

**WATER-QUALITY MONITORING PROGRAM
CHATFIELD BASIN AND RESERVOIR
FINAL BASIC-DATA REPORT
JANUARY 2001-DECEMBER 2001**

April 24, 2002

Prepared For:

**Chatfield Watershed Authority
Denver, Colorado**

Prepared By:

**Commodore Advanced Sciences, Inc.
4251 Kipling Street, Suite 575
Wheat Ridge, Colorado 80033-6810**

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Chatfield Watershed Authority
Russell N. Clayshulte
Environmental Resource Manager
Denver Regional Council of Governments
2480 West 26th Avenue, Suite 200B
Denver, CO 80211-5580

Subject: Water-Quality Monitoring Program, Chatfield Basin and Reservoir
Final Basic-Data Report, January-December 2001
CAS Project No. 8206.05

Dear Mr. Clayshulte:

This 2001 Annual Basic-Data Report is submitted by Commodore Advanced Sciences, Inc. (CAS) in fulfillment of the subject program's contract requirements. The data provided in this report were collected in accordance with "2001 Chatfield Watershed Authority Water Quality Monitoring Program (January 8, 2001)." ACZ Laboratories, Inc., Steamboat Springs, CO, and Mountain States Analytical, Inc., Salt Lake City, UT, performed chemical analyses, and biological analyses were performed by Plateau Ecosystems Consulting, Inc. (PEC), Arvada, CO, Chadwick and Associates, Englewood, CO, and the University of Colorado (CU) Limnology Laboratory.

The report is organized into four primary sections - 1. Sampling Site Descriptions and Locations; 2. Basic Data Tables; 3. Summary Data Tables; and 4. Figures. The first section of the report provides written descriptions (Table 1) and maps (Figures 1 and 2) for each sampling location.

Tables 2 through 21 provide the field measurements and laboratory chemical data for samples collected by CAS for the January-through-December 2001 period. Tables 2 through 17 contain data for the three inflow/outflow sites and the in-reservoir site. Separate tables are provided for field measurements, miscellaneous analyses, nutrient analyses, and metals analyses for each of the sampling sites. Table 19 contains data from an annual reservoir-bottom sediment sample analyzed for total phosphorous, five metals, and total organic carbon. This sample is taken at the in-reservoir location (field code RM) shown on Figure 1.

Table 18 includes tabular in-reservoir water-quality profiles for January 23, 2001 through November 14, 2001 water-quality surveys. The field parameters are presented at one-meter increments for pH, specific conductance, dissolved oxygen and temperature. These data are shown graphically in Figures 16 through 29.

The phytoplankton and zooplankton results are provided in both tabular (Tables 20 and 21) and graphical format (Figures 10 through 15).

Tables 22 through 24 provide the data collected during the supplemental field screening surveys performed during June through April, 2001 at 23 locations throughout the watershed. Figures 2A, 2B, and 2C are maps of the sampling locations, and Figures 31 through 35 provide graphical summaries of nitrate and phosphorous for the field screening locations.

Table 25 provides a summary of the total phosphorous and chlorophyll_a concentrations in the reservoir for the period 1982 to 2001. As indicated on this table the average growing-season concentrations of total phosphorous and chlorophyll_a increased from 2000 levels. Both of these constituents have been steadily increasing since 1997. The average total phosphorous concentration during the 2001 growing season did not exceed the growing-season standard, and the average chlorophyll_a concentration remained less than the growing-season goal established for Chatfield Reservoir.

Table 26 provides a summary of the data for trace metals analyses from the inflow/outflow and reservoir sites for the last 5 years (1997-2001). In 2001, metals sampling events were greatly reduced from previous years, to one event per site for the entire year. Plum Creek was dry from July-October, during which time metals were sampled at the other sites, so Plum Creek was not sampled for metals in 2001. For comparative purposes only, water-quality standards for each of these trace metals are also provided on this table. Where applicable, the standards presented on this table are numerical standards based on a hardness of 100 mg/l CaCO₃ (the estimated average low flow hardness) for segment 6 of the South Platte River as established by the Colorado Water Quality Control Commission (WQCC). If such a standard does not exist, the basic standard established by the WQCC is provided. The data on this table indicate that the concentrations of these trace metals at the inflow/outflow and reservoir sampling sites during 2001 were consistent with the concentrations in samples from the previous 4 years.

Plots of peak and average concentrations for the indicator in-reservoir variables (total phosphorus, chlorophyll-a, and Secchi depth) are given in Figures 3 through 8. Beginning in 1997, the time-series plots depict a point value, rather than an average value from three reservoir locations (field codes RM-1, RM-2, and RM-3). Comparison of growing-season total-phosphorus versus chlorophyll-a concentrations is shown in Figure 9.

Of particular note is a discovery made during data review for this report, that Secchi depths have been misreported in meters for the past four years, beginning in 1997. The unit of measurement was changed from feet to meters beginning in January 1997, however the unit conversion in reports was not made until now. The corrected data show a marked improvement in water clarity in Chatfield Reservoir since 1996.

Cumulative 1988-2001 Data Summary (T.D. Steele)

The most apparent pattern of time trends involves Secchi-depth measurements (Figures 7 and 8). Despite year-to-year variability over the 14-year period of evaluation (1988 through 2001), it was observed that the average growing-season (Figure 7) and annual mean Secchi depths (Figure

8) indicate a pronounced shift upward since 1997. For this recent 5-year period (1997-2001), the average growing-season Secchi depth (8.0 ft) is 45 percent greater than the average Secchi depth (5.5 ft) for the historical period of 9 years (1988-96). This shift to higher values (hence, deeper water transparencies in the Reservoir) was significant only to about the 87.5 percent level; above that level of significance, the shift is not significant, using the Mann-Kendall nonparametric test for trend (Gilbert, 1987).

This shift in Secchi depths appears to have conflicting causes. A major event that would have caused the reverse of this condition was the Buffalo Creek fire in the upper South Platte River subwatershed. This fire occurred in late-June/early-July 1996 (Steve Lohman, Denver Water Department, oral commun., 4/9/02), and in September of that same year a large storm in the basin resulted in a large volume of runoff, which contributed large amounts of suspended sediment. However, a change in the Secchi disk at this same time may cause the observed bias in time-series pattern, in that a new disk may have resulted in higher (more light transparency) readings than the old Secchi disk (Walt Foutz, Commodore Advanced Sciences, Inc., oral commun., 4/22/02).

A coincidental impact in terms of total-phosphorus (T-P) concentrations in Chatfield Reservoir in general was not apparent (Figures 3 and 4). The lowest peak T-P concentration occurred in 1997, which is the reverse of what might be expected of relatively larger sediment loads per unit area of watershed that appear to have impacted in-Reservoir light-transparencies (measured by Secchi depths). Otherwise, year-to-year T-P concentrations appear to vary quite randomly over time. For the 14-year period of record, average growing-season T-P concentrations were 0.018 mg/L for 1988-1996, compared to 0.017 mg/L for 1997-2001. This difference was judged not to be significant.

The same conclusion as for T-P applies to the time-series for chlorophyll-*a*. Average growing-season chlorophyll-*a* concentrations were 4.5 ug/L for 1987-96 versus 4.6 ug/L for 1997-2000, indicating no significant difference. The 2001 average chlorophyll-*a* concentration (10.4 ug/L) was the highest for the 15-year period of record; if this average is included in the recent-period average, it would become nearly 5.8 ug/L (instead of 4.6 ug/L). However, this may not be an indication of a significant trend. All average growing-season chlorophyll-*a* values remain below the control-regulation goal of 17 ug/L.

In summary, it is concluded that any perceived time trends in Chatfield Reservoir's Secchi-depth measurements are not significant (T.D. Steele, April 22, 2002.)

In addition to this data report, CAS was requested to perform other tasks during 2001. The most significant of these tasks was to prepare three documents; a Standard Operating Procedure (SOP), a Sampling and Analysis Plan (SAP), and a Quality Assurance Plan (QAP). These documents were completed, reviewed, and submitted under separate cover on January 1, 2002. The other significant task was to compile and evaluate the data collected from 1999-2000 High-Flow Screening Surveys, and 1990-2000 Groundwater Data from the Plum Creek Alluvial wells. The data evaluation and summary report are included in this report as Appendix A.

CAS appreciates having the opportunity to provide the Chatfield Watershed Authority with continuing water-quality monitoring and data compilation services. This Basic-Data Report constitutes the final deliverable under our 2001 calendar-year contract. If you have any questions, or need additional information, please call me at 303.421.1511, or email at wfoutz@commodore.com.

Sincerely,
COMMODORE ADVANCED SCIENCES, INC.

A handwritten signature in black ink that reads "W Foutz". The letters are cursive and somewhat stylized.

Walt Foutz, CPG
Project Manager

Attachments – Final Annual Basic-Data Report

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Appendix A

Water Quality Data Assessment and Report on 1999-2001 High-Flow Screening Surveys and 1990-2000 Groundwater Data from Plum Creek Alluvial Wells.

SAMPLING SITE DESCRIPTIONS AND LOCATIONS

**TABLE 1
2001 CHATFIELD WATERSHED AUTHORITY
WATER QUALITY MONITORING PROGRAM**

SAMPLING LOCATION DESCRIPTIONS

In-Reservoir and Inflow/Outflow Sites (Figure 1)

<u>Field Code</u>	<u>Description</u>
RM	In-reservoir near dam
PC	Plum Creek at Titan Road, USGS Site 06709530
SO	Outfall from Chatfield Reservoir, USGS Site 06709601
SP	South Platte at Waterton, USGS Site 06708000

Basin-Wide Screening Locations (Figure 2)

<u>Field Code</u>	<u>Description</u>
CH01	6.2 miles up Deer Creek Canyon Road at confluence of north and south forks of Deer Creek
CH02	Deer Creek just west of Chatfield Reservoir - sampled within park boundary
CH03	Up Waterton Canyon Road to just below Strontia Springs Dam
CH04	South Platte River at Waterton Canyon bridge - routine monitoring site SP
CH05	Drainage from Lockheed-Martin facility - sample at bridge across from Waterton Canyon turnoff on Wadsworth Boulevard
CH06	South Platte River approximately 1 mile upstream from Chatfield Reservoir - follow road past beaver ponds on the south end
CH07	South Platte River at the bridge for the main park road
CH08	Massey Draw just west of the Chatfield park perimeter road near the bike path
CH09	Cook Creek at intersection with Noe Road
CH10	East Plum Creek just below confluence with Cook Creek - under railroad tracks just south of Larkspur
CH11	East Plum Creek at subdivision turnoff - bridge on the east frontage road of I-25 near Tomah exit between Larkspur and Castle Rock
CH12	East Plum Creek at the business park on the south end of Castle Rock

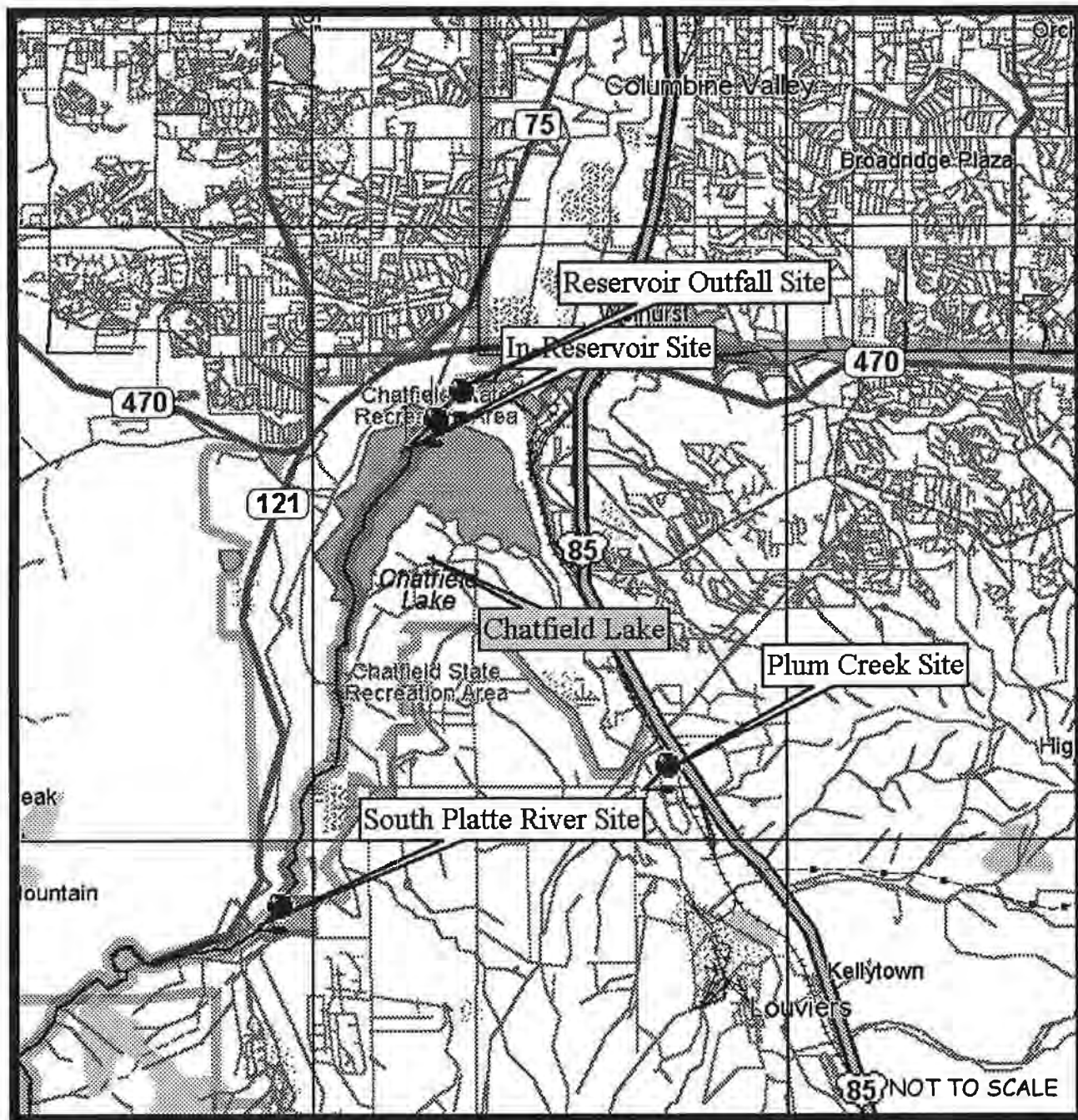
TABLE 1
2001 CHATFIELD WATERSHED AUTHORITY
WATER QUALITY MONITORING PROGRAM

SAMPLING LOCATION DESCRIPTIONS

CH13	East Plum Creek just upstream of the Plum Creek Wastewater Plant - bridge at Meadows Boulevard and Highway 85
CH14	East Plum Creek at Sedalia - State Highway 67 bridge
CH15	Plum Creek off County Road 16 from Highway 85 - near alluvial well number 4
CH16	Plum Creek at Titan Road bridge
CH17	Plum Creek within Chatfield State Park boundary above reservoir
CH18	Indian Creek at intersection with Rio Grande Avenue west of Sedalia
CH19	Site is on private land and permission for access was not granted
CH20	Jackson Creek on FR502 (road was washed out) - for last 2 events site was moved to the intersection of Jackson Creek Road off Road 105
CH21	Bear Creek west of Perry Park subdivision - follow Cheyenne Road to intersection
CH22	West Plum Creek at Red Rock Road intersection off Road 105
CH23	West Plum Creek at intersection with Dakan Road off Road 105
CH24	West Plum Creek at intersection with Highway 67 west of Sedalia

Alluvial Groundwater Monitoring Wells (Figure 2)

<u>Field Code</u>	<u>Description</u>
1W	At Plum Creek Wastewater Treatment Plant
2W	Town of Sedalia Cistern
3W	Town of Castle Rock Well Located at Douglas County Fairgrounds
4W	Residential Well on Airport Road Southwest of Louviers - Flying C Ranch
5W	Residential Well Located West of Louviers



**FIGURE 1
IN-RESERVOIR AND INFLOW/OUTFLOW
SAMPLING LOCATIONS**

**CHATFIELD BASIN AND RESERVOIR
WATER-QUALITY MONITORING PROGRAM**

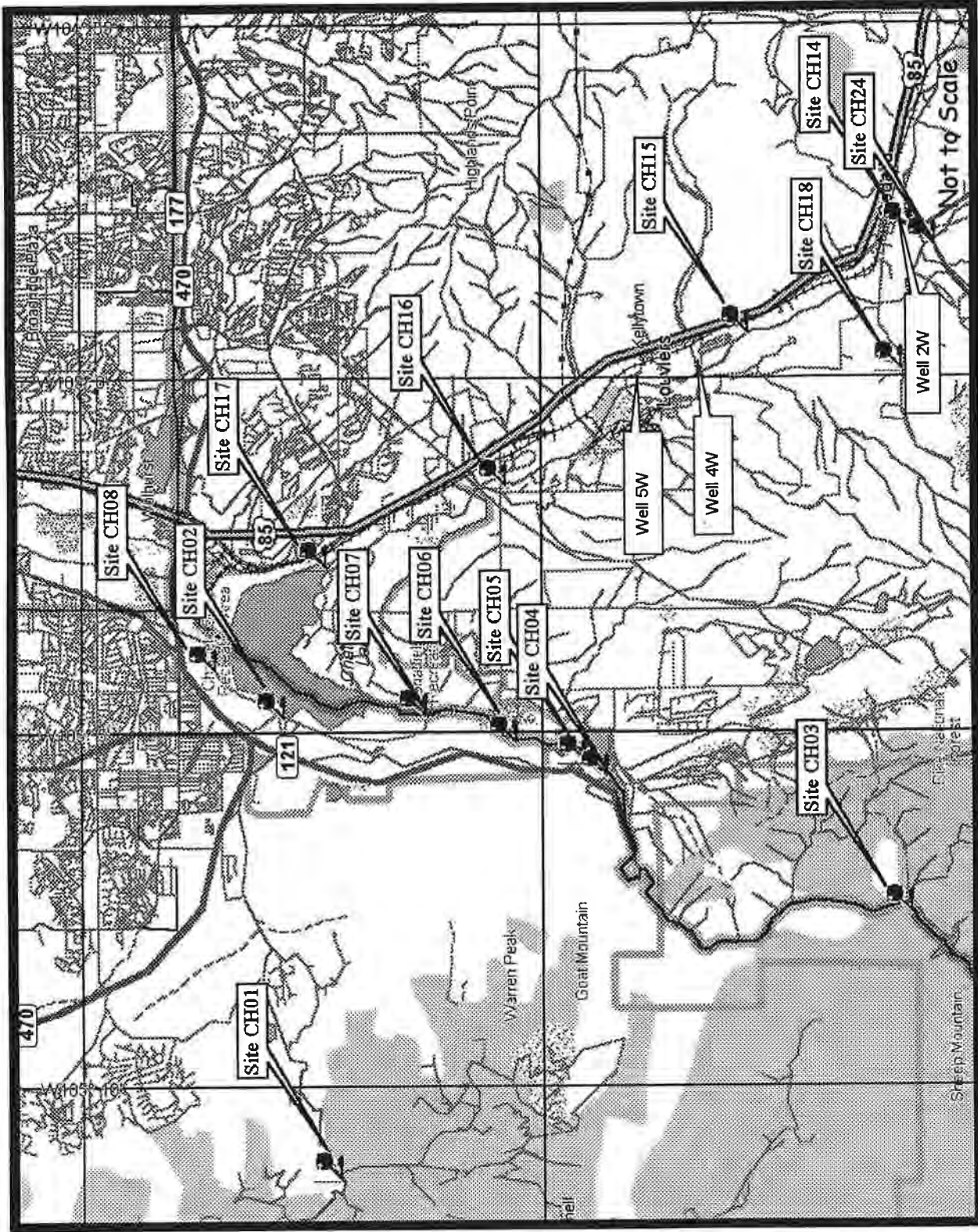


FIGURE 2A
BASIN-WIDE SCREENING SURVEY SAMPLING LOCATIONS
CHATFIELD BASIN AND RESERVOIR
WATER-QUALITY MONITORING PROGRAM

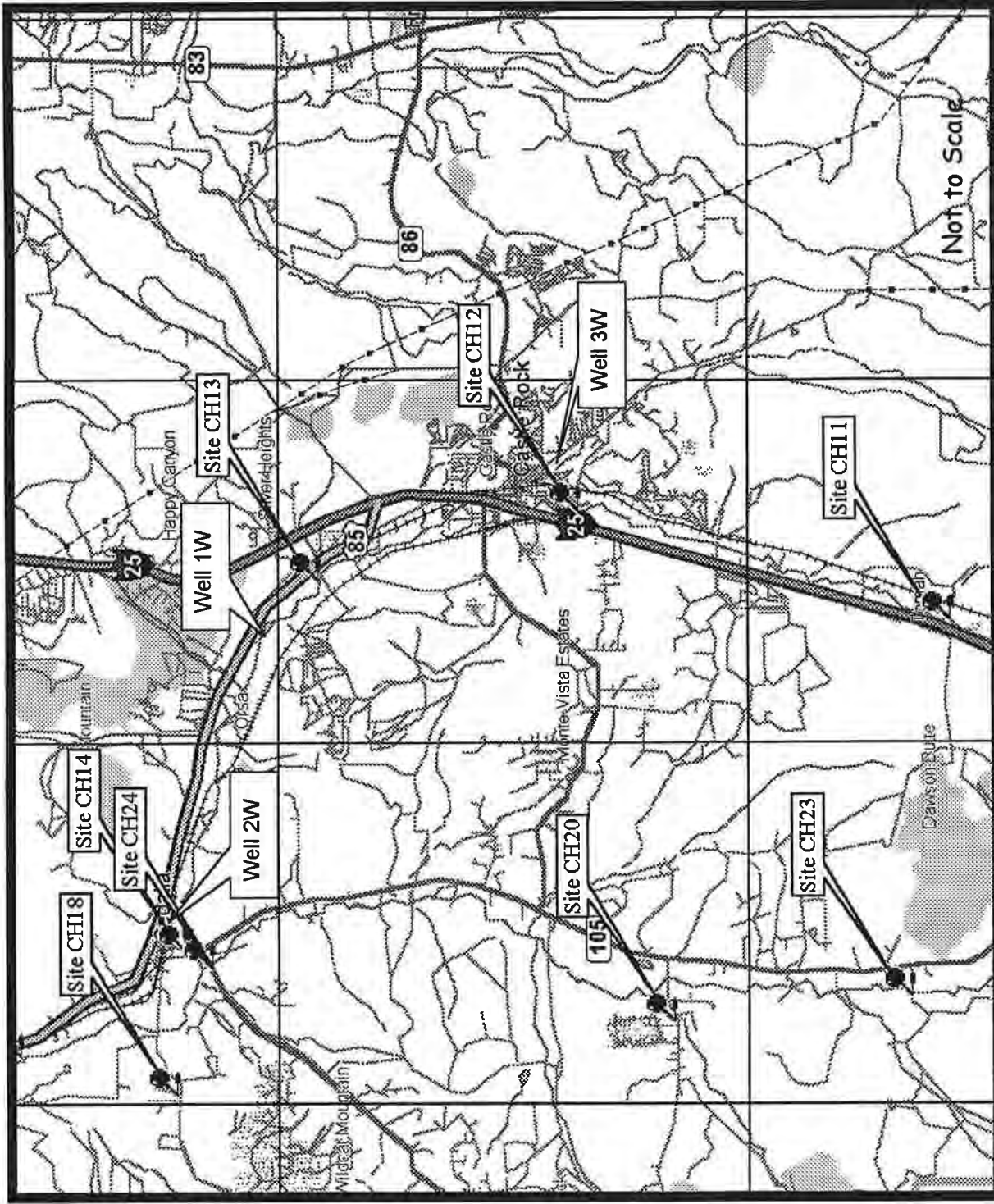


FIGURE 2B
BASIN-WIDE SCREENING SURVEY LOCATIONS
CHATFIELD BASIN AND RESERVOIR
WATER-QUALITY MONITORING PROGRAM

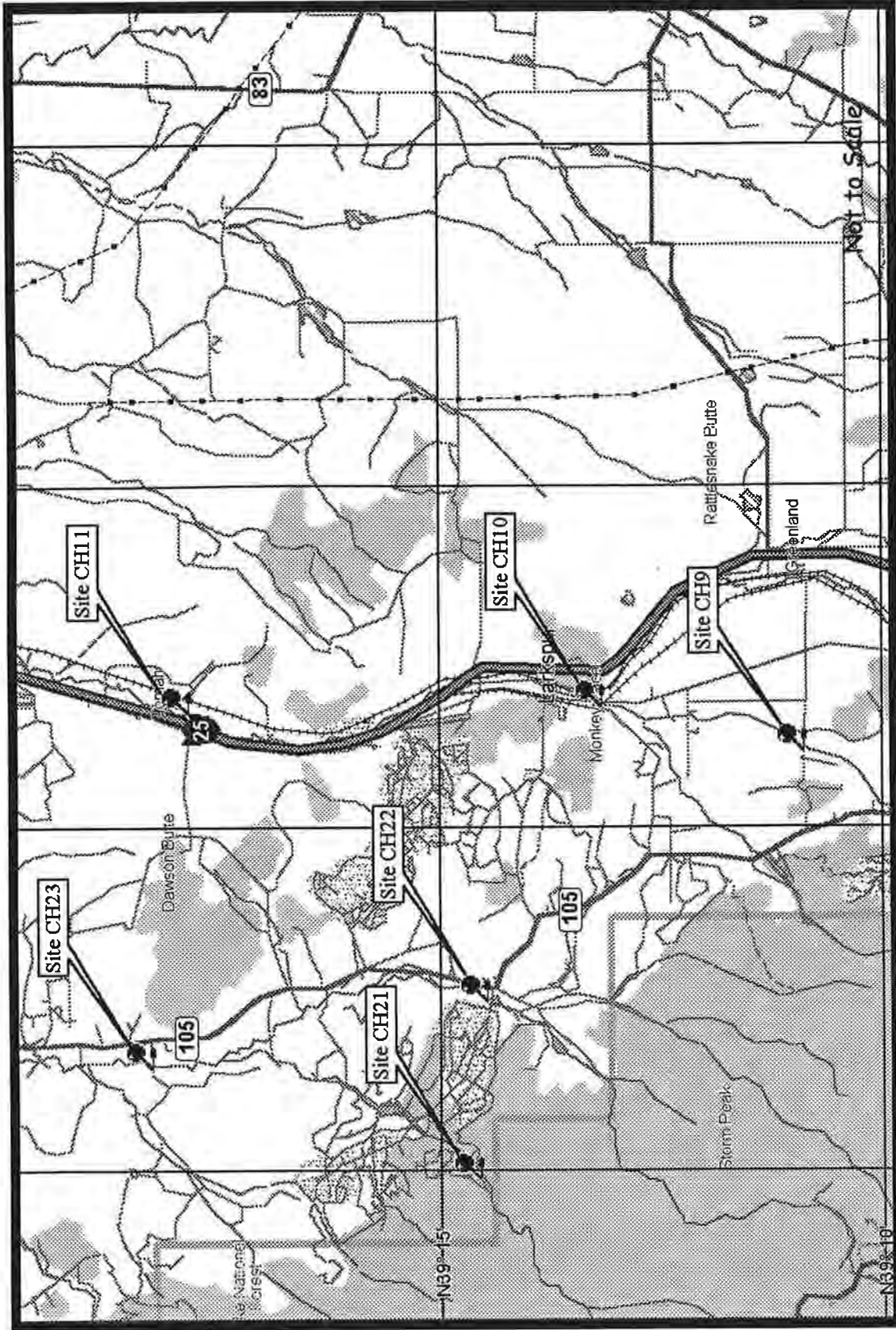


FIGURE 2C
BASIN-WIDE SCREENING SURVEY LOCATIONS
CHATFIELD BASIN AND RESERVOIR
WATER-QUALITY MONITORING PROGRAM

BASIC DATA TABLES

TABLE 2
SOUTH PLATTE RIVER AT WATERTON, CO
(FIELD CODE - SP; USGS STATION 06708000)
FIELD MEASUREMENTS

DATE	TIME	Instantaneous Streamflow (CFS) ¹⁾	Specific Conductance		Oxygen, Dissolved (mg/l)	pH Field (Std. Units)	Temperature (Deg C)
			Field (us/cm)	Field			
01-23-2001	1130	35.7	311	15.5	7.1	0.8	
02-27-2001	1110	45.8	292	16.68	6.73	0.3	
03-28-2001	1240	32.4	279	10.4	8.34	5.9	
04-18-2001	655	32.4	304	10.38	7.25	5.2	
05-16-2001	635	64.9	271	9.23	6.12	8.4	
06-13-2001	655	148.0	354	8.57	5.24	11.1	
07-11-2001	705	182.0	278	10.04	6.79	13.2	
07-24-2001	805	389.0	269	9.94	6.89	14.2	
08-15-2001	810	69.6	260	10.03	6.85	14.9	
09-12-2001	710	67.0	299	10.14	7.21	11.7	
09-26-2001	715	39.1	295	9.72	6.49	12	
10-10-2001	720	37.4	297	11.4	6.9	7.5	
11-14-2001	825	40.8	295	13.64	6.96	4.4	
12-19-2001	715	47.9	299	14.51	6.38	0.3	

MINUS SIGN MEANS "LESS THAN" INDICATED VALUE (EXCEPT TEMPERATURE).

BLANK RANGES INDICATE NO ANALYSES WERE REQUESTED.

** DATA ITALICIZED MEANS THE SAMPLE IS A DUPLICATE OR A SPLIT OF THE SAMPLE IMMEDIATELY ABOVE.

1) STREAMFLOW DATA SOURCE: Colorado Division of Water Resources (written comm. D. Dzurovchin, April 9, 2002)

2) MDL = METHOD DETECTION LIMIT.

3) PQL = PRACTICAL QUANTITATION LIMIT.

TABLE 3
SOUTH PLATTE RIVER AT WATERTON, CO
(FIELD CODE - SP; USGS STATION 06708000)
MISCELLANEOUS ANALYSES

Date	Bicarbonate as CaCO3 (mg/L)	E. Coli Colonies (#/100 ML)	Cyanide, WAD (mg/L)	Total Suspended Solids (TSS) (gm/M ³)	Total Alkalinity (mg/L)
MDL ¹⁾	2	1	0.01	5	2
PQL ²⁾	10	1	0.05	20	10
23-Jan-01		1		<u>2.5</u>	
27-Feb-01	54	1	<u>0.005</u>	<u>2.5</u>	54
28-Mar-01		1		<u>2.5</u>	
18-Apr-01		2		6	
16-May-01	65	8	<u>0.005</u>	<u>2.5</u>	65
13-Jun-01		11		<u>2.5</u>	
11-Jul-01		13		<u>6</u>	
24-Jul-01		13		<u>10</u>	
15-Aug-01		4		<u>2.5</u>	
29-Aug-01		4		<u>2.5</u>	
12-Sep-01		13		6	
26-Sep-01		13		<u>2.5</u>	
10-Oct-01		1		<u>2.5</u>	
14-Nov-01		4		0	
19-Dec-01		1		<u>2.5</u>	

UNDERLINED VALUES ARE LESS THAN MDL.

BLANK RANGES INDICATE NO ANALYSES WERE REQUESTED.

1) MDL = METHOD DETECTION LIMIT.

2) PQL = PRACTICAL QUANTITATION LIMIT.

TABLE 4
 SOUTH PLATTE RIVER AT WATERTON, CO
 (FIELD CODE - SP; USGS STATION 06708000)
 NUTRIENT ANALYSES

DATE	Nitrate (mg/L as N)	Nitrate/ Nitrite (mg/L as N)	Nitrite (mg/L as N)	Nitrogen, ammonia (mg/L)	Nitrogen, total (mg/L)	Phosphorus ortho, total (mg/L as P)	Phosphorus, total (mg/L as P)
MDL ¹⁾	0.02	0.02	0.01	0.05	0.1	0.005	0.02
PQL ²⁾	0.10	0.10	0.05	0.3	0.5	0.03	0.1
23-Jan-01	0.30	0.30	0.005	0.18	0.4	0.0025	0.01
27-Feb-01	0.23	0.23	0.005	0.025	0.4	0.008	0.01
28-Mar-01	0.19	0.19	0.005	0.025	0.4	0.0025	0.01
18-Apr-01	0.23	0.23	0	0.07	0.4	0.018	0.005
16-May-01	0.13	0.13	0	0	0.4	0.007	0.02
13-Jun-01	0.11	0.11	0.005	0.025	0.4	0.009	0.02
11-Jul-01	0.07	0.07	0.005	0.025	0.4	0.0025	0.02
24-Jul-01	0.06	0.06	0.005	0.025	0.4	0.0025	0.03
15-Aug-01	0.14	0.14	0.005	0.025	0.4	0.011	0.01
29-Aug-01	0.16	0.16	0.005	0.025	0.4	0.0025	0.005
12-Sep-01	0.00	0.05	0	0.16	0.4	0.007	0.01
26-Sep-01	0.16	0.16	0.005	0.11	0.4	0.0025	0.01
10-Oct-01	0.16	0.16	0.005	0.12	0.4	0.007	0.01
14-Nov-01	0.32	0.32	0	0	0.6	0.013	0.01
19-Dec-01	0.40	0.40	0.005	0.06	0.6	0.009	0.01

UNDERLINED VALUES ARE LESS THAN MDL.

BLANK RANGES INDICATE NO ANALYSES WERE REQUESTED.

** DATA ITALICIZED MEANS THE SAMPLE IS A DUPLICATE OR A SPLIT OF THE SAMPLE IMMEDIATELY ABOVE.

1) MDL = METHOD DETECTION LIMIT.

2) PQL = PRACTICAL QUANTITATION LIMIT.

TABLE 5
SOUTH PLATTE RIVER AT WATERTON, CO
(FIELD CODE - SP; USGS STATION 06708000)
METALS ANALYSES

DATE	Arsenic, total (mg/l)	Cadmium, dissolved (mg/l)	Calcium, dissolved (mg/l)	Copper, dissolved (mg/l)	Hardness dissolved (mg/l)	Iron, dissolved (mg/l)
MDL ¹⁾	0.001	0.003	0.2	0.01	1	0.01
PQL ²⁾	0.005	0.02	1.0	0.05	7	0.05
23-Jan-01			36.6		126	
23-Jan-02			36.3		124	
20-Feb-02			37.1		125	
27-Feb-01			37.1		120	
28-Mar-01			36.1		117	
18-Apr-01			45.6		153	
18-Apr-01			39.9		130	
16-May-01			32.3		112	
16-May-01			32.2		111	
13-Jun-01			31.2		105	
11-Jul-01			31.1		114	
15-Aug-01	<u>0.0005</u>	<u>0.0015</u>	30.3	<u>0.005</u>	109	<u>0.02</u>
29-Aug-01			29.7		109	
26-Sep-01			33.3		118	
10-Oct-01			31.6		114	
14-Nov-01			29.7		108	
19-Dec-01			32.9		117	

UNDERLINED VALUES ARE LESS THAN MDL.

BLANK RANGES INDICATE NO ANALYSES WERE REQUESTED.

** DATA ITALICIZED MEANS THE SAMPLE IS A DUPLICATE OF THE SAMPLE ABOVE.

1) MDL = METHOD DETECTION LIMIT.

2) PQL = PRACTICAL QUANTITATION LIMIT.

TABLE 5
 SOUTH PLATTE RIVER AT WATERTON, CO
 (FIELD CODE - SP; USGS STATION 06708000)
 METALS ANALYSES

DATE	Lead, dissolved (mg/l)	Magnesium, dissolved (mg/l)	Manganese, dissolved (mg/l)	Mercury, dissolved (mg/l)	Nickel, dissolved (mg/l)	Selenium, dissolved (mg/l)	Silver, dissolved (mg/l)	Zinc, dissolved (mg/l)
MDL ¹⁾	0.04	0.2	0.005	0.0002	0.01	0.001	0.005	0.01
PQL ²⁾	0.2	1.0	0.03	0.001	0.05	0.005	0.03	0.05
23-Jan-01		8.4						
23-Jan-02		8.1						
20-Feb-02		7.8						
27-Feb-01		6.6						
28-Mar-01		6.4						
18-Apr-01		9.6						
18-Apr-01		7.3						
16-May-01		7.1						
16-May-01		7.5						
13-Jun-01		6.6						
11-Jul-01		8.7						
15-Aug-01	<u>0.02</u>	8.0	0.007	<u>0.0001</u>	<u>0.005</u>	<u>0.0005</u>	<u>0.00025</u>	<u>0.02</u>
29-Aug-01		8.4						
26-Sep-01		8.4						
10-Oct-01		8.5						
14-Nov-01		8.1						
19-Dec-01		8.4						

UNDERLINED VALUES ARE LESS THAN MDL.

BLANK RANGES INDICATE NO ANALYSES WERE REQUESTED.

** DATA ITALICIZED MEANS THE SAMPLE IS A DUPLICATE OF THE SAMPLE ABOVE.

1) MDL = METHOD DETECTION LIMIT.

2) PQL = PRACTICAL QUANTITATION LIMIT.

TABLE 6
PLUM CREEK AT TITAN ROAD NEAR LOUVIERS, CO
(FIELD CODE - PC; USGS STATION 06709530)
FIELD MEASUREMENTS

DATE	TIME	Instantaneous Streamflow (CFS) ¹⁾	Specific Conductance Field (us/cm)	Oxygen, Dissolved (mg/l)	pH Field (Std. Units)	Temperature (Deg C)
MDL ²⁾						
PQL ³⁾						
01-23-2001	1155	19.0	459	8.5	7.09	0.1
02-27-2001	1100	9.7	450	13.03	7.86	2.4
03-28-2001	1300	49.0	399	9.5	7.76	7.3
04-18-2001	715	30.0	339	8.95	7.6	5.9
05-16-2001	705	139.0	198	7.26	6.75	12.5
06-13-2001	720	27.0	321	4.8	6.37	14
07-11-2001	725	0.7	397	3.86	6.67	18.8
07-24-2001	835	104	369	2.96	6.45	19.7
08-15-2001	835	0.0	-	-	-	-
09-12-2001	735	0.0	-	-	-	-
09-26-2001	730	0.0	-	-	-	-
10-10-2001	735	0.0	-	-	-	-
11-14-2001	915	7.3	503	10.52	6.95	6.3
12-19-2001	750	12.0	479	12.37	6.64	0.1
12-28-2000	700	22.0	474	3.37	6.81	0.3

MINUS SIGN MEANS "LESS THAN" INDICATED VALUE (EXCEPT TEMPERATURE).

BLANK RANGES INDICATE NO ANALYSES WERE REQUESTED.

** DATA ITALICIZED MEANS THE SAMPLE IS A DUPLICATE OR A SPLIT OF THE SAMPLE IMMEDIATELY ABOVE.

1) STREAMFLOW DATA SOURCE: U.S. Geological Survey (written comm., G. Smith, April 9, 2002)

TABLE 7
PLUM CREEK AT TITAN ROAD NEAR LOUVIERS, CO
(FIELD CODE - PC; USGS STATION 06709530)
MISCELLANEOUS ANALYSES

Date	Bicarbonate as CaCO ₃ (mg/L)	E. Coli Colonies (#/100 ML)	Cyanide, WAD (mg/L)	Total Suspended Solids (TSS) (gm/M ³)	Total Alkalinity (mg/L)
MDL ¹⁾	2	1	0.01	5	2
PQL ²⁾	10	1	0.05	20	10
23-Jan-01		13		26	
27-Feb-01	96	11	<u>0.005</u>	54	96
28-Mar-01		13		18	
18-Apr-01		13		84	
16-May-01	58	30	<u>0.005</u>	60	58
13-Jun-01		80		24	
11-Jul-01		30		26	
24-Jul-01		240		46	
24-Jul-01		80		44	
14-Nov-01		23		0	
19-Dec-01		30		<u>2.5</u>	

** DATA ITALICIZED MEANS THE SAMPLE IS A DUPLICATE OR A SPLIT OF THE SAMPLE IMMEDIATELY ABOVE.

1) MDL = METHOD DETECTION LIMIT.

2) PQL = PRACTICAL QUANTITATION LIMIT.

TABLE 8
PLUM CREEK AT TITAN ROAD NEAR LOUVIERS, CO
(FIELD CODE - PC; USGS STATION 06709530)
NUTRIENT ANALYSES

DATE	Nitrate (mg/L as N)	Nitrate/ Nitrite (mg/L as N)	Nitrite (mg/L as N)	Nitrogen, ammonia (mg/L)	Nitrogen, total (mg/L)	Phosphorus ortho, total (mg/L as P)	Phosphorus, total (mg/L as P)
MDL ¹⁾	0.02	0.02	0.01	0.05	0.1	0.005	0.02
PQL ²⁾	0.10	0.10	0.05	0.3	0.5	0.03	0.10
23-Jan-01	1.32	1.36	0.04	<u>0.025</u>		0.011	0.04
23-Jan-02	1.33	1.34	0.01	0.12		0.056	0.03
27-Feb-01	1.13	1.13	<u>0.005</u>	0.025	1.6	0.019	0.09
28-Mar-01	0.58	0.58	<u>0.005</u>	0.06		0.022	0.06
18-Apr-01	0.30	0.31	<u>0.01</u>	0.13		0.085	0.12
16-May-01	0.21	0.21	<u>0</u>	0	0.5	0.062	0.16
13-Jun-01	0.21	0.21	<u>0.005</u>	0.16		0.036	0.08
11-Jul-01	0.03	0.03	<u>0.005</u>	0.14		0.029	0.07
24-Jul-01	0.08	0.08	<u>0.005</u>	<u>0.025</u>		0.036	<u>0.11</u>
14-Nov-01*	0.42	0.42	<u>0</u>	0	0.8	0.015	<u>0.02</u>
19-Dec-01	0.98	0.99	<u>0.01</u>	0.06		0.009	<u>0.01</u>

UNDERLINED VALUES ARE LESS THAN MDL.
BLANK RANGES INDICATE NO ANALYSES WERE REQUESTED.

1) MDL = METHOD DETECTION LIMIT.

2) PQL = PRACTICAL QUANTITATION LIMIT.

* no flow in Plum Creek August-November 2001

TABLE 9
PLUM CREEK AT TITAN ROAD NEAR LOUVIERS, CO
(FIELD CODE - PC; USGS STATION 06709530)
METALS ANALYSES

DATE	Arsenic, total (mg/l)	Cadmium, dissolved (mg/l)	Calcium, dissolved (mg/l)	Copper, dissolved (mg/l)	Hardness dissolved (mg/l)	Iron, dissolved (mg/l)
MDL ¹⁾	0.001	0.003	0.2	0.01	1	0.01
PQL ²⁾	0.005	0.02	1.0	0.05	7	0.05
<u>23-Jan-01</u>			51.9		161	
<u>23-Jan-02</u>			54.4		167	
<u>20-Feb-02</u>			52.4		161	
<u>27-Feb-01</u>			50.0		154	
<u>28-Mar-01</u>			45.5		142.0	
<u>18-Apr-01</u>			43.2		132.0	
<u>16-May-01</u>			25.3		79.0	
<u>13-Jun-01</u>			42.3		130	
<u>11-Jul-01</u>			49.9		154	
<u>24-Jul-01</u>			29.7		108	
<u>14-Nov-01</u>			52.5		163	
<u>19-Dec-01</u>			53.6		166	

UNDERLINED VALUES ARE LESS THAN MDL.

BLANK RANGES INDICATE NO ANALYSES WERE REQUESTED.

** DATA ITALICIZED MEANS THE SAMPLE IS A DUPLICATE OR A SPLIT OF THE SAMPLE IMMEDIA

*No flow in Plum Creek August-October 2001

1) MDL = METHOD DETECTION LIMIT.

2) PQL = PRACTICAL QUANTITATION LIMIT.

TABLE 9
PLUM CREEK AT TITAN ROAD NEAR LOUVIERS, CO
(FIELD CODE - PC; USGS STATION 06709530)
METALS ANALYSES

DATE	Lead, dissolved (mg/l)	Magnesium, dissolved (mg/l)	Manganese, dissolved (mg/l)	Mercury, dissolved (mg/l)	Nickel, dissolved (mg/l)	Selenium, dissolved (mg/l)	Silver, dissolved (mg/l)	Zinc, dissolved (mg/l)
MDL ¹⁾	0.04	0.2	0.005	0.0002	0.01	0.001	0.005	0.01
PQL ²⁾	0.2	1	0.03	0.001	0.05	0.005	0.03	0.05
23-Jan-01		7.5						
23-Jan-02		7.5						
20-Feb-02		7.3						
27-Feb-01		7.1						
28-Mar-01		6.9						
18-Apr-01		5.9						
16-May-01		3.7						
13-Jun-01		6						
11-Jul-01		7.1						
24-Jul-01		8.1						
14-Nov-01		7.8						
19-Dec-01		7.9						

UNDERLINED VALUES ARE LESS THAN MDL.

BLANK RANGES INDICATE NO ANALYSES WERE REQUESTED.

** DATA ITALICIZED MEANS THE SAMPLE IS A DUPLICATE OF THE SAMPLE ABOVE.

*No flow in Plum Creek August-October 2001

1) MDL = METHOD DETECTION LIMIT.

2) PQL = PRACTICAL QUANTITATION LIMIT.

TABLE 10
CHATFIELD RESERVOIR OUTFLOW NEAR LITTLETON, CO
(FIELD CODE - SO; USGS STATION 06709601)
FIELD MEASUREMENTS

DATE	TIME	Instantaneous Streamflow (CFS) ¹⁾	Specific Conductance Field (us/cm)	Oxygen, Dissolved (mg/l)	pH Field (Std. Units)	Temperature (Deg C)
MDL ²⁾						
PQL ³⁾						
01-23-2001	1220	43.3	371	12.6	7.66	4.5
02-27-2001	1135	46.2	393	13.7	7.35	4.2
03-28-2001	1215	46.2	356	9.6	8.09	6.7
04-18-2001	750	39.8	361	9.92	7.63	8
05-16-2001	735	143.0	346	8.22	7.02	11.5
06-13-2001	750	249.0	329	7.07	7.14	16.3
07-11-2001	805	197.0	321	8.32	7.2	20.8
07-24-2001	930	143.0	315	7.86	6.89	21.5
08-15-2001	900	92.7	318	8.66	7	21.4
09-12-2001	800	0.13	330	7.54	7.55	14.6
09-26-2001	800	41.6	330	9.24	7.42	16.4
10-10-2001	800	0.19	325	8.09	7.3	8.6
11-14-2001	1020	1.25	351	9.61	7.8	7.3
12-19-2001	835	0.13	373	12.82	7.55	3

MINUS SIGN MEANS "LESS THAN" INDICATED VALUE (EXCEPT TEMPERATURE).

BLANK RANGES INDICATE NO ANALYSES WERE REQUESTED.

** DATA ITALICIZED MEANS THE SAMPLE IS A DUPLICATE OR A SPLIT OF THE SAMPLE IMMEDIATELY ABOVE.

1) STREAMFLOW DATA SOURCE: U.S. ARMY CORPS OF ENGINEERS (written commun., K. Grode April 12, 2002)

2) MDL = METHOD DETECTION LIMIT.

3) PQL = PRACTICAL QUANTITATION LIMIT.

TABLE 11
CHATFIELD RESERVOIR OUTFLOW NEAR LITTLETON, CO
(FIELD CODE - SO; USGS STATION 06709601)
MISCELLANEOUS ANALYSES

Date	Bicarbonate as CaCO3 (mg/L)	E. Coli Colonies (#/100 ML)	Cyanide, WAD (mg/L)	Total Suspended Solids (TSS) (gm/M ³)	Total Alkalinity (mg/L)
MDL ¹⁾	2	1	0.01	5	2
PQL ²⁾	10	1	0.05	20	10
23-Jan-01		<u>1</u>		10	
27-Feb-01	93	1	0.005	<u>2.5</u>	93
28-Mar-01		<u>1</u>		<u>2.5</u>	
18-Apr-01		<u>1</u>		<u>2.5</u>	
16-May-01	90	<u>1</u>	<u>0.005</u>	<u>2.5</u>	90
13-Jun-01		<u>4</u>		<u>6</u>	
13-Jun-01		8		8	
11-Jul-01		2		14	
24-Jul-01		13		10	
15-Aug-01		1		10	
29-Aug-01		1		8	
12-Sep-01		<u>1</u>		10	
26-Sep-01		<u>1</u>		12	
10-Oct-01		<u>8</u>		2.5	
14-Nov-01		1		<u>0</u>	
19-Dec-01		<u>1</u>		2.5	

UNDERLINED VALUES ARE LESS THAN MDL.

BLANK RANGES INDICATE NO ANALYSES WERE REQUESTED.

** DATA ITALICIZED MEANS THE SAMPLE IS A DUPLICATE OR A SPLIT OF THE SAMPLE IMMEDIATELY ABOVE.

1) MDL = METHOD DETECTION LIMIT.

2) PQL = PRACTICAL QUANTITATION LIMIT.

TABLE 12
 CHATFIELD RESERVOIR OUTFLOW NEAR LITTLETON, CO
 (FIELD CODE - SO; USGS STATION 06709601)
 NUTRIENT ANALYSES

DATE	Nitrate (mg/L as N)	Nitrate/ Nitrite (mg/L as N)	Nitrite (mg/L as N)	Nitrate/ Nitrite (mg/L as N)	Nitrite (mg/L as N)	Nitrogen, ammonia (mg/L)	Nitrogen, total (mg/L)	Phosphorus ortho, total (mg/L as P)	Phosphorus, total (mg/L as P)
MDL ¹⁾	0.02	0.02	0.01	0.05	0.05	0.1	0.1	0.005	0.02
PQL ²⁾	0.1	0.1	0.05	0.3	0.3	0.5	0.5	0.03	0.1
23-Jan-01	0.08	0.08	0.005	0.06	0.06	0.4	0.4	0.0025	0.01
27-Feb-01	0.1	0.1	0.005	0.07	0.07	0.3	0.3	0.0025	0.01
28-Mar-01	0.08	0.08	0.005	0.025	0.025	0.3	0.3	0.0025	0.01
18-Apr-01	0.06	0.06	0.005	0.07	0.07	0.3	0.3	0.01	0.01
16-May-01	0.04	0.04	0.005	0.025	0.025	0.3	0.3	0.007	0.02
13-Jun-01	0.01	0.01	0.005	0.025	0.025	0.3	0.3	0.0025	0.02
13-Jun-01	0.03	0.03	0.005	0.025	0.025	0.3	0.3	0.019	0.02
11-Jul-01	0.01	0.01	0.005	0.025	0.025	0.3	0.3	0.011	0.02
24-Jul-01	0.01	0.01	0.005	0.025	0.025	0.3	0.3	0.0025	0.03
15-Aug-01	0.01	0.01	0.005	11.3	11.3	0.3	0.3	0.013	0.03
29-Aug-01	0.03	0.03	0.005	0.025	0.025	0.3	0.3	0.0025	0.01
12-Sep-01	0	0	0	0.07	0.07	0.3	0.3	0.0025	0.02
26-Sep-01	0.01	0.01	0.005	0.025	0.025	0.3	0.3	0.012	0.03
10-Oct-01	0.01	0.01	0.005	0.09	0.09	0.3	0.3	0.0025	0.02
14-Nov-01	0	0	0	0	0	0.3	0.3	0.006	0.01
14-Nov-01	0.02	0.02	0	0	0	0.3	0.3	0.006	0.02
19-Dec-01	0.11	0.11	0.005	0.025	0.025	0.3	0.3	0.0025	0.01

UNDERLINED VALUES ARE LESS THAN MDL.

BLANK RANGES INDICATE NO ANALYSES WERE REQUESTED.

** DATA ITALICIZED MEANS THE SAMPLE IS A DUPLICATE OR A SPLIT OF THE SAMPLE IMMEDIATELY ABOVE.

1) MDL = METHOD DETECTION LIMIT.

2) PQL = PRACTICAL QUANTITATION LIMIT.

TABLE 13
 CHATFIELD RESERVOIR OUTFLOW NEAR LITTLETON, CO
 (FIELD CODE - SO; USGS STATION 06709601)
 METALS ANALYSES

DATE	Arsenic, total (mg/l)	Cadmium, dissolved (mg/l)	Calcium, dissolved (mg/l)	Copper, dissolved (mg/l)	Hardness dissolved (mg/l)	Iron, dissolved (mg/l)
MDL ¹⁾	0.001	0.003	0.2	0.01	1	0.01
PQL ²⁾	0.005	0.02	1.0	0.05	7	0.05
23-Jan-01			36.6		126	
23-Jan-02			36.3		124	
20-Feb-02			37.1		125	
27-Feb-01			37.1		120	
28-Mar-01			36.1		117	
18-Apr-01			45.6		153	
18-Apr-01			39.9		130	
16-May-01			32.3		112	
16-May-01			32.2		111	
13-Jun-01			31.2		105	
11-Jul-01			31.1		114	
15-Aug-01	0.0005	<u>0.0015</u>	30.3	<u>0.005</u>	109	<u>0.02</u>
29-Aug-01			29.7		109	
26-Sep-01			33.3		118	
10-Oct-01			31.6		114	
14-Nov-01			29.7		108	
19-Dec-01			32.9		117	

UNDERLINED VALUES ARE LESS THAN MDL.

BLANK RANGES INDICATE NO ANALYSES WERE REQUESTED.

*** DATA ITALICIZED MEANS THE SAMPLE IS A DUPLICATE SAMPLE ABOVE.

1) MDL = METHOD DETECTION LIMIT.

2) PQL = PRACTICAL QUANTITATION LIMIT.

TABLE 13
 CHATFIELD RESERVOIR OUTFLOW NEAR LITTLETON, CO
 (FIELD CODE - SO; USGS STATION 06709601)
 METALS ANALYSES

DATE	Lead, dissolved (mg/l)	Magnesium, dissolved (mg/l)	Manganese, dissolved (mg/l)	Mercury, dissolved (mg/l)	Nickel, dissolved (mg/l)	Selenium, dissolved (mg/l)	Silver, dissolved (mg/l)	Zinc, dissolved (mg/l)
MDL ¹⁾	0.04	0.2	0.005	0.0002	0.01	0.001	0.005	0.01
PQL ²⁾	0.2	1	0.03	0.001	0.05	0.005	0.03	0.05
23-Jan-01		8.4						
23-Jan-02		8.1						
20-Feb-02		7.8						
27-Feb-01		6.6						
28-Mar-01		6.4						
18-Apr-01		9.6						
18-Apr-01		7.3						
16-May-01		7.1						
16-May-01		7.5						
13-Jun-01		6.6						
11-Jul-01		8.7						
15-Aug-01	<u>0.02</u>	8	0.007	<u>0.0001</u>	<u>0.005</u>	<u>0.0005</u>	<u>0.00025</u>	<u>0.02</u>
29-Aug-01		8.4						
26-Sep-01		8.4						
10-Oct-01		8.5						
14-Nov-01		8.1						
19-Dec-01		8.4						

UNDERLINED VALUES ARE LESS THAN MDL.

BLANK RANGES INDICATE NO ANALYSES WERE REQUESTED.

** DATA ITALICIZED MEANS THE SAMPLE IS A DUPLICATE THE SAMPLE ABOVE.

1) MDL = METHOD DETECTION LIMIT.

2) PQL = PRACTICAL QUANTITATION LIMIT.

TABLE 14
CHATFIELD RESERVOIR NEAR DAM
(FIELD CODE - RM)
FIELD MEASUREMENTS

DATE	TIME	Sampling depth (Meters)	Total depth (Meters)	Transparency Secchi disk (Meters)	pH, Field (Std. Units)	Specific Conductance (us/cm)	Oxygen, dissolved (mg/l)	Temperature (deg. C)
MDL ¹⁾								
PQL ²⁾								
23-Jan-01	1245	1			7.92	366	14.50	3.6
23-Jan-01	1240	1		ICE	7.92	366	14.50	3.6
23-Jan-01	1235	5	6		7.69	369	8.90	3.6
27-Feb-01	1200	1			7.95	379	14.08	4.2
27-Feb-01	1215	1		2	7.95	379	14.08	4.2
27-Feb-01	1230	5	6		7.70	402	12.65	3.7
28-Mar-01	1115	1			7.70	358	9.20	5.7
28-Mar-01	1100	1		2	7.70	358	9.20	5.7
28-Mar-01	1045	10	11		7.09	357	9.20	5.4
18-Apr-01	830	1			7.93	359	11.64	9.0
18-Apr-01	845	1		2.5	7.93	359	11.64	9.0
18-Apr-01	900	10	11		7.73	360	11.82	8.5
16-May-01	900	1			7.69	330	10.51	16.1
16-May-01	915	1		2	7.69	330	10.51	16.1
16-May-01	930	10	11		7.11	340	7.69	10.8
13-Jun-01	900	1			7.67	327	9.03	19.0
13-Jun-01	915	1.5		3	7.69	325	9.03	19.0
13-Jun-01	930	10	11		6.97	324	3.02	15.0
11-Jul-01	1115	1			7.80	320	8.24	22.5
11-Jul-01	1100	0.5		1	7.80	320	8.42	22.5
11-Jul-01	1045	10	11		7.12	306	3.11	19.6
24-Jul-01	1100	1			7.42	317	7.67	23.3
24-Jul-01	1115	1		2	7.42	317	7.67	23.3
24-Jul-01	1130	8	9		6.87	313	2.58	21.2
15-Aug-01	1000	1			7.06	318	7.12	21.8
15-Aug-01	1015	1.5		2.5	7.06	318	7.12	21.8
15-Aug-01	1030	10	11		7.34	317	5.99	21.6
12-Sep-01	1115	1			7.93	330	9.53	18.0
12-Sep-01	1100	1		2	7.93	330	7.70	17.8
12-Sep-01	1045	8	9		7.43	330	7.70	17.8
26-Sep-01	1115	1			7.91	328	9.10	17.8
26-Sep-01	1100	1		2	7.91	328	9.10	17.8
26-Sep-01	1045	8	9		7.70	325	8.65	17.6
10-Oct-01	1100	1			7.64	332	8.40	14.7
10-Oct-01	1045	1		2	7.64	332	8.40	14.7
10-Oct-01	1030	7	8		7.64	331	8.70	13.8
14-Nov-01	1215	1			7.94	350	10.95	8.5
14-Nov-01	1200	1		1.5	7.94	350	10.95	8.5
14-Nov-01	1145	9	10		7.68	345	10.64	8.4

UNDERLINED VALUES ARE LESS THAN MDL.

BLANK RANGES INDICATE NO ANALYSES WERE REQUESTED.

** DATA ITALICIZED MEANS THE SAMPLE IS A DUPLICATE OR A SPLIT OF THE SAMPLE IMMEDIATELY ABOVE.

1) MDL = METHOD DETECTION LIMIT.

2) PQL = PRACTICAL QUANTITATION LIMIT.

TABLE 15
 CHATFIELD RESERVOIR NEAR DAM
 (FIELD CODE - RM)
 MISCELLANEOUS ANALYSES

DATE	Sampling depth (Meters)	Total Oranic Carbon mg/L	Chlorophyll_a (mg/M ³)	Coliform, Fecal (#/100 ML)	Cyanide, WAD (mg/L)	Total Suspended Solids (TSS) (gm/M ³)	Total Alkalinity (mg/L)
MDL ¹⁾		5	0.30	1	0.01	5	2
PQL ²⁾		20		1	0.05	20	10
23-Jan-01	1	3	9.44	<u>1</u>		<u>3</u>	
23-Jan-01	1	2		8		6	
23-Jan-01	5	2		13		<u>3</u>	
27-Feb-01	1	5	4.43	<u><2</u>	<u>0.005</u>	<u>3</u>	89
27-Feb-01	1	5		<u><2</u>	<u>0.005</u>	<u>3</u>	93
27-Feb-01	5	4		<u><2</u>	<u>0.005</u>	<u>3</u>	91
28-Mar-01	1	5	8.11	<u><2</u>		6	
28-Mar-01	1	5		<2		6	
28-Mar-01	10	4		<2		22	
28-Mar-01	10	6		<u><2</u>		<u>24</u>	
18-Apr-01	1	5	8.15	<2		<u>0</u>	
18-Apr-01	1			<2		<u>0</u>	
18-Apr-01	1	5		<u><2</u>		<u>0</u>	
18-Apr-01	10	4		<2		<u>0</u>	
16-May-01	1	6	7.28	2	0.005	<u>3</u>	87
16-May-01	1	6		<2	0.005	<u>3</u>	88
16-May-01	10	5		<u><2</u>	0.005	<u>6</u>	89
13-Jun-01	1	3		<u><2</u>		<u>3</u>	
13-Jun-01	1	4	13.80	<u><2</u>		<u>6</u>	
13-Jun-01	2	3		<2		6	
13-Jun-01	10	3		<2		<u>3</u>	
11-Jul-01	1	5	13.75	<2		<u>3</u>	
11-Jul-01	1	4		<2		6	
11-Jul-01	10	4		27		14	
11-Jul-01	10	4		30		<u>6</u>	
24-Jul-01	1		7.35	13		<u>3</u>	
24-Jul-01	1			30		8	
24-Jul-01	8			30		14	
15-Aug-01	1		10.30			<u>3</u>	
15-Aug-01	2					<u>3</u>	
15-Aug-01	10					18	
29-Aug-01	1	3	8.70	<2		8	
29-Aug-01	1	2		<2		<u>3</u>	
29-Aug-01	8	1		<2		6	
12-Sep-01	1		11.20	<u><2</u>		6	
12-Sep-01	1			<u><2</u>		6	
12-Sep-01	8			8		10	
26-Sep-01	1	4	11.20	<2		<u>3</u>	
26-Sep-01	1	5		<2		<u>3</u>	
26-Sep-01	7	5		<2		<u>3</u>	
10-Oct-01	1	3	15.30	<2		<u>3</u>	
10-Oct-01	1	3		<u><2</u>		<u>3</u>	
10-Oct-01	9	3		<u><2</u>		10	
14-Nov-01	1	3	15.30	<2	<u>0.000</u>	<u>0</u>	91
14-Nov-01	1	3		<2	<u>0.000</u>	<u>6</u>	92
14-Nov-01	9	3		<u><2</u>	<u>0.060</u>	34	91

UNDERLINED VALUES ARE LESS THAN MDL.

BLANK RANGES INDICATE NO ANALYSES WERE REQUESTED.

** DATA ITALICIZED MEANS THE SAMPLE IS A DUPLICATE OR A SPLIT OF THE SAMPLE IMMEDIATELY ABOVE.

1) MDL = METHOD DETECTION LIMIT.

2) PQL = PRACTICAL QUANTITATION LIMIT.

TABLE 16
 CHATFIELD RESERVOIR NEAR DAM
 (FIELD CODE - RM)
 NUTRIENT ANALYSES

DATE	Sampling depth (Meters)	Nitrogen, total (mg/L)	Phosphorus ortho, total (mg/L as P)	Phosphorus, total (mg/L as P)
MDL ¹⁾		0.1	0.005	0.02
PQL ²⁾		0.5	0.03	0.1
23-Jan-01	1	0.40	0.0060	<u>0.01</u>
23-Jan-01	1	0.20	<u>0.0025</u>	<u>0.01</u>
23-Jan-01	5	0.30	<u>0.0025</u>	<u>0.01</u>
27-Feb-01	1	0.20	<u>0.0025</u>	<u>0.01</u>
27-Feb-01	1	0.30	<u>0.0025</u>	<u>0.01</u>
27-Feb-01	5	0.30	<u>0.0025</u>	<u>0.01</u>
28-Mar-01	1	0.40	<u>0.0025</u>	0.03
28-Mar-01	1	0.40	<u>0.0025</u>	0.03
28-Mar-01	10	0.60	<u>0.0025</u>	0.05
28-Mar-01	10	<i>0.50</i>	<u>0.0025</u>	<i>0.05</i>
18-Apr-01	1	0.30	0.0120	<u>0.01</u>
18-Apr-01	1	0.30	0.0100	<u>0.01</u>
18-Apr-01	10	0.30	0.0100	<u>0.01</u>
16-May-01	1	0.30	0.0100	<u>0.02</u>
16-May-01	1	0.50	<u>0.0025</u>	<u>0.01</u>
16-May-01	10	0.50	<u>0.0025</u>	<u>0.02</u>
13-Jun-01	1	<u>0.10</u>	<u>0.0025</u>	0.03
13-Jun-01	1	<i>0.10</i>	<i>0.0025</i>	<i>0.03</i>
13-Jun-01	1.5	<u>0.05</u>	<u>0.0025</u>	<u>0.01</u>
13-Jun-01	10	<u>0.10</u>	<u>0.0050</u>	<u>0.01</u>
11-Jul-01	1	0.40	0.0080	0.03
11-Jul-01	0.5	0.30	<u>0.0025</u>	0.04
11-Jul-01	10	0.40	0.0170	0.03
11-Jul-01	10	<i>0.40</i>	<i>0.0160</i>	<i>0.05</i>
24-Jul-01	1	0.30	<u>0.0025</u>	<u>0.02</u>
24-Jul-01	1	0.30	<u>0.0025</u>	0.03
24-Jul-01	8	0.30	0.0180	0.08
15-Aug-01	1	*	<u>0.0025</u>	<u>0.02</u>
15-Aug-01	1.5	*	0.0080	<u>0.02</u>
15-Aug-01	10	*	0.0150	0.05
29-Aug-01	1	*	0.0070	<u>0.01</u>
29-Aug-01	1	*	0.0060	<u>0.01</u>
29-Aug-01	8	*	0.0060	0.03
12-Sep-01	1	*	***	0.03
12-Sep-01	1	*	***	0.02
12-Sep-01	8	*	***	0.03
26-Sep-01	1	0.40	0.0090	0.03
26-Sep-01	1	0.30	0.0050	<u>0.02</u>
26-Sep-01	7	0.40	0.0110	0.03
10-Oct-01	1	0.40	0.0080	<u>0.02</u>
10-Oct-01	1	0.40	0.0080	0.03
10-Oct-01	9	0.40	0.0110	0.04
14-Nov-01	0.5	0.40	0.0060	<u>0.01</u>
14-Nov-01	0.5	0.50	***	0.04
14-Nov-01	1	0.80	0.0390	0.05

UNDERLINED VALUES ARE LESS THAN MDL.

BLANK RANGES INDICATE NO ANALYSES WERE REQUESTED.

* Samples not analyzed due to lab instrument failure, hold times expired.

** DATA ITALICIZED MEANS THE SAMPLE IS A DUPLICATE OR A SPLIT OF THE SAMPLE IMMEDIATELY ABOVE.

*** Analyses not performed due to lab error

1) MDL = METHOD DETECTION LIMIT.

2) PQL = PRACTICAL QUANTITATION LIMIT.

**TABLE 17
CHATFIELD RESERVOIR NEAR DAM
(FIELD CODE - RM)
METALS ANALYSES**

DATE	Sampling depth (Meters)	Arsenic, total (mg/l)	Cadmium, dissolved (mg/l)	Calcium, dissolved (mg/l)	Copper, dissolved (mg/l)	Cyanide, WAD	Hardness dissolved (mg/l)
MDL ¹⁾		0.001	0.003	0.2	0.01		1
PQL ²⁾		0.005	0.02	1.0	0.05		7
23-Jan-01	1			41.7			147
23-Jan-01	1			41.9			147
23-Jan-01	5			41.3			145
27-Feb-01	1			42.1		<u>0.005</u>	147
27-Feb-01	1			42.1		<u>0.005</u>	146
27-Feb-01	5			40.6		<u>0.005</u>	141
28-Mar-01	1			41.0			144
28-Mar-01	1			40.9			143
28-Mar-01	1			41.6			146
28-Mar-01	10			41.0			144
18-Apr-01	1			45.7			154
18-Apr-01	1			45.6			153
18-Apr-01	1			45.1			151
18-Apr-01	10			45.0			152
16-May-01	1			40.5		<u>0.005</u>	137
16-May-01	1			40.9		<u>0.005</u>	138
16-May-01	10			41.7		<u>0.005</u>	142
13-Jun-01	1			41.1			138
13-Jun-01	1			39.8			134
13-Jun-01	1.5			41.0			137
13-Jun-01	10			42.6			142
11-Jul-01	1			37.6			130
11-Jul-01	0.5			38.1			131
11-Jul-01	10			37.2			129
11-Jul-01	10			37.0			128
15-Aug-01	1	0.0005	<u>0.0015</u>	36.1	<u>0.005</u>		127
15-Aug-01	1.5	0.0005	<u>0.0015</u>	36.2	<u>0.005</u>		127
15-Aug-01	10	0.001	<u>0.0015</u>	35.7	<u>0.005</u>		126
29-Aug-01	1			37.2			130
29-Aug-01	1			37.8			131
29-Aug-01	8			36.6			128
26-Sep-01	1			38.0			132
26-Sep-01	1			37.0			129
26-Sep-01	7			37.8			131
10-Oct-01	1			37.9			133
10-Oct-01	1			37.7			132
10-Oct-01	9			38.1			133
14-Nov-01	1			37.1			136
14-Nov-01	1			37.1			136
14-Nov-01	9			37.4			137
19-Dec-01	unsafe ice			ICE			ICE
19-Dec-01	unsafe ice			ICE			ICE
19-Dec-01	unsafe ice			ICE			ICE

UNDERLINED VALUES ARE LESS THAN MDL.
BLANK RANGES INDICATE NO ANALYSES WERE REQUESTED.

**TABLE 17
CHATFIELD RESERVOIR NEAR DAM
(FIELD CODE - RM)
METALS ANALYSES**

DATE	Sampling depth (Meters)	Iron, dissolved (mg/l)	Lead, dissolved (mg/l)	Magnesium, dissolved (mg/l)	Manganese, dissolved (mg/l)	Mercury, dissolved (mg/l)	Nickel, dissolved (mg/l)	Selenium, dissolved (mg/l)	Silver, dissolved (mg/l)	Zinc, dissolved (mg/l)
MDL ¹⁾		0.01	0.04	0.2	0.005	0.0002	0.01	0.001	0.005	0.01
PQL ²⁾		0.05	0.2	1	0.03	0.001	0.05	0.005	0.03	0.05
23-Jan-01	1			10.3						
23-Jan-01	1			10.3						
23-Jan-01	5			10.1						
27-Feb-01	1			10.1						
27-Feb-01	1			9.9						
27-Feb-01	5			9.7						
28-Mar-01	1			10						
28-Mar-01	1			10						
28-Mar-01	1			10.1						
28-Mar-01	10			10						
18-Apr-01	1			9.6						
18-Apr-01	1			9.6						
18-Apr-01	1			9.4						
18-Apr-01	10			9.5						
16-May-01	1			8.6						
16-May-01	1			8.7						
16-May-01	10			9.1						
13-Jun-01	1			8.6						
13-Jun-01	1			8.4						
13-Jun-01	1.5			8.4						
13-Jun-01	10			8.7						
11-Jul-01	1			8.7						
11-Jul-01	0.5			8.6						
11-Jul-01	10			8.7						
11-Jul-01	10			8.6						
15-Aug-01	1	0.005	<u>0.02</u>	9	0.009	<u>0.0001</u>	<u>0.005</u>	<u>0.0005</u>	<u>0.00025</u>	0.02
15-Aug-01	1.5	0.005	<u>0.02</u>	9	0.0025	<u>0.0004</u>	<u>0.005</u>	<u>0.0005</u>	<u>0.00025</u>	0.02
15-Aug-01	10	0.01	<u>0.02</u>	8.9	0.024	<u>0.0002</u>	<u>0.005</u>	<u>0.0005</u>	<u>0.00025</u>	0.03
29-Aug-01	1			8.9						
29-Aug-01	1			9						
29-Aug-01	8			8.9						
26-Sep-01	1			9.1						
26-Sep-01	1			8.8						
26-Sep-01	7			9						
10-Oct-01	1			9.3						
10-Oct-01	1			9.2						
10-Oct-01	9			9.3						
14-Nov-01	1			10.6						
14-Nov-01	1			10.6						
14-Nov-01	9			10.6						
19-Dec-01	unsafe ice			ICE						
19-Dec-01	unsafe ice			ICE						
19-Dec-01	unsafe ice			ICE						

UNDERLINED VALUES ARE LESS THAN MDL.
BLANK RANGES INDICATE NO ANALYSES WERE REQUESTED.

TABLE 18 (Continued)
CHATFIELD IN-RESERVOIR DEPTH-PROFILE DATA
(FIELD CODE RM)

May 16, 2001, 0900 hours				
DEPTH (meters)	pH (s.u.)	SC (uS/cm)	DO (mg/L)	TEMP. (deg C)
1	7.7	330	10.5	16.1
2	7.7	330	9.5	16.1
3	7.6	332	9.9	15.8
4	7.4	332	9.3	14.6
5	7.2	344	9.0	12.5
6	7.2	346	8.7	12.2
7	7.1	346	7.9	11.2
8	7.1	346	8.0	11.0
9	7.1	340	7.7	10.9
10	7.1	340	7.7	10.8

June 13, 2001, 0900 hours				
DEPTH (meters)	pH (s.u.)	SC (uS/cm)	DO (mg/L)	TEMP. (deg C)
1	7.7	327	9.0	19.0
2	7.7	325	9.0	19.0
3	7.7	326	9.0	19.0
4	7.7	326	8.9	18.9
5	7.6	326	8.6	18.8
6	7.3	327	8.4	18.4
7	7.0	317	5.8	16.9
8	6.9	307	6.4	16.4
9	6.9	324	3.8	15.6
10	7.0	324	3.0	15.0

TABLE 18 (Continued)
CHATFIELD IN-RESERVOIR DEPTH-PROFILE DATA
(FIELD CODE RM)

July 11, 2001, 1045 hours				
DEPTH (meters)	pH (s.u.)	SC (uS/cm)	DO (mg/L)	TEMP. (deg C)
1	7.8	320	8.4	22.5
2	7.8	320	8.6	22.0
3	7.6	320	7.8	21.9
4	7.6	320	7.8	21.9
5	7.6	321	7.6	21.8
6	7.5	320	7.0	21.7
7	7.3	325	5.0	21.0
8	7.1	314	3.7	20.3
9	7.1	307	3.3	19.9
10	7.1	306	3.1	19.6

July 24, 2001, 1100 hours				
DEPTH (meters)	pH (s.u.)	SC (uS/cm)	DO (mg/L)	TEMP. (deg C)
1	7.4	317	7.7	23.3
2	7.4	316	7.7	22.7
3	7.3	316	7.3	22.6
4	7.2	318	7.3	22.5
5	7.1	318	7.1	22.4
6	7.0	316	5.8	22.2
7	6.9	314	3.6	21.5
8	6.9	313	2.6	21.2

TABLE 18 (Continued)
CHATFIELD IN-RESERVOIR DEPTH-PROFILE DATA
(FIELD CODE RM)

August 15, 2001, 1030 hours				
DEPTH (meters)	pH (s.u.)	SC (uS/cm)	DO (mg/L)	TEMP. (deg C)
1	7.1	318	7.1	21.8
2	7.0	318	7.0	21.7
3	7.0	318	6.8	21.6
4	7.1	318	6.8	21.6
5	7.1	318	6.6	21.6
6	7.0	318	6.9	21.6
7	7.1	316	6.6	21.6
8	7.1	317	6.7	21.6
9	7.2	317	5.8	21.6
10	7.3	317	6.0	21.6

August 29, 2001, 0945 hours				
DEPTH (meters)	pH (s.u.)	SC (uS/cm)	DO (mg/L)	TEMP. (deg C)
1	7.4	319	7.8	20.6
2	7.4	319	7.7	20.5
3	7.4	319	7.6	20.5
4	7.4	319	7.7	20.4
5	7.4	319	7.5	20.4
6	7.4	319	7.5	20.4
7	7.3	316	7.4	20.4
8	7.3	316	7.5	20.5
9	7.1	329	7.2	20.4
10	6.8	338	7.2	20.5

TABLE 18 (Continued)
CHATFIELD IN-RESERVOIR DEPTH-PROFILE DATA
(FIELD CODE RM)

September 12, 2001, 1045 hours				
DEPTH (meters)	pH (s.u.)	SC (uS/cm)	DO (mg/L)	TEMP. (deg C)
1	7.9	330	9.5	18.0
2	7.9	329	9.1	17.9
3	7.8	330	8.9	17.7
4	7.8	330	8.5	17.7
5	7.7	330	8.4	17.7
6	7.7	329	8.4	17.7
7	7.6	319	7.7	17.8
8	7.4	320	7.7	17.8

September 26, 2001, 1045 hours				
DEPTH (meters)	pH (s.u.)	SC (uS/cm)	DO (mg/L)	TEMP. (deg C)
1	7.9	328	9.1	17.8
2	7.8	328	8.9	17.7
3	7.8	328	8.8	17.6
4	7.8	328	8.9	17.6
5	7.8	328	8.9	17.7
6	7.8	328	9.0	17.7
7	7.7	325	8.9	17.6
8	7.7	325	8.7	17.6

TABLE 18 (Continued)
CHATFIELD IN-RESERVOIR DEPTH-PROFILE DATA
(FIELD CODE RM)

October 10, 2001, 1030 hours				
DEPTH (meters)	pH (s.u.)	SC (uS/cm)	DO (mg/L)	TEMP. (deg C)
1	7.6	332	8.4	14.7
2	7.6	332	7.6	14.4
3	7.7	332	7.9	14.3
4	7.6	332	7.9	14.1
5	7.6	333	8.2	14.1
6	7.7	333	8.2	14.0
7	7.6	331	8.7	13.8

November 14, 2001, 1145 hours				
DEPTH (meters)	pH (s.u.)	SC (uS/cm)	DO (mg/L)	TEMP. (deg C)
1	7.9	350	11.0	8.5
2	7.9	350	10.2	8.4
3	7.9	347	10.9	8.3
4	7.9	348	11.3	8.2
5	7.9	348	10.8	8.2
6	7.9	348	11.0	8.2
7	7.9	345	11.2	8.3
8	7.8	345	10.7	8.3
9	7.7	345	10.6	8.4

TABLE 19
 CHATFIELD RESERVOIR NEAR DAM
 (FIELD CODE - RM)
 SEDIMENT-QUALITY DATA

DATE	Arsenic, total mg/L	Cadmium, total (mg/l)	Copper, total (mg/l)	Lead, total (mg/l)	Mercury, total (mg/l)	Phosphorus, total (mg/l)	Selenium, total (mg/l)
MDL ¹⁾	0.001	0.5	2	7	0.02	0.0004	0.2
PQL ²⁾	0.005	2	8	30	0.1	0.002	0.8
15-Aug-01	2.0	<u>0.15</u>	14.9	22	<u>0.02</u>	0.0328	0.77

DATE	Carbon, total organic (TOC) (mg/kg)	Texture by Hydrometer		
		Silt (percent)	Clay (percent)	Solids (percent)
MDL ¹⁾	0.02	0.1	0.1	0.1
PQL ²⁾	0.1	5	5	0.5
15-Aug-01	0.86	7.5	17.5	98.8

UNDERLINED VALUES ARE LESS THAN MDL.
 BLANK RANGES INDICATE NO ANALYSES WERE REQUESTED.
 ** DATA ITALICIZED MEANS THE SAMPLE IS A DUPLICATE OR A SPLIT OF THE SAMPLE IMMEDIATELY ABOVE.
 1) MDL = METHOD DETECTION LIMIT.
 2) PQL = PRACTICAL QUANTITATION LIMIT.

TABLE 20
PHYTOPLANKTON DATA, 2001 SURVEY RESULTS
CHATFIELD RESERVOIR (Field Code RM)

Date	5/16/01	7/24/01	8/29/01	9/12/01	11/14/01
BACILLARIOPHYTA (cells/ml)					
<i>Asterionella formosa</i>	800	2			
<i>Aulacoseira granulata</i>			50	102.5	
<i>Aulacoseira italica var. tenuissima</i>		60			
<i>Cyclotella</i> sp.		5	320	10	480
<i>Fragilaria crotonensis</i>	202.5				
<i>Nitzschia acicularis</i>		120	240		
<i>Nitzschia paleacea</i>			560	20	
<i>Nitzschia</i> sp.			1360		240
<i>Synedra acus</i>		20			
<i>Synedra rumpens var. familiaris</i>			320	20	
<i>Synedra ulna var. chaseana</i>			2.5	5	
CHLOROPHYTA (cells/ml)					
<i>Ankistrodesmus falcatus</i>				90	
<i>Ankistrodesmus gracilis</i>		30			
<i>Chlamydomonas angulosa</i>		40			160
<i>Chlamydomonas</i> sp.		500	20		750
<i>Chlorella minutissima</i>	19500	33750	52500	12750	23250
<i>Chlorella vulgaris</i>		1000	125		
<i>Chlorogonium</i> sp.					80
<i>Choricystis minor</i>	3000	24000	13000	32500	11500
<i>Closterium</i> sp.		10			
<i>Crucigenia smithii</i>					10
<i>Crucigenia tetrapedia</i>				320	
<i>Dictyosphaerium ehrenbergianum</i>				680	
<i>Fusola viridis</i>		20			10
<i>Kirchneriella lunaris</i>					480
<i>Lagerheimia genevensis</i>			40	20	
<i>Micractinium pusillum</i>				20	62.5
<i>Monoraphidium minutum</i>		80	400	380	
<i>Pandorina morum</i>		12			
<i>Raphidocelis contorta</i>			160	60	
<i>Scenedesmus communis</i>				40	320
<i>Scenedesmus intermedius</i>		80		200	160
<i>Tetrastrum elegans</i>				80	
<i>Treubaria triappendiculata</i>		80	10		

TABLE 20
PHYTOPLANKTON DATA, 2001 SURVEY RESULTS
CHATFIELD RESERVOIR (Field Code RM)

Date	5/16/01	7/24/01	8/29/01	9/12/01	11/14/01
CHRYSTOPHYTA (cells/ml)					
<i>Dinobryon bavaricum</i>			32.5	2.5	290
<i>Dinobryon cylindricum</i>		2			
<i>Dinobryon divergens</i>		36			
<i>Dinobryon sociale var americana</i>			40		115
<i>Ochromonas minuscula</i>			1000		
CRYPTOPHYTA (cells/ml)					
<i>Campylomonas reflexa</i>		25	37.5	152.5	480
<i>Campylomonas rostratiformis</i>		15	2.5	12.5	
<i>Campylomonas sp.</i>		25			
<i>Cyathomonas truncata</i>	290				
<i>Plagioselmis nannoplantica</i>		1800	120	6200	5360
<i>Storeatula rhinosa</i>	120			20	
CYANOPHYTA (cells/ml)					
<i>Anabaenopsis sp.</i>			490	565	
<i>Aphanocapsa delicatissima</i>		5000	4000		
<i>Aphanothece clathrata</i>					187.5
<i>Aphanothece minutissima</i>	37500	64250	45000	96750	20000
<i>Cyanobium sp.</i>			10500	500	
<i>Dactylococcopsis fascicularis</i>		120		80	
<i>Dactylococcopsis sp.</i>					7280
<i>Mersmopedia tenuissima</i>				160	
<i>Oscillatoria sp.</i>		3040	960	220	8960
<i>Pseudanabaena sp.</i>		560			
<i>Rhabdogloe smithii</i>			7680		
<i>Synechococcus sigmoideus</i>		125			
EUGLENOPHYTA (cells/ml)					
<i>Euglena viridis</i>		1	40		
<i>Trachelomonas sp.</i>		2	20	47.5	20
PYRRROPHYTA (cells/ml)					
<i>Peridinium aciculiferum</i>		5			
<i>Peridinium umbonatum</i>		40			
TOTAL DENSITY	61412.5	134855	139030	152007.5	80195
Number of Species	7	33	29	29	22

TABLE 21
ZOOPLANKTON DATA, 2001 SURVEY RESULTS
CHATFIELD RESERVOIR (FIELD CODE RM) - August 15, 2001

Taxa	Mean Density in Concentrate (organisms/ml)	Specific Density in Lake (organisms/ml)	General Density in Lake (organisms/ml)
ROTIFERA (rotifers)			
<i>Asplanchna</i> sp.	35.67	8.05	8
<i>Conochilus</i> sp.	1.33	0.30	0.5
<i>Kellicottia</i> sp.	1.67	0.38	0.5
<i>Keratella</i> sp.	35.33	7.79	8
<i>Polyarthra</i> sp.	90.00	20.31	20
CLADOCERA (water fleas)			
<i>Bosmina longirostris</i>	1.33	0.30	0.5
<i>Daphnia pulex</i>	4.33	0.98	1
<i>Daphnia rosea</i>	0.67	0.15	0.5
<i>Diaphanosoma</i> sp.	0.33	0.07	0.5
<i>Nauplius</i> sp.	45.67	10.31	10
COPEPODA (copepods)			
<i>Canthocamptus</i> sp.	0.33	0.07	0.5
<i>Cyclops</i> sp.	1.00	0.23	0.5
<i>Diaptomus</i> sp.	0.37	0.15	0.5
TOTAL DENSITY	218.33	49.28	49
TOTAL NUMBER OF TAXA	13	13	13

TABLE 22
 BASIN-WIDE SCREENING SURVEYS
 CHATFIELD WATERSHED - APRIL 2001

DATE	Screening Location	TIME	Field Measurements							Lab Analyses		
			Instantaneous Flow (est.) (cfs) ¹⁾	Specific Conductance Field (us/cm)	Oxygen dissolved (mg/l)	pH (std. Units)	Temperature (Deg C)	Nitrate, Field (mg/l)	Total Phosphorous Field (mg/l)	Total Suspended Solids (TSS) (gm/M ³)		
MDL ¹⁾												5
PQL ²⁾												20
04-04-2001	CH01	805	3	0.245	10.6	6.27	1.7	1.5	0.5			8
04-04-2001	CH02	955	1	0.52	6.5	7.37	8.5	0.7	0.2			2.5
04-04-2001	CH03	920	40	0.379	10.8	7.24	4.3	1.7	0.1			2.5
04-04-2001	CH04	845	50	0.287	10.3	7.29	5.5	1.6	0.1			2.5
04-04-2001	CH05					No Flow						
04-04-2001	CH06	1050	54	0.308	10.2	7.4	9.3	1.7	0.1			2.5
04-04-2001	CH07	1105	60	0.304	10.3	7.32	9.3	1	0.3			2.5
04-04-2001	CH08	1025	2	0.89	11	8.08	10.3	2.1	0.2			2.5
04-04-2001	CH09	1500	1	0.116	6.2	7.1	13.9	0	0.7			2.5
04-04-2001	CH10	1445	11	0.104	9	7.87	12.6	1.2	0.2			2.5
04-04-2001	CH11	1420	14	0.214	7.3	8	15	1.5	0.1			2.5
04-04-2001	CH12	1350	20	0.247	7.3	7.91	16.4	0.6	2.2			14
04-04-2001	CH13	1330	25	0.321	9.1	8.1	16.4	0.4	0.9			44
04-04-2001	CH14	1310	30	0.428	8.1	8.02	16.8	4.7	4.8			234
04-04-2001	CH15	1215	43	0.354	7.9	7.89	15	3.6	1.2			62
04-04-2001	CH16	1125	65	0.389	8.3	7.53	10.8	1.9	0.8			28
04-04-2001	CH17	1150	0	0.407	8.9	7.61	10.4	1.7	0.4			18
04-04-2001	CH18	1240	1	0.516	9	7.97	14.5	0.8	0			6
04-04-2001	CH20	1630	9	0.088	7.5	7.97	13	2.9	0.4			6
04-04-2001	CH21	1545	0.5	0.089	9.1	7.62	5.8	1.2	0.1			2.5
04-04-2001	CH22	1520	7	0.142	6.9	7.36	13	1.5	0.2			6
04-04-2001	CH23	1615	8	0.314	7.9	7.83	14.6	0.9	0.5			16
04-04-2001	CH24	125	15	0.262	7.4	8.12	14.8	2.1	0			6
04-12-2001	CH01	745	4	0.249	14.12	5.92	0.5	3	0.3			16
04-12-2001	CH02	910	0	1.64	6.81	7.36	4.6	2.9	1.1			14
04-12-2001	CH03	845	45	0.391	10.36	7.54	4.8	2.1	0.1			2.5
04-12-2001	CH04	820	55	0.308	11.01	7.65	4.6	2	0.1			2.5
04-12-2001	CH05	745	0.5	0.249	14.12	5.92	0.5	3	0.3			10
04-12-2001	CH06	940	60	0.362	11.53	8.18	5.3	2.1	0.4			2.5
04-12-2001	CH07	955	65	0.343	11.66	8.01	5.5	1.8	0			2.5
04-12-2001	CH08	925	8	1.15	11.31	8.04	4.4	1.2	0			30
04-12-2001	CH09	1325	3	0.097	11.06	7.31	2.4	2.1	0.7			18
04-12-2001	CH10	1310	7	0.112	11.55	7.6	4.4	1.3	0.1			2.5
04-12-2001	CH11	1250	12	0.197	10.37	7.75	6.8	1.5	0.4			2.5
04-12-2001	CH12	1215	15	0.234	8.79	7.69	9.7	2.8	2			92
04-12-2001	CH13	1155	24	0.431	9.71	7.85	9.1	0	3.6			124
04-12-2001	CH14	1135	30	0.435	9.07	7.74	10.4	0	8.2			464

TABLE 22
 BASIN-WIDE SCREENING SURVEYS
 CHATFIELD WATERSHED - APRIL 2001

DATE	Screening Location	TIME	Instantaneous Flow (est.) (cfs) ¹⁾	Field Measurements						Lab Analyses		
				Specific Conductance Field (us/cm)	Oxygen dissolved (mg/l)	pH (std. Units)	Temperature (Deg C)	Nitrate, Field (mg/l)	Total Phosphorous Field (mg/l)	Total Suspended Solids (TSS) (gm/M ³)		
MDL ¹⁾											5	
PQL ²⁾											20	
04-12-2001	CH15	1045	42	0.364	9.97	7.69	8	5.7	0.8		286	
04-12-2001	CH16	1030	60	0.41	10.93	7.59	4.4	2.4	3.8		76	
04-12-2001	CH17	1010	0	0.412	11.26	7.63	4.9	2.4	2.5		60	
04-12-2001	CH18	1105	1	0.479	10.7	7.76	7.9	2.7	0.4		26	
04-12-2001	CH20	1430	9	0.096	8.69	7.72	9.7	0.8	0.2		2.5	
04-12-2001	CH21	1215	15	0.234	8.79	7.69	9.7	2.8	2		6	
04-12-2001	CH22	1350	7	0.114	9.71	7.34	6.4	1.6	0.02		16	
04-12-2001	CH23	1410	6	0.286	9.75	7.58	9.9	1.2	0.4		32	
04-12-2001	CH24	1120	17	0.253	9.09	7.9	9	0	0.5		138	
04-18-2001	CH01	620	7	0.231	12.08	5.35	3	1.6	2.4		2.5	
04-18-2001	CH02	1020	0	1.67	6.57	7.87	9.2	1.2	0.2		2.5	
04-18-2001	CH03	11	45	0.329	11.33	8.69	7.1	2.1	0		2.5	
04-18-2001	CH04	655	55	0.304	10.38	7.25	5.2	4	0		40	
04-18-2001	CH05	645	0.5	0.672	10.51	6.42	5.5	3.5	0.4		2.5	
04-18-2001	CH06	1000	60	0.321	11.82	8.47	8	3	0.1		2.5	
04-18-2001	CH07	950	70	0.325	11.08	8.28	7.4	2	0.1		16	
04-18-2001	CH08	1030	2	1.11	9.78	8.67	11.2	3.4	0.3		2.5	
04-18-2001	CH09	1410	4	0.109	6.96	7.8	14.1	2.3	0.2		2.5	
04-18-2001	CH10	1400	14	0.094	9.2	8.35	11.4	2.9	0.4		8	
04-18-2001	CH11	1340	23	0.187	8.23	8.27	14.5	3	0.5		62	
04-18-2001	CH12	1310	48	0.21	7.64	8.2	14.7	2.9	1.3		142	
04-18-2001	CH13	1250	52	0.259	7.93	8.28	15.2	0	4.5		230	
04-18-2001	CH14	1235	55	0.355	7.25	8.19	15.6	0.6	4.4		146	
04-18-2001	CH15	1145	70	0.291	8.34	8.36	13	1.6	3.1		82	
04-18-2001	CH16	715	84	0.339	8.95	7.6	5.9	2.5	2.3		44	
04-18-2001	CH17	935	90	0.362	9.3	7.95	7.6	2.3	1.3		8	
04-18-2001	CH18	1205	2	0.466	10.21	8.36	13.9	2.3	0.4		26	
04-18-2001	CH20	1530	16	0.76	7.66	8.19	15	3.4	1		2.5	
04-18-2001	CH21	1445	0.5	0.08	10.66	8.14	7	2.8	0.1		2.5	
04-18-2001	CH22	1430	14	0.112	7.86	7.85	14.6	2.7	0.2		42	
04-18-2001	CH23	1510	14	0.259	7.35	8.11	15.7	6.6	0.9		52	
04-18-2001	CH24	1220	22	0.214	8.3	8.42	13.9	2.3	1.3		10	
04-24-2001	CH01	640	4	0.282	13.42	5.1	1.2	1.8	0.3		26	
04-24-2001	CH02	810	1	1.7	7.62	7.32	5.2	1.7	0.3		2.5	
04-24-2001	CH03	740	50	0.319	11.01	7.17	4.9	1.2	0.1		0.4	
04-24-2001	CH04	720	58	0.309	11	6.84	4	1.2	0.4		6	
04-24-2001	CH05	705	2	0.515	10.33	6.6	3.9	1.6	0.4		14	
04-24-2001	CH06	840	60	0.347	11.41	7.79	5.7	2.2	0			

TABLE 22
 BASIN-WIDE SCREENING SURVEYS
 CHATFIELD WATERSHED - APRIL 2001

DATE	Screening Location	TIME	Instantaneous Flow (est.) (cfs) ¹⁾	Field Measurements					Lab Analyses			
				Specific Conductance Field (us/cm)	Oxygen dissolved (mg/l)	pH (std. Units)	Temperature (Deg C)	Nitrate, Field (mg/l)	Total Phosphorous Field (mg/l)	Total Suspended Solids (TSS) (gm/M ³)		
<u>MDL</u> ¹⁾												
<u>PQL</u> ²⁾												
04-24-2001	CH07	850	70	0.336	11.4	7.6	5.6	2.4	0.3		5	
04-24-2001	CH08	820	7.99	0.876	11.78		6	1.4	0.6		20	
04-24-2001	CH09	1215	6	0.096	8.3	6.87	11.9	1.8	0.4		2.5	
04-24-2001	CH10	1155	20	0.091	9.34	7.36	9.2	3.2	0.1		6	
04-24-2001	CH11	1135	32	0.168	9.22	7.66	10.9	1.2	0.4		6	
04-24-2001	CH12	1115	34	0.19	8.46	7.58	12	1.8	0.8		48	
04-24-2001	CH13	1045	35	0.236	9.07	7.47	10.4	0.6	1.2		52	
04-24-2001	CH14	1025	41	0.314	9.18	7.45	10.9	0	12.3		734	
04-24-2001	CH15	940	80	0.252	9.79	7.32	7.5	1.4	2.8		140	
04-24-2001	CH16	925	87	0.289	9.75	7.35	6	1.2	2.1		66	
04-24-2001	CH17	905	90	0.326	9.66	7.29	6	1.8	1.4		44	
04-24-2001	CH18	955	3	0.441	10.89	7.57	8.5	0	0.3		2.5	
04-24-2001	CH20	1350	20	0.071	7.72	7.45	12.7	2	0.2		2.5	
04-24-2001	CH21	1250	3	0.074	11.14	7.49	5.3	1.9	0		2.5	
04-24-2001	CH22	1235	16	0.087	8.7	7.31	11	1.9	0.3		2.5	
04-24-2001	CH23	1330	18	0.193	8.08	7.3	13.3	2.2	0.5		2.5	
04-24-2001	CH24	1010	48	0.188	9.79	7.43	8.3	2.8	1.5			

UNDERLINED VALUES ARE LESS THAN MDL.
 BLANK RANGES INDICATE NO ANALYSES WERE REQUESTED.

1) MDL = METHOD DETECTION LIMIT.
 2) PQL = PRACTICAL QUANTITATION LIMIT.

TABLE 23
BASIN-WIDE SCREENING SURVEYS
CHATFIELD WATERSHED -MAY 2001

DATE	Screening Location	TIME	Instantaneous Flow (est.) (cfs) ¹⁾	Field Measurements					Lab Analyses		
				Specific Conductance Field (us/cm)	Oxygen dissolved (mg/l)	pH (std. Units)	Temperature (Deg C)	Nitrate, Field (mg/l)	Total Phosphorous Field (mg/l)	Total Suspended Solids (TSS) (gm/M ³)	
MDL ³⁾											5
PQL ²⁾											20
3-May-01	CH01	635	4	0.252	12.40	5.37	3.6	2.5	0.20		6
3-May-01	CH02	825	0	1.670	7.83	6.93	4.9	1.8	0.90		10
3-May-01	CH03	755	40	0.320	10.12	6.94	5.7	3.5	0.60		2.5
3-May-01	CH04	725	50	0.311	10.35	6.66	4.3	1.2	0.20		2.5
3-May-01	CH05	715	3	0.588	10.66	6.57	3.6	0.7	1.00		12
3-May-01	CH06	850	60	0.351	11.22	7.52	4.0	2.0	0.00		6
3-May-01	CH07	905	70	0.340	10.30	7.27	4.2	0.5	0.20		2.5
3-May-01	CH08	830	5	1.080	9.92	7.63	5.6	1.8	1.00		18
3-May-01	CH09	1250	4	0.096	10.49	6.79	5.0	1.5	0.00		2.5
3-May-01	CH10	1235	12	0.098	10.61	7.25	4.9	1.6	0.10		2.5
3-May-01	CH11	1215	18	0.188	10.42	7.19	4.8	1.3	0.90		20
3-May-01	CH12	1200	20	0.215	10.14	7.44	5.4	0.7	1.70		70
3-May-01	CH13	1110	24	0.291	10.93	7.21	4.9	0.0	2.10		112
3-May-01	CH14	1050	32	0.351	10.48	7.25	5.4	0.0	12.50		704
3-May-01	CH15	1000	80	0.277	10.81	7.32	4.4	3.1	2.60		138
3-May-01	CH16	940	90	0.312	9.08	7.02	4.8	1.4	1.70		26
3-May-01	CH17	920	107	0.342	10.43	7.10	4.9	1.5	0.90		98
3-May-01	CH18	1020	2	0.440	9.92	7.23	5.1	1.9	0.90		10
3-May-01	CH20	1415	30	0.081	10.67	7.07	5.0	2.0	0.30		2.5
3-May-01	CH21	1330	0.5	0.079	10.88	6.71	2.2	1.5	0.10		2.5
3-May-01	CH22	1315	13	0.087	11.23	6.94	4.4	1.8	4.00		2.5
3-May-01	CH23	1355	24	0.183	10.58	7.16	5.6	1.0	0.60		2.5
3-May-01	CH24	1040	48	0.195	10.73	7.16	4.5	1.1	2.30		118
10-May-01	CH01	725	10	0.186	10.35	5.78	6.7	1.8	1.00		30
10-May-01	CH02	850	15	0.253	9.47	4.15	7.5	1.7	1.50		24
10-May-01	CH03	825	75	2.910	9.58	7.00	6.8	1.1	0.30		6
10-May-01	CH04	800	43	0.257	9.27	6.54	8.9	0.6	0.30		8
10-May-01	CH05	750	10	0.192	9.40	6.09	8.1	1.9	1.40		16
10-May-01	CH06	920	50	0.301	9.44	7.94	10.1	2.3	0.40		10
10-May-01	CH07	930	55	0.295	8.90	7.77	10.0	1.7	0.30		8
10-May-01	CH08	900	5	0.950	9.23	7.75	11.8	1.6	0.60		10
10-May-01	CH09	1255	10	0.077	8.86	7.40	9.6	0.9	0.70		20
10-May-01	CH10	1240	20	0.076	10.36	7.67	9.2	1.8	2.60		136
10-May-01	CH11	1225	25	0.133	9.50	7.45	11.4	0.0	2.70		58
10-May-01	CH12	1200	30	0.147	8.72	7.64	12.1	0.0	7.70		268
10-May-01	CH13	1130	38	0.180	8.41	7.62	12.6	0.0	6.50		232
10-May-01	CH14	1110	40	0.244	8.14	7.48	13.2	0.0	7.80		450
10-May-01	CH15	1025	80	0.172	9.01	7.57	11.0	0.0	9.40		468
10-May-01	CH16	1005	88	0.204	8.74	7.71	10.3	0.6	5.70		154
10-May-01	CH17	945	95	0.235	8.29	7.51	10.7	0.0	5.60		184
10-May-01	CH18	1040	2	0.264	8.73	7.60	10.4	0.0	11.00		494

TABLE 23
 BASIN-WIDE SCREENING SURVEYS
 CHATFIELD WATERSHED - MAY 2001

DATE	Screening Location	TIME	Instantaneous Flow (est.) (cfs) ¹⁾	Field Measurements					Lab Analyses			
				Specific Conductance Field (us/cm)	Oxygen dissolved (mg/l)	pH (std. Units)	Temperature (Deg C)	Nitrate, Field (mg/l)	Total Phosphorous Field (mg/l)	Total Suspended Solids (TSS) (gm/lit ²⁾		
MDL ¹⁾											20	5
PQL ²⁾											20	5
10-May-01	CH20	1420	40	0.061	8.70	7.47	11.6	1.4	0.10		74	
10-May-01	CH21	1330	3	0.066	10.34	7.35	6.5	1.0	1.90		32	
10-May-01	CH22	1315	25	0.062	8.90	7.39	10.4	1.2	0.70		12	
10-May-01	CH23	1405	30	0.120	8.39	7.27	12.5	1.2	4.10		220	
10-May-01	CH24	1055	45	0.131	9.22	7.61	11.2	0.0	9.70		540	
16-May-01	CH01	610	10	0.181	8.20	5.32	8.9	1.8	0.40		8	
16-May-01	CH02	1040	15	0.448	8.31	7.49	12.1	1.8	0.50		6	
16-May-01	CH03	1125	190	0.300	9.08	7.66	9.3	1.9	0.20		2.5	
16-May-01	CH04	635	62	0.271	9.23	6.12	8.4	0.8	0.20		2.5	
16-May-01	CH05	1105	2	0.325	7.79	7.84	12.9	1.5	0.70		2.5	
16-May-01	CH06	1020	70	0.290	8.93	7.53	11.2	1.7	0.40		2.5	
16-May-01	CH07	1005	75	0.291	9.06	7.57	11.2	1.2	0.30		14	
16-May-01	CH08	1050	3	1.270	10.04	7.93	15.4	2.4	0.20		2.5	
16-May-01	CH09	1410	10	0.087	6.45	6.84	14.9	1.2	0.20		6	
16-May-01	CH10	1355	18	0.086	6.91	7.29	15.8	2.1	0.90		18	
16-May-01	CH11	1335	22	0.159	6.53	7.14	17.5	0.1	0.60		14	
16-May-01	CH12	1320	28	0.177	6.04	7.25	18.8	0.8	1.30		44	
16-May-01	CH13	1305	30	0.220	6.16	7.42	19.8	0.0	1.40		42	
16-May-01	CH14	1245	40	0.309	6.28	7.25	19.9	0.0	4.30		216	
16-May-01	CH15	1205	75	0.184	6.35	7.24	17.4	0.0	3.20		130	
16-May-01	CH16	705	80	0.198	7.26	6.75	12.5	1.5	2.70		62	
16-May-01	CH17	950	85	0.232	6.70	7.38	14.2	0.0	2.40		70	
16-May-01	CH18	1220	3	0.384	7.33	7.28	15.3	0.7	0.40		10	
16-May-01	CH20	0	42	0.069	7.09	7.06	14.0	1.0	0.80		22	
16-May-01	CH21	1440	3	0.071	8.76	6.95	9.2	1.6	0.10		2.5	
16-May-01	CH22	1425	30	0.065	7.58	6.86	14.6	0.9	0.40		2.5	
16-May-01	CH23	1505	35	0.121	6.78	6.98	15.3	1.6	1.30		50	
16-May-01	CH24	1235	45	0.134	6.23	7.30	17.0	0.0	2.70		108	
22-May-01	CH01	625	9	0.201	3.10	5.13	5.7	3.1	0.30		8	
22-May-01	CH02	800	12	0.455	8.05	6.97	7.5	3.3	0.30		2.5	
22-May-01	CH03	730	140	0.219	9.02	6.75	8.5	3.0	1.00		16	
22-May-01	CH04	700	62	0.223	8.46	6.54	7.6	3.1	0.70		8	
22-May-01	CH05	650	2	0.449	9.44	6.06	6.6	3.0	0.40		6	
22-May-01	CH06	830	7.52	0.267	8.89	7.24	9.4	3.3	1.30		14	
22-May-01	CH07	840	70	0.257	6.65	7.59	8.9	2.6	0.60		10	
22-May-01	CH08	810	5	0.728	8.90	6.91	10.0	3.2	0.60		8	
22-May-01	CH09	1220	3	0.089	6.69	6.91	14.7	2.8	0.40		2.5	
22-May-01	CH10	1210	15	0.086	7.90	7.42	13.3	3.2	0.30		10	
22-May-01	CH11	1150	17	0.157	7.84	7.28	13.8	1.5	0.70		18	
22-May-01	CH12	1130	22	0.177	7.39	7.45	15.2	2.5	1.40		52	
22-May-01	CH13	1045	25	0.221	7.63	7.36	14.0	1.3	1.70		52	

TABLE 23
BASIN-WIDE SCREENING SURVEYS
CHATFIELD WATERSHED -MAY 2001

DATE	Screening Location	TIME	Instantaneous Flow (est.) (cfs) ¹⁾	Field Measurements					Lab Analyses		
				Specific Conductance Field (us/cm)	Oxygen dissolved (mg/l)	pH (std. Units)	Temperature (Deg C)	Nitrate, Field (mg/l)	Total Phosphorous Field (mg/l)	Total Suspended Solids (TSS) (gm/M ³)	
MDL ¹⁾											5
PQL ²⁾											200
22-May-01	CH14	1025	28	0.293	7.37	7.21	14.4	0.0	3.80		200
22-May-01	CH15	940	45	0.212	8.17	7.21	10.8	0.1	2.70		104
22-May-01	CH16	920	50	0.234	8.57	7.22	9.2	1.9	2.00		44
22-May-01	CH17	905	55	0.267	7.92	7.21	9.4	1.1	1.60		44
22-May-01	CH18	1000	2	0.371	9.23	7.24	11.9	1.5	0.20		6
22-May-01	CH20	1400	23	0.074	6.96	7.29	15.3	2.8	0.50		8
22-May-01	CH21	1300	1	0.073	9.33	7.21	9.3	3.3	0.00		2.5
22-May-01	CH22	1245	10	0.079	8.19	7.02	13.2	2.9	0.40		2.5
22-May-01	CH23	1345	14	0.141	7.20	7.11	15.9	2.4	0.60		22
22-May-01	CH24	1015	25	0.155	8.16	7.31	11.6	2.5	2.00		80
31-May-01	CH01	630	5	0.243	8.37	5.35	7.5	2.4	0.20		2.5
31-May-01	CH02	720	8	0.593	6.71	7.18	10.9	2.5	0.20		2.5
31-May-01	CH03	900	450	0.231	8.50	7.50	11.2	2.3	0.20		2.5
31-May-01	CH04	705	140	0.236	8.36	7.26	10.1	2.6	0.40		2.5
31-May-01	CH05	655	2	0.627	8.18	7.03	10.2	2.6	0.30		2.5
31-May-01	CH06	755	145	0.248	8.46	7.77	10.9	2.4	0.50		10
31-May-01	CH07	810	150	0.241	8.17	7.49	10.7	2.7	0.50		10
31-May-01	CH08	735	2	0.970	8.24	7.86	11.7	5.2	0.50		6
31-May-01	CH09	1230	2	0.094	5.85	7.21	18.7	2.3	0.10		6
31-May-01	CH10	1210	15	0.016	6.78	7.61	17.9	2.2	0.80		12
31-May-01	CH11	1150	22	0.180	6.96	7.61	17.9	2.6	0.20		2.5
31-May-01	CH12	1130	25	0.204	6.34	7.65	19.2	2.8	0.50		14
31-May-01	CH13	1100	30	0.263	6.26	7.58	18.2	0.9	0.70		24
31-May-01	CH14	1040	35	0.333	6.89	7.58	18.8	0.0	4.20		226
31-May-01	CH15	955	60	0.253	7.22	7.35	15.2	0.1	2.00		88
31-May-01	CH16	940	65	0.268	6.44	7.40	13.3	3.3	1.40		30
31-May-01	CH17	825	70	0.303	8.24	7.11	11.6	4.8	1.00		30
31-May-01	CH18	1015	1	0.398	7.74	7.53	13.4	2.7	0.10		6
31-May-01	CH20	1345	23	0.088	7.24	7.63	19.4	1.4	0.20		6
31-May-01	CH21	1300	0.5	0.061	9.17	7.92	11.6	2.3	0.10		2.5
31-May-01	CH22	1250	15	0.097	6.61	7.32	17.8	3.0	0.20		2.5
31-May-01	CH23	1330	19	0.185	7.16	7.56	19.4	1.6	0.30		6
31-May-01	CH24	1030	25	0.188	7.15	7.53	16.3	1.8	1.00		40

UNDERLINED VALUES ARE LESS THAN MDL.
BLANK RANGES INDICATE NO ANALYSES WERE REQUESTED.
1) MDL = METHOD DETECTION LIMIT.
2) PQL = PRACTICAL QUANTITATION LIMIT.

TABLE 24
 BASIN-WIDE SCREENING SURVEYS
 CHATFIELD WATERSHED - JUNE 2001

DATE	Screening Location	TIME	Instantaneous Flow (est.) (cfs) ¹⁾	Field Measurements					Lab Analyses		
				Specific Conductance Field (us/cm)	Oxygen, dissolved (mg/l)	pH (std. Units)	Temperature (Deg C)	Nitrate, Field (mg/l)	Total Phosphorous Field (mg/l)	Total Suspended Solids (TSS) (gm/M ³)	
MDL ¹⁾											5
PQL ²⁾											20
7-Jun-01	CH01	630	2	0.266	8.25	5.73	10.9	1.4	0.10		2.5
7-Jun-01	CH02	800	6	0.790	4.61	7.15	14.1	1.0	0.40		2.5
7-Jun-01	CH03	730	170	0.266	8.11	7.39	11.7	2.1	0.20		2.5
7-Jun-01	CH04	710	65	0.252	7.77	7.42	12.1	0.6	0.20		2.5
7-Jun-01	CH05	655	2	0.881	7.34	7.29	12.4	1.4	0.20		2.5
7-Jun-01	CH06	835	70	0.273	8.12	7.94	13.7	0.0	0.80		6
7-Jun-01	CH07	850	74	0.266	7.86	7.56	13.4	1.8	0.30		6
7-Jun-01	CH08	815	3	1.120	9.18	8.00	14.9	2.3	0.20		2.5
7-Jun-01	CH09	1215	2	0.101	5.70	6.91	21.1	1.5	0.20		2.5
7-Jun-01	CH10	1205	10	0.104	6.76	7.38	19.6	2.4	0.20		2.5
7-Jun-01	CH11	1140	14	0.196	6.74	7.53	19.8	0.7	0.10		2.5
7-Jun-01	CH12	1125	16	0.224	6.25	7.51	21.1	2.3	0.20		2.5
7-Jun-01	CH13	1040	18	0.295	6.65	7.62	19.0	2.1	0.50		14
7-Jun-01	CH14	1025	21	0.355	7.29	7.63	20.1	3.1	1.30		32
7-Jun-01	CH15	940	39	0.289	7.32	7.45	17.2	1.4	1.10		46
7-Jun-01	CH16	925	44	0.305	5.40	7.10	16.0	1.6	1.10		28
7-Jun-01	CH17	905	46	0.337	6.72	7.31	14.8	2.4	0.70		14
7-Jun-01	CH18	1000	1	0.413	8.32	7.58	14.5	1.7	0.70		2.5
7-Jun-01	CH20	1340	10	0.101	6.83	7.48	19.5	1.4	0.10		2.5
7-Jun-01	CH21	1300	0.5	0.084	9.08	7.55	11.9	1.4	0.20		2.5
7-Jun-01	CH22	1240	11	0.116	6.02	7.33	20.5	1.0	0.20		2.5
7-Jun-01	CH23	1325	13	0.221	6.64	7.61	19.5	1.1	0.20		2.5
7-Jun-01	CH24	1015	20	0.216	7.13	7.42	17.8	2.8	0.50		22
13-Jun-01	CH01	1025	2	0.275	11.28	8.09	10.5	0.6	0.10		10
13-Jun-01	CH02	1000	5	0.968	7.13	7.23	13.4	0.3	0.30		16
13-Jun-01	CH03	1100	350	0.294	9.24	7.37	10.9	1.4	0.20		2.5
13-Jun-01	CH04	655	90	0.354	8.57	5.24	11.1	1.3	0.30		2.5
13-Jun-01	CH05	1035	2	1.270	10.23	8.24	13.6	0.8	0.20		8
13-Jun-01	CH06	950	90	0.349	9.84	7.74	13.2	0.7	0.40		30
13-Jun-01	CH07	940	95	0.354	10.13	7.84	12.4	0.5	1.10		30
13-Jun-01	CH08	1010	4	0.893	12.70	8.14	15.8	2.6	0.40		34
13-Jun-01	CH09	1330	2	0.105	8.25	6.68	14.3	1.0	0.30		2.5
13-Jun-01	CH10	1315	8	0.103	9.20	7.06	14.5	0.1	0.30		6
13-Jun-01	CH11	1300	10	0.203	8.16	7.26	15.1	2.1	0.20		36
13-Jun-01	CH12	1245	13	0.237	8.79	7.28	14.8	1.1	0.20		2.5
13-Jun-01	CH13	1230	15	0.316	9.53	7.38	15.2	0.8	0.50		16
13-Jun-01	CH14	1205	18	0.392	9.05	7.43	16.1	2.7	0.70		54
13-Jun-01	CH15	1130	40	0.375	9.08	7.87	17.0	2.0	0.70		22

TABLE 24
 BASIN-WIDE SCREENING SURVEYS
 CHATFIELD WATERSHED - JUNE 2001

DATE	Screening Location	TIME	Instantaneous Flow (est.) (cfs) ¹⁾	Field Measurements					Lab Analyses		
				Specific Conductance Field (us/cm)	Oxygen, dissolved (mg/l)	pH (std. Units)	Temperature (Deg C)	Nitrate, Field (mg/l)	Total Phosphorous Field (mg/l)	Total Suspended Solids (TSS) (gm/M ³)	
MDL ¹⁾											5
PQL ²⁾											20
13-Jun-01	CH16	720	45	0.321	4.80	6.37	14.0	1.4	1.00		24
13-Jun-01	CH17	935	50	0.340	9.55	7.72	13.6	1.7	0.80		20
13-Jun-01	CH18	1145	1	0.447	9.76	7.63	13.2	1.4	0.20		<u>2.5</u>
13-Jun-01	CH20	1430	10	0.103	10.01	6.90	12.7	1.8	0.50		<u>2.5</u>
13-Jun-01	CH21	1400	0.5	0.088	9.67	6.70	9.3	1.1	0.20		<u>2.5</u>
13-Jun-01	CH22	1345	12	0.106	8.40	6.88	14.5	1.2	0.00		<u>28</u>
13-Jun-01	CH23	1415	14	0.133	9.75	7.27	12.5	2.2	0.40		<u>2.5</u>
13-Jun-01	CH24	1155	19	0.111	9.04	7.40	16.0	2.0	0.20		66
20-Jun-01	CH01	640	2	0.316	8.78	5.83	9.6	1.2	0.10		<u>2.5</u>
20-Jun-01	CH02	815	4	1.090	5.33	7.40	12.9	2.1	0.90		54
20-Jun-01	CH03	740	230	0.275	8.32	7.73	10.8	1.5	0.20		6
20-Jun-01	CH04	715	75	0.285	8.53	7.82	11.1	1.2	0.10		<u>2.5</u>
20-Jun-01	CH05	705	1	1.220	8.05	7.70	12.0	0.8	0.20		6
20-Jun-01	CH06	850	80	0.303	9.17	7.96	12.5	1.0	0.10		<u>2.5</u>
20-Jun-01	CH07	900	83	0.292	8.43	7.73	12.1	1.8	0.00		<u>2.5</u>
20-Jun-01	CH08	830	2	1.080	9.61	8.04	13.9	1.9	0.20		<u>2.5</u>
20-Jun-01	CH09	1230	1	0.111	5.21	6.84	20.4	0.7	0.20		<u>2.5</u>
20-Jun-01	CH10	1215	7	0.105	6.82	7.62	19.3	2.0	0.10		<u>2.5</u>
20-Jun-01	CH11	1150	7	0.211	6.61	7.56	20.6	0.5	0.30		<u>2.5</u>
20-Jun-01	CH12	1140	8	0.245	6.27	7.52	22.2	0.6	0.60		<u>2.5</u>
20-Jun-01	CH13	1055	10	0.339	6.81	7.48	19.3	1.8	0.10		<u>2.5</u>
20-Jun-01	CH14	1035	11	0.394	7.01	7.60	20.0	2.9	0.80		28
20-Jun-01	CH15	950	20	0.329	7.02	7.44	17.0	2.4	0.70		24
20-Jun-01	CH16	940	22	0.333	6.28	7.29	14.9	1.6	0.70		22
20-Jun-01	CH17	915	23	0.360	7.25	7.44	13.3	1.8	0.30		16
20-Jun-01	CH18	1010	1	0.423	8.88	7.68	14.0	0.9	0.10		<u>2.5</u>
20-Jun-01	CH20	1400	5	0.111	6.49	7.50	22.3	1.5	0.00		<u>2.5</u>
20-Jun-01	CH21	1305	0.5	0.082	8.77	7.42	13.9	0.6	0.00		<u>2.5</u>
20-Jun-01	CH22	1250	7	0.145	6.36	7.14	20.6	2.1	0.30		<u>2.5</u>
20-Jun-01	CH23	1345	8	0.275	6.85	7.58	22.7	0.7	0.10		<u>2.5</u>
20-Jun-01	CH24	1025	9	0.240	6.71	7.57	18.1	2.7	0.10		<u>2.5</u>

UNDERLINED VALUES ARE LESS THAN MDL.
 BLANK RANGES INDICATE NO ANALYSES WERE REQUESTED.

1) MDL = METHOD DETECTION LIMIT.

2) PQL = PRACTICAL QUANTITATION LIMIT.

TABLE 18
CHATFIELD IN-RESERVOIR DEPTH-PROFILE DATA
(FIELD CODE RM)

JANUARY 23, 2001, 1235 hours				
DEPTH (meters)	pH (s.u.)	SC (uS/cm)	DO (mg/L)	TEMP. (deg C)
1	7.9	366	14.5	3.4
2	7.8	368	12.7	3.5
3	7.7	369	11.2	3.6
4	7.7	369	10.4	3.6
5	7.7	369	8.9	3.6

February 27, 2001, 1200 hours				
DEPTH (meters)	pH	SC (uS/cm)	DO (mg/L)	TEMP. (deg C)
1	8.0	379	14.1	4.2
2	7.9	381	13.6	4.1
3	7.8	384	13.5	4.0
4	7.7	396	12.8	3.5
5	7.7	402	12.7	3.7

TABLE 18 (Continued)
CHATFIELD IN-RESERVOIR DEPTH-PROFILE DATA
(FIELD CODE RM)

March 28, 2001, 1045 hours				
DEPTH (meters)	pH (s.u.)	SC (uS/cm)	DO (mg/L)	TEMP. (deg C)
1	7.7	358	9.2	5.7
2	7.7	359	9.2	5.6
3	7.6	359	9.2	5.5
4	7.6	359	9.2	5.5
5	7.6	359	9.1	5.4
6	7.5	359	9.0	5.4
7	7.4	357	9.2	5.4
8	7.3	357	9.3	5.4
9	7.3	358	9.2	5.4
10	7.1	357	9.2	5.4

April 18, 2001, 0830 hours				
DEPTH (meters)	pH (s.u.)	SC (uS/cm)	DO (mg/L)	TEMP. (deg C)
1	7.9	359	11.6	9.0
2	7.9	359	12.0	9.0
3	7.9	359	12.2	9.0
4	7.9	360	12.2	9.0
5	7.8	360	12.2	8.9
6	7.8	360	11.8	8.9
7	7.8	358	12.0	8.9
8	7.8	359	11.7	8.8
9	7.7	360	11.7	8.7
10	7.7	360	11.8	8.5

SUMMARY DATA TABLES

TABLE 25
GROWING SEASON (JULY-THROUGH-SEPTEMBER)*
TOTAL-PHOSPHORUS AND CHLOROPHYLL-a CONCENTRATIONS
CHATFIELD RESERVOIR

Year	Total- Phosphorus Concentration (mg/L) ¹⁾²⁾	Chlorophyll-a Concentration (ug/L) ¹⁾³⁾
1982	0.023	15
1983	0.050	16
1984	0.035	6.7
1985	0.028	8.9
1986	4)	4)
1987	0.077	5.7
1988	0.023	7.6
1989	0.011	3.6
1990	0.015	7.1
1991	0.025	3.0
1992	0.015	3.9
1993	0.015	4.0
1994	0.013	3.0
1995	0.010	3.6
1996	0.034	3.9
1997	0.012	2.4
1998	0.016	3.8
1999	0.021	4.7
2000	0.012	7.5
2001	<u>0.023</u>	<u>10.4</u>
Mean	0.024	6.4
Std. Dev.	0.016	3.8
Maximum	0.077	16.0
Minimum	0.010	2.4
N	19	19

* growing season redefined in 2001 as July-Sept

- 1) Average Reservoir values.
- 2) Growing-season standard = 0.027 mg/L.
- 3) Growing-season goal = 17 ug/L.
- 4) No data.

TABLE 26
CHATFIELD WATERSHED
SUMMARY OF METALS DATA, 1997 - 2001

Site RM - Reservoir

Metal	Water Quality Standards (ug/l)		Summary 1997 - 2000		2001**	
	Acute	Chronic	% Detect	Maximum (ug/l)	% Detect	Maximum (ug/l)
Arsenic (Total)	360	150	22%	1.5	33%	1
Cadmium	10	1	1%	4	0%	NA
Chromium III	50	50	0%	0	0%	NA
Chromium VI	16	11	2%	7	0%	NA
Copper	18	12	10%	15	0%	NA
Iron	300	300	90%	590	33%	10
Lead	96	4	1%	200	0%	NA
Manganese	3110	50	90%	486	66%	24
Mercury	2	0.1	38%	171	66%	0.4
Nickel	925	96	0%	0	0%	NA
Selenium	140	10	2%	18	0%	NA
Silver	2	3	0%	0	0%	NA
Zinc	117	106	75%	60	100%	30

* Numerical standards based on hardness of 100 mg/l (as CaCO₃) for South Platte River segment if such standards are not applicable, the standard is the basic standard established by the

**Metals were sampled once in 2001, at three reservoir depths, resulting in 0%, 33%, 66%, or

Site SO - Reservoir Outfall

Metal	Water Quality Standards (ug/l)		Summary 1997 - 2000		2001**	
	Acute	Chronic	% Detect	Maximum (ug/l)	% Detect	Maximum (ug/l)
Arsenic (Total)	360	150	40%	2	0%	NA
Cadmium	10	1	7%	4	0%	NA
Chromium III	50	50	0%	N/A	NA	NA
Chromium VI	16	11	7%	8	NA	NA
Copper	18	12	14%	10	0%	NA
Iron	300	300	100%	370	100%	10
Lead	96	4	0%	N/A	0%	NA
Manganese	3110	50	100%	198	100%	37
Mercury	2	0.1	0%	N/A	0%	NA
Nickel	925	96	0%	N/A	0%	NA
Selenium	140	10	2%	1	0%	NA
Silver	2	3	0%	N/A	0%	NA
Zinc	117	106	80%	40	100%	20

* Numerical standards based on hardness of 100 mg/l (as CaCO₃) for South Platte River segment if such standards are not applicable, the standard is the basic standard established by the

**Reservoir outflow was sampled for metals once in 2001, resulting in detection rates of 0% or

TABLE 26 (Continued)
CHATFIELD WATERSHED
SUMMARY OF METALS DATA, 1997 - 2001

Site PC - Plum Creek at Titan Road

Metal	Water Quality Standards (ug/l)		Summary 1997 - 2001		2001**	
	Acute	Chronic	Detection %	Maximum (ug/l)	Detection %	Maximum (ug/l)
Arsenic (Total)	360	150	60%	3	0	NA
Cadmium	10	1	2%	4	0	NA
Chromium I	50	50	7%	5	0	NA
Chromium V	16	11	7%	5	0	NA
Copper	18	12	5%	10	0	NA
Iron	300	300	93%	600	0	NA
Lead	96	4	0%	N/A	0	NA
Manganese	3110	50	100%	1120	0	NA
Mercury	2	0.1	0%	N/A	0	NA
Nickel	925	96	0%	N/A	0	NA
Selenium	140	10	29%	2	0	NA
Silver	2	3	0%	N/A	0	NA
Zinc	117	106	71%	200	0	NA

* Numerical standards based on hardness of 100 mg/l (as CaCO₃) for South Platte. If such standards are not applicable, the standard is the basic standard established in the National Sanitation Foundation Water Quality Institute (NSF) Handbook of Drinking Water Quality.

**No flow in Plum Creek when metals were sampled, resulting in detection rates of 0%.

Site SP - South Platte at Waterton

Metal	Water Quality Standards (ug/l)		Summary 1997 - 2001		2001**	
	Acute	Chronic	Detection %	Maximum (ug/l)	Detection %	Maximum (ug/l)
Arsenic (Total)	360	150	17%	1	0%	NA
Cadmium	10	1	0%	N/A	0%	NA
Chromium I	50	50	0%	N/A	0%	NA
Chromium V	16	11	8%	7	0%	NA
Copper	18	12	9%	10	0%	NA
Iron	300	300	100%	240	100%	20
Lead	96	4	0%	N/A	0%	NA
Manganese	3110	50	100%	42	100%	7
Mercury	2	0.1	2%	0.2	0%	NA
Nickel	925	96	0%	N/A	0%	NA
Selenium	140	10	2%	2	0%	NA
Silver	2	3	0%	N/A	0%	NA
Zinc	117	106	58%	40	100%	20

* Numerical standards based on hardness of 100 mg/l (as CaCO₃) for South Platte. If such standards are not applicable, the standard is the basic standard established in the National Sanitation Foundation Water Quality Institute (NSF) Handbook of Drinking Water Quality.

**South Platte River inflow was sampled once for metals, resulting in detection rates of 0%.

FIGURES

Growing Season Standard = 27 ug/l

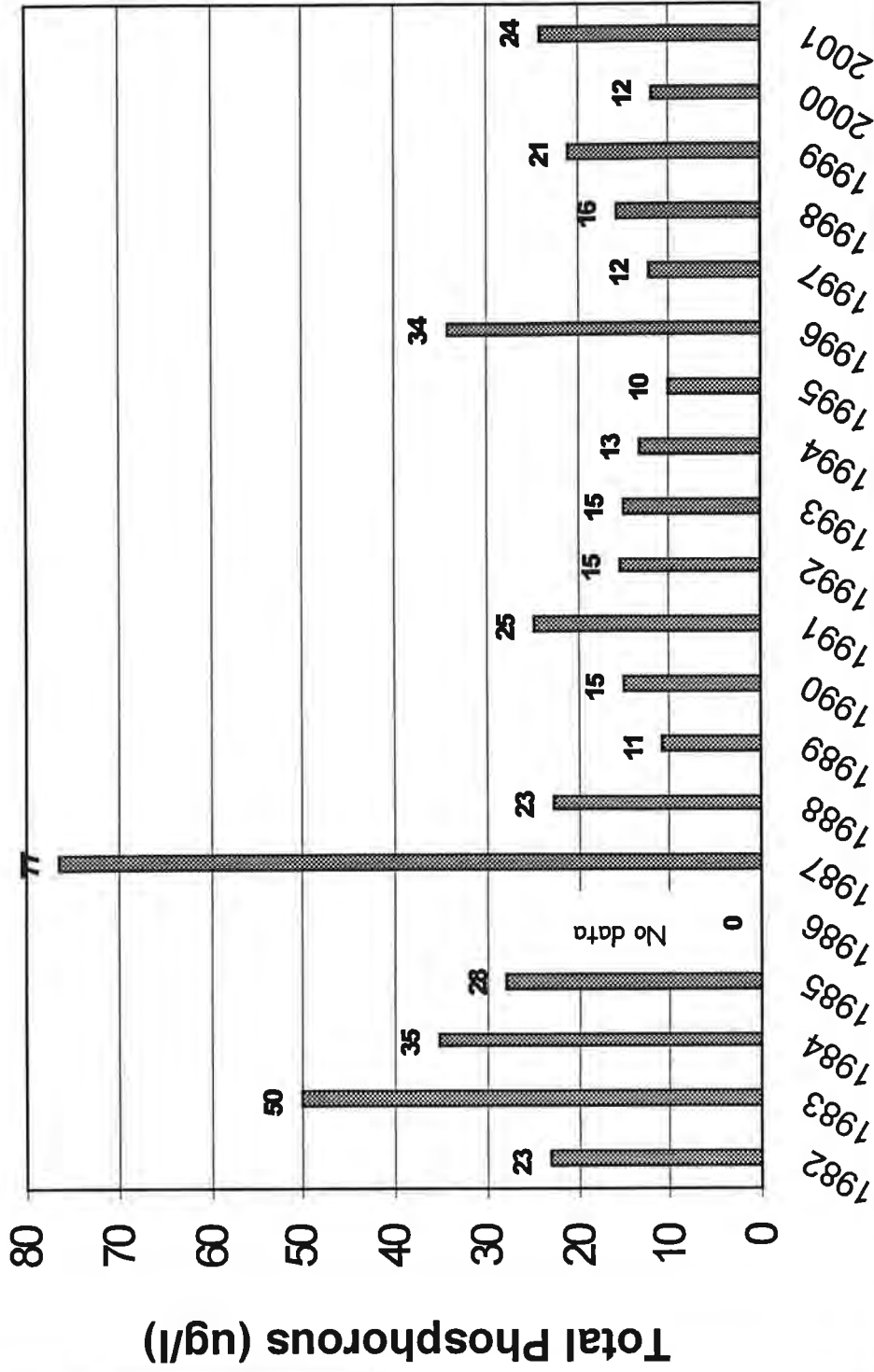


FIGURE 3

AVERAGE GROWING-SEASON TOTAL PHOSPHOROUS CONCENTRATION IN RESERVOIR, 1982-2001

COMMODORE
ADVANCED SCIENCES, INC.

CHATFIELD BASIN AND RESERVOIR
WATER-QUALITY MONITORING PROGRAM

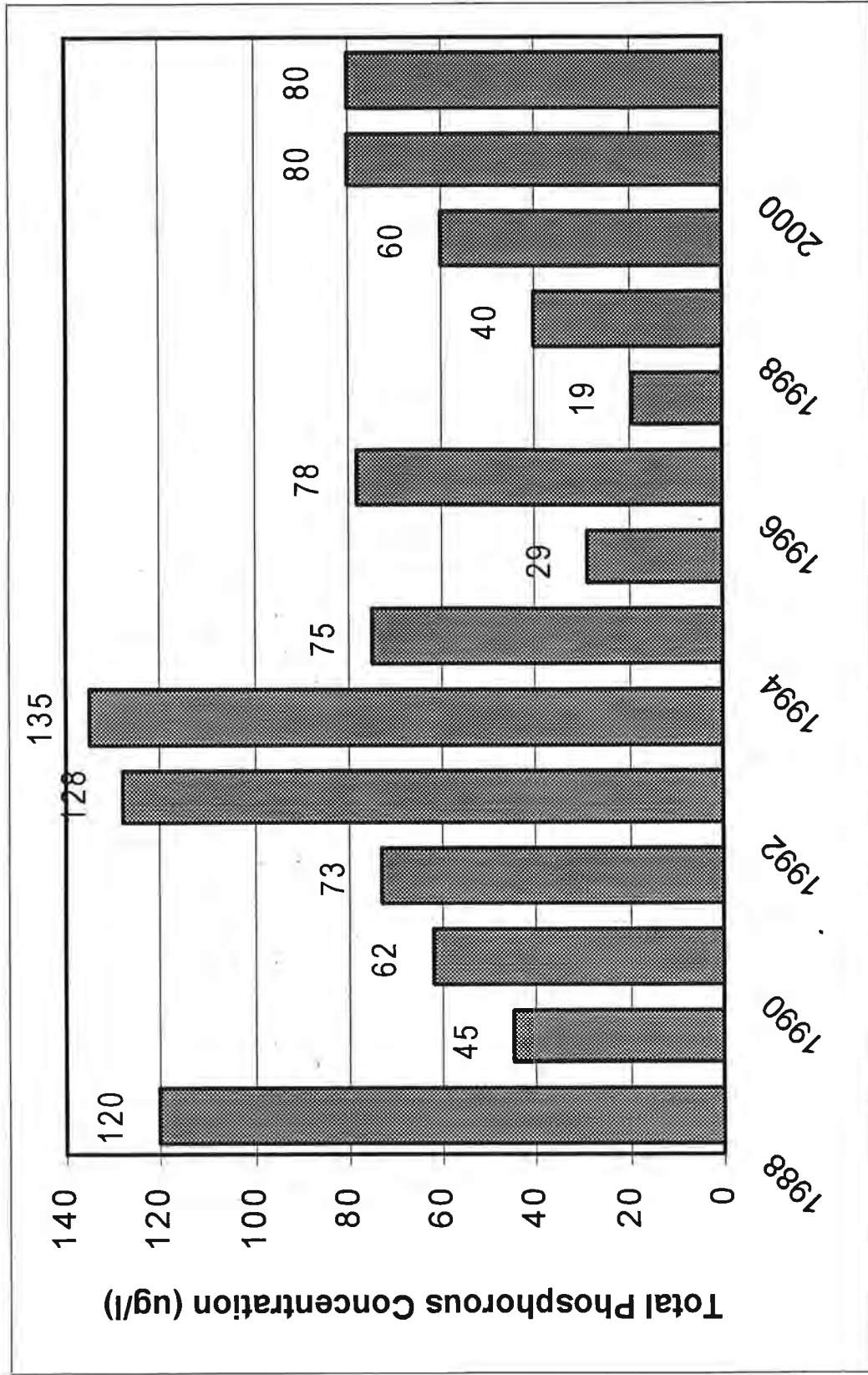


FIGURE 4
PEAK TOTAL PHOSPHOROUS CONCENTRATION IN RESERVOIR, 1988-2001

CHATFIELD BASIN AND RESERVOIR
WATER-QUALITY MONITORING PROGRAM

COMMODORE
ADVANCED SCIENCES, INC.

Growing Season Goal = 17 mg/l

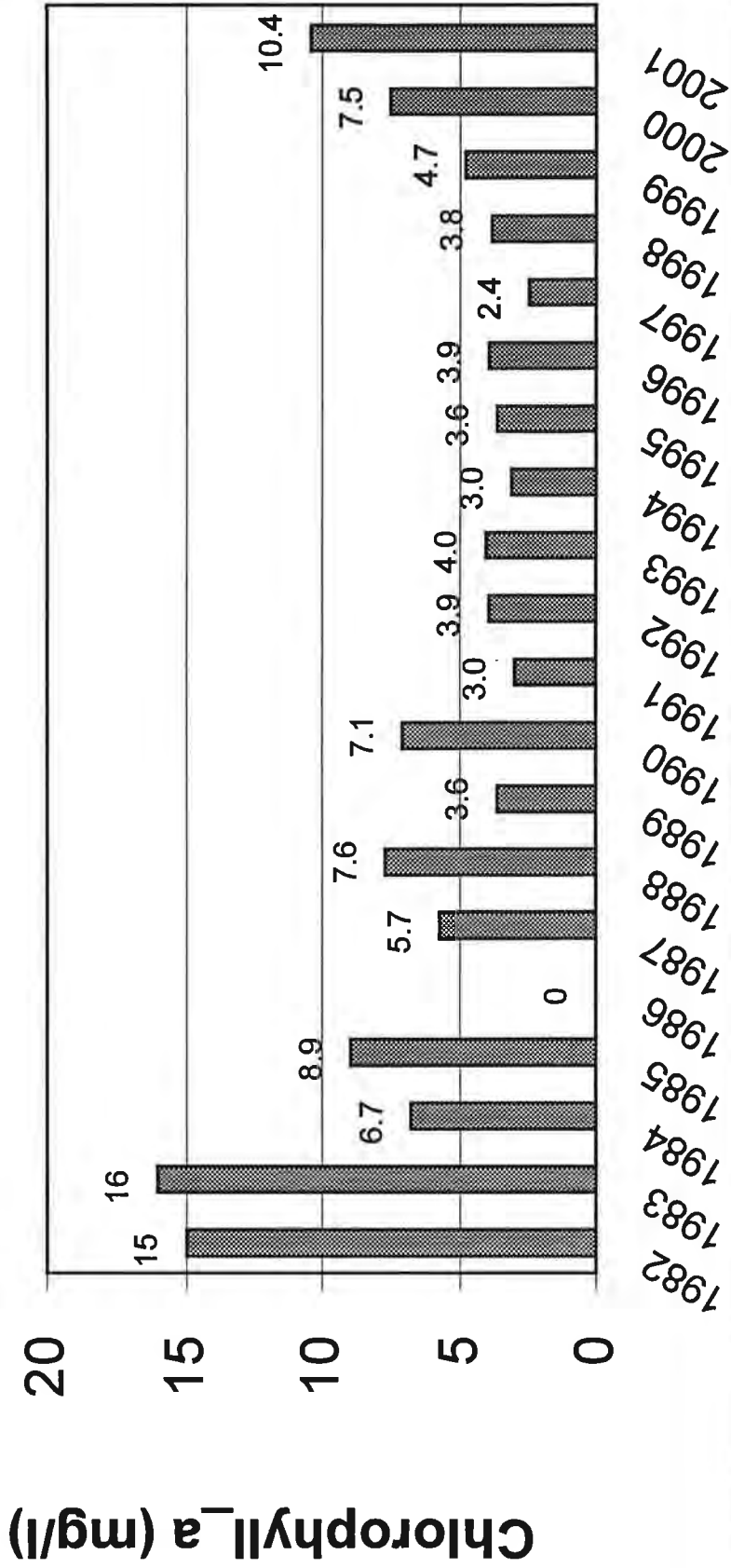


FIGURE 5

AVERAGE GROWING-SEASON CHLOROPHYLL_a CONCENTRATION IN RESERVOIR, 1982-2001

COMMODORE
ADVANCED SCIENCES, INC.

CHATFIELD BASIN AND RESERVOIR
WATER-QUALITY MONITORING PROGRAM

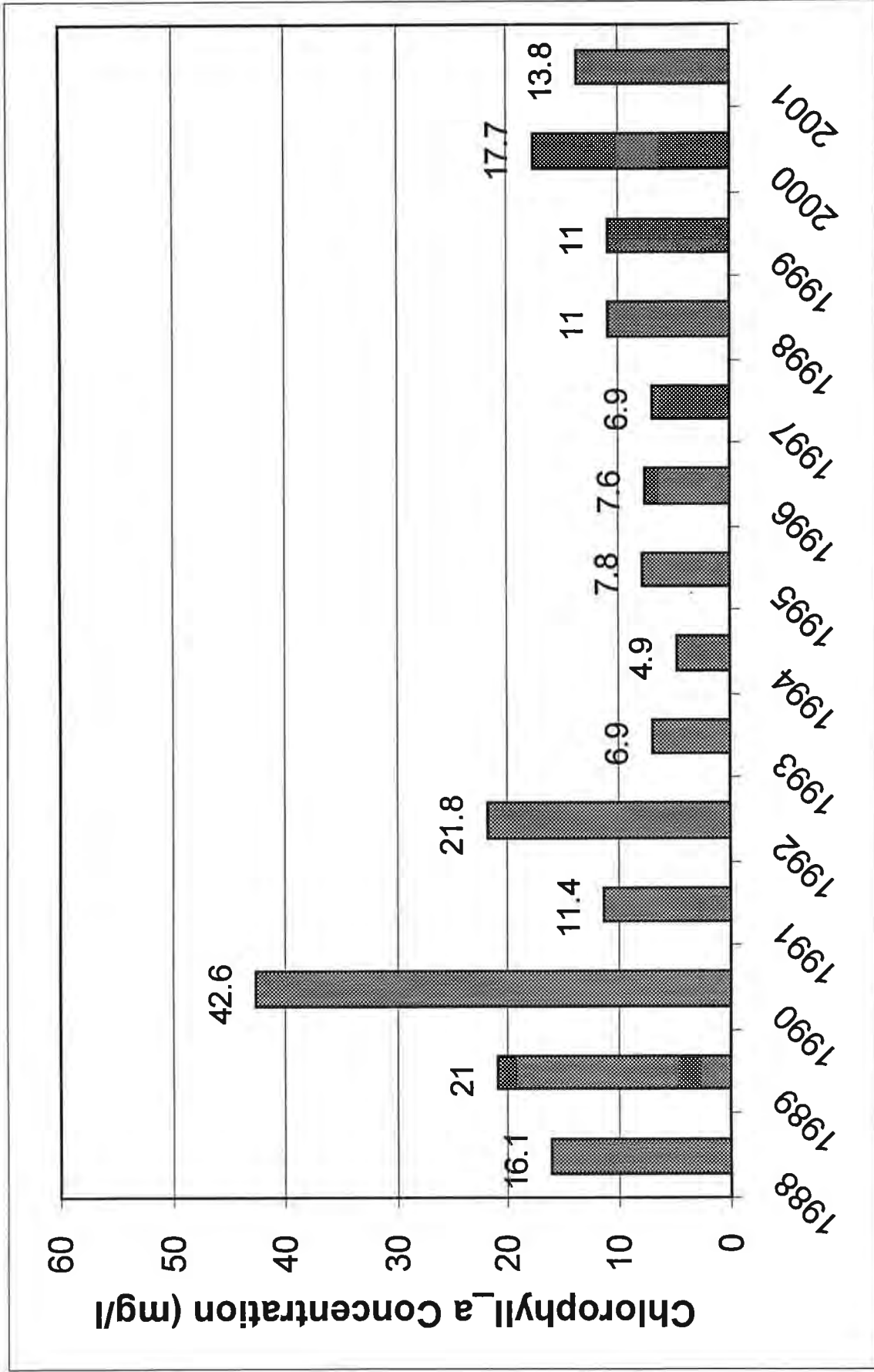


FIGURE 6
 PEAK CHLOROPHYLL_a CONCENTRATION IN RESERVOIR, 1988-2001

COMMODORE
 ADVANCED SCIENCES, INC.
 CHATFIELD BASIN AND RESERVOIR
 WATER-QUALITY MONITORING PROGRAM

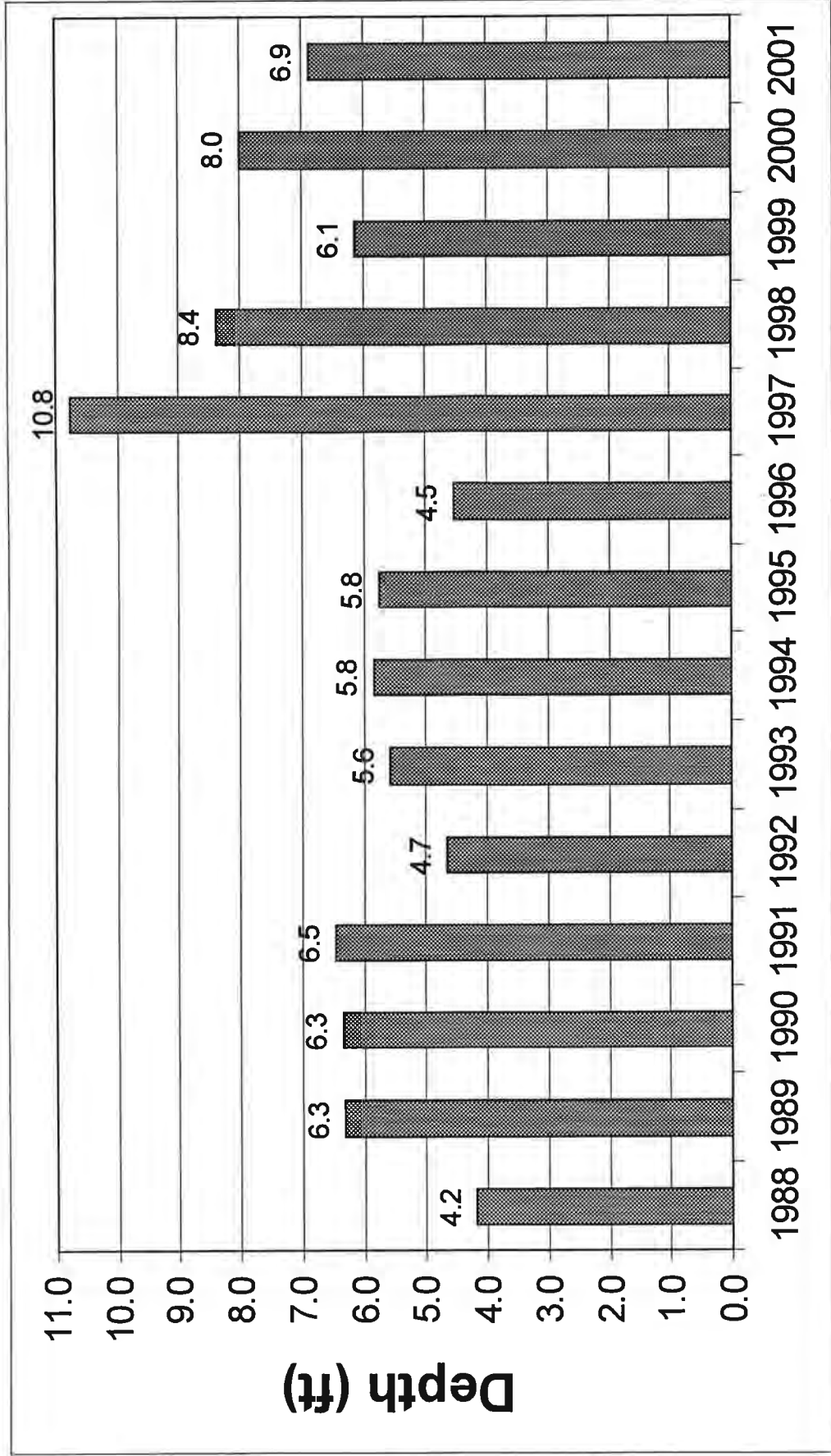


FIGURE 7
AVERAGE GROWING-SEASON SECCHI DEPTH IN RESERVOIR, 1988-2001

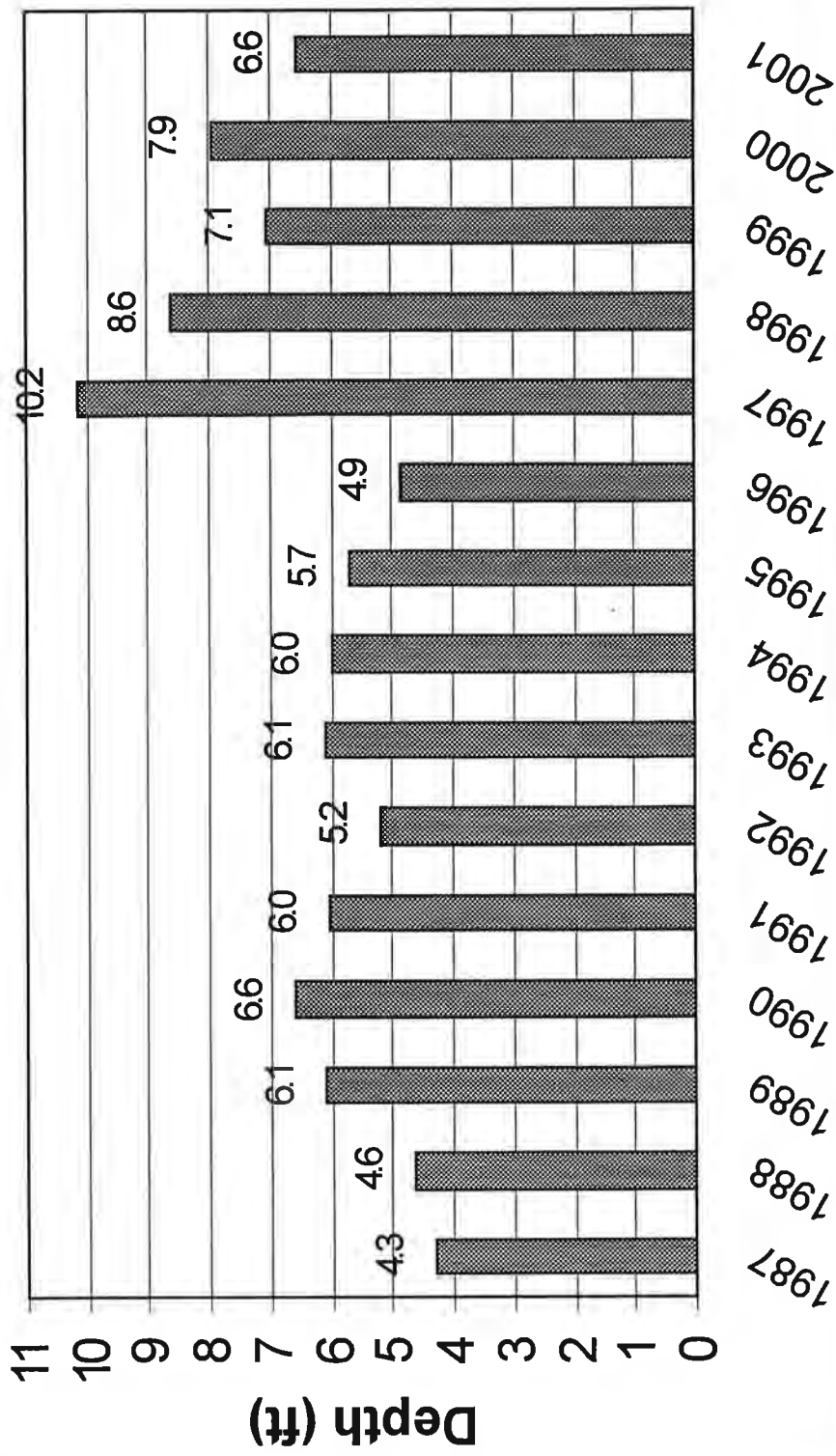


FIGURE 8
AVERAGE ANNUAL SECCHI DEPTH IN RESERVOIR, 1982-2001

CHATFIELD BASIN AND RESERVOIR
WATER-QUALITY MONITORING PROGRAM

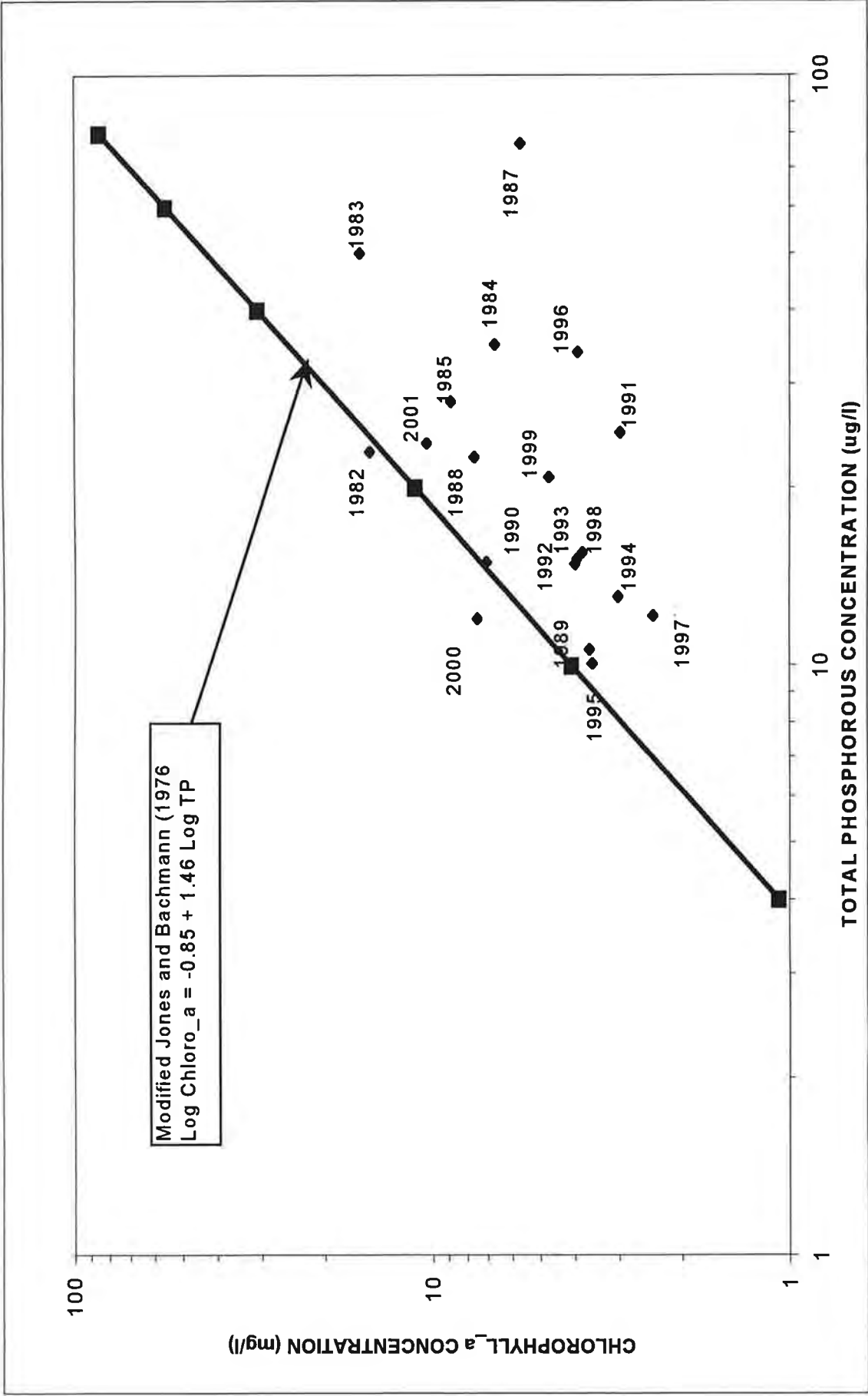


FIGURE 9
GROWING SEASON CHLOROPHYLL_a vs. TOTAL PHOSPHOROUS IN RESERVOIR, 1982-2001

CHATFIELD BASIN AND RESERVOIR
WATER-QUALITY MONITORING PROGRAM

Chatfield Reservoir Phytoplankton May 2001

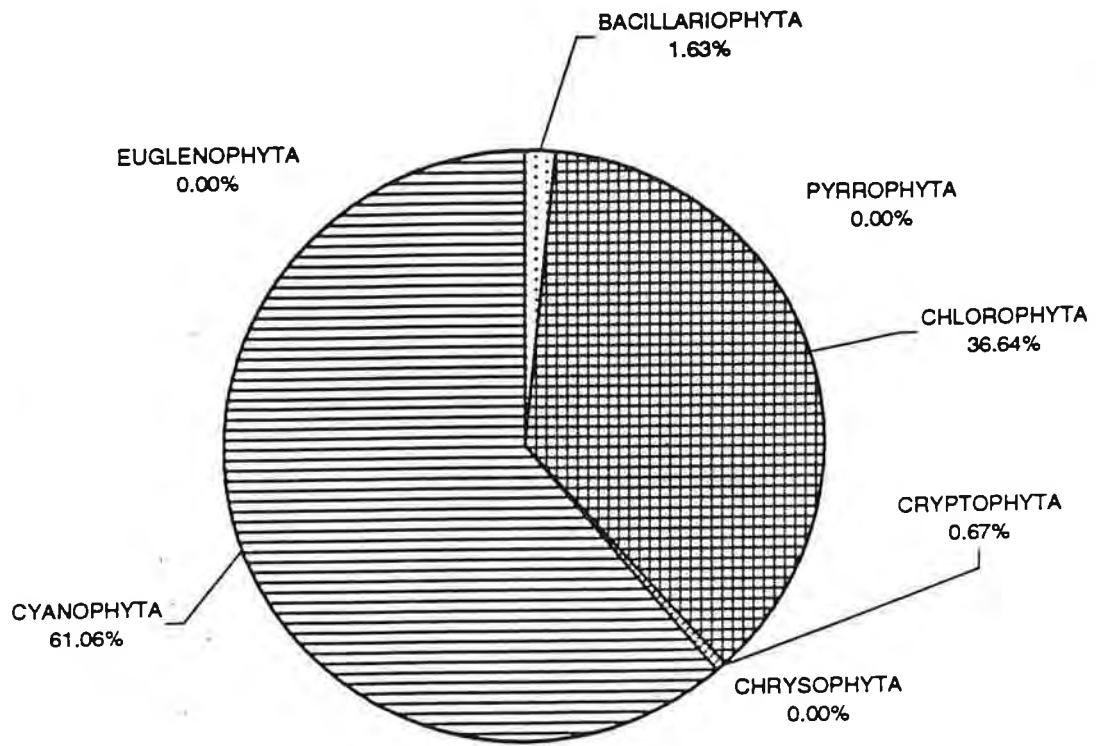


FIGURE 10

SUMMARY OF RESULTS OF PHYTOPLANKTON ANALYSES CONDUCTED FOR A SAMPLE COLLECTED AT SITE RM-1, CHATFIELD RESERVOIR, MAY 16, 2001

Chatfield Reservoir Phytoplankton July 2001

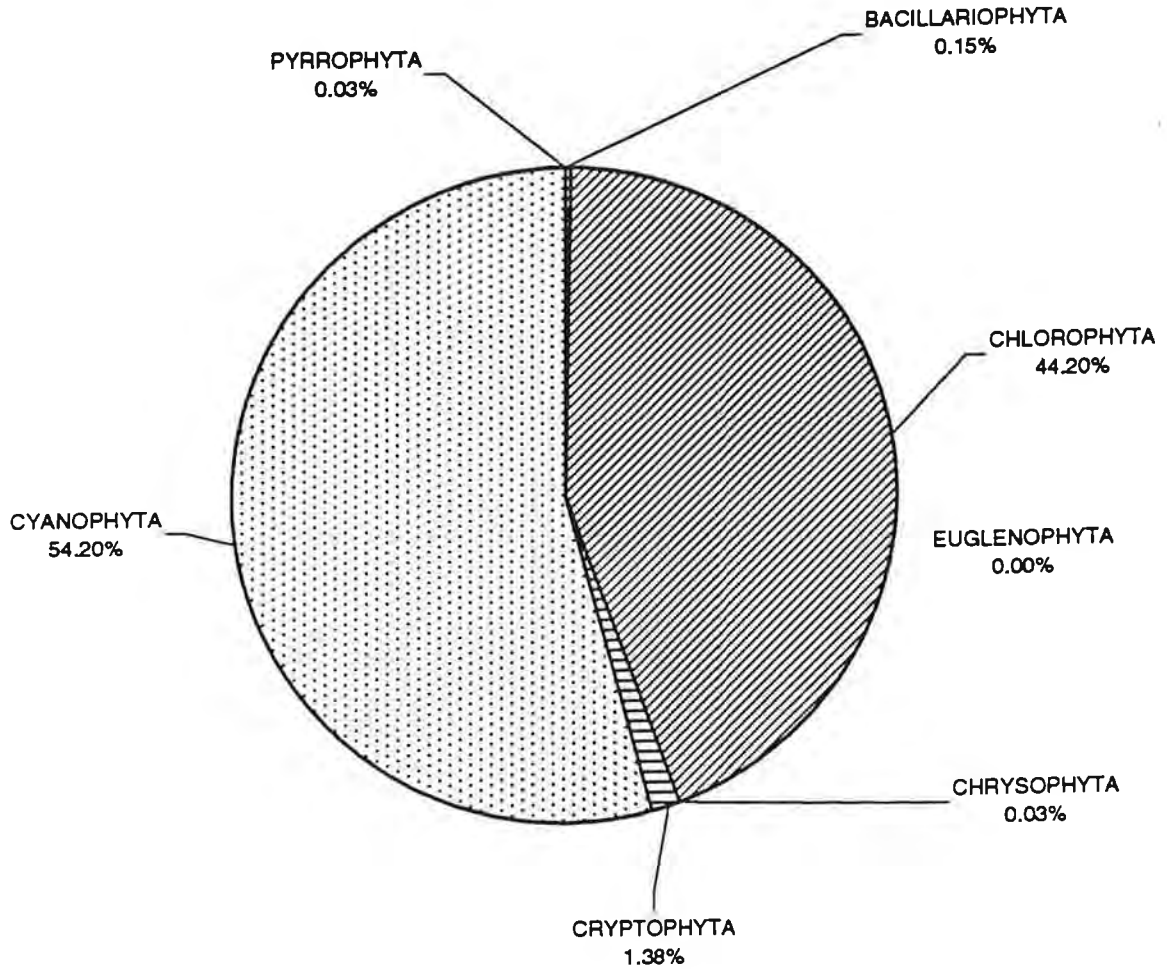


FIGURE 11
SUMMARY OF RESULTS OF PHYTOPLANKTON ANALYSES CONDUCTED FOR A SAMPLE COLLECTED
AT SITE RM-1, CHATFIELD RESERVOIR, JULY 24, 2001

Chatfield Reservoir Phytoplankton August 2001

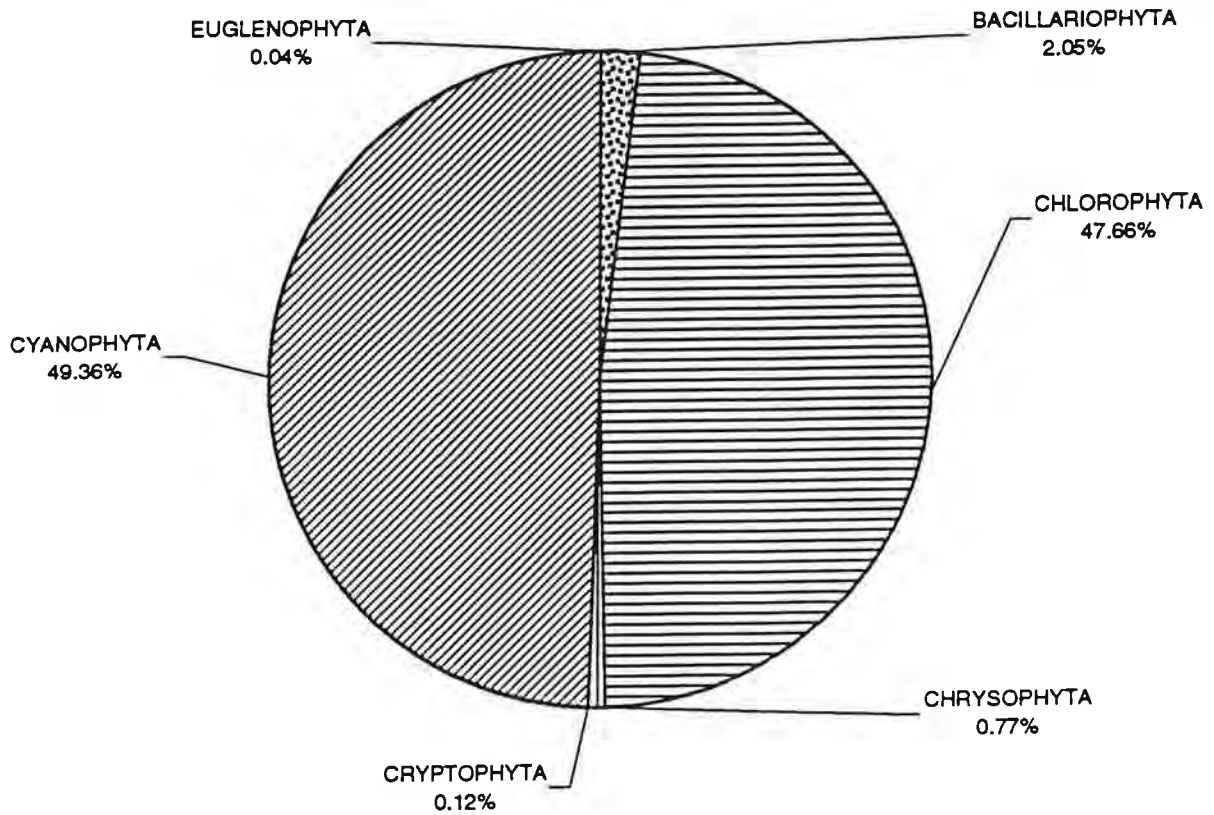


FIGURE 12
SUMMARY OF RESULTS OF PHYTOPLANKTON ANALYSES CONDUCTED FOR A SAMPLE COLLECTED
AT SITE RM-1, CHATFIELD RESERVOIR, AUGUST 29, 2001

Chatfield Reservoir Phytoplankton September 2001

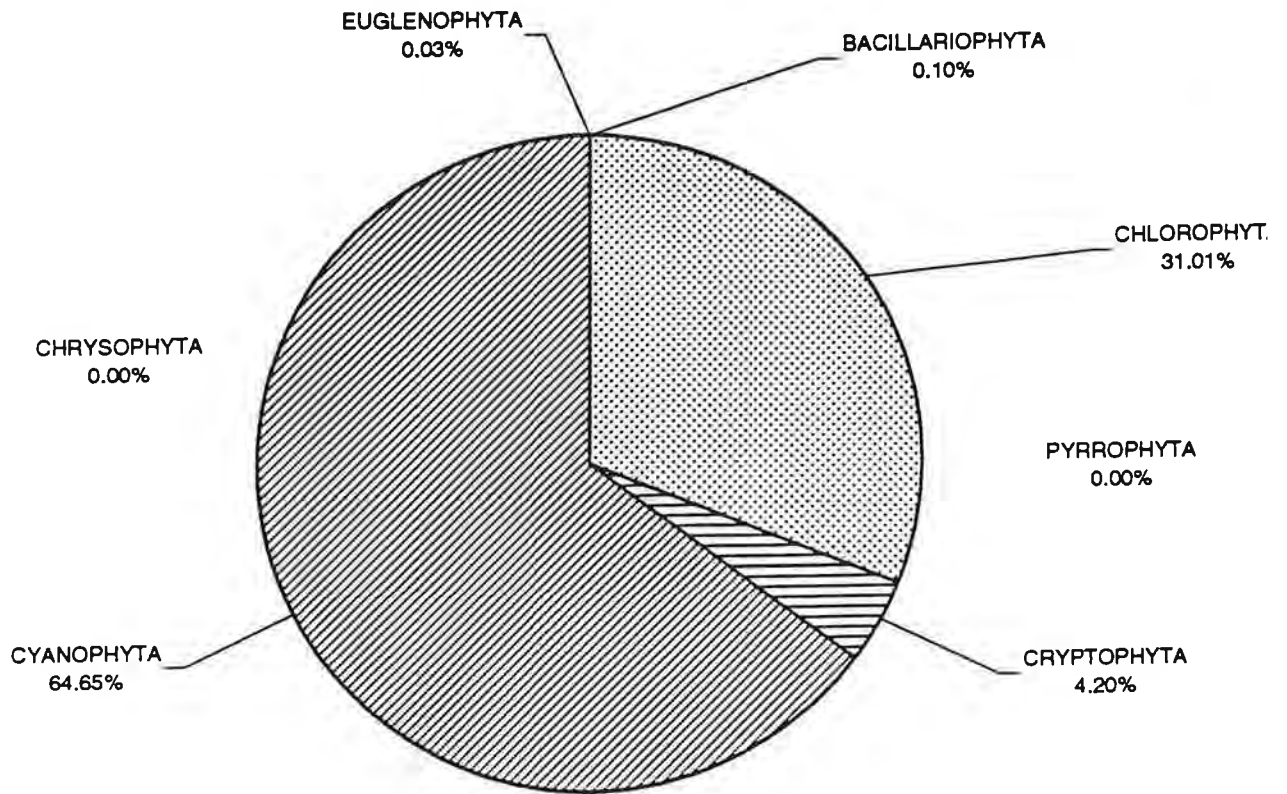


FIGURE 13

SUMMARY OF RESULTS OF PHYTOPLANKTON ANALYSES CONDUCTD FOR A SAMPLE COLLECTED AT
SITE RM-1, CHATFIELD RESERVOIR, SEPTEMBER 12, 2001

Chatfield Reservoir Phytoplankton November 2001

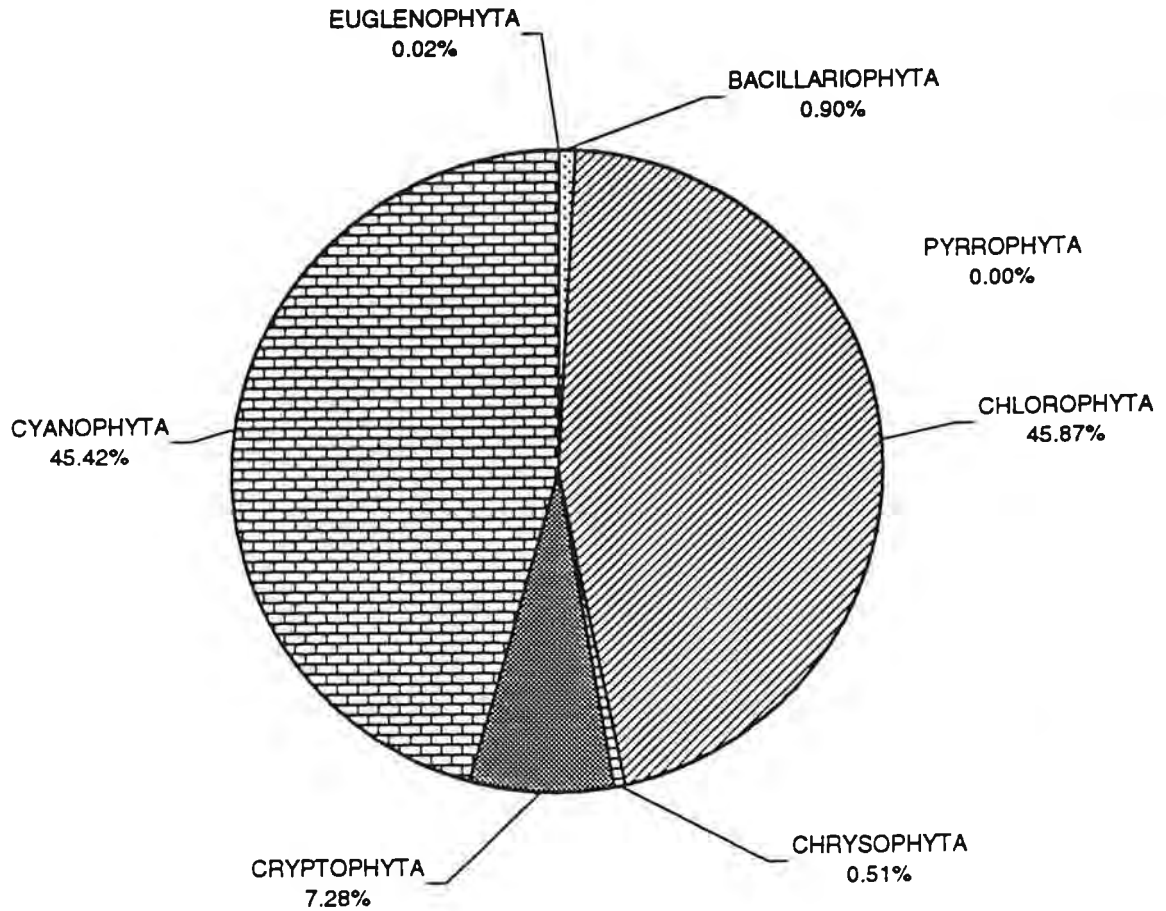


FIGURE 14
SUMMARY OF RESULTS OF PHYTOPLANKTON ANALYSES CONDUCTED FOR A SAMPLE COLLECTED
AT SITE RM-1, CHATFIELD RESERVOIR, NOVEMBER 14, 2001

**Chatfield Reservoir Zooplankton
August 2001**

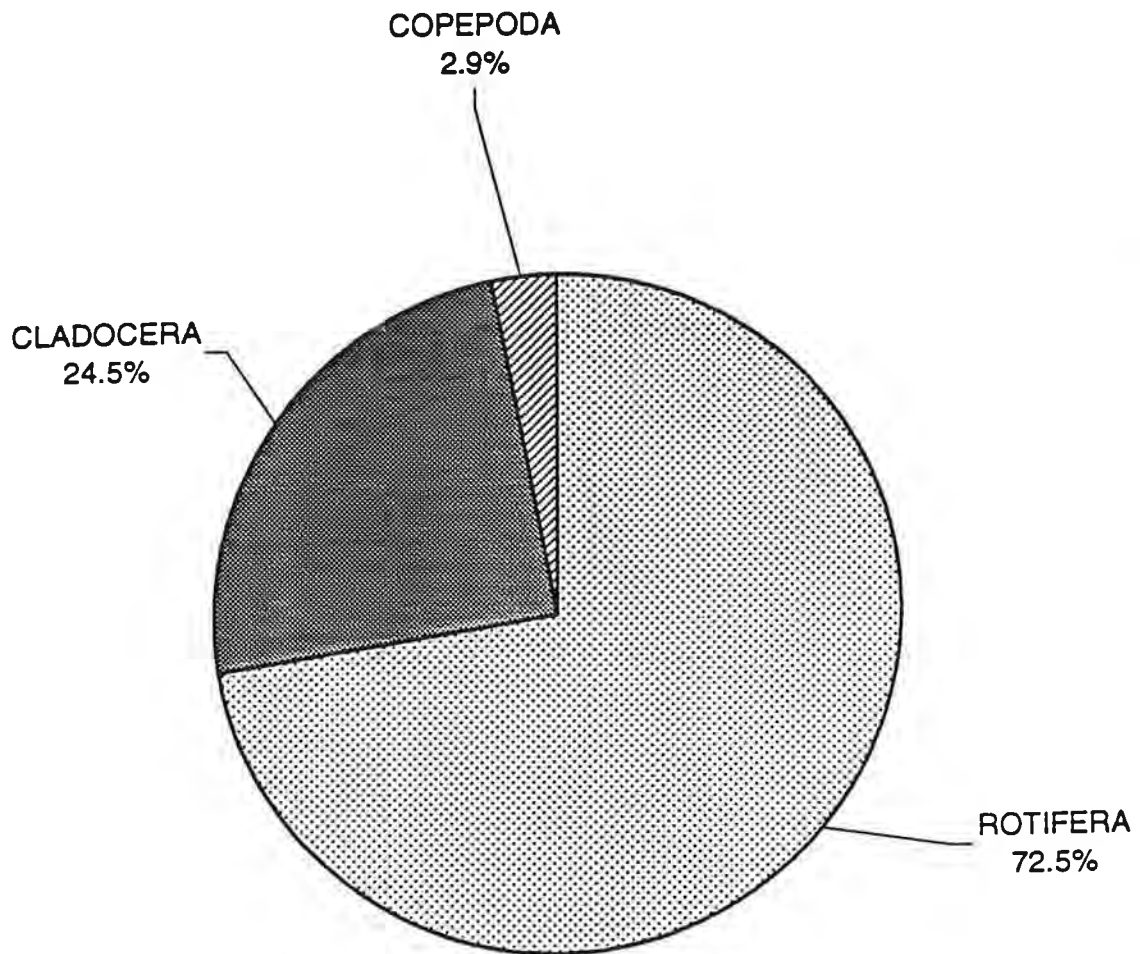
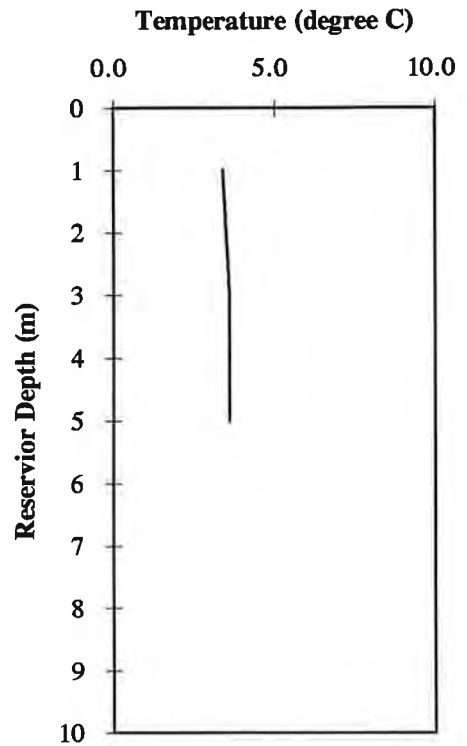
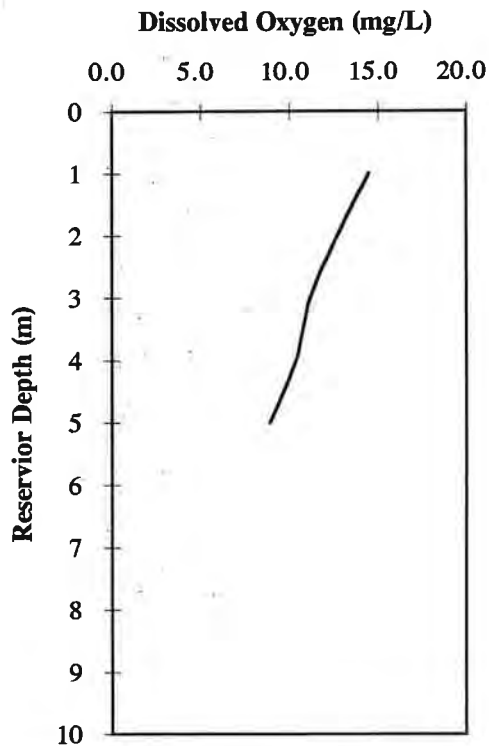
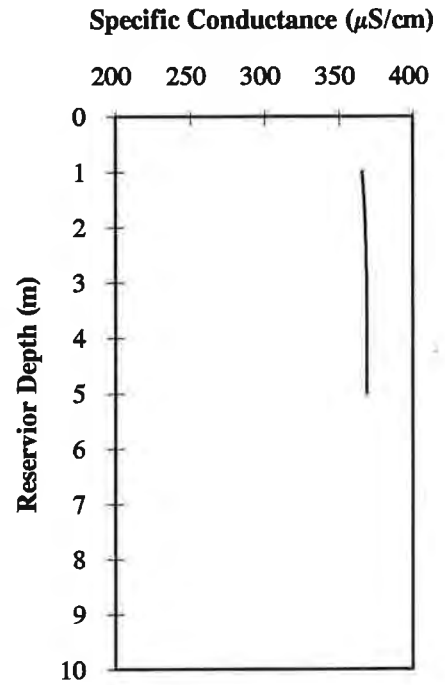
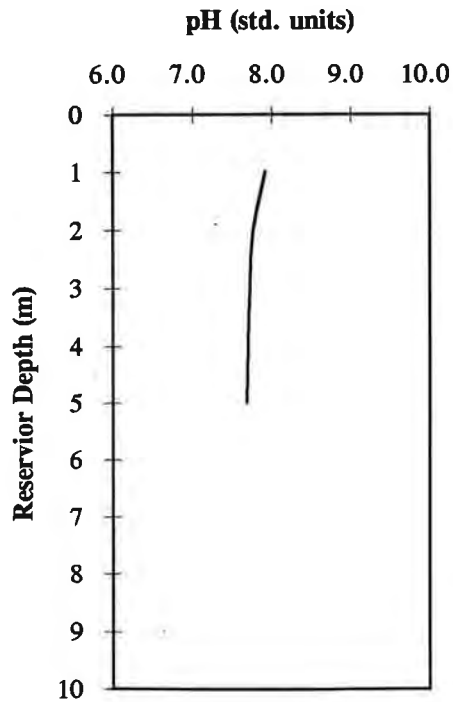
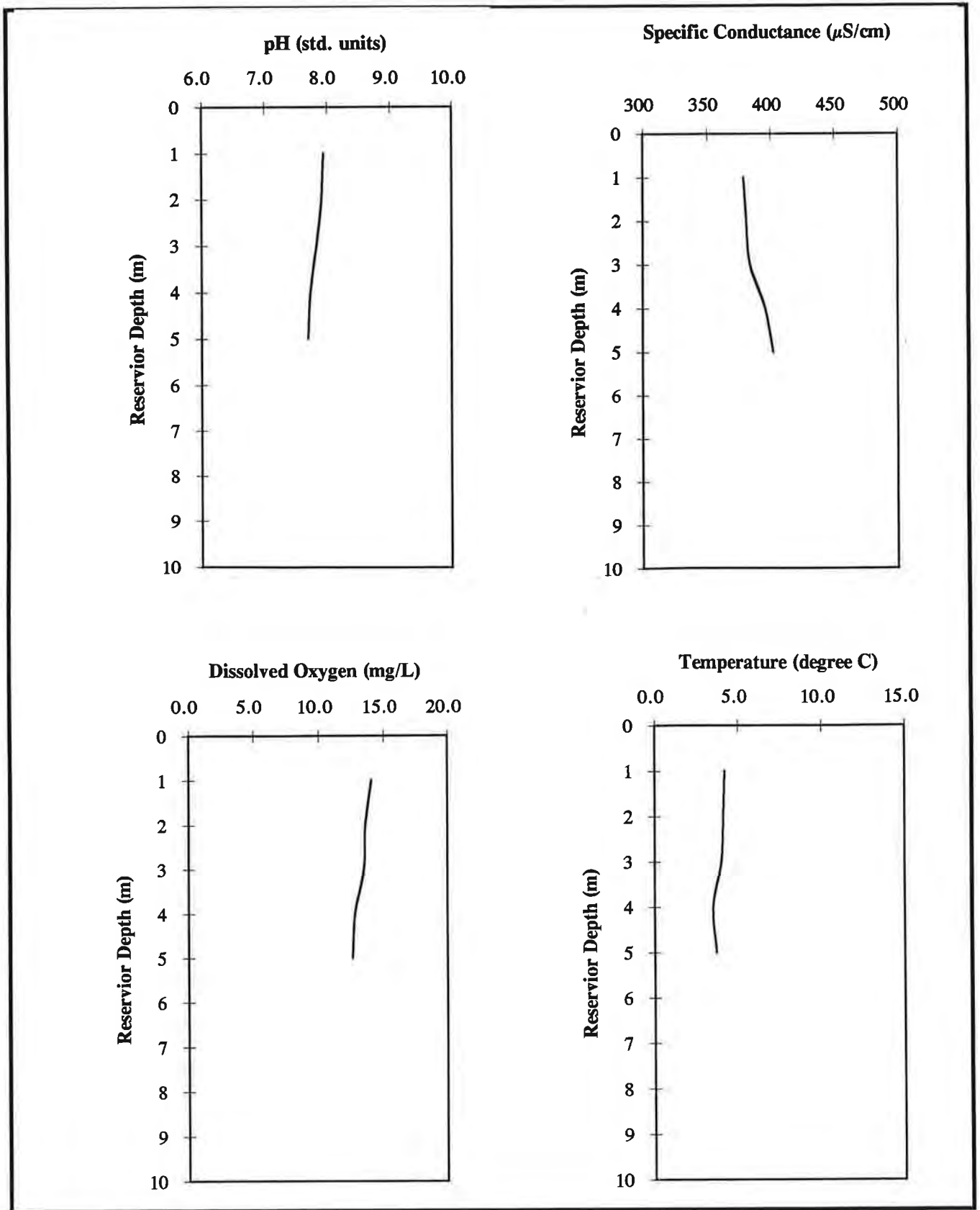


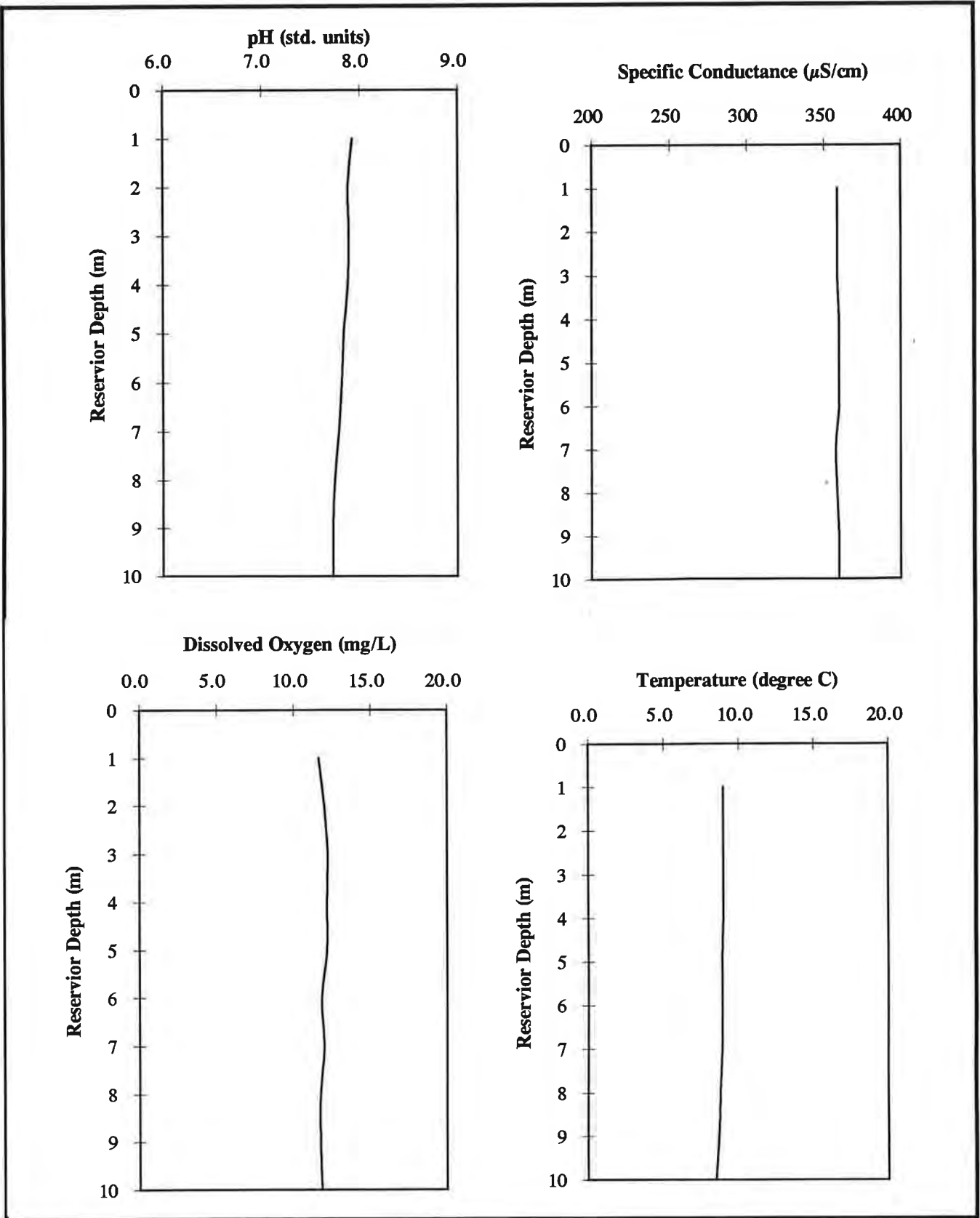
FIGURE 15
SUMMARY OF RESULTS OF ZOOPLANKTON ANALYSES CONDUCTED FOR A SAMPLE COLLECTED AT
SITE RM, CHATFIELD RESERVOIR, AUGUST 15, 2001



**IN-RESERVOIR DEPTH PROFILE DATA, SITE RM
CHATFIELD RESERVOIR - JANUARY 23, 2001**



**IN-RESERVOIR DEPTH PROFILE DATA, SITE RM
CHATFIELD RESERVOIR - February 27, 2001**



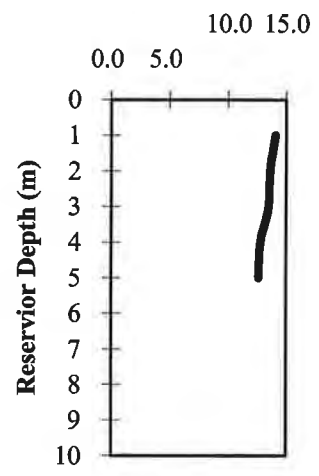
IN-RESERVOIR DEPTH PROFILE DATA, SITE RM

CHATFIELD RESERVOIR - April 18, 2001

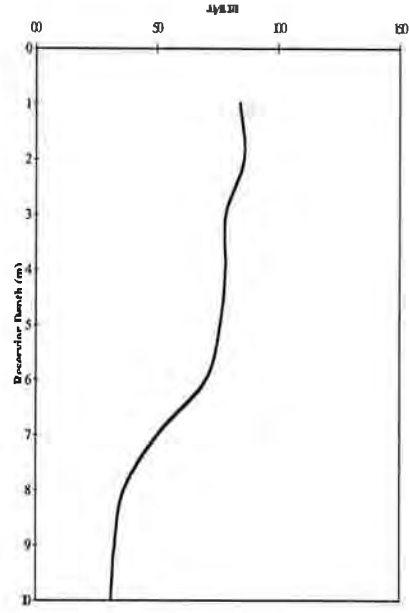
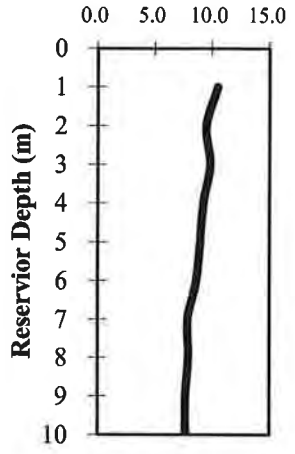
CHATFIELD BASIN AND RESERVOIR

WATER-QUALITY MONITORING PROGRAM

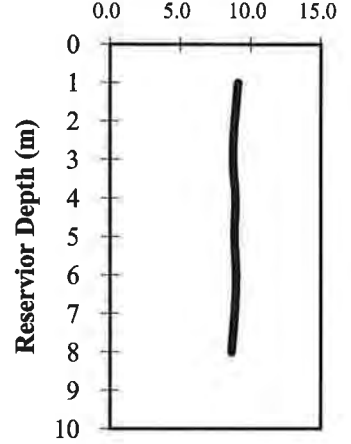
February 27, 2001

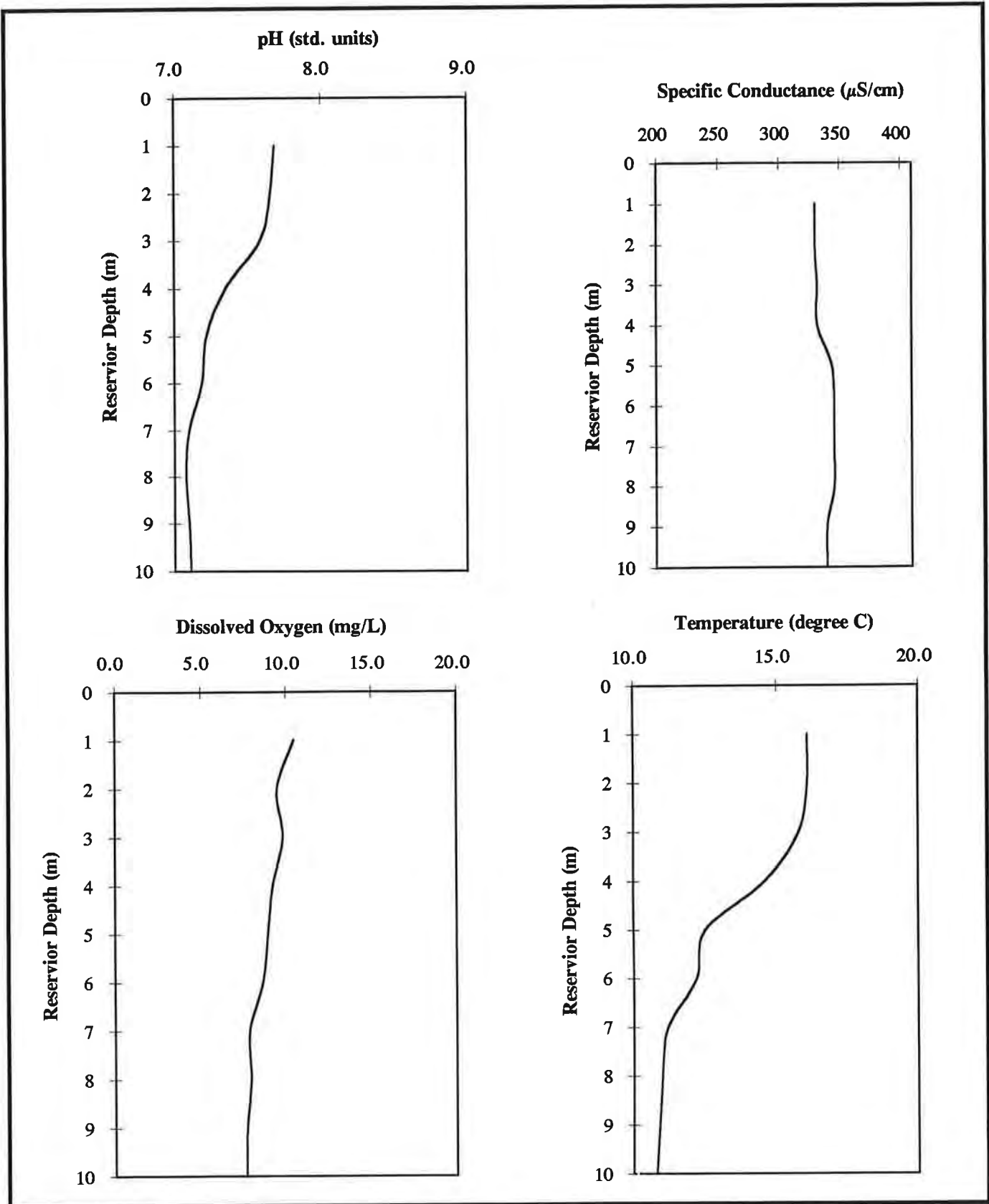


May 16, 2001

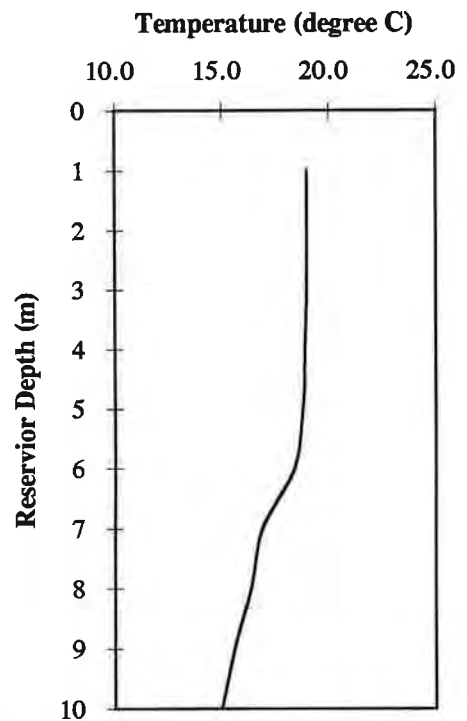
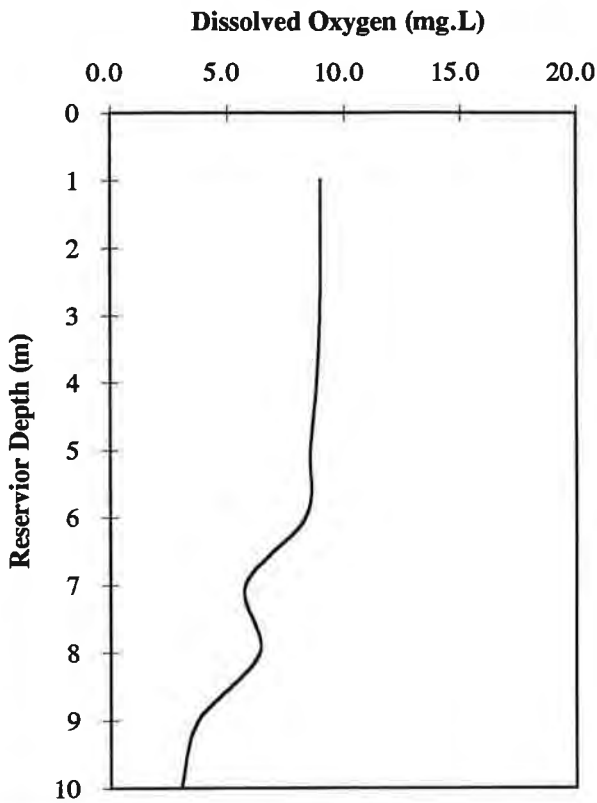
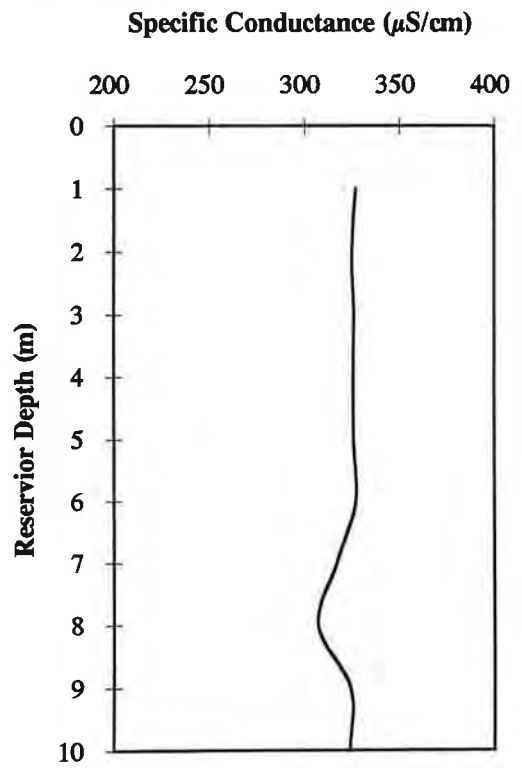
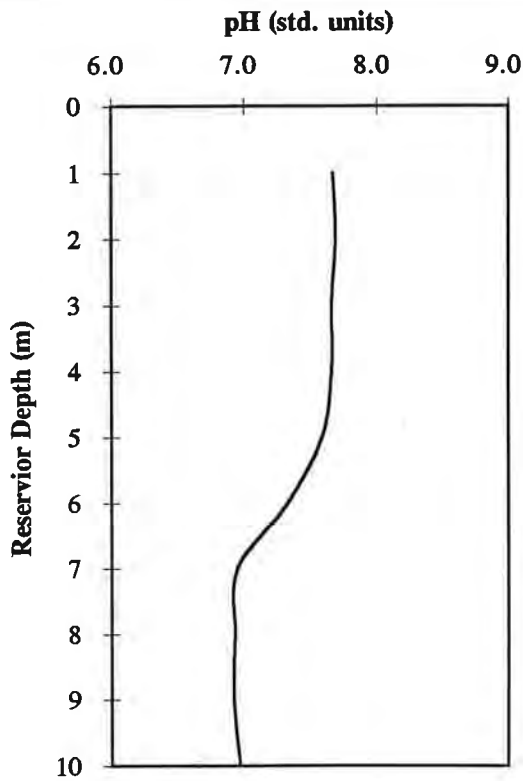


September 26, 2001

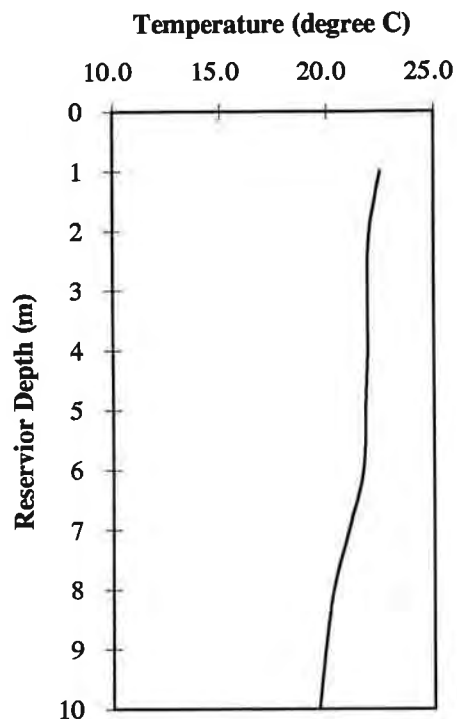
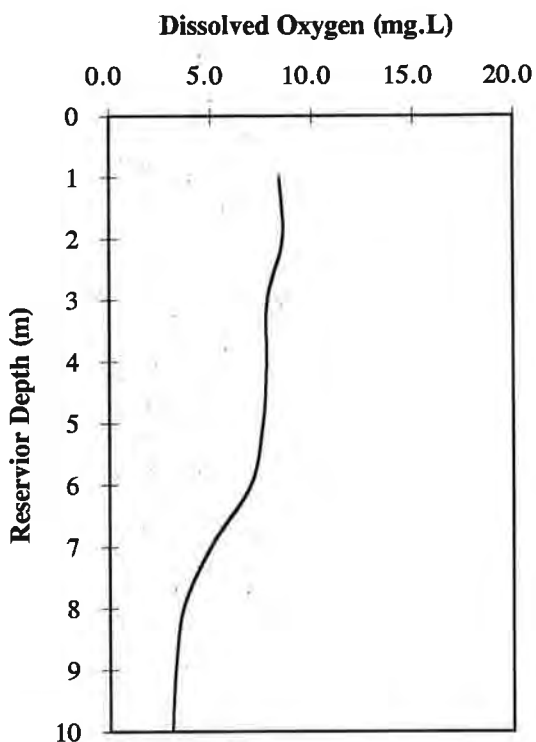
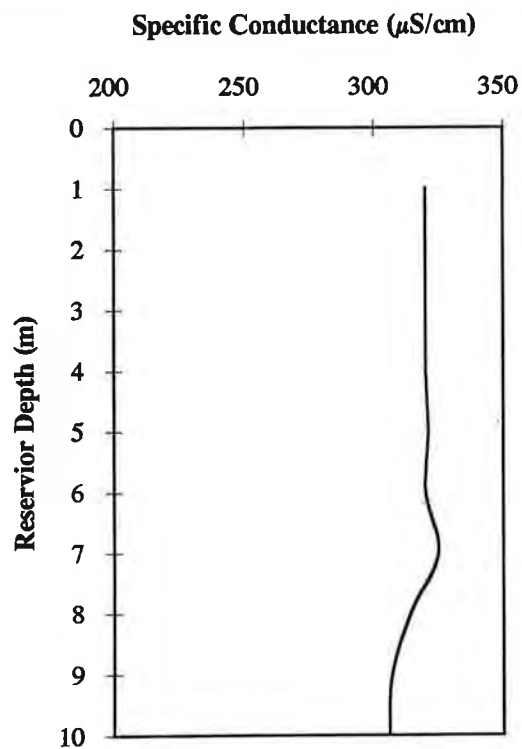
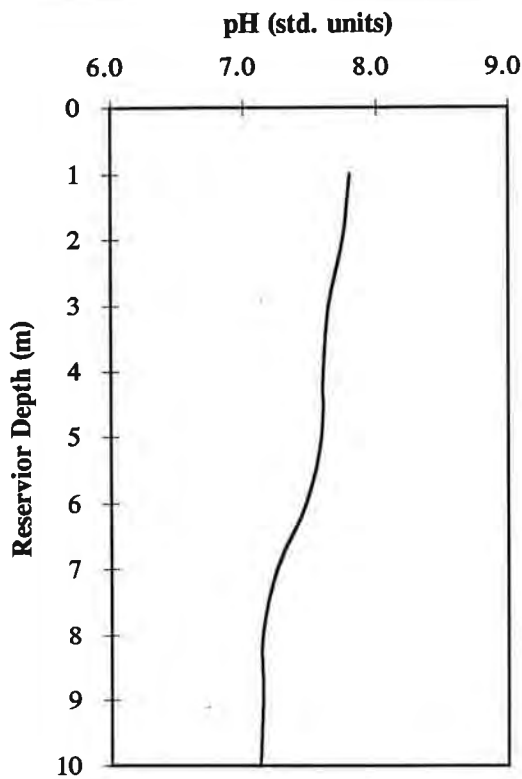




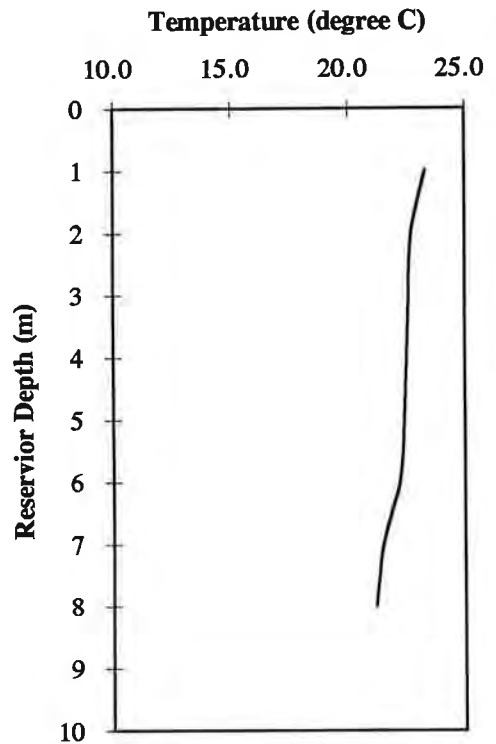
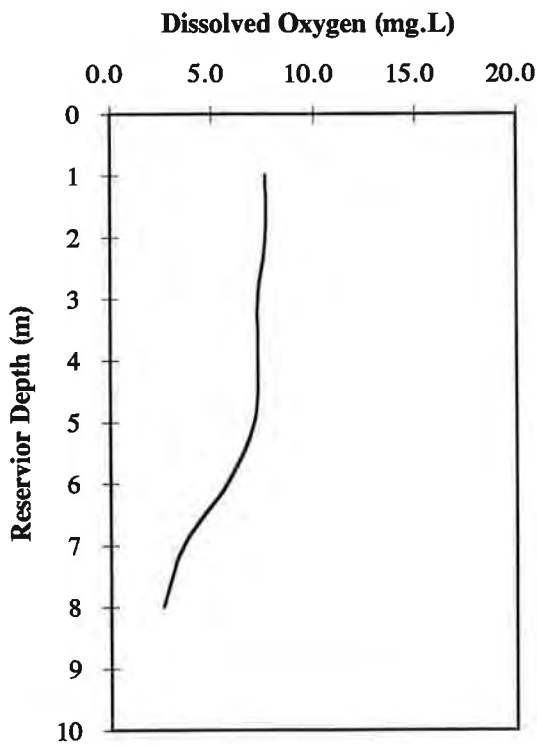
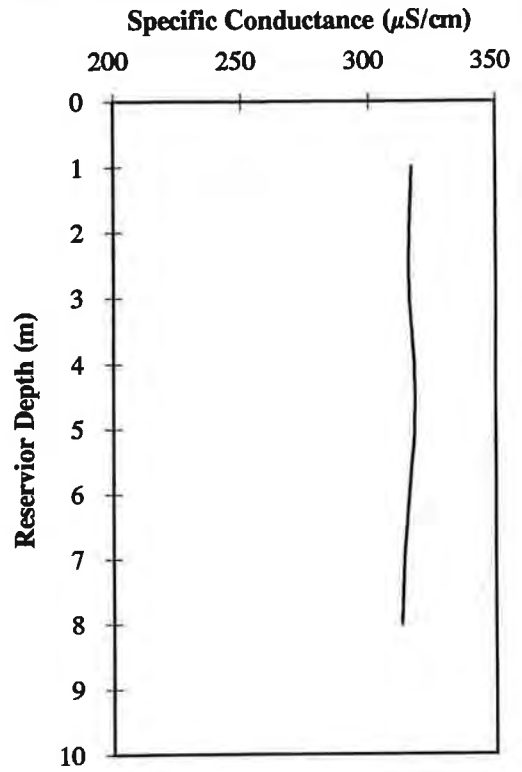
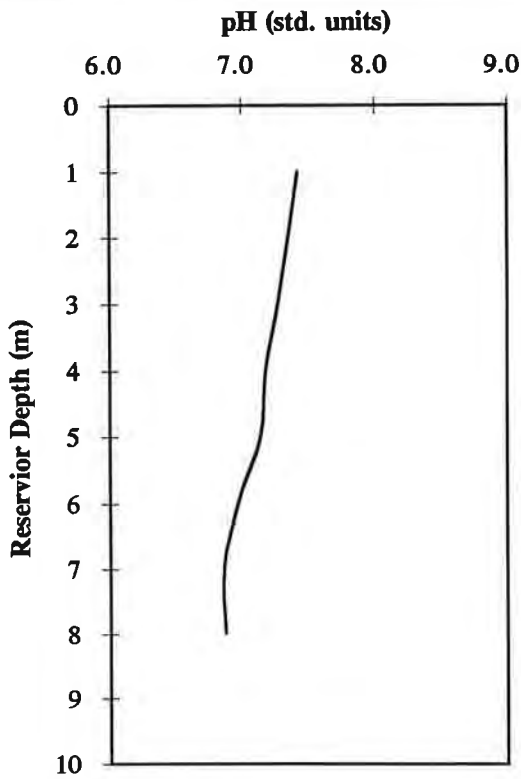
**IN-RESERVOIR DEPTH PROFILE DATA, SITE RM
CHATFIELD RESERVOIR - May 16, 2001**



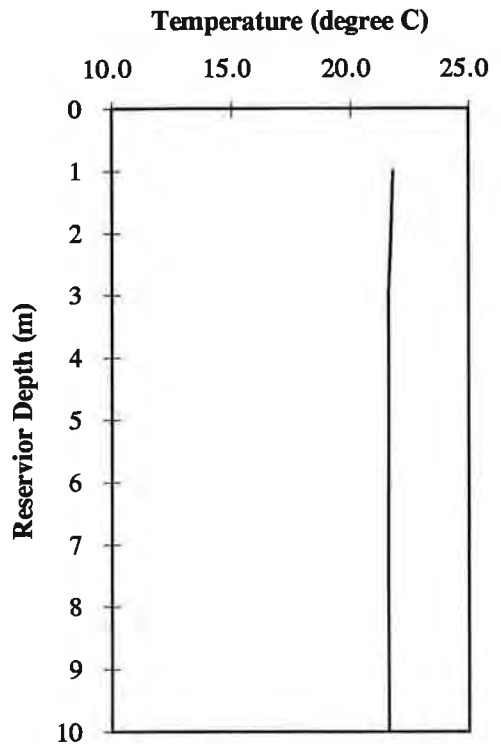
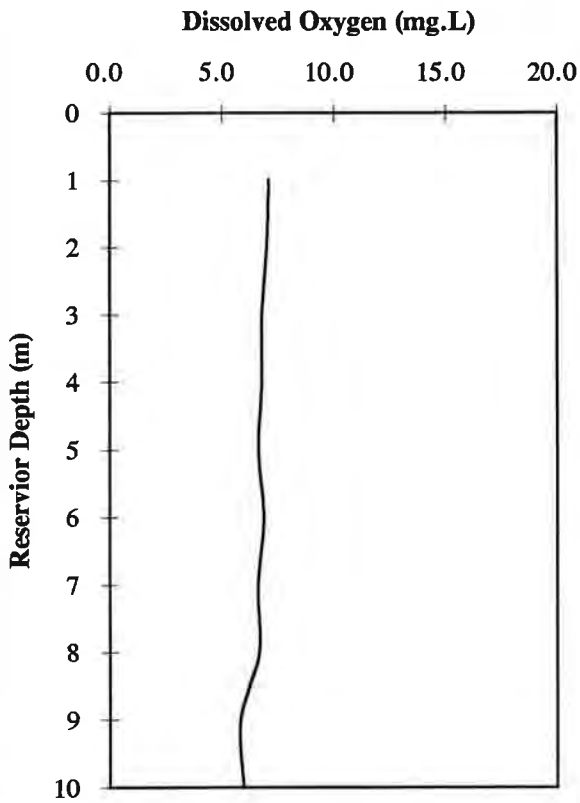
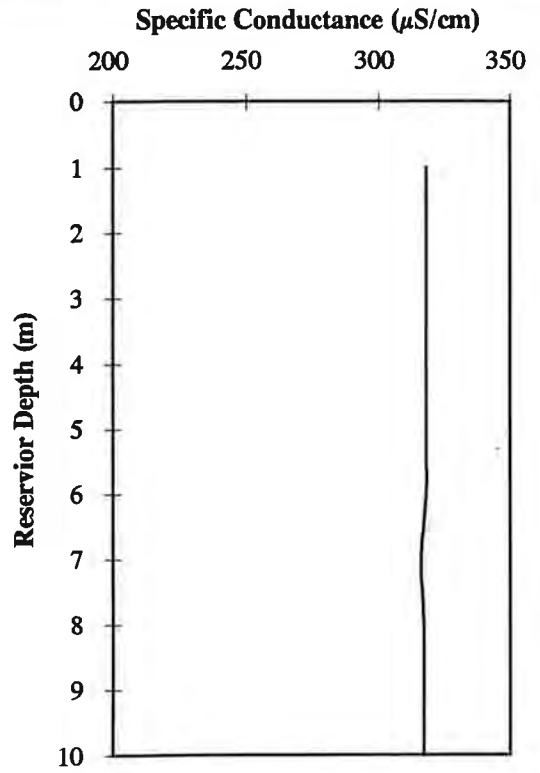
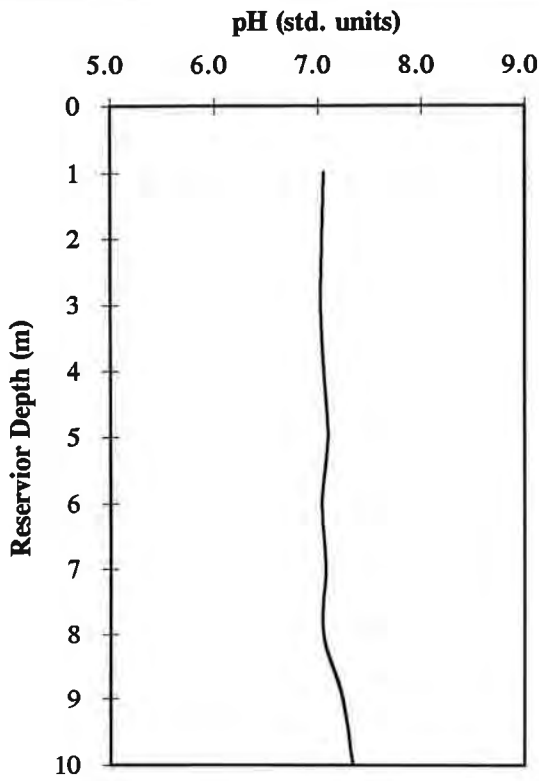
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CHATFIELD RESERVOIR - June, 13 2001**



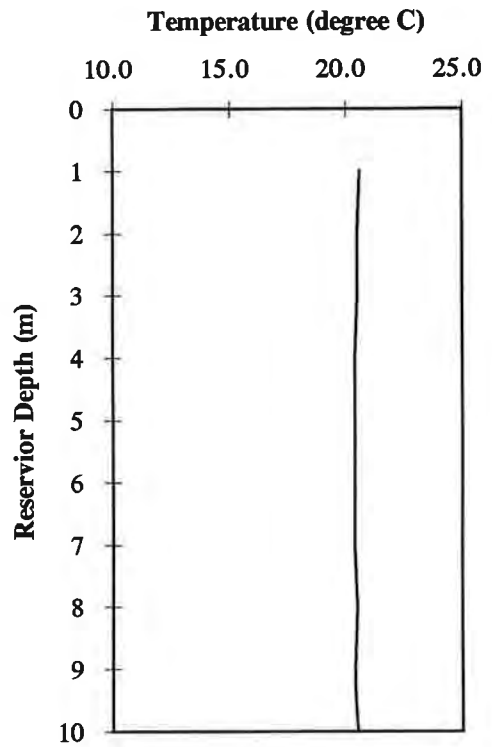
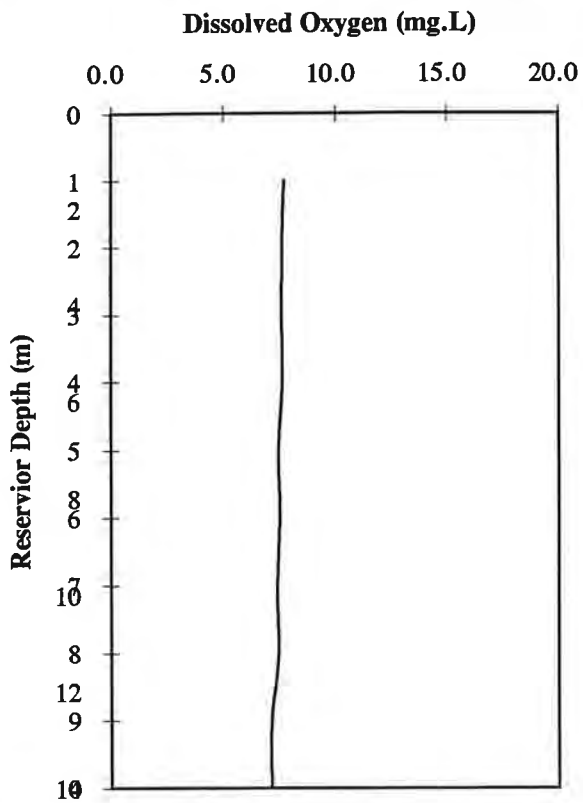
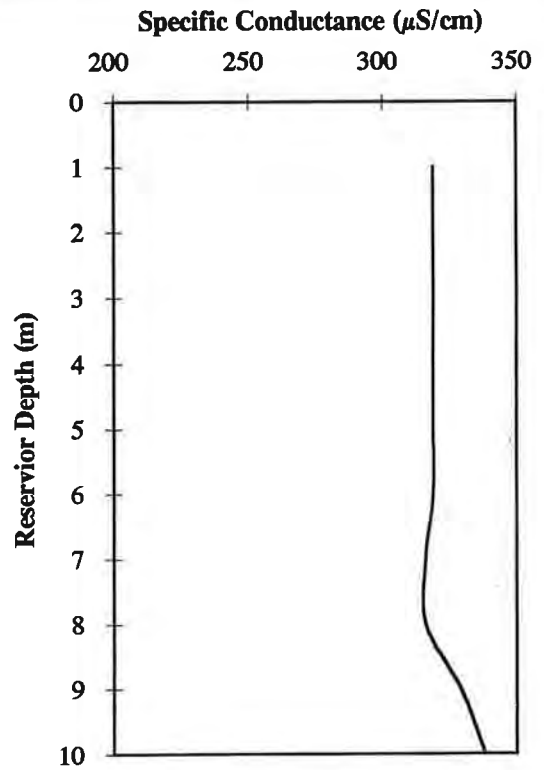
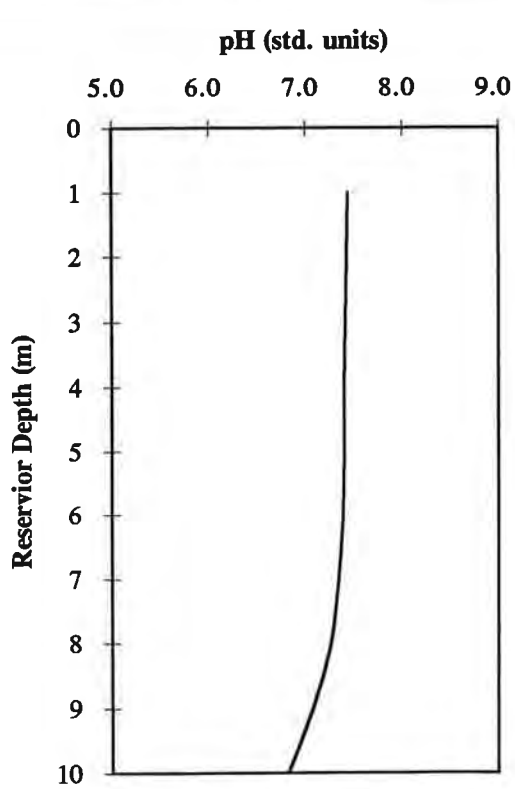
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CHATFIELD RESERVOIR - JULY 11, 2001**



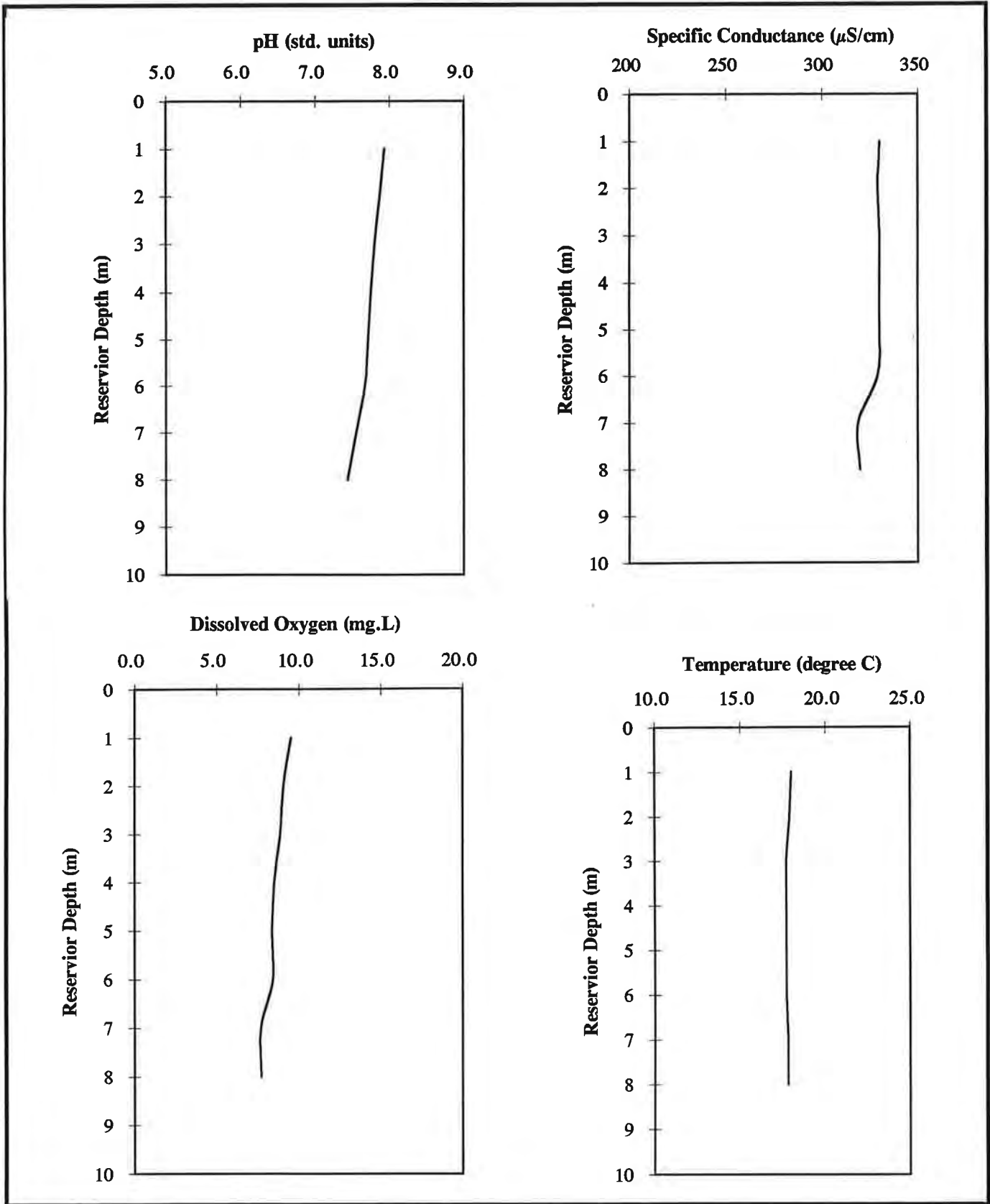
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CHATFIELD RESERVOIR - July 24, 2001**



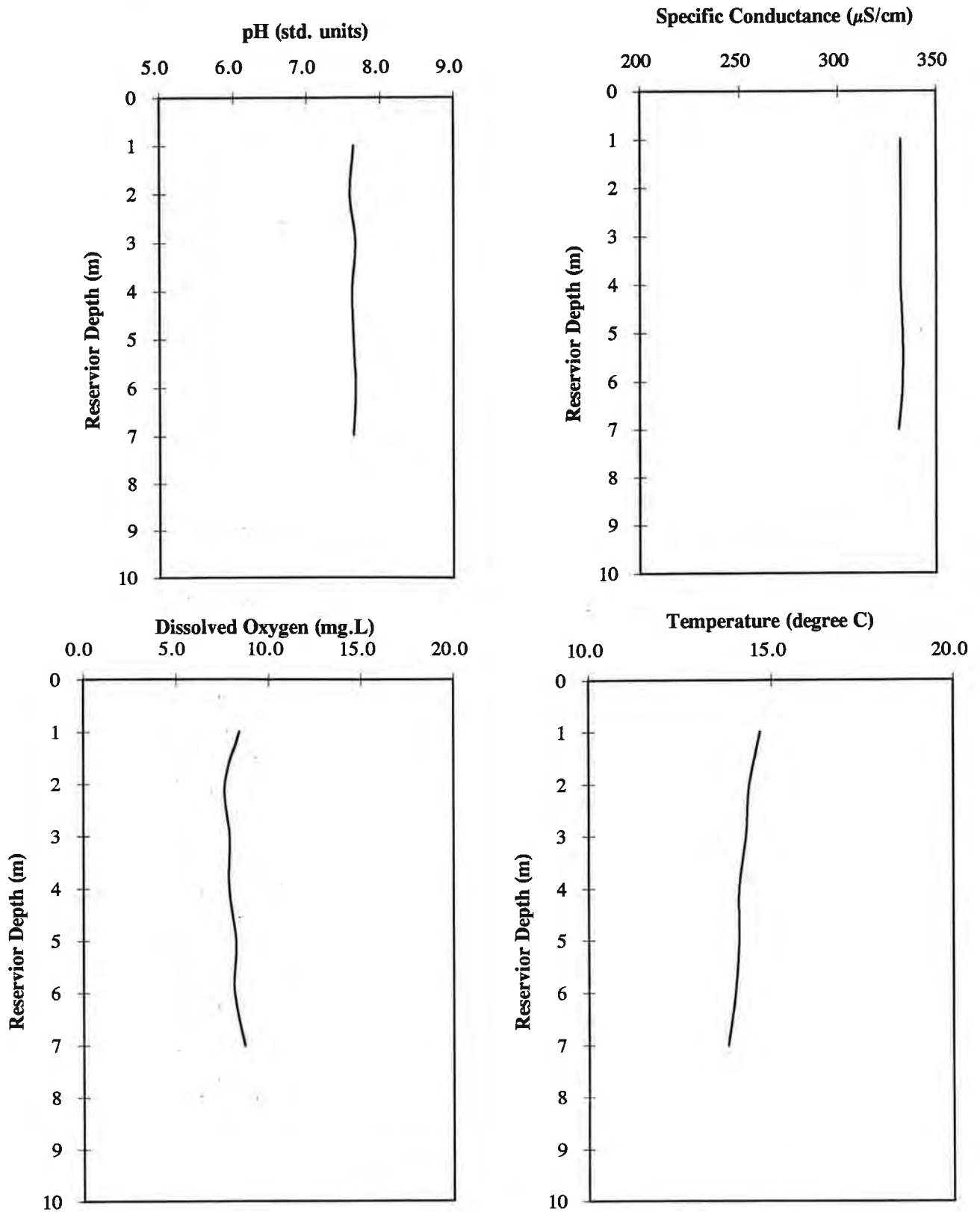
**IN-RESERVOIR DEPTH PROFILE DATA, SITE RM
CHATFIELD RESERVOIR - AUGUST 15, 2001**



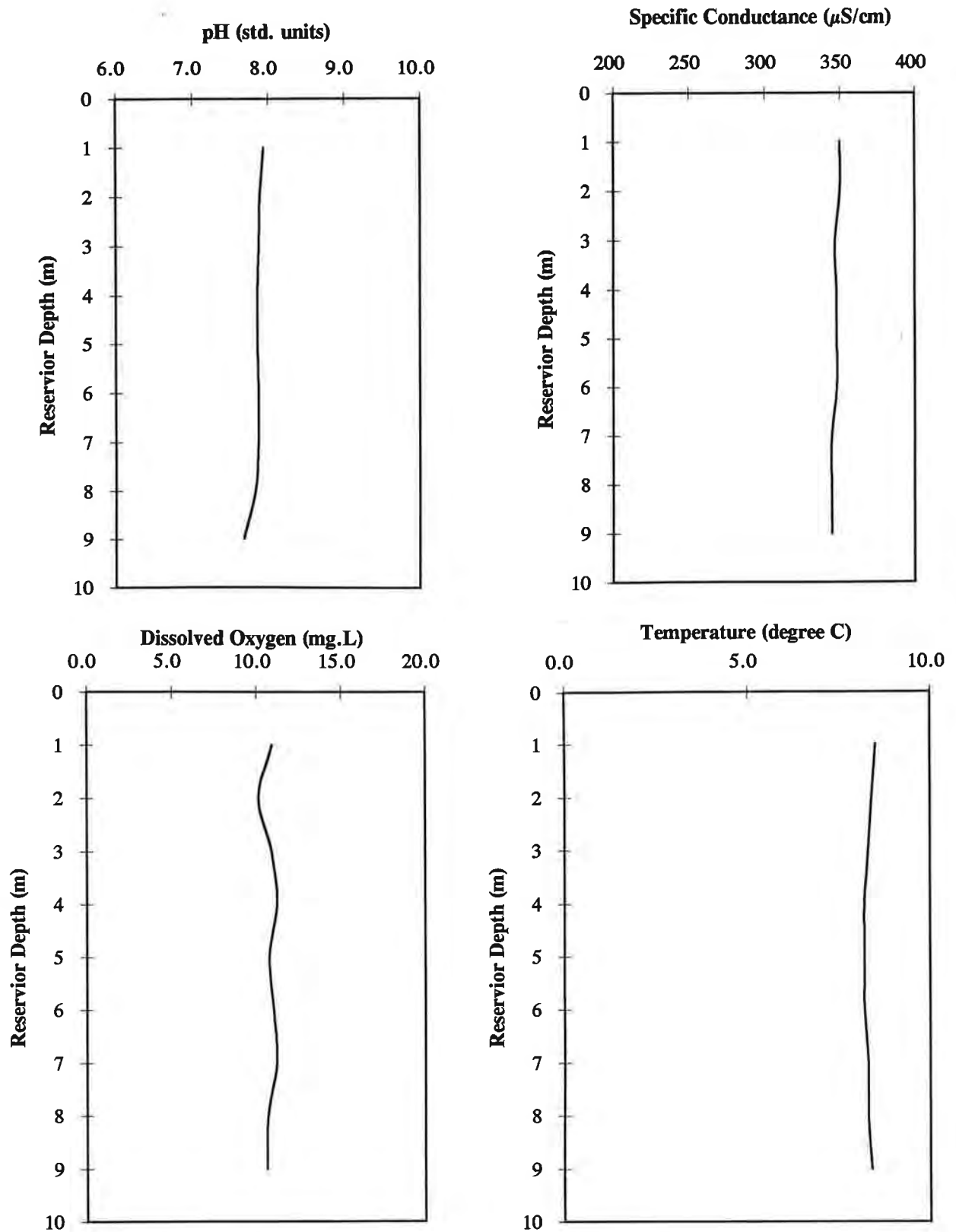
**IN-RESERVOIR DEPTH PROFILE DATA, SITE RM
CHATFIELD RESERVOIR - AUGUST 29, 2001**



**IN-RESERVOIR DEPTH PROFILE DATA, SITE RM
CHATFIELD RESERVOIR - SEPTEMBER 12, 2001**



**IN-RESERVOIR DEPTH PROFILE DATA, SITE RM
CHATFIELD RESERVOIR - OCTOBER 10, 2001**



**IN-RESERVOIR DEPTH PROFILE DATA, SITE RM
CHATFIELD RESERVOIR - NOVEMBER 14, 2001**

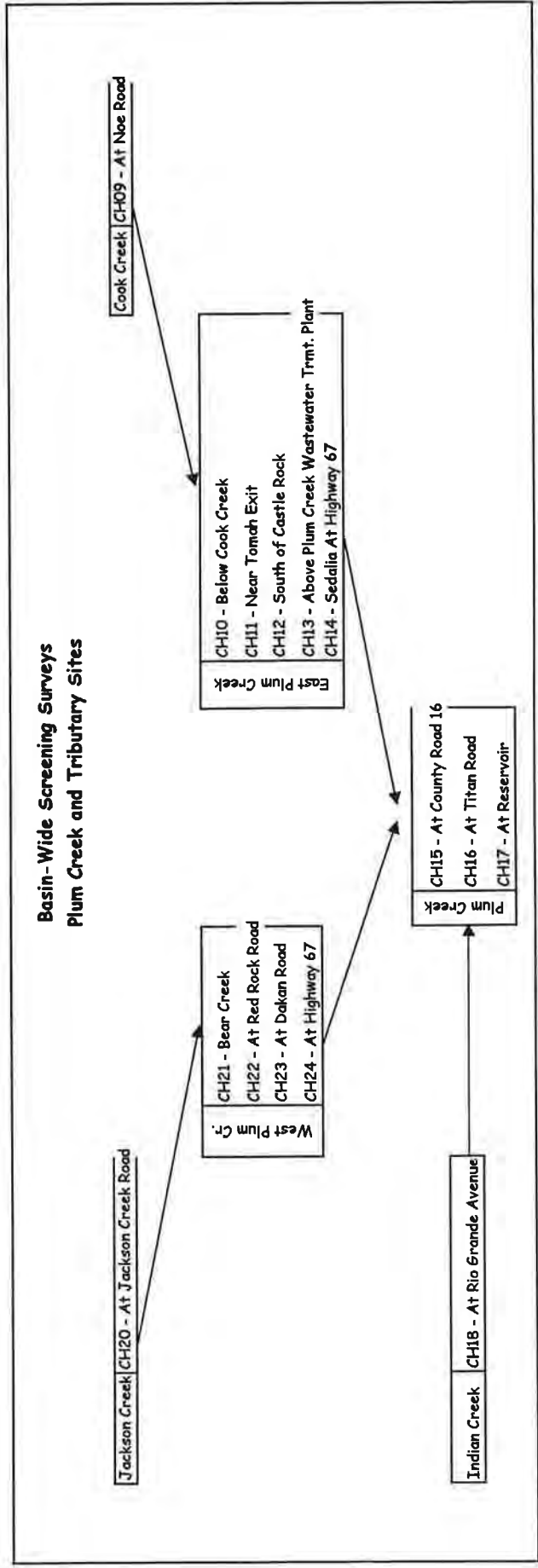
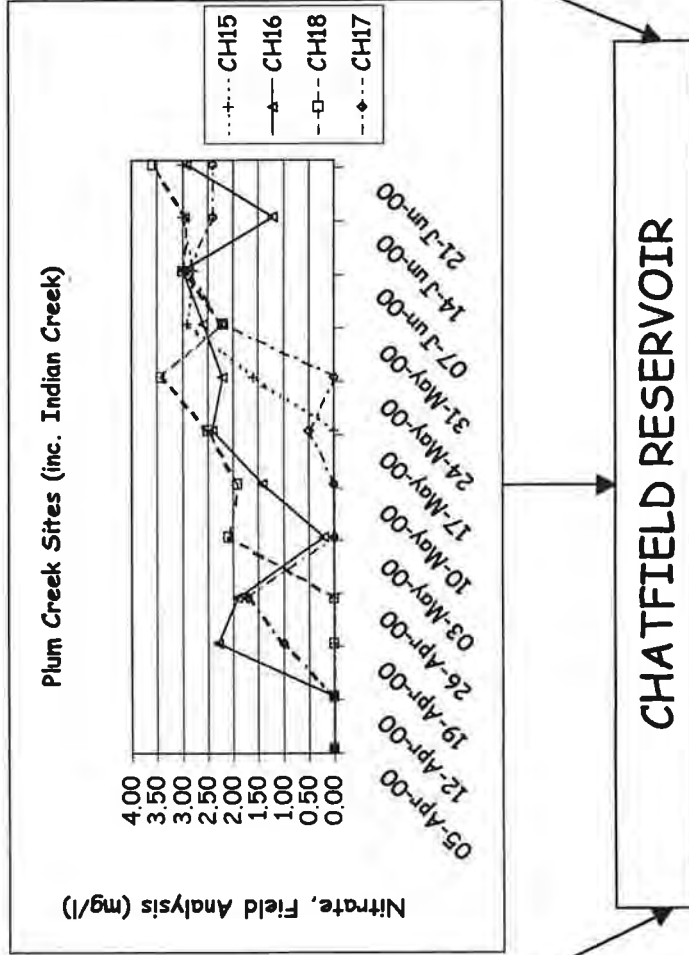
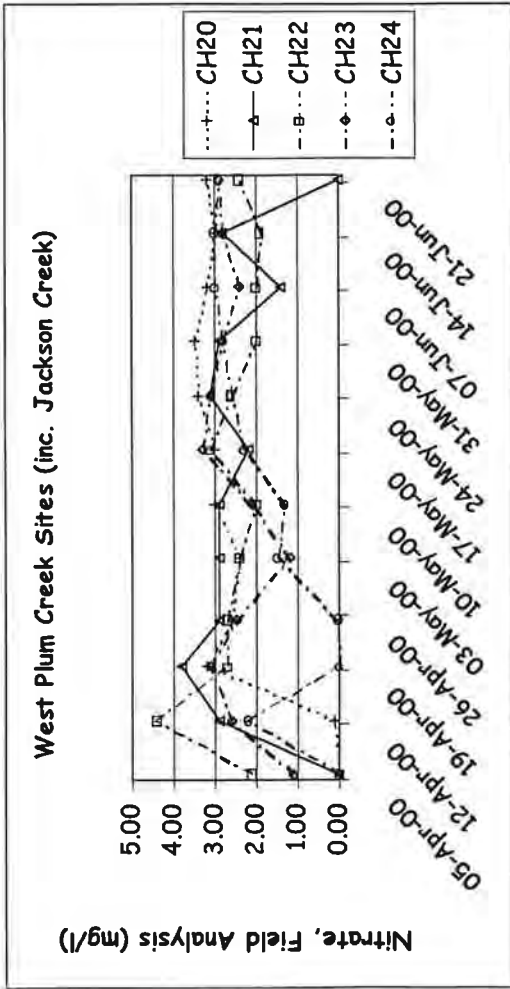
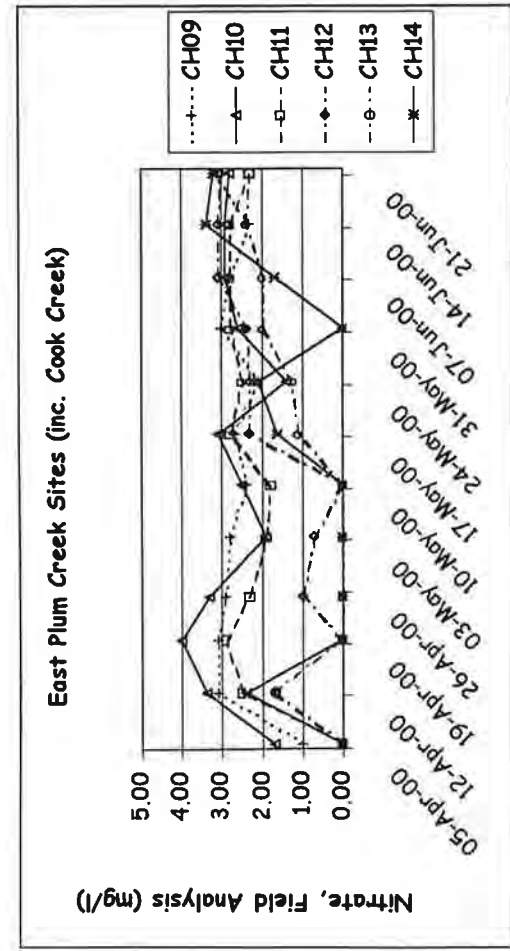


FIGURE 30
SCHEMATIC DIAGRAM OF PLUM CREEK AND TRIBUTARY BASIN-WIDE SCREENING SURVEY SITES



CHATFIELD RESERVOIR

FIGURE 31
SUMMARY OF NITRATE DATA FOR PLUM CREEK AND TRIBUTARY SCREENING
SURVEY SITES, APRIL - JUNE, 2000

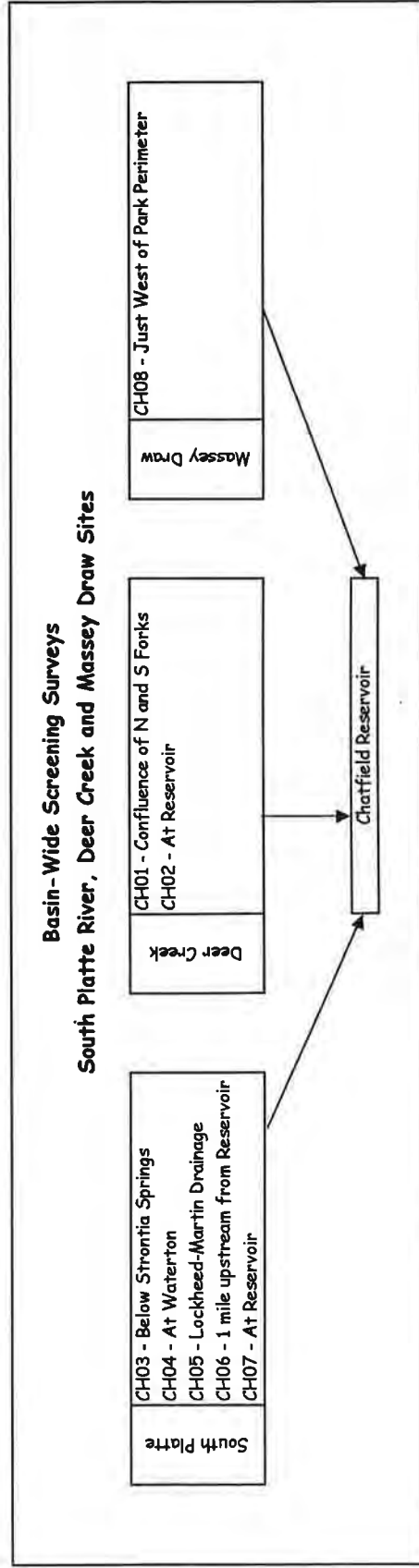
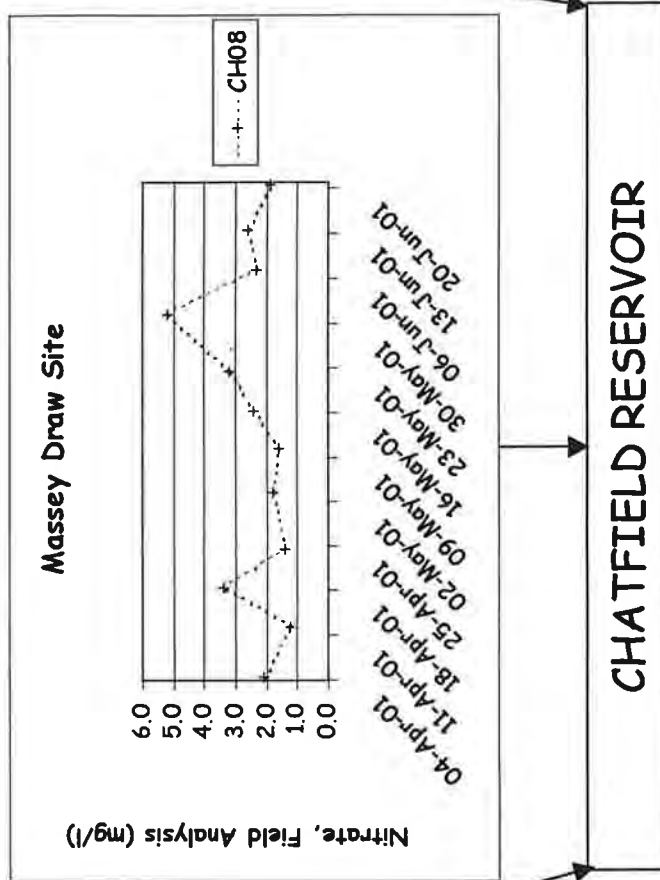
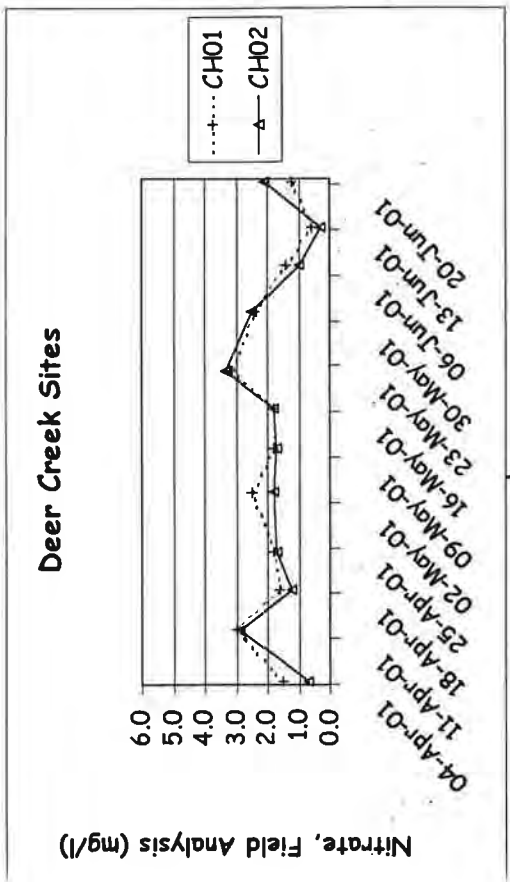
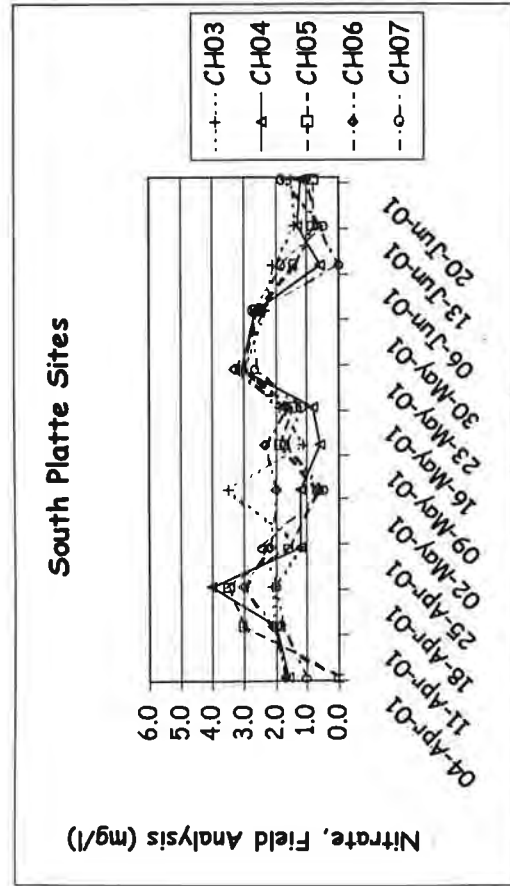


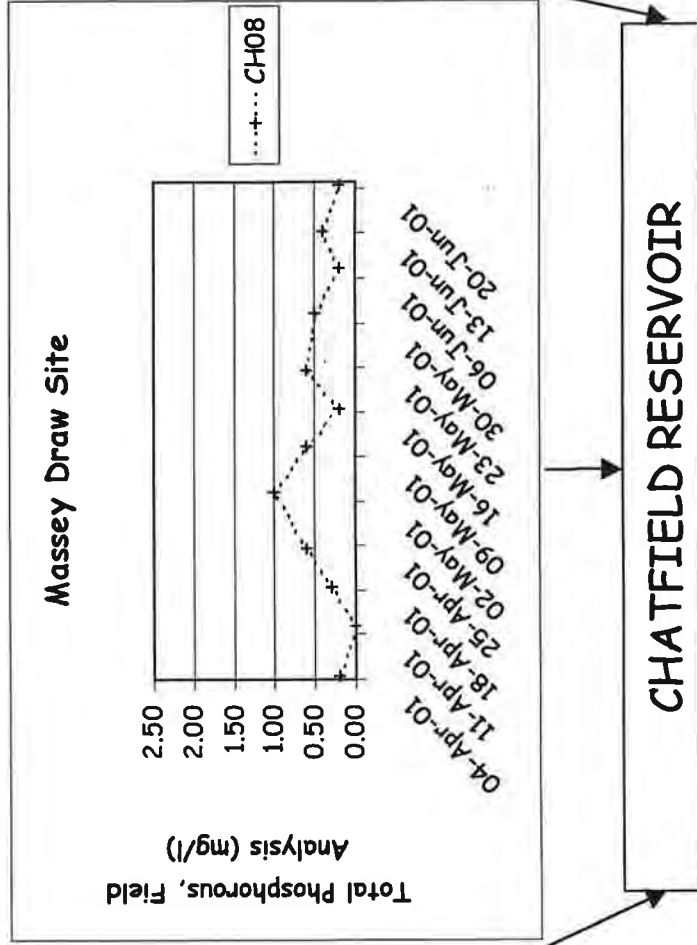
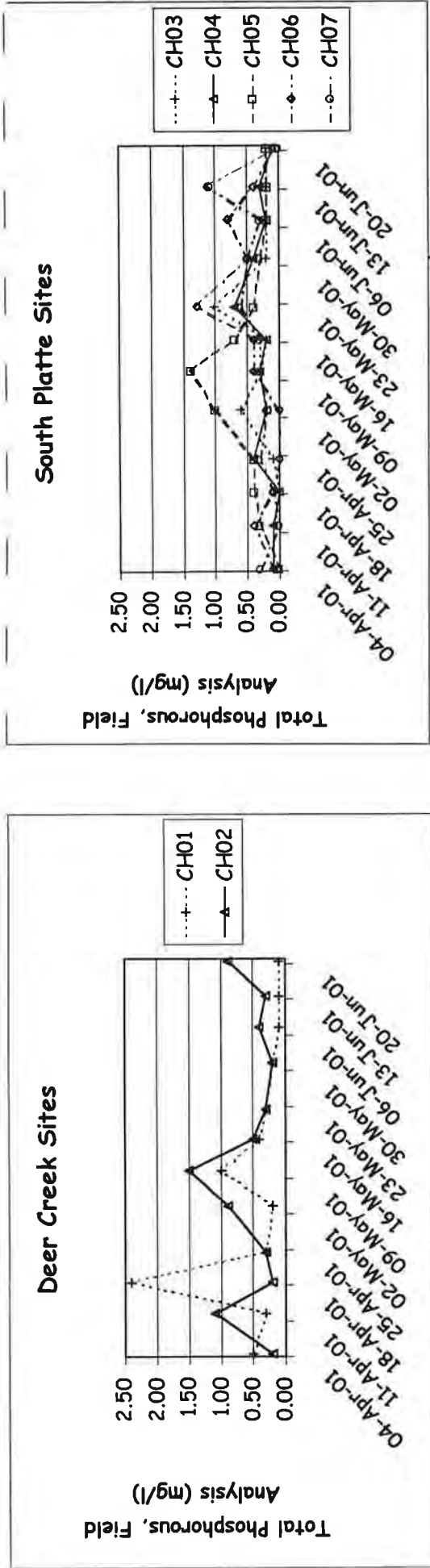
FIGURE 33

SCHEMATIC DIAGRAM OF SOUTH PLATTE RIVER, DEER CREEK, AND MASSEY DRAW BASIN-WIDE SCREENING SURVEY SITES



CHATFIELD RESERVOIR

FIGURE 34
 SUMMARY OF NITRATE DATA FOR SOUTH PLATTE RIVER, DEER CREEK, AND MASSEY DRAW SCREENING
 SURVEY SITES, APRIL - JUNE, 2001



CHATFIELD RESERVOIR

FIGURE 35
SUMMARY OF TOTAL PHOSPHOROUS DATA FOR SOUTH PLATTE RIVER, DEER CREEK, AND MASSEY DRAW SCREENING SURVEY SITES, APRIL - JUNE, 2001

APPENDIX A

CHATFIELD BASIN
WATER-QUALITY DATA ASSESSMENT

1999-2001 High-Flow Screening Surveys and
1990-2000 Groundwater-Quality, Plum Creek Alluvial Wells

Prepared for:

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4251 Kipling Street, Suite 575
Wheat Ridge, CO 80033-6810

Prepared on Behalf of:

Chatfield Watershed Authority
c/o Denver Regional Council of Governments (DRCOG)
2438 W. 26th Avenue, Suite 200B
Denver, CO 80211-5580

Prepared by:

TDS Consulting Inc.
595 West Meadow Road
Evergreen, CO 80439-9745

TDS Project No. 9903

November 19, 2001
[Amended January 31, 2002]

CHATFIELD BASIN
WATER-QUALITY DATA ASSESSMENT
1999-2001 High-Flow Screening Surveys and
1990-2000 Groundwater-Quality, Plum Creek Alluvial Wells

Introduction

On October 10, 2001, Commodore Advanced Sciences, Inc. (CAS) requested TDS Consulting Inc. (TDS) to perform a water-quality data evaluation on behalf of the Chatfield Watershed Authority (CWA). The assessment focused on (1) screening-survey data collected approximately weekly at 23 streamflow sites throughout the watershed for a 1-to-3 month period for each of calendar years 1999 through 2000 (season for high flows); and (2) groundwater-quality data for up to six alluvial wells collected intermittently since 1990 along Plum Creek. The assessment was conducted during November 2001, and the results are documented herein.

Approaches

Two components of the long-term and ongoing water-quality monitoring program for the Chatfield watershed were considered in this data assessment:

- So-called watershed-wide “screening-survey” data for up to 23 sites along major and small tributaries located throughout the watershed; and
- Groundwater-quality data for up to six alluvial wells along Plum Creek.

For the screening surveys, three watershed-wide surveys were completed during June 1999, and 12 surveys were completed during the April-through-June periods of 2000 and 2001. Focus was on estimating/measuring flows and on field-measured indicator water-quality variables: total suspended solids (TSS), specific conductance (SC), pH, dissolved oxygen (DO), water temperature, nitrate-nitrogen (NO₃-N) concentration, and total-phosphorus (T-P) concentration. For one or two of the surveys during 2000, laboratory analyses of ortho-phosphorus concentrations were made; however, these few data averages were only included in the summary tabulation.

For the groundwater-quality data, up to six Plum Creek alluvial wells were sampled during the 1990-2000 period. The following details are provided of the changing patterns for surveys over this period, providing data results for up to 27 alluvial-well sampling surveys:

- 1990: monthly, for July through September and November through December;
- 1991: quarterly, for the months of April, June, September, and December;
- 1992: quarterly, for the months of February, May, August, and November;
- 1993: bi-annual, for the months of February and November;
- 1995: annually, for the month of June;
- 1998: bimonthly, for the months of April through June; and
- 2000: bimonthly, for the months of April through June.

The groundwater-quality data focused on the following variables: water temperature, specific conductance (SC), dissolved oxygen (DO, intermittent data); total nitrogen (T-N), total phosphorus (T-P), and total ortho-phosphorus. Fewer, more recent analyses of nitrate-nitrogen and nitrite-nitrogen concentrations are included in the data summary but are not further used in the assessment. For alluvial-well 6W, data were available only for the 1990-1993 period of record. Also, for several (approximately seven) of the surveys, alluvial-well 4W was not sampled or could not be accessed.

The appropriate data sets were compiled using both electronic files provided by CAS and completing these with other data included in published CAS annual monitoring reports for the CWA. Some effort was required for this data-compilation phase, due to the following causes: different formats for the electronic files, missing records (found in published data), and occasional data transcriptional errors.

For both data components (screening surveys and groundwater quality), the water-quality data assessment principally relied upon statistical averages for the periods of record and time-series graphics for the principal variables considered. In the results and discussion sections that follow, some of the limitations of the data are specifically provided. Recommendations for future consideration are also provided.

Results

Screening Surveys.—The following observations and watershed conditions were noted (Table 1 and Appendix A):

Total Suspended Solids

- The highest average TSS concentrations (all exceeding 65 mg/L) were found for lower East Plum Creek from Castle Rock to Sedalia (sites CH12, CH13, and CH14), the lowest part of West Plum Creek at Sedalia (site CH24), and the three mainstem Plum Creek sites (CH15, CH16, and CH17).
- Relatively low average TSS concentrations (all less than 10 mg/L) were found for South Platte River sites (CH03, CH04, CH06, and CH07), the Lockheed-Martin tributary (believed to be Brush Creek, site CH05), Massey Draw (site CH08), Cook Creek (site CH09), Bear Creek (site CH21), and upper West Plum Creek (site CH22).
- The remaining seven sites were characterized by intermediate average TSS concentrations (ranging between nearly 14 and over 40 mg/L; sites CH01, CH02 on Deer Creek; sites CH10 and CH11 for upper East Plum Creek; Indian Creek and Jackson Creek (tributaries of West Plum Creek, sites CH18 and CH19), and the mid-reach of Plum Creek (near Dakan Road, site CH23).

Specific Conductance

- The highest average SC value of 1.026 mmhos/cm (or 1026 umhos/cm) was for Massey Draw (site CH08). Two intermediately-high average SC values occurred for lower Deer Creek (site CH02, 0.814 mmhos/cm) and for Brush Creek (site CH05, 0.687 mmhos/cm).

- Relatively low average SC values (0.117 mmhos/cm or less) were noted for five streams (Table 1): (a) Cook Creek (site CH09); (b) upper East Plum Creek (site CH10); Jackson Creek (site CH18); (d) Bear Creek (site CH21); and upper West Plum Creek (site CH22).
- For the remaining 14 stream sites, average SC values remained in the range between 0.211 and 0.393 mmhos/cm, still characterizing good water quality from an overall salinity perspective.
- A number of site averages were affected by a series of high SC measurements recorded for the 4/5/00 survey, indicating a possible field-instrument problem (see below).

Relative Streamflows

- The smaller tributaries were characterized by seasonal streamflows averaging less than 15 cfs: sites CH01, CH02, CH05, CH08, CH09, CH10, CH18, CH20, CH21, and CH22.
- Lower reaches of both East Plum Creek (sites CH14 through CH 17) and West Plum Creek (sites CH 23 and CH24) were characterized by average streamflows of between about 20 and 40 cfs.
- For the mainstem South Platte River, seasonal average streamflows ranged between 253 and 345 cfs (sites CH03, CH04, CH06, and CH07).

Other Physical Variables (pH, DO, and temperature)

- For upper Deer Creek (site CH01), the average pH value was 6.27 (standard units). Otherwise, for all other (22) sites, average pH values remained between 7 and 8, which is considered normal. However, a downward trend in pH values over the period of record was noted for numerous sites (Appendix B).
- The highest average DO (exceeding 8 mg/L) concentrations were noted for upper tributaries (site CH01 on Deer Creek; the mainstem South Platte River at all four sites, Brush Creek at site CH05), Massey Draw at site CH08), Indian Creek at site CH18, and Bear Creek at site CH21). For all other sites, the average DO concentrations all were 8.05 mg/L or lower (but above 7 mg/L).
- Seasonal water temperatures were highly variable for any given site, due in large part to different times of day for measurement. Systematically low water-temperature values were recorded for the 05/03/01 screening survey for a number of sites (Appendix A), indicating a possible instrument-calibration problem.

Nutrient Species (N and P)

- For T-P, the highest average concentrations (ranging between 0.79 and 2.58 mg/L) were associated with the lower segments of East Plum Creek (sites CH12, CH13, and CH14), lower West Plum Creek (site CH24), and the mainstem Plum Creek (sites CH15, CH16, and CH17). A relatively high average T-P concentrations was noted for Indian Creek (0.60 mg/L). For the remaining screening-survey sites (Table 1), average T-P concentrations were 0.40 mg/L or less. The lowest average T-P concentrations were associated with the South Platte River (ranging between 0.13 and 0.19 mg/L; sites CH03, CH04, CH06, and CH07). Due

to detection-limit shifts, 2001 T-P concentrations were consistently higher than for 1999 or 2000; a systematic bias in average T-P concentrations results (Appendix A).

- Average T-N concentrations were contrasted with those for T-P: Relatively low T-N concentrations (1.9 mg/L or less) occurred for East Plum Creek, except for the upper site CH10; lower West Plum Creek (site CH 24), the mainstem Plum Creek (all three sites), and Indian Creek. Otherwise, average T-N concentrations ranged between 2.0 and 2.6 mg/L (Table 1). Some intermittently high T-N concentration anomalies occurred (Appendix A).

Groundwater Quality.—Six alluvial wells were selected for characterization of groundwater quality along Plum Creek. The wells, identified as 1W through 6W, were generally located in an upstream-to-downstream sequence. As was noted above, well 6W was sampled only during 1990-1993, and well 4W was not sampled during several of the surveys. The following observations and alluvial-well conditions were noted (Table 2 and Appendix B):

- Due to the irregular intervals, water temperatures varied greatly and did not depict any seasonal patterns. Average water temperatures ranged between 10.0 and 15.4 degrees C.
- Specific conductances, with two exceptions, were below 600 umhos/cm (Table 2). For wells 2W and 5W, one high SC value for each was noted, which was judged to be anomalous. Average SCs ranged between 252 and 363 umhos/cm. For the five wells with long-term records (1990-2000), some increasing time trends in the data series were noted (Appendix B).
- Dissolved-oxygen concentrations in the wells indicated two distinct patterns. For the upper Plum Creek sites (1W, 2W, and 3W), DO concentrations averaged between 7.01 and 7.34 mg/L; whereas, for the lower Plum Creek sites (4W, 5W, and 6W), DO concentrations averaged between 4.04 and 5.04 mg/L (Table 2). DO concentrations were not reported for the 1995 and 1998 surveys (Appendix B).
- The wells' pH values averaged within a narrow range, between 6.94 and 7.26 standard units.
- Regarding nutrient species, again two distinct patterns were noted (see DO discussion above and Table 2). For the upper-reach wells (1W, 2W, and 3W), average nutrient-species concentrations were higher: T-N, 2.40-3.17 mg/L; T-P, 0.09-0.17 mg/L, and Ortho-P, 0.07-0.16 mg/L. For the lower-reach wells (4W, 5W, and 6W), nutrient concentrations were lower: T-N, 0.24-0.35 mg/L; T-P, 0.01-0.02 mg/L; and Ortho-P, 0.01-0.02 mg/L. Intermittent anomalously high nutrient concentration values were noted (Appendix B).
- Several examples of anomalous values include the following: Well 1W, T-P, 0.75 mg/L; Well 2W, SC, 963 umhos/cm; Well 2W, T-P, 0.514 mg/L; Well 4W, SC, 557 umhos/cm; Well 5W, SC, 925 umhos/cm, and Well 6W, T-N, 1.2 mg/L.

Summary and Recommendations

Screening Surveys

1. The screening surveys for the seasonally high April-through-June periods for 1999 through 2001 provide a useful areal characterization of flow and water-quality patterns throughout parts of the Chatfield basin for the selected indicator variables.
2. The absence of April-May 1999 data should be noted. This period appeared to reflect high-than-normal flow conditions. This condition indicates the usefulness of collecting such data over several years and of including flow as a critical variable included in this monitoring component.
3. The change in field-measurement method for total-phosphorus concentrations resulted in a systemic bias in CY-2001 results for this variable. However, with the purpose of evaluating relative changes areally for the 23 screening-survey sites and with combining data for the period of record (1999-2001), the impact of this factor has been reduced.
4. Areal differences in the various water-quality indicators (TSS, SC, pH, DO, temperature, and nutrient species T-P and T-N, as well as flow are described in the main text (pp. 2-3). Several sites appeared to have anomalously high SC measurements; however, these values have not affected average values to a large degree. However, this does point out the importance of consistent meter calibration prior to each survey.
5. It is recommended that this areal configuration of screening surveys be continued, in particular, to assess nonpoint-source contributions from critical subareas. However, this monitoring component has a lower priority than the alluvial-well surveys discussed below, in the case of limited CWA budget.

Groundwater Quality

1. The Plum Creek alluvial wells' monitoring component extended over a period of 11 years. However, the survey scheduling has varied over this period (p. 1) and seasonal patterns of water-quality variability could not be discerned. Also, it has been unfortunate that the monitoring of well 6W has not continued since 1993.
2. Specific conductances (SCs) in general appeared to be increasing in the Plum Creek alluvial system over this period of record. This is judged (confirmed by Tim Grotheer, pers. commun., January 22, 2002) to be a result of a change of water-use patterns in the Plum Creek subwatershed, contributing to more flows to East Plum Creek and Plum Creek and their associated alluvial system. Also, SCs were slightly higher in the upper alluvial system (wells 3W-1W-2W) of East Plum Creek, compared to results for the three wells (4W-5W-6W) downgradient along

the mainstem Plum Creek. A couple of anomalous SC measurements were noted (see Table 2).

3. Alluvial-reach patterns indicated lowering of average DO, T-N, T-P, and Ortho-P, between the East Plum Creek and mainstem Plum Creek subreaches, respectively (Table 2). A couple of anomalous nutrient-species concentrations were noted (p. 4). DO measurements were not included in the 1995 and 1998 alluvial surveys. Alluvial-reach conditions for other indicator water-quality variables are discussed in the text (p. 4).
4. Biennial (every 2 years) alluvial surveys along the Plum Creek system are recommended and are given a high priority. The sample-survey scheduling used for the last two survey periods (bimonthly during the April-through-June periods of 1998 and 2000) appears to give good characterization of this seasonal period. Consideration should be given to assess at least quarterly the remaining nine months of a given monitoring year.