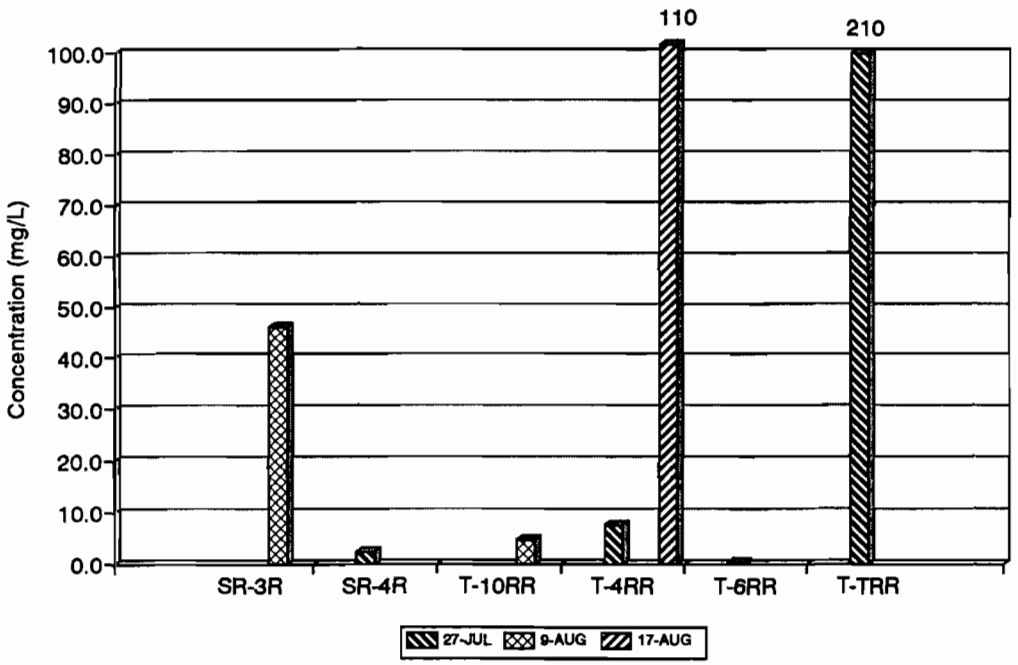
Dissolved Lead - 1997
Tributary Rainfall-Runoff (Rising Limb)



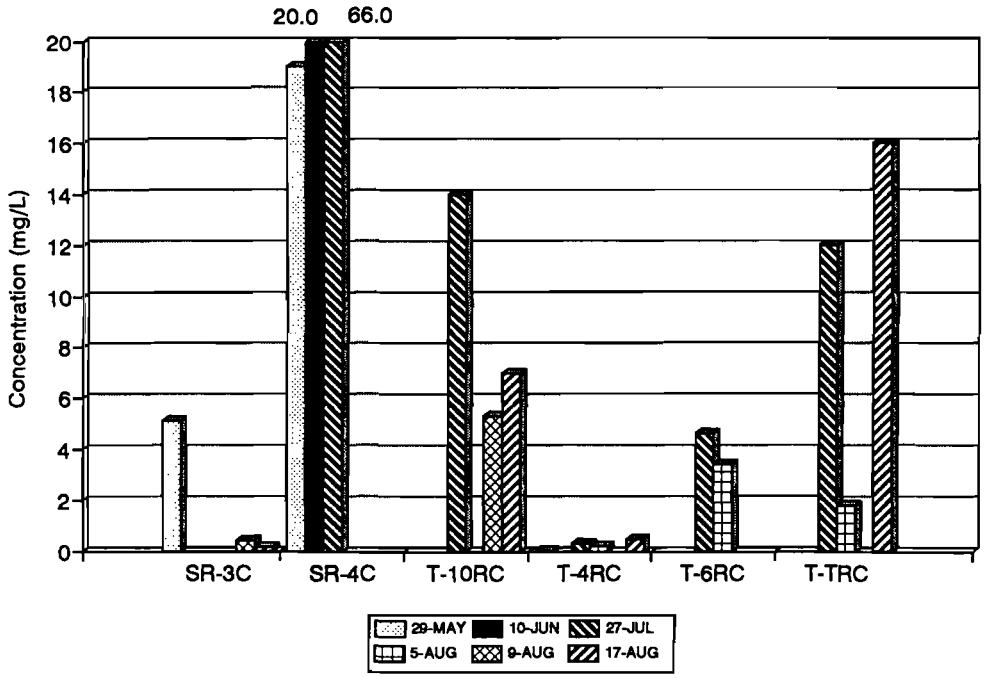
Total Recoverable Lead - 1997
Tributary Rainfall-Runoff (Composite)



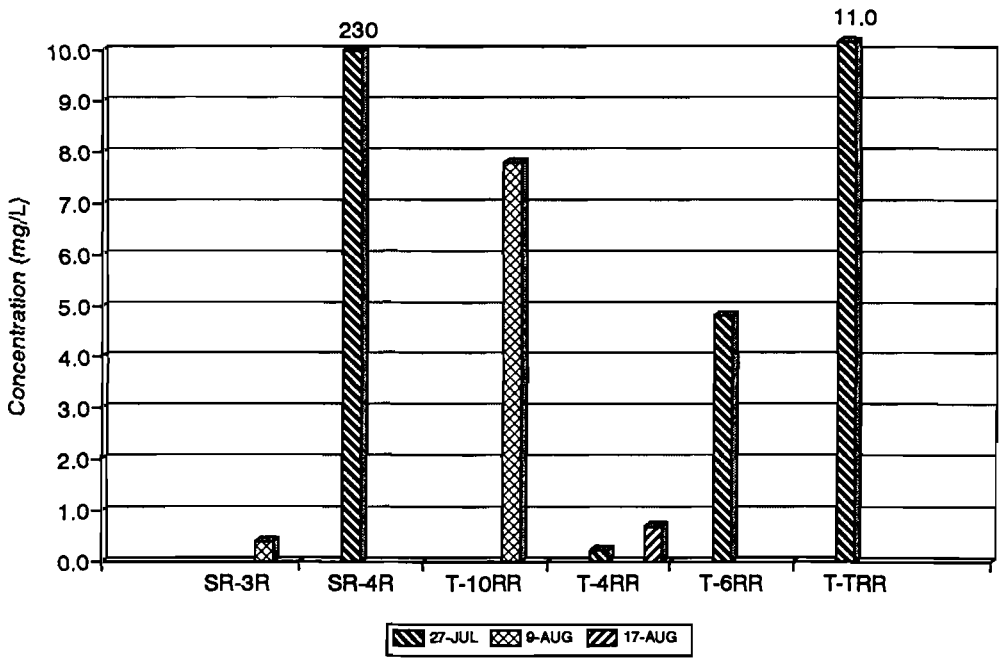
Total Recoverable Lead - 1997
Tributary Rainfall-Runoff (Rising Limb)



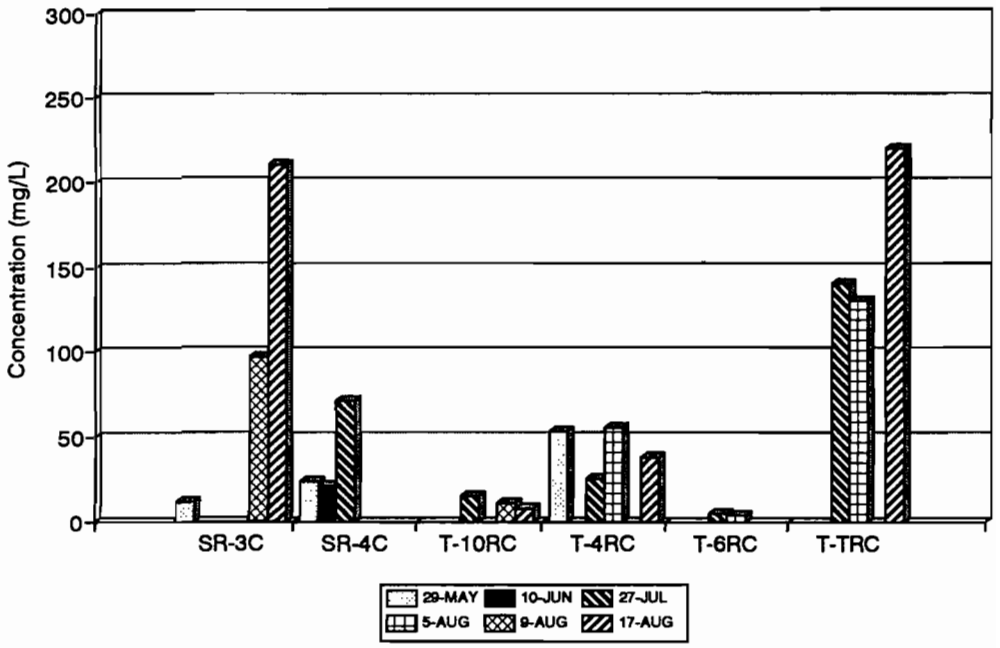
Dissolved Manganese - 1997
Tributary Rainfall-Runoff (Composite)



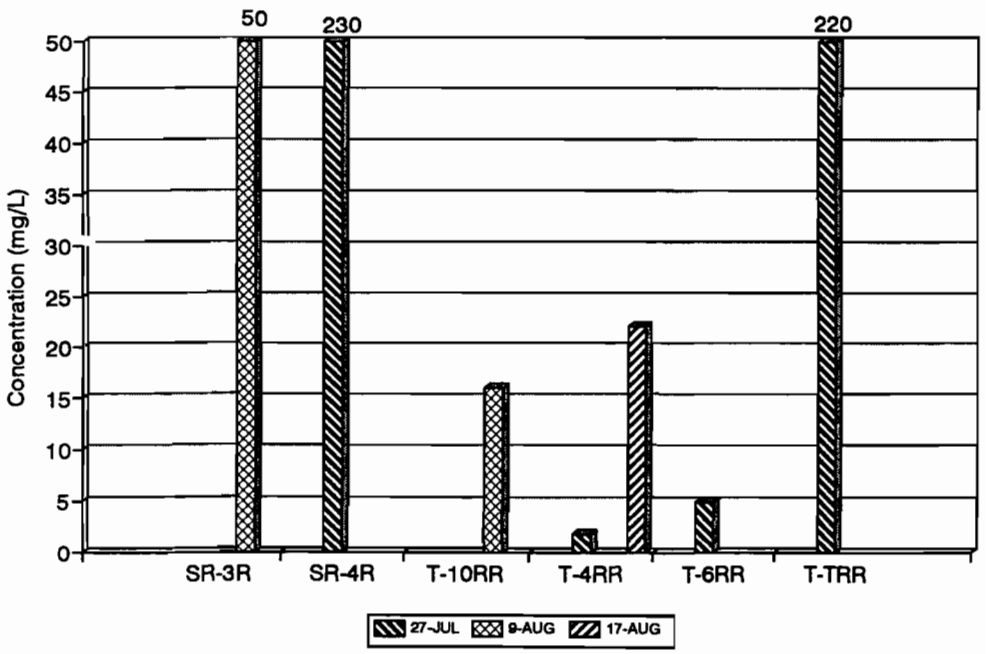
Dissolved Manganese - 1997
Tributary Rainfall-Runoff (Rising Limb)



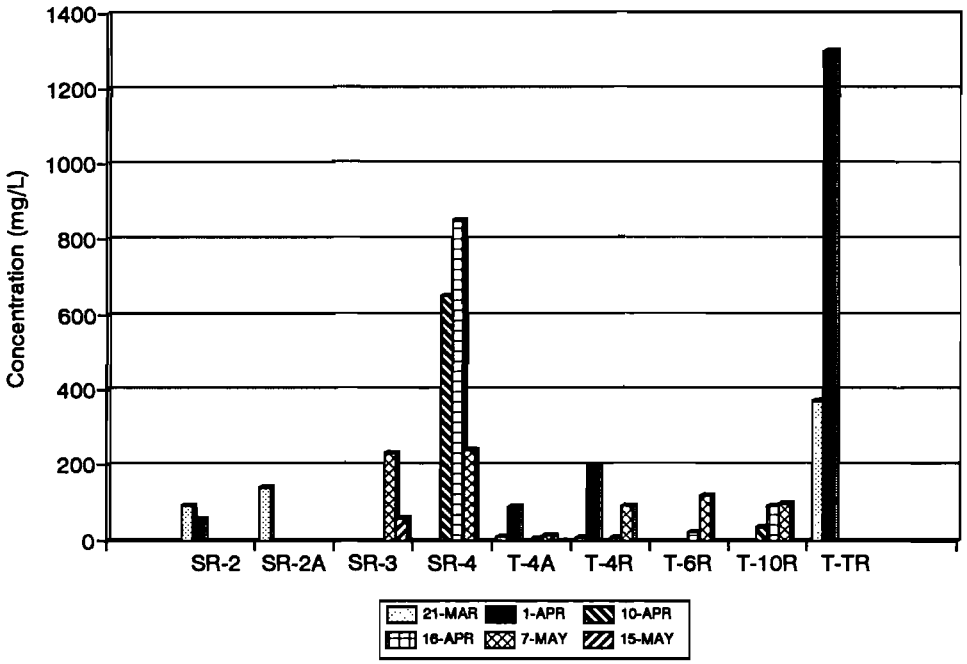
Total Recoverable Manganese - 1997
Tributary Rainfall-Runoff (Composite)



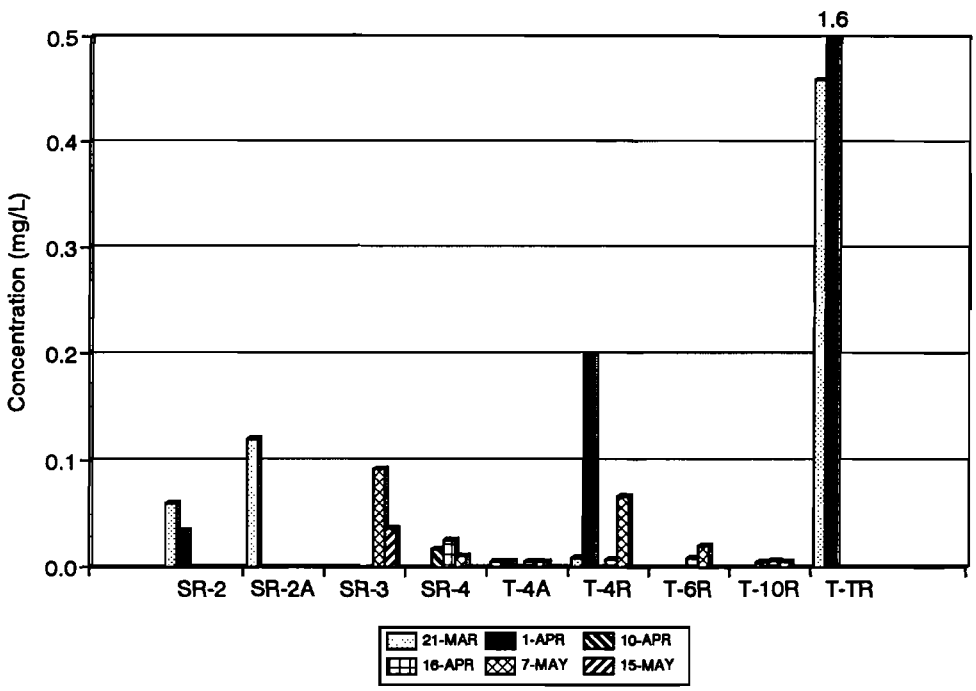
Total Recoverable Manganese - 1997
Tributary Rainfall-Runoff (Rising Limb)



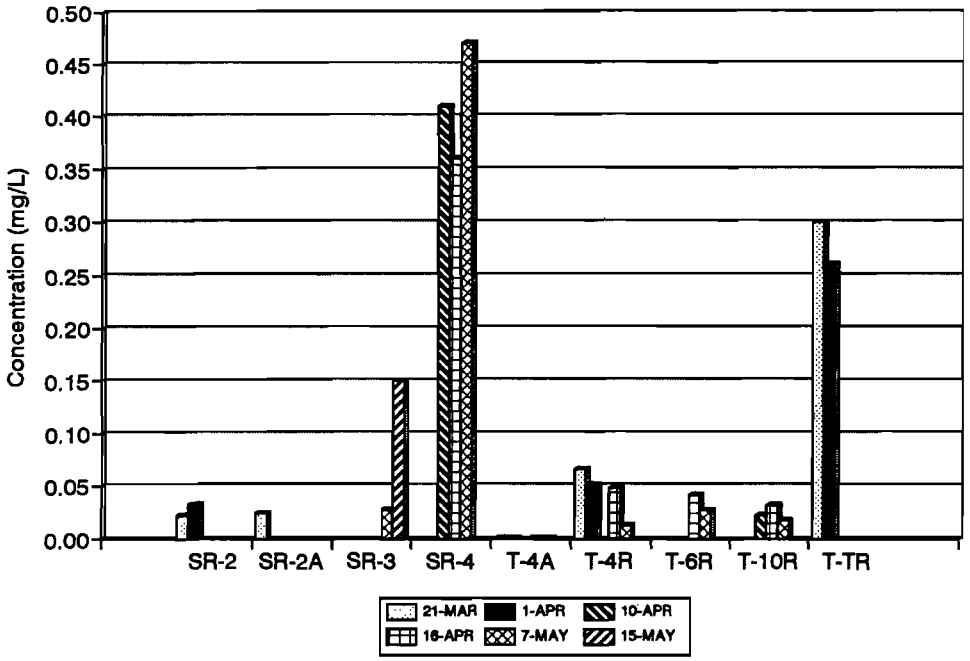
Suspended Solids - 1996
Tributary Snowmelt-Runoff



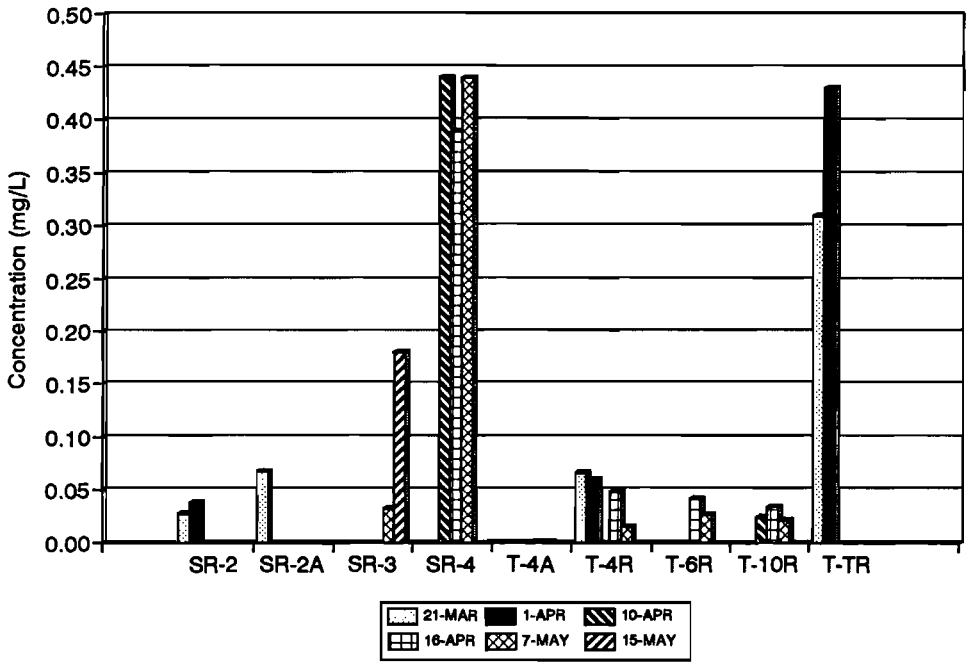
Total Recoverable Arsenic - 1996
Tributary Snowmelt-Runoff



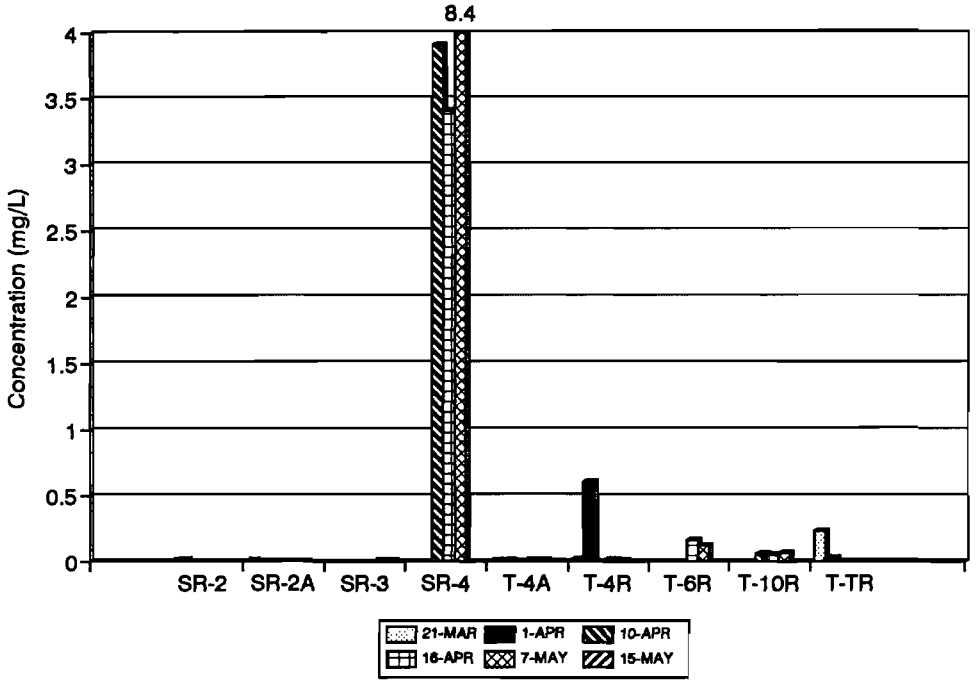
Dissolved Cadmium - 1996
Tributary Snowmelt-Runoff



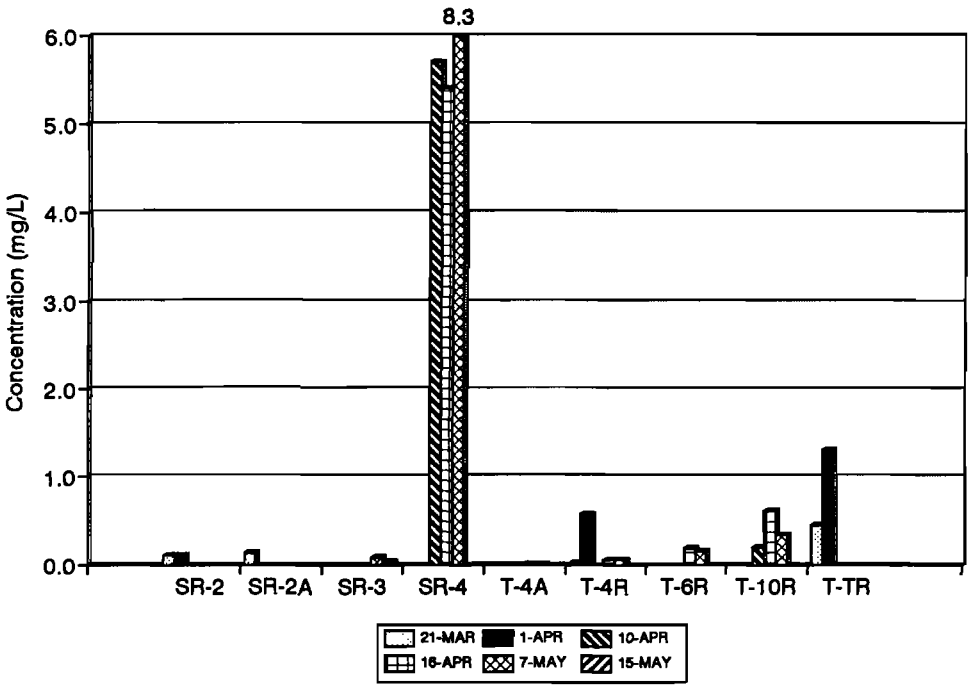
Total Recoverable Cadmium - 1996
Tributary Snowmelt-Runoff



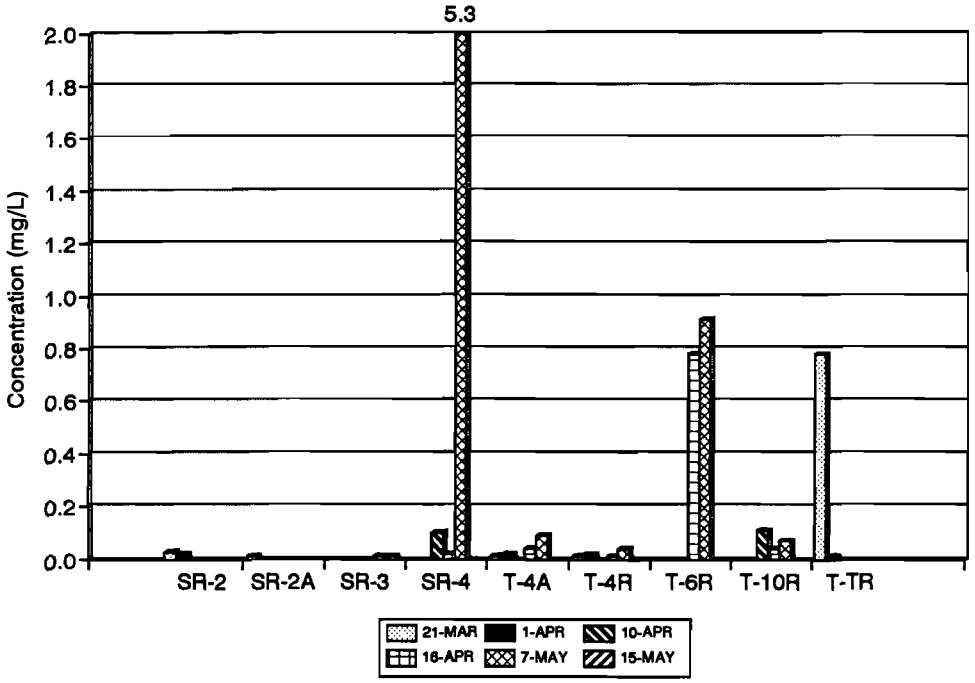
Dissolved Copper - 1996
Tributary Snowmelt-Runoff



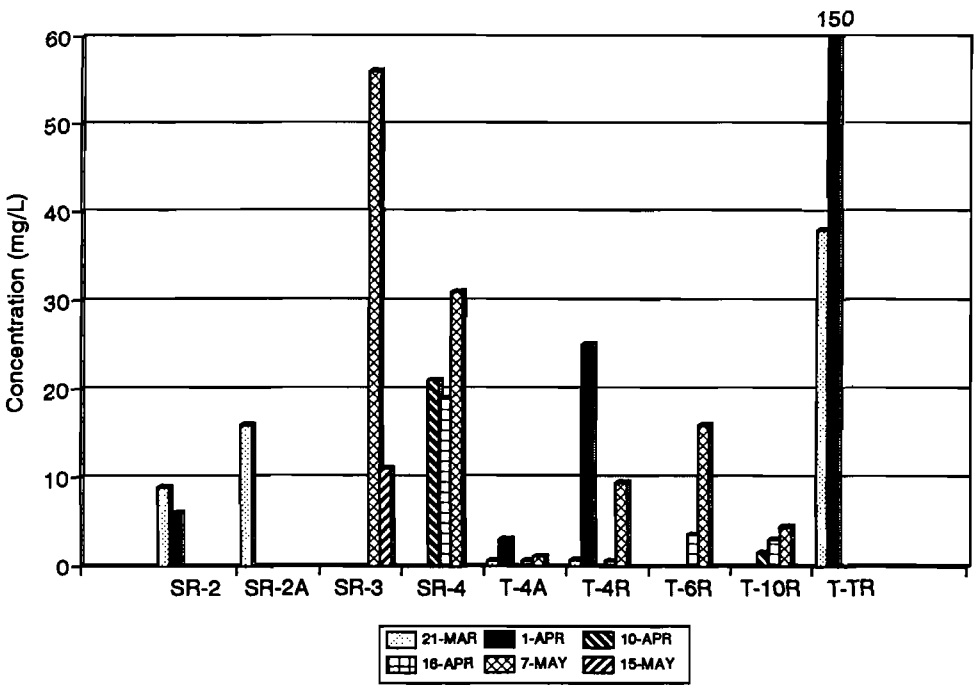
Total Recoverable Copper - 1996
Tributary Snowmelt-Runoff



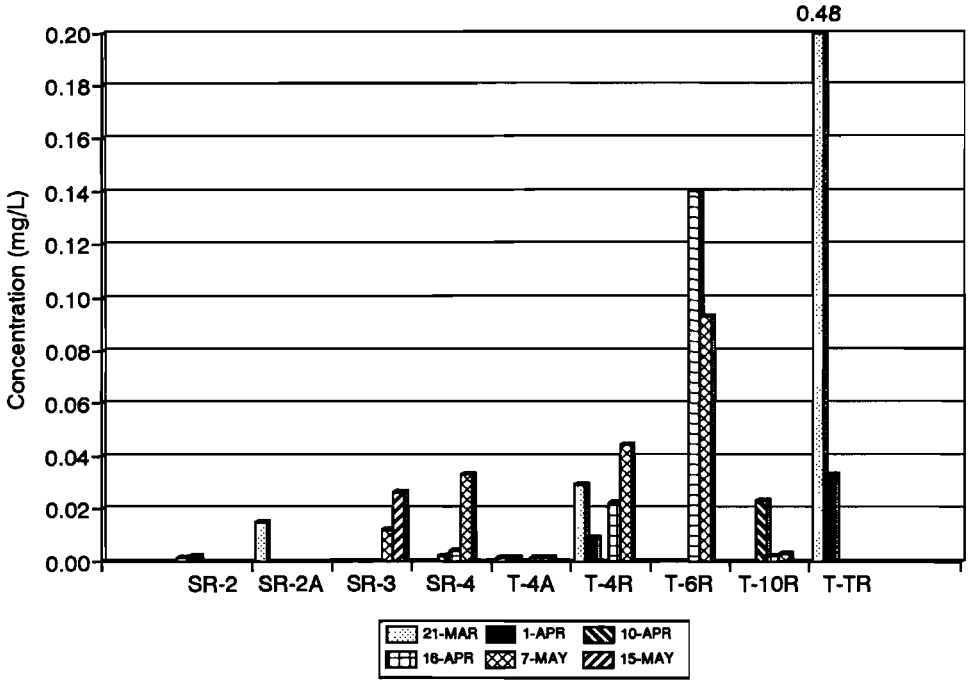
Dissolved Iron - 1996
Tributary Snowmelt-Runoff



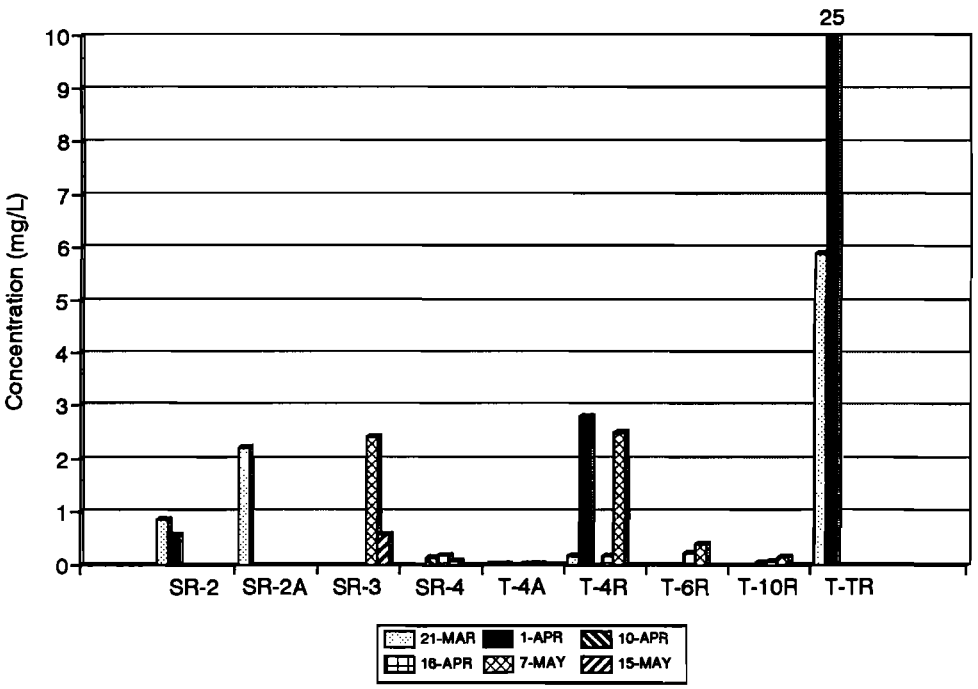
Total Recoverable Iron - 1996
Tributary Snowmelt-Runoff



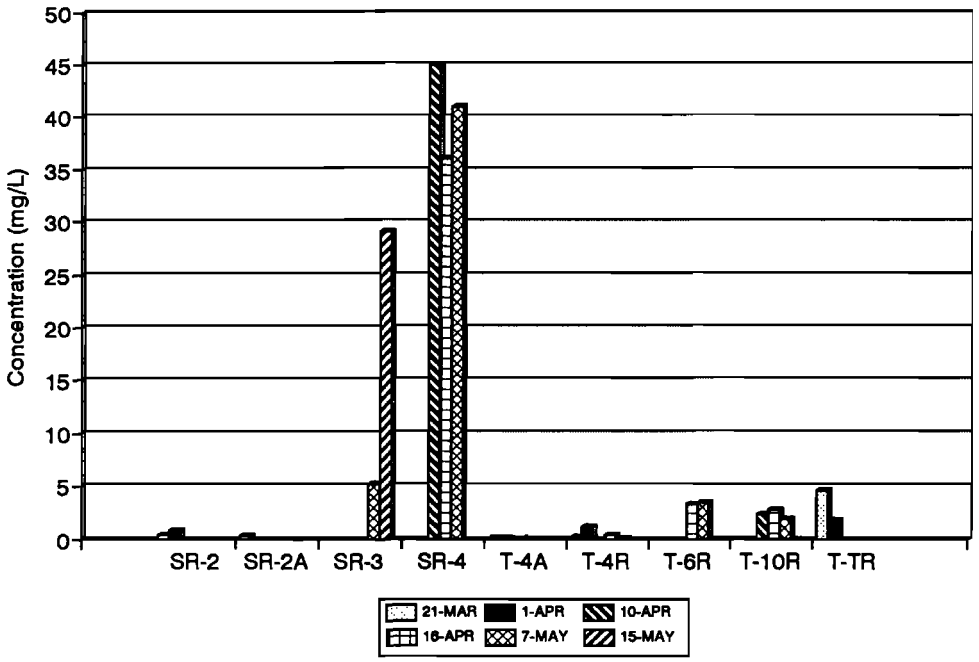
Dissolved Lead - 1996
Tributary Snowmelt-Runoff



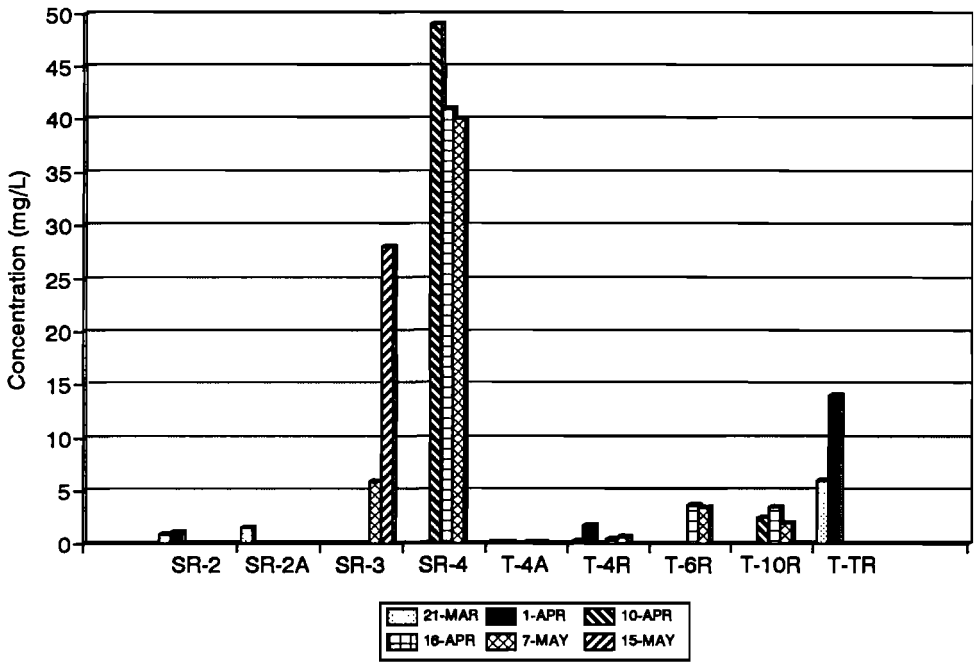
Total Recoverable Lead - 1996
Tributary Snowmelt-Runoff



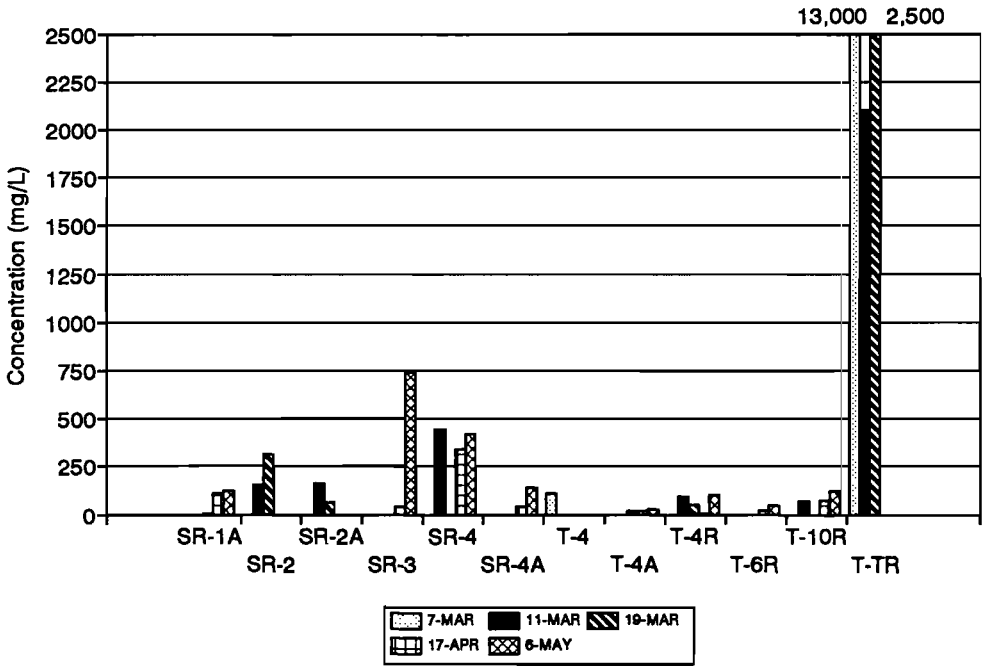
Dissolved Manganese - 1996
Tributary Snowmelt-Runoff



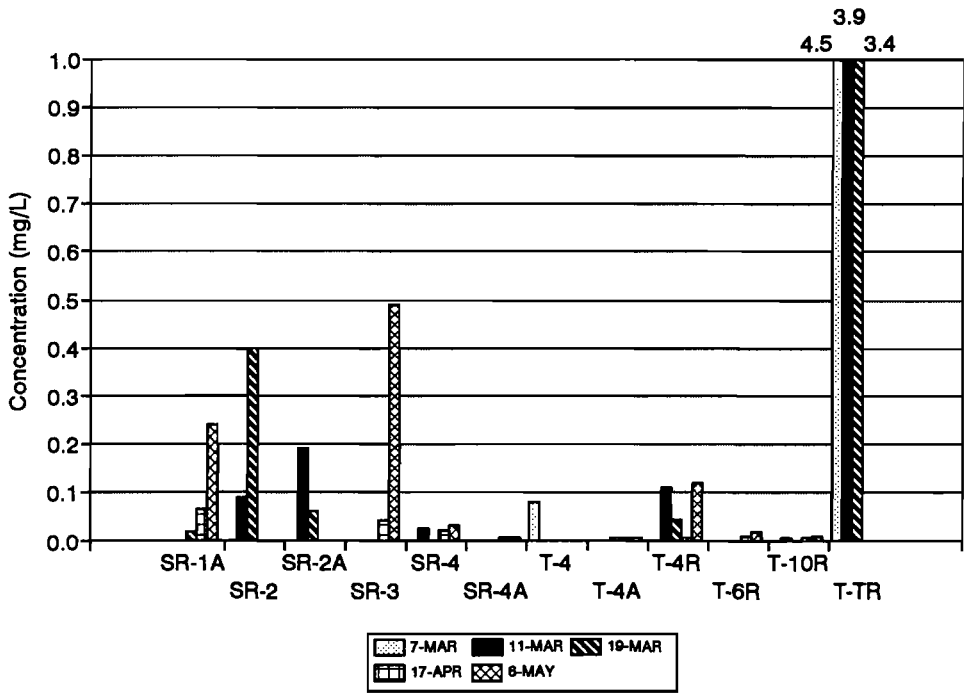
Total Recoverable Manganese - 1996
Tributary Snowmelt-Runoff



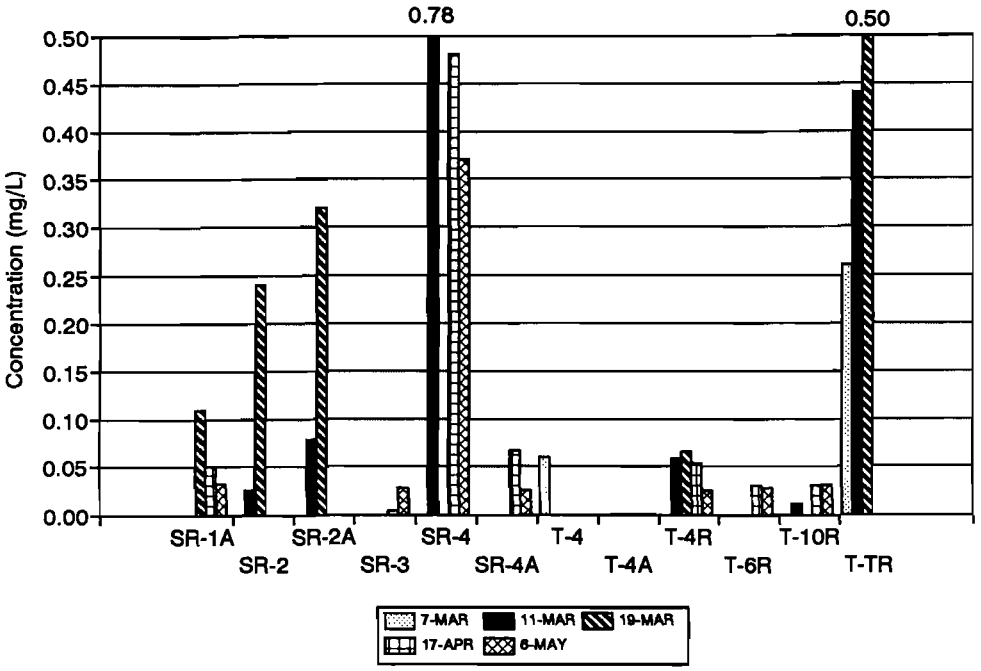
Suspended Solids - 1997
Tributary Snowmelt-Runoff



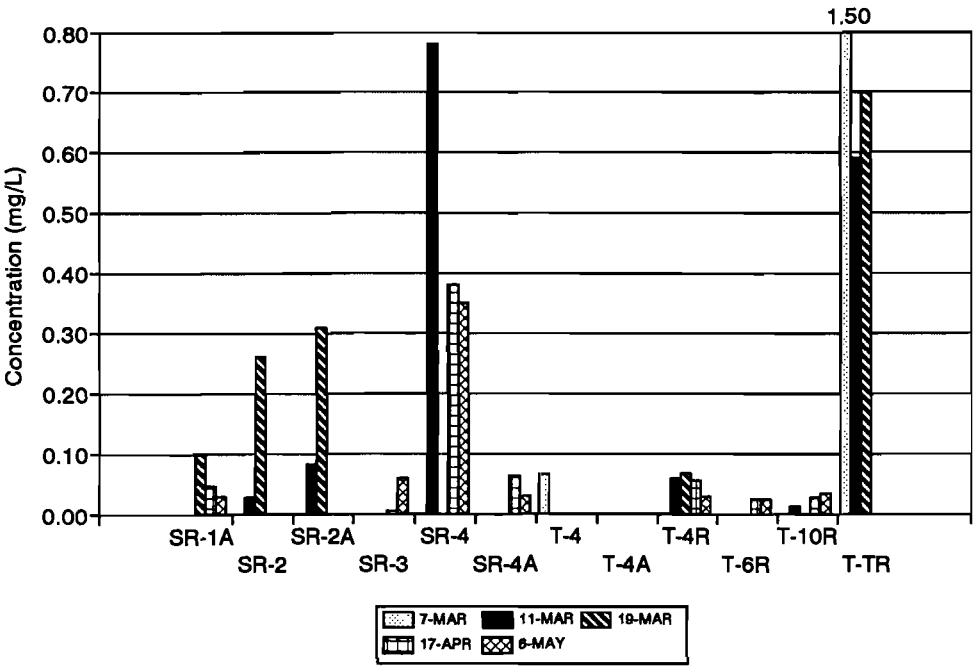
Total Recoverable Arsenic - 1997
Tributary Snowmelt-Runoff



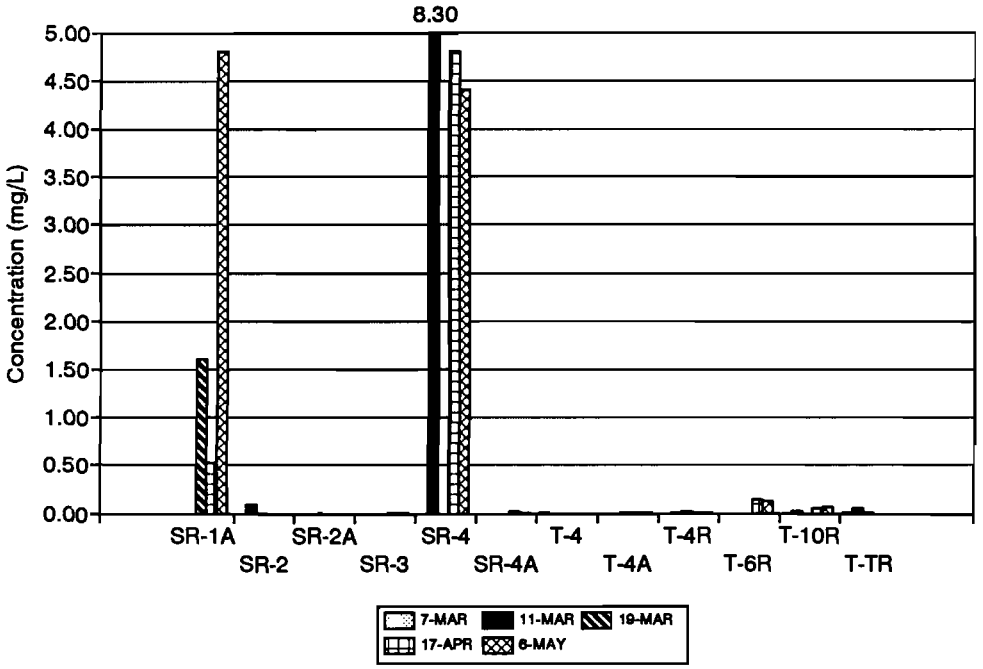
Dissolved Cadmium - 1997
Tributary Snowmelt-Runoff



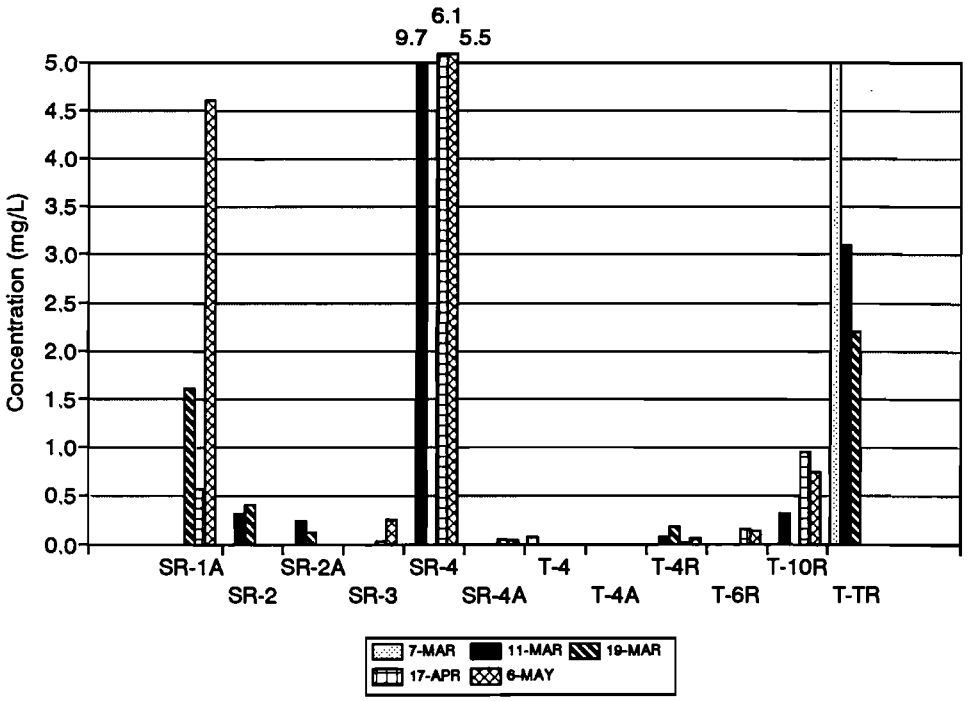
Total Recoverable Cadmium - 1997
Tributary Snowmelt-Runoff



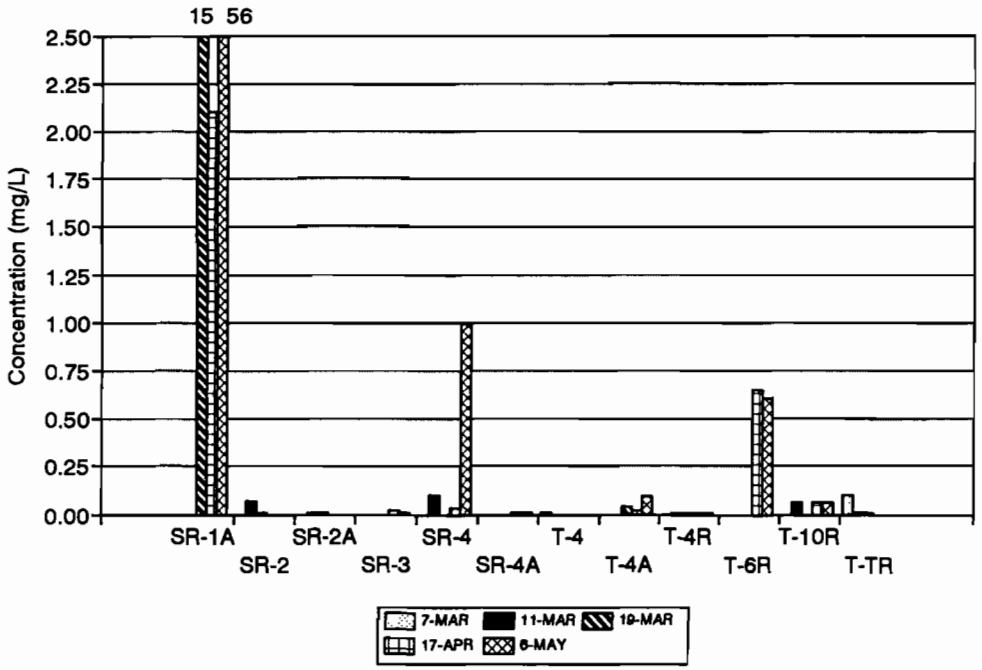
Dissolved Copper - 1997
Tributary Snowmelt-Runoff



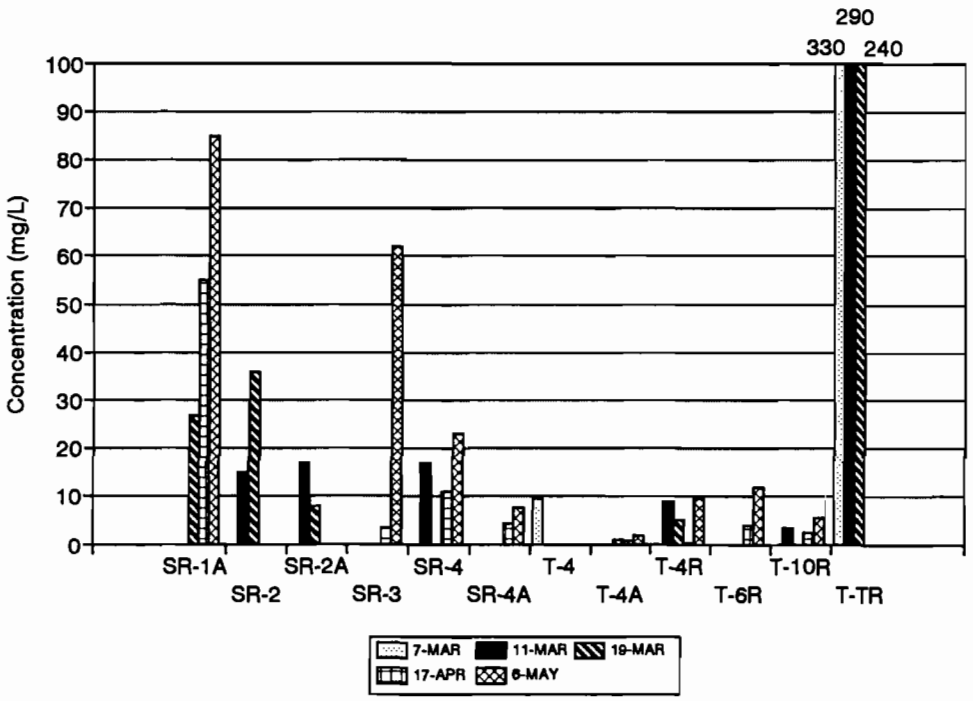
Total Recoverable Copper - 1997
Tributary Snowmelt-Runoff



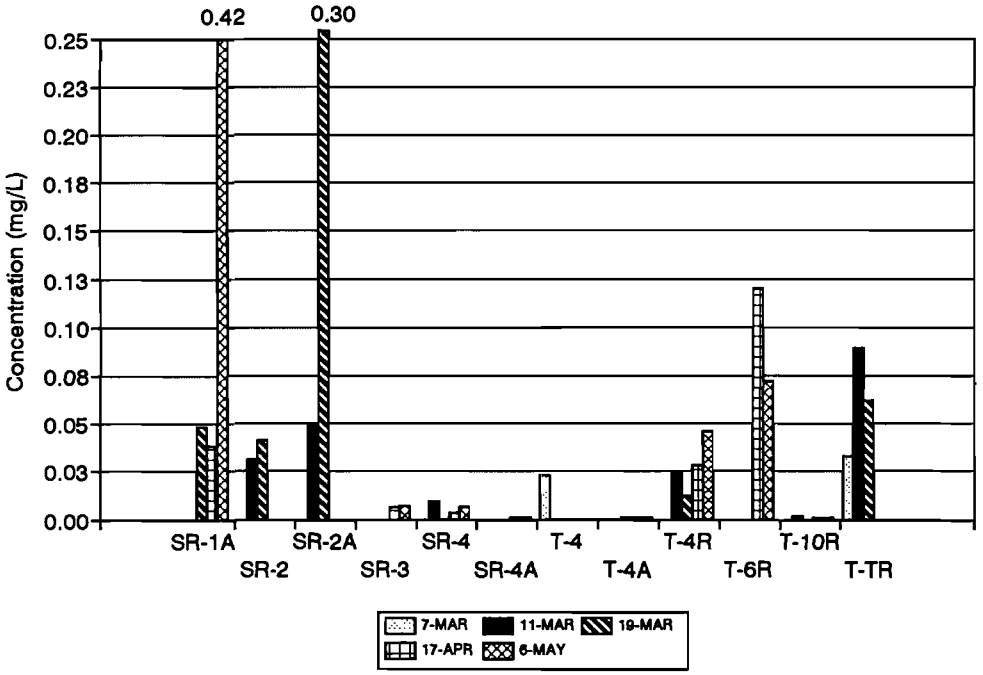
Dissolved Iron - 1997
Tributary Snowmelt-Runoff



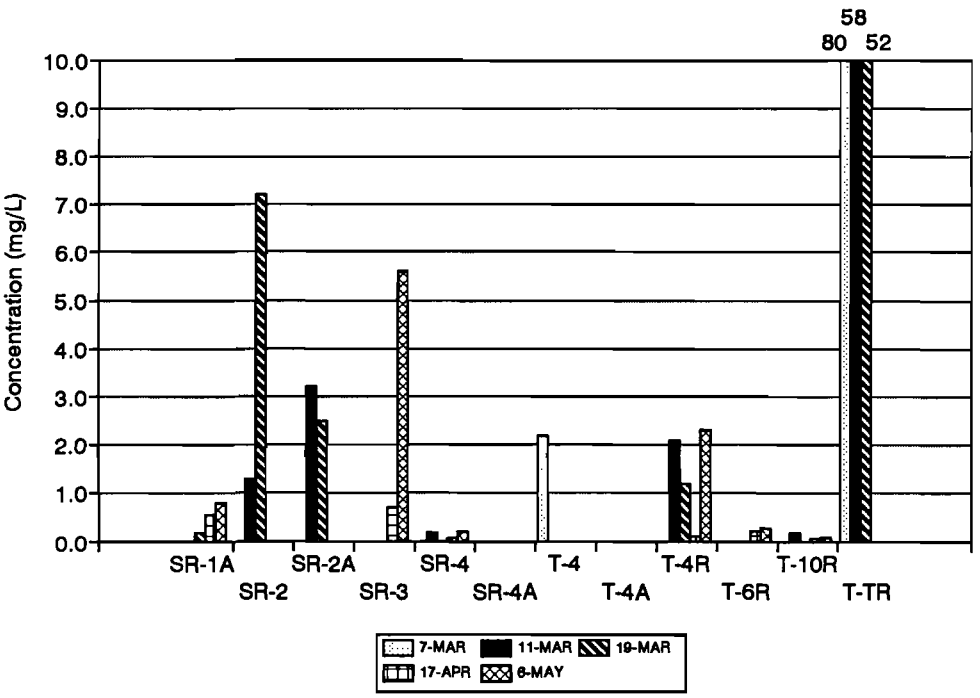
Total Recoverable Iron - 1997
Tributary Snowmelt-Runoff



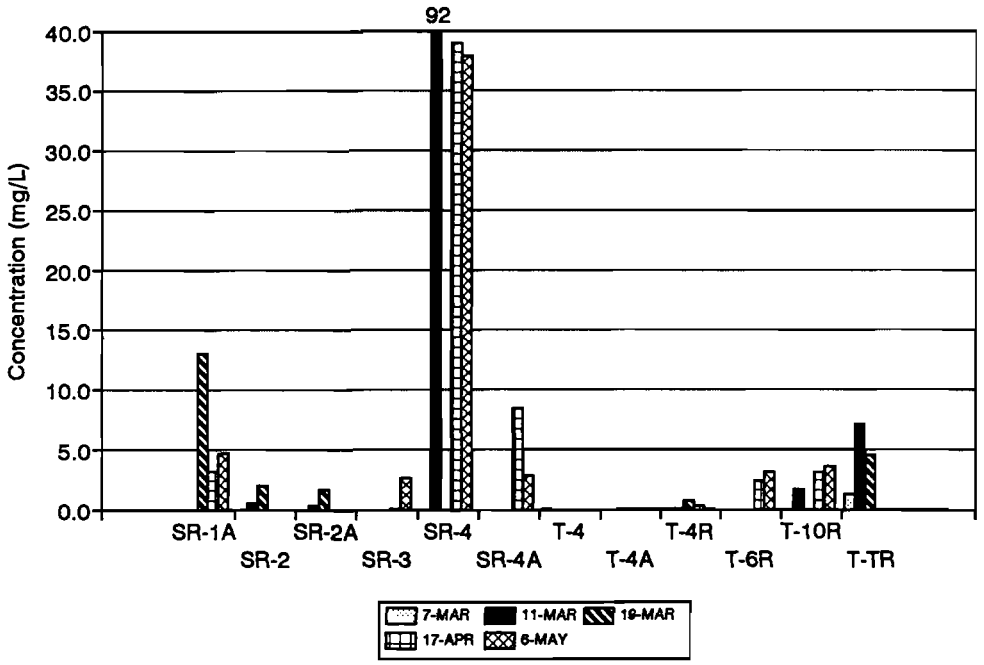
Dissolved Lead - 1997
Tributary Snowmelt-Runoff



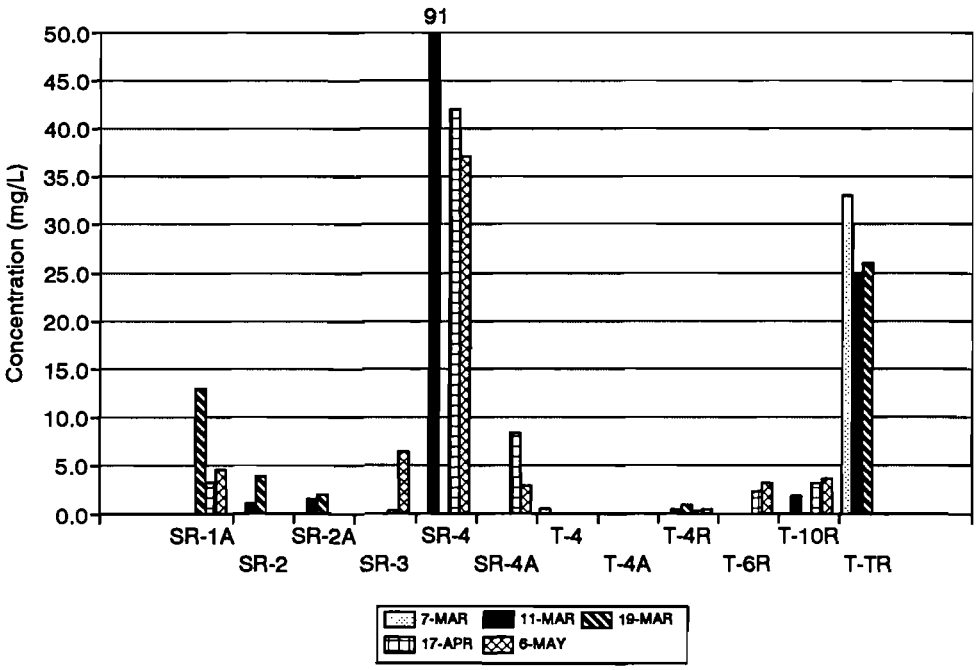
Total Recoverable Lead - 1997
Tributary Snowmelt-Runoff



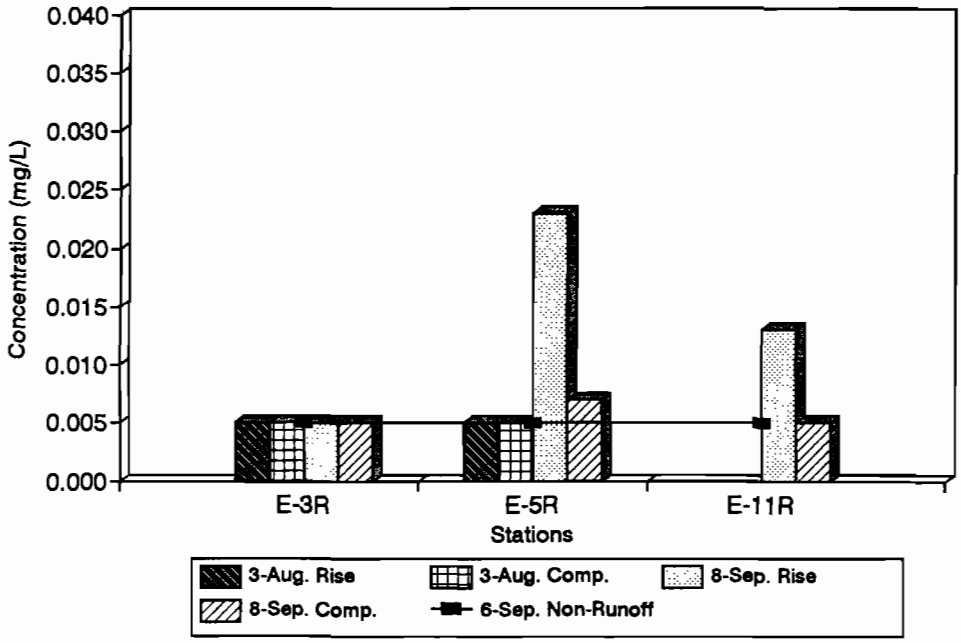
Dissolved Manganese - 1997
Tributary Snowmelt-Runoff



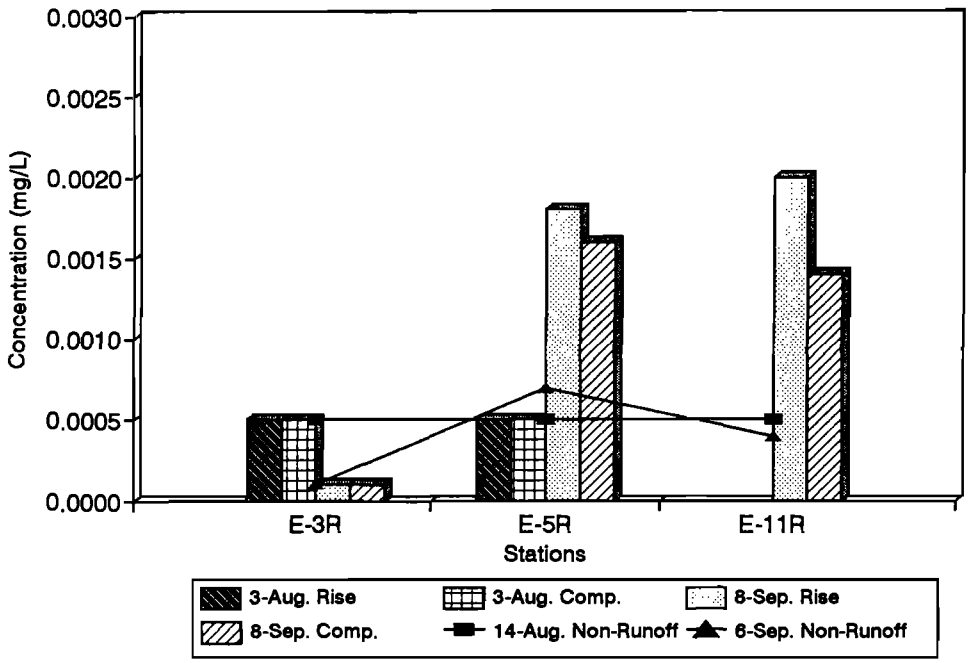
Total Recoverable Manganese - 1997
Tributary Snowmelt-Runoff



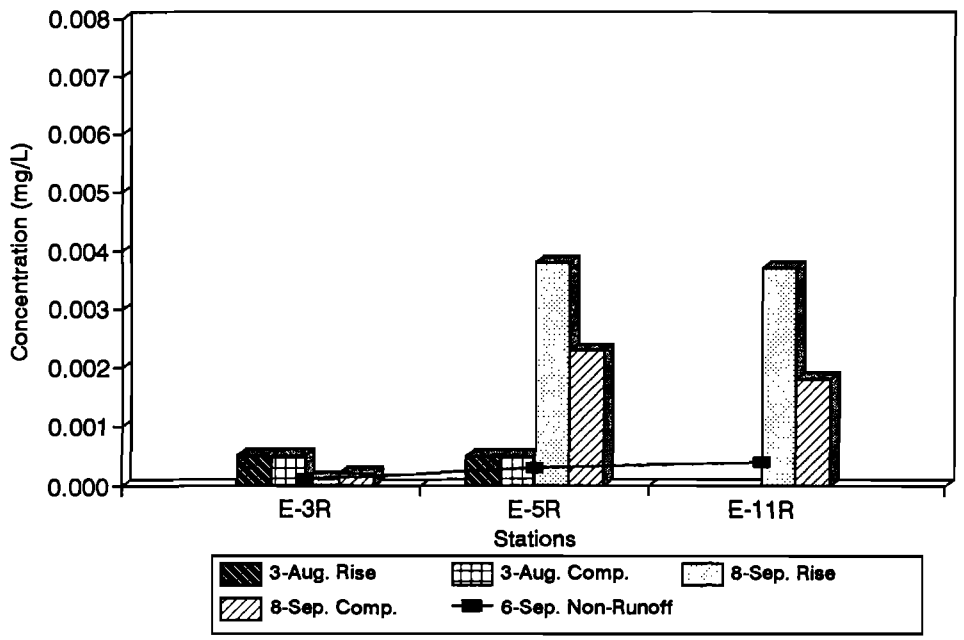
Total Recoverable Arsenic - 1995
Eagle River Rainfall-Runoff Events



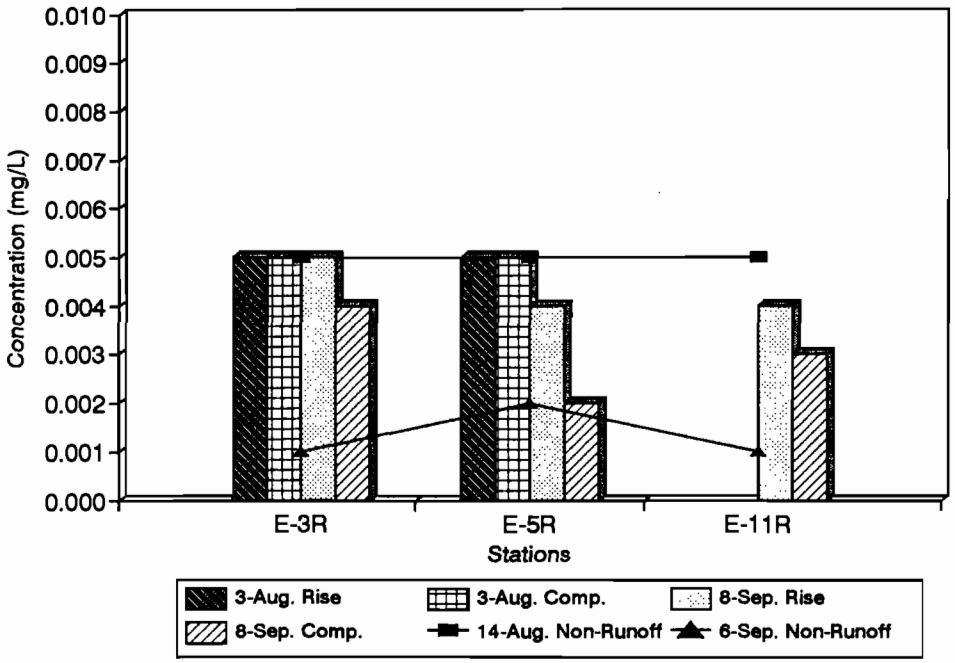
Dissolved Cadmium - 1995
Eagle River Rainfall-Runoff Events



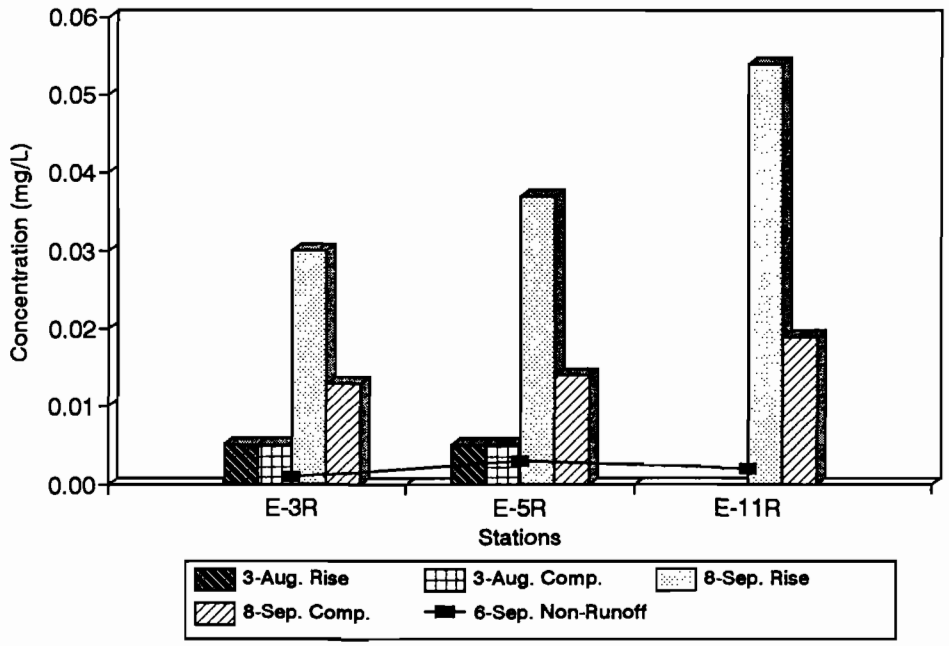
Total Recoverable Cadmium - 1995
Eagle River Rainfall-Runoff Events



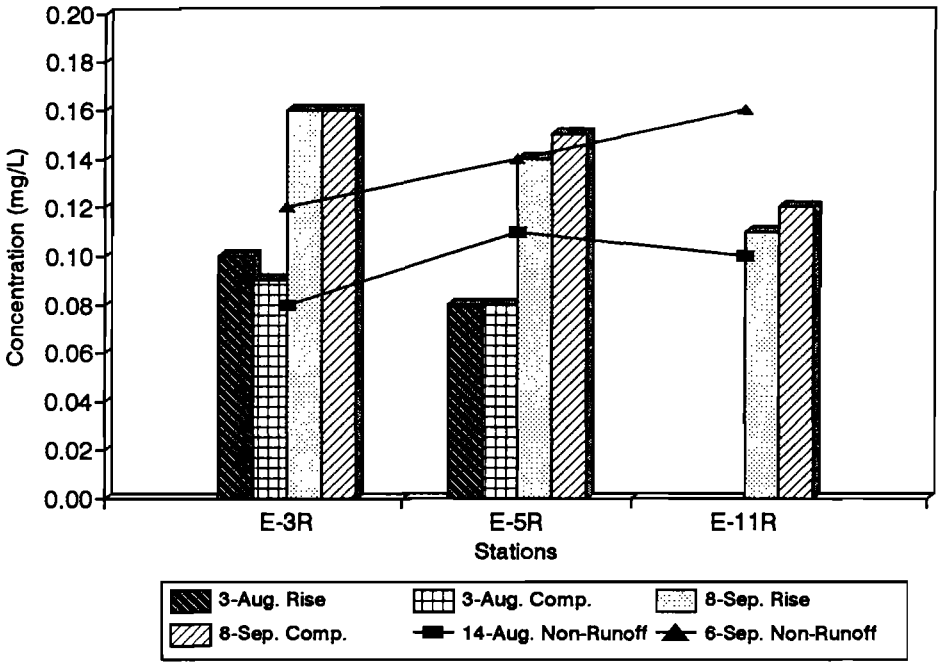
Dissolved Copper - 1995
Eagle River Rainfall-Runoff Events



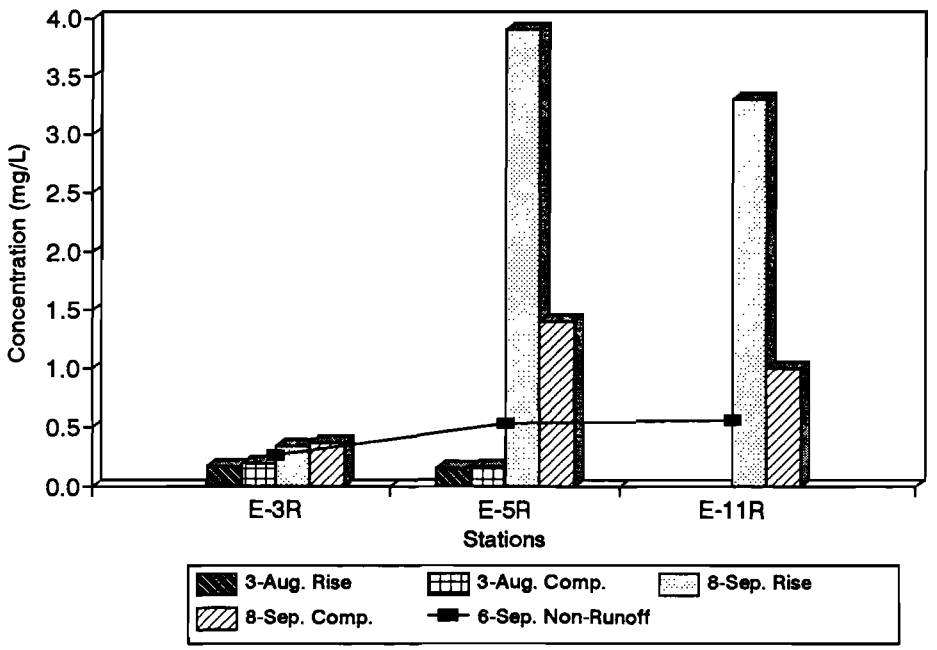
Total Recoverable Copper - 1995
Eagle River Rainfall-Runoff Events



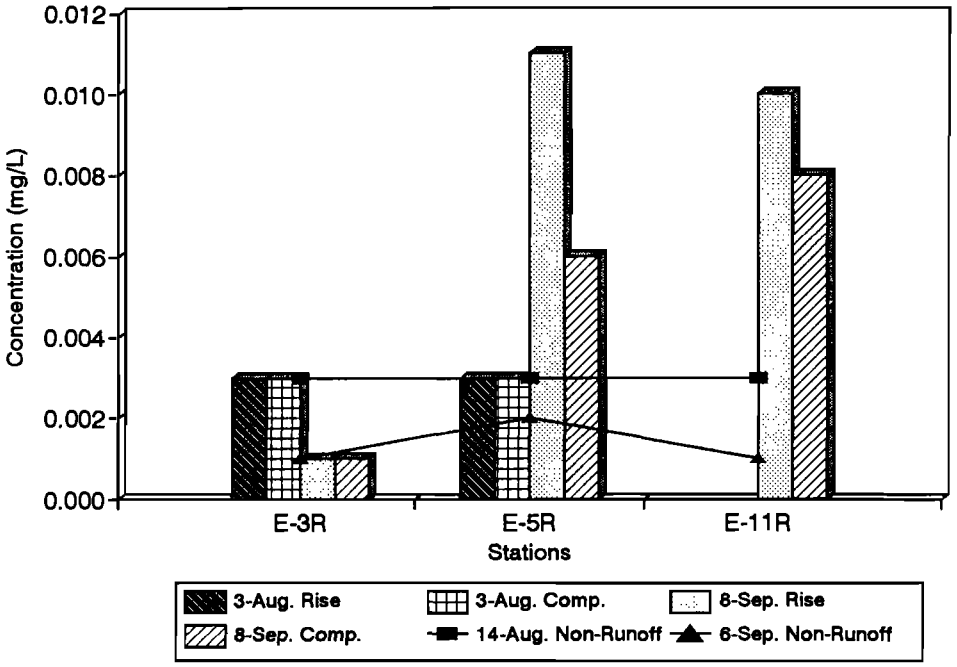
Dissolved Iron - 1995
Eagle River Rainfall-Runoff Events



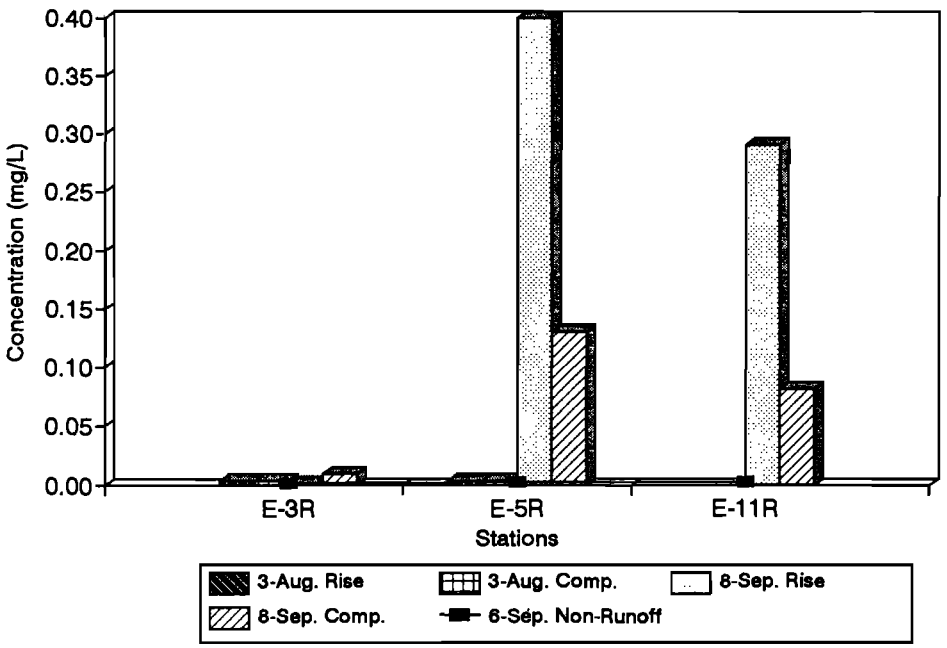
Total Recoverable Iron - 1995
Eagle River Rainfall-Runoff Events



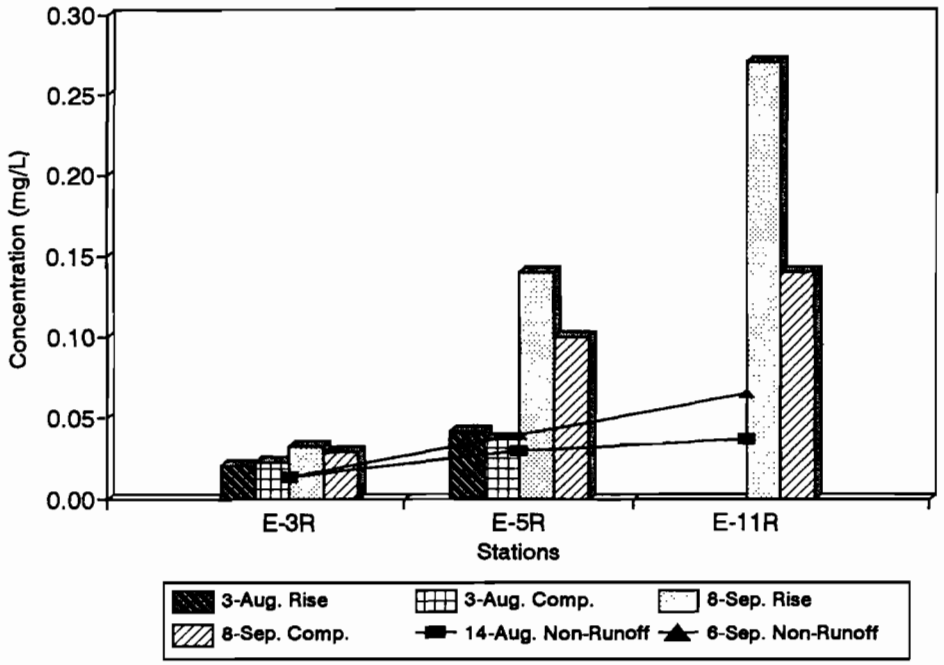
Dissolved Lead - 1995
Eagle River Rainfall-Runoff Events



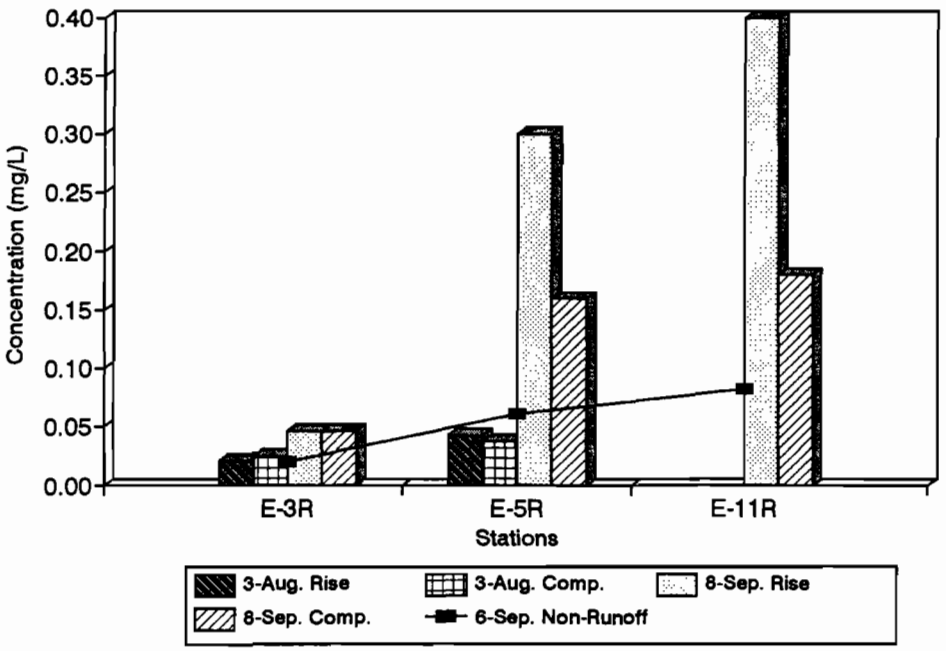
Total Recoverable Lead - 1995
Eagle River Rainfall-Runoff Events



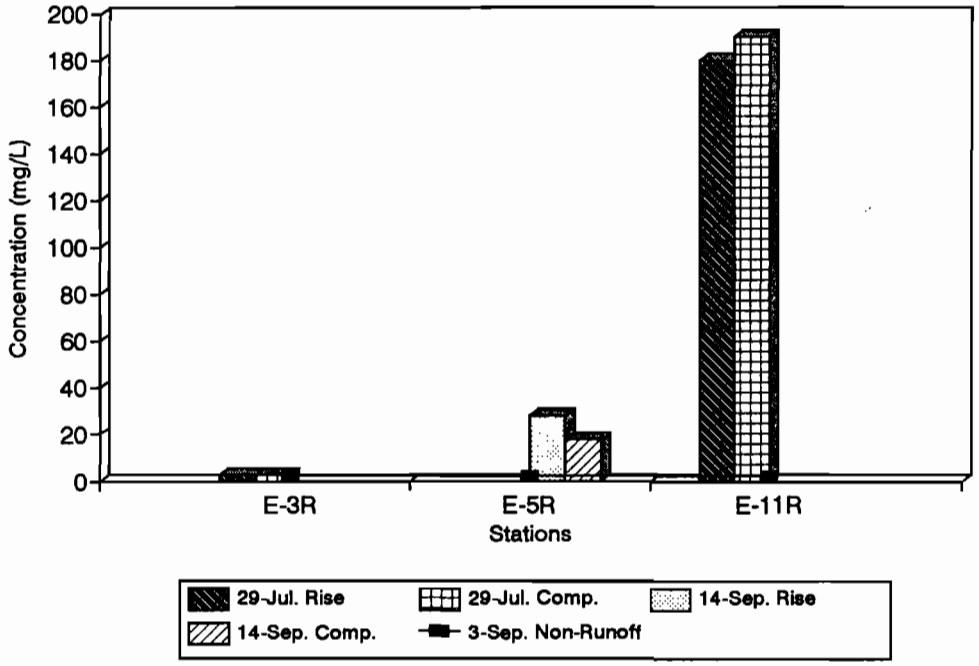
Dissolved Manganese - 1995
Eagle River Rainfall-Runoff Events



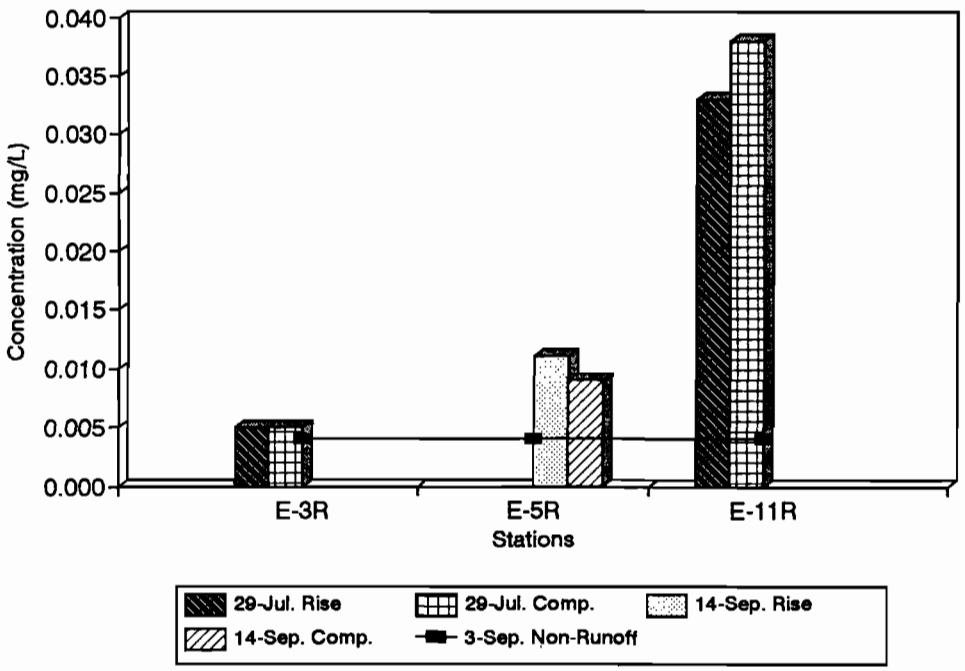
Total Recoverable Manganese - 1995
Eagle River Rainfall-Runoff Events



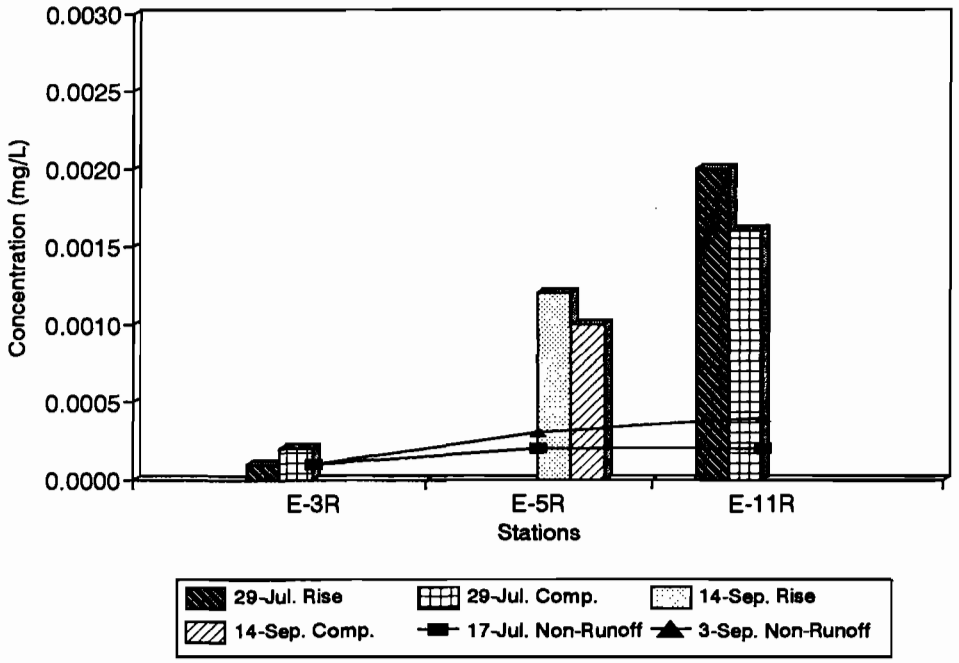
Suspended Solids -1996
Eagle River Rainfall-Runoff Events



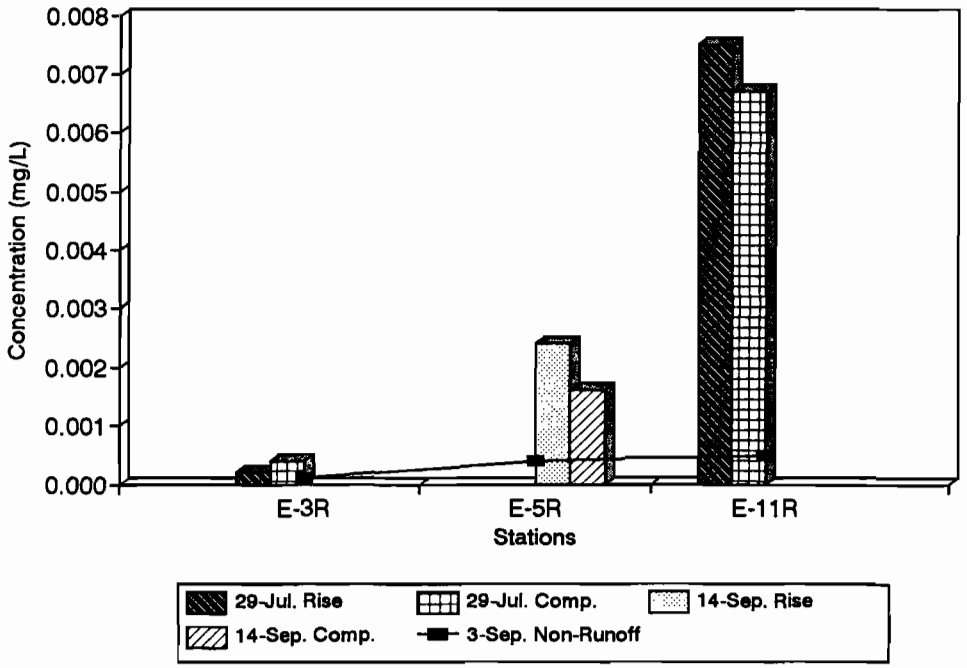
Total Recoverable Arsenic - 1996
Eagle River Rainfall-Runoff Events



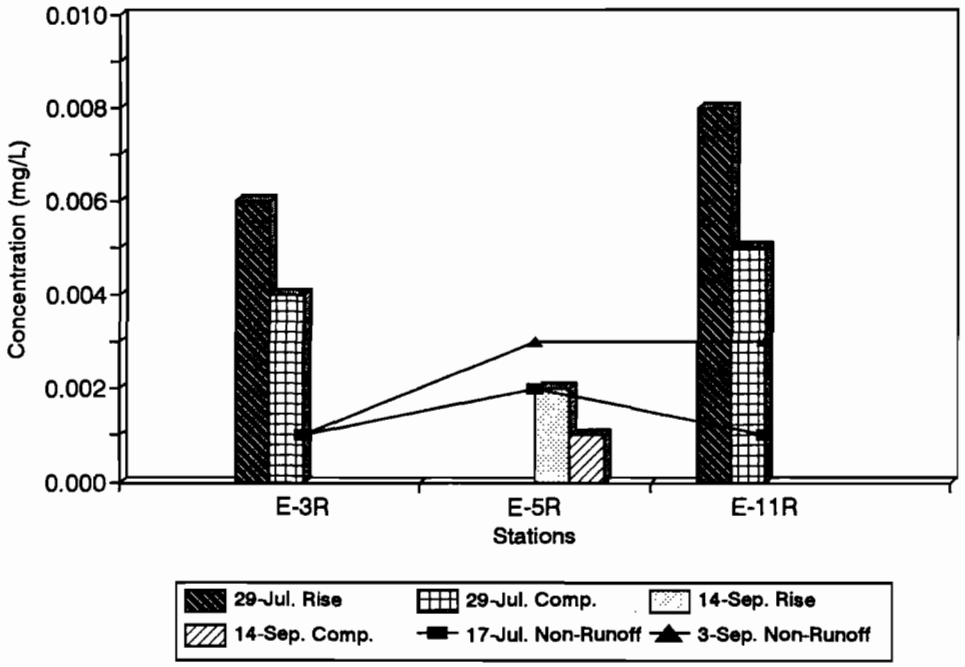
Dissolved Cadmium - 1996
Eagle River Rainfall-Runoff Events



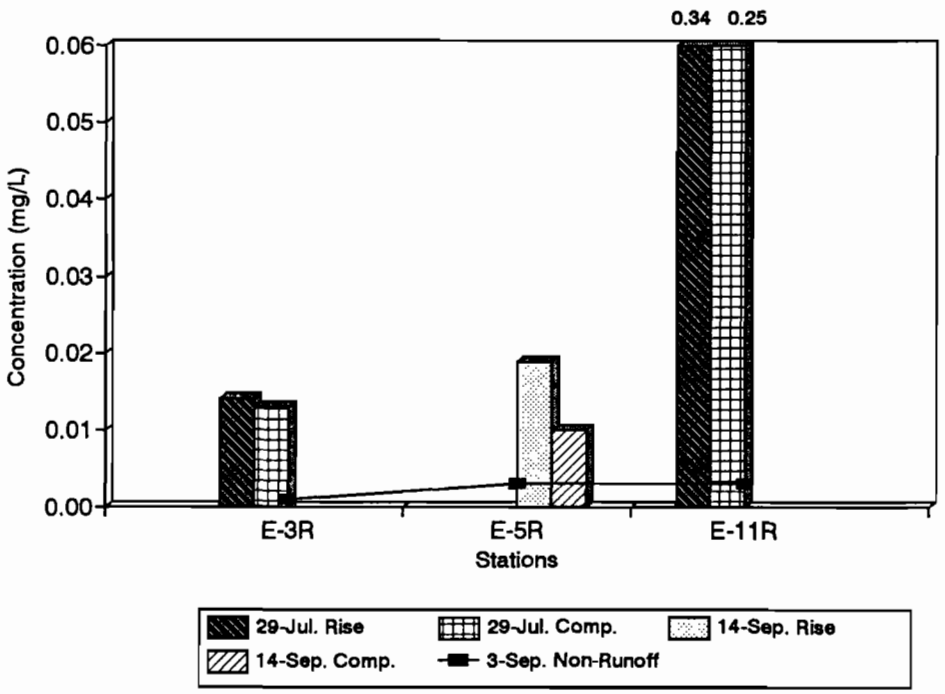
Total Recoverable Cadmium - 1996
Eagle River Rainfall-Runoff Events



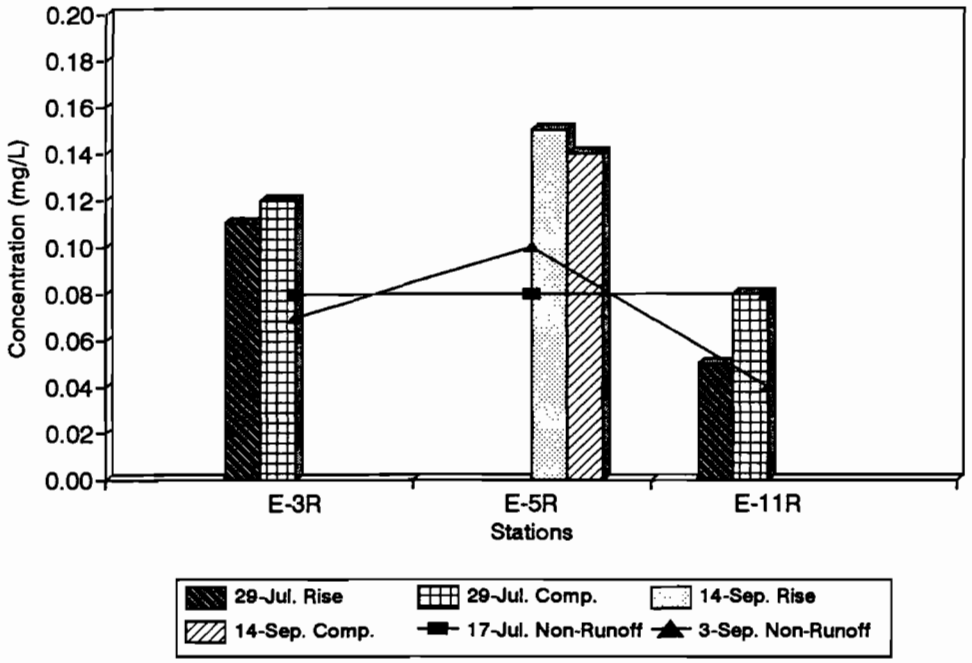
Dissolved Copper - 1996
Eagle River Rainfall-Runoff Events



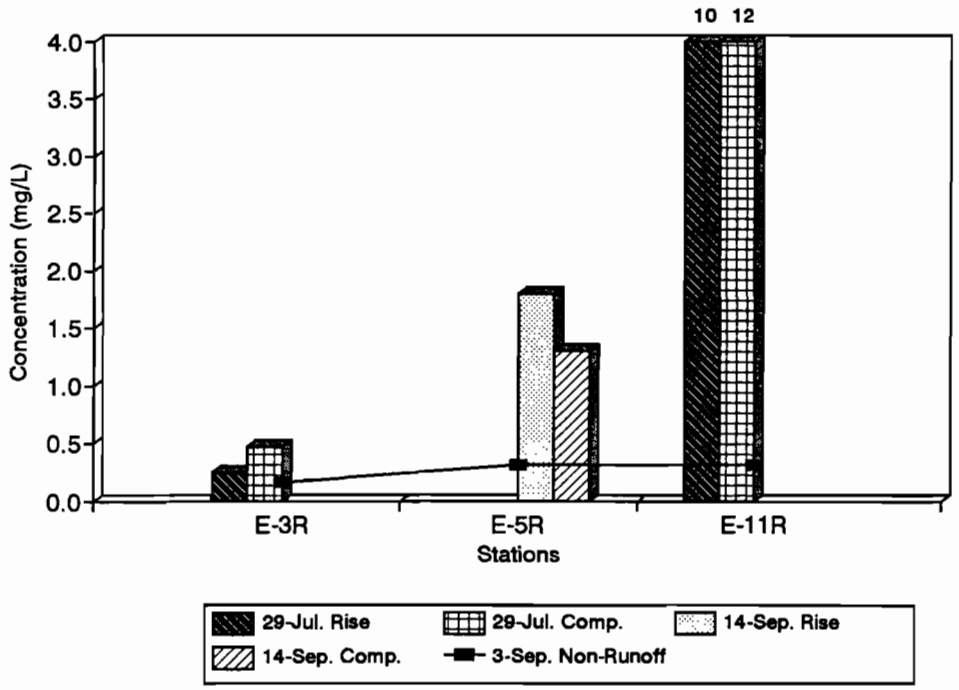
Total Recoverable Copper - 1996
Eagle River Rainfall-Runoff Events



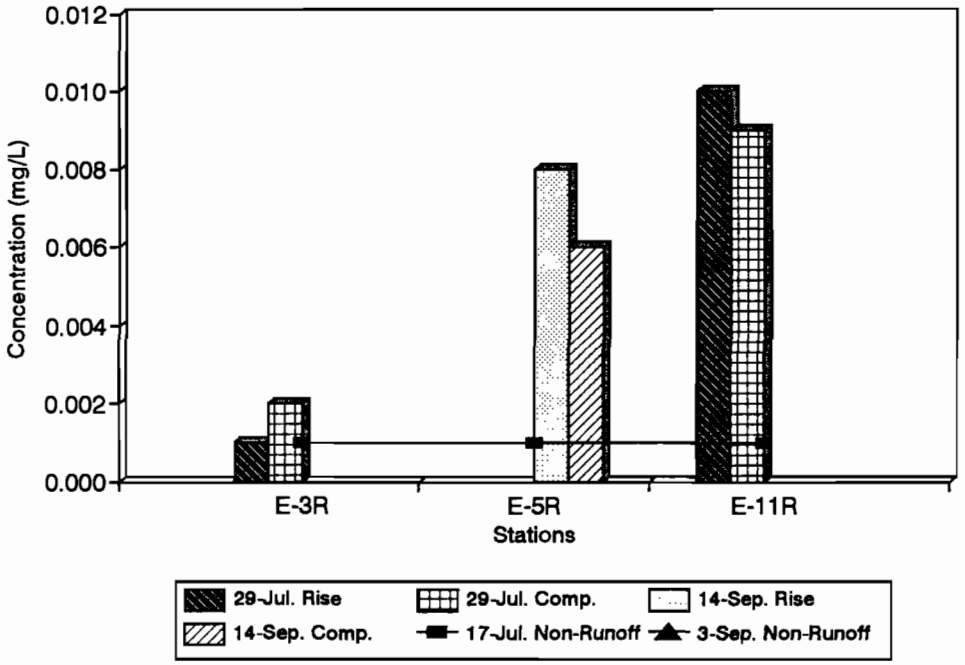
Dissolved Iron - 1996
Eagle River Rainfall-Runoff Events



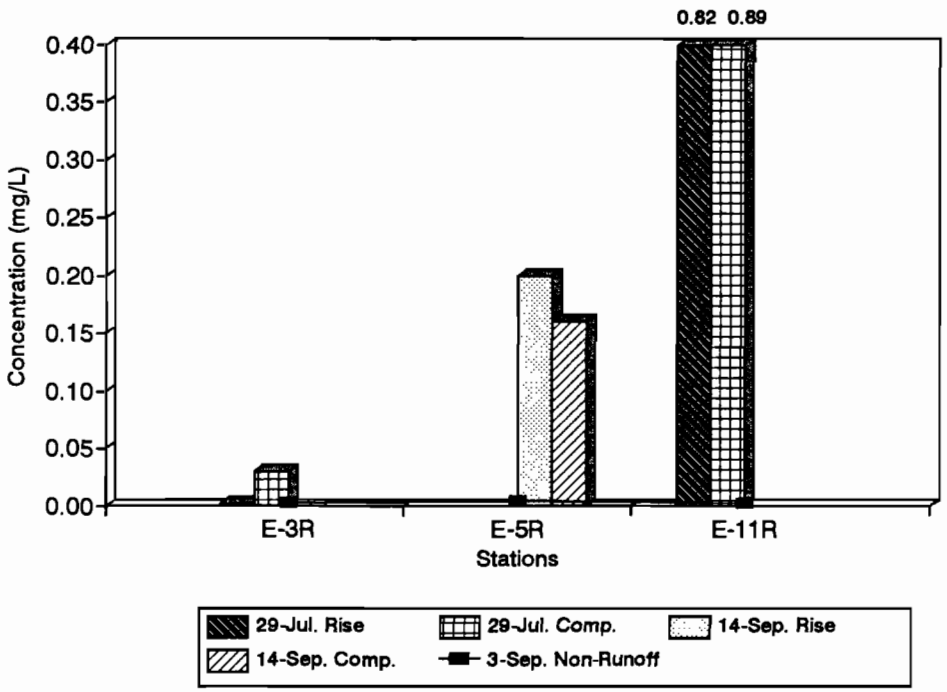
Total Recoverable Iron - 1996
Eagle River Rainfall-Runoff Events



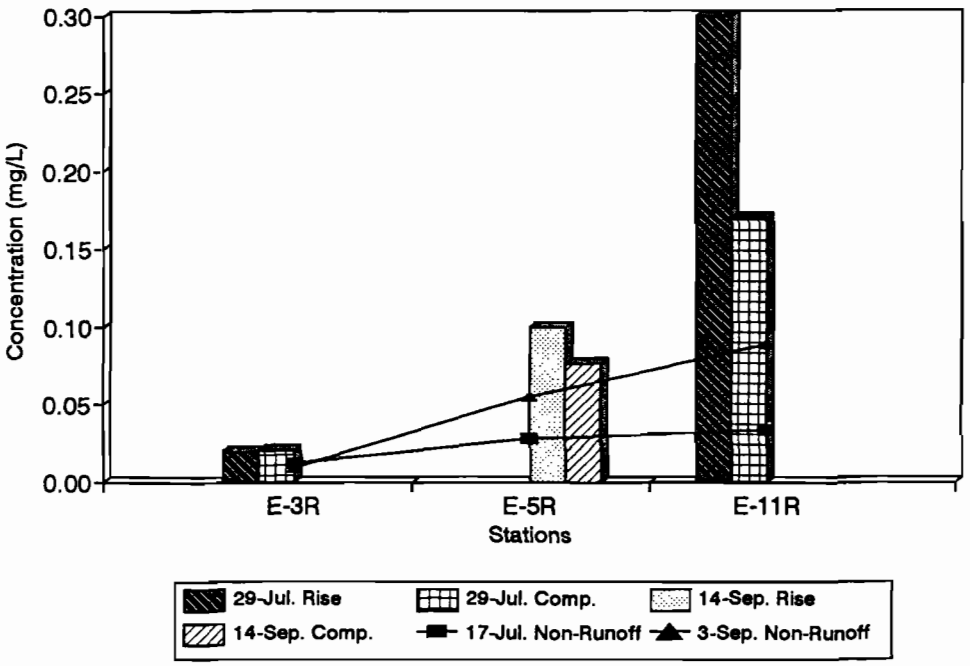
Dissolved Lead - 1996
Eagle River Rainfall-Runoff Events



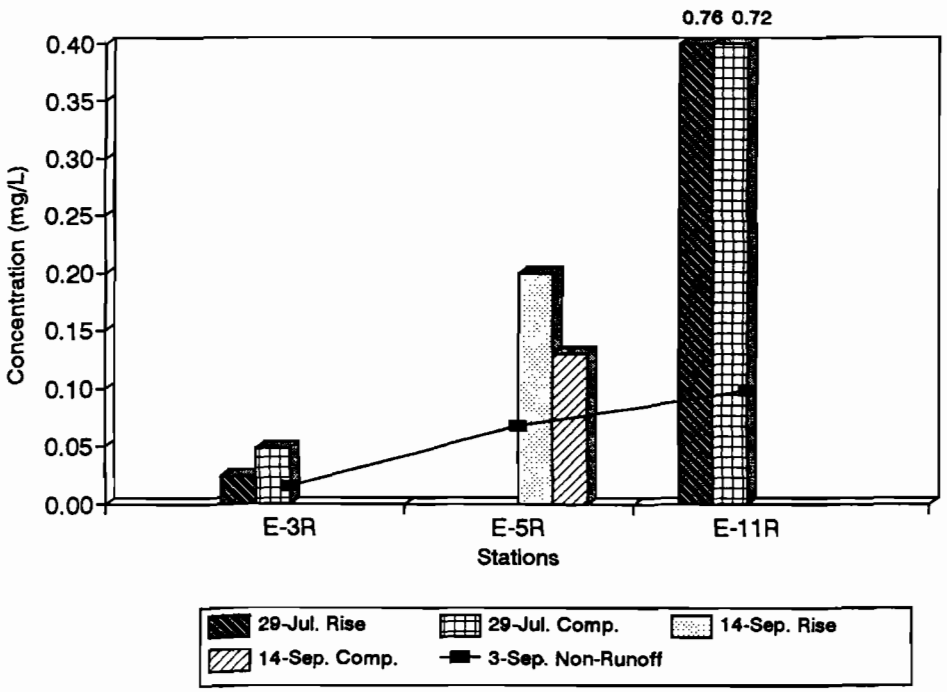
Total Recoverable Lead - 1996
Eagle River Rainfall-Runoff Events



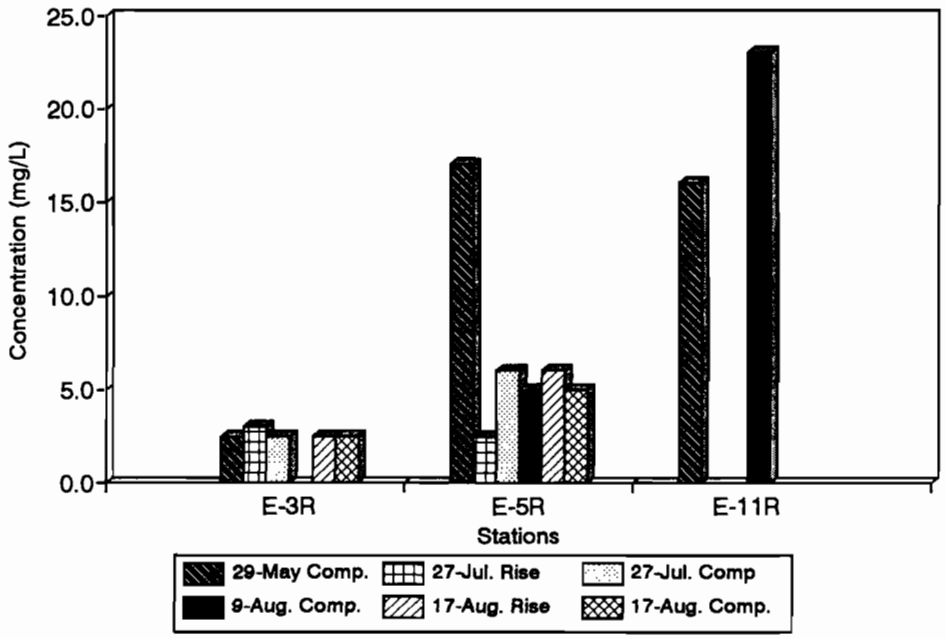
Dissolved Manganese - 1996
Eagle River Rainfall-Runoff Events



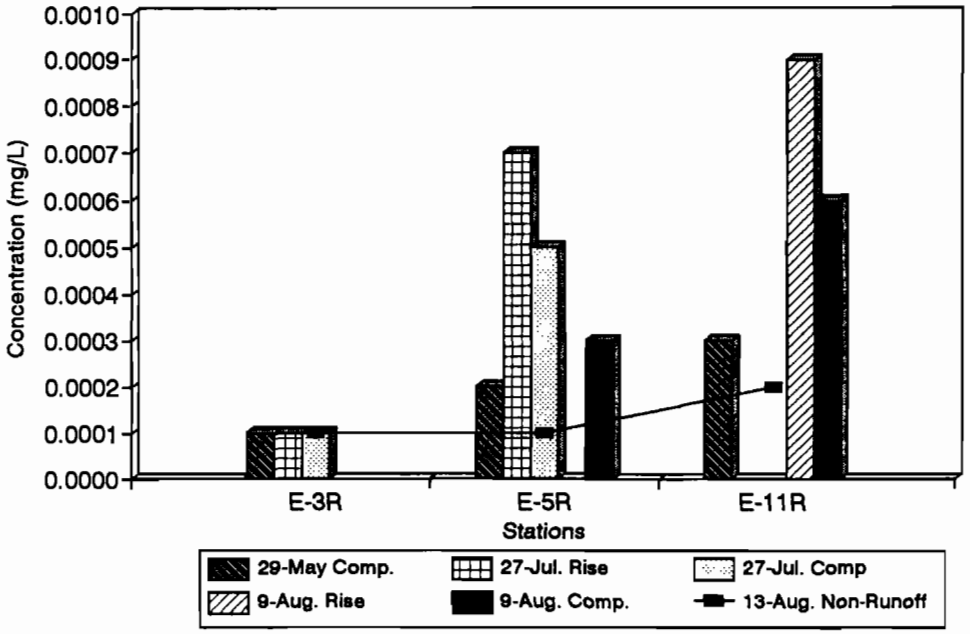
Total Recoverable Manganese - 1996
Eagle River Rainfall-Runoff Events



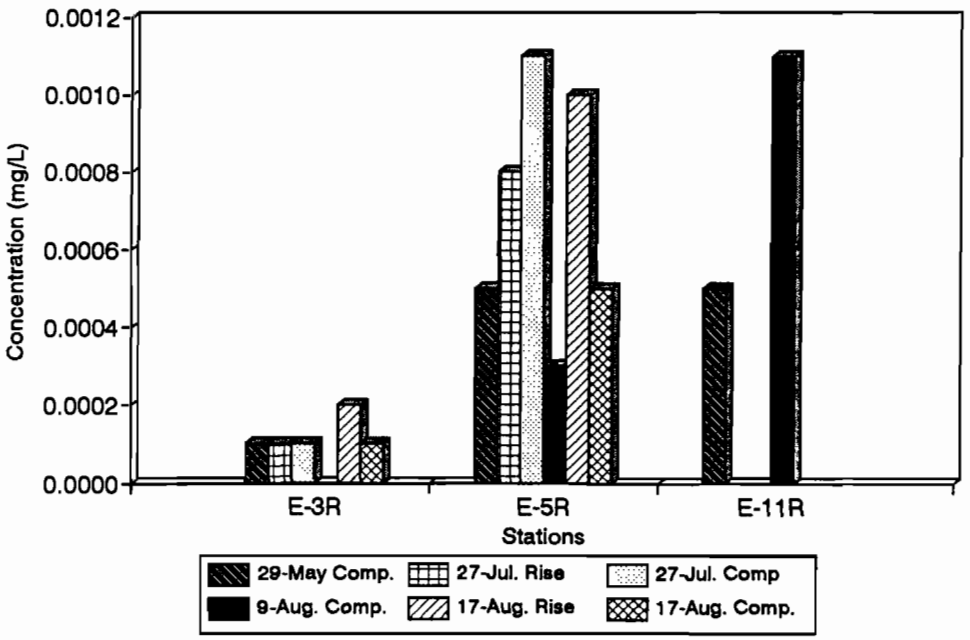
Suspended Solids - 1997
Eagle River Rainfall-Runoff Events



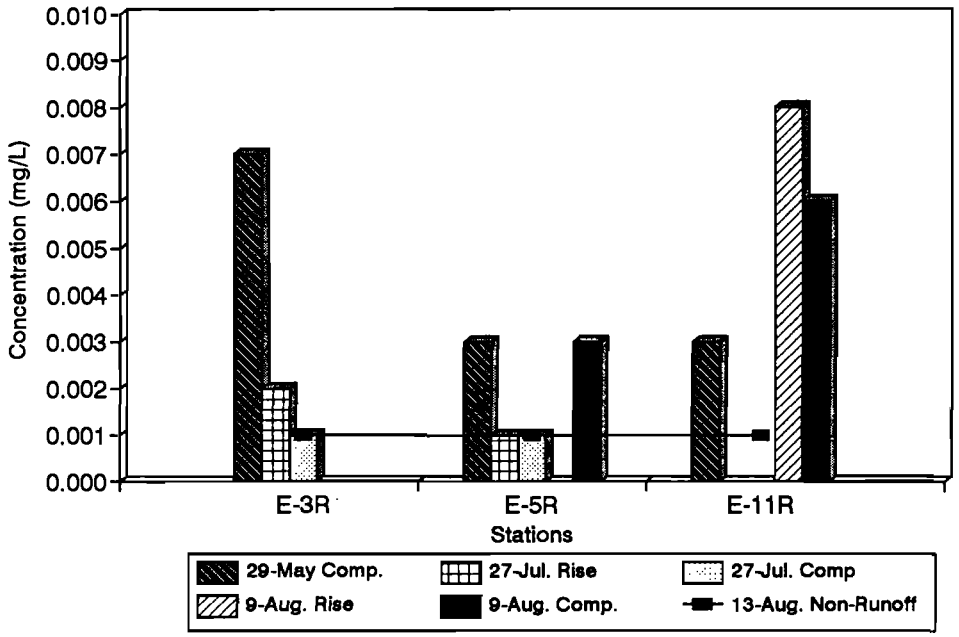
Dissolved Cadmium - 1997
Eagle River Rainfall-Runoff Events



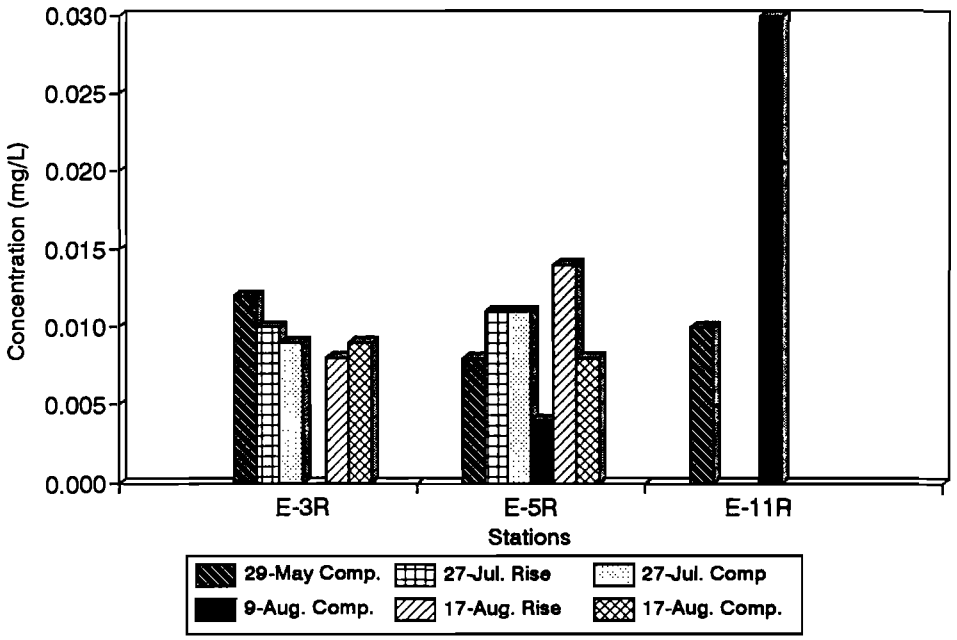
Total Recoverable Cadmium - 1997
Eagle River Rainfall-Runoff Events



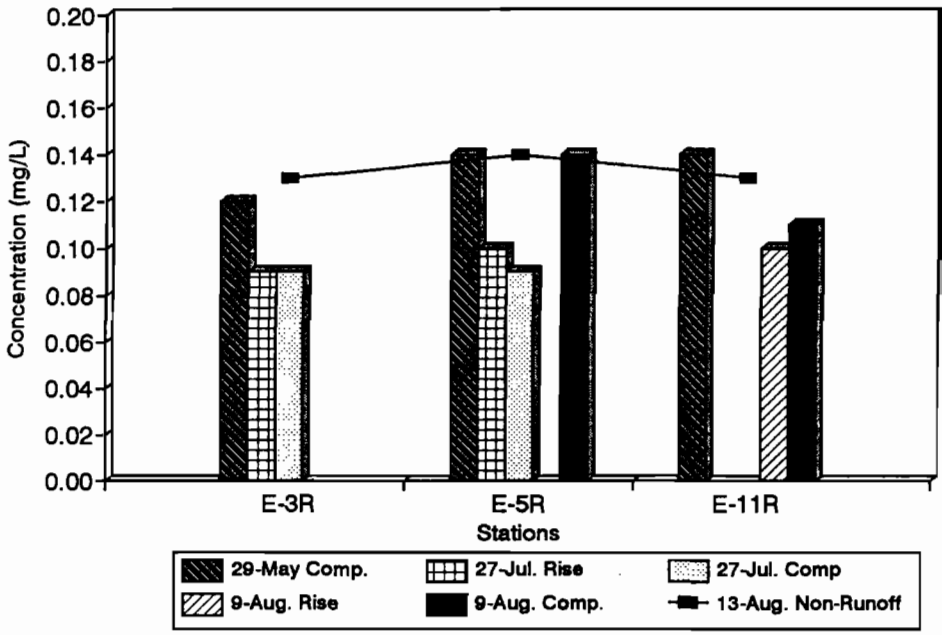
Dissolved Copper - 1997
Eagle River Rainfall-Runoff Events



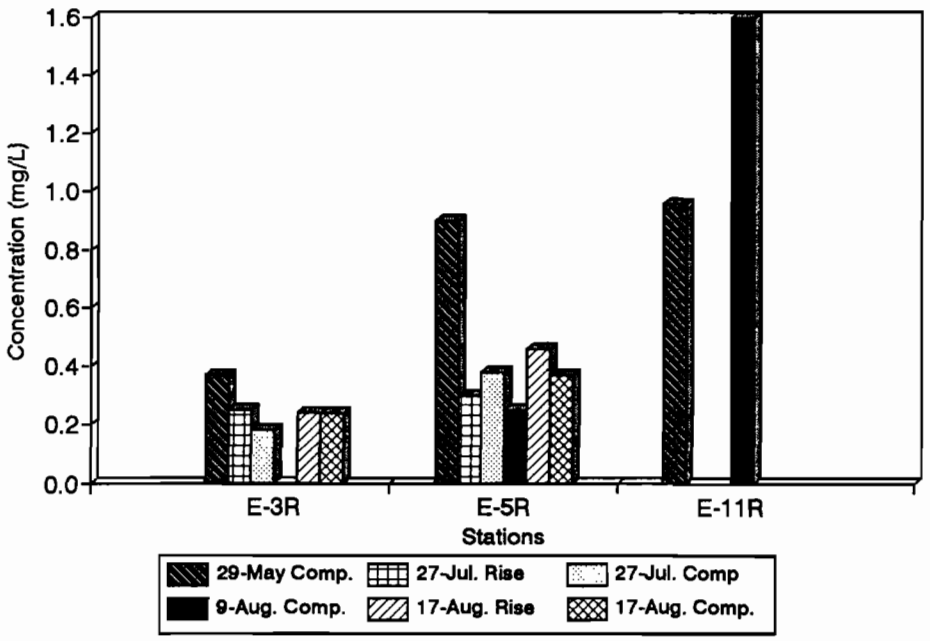
Total Recoverable Copper - 1997
Eagle River Rainfall-Runoff Events



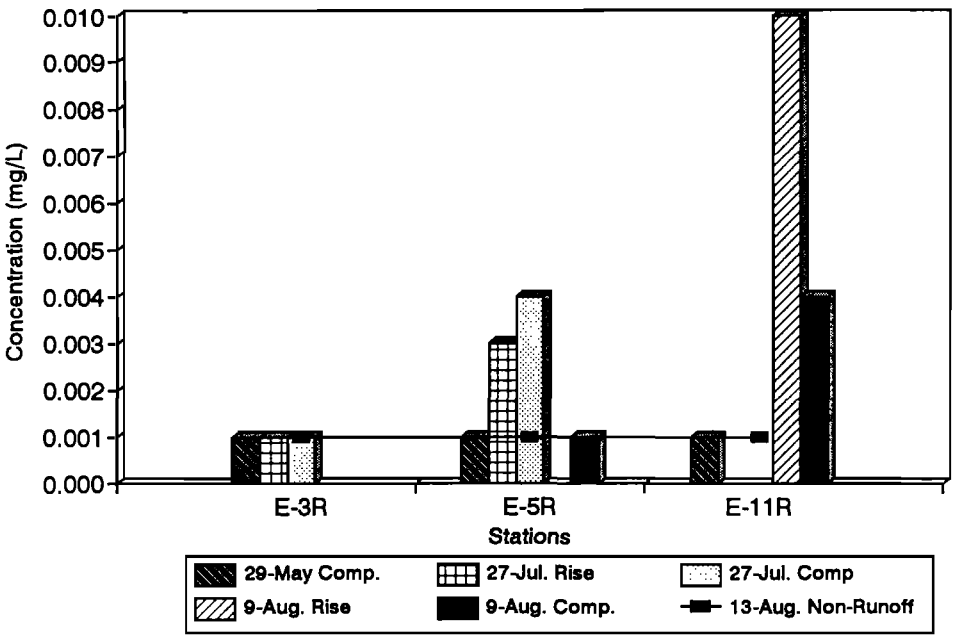
Dissolved Iron - 1997
Eagle River Rainfall-Runoff Events



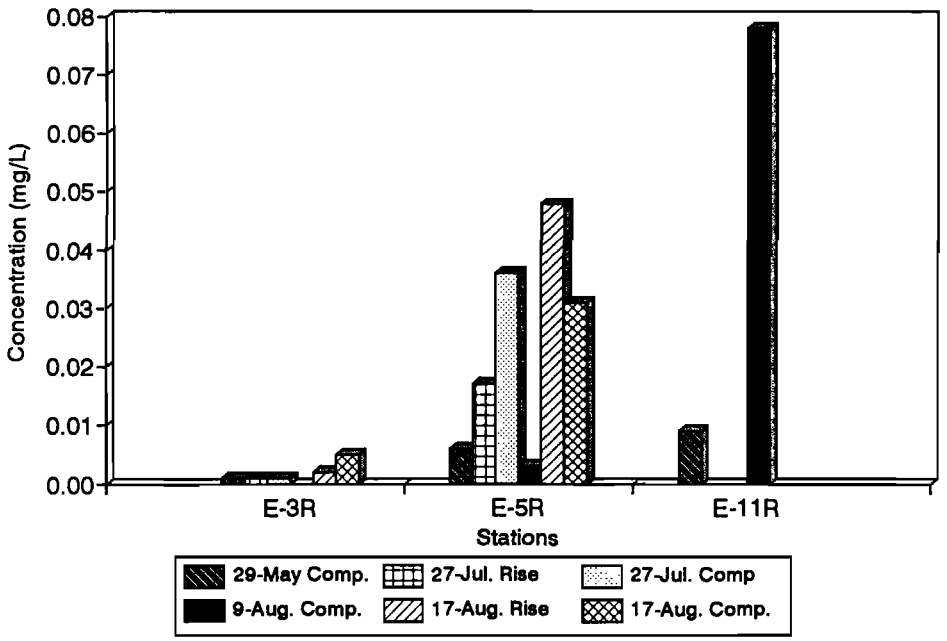
Total Recoverable Iron - 1997
Eagle River Rainfall-Runoff Events



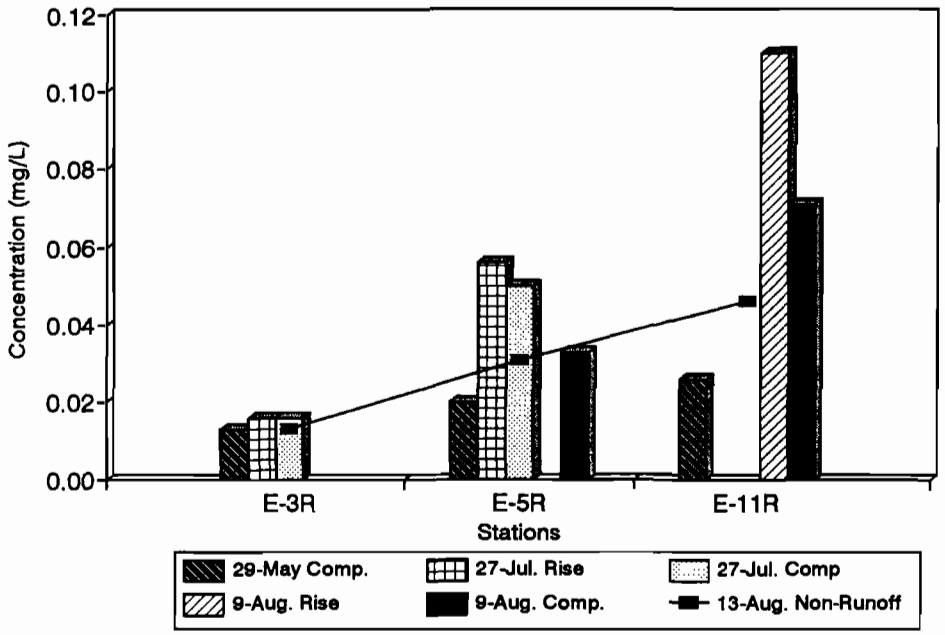
Dissolved Lead - 1997
Eagle River Rainfall-Runoff Events



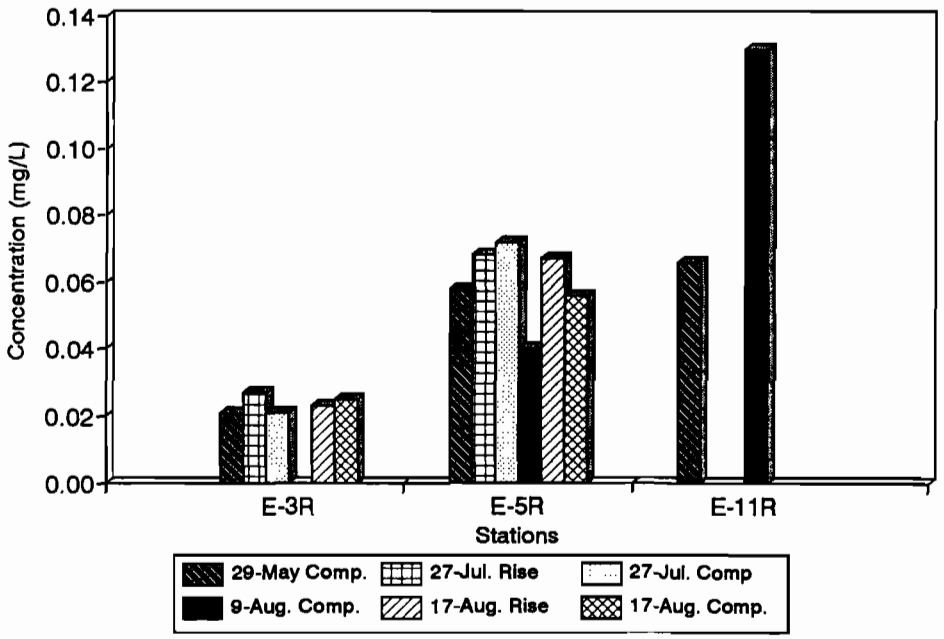
Total Recoverable Lead - 1997
Eagle River Rainfall-Runoff Events



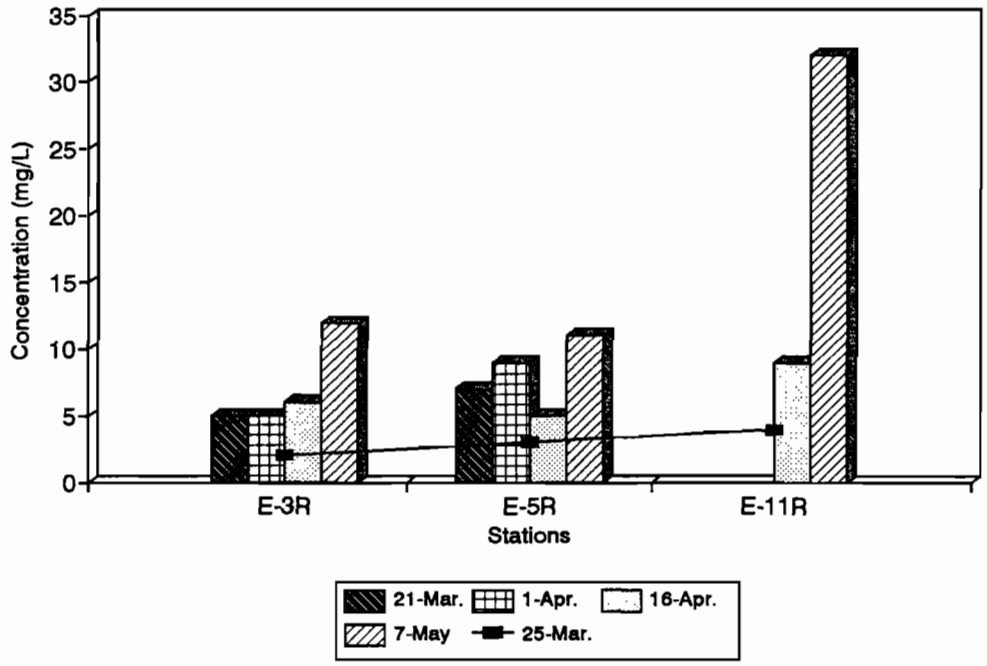
Dissolved Manganese - 1997
Eagle River Rainfall-Runoff Events



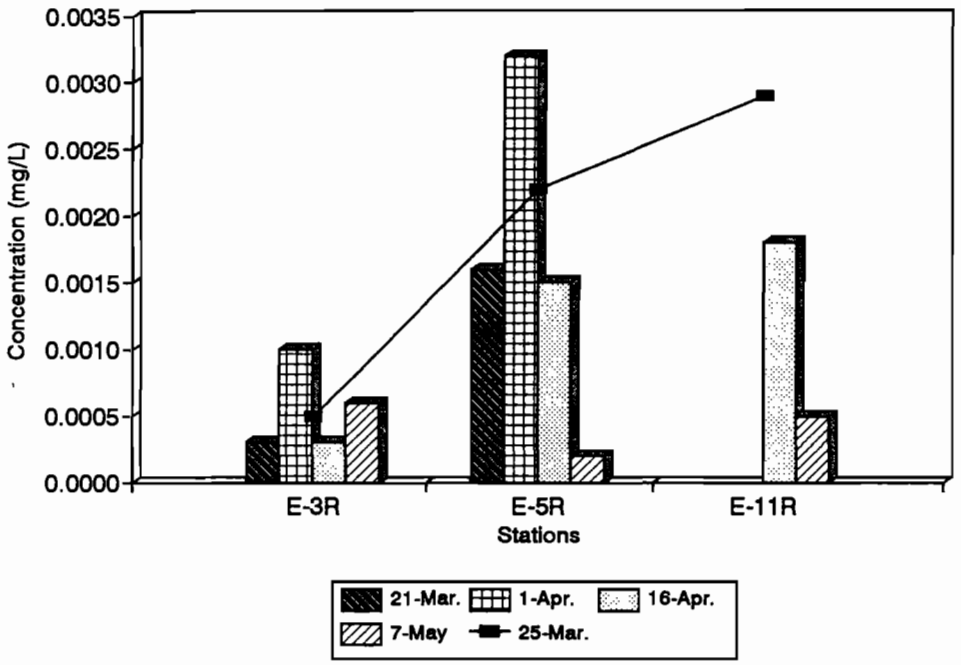
Total Recoverable Manganese - 1997
Eagle River Rainfall-Runoff Events



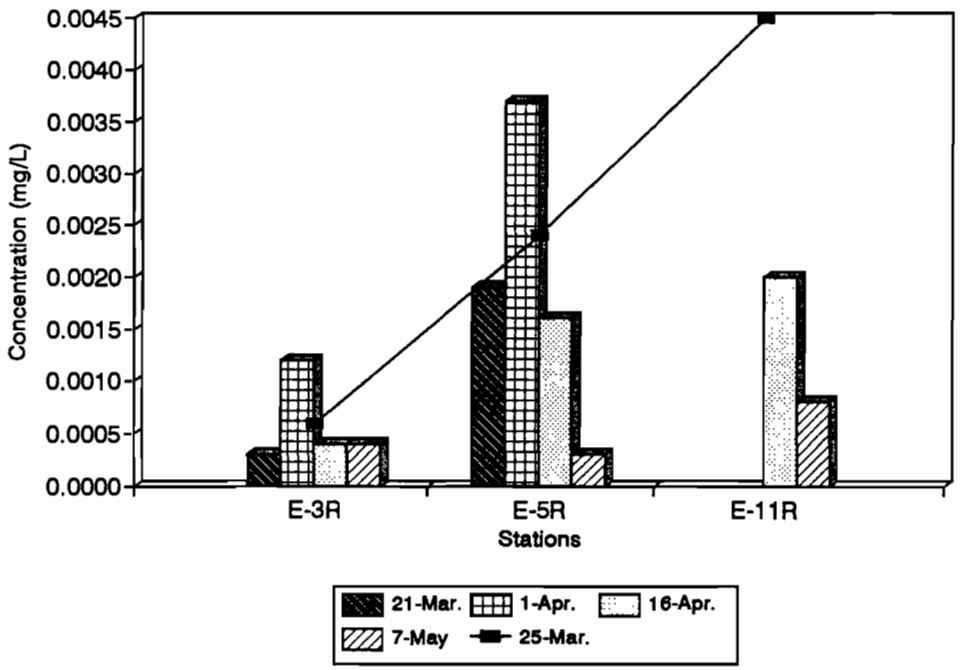
Suspended Solids - 1996
Eagle River Snowmelt-Runoff Events



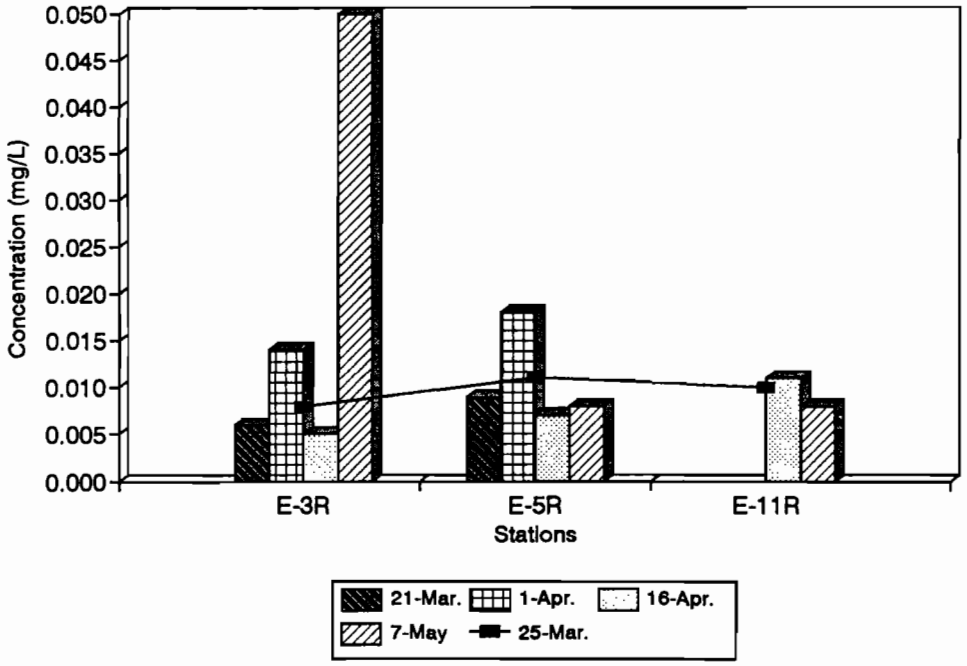
Dissolved Cadmium - 1996
Eagle River Snowmelt-Runoff Events



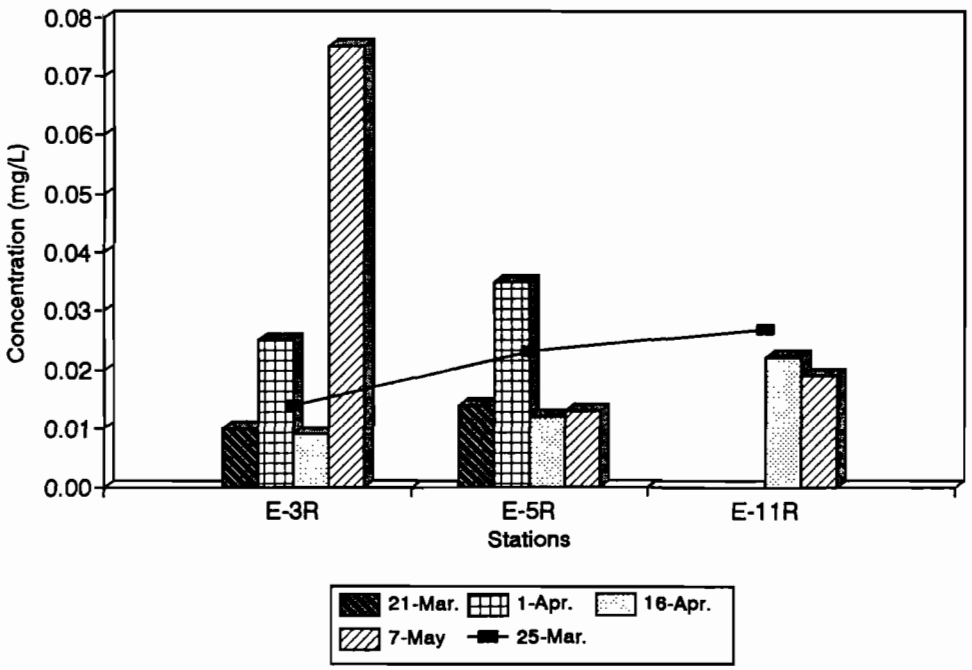
Total Recoverable Cadmium - 1996
Eagle River Snowmelt-Runoff Events



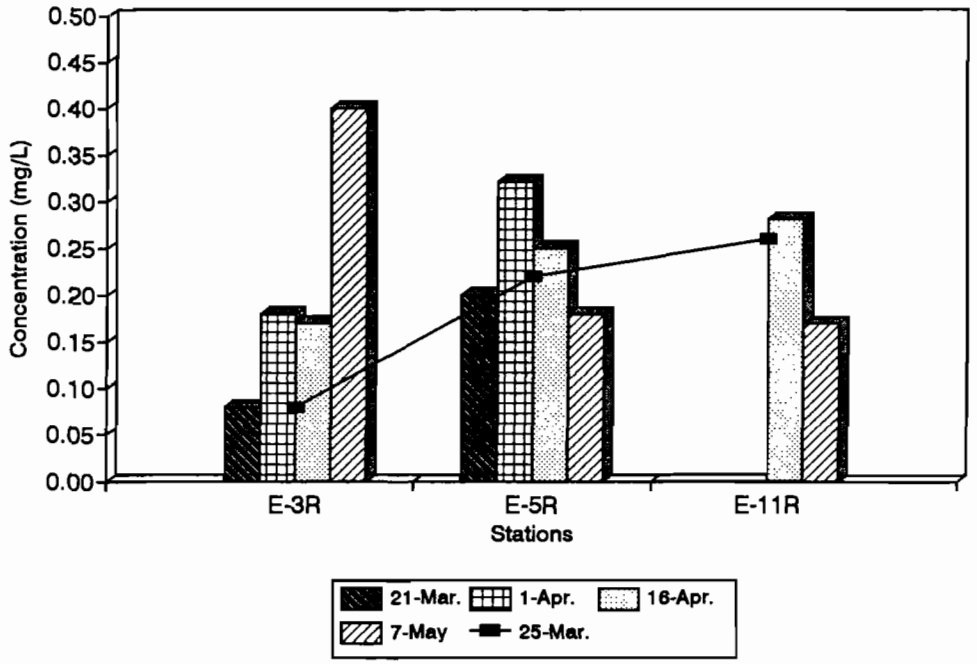
Dissolved Copper - 1996
Eagle River Snowmelt-Runoff Events



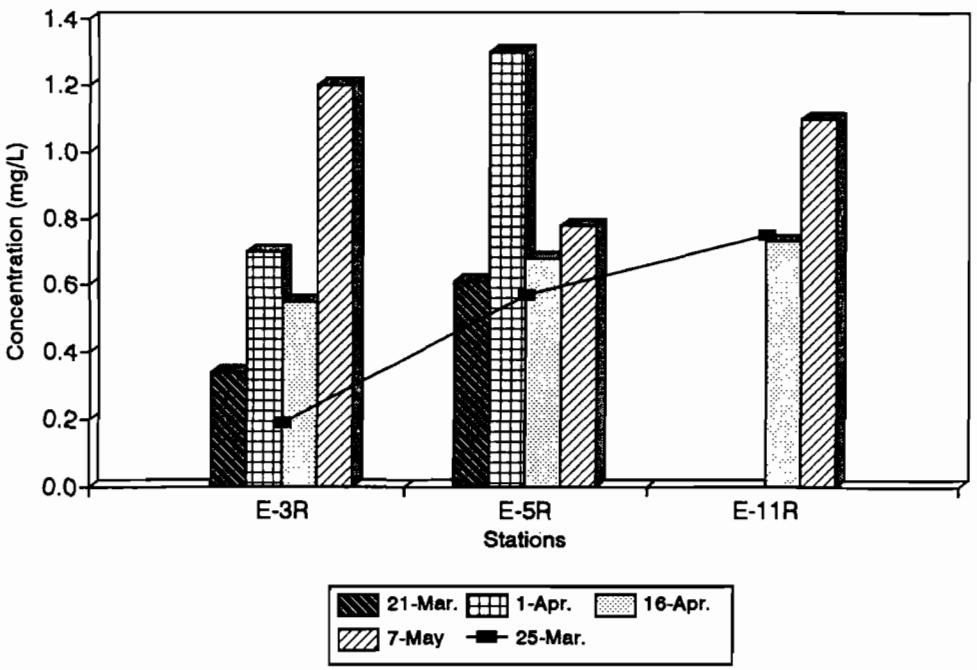
Total Recoverable Copper - 1996
Eagle River Snowmelt-Runoff Events



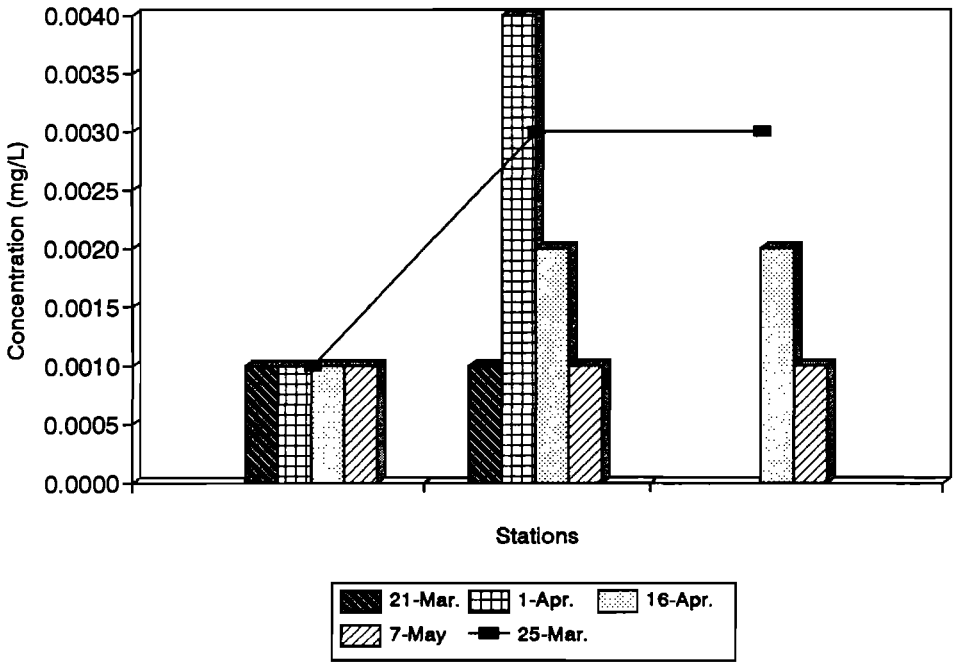
Dissolved Iron - 1996
Eagle River Snowmelt-Runoff Events



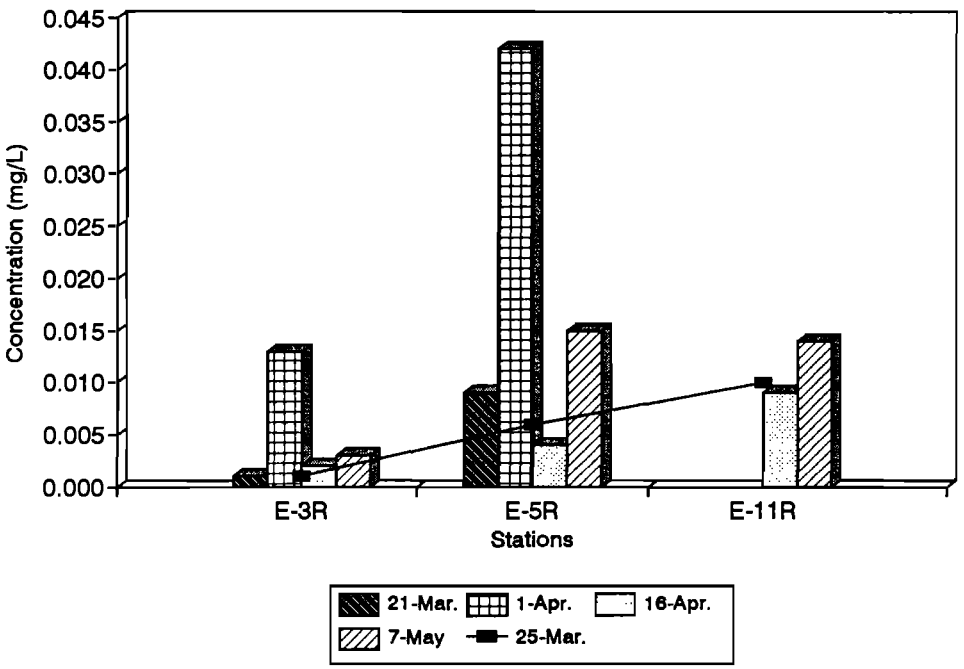
Total Recoverable Iron - 1996
Eagle River Snowmelt-Runoff Events



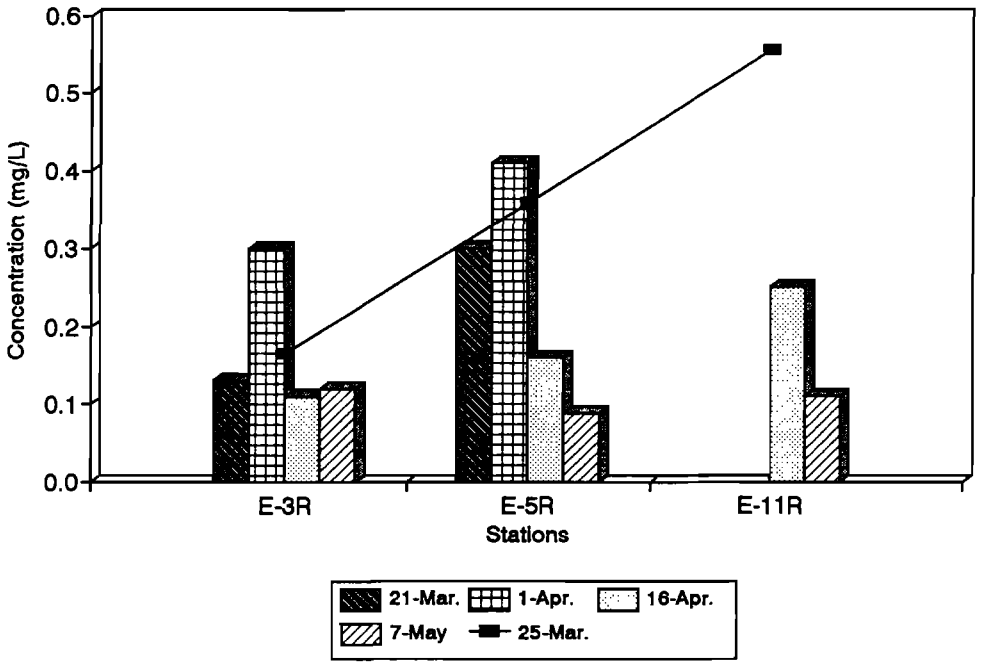
Dissolved Lead - 1996
Eagle River Snowmelt-Runoff Events



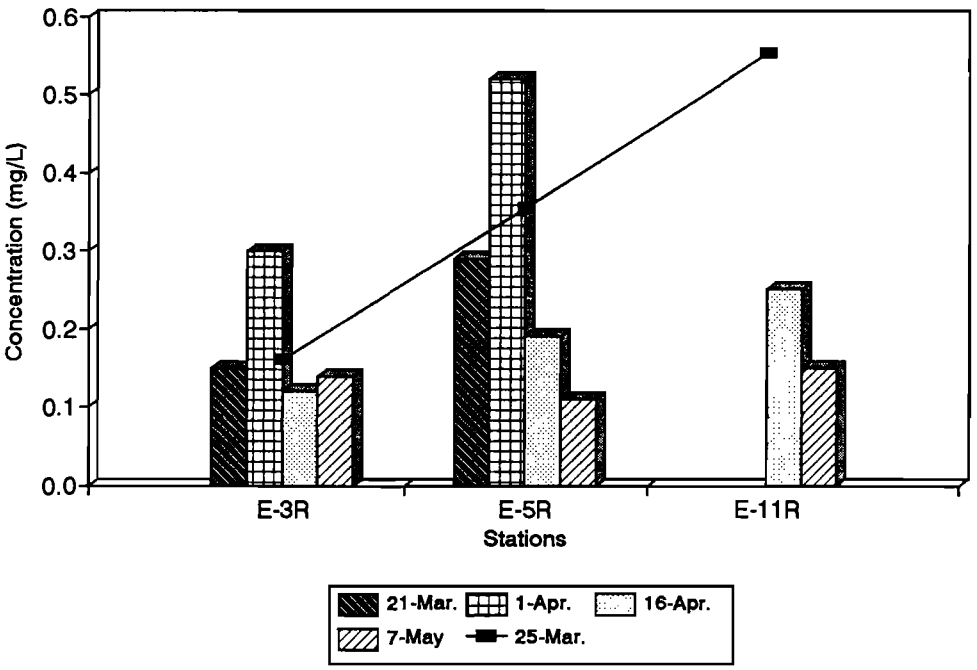
Total Recoverable Lead - 1996
Eagle River Snowfall-Runoff Events



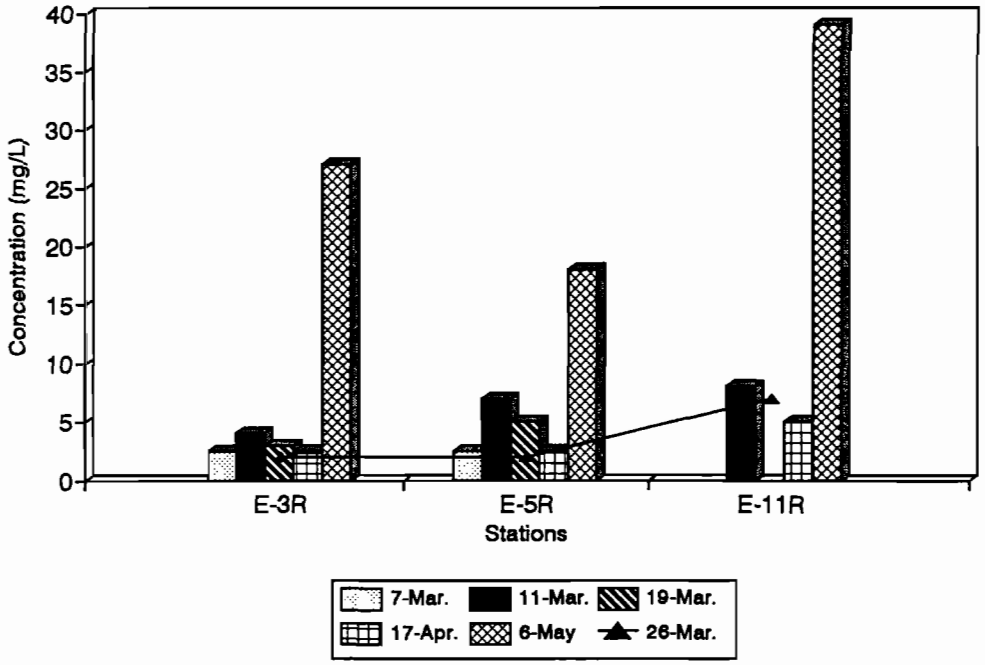
Dissolved Manganese - 1996
Eagle River Snowmelt-Runoff Events



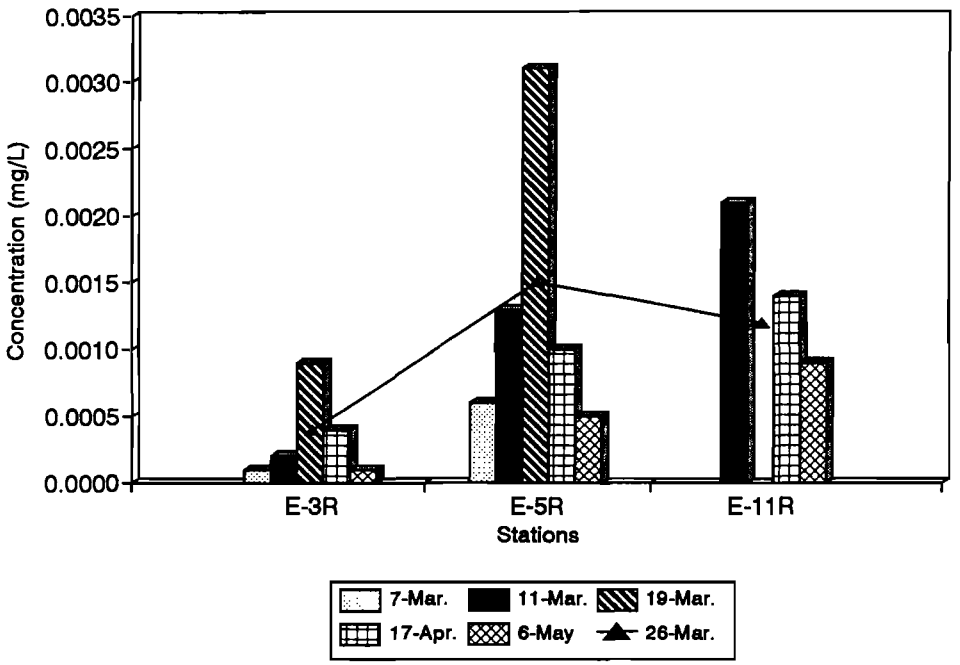
Total Recoverable Manganese - 1996
Eagle River Snowmelt-Runoff Events



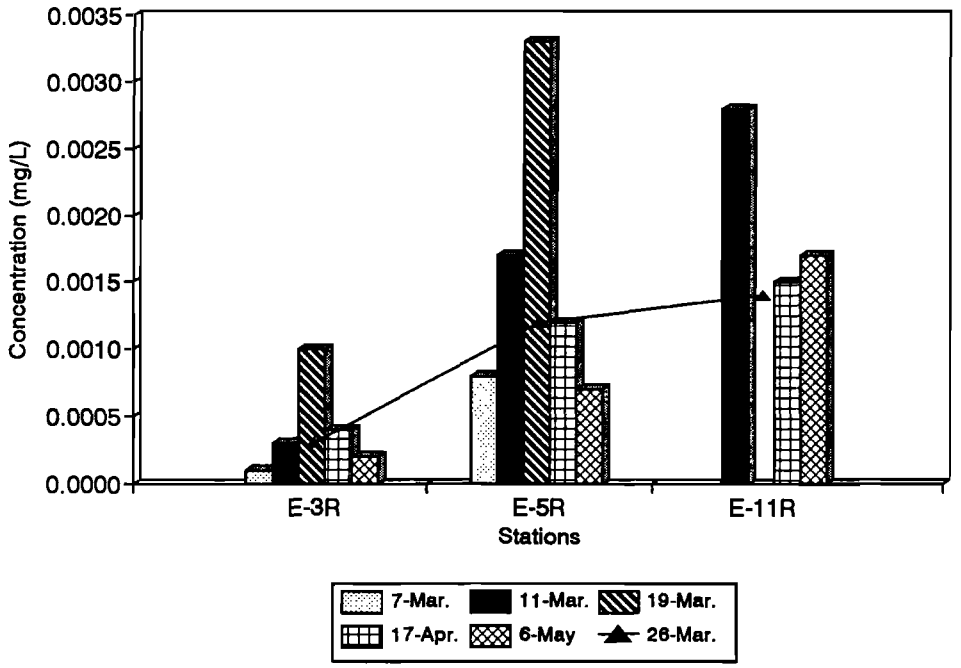
Suspended Solids -1997
Eagle River Snowmelt-Runoff Events



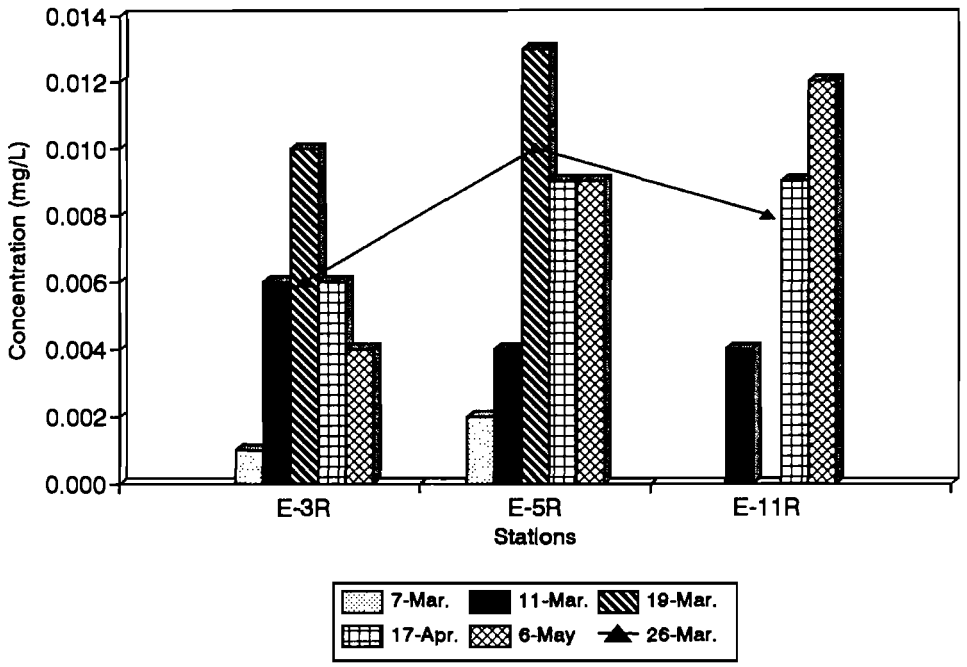
Dissolved Cadmium -1997
Eagle River Snowmelt-Runoff Events



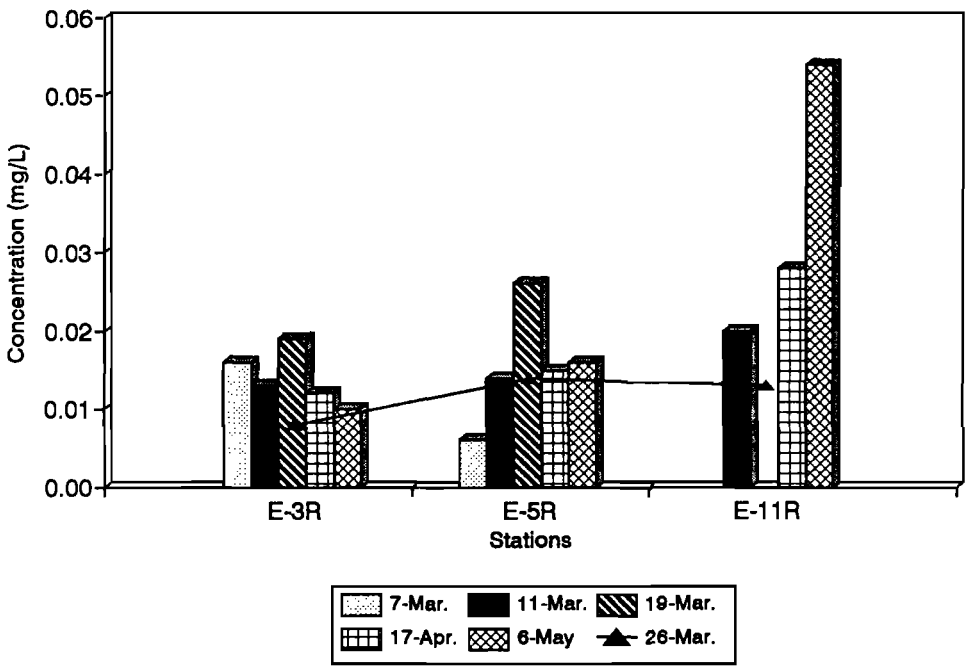
Total Recoverable Cadmium -1997
Eagle River Snowmelt-Runoff Events



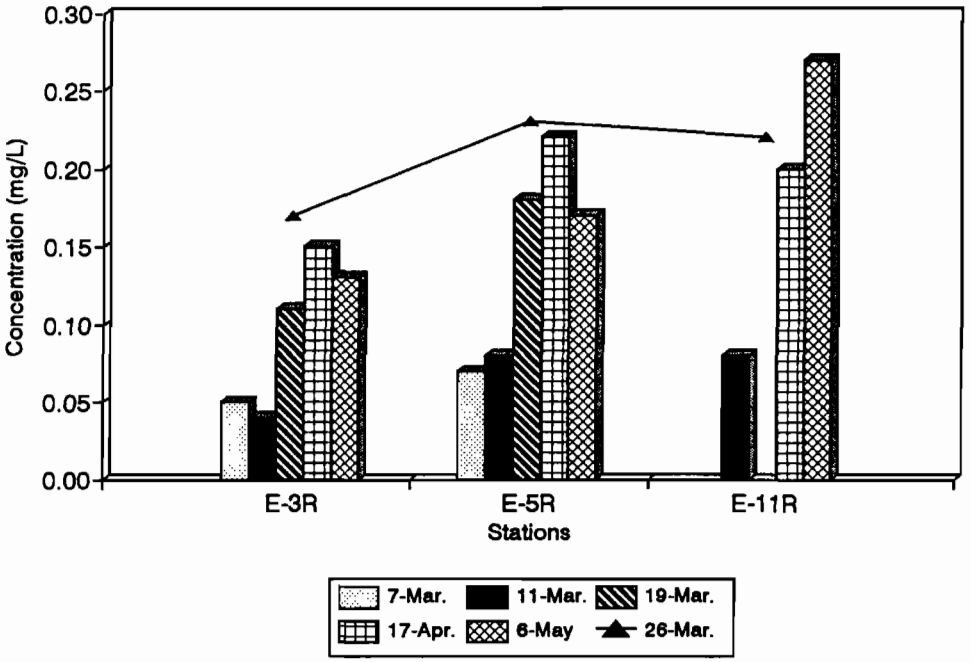
Dissolved Copper -1997
Eagle River Snowmelt-Runoff Events



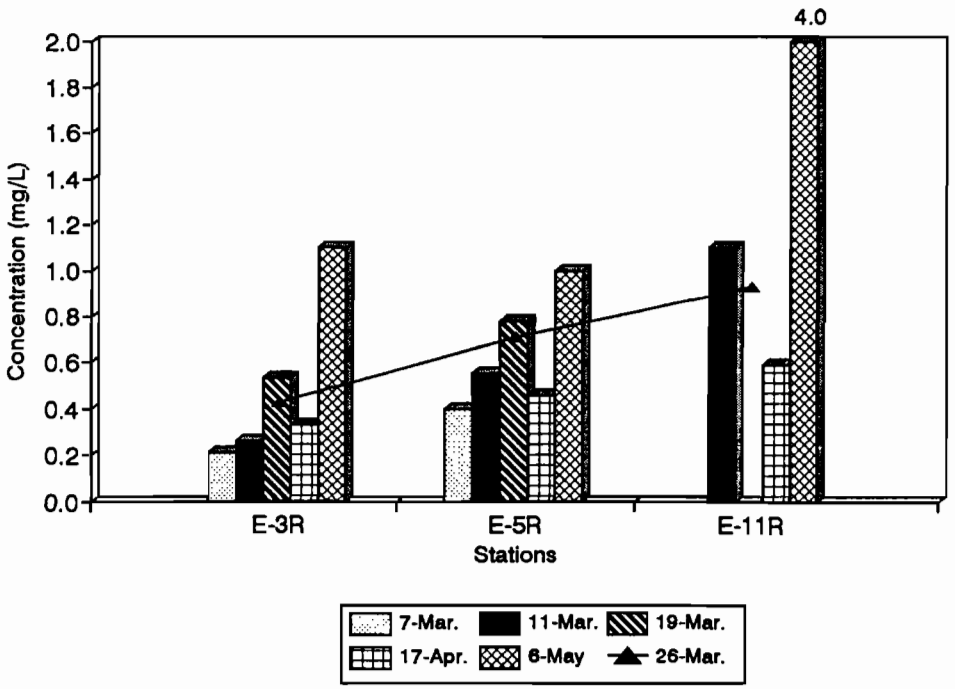
Total Recoverable Copper -1997
Eagle River Snowmelt-Runoff Events



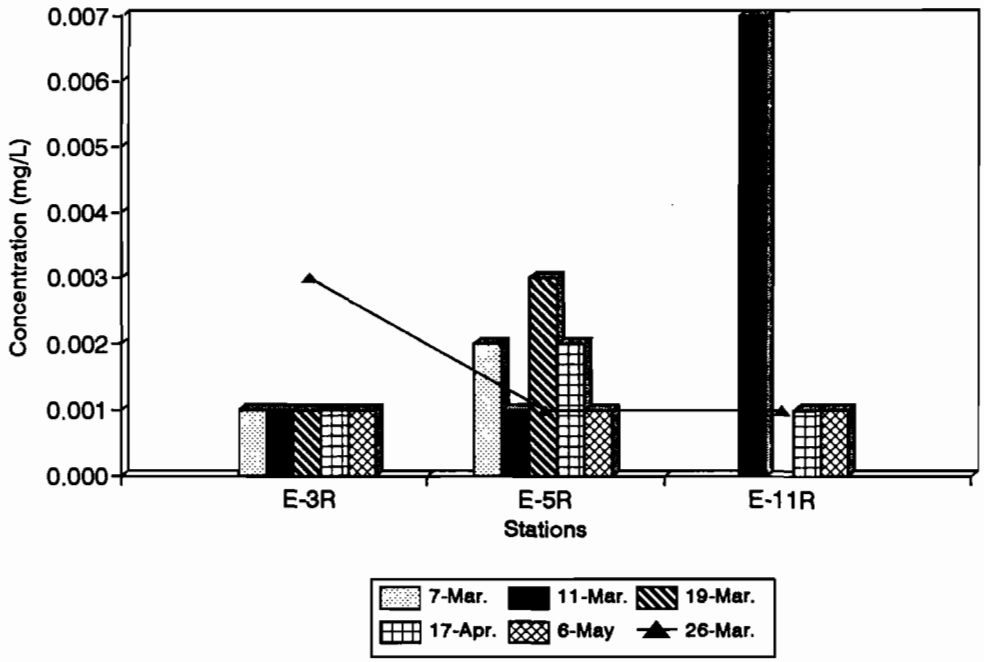
Dissolved Iron -1997
Eagle River Snowmelt-Runoff Events



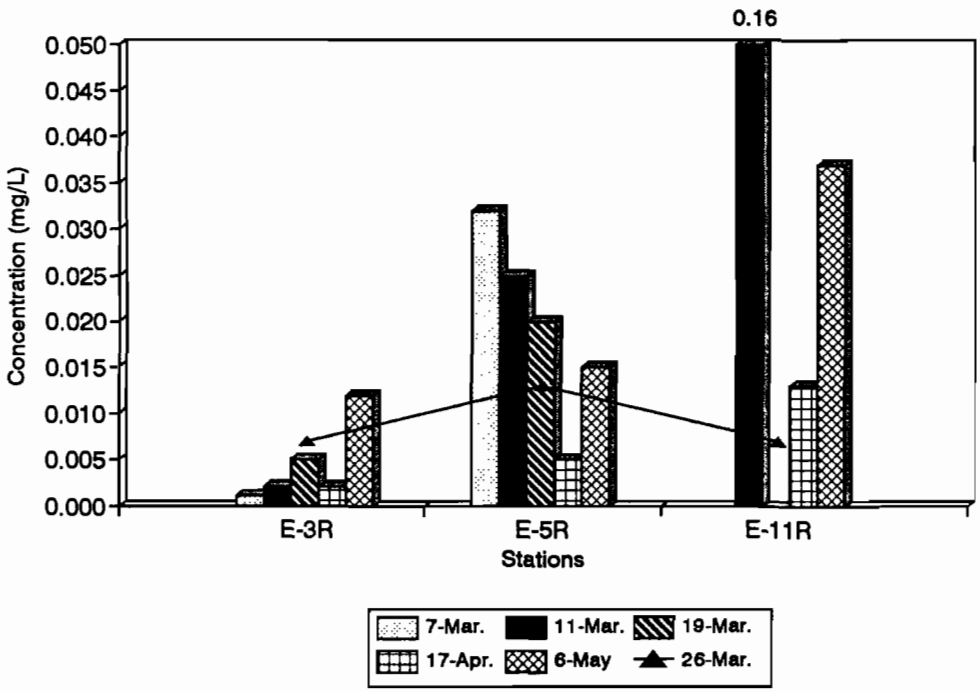
Total Recoverable Iron -1997
Eagle River Snowmelt-Runoff Events



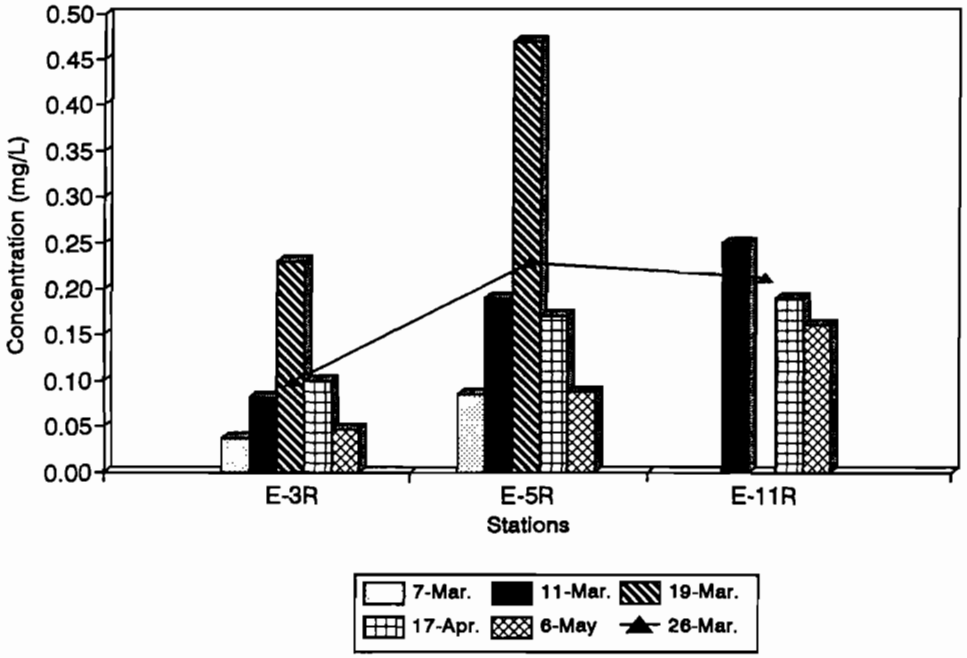
Dissolved Lead -1997
Eagle River Snowmelt-Runoff Events



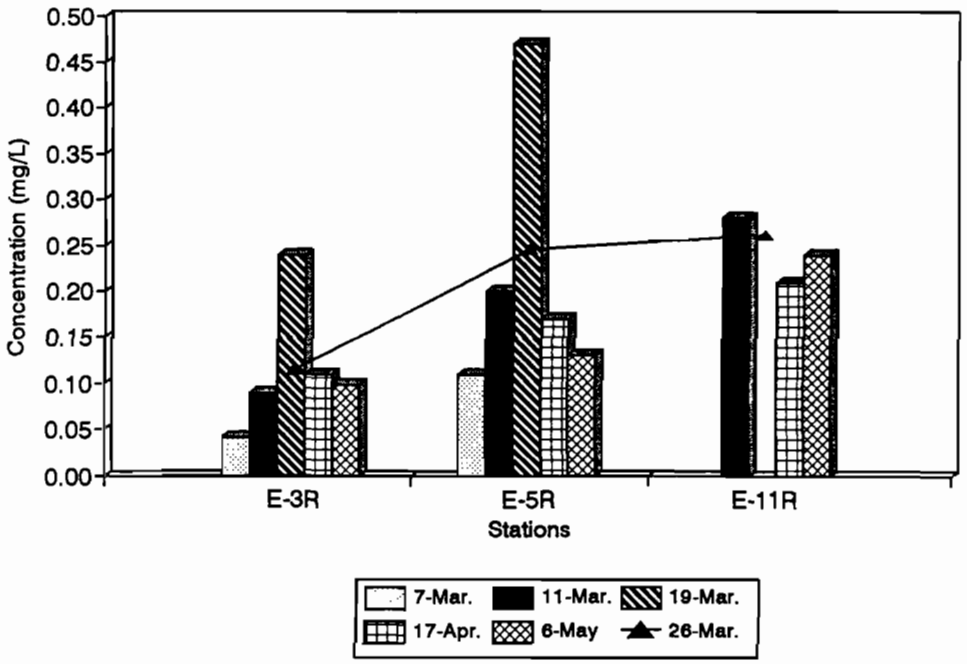
Total Recoverable Lead -1997
Eagle River Snowmelt-Runoff Events



Dissolved Manganese -1997
Eagle River Snowmelt-Runoff Events



Total Recoverable Manganese -1997
Eagle River Snowmelt-Runoff Events

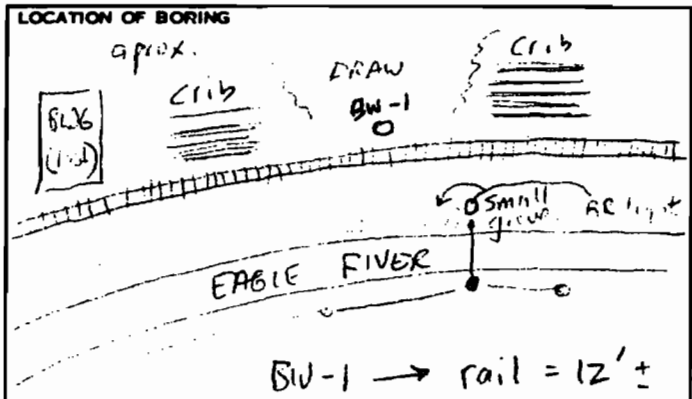


APPENDIX F

Belden Well Boring Logs,
Belden Ground Water Flow/Load Calculations,
and Water Level Plots

Dames & Moore

LOCATION OF BORING



DATUM ELEVATION

JOB NO.	CLIENT	LOCATION
12350-099	VIACOM - EAGLE	MINTURN/BELDEN

DRILLING METHOD:	BORING NO.
AP 1000 9" OD casing. Dual wall air percussion hammer	BW-1
SAMPLING METHOD:	SHEET
cyclone / grab	1 OF 1

					DRILLING START TIME	DRILLING FINISH TIME
WATER LEVEL	DRY				1115	1120
TIME	0835					
DATE	7-12-95				DATE 7-11-95	DATE
CASING DEPTH	5.44'					

SAMPLER TYPE	INCHES DRIVEN / INCHES RECOVERED	DEPTH OF CASING	SAMPLE NO. / SAMPLE DEPTH	BLOWS/FT. SAMPLER	NUMBER OF RINGS	DEPTH IN FEET	SOIL GRAPH	SURFACE CONDITIONS: railroad fill, fill material for pipe silt → cobble size
						0		0-2' Lt brn silt → FCd, dry cobble frags, qtz vein material occ loose pyrite & xtals on rock frags.
						1	Sm / Gm	
						2		2-4' brown silt - pebble size, damp, occasional wx clay/silt pieces lt brn no indication of mineralization
						3		
						4		4-6' org-brn silt, some clay, silt dry but clay clds damp inside no mineralized frags apparent 4-6'
						5	ML	
						6		complete ~~well~~ hole @ 6'2" deep @ 1120 hrs, well dry! no indication of water from cyclone
						7		
						8		cut & construct 2' screen (top screen = bottom + 1'7") cut total length to 5'9"
						9		sand to 3' 8-12 CS 1/4 bag.
						0		bentonite to 1' hydrate hole w/ 4 gal Bills Lake water (1 bucket).
						1		
						2		screen w/ 6-4' sand 2-3' (1 slot screen) blank 4'-surf bentonite 3-1' (2 (opt)
						3		
						4		
						5		
						6		
						7		
						8		
						9		
						0		

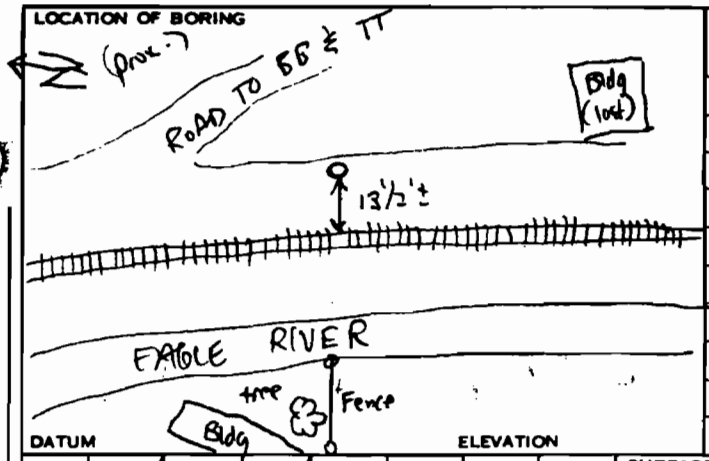
DRILLING CONTR. Day 07/20/95 TOC

BY DATE CHK'D BY

(1-13) (REV. 11-80)

Dames & Moore

LOCATION OF BORING



DATUM ELEVATION

JOB NO.	CLIENT	LOCATION
12330-099	VIACOM-EAGLE	BELDEN

DRILLING METHOD: AP 1000 9" OD CSG
Dual wall air percussion hammer

SAMPLING METHOD: cyclone/grab

BORING NO. BW-2

SHEET 1 OF 1

					DRILLING START TIME	DRILLING FINISH TIME
WATER LEVEL	DRY				1230	1250
TIME	0830					
DATE	7-12				DATE 7-11-95	DATE 7-11-95
CASING DEPTH	8.10'					

SURFACE CONDITIONS: fill material, lt-brn silt → angular frags, cobble size

SAMPLER TYPE	INCHES DRIVEN / INCHES RECOVERED	DEPTH OF CASING	SAMPLE NO. / SAMPLE DEPTH	BLOWS/FT. SAMPLER	NUMBER OF RINGS	DEPTH IN FEET	SOIL GRAPH	
						0		0-2' lt-brn to brn silt → pebbles dry qtzite, ?limonite, some free pyrite & small chk
						1	sm / om	
						2		2-4' org-brn to brn silt → pebbles w/some large ang frags, v. sl damp, frags limonite, slag.
						3		
						4		4-6' brn sd - m-c, poorly graded some silt v. sl damp
						5	sm	
						6		6-8' org-brn silt - vc sd & pebbles some large ang frags 1" → 3" dry. (drier than abv)
						7	sm / om	
						8		8'+ a/a, fist size qtzite frags (driller says not bedrk)
						9		8'9" TD @ 1250 hrs
						0		no indication of water from cyclone
						1		5' screen (top of slots = 5' 1½" abv TD)
						2		8.75 - 3.75 = screen 8.75 - 2.5 = sand (sand 1.25' abv screen)
						3		~~2.5~~ 1 = bent. (bentonite 1.5 feet) 2.5-1
						4		
						5		
						6		
						7		
						8		
						9		
						0		

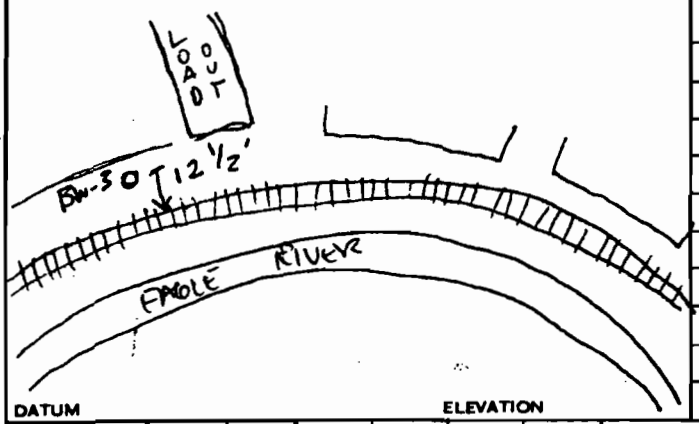
DRILLING CONTR. _____ BY _____ DATE _____ CHK'D BY _____

N014823

628.1 (3) (REV. 11-80)

Dames & Moore

LOCATION OF BORING



DATUM ELEVATION

JOB NO.	CLIENT	LOCATION
12330-099	VIACOM - EAGLE	MIDTUNNEL ~~BW-3~~ BELOW

DRILLING METHOD: AP 1000 9"OD CSG
Dual wall air percussion hammer

BORING NO. BW-3

SHEET 1 OF 1

SAMPLING METHOD: cyclone / grab

DRILLING

					START	FINISH
WATER LEVEL	DRY				TIME 1400	TIME 1420
TIME	0820					
DATE	7-12				DATE 7-11-95	DATE
CASING DEPTH	9.82'					

SURFACE CONDITIONS: fill, silty, lt brn, dry

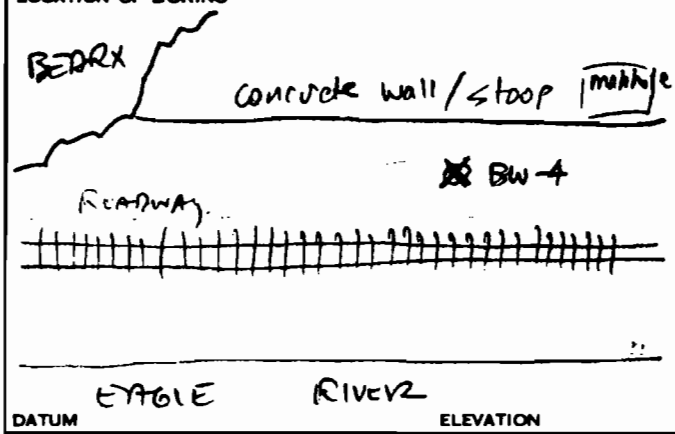
SAMPLER TYPE	INCHES DRIVEN / INCHES RECOVERED	DEPTH OF CASING	SAMPLE NO. / SAMPLE DEPTH	BLOWS/FT. SAMPLER	NUMBER OF RINGS	DEPTH IN FEET	SOIL GRAPH	
						0		0-2 brn - dk brn silt, some clay, sl damp some slag frags
						1	ML	
						2	— —	2-4 org brn silt w/ cobble size frags, angular; dry.
						3	SM/GM	
						4		4-6 a/a lt org-brn, dry more frags, less silt. frags dk gray ? LS, wood clips
						5		
						6		6-8 More matrix than a/a, sl damp silt-clay org-brn → dk brn, some large (cobble size) aug frags rose color ? qtzite, wood clips continue.
						7	SM/GM	
						8		no mineralization apparent 0'-8', no indication of water
						9		8-10.5 olive gru-brn silt some clay, w/ pebble — cobble size frags, more rounded than abv. damp.
						10		no indication of water from cyclone
						1		1420 - hole complete @ 10.5'
						2		5' screen 10.5 - 5.5 screen (screen top = TD + 5'1") 10.5 - 3.5 sand (sand 2' abv screen)
						3		3.5 - 1.5 bent. (2' bent)
						4		
						5		
						6		
						7		
						8		
						9		
						0		

CHK'D BY _____ DATE _____

225-1 (3) (REV. 11-80)

Dames & Moore

LOCATION OF BORING



DATUM ELEVATION

JOB NO.	CLIENT	LOCATION
12330-099	VIACOM - EAGLE	MINTURN/BELDEN

DRILLING METHOD: AP 1000 9" OD CSG
Dual wall air percussion hammer

SAMPLING METHOD: cyclone / grab

BORING NO. BW-4

SHEET 1 OF 1

					DRILLING START	DRILLING FINISH
WATER LEVEL	8.20	8.32	9.12		TIME 1525	TIME 1605
TIME	1230	1540	1715			
DATE	7-12	7-13	7-17		DATE 7-11-95	DATE 7-11-95
CASING DEPTH	11.84					

DRILLING CONTR. LAYNE

No 1482290

SAMPLER TYPE	INCHES DRIVEN / INCHES RECOVERED	DEPTH OF CASING	SAMPLE NO. / SAMPLE DEPTH	BLOWS/FT. SAMPLER	NUMBER OF RINGS	DEPTH IN FEET	SOIL GRAPH	SURFACE CONDITIONS: lt brn silt w/ slag. dry.
						0	SM	0-2 matrix lt brn silt, w/ any frags (granite,)
						1		
						2	SM/GM	2-4 a/a sl darker color, sl damp, more pebbles. some wood chips
						3		
						4	GP	4-6 all frags, v. little matrix
						5		large qtzite cobble, small boulder. white.
						6	SM/GM	6-8 a/a matrix org-brn silt, dry.
						7		
						8	GP	8-10 big qtzite, limonite (cemented) frags. dry
						9		no indication of water from cyclone
								" " of mineralization
						10		large cobbles / boulders
						1		white qtzite, dk green
						2		TD @ 12.7' @ 1605 hrs
								no indication of water
						3		12.5-7.5 screen
						4		12.5-6.0 sand (sand 1.5' abv screen)
								6.0-4.5 bent. (2' bentonite)
						5		bottom 1.5' of bit damp-wet when
						6		withdrawn.
						7		
						8		
						9		
						0		

BY DATE CHK'D BY

528.1 (3) (REV. 11-80)

DISCHARGE CALCULATIONS

$Q = KIA$ $\qquad I = \frac{h_1 - h_2}{L}$

BW-1 SNOWMELT

$$Q = 1.6\ ft/day \times \left[\frac{8383.39\ (\text{max elev}) - 8377.04\ (\text{low river elev})}{44'\ (\text{distance to river})}\right]$$

$$\times \left[135'\ (\text{one-half distance to BW-2}) \times 2 \times 6.35'\ (\text{MAX sat. thick})\right]$$

$$Q = 1.6\ ft/day \times 0.144 \times 1714.5\ ft^2$$

$$Q = 395\ ft^3/day$$

BW-2 BASELINE

$$Q = 82\ ft/day \times \left[\frac{8373.7\ (\text{AVG. ~~MAX~~ elev}) - 8369.65\ (\text{low river elev})}{51'\ (\text{dist to river})}\right]$$

$$\times \left[135'\ (\text{one-half dist to ~~BW-2~~ BW-1}) + 261'\ (\text{one-half dist to BW-3}) \times 4.05\ (\text{max})\right]$$

$$Q = 82\ ft/day \times 0.079 \times 1604$$

$$Q = \cancel{10{,}391}\ 10{,}445\ ft^3/day$$

BW-3 SNOWMELT

$$Q = 10\ ft/day \times \left[\frac{8367.19\ (\text{MAX elev}) - 8361.06\ (\text{low river elev})}{56'\ (\text{distance to river})}\right]$$

$$\times \left[261'\ (\text{one-half dist to BW-2}) + 231'\ (\text{one-half dist to BW-4}) \times 6.13\ (\text{max sat})\right]$$

$$Q = 10\ ft/day \times 0.110 \times 3016$$

$$Q = 3318\ ft^3/day$$

DISCHARGE CALCULATIONS

page two

BW-4 MAX SNOWMELT

$$Q = 1.0\ ft/day \times \left[\frac{\cancel{8365.15}\ 8367.25\ (\text{MAX elev}) - 8360.49\ (\text{low river elev})}{65'\ (\text{distance to river})}\right]$$

$$\times \left[231'\ (\text{one-half dist to BW-3}) \times 2 \times 4.66\ (\text{MAX sat. thick})\right]$$

$$Q = 1.0\ ft/day \times 0.07 \times 2153\ ft^2$$

$$Q = 151\ ft^3/day$$

BW-4 BASELINE

$$Q = 1.0\ ft/day \times \left[\frac{8360.74\ (\text{Avg level}) - 8360.49\ (\text{low river el.})}{65'\ (\text{distance to river})}\right]$$

$$\times \left[231'\ (\text{one-half dist to BW-3}) \times 2 \times 0.25\ (\text{Avg less river elev})\right]$$

$$Q = 1.0\ ft/day \times 0.004 \times 116\ ft^2$$

$$Q = 0.46\ ft^3/day$$

LOAD CALCULATIONS

BW-1 (SNOWMELT)

ZN load = 395 ft^3/day × $\frac{1\ day}{24\ hrs}$ × $\frac{1\ hr}{60\ min}$ × $\frac{1\ min}{60\ secs}$ × ~~12~~ 48 mg/L × 5.4

= ~~0.3~~ 0.7 lbs/day dissolved zinc

BW-2 (Baseline)

ZN load not calculated; no sample results

BW-3 (SNOWMELT)

ZN load = 3318 ft^3/day × $\frac{1\ day}{24\ hrs}$ × $\frac{1\ hr}{60\ min}$ × $\frac{1\ min}{60\ sec}$ × ~~460~~ 285 mg/L × 5.4 *

= ~~95~~ lbs/day dissolved zinc

59±

BW-4 max (SNOWMELT)

ZN load = 151 ft^3/day × $\frac{1\ day}{24\ hrs}$ × $\frac{1\ hr}{60\ min}$ × $\frac{1\ min}{60\ sec}$ × ~~14.2~~ 36 mg/L × 5.4 *

= ~~0.13~~ lbs/day

0.34

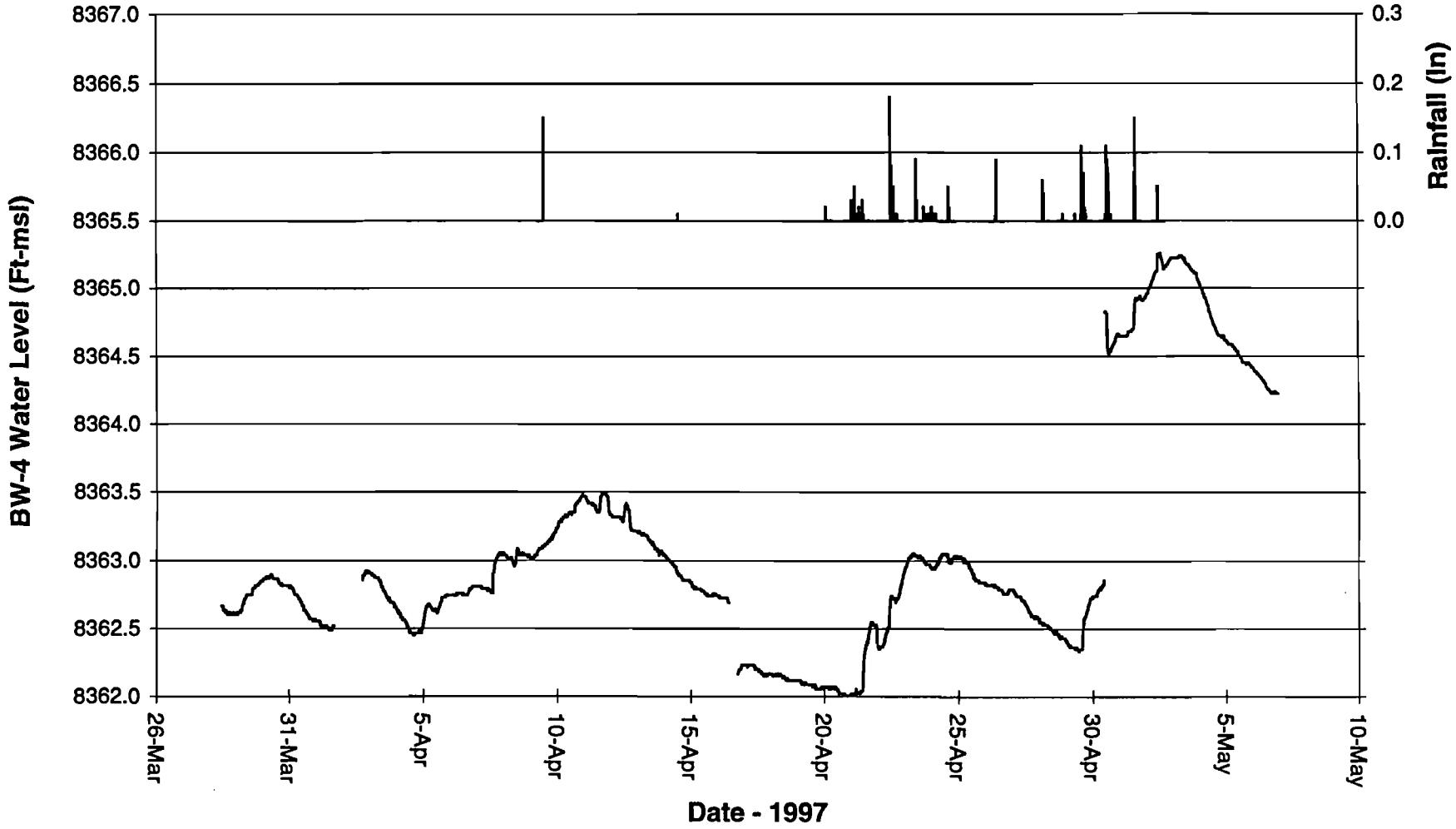
BW-4 baseline

ZN load = 0.46 ft^3/day × $\frac{1\ day}{24\ hrs}$ × $\frac{1\ hr}{60\ min}$ × $\frac{1\ min}{60\ sec}$ × ~~8.40~~ 17 mg/L × 5.4

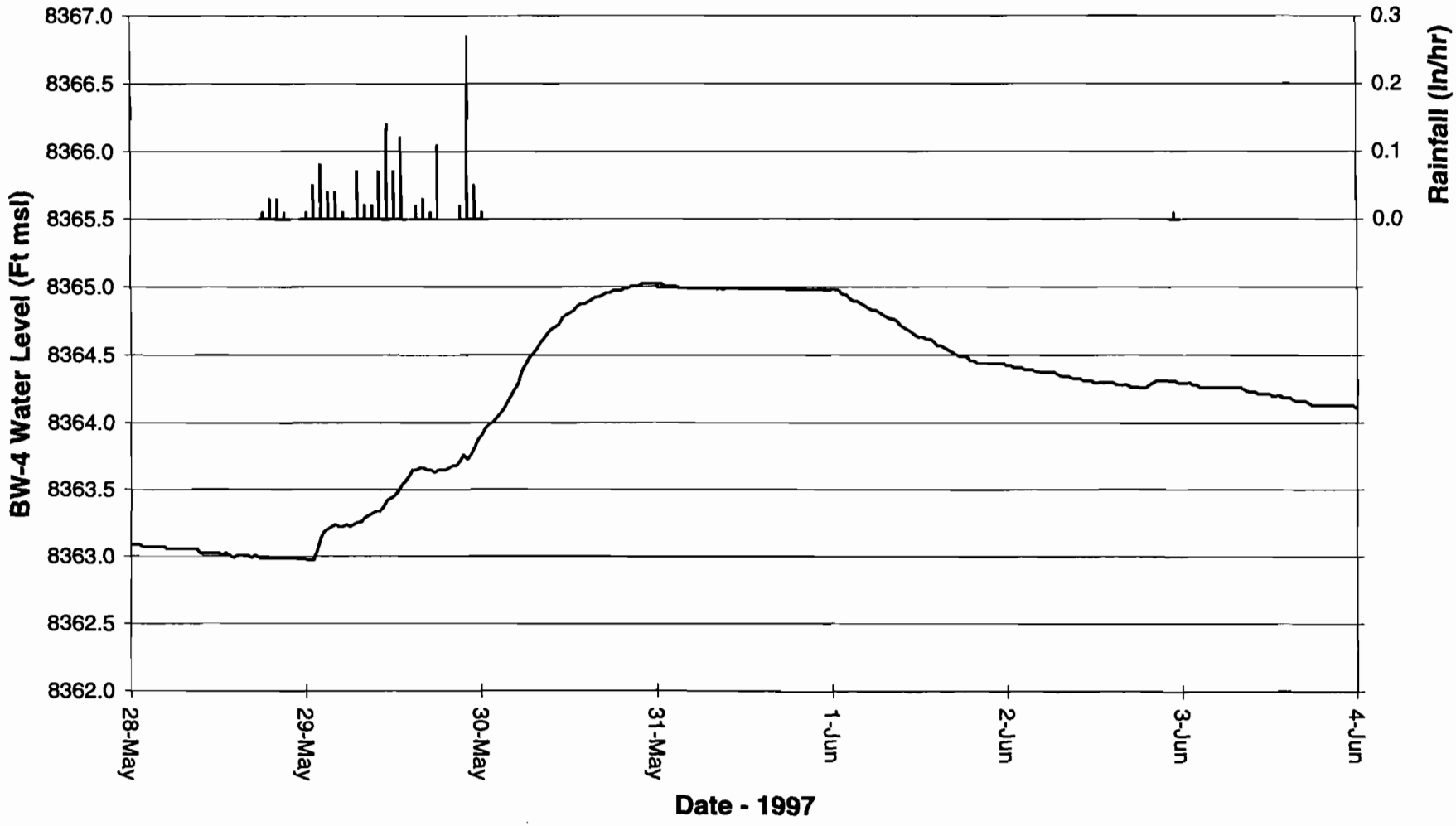
= ~~0.0002~~ 0.0005 lbs/day

* NOTE: 5.4 conversion factor used in all loading reports; ft^3/sec × mg/L × 5.4 = lbs/d

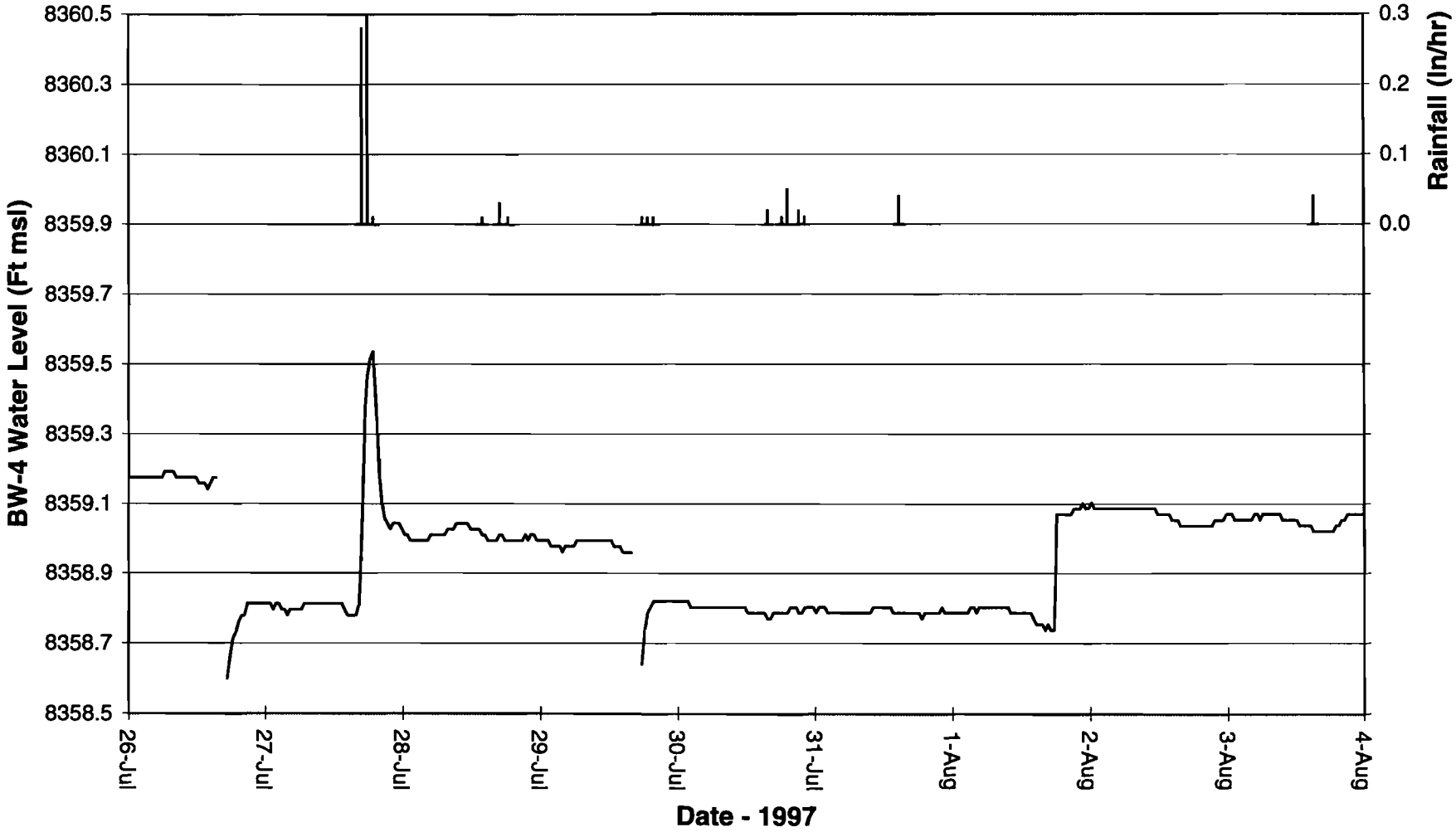
Belden Well BW-4
April-May, 1997 Snowmelt



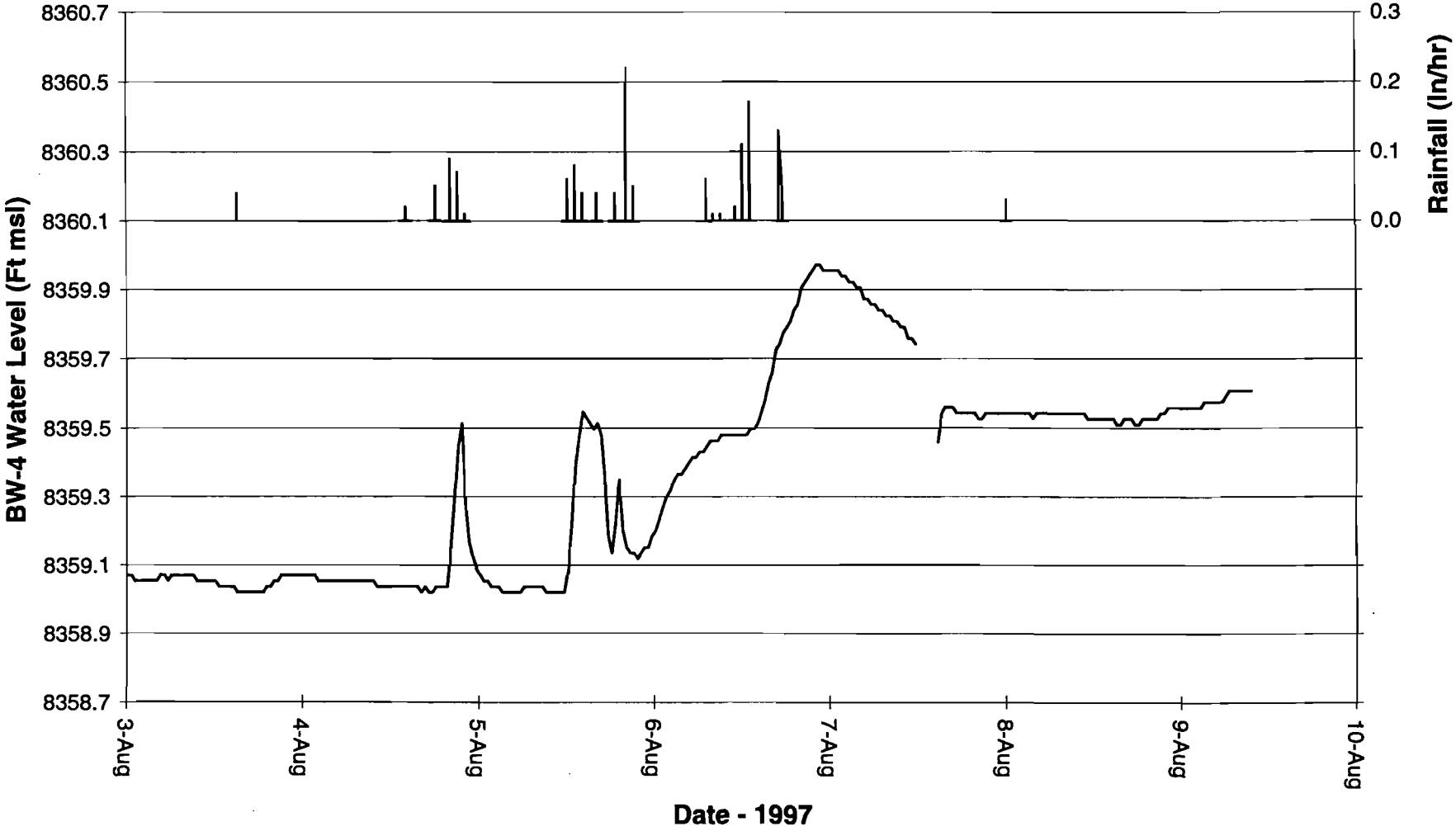
Belden Well BW-4
May 29, 1997 Rainfall Event



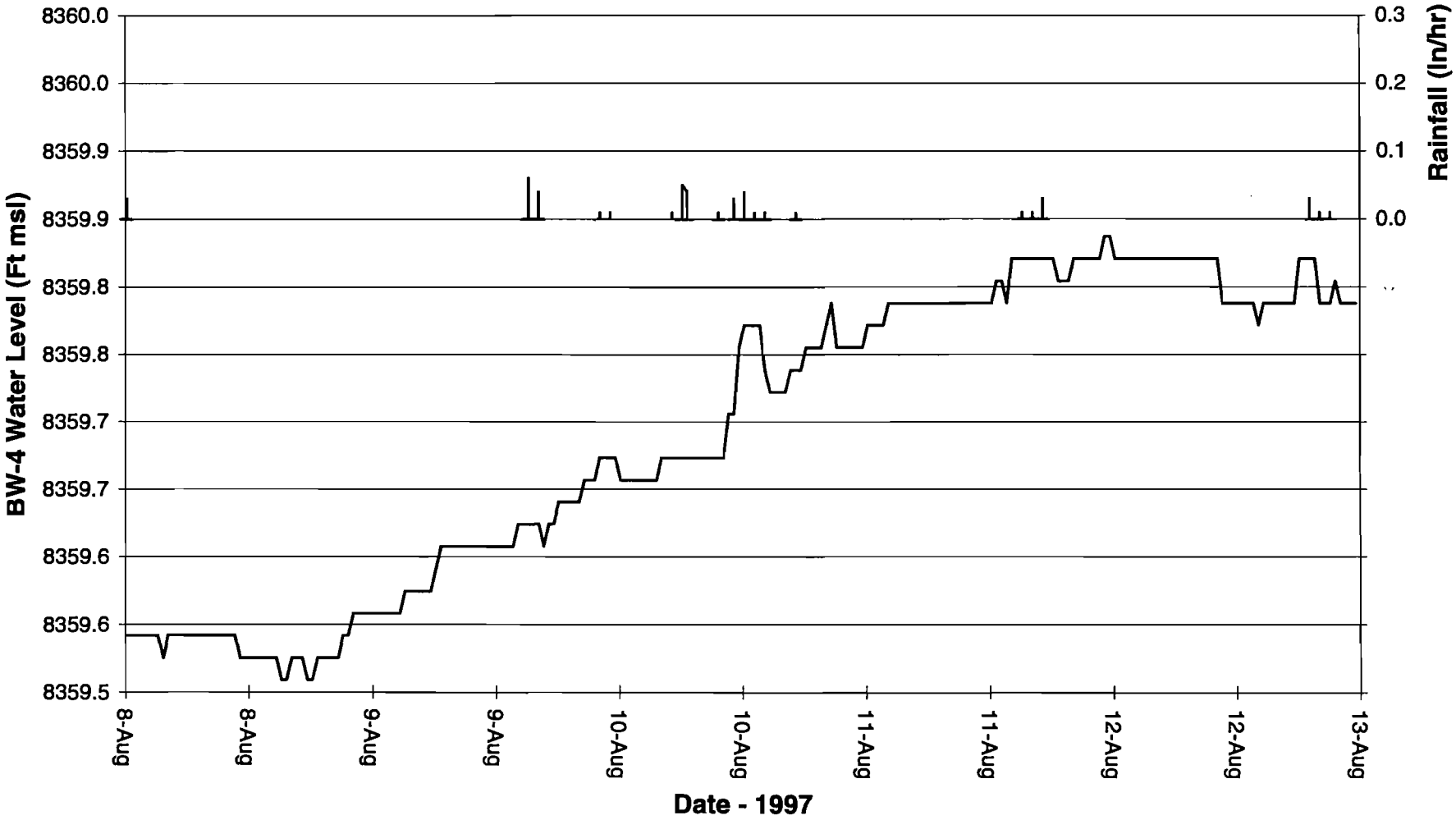
Belden Well BW-4
July 29, 1997 Rainfall Event



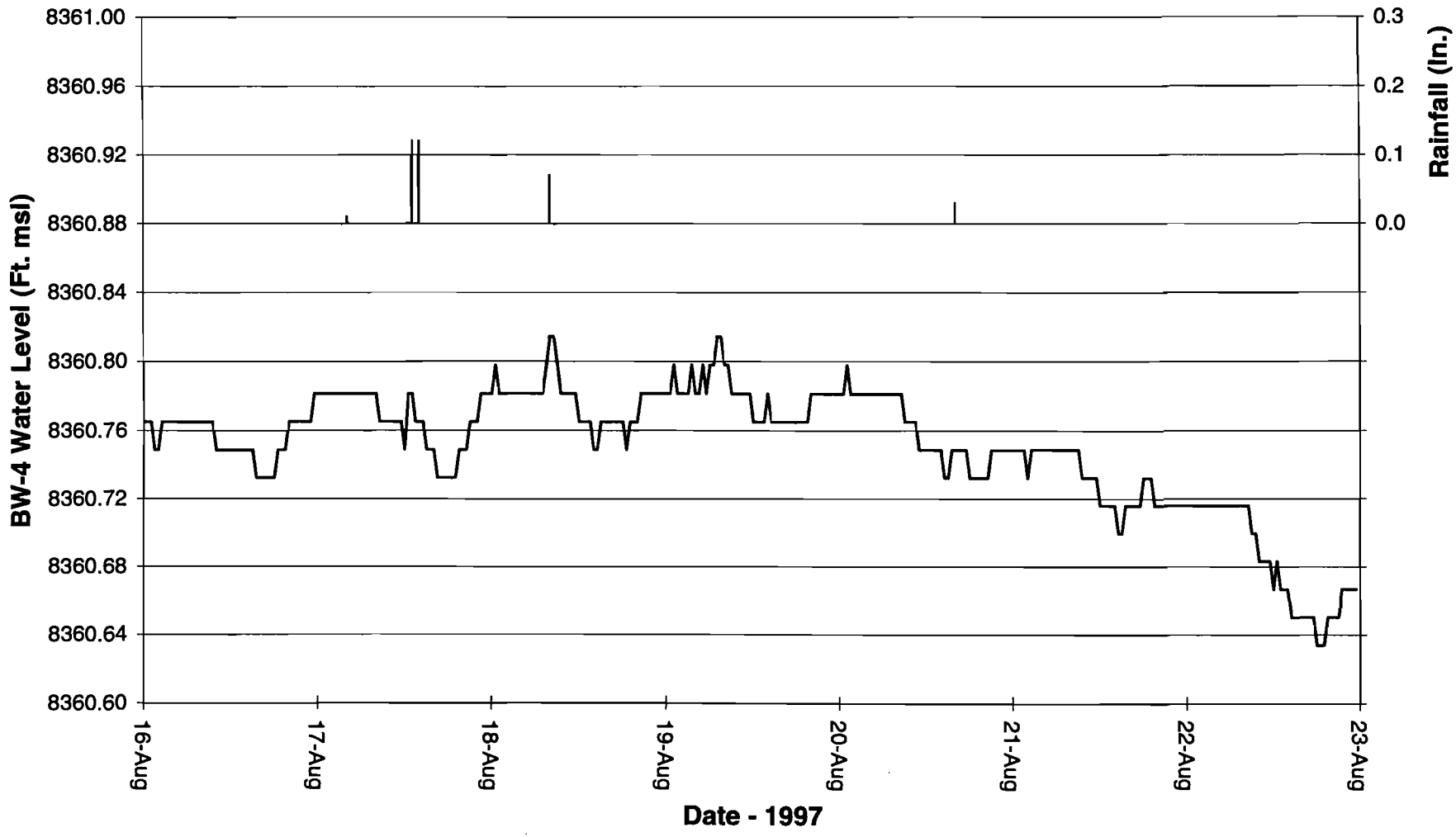
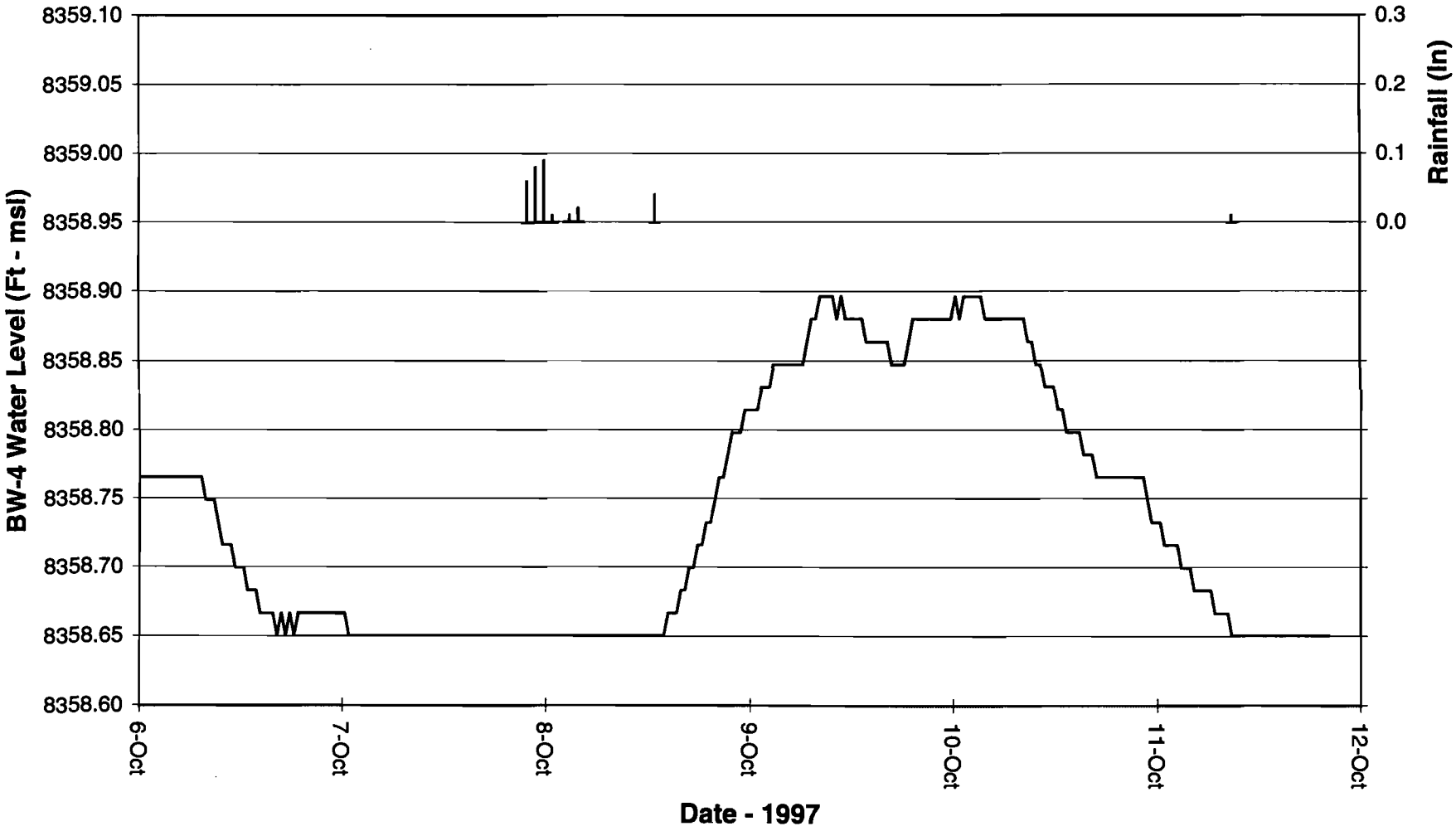
Belden Well BW-4
August 5, 1997 Rainfall Event



Belden Well BW-4
August 9, 1997 Rainfall Event



Belden Well BW-4
August 17, 1997 Rainfall Event



Belden Well BW-4
October 7-8, 1997 Rainfall Event