



ECOLOGICAL CONSULTING AND
ENVIRONMENTAL LABORATORY SERVICES

WHITE WATER ASSOCIATES, INC.

February 8, 2001

The Secretary
Federal Energy Regulatory Commission
Mail Code: DLC, HL-11.2
888 First Street, NE
Washington, DC 20426

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02 FEB 13 PM 1:17
FEDERAL ENERGY
REGULATORY COMMISSION

Dear Secretary:

I am submitting copies of this final interim report for the Water Quality Monitoring Study (2001 Monitoring) for the City of Crystal Falls Hydroelectric Project (Project No. 11402-013). This study is being conducted to comply with the FERC order issued April 10, 1997 approving the licensee's Water Quality Monitoring Plan.

This letter is tendered as "Proof of Service" indicated in the FERC order. In addition mailing these copies to FERC, I hereby certify sending a copy of this report to each of the following agencies:

Michigan Department of Natural Resources
Attention: Jessica Mistak, Fisheries Biologist
Habitat Protection Unit
484 Cherry Creek Rd.
Marquette, MI 49855

U.S. Fish and Wildlife Service
Attention: James Fossum, Fish and Wildlife Biologist
Division of Ecological Services
Green Bay Field Office
1015 Challenger Court
Green Bay, WI 54311

Thank you for your attention to this package. If you need anything further, do not hesitate to call.

Sincerely,

Kent F. Premo

Kent F. Premo
Associate Consultant

AS
DOCKETED

enc.

cc: Jessica Mistak (MDNR), James Fossum (USFWS), City of Crystal Falls

020214-0503-3



WHITE WATER ASSOCIATES, INC.

City of Crystal Falls Hydroelectric Project (Project No. 11402-013) Water Quality Monitoring Study

Annual Report for 2001 Monitoring

To be submitted to:

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Draft copies were sent to Michigan Department of Natural Resources (Jessica Mistak) and U.S. Fish and Wildlife Service (James Fossum)

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Date: February 8, 2002

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INTRODUCTION

This final interim report describes Year 2001 results for the Water Quality Monitoring Study being conducted for the City of Crystal Falls (licensee) on the City of Crystal Falls Hydroelectric Project (FERC Project No. 11402) located on the Paint River in Crystal Falls, Michigan (Iron County). This study is being conducted to comply with the FERC order issued April 10, 1997 approving the licensee's Water Quality Monitoring Plan (Appendix A). The study is being conducted by an independent ecological consulting firm (White Water Associates, Inc.) under contract with the licensee, with oversight by the Michigan Department of Natural Resources (MDNR) and United States Fish and Wildlife Service (USFWS).

The Water Quality Monitoring Plan submitted by the licensee was prepared by its contractor Mead and Hunt (Appendix A). The FERC order on the plan modified the proposed two-year monitoring term to a three-year term. In addition, it set reporting schedules specifying that annual reports, including copies of agency comments as well as any proposed modifications for subsequent years of the study, be filed with the FERC by February 15 (2002, for this year's monitoring). The order also specified special reporting instances should water quality measurements fail to meet standards set by Article 404 (Appendix A). This report is the full interim report product, incorporating the agency comments, which are included in Appendix H. Consultant and client correspondence regarding the report and agency response is provided in Appendix I.

This report is comprised of five principal sections, including this one (the Introduction). The next section will describe the general area of the hydroelectric project and the specific monitoring sites. The Methodology section describes four aspects of the study: (1) Upstream Water Quality Profiles, (2) Upstream Temperature Monitoring, (3) Downstream Dissolved Oxygen and Temperature Monitoring, and (4) Data Management and Analysis. (Except where noted, the Description of the General Area and Methodology sections are identical to those of the 2000 annual report, except for monitoring dates.) The Findings section presents our observations and data collected from the field, and provides an analysis of the data. The Discussion section reviews the first two years of monitoring and recommends how anticipated effort for the field season in the third and final year may be modified.

DESCRIPTION OF THE GENERAL AREA AND MONITORING SITES

The study area is composed of two sites: an upstream site at the upper outer end of the floating platform ("catwalk") from which the barrier net is suspended, and the downstream site below the dam on the west side (river right). Throughout this report, these sites are often referred to simply as upstream and downstream. (See Figure 1, Appendix B.)

Servicing the upstream site was reliable and convenient thanks to the floating platform. This substantial structure is composed of wooden rafts connected into two large floating limbs oriented at approximate right angles to one another. The limb that is oriented upstream-downstream is 84 feet long and the limb that is placed cross-current is 96 feet long. It is held in place by steel cables that are stretched between anchor points on the dam, island, and western shore. The inner corner of the two limbs, just outside the barrier net, was the upstream site for deploying water quality monitoring equipment and taking profiles every two weeks. (Note: this was an approved change from the 2000 monitoring effort, which involved weekly visits.)

The downstream site was chosen for its security, remoteness, consistent depth, and relation to the dam. It was approximately 100 feet downstream. The study plan prepared by Mead and Hunt and referenced in the FERC order indicated that positions be approximately 500 feet above and below the dam. Convenience and security dictated that these distances be reduced; however, the intent of the plan held—to measure water quality parameters at proper depth, well above and below the dam. In addition, the downstream site corresponded with the location of past deployment of similar equipment, lending to historical comparisons.

The aptness of depths of the two sites for this study was supported by historical data. In 1992, White Water Associates conducted aquatic and terrestrial studies within the Crystal Falls project area as part of the relicensing requirements (Paint River Ecology and Water Quality Study, White Water Associates, 1992). Bathymetry measures at two-foot contours were conducted throughout the impoundment including the area of the barrier net. From that data, depth at the upstream deployment site was determined to be among the deepest locations of the impoundment (as specified by the plan describing the site selection for dissolved oxygen and temperature profiles) at around 14 feet or 4.5 meters. From similar experience, the depth of the downstream site was known to typically be from 3 to 4 feet (1 meter) during the study period.

METHODOLOGY

For the Water Quality Monitoring Study, we followed the study protocol outlined in the licensee's monitoring plan prepared by its contractor, Mead and Hunt, filed with the Commission in November 1996, as modified in the order approving the plan issued April 10, 1997 (Appendix A), with the exception of profiles and data collection every two weeks rather than weekly, as noted above. This section details the methods we used for the 2001 component of the study under four subheadings: (1) Upstream Water Quality Profiles, (2) Upstream Temperature Monitoring, (3) Downstream Dissolved Oxygen and Temperature Monitoring, and (4) Data Management and Analysis.

Upstream Water Quality Profiles

Upstream water quality was measured by means of a portable YSI dissolved oxygen/temperature probe. The probe's cable was marked at 0.5-meter intervals. According to the plan and its approving order, measures were only required every meter, which is how we conducted the profiles in 2001. Measures of temperature and dissolved oxygen were taken approximately every two weeks at the upstream site, starting June 7 and ending September 24.

Two additional profiles are scheduled for the month of February (2002), but due to their timing the results cannot be included in this year's report without an extension of the deadline. Last year, the February profile results were filed with the agencies, MDNR and USFWS, in March. These 2001 results are included with this report.

Upstream Temperature Monitoring

In addition to affording a location for water quality profiles, the upstream site was the point of deployment for a temperature probe, Ryan TempMentor II, programmed to record temperature hourly. The temperature probe was factory calibrated before the study. The probe and datalogger, joined in a buoyant plastic cannister, were suspended from a weighted chain about 6 feet (2 meters) in depth from the surface. Every two weeks, when the site was visited

for profiles, the probe was checked to make sure it was functioning properly; data was downloaded via a laptop computer at the end of the season. The unit collected data from June 1 through September 30.

Downstream Dissolved Oxygen and Temperature Monitoring

Visits every ten to fourteen days coinciding with upstream profiles were scheduled to service the Hydrolab Datasonde 3 probe deployed below the dam. The datasonde was programmed to measure dissolved oxygen and temperature hourly, as well as several related and operational parameters. Standard service included calibration checks and downloading of data, as well as occasional programming for monitoring runs. Standard membranes were used for the unit's dissolved oxygen probe. Several datasondes were used during the course the study. Any interruptions in readings due to servicing were noted for purposes of data management and analysis. The units collected data from June 1 through September 30.

The downstream site was a steep scramble down a heavily wooded hillside adjacent to the hydroelectric facility, minimizing the opportunity for theft or destruction. For further protection, the unit was encased in an slightly oversized PVC tube with holes on the probe end, chained to a tree on the riverbank. Weights held either end of the tube down to prevent shifting.

Data Management and Analysis

Data collected from the profiles were placed in an Excel spreadsheet table for purposes of presentation and graphing. Percent oxygen saturation was calculated from temperature and dissolved oxygen using a nomogram published in the 1975 book *Limnology* (Robert G. Wetzel, W.B. Saunders Co., Philadelphia); results were placed in the same table.

The upstream temperature probe requires special software to communicate and download data. The result is two files associated with each download: a data file (basically a long string of temperature measurements with no indication of time or date) and a header file (data manually entered in the tempmentor during setup and deployment, including the start time/date and interval). These two files together allowed preparation of Excel spreadsheet tables giving all hourly measurements of temperature, together with daily maximums, minimums, and

averages. These results were graphed to show a line of points for daily average, with a vertical bar through each point giving the maximum and minimum readings for that day. The tables and graphs were formatted to display one month of data at a time.

The downstream dissolved oxygen and temperature probe was slightly more sophisticated in its data handling than the upstream probe. The unit's internal data files allowed storing date and time with each reading. Nonetheless, the data had to be arrayed in an Excel spreadsheet table for proper presentation, including calculation of daily averages, maximums, and minimums, and graphing. The graphs were the same format as those prepared for the upstream site. Any data loss due to servicing was noted on the spreadsheet. The results were formatted to display one month of data at a time.

A comparison of temperatures collected hourly at upstream and downstream sites was produced. First, a spreadsheet was created to show a long list of data points for the two sites. Second, the difference between downstream site and upstream site was calculated. Third, the resulting table was used to produce graphs, broken down by month, showing all the raw data. As an additional step, the differences were arrayed similarly to those tables and graphs previously described to present daily averages, maximums, and minimums of these differences.

As indicated in the study plan, computer data were provided to the agencies, MDNR and USFWS, as part of the submission for review. The format of the raw data presented certain limitations (for instance, the upstream monitor does not record date and time with the measurement). Also the fact that more than one unit and deployment bout were used during the course of the study made it difficult to discern how the individual files make up the data set, without reviewing detailed records of service activity. For convenience of the reviewer, we compiled all the raw data into a single "processed raw" data file for each location, appended date/time where necessary, and included any annotations useful to the reviewer. Besides these processed raw data files, the tabular and graphic presentations were also provided. The files provided at the review stage were all in Excel 2000 format. An accompanying README.XLS file describes all the individual files making up that submission.

FINDINGS

In this section, we describe our findings regarding the four categories just described under Data Management and Analysis in the Methodology section.

Upstream Water Quality Profiles

Measurements of dissolved oxygen and temperature at 1-meter intervals were taken weekly starting June 7 and ending September 24. The results of those measures and subsequent calculation of percent oxygen saturation are presented in Appendix C. At no time was there any dissolved oxygen readings below 5.0 mg/L (the exceedence limit) even near the bottom of the 4-meter range in depths, and readings were usually substantially higher. Week-to-week variance was likely caused by normal variation in the field equipment, despite regular calibration. Temperature readings ranged with the depth, from surface depth highs of 28°C to bottom depth highs of 24.6°C (both from June 28); these readings were compared to data from the remote temperature probe taken during the same time period.

Two additional profiles performed February 2001 yielded dissolved oxygen readings varying from 7.0 to 9.0 mg/L, with the average over the two visits across all ten readings of about 8.1 mg/L. Temperature always read as 1°C.

Upstream Temperature Monitoring

Readings of the Ryan TempMentor, the unit responsible for upstream temperature measurements, were collected at a fixed depth of about 6 feet (2 meters) rather than taken as a profile across the water column as described in the previous section. Continuous hourly measures allowed presenting and graphing all data points from its deployment June 1 through the end of the study September 30. Temperature readings ranged from a high of 29°C in August to a low of 10°C in September, and averaged 19.6°C for the entire span. The results are shown in tables and graphs for these four months (Appendix D). Monthly averages, maximums, and minimums are presented in the following table:

Upstream	Temperature (°C)		
Year: 2001	Average	Maximum	Minimum
June	19.3	27.0	10.7
July	21.8	27.6	18.6
August	21.7	29.0	17.9
September	15.6	20.3	10.0

Downstream Dissolved Oxygen and Temperature Monitoring

The Hydrolab Datasonde 3 responsible for downstream measurements recorded dissolved oxygen in addition to temperature. This record on a continuous hourly basis allowed presentation of the data, in tabular and graphic forms, from the unit's deployment June 1 through September 30. The results are shown for these four months in Appendix E (temperature) and Appendix F (dissolved oxygen).

Due to the servicing necessary to maintain this equipment, on several occasions units were out of the water during time programmed for readings because a site visit was in progress. A "missing" reading is represented by an asterisk (*) in the data tables. Starting July 30 (0100) and continuing until July 31 (1500), when it was serviced, the deployed datasonde unit failed to take readings due to low battery power.

Early in August, we recorded a week of DO readings at the downstream site that were frequently below the standards specified by Article 404 (5.0 mg/L or above). This incident was reported to the MDNR and USFWS on August 17, in much the same way as it is described in the remainder of this section. While the temperatures never exceeded the standard of 30°C, readings were by far the highest of those ever recorded by White Water Associates, considering data from 1992 and 2000. The record highs in air temperature were also well documented by the National Weather Service in Marquette, which reported near 100°F temperatures throughout the south and south central U.P during the period. It also bears up our own weather station records at White Water's offices in Amasa.

Water temperature has a direct effect on dissolved oxygen levels. For a week, the downstream site experienced water temperatures that often exceeded 25°C and reached highs

over 28°C (82.5°F). We do, however, believe there was one other factor responsible for several DO readings falling below 5.0 mg/L during this period: calibration of the DO probe itself.

We typically have a two-week deployment before pickup and exchange or redeployment. The week of the incident, when the unit was retrieved from the field (in about 2.5 feet of water) after deployment, DO readings were observed to be low in the downloaded data. This deployment was preceded by a deployment that ended with battery failure and loss of a day's worth of data, as previously noted.

The unit was calibrated in the lab to check its reliability. The results of checking against a lab YSI DO meter are as follows (all in mg/L):

Tap water	
Reading (probe)	4.2
Reading (YSI)	5.3

Well stirred tap water	
Reading (probe)	6.1
Reading (YSI)	7.4

Recalibration to air (100% oxygen saturation)	
After calibration	8.7
Reading (probe)	7.2

This pattern shows the DO probe was consistently low under these three conditions, by 1.1, 1.3, and 1.5 mg/L, respectively.

Applying the most conservative adjustment of 1.1 mg/L to the readings recorded during the period of concern (August 1-7), the three lowest adjusted DO readings were 5.0 (rounded), 5.1, and 5.2 indicating an exceedence may have occurred. According to the FERC order, "State standards require a DO of at least 5 milligrams/liter (mg/l) and the water downstream shall not

receive a heat load that would warm the receiving water at the edge of the mixing zone by more than 5°F above natural water temperatures. Further, the Paint River shall not receive a heat load that would warm the receiving water at the edge of the mixing zone to temperatures greater than monthly maximums.”

The order further stated, “If DO or water temperature, as measured by the approved monitoring system, falls below that required by article 404, the licensee shall file a report with the Commission within 30 days of the date the data becomes available indicating an incident has occurred. The report should, to the extent possible, identify the cause, severity, and duration of the incident, and any observed or reported adverse environmental impacts resulting from the incident. The report should also include (1) operational data necessary to determine compliance with article 404; (2) a description of any corrective measures implemented at the time of occurrence and the measures implemented or proposed to ensure that similar incidents do not recur; and (3) comments or correspondence, if any, received from the resource agencies regarding the incident. Based on the report and the Commission’s evaluation of the incident, the Commission shall reserve the right to require modifications to project facilities and operations to ensure future compliance.”

The initial report filed by e-mail with the MDNR and USFWS was sufficiently detailed to meet the objectives outlined for the incident report. The same report, together with a Microsoft Word file of a letter of response written August 27 by Jessica Mistak, MDNR, and an Excel file showing tabular and graphic data of the incident, was filed with FERC by e-mail on August 28. Mistak’s letter (Appendix H) recommended the following measures be taken in response to the incident:

- Increase the frequency of all visits to download data to 10 days
- If high water temperatures (>25°C) are experienced, download data on at least a weekly basis
- Consistent post-calibration of retrieved data collection units

These recommended measures were taken. Water temperatures during the remaining season never exceeded 25°C.

Although we had produced several post calibration corrections ranging from 1.1 to 1.5 mg/L for the specific event, it was our decision to show the dissolved oxygen data in uncorrected format in all tables, graphs, and data files provided, including the one below. The monthly averages, maximums, and minimums for temperature and dissolved oxygen are as follows:

Downstream	Temperature (°C)		
Year: 2001	Average	Maximum	Minimum
June	19.93	27.40	11.18
July	22.53	27.78	19.28
August	22.19	28.40	18.59
September	16.13	21.03	10.57

Downstream	Dissolved Oxygen (mg/L)		
Year: 2001	Average	Maximum	Minimum
June	7.21	9.35	5.04
July	6.81	8.18	5.17
August	6.28	8.50	3.87
September	8.26	10.51	5.80

Comparison Between Hourly Temperatures at Sites

Continuous hourly temperature readings upstream and downstream of the dam allowed the comparisons from hour to hour, day to day, and month to month included in this report. The data are presented in tabular and graphic forms in Appendix G, for the four months involved. In addition to the daily averages, maximums, and minimums reported in those tables, the following is a table showing these differences compiled over a monthly basis:

Delta Temperature °C (Downstream Minus Upstream)			
Year: 2001	Average	Maximum	Minimum
June	0.6	1.1	-0.8
July	0.5	0.9	-0.6
August	0.5	1.1	-0.9
September	0.6	0.9	-0.3

Delta temperature in this case means “downstream minus upstream” so a positive number indicates that the temperature downstream was higher than the temperature upstream. Looking at the averages in the previous table, it seems that unit(s) downstream tended to have higher readings (averaging from 0.5 to 0.6°C) but differences of this magnitude could be due to variations in tunings of the factory-calibrated units. Swings in the positive direction never exceeded 1.1°C. Swings in the negative direction (i.e., temperature upstream higher than temperature downstream) were as great as -0.9°C. At no time, did the “downstream minus upstream” temperature difference exceed the delta standard of 5°C.

DISCUSSION AND RECOMMENDATIONS

With the exception of the period in early August when air and water temperatures were unusually high, water quality measurements are within normal ranges expected of this study setting and time period. During that period, partly exacerbated by a calibration problem, dissolved oxygen readings fell below 5.0 mg/L for a period from August 5 to August 12, when the unit was recalibrated, and air temperatures returned to more normal ranges. Dissolved oxygen and temperature profiles were typical, with both decreasing slightly with depth. Differences in readings for temperature upstream and downstream of the dam were low, less than 1.2°C, at all times. At times, the upstream site actually recorded higher readings than the downstream site. This could perhaps be due to rainfall events, diurnal sunlight patterns affecting the downstream site, or seasonal changes.

The visits every two weeks to service the downstream monitoring probe meant that any maintenance, calibration, or exceedence problems were dealt with reasonably soon. The plan originally submitted to and approved by FERC calls for calibration visits every two weeks and data download visits every week.

During the first year of study, the weekly visits for upstream profiles and downstream data download seemed too frequent for the level of problems found. Visits every two weeks for these tasks were recommended as adequate to measure changes in conditions and ensure proper operation without risking large amounts of data loss, and this pattern was adopted for 2001 monitoring efforts. In hindsight, due to the unusually high temperatures in late July and early August, more effort should have been invested in covering that period. No problems occurred in June and September.

It was our recommendation in the draft report that in 2002, the final year of the study, we reduce the monitoring period to July and August only, but increase visits for calibration and download to every 10 days, or more frequent if hot weather or equipment problems warrant. Data from 2000 suggest that in years when air temperature did not reach historical highs and when equipment functioned well, dissolved oxygen was ample below the dam, never approaching the stated exceedence limit of 5.0 mg/L.

Agency comments (Appendix H) held that the full study term, June through September, be followed in 2002. Consultant and client correspondence (Appendix I) assumes more frequent visits, proposed in the agency response to August's incident report, as well as consistent post-calibration and attention to DO conditions when water temperatures exceed 25°C.

APPENDIX A

Study Plan, Order, and Article 404

A Plan for Monitoring Dissolved Oxygen and Temperature Levels in the Paint River in the vicinity of the Crystal Falls Hydroelectric Facility

Introduction

On October 18, 1995, the Federal Energy Regulatory Commission issued a license for the City of Crystal Falls to continue to operate and maintain the 1,000-kilowatt Crystal Falls Hydroelectric Project, No. 11402, located on the Paint River in Iron County, Michigan. This license is subject to various articles. Among those articles, Article 404 specifies that "Within 6 months of the license issuance, the Licensee shall file with the Commission, for approval, a plan to monitor dissolved oxygen (DO) and temperature levels in the Paint River downstream of the project. This report is intended to provide the plans for implementation of the DO and temperature monitoring program in accordance with Article 404.

Article 404 of the Commissions's license, requires that the water quality data (DO and temperature) would be compared to Michigan State water quality standards. According to these standards (R323.1041), the Crystal Falls hydroelectric project should not influence DO or temperature beyond specified limits as follows: a DO of at least 5 mg/l should be maintained; and a heat load shall not be received that would warm the waters at the edge of the mixing zone by more than 5°C above natural water temperatures, or greater than monthly maximums.

A draft plan for monitoring DO and temperature was prepared and forwarded to the appropriate resource agencies for review in February, 1996. The Michigan Departments of Natural Resources and Environmental Quality prepared a joint reply and the Fish and Wildlife Service concurred with their comments – these entities are hereinafter referred to as the "Agencies." A copy of the draft plan, and the Agencies' comments are attached. The draft plan intended to monitor dissolved oxygen and temperature in the Crystal Falls impoundment and at a downstream location only during the times when the activities related to the proposed Barrier Net Effectiveness Study would be in operation. This allowed the city to combine efforts and maintain study costs for water quality monitoring to within the FERC's proposed \$15,000 cost estimate (FERC Environmental Assessment, page 65). This original plan has been substantially revised as follows to reflect the Agencies' comments and due to the fact that the original Barrier Net Effectiveness Study plan has also been substantially revised.

Study Plan

We propose to continuously monitor both temperature and DO in a mid-depth placement approximately 500 feet below the dam in the Paint River during the months of June through September. Additionally, temperature will be continuously monitored at a mid-depth placement in the Paint River approximately 500 feet upstream of the Crystal Falls impoundment area. A one-meter-increment profile of temperature and DO will be obtained from the deepest part of the impoundment once a week during the months of June through September, and twice during the month of February.

The water quality monitoring plan is proposed to take place in conjunction with the Barrier Net Effectiveness Plan. That is, the site visits used to perform weekly fisheries studies for the effectiveness of the barrier net would be also used to download and recalibrate the continuous monitoring probes, and to conduct weekly profiles of the impoundment. Thus, it is proposed to conduct the water quality monitoring plan during the same two years that are proposed for the Barrier Net Effectiveness Study.

Monitoring Equipment

We propose to use Hydrolab DataSonde III probes for temperature and DO monitoring. The probes would be calibrated according to the manufacturers recommended procedure every two weeks throughout the continuous monitoring period. The continuous monitoring probes would be recalibrated bi-weekly throughout the deployment period and the profiling probe would be calibrated prior to each sample.

Schedule

Continuous monitoring would record temperature and DO hourly during the deployment period. The profile of the impoundment would produce instantaneous data. It is proposed to conduct water quality monitoring for a period of two years. If at no time within this two year period the water quality standards have been exceeded the Crystal Falls Hydroelectric Project should be considered as not having the potential to violate state water quality standards and water quality monitoring would be discontinued. If, however, at any time during the monitoring period, water quality standards are substantially exceeded, the applicant shall inform the Agencies of the deviation from the established limits and, in consultation with the Agencies, the applicant may modify the water sampling procedures to more closely verify the extent and source of the water quality problem and success of any mitigation procedure.

Reporting and Compliance

It is intended to download temperature and DO data from the continuous monitoring

probes weekly throughout the deployment period. At each download, it will be determined if there has been a violation of the water quality standards during the preceding week, and if this violation is still occurring; if so, the Agencies would be immediately notified by telephone and procedures to mitigate the violation would be attempted. If there is a violation of the 5 mg/L dissolved oxygen level at the downstream location, it is proposed that the most likely procedure would be to implement spillage from the impoundment surface waters to aerate the water below the dam. If this plan is invoked, the downstream dissolved oxygen levels would be downloaded daily to monitor the success of this effort. The amount of spillage would be modified according to the success of this effort in increasing the DO as determined by the daily monitoring. The Agencies would be kept apprised of this effort. We have no plan, nor has the Agencies offered a solution, to mitigate any violation of the Delta Temperature Standard. It is proposed to report any violation of the Delta Temperature Standard to the Agencies immediately upon its discovery and at that time determine what, if any, solution might exist to the problem.

In addition to the above reporting procedures, we would prepare an annual report to the FERC and the Agencies. This report would include a computer diskette with all raw data from the continuous and weekly monitoring efforts. In addition to the raw data, a summary of the data by daily average, minimum, and maximum DO, and temperature at the continuous monitoring sites and weekly profiles from the impoundment would be provided. This report would also include an upstream/downstream comparison of the Temperature Delta Standard.

Agency Comments

The agency recommendations have been accommodated into our revised plan as follows:

a) Monitoring locations and equipment. We have added a site upstream for temperature measurements. We intend to calibrate our probes according to the manufacturers recommended procedure. We do not understand their request for a 70% data quality goal – all continuous monitoring probes would be recalibrated bi-weekly regardless of their accuracy to a calibration standard. We have agreed to monitor at one-meter intervals within the deepest part of the impoundment once a week from June through September.

b) Monitoring Schedule. We propose to monitor temperature and DO only during the months of June through September. It is unlikely that DO would be less than 5 mg/L during May or October and continuous monitoring during winter months is not feasible due to extreme weather conditions which would make access and equipment malfunctioning a problem.. We will agree to provide a temperature and DO profile of the impoundment twice during the month of February to determine if there exists a potential for ice cover to deplete DO within the impoundment during the period of this event's greatest likelihood.

c) Data Reporting. We propose to provide an annual report to the FERC and the Agencies. This report would include a computer diskette of all raw data and a graphical and tabular presentation of daily minimum, maximum, and average temperature and DO values as measured during the previous year. This report will also note any violations of the Delta Temperature Standard or DO violations and rationale for any lapses in the data. We do not propose to measure any other water quality parameters as suggested such as stream flow, chlorophyll level, or instream chemistry. We do not understand what is meant by the recommendation for "instantaneous" comparisons of temperature values.

d) Detection and Notification. Data would be downloaded weekly from the continuous monitoring probes (at the time of the weekly temperature/oxygen profile of the impoundment). The comment of the Agencies seems to suggest that an hourly downloading and reporting is preferred but we do not understand how this is possible. Other than the annual report described above, no other reports would be made to the agency unless there is a recorded violation of the water quality standards. If such a violation in either the Delta Temperature Standard or the 5 mg/L DO limit is found, then the Agencies would be immediately notified by telephone and a remediation or mitigation procedure would be invoked. We would, as suggested, notify both the Chief of Surface Water Quality Division of the Michigan Department of Environmental Quality, and the FERC Program Manager for the Michigan Department of Natural Resources within one working day of any detected water quality standard violations.

e) Mitigative measures. If water quality standards are violated we intend to notify and work with the Agencies to mitigate those violations. The exact nature of the mitigation measure would depend upon the significance of the violation and the environmental conditions contributing to or otherwise affecting the ability of the applicant to remediate or mitigate the violation.

f) Initial monitoring period. We disagree with the requirement for long term monitoring. An initial period of two years should be adequate to assess whether there exists the potential for significant effects of the hydropower facility on the Paint River water quality. Furthermore, the FERC Environmental Assessment concluded that the water quality monitoring plan should cost about \$15,000. It is our estimate that the plan we have proposed will somewhat exceed that estimate. To extend the monitoring plan beyond two years would substantially and unreasonably exceed that estimate. Extended monitoring is regarded as necessary only if the initial two-year monitoring indicates that there is potential for significant water quality degradation from the hydropower operations that warrant further monitoring to develop and/or monitor long-term mitigation measures.

UNITED STATES OF AMERICA
FEDERAL ENERGY REGULATORY COMMISSION

City of Crystal Falls) Project No. 11402-013

ORDER APPROVING WATER QUALITY MONITORING PLAN

(Issued April 10, 1997)

City of Crystal Falls (licensee) filed for Commission approval, on November 19, 1996, and supplemented on November 20, 1996, a water quality monitoring plan. This plan is required by article 404 of the license for the Crystal Falls Project, issued on October 18, 1995. 1/ The project is located on the Paint River in Iron County, Michigan.

Article 404 requires the licensee to consult with Michigan Department of Natural Resources (MDNR) and the U.S. Fish and Wildlife Service (FWS) and develop a plan to monitor dissolved oxygen concentrations (DO) and water temperature levels at the project. 2/

LICENSEE'S PROPOSED PLAN

The licensee plans to monitor DO for two years in conjunction with implementation of the licensee's barrier net study. 3/ Specifically, the licensee proposes to continuously monitor water temperature and DO at mid-depth approximately 500 feet downstream of the dam and approximately 500 feet upstream of the impoundment (water temperature only) from June through September. One-meter increment profiles of water temperature and DO will be taken once a week from June through September and twice during the month of February for water temperature and DO.

The licensee plans to use Hydrolab DataSonde III probes for the water quality monitoring. Water temperature and DO will be

1/ 73 FERC ¶ 62,036. See also Order on Rehearing, issued on May 17, 1996 (75 FERC ¶ 61,174).

2/ State standards require a DO of at least 5 milligrams/liter (mg/l) and the waters downstream shall not receive a heat load that would warm the receiving water at the edge of the mixing zone by more than 5° F above natural water temperatures. Further, the Paint River shall not receive a heat load that would warm the receiving water at the edge of the mixing zone to temperatures greater than monthly maximums.

3/ This plan was approved in the Order Modifying and Approving Plan for the Installation and Monitoring of a Barrier Net, issued on May 10, 1996 (75 FERC ¶ 62,102).

Project No. 11402-013

-2-

recorded hourly during the monitoring period. The licensee plans to calibrate the continuous monitoring probes every two weeks during the monitoring period and the profile probes prior to each sample, according to manufacturer's instructions.

The licensee plans to download DO and water temperature data weekly. At this time, the data will be reviewed to determine if a deviation from state standards has occurred. If a deviation in DO or water temperature occurs, the licensee plans to inform the agencies immediately and determine what, if any, mitigative measures are necessary. If additional measures are implemented, the licensee plans to download data daily to more closely monitor changes in water quality in response to the measures implemented. In the event of DO falling below state standards, the licensee plans to increase spillage. If water temperature standards are exceeded, the licensee plans to immediately contact the agencies to determine what, if any, measures can be taken.

The licensee plans to submit a report to the agencies and to the Commission each year of the two-year monitoring period. This report would include DO and water temperature daily averages, minimum and maximums, and DO and water temperature profile data. The report would also provide comparisons between upstream and downstream water temperature. If at no time within the two-year monitoring period the water quality standards have been exceeded, the licensee will consider the project to have no adverse effect on water quality and will discontinue the monitoring.

AGENCY COMMENTS

The MDNR commented on the proposed plan in a letter dated April 1, 1996. The FWS did not provide comments on the proposed plan.

The MDNR recommends the monitoring period extend from May-October for at least three years. After three years, the licensee may request to change the frequency of monitoring. The MDNR also recommends that water temperature be monitored continuously given that violations could occur in any season. Monitoring locations should be selected in consultation with MDNR.

The MDNR requests that all monitoring equipment be validated with an independent measurement system such as a National Bureau of Standards thermometer for temperature and a Winkler analysis for DO at the end of each unattended monitoring period. Further, 70 percent of the DO data should be verified as accurate to within 1 milligram/liter (mg/l) of the true DO value. Weekly service visits should be scheduled for quality assurance. Further, the MDNR suggests a real-time evaluation of the data to provide for immediate detection of a deviation from state standards.

Regarding reports, the MDNR requests that DO values be compared hourly to the state DO standard and delta temperature values be compared instantaneously. Plausible explanations for any deviations should be provided in the reports, along with a description of the effectiveness of any measures implemented to improve water quality. The MDNR also requests quarterly transmittals of raw data along with information pertaining to the calibration of equipment during that quarter.

Other comments by MDNR were incorporated into the licensee's proposed plan.

DISCUSSION

The licensee's proposed water quality monitoring plan includes those requirements stipulated in article 404 of the license. Implementation of the proposed plan should enable the licensee to monitor the effects of project operation on water temperatures and DO. Calibration of the monitoring equipment according to manufacturer's recommendations, as proposed by the licensee, should be adequate to ensure accurate data are collected. To the extent practicable, the licensee should choose monitoring locations in coordination with the MDNR and FWS.

Article 404 of the license states the purpose of the plan is to ensure that water quality below the project, as measured immediately downstream of the project tailrace, maintain the Michigan standards for DO and water temperature. Further, article 404 requires the licensee develop operating procedures to address when deviations from state standards occur.

Monitoring from June-September, as proposed by the licensee, encompasses the period when warmer temperatures are expected, thus affecting low DO. Therefore, deviations from state standards should be detected upon implementation of the licensee's proposed plan. However, monitoring for only two years, as proposed by the licensee, will not meet the purpose of the plan. Article 404 requires monitoring to ensure state water quality standards are met. The licensee cannot meet this goal if monitoring is discontinued.

Commission staff acknowledges that water quality data collected prior to licensing indicate project operations do not result in violations of the state water quality standards. 4/ If after implementation of monitoring, the data still indicates that project operations do not adversely affect water quality in the project area, the licensee may file a request to modify the water

4/ See the Environmental Assessment for Application for License for the Crystal Falls Project, issued on October 18, 1995 (73 FERC ¶ 62,036).

quality monitoring plan, as recommended by the MDNR. Any recommendations to amend the water quality monitoring plan should be filed for Commission approval, as discussed below.

Providing annual reports to the agencies and immediately contacting the FWS and MDNR upon detection of any deviation from the state standards, as proposed, should provide the agencies with the results of the monitoring in a timely manner. These reports should include, to the extent possible, explanations for any deviations and the effectiveness of any measures implemented to improve water quality, as recommended by MDNR. Quarterly reports of water quality data, as requested by MDNR, are not necessary. The licensee did not provide a schedule for submitting these reports to the agencies or to the Commission. The licensee should provide annual report(s) to these agencies by December 15 of each year of monitoring.

It is only necessary to provide the annual report to the Commission for the first three years of monitoring. Our review of the annual report for a three year period will allow us to evaluate water quality during project operations. The annual report to the Commission should be filed by February 15 of the year following monitoring. The filing should include agency comments, the licensee's response to agency comments, and any recommendations, for Commission approval, for modifying or discontinuing water quality monitoring. Each agency should be given 30 days to comment. If there are no changes to the water quality monitoring plan, the licensee should continue to provide the annual reports to the consulted agencies as identified in the licensee's proposed plan. So that the Commission can monitor compliance with article 404, the licensee should notify the Commission of any deviation from the state standards for DO and water temperature.

The MDNR recommends the licensee analyze data in real time to immediately determine if a problem in water quality exists. The licensee proposes to retrieve data biweekly. Given that the available data indicates no existing water quality problems, as discussed above, the licensee's schedule appears adequate. Further, when the licensee does detect a problem, the licensee plans to retrieve data daily, after contacting the agencies to determine what measures should be implemented in efforts to improve water quality. Therefore, the licensee can timely note any improvements in water quality resulting from any measures implemented.

The licensee proposes to consult with the FWS and MDNR to determine what measures are appropriate in efforts to improve water quality. The licensee specifies that the most likely measure to improve DO is to increase spill. This should be adequate. However, if additional measures are necessary, or if the parties disagree on which measures are appropriate, the

Commission should determine which, if any, additional measures are necessary to improve water quality.

The licensee's water quality monitoring plan, with the modifications discussed, should be adequate to monitor the requirements of article 404 and should be approved.

The Director orders:

(A) The licensee's water quality monitoring plan, filed with the Commission on November 19, 1996, and supplemented on November 20, 1996, as modified in paragraph (B), is approved.

(B) The licensee shall monitor dissolved oxygen concentrations and water temperature at the project for the remainder of the license term. The licensee shall file annual reports with the Commission for the first three years of monitoring. These reports shall be filed by February 15 of the year following monitoring and shall include agency comments, the licensee's response to agency comments, and any recommendations, for Commission approval, on modifying the water quality monitoring plan.

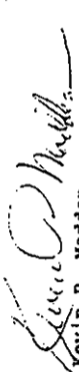
(C) If DO or water temperature, as measured by the approved monitoring system, falls below that required by article 404, the licensee shall file a report with the Commission within 30 days of the date the data becomes available indicating an incident has occurred. The report should, to the extent possible, identify the cause, severity, and duration of the incident, and any observed or reported adverse environmental impacts resulting from the incident. The report should also include: (1) operational data necessary to determine compliance with article 404; (2) a description of any corrective measures implemented at the time of occurrence and the measures implemented or proposed to ensure that similar incidents do not recur; and (3) comments or correspondence, if any, received from the resource agencies regarding the incident. Based on the report and the Commission's evaluation of the incident, the Commission shall reserve the right to require modifications to project facilities and operations to ensure future compliance.

(D) Unless otherwise directed in this order, the licensee shall file an original and seven copies of any filing required by this order with:

The Secretary
Federal Energy Regulatory Commission
Mail Code: DLC, HL-11.2
888 First Street, NE
Washington, DC 20426

In addition, the licensee shall serve copies of these filings on any entity specified in this order to be consulted on matters related to these filings. Proof of service on these entities shall accompany the filings with the Commission.

(E) This order constitutes final agency action. Requests for rehearing by the Commission may be filed within 30 days of the date of issuance of this order, pursuant to CFR § 385.713.


Kevin P. Madden
Acting Director
Office of Hydropower Licensing

Article 404. Within 6 months of license issuance, the Licensee shall file with the Commission, for approval, a plan to monitor dissolved oxygen (DO) and temperature levels in the Paint River downstream of the project.

The purpose of this monitoring plan is to ensure that streamflows below the project, as measured immediately downstream of the project tailrace, maintain the Michigan standards for DO concentration and temperature.

The monitoring plan shall include provisions for (1) monitoring of DO concentrations and temperature levels in the impoundment and downstream, with sensor locations and sampling frequently determined in consultation with the Michigan Department of Natural Resources (MDNR) and the U.S. Fish and Wildlife Service (FWS); and (2) the preparation of operating procedures developed in consultation with MDNR and FWS to address water quality conditions which deviate from the above limits.

The Licensee shall prepare the plan after consultation with MDNR and FWS. The water quality monitoring plan shall include a schedule for:

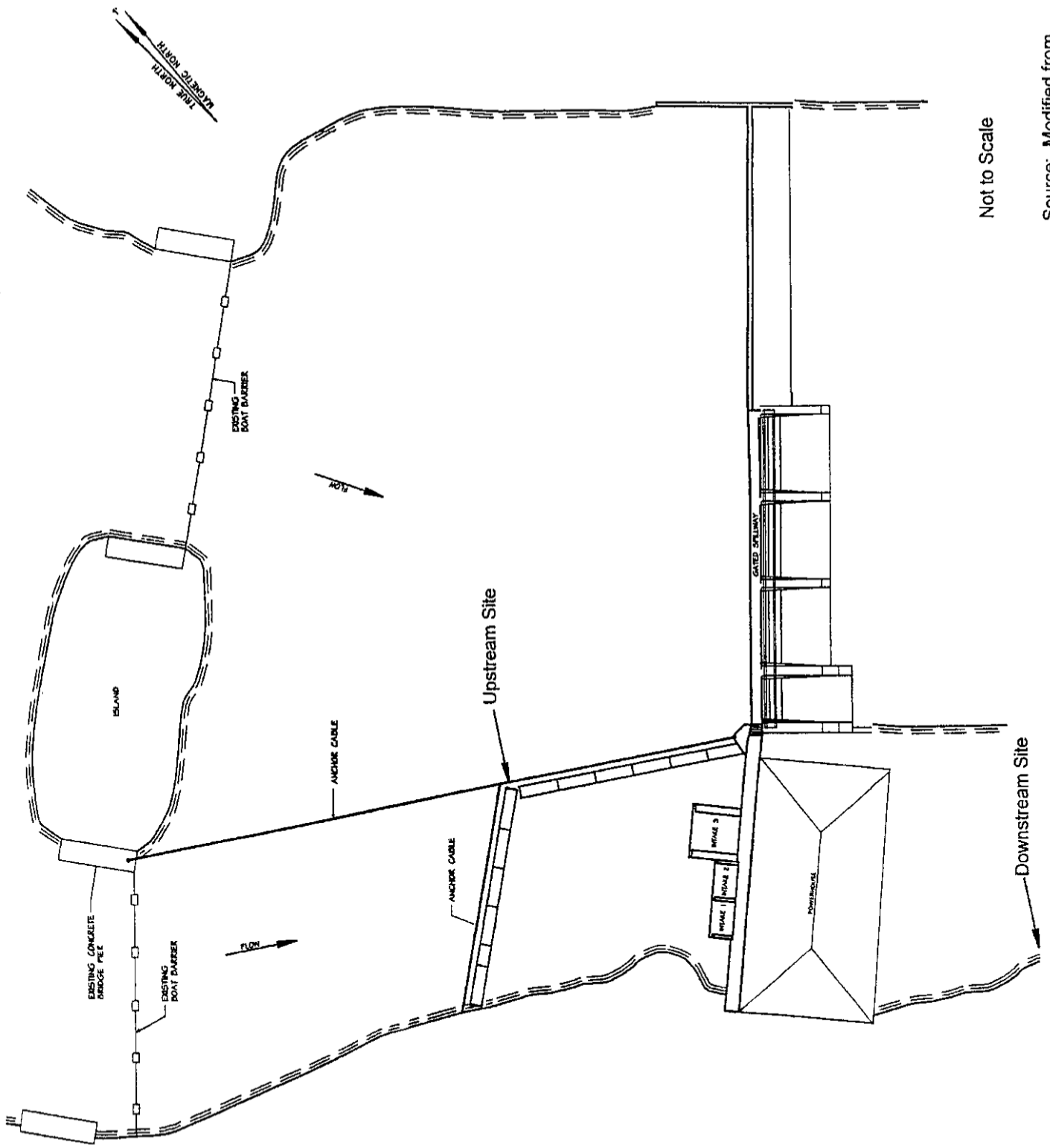
- (a) implementation of the program within 24 months from the date of issuance of this license;
- (b) consultation with MDNR and FWS concerning the results of the monitoring; and
- (c) filing the requests, agency comments, and Licensee's response to agency comments with the Commission.

The Licensee shall include with the plan documentation of consultation, copies of comments and recommendations on the completed plan after it has been prepared and provided to the agencies, and specific descriptions of how the agencies' comments are accommodated by the plan. The Licensee shall allow a minimum of 30 days for the agencies to comment and make recommendations before filing the plan with the Commission. If the Licensee does not adopt a recommendation, the filing shall include the Licensee's reasons, based on project-specific information.

The Commission reserves the right to require changes to the plan. Upon Commission approval, the Licensee shall implement the DO concentration and temperature monitoring plan, including any changes required by the Commission.

APPENDIX B

Map



Not to Scale

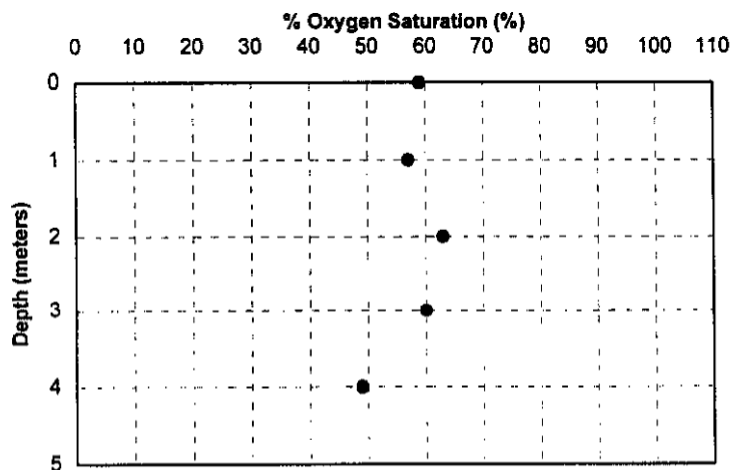
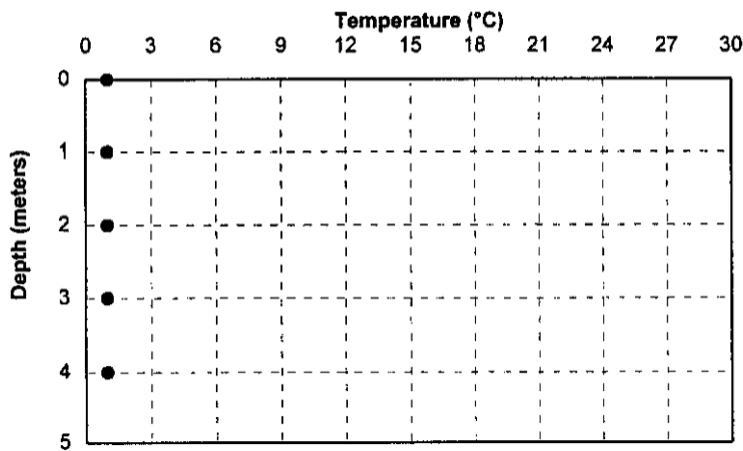
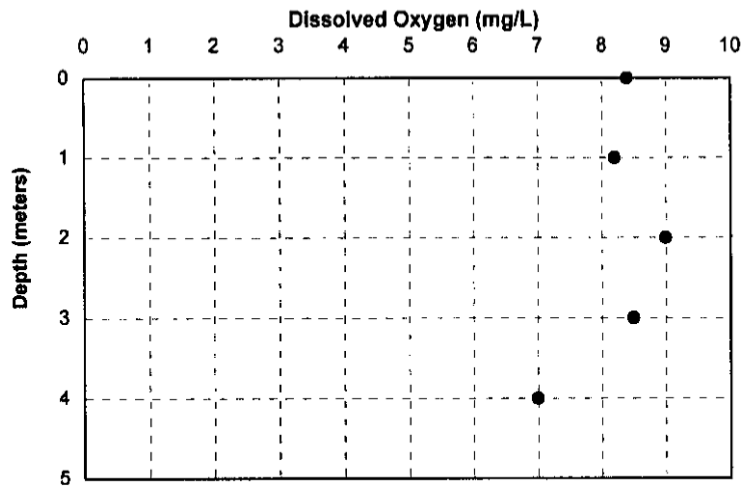
Source: Modified from
Mead & Hunt,

APPENDIX C

Upstream Water Quality Profiles

Crystal Falls Hydroelectric Project

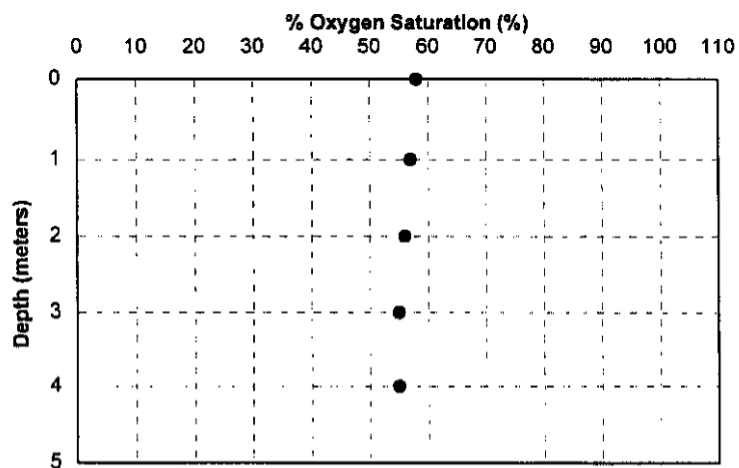
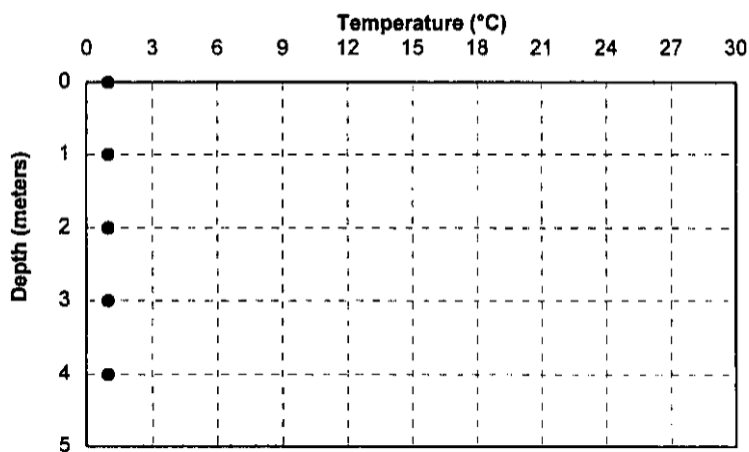
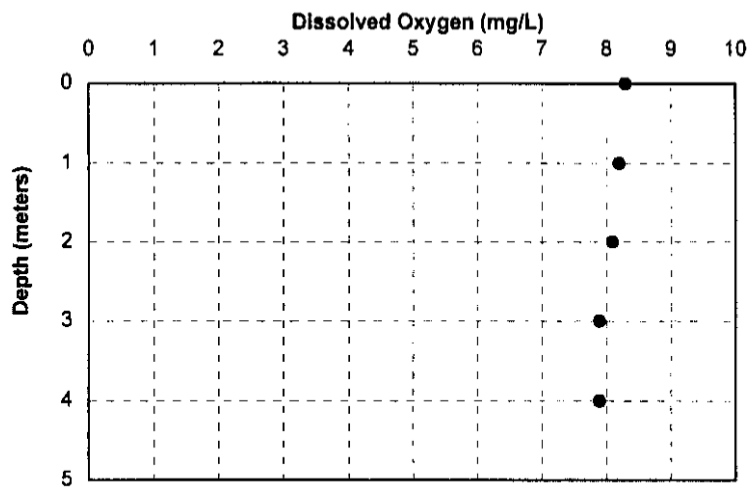
Limnological Profiles	Depth (meters)	Dissolved Oxygen (mg/L)	Temperature (°C)	% Oxygen Saturation (%)
February 20, 2001	0.0	8.4	1.0	59
	1.0	8.2	1.0	57
	2.0	9.0	1.0	63
	3.0	8.5	1.0	60
	4.0	7.0	1.0	49



Crystal Falls Hydroelectric Project

Limnological Profiles

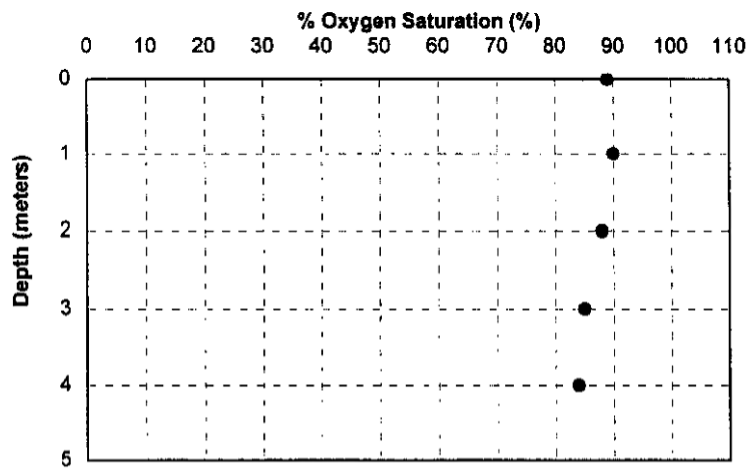
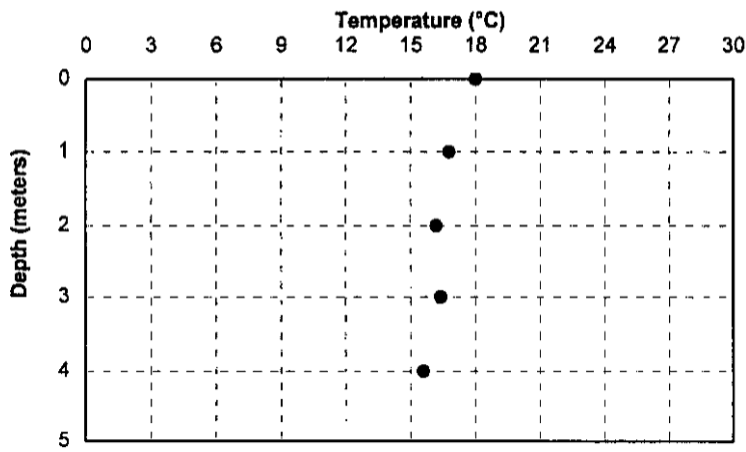
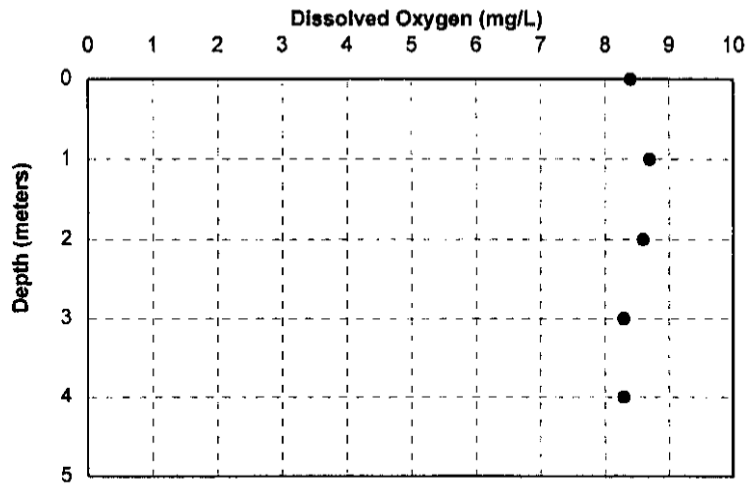
	Depth (meters)	Dissolved Oxygen (mg/L)	Temperature (°C)	% Oxygen Saturation (%)
February 26, 2001	0.0	8.3	1.0	58
	1.0	8.2	1.0	57
	2.0	8.1	1.0	56
	3.0	7.9	1.0	55
	4.0	7.9	1.0	55



Crystal Falls Hydroelectric Project

Limnological Profiles

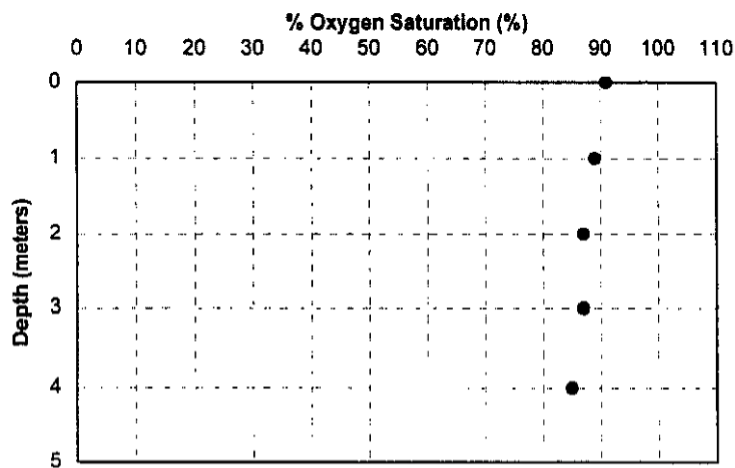
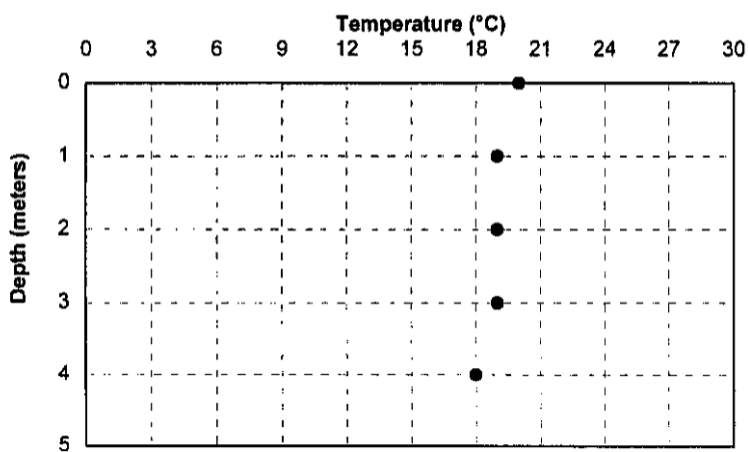
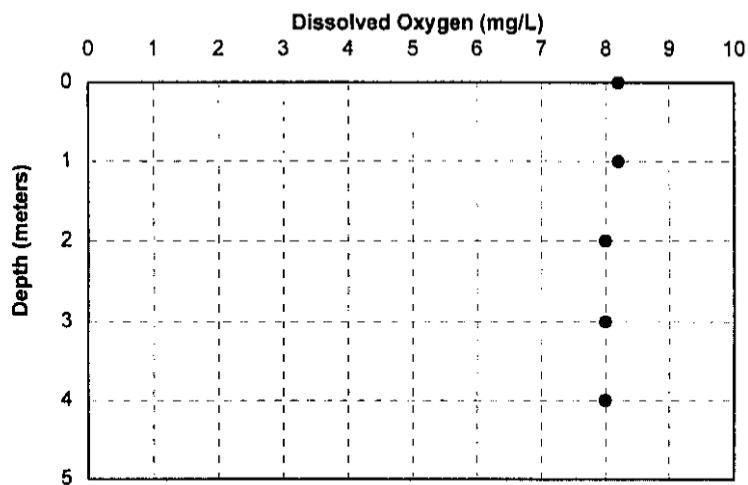
	Depth (meters)	Dissolved Oxygen (mg/L)	Temperature (°C)	% Oxygen Saturation (%)
June 7, 2001	0.0	8.4	18.0	89
	1.0	8.7	16.8	90
	2.0	8.6	16.2	88
	3.0	8.3	16.4	85
	4.0	8.3	15.6	84



Crystal Falls Hydroelectric Project

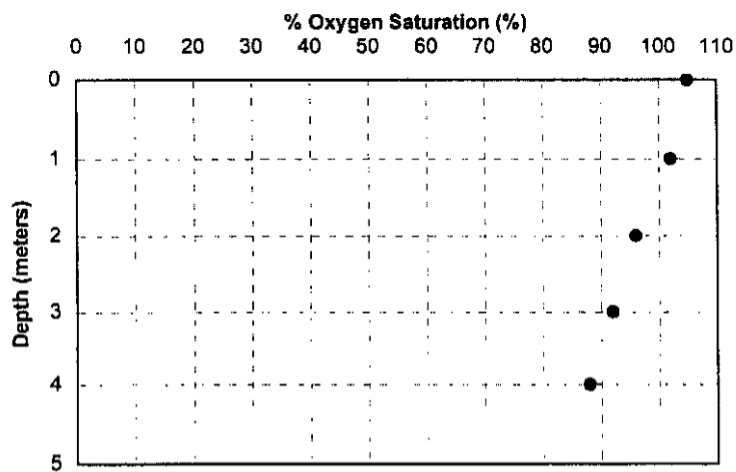
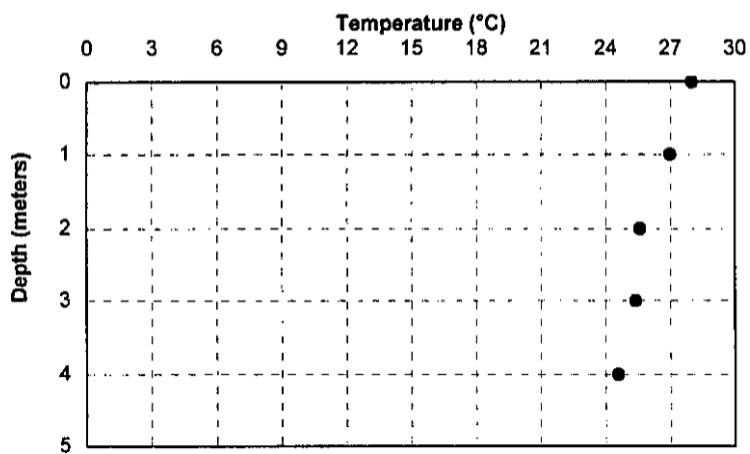
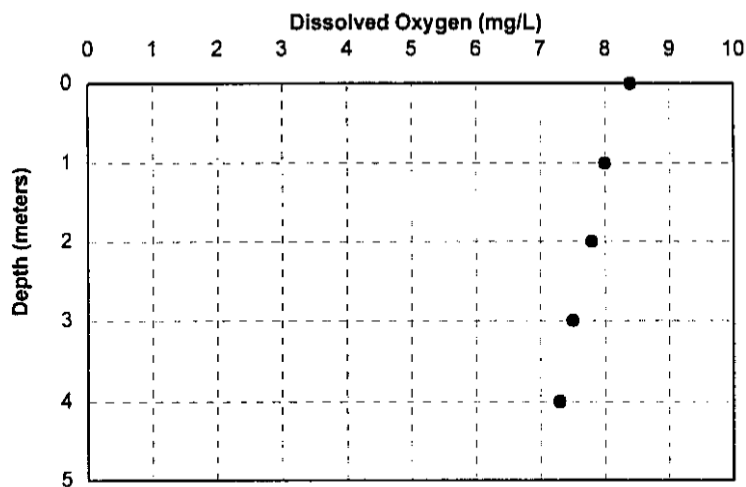
Limnological Profiles

	Depth (meters)	Dissolved Oxygen (mg/L)	Temperature (°C)	% Oxygen Saturation (%)
June 19, 2001	0.0	8.2	20.0	91
	1.0	8.2	19.0	89
	2.0	8.0	19.0	87
	3.0	8.0	19.0	87
	4.0	8.0	18.0	85



Crystal Falls Hydroelectric Project

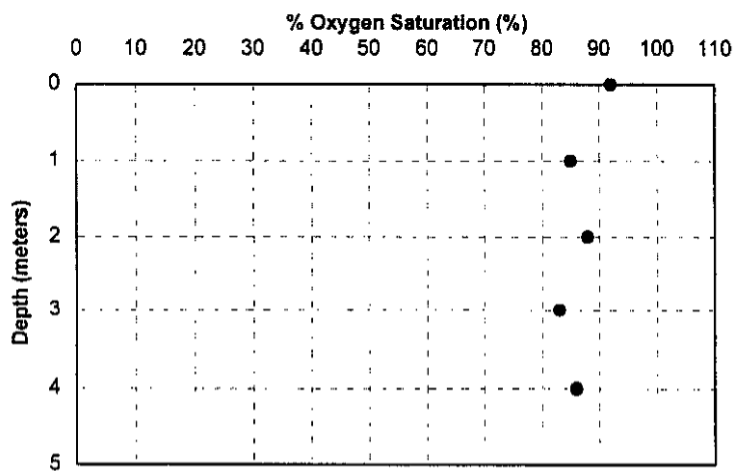
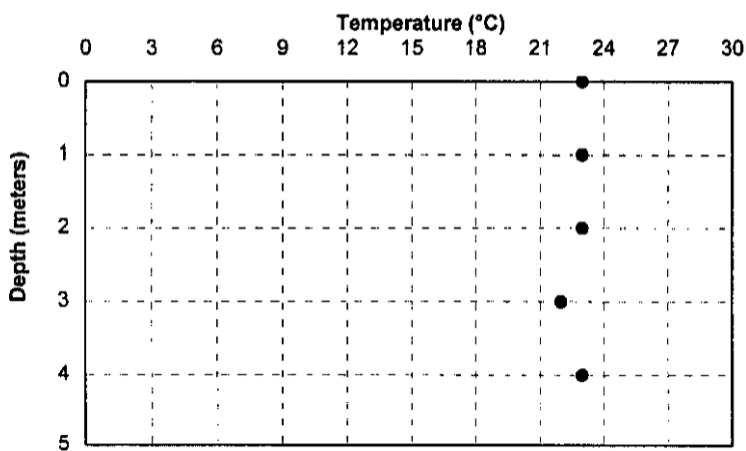
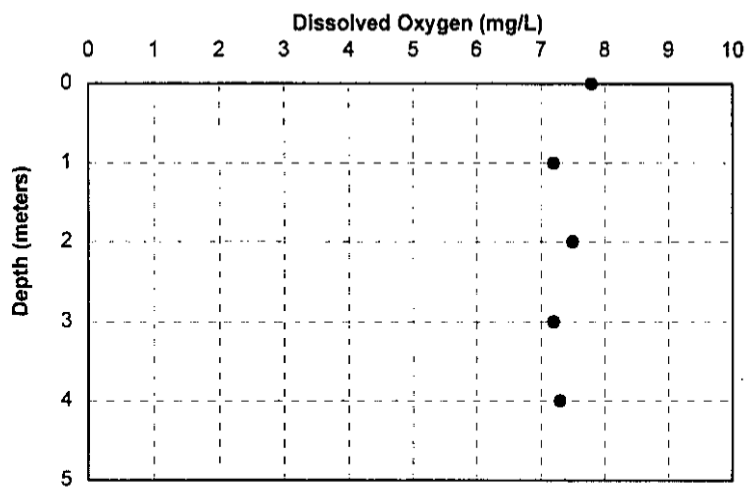
Limnological Profiles	Depth (meters)	Dissolved Oxygen (mg/L)	Temperature (°C)	% Oxygen Saturation (%)
June 28, 2001	0.0	8.4	28.0	105
	1.0	8.0	27.0	102
	2.0	7.8	25.6	96
	3.0	7.5	25.4	92
	4.0	7.3	24.6	88



Crystal Falls Hydroelectric Project

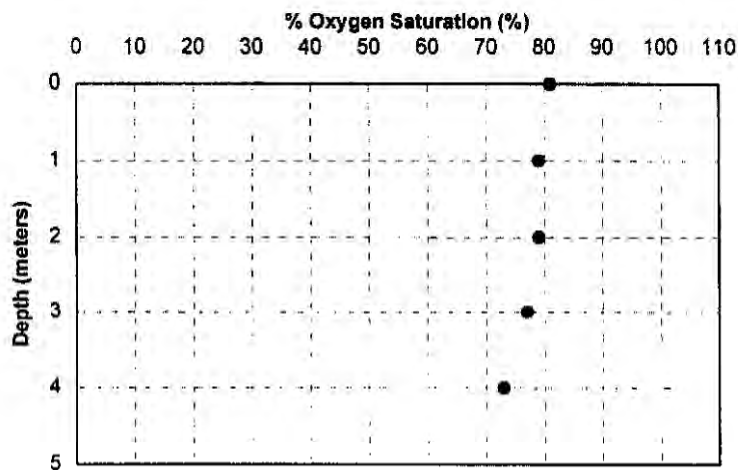
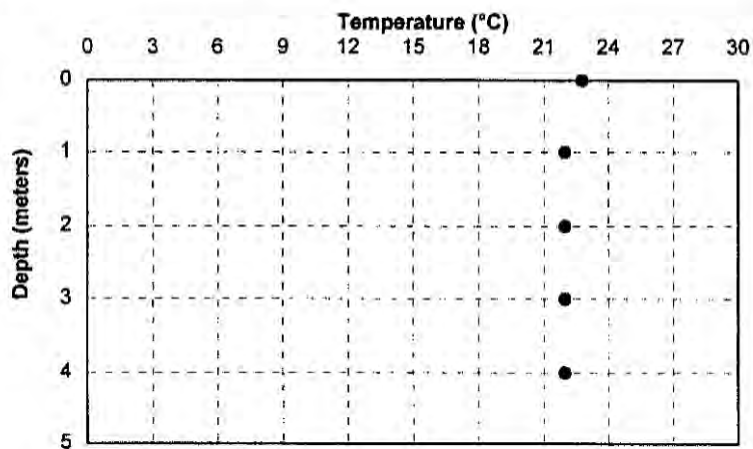
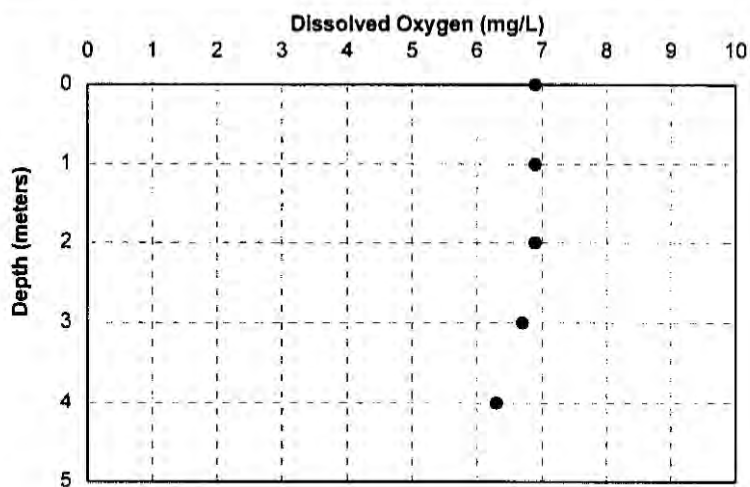
Limnological Profiles

	Depth (meters)	Dissolved Oxygen (mg/L)	Temperature (°C)	% Oxygen Saturation (%)
July 11, 2001	0.0	7.8	23.0	92
	1.0	7.2	23.0	85
	2.0	7.5	23.0	88
	3.0	7.2	22.0	83
	4.0	7.3	23.0	86



Crystal Falls Hydroelectric Project

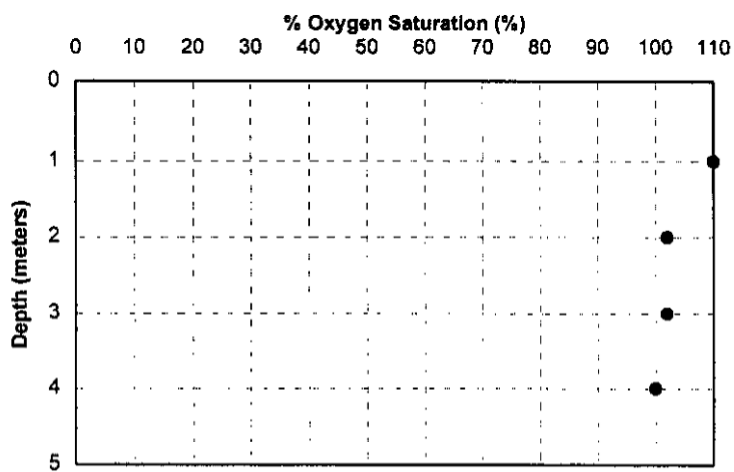
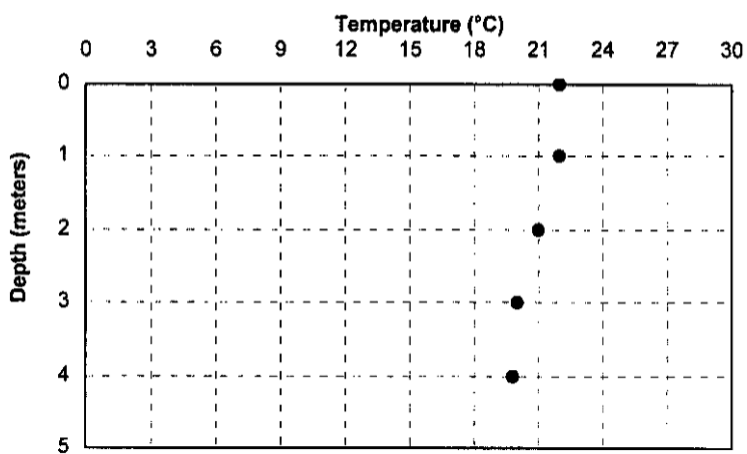
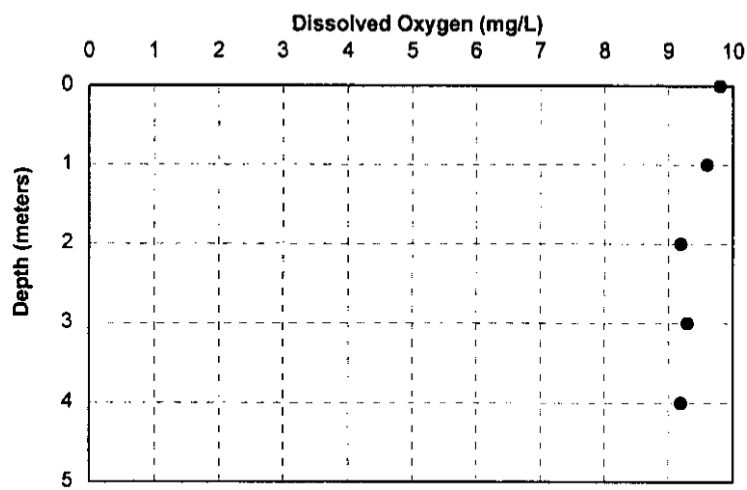
Limnological Profiles	Depth (meters)	Dissolved Oxygen (mg/L)	Temperature (°C)	% Oxygen Saturation (%)
July 17, 2001	0.0	6.9	22.8	81
	1.0	6.9	22.0	79
	2.0	6.9	22.0	79
	3.0	6.7	22.0	77
	4.0	6.3	22.0	73



Crystal Falls Hydroelectric Project

Limnological Profiles

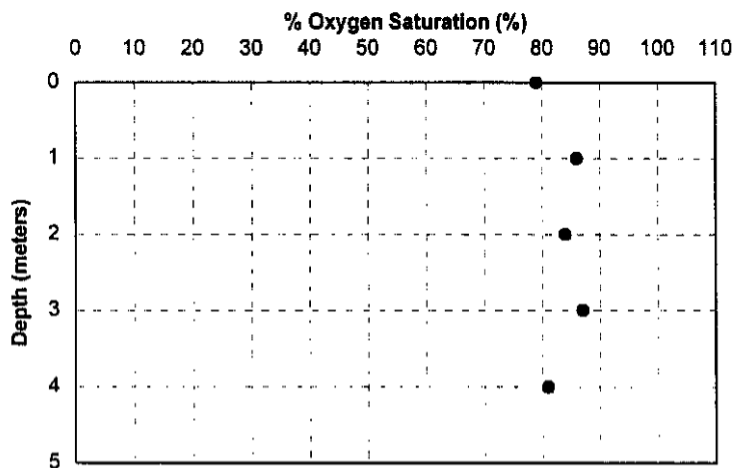
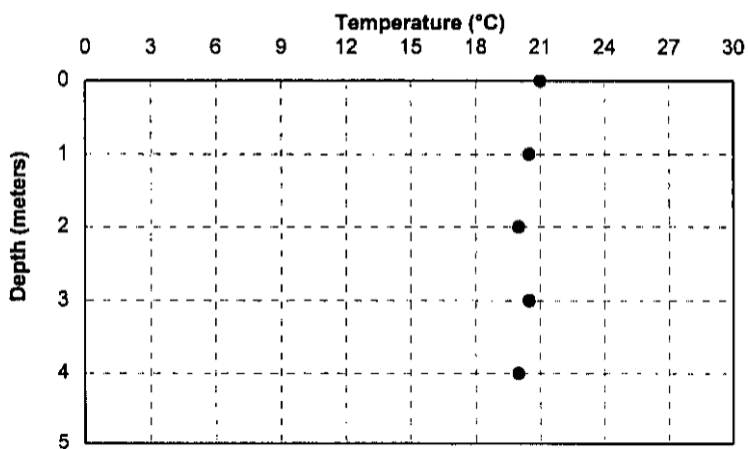
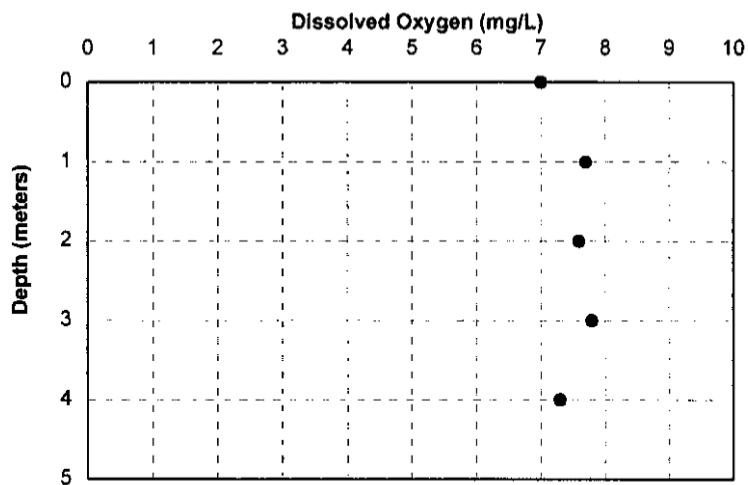
	Depth (meters)	Dissolved Oxygen (mg/L)	Temperature (°C)	% Oxygen Saturation (%)
July 31, 2001	0.0	9.8	22.0	112
	1.0	9.6	22.0	110
	2.0	9.2	21.0	102
	3.0	9.3	20.0	102
	4.0	9.2	19.8	100



Crystal Falls Hydroelectric Project

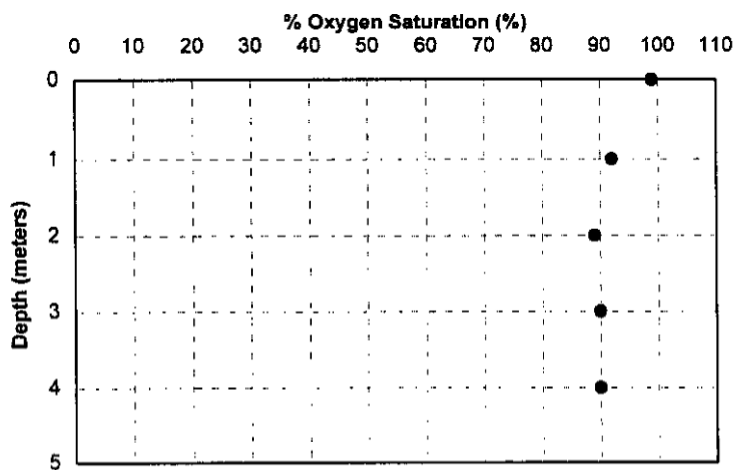
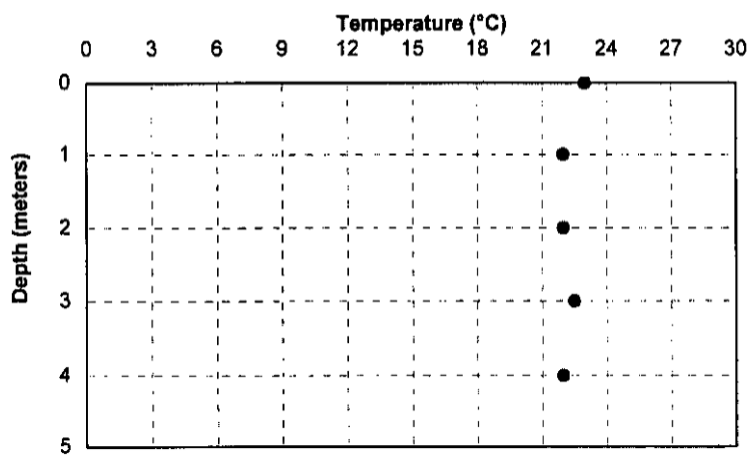
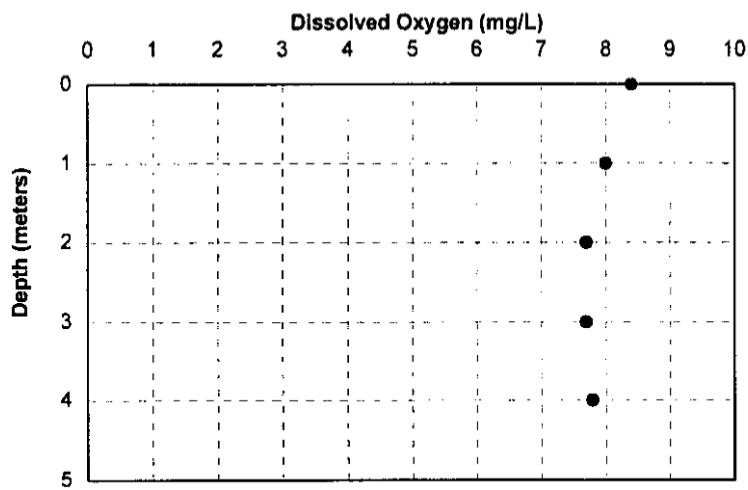
Limnological Profiles

	Depth (meters)	Dissolved Oxygen (mg/L)	Temperature (°C)	% Oxygen Saturation (%)
August 16, 2001	0.0	7.0	21.0	79
	1.0	7.7	20.5	86
	2.0	7.6	20.0	84
	3.0	7.8	20.5	87
	4.0	7.3	20.0	81



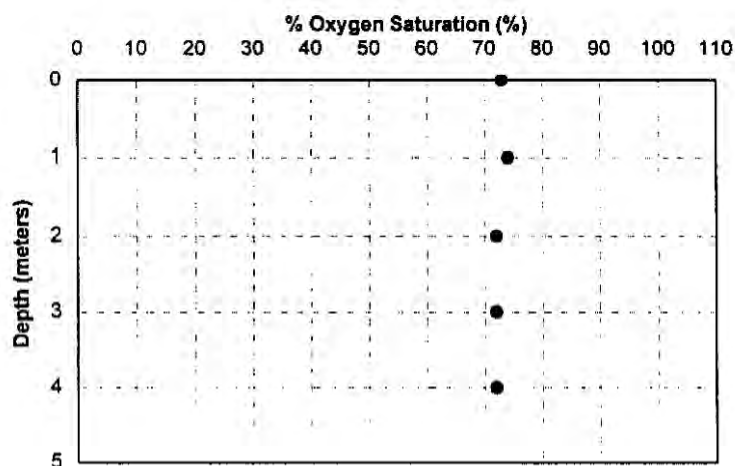
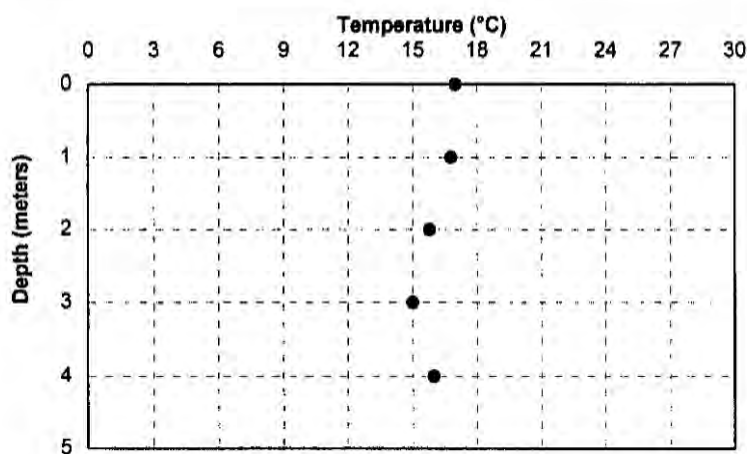
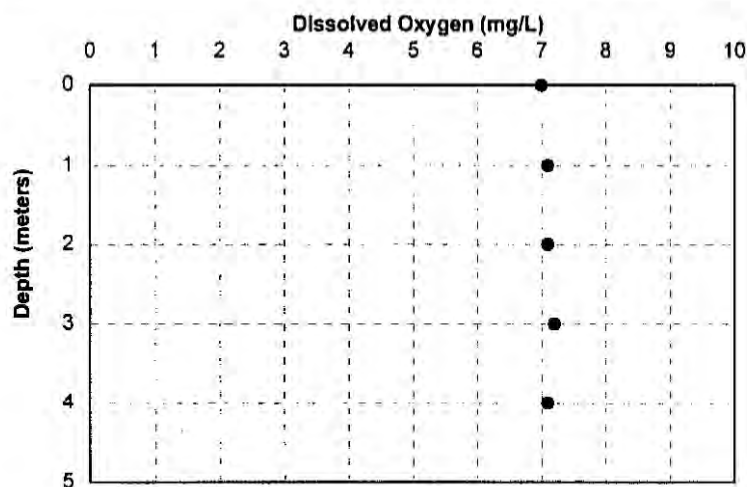
Crystal Falls Hydroelectric Project

Limnological Profiles	Depth (meters)	Dissolved Oxygen (mg/L)	Temperature (°C)	% Oxygen Saturation (%)
August 28, 2001	0.0	8.4	23.0	99
	1.0	8.0	22.0	92
	2.0	7.7	22.0	89
	3.0	7.7	22.5	90
	4.0	7.8	22.0	90



Crystal Falls Hydroelectric Project

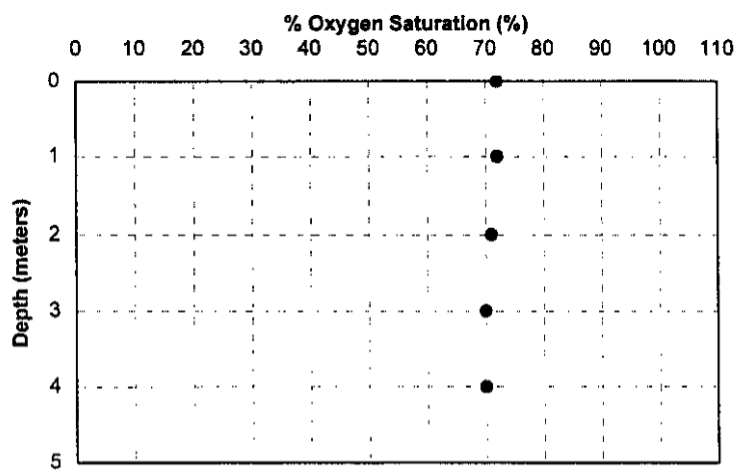
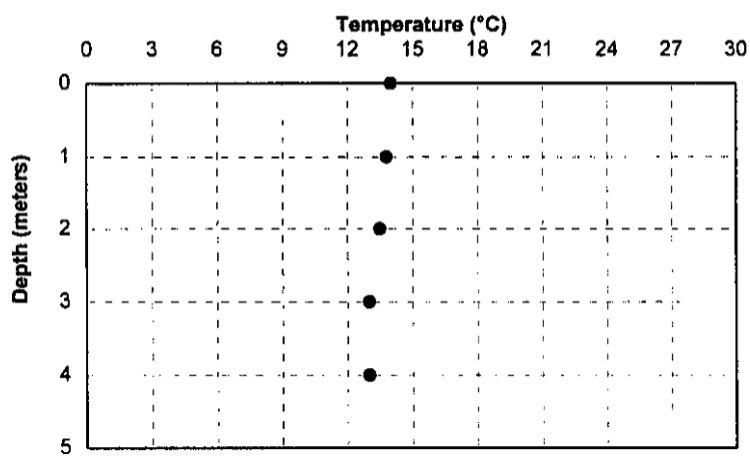
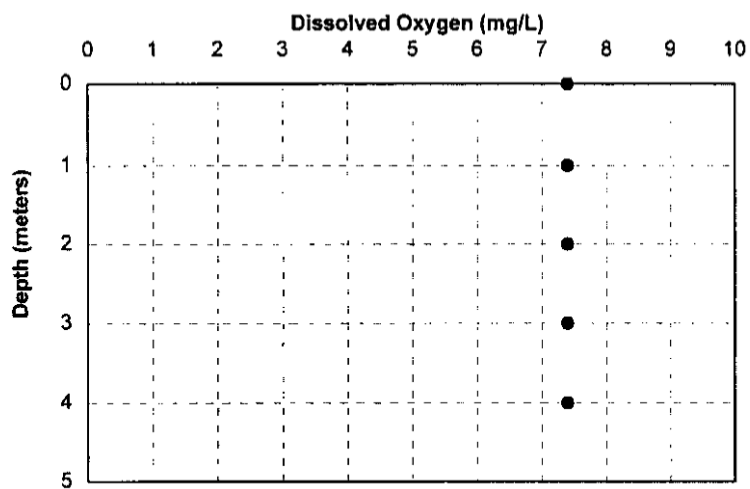
Limnological Profiles	Depth (meters)	Dissolved Oxygen (mg/L)	Temperature (°C)	% Oxygen Saturation (%)
September 11, 2001	0.0	7.0	17.0	73
	1.0	7.1	16.8	74
	2.0	7.1	15.8	72
	3.0	7.2	15.0	72
	4.0	7.1	16.0	72



Crystal Falls Hydroelectric Project

Limnological Profiles

	Depth (meters)	Dissolved Oxygen (mg/L)	Temperature (°C)	% Oxygen Saturation (%)
September 24, 2001	0.0	7.4	14.0	72
	1.0	7.4	13.8	72
	2.0	7.4	13.5	71
	3.0	7.4	13.0	70
	4.0	7.4	13.0	70



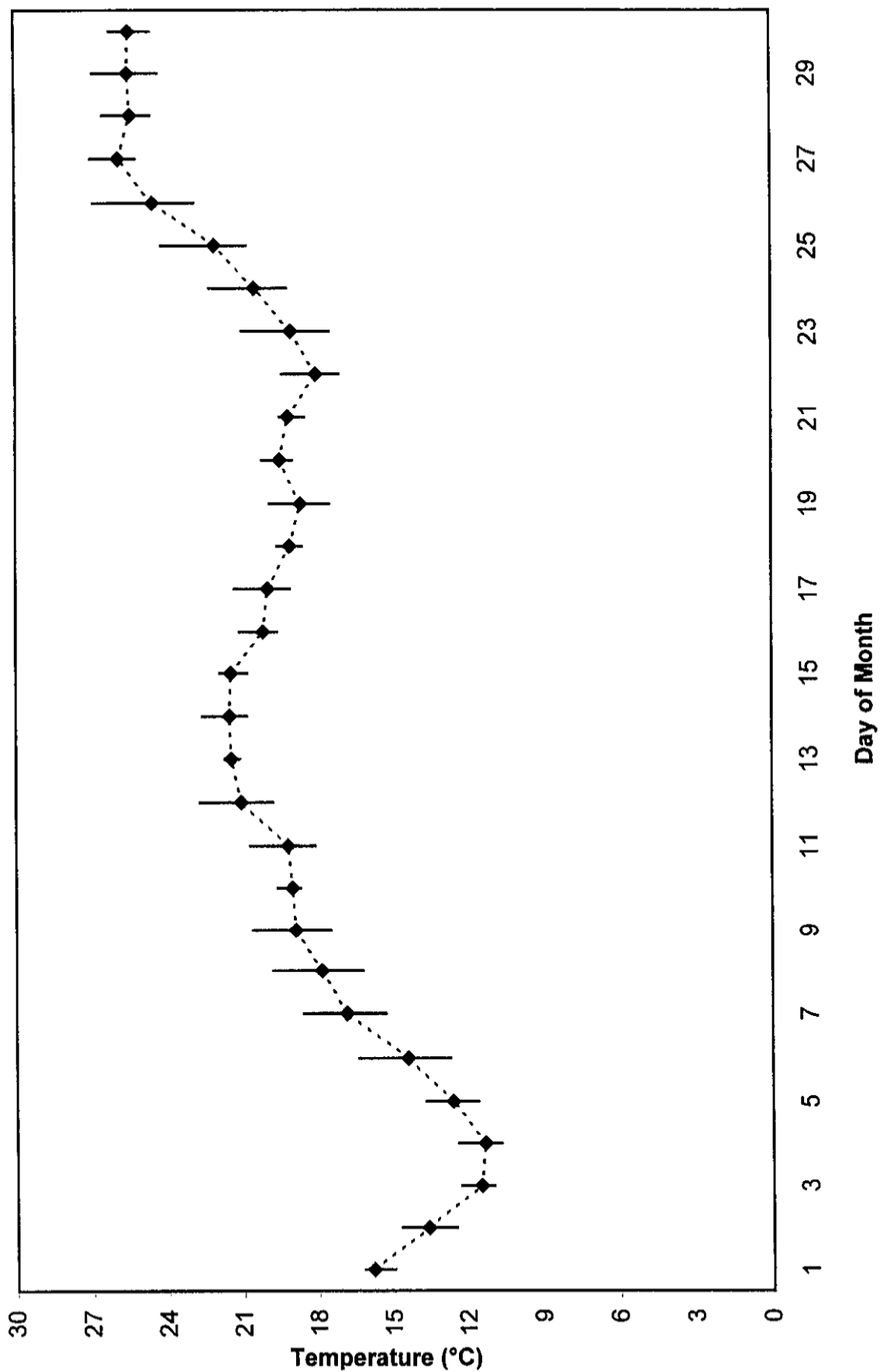
APPENDIX D

Upstream Temperature Monitoring

Hourly Temperature Readings: Crystal Falls Hydroelectric Project (Upstream of Dam), June 2001

Time	Day of Month																													
	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28	29	30
12:00a	18.2	14.7	12.3	10.9	11.8	13.2	15.8	17.3	18.2	19.6	19.0	18.8	21.4	21.0	21.9	20.5	19.7	19.6	18.6	19.3	19.3	18.2	18.0	20.2	21.5	23.8	26.2	25.3	25.3	25.7
1:00a	16.1	14.5	12.2	10.8	11.8	13.0	15.6	17.0	18.0	19.4	19.0	19.8	21.3	21.0	21.7	20.4	19.6	19.5	18.5	19.3	19.1	18.0	18.0	20.0	21.5	23.8	26.0	25.3	25.1	25.4
2:00a	16.0	14.4	12.1	10.8	11.8	13.0	15.6	16.8	18.0	19.3	18.7	19.9	21.4	20.8	21.7	20.2	19.6	19.3	18.4	19.2	19.2	17.9	18.0	19.7	21.3	23.5	26.0	25.2	24.8	25.4
3:00a	16.0	14.3	12.0	10.8	11.7	12.9	15.5	16.7	17.8	19.3	18.6	20.0	21.4	20.8	21.6	20.1	19.4	19.3	18.2	19.1	19.1	17.6	17.8	19.6	21.2	23.3	25.8	25.0	24.6	25.2
4:00a	15.9	14.1	11.9	10.8	11.6	12.8	15.5	16.6	17.6	19.1	18.5	19.8	21.4	20.8	21.7	19.9	19.3	19.1	18.0	19.0	19.1	17.4	17.8	19.4	21.1	23.2	25.7	25.0	24.6	25.0
5:00a	15.8	14.0	11.8	10.8	11.6	12.8	15.4	16.4	17.6	19.1	18.4	19.8	21.4	20.8	21.6	19.8	19.3	19.1	18.0	19.0	19.1	17.4	17.7	19.3	21.0	23.0	25.4	25.0	24.6	24.9
6:00a	15.7	14.0	11.6	10.7	11.7	12.8	15.4	16.2	17.5	19.0	18.4	19.9	21.4	20.8	21.5	19.6	19.1	19.0	17.9	19.0	19.1	17.3	17.6	19.3	20.8	22.9	25.3	24.8	24.4	24.9
7:00a	15.8	13.8	11.6	10.7	11.6	12.7	15.3	16.2	17.5	19.0	18.2	18.9	21.5	20.9	21.5	19.6	19.1	19.0	17.6	18.0	19.1	17.1	17.5	19.2	20.8	22.9	25.2	24.6	24.3	24.6
8:00a	15.9	13.9	11.4	10.7	11.8	12.8	15.5	16.2	17.6	19.0	18.1	20.0	21.5	20.9	21.5	19.6	19.1	19.0	17.5	18.1	19.1	17.1	17.7	19.3	20.8	23.0	25.4	24.6	24.4	24.6
9:00a	15.9	13.7	11.3	10.8	12.1	13.1	15.7	16.4	17.8	19.0	18.2	20.2	21.6	21.1	21.5	19.7	19.4	18.0	17.6	19.3	19.2	17.1	17.9	19.4	21.1	23.2	25.5	24.6	24.6	24.7
10:00a	15.9	13.7	11.4	10.9	12.2	13.6	16.2	16.7	17.9	18.7	18.3	20.5	21.6	21.2	21.5	19.7	19.6	19.1	17.7	19.6	19.3	17.3	18.3	19.6	21.2	23.5	25.9	24.8	24.9	25.0
11:00a	15.9	13.7	11.4	11.0	12.5	13.8	16.8	17.1	18.2	18.8	18.6	21.1	21.6	21.4	21.5	20.0	20.2	19.0	18.0	19.8	19.3	17.6	19.0	20.2	21.5	23.5	26.3	25.0	25.2	25.3
12:00p	16.0	13.6	11.4	11.2	12.7	14.5	16.8	17.6	18.6	18.7	19.1	21.6	21.7	21.5	21.5	20.4	20.4	19.0	18.1	19.7	19.3	17.8	19.3	20.4	21.8	24.2	26.2	25.2	25.2	25.3
1:00p	16.0	13.6	11.4	11.6	13.2	14.9	17.5	18.5	19.2	18.7	19.1	21.7	21.6	21.6	21.5	20.6	20.4	19.1	18.5	19.9	19.5	18.1	19.4	20.7	21.6	24.6	26.5	25.4	26.0	25.7
2:00p	16.0	13.6	11.4	11.6	13.3	15.3	18.0	19.2	19.7	18.7	19.2	22.1	21.8	21.9	21.5	20.8	20.8	19.1	19.1	19.7	19.4	18.4	19.6	20.7	22.0	24.6	27.0	25.7	26.2	26.0
3:00p	16.0	13.5	11.3	11.7	13.4	15.6	18.0	19.8	20.2	18.7	19.0	22.3	21.7	22.1	21.4	20.9	21.2	19.2	18.4	20.2	19.5	18.6	19.6	20.8	22.2	25.2	26.9	25.7	26.4	26.0
4:00p	16.1	13.4	11.3	11.8	13.6	16.1	18.6	19.1	20.2	19.0	19.0	22.4	21.5	22.3	21.5	21.1	21.3	19.2	19.6	20.0	19.4	19.0	19.9	21.0	22.6	25.8	26.5	25.8	26.7	26.2
5:00p	15.9	13.4	11.3	12.3	13.7	15.6	18.6	19.3	20.5	19.0	20.0	22.6	21.5	22.3	21.5	20.8	20.9	19.3	19.8	20.2	19.3	19.1	20.5	21.2	22.9	25.8	26.2	25.9	26.7	26.2
6:00p	15.9	13.2	11.3	12.4	13.6	16.2	18.5	19.3	20.6	19.1	20.6	22.3	21.5	22.3	21.6	20.5	20.8	19.3	19.9	19.9	19.3	19.4	20.5	21.8	23.3	26.1	25.6	25.9	26.9	26.2
7:00p	15.6	13.1	11.2	12.3	13.5	16.1	18.5	19.6	20.5	19.1	20.5	22.7	21.4	22.6	21.4	20.2	20.5	19.1	19.9	19.8	19.2	19.2	20.8	22.0	23.6	26.5	25.6	26.4	26.4	26.2
8:00p	15.6	12.8	11.1	12.0	13.4	16.3	18.6	19.8	20.4	19.1	20.7	22.3	21.2	22.3	21.3	20.1	20.4	19.1	19.7	19.6	19.1	18.9	20.3	22.3	23.8	26.5	25.7	26.5	26.4	26.1
9:00p	15.3	12.7	11.1	12.0	13.4	16.4	18.2	19.3	20.2	19.0	20.7	21.7	21.2	22.2	21.1	19.9	20.1	19.0	19.5	19.6	19.0	18.5	21.0	22.3	24.2	26.9	25.6	26.3	26.2	25.8
10:00p	15.2	12.6	11.0	11.8	13.3	16.2	17.8	19.1	20.0	19.0	20.6	21.5	21.1	22.0	20.9	19.9	19.9	18.7	19.3	19.5	18.7	18.3	20.6	22.0	24.2	26.7	25.4	26.0	26.1	25.4
11:00p	15.0	12.5	11.0	11.8	13.2	16.1	17.4	18.5	19.7	19.0	20.2	21.4	21.1	21.9	20.8	19.9	19.7	18.6	19.3	19.4	18.5	18.1	20.7	21.9	24.2	26.5	25.4	25.7	25.6	25.2
Max.	16.2	14.7	12.3	12.4	13.7	16.4	18.6	19.8	20.6	19.6	20.7	22.7	21.7	22.6	21.9	21.1	21.3	19.6	19.9	20.2	19.5	19.4	21.0	22.3	24.2	26.9	27.0	26.5	26.9	26.2
Min.	15.0	12.5	11.0	10.7	11.6	12.7	15.3	16.2	17.5	18.7	18.1	19.8	21.1	20.8	20.8	19.6	19.1	18.6	17.5	19.0	18.5	17.1	17.5	19.2	20.8	22.9	25.2	24.6	24.3	24.6
Avg.	15.8	13.6	11.5	11.3	12.6	14.4	16.9	17.9	18.9	19.0	19.2	21.1	21.4	21.5	21.5	20.2	20.0	19.1	18.7	19.5	19.2	18.1	19.1	20.5	22.1	24.5	25.9	25.4	25.5	25.5

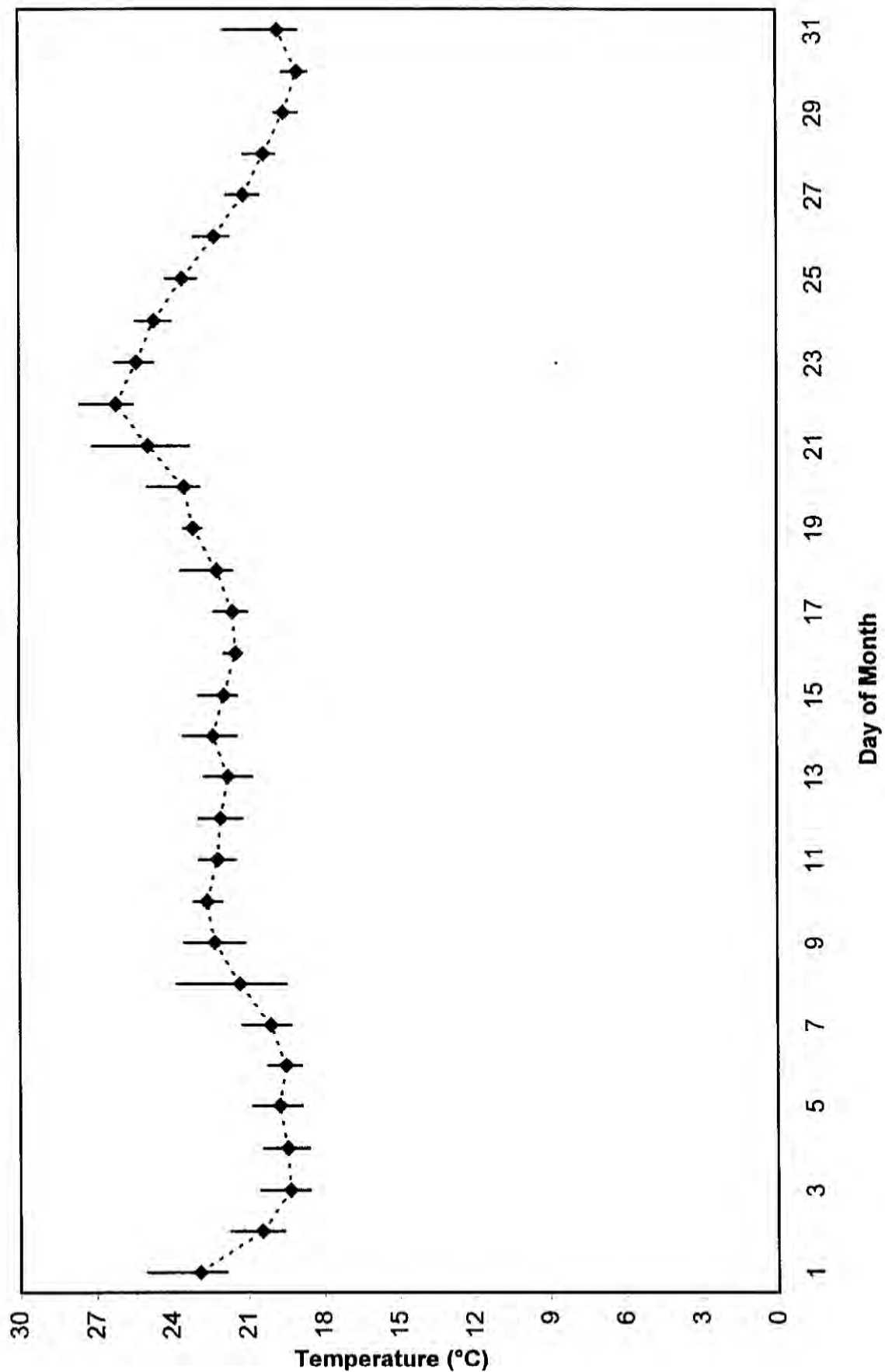
Average Daily Temperature Readings
Crystal Falls Hydroelectric Project (Upstream of Dam)
June 2001



Hourly Temperature Readings: Crystal Falls Hydroelectric Project (Upstream of Dam), July 2001

Time	Day of Month																														
	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28	29	30	31
12:00a	25.0	21.7	19.4	19.3	19.9	19.9	19.6	20.2	22.3	22.9	22.4	22.0	21.7	22.0	22.9	21.4	21.8	22.1	23.4	23.2	24.6	25.6	25.3	25.1	24.2	22.8	21.7	21.1	19.9	18.9	19.3
1:00a	24.7	21.5	19.3	19.1	19.8	19.6	19.6	20.0	22.0	22.7	22.2	22.0	21.5	21.8	22.9	21.4	21.8	22.1	23.2	23.1	24.4	25.7	25.2	25.0	24.1	22.6	21.5	21.0	19.9	18.8	19.2
2:00a	24.4	21.3	19.3	18.9	19.6	19.4	19.6	19.8	21.8	22.6	22.1	21.8	21.4	21.7	22.6	21.3	21.8	22.0	23.1	23.0	24.1	25.7	25.0	24.9	24.0	22.5	21.4	20.9	19.6	18.7	19.1
3:00a	24.1	21.2	19.0	18.9	19.4	19.3	19.4	19.7	21.6	22.6	22.0	21.7	21.2	21.7	22.6	21.2	21.7	21.9	23.1	22.9	23.9	25.7	24.8	24.7	23.9	22.4	21.2	20.8	19.6	18.7	19.2
4:00a	23.7	20.9	19.0	18.8	19.3	19.1	19.3	19.7	21.4	22.4	21.9	21.6	21.1	21.6	22.4	21.3	21.6	21.9	23.1	22.9	23.7	25.7	24.9	24.6	23.8	22.1	21.0	20.7	19.6	18.6	19.1
5:00a	23.5	20.7	18.9	18.7	19.1	19.0	19.3	19.6	21.2	22.2	21.6	21.5	21.1	21.5	22.3	21.2	21.4	21.7	23.0	22.9	23.5	25.7	24.9	24.4	23.6	22.1	20.8	20.6	19.5	18.6	19.0
6:00a	23.1	20.5	18.7	18.6	19.0	18.9	19.3	19.6	21.2	22.1	21.7	21.3	21.0	21.4	22.2	21.2	21.3	21.7	23.0	22.9	23.4	25.7	24.7	24.2	23.4	22.0	20.6	20.6	19.4	18.6	19.0
7:00a	22.8	20.3	18.7	18.6	19.0	19.0	19.3	19.5	21.1	22.0	21.5	21.2	20.8	21.4	22.1	21.2	21.2	21.6	22.9	22.9	23.3	25.7	24.7	24.1	23.2	21.8	20.5	20.5	19.4	18.6	19.0
8:00a	22.4	20.2	18.6	18.6	18.9	18.9	19.3	19.6	21.2	22.1	21.5	21.3	20.9	21.4	21.9	21.2	21.1	21.6	22.9	22.9	23.5	25.7	24.8	24.0	23.2	21.7	20.5	20.4	19.4	18.7	19.0
9:00a	22.3	20.4	18.6	18.6	19.0	19.1	19.4	19.8	21.4	22.2	21.5	21.4	20.9	21.5	21.8	21.2	21.0	21.6	22.9	22.9	23.6	25.8	25.0	24.1	23.2	21.7	20.6	20.4	19.3	18.7	19.0
10:00a	22.1	20.3	18.6	19.0	19.0	19.2	19.9	20.2	21.7	22.3	21.7	21.5	21.1	21.5	21.8	21.2	21.0	21.7	22.8	23.0	23.9	26.2	25.2	24.1	23.2	21.8	20.6	20.3	19.4	18.9	19.3
11:00a	22.2	20.4	18.8	19.0	19.2	19.3	20.2	20.5	21.8	22.4	21.9	22.0	21.4	21.9	21.7	21.4	21.0	21.7	22.8	23.1	24.4	26.3	25.4	24.3	23.2	21.9	20.7	20.3	19.3	19.0	19.4
12:00p	22.3	20.5	19.0	19.2	19.4	19.6	20.1	21.0	22.1	22.6	22.2	22.4	21.5	22.1	21.6	21.3	21.2	21.9	22.9	23.3	24.6	26.2	25.4	24.6	23.2	22.0	20.8	20.2	19.3	19.1	19.9
1:00p	22.3	20.5	19.2	19.5	19.6	19.5	20.2	21.6	22.6	22.7	22.4	22.5	22.0	22.6	21.5	21.3	21.2	22.0	22.9	23.2	25.0	26.9	25.3	24.7	23.5	22.0	21.0	20.2	19.5	19.0	19.9
2:00p	22.6	20.6	19.8	19.8	20.0	19.6	20.3	22.3	22.9	22.9	22.6	22.5	22.3	22.8	21.6	21.4	21.5	22.1	23.0	23.3	25.4	27.0	25.4	24.9	23.8	22.3	21.2	20.2	19.5	19.0	19.4
3:00p	22.7	20.4	19.6	20.1	20.4	20.0	20.7	22.7	23.2	23.0	22.6	22.8	22.4	23.1	21.6	21.7	21.5	22.3	23.2	23.9	26.1	27.6	25.8	25.1	23.9	22.6	21.3	20.1	19.7	19.0	19.7
4:00p	22.9	20.4	20.0	20.2	20.6	20.2	20.8	23.5	23.1	23.1	22.9	22.9	22.7	23.5	21.6	21.7	21.5	22.6	23.4	23.7	26.1	27.5	25.9	25.4	23.9	22.7	21.4	20.0	19.9	19.2	20.1
5:00p	22.9	20.2	19.9	20.4	20.8	19.7	21.2	23.3	23.3	23.0	22.9	22.9	22.7	23.4	21.7	21.7	21.6	22.6	23.5	23.9	26.5	27.0	26.1	25.4	23.9	22.8	21.6	20.1	19.5	19.5	19.9
6:00p	22.8	20.1	20.1	20.4	20.7	20.1	21.2	23.8	23.5	23.1	22.8	22.8	22.7	23.3	21.7	21.8	21.6	22.6	23.5	24.0	27.1	26.8	26.2	25.2	23.8	23.1	21.6	20.0	19.8	19.6	19.9
7:00p	22.6	20.0	20.5	20.4	20.6	20.0	21.1	23.6	23.4	23.0	22.6	22.7	22.6	23.5	21.6	21.5	22.1	22.4	23.5	24.2	27.1	26.4	26.2	25.1	23.8	23.1	21.8	19.9	19.7	19.5	20.4
8:00p	22.6	19.9	20.3	20.4	20.5	19.9	20.9	23.4	23.3	22.9	22.6	22.5	22.6	23.2	21.5	21.7	22.3	22.6	23.4	24.4	26.5	26.2	26.0	24.9	23.5	22.8	21.5	20.0	19.8	19.5	20.8
9:00p	22.3	19.7	19.9	20.3	20.4	19.7	20.8	22.9	23.2	22.7	22.4	22.3	22.4	23.2	21.5	21.9	22.3	23.2	23.4	24.6	25.9	26.0	25.8	24.6	23.2	22.3	21.5	19.9	19.8	19.3	21.5
10:00p	22.0	19.6	19.7	20.1	20.2	19.7	20.6	22.6	23.1	22.6	22.3	22.1	22.3	23.2	21.5	21.7	22.3	23.6	23.2	24.9	25.6	25.7	25.6	24.6	23.1	22.0	21.3	20.0	19.4	19.4	21.9
11:00p	21.9	19.6	19.6	20.0	20.0	19.6	20.5	22.5	22.9	22.4	22.1	21.9	22.1	23.2	21.4	21.7	22.2	23.6	23.2	24.9	25.4	25.5	25.3	24.4	23.0	22.0	21.2	19.9	19.0	19.3	21.8
Max.	25.0	21.7	20.5	20.4	20.8	20.2	21.2	23.8	23.5	23.1	22.9	22.9	22.7	23.5	22.9	21.9	22.3	23.6	23.5	24.9	27.1	27.6	26.2	25.4	24.2	23.1	21.8	21.1	19.9	19.6	21.9
Min.	21.9	19.6	18.6	18.6	18.9	18.9	19.3	19.5	21.1	22.0	21.5	21.2	20.8	21.4	21.4	21.2	21.0	21.6	22.8	22.9	23.3	25.5	24.7	24.0	23.0	21.7	20.5	19.9	19.0	18.6	19.0
Avg.	22.9	20.5	19.4	19.5	19.8	19.5	20.1	21.3	22.3	22.6	22.2	22.1	21.8	22.4	21.9	21.4	21.6	22.2	23.1	23.5	24.9	26.2	25.4	24.7	23.6	22.3	21.1	20.3	19.6	19.0	19.8

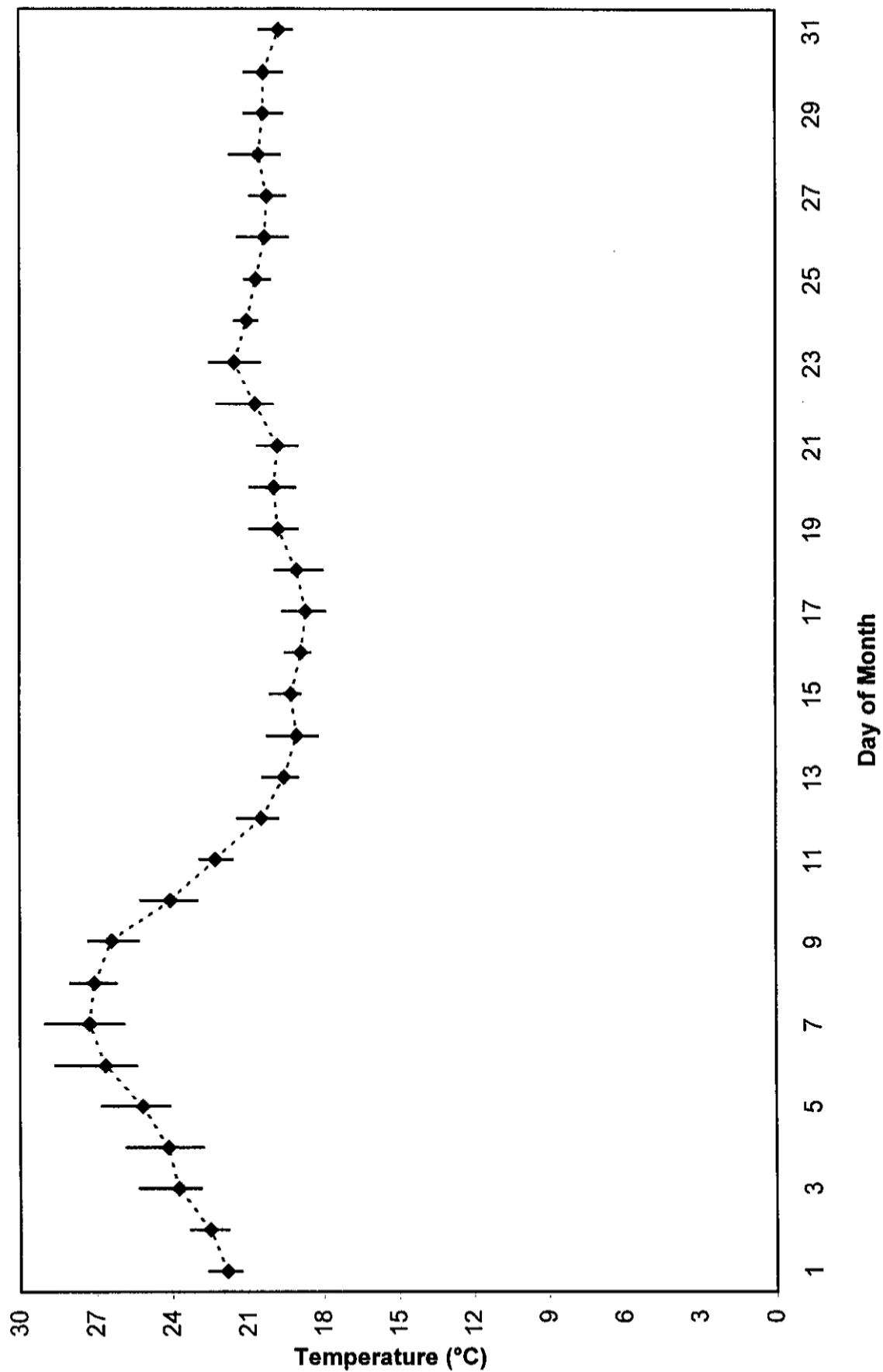
Average Daily Temperature Readings
Crystal Falls Hydroelectric Project (Upstream of Dam)
July 2001



Hourly Temperature Readings: Crystal Falls Hydroelectric Project (Upstream of Dam), August 2001

Time	Day of Month																														
	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28	29	30	31
12:00a	21.9	22.3	23.0	23.4	25.4	26.2	27.1	27.8	27.3	25.2	22.9	21.4	19.6	19.2	20.1	18.9	18.4	19.0	19.5	20.0	20.0	20.5	22.0	21.4	21.1	20.0	20.3	20.2	20.5	20.4	20.5
1:00a	21.6	22.3	23.0	23.2	25.1	26.0	26.8	27.6	27.1	25.1	22.8	21.1	19.6	19.0	19.9	18.9	18.4	19.0	19.5	19.8	19.9	20.4	21.7	21.2	21.0	19.9	20.2	20.1	20.4	20.3	20.3
2:00a	21.4	22.2	23.1	23.2	24.8	25.9	26.5	27.1	26.9	25.0	22.6	20.9	19.4	18.9	19.6	18.9	18.2	18.5	19.3	19.7	19.7	20.3	21.4	21.1	20.9	19.9	20.0	20.0	20.3	20.0	20.2
3:00a	21.4	22.2	22.9	23.0	24.5	25.8	26.2	26.9	26.7	24.9	22.5	20.7	19.4	18.6	19.6	18.7	18.2	18.4	19.2	19.5	19.5	20.3	21.4	20.9	20.8	19.8	19.9	19.9	20.2	19.9	20.0
4:00a	21.4	22.1	22.9	23.0	24.2	25.6	26.1	26.8	26.5	24.7	22.3	20.5	19.3	18.5	19.4	18.6	18.1	18.3	19.1	19.4	19.3	20.3	21.1	20.8	20.9	19.7	19.8	19.9	20.0	19.8	19.9
5:00a	21.4	22.1	22.9	22.9	24.2	25.4	26.0	26.6	26.5	24.5	22.3	20.4	19.2	18.4	19.4	18.7	18.1	18.2	19.0	19.2	19.0	20.2	20.9	20.8	20.9	19.6	19.8	19.8	19.9	19.8	19.8
6:00a	21.4	21.9	22.9	22.8	24.2	25.4	25.9	26.4	26.3	24.3	22.0	20.3	19.0	18.3	19.2	18.6	18.0	18.1	19.0	19.2	19.0	20.2	20.7	20.7	20.8	19.6	19.7	19.7	19.8	19.8	19.7
7:00a	21.3	21.8	22.9	22.9	24.1	25.4	25.9	26.3	26.2	24.1	21.8	20.2	19.0	18.2	19.0	18.6	17.9	18.0	19.0	19.1	19.0	20.0	20.6	20.7	20.8	19.4	19.6	19.7	19.7	19.8	19.5
8:00a	21.4	21.8	22.9	22.9	24.1	25.4	25.9	26.2	26.2	23.9	21.8	20.2	19.0	18.2	19.0	18.7	17.9	18.1	19.0	19.1	19.0	20.0	20.5	20.7	20.8	19.5	19.5	19.7	19.6	19.6	19.5
9:00a	21.4	21.9	22.9	23.2	24.3	25.4	26.2	26.2	26.3	23.8	21.9	20.3	19.1	18.3	19.1	18.7	17.9	18.3	19.1	19.1	19.1	20.1	20.5	20.6	20.8	19.5	19.6	19.8	19.8	19.8	19.6
10:00a	21.4	22.0	23.2	23.4	24.5	25.6	26.3	26.5	26.5	23.8	22.0	20.3	19.3	18.5	19.2	18.7	18.0	18.5	19.4	19.4	19.3	20.2	20.7	20.7	20.8	19.8	19.7	20.0	19.9	19.8	19.6
11:00a	21.6	22.2	23.5	23.8	24.9	25.8	26.5	26.5	26.5	23.8	22.0	20.3	19.4	18.6	19.3	18.7	18.1	19.0	19.6	19.5	19.4	20.2	21.1	20.6	20.8	20.0	19.9	20.3	20.0	20.0	19.6
12:00p	21.7	22.4	23.8	24.4	25.0	26.2	27.0	26.9	26.5	23.8	22.2	20.4	19.6	19.0	19.2	18.7	18.5	19.0	19.7	19.8	19.8	20.3	21.4	20.7	20.7	20.5	20.2	20.6	20.2	20.3	19.6
1:00p	21.8	22.6	24.2	24.5	24.7	26.5	27.3	26.9	26.5	24.0	22.2	20.4	19.9	19.3	19.2	18.9	18.6	19.3	19.9	19.8	19.9	20.4	21.7	20.8	20.7	20.8	20.5	20.8	20.3	20.5	19.7
2:00p	21.9	22.8	24.6	24.2	25.1	27.3	27.9	26.9	26.5	24.1	22.3	20.5	20.0	19.4	19.3	19.0	19.1	19.5	20.1	20.1	20.0	20.4	22.0	20.9	20.6	21.0	20.8	21.0	20.8	20.8	19.8
3:00p	21.9	23.2	25.0	25.0	25.3	27.5	27.9	27.2	26.5	24.0	22.4	20.8	20.0	19.3	19.3	19.4	19.1	19.6	20.4	20.5	20.1	20.6	22.1	21.0	20.6	21.2	20.9	21.4	21.0	21.1	19.8
4:00p	22.1	23.3	25.3	25.0	25.8	28.0	28.4	27.1	26.5	23.9	22.6	20.6	20.4	19.4	19.3	19.5	19.3	19.7	20.5	20.9	20.3	20.8	22.4	21.2	20.6	21.4	20.9	21.5	21.1	21.0	19.8
5:00p	22.3	23.2	24.9	25.5	25.8	27.8	28.8	27.3	26.5	23.9	22.8	20.5	20.1	19.5	19.2	19.5	19.5	19.7	20.6	20.8	20.3	21.1	22.4	21.4	20.5	21.2	20.9	21.7	21.1	21.0	19.8
6:00p	22.6	23.2	24.9	25.6	25.8	27.8	28.9	27.6	26.5	23.8	22.7	20.6	20.1	19.5	19.3	19.4	19.5	19.8	20.9	20.9	20.2	21.4	22.5	21.4	20.4	21.1	20.8	21.6	20.9	21.1	19.8
7:00p	22.6	23.2	25.1	25.6	25.9	28.6	29.0	27.7	26.2	23.7	22.6	20.5	19.9	19.5	19.1	19.2	19.6	19.9	20.7	20.9	20.5	21.2	22.3	21.4	20.4	21.1	20.8	21.5	21.0	21.0	19.8
8:00p	22.6	23.1	24.7	25.4	26.5	28.4	28.6	27.9	25.9	23.6	22.5	20.3	19.8	19.4	19.0	19.0	19.6	19.9	20.6	20.8	20.5	21.6	22.1	21.5	20.5	20.9	20.6	21.4	20.9	20.9	19.6
9:00p	22.5	23.0	24.2	25.8	26.8	28.2	28.5	28.0	25.8	23.3	22.2	20.2	19.7	19.9	19.0	18.7	19.5	19.9	20.5	20.8	20.6	22.0	21.9	21.5	20.3	20.8	20.4	21.2	20.7	20.8	19.4
10:00p	22.4	23.0	23.8	25.8	26.5	27.8	28.5	27.8	25.5	23.2	22.0	20.0	19.5	20.1	19.0	18.6	19.5	19.9	20.4	20.5	20.6	22.2	21.6	21.4	20.2	20.5	20.4	20.9	20.6	20.5	19.4
11:00p	22.3	23.0	23.6	25.5	26.3	27.4	28.1	27.6	25.3	23.0	21.6	19.8	19.3	20.2	18.9	18.5	19.3	19.6	20.1	20.3	20.6	22.0	21.5	21.2	20.1	20.4	20.3	20.9	20.4	20.5	19.2
Max.	22.6	23.3	25.3	25.8	26.8	28.6	29.0	28.0	27.3	25.2	22.9	21.4	20.4	20.2	20.1	19.5	19.6	19.9	20.9	20.9	20.6	22.2	22.5	21.5	21.1	21.4	20.9	21.7	21.1	21.1	20.5
Min.	21.3	21.8	22.9	22.8	24.1	25.4	25.9	26.2	25.3	23.0	21.6	19.8	19.0	18.2	18.9	18.5	17.9	18.0	19.0	19.1	19.0	20.0	20.5	20.6	20.1	19.4	19.5	19.7	19.6	19.6	19.2
Avg.	21.8	22.5	23.8	24.2	25.2	26.6	27.3	27.1	26.4	24.1	22.3	20.5	19.6	19.1	19.3	18.9	18.7	19.1	19.8	20.0	19.8	20.7	21.5	21.0	20.7	20.3	20.2	20.6	20.4	20.4	19.7

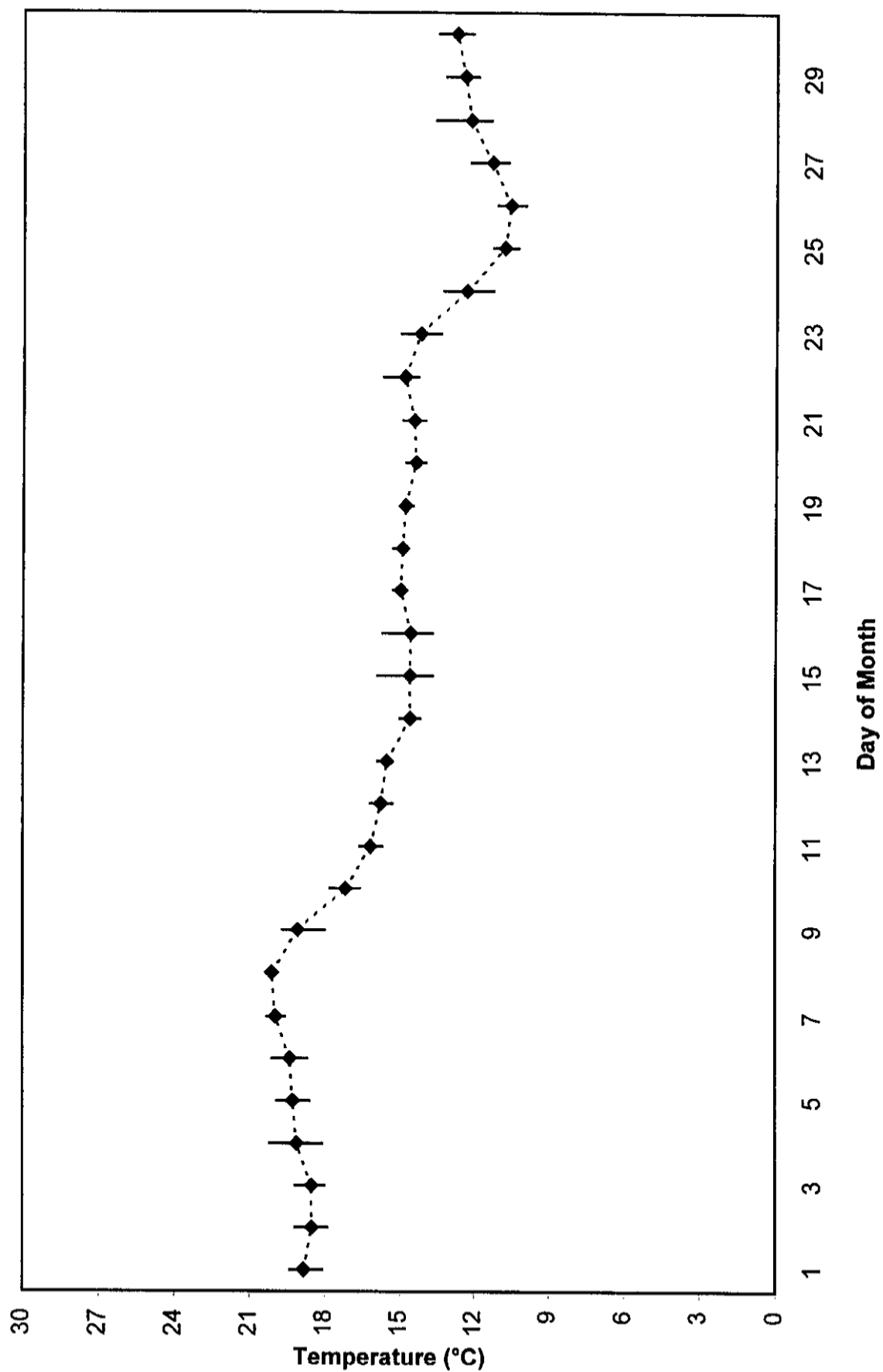
Average Daily Temperature Readings
Crystal Falls Hydroelectric Project (Upstream of Dam)
August 2001



Hourly Temperature Readings: Crystal Falls Hydroelectric Project (Upstream of Dam), September 2001

Time	Day of Month																													
	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28	29	30
12:00a	19.2	18.9	18.6	18.9	19.7	19.8	20.0	20.2	19.7	17.8	16.5	15.9	15.6	15.0	14.4	14.4	15.3	14.9	15.0	14.4	14.4	14.5	15.0	13.3	11.1	10.6	10.8	11.6	12.2	12.8
1:00a	19.0	18.6	18.5	18.6	19.6	19.6	19.9	20.2	19.6	17.8	16.4	15.8	15.5	15.0	14.2	14.4	15.1	14.8	15.0	14.3	14.4	14.5	14.9	13.1	11.0	10.6	10.8	11.6	12.2	12.6
2:00a	19.0	18.5	18.5	18.5	19.4	19.5	19.8	20.3	19.6	17.6	16.3	15.7	15.6	14.8	14.1	14.1	15.0	14.8	14.9	14.3	14.4	14.4	14.8	13.0	10.9	10.5	10.8	11.6	12.0	12.6
3:00a	18.7	18.3	18.3	18.4	19.2	19.3	19.8	20.2	19.6	17.4	16.2	15.7	15.5	14.7	13.9	14.0	14.9	14.8	14.9	14.3	14.3	14.4	14.7	12.9	10.8	10.4	10.7	11.6	12.0	12.4
4:00a	18.6	18.1	18.3	18.4	19.1	19.2	19.7	20.0	19.5	17.4	16.1	15.6	15.4	14.7	13.9	13.8	14.9	14.7	14.9	14.2	14.2	14.4	14.7	12.8	10.8	10.4	10.8	11.6	12.0	12.3
5:00a	18.5	18.0	18.2	18.3	19.0	19.1	19.7	20.0	19.4	17.2	16.0	15.6	15.3	14.5	13.9	13.7	14.8	14.7	14.9	14.2	14.2	14.4	14.7	12.7	10.6	10.3	10.8	11.6	12.0	12.3
6:00a	18.3	18.0	18.0	18.3	18.7	19.0	19.7	20.0	19.4	17.0	15.9	15.5	15.3	14.4	13.9	13.7	14.8	14.8	14.8	14.1	14.1	14.3	14.7	12.6	10.6	10.3	10.8	11.6	12.1	12.2
7:00a	18.2	17.9	18.0	18.2	18.6	18.9	19.6	20.0	19.3	17.0	15.9	15.4	15.3	14.3	13.7	13.7	14.8	14.8	14.8	14.1	14.1	14.3	14.6	12.5	10.5	10.2	10.8	11.4	12.0	12.2
8:00a	18.1	18.0	18.0	18.1	18.6	18.7	19.7	20.0	19.3	16.8	15.7	15.4	15.3	14.2	13.7	13.8	14.8	14.8	14.8	14.0	14.0	14.3	14.4	12.4	10.4	10.0	10.8	11.5	11.9	12.1
9:00a	18.2	17.9	18.0	18.2	18.6	18.9	19.7	20.0	19.2	16.8	15.8	15.3	15.3	14.2	13.7	13.9	14.8	14.7	14.8	14.0	14.1	14.3	14.5	12.3	10.3	10.1	10.8	11.6	11.9	12.2
10:00a	18.3	17.9	18.0	18.4	18.7	18.9	19.8	20.0	19.2	17.0	15.9	15.3	15.4	14.3	13.9	14.1	14.8	14.8	14.8	14.1	14.1	14.4	14.4	12.2	10.4	10.1	10.9	11.6	12.0	12.3
11:00a	18.4	18.0	18.1	18.6	18.9	19.0	19.9	20.0	19.2	17.2	16.2	15.4	15.5	14.4	14.1	14.1	14.8	14.8	14.8	14.2	14.1	14.5	14.2	12.3	10.6	10.3	11.0	11.7	12.3	12.3
12:00p	18.9	18.1	18.3	19.2	19.0	19.2	20.0	20.1	19.2	17.4	16.1	15.7	15.6	14.7	14.7	14.3	14.8	14.8	14.8	14.3	14.3	14.6	14.1	12.3	10.8	10.5	11.3	12.0	12.3	12.6
1:00p	18.9	18.4	18.5	19.3	19.4	19.3	20.2	20.2	19.2	17.4	16.3	16.0	15.6	14.5	14.5	14.5	14.9	15.0	14.8	14.4	14.5	14.7	14.1	12.3	10.9	10.6	11.5	12.2	12.6	12.8
2:00p	19.1	18.5	18.9	19.8	19.3	19.5	20.3	20.2	19.1	17.5	16.6	16.1	15.8	14.6	15.1	14.7	15.0	15.0	14.8	14.7	14.7	14.9	14.0	12.4	11.1	10.8	11.7	12.4	12.7	13.2
3:00p	19.2	19.0	19.0	20.0	19.4	19.5	20.3	20.3	19.1	17.4	16.6	16.1	15.8	14.5	15.3	14.9	15.2	15.2	14.8	14.7	14.8	15.4	14.0	12.4	11.1	10.9	11.9	12.7	12.6	13.3
4:00p	19.3	19.0	19.1	19.9	19.6	19.6	20.3	20.3	19.1	17.3	16.5	16.2	15.9	14.7	15.4	15.3	15.3	15.2	14.8	14.8	14.8	15.3	13.9	12.3	11.3	11.0	12.1	13.2	12.7	13.3
5:00p	19.1	19.2	19.2	20.2	19.6	19.6	20.3	20.3	19.0	17.3	16.6	16.1	15.9	14.8	15.9	15.5	15.3	15.3	14.8	14.8	14.9	15.6	13.9	12.3	11.3	11.1	12.1	13.3	12.6	13.4
6:00p	19.2	19.2	19.2	20.2	19.7	19.6	20.3	20.3	18.8	17.1	16.4	16.2	15.7	14.8	15.9	15.7	15.1	15.2	14.8	14.7	14.9	15.7	13.9	12.2	11.1	11.1	12.1	13.6	12.6	13.5
7:00p	19.4	19.1	19.0	20.0	19.8	19.5	20.3	20.2	18.6	17.0	16.2	16.0	15.6	14.8	15.4	15.6	15.2	15.1	14.8	14.7	14.8	15.7	13.7	12.0	11.1	11.0	12.2	13.4	13.0	13.4
8:00p	19.4	19.1	19.0	20.0	19.9	19.9	20.2	20.2	18.5	16.9	16.1	16.0	15.6	14.7	15.5	15.5	15.1	15.0	14.7	14.7	14.8	15.6	13.6	11.8	11.0	11.0	12.0	13.1	13.1	13.3
9:00p	19.3	19.1	18.9	20.0	19.8	20.1	20.0	20.0	18.4	16.8	16.1	15.9	15.6	14.7	15.5	15.6	15.1	15.0	14.7	14.5	14.7	15.6	13.6	11.6	10.9	10.9	11.9	12.8	13.2	13.1
10:00p	19.2	19.0	18.7	19.9	19.8	20.1	20.0	19.9	18.2	16.7	16.0	15.8	15.4	14.7	15.2	15.4	15.0	15.0	14.6	14.5	14.7	15.3	13.4	11.4	10.8	10.8	11.8	12.6	13.1	13.1
11:00p	19.0	18.9	18.6	19.8	19.7	20.0	20.1	19.9	18.0	16.6	15.9	15.7	15.3	14.5	14.8	15.3	14.9	15.0	14.5	14.4	14.7	15.0	13.4	11.3	10.7	10.8	11.7	12.3	13.0	13.0
Max.	19.4	19.2	19.2	20.2	19.9	20.1	20.3	20.3	19.7	17.8	16.6	16.2	15.9	15.0	15.9	15.7	15.3	15.3	15.0	14.8	14.9	15.7	15.0	13.3	11.3	11.1	12.2	13.6	13.2	13.5
Min.	18.1	17.9	18.0	18.1	18.6	18.7	19.6	19.9	18.0	16.6	15.7	15.3	15.3	14.2	13.7	13.7	14.8	14.7	14.5	14.0	14.0	14.3	13.4	11.3	10.3	10.0	10.7	11.4	11.9	12.1
Avg.	18.9	18.5	18.5	19.1	19.3	19.4	20.0	20.1	19.1	17.2	16.2	15.8	15.5	14.6	14.6	14.6	15.0	14.9	14.8	14.4	14.5	14.8	14.2	12.4	10.8	10.6	11.3	12.2	12.4	12.8

Average Daily Temperature Readings
Crystal Falls Hydroelectric Project (Upstream of Dam)
September 2001



APPENDIX E

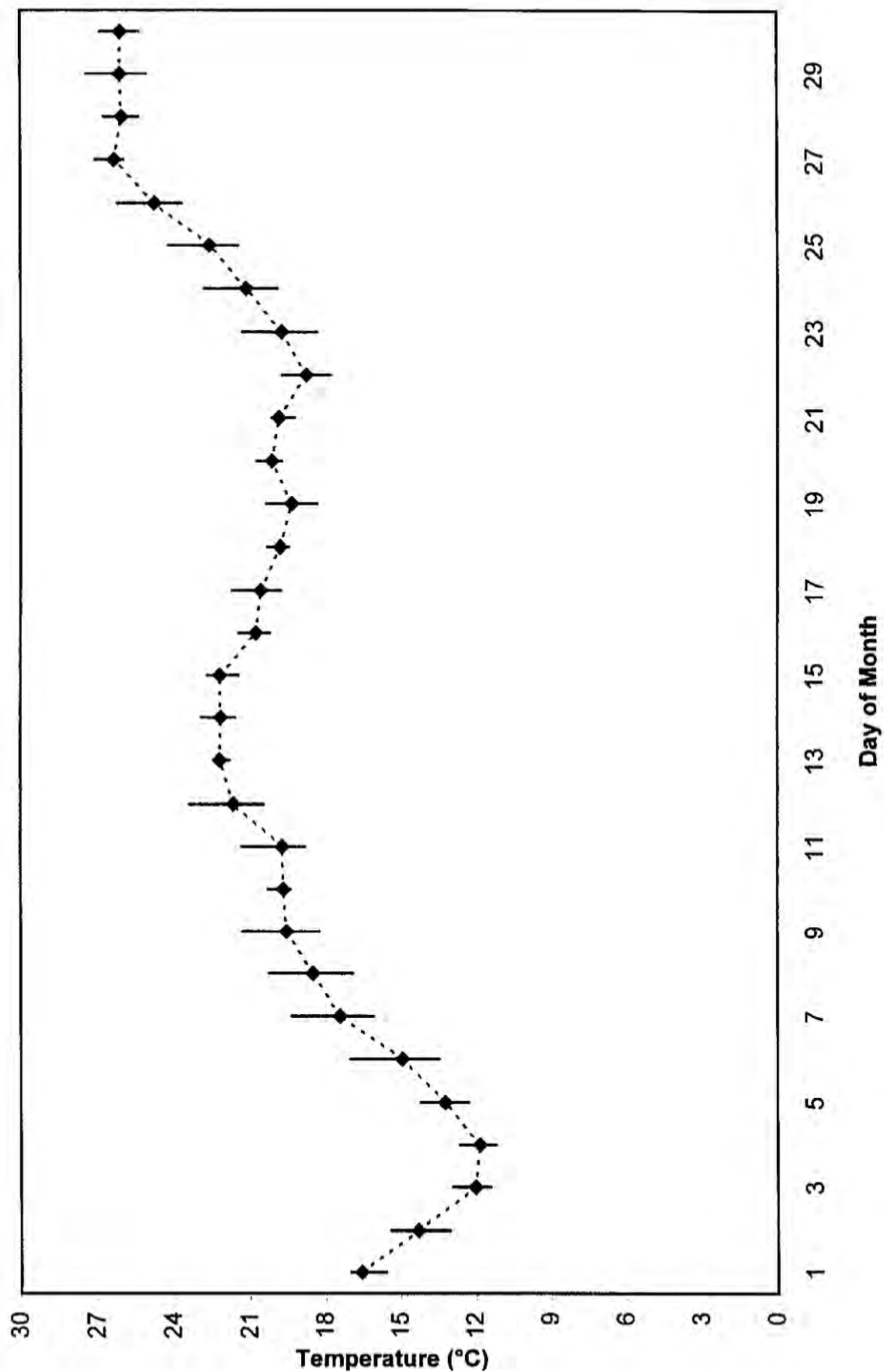
Downstream Temperature Monitoring

Hourly Temperature Readings: Crystal Falls Hydroelectric Project (Downstream of Dam), June 2001

Day of Month

Time	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28	29	30
12:00a	17.01	15.40	12.92	11.36	12.43	13.88	16.49	17.89	18.84	20.27	19.53	20.46	22.12	21.73	22.86	21.27	20.45	20.31	19.33	20.05	19.96	19.01	18.84	20.78	22.27	23.94	26.18	25.93	25.83	26.28
1:00a	16.88	15.20	12.79	11.31	12.38	13.78	16.42	17.71	18.72	20.12	19.51	20.55	22.12	21.68	22.53	21.08	20.34	20.17	19.20	19.94	19.91	18.78	18.82	20.46	22.09	23.93	26.25	25.87	25.60	26.11
2:00a	16.76	15.06	12.64	11.28	12.33	13.68	16.29	17.57	18.61	20.05	19.46	20.55	22.09	21.63	22.44	20.90	20.25	20.03	19.11	19.87	19.87	18.56	18.73	20.38	22.00	24.24	26.26	25.79	25.45	26.00
3:00a	16.66	14.95	12.54	11.25	12.32	13.62	16.22	17.42	18.53	19.94	19.35	20.59	22.11	21.61	22.39	20.74	20.12	19.82	18.99	19.80	19.79	18.39	18.65	20.24	21.91	24.07	26.23	25.68	25.36	25.86
4:00a	16.64	14.83	12.41	11.21	12.28	13.57	16.17	17.26	18.44	19.85	19.27	20.53	22.12	21.59	22.36	20.60	20.01	19.84	18.84	19.75	19.79	18.22	18.58	20.13	21.80	23.85	26.15	25.61	25.27	25.73
5:00a	16.61	14.76	12.31	11.20	12.28	13.49	16.13	17.13	18.35	19.79	19.18	20.53	22.14	21.59	22.30	20.48	19.91	19.77	18.73	19.72	19.75	18.06	18.44	20.01	21.70	23.74	26.06	25.51	25.19	25.57
6:00a	16.59	14.66	12.20	11.18	12.30	13.46	16.10	16.99	18.25	19.72	19.02	20.50	22.18	21.59	22.28	20.38	19.82	19.72	18.53	19.72	19.77	17.96	18.37	19.92	21.57	23.67	25.96	25.49	25.10	25.44
7:00a	16.59	14.58	12.11	11.18	12.36	13.46	16.08	16.91	18.27	19.66	18.92	20.52	22.25	21.63	22.25	20.25	19.77	19.68	18.37	19.75	19.80	17.86	18.32	19.91	21.48	23.67	25.96	25.40	25.08	25.36
8:00a	16.64	14.51	12.02	11.18	12.48	13.58	16.20	16.94	18.30	19.63	18.82	20.59	22.30	21.68	22.27	20.19	19.80	19.66	18.32	19.82	19.80	17.81	18.39	19.92	21.47	23.71	25.98	25.38	25.10	25.36
9:00a	16.67	14.48	11.95	11.25	12.66	13.77	16.37	17.10	18.41	19.53	18.82	20.80	22.32	21.71	22.25	20.19	19.92	19.68	18.35	19.91	19.87	17.86	18.53	19.99	21.57	23.83	26.09	25.36	25.18	25.44
10:00a	16.69	14.45	11.89	11.36	12.84	14.00	16.59	17.47	18.63	19.49	18.84	21.13	22.36	21.82	22.23	20.32	20.19	19.68	18.46	20.03	19.88	17.98	18.87	20.19	21.71	24.00	26.28	25.53	25.40	25.57
11:00a	16.74	14.46	11.90	11.54	13.12	14.25	17.01	17.93	18.92	19.46	18.90	21.48	22.39	22.02	22.23	20.52	20.57	19.70	18.65	20.25	19.98	18.22	19.21	20.53	21.98	24.24	26.66	25.74	25.73	25.79
12:00p	16.74	14.41	11.89	11.79	13.41	14.71	17.43	18.47	19.30	19.42	19.11	21.91	22.41	22.16	22.23	20.74	20.96	19.72	18.94	20.27	20.01	18.53	19.91	21.11	22.21	24.83	26.68	26.04	26.01	25.88
1:00p	16.74	14.36	11.85	12.02	13.69	14.90	17.83	19.09	19.79	19.44	19.30	22.43	22.32	22.25	22.19	20.97	21.08	19.73	19.33	20.34	20.08	18.84	20.45	21.54	22.43	25.09	26.72	26.17	26.33	26.13
2:00p	16.74	14.30	11.90	12.22	13.81	15.26	18.18	19.79	20.20	19.39	19.51	22.77	22.30	22.27	22.16	21.20	21.29	19.75	19.59	20.27	20.06	19.18	20.32	21.52	22.70	24.81	26.97	26.28	26.73	26.47
3:00p	16.72	14.18	11.89	12.36	13.90	15.56	18.51	19.91	20.59	19.47	19.73	22.97	22.37	22.50	22.12	21.27	21.68	19.82	19.94	20.39	20.12	19.39	20.62	21.68	22.98	25.18	27.06	26.41	27.06	26.66
4:00p	16.82	14.10	11.82	12.45	14.01	16.15	18.54	19.82	20.82	19.53	19.98	23.36	22.25	22.59	22.12	21.43	21.71	19.82	20.13	20.66	20.08	19.66	20.53	21.80	23.22	25.49	26.93	26.56	27.19	26.79
5:00p	16.72	14.01	11.77	12.43	14.05	16.55	19.09	20.01	21.18	19.61	20.48	22.98	22.25	22.77	22.16	21.27	21.29	19.87	20.31	20.71	20.03	19.63	21.06	21.93	23.49	25.66	26.59	26.62	27.40	26.86
6:00p	16.55	13.86	11.74	12.45	14.13	16.81	19.35	20.24	21.29	19.66	20.66	23.06	22.18	22.84	22.18	21.13	21.25	19.85	20.34	20.60	19.98	19.70	21.18	22.21	23.89	25.74	26.15	26.67	27.34	26.85
7:00p	16.37	13.70	11.67	12.63	14.21	16.82	19.08	19.98	21.13	19.70	20.81	22.64	22.07	22.88	22.09	20.89	20.99	19.82	20.32	20.48	19.87	19.72	21.18	22.52	24.20	25.89	26.26	26.67	27.27	26.77
8:00p	16.23	13.53	11.61	12.64	14.20	17.01	18.96	19.96	20.94	19.68	21.29	22.43	22.02	22.82	21.95	20.66	20.73	19.79	20.22	20.38	19.73	19.47	21.25	22.75	23.65	26.02	26.21	26.73	27.11	26.64
9:00p	16.07	13.37	11.53	12.61	14.18	16.82	18.78	19.85	20.73	19.66	21.20	22.36	21.95	22.79	21.79	20.59	20.59	19.68	20.10	20.22	19.59	19.28	21.29	22.77	23.82	26.09	26.11	26.60	26.60	26.41
10:00p	15.85	13.22	11.48	12.51	14.06	16.64	18.29	19.59	20.59	19.59	20.94	22.23	21.84	22.73	21.64	20.57	20.52	19.54	20.08	20.13	19.42	19.13	21.29	22.73	23.98	26.19	26.09	26.33	26.54	26.15
11:00p	15.60	13.04	11.41	12.48	13.98	16.57	18.13	19.16	20.41	19.54	20.57	22.16	21.79	22.71	21.45	20.53	20.39	19.46	20.08	20.06	19.21	18.92	21.06	22.48	24.00	26.15	26.02	26.17	26.39	25.92
Max.	17.01	15.40	12.92	12.64	14.21	17.01	19.35	20.24	21.29	20.27	21.29	23.36	22.41	22.88	22.66	21.43	21.71	20.31	20.34	20.71	20.12	19.72	21.29	22.77	24.20	26.19	27.06	26.73	27.40	26.86
Min.	15.60	13.04	11.41	11.18	12.28	13.46	16.08	16.91	18.25	19.39	18.82	20.46	21.79	21.59	21.45	20.19	19.77	19.46	18.32	19.72	19.21	17.81	18.32	19.91	21.47	23.67	25.96	25.36	25.08	25.36
Avg.	16.57	14.31	12.01	11.83	13.23	14.93	17.43	18.51	19.56	19.68	19.72	21.65	22.18	22.15	22.18	20.76	20.57	19.79	19.34	20.13	19.85	18.76	19.74	21.15	22.59	24.75	26.33	26.02	26.09	26.09

Average Daily Temperature Readings
Crystal Falls Hydroelectric Project (Downstream of Dam)
June 2001



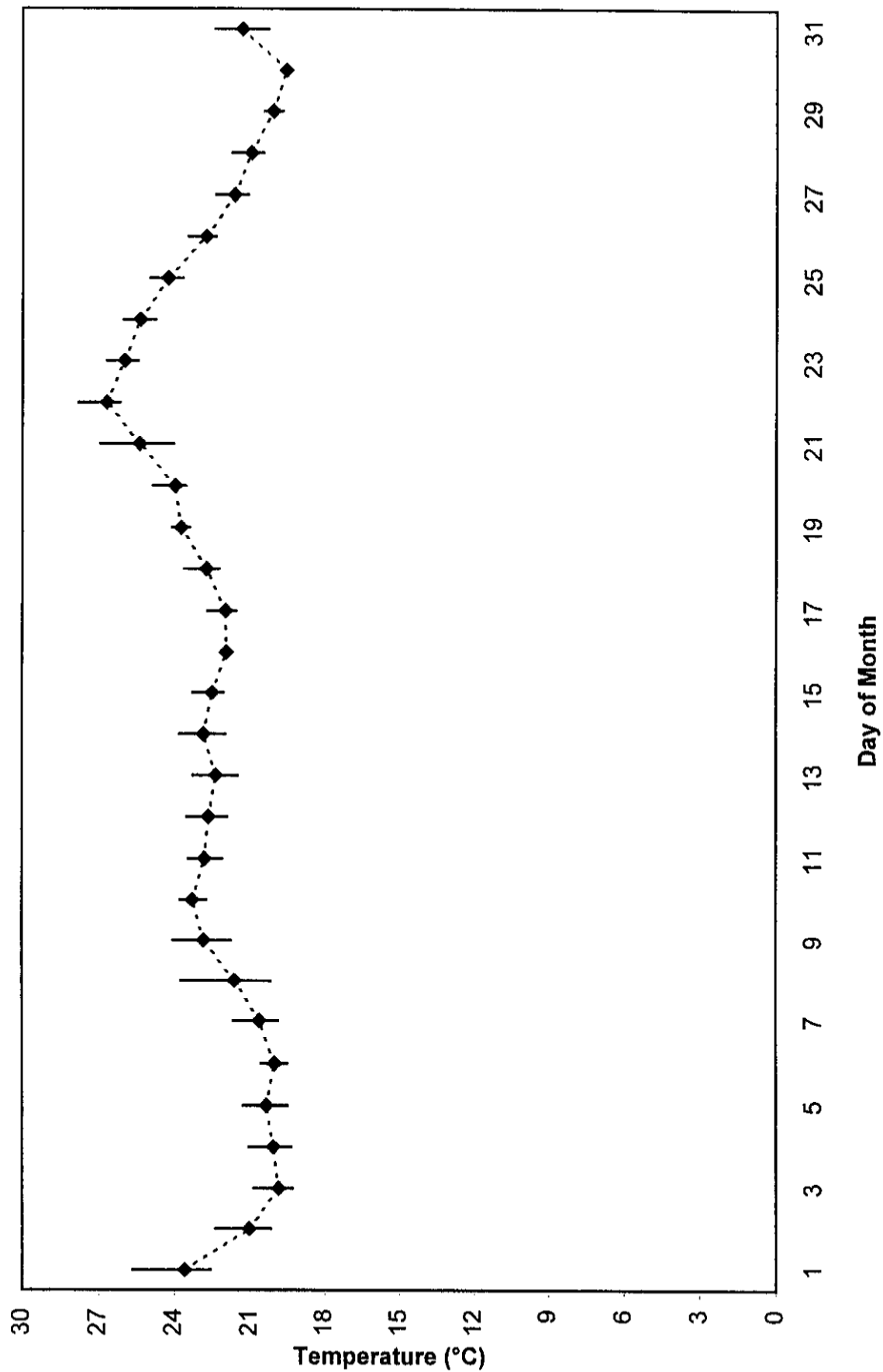
Hourly Temperature Readings: Crystal Falls Hydroelectric Project (Downstream of Dam), July 2001

Day of Month

Time	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28	29	30	31
12:00a	25.64	22.36	19.99	19.73	20.48	20.53	20.18	20.79	22.68	23.56	23.01	22.72	22.36	22.67	23.26	22.01	21.93	22.67	23.76	23.87	24.95	26.28	26.00	25.77	24.95	23.46	22.36	21.72	20.44	19.56	**
1:00a	25.42	22.17	19.87	19.59	20.39	20.32	20.16	20.62	22.56	23.42	22.90	22.59	22.20	22.54	23.24	21.97	21.99	22.63	23.78	23.78	24.82	26.37	25.85	25.68	24.84	23.26	22.20	21.63	20.39	**	**
2:00a	25.14	21.97	19.78	19.50	20.25	20.11	20.09	20.49	22.38	23.31	22.77	22.49	22.08	22.43	23.15	21.93	22.04	22.58	23.75	23.71	24.60	26.39	25.72	25.57	24.71	23.11	22.04	21.51	20.34	**	**
3:00a	24.82	21.72	19.71	19.45	20.09	19.97	20.04	20.39	22.20	23.20	22.67	22.38	21.95	22.34	23.08	21.90	22.01	22.52	23.71	23.66	24.48	26.37	25.62	25.40	24.59	22.97	21.85	21.42	20.27	**	**
4:00a	24.53	21.51	19.63	19.44	19.92	19.82	19.99	20.32	22.02	23.06	22.52	22.25	21.83	22.25	22.97	21.88	21.97	22.45	23.69	23.60	24.22	26.37	25.57	25.25	24.46	22.84	21.65	21.35	20.21	**	**
5:00a	24.27	21.30	19.54	19.40	19.76	19.68	19.94	20.27	21.92	22.93	22.41	22.13	21.72	22.15	22.86	21.85	21.88	22.38	23.84	23.58	24.11	26.37	25.49	25.12	24.29	22.72	21.44	21.26	20.13	**	**
6:00a	23.91	21.09	19.45	19.37	19.63	19.57	19.89	20.18	21.79	22.81	22.29	22.01	21.60	22.04	22.75	21.81	21.81	22.34	23.62	23.56	24.02	26.37	25.45	24.97	24.15	22.61	21.28	21.18	20.06	**	**
7:00a	23.51	20.91	19.38	19.33	19.54	19.50	19.85	20.15	21.74	22.74	22.18	21.90	21.51	21.97	22.67	21.79	21.70	22.27	23.60	23.55	24.04	26.37	25.44	24.84	24.00	22.47	21.18	21.11	19.99	**	**
8:00a	23.20	20.84	19.35	19.33	19.49	19.50	19.89	20.18	21.76	22.72	22.09	21.90	21.49	21.98	22.58	21.79	21.63	22.24	23.53	23.55	24.07	26.35	25.47	24.75	23.93	22.36	21.12	21.05	19.92	**	**
9:00a	22.95	20.88	19.30	19.40	19.50	19.61	19.99	20.34	21.88	22.81	22.17	21.95	21.56	22.08	22.52	21.79	21.56	22.24	23.47	23.56	24.22	26.43	25.58	24.75	23.87	22.38	21.09	21.00	19.90	**	**
10:00a	22.84	20.88	19.28	19.50	19.59	19.69	20.21	20.58	22.01	22.97	22.25	22.15	21.69	22.20	22.45	21.83	21.55	22.29	23.40	23.58	24.48	26.54	25.72	24.82	23.82	22.40	21.14	20.95	19.92	**	**
11:00a	22.79	20.91	19.35	19.64	19.71	19.78	20.44	20.91	22.18	23.06	22.43	22.25	21.85	22.54	22.38	21.86	21.56	22.33	23.40	23.66	24.97	26.62	25.79	24.95	23.87	22.40	21.16	20.88	19.92	**	**
12:00p	22.81	21.00	19.59	19.82	19.90	19.94	20.67	21.33	22.50	23.17	22.65	22.52	22.04	22.70	22.27	21.90	21.63	22.45	23.44	23.80	25.42	26.75	25.86	25.16	23.98	22.47	21.23	20.84	19.90	**	**
1:00p	22.97	21.05	19.76	20.06	*	20.02	20.81	21.74	22.88	23.33	22.88	22.74	22.34	22.92	22.22	21.90	21.76	22.63	23.55	23.87	25.75	27.00	25.94	25.38	24.18	22.56	21.33	20.83	19.95	**	**
2:00p	23.13	21.07	19.90	20.34	20.35	20.06	20.90	22.20	23.22	23.53	23.08	22.93	22.68	23.15	22.24	21.97	21.86	22.77	23.67	24.02	26.17	27.32	25.98	25.57	24.37	22.67	21.46	20.79	19.97	**	**
3:00p	23.31	20.93	19.85	20.56	20.74	20.16	21.05	22.52	23.49	23.67	23.22	23.11	22.92	23.38	22.22	22.06	21.95	22.90	23.76	24.11	26.45	27.59	26.18	25.77	24.38	22.83	21.58	20.76	20.11	**	**
4:00p	23.44	20.84	20.02	20.81	21.02	20.23	21.25	22.95	23.62	23.75	23.37	23.33	23.04	23.55	22.20	22.09	22.04	22.97	23.87	24.18	26.66	27.78	26.47	26.00	24.51	22.86	21.70	20.72	20.20	**	20.27
5:00p	23.44	20.72	19.97	20.98	21.18	20.21	21.42	23.20	23.73	23.73	23.42	23.47	23.17	23.73	22.22	22.09	22.02	23.06	24.00	24.29	26.68	27.25	26.60	26.01	24.55	22.90	21.85	20.67	20.20	**	20.34
6:00p	23.42	20.65	20.84	21.04	21.26	20.23	21.65	23.53	23.89	23.73	23.42	23.49	23.24	23.76	22.22	22.11	22.11	23.06	24.09	24.31	26.77	27.04	26.84	25.92	24.53	22.99	21.86	20.63	20.11	**	20.38
7:00p	23.29	20.53	20.79	21.02	21.25	20.32	21.63	23.71	24.02	23.69	23.31	23.38	23.22	23.78	22.20	22.06	22.25	23.15	24.07	24.37	26.92	26.88	26.66	25.72	24.35	22.95	21.90	20.62	20.02	**	21.20
8:00p	23.17	20.42	20.83	21.00	21.18	20.27	21.44	23.53	23.95	23.56	23.22	23.17	23.19	23.67	22.17	22.06	22.40	23.19	24.04	24.49	26.67	26.67	26.52	25.49	24.18	22.88	21.97	20.58	20.04	**	21.73
9:00p	22.99	20.37	20.09	20.90	21.04	20.28	21.25	23.15	23.91	23.42	23.11	22.93	23.06	23.56	22.11	22.04	22.54	23.35	23.98	24.57	26.11	26.49	26.37	25.32	23.98	22.72	21.92	20.55	20.16	**	22.03
10:00p	22.77	20.27	20.02	20.72	20.88	20.23	21.11	22.84	23.84	23.28	22.99	22.77	22.95	23.44	22.08	21.97	22.65	23.46	23.91	24.64	26.13	26.33	26.11	25.18	23.82	22.61	21.86	20.53	19.92	**	22.23
11:00p	22.58	20.16	19.94	20.56	20.69	20.21	20.97	22.77	23.69	23.13	22.84	22.58	22.81	23.37	22.04	21.93	22.88	23.60	23.91	24.84	26.17	26.15	25.88	25.05	23.66	22.50	21.81	20.48	19.71	**	22.39
Max.	25.64	22.36	20.84	21.04	21.26	20.53	21.65	23.71	24.02	23.75	23.42	23.49	23.24	23.78	23.26	22.11	22.88	23.60	24.09	24.84	26.92	27.78	26.66	26.01	24.95	23.46	22.36	21.72	20.44	19.56	22.39
Min.	22.58	20.16	19.28	19.33	19.49	19.50	19.85	20.15	21.74	22.72	22.09	21.90	21.49	21.97	22.04	21.79	21.55	22.24	23.40	23.55	24.02	26.15	25.44	24.75	23.66	22.36	21.09	20.48	19.71	19.56	20.27
Avg.	23.60	21.02	19.84	20.06	20.34	20.01	20.62	21.61	22.83	23.27	22.80	22.63	22.35	22.84	22.50	21.94	21.98	22.73	23.74	23.96	25.37	26.67	25.95	25.35	24.25	22.75	21.62	20.98	20.07	19.56	21.32

* Service point (missing data), ** Battery failure

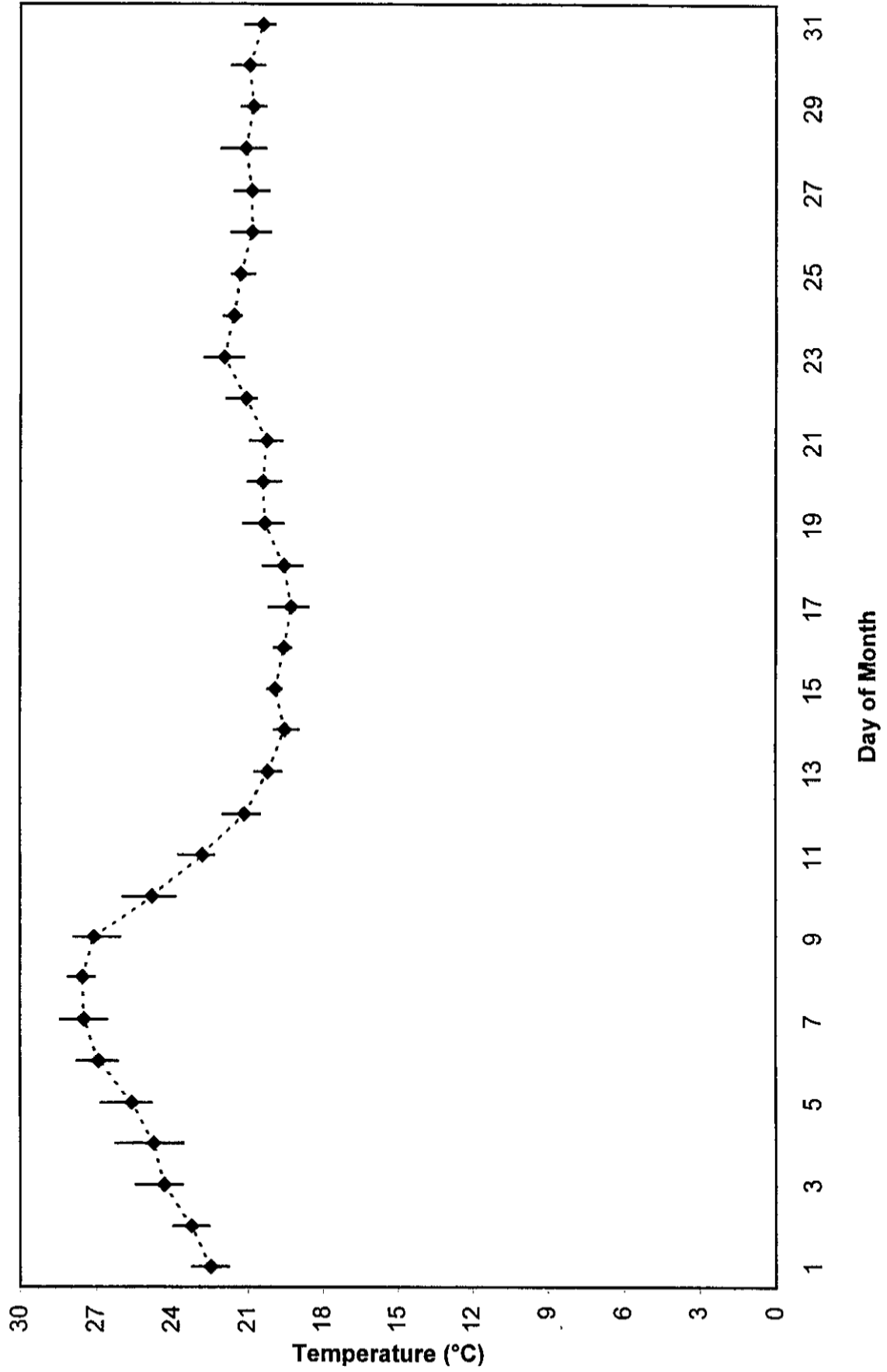
Average Daily Temperature Readings
Crystal Falls Hydroelectric Project (Downstream of Dam)
July 2001



Hourly Temperature Readings: Crystal Falls Hydroelectric Project (Downstream of Dam), August 2001

Time	Day of Month																														
	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28	29	30	31
12:00a	22.23	23.02	23.78	24.05	25.48	26.62	27.43	28.08	27.87	25.94	23.73	21.98	20.38	19.92	20.01	19.61	19.18	19.50	20.18	20.67	20.65	20.93	21.85	21.99	21.65	20.67	20.88	20.86	21.26	20.71	21.12
1:00a	21.77	22.98	23.78	23.98	25.51	26.57	27.33	27.97	27.72	25.83	23.56	21.68	20.27	19.79	20.12	19.58	19.09	19.38	20.08	20.49	20.46	20.93	21.88	21.86	21.63	20.62	20.77	20.77	21.12	20.64	21.01
2:00a	21.93	22.97	23.76	23.91	25.48	26.49	27.12	27.76	27.54	25.68	23.42	21.54	20.15	19.65	20.17	19.56	19.01	19.25	19.95	20.30	20.30	20.90	21.83	21.74	21.60	20.51	20.67	20.70	20.98	20.56	20.85
3:00a	21.91	22.93	23.73	23.82	25.20	26.42	26.97	27.56	27.39	25.53	23.24	21.40	20.06	19.53	20.19	19.53	18.94	19.13	19.85	20.16	20.13	20.90	21.83	21.62	21.58	20.44	20.58	20.62	20.85	20.52	20.71
4:00a	21.96	22.88	23.69	23.74	25.03	26.30	26.81	27.35	27.27	25.38	23.06	21.25	19.98	19.37	20.12	19.49	18.87	18.99	19.80	20.02	19.97	20.88	21.74	21.51	21.58	20.37	20.48	20.55	20.73	20.49	20.57
5:00a	22.02	22.79	23.65	23.69	24.92	26.25	26.70	27.22	27.18	25.22	22.91	21.13	19.87	19.23	20.01	19.46	18.80	18.92	19.73	19.90	19.83	20.83	21.55	21.42	21.55	20.30	20.41	20.48	20.59	20.45	20.47
6:00a	22.02	22.68	23.62	23.62	24.88	26.21	26.62	27.14	27.06	25.01	22.73	21.03	19.79	19.11	19.87	19.44	18.71	18.87	19.66	19.82	19.75	20.76	21.40	21.35	21.53	20.23	20.32	20.41	20.47	20.43	20.36
7:00a	22.05	22.59	23.60	23.58	24.84	26.17	26.57	27.06	26.99	24.84	22.59	20.96	19.72	18.99	19.82	19.42	18.65	18.83	19.61	19.73	19.66	20.70	21.25	21.32	21.49	20.16	20.23	20.32	20.36	20.38	20.26
8:00a	22.12	22.55	23.62	23.62	24.86	26.17	26.61	27.04	26.93	24.73	22.50	20.90	19.66	18.96	19.77	19.44	18.59	18.83	19.59	19.69	19.64	20.67	21.19	21.28	21.46	20.13	20.18	20.30	20.29	20.35	20.21
9:00a	22.18	22.59	23.73	23.80	24.96	26.19	26.72	27.04	26.95	24.66	22.48	20.97	19.72	19.01	19.80	19.46	18.61	18.92	19.68	19.73	19.69	20.69	21.21	21.28	21.44	20.18	20.20	20.35	20.31	20.35	20.16
10:00a	22.25	22.70	23.89	24.07	25.12	26.26	26.93	27.08	27.02	24.57	22.55	21.01	19.84	19.13	19.85	19.47	18.70	19.09	19.87	19.85	19.85	20.72	21.33	21.28	21.40	20.32	20.32	20.48	20.40	20.43	20.21
11:00a	22.34	22.88	24.05	24.29	25.23	26.40	27.14	27.14	27.10	24.60	22.55	21.01	20.01	19.28	19.92	19.49	18.83	19.25	20.06	20.04	19.95	20.77	21.55	21.30	21.39	20.49	20.51	20.67	20.52	20.63	20.19
12:00p	22.50	23.02	24.18	24.99	25.40	26.66	27.35	27.25	27.18	24.64	22.61	21.01	20.15	19.46	19.92	19.42	19.06	19.40	20.25	20.23	20.15	20.83	21.79	21.30	21.37	20.65	20.74	20.97	20.54	20.84	20.23
1:00p	22.62	23.22	24.60	25.31	25.40	27.02	27.60	27.35	27.18	24.66	22.64	21.06	20.34	19.66	19.96	19.47	19.28	19.56	20.34	20.41	20.27	20.90	22.08	21.35	21.33	20.97	21.02	21.23	20.68	21.05	20.26
2:00p	22.66	23.54	24.94	25.31	25.49	27.35	27.89	27.47	27.16	24.68	22.70	21.18	20.46	19.80	19.96	19.68	19.50	19.75	20.46	20.55	20.37	21.02	22.29	21.44	21.28	21.35	21.25	21.46	20.95	21.26	20.36
3:00p	22.71	23.80	25.14	25.63	25.61	27.60	28.05	27.56	27.22	24.68	22.79	21.22	20.57	19.73	19.94	19.82	19.63	19.95	20.69	20.74	20.44	21.09	22.43	21.56	21.23	21.56	21.44	21.68	21.15	21.43	20.45
4:00p	22.80	23.85	25.23	25.87	25.74	27.82	28.10	27.62	27.23	24.68	22.84	21.22	20.71	19.70	19.92	19.94	19.76	20.02	20.86	20.91	20.44	21.23	22.63	21.62	21.19	21.58	21.53	21.82	21.27	21.54	20.49
5:00p	22.95	23.91	25.20	25.89	25.81	27.56	28.40	27.66	27.23	24.64	22.86	21.25	20.71	19.66	19.89	19.90	19.90	20.09	21.04	21.00	20.46	21.32	22.74	21.72	21.12	21.67	21.55	21.95	21.24	21.63	20.49
6:00p	23.16	23.94	25.36	26.13	26.49	27.66	28.32	27.74	27.14	24.51	22.86	21.24	20.69	19.68	19.84	19.85	20.02	20.18	21.18	20.95	20.46	21.42	22.72	21.78	21.05	21.63	21.49	22.05	21.07	21.66	20.47
7:00p	23.22	23.94	25.44	26.23	26.70	27.68	28.26	27.87	26.99	24.38	22.71	21.15	20.62	19.70	19.80	19.76	20.09	20.27	21.04	20.98	20.49	21.53	22.61	21.81	21.04	21.51	21.42	22.07	21.01	21.63	20.40
8:00p	23.15	23.85	25.22	25.49	26.83	27.76	28.16	27.93	26.78	24.24	22.61	20.97	20.48	19.72	19.77	19.61	20.15	20.34	21.07	20.91	20.56	21.65	22.45	21.81	21.02	21.42	21.28	21.91	20.92	21.54	20.28
9:00p	23.15	23.82	24.88	25.55	26.45	27.74	28.07	27.95	26.51	24.11	22.48	20.83	20.34	19.82	19.72	19.49	19.97	20.39	21.07	20.95	20.69	21.78	22.38	21.78	20.95	21.28	21.12	21.73	20.84	21.43	20.17
10:00p	23.07	23.78	24.44	25.55	26.49	27.60	28.07	27.93	26.26	24.00	22.36	20.67	20.20	19.77	19.68	19.37	19.80	20.37	20.98	20.93	20.84	21.79	22.24	21.74	20.84	21.16	21.04	21.56	20.85	21.33	20.05
11:00p	23.02	23.78	24.24	25.49	26.66	27.58	28.08	27.99	26.08	23.87	22.34	20.50	20.06	19.87	19.65	19.28	19.64	20.28	20.83	20.79	20.93	21.86	22.11	21.70	20.76	21.02	20.97	21.38	20.77	21.24	19.93
Max.	23.22	23.94	25.44	26.23	26.83	27.76	28.40	28.08	27.87	25.94	23.73	21.98	20.71	19.92	20.19	19.94	20.15	20.39	21.18	21.00	20.93	21.86	22.74	21.99	21.65	21.67	21.55	22.07	21.27	21.66	21.12
Min.	21.77	22.55	23.60	23.58	24.84	26.17	26.57	27.04	26.08	23.87	22.34	20.50	19.66	18.96	19.65	19.28	18.59	18.83	19.59	19.69	19.64	20.67	21.19	21.28	20.76	20.13	20.18	20.30	20.29	20.35	19.93
Avg.	22.49	23.25	24.32	24.73	25.61	26.91	27.47	27.53	27.08	24.80	22.80	21.13	20.20	19.52	19.90	18.56	19.28	19.57	20.33	20.41	20.25	21.09	21.96	21.57	21.31	20.84	20.85	21.10	20.80	20.94	20.40

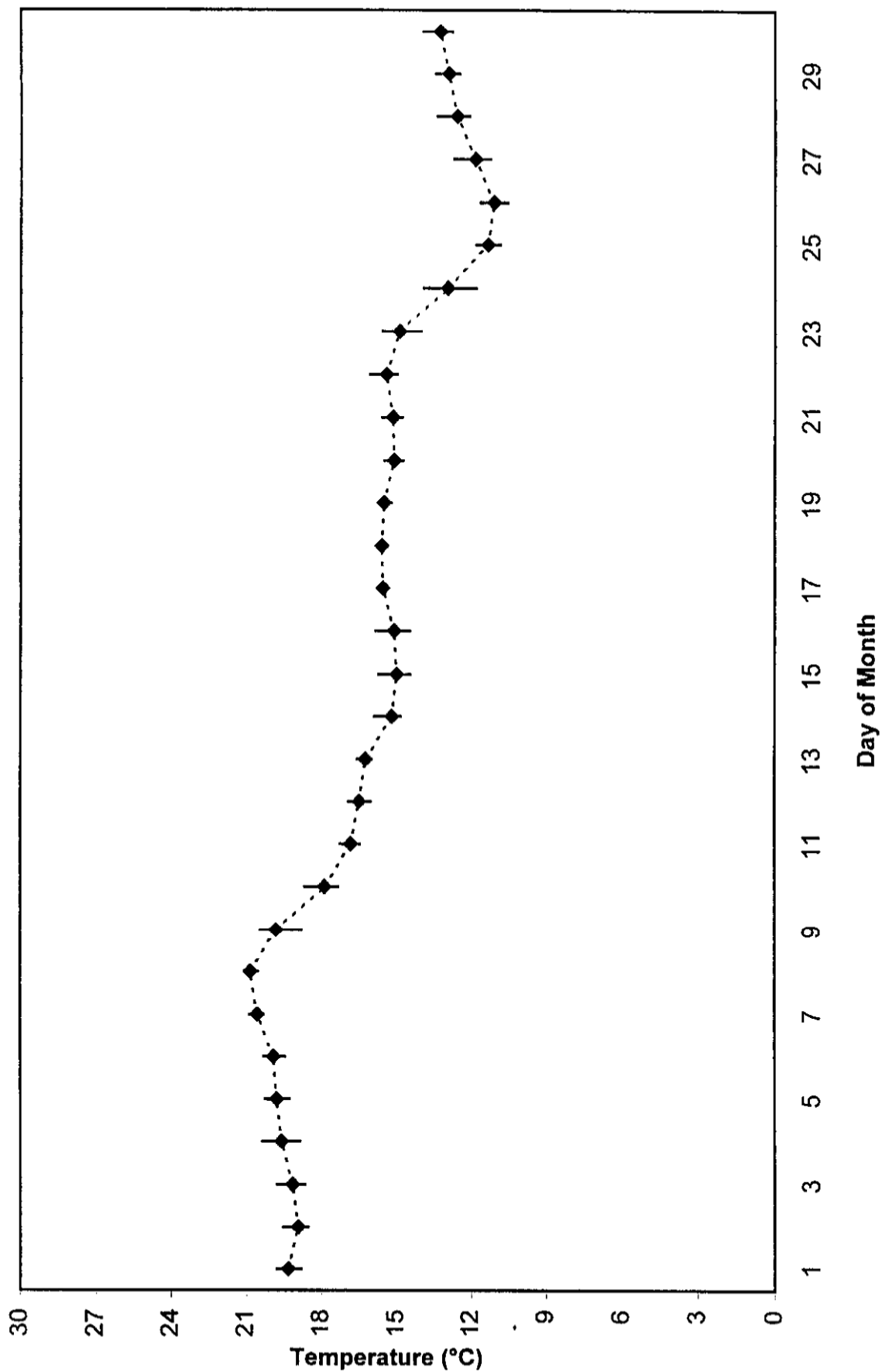
Average Daily Temperature Readings
Crystal Falls Hydroelectric Project (Downstream of Dam)
August 2001



Hourly Temperature Readings: Crystal Falls Hydroelectric Project (Downstream of Dam), September 2001

	Day of Month																													
Time	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28	29	30
12:00a	19.79	19.27	18.91	19.38	20.07	20.19	20.29	20.84	20.43	18.66	17.25	16.62	16.39	15.88	14.92	15.05	15.68	15.52	15.65	15.13	15.10	15.27	15.58	13.91	11.67	11.09	11.32	12.26	12.82	13.34
1:00a	19.65	19.17	18.98	19.33	20.02	20.12	20.38	20.87	20.36	18.50	17.16	16.55	16.30	15.75	14.83	14.90	15.62	15.50	15.63	15.08	15.05	15.22	15.53	13.79	11.55	11.04	11.29	12.23	12.72	13.25
2:00a	19.52	19.03	18.96	19.26	19.91	20.05	20.40	20.87	20.31	18.35	17.06	16.49	16.24	15.60	14.75	14.75	15.60	15.48	15.62	15.02	15.02	15.17	15.50	13.69	11.45	11.00	11.26	12.18	12.67	13.13
3:00a	19.39	18.91	18.91	19.21	19.81	19.95	20.38	20.82	20.26	18.21	16.98	16.42	16.17	15.45	14.70	14.65	15.58	15.47	15.62	15.00	14.97	15.13	15.43	13.59	11.36	10.95	11.26	12.14	12.64	13.05
4:00a	19.27	18.81	18.86	19.12	19.69	19.86	20.33	20.80	20.19	18.08	16.87	16.35	16.14	15.32	14.65	14.57	15.57	15.47	15.60	14.95	14.93	15.10	15.40	13.49	11.27	10.91	11.26	12.13	12.62	12.98
5:00a	19.15	18.74	18.79	19.03	19.57	19.76	20.29	20.78	20.12	17.94	16.76	16.29	16.10	15.20	14.60	14.50	15.55	15.47	15.58	14.92	14.88	15.05	15.37	13.38	11.18	10.86	11.27	12.11	12.60	12.93
6:00a	19.03	18.67	18.76	18.96	19.45	19.64	20.31	20.79	20.07	17.84	16.66	16.22	16.05	15.07	14.55	14.47	15.52	15.47	15.57	14.87	14.83	15.02	15.33	13.21	11.08	10.75	11.27	12.11	12.57	12.87
7:00a	18.91	18.60	18.69	18.90	19.36	19.53	20.31	20.77	20.02	17.72	16.55	16.15	16.03	14.97	14.50	14.47	15.50	15.47	15.57	14.82	14.82	14.97	15.27	13.10	11.00	10.68	11.27	12.09	12.54	12.82
8:00a	18.81	18.54	18.66	18.86	19.27	19.46	20.33	20.78	19.96	17.62	16.45	16.08	16.00	14.85	14.45	14.49	15.48	15.47	15.53	14.77	14.80	14.97	15.17	13.03	10.90	10.60	11.29	12.08	12.50	12.78
9:00a	18.81	18.55	18.67	18.88	19.26	19.48	20.36	20.77	19.95	17.57	16.45	16.03	16.02	14.83	14.44	14.55	15.47	15.47	15.52	14.73	14.80	15.02	15.07	12.95	10.88	10.57	11.34	12.08	12.49	12.77
10:00a	18.88	18.55	18.69	19.02	19.33	19.52	20.40	20.73	19.95	17.62	16.60	16.03	16.08	14.90	14.53	14.85	15.47	15.48	15.50	14.77	14.78	15.08	15.00	12.88	10.88	10.60	11.39	12.11	12.54	12.83
11:00a	18.96	18.62	18.76	19.22	19.41	19.58	20.45	20.77	19.93	17.72	16.71	16.15	16.15	14.97	14.68	14.75	15.48	15.50	15.50	14.87	14.85	15.17	14.92	12.85	11.01	10.72	11.52	12.19	12.65	12.93
12:00p	19.12	18.69	18.95	19.50	19.55	19.71	20.54	20.85	19.91	17.89	16.79	16.35	16.24	15.08	14.90	14.90	15.50	15.53	15.50	14.95	14.97	15.25	14.80	12.88	11.19	10.90	11.73	12.37	12.82	13.08
1:00p	19.31	18.84	19.19	19.64	19.64	19.84	20.64	20.95	19.88	18.01	16.91	16.80	16.35	15.10	15.08	15.02	15.52	15.62	15.52	15.05	15.12	15.37	14.75	12.88	11.37	11.14	11.95	12.57	12.97	13.29
2:00p	19.45	18.96	19.38	19.86	19.76	19.93	20.73	20.92	19.84	18.04	16.99	16.82	16.45	15.15	15.28	15.23	15.57	15.73	15.52	15.22	15.28	15.55	14.70	12.93	11.60	11.31	12.23	12.70	13.06	13.54
3:00p	19.50	19.43	19.55	20.14	19.84	20.00	20.77	20.99	19.79	18.01	17.08	16.87	16.49	15.22	15.37	15.50	15.58	15.75	15.52	15.38	15.42	15.73	14.65	12.95	11.72	11.42	12.44	12.88	13.16	13.64
4:00p	19.57	19.53	19.71	20.29	19.96	20.05	20.77	21.03	19.72	17.99	17.13	16.89	16.57	15.27	15.50	15.68	15.63	15.75	15.53	15.45	15.52	15.88	14.62	12.97	11.75	11.55	12.57	13.10	13.28	13.77
5:00p	19.60	19.26	19.76	20.35	20.00	20.07	20.82	21.02	19.64	17.94	17.01	16.92	16.55	15.25	15.72	15.75	15.62	15.75	15.52	15.48	15.58	15.97	14.55	12.87	11.80	11.65	12.69	13.36	13.26	13.74
6:00p	19.62	19.26	19.75	20.31	20.00	20.07	20.84	21.01	19.53	17.77	16.94	16.89	16.49	15.22	15.60	15.83	15.58	15.75	15.48	15.47	15.58	16.08	14.49	12.70	11.73	11.62	12.70	13.33	13.26	13.94
7:00p	19.67	19.17	19.67	20.23	20.10	20.10	20.85	20.93	19.41	17.75	16.87	16.82	16.39	15.17	15.58	15.77	15.57	15.75	15.45	15.42	15.53	15.98	14.40	12.52	11.65	11.57	12.67	13.38	13.26	13.76
8:00p	19.62	19.07	19.64	20.23	20.19	20.21	20.77	20.86	19.27	17.63	16.77	16.72	16.29	15.12	15.42	15.67	15.60	15.75	15.38	15.35	15.48	15.92	14.29	12.32	11.54	11.49	12.57	13.25	13.28	13.48
9:00p	19.55	18.98	19.57	20.23	20.19	20.29	20.74	20.73	19.12	17.53	16.72	16.62	16.20	15.13	15.40	15.75	15.57	15.73	15.33	15.27	15.43	15.87	14.20	12.14	11.40	11.42	12.47	13.18	13.41	13.48
10:00p	19.48	18.93	19.48	20.16	20.23	20.29	20.73	20.61	18.95	17.45	16.69	16.55	16.12	15.08	15.33	15.70	15.55	15.68	15.27	15.20	15.38	15.72	14.10	11.96	11.29	11.39	12.39	13.05	13.44	13.41
11:00p	19.38	18.91	19.43	20.09	20.23	20.29	20.78	20.52	18.79	17.33	16.66	16.47	16.02	15.03	15.15	15.68	15.53	15.67	15.20	15.15	15.33	15.62	14.02	11.81	11.19	11.34	12.31	12.92	13.41	13.38
Max.	19.79	19.53	19.76	20.35	20.23	20.29	20.85	21.03	20.43	18.66	17.25	16.92	16.57	15.88	15.72	15.83	15.68	15.75	15.65	15.48	15.58	16.08	15.58	13.91	11.80	11.65	12.70	13.38	13.44	13.94
Min.	18.81	18.54	18.66	18.86	19.26	19.46	20.29	20.52	18.79	17.33	16.45	16.03	16.00	14.83	14.44	14.47	15.47	15.47	15.20	14.73	14.78	14.97	14.02	11.81	10.86	10.57	11.26	12.08	12.49	12.77
Avg.	19.34	18.94	19.16	19.59	19.79	19.92	20.55	20.83	19.81	17.88	16.84	16.50	16.24	15.19	15.00	15.10	15.56	15.59	15.50	15.10	15.14	15.42	14.88	12.95	11.35	11.11	11.85	12.58	12.92	13.26

**Average Daily Temperature Readings
Crystal Falls Hydroelectric Project (Downstream of Dam)
September 2001**



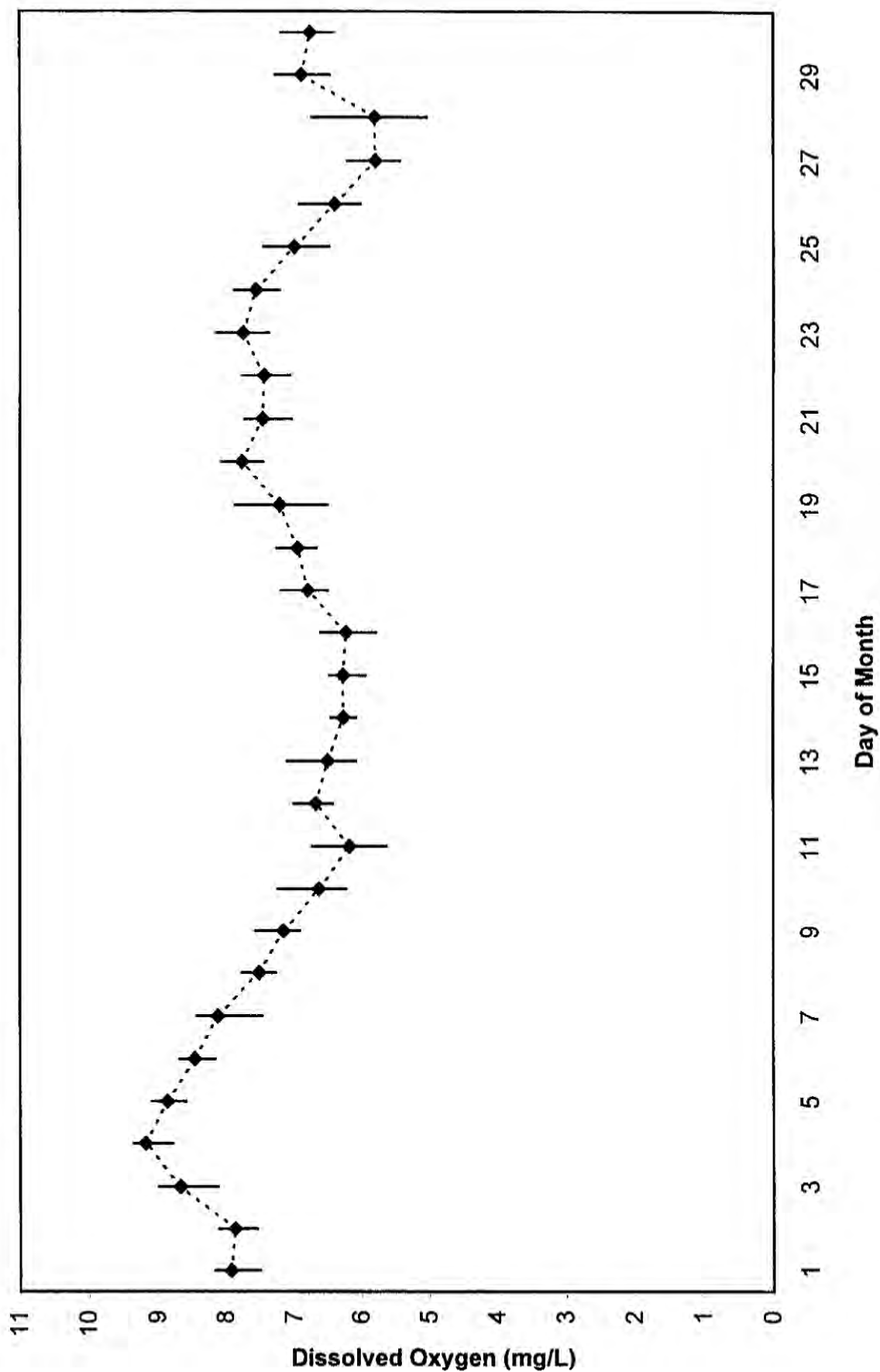
APPENDIX F

Downstream Dissolved Oxygen Monitoring

Hourly Dissolved Oxygen Readings: Crystal Falls Hydroelectric Project (Downstream of Dam), June 2001

Time	Day of Month																													
	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28	29	30
12:00a	8.04	7.55	8.13	9.05	8.86	8.64	8.06	7.53	7.56	7.20	6.15	6.52	6.86	6.17	6.32	5.90	6.50	6.84	6.64	7.70	7.51	7.06	7.50	7.55	7.22	6.52	6.01	5.45	6.64	6.86
1:00a	8.07	7.58	8.22	9.05	8.84	8.61	8.10	7.46	7.53	7.23	6.02	6.56	6.95	6.18	6.34	5.88	6.52	6.71	6.60	7.80	7.53	7.07	7.46	7.60	7.16	6.43	5.98	5.30	6.55	6.58
2:00a	8.07	7.63	8.27	9.11	8.79	8.58	8.13	7.50	7.46	6.69	5.99	6.50	7.10	6.15	6.39	5.88	6.56	6.84	6.51	7.82	7.48	7.11	7.37	7.49	7.01	6.81	6.00	5.28	6.59	6.58
3:00a	8.17	7.69	8.33	9.13	8.88	8.64	8.08	7.46	7.14	6.61	5.92	6.53	7.04	6.17	6.37	5.91	6.59	6.99	6.50	7.88	7.47	7.16	7.54	7.42	6.96	6.81	5.84	5.27	6.47	6.63
4:00a	8.16	7.74	8.42	9.16	8.97	8.66	8.20	7.53	7.09	6.55	5.87	6.56	6.99	6.13	6.42	5.93	6.51	6.96	6.61	7.88	7.63	7.20	7.45	7.46	6.96	6.72	5.79	5.16	6.55	6.51
5:00a	8.15	7.79	8.46	9.20	8.99	8.68	8.28	7.44	6.94	6.61	5.78	6.59	6.92	6.15	6.47	5.99	6.55	6.94	6.71	7.94	7.65	7.20	7.54	7.49	6.92	6.59	5.74	5.04	6.55	6.59
6:00a	8.15	7.82	8.47	9.24	9.01	8.61	8.28	7.46	6.96	6.47	5.65	6.42	6.77	6.08	6.38	5.94	6.54	6.91	6.81	8.01	7.68	7.22	7.51	7.54	6.90	6.03	5.59	5.24	6.73	6.52
7:00a	8.16	7.84	8.52	9.24	9.01	8.63	8.24	7.52	6.91	6.41	5.63	6.45	6.81	6.23	6.38	6.01	6.68	6.98	6.90	8.00	7.59	7.20	7.60	7.44	6.83	6.02	5.61	5.23	6.78	6.43
8:00a	8.15	7.89	8.55	9.31	9.04	8.63	8.25	7.44	7.06	6.56	5.67	6.42	6.73	6.20	6.31	6.10	6.65	6.98	6.94	8.06	7.63	7.23	7.69	7.51	6.85	6.12	5.58	5.22	6.75	6.57
9:00a	8.13	7.91	8.61	9.32	9.04	8.57	8.29	7.45	7.02	6.65	5.75	6.58	6.61	6.27	6.42	5.79	6.80	7.04	6.95	7.99	7.62	7.32	7.81	7.47	6.84	6.16	5.58	5.20	6.83	6.53
10:00a	8.12	7.95	8.66	9.35	9.09	8.52	8.39	7.59	7.03	6.73	5.79	6.80	6.48	6.23	6.39	5.91	6.81	7.06	6.99	8.01	7.68	7.39	7.91	7.50	6.97	6.25	5.72	5.28	7.07	6.73
11:00a	8.09	7.97	8.67	9.34	9.03	8.49	8.34	7.61	7.01	6.57	5.92	6.90	6.36	6.39	6.39	6.27	6.81	7.23	7.11	7.96	7.72	7.47	8.07	7.61	7.04	6.17	5.46	7.19	6.96	
12:00p	8.04	8.00	8.91	9.35	9.00	8.53	8.40	7.76	7.11	6.61	5.94	6.83	6.21	6.45	6.36	6.38	7.06	7.24	7.10	7.85	7.67	7.58	8.15	7.67	7.00	6.78	5.78	5.57	7.25	6.91
1:00p	8.01	7.99	8.90	9.35	8.99	8.43	8.43	7.72	7.18	6.67	6.29	6.87	6.10	6.36	6.36	6.47	6.99	7.25	7.51	7.73	7.60	7.65	8.02	7.86	7.11	6.93	5.76	5.61	7.14	6.99
2:00p	7.93	7.91	8.83	9.33	8.88	8.42	8.37	7.61	7.12	6.73	6.58	6.89	6.08	6.26	6.32	6.46	7.19	7.24	7.79	7.66	7.58	7.75	7.97	7.88	7.03	6.37	5.92	5.77	7.24	7.10
3:00p	7.83	7.92	8.86	9.34	8.82	8.38	8.35	7.69	7.21	6.72	6.61	6.99	6.09	6.37	6.27	6.49	7.14	7.06	7.86	7.58	7.47	7.72	8.02	7.83	7.15	6.23	5.89	6.60	7.10	7.11
4:00p	7.82	7.91	8.87	9.21	8.77	8.34	8.22	7.55	7.03	6.73	6.48	7.00	6.23	6.33	6.25	6.53	7.07	7.06	7.83	7.79	7.43	7.76	8.02	7.80	7.35	6.53	5.86	6.53	7.28	7.19
5:00p	7.78	7.89	8.90	9.18	8.70	8.28	8.09	7.45	7.04	6.76	6.53	6.85	6.33	6.35	6.13	6.49	7.05	6.92	7.79	7.57	7.30	7.71	8.00	7.71	7.41	6.60	5.73	6.68	7.22	7.08
6:00p	7.70	7.91	8.94	9.16	8.73	8.23	8.03	7.59	7.13	6.74	6.57	6.69	6.27	6.38	6.19	6.57	6.94	6.89	7.70	7.54	7.28	7.74	7.84	7.70	7.45	6.51	6.17	6.61	7.24	6.93
7:00p	7.63	7.91	8.92	9.11	8.67	8.28	7.96	7.41	7.04	6.53	6.53	6.70	6.25	6.35	6.15	6.61	6.85	6.75	7.73	7.60	7.18	7.75	7.86	7.53	7.44	6.48	6.21	6.56	7.14	6.86
8:00p	7.59	7.97	8.96	9.09	8.67	8.29	7.79	7.50	7.09	6.44	6.66	6.55	6.19	6.36	6.01	6.52	6.89	6.78	7.87	7.52	7.17	7.89	7.79	7.52	6.79	6.30	5.75	6.61	6.97	6.91
9:00p	7.59	8.02	8.94	9.09	8.69	8.26	7.56	7.44	7.38	6.44	6.89	6.67	6.20	6.22	5.99	6.47	6.91	6.75	7.63	7.45	7.09	7.49	7.66	7.35	6.51	6.14	5.65	6.55	6.95	6.81
10:00p	7.52	8.02	8.94	8.94	8.59	8.23	7.47	7.27	7.40	6.27	6.73	6.67	6.22	6.31	5.96	6.51	6.78	6.67	7.59	7.47	7.09	7.58	7.64	7.32	6.62	6.10	5.51	6.63	6.67	6.55
11:00p	7.51	8.11	8.99	8.79	8.68	8.17	7.61	7.32	7.30	6.22	6.52	6.80	6.20	6.29	5.94	6.52	6.76	6.72	7.64	7.52	7.03	7.49	7.55	7.22	6.48	6.05	5.44	6.74	6.59	6.41
Max.	8.17	8.11	8.99	9.35	9.09	8.68	8.43	7.76	7.56	7.23	6.73	7.00	7.10	6.45	6.47	6.61	7.19	7.25	7.86	8.06	7.72	7.76	8.15	7.88	7.45	6.93	6.21	6.74	7.28	7.19
Min.	7.51	7.55	8.13	8.79	8.59	8.17	7.47	7.27	6.91	6.22	5.83	6.42	6.08	6.08	5.94	5.79	6.50	6.67	6.50	7.45	7.03	7.06	7.37	7.22	6.48	6.02	5.44	5.04	6.47	6.41
Avg.	7.93	7.87	8.68	9.19	8.86	8.46	8.12	7.51	7.16	6.63	6.18	6.68	6.50	6.27	6.27	6.23	6.80	6.95	7.21	7.76	7.46	7.44	7.75	7.56	7.00	6.40	5.80	5.82	6.90	6.76

**Average Daily Dissolved Oxygen Readings
Crystal Falls Hydroelectric Project (Downstream of Dam)
June 2001**



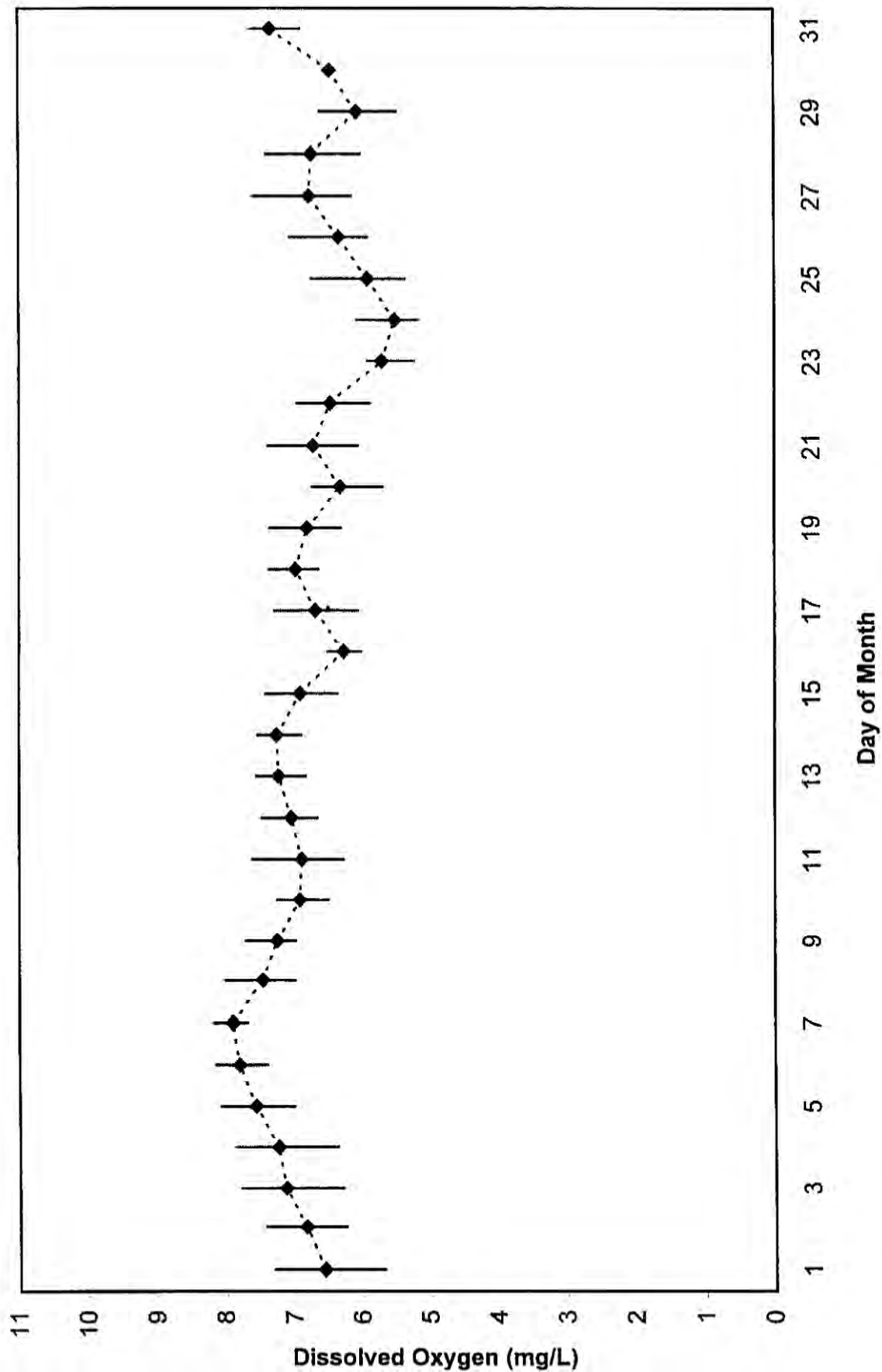
Hourly Dissolved Oxygen Readings: Crystal Falls Hydroelectric Project (Downstream of Dam), July 2001

Time	Day of Month																														
	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28	29	30	31
12:00a	6.27	6.25	7.05	7.38	7.67	7.89	8.18	8.01	7.66	7.02	6.86	7.06	7.52	7.26	7.21	6.35	6.49	7.26	6.82	6.73	6.47	6.95	5.92	5.25	5.37	6.40	6.64	7.40	6.56	6.47	**
1:00a	6.24	6.50	7.05	7.53	7.18	7.67	8.10	7.88	7.37	6.99	6.87	6.92	7.38	7.29	7.37	6.37	6.31	7.31	6.85	6.66	6.41	6.90	5.71	5.25	5.45	6.12	6.67	7.27	6.62	**	**
2:00a	6.15	6.54	6.94	7.35	7.38	8.07	7.99	7.77	7.71	6.72	6.73	7.01	7.16	7.22	7.42	6.17	6.06	7.36	6.65	6.31	6.38	6.82	5.81	5.32	5.48	6.01	6.33	7.36	6.43	**	**
3:00a	6.06	6.67	7.00	7.11	7.15	7.92	8.05	7.68	7.09	6.87	6.55	6.86	7.03	7.31	7.30	6.34	6.42	7.15	6.93	6.32	6.31	6.81	5.79	5.17	5.60	6.06	6.62	7.23	6.41	**	**
4:00a	6.07	6.57	6.96	6.69	7.13	7.73	8.03	7.50	7.08	6.76	6.67	6.77	7.11	7.27	7.29	6.25	6.51	7.23	6.30	5.89	6.48	6.84	5.70	5.23	5.56	5.92	6.17	7.24	6.11	**	**
5:00a	6.05	6.44	6.29	7.13	7.32	7.80	7.98	7.44	7.34	6.98	6.35	6.80	7.16	7.14	7.36	6.18	6.33	7.05	7.12	6.45	6.47	6.87	5.84	5.23	5.49	5.99	6.46	7.19	6.28	**	**
6:00a	5.69	6.54	6.96	6.37	7.22	7.73	7.77	7.28	7.31	6.83	6.68	6.66	6.93	6.90	7.16	6.29	6.38	6.64	6.67	6.25	6.31	6.84	5.78	5.20	5.58	6.07	6.30	7.06	6.21	**	**
7:00a	5.72	6.51	6.67	7.06	7.01	7.73	7.73	7.35	7.29	6.74	6.44	6.85	6.83	7.06	7.26	6.07	6.42	6.84	6.60	6.40	6.05	6.89	5.56	5.20	5.49	5.96	6.33	6.34	5.95	**	**
8:00a	6.14	6.64	6.66	6.59	7.25	7.40	7.70	7.25	7.17	6.49	6.70	6.80	6.89	7.13	7.21	6.10	6.42	6.82	6.62	6.38	6.28	6.86	5.72	5.22	5.67	6.11	6.50	6.30	5.65	**	**
9:00a	6.18	6.79	6.81	6.67	7.30	7.69	7.68	7.15	7.10	6.62	6.73	6.85	6.97	7.26	6.98	6.01	6.43	6.80	6.39	6.49	6.33	6.78	5.69	5.31	5.52	6.11	6.46	6.30	6.08	**	**
10:00a	6.38	6.63	6.86	6.86	7.30	7.55	7.75	7.45	7.30	6.85	6.66	6.76	6.96	7.21	7.18	6.22	6.42	7.00	6.56	6.68	6.39	6.58	5.73	5.27	5.62	6.16	6.15	6.37	5.79	**	**
11:00a	6.57	6.98	7.01	7.17	7.31	7.70	7.77	6.99	7.29	7.00	6.27	7.00	7.21	7.21	7.03	6.28	6.92	7.16	6.59	6.52	6.50	6.42	5.75	5.64	5.64	6.31	6.48	6.02	5.98	**	**
12:00p	6.61	6.76	6.93	6.92	7.36	7.70	7.69	7.23	7.05	7.01	6.84	6.87	7.28	6.94	6.78	6.15	6.85	7.07	6.53	6.42	6.57	6.32	5.83	5.72	5.91	6.14	6.51	6.51	5.74	**	**
1:00p	6.96	6.70	7.18	7.26	*	7.61	7.77	7.41	7.24	7.14	6.92	6.99	7.41	7.14	6.88	6.30	6.11	6.65	6.36	6.30	6.87	6.26	5.76	5.68	5.74	6.51	6.87	6.29	5.90	**	**
2:00p	6.57	7.23	7.19	7.41	7.76	7.66	7.83	7.49	7.31	7.00	6.95	6.95	7.42	7.35	6.47	6.38	7.08	6.66	7.08	6.20	6.80	6.22	5.65	5.86	6.12	6.11	6.51	6.78	5.49	**	**
3:00p	7.00	7.20	7.29	7.51	7.97	7.88	7.82	7.28	6.98	7.23	7.29	7.04	7.17	7.36	6.51	6.50	7.16	7.06	6.78	6.17	7.05	6.26	5.64	5.68	5.75	6.62	6.83	6.85	5.64	**	**
4:00p	7.24	7.26	7.22	7.45	8.00	7.82	7.86	7.40	7.06	6.94	7.17	7.21	7.28	7.44	6.70	6.32	6.83	6.92	7.09	6.30	6.96	6.20	5.76	5.74	6.03	6.50	6.53	6.87	5.79	**	7.25
5:00p	7.20	7.23	7.27	7.41	7.74	7.92	8.05	7.46	7.25	7.25	7.41	7.47	7.27	7.37	6.63	6.41	6.87	7.04	7.20	6.20	7.22	6.13	5.71	5.85	6.37	6.27	6.92	6.61	5.93	**	6.90
6:00p	7.30	7.02	7.62	7.78	8.02	7.84	8.07	7.70	7.00	7.07	7.61	7.47	7.55	7.53	6.61	6.42	6.99	6.98	7.35	6.22	7.32	6.16	5.60	6.07	6.74	6.85	7.57	6.70	5.86	**	7.11
7:00p	7.18	7.42	7.62	7.86	7.99	7.91	8.17	7.65	7.32	7.14	7.04	7.46	7.33	7.52	6.62	6.15	7.14	7.00	7.17	6.19	7.32	6.05	5.69	5.78	6.43	6.57	7.59	6.78	5.99	**	7.42
8:00p	7.27	7.22	7.78	7.56	7.93	8.09	7.79	7.77	7.53	7.01	7.32	7.37	7.24	7.51	6.39	6.27	6.94	6.77	7.09	5.93	7.38	6.05	5.63	5.92	6.69	7.06	7.50	6.62	6.19	**	7.62
9:00p	6.80	7.12	7.77	7.75	8.08	8.03	7.92	7.31	7.35	6.97	7.24	7.20	7.49	7.26	6.36	6.35	6.90	6.84	6.81	5.84	7.19	5.88	5.77	5.57	6.68	6.94	7.54	6.63	6.43	**	7.56
10:00p	6.95	6.95	7.44	7.52	7.85	7.88	8.09	7.46	7.25	6.80	7.13	7.30	7.43	7.39	6.59	6.35	7.28	7.01	6.96	6.36	7.13	6.00	5.66	5.69	6.51	6.84	7.57	6.67	6.36	**	7.42
11:00p	6.90	6.85	7.55	7.47	8.04	8.15	7.82	7.17	7.11	6.65	7.02	7.42	7.54	7.11	6.60	6.24	7.23	6.96	6.90	6.59	7.06	6.03	5.22	5.59	6.60	6.49	7.53	6.42	6.51	**	7.47

Max.	7.30	7.42	7.78	7.86	8.08	8.15	8.18	8.01	7.71	7.25	7.61	7.47	7.55	7.53	7.42	6.50	7.28	7.36	7.35	6.73	7.38	6.95	5.92	6.07	6.74	7.06	7.59	7.40	6.62	6.47	7.62
Min.	5.69	6.25	6.29	6.37	7.01	7.40	7.68	6.99	6.98	6.49	6.27	6.66	6.83	6.90	6.36	6.01	6.06	6.64	6.30	5.69	6.05	5.88	5.22	5.17	5.37	5.92	6.15	6.02	5.49	6.47	6.90
Avg.	6.56	6.83	7.13	7.24	7.56	7.81	7.90	7.46	7.26	6.92	6.89	7.05	7.23	7.26	6.91	6.27	6.69	6.98	6.81	6.32	6.72	6.46	5.71	5.52	5.92	6.34	6.77	6.74	6.08	6.47	7.34

* Service point (missing data), ** Battery failure

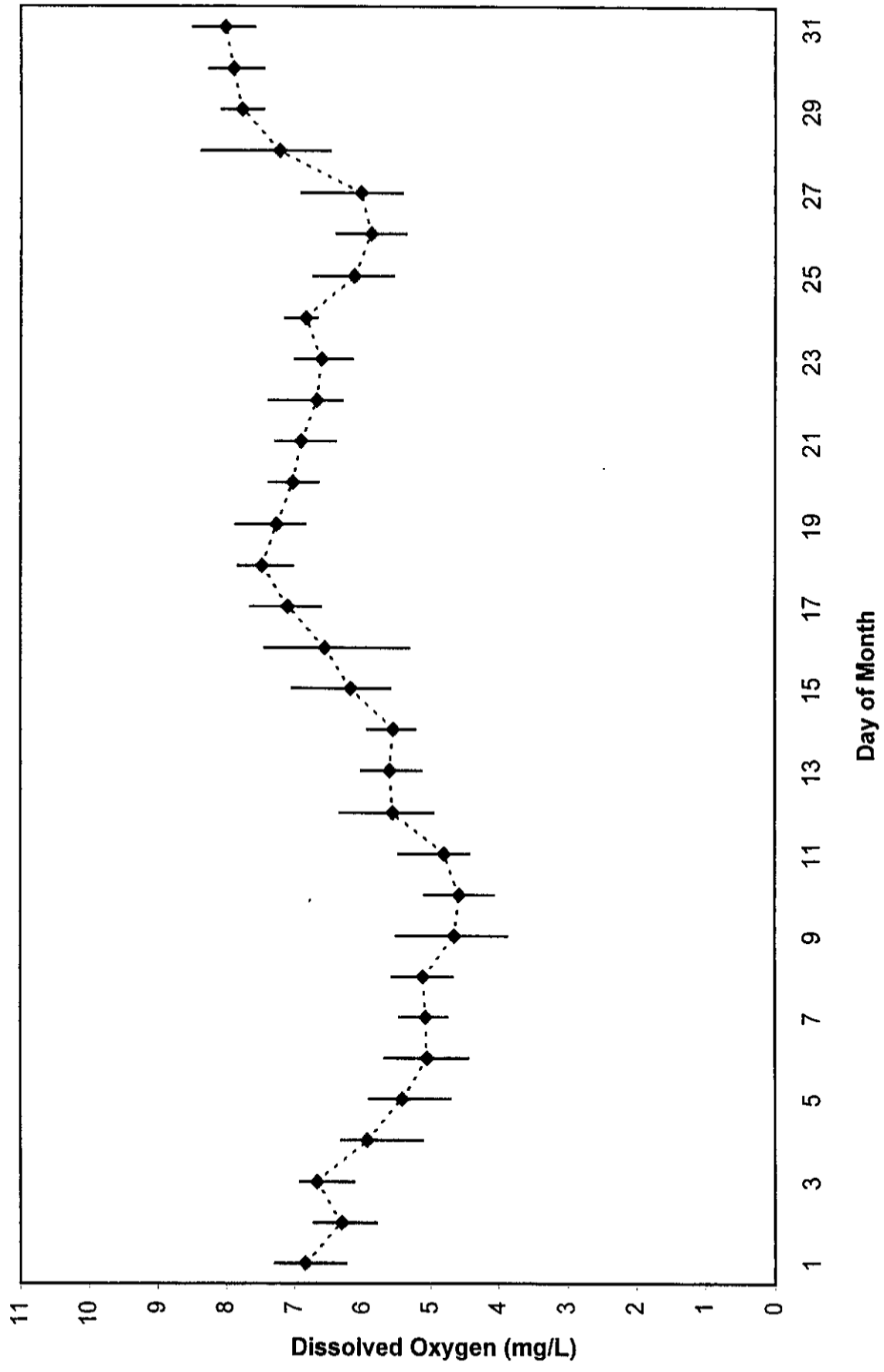
**Average Daily Dissolved Oxygen Readings
Crystal Falls Hydroelectric Project (Downstream of Dam)
July 2001**



Hourly Dissolved Oxygen Readings: Crystal Falls Hydroelectric Project (Downstream of Dam), August 2001

Time	Day of Month																														
	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28	29	30	31
12:00a	7.29	6.11	6.63	6.11	5.30	5.04	5.29	5.14	5.18	4.86	4.62	5.44	5.61	5.45	5.83	5.95	6.75	7.39	7.86	7.09	7.06	6.58	6.34	7.14	6.73	5.72	5.89	6.86	7.96	7.89	7.96
1:00a	6.32	6.04	6.66	6.13	5.65	5.02	5.34	5.32	5.50	4.76	4.80	5.36	5.48	5.83	5.80	6.00	6.61	7.64	7.64	7.27	7.02	6.81	6.41	7.07	6.69	5.66	6.04	6.75	7.85	7.86	7.89
2:00a	6.73	5.95	6.66	6.20	5.80	5.15	5.45	4.92	4.78	4.80	4.54	5.11	5.13	5.31	5.59	5.76	6.91	7.39	7.61	7.31	7.13	6.53	6.54	7.10	6.70	5.58	6.19	6.71	7.84	7.72	7.78
3:00a	6.84	6.06	6.80	6.08	5.52	4.95	5.23	4.93	4.61	5.04	4.56	4.95	5.49	5.33	6.09	5.69	6.82	7.28	7.56	7.01	7.08	6.45	6.74	6.99	6.57	5.76	5.76	6.71	7.69	7.83	7.72
4:00a	6.80	5.89	6.79	6.10	5.41	4.99	5.01	5.18	4.55	4.90	4.59	5.06	5.84	5.45	6.21	5.72	6.75	7.21	7.44	7.12	6.75	6.98	6.38	6.92	6.58	5.73	5.81	6.73	7.46	7.78	7.77
5:00a	7.06	5.95	6.89	5.92	5.46	4.88	5.06	4.97	4.56	4.46	4.57	5.13	5.61	5.46	5.89	5.43	6.88	7.45	7.14	7.13	6.94	6.31	6.57	6.88	6.56	5.62	5.65	6.64	7.69	7.73	7.81
6:00a	7.24	5.91	6.92	5.95	5.26	4.44	4.87	4.92	4.08	4.13	4.42	6.33	5.40	5.49	5.98	5.92	6.90	7.02	7.37	7.05	6.89	6.56	6.15	6.77	6.54	5.37	5.77	6.65	7.54	7.67	7.59
7:00a	7.01	5.96	6.83	5.97	4.94	4.57	4.98	4.78	4.00	4.06	4.51	6.33	5.35	5.28	6.08	6.06	6.61	7.31	7.15	6.65	6.92	6.60	6.73	6.76	6.48	5.73	5.42	6.56	7.58	7.50	7.60
8:00a	7.07	5.80	6.83	5.92	5.02	4.91	4.91	4.80	4.45	4.10	4.52	5.81	5.57	5.22	6.01	5.78	6.80	7.28	6.84	6.86	6.62	6.85	6.43	6.75	5.85	5.88	5.54	6.48	7.66	7.46	7.59
9:00a	7.17	5.81	6.77	5.55	5.16	4.56	4.93	4.67	4.12	4.30	4.77	5.72	5.38	5.39	6.16	5.81	6.86	7.39	7.26	6.66	6.96	6.35	6.31	6.69	5.86	5.89	5.93	6.66	7.63	7.57	7.75
10:00a	7.12	6.01	6.85	6.27	5.19	4.87	5.04	4.91	4.38	4.19	4.61	5.65	5.25	5.43	5.86	5.51	6.65	7.16	7.07	6.74	6.40	6.41	6.49	6.67	6.18	5.88	5.54	6.53	7.56	7.67	7.76
11:00a	7.15	6.39	6.87	6.13	5.33	4.85	5.16	4.80	3.87	4.29	4.63	5.62	5.54	5.53	5.85	5.31	6.90	7.62	7.16	6.84	6.79	6.74	6.63	6.73	5.90	5.96	5.58	6.59	7.57	7.64	7.84
12:00p	7.12	6.53	6.79	6.31	5.43	4.96	4.85	4.93	4.20	4.26	4.76	5.65	5.74	5.45	6.34	7.37	7.19	7.38	7.16	7.19	6.93	6.36	6.84	6.79	5.96	5.85	5.76	6.68	7.70	7.90	7.92
1:00p	7.11	6.48	6.82	6.16	5.45	4.92	5.23	4.92	4.50	4.27	4.77	5.39	5.26	5.84	7.03	7.42	7.24	7.43	7.26	6.83	7.06	7.38	6.84	6.76	5.87	5.66	5.81	6.74	7.73	8.04	8.09
2:00p	7.07	6.69	6.79	6.28	5.37	5.47	4.74	5.14	4.51	4.54	4.87	5.52	5.67	5.35	6.40	7.36	7.11	7.62	7.28	7.10	7.28	6.95	6.51	6.78	5.55	6.08	5.93	6.76	7.66	8.12	8.17
3:00p	6.71	6.72	6.73	6.16	5.26	5.07	5.16	5.27	4.67	4.47	4.95	5.52	5.58	5.50	6.53	7.41	7.17	7.59	6.98	6.93	6.90	6.44	6.37	6.79	6.10	6.01	6.04	8.37	7.94	8.06	8.23
4:00p	6.70	6.66	6.78	6.16	5.56	5.37	4.90	5.53	4.97	4.52	5.11	5.50	5.79	5.73	6.59	7.39	7.45	7.76	6.98	7.27	6.91	6.89	6.48	6.79	5.74	5.89	6.12	8.28	7.97	8.19	8.33
5:00p	6.25	6.67	6.60	6.00	5.53	5.67	4.92	5.38	4.83	4.80	4.79	5.71	5.92	5.53	6.74	7.43	7.44	7.75	7.13	7.37	6.86	6.82	6.70	6.86	5.75	6.23	5.95	8.31	8.01	8.21	8.49
6:00p	6.98	6.66	6.53	5.90	5.84	5.66	5.07	5.56	4.96	4.79	5.00	5.81	5.79	5.80	6.60	7.43	7.62	7.56	7.21	7.23	7.03	6.97	7.00	6.86	5.81	6.14	6.43	8.13	7.87	8.16	8.50
7:00p	6.66	6.70	6.26	5.72	5.90	4.89	5.24	5.23	5.05	4.89	4.99	5.84	5.92	5.60	5.94	7.40	7.60	7.47	7.27	6.79	6.91	6.90	6.80	6.87	5.69	6.15	6.64	8.10	8.08	8.17	8.42
8:00p	6.67	6.59	6.40	5.30	5.79	5.40	5.08	5.26	5.05	4.63	5.03	5.46	5.61	5.92	5.99	7.42	7.53	7.78	7.25	7.26	7.08	6.80	7.00	6.87	5.67	6.05	6.16	8.01	7.93	8.26	8.36
9:00p	6.58	6.56	6.45	5.11	5.39	5.01	4.95	5.28	4.90	5.08	5.26	5.66	6.01	5.82	6.17	7.28	7.46	7.82	7.03	6.89	6.60	6.48	6.77	6.82	5.98	6.39	6.91	8.18	7.94	8.19	8.37
10:00p	6.40	6.65	6.30	5.47	5.68	5.36	5.07	5.31	4.81	5.04	5.02	5.41	5.74	5.81	6.34	7.24	7.64	7.60	7.33	7.10	6.68	6.66	6.73	6.70	6.12	5.84	6.90	8.01	7.86	8.04	8.30
11:00p	6.25	6.62	6.13	5.49	4.70	5.19	5.21	5.38	4.96	4.59	5.46	5.29	5.71	5.59	6.12	7.18	7.48	7.55	7.44	6.85	6.87	6.30	6.72	6.72	6.16	6.00	6.82	7.91	7.79	7.92	8.24

**Average Daily Dissolved Oxygen Readings
Crystal Falls Hydroelectric Project (Downstream of Dam)
August 2001**

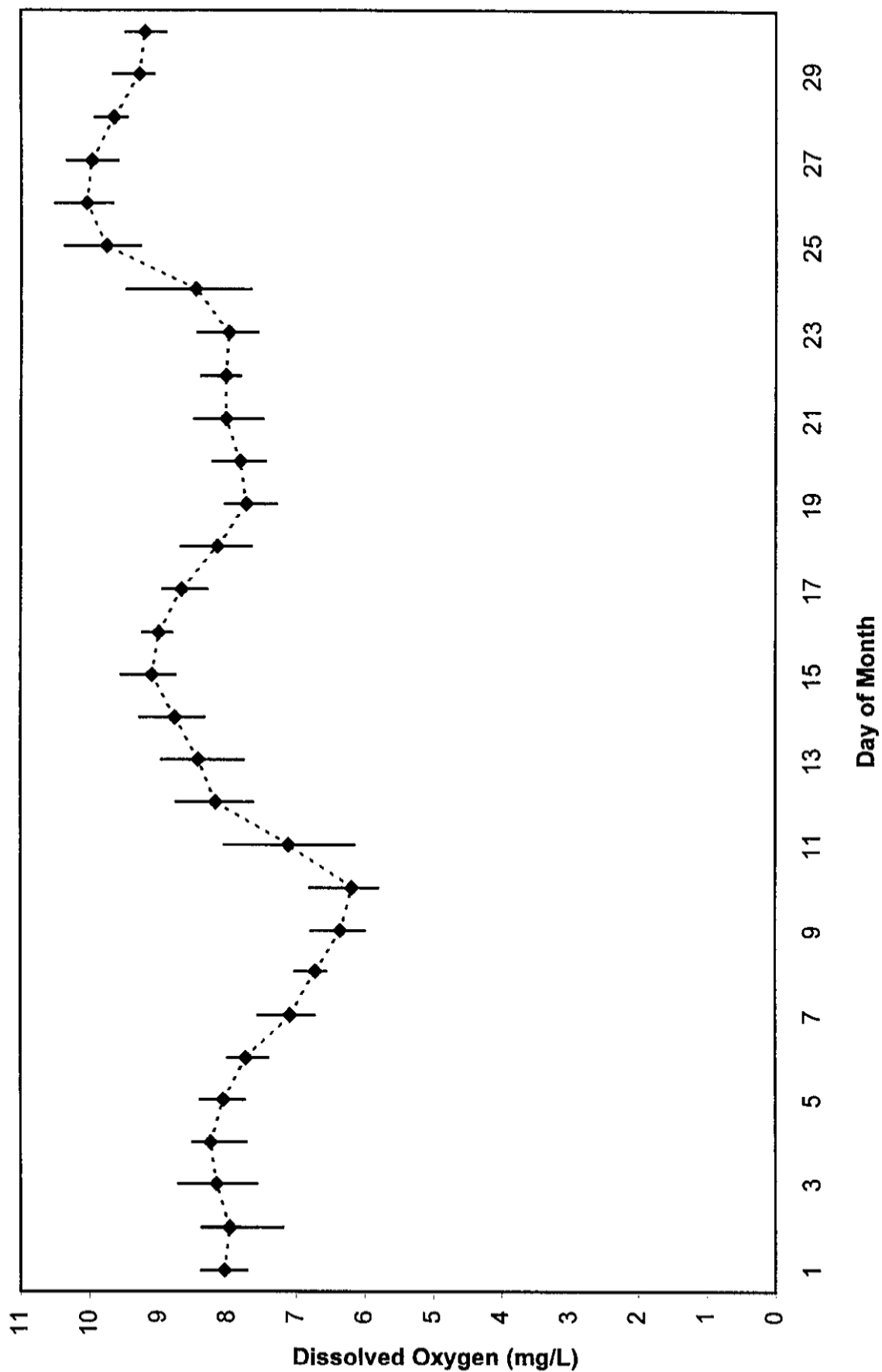


Hourly Dissolved Oxygen Readings: Crystal Falls Hydroelectric Project (Downstream of Dam), September 2001

Day of Month

Time	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28	29	30
12:00a	8.12	8.08	7.99	8.26	8.39	7.74	7.33	7.01	6.64	5.83	6.39	8.11	8.59	8.76	9.24	9.23	8.89	8.67	8.03	7.63	7.96	8.05	8.44	8.00	9.27	10.00	10.20	9.50	9.45	9.30
1:00a	8.03	8.03	8.11	8.23	8.26	7.86	7.44	6.98	6.65	5.87	6.51	8.05	8.55	8.74	9.26	8.95	8.74	8.47	7.82	7.73	8.03	8.14	8.02	7.78	9.28	9.98	10.18	9.76	9.55	9.42
2:00a	8.00	8.03	7.94	8.20	8.11	7.97	7.12	6.91	6.78	5.80	6.31	7.95	8.39	8.84	9.11	8.92	8.94	8.46	7.90	7.70	7.89	8.08	8.29	7.76	9.32	9.85	10.04	9.93	9.66	9.48
3:00a	7.87	8.37	8.04	8.17	8.33	7.88	7.55	6.84	6.75	5.86	6.55	7.84	8.25	8.60	9.08	8.95	8.89	8.51	7.82	7.67	8.18	7.94	8.40	7.71	9.32	9.91	10.01	9.81	9.35	9.34
4:00a	7.91	7.93	8.06	8.28	8.20	7.84	7.20	6.67	6.71	5.98	6.49	7.99	8.33	8.66	9.06	9.03	8.69	8.29	7.68	7.72	7.86	8.06	8.22	7.71	9.34	9.82	9.98	9.86	9.22	9.35
5:00a	7.87	7.95	8.01	8.03	8.04	7.98	7.13	6.64	6.63	5.85	6.46	7.71	8.36	8.53	9.06	8.98	8.89	8.35	7.89	7.57	7.78	8.08	8.14	7.84	9.41	9.83	9.98	9.68	9.16	9.35
6:00a	7.75	7.99	7.91	8.02	8.02	7.81	7.00	6.74	6.59	5.81	6.57	7.69	8.23	8.37	9.10	8.96	8.71	8.27	7.75	7.51	7.75	7.82	7.78	7.60	9.35	9.87	9.90	9.81	9.07	9.24
7:00a	7.72	7.88	8.02	7.77	7.87	7.80	6.98	6.62	6.51	5.95	6.57	7.64	8.05	8.33	9.19	8.82	8.74	8.12	7.73	7.44	7.78	7.92	7.56	7.75	9.49	9.85	9.80	9.59	9.17	9.12
8:00a	7.78	7.88	7.84	7.72	7.75	7.67	6.92	6.64	6.10	6.01	6.52	7.63	8.20	8.46	8.82	9.06	8.76	8.12	7.62	7.58	7.72	7.81	7.79	7.66	9.48	9.67	9.60	9.59	9.21	9.09
9:00a	7.75	7.50	7.86	7.97	7.85	7.40	6.96	6.62	6.47	6.13	6.15	7.71	8.17	8.50	8.84	8.92	8.76	7.99	7.71	7.82	7.48	8.15	7.87	7.66	9.58	9.77	9.75	9.55	9.09	8.97
10:00a	7.81	7.67	7.57	8.03	7.79	7.46	6.73	6.63	6.16	6.15	6.41	7.79	8.16	8.37	8.91	8.80	8.62	8.04	7.55	7.67	7.53	7.87	7.84	7.93	9.60	9.81	9.89	9.49	9.17	8.98
11:00a	7.85	7.83	8.11	8.26	7.79	7.71	6.86	6.56	6.23	6.16	6.56	7.80	8.27	8.58	8.79	9.01	8.65	7.95	7.76	7.75	7.72	7.89	7.62	7.95	9.72	9.87	9.82	9.62	9.22	9.02
12:00p	7.97	7.90	8.09	8.21	7.88	7.60	6.83	6.61	6.35	6.26	6.49	8.22	8.14	8.59	8.75	9.01	8.46	7.91	7.66	7.79	8.00	7.92	7.93	7.91	9.83	9.99	9.85	9.55	9.26	9.16
1:00p	8.09	7.92	8.00	8.36	7.97	7.68	6.82	6.60	6.52	6.40	7.63	8.19	7.76	8.72	8.97	9.09	8.65	8.17	7.62	7.68	8.29	7.85	7.89	8.13	9.79	10.03	9.86	9.59	9.23	9.30
2:00p	8.12	8.02	8.17	8.40	8.11	7.72	7.10	6.71	6.32	6.26	7.50	8.26	8.02	8.80	8.92	8.93	8.59	8.10	7.98	7.95	8.33	7.91	7.70	9.24	9.87	9.98	10.04	9.74	9.22	9.15
3:00p	8.21	7.47	8.03	8.36	7.98	7.81	7.38	6.68	5.99	6.26	7.79	8.50	8.22	8.80	9.16	9.19	8.29	8.16	7.72	8.02	8.17	7.97	7.73	9.30	9.94	10.33	10.08	9.66	9.11	9.20
4:00p	8.22	7.19	8.45	8.40	8.08	7.93	7.33	6.71	6.07	6.33	7.97	8.45	8.81	8.82	8.89	9.05	8.66	8.32	7.74	8.03	8.15	8.13	8.02	9.25	9.83	10.33	10.11	9.84	9.37	9.36
5:00p	8.38	8.32	8.35	8.41	8.12	7.99	7.25	6.74	6.42	6.48	7.90	8.49	8.71	9.00	9.10	9.14	8.88	7.99	7.93	8.07	8.32	8.38	8.11	9.35	10.30	10.08	10.11	9.76	9.47	9.37
6:00p	8.34	8.37	8.71	8.38	8.15	7.85	6.85	6.87	6.13	6.25	8.03	8.73	8.94	9.07	9.21	9.09	8.74	8.04	7.64	8.03	8.42	8.25	7.92	9.40	10.37	10.44	10.04	9.72	9.30	8.89
7:00p	8.25	8.32	8.35	8.39	8.25	7.71	7.01	6.71	6.23	6.80	8.04	8.74	8.95	9.18	9.21	8.95	8.44	7.97	7.28	8.07	8.02	7.93	8.12	9.47	10.34	10.25	9.93	9.66	9.37	9.05
8:00p	8.38	8.13	8.69	8.49	8.16	7.68	7.00	6.63	6.08	6.63	7.87	8.71	8.75	9.11	9.54	9.09	8.51	8.16	7.65	8.21	8.16	7.81	8.16	9.38	10.25	10.33	10.23	9.81	9.10	9.33
9:00p	8.14	8.28	8.57	8.50	8.11	7.48	7.13	6.68	6.15	6.68	7.97	8.68	8.76	9.14	9.40	9.00	8.31	8.01	7.58	8.07	8.48	8.02	8.00	9.39	10.24	10.51	10.34	9.59	9.50	9.08
10:00p	8.21	8.14	8.47	8.50	8.08	7.49	7.13	6.85	6.12	6.47	8.00	8.54	8.72	9.06	9.52	8.96	8.51	7.65	7.67	8.02	8.20	8.27	7.83	9.35	10.20	10.41	9.86	9.46	9.10	9.20
11:00p	8.29	8.05	8.48	8.42	8.08	7.49	7.02	6.58	6.05	6.31	7.84	8.66	8.73	9.27	9.16	8.81	8.64	7.76	7.67	7.81	8.21	8.33	8.14	9.40	10.20	10.25	9.81	9.52	9.38	9.02
Max.	8.38	8.37	8.71	8.50	8.39	7.99	7.55	7.01	6.78	6.80	8.04	8.74	8.95	9.27	9.54	9.23	8.94	8.67	8.03	8.21	8.48	8.38	8.44	9.47	10.37	10.51	10.34	9.93	9.66	9.48
Min.	7.72	7.19	7.57	7.72	7.75	7.40	6.73	6.56	5.99	5.80	6.15	7.63	7.76	8.33	8.75	8.80	8.29	7.65	7.28	7.44	7.48	7.81	7.56	7.66	9.27	9.67	9.60	9.46	9.07	8.89
Avg.	8.04	7.97	8.16	8.24	8.06	7.73	7.09	6.72	6.36	6.19	7.11	8.17	8.42	8.76	9.10	9.00	8.67	8.15	7.73	7.81	8.02	8.02	7.98	8.46	9.76	10.05	9.98	9.65	9.28	9.20

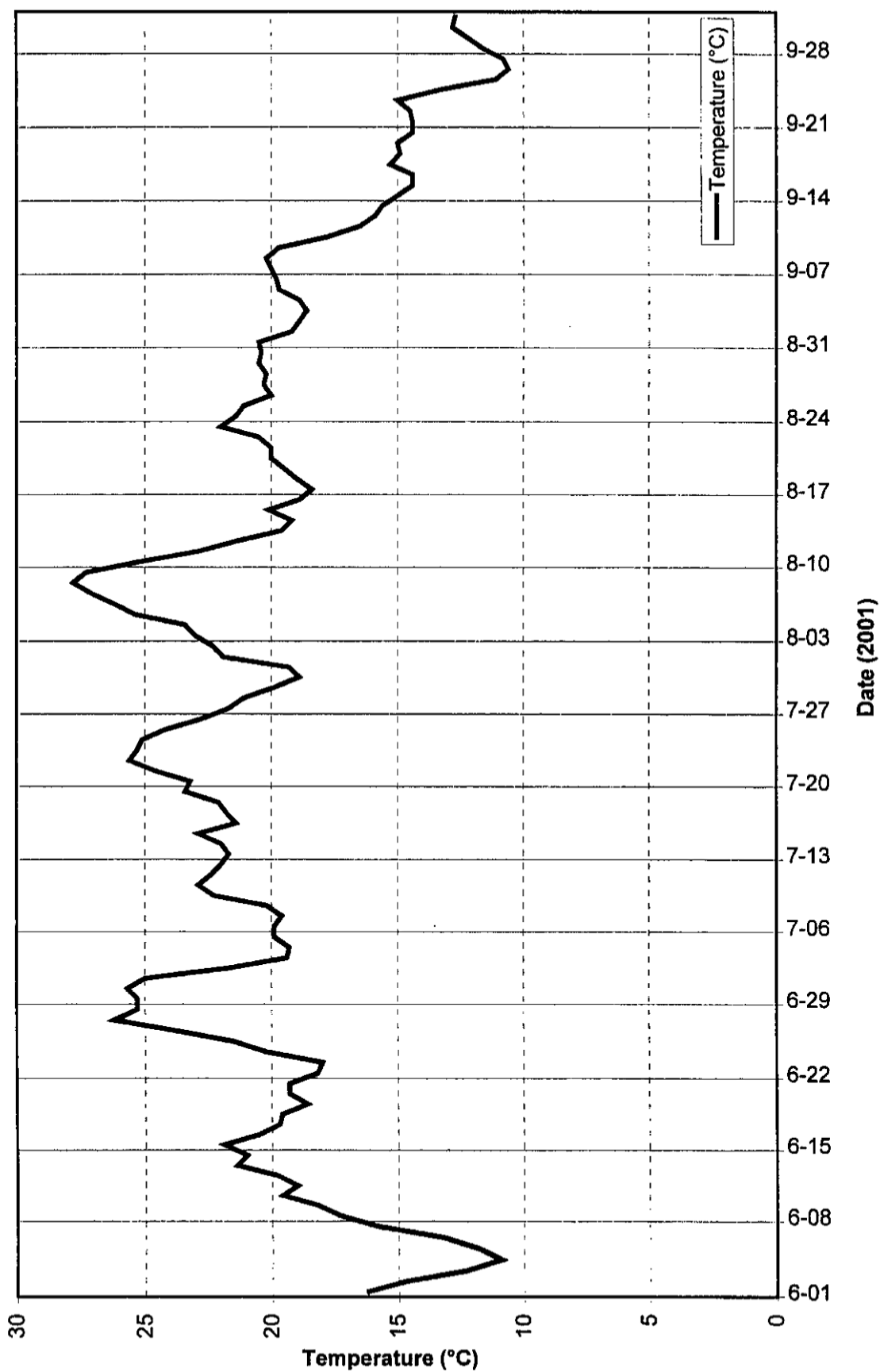
**Average Daily Dissolved Oxygen Readings
Crystal Falls Hydroelectric Project (Downstream of Dam)
September 2001**



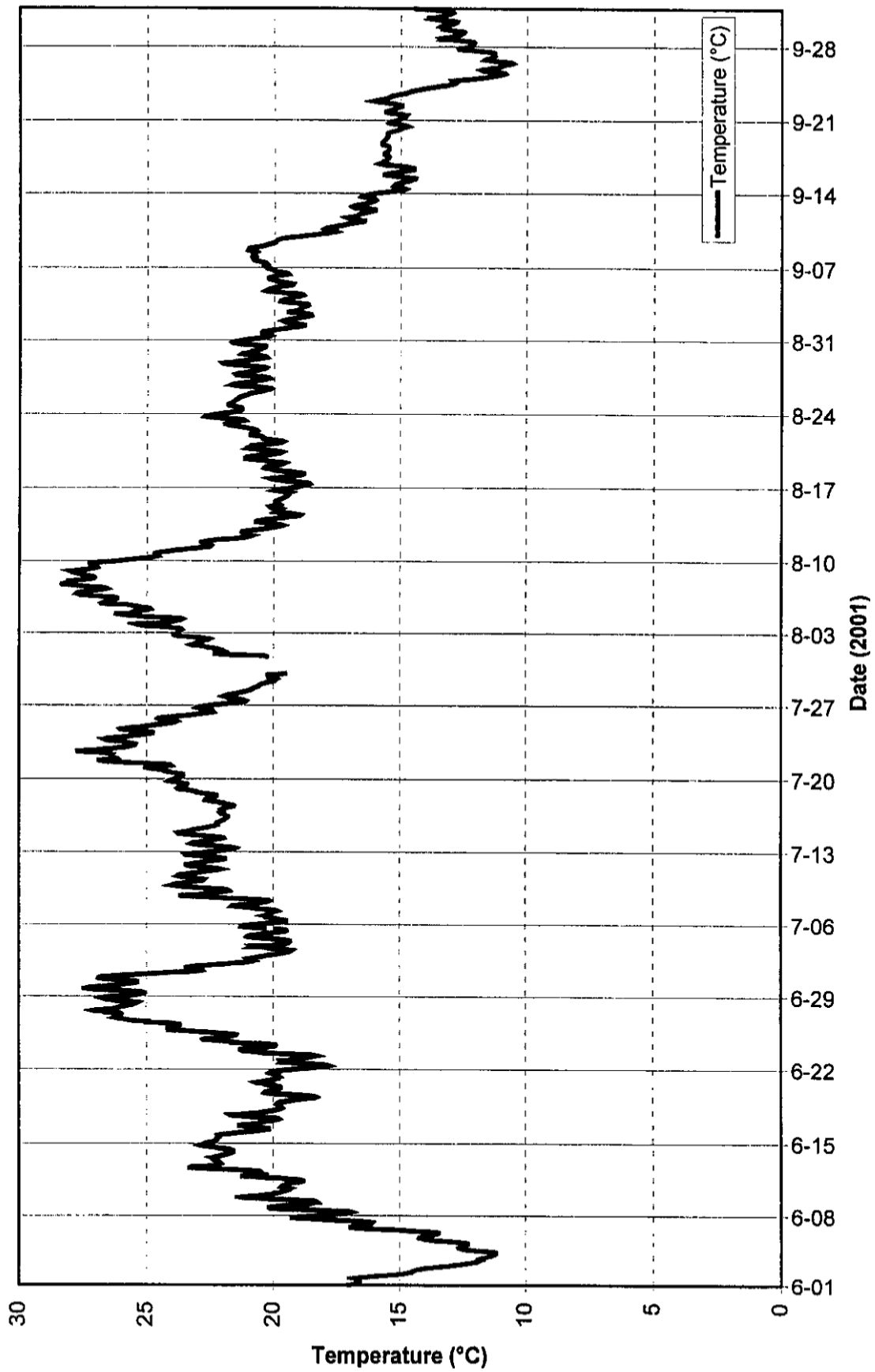
APPENDIX G

Comparison Between Hourly Temperatures at Sites

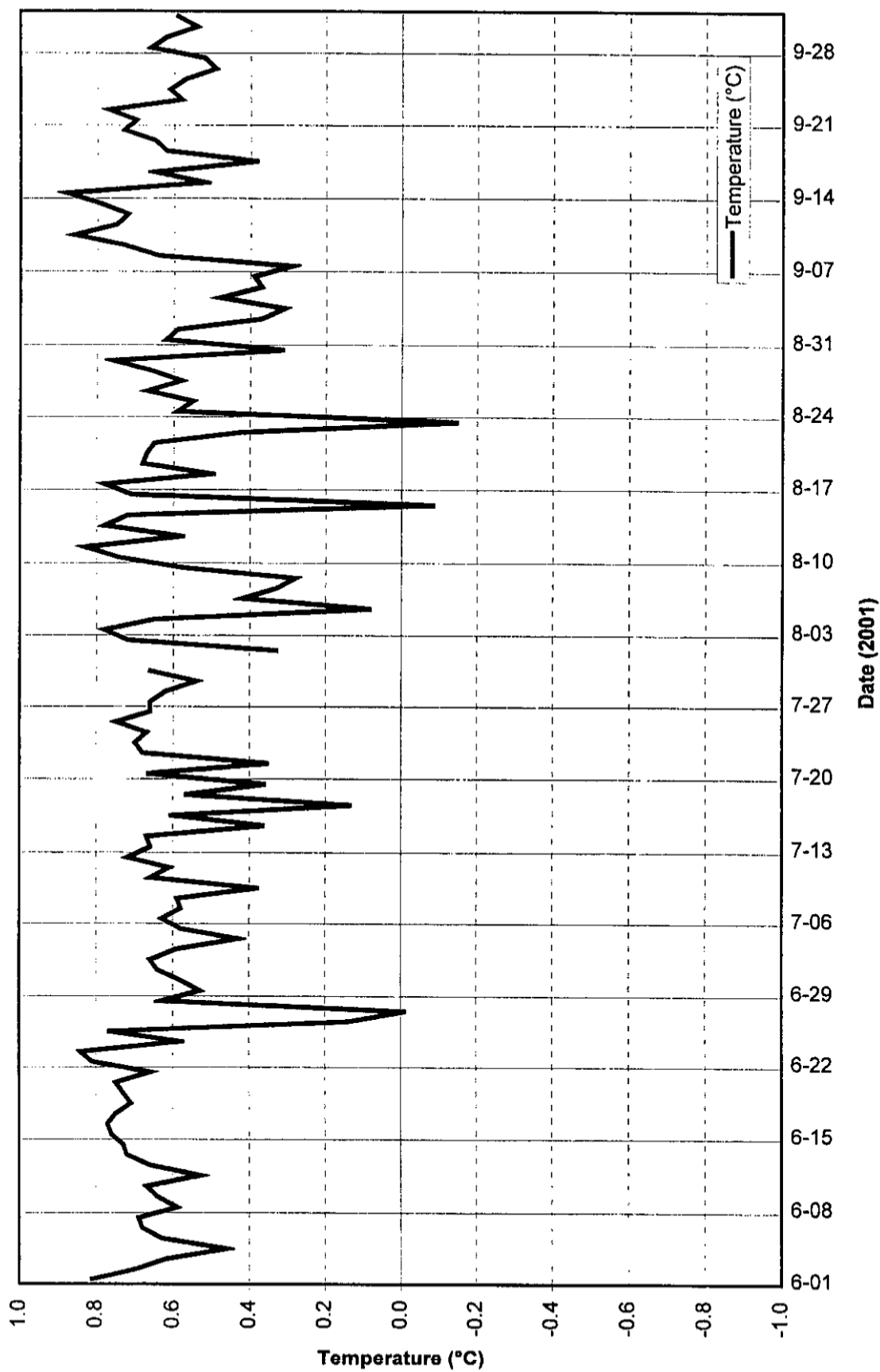
Hourly Temperature Upstream of Crystal Falls Hydroelectric Project, 2001



Hourly Temperature Downstream of Crystal Falls Hydroelectric Project, 2001



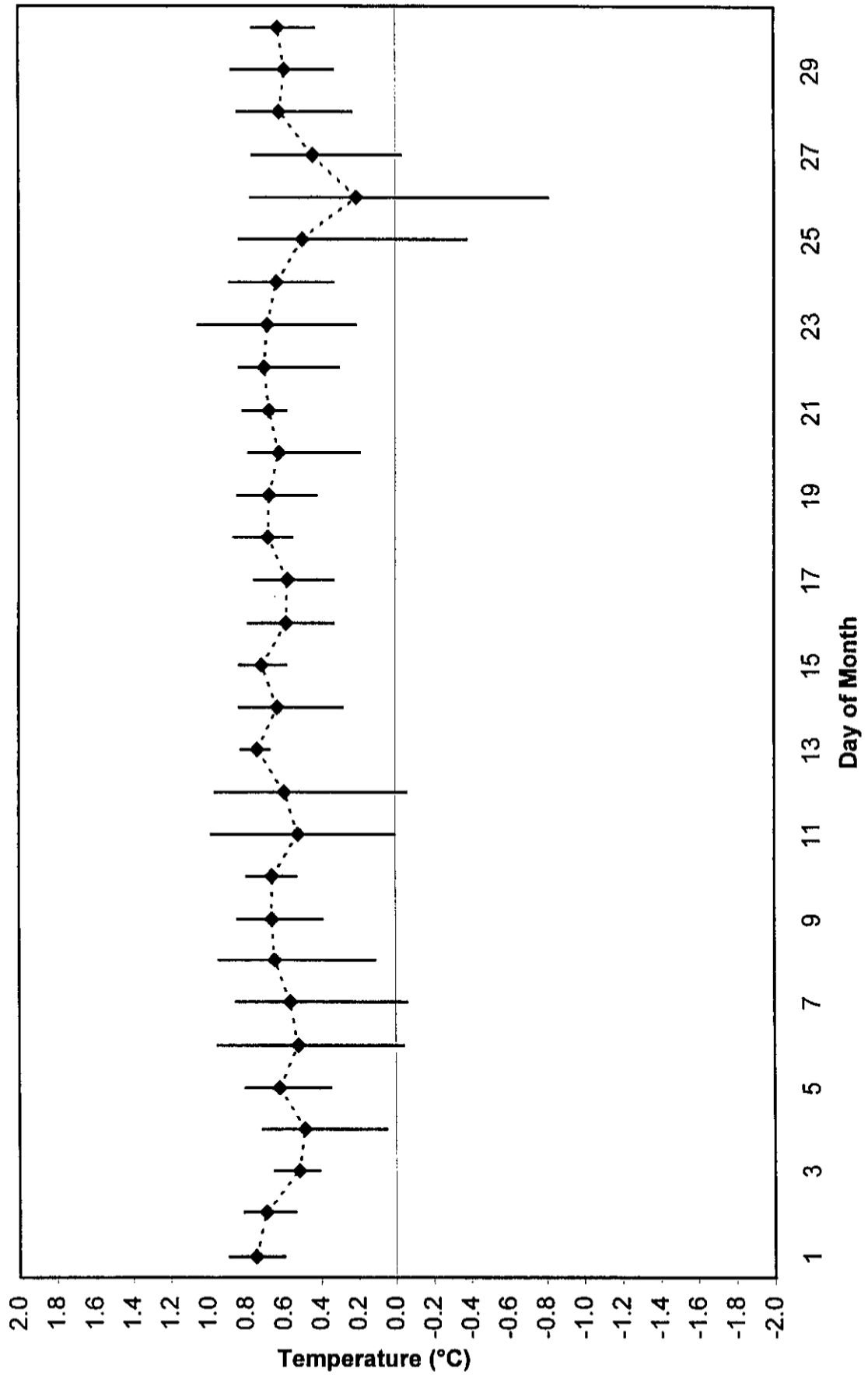
Delta Temperature (Downstream Minus Upstream) of Crystal Falls Hydroelectric Project, 2001



Hourly Delta Temperature Calculations: Crystal Falls Hydroelectric Project (Downstream Minus Upstream), June 2001

Time	Day of Month																														
	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28	29	30	
12:00a	0.8	0.7	0.6	0.5	0.6	0.7	0.7	0.6	0.6	0.7	0.5	0.7	0.7	0.7	0.8	0.8	0.8	0.7	0.7	0.8	0.7	0.8	0.8	0.8	0.6	0.8	0.1	0.0	0.6	0.5	0.6
1:00a	0.8	0.7	0.6	0.5	0.6	0.8	0.8	0.7	0.7	0.7	0.5	0.8	0.8	0.7	0.8	0.7	0.7	0.7	0.7	0.6	0.8	0.8	0.8	0.5	0.6	0.1	0.3	0.6	0.5	0.7	
2:00a	0.8	0.7	0.5	0.5	0.5	0.7	0.7	0.8	0.6	0.8	0.8	0.7	0.7	0.8	0.7	0.7	0.7	0.6	0.7	0.7	0.7	0.7	0.7	0.7	0.7	0.7	0.7	0.3	0.6	0.6	0.6
3:00a	0.7	0.6	0.5	0.4	0.6	0.7	0.6	0.7	0.7	0.6	0.8	0.6	0.7	0.8	0.8	0.6	0.7	0.6	0.8	0.7	0.7	0.8	0.8	0.6	0.7	0.8	0.4	0.7	0.8	0.7	0.7
4:00a	0.7	0.7	0.5	0.4	0.7	0.8	0.7	0.7	0.8	0.8	0.8	0.7	0.7	0.8	0.7	0.7	0.7	0.7	0.8	0.8	0.7	0.8	0.8	0.7	0.7	0.7	0.7	0.4	0.6	0.7	0.7
5:00a	0.8	0.8	0.5	0.4	0.7	0.7	0.7	0.7	0.8	0.7	0.8	0.7	0.7	0.8	0.7	0.7	0.6	0.7	0.7	0.7	0.6	0.7	0.7	0.7	0.7	0.7	0.7	0.7	0.5	0.6	0.7
6:00a	0.9	0.7	0.6	0.5	0.6	0.7	0.7	0.8	0.8	0.7	0.6	0.6	0.8	0.8	0.8	0.8	0.7	0.7	0.6	0.7	0.7	0.7	0.8	0.6	0.8	0.8	0.7	0.7	0.7	0.7	0.5
7:00a	0.8	0.8	0.5	0.5	0.8	0.8	0.8	0.7	0.8	0.7	0.7	0.6	0.8	0.8	0.7	0.8	0.6	0.7	0.8	0.8	0.7	0.8	0.8	0.7	0.7	0.8	0.8	0.8	0.8	0.8	0.8
8:00a	0.7	0.6	0.6	0.5	0.7	0.8	0.7	0.7	0.7	0.6	0.7	0.6	0.8	0.8	0.8	0.6	0.7	0.7	0.8	0.7	0.7	0.7	0.7	0.6	0.7	0.7	0.7	0.6	0.8	0.7	0.8
9:00a	0.8	0.8	0.6	0.4	0.6	0.7	0.7	0.7	0.6	0.5	0.6	0.6	0.7	0.6	0.8	0.5	0.5	0.7	0.8	0.6	0.7	0.8	0.6	0.6	0.5	0.6	0.6	0.8	0.6	0.7	0.7
10:00a	0.8	0.8	0.5	0.5	0.6	0.4	0.4	0.8	0.7	0.8	0.5	0.6	0.8	0.6	0.7	0.6	0.6	0.6	0.8	0.4	0.6	0.7	0.8	0.6	0.5	0.5	0.4	0.7	0.5	0.4	0.6
11:00a	0.8	0.8	0.5	0.5	0.6	0.4	0.4	0.8	0.7	0.7	0.3	0.4	0.8	0.6	0.7	0.5	0.4	0.7	0.6	0.4	0.7	0.6	0.2	0.3	0.5	0.7	0.4	0.7	0.5	0.5	0.5
12:00p	0.7	0.8	0.5	0.6	0.7	0.2	0.6	0.9	0.7	0.7	0.0	0.3	0.7	0.7	0.7	0.3	0.6	0.7	0.8	0.6	0.7	0.7	0.6	0.7	0.4	0.6	0.5	0.8	0.5	0.8	0.6
1:00p	0.7	0.8	0.4	0.4	0.5	0.0	0.3	0.6	0.6	0.7	0.2	0.7	0.7	0.6	0.7	0.4	0.7	0.6	0.8	0.4	0.6	0.7	1.1	0.8	0.8	0.5	0.2	0.8	0.3	0.4	0.4
2:00p	0.7	0.7	0.5	0.6	0.5	0.0	0.2	0.6	0.5	0.7	0.3	0.7	0.7	0.4	0.7	0.4	0.5	0.6	0.5	0.6	0.7	0.8	0.7	0.8	0.7	0.2	0.0	0.6	0.5	0.5	0.5
3:00p	0.7	0.7	0.6	0.7	0.5	0.0	0.5	0.1	0.4	0.8	0.7	0.7	0.7	0.4	0.7	0.4	0.5	0.6	0.5	0.2	0.6	0.8	1.0	0.9	0.8	0.0	0.2	0.7	0.7	0.7	0.7
4:00p	0.7	0.7	0.5	0.6	0.4	0.0	-0.1	0.7	0.7	0.5	1.0	1.0	0.8	0.3	0.6	0.3	0.4	0.6	0.5	0.7	0.7	0.7	0.6	0.6	0.6	-0.3	0.4	0.8	0.5	0.5	0.6
5:00p	0.8	0.6	0.5	0.1	0.4	1.0	0.5	0.7	0.7	0.6	0.5	0.4	0.8	0.5	0.7	0.5	0.4	0.6	0.5	0.5	0.7	0.5	0.6	0.7	0.6	-0.1	0.4	0.7	0.7	0.7	0.7
6:00p	0.7	0.7	0.4	0.0	0.5	0.6	0.9	0.9	0.7	0.6	0.1	0.8	0.7	0.5	0.6	0.6	0.4	0.6	0.4	0.7	0.7	0.3	0.7	0.4	0.6	-0.4	0.5	0.8	0.4	0.7	0.7
7:00p	0.8	0.6	0.5	0.3	0.7	0.7	0.6	0.4	0.6	0.6	0.3	-0.1	0.7	0.3	0.7	0.7	0.5	0.7	0.4	0.7	0.7	0.5	0.4	0.5	0.6	-0.6	0.7	0.3	0.9	0.6	0.6
8:00p	0.6	0.7	0.5	0.6	0.8	0.7	0.4	0.2	0.5	0.6	0.6	0.1	0.8	0.5	0.6	0.6	0.3	0.7	0.5	0.8	0.6	0.6	0.9	0.4	-0.2	-0.5	0.5	0.2	0.7	0.5	0.5
9:00p	0.8	0.7	0.4	0.6	0.8	0.4	0.6	0.6	0.5	0.7	0.5	0.7	0.8	0.6	0.7	0.7	0.5	0.7	0.6	0.6	0.6	0.8	0.3	0.5	-0.4	-0.8	0.5	0.3	0.4	0.6	0.6
10:00p	0.7	0.6	0.5	0.7	0.8	0.4	0.5	0.5	0.6	0.6	0.3	0.7	0.7	0.7	0.7	0.7	0.6	0.8	0.8	0.6	0.7	0.8	0.7	0.7	-0.2	-0.5	0.7	0.3	0.4	0.8	0.8
11:00p	0.6	0.5	0.4	0.7	0.8	0.5	0.7	0.7	0.7	0.5	0.4	0.8	0.7	0.8	0.6	0.6	0.7	0.9	0.8	0.7	0.7	0.8	0.4	0.6	-0.2	-0.4	0.6	0.5	0.6	0.7	0.7
Max.	0.89	0.81	0.65	0.71	0.80	0.95	0.85	0.94	0.84	0.79	0.98	0.96	0.82	0.83	0.83	0.78	0.75	0.96	0.84	0.78	0.81	0.83	1.05	0.88	0.83	0.77	0.76	0.84	0.87	0.76	0.76
Min.	0.60	0.54	0.41	0.05	0.35	-0.04	-0.06	0.11	0.39	0.53	0.01	-0.06	0.67	0.28	0.58	0.33	0.33	0.55	0.42	0.19	0.58	0.30	0.21	0.33	-0.38	-0.81	-0.03	0.23	0.33	0.43	0.43
Avg.	0.75	0.69	0.52	0.49	0.62	0.52	0.56	0.65	0.66	0.66	0.52	0.59	0.74	0.63	0.71	0.58	0.58	0.68	0.67	0.62	0.67	0.70	0.68	0.63	0.50	0.21	0.44	0.62	0.59	0.63	0.63

Average Delta Temperature Calculations: Crystal Falls Hydroelectric Project (Downstream Minus Upstream), June 2001



Hourly Delta Temperature Calculations: Crystal Falls Hydroelectric Project (Downstream Minus Upstream), July 2001

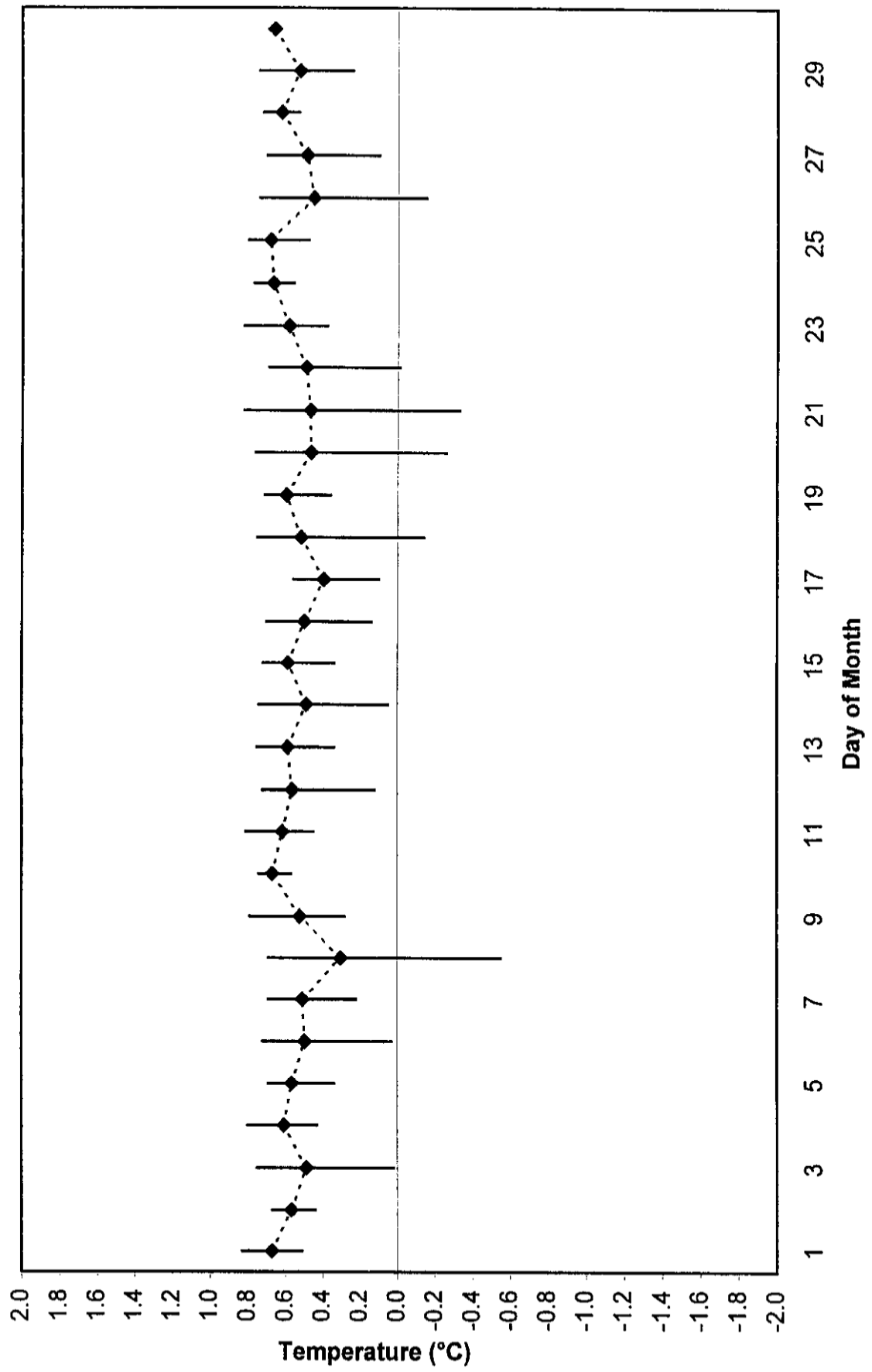
Day of Month

Time	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28	29	30	31
12:00a	0.6	0.7	0.6	0.4	0.6	0.6	0.6	0.6	0.4	0.7	0.6	0.7	0.7	0.7	0.4	0.6	0.1	0.6	0.4	0.7	0.3	0.7	0.7	0.7	0.8	0.7	0.7	0.6	0.5	0.7	**
1:00a	0.7	0.7	0.6	0.5	0.6	0.7	0.6	0.6	0.6	0.7	0.7	0.6	0.7	0.7	0.3	0.6	0.2	0.5	0.6	0.7	0.4	0.7	0.7	0.7	0.7	0.7	0.7	0.6	0.5	**	**
2:00a	0.7	0.7	0.5	0.6	0.6	0.7	0.5	0.7	0.6	0.7	0.7	0.7	0.7	0.7	0.5	0.6	0.2	0.6	0.6	0.7	0.5	0.7	0.7	0.7	0.7	0.6	0.6	0.6	0.7	**	**
3:00a	0.7	0.5	0.7	0.6	0.7	0.7	0.6	0.7	0.6	0.6	0.7	0.7	0.8	0.6	0.5	0.7	0.3	0.6	0.6	0.8	0.6	0.7	0.8	0.7	0.7	0.6	0.7	0.6	0.7	**	**
4:00a	0.8	0.6	0.6	0.6	0.6	0.7	0.7	0.6	0.6	0.6	0.7	0.6	0.6	0.7	0.6	0.6	0.4	0.6	0.6	0.7	0.5	0.7	0.7	0.6	0.7	0.7	0.6	0.7	0.6	**	**
5:00a	0.8	0.6	0.6	0.7	0.7	0.7	0.6	0.7	0.7	0.7	0.8	0.6	0.6	0.6	0.6	0.7	0.5	0.7	0.5	0.7	0.6	0.7	0.6	0.7	0.7	0.6	0.6	0.7	0.6	**	**
6:00a	0.8	0.6	0.8	0.8	0.6	0.7	0.6	0.6	0.6	0.7	0.6	0.7	0.6	0.6	0.6	0.6	0.5	0.6	0.6	0.7	0.6	0.7	0.8	0.8	0.8	0.6	0.7	0.6	0.7	**	**
7:00a	0.7	0.6	0.7	0.7	0.5	0.5	0.6	0.6	0.6	0.7	0.7	0.7	0.7	0.6	0.6	0.6	0.5	0.7	0.7	0.7	0.7	0.7	0.7	0.7	0.8	0.7	0.7	0.6	0.6	**	**
8:00a	0.8	0.6	0.8	0.7	0.6	0.6	0.6	0.6	0.6	0.6	0.6	0.6	0.6	0.6	0.7	0.6	0.5	0.8	0.6	0.7	0.6	0.7	0.7	0.8	0.7	0.7	0.6	0.7	0.5	**	**
9:00a	0.6	0.5	0.7	0.8	0.5	0.5	0.6	0.5	0.5	0.6	0.7	0.6	0.7	0.6	0.7	0.6	0.6	0.8	0.6	0.7	0.6	0.6	0.6	0.6	0.6	0.7	0.7	0.5	0.6	**	**
10:00a	0.7	0.6	0.7	0.5	0.6	0.5	0.3	0.4	0.3	0.7	0.6	0.6	0.6	0.7	0.6	0.6	0.6	0.6	0.6	0.6	0.6	0.3	0.5	0.7	0.6	0.6	0.5	0.6	0.5	**	**
11:00a	0.6	0.5	0.6	0.6	0.5	0.5	0.2	0.4	0.4	0.7	0.5	0.3	0.5	0.6	0.7	0.5	0.6	0.6	0.6	0.6	0.6	0.6	0.3	0.4	0.6	0.7	0.5	0.6	0.6	**	**
12:00p	0.5	0.5	0.6	0.6	0.5	0.3	0.6	0.3	0.4	0.6	0.4	0.1	0.5	0.6	0.7	0.6	0.4	0.6	0.5	0.5	0.8	0.6	0.5	0.6	0.8	0.5	0.4	0.6	0.6	**	**
1:00p	0.7	0.6	0.6	0.6	*	0.5	0.6	0.1	0.3	0.6	0.5	0.2	0.3	0.3	0.7	0.6	0.6	0.6	0.7	0.7	0.8	0.1	0.6	0.7	0.7	0.8	0.3	0.6	0.4	**	**
2:00p	0.5	0.5	0.1	0.5	0.4	0.5	0.6	-0.1	0.3	0.6	0.5	0.4	0.4	0.3	0.6	0.6	0.4	0.7	0.7	0.7	0.8	0.3	0.6	0.7	0.6	0.4	0.3	0.6	0.5	**	**
3:00p	0.6	0.5	0.3	0.5	0.3	0.2	0.4	-0.2	0.3	0.7	0.6	0.3	0.5	0.3	0.6	0.4	0.4	0.6	0.6	0.2	0.3	0.0	0.4	0.7	0.5	0.2	0.3	0.7	0.4	**	**
4:00p	0.5	0.4	0.0	0.6	0.4	0.0	0.4	-0.6	0.5	0.6	0.5	0.4	0.3	0.1	0.6	0.4	0.5	0.4	0.5	0.5	0.6	0.3	0.6	0.6	0.6	0.2	0.3	0.7	0.3	**	0.2
5:00p	0.5	0.5	0.1	0.6	0.4	0.5	0.2	-0.1	0.4	0.7	0.5	0.6	0.5	0.3	0.5	0.4	0.4	0.5	0.5	0.4	0.2	0.3	0.5	0.6	0.7	0.1	0.3	0.6	0.7	**	0.4
6:00p	0.6	0.5	0.7	0.6	0.6	0.1	0.4	-0.3	0.4	0.6	0.6	0.7	0.5	0.5	0.3	0.6	0.5	0.5	0.6	0.3	-0.3	0.2	0.4	0.7	0.7	-0.1	0.3	0.6	0.3	**	0.5
7:00p	0.7	0.5	0.3	0.6	0.6	0.3	0.5	0.1	0.6	0.7	0.7	0.7	0.6	0.3	0.6	0.6	0.1	0.8	0.6	0.2	-0.2	0.5	0.5	0.6	0.6	-0.2	0.1	0.7	0.3	**	0.8
8:00p	0.6	0.5	0.5	0.6	0.7	0.4	0.5	0.1	0.6	0.7	0.6	0.7	0.6	0.5	0.7	0.4	0.1	0.6	0.6	0.1	0.2	0.5	0.5	0.6	0.7	0.1	0.5	0.6	0.2	**	0.9
9:00p	0.7	0.7	0.2	0.6	0.6	0.6	0.4	0.3	0.7	0.7	0.7	0.6	0.7	0.4	0.6	0.1	0.2	0.2	0.6	0.0	0.2	0.5	0.6	0.7	0.8	0.4	0.4	0.7	0.4	**	0.5
10:00p	0.8	0.7	0.3	0.6	0.7	0.5	0.5	0.2	0.7	0.7	0.7	0.7	0.6	0.2	0.6	0.3	0.3	-0.1	0.7	-0.3	0.5	0.6	0.5	0.6	0.7	0.6	0.6	0.5	0.5	**	0.3
11:00p	0.7	0.6	0.3	0.6	0.7	0.6	0.5	0.3	0.8	0.7	0.7	0.7	0.7	0.2	0.6	0.2	0.5	0.0	0.7	-0.1	0.8	0.6	0.6	0.7	0.7	0.5	0.6	0.6	0.7	**	0.6

Max.	0.83	0.67	0.75	0.80	0.69	0.72	0.69	0.69	0.79	0.74	0.81	0.72	0.75	0.74	0.72	0.70	0.56	0.75	0.71	0.76	0.82	0.69	0.82	0.77	0.80	0.74	0.70	0.72	0.74	0.86	0.93
Min.	0.51	0.44	0.02	0.43	0.34	0.03	0.22	-0.55	0.28	0.57	0.45	0.12	0.34	0.05	0.34	0.14	0.10	-0.14	0.36	-0.26	-0.33	-0.01	0.38	0.56	0.48	-0.15	0.10	0.53	0.24	0.86	0.17
Avg.	0.67	0.57	0.49	0.61	0.57	0.50	0.51	0.30	0.52	0.67	0.62	0.56	0.59	0.49	0.59	0.50	0.40	0.52	0.60	0.46	0.47	0.49	0.58	0.67	0.68	0.45	0.49	0.62	0.52	0.86	0.53

* Service point (missing data), ** Battery failure

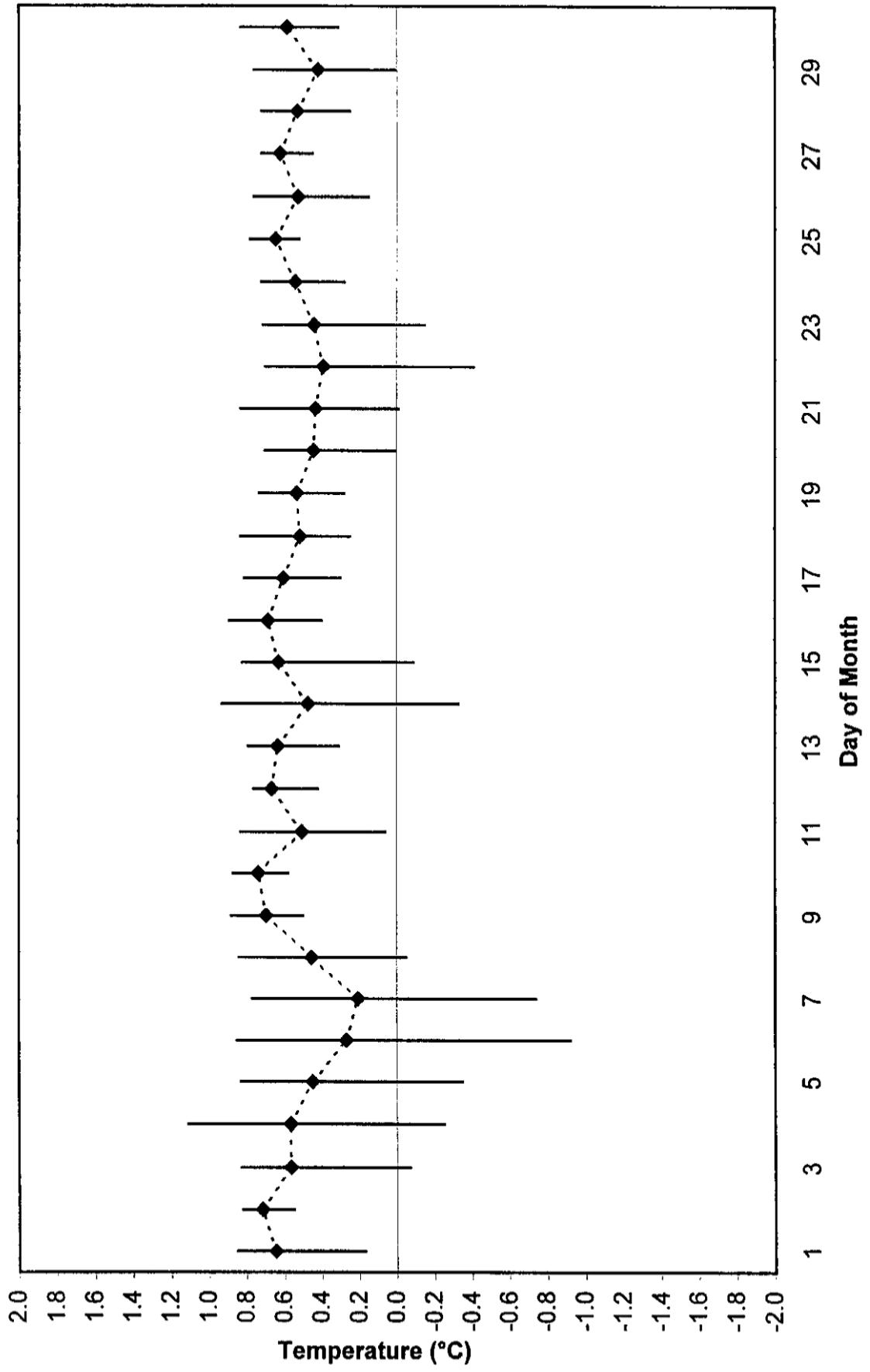
Average Delta Temperature Calculations: Crystal Falls Hydroelectric Project (Downstream Minus Upstream), July 2001



Hourly Delta Temperature Calculations: Crystal Falls Hydroelectric Project (Downstream Minus Upstream), August 2001

Time	Day of Month																																
	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28	29	30	31		
12:00a	0.3	0.7	0.8	0.7	0.1	0.4	0.3	0.3	0.6	0.7	0.8	0.6	0.8	0.7	-0.1	0.7	0.8	0.5	0.7	0.7	0.6	0.4	-0.1	0.6	0.5	0.7	0.6	0.7	0.6	0.7	0.8	0.3	0.6
1:00a	0.2	0.7	0.8	0.8	0.4	0.6	0.5	0.4	0.6	0.7	0.8	0.6	0.7	0.8	0.2	0.7	0.7	0.4	0.6	0.7	0.6	0.5	0.2	0.7	0.6	0.7	0.6	0.7	0.6	0.7	0.7	0.3	0.7
2:00a	0.5	0.8	0.7	0.7	0.7	0.6	0.6	0.7	0.6	0.7	0.8	0.6	0.8	0.8	0.6	0.7	0.8	0.8	0.6	0.6	0.6	0.6	0.4	0.6	0.7	0.6	0.7	0.6	0.7	0.7	0.6	0.7	0.7
3:00a	0.5	0.7	0.8	0.8	0.7	0.6	0.8	0.7	0.7	0.6	0.7	0.7	0.7	0.9	0.6	0.8	0.7	0.7	0.7	0.7	0.6	0.6	0.4	0.7	0.8	0.6	0.7	0.7	0.7	0.7	0.6	0.7	0.7
4:00a	0.6	0.8	0.8	0.7	0.8	0.7	0.7	0.6	0.8	0.7	0.8	0.8	0.7	0.9	0.7	0.9	0.8	0.7	0.7	0.6	0.7	0.6	0.6	0.7	0.7	0.8	0.6	0.7	0.7	0.7	0.7	0.6	0.7
5:00a	0.6	0.7	0.8	0.8	0.7	0.9	0.7	0.6	0.7	0.7	0.6	0.7	0.7	0.8	0.6	0.8	0.7	0.7	0.7	0.7	0.8	0.6	0.7	0.6	0.7	0.7	0.6	0.7	0.7	0.6	0.7	0.6	0.7
6:00a	0.6	0.8	0.7	0.8	0.7	0.8	0.7	0.7	0.8	0.7	0.7	0.7	0.8	0.8	0.7	0.8	0.7	0.8	0.7	0.6	0.8	0.6	0.7	0.7	0.7	0.6	0.6	0.7	0.6	0.7	0.7	0.6	0.7
7:00a	0.8	0.8	0.7	0.7	0.7	0.8	0.7	0.8	0.8	0.7	0.8	0.8	0.7	0.8	0.8	0.8	0.8	0.8	0.6	0.6	0.7	0.7	0.6	0.6	0.7	0.8	0.6	0.6	0.6	0.7	0.6	0.8	
8:00a	0.7	0.8	0.7	0.7	0.8	0.8	0.7	0.8	0.7	0.8	0.7	0.7	0.7	0.8	0.8	0.7	0.7	0.7	0.6	0.6	0.6	0.7	0.7	0.8	0.7	0.6	0.7	0.6	0.7	0.6	0.7	0.8	0.7
9:00a	0.8	0.7	0.8	0.6	0.7	0.8	0.5	0.8	0.6	0.9	0.6	0.7	0.6	0.7	0.7	0.8	0.7	0.6	0.6	0.6	0.6	0.6	0.7	0.7	0.6	0.7	0.6	0.7	0.6	0.5	0.6	0.6	0.6
10:00a	0.9	0.7	0.7	0.7	0.6	0.7	0.8	0.6	0.5	0.8	0.6	0.7	0.5	0.6	0.7	0.8	0.7	0.6	0.5	0.5	0.6	0.5	0.6	0.6	0.6	0.6	0.5	0.6	0.5	0.5	0.6	0.6	0.6
11:00a	0.7	0.7	0.6	0.5	0.3	0.6	0.6	0.6	0.5	0.8	0.6	0.7	0.6	0.7	0.6	0.8	0.7	0.3	0.5	0.5	0.6	0.6	0.4	0.7	0.6	0.5	0.6	0.4	0.5	0.6	0.6	0.6	0.6
12:00p	0.8	0.6	0.4	0.6	0.4	0.5	0.4	0.4	0.7	0.8	0.4	0.6	0.5	0.5	0.7	0.7	0.6	0.4	0.6	0.4	0.3	0.5	0.4	0.6	0.7	0.1	0.5	0.4	0.3	0.4	0.3	0.5	0.6
1:00p	0.8	0.6	0.4	0.8	0.7	0.5	0.3	0.5	0.7	0.7	0.4	0.7	0.4	0.4	0.8	0.6	0.7	0.3	0.4	0.6	0.4	0.5	0.4	0.6	0.6	0.2	0.5	0.4	0.4	0.4	0.6	0.6	0.6
2:00p	0.8	0.7	0.3	1.1	0.4	0.1	0.0	0.8	0.7	0.6	0.4	0.7	0.5	0.4	0.7	0.7	0.4	0.3	0.4	0.4	0.4	0.6	0.3	0.5	0.7	0.4	0.4	0.4	0.5	0.1	0.5	0.8	0.6
3:00p	0.8	0.6	0.1	0.6	0.3	0.1	0.2	0.4	0.7	0.7	0.4	0.4	0.6	0.4	0.6	0.4	0.5	0.3	0.3	0.2	0.3	0.5	0.3	0.6	0.6	0.4	0.5	0.3	0.1	0.3	0.1	0.3	0.6
4:00p	0.7	0.6	-0.1	0.9	-0.1	-0.4	-0.3	0.5	0.7	0.8	0.2	0.6	0.3	0.3	0.6	0.4	0.5	0.3	0.4	0.0	0.1	0.4	0.2	0.4	0.6	0.2	0.6	0.3	0.2	0.3	0.2	0.5	0.7
5:00p	0.6	0.7	0.3	0.4	0.0	-0.2	-0.4	0.4	0.7	0.7	0.1	0.8	0.6	0.2	0.7	0.4	0.4	0.4	0.4	0.2	0.2	0.2	0.3	0.3	0.6	0.5	0.7	0.3	0.1	0.6	0.7	0.7	0.7
6:00p	0.6	0.7	0.5	0.5	0.7	-0.1	-0.6	0.1	0.6	0.7	0.2	0.6	0.6	0.2	0.5	0.5	0.4	0.3	0.1	0.3	0.0	0.2	0.4	0.7	0.5	0.7	0.4	0.2	0.6	0.7	0.6	0.7	0.7
7:00p	0.6	0.7	0.3	0.6	0.8	-0.9	-0.7	0.2	0.8	0.7	0.1	0.6	0.7	0.2	0.7	0.6	0.5	0.4	0.3	0.1	0.0	0.3	0.3	0.4	0.6	0.4	0.6	0.6	0.0	0.6	0.6	0.6	0.6
8:00p	0.5	0.8	0.5	0.1	0.3	-0.6	-0.4	0.0	0.9	0.6	0.1	0.7	0.7	0.3	0.8	0.6	0.5	0.4	0.5	0.1	0.1	0.0	0.3	0.3	0.5	0.5	0.7	0.5	0.0	0.6	0.7	0.7	0.7
9:00p	0.6	0.8	0.7	-0.3	-0.4	-0.5	-0.4	-0.1	0.7	0.8	0.3	0.6	0.6	-0.1	0.7	0.8	0.5	0.5	0.6	0.1	0.1	-0.2	0.5	0.3	0.6	0.5	0.7	0.5	0.1	0.6	0.8	0.8	0.8
10:00p	0.7	0.8	0.6	-0.3	0.0	-0.2	-0.4	0.1	0.8	0.8	0.4	0.7	0.7	-0.3	0.7	0.8	0.3	0.5	0.6	0.4	0.2	-0.4	0.6	0.3	0.6	0.7	0.6	0.7	0.6	0.7	0.3	0.8	0.7
11:00p	0.7	0.8	0.6	0.0	0.4	0.2	0.0	0.4	0.8	0.9	0.7	0.7	0.8	-0.3	0.8	0.8	0.3	0.7	0.7	0.5	0.3	-0.1	0.6	0.5	0.7	0.6	0.7	0.5	0.4	0.7	0.7	0.7	0.7
Max.	0.85	0.82	0.83	1.11	0.83	0.85	0.77	0.84	0.88	0.87	0.83	0.76	0.79	0.93	0.82	0.89	0.81	0.83	0.73	0.70	0.83	0.70	0.71	0.72	0.78	0.76	0.72	0.72	0.76	0.83	0.77	0.77	0.77
Min.	0.17	0.55	-0.07	-0.25	-0.35	-0.92	-0.74	-0.05	0.50	0.58	0.06	0.42	0.31	-0.33	-0.09	0.40	0.30	0.25	0.28	0.01	-0.01	-0.41	-0.15	0.28	0.52	0.15	0.45	0.25	0.01	0.31	0.56	0.56	0.56
Avg.	0.65	0.72	0.57	0.57	0.45	0.27	0.21	0.46	0.70	0.74	0.51	0.67	0.63	0.47	0.63	0.69	0.60	0.52	0.53	0.44	0.43	0.39	0.44	0.54	0.65	0.53	0.62	0.53	0.42	0.58	0.66	0.66	0.66

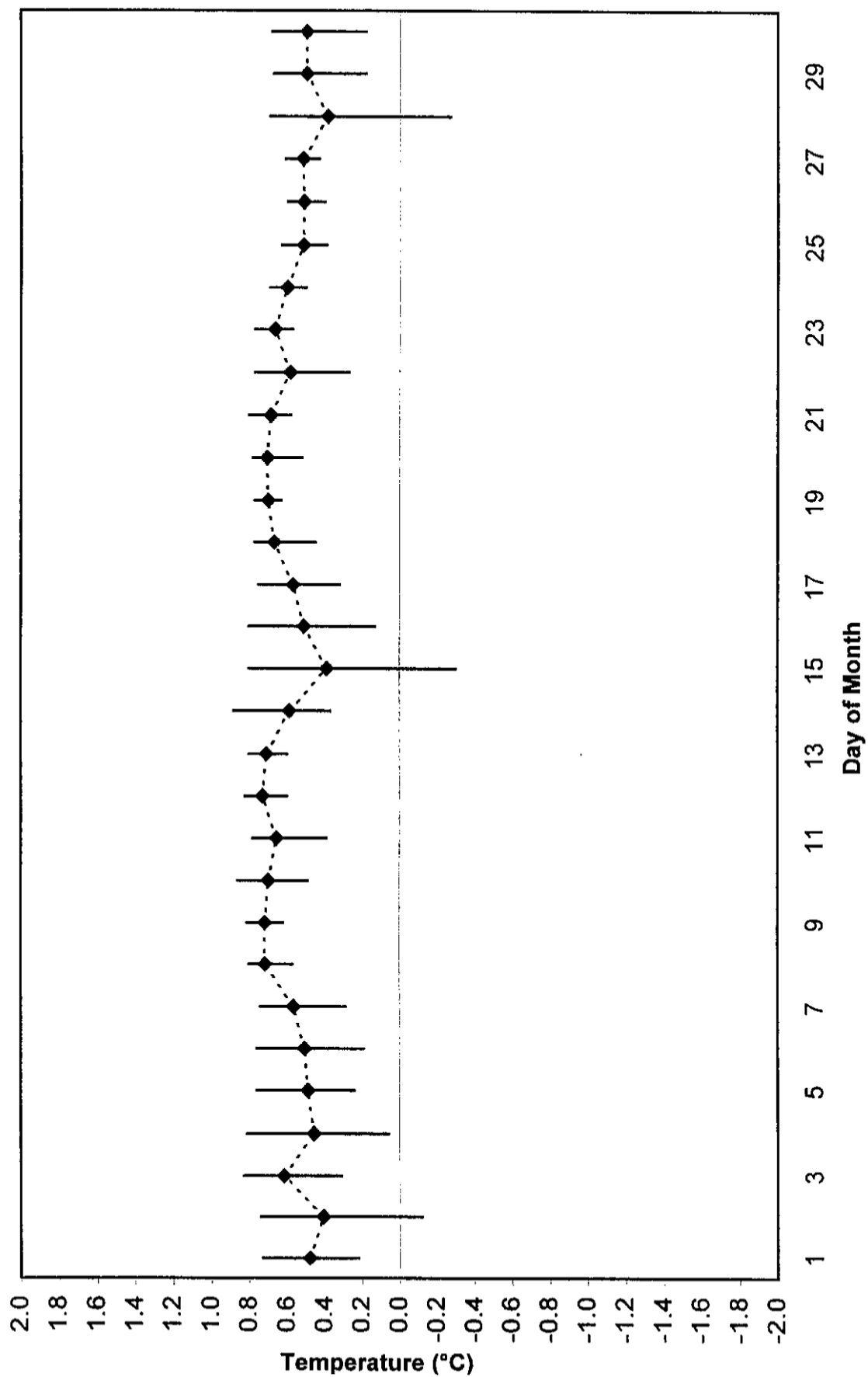
Average Delta Temperature Calculations: Crystal Falls Hydroelectric Project (Downstream Minus Upstream), Aug. 2001



Hourly Delta Temperature Calculations: Crystal Falls Hydroelectric Project (Downstream Minus Upstream), September 2001

Time	Day of Month																													
	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28	29	30
12:00a	0.6	0.4	0.3	0.5	0.4	0.4	0.3	0.6	0.7	0.9	0.8	0.7	0.8	0.9	0.5	0.7	0.4	0.6	0.7	0.7	0.7	0.8	0.6	0.6	0.6	0.5	0.5	0.7	0.8	0.5
1:00a	0.6	0.6	0.5	0.7	0.4	0.5	0.5	0.7	0.8	0.7	0.8	0.8	0.8	0.8	0.6	0.5	0.5	0.7	0.6	0.8	0.7	0.7	0.6	0.7	0.6	0.4	0.5	0.6	0.5	0.7
2:00a	0.5	0.5	0.5	0.8	0.5	0.6	0.6	0.6	0.7	0.8	0.8	0.8	0.6	0.8	0.7	0.7	0.6	0.7	0.7	0.7	0.6	0.8	0.7	0.7	0.5	0.5	0.5	0.6	0.7	0.5
3:00a	0.7	0.6	0.6	0.8	0.6	0.6	0.6	0.6	0.7	0.8	0.8	0.7	0.7	0.8	0.8	0.7	0.7	0.7	0.7	0.7	0.7	0.7	0.7	0.7	0.6	0.5	0.6	0.5	0.6	0.7
4:00a	0.7	0.7	0.6	0.7	0.6	0.7	0.6	0.8	0.7	0.7	0.8	0.8	0.7	0.6	0.8	0.8	0.7	0.8	0.7	0.8	0.7	0.7	0.7	0.7	0.5	0.5	0.5	0.5	0.8	0.7
5:00a	0.6	0.7	0.6	0.7	0.6	0.7	0.6	0.8	0.7	0.7	0.8	0.7	0.8	0.7	0.7	0.8	0.8	0.8	0.7	0.7	0.7	0.7	0.7	0.7	0.6	0.6	0.5	0.5	0.6	0.6
6:00a	0.7	0.7	0.8	0.7	0.8	0.6	0.6	0.8	0.7	0.8	0.8	0.7	0.8	0.7	0.7	0.8	0.7	0.7	0.8	0.8	0.7	0.7	0.6	0.6	0.5	0.4	0.5	0.5	0.5	0.7
7:00a	0.7	0.7	0.7	0.7	0.8	0.6	0.7	0.8	0.7	0.7	0.7	0.7	0.7	0.7	0.8	0.8	0.7	0.7	0.8	0.7	0.7	0.7	0.7	0.6	0.5	0.5	0.5	0.7	0.5	0.6
8:00a	0.7	0.5	0.7	0.8	0.7	0.8	0.6	0.8	0.7	0.8	0.8	0.7	0.7	0.8	0.8	0.7	0.7	0.7	0.7	0.8	0.8	0.7	0.8	0.6	0.5	0.6	0.5	0.6	0.6	0.7
9:00a	0.6	0.7	0.7	0.7	0.7	0.6	0.7	0.8	0.8	0.8	0.6	0.7	0.7	0.6	0.7	0.7	0.7	0.8	0.7	0.7	0.7	0.7	0.6	0.6	0.6	0.5	0.5	0.5	0.8	0.6
10:00a	0.6	0.7	0.7	0.6	0.6	0.6	0.6	0.7	0.8	0.6	0.7	0.7	0.7	0.6	0.6	0.6	0.7	0.7	0.7	0.7	0.7	0.7	0.6	0.7	0.5	0.5	0.5	0.5	0.5	0.5
11:00a	0.6	0.6	0.7	0.6	0.5	0.6	0.8	0.8	0.7	0.5	0.5	0.7	0.6	0.6	0.6	0.7	0.7	0.7	0.7	0.7	0.8	0.7	0.7	0.5	0.4	0.4	0.5	0.5	0.4	0.6
12:00p	0.2	0.6	0.6	0.3	0.6	0.5	0.5	0.8	0.7	0.5	0.7	0.7	0.6	0.4	0.2	0.6	0.7	0.7	0.7	0.8	0.7	0.7	0.7	0.6	0.4	0.4	0.4	0.4	0.5	0.5
1:00p	0.4	0.4	0.7	0.3	0.2	0.5	0.4	0.8	0.7	0.6	0.8	0.6	0.8	0.6	0.6	0.5	0.6	0.6	0.7	0.7	0.6	0.7	0.7	0.6	0.5	0.5	0.4	0.4	0.4	0.5
2:00p	0.3	0.5	0.5	0.1	0.5	0.4	0.4	0.7	0.7	0.5	0.4	0.7	0.6	0.6	0.2	0.5	0.6	0.7	0.7	0.5	0.6	0.7	0.7	0.5	0.5	0.5	0.5	0.3	0.4	0.3
3:00p	0.3	0.4	0.6	0.1	0.4	0.5	0.5	0.7	0.7	0.6	0.5	0.8	0.7	0.7	0.1	0.6	0.4	0.6	0.7	0.7	0.6	0.3	0.7	0.5	0.6	0.5	0.5	0.2	0.6	0.3
4:00p	0.3	0.5	0.6	0.4	0.4	0.4	0.5	0.7	0.6	0.7	0.6	0.7	0.7	0.6	0.1	0.4	0.3	0.6	0.7	0.6	0.7	0.6	0.7	0.7	0.4	0.6	0.5	-0.1	0.6	0.5
5:00p	0.5	0.1	0.6	0.2	0.4	0.5	0.5	0.7	0.6	0.6	0.4	0.8	0.7	0.4	-0.2	0.3	0.3	0.4	0.7	0.7	0.7	0.4	0.7	0.6	0.5	0.6	0.6	0.1	0.7	0.3
6:00p	0.4	0.1	0.6	0.1	0.3	0.5	0.5	0.7	0.7	0.7	0.5	0.7	0.8	0.4	-0.3	0.1	0.5	0.6	0.7	0.8	0.7	0.4	0.6	0.5	0.6	0.5	0.6	-0.3	0.7	0.4
7:00p	0.3	0.1	0.7	0.2	0.3	0.6	0.6	0.7	0.8	0.8	0.7	0.8	0.8	0.4	0.2	0.2	0.4	0.7	0.6	0.7	0.7	0.3	0.7	0.5	0.6	0.6	0.5	0.0	0.3	0.4
8:00p	0.2	0.0	0.6	0.2	0.3	0.3	0.6	0.7	0.8	0.7	0.7	0.7	0.7	0.4	-0.1	0.2	0.5	0.8	0.7	0.7	0.7	0.3	0.7	0.5	0.5	0.5	0.6	0.2	0.2	0.2
9:00p	0.3	-0.1	0.7	0.2	0.4	0.2	0.7	0.7	0.7	0.7	0.6	0.7	0.6	0.4	-0.1	0.2	0.5	0.7	0.6	0.8	0.7	0.3	0.6	0.5	0.5	0.5	0.6	0.4	0.2	0.4
10:00p	0.3	-0.1	0.8	0.3	0.4	0.2	0.7	0.7	0.8	0.8	0.7	0.8	0.7	0.4	0.1	0.3	0.6	0.7	0.7	0.7	0.7	0.4	0.7	0.6	0.5	0.6	0.6	0.5	0.3	0.3
11:00p	0.4	0.0	0.8	0.3	0.5	0.3	0.7	0.6	0.8	0.7	0.8	0.8	0.7	0.5	0.4	0.4	0.6	0.7	0.7	0.8	0.6	0.6	0.6	0.5	0.5	0.5	0.6	0.6	0.4	0.4
Max.	0.73	0.74	0.83	0.81	0.76	0.76	0.74	0.80	0.81	0.86	0.78	0.82	0.80	0.88	0.80	0.80	0.75	0.77	0.77	0.78	0.80	0.77	0.77	0.69	0.63	0.60	0.81	0.69	0.67	0.68
Min.	0.22	-0.12	0.31	0.06	0.24	0.19	0.29	0.57	0.62	0.49	0.39	0.60	0.60	0.37	-0.30	0.13	0.32	0.45	0.63	0.52	0.58	0.27	0.57	0.50	0.39	0.40	0.43	-0.27	0.18	0.18
Avg.	0.48	0.41	0.62	0.46	0.49	0.51	0.57	0.72	0.72	0.70	0.66	0.73	0.71	0.59	0.39	0.51	0.57	0.67	0.70	0.71	0.69	0.58	0.66	0.60	0.51	0.51	0.52	0.38	0.49	0.50

Average Delta Temperature Calculations: Crystal Falls Hydroelectric Project (Downstream Minus Upstream), Sept. 2001



APPENDIX H

Incident Report and Agency Comments to Incident Report and Draft Annual Report for 2001 Monitoring



JOHN ENGLER
GOVERNOR

STATE OF MICHIGAN
DEPARTMENT OF NATURAL RESOURCES
LANSING

K. L. COOL
DIRECTOR

Refer to: 4202.2.76

December 18, 2001

JAN - 4

Mr. Kent Premo
White Water Associates, Inc.
429 River Lane, Box 27
Amasa, MI 49903

Subject: City of Crystal Falls Hydroelectric Project (FERC No. 11402)
Comments on the 2001 Water Quality Monitoring draft report

Dear Mr. Premo:

The Michigan Department of Natural Resources (MDNR) is in receipt of your draft copy of the Water Quality Monitoring study dated December 14, 2001. In this report, results for the City of Crystal Falls Hydroelectric Project Water Quality Monitoring Plan were submitted for data collected during 2001.

Monitoring methods and results were in compliance with the Federal Energy Regulatory Commission (FERC) Order Approving Water Quality Monitoring Plan. Except for one instance, the Crystal Falls hydroelectric project did not influence DO or water temperature beyond limits specified by the state of Michigan.

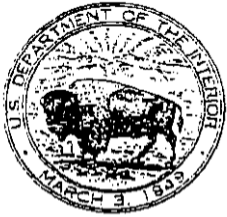
As a result of this compliance, White Water Associates, Inc. has asked for the 2002 monitoring period to be reduced from June through September to only July and August. It is further stated that the shortened monitoring period will be accompanied by more frequent visits for calibration and downloading. Although MDNR is pleased with the monitoring results, we do not agree with this request and believe that the April 10, 1997 FERC Order Approving Water Quality Monitoring Plan should be followed. This order states that "review of the annual report for a three year period will allow us (FERC) to evaluate water quality during project operations." MDNR is willing to consider requests to modify the water quality plan, but only after three years of data show that project operations do no adversely affect water quality in the project area

Thank you for the opportunity to comment. If you have any questions, please contact me.

Sincerely,

Jessica Mistak, Fisheries Biologist
Marquette Fisheries Station
484 Cherry Creek Rd
Marquette, MI 49855
906/249-1611
mistakjl@state.mi.us

cc: Mr. Kurt Newman, MDNR
Mr. Jim Fossum, USFWS



United States Department of the Interior

U.S. FISH AND WILDLIFE SERVICE

Green Bay Field Office

1015 Challenger Court

Green Bay, Wisconsin 54311-8331

facsimile transmittalPages: 2, including this cover sheetDate: 01-24-02Time: 9:15 AMTo: Mr. Kent PremoOffice: White Water AssociatesDestination Fax Number: 906-822-7977From: Jim FossumOffice: USFWS, Green Bay Field OfficeSubject: Water Quality Report - Crystal Falls Hydro

Special Instructions:

Thanks for the Water Quality ReportDue to the need for me to work on higher priority items at this time, I will not be preparing a FWS letter on the report. Please note in your files that the FWS concurs with the Michigan DNR's response dated Dec. 18, 2001.Thanks
Jim

If you have any problems with receipt of this transmission,

please call (920) 465-7440 FAX (920) 465-7410.

Our office hours are 8:00 a.m. to 4:30 p.m. CST.



Out

To: Patricia Grant <patricia.grant@ferc.fed.us>
Subject: Crystal Falls Hydroelectric Project (No. 11402-013), Incident Report
X-Attachments: C:\WINDOWS\Desktop\Cfdochart.xls;
C:\Eudora\Whitewtr\attach\Crystal Falls Low DO 8-01_1.doc;

INCIDENT REPORT FOR CRYSTAL FALLS HYDROELECTRIC PROJECT
Project No. 11402-013
August 22, 2001

Early in August, we recorded a week of DO readings at the monitoring point below the Crystal Falls dam that were frequently below the standards specified by Article 404 (5.0 mg/L or above). While the temperatures never exceeded the standard of 30 C, readings were by far the highest of those ever recorded by White Water Associates, considering data from 1992 and 2000. The record highs in air temperature are well documented by the National Weather Service in Marquette, which reported near 100 F temperatures throughout the south and south central U.P during the period. It also bears up our own weather station records here at White Water's offices in Amasa.

Water temperature has a direct effect on dissolved oxygen levels. For a week, we had water temperatures that often exceeded 25 C and reached highs over 28 C (82.5 F). We do, however, believe there was one other factor responsible for several DO readings falling below 5.0 mg/L during this period: calibration of the DO probe itself.

We typically have a two-week deployment before pickup and exchange or redeployment. This week, when the unit was retrieved from the field (in about 2.5 feet of water) after deployment, the low DO readings were observed to be low in the downloaded data. This deployment was preceded by a deployment that ended with battery failure and loss of a day's worth of data collection period in case you see the gap in the attached graph.

The unit was then calibrated in the lab to check its reliability. The results (in mg/L) of checking against a lab YSI DO meter are as follows:

Tap water:

Reading (probe): 4.2
Reading (YSI): 5.3

Well stirred tap water:

Reading (probe): 6.1
Reading (YSI): 7.4

Recalibration to air (100% O2 saturation):

Reading (probe): 7.2
After calibration: 8.7

This pattern shows the DO probe was consistently low under these three conditions, by 1.1, 1.3, and 1.5, respectively.

Applying the most conservative adjustment of 1.1 mg/L to the readings recorded during the period of concern (August 1-7), the three lowest DO

readings were 4.97, 5.1, and 5.2 (adjusted) indicating an exceedence may have indeed occurred.

According to the FERC order:

"State standards require a DO of at least 5 milligrams/liter (mg/l) and the water downstream shall not receive a heat load that would warm the receiving water at the edge of the mixing zone by more than 5 F above natural water temperatures. Further, the Paint River shall not receive a heat load that would warm the receiving water at the edge of the mixing zone to temperatures greater than monthly maximums."

And further:

"If DO or water temperature, as measured by the approved monitoring system, falls below that required by article 404, the licensee shall file a report with the Commission within 30 days of the date the data becomes available indicating an incident has occurred. The report should, to the extent possible, identify the cause, severity, and duration of the incident, and any observed or reported adverse environmental impacts resulting from the incident. The report should also include: (1) operational data necessary to determine compliance with article 404; (2) a description of any corrective measures implemented at the time of occurrence and the measures implemented or proposed to ensure that similar incidents do not recur; and (3) comments or correspondence, if any, received from the resource agencies regarding the incident. Based on the report and the Commission's evaluation of the incident, the Commission shall reserve the right to require modifications to project facilities and operations to ensure future compliance."

According to the order, this incident report and accompanying agency comments are due with the commission within 30 days of the incident, or September 1. An attached letter from Jessica Mistak of MDNR (in Microsoft Word format) constitutes the agency response to this incident report; by e-mail Jim Fossum of USFWS deferred to MDNR. A more detailed research report will be submitted, according to the schedule of the FERC order, in December which may discuss further supporting data relating to this incident.

To help you understand the data collected so far, I have attached an Excel 2000 spreadsheet showing the raw data, graphs of DO/temperature, and some supporting air temperature data and graphs (Amasa data). It shows two other periods, in July, when temperatures were high and DO low although no exceedences were measured. We will be reviewing upstream DO/temperature profiles for the period as well. We will also download continuous temperature readings from an upstream TempMentor to calculate delta temperatures between the two probes. We will contact the power house to find out what sort of temperature data (air or water) they collect.

We've taken steps to ensure that a properly calibrated unit is in place and operating reliably. We will increase the visits to every 10 days, and more frequent if hot temperatures are experienced. We will always post calibrate units retrieved from the field.

Respectfully submitted,

Out

Kent Premo
Associate Consultant
White Water Associates, Inc.
906/822-7889

**NATURAL RESOURCES
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STEVENS T MASON BUILDING, PO BOX 30028, LANSING MI 48909-7528

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K. L. COOL, Director

REPLY TO:

MARQUETTE FISHERIES STATION
484 CHERRY CREEK RD
MARQUETTE MI 49855-8999

TEL: (906) 249-1611
FAX: (906) 249-3190

Refer to: 4202.2.76

August 27, 2001

Mr. Kent Premo
White Water Associates, Inc.
429 River Lane, Box 27
Amasa, MI 49903

Dear Mr. Premo:

Subject: City of Crystal Falls Hydroelectric Project (FERC No. 11402)
Article 404 State Water Quality Standard Violation (DO)

The Michigan Department of Natural Resources (MDNR) is in receipt of your incident report for the Crystal Falls Hydroelectric Project dated August 22, 2001. In this report, it was noted that dissolved oxygen (DO) readings taken below the dam exceeded state water quality standards (5.0 mg/L or above) within the period of August 1 through 7, 2001. In this report, both water temperature and calibration of the probe are explained as factors that may have led to low DO.

As a result of compliance with state water quality standards during the year 2000, White Water Associates, Inc. asked for the relaxation of the weekly download of data requirement. It was held that visits every two weeks would be adequate to measure changes in conditions and ensure proper operation without risking large amounts of data loss. MDNR agreed that it was appropriate to relax downloading of data to become bi-weekly. However, it was stipulated that bi-weekly downloading was appropriate only if no problems with data collection were encountered. If problems such as unusual DO drift or non-compliance should occur, MDNR requested the licensee return to downloading data on a weekly basis.

In light of the above request and to ensure that similar incidents do not occur, MDNR would like the following measures taken:

- Increase frequency of all visits to download data to 10 days
- If high water temperatures (>25°C) are experienced, download data on at least a weekly basis
- Consistent post-calibration of retrieved data collection units

Thank you for the opportunity to comment. If you have any questions, please contact me.

Sincerely,

Jessica Mistak
Habitat Management Unit
Fisheries Division
906/249-1611
mistakjl@state.mi.us

cc: Dr. Kurt Newman, MDNR
Mr. Jim Fossum, USFWS

APPENDIX I

Client and Consultant Correspondence on Draft Annual Report for 2001 Monitoring



ECOLOGICAL CONSULTING AND
ENVIRONMENTAL LABORATORY SERVICES

WHITE WATER ASSOCIATES, INC.

February 5, 2002

City of Crystal Falls, Electric Department
Attention: David Graff
401 Superior Ave.
Crystal Falls, MI

Dear Mr. Graff:

Regarding your comments on the 2001 final report of the three-year water quality monitoring study for the City of Crystal Falls Hydroelectric Project, I am providing more specific details about our response to the incident that occurred August 2001 where low oxygen readings were recorded. I provided an incident report to the agencies dated August 22 strongly supporting the finding that the unit in question was out of calibration at the time these readings were taken, probably due to DO calibration drift.

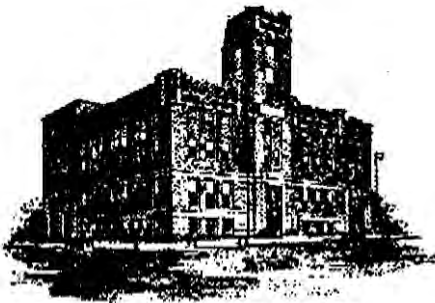
In the incident report, three calibration trials in tap water, well-stirred tap water, and moist air showed differences between the unit and a lab-calibrated YSI DO meter of 1.1, 1.3, and 1.5 mg/L, respectively. Using the most conservative adjustment of 1.1, I reported the lowest reading would have been 4.97. After further review, I have determined that this number was the result of an incorrect rounding procedure. The sum of the lowest recorded reading (3.87) and 1.1 should have been rounded to 5.0, reflecting the accuracy of the YSI meter to the tenth. Additionally, the field unit is more likely reading to the tenth but reporting greater accuracy as a result of its software design.

This rounding procedure (involving the hundredth's decimal place) points out how slight arithmetic decisions can make a difference in determining whether readings are actually within stated water quality standards of 5.0 mg/L or above. Using either of the other corrections of 1.3 and 1.5 would have placed the lowest reading at either 5.2 or 5.4, respectively. An average between the three trial corrections would have settled on 1.3 mg/L rather than the more conservative 1.1 correction used.

For the reasons stated, my professional opinion is that the water quality standard of 5.0 mg/L was not exceeded. Unfortunately, we have no independent evidence, either corroborating or refuting DO measures taken downstream by the continuously measuring Datasonde. No independent DO measurements upstream or downstream were taken during the period when readings were at their lowest. Next summer's stepped-up schedule of every 10 days, with special attention to water temperature conditions above 25°C, may help alleviate the problems of calibration drift and lack of supporting evidence, and provide an ample data set in the final year of the study.

Sincerely,

Kent F. Premo
Associate Consultant



WWW.CRYSTALFALLS.ORG

CITY OF CRYSTAL FALLS
401 Superior Avenue
Crystal Falls, MI 49920

Clerk/Treasurer: (906) 875-3212
City Manager: (906) 875-6647
Fax: (906) 875-3767
TDD: (800) 649-3777

February 6, 2002

Jessica Mistak, Fisheries Biologist
Marquette Fisheries Station
484 Cherry Creek Rd
Marquette, MI 49855

Subject: White Water Associates' Water Quality Monitoring Study, 2001 Final Report
Project No. 11402-013

Dear Jessica Mistak,

Thank you for your careful review of the draft Water Quality Monitoring Study, 2001, for the City of Crystal Falls. There is one item that we would like to clarify for the record. This letter is respectfully submitted to document our claim that the DO levels were never out of compliance in 2001 despite the record temperatures recorded in our region.

After review of the White Water Associates 2001 Final Report and discussing with them their findings, we (The City of Crystal Falls) feel that never once were the DO (dissolved oxygen) levels out of compliance with those specified in Article 404. This is despite the fact that White Water had submitted an incident report to FERC dated August 22, 2001 stating that instruments had recorded levels below the 5.0 mg/L minimum level specified by Article 404. To support our claim, we submit the following information.

In White Water's 2001 water quality monitoring final report, there was but one period (from Aug 5 – Aug 12) in which low levels were recorded. The recorded DO (dissolved oxygen) level in the tailrace had fallen below the 5.0 mg/L lower limit specified by Article 404. However, the monitoring equipment during that period was shown to be out of calibration, and injecting error in the negative direction. Thus, all the recorded DO data should have had higher values. In fact, if the data was compensated by the minimum 10% figure, all the DO recorded data would have been in compliance.

The above information was discussed with and supported by the enclosed fax and letter from White Water Associates dated Feb 15, 2002. Particularly, please pay attention to the last paragraph of the letter where Kent Premo states "For the reasons stated, my professional opinion is that the water quality standard of 5.0 mg/L was not exceeded."

"CITY OF COMMUNITY PRIDE"

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February 7, 2002

Though we feel that the DO level was in compliance, we do realize that instrument drift can lead to faulty data. Consequently, for the year 2002, we shall follow the recommendations you laid out in your August 27, 2001 letter to White Water's Kent Premo, namely

1. Increase frequency of all visits to download data to 10 days
2. If high water temperatures ($>25^{\circ}\text{C}$) are experienced, download data on at least a weekly basis.
3. Consistent post-calibration of retrieved data collection units.

Upon completion of next year's annual report and upon careful analysis of three consecutive years of data, we will want to sit down with the appropriate agencies to investigate a less intensive monitoring program - yet assure that our water quality is not jeopardized.

Sincerely,

D.G.

Dave Graff
Project Engineer

cc: Mr. Kurt Newman, MDNR
Mr. Jim Fossum, USFWS
Ms. Patricia Grant, FERC
✓ Mr. Kent Premo, White Water Associates
Mr. Charles Nordeman, City Manager

