ROCKY FLATS ENVIRONMENTAL TECHNOLOGY SITE
QUARTERLY
ENVIRONMENTAL MONITORING REPORT
OCTOBER - DECEMBER 1998

Rocky Flats Environmental Technology Site
P O Box 464 Golden, CO 80402-0464

FEBRUARY 1999
RF/RMRS-99-329 UN

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PREPARED BY ROCKY MOUNTAIN REMEDIATION SERVICES, L L C

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HIGHLIGHTS FOR OCTOBER, NOVEMBER, AND DECEMBER 1998

This report is produced and distributed quarterly as part of our ongoing Agreement in Principle and as a forum for the Rocky Flats Cleanup Agreement (RFCA) quarterly monitoring requirement As discussed at the last Exchange of Information Meeting held on November 17 1999 the Site is consolidating its reporting for selected media In an effort to provide a more meaningful interpretation of the data presented and to save some natural resources namely trees the Site will be providing analytical data in the following formats

Airborne effluent data is represented by a single graph providing cumulative plutonium emissions for 1997 and 1998 Ambient air data is represented by two graphs – a summary of estimated off-site dose as compared to a 10 Mrem per year standard and air concentrations at perimeters sample locations expressed as a percentage of EPA air concentration-based dose limit for members of the public Meteorological data are represented by one windrose and a climatic summary for each month in the reporting period

Compliance data in support of the Site National Pollutant Discharge Elimination System (NPDES) permit are presented without change Analytical data collected in support of RFCA will be limited to the following locations GS01 GS03 GS08 GS11 GS31 GS10 SW027 SW093 SW022 and SW091 Data include the hydrograph mean daily flow and available water quality measurements for each location during the reporting period

For information concerning analytical data from any medium that is no longer included in this report contact Steve Nesta Kaiser-Hill Team at 303-966-6386

Airborne Effluent

Discussions involving complete isotopic analytical data for January through November 1998 are included in this report Data for December 1998 are not complete at this time All data are within the normally observed ranges of concentrations for their respective locations

In November 1998 plenum 404 Building 779 started exhausting to the atmosphere The results reflect the addition of this new emission point One of the September filters from the special sampling in Building 779 was torn but still intact Some loss of sample may have occurred

Due to parallel sampling tests being conducted in Building 371 and the information setup in the Air Monitoring System Database Building 371 data were double counted for the months of January through September 1998 The data used for this report reflect the corrected release and concentration information

Consistent with all other uses of these data, positive values only are included in the total release calculation (the negative values are treated as zeros) The uncertainty calculation does reflect all values

Ambient Air

Discussions involving complete isotopic analytical data for January through December 1998 for coarse (> 10 micrometers) and fine (<10 micrometers) particles are included in this report All data are within the normally observed ranges of concentrations for their respective locations

A malfunction in the hour meter (used to establish filter exposure time) was discovered at sampler S-138 for the month of December Run times have been estimated based on continuous operation between filter changes instead of elapsed time meter readings Routine radiotelemetry data do not indicate any outages during this period The uncertainty in the total run time is less than five hours out of 864 hours

Meteorology and Climatology

Meteorological data are routinely measured from instrumentation on a 61-meter tower located in the west buffer zone at an elevation of 1 870 meters (6,140 feet) above sea level All meteorological data are being collected on a real-time basis and are transmitted as 15 minute averaged values to the Computer Assisted Protective Action Recommendations System (CAPARS) model for emergency response purposes The same data are logged at the tower and downloaded for air quality and surface water modeling purposes

Climatic summaries and Windroses for October 1998 through December 1998 are included in this report.

As a result of the new protocols used to validate the meteorological data, each 15 minute-averaged observation is validated, rather than the entire observation record for the same time period (which might contain 70 different observations-i e temperature wind speed, etc) Missing data will be reported with respect to the wind speed and wind direction values, for example, rather than recording all observations missing for the same 15 minute period Wind speed/direction data from the following times are missing due to maintenance, equipment failure, or calibrations

- October 1, from 0000 to 0015
- November 1, from 0000 to 0015
- December 1, from 0000 to 0015

Surface Water

Surface water analytical data collected during first quarter of FY 99 (October November and December) for NPDES/FFCA permit compliance are presented in this report All reported data are consistant with historical measurements and within permit limitations

Hydrologic Monitoring and Rocky Flats Cleanup Agreement (RFCA) Monitoring

All available analytical data collected during first quarter of FY 99 (October November, and December) from samples collected for RFCA and Hydrologic Monitoring are included in this report

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1 AIR DATA

1 1 EFFLUENT AIR DATA

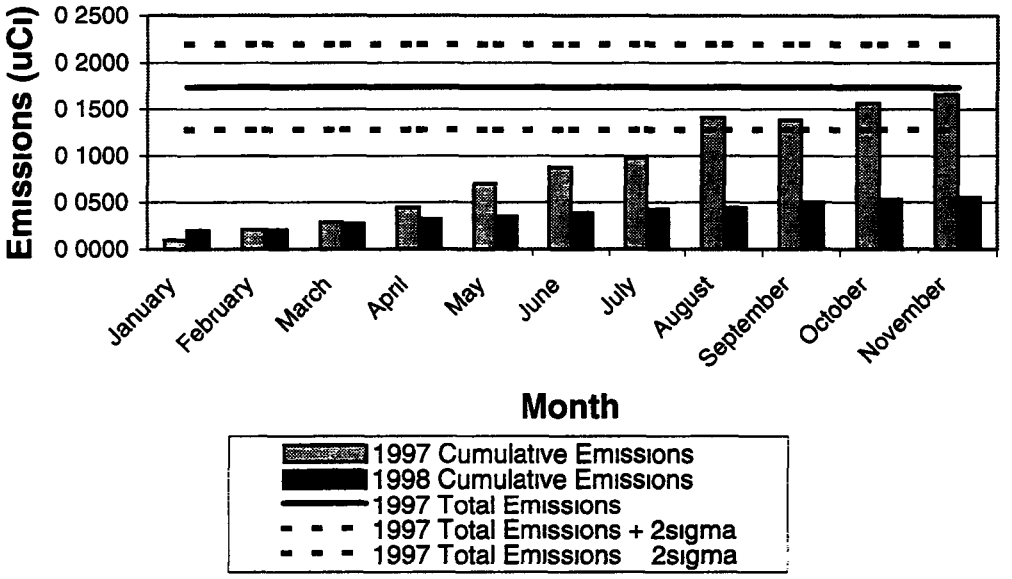


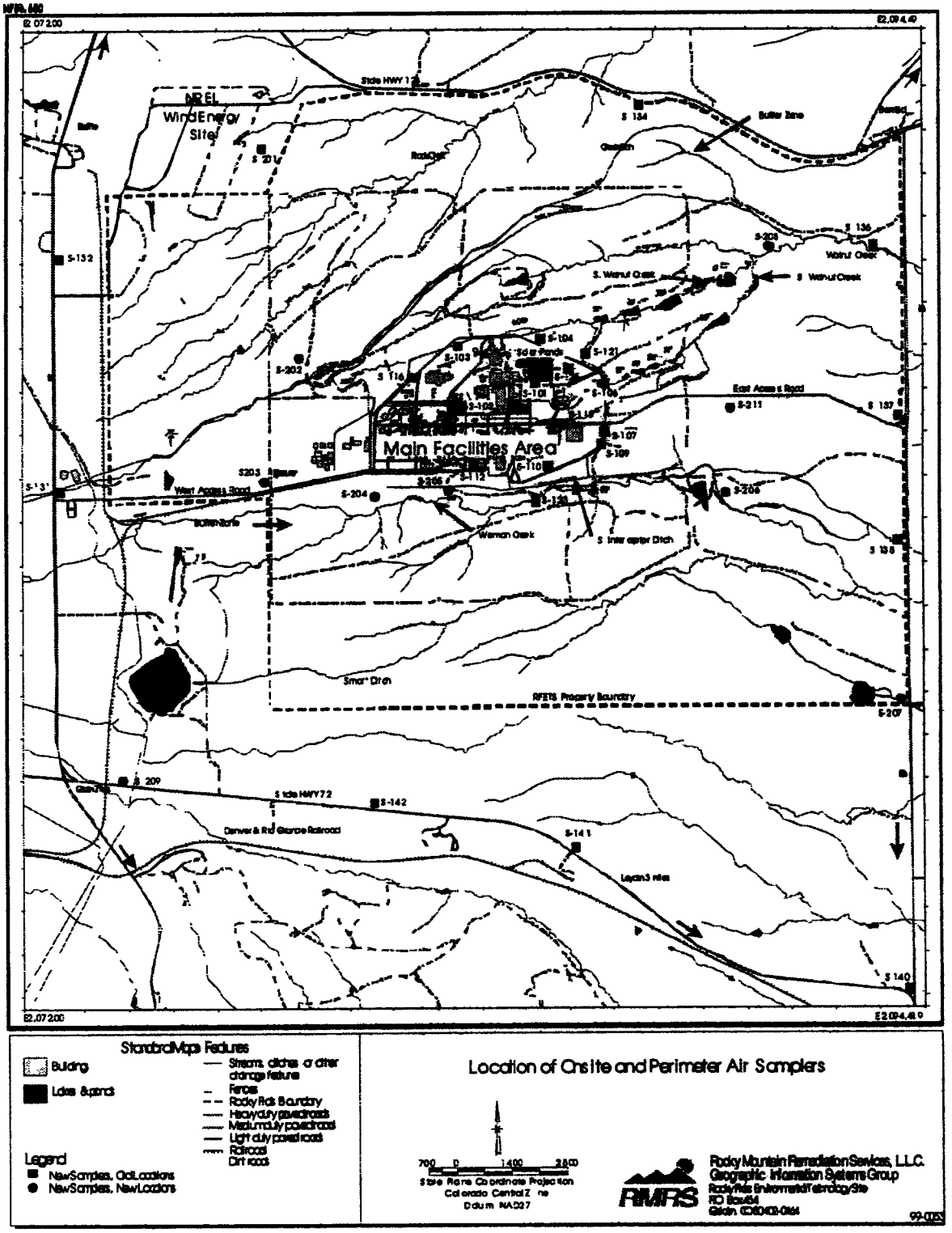
Figure 1-1 Cumulative Plutonium Airborne Effluent Emissions, 1997 & 1998

The above graph shows the cumulative airborne effluent emissions of plutonium from building stacks The total plutonium emissions for 1997 were 0 17 micro Curies (uCi) Plutonium emissions through November 1998 are about 35% of the observed emissions through the same time period in 1997

The americium and uranium airborne effluent emissions results are dominated by their uncertainties Therefore it is difficult to draw conclusions between 1997 and 1998 emissions data for americium and uranium The monthly tritium airborne effluent emissions for October through December 1998 are below the mean monthly emissions for 1997

In comparing the airborne effluent monthly maximum concentrations to the Rad NESHAP Concentration Levels for Environmental Compliance none of the monthly concentrations exceeded 20 percent of the Rad NESHAP levels In fact most of the maximum concentrations were less than five percent of the Rad NESHAP levels

Map 1-1 Location of Onsite and Perimeter Air Samplers



1 2 AMBIENT AIR DATA

1 2 1 Perimeter Sampler Locations – Annual 1998 Dose

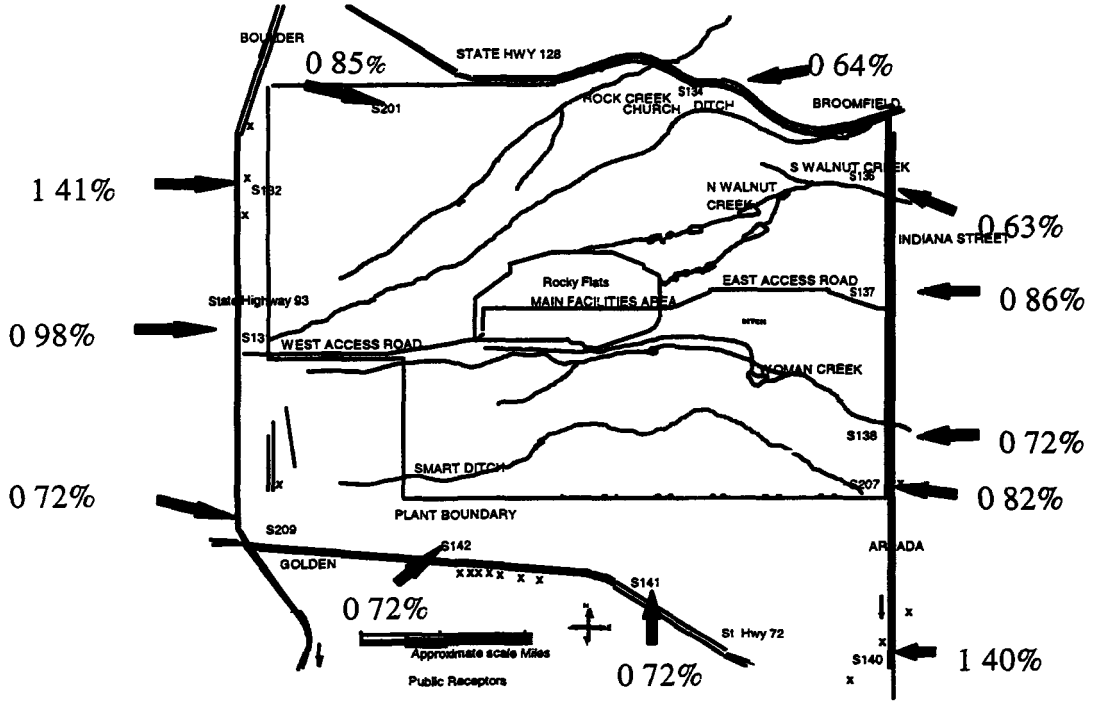


Figure 1-2 Perimeter Samplers Dose Map

The above map illustrates the perimeter Radioactive Ambient Air Monitoring Program (RAAMP) sampler locations and the annual 1998 dose expressed as a percentage of EPA s air concentration-based dose limit for members of the public

The percentages include the naturally occurring uranium isotopes as well as the isotopes from site contributions The maximum dose percentages are found at locations S-132 and S-140 as we have typically seen in the past

The percentage values are based on the measured air concentrations averaged over the year converted to a dose (using Rad NESHAP Concentration Levels for Environmental Compliance) and then expressed as a percent of the Rad N NESHAP levels

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1 2 2 Perimeter Sampler Locations – Dose Rate Graph

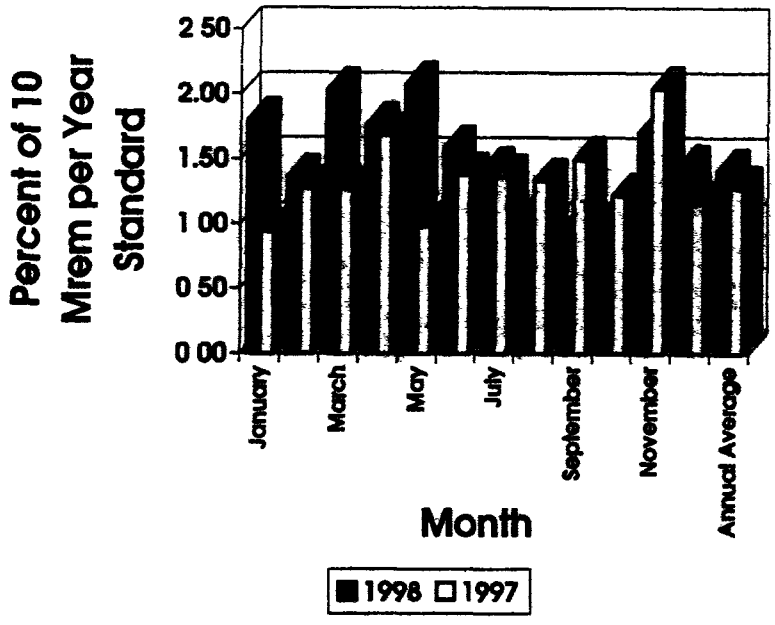


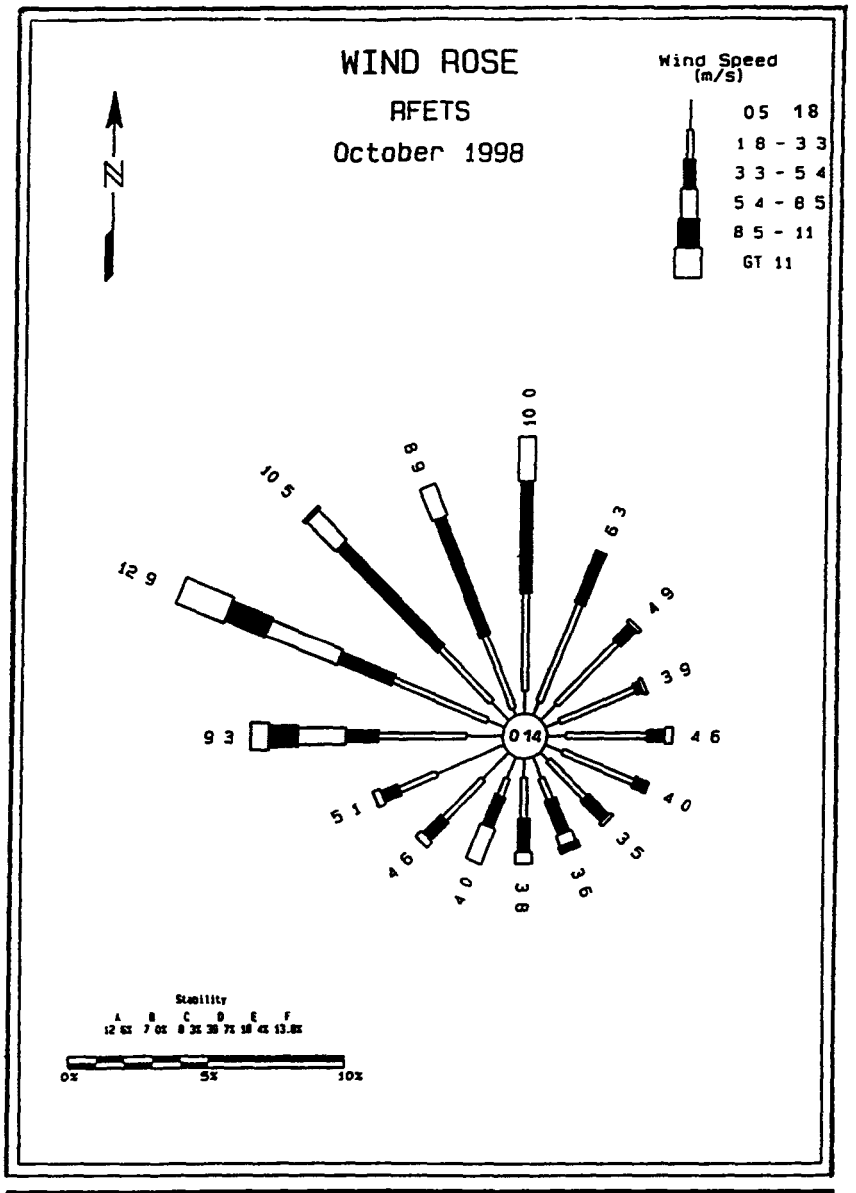
Figure 1-3 Offsite Dose Rate Summary

The above graph illustrates the monthly estimated dose rates at the perimeter sampler showing highest radionuclide concentrations, including contributions from naturally occurring uranium isotopes All of the highest dose rates were seen at either location S-132 or S-140, with equal frequency The monthly dose rates were less than 2 5 percent of the 10 mrem standard Omitting the uranium contribution better reflects the contribution from Site operations and results in an estimated dose rate of less than 0 5% of the standard

Ambient concentrations and dose rates for 1998 are similar to the rates observed in 1997

2 METEOROLOGY AND CLIMATOLOGY

2 1 WIND ROSES FOR OCTOBER – DECEMBER 1998



Monthly Climatic Summary

Month	Temperature (°F) Mean Daily High	Mean Daily Low	Mean Daily	Mean Dew Point (°F)	Mean Relative Humidity (%)	Wind Speed (mph) Mean	Max	Pressure Mean (mb)	Solar Total (kW-h/m²)	Precipitation (in) Total	Max
Oct-98	57 23	41 09	49.46	31.4	59.11	7 72	61.56	813.4	100.98	0 68	0 04

Figure 2-1 Wind Rose for Rocky Flats Environmental Technology Site for October 1998

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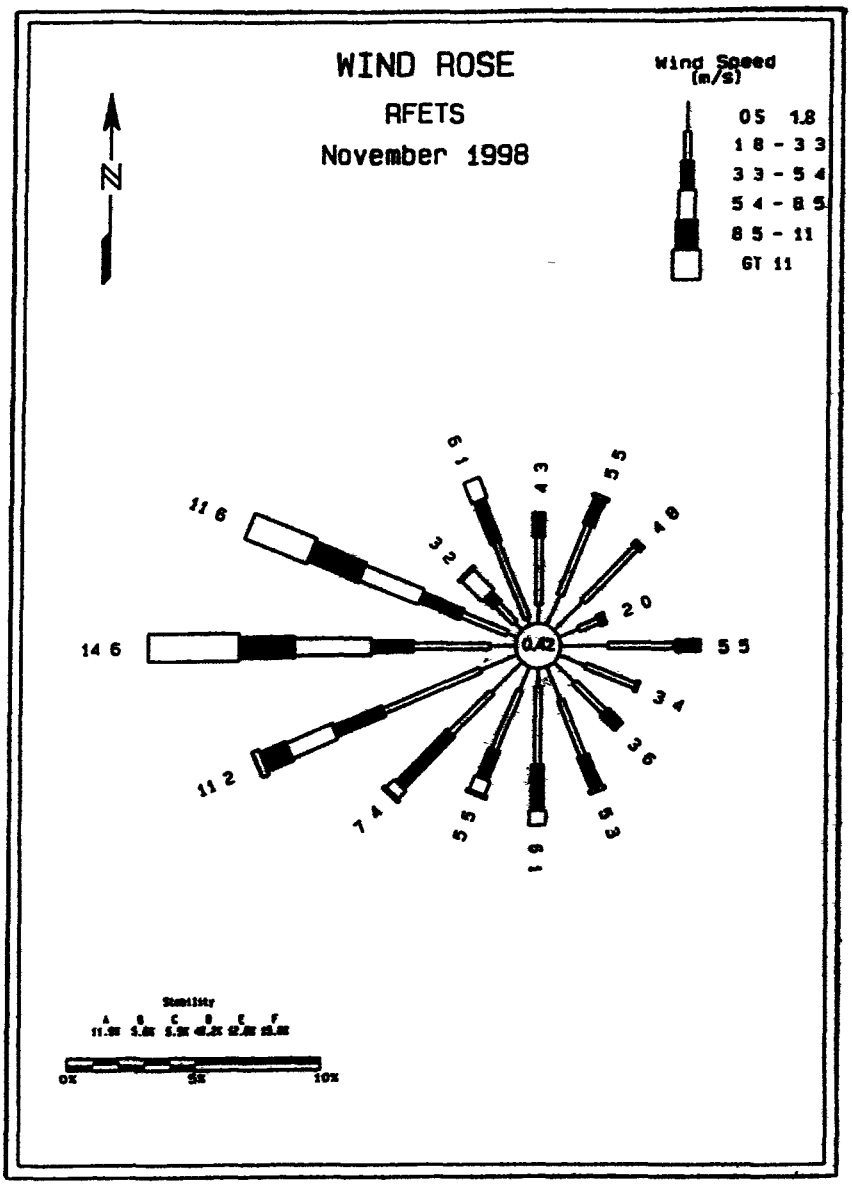
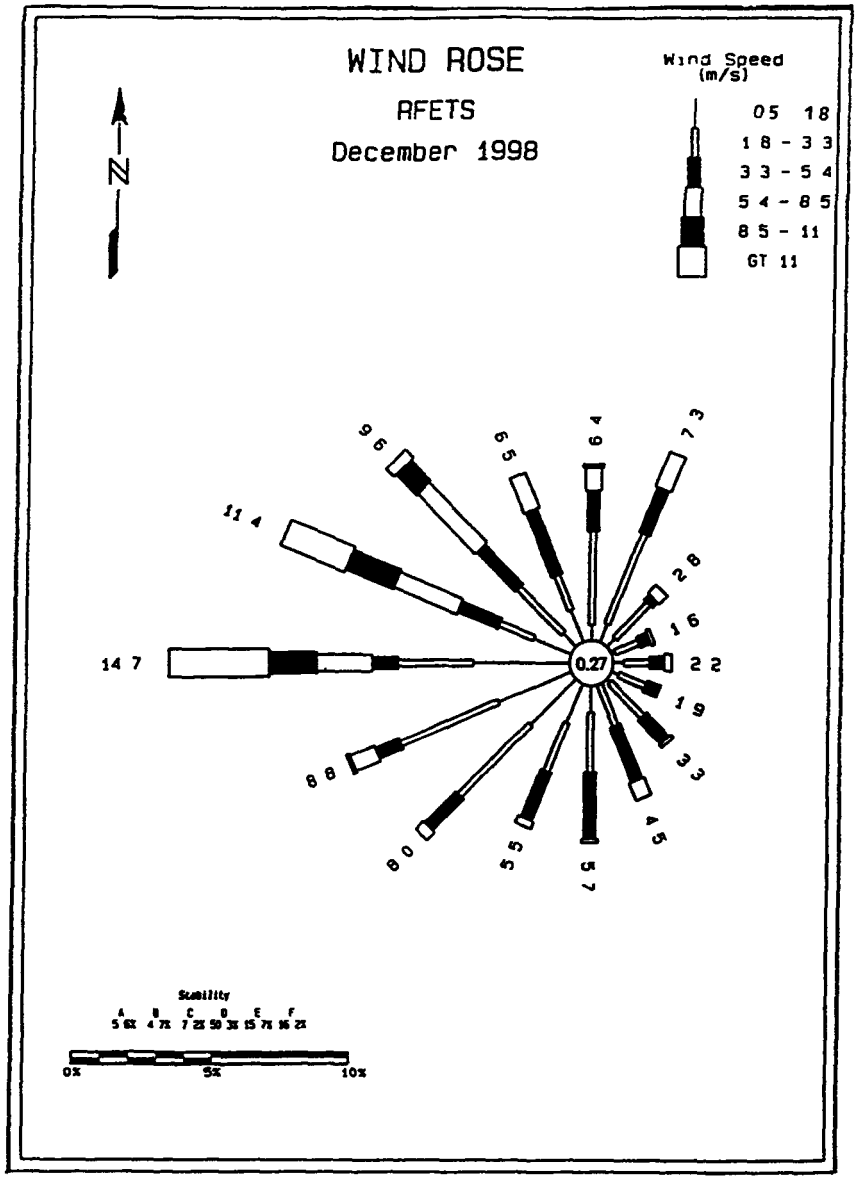


Monthly Climatic Summary

Month	Temperature (°F) Mean Daily High	Mean Daily Low	Daily Mean	Mean Dew Point (°F)	Mean Relative Humidity (%)	Wind Speed (mph) Mean	Max	Pressure Mean (mb)	Solar Total (ly)	Precipitation (in) Total	Max
Nov-98	50.81	35.14	43.08	21.67	53.56	9.08	30.5	810.74	76.81	1.18	0.06

Figure 2-2 Windrose for Rocky Flats Environmental Technology Site for November 1998



Monthly Climatic Summary

Month	Temperature (°F) Mean Daily High	Mean Daily Low	Daily Mean	Mean Dew Point (°F)	Mean Relative Humidity (%)	Wind Speed (mph) Mean	Max	Pressure Mean (mb)	Solar Total (kW-h/m²)	Precipitation (in) Total	Max
Dec-98	40 74	25.49	32 59	11 72	53 62	9 15	90 92	811 18	68.33	0.52	0 02

Figure 2-3 Windrose for Rocky Flats Environmental Technology Site for December 1998

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3 SURFACE WATER DATA

Map 3-1 Holding Ponds and Liquid Effluent Water Courses

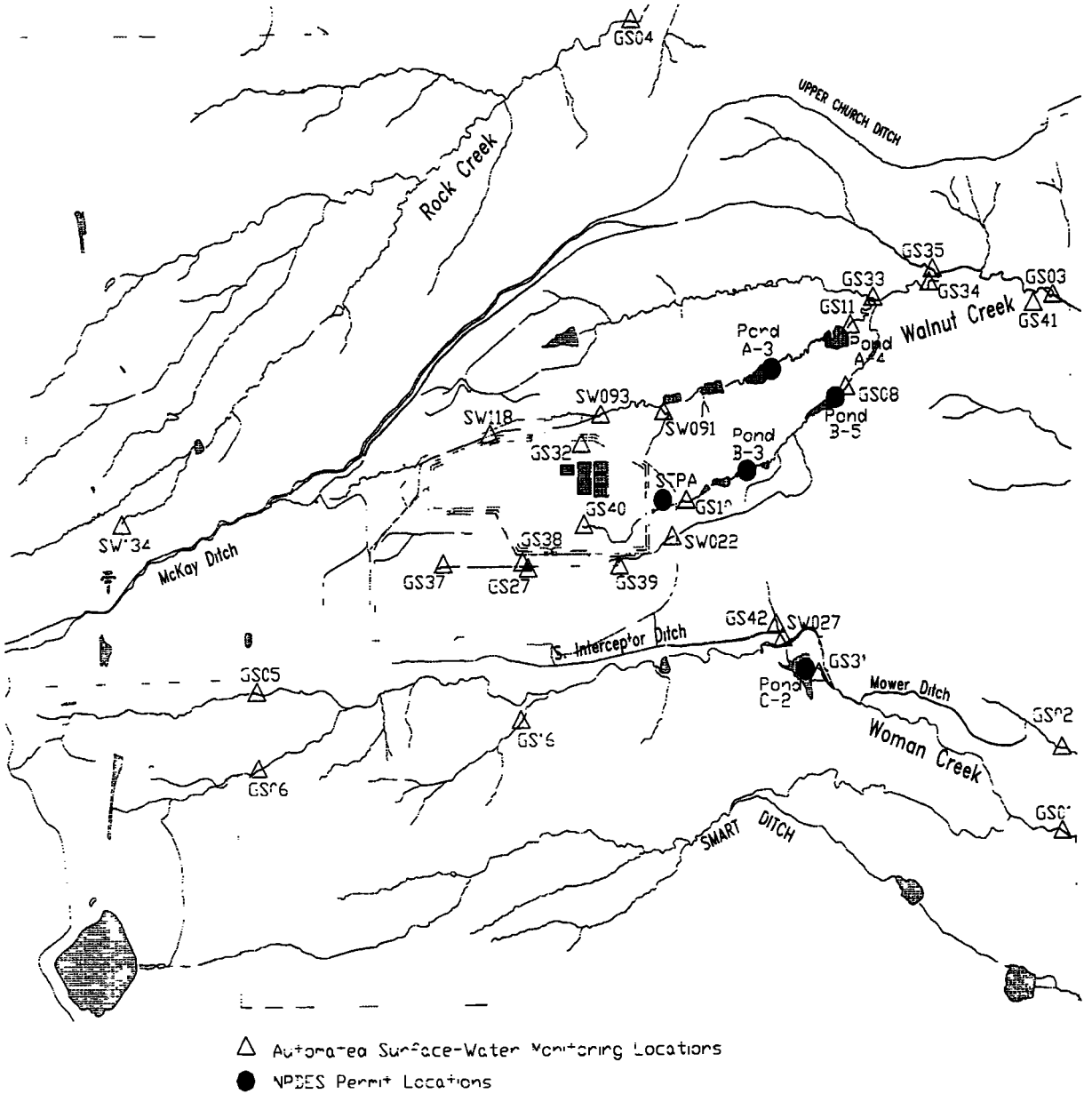

Table 3-1 Pond B-3 (Outfall 001A)

Dates of discharge 10/01/98 – 12/31/98

NO3/NO2 mg/l	3 9 4 4	10	5 5 7 9	20	N/A	N/A
TRC mg/l	N/A	N/A	N/A	N/A	0 07	0 5
BOD5 mg/l	15 20	a	N/A	N/A	18 31	a
CBOD5 mg/l	3 7	a	N/A	N/A	4 21	a
TSS mg/l	7 48	a	N/A	N/A	9 - 170	a

a	Report Only
N/A	Not Applicable
TRC	Total Residual Chlorine
TSS	Total Suspended Solids
BOD5	Biochemical Oxygen Demand 5-Day Test
CBOD5	Carbonaceous Biochemical Oxygen Demand, 5-Day Test

Note Results are the range of value measured during the reporting period

Table 3-2 Sewage Treatment Plant (Outfall STP A)

Dates of discharge 10/01/98 – 12/31/98 Metals and VOA samples collected 10/06/98 11/03/98 & 12/01/98

Parameter & Units	Measured 30-day Average	Limit 30-Day Average	Measured 7-Day Average	Limit 7-Day Average	Measured Daily Minimum	Limit Daily Minimum	Measured Daily Maximum	Limit Daily Maximum	Observed Sheen	Measured Result
pH SU	N/A	N/A	N/A	N/A	6 7	6 0	7 3 7 5	9 0	N/A	N/A
TSS mg/l	<5	30	<5	45	N/A	N/A	N/A	N/A	N/A	N/A
Total Phos mg/l	1 3	8	N/A	N/A	N/A	N/A	2 11	12	N/A	N/A
TRC mg/l	<0 01	a	<0 02	a	N/A	N/A	N/A	N/A	N/A	N/A
Total Cr ug/l	<1	50	N/A	N/A	N/A	N/A	1	100	N/A	N/A
F Coliform #/100ml	<3	200b	<2 6	440b	N/A	N/A	N/A	N/A	N/A	N/A
CBOD5, mg/l	<3	10	N/A	N/A	N/A	N/A	4 6	25	N/A	N/A
Oil & Grease	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	c	N/A
WET										
Ceriodaphnia	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	>100
Fathead Minnows	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	>100
Antimony ug/l	<2 5	a	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
Arsenic ug/l	<2 5	a	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
Beryllium ug/l	<005	a	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
Cadmium ug/l	<0 5	a	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
Copper ug/l	1 – 3	a	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
Iron ug/l	<17 5-214	a	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
Lead ug/l	<1	a	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
Manganese ug/l	9 – 13 7	a	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
Mercury ug/l	<0 10-0 4	a	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
Nickel ug/l	<0 16-1 4	a	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
Silver ug/l	<2	a	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
Zinc ug/l	22 6-29 3	a	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
VOCs ug/l	d	a	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A

a	Report Only	TRC	Total Residual Chlorine
b	Geometric	CBOD5	Carbonaceous Biochemical Oxygen Demand 5 Day Test
c	No Sheen Observed	PQL	Practical Quantitation Limit
d	None Detected Above PQL	WET	Whole Effluent Toxicity
N/A	Not Applicable	SU	Standard Units
TSS	Total Suspended Solids		

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Table 3-3 Ponds – Interior and Terminal

Pond A-3 discharged 11/30/98, 12/01/98 – 12/04/98, Pond A-4 discharged 11/19/98 – 11/30/98, Ponds B-5 and C-2 not discharged during reporting period

Pond A 3 (Outfall 002) pH SU	N/A	N/A	N/A	N/A	7 0 – 8.2	6 0	8.2	9 0	N/A
NO3/NO2 mg/l	2 0	10	N/A	N/A	N/A	N/A	2 0	20	N/A
Pond A-4 (Outfall 005A) Total Cr ug/l	N/A	N/A	N/A	N/A	N/A	N/A	<1	50	N/A
WET									
Ceriodaphnia	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	>100
Fathead Minnows	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	>100
Pond B-5 (Outfall 006A) Total Cr ug/l	N/A	N/A	N/A	N/A	N/A	N/A		50	N/A
WET									
Cenodaphnia	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	
Fathead Minnows	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	
NO3/NO2 mg/l*	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
Pond C-2 (Outfall 007A) Total Cr ug/l	N/A	N/A	N/A	N/A	N/A	N/A		50	N/A
WET									
Ceriodaphnia	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	
Fathead Minnows	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	

* Sample and analysis required only if Pond B 3 is bypassed
N/A Not applicable
SU Standard units
TRC Total residual chlorine
WET Whole Effluent Toxicity

Table 3-4 Daily Transfer Flow Data Recorded for Pond B-5 to Pond A-4

Date	Pond B-5 to Pond A-4 (gal)	Date	Pond B-5 to Pond A-4 (gal)	Date	Pond B-5 to Pond A-4 (gal)
10/1/98	No transfer	11/1/98	1 215 000	12/1/98	1 190 000
10/2/98	No transfer	11/2/98	647 000	12/2/98	1 532 000
10/3/98	No transfer	11/3/98	No transfer	12/3/98	1 480 000
10/4/98	No transfer	11/4/98	No transfer	12/4/98	1 418 000
10/5/98	No transfer	11/5/98	No transfer	12/5/98	1 345 000
10/6/98	No transfer	11/6/98	No transfer	12/6/98	1 268 000
10/7/98	No transfer	11/7/98	No transfer	12/7/98	1 220 000
10/8/98	No transfer	11/8/98	No transfer	12/8/98	664 000
10/9/98	No transfer	11/9/98	No transfer	12/9/98	No transfer
10/10/98	No transfer	11/10/98	No transfer	12/10/98	No transfer
10/11/98	No transfer	11/11/98	No transfer	12/11/98	No transfer
10/12/98	No transfer	11/12/98	No transfer	12/12/98	No transfer
10/13/98	No transfer	11/13/98	No transfer	12/13/98	No transfer
10/14/98	No transfer	11/14/98	No transfer	12/14/98	No transfer
10/15/98	No transfer	11/15/98	No transfer	12/15/98	No transfer
10/16/98	No transfer	11/16/98	No transfer	12/16/98	No transfer
10/17/98	No transfer	11/17/98	No transfer	12/17/98	No transfer
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10/24/98	No transfer	11/24/98	No transfer	12/24/98	No transfer
10/25/98	No transfer	11/25/98	No transfer	12/25/98	No transfer
10/26/98	1 166 000	11/26/98	No transfer	12/26/98	No transfer
10/27/98	1 503 000	11/27/98	No transfer	12/27/98	No transfer
10/28/98	1 451 000	11/28/98	No transfer	12/28/98	No transfer
10/29/98	1 400 000	11/29/98	No transfer	12/29/98	No transfer
10/30/98	1 322 000	11/30/98	No transfer	12/30/98	No transfer
10/31/98	1 284 000			12/31/98	No transfer
Total	8 126 000	Total	1 862 000	Total	10 117 000

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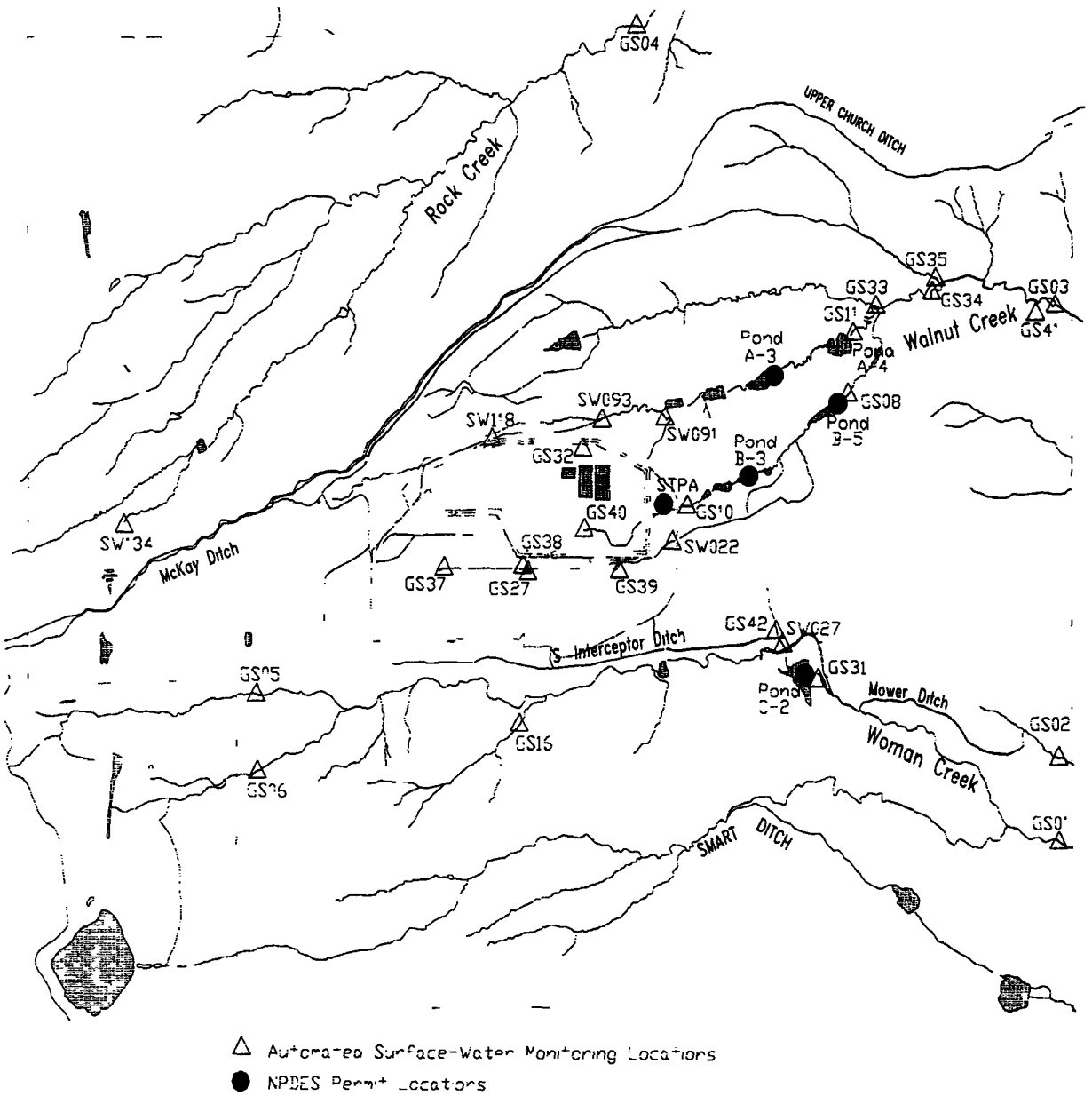
4 HYDROLOGIC AND ROCKY FLATS CLEAN-UP AGREEMENT (RFCA) DATA

Map 4-1 Gaging Station Locations



4 1 FLOW MONITORING

Table 4-1 Gaging Station GS01 Mean Daily Discharge (cubic feet per second)

1	0 000	0 000	0 156
2	0 000	0 000	0 157
3	0 000	0 000	0 152
4	0 000	0 000	0 158
5	0 000	0 000	0 161
6	0 000	0 000	0 170
7	0 000	0 000	0 161
8	0 000	0 000	0 136
9	0 000	0 067	0 150
10	0 000	0 189	0 190
11	0 000	0 187	0.258
12	0 000	0 308	0.275
13	0 000	0 436	0.268
14	0 000	0 787	0 318
15	0 000	0 695	0 324
16	0 000	0 509	0.269
17	0 000	0 387	0 281
18	0 000	0.257	0.362
19	0 000	0 212	0.204
20	0 000	0 204	0 134a
21	0 000	0 201	0 125a
22	0 000	0.205	0 117a
23	0 000	0 201	0 108a
24	0 000	0.200	0 100a
25	0.000	0 167	0 092a
26	0 000	0 150	0 120a
27	0 000	0 162	0.208
28	0 000	0 178	0.245
29	0 000	0 177	0 328
30	0 000	0 158	0 464
31	0 000	NA	0 476
Monthly Average (cfs)	0 000	0 201	0.215

Monthly Discharge

Cubic Feet	0	521617	576054
Gallons	0	3901969	4309187
Acre-Feet	0 00	11 97	13 22

Note Mean flow values are reported to the nearest 0 001 cfs values less than 0 0005 cfs are reported as zero

[a] Contains data estimated from field observations and electronic record at adjacent or comparable gages.

Gaging Station GS01 is located at 39° 52 40"N 105° 09 55"W at Woman Creek and Indiana Street (See Section 4 Map) This station is a RFCA Point of Compliance a Buffer Zone Monitoring Location and a monitoring point for water leaving the Site and flowing to Woman Creek Reservoir This station collects samples for selected radionuclides using continuous flow-paced sampling and storm event sampling for selected water quality parameters metals and major ions

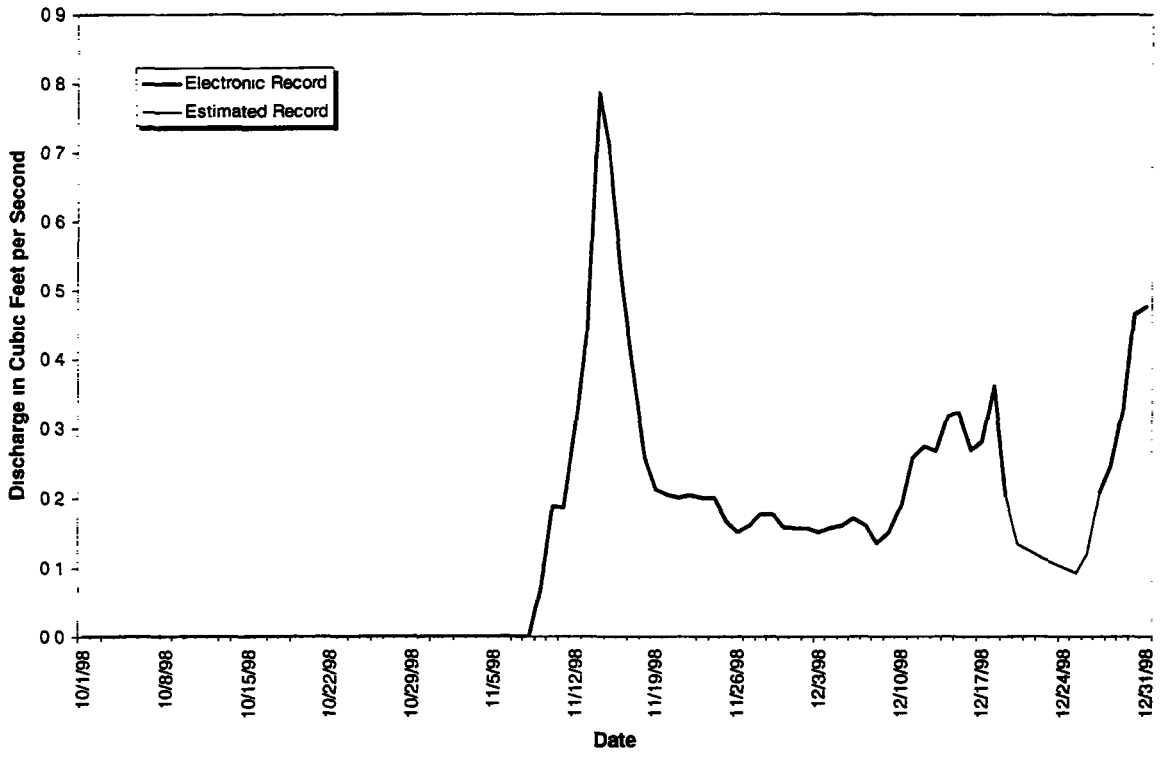


Figure 4-1 Mean Daily Discharge at GS01, Water Year 1999 (October, November and December)

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Table 4-2 Gaging Station GS03 Mean Daily Discharge (cubic feet per second)

DAY			
1	0 000	0 000	0 021
2	0 000	0 000	0 014
3	0 000	0 000	0 011
4	0 000	0 000	0 010
5	0 000	0.000	0 008
6	0 000	0 000	0 008a
7	0 000	0 000	0 008a
8	0 000	0 000	*0.007*
9	0 000	0 000	0 009
10	0 000	0 000	0 007
11	0 000	0 000	0 006
12	0 000	0 000	0 006
13	0 000	0 000	0 006
14	0 000	0 000	0 006
15	0 000	0 000	0 005
16	0 000	0 000	0 005
17	0 000	0 000	0 005
18	0 000	0 000	0 004
19	0 000	1.265	0.004
20	0 000	3 437	0 005
21	0 000	3.342	0 005
22	0 000	3 038	0 007a
23	0 000	2 828	0 008a
24	0 000	2 414	0 007a
25	0 000	1 870	0 007a
26	0 000	1 515	0 004a
27	0 000	1 168	0 004a
28	0 000	0 795	0 004
29	0 000	0 468	0 003
30	0 000	0 142	0 003
31	0 000	NA	0 004
Monthly Average (cfs)	0 564	0.743	0 007

Monthly Discharge

Cubic Feet	0	1925204	18322
Gallons	0	14401527	137056
Acre-Feet	0 00	44 19	0 42

Note Mean flow values are reported to the nearest 0 001 cfs values less than 0 0005 cfs are reported as zero

[a] Contains data estimated from field observations and electronic record at adjacent or comparable gages

Gaging Station GS03 is located at 39° 54 7"N 105° 9 59 W at Walnut Creek and Indiana Street (See Section 4 Map) This station is a RFCA Point of Compliance a Buffer Zone Monitoring Location and a monitoring point for water leaving the Site and flowing to the Broomfield Diversion Ditch This station collects samples for selected radionuclides using continuous flow-paced sampling and storm event sampling for selected water quality parameters metals and major ions

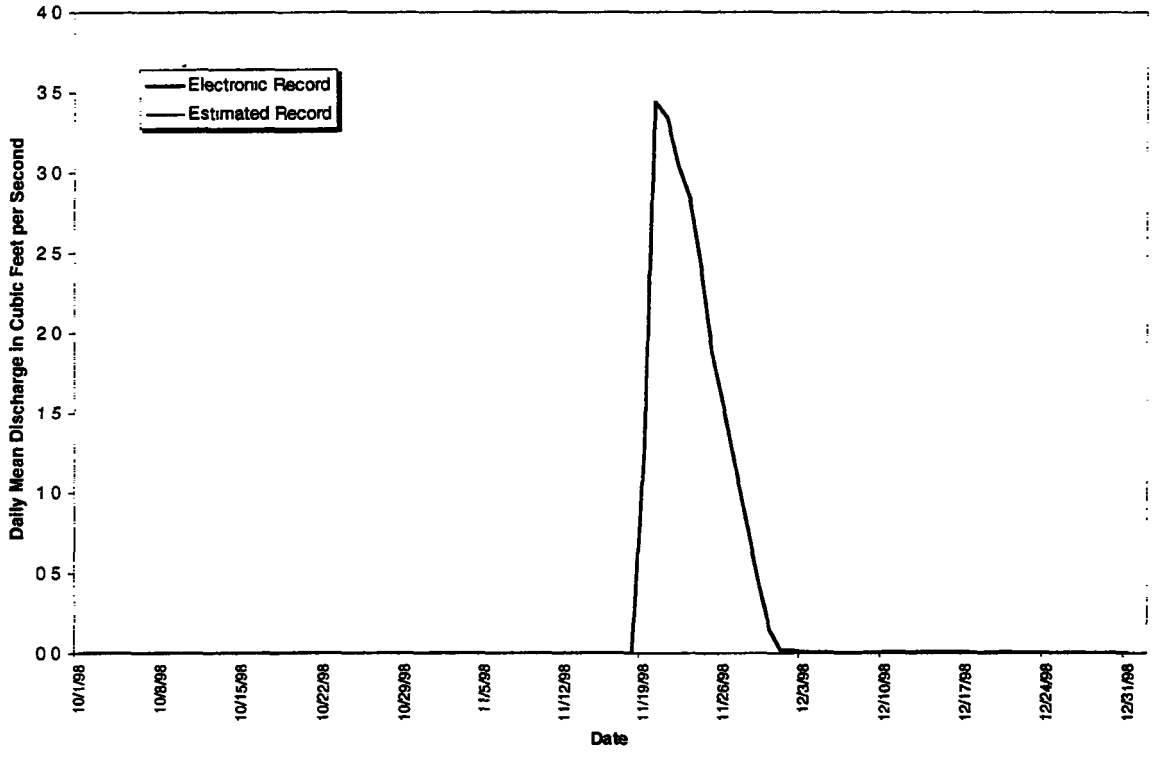

Figure 4-2 Mean Daily Discharge at Gaging Station GS03, Water Year 1999 (October, November, and December)

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Table 4-3 Gaging Station GS08 Mean Daily Discharge (cubic feet per second)

1	0 000	0 000	0 000
2	0 000	0 000	0 000
3	0 000	0 000	0 000
4	0 000	0 000	0 000
5	0 000	0 000	0 000
6	0 000	0 000	0 000
7	0 000	0 000	0 000
8	0 000	0 000	0 000
9	0 000	0 000	0 000
10	0 000	0 000	0 000
11	0 000	0.000	0 000
12	0 000	0 000	0 000
13	0 000	0 000	0 000
14	0 000	0 000	0 000
15	0 000	0 000	0 000
16	0 000	0 000	0 000
17	0 000	0 000	0 000
18	0 000	0 000	0.000
19	0 000	0 000	0 000
20	0 000	0.000	0 000
21	0.000	0 000	0 000
22	0 000	0 000	0 000
23	0 000	0 000	0 000
24	0 000	0 000	0 000
25	0 000	0 000	0 000
26	0 000	0 000	0 000
27	0 000	0 000	0 000
28	0 000	0 000	0 000
29	0 000	0 000	0 000
30	0 000	0 000	0 000
31	0 000	NA	0 000
Monthly Average (cfs)	0 000	0 000	0 000

Monthly Discharge

Cubic Feet	0	0	0
Gallons	0	0	0
Acre-Feet	0 00	0 00	0 00

Note Mean flow values are reported to the nearest 0 001 cfs values less than 0 0005 cfs are reported as zero

Gaging Station GS08 is located 39° 53 54 N 105° 10 48 W at the Pond B-5 Outfall on South Walnut Creek (See Section 4 Map) This station is a RFCA Point of Compliance and monitors water discharged from Pond B-5 to South Walnut Creek This station collects samples for selected radionuclides using continuous flow-paced sampling

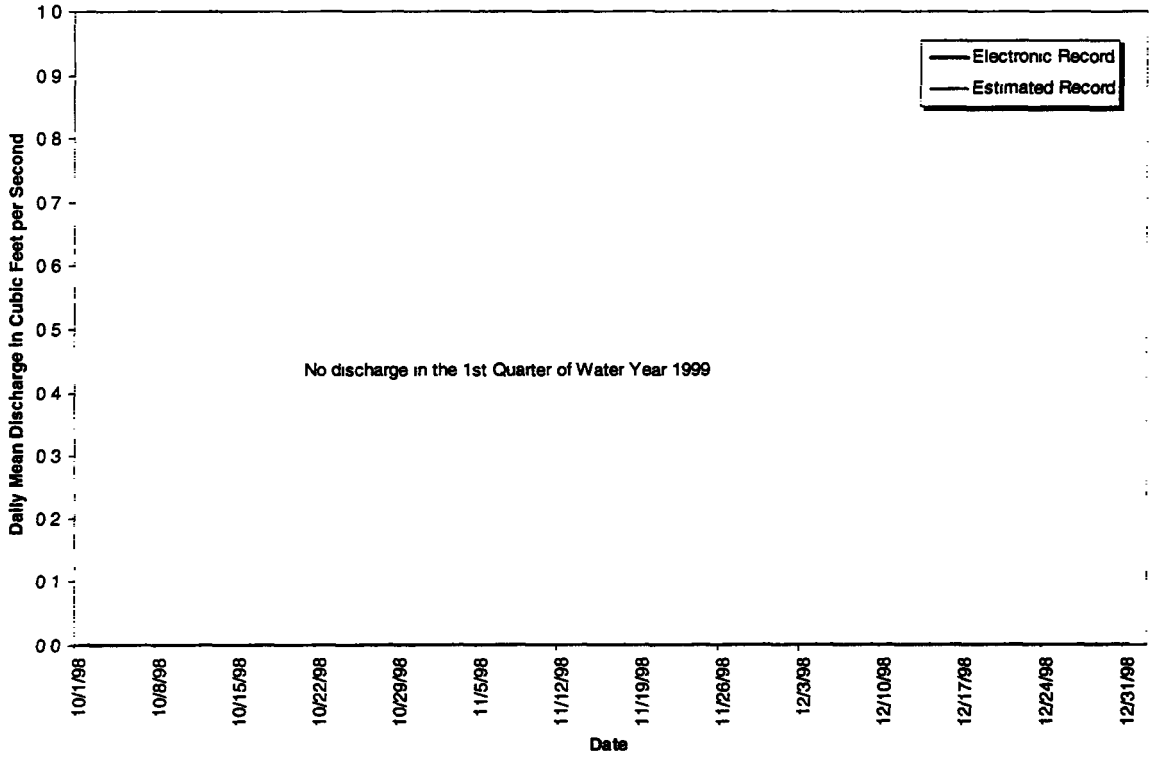

Figure 4-3 Mean Daily Discharge at Gaging Station GS08, Water Year 1999 (October, November, and December)

Table 4-4 Gaging Station GS10 Mean Daily Discharge (cubic feet per second)

Day			
1	0 081	0 082	0 061
2	0.094	0.255	0 060
3	0 069	0 150	0 062
4	0 131	0 174	0 061
5	0 067	0 064	0 060
6	0 068	0 056	0 062
7	0 071	0 575	0 065
8	0 074	0 161	0 060
9	0 079	0 430	0 062
10	0 083	0 137	0 081
11	0 075	0 104	0 097
12	0.080	0.106	0 087
13	0 085	0 171	0 088
14	0 089	0 178	0 087
15	0 098	0.097	0 072
16	0 103	0 081	0 069
17	0.079	0 075	0.075
18	0 075	0 074	0 067
19	0 080	0 070	0 061
20	0 083	0 071	0 059a
21	0 085	0 069	0 057a
22	0 090	0 068	0 059a
23	0 101	0 066	0 060a
24	0 086	0 066	0 062a
25	0 076	0 063	0 063a
26	0 056	0 062	0 065a
27	0 176	0 061	0 067a
28	0 291	0 061	0 081a
29	0 050	0 061	0 076
30	0 052	0 060	0 090
31	0 084	NA	0 068
Monthly Average (cfs)	0 091	0 125	0 069

Monthly Discharge			
Cubic Feet	242844	323909	185202
Gallons	1816600	2423008	1385407
Acre-Feet	5 57	7 43	4 25

Note mean flow values are reported to the nearest 0 001 cfs values less than 0 0005 cfs are reported as zero

[a] Contains data estimated from field observations and electronic record at adjacent or comparable gages

Gaging Station GS10 is located 39° 53 35 N 105° 11 27 W on South Walnut Creek above the Pond B-1 Bypass (See Section 4 Map) This station is a RFCA Action Level Framework and a New Source Detection Location and monitors water leaving the Site Industrial Area and entering the B-Series Ponds and South Walnut Creek This station collects samples for selected radionuclides metals and water quality parameters using continuous flow-paced sampling

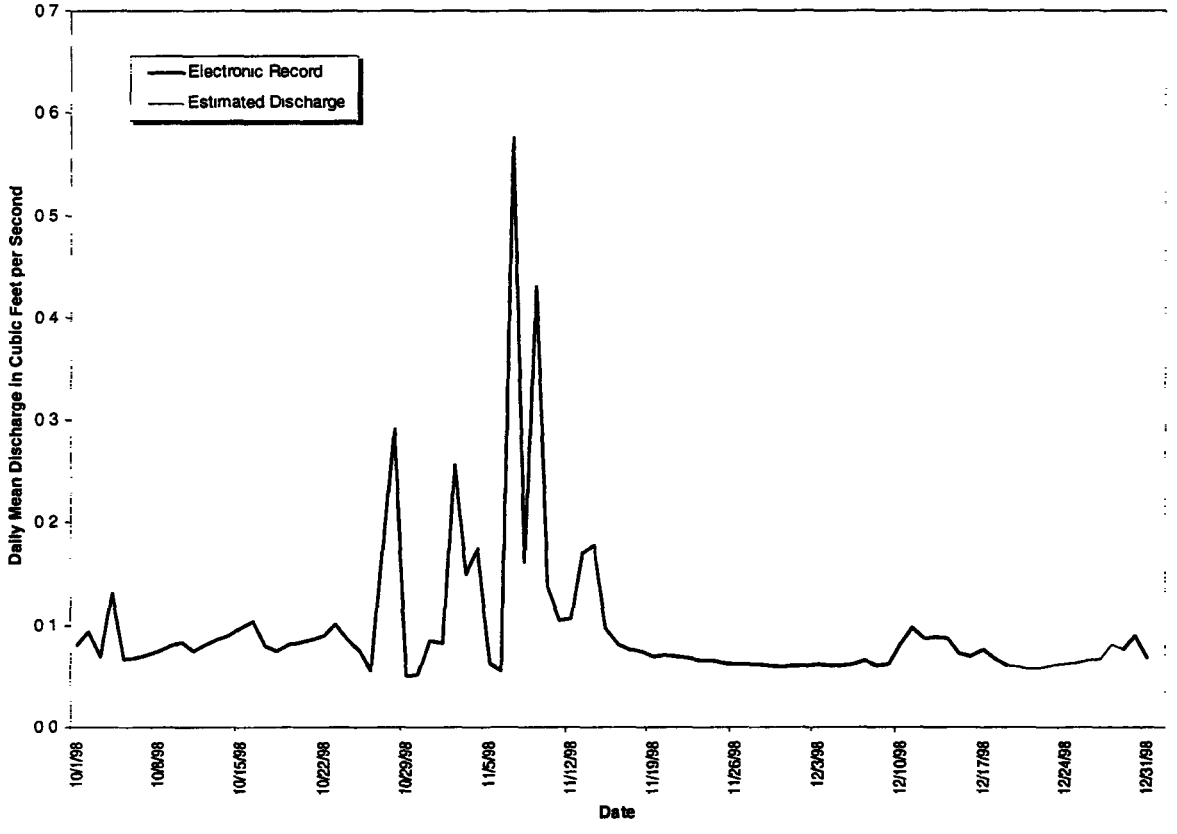

Figure 4-4 Mean Daily Discharge at Gaging Station GS10, Water Year 1999 (October, November, and December)

Table 4-5 Gaging Station GS11 Mean Daily Discharge (cubic feet per second)

1	0 000	0 000	0 000
2	0 000	0 000	0 000
3	0 000	0 000	0 000
4	0 000	0 000	0 000
5	0 000	0 000	0 000
6	0 000	0 000	0 000
7	0 000	0 000	0 000
8	0 000	0 000	0 000
9	0 000	0 000	0 000
10	0 000	0 000	0 000
11	0 000	0 000	0 000
12	0 000	0 000	0 000
13	0.000	0 000	0 000
14	0 000	0 000	0 000
15	0 000	0 000	0 000
16	0 000	0 000	0 000
17	0 000	0 000	0 000
18	0 000	0 000	0 000
19	0 000	2 148	0 000
20	0 000	3 624	0 000
21	0 000	3 473	0 000
22	0 000	3 131	0 000
23	0 000	2 954	0 000
24	0 000	2 503	0 000
25	0 000	2 007	0 000
26	0 000	1 606	0.000
27	0 000	1.212	0 000
28	0 000	0 751	0 000
29	0 000	0 409	0 000
30	0 000	0 063	0 000
31	0 000	NA	0 000
Monthly Average (cfs)	0 000	0 796	0 000

Monthly Discharge

Cubic Feet	0	2063324	0
Gallons	0	15434737	0
Acre-Feet	0 00	47 36	0 00

Note Mean flow values are reported to the nearest 0 001 cfs, values less than 0 0005 cfs are reported as zero

Gaging Station GS11 is located 39° 54 3' N 105° 10 47 W at the Pond A-4 Outfall on North Walnut Creek (See Section 4 Map) This station is a RFCA Point of Compliance and monitors water discharged from Pond A-4 to North Walnut Creek This station collects samples for selected radionuclides using continuous flow-paced sampling

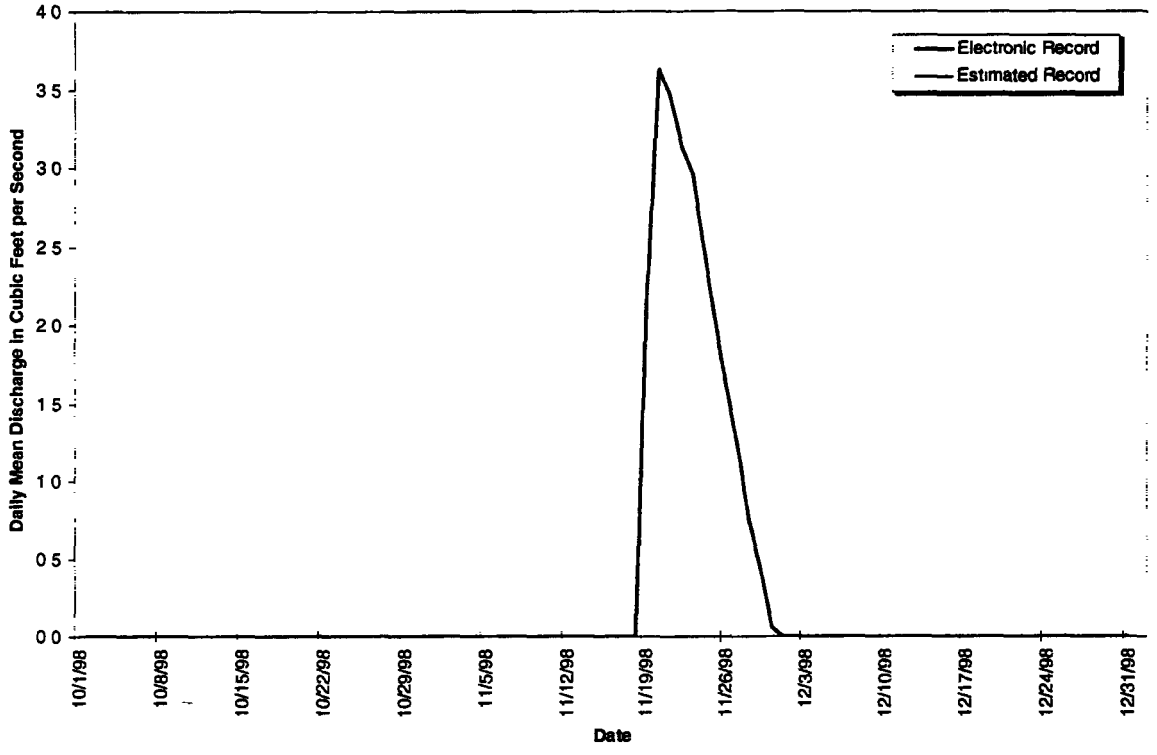

Figure 4-5 Mean Daily Discharge at Gaging Station GS11 Water Year 1999 (October, November, and December)

Table 4-6 Gaging Station GS31 Mean Daily Discharge (cubic feet per second)

1	0 000	0 000	0 000
2	0 000	0 000	0 000
3	0 000	0 000	0 000
4	0 000	0 000	0 000
5	0 000	0 000	0.000
6	0 000	0 000	0 000
7	0 000	0 000	0 000
8	0 000	0 000	0 000
9	0 000	0 000	0 000
10	0 000	0 000	0 000
11	0 000	0 000	0 000
12	0 000	0 000	0 000
13	0 000	0.000	0 000
14	0 000	0 000	0 000
15	0 000	0.000	0 000
16	0.000	0 000	0 000
17	0 000	0 000	0 000
18	0 000	0 000	0 000
19	0.000	0 000	0.000
20	0 000	0.000	0 000
21	0 000	0 000	0 000
22	0 000	0 000	0 000
23	0 000	0 000	0.000
24	0 000	0 000	0 000
25	0 000	0 000	0 000
26	0 000	0 000	0 000
27	0 000	0 000	0 000
28	0 000	0 000	0 000
29	0 000	0 000	0 000
30	0 000	0 000	0 000
31	0 000	NA	0 000
Monthly Average (cfs)	0 000	0 000	0 000

Monthly Discharge

Cubic Feet	0	0	0
Gallons	0	0	0
Acre-Feet	0 00	0 00	0 00

Note Mean flow values are reported to the nearest 0 001 cfs values less than 0 0005 cfs are reported as zero

Gaging Station GS31 is located at State Plane 2089268 747506 at the Pond C-2 Outfall (See Section 4 Map) This station is a RFCA Point of Compliance and monitors water discharged from Pond C-2 This station collects samples for selected radionuclides using continuous flow-paced sampling

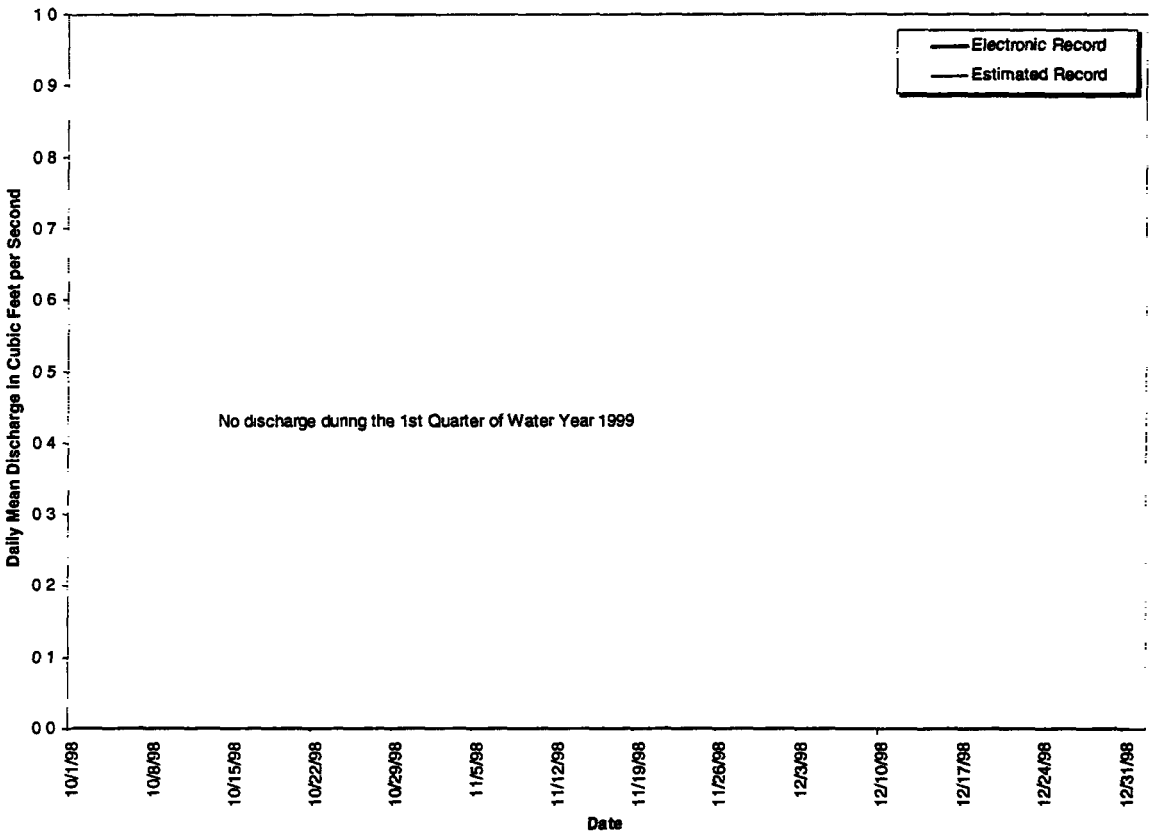

Figure 4-6 Mean Daily Discharge at Gaging Station GS31 Water Year 1999 (October, November, and December)

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Table 4-7 Gaging Station SW022 Mean Daily Discharge (cubic feet per second)

1	0 000	0 000	0 000
2	0 000	0 060	0 000
3	0 000	0 014	0 000
4	0 000	0 005	0 000
5	0 000	0.000	0 000
6	0 000	0 000	0 000
7	0.000	0 241	0 000
8	0 000	0 050a	0 000
9	0 000	0 189	0 000
10	0 000	0 026a	0 000
11	0 000	0 009a	0 000
12	0 000	0 016a	0 000
13	0 000	0 043a	0 000
14	0 000	0 022	0 000
15	0 000	0 001	0 000
16	0 000	0 000	0 000
17	0 000	0 000	0 000
18	0 000	0 000	0 000
19	0 000	0 000	0 000
20	0 000	0 000	0 000
21	0 000	0 000	0 000
22	0 000	0 000	0 000
23	0 000	0.000	0 000
24	0 000	0.000	0 000
25	0 000	0.000	0 000
26	0 000	0 000	0 000
27	0 029	0 000	0 000
28	0 089	0 000	0 000
29	0 000	0 000	0.000
30	0 000	0 000	0 000
31	0 000	NA	0 000
Monthly Average (cfs)	0 004	0 022	0 000

Monthly Discharge

Cubic Feet	10158	58248	0
Gallons	75987	435729	0
Acre-Feet	0 23	1 34	0 00

Note Mean flow values are reported to the nearest 0 001 cfs values less than 0 0005 cfs are reported as zero

[a] Contains data estimated from field observations and electronic record at adjacent or comparable gages

Gaging Station SW022 is located 39° 53 30 N 105° 11 30 W at the Central Avenue Ditch at the Inner East Gate (See Section 4 Map) This location is a RFCA New Source Detection Location and monitors water in the Central Avenue Ditch entering the B-Series Ponds and South Walnut Creek Storm event samples are collected for selected radionuclides

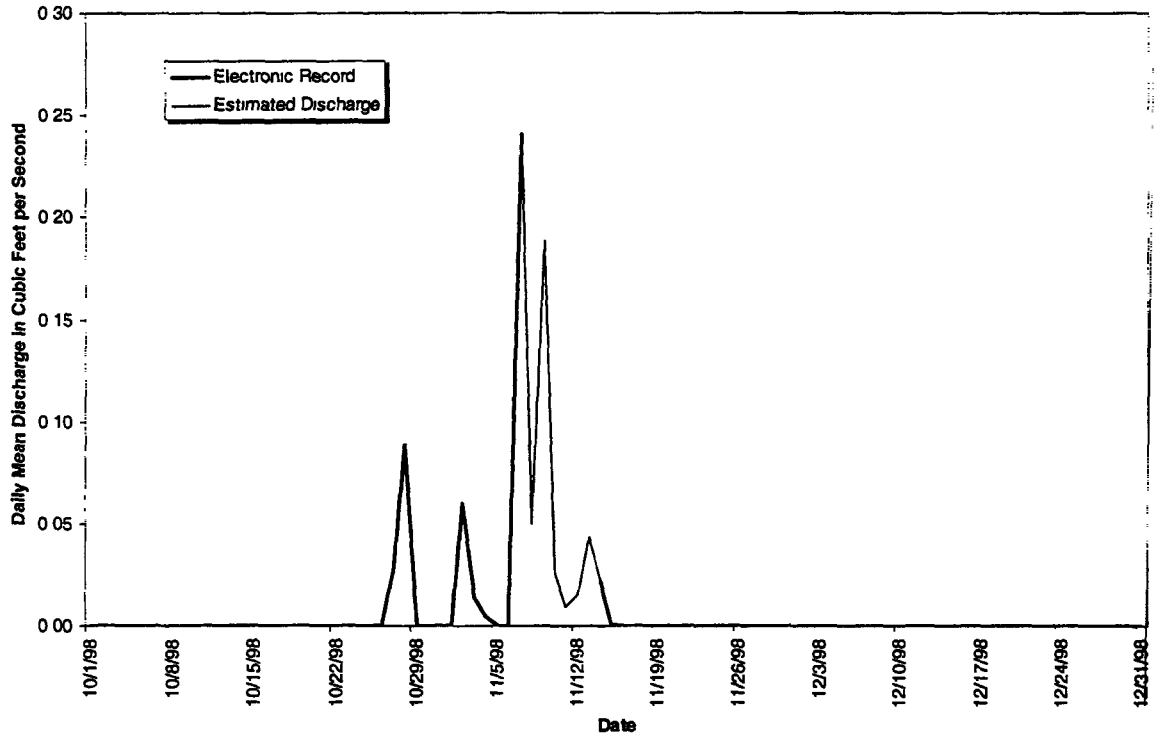

Figure 4-7 Mean Daily Discharge at Gaging Station SW022, Water Year 1999 (October, November, and December)

Table 4-8 Gaging Station SW027 Mean Daily Discharge (cubic feet per second)

1	0 000	0 000	0 000
2	0 000	0 000	0 000
3	0 000	0 000	0 000
4	0 000	0 000	0 000
5	0 000	0.000	0 000
6	0 000	0 000	0 000
7	0 000	0 000a	0 000
8	0 000	0 000	0.000
9	0 000	0 000	0 000
10	0 000	0 022	0 000
11	0 000	0 004	0 000
12	0 000	0 011	0 000
13	0 000	0 020	0 000
14	0 000	0 106	0 000
15	0 000	0 036	0 000
16	0 000	0 006	0 000
17	0 000	0.005	0 000
18	0 000	0 002	0 000
19	0 000	0 002	0 000
20	0 000	0.001	0 000
21	0 000	0 001	0 000
22	0 000	0 000	0 000
23	0 000	0 000	0 000
24	0 000	0 000	0 000
25	0 000	0 000	0 000
26	0 000	0 000	0 000
27	0.000	0 000	0 000
28	0 000	0 000	0 000
29	0 000	0 000	0 000
30	0 000	0 000	0.000
31	0 000	NA	0 000
Monthly Average (cfs)	0 000	0 007	0 000

Monthly Discharge

Cubic Feet	0	18799	0
Gallons	0	140626	0
Acre-Feet	0 00	0 43	0 00

Note Mean flow values are reported to the nearest 0 001 cfs values less than 0 0005 cfs are reported as zero

• Contains data estimated from field observations and electronic record at adjacent or comparable gages

Gaging Station SW027 is located 39° 53 12 N 105° 11 4' W at the South Interceptor Ditch above Pond C-2 (See Section 4 Map) This station is a RFCA Action Level Framework and a New Source Detection Location and monitors water in the South Interceptor Ditch entering Pond C-2 This station collects samples for selected radionuclides metals, and water quality parameters using continuous flow-paced sampling

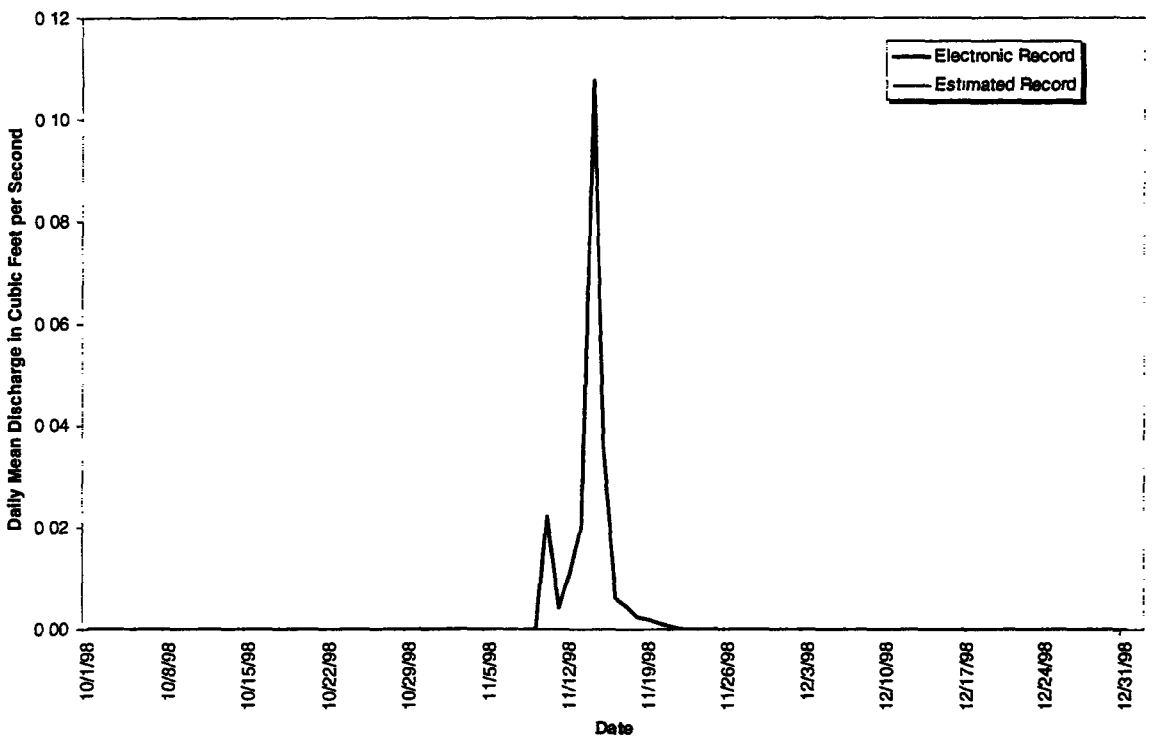

Figure 4-8 Mean Daily Discharge at Gaging Station SW027, Water Year 1999 (October, November, and December)

Table 4-9 Gaging Station SW091 Mean Daily Discharge (cubic feet per second)

1	0 0000	0 0000	0 0000
2	0 0000	0 0000	0 0000
3	0 0000	0 0000	0 0000
4	0 0000	0 0000	0 0000
5	0 0000	0 0000	0 0000
6	0 0000	0 0000	0 0000
7	0 0000	0 0000	0.0000
8	0 0000	0 0000	0 0000
9	0 0000	0 0000	0 0000
10	0 0000	0 0001	0 0000
11	0 0000	0 0000	0 0000
12	0.0000	0 0000	0 0000
13	0 0000	0.0000	0 0000
14	0 0000	0 0000	0 0000
15	0 0000	0 0000	0 0000
16	0 0000	0.0000	0.0000
17	0.0000	0.0000	0 0000
18	0 0000	0 0000a	0 0000
19	0 0000	0 0000	0 0000
20	0 0000	0 0000	0 0000
21	0 0000	0 0000	0.0000
22	0 0000	0.0000	0.0000
23	0 0000	0.0000	0 0000
24	0.0000	0 0000	0 0000
25	0 0000	0 0000a	0 0000a
26	0 0000	0 0000	0 0000
27	0 0000	0.0000	0 0000a
28	0 0000	0 0000	0.0000
29	0 0000	0 0000	0 0000
30	0 0000	0 0000	0 0000
31	0.0000	NA	0 0000
Monthly Average (cfs)	0 0000	0 0000	0.0000

Monthly Discharge

Cubic Feet	0	11	0
Gallons	0	84	0
Acre Feet	0 00	0 00	0.00

Note Mean flow values are reported to the nearest 0 001 cfs values less than 0 0005 cfs are reported as zero
[a] Contains data estimated from field observations and electronic record at adjacent or comparable gages

Gaging Station SW091 is located at State Plane 2086064 751322, along the drainage NE of the Solar Ponds draining to the A-Series Ponds (See Section 4 Map) This location is a RFCA New Source Detection Location and monitors water draining from the area NE of the Solar Ponds Storm event samples are collected for selected radionuclides

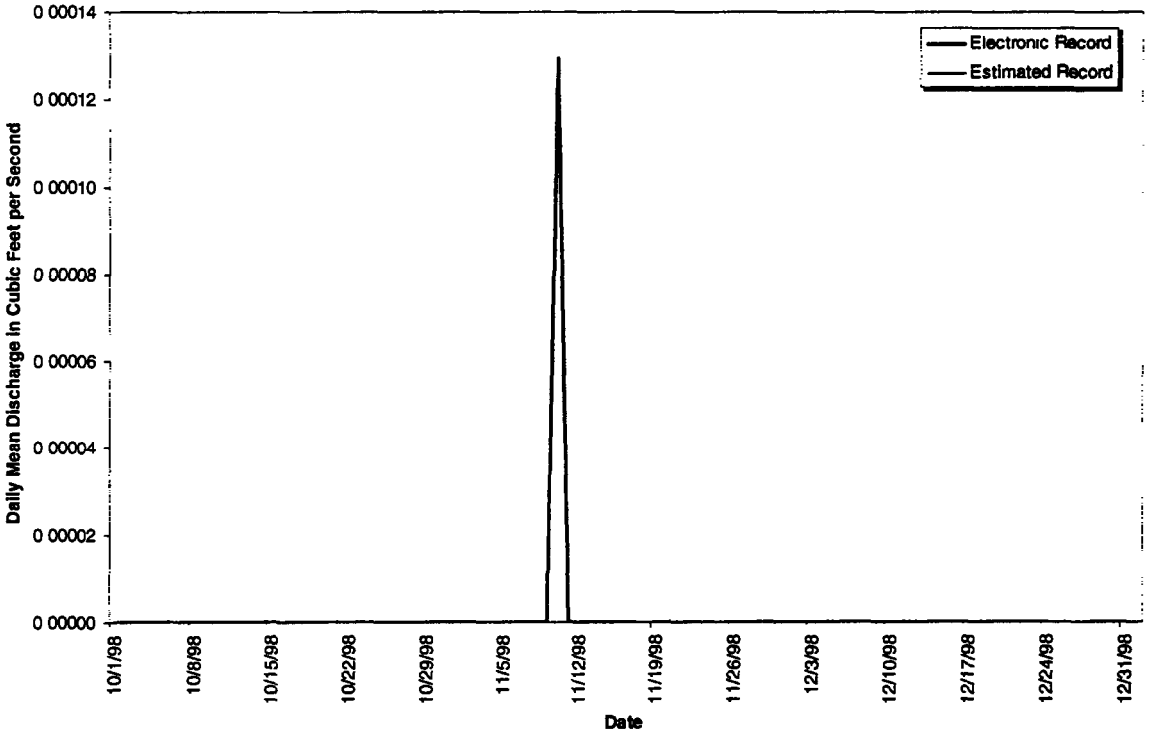

Figure 4-9 Mean Daily Discharge at Gaging Station SW091, Water Year 1999 (October, November, and December)

Table 4-10 Gaging Station SW093 Mean Daily Discharge (cubic feet per second)

1	0 052	0 130	0 077
2	0.113	0 223	0 078
3	0 060	0 136	0 086
4	0 121	0 105	0 090
5	0 051	0 086	0 089
6	0 039	0 078	0 090
7	0 039	0 830a	0 083
8	0 036	0.247a	0 083
9	0 034	0 647a	0 088
10	0 041	0 225a	0 089
11	0 035	0 183a	0 122
12	0 041	0 217	0 113
13	0.042	0 390	0 120
14	0 040	0 444	0 134
15	0 037	0 245	0 119
16	0.042	0 153	0 105
17	0 048	0 119	0 130
18	0 045	0 091	0 123
19	0 047	0 088	0 096
20	0 050	0 083	0 070
21	0 047	0 084	0 058
22	0 052	0 077	0 054a
23	0 057	0 077	0 059a
24	0 050	0 078	0 059a
25	0 048	0 078	0 059a
26	0 050	0 087	0 066a
27	0 218	0 090	0 059
28	0 252	0 102	0 071
29	0 069	0 085	0 087
30	0 068	0 081	0 135
31	0 113	NA	0 083
Monthly Average (cfs)	0 066	0 185	0 090

Monthly Discharge

Cubic Feet	175727	480205	239741
Gallons	1314530	3592183	1793385
Acre-Feet	4 03	11 02	5 50

Note Mean flow values are reported to the nearest 0 001 cfs values less than 0 0005 cfs are reported as zero

[a] Contains data estimated from field observations and electronic record at adjacent or comparable gages

Gaging Station SW093 is located 39° 53 51 N 105° 11 48 W along North Walnut Creek at the 72 culvert 1000 feet above the Pond A-1 Bypass (See Section 4 Map) This station is a RFCA Action Level Framework and a New Source Detection Location and monitors water leaving the Site Industrial Area and entering the A-Series Ponds and North Walnut Creek This station collects samples for selected radionuclides metals and water quality parameters using continuous flow-paced sampling

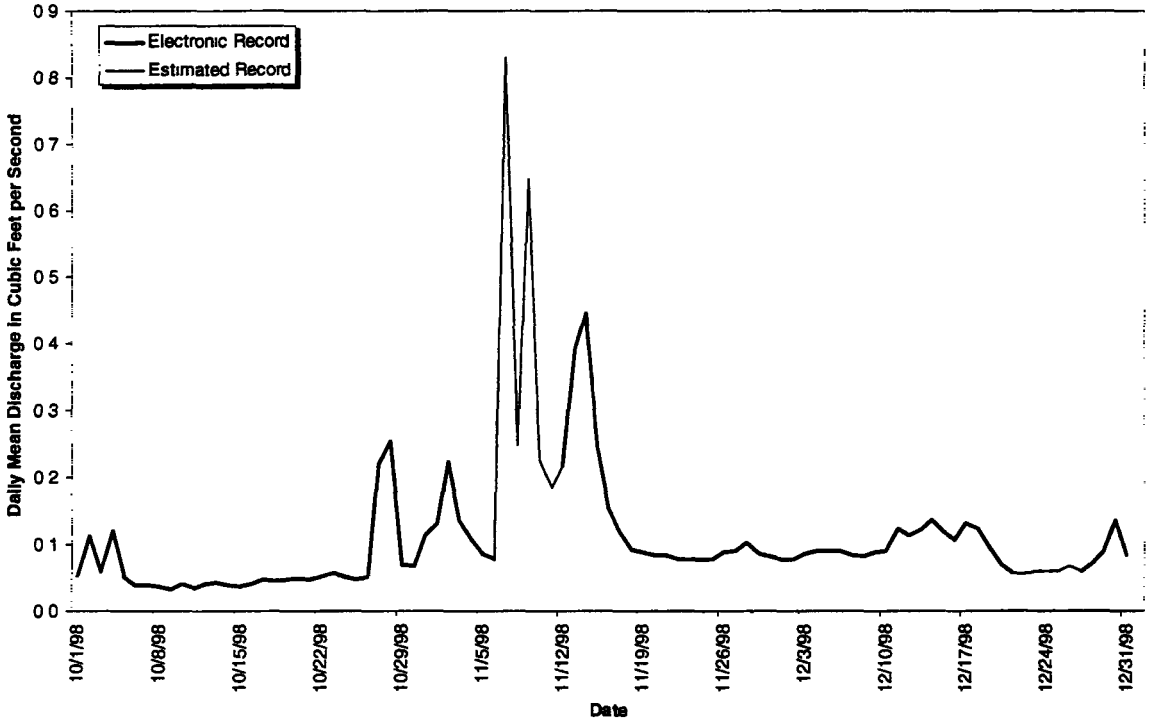

Figure 4-10 Mean Daily Discharge at Gaging Station SW093, Water Year 1999 (October, November, and December)

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4 2 WATER QUALITY DATA

Table 4-11 Radionuclides, Water Year 1999 (October, November, and December)

GS01	11/9 11/16/98	0 003	0 002	a	b
GS01	11/16 11/25/98	-0 005	-0 012	a	c
GS01	11/25 12/10/98	0 003	0 003	a	19 5
GS01	12/10 - 12/26/98	0 007	0 008	a	c
GS01	12/26/98 - 1/4/99	0 002	0 009	a	c
GS03	9/8 11/19/98	d	d	d	d
GS03	11/19 - 11/21/98	-0 002	0 017	a	210
GS03	11/21 - 11/25/98	0 008	0 037	a	0
GS03	11/25 - 11/30/98	0 007	0 038	a	147
GS03	11/30 12/8/98	0 008	-0 013	a	120
GS03	12/8/98 1/7/99	d	d	d	d
GS10	10/8 10/22/98	0 003	0 006	2 721	a
GS10	10/22 10/29/98	0 058	0 126	1 980	a
GS10	10/29 11/5/98	0 021	0.015	1 922	a
GS10	11/5 - 11/9/98	0 015	0 019	1 231	a
GS10	11/9 11/17/98	-0 001	-0 005	4 855	a
GS10	11/17 12/1/98	0 015	-0 025	3 912	a
GS10	12/1/98 1/4/99	0 011	0 034	3 163	a
GS11	11/19 - 11/21/98	0 011	0 013	1 502	a
GS11	11/21 11/25/98	-0 001	0.004	1 622	a
GS11	11/25 11/30/98	-0 001	0 010	1 836	a
SW022	11/2/98	0 008	0 020	0 706	a
SW027	9/10/98 -	e	e	e	a
SW093	10/1 10/19/98	0 004	0 004	3.699	a
SW093	10/19 - 10/29/98	0 004	0 047	3.940	a
SW093	10/29 11/5/98	0 004	0 007	2 988	a
SW093	11/5 11/11/98	0 001	0 004	1 519	a
SW093	11/11 11/16/98	-0 005	0 001	1 571	a
SW093	11/16 11/25/98	0 001	0 002	4 201	a
SW093	11/25 12/2/98	0 002	0 005	5 161	a
SW093	12/2 12/17/98	0 020	0 000	3 873	a
SW093	12/17/98 1/7/99	c	c	c	a

a Not applicable
b Not collected
c Incomplete laboratory analysis
d Non-sufficient quantity
e Composite sample in progress

Table 4-12 Metals Water Year 1999 (October, November, and December)

Location	Sample Dates	Analyte Be ug/L	Analyte Dissolved Cd ug/L	Analyte Cr ug/L	Analyte Dissolved Ag ug/L
GS10	9/8 9/24/98	undetect	0 06	undetect	undetect
GS10	9/24 10/8/98	undetect	undetect	undetect	undetect
GS10	10/8 10/22/98	undetect	undetect	0 34	undetect
GS10	10/22 10/29/98	0 12	undetect	2 1	undetect
GS10	10/29 11/5/98	0 18	undetect	2 5	undetect
GS10	11/5 11/9/98	0 12	0 1	1 85	0 065
GS10	11/9 11/17/98	undetect	undetect	0 89	undetect
GS10	11/17 12/1/98	undetect	undetect	undetect	undetect
GS10	12/1/98 1/4/99	a	a	a	a
SW027	9/10/98	b	b	b	b
SW093	9/3 9/16/98	undetect	undetect	0 79	0 06
SW093	9/16 10/1/98	undetect	0 08	undetect	undetect
SW093	10/1 10/19/98	undetect	undetect	undetect	undetect
SW093	10/19 10/29/98	0 14	0 05	1 2	undetect
SW093	10/29 11/5/98	0 11	0 06	0 63	undetect
SW093	11/5 11/11/98	0 06	undetect	1 8	undetect
SW093	11/11 11/16/98	undetect	undetect	undetect	undetect
SW093	11/16 11/25/98	undetect	undetect	undetect	undetect
SW093	11/25 12/2/98	undetect	undetect	undetect	undetect
SW093	12/2 12/17/98	a	a	a	a
SW093	12/17/98 1/7/99	a	a	a	a

a Incomplete laboratory analysis

b Composite sample in progress

Table 4-13 Water Quality Parameters, Water Year 1999 (October, November, and December)

GS10	10/8 10/22/98	190
GS10	10/22 10/29/98	120
GS10	10/29 11/5/98	140
GS10	11/5 11/9/98	110
GS10	11/9 11/17/98	200
GS10	11/17 12/1/98	240
GS10	12/1/98 - 1/4/99	a
SW027	9/10/98 -	b
SW093	10/1 10/19/98	340
SW093	10/19 10/29/98	280
SW093	10/29 11/5/98	230
SW093	11/5 11/11/98	180
SW093	11/11 11/16/98	210
SW093	11/16 11/25/98	320
SW093	11/25 12/2/98	350
SW093	12/2 12/17/98	310
SW093	12/17/98 1/7/99	a

a Incomplete laboratory analysis

b Composite sample in progress

45/45