

TES

**DeSabra-Centerville Project,
Two-Year
Water Temperature and
Stream Flow Monitoring Study**

Prepared by
Land and Water Quality Unit

January 28, 1994

Report 026.11-93.8

**Pacific Gas and Electric Company
Technical and Ecological Services
3400 Crow Canyon Road, San Ramon, California 94583**

Memorandum

Date: January 28, 1994 **File #:** 026.11
To: HYDRO GENERATION
From: TECHNICAL AND ECOLOGICAL SERVICES
Subject: DeSabra-Centerville Project Water Temperature Study



NICK MARKEVICH:

This letter is to confirm that today you picked-up 20 copies of the final TES report 026.11-93.8, "DeSabra-Centerville Project, Two-Year Water Temperature and Stream Flow Monitoring Study." The report fulfills the two-year study requirements of Article 402 of the Federal Energy Regulatory Commission's (FERC's) January 1992 order amending the DeSabra-Centerville Project (FERC 803) license.

I understand that you will distribute the report to the FERC, resource agencies, and Hydro Generation employees.

Korky

KORBIN D. CREEK

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Attachment

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EXECUTIVE SUMMARY

In January 1992, the Federal Energy Regulatory Commission (FERC) issued an order amending the DeSabra-Centerville Project license (FERC 803) allowing PG&E to replace the existing Centerville Powerhouse with a new, more efficient unit. Part of the license amendment (Article 402, issued by errata dated February 28, 1992) required PG&E to conduct a two-year water temperature and stream flow monitoring study of the entire project area. The purpose of the study was to provide FERC staff adequate information to determine if potential operational changes in the upper project area might reduce water temperatures for spring-run salmon over-summering in Butte Creek below Lower Centerville Diversion Dam (LCDD). As required, the study was completed within two years of the issuance of the license amendment (1992-1993).

The primary focus of License Article 402 is PG&E facilities upstream of LCDD on Butte Creek and the West Branch Feather River (WBFR) and the effect that operations at these facilities have on stream temperatures in Butte Creek between LCDD and Centerville Powerhouse. This 5.3-mile reach, particularly near Pool 4 (3.8 miles below LCDD), is a summer holding area for spring-run chinook salmon. The chinook's small population and suspected sensitivity to temperature have led to a concern over Butte Creek stream temperatures below LCDD.

Water temperature monitoring and modeling efforts conducted in 1986-1988 for the reach below LCDD established that if incoming temperatures at LCDD were above 16.7°C, then no amount of flow increases (above the 40 cfs maximum) will prevent temperatures in Pool 4 from exceeding 20.0°C. Data collected by PG&E during 1989-1991 indicated that stream temperatures at LCDD generally exceeded 17.0°C beginning in late June and continuing through August. Therefore, on the basis of its own environmental assessment using available stream temperature data, FERC speculated that any possible reduction in water temperature in the reach below LCDD could only be accomplished with facilities and operational changes beyond those already studied.

The purpose of the two-year monitoring program was to collect data from PG&E facilities upstream of LCDD in order to evaluate the ability of changes in project operations to provide cooler water arriving at the LCDD. Temperature monitoring was performed by PG&E in streams and forebays in the project area between Round Valley Reservoir and LCDD. In general, findings of the two-year study indicate that the ability of the upstream project (primarily diversion from the WBFR) to provide cooler water at LCDD is a function of the amount of water available for diversion. It was demonstrated using data collected in 1992-1993 that the most effective method of reducing heating in the system is to maintain incoming flows through DeSabra Forebay at relatively high rates (greater than 50 cfs). However, during below-normal

water years (as in 1992), the ability to divert available water is constrained by the natural flow available, minimum release schedules and various water rights agreements, thereby reducing the total volume of water delivered to the forebay and thus increasing the amount of heating. During above-normal water years (as in 1993) the increased runoff provides sufficient water for all release requirements and still allows adequate flows to DeSabra Forebay to keep heating in the forebay to a minimum.

Using data collected during the two-year monitoring program, different operational scenarios were identified and evaluated with respect to lowering stream temperatures at LCDD. Findings of the evaluations are:

- Round Valley Reservoir, the upper most storage reservoir in the system, is too small and warms too early in the season to provide a significant supply of cool water to reduce temperatures at LCDD.
- Philbrook Reservoir has a limited supply of cool water which is depleted rapidly once increased releases are begun. The combined effect of unregulated WBFR flows and Philbrook releases currently provide relatively cool water for diversion to Butte Creek.
- Increased diversion of the WBFR into Hendricks Canal would not lower temperatures in the canal but would reduce residence time and heating in DeSabra Forebay, which would reduce temperatures slightly at LCDD. However, increased diversion may negatively impact the amount of aquatic habitat in the WBFR downstream of Hendricks Head Dam because of reduced instream flow releases.
- Decreased diversion into Hendricks Canal would produce warmer temperatures at LCDD by: 1) reducing inflow and increasing residence time in DeSabra Forebay and 2) reducing the amount of cool WBFR water delivered to LCDD.
- Increased diversion of Butte Creek into Butte Canal would not lower temperatures in the canal but would reduce residence time and heating in DeSabra Forebay, which would reduce temperatures slightly at LCDD. However, increased diversion may negatively impact the amount of aquatic habitat in Butte Creek downstream of Butte Head Dam because of reduced instream flow releases.
- Decreased diversion of Butte Creek into Butte Canal would produce warmer temperatures at LCDD by: 1) increasing residence time in DeSabra Forebay and 2) leaving more water in the natural Butte Creek channel, which warms more quickly than Butte Canal.
- Eliminating DeSabra Forebay to reduce retention time is not recommended because of operational constraints associated with DeSabra Powerhouse. Channelizing inflow toward the intake to reduce mixing and indirectly reduce retention time would produce only incremental benefits for temperatures at LCDD. The resultant increased capacity would increase retention time during low inflow periods, and may increase temperatures arriving at LCDD.

Based on this assessment, there do not appear to be any feasible operational changes in the upper watershed reservoirs which would provide appreciably cooler water at LCDD, because the volume of cool water is relatively small. This combined with the affect of unregulated WBFR flows and the long total travel time all tend to moderate any potential temperature benefits at LCDD. However, the current operational system of maintaining canal flows at the maximum possible level reduces residence time in the system, which reduces heating and results in the coolest possible temperatures arriving at LCDD. Suggested operational considerations are:

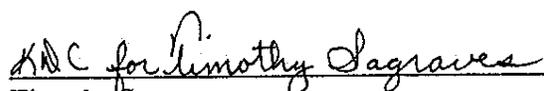
Releases from Round Valley Reservoir should begin as soon as canal capacity is available downstream and should be maintained at a moderate rate (5 to 10 cfs) until the reservoir is empty (approximately 50 to 100 days). The early releases will minimize heating in the reservoir, and any negative impact associated with the inevitable warm release flows will be minimized by the moderate release rate.

The current method of operating Philbrook Reservoir based on water demand downstream appears to be the most beneficial regime. As discussed, the most important factor in minimizing temperature increases in DeSabra Forebay is to maintain flows at moderate to high rates (greater than 50 cfs).

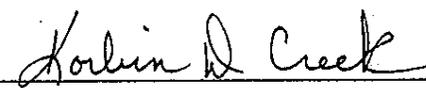
There are no operational changes in either Butte or Hendricks/Toadtown Canal which will reduce temperatures in the canals. However, increased diversions into the canals will slightly reduce residence time in DeSabra Forebay and provide the coolest possible temperatures at LCDD, at the expense of instream flow releases in the affected natural stream reach.

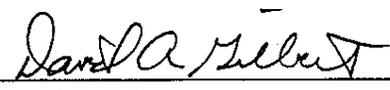
Reduction of residence time in DeSabra Forebay should be achieved using canal inflow rates. The current operational objective of maintaining maximum flows into the forebay should be maintained. It is recommended that any scheduled maintenance outages on Butte Canal or in the WBFR system not take place during the critical temperature period between July 1 and September 15.

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Section 1

INTRODUCTION

The DeSabra-Centerville Hydroelectric Project (FERC 803), operated by Pacific Gas and Electric Company (PG&E), is located in the foothills east of Chico, California (Figure 1-1). The hydroelectric generation system uses water diverted from Butte Creek and the West Branch Feather River (WBFR) for power generation at three powerhouses: Toadtown, DeSabra, and Centerville.

Centerville Powerhouse is the last powerhouse in the system and is located on Butte Creek. Diversions to this powerhouse at Lower Centerville Diversion Dam (LCDD) reduce flows in a 5.3-mile reach of Butte Creek that is used by spring-run chinook salmon for summer holding and spawning. The chinook's small population and suspected sensitivity to temperature have led to a concern over Butte Creek stream temperatures below LCDD.

Stream temperature monitoring and modeling efforts conducted in 1986-1988 for the reach below LCDD established that if incoming temperatures at LCDD were above 16.7°C, then no amount of flow increases (above the 40 cfs maximum) will prevent temperatures in Pool 4 from exceeding 20.0°C. Data collected by PG&E during 1989-1991 indicate that stream temperatures at LCDD generally exceeded 17.0°C beginning in late June and continuing through August.

On the basis of its own environmental assessment using available stream temperature data, the Federal Energy Regulatory Commission (FERC) concluded that any possible reduction in water temperature in the reach below LCDD could only be accomplished with facilities and operational changes beyond those already studied.

In January 1992 the FERC issued an order amending the DeSabra-Centerville Project license, allowing PG&E to replace the existing Centerville Powerhouse with a new, more efficient unit. Part of the license amendment (Article 402, issued by errata dated February 28, 1992) required PG&E to conduct a two-year water temperature and stream flow monitoring study of the entire project area. The purpose of the study was to provide FERC staff adequate information to determine if operational changes in the upper project area might reduce water temperatures below LCDD for over-summering anadromous fish populations. This study was to be completed within two years of the issuance of the license amendment.

The purpose of this report is to document the findings of the two-year monitoring program and discuss the potential effect of operational changes on the temperature of waters arriving at LCDD.

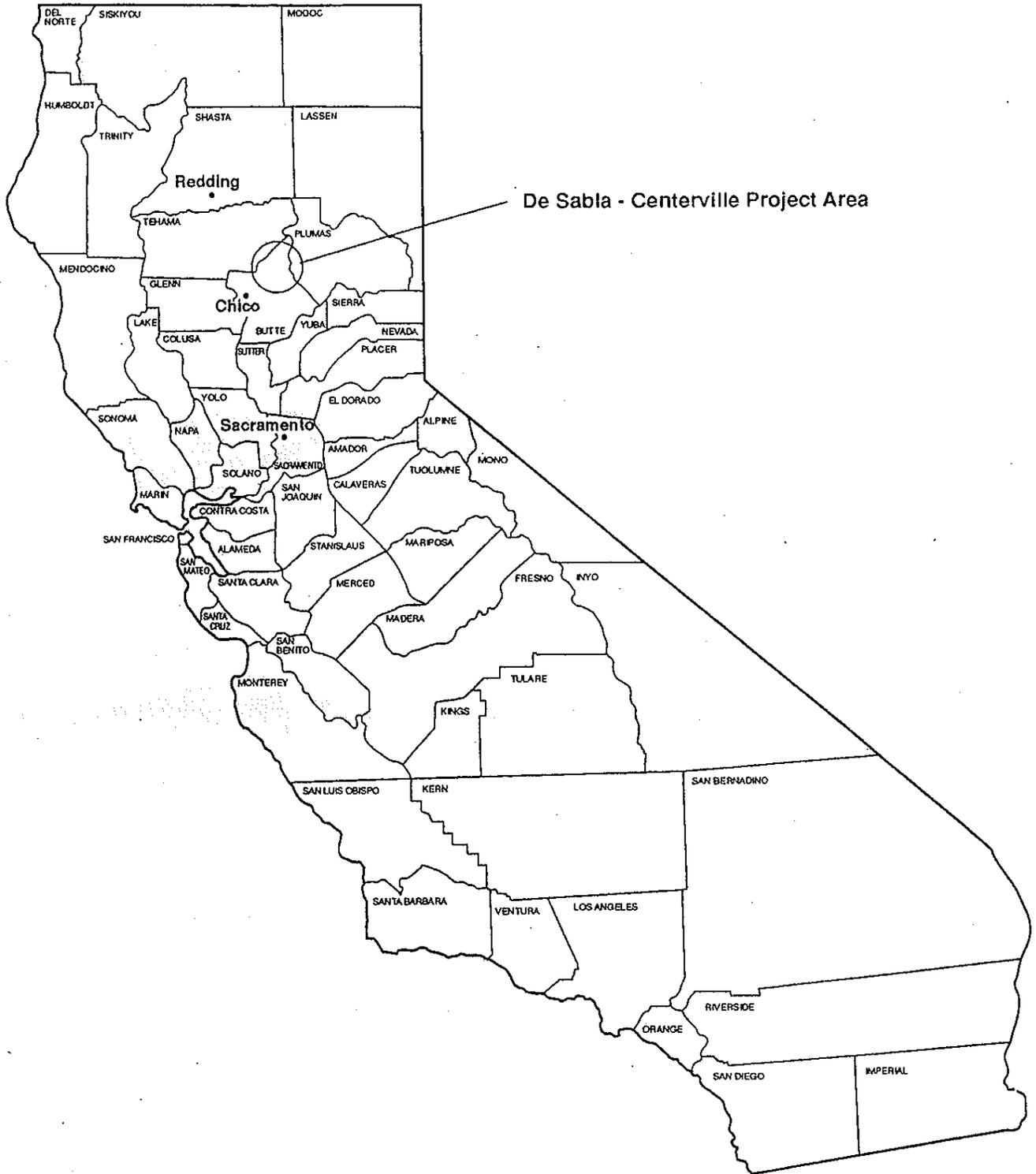


Figure 1-1. DeSabra-Centerville regional area.

Section 2

STUDY OBJECTIVES

The primary focus of License Article 402 is on PG&E facilities upstream of LCDD on Butte Creek and the WBFR, and the effect that operations at these facilities have on stream temperatures in the reach of Butte Creek between LCDD and Centerville Powerhouse.

Different operational alternatives for these facilities were suggested in a FERC and resource agency approved study plan (PG&E 1992a) prepared for the Article 402 two-year monitoring program. These alternatives were:

- Earlier release of Round Valley Reservoir storage.
- Delayed release of Round Valley Reservoir storage.
- Earlier release of Philbrook Reservoir storage.
- Delayed release of Philbrook Reservoir storage.
- Increased diversion of WBFR into Hendricks and Toadtown canals.
- Decreased diversion of WBFR into Hendricks and Toadtown canals.
- Increased diversion of Butte Creek into Butte Canal.
- Decreased diversion of Butte Creek into Butte Canal.
- Decrease retention time in DeSabra Forebay by either eliminating the forebay or channelizing inflow to the intake.

Using data obtained from the 1992-1993 monitoring program, each alternative is evaluated based on temperature affects at that point and downstream in Butte Creek below LCDD. The results are discussed in this report.

Section 3

STUDY AREA

The DeSabra-Centerville Project uses water from Butte Creek and West Branch Feather River watersheds. Rainfall and snow melt are the principal sources of water with minor contributions from groundwater. Heavy flows from snow melt occur in late spring and early summer. Flows are typically lowest in late summer and early fall (September through October).

A complex of hydroelectric generation and water supply systems now control flows in Butte Creek in the project area (Figure 3-1). PG&E's system includes two small storage reservoirs (Round Valley and Philbrook), DeSabra Forebay, several small diversion dams, canals, tunnels, penstocks, and three powerhouses.

WEST BRANCH FEATHER RIVER

The WBFR drains a watershed ranging in elevation from 7,000 feet above mean sea level (msl) to 3,200 feet above msl at the Hendricks Head Dam (PG&E's diversion point). Philbrook and Round Valley reservoirs are used to store winter runoff, which is then used to supplement summer flows in the WBFR. These reservoirs have a combined capacity of 6,200 acre-feet.

Round Valley Reservoir

Round Valley Reservoir is at the head of the WBFR. Round Valley Reservoir has a maximum depth of about 25 ft, it holds approximately 1,200 acre-feet, and it is more than 12 stream miles above Hendricks Head Dam. Article 39 of the FERC license requires a minimum instream flow release of 0.5 cfs and 0.1 cfs at the dam in normal and dry water years, respectively. The WBFR is joined by Coon Hollow Creek approximately 1.3 miles downstream of the Round Valley release.

As per the 1983 Fish and Wildlife Agreement between PG&E and the California Department of Fish and Game (CDF&G), in normal water years PG&E does not draft Round Valley Reservoir until after July 15 for waterfowl management. After July 15, the reservoir is lowered at the maximum rate of 15 cfs and is generally empty by the end of August.

Philbrook Reservoir

Philbrook Reservoir is near the head of Philbrook Creek, a tributary to WBFR. Philbrook Reservoir has a maximum depth of about 60 ft, it holds approximately 5,000 acre-feet, and it is more than 10 stream miles

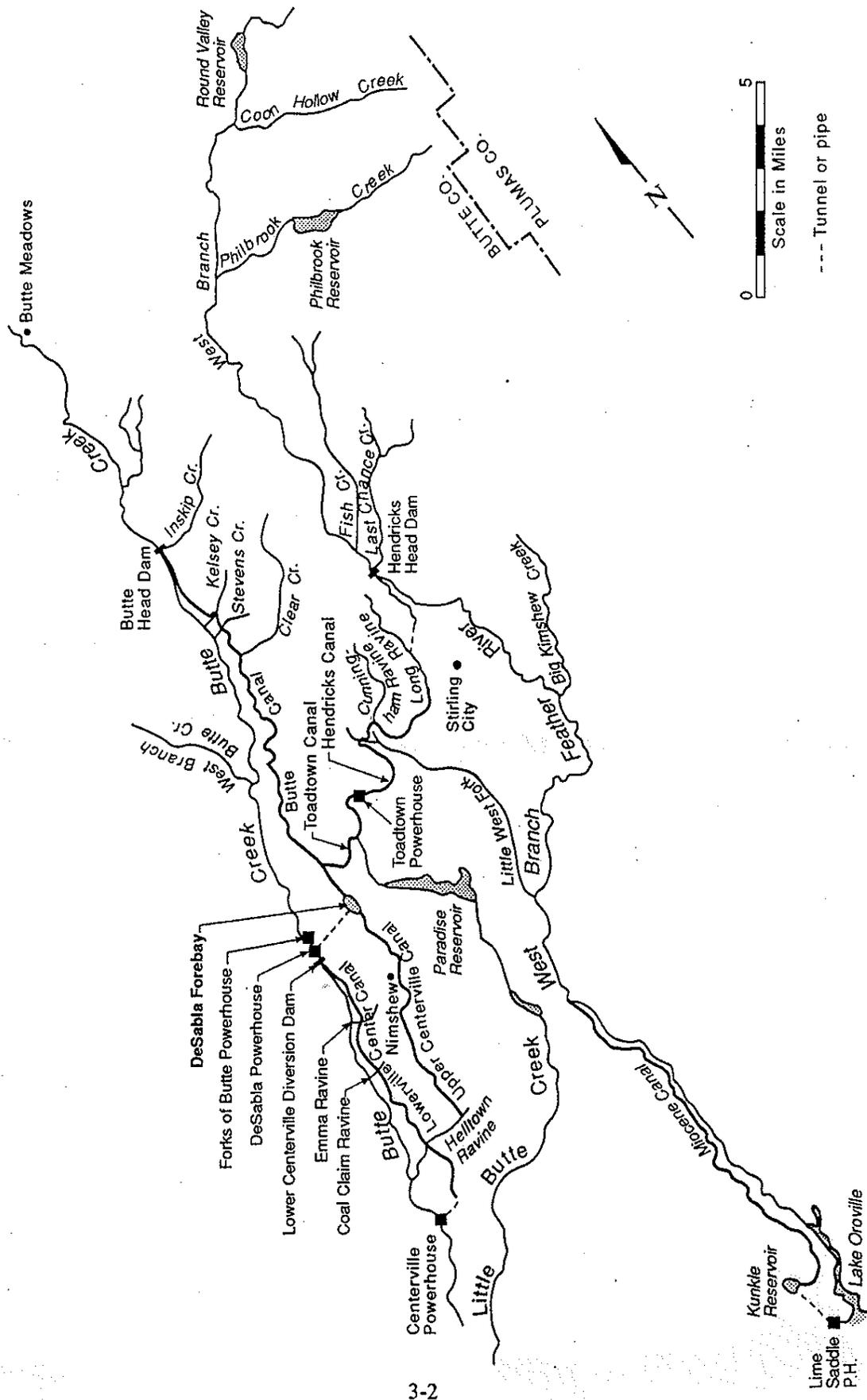


Figure 3-1. DeSabra-Centerville project area.

from the Hendricks Head Dam. Article 39 of the FERC license requires a minimum pool of no less than 250 acre-feet and minimum instream flow release of 2 cfs at the dam. PG&E generally begins to draft water from the reservoir after July 4, however, water is usually not released until capacity is available in the Lower Centerville Canal since to do otherwise would result in spilled water at LCDD. Drawdown usually continues at approximately 45–50 cfs until the minimum pool is reached in November. The confluence of Philbrook Creek and the WBFR is 2.0 miles downstream of the Philbrook release.

Hendricks Canal

Hendricks Canal is approximately 11 miles long and is composed mostly of earthen ditch with several flume and tunnel sections. It carries up to 125 cfs diverted from the WBFR at Hendricks Head Dam. Hendricks Diversion Dam, a secondary diversion dam located on Long Ravine Creek, is 2.4 miles downstream from the WBFR and Hendricks Head Dam. Hendricks Canal follows the contour of the land and is well shaded.

Toadtown Powerhouse

Toadtown Powerhouse is fed by water from the Hendricks Canal through a welded steel penstock. The powerhouse is located approximately 8.6 miles downstream of Hendricks Head Dam. There is no storage reservoir associated with the powerhouse.

Toadtown Canal

Toadtown Canal begins at the tailrace of Toadtown Powerhouse. It is principally an earth canal with a capacity of 125 cfs. Toadtown Canal joins Butte Canal approximately 0.7 mile above DeSabra Forebay. The total length of the Toadtown Canal is about 2.4 miles.

BUTTE CREEK

The Butte Creek basin ranges in elevation from 7,100 feet above msl to 550 feet above msl at Centerville Powerhouse. Butte Creek drains into the Sacramento River approximately 50 miles below Centerville Powerhouse near Colusa, California.

Water is first diverted from Butte Creek at the Butte Head Dam, where up to 91 cfs enter Butte Canal. Butte Canal also diverts several small Butte Creek tributaries.

Approximately 4 miles below the Butte Head Dam on Butte Creek is the Forks of Butte Hydroelectric Project Diversion Dam, which diverts water for use at Forks of Butte Powerhouse. These facilities are owned and operated by Energy Growth Partnership Inc. Forks of Butte Powerhouse is about 9.7 stream miles downstream from Butte Head Dam, immediately upstream of PG&E's DeSabra Powerhouse. The

Forks of Butte Project can divert up to 275 cfs, with a 47 cfs minimum instream flow requirement. As a result of the 47 cfs flow requirement, the powerhouse does not operate through most of the summer since adequate flows are not available.

Butte Canal

Butte Canal can carry approximately 91 cfs and is about 11 miles long. It is comprised of earth berm sections, gunited sections, a siphon, and flume sections. It generally follows the contour of the hillside and is well shaded.

Approximately 0.7 mile above DeSabra Forebay, Butte Canal and Toadtown Canal (carrying water diverted from the West Branch Feather River) join and flow to DeSabra Forebay. This location is 10.7 canal miles downstream from Butte Head Dam.

DESABLA FOREBAY

DeSabra Forebay has a listed capacity of 188 acre-feet, however, sedimentation has reduced this capacity significantly. The forebay has a surface area of approximately 14 acres at full capacity. DeSabra Forebay is a regulating facility for DeSabra Powerhouse; however, the powerhouse and associated intake is float controlled and the reservoir fluctuates minimally during normal operations. The forebay is stocked annually with trout by CDF&G and is popular with local fishermen and summer recreationists.

DESABLA POWERHOUSE

DeSabra Powerhouse is fed by water from DeSabra Forebay through a welded steel penstock, and discharges directly into Butte Creek above LCDD. It has a capacity of approximately 200 cfs. The powerhouse is about 1.3 miles downstream of DeSabra Forebay.

LOWER CENTERVILLE CANAL

The Lower Centerville Canal diverts approximately 185 cfs from Butte Creek below DeSabra Powerhouse. It is approximately 8 miles long and is composed of earthen canal and several flume sections. It is more exposed to solar radiation than either the Hendricks or Butte canals. The Lower Centerville Canal carries water to Centerville Powerhouse.

LOWER BUTTE CREEK

A minimum flow of 40 cfs ^{June} (July 1 to September 15) is released into Butte Creek at LCDD. Pool 4 is located 3.8 miles downstream of LCDD. This pool represents the lower end of the most suitable salmon holding area, and was used as the site where temperature conditions were measured. The objective stream temperature at this location is 20°C as a daily maximum. The stream morphology in this section of Butte

Creek is primarily steep bedrock channels with additional large boulder substrate. A second monitoring location in Butte Creek is located at Helltown Bridge, which is about 4.8 miles downstream from LCDD. The Helltown Bridge area represents the lowest end of the regulated section where spring-run salmon over-summer.

CENTERVILLE POWERHOUSE

Centerville Powerhouse is fed by water from the Lower Centerville Canal through two riveted steel penstocks. The forebay is a 27 ft x 37 ft concrete header box. The present and proposed powerhouses have the same flow capacity of about 195 cfs. The Centerville Powerhouse discharges directly into Butte Creek about 5.3 miles downstream of LCDD.

Section 4

STUDY DESIGN

Monitoring was conducted between May and September in 1992 and 1993 to define conditions during the summer period. Table 4-1 lists the monitoring activities by station. Figure 4-1 presents a schematic map of the various sampling station locations.

WATER TEMPERATURE

Continuous water temperature monitoring was conducted from May through September 15 of each year at 19 stations in the project area—three lake profile stations and 16 stream stations.

STREAM FLOW

Mean daily stream flow data was collected from the locations indicated in Figure 4-1. Data was gathered using existing PG&E stream flow gages.

LAKE STORAGE

Lake stage/storage was determined at the two storage reservoirs. Existing PG&E lake stage gages were used as were the associated lake storage tables.

METEOROLOGY

Mean daily meteorology was monitored at three locations to aid in the analysis and interpretation of water temperature data. Two meteorological stations were operated in the project area above LCDD: Philbrook Reservoir and at DeSabra Forebay. These stations were temporary installations operated from July-September 1992 and June-September 1993 (Figure 4-1). Meteorology for the project area below LCDD was obtained from a PG&E station in Chico.

TIME-OF-TRAVEL STUDIES

Time-of-travel studies were conducted in June and August 1993, to establish the rate at which water is transported through the upper system of natural stream channels, canals, and reservoirs. These studies were conducted under low and high flow conditions on various sections within the system.

SPECIAL STUDIES

The National Marine Fisheries Service and the U.S. Fish and Wildlife Service (USF&WS) recommended that PG&E experimentally evaluate certain potential changes in operation. Increasing the instream flow release at Butte Head Dam and changing operations of Round Valley and Philbrook reservoirs were

Table 4-1

Centerville Temperature Study Station Location and Activities

Site	Location	Continuous Temperature	Meteorology	Flow or Stage
<i>Stream Stations:</i>				
WBFR	below Round Valley Reservoir	X		X
Philbrook Creek	below Philbrook Reservoir	X		X
WBFR	above Hendricks Head Dam	X		X
Hendricks Canal	above Hendricks Diversion Dam	X		
Toadtown Canal	below Toadtown Powerhouse	X		
Toadtown Canal	above Butte Canal confluence	X		X
Butte Creek	above Butte Head Dam	X		X
Butte Canal	above Toadtown Canal confluence	X		X
Butte Canal	above DeSabra Forebay	X		
Butte Creek	above Forks of Butte Powerhouse	X		
DeSabra PH Tailrace	DeSabra Powerhouse Tailrace outfall	X		X
Butte Creek	below LCDD	X		X
Butte Creek	at Pool 4	X		
Butte Creek	at Helltown Bridge	X		
Lower Centerville Canal	at Canal Head-works	X		X
Butte Creek	below Centerville Powerhouse	X	X (Chico)	X
<i>Lake Stations:</i>				
Round Valley Reservoir	near Dam	X		X
Philbrook Reservoir	near Dam	X	X	X
DeSabra Forebay	at Intake	X	X	X

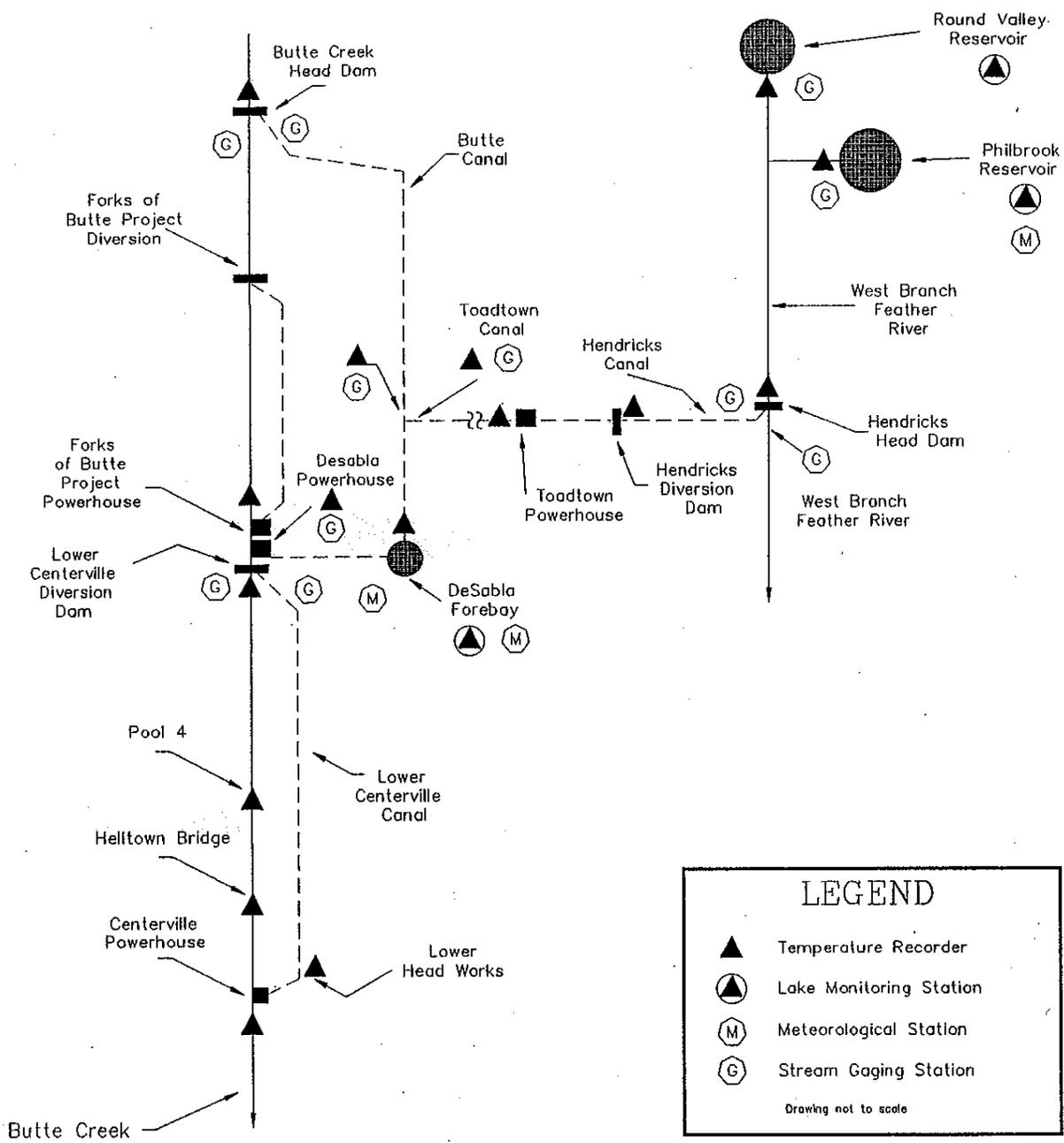


Figure 4-1. Schematic diagram of project area sampling locations.

specifically suggested. Studies to address these issues were incorporated into the monitoring plan. On its own accord, PG&E also performed a bathymetric investigation of DeSabra Forebay to evaluate the effects of bottom topography on retention time.

Test of Various Butte Creek Flow Releases

To show specifically the result of increasing the instream flow release at Butte Head Dam, PG&E made the following test releases:

1. PG&E released nearly the full flow of Butte Creek from Butte Head Dam at the present location of the instream flow release for a period of 3 days in August 1992. Approximately 7 cfs was retained in the canal to maintain fish life and provide a cool water inflow for the DeSabra Forebay fishery.
2. PG&E then split incoming flows at Butte Head Dam between the canal (33%) and creek (67%) for 5 days in August 1992.

These test flow releases were made with the Hendricks Canal out of service. This effectively isolated the effects of the different Butte Creek flow splits and provided information on heating occurring in DeSabra Forebay during low inflows.

Altered Release of Round Valley Reservoir

The USF&WS suggested that PG&E consider releasing water from Round Valley Reservoir earlier in the year. Presently PG&E is required by the 1983 Fish and Wildlife Agreement, which was incorporated into Exhibit S of the FERC license, to maintain Round Valley Reservoir at or above elevation 5,650 until July 15 of normal water years and June 1 of dry years. Water needs prior to these dates are met by releasing water from Philbrook Reservoir. The delay in releasing Round Valley water can result in significant heating of the reservoir due to its small volume and shallow depth (average depth is approximately 10 feet at full pool).

To evaluate the USF&WS suggestion, during the 1993 monitoring season PG&E attempted to draft Round Valley Reservoir as soon as the water could be beneficially used downstream for power generation. Due to above normal precipitation in 1993, however, releases could not be started any earlier than normal and the effectiveness of earlier Round Valley Reservoir releases could not be evaluated.

DeSabra Forebay Bathymetry

To aid in evaluating temperature changes occurring in DeSabra Forebay, a bathymetric investigation was performed in August 1993. The objective of this investigation was to determine current forebay capacity and to define the bottom topography sufficiently to help explain forebay temperature dynamics.

Section 5

METHODS

Personnel from PG&E's Technical and Ecological Services department (TES) Water Resources Unit were responsible for the installation, calibration, site sampling efforts, data analysis, and management of the monitoring program.

WATER TEMPERATURE

Continuous water temperature was recorded using Omnidata International's Datapod Model 112 thermographs. The Model 112 Datapod is accurate to 0.1°C, and has a temperature range of 5 to 30°C. Recorders were deployed between May and early July in 1992 and between May and early June in 1993. The late installations were due to delays in obtaining instrumentation or access problems related to the snow pack.

Stream station recorders were located at one specific depth at each location. Lake station recorders were located at multiple depths (usually top, middle, and bottom) depending on overall depth. Continuous temperature data was recorded as hourly averages. To verify their accuracy, Omnidata International datapods were calibrated to reference temperatures before and after being placed in the field. In addition, synoptic water temperature measurements were made during monthly site visits. The resulting calibration and synoptic data was compared with recorder output to confirm recorded measurements.

STREAM FLOW

Existing stream gage stations were used to gather flow data for this monitoring program. The stations were maintained and operated by PG&E according to standard US Geological Survey Methods.

LAKE STORAGE

Existing lake stage gages were used during this monitoring program. PG&E's established area/capacity rating curves were used to convert stage readings into storage.

METEOROLOGY

The two temporary meteorological stations were deployed in early July 1992, because of delays in obtaining the monitoring instrumentation. In 1993, the DeSabra meteorological station was installed in May, while the Philbrook station was installed in early July. The Philbrook installation was delayed until July because of access problems related to the snow pack.

The data collected at each meteorological station included average hourly wind speed and direction, air temperature, relative humidity, and solar radiation. Data was recorded at the two stations located above LCDD using Omnidata International's meteorological recorders and sensors. The data at the Chico station was recorded using instrumentation already in place and maintained by PG&E.

TIME-OF-TRAVEL STUDIES

Time-of-travel studies in Butte Creek, WBFR and associated diversion canals were conducted in 1993. Rhodamine WT dye was released into the water course where travel time was being determined. Dye release volumes were calculated based on assumed velocities and a desired 10 part per billion concentration at the end of the study reach. The dye concentration was measured at the end of each study reach using a fluorometer. Knowing the release time, the travel time was determined by monitoring the passage of the dye using a fluorometer. Separate tests were conducted on relatively homogeneous stream/canal segments to determine overall time-of-travel. Travel times were determined at high and low flows at most sites throughout the system.

Section 6

RESULTS

This section presents the results of the two-year monitoring program. Analysis and interpretation of the data follows in Section 7. The study plan outlined a monitoring period of May through September, however for various reasons (equipment availability, site access) not all recorders were deployed in May of either year. Therefore, the comparison of data ranges between years is based on a period from June 1 through September 15 unless otherwise stated. The various project watershed facilities have been separated into sections to facilitate discussion.

WATER TEMPERATURE

Table 6-1 summarizes the water temperature data collected during the monitoring program. Appendix A presents the hourly average data and daily minimum, maximum and mean values recorded at each station. Appendix B presents graphs of daily mean water temperatures as well as corresponding mean daily air temperature and flow at each station. Appendix C presents temperature profiles from Round Valley and Philbrook reservoirs.

West Branch Feather River

Near-surface temperatures in Round Valley Reservoir ranged from 12.8 to 24.1°C during the two year monitoring program. Bottom temperatures during the same period ranged from 11.6 to 22.8°C. The instantaneous difference between top and bottom temperatures within the reservoir in 1993 averaged 0.4°C, with a maximum of 2.9°C. Continuous temperature was not measured in 1992, but based on monthly profiles, these differences were similar to that observed in 1993. Figure 6-1 presents temperature data from recorders deployed in the reservoir at different depths in the water column, along with release flow rates.

Release temperatures in the WBFR below Round Valley Reservoir ranged from 13.5 to 25.5°C in 1992 and from 9.2 to 22.0°C in 1993. July temperatures averaged 18.7°C in 1992 and 18.6°C in 1993. Average August temperatures were 19.9 and 19.6°C for 1992 and 1993, respectively. Figure 6-2 compares mean monthly data from each of the stream stations in the WBFR.

Near-surface temperatures in Philbrook Reservoir ranged from 7.1 to 24.9°C during the two year monitoring program. Bottom temperatures during the same period ranged from less than 5.0 to 21.9°C. Thermal stratification within the reservoir was greatest in 1993 averaging 7.4°C, with a maximum of 13.7°C. Stratification in 1992 averaged 5.7°C, and reached a maximum of 9.4°C. Maximum stratification

Table 6-1

Monthly Water Temperature Summary for the DeSabra-Centerville Project

Station Description	Month	Year	Monthly		Monthly Mean (°C)	Average Daily		Maximum Daily		Minimum Daily		Number of Data Days in Month	Remarks
			Maximum (°C)	Minimum (°C)		Range	Range	Range	Range				
WBFR below Round Valley Reservoir	MAY	1992	19.8	12.3	15.3	3.6	4.4	2.6	18				
	JUNE	1992	21.2	14.1	16.9	2.9	4.3	1.6	30				
	JULY	1992	22.8	14.5	18.7	2.0	4.1	0.3	31				
	AUG	1992	25.5	15.3	19.9	4.6	6.3	1.0	25				
	SEPT	1992	21.4	13.5	16.3	5.2	6.2	3.1	15				through Sept. 15
	MAY	1993	--	--	--	--	--	--	0				
	JUNE	1993	19.3	9.2	13.9	3.0	5.2	0.0	20				
	JULY	1993	21.4	15.2	18.6	2.3	4.5	0.5	31				
	AUG	1993	22.0	15.4	19.6	0.8	2.4	0.0	19				Reservoir dry on 8/19/93
	SEPT	1993	--	--	--	--	--	--	0				
Round Valley Reservoir at 3 ft depth	MAY	1992	--	--	--	--	--	--	0				
	JUNE	1992	19.3	12.8	16.3	0.7	1.6	0.0	20				
	JULY	1992	23.7	18.5	20.3	1.5	4.4	0.5	31				
	AUG	1992	24.1	15.7	20.1	1.3	3.9	0.0	19				Reservoir dry on 8/19/93
	SEPT	1992	--	--	--	--	--	--	0				
Round Valley Reservoir at 20 ft depth, (1 ft off bottom)	MAY	1993	--	--	--	--	--	--	0				
	JUNE	1993	18.4	11.6	15.7	0.5	1.4	0.0	20				
	JULY	1993	21.6	18.3	19.8	0.8	2.1	0.3	31				
	AUG	1993	22.8	15.4	19.7	1.0	3.1	0.0	19				Reservoir dry on 8/19/93
	SEPT	1993	--	--	--	--	--	--	0				
Philbrook Crk below Philbrook Reservoir	MAY	1992	15.4	11.3	12.9	1.5	2.7	0.7	18				
	JUNE	1992	14.2	6.4	9.3	2.0	3.4	0.8	30				
	JULY	1992	14.6	6.7	9.2	1.2	3.0	0.6	31				
	AUG	1992	21.6	10.7	17.5	1.4	3.0	0.6	31				
	SEPT	1992	19.3	15.6	17.5	1.4	1.5	1.5	15				through Sept. 15
	MAY	1993	--	--	--	--	--	--	0				
	JUNE	1993	6.9	5.2	5.7	0.6	1.3	0.0	20				
	JULY	1993	8.1	5.9	6.7	1.0	1.9	0.3	31				
	AUG	1993	17.8	7.3	12.1	0.8	1.1	0.5	31				
	SEPT	1993	18.3	16.5	17.6	0.5	1.2	0.3	15				

Table 6-1 (continued)

Monthly Water Temperature Summary for the DeSabra-Centerville Project

Station Description	Month	Year	Monthly Maximum (°C)		Monthly Minimum (°C)		Monthly Mean (°C)	Average Daily Range		Maximum Daily Range		Minimum Daily Range		Number of Data Days in Month	Remarks
			Max	Min	Max	Min		Avg	Max	Min	Max	Min			
Philbrook Res. at 5 ft depth	MAY	1992	--	--	--	--	--	--	--	--	--	--	--	0	
	JUNE	1992	--	--	--	--	--	--	--	--	--	--	--	0	
	JULY	1992	24.9	17.5	20.5	1.6	3.7	0.4						24	Reservoir below recorder level
	AUG	1992	--	--	--	--	--	--	--	--	--	--	--	0	
Philbrook Res. at 25 ft depth; (25 ft off bottom)	SEPT	1992	--	--	--	--	--	--	--	--	--	--	--	0	
	MAY	1993	--	--	--	--	--	--	--	--	--	--	--	0	
	JUNE	1993	16.2	7.1	12.7	1.2	3.3	0.0						20	
	JULY	1993	20.1	15.2	18.4	0.7	2.0	0.3						31	
Philbrook Res. at 55 ft depth; (5 ft off bottom)	AUG	1993	21.5	18.3	19.6	1.0	1.5	0.4						31	
	SEPT	1993	20.6	14.0	19.1	1.5	5.6	0.9						15	
	MAY	1992	--	--	--	--	--	--	--	--	--	--	--	0	
	JUNE	1992	--	--	--	--	--	--	--	--	--	--	--	0	
Philbrook Res. at 55 ft depth; (5 ft off bottom)	JULY	1992	22.1	17.1	20.0	0.8	1.2	0.3						24	
	AUG	1992	23.1	19.1	20.9	0.8	2.3	0.3						31	
	SEPT	1992	19.5	16.9	18.4	0.4	0.6	0.3						15	through Sept. 15
	MAY	1993	--	--	--	--	--	--	--	--	--	--	--	0	
Philbrook Res. at 55 ft depth; (5 ft off bottom)	JUNE	1993	12.5	5.3	7.6	0.9	4.3	0.0						20	
	JULY	1993	15.5	8.4	10.8	0.9	1.7	0.4						31	
	AUG	1993	19.8	14.3	18.1	0.8	2.5	0.2						31	
	SEPT	1993	19.4	17.2	18.6	0.4	1.3	0.2						15	
Philbrook Res. at 55 ft depth; (5 ft off bottom)	MAY	1992	--	--	--	--	--	--	--	--	--	--	--	0	
	JUNE	1992	--	--	--	--	--	--	--	--	--	--	--	0	
	JULY	1992	21.3	9.5	14.6	1.4	2.4	0.7						24	
	AUG	1992	21.9	19.2	20.6	0.5	0.8	0.1						31	
Philbrook Res. at 55 ft depth; (5 ft off bottom)	SEPT	1992	19.3	16.8	18.3	0.4	0.5	0.1						15	through Sept. 15
	MAY	1993	--	--	--	--	--	--	--	--	--	--	--	0	
	JUNE	1993	6.2	<5.0	5.2	0.2	1.0	0.0						18	
	JULY	1993	7.6	5.6	6.2	0.4	1.0	0.2						31	
Philbrook Res. at 55 ft depth; (5 ft off bottom)	AUG	1993	17.7	7.0	10.8	1.2	2.0	0.5						31	
	SEPT	1993	18.4	16.8	17.7	0.7	1.6	0.5						15	

Table 6-1 (continued)

Monthly Water Temperature Summary for the DeSabra-Centerville Project

Station Description	Month	Year	Monthly Maximum (°C)		Monthly Mean (°C)	Average Daily Range		Maximum Daily Range		Minimum Daily Range		Number of Data Days in Month	Remarks
			Maximum	Minimum		Range	Range	Range	Range				
WBFR at Hendricks Head Dam	MAY	1992	--	--	--	--	--	--	--	--	--	0	
	JUNE	1992	17.6	9.3	13.5	2.3	3.7	0.8	0.8	0.8	0.8	23	
	JULY	1992	18.1	10.8	14.7	2.5	3.4	0.9	0.9	0.9	0.9	31	
	AUG	1992	19.7	12.2	15.7	2.8	3.6	2.0	2.0	2.0	2.0	31	
	SEPT	1992	16.1	8.0	13.0	2.8	4.8	1.8	1.8	1.8	1.8	15	through Sept. 15
	MAY	1993	10.7	5.2	7.2	2.6	4.8	0.0	0.0	0.0	0.0	27	
	JUNE	1993	15.4	5.8	10.5	3.3	4.5	0.9	0.9	0.9	0.9	30	
	JULY	1993	16.7	10.9	13.8	2.9	3.6	2.1	2.1	2.1	2.1	31	
	AUG	1993	16.8	10.7	13.8	2.5	3.2	1.7	1.7	1.7	1.7	31	
SEPT	1993	15.8	10.9	13.9	2.2	2.5	1.8	1.8	1.8	1.8	15		
Hendricks Canal at Diversion Dam	MAY	1992	--	--	--	--	--	--	--	--	--	0	
	JUNE	1992	--	--	--	--	--	--	--	--	--	0	
	JULY	1992	18.1	12.9	15.4	1.6	2.9	0.8	0.8	0.8	0.8	22	
	AUG	1992	18.5	13.1	15.5	1.1	3.5	1.2	1.2	1.2	1.2	12	Pod Stolen
	SEPT	1992	--	--	--	--	--	--	--	--	--	0	
Toadtown Canal below Toadtown Powerhouse	MAY	1993	10.7	5.3	7.5	2.5	4.6	0.0	0.0	0.0	0.0	27	
	JUNE	1993	15.4	6.1	10.6	3.1	4.3	0.9	0.9	0.9	0.9	30	
	JULY	1993	16.6	11.0	13.9	2.8	3.4	1.9	1.9	1.9	1.9	31	
	AUG	1993	16.8	10.8	13.9	2.4	2.9	1.7	1.7	1.7	1.7	31	
	SEPT	1993	15.7	11.0	13.9	2.0	2.4	1.7	1.7	1.7	1.7	15	
Toadtown Canal below Toadtown Powerhouse	MAY	1992	--	--	--	--	--	--	--	--	--	0	
	JUNE	1992	--	--	--	--	--	--	--	--	--	0	
	JULY	1992	19.1	13.5	15.9	1.6	2.9	0.8	0.8	0.8	0.8	22	
	AUG	1992	22.5	12.6	16.9	3.9	7.3	1.5	1.5	1.5	1.5	31	Canal down on 8/15
	SEPT	1992	--	--	--	--	--	--	--	--	--	0	Canal down
Hendricks Canal at Diversion Dam	MAY	1993	10.8	5.2	7.8	2.5	4.3	0.0	0.0	0.0	0.0	27	
	JUNE	1993	15.4	6.3	10.9	2.8	4.0	1.0	1.0	1.0	1.0	30	
	JULY	1993	16.7	11.7	14.3	2.1	3.4	1.2	1.2	1.2	1.2	31	
	AUG	1993	17.1	11.4	14.3	1.6	2.1	1.0	1.0	1.0	1.0	31	
	SEPT	1993	15.8	11.6	14.4	1.5	2.0	1.2	1.2	1.2	1.2	15	

* Canal down during this period

Table 6-1 (continued)

Monthly Water Temperature Summary for the DeSabra-Centerville Project

Station Description	Month	Year	Monthly Maximum (°C)	Monthly Minimum (°C)	Monthly Mean (°C)	Average Daily Range	Maximum Daily Range	Minimum Daily Range	Number of Data Days in Month	Remarks
Toadown Canal above Butte Canal	MAY	1992	--	--	--	--	--	--	0	
	JUNE	1992	19.0	10.7	14.8	3.0	4.3	0.7	15	
	JULY	1992	19.2	10.4	15.6	2.2	3.1	0.9	24	
	* AUG	1992	19.9	13.4	16.7	2.7	4.3	1.5	16	Pod Stolen
	SEPT	1992	--	--	--	--	--	--	0	Canal down 8/15
	MAY	1993	10.7	4.9	7.8					Mass balance calculation
	JUNE	1993	15.2	6.2	11.0					
	JULY	1993	16.7	11.7	14.3					
	AUG	1993	17.1	11.4	14.3					
	SEPT	1993	15.8	11.6	14.4					
Butte Creek at Head Dam	MAY	1992	--	--	--	--	--	--	0	
	JUNE	1992	17.6	8.8	13.7	1.8	2.7	0.4	23	
	JULY	1992	18.9	11.4	15.4	1.9	2.8	0.7	31	
	AUG	1992	18.8	11.4	15.1	1.7	2.2	0.8	31	
	* SEPT	1992	14.9	10.0	12.2	1.3	1.8	0.7	15	through Sept. 15
	MAY	1993	12.0	5.2	8.6	3.2	5.6	0.0	27	
	JUNE	1993	16.0	6.6	11.4	3.6	4.6	1.2	30	
	JULY	1993	16.7	11.1	14.2	2.8	3.8	1.7	31	
	AUG	1993	17.1	10.9	13.9	1.7	2.4	1.2	31	
	SEPT	1993	14.3	10.3	13.0	1.3	1.6	1.0	15	
Butte Canal above Toadown Canal	MAY	1992	--	--	--	--	--	--	0	
	JUNE	1992	19.2	10.9	14.9	2.4	3.8	0.4	15	
	JULY	1992	20.8	11.7	16.1	3.1	3.8	0.9	31	
	AUG	1992	20.8	11.9	16.1	3.2	4.1	2.2	31	
	* SEPT	1992	--	--	--	--	--	--	0	Canal down 9/1
	MAY	1993	12.0	5.9	9.3	2.4	4.3	0.0	27	
	JUNE	1993	15.8	7.2	11.9	2.6	3.6	0.9	30	
	JULY	1993	17.0	12.1	14.6	2.0	2.5	1.3	31	
	AUG	1993	18.5	11.6	14.4	2.2	2.8	1.1	31	
	SEPT	1993	16.0	12.7	14.1	1.7	2.5	0.0	12	

* Canal down during this period

Table 6-1 (continued)
 Monthly Water Temperature Summary for the DeSabra-Centerville Project

Station Description	Month	Year	Monthly Maximum (°C)		Monthly Mean (°C)	Monthly Average Daily Range		Monthly Minimum Daily Range		Number of Data Days in Month	Remarks
			Maximum	Minimum		Maximum	Minimum	Maximum	Minimum		
Butte Canal above DeSabra Forebay	MAY	1992	--	--	--	--	--	--	--	0	
	JUNE	1992	18.9	11.0	14.8	2.6	3.7	0.5	0.5	15	
	JULY	1992	19.7	11.4	15.7	2.6	3.6	0.9	0.9	31	
	* AUG	1992	20.5	11.9	16.3	3.0	6.9	1.6	1.6	31	Canals down 8/17 & 9/1 through Sept. 15
	* SEPT	1992	18.1	10.8	13.7	2.5	3.0	1.9	1.9	15	
	MAY	1993	11.2	5.4	8.4	2.3	4.1	0.0	0.0	27	
	JUNE	1993	15.4	6.6	11.3	2.5	3.5	1.0	1.0	30	
	JULY	1993	17.0	11.9	14.4	2.0	2.5	1.4	1.4	31	
	AUG	1993	17.7	11.5	14.3	1.8	2.3	1.2	1.2	31	
	SEPT	1993	15.9	11.6	14.1	1.7	2.2	1.3	1.3	15	
DeSabra Forebay at 5 ft depth	MAY	1992	--	--	--	--	--	--	--	0	
	JUNE	1992	19.7	11.7	17.2	1.8	3.6	0.5	0.5	8	
	JULY	1992	21.4	12.1	17.3	2.2	2.9	1.1	1.1	31	
	* AUG	1992	21.1	15.9	18.4	1.4	2.2	0.5	0.5	31	Canals down 8/17 & 9/1 through Sept. 15
	* SEPT	1992	20.3	14.1	16.8	1.2	2.0	0.6	0.6	15	
	MAY	1993	11.1	6.7	9.1	1.1	2.2	0.0	0.0	27	
	JUNE	1993	15.8	7.5	12.1	1.5	2.4	0.6	0.6	30	
	JULY	1993	18.0	13.2	15.4	1.6	2.0	1.1	1.1	31	
	AUG	1993	19.0	13.1	15.6	1.7	2.4	0.9	0.9	31	
	SEPT	1993	16.8	14.5	15.8	1.0	1.9	0.0	0.0	11	
DeSabra Forebay at 20 ft depth	MAY	1992	--	--	--	--	--	--	--	0	
	JUNE	1992	18.1	11.3	15.9	1.5	3.8	0.3	0.3	8	
	JULY	1992	19.3	11.6	15.9	1.2	1.9	0.8	0.8	31	
	AUG	1992	19.8	14.5	16.9	1.0	2.2	0.2	0.2	31	Canals down 8/17 & 9/1 through Sept. 15
	SEPT	1992	18.7	12.9	15.3	0.8	2.2	0.3	0.3	15	
	MAY	1993	11.1	6.6	9.0	1.3	2.4	0.0	0.0	27	
	JUNE	1993	15.6	7.4	11.8	1.6	2.4	0.6	0.6	30	
	JULY	1993	16.9	12.9	14.9	1.4	1.9	1.1	1.1	31	
	AUG	1993	17.9	12.5	14.7	1.3	1.9	0.9	0.9	31	
	SEPT	1993	16.0	12.7	14.6	1.1	1.4	0.6	0.6	15	

* Canal down during this period

Table 6-1 (continued)

Monthly Water Temperature Summary for the DeSabra-Centerville Project

Station Description	Month	Year	Monthly Maximum (°C)		Monthly Mean (°C)	Average Daily Range		Maximum Daily Range		Minimum Daily Range	Number of Data Days in Month	Remarks
			Maximum	Minimum		Range	Range	Range				
Butte Creek above Forks of Butte P.H.	MAY	1992	--	--	--	--	--	--	--	--	0	
	JUNE	1992	21.0	14.3	18.1	2.2	3.1	1.2	1.2	1.2	15	
	JULY	1992	23.0	14.3	19.0	2.4	3.0	1.1	1.1	1.1	31	
	AUG	1992	22.5	15.5	18.8	2.2	2.8	1.3	1.3	1.3	31	
	SEPT	1992	18.2	13.1	15.8	1.9	2.2	1.2	1.2	1.2	15	through Sept. 15
	MAY	1993	14.9	8.1	11.4	1.6	3.6	0.0	0.0	0.0	25	
	JUNE	1993	18.8	8.8	13.9	2.8	4.0	0.5	0.5	0.5	30	
	JULY	1993	20.5	14.5	17.5	2.9	3.4	2.4	2.4	2.4	31	
	AUG	1993	21.2	14.5	17.3	2.5	3.3	1.4	1.4	1.4	31	
	SEPT	1993	18.6	12.5	16.5	2.2	2.5	1.7	1.7	1.7	15	
DeSabra Powerhouse Tailrace	MAY	1992	--	--	--	--	--	--	--	--	0	
	JUNE	1992	--	--	--	--	--	--	--	--	0	
	JULY	1992	20.2	15.6	17.5	1.3	1.8	0.8	0.8	0.8	22	
	* AUG	1992	20.3	15.8	17.9	1.0	1.8	0.4	0.4	0.4	31	Canals down 8/17 & 9/1 through Sept. 11
	** SEPT	1992	18.8	14.0	15.5	0.7	1.9	0.3	0.3	0.3	11	
	MAY	1993	11.1	5.7	9.1	1.2	2.3	0.0	0.0	0.0	27	
	JUNE	1993	15.7	7.5	12.0	1.6	2.3	0.6	0.6	0.6	30	
	JULY	1993	17.2	13.1	15.2	1.1	1.6	0.6	0.6	0.6	31	
	AUG	1993	18.2	13.1	15.2	1.1	1.6	0.5	0.5	0.5	31	
	SEPT	1993	16.3	14.3	15.3	0.6	1.1	0.0	0.0	0.0	13	
Butte Creek below Lower Centerville Diversion Dam	MAY	1992	--	--	--	--	--	--	--	--	0	
	JUNE	1992	19.2	12.4	16.5	0.7	1.5	0.8	0.8	0.8	15	
	JULY	1992	20.5	12.8	17.3	1.3	1.9	0.7	0.7	0.7	31	
	AUG	1992	21.0	15.6	18.1	1.3	2.0	0.7	0.7	0.7	31	
	SEPT	1992	18.4	13.6	15.9	1.5	3.2	0.9	0.9	0.9	15	through Sept. 15
	MAY	1993	12.2	7.6	10.1	1.3	2.5	0.0	0.0	0.0	27	
	JUNE	1993	16.6	8.3	12.7	1.6	2.2	0.5	0.5	0.5	30	
	JULY	1993	18.1	13.7	15.8	1.4	1.8	0.8	0.8	0.8	31	
	AUG	1993	18.9	13.5	15.8	1.4	2.0	0.9	0.9	0.9	31	
	SEPT	1993	16.8	13.0	15.5	1.2	1.5	0.9	0.9	0.9	15	

* Canal down during this period

** Powerhouse flows reduced during this period

Table 6-1 (continued)

Monthly Water Temperature Summary for the DeSabra-Centerville Project

Station Description	Month	Year	Monthly Maximum (°C)	Monthly Minimum (°C)	Monthly Mean (°C)	Average Daily Range	Maximum Daily Range	Minimum Daily Range	Number of Data Days in Month	Remarks
Butte Creek at Pool 4 - 3 ft depth	MAY	1992	--	--	--	--	--	--	0	
	JUNE	1992	22.6	12.6	17.7	3.5	4.9	1.6	23	
	JULY	1992	24.1	16.5	19.9	4.1	4.8	2.0	23	
	AUG	1992	26.7	16.0	19.5	3.7	4.4	2.3	31	
	SEPT	1992	20.4	13.7	17.2	3.0	3.5	2.3	15	through Sept. 15
	MAY	1993	13.4	8.5	10.	1.1	2.1	0.0	27	
	JUNE	1993	19.2	9.0	13.7	2.2	3.7	0.5	30	
	JULY	1993	21.9	14.8	17.8	4.0	4.5	3.5	31	
	AUG	1993	22.3	15.0	17.8	3.6	4.4	2.3	31	
	SEPT	1993	20.1	13.7	17.2	3.2	3.7	2.9	15	
Butte Creek at Pool 4 - 15 ft depth	MAY	1992	--	--	--	--	--	--	0	
	JUNE	1992	22.6	12.6	17.7	3.5	4.9	1.6	23	
	JULY	1992	23.9	13.8	19.0	4.1	4.8	1.9	31	
	AUG	1992	23.7	16.0	19.5	3.7	4.5	2.3	31	
	SEPT	1992	20.4	13.7	17.2	3.0	3.5	2.3	15	through Sept. 15
	MAY	1993	13.4	8.6	10.9	1.1	2.1	0.0	27	
	JUNE	1993	19.2	9.2	13.6	2.0	3.7	0.5	30	
	JULY	1993	21.8	15.0	17.9	4.0	4.5	2.9	31	
	AUG	1993	22.3	14.9	17.7	3.6	4.4	2.4	31	
	SEPT	1993	19.9	13.7	17.2	3.2	3.7	2.9	15	
Butte Creek at Helltown Bridge	MAY	1992	--	--	--	--	--	--	0	
	JUNE	1992	22.7	14.1	18.9	3.1	4.4	1.6	15	
	JULY	1992	24.0	14.6	19.8	3.4	4.0	1.7	31	
	AUG	1992	23.6	17.0	20.2	3.0	3.7	2.0	31	
	SEPT	1992	20.9	14.6	17.8	2.6	2.9	1.9	15	through Sept. 15
	MAY	1993	--	--	--	--	--	--	0	
	JUNE	1993	--	--	--	--	--	--	0	
	JULY	1993	21.9	16.1	19.1	2.3	4.0	0.0	20	
	AUG	1993	23.0	15.9	18.9	3.2	4.0	2.0	31	
	SEPT	1993	20.6	13.7	17.2	3.2	3.3	2.9	15	

Table 6-1 (continued)

Monthly Water Temperature Summary for the DeSabla-Centerville Project

Station Description	Month	Year	Monthly Maximum (°C)		Monthly Mean (°C)	Monthly Average Daily Range		Maximum Daily Range		Minimum Daily Range	Number of Data Days in Month	Remarks	
			Maximum	Minimum		Mean	Maximum	Minimum					
Lower Centerville Canal at head works of Centerville P.H.	MAY	1992	--	--	--	--	--	--	--	--	0		
	JUNE	1992	--	--	--	--	--	--	--	--	0		
	JULY	1992	23.1	16.2	18.8	2.9	3.5	1.3	1.3	1.3	23		
	AUG	1992	27.0	15.5	19.4	3.7	8.4	1.3	1.3	1.3	31		
	SEPT	1992	21.5	13.4	17.7	4.0	5.0	2.3	2.3	2.3	15	through Sept. 15	
	MAY	1993	13.0	8.1	10.6	1.2	2.2	0.0	0.0	0.0	27		
	JUNE	1993	17.5	8.7	13.2	1.8	4.0	0.3	0.3	0.3	30		
	JULY	1993	19.1	14.0	16.4	2.1	2.5	1.8	1.8	1.8	31		
	AUG	1993	20.4	14.0	16.4	2.2	2.7	1.2	1.2	1.2	31		
	SEPT	1993	18.5	13.3	16.1	2.3	2.9	1.8	1.8	1.8	15		
	Butte Creek below Centerville P.H.	MAY	1992	--	--	--	--	--	--	--	--	0	
		JUNE	1992	22.8	12.9	18.8	3.6	4.6	1.9	1.9	1.9	11	
		JULY	1992	24.3	15.1	19.3	3.3	4.2	1.5	1.5	1.5	31	
		AUG	1992	24.7	17.3	19.5	3.1	4.1	1.9	1.9	1.9	27	
		SEPT	1992	21.5	14.8	18.3	3.0	3.4	1.9	1.9	1.9	15	through Sept. 15
MAY		1993	13.5	8.5	10.9	1.2	2.2	0.0	0.0	0.0	27		
JUNE		1993	18.1	9.0	13.6	2.0	2.8	0.3	0.3	0.3	30		
JULY		1993	19.8	14.4	16.9	2.4	2.8	1.9	1.9	1.9	31		
AUG		1993	21.1	14.6	17.1	2.5	3.0	1.3	1.3	1.3	31		
SEPT		1993	19.3	14.0	17.0	2.4	3.0	2.0	2.0	2.0	15		

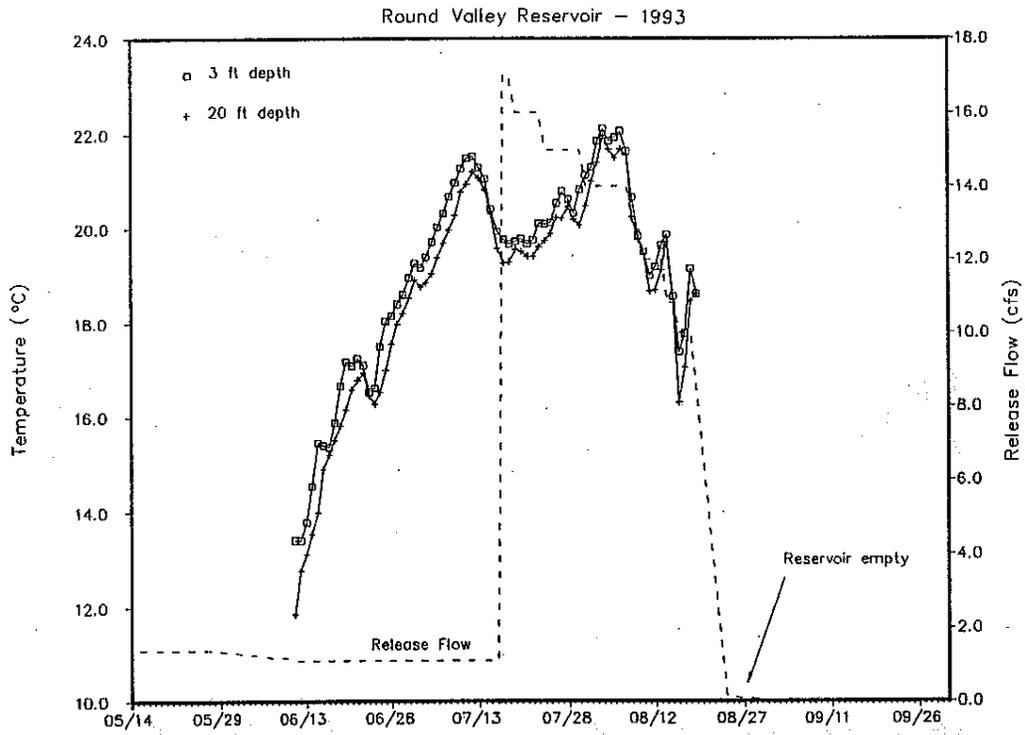


Figure 6-1. Mean daily temperatures from recorders in Round Valley Reservoir.

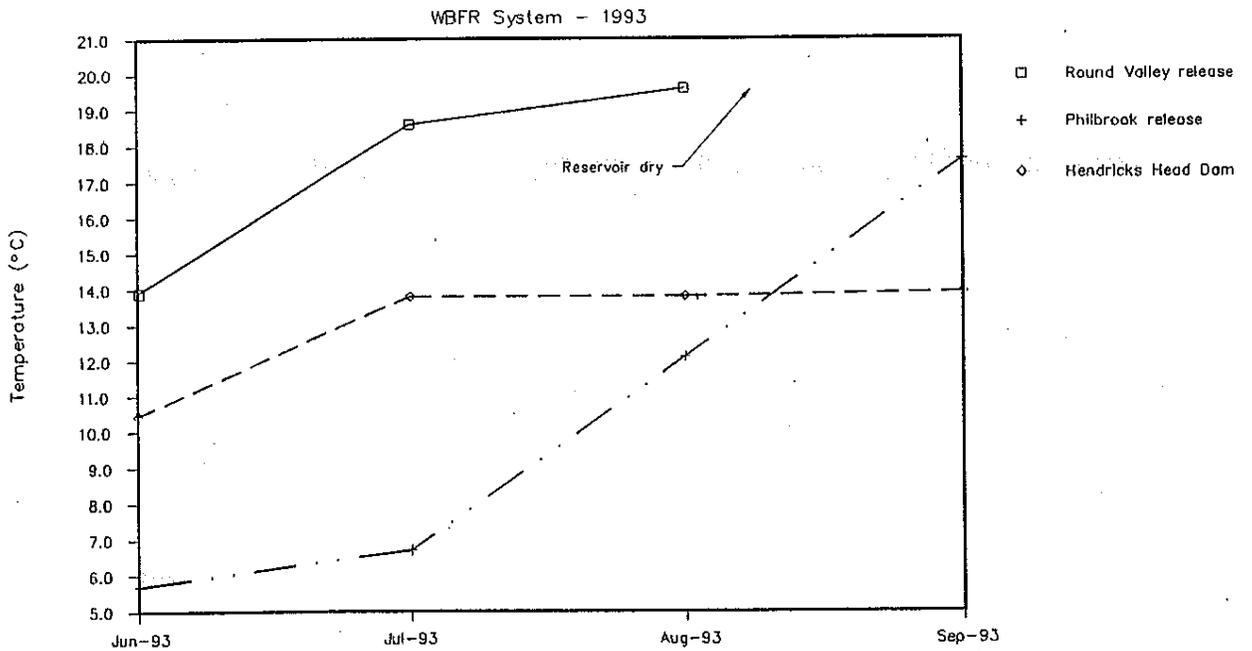
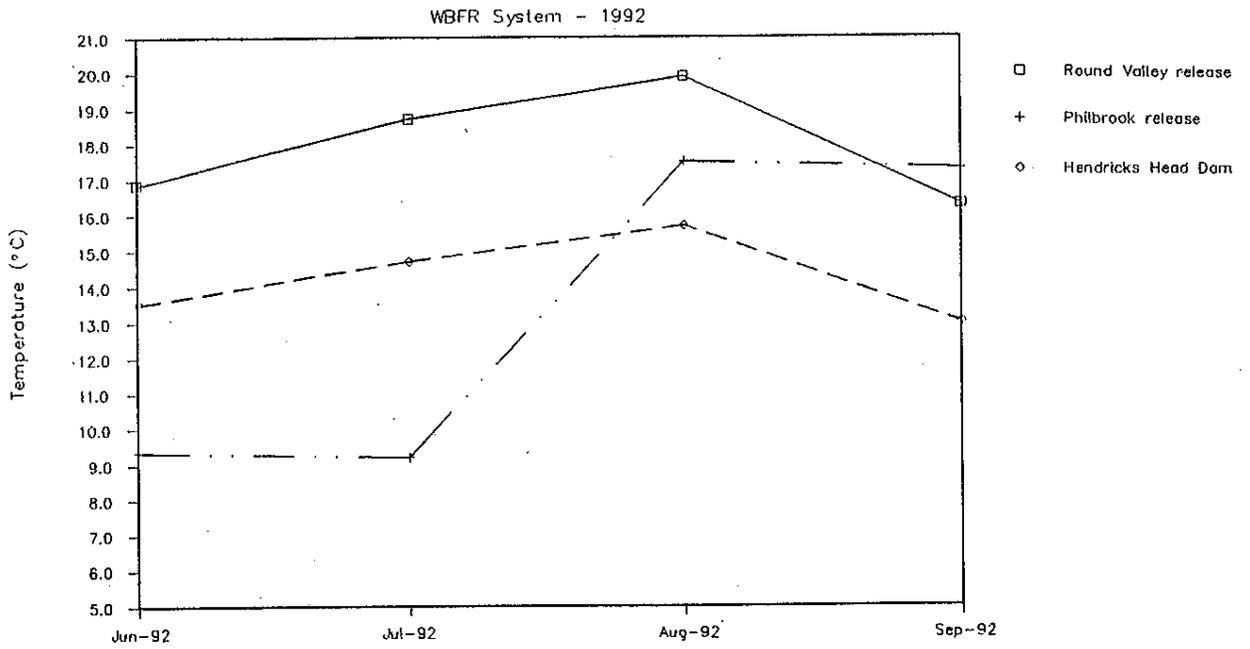


Figure 6-2. Mean monthly temperature plots for stations in WBFR.

occurs in early summer and begins to decline as soon as increased releases begin. Figure 6-3 presents comparative data from recorders deployed at different depths within and immediately downstream of the reservoir, and corresponding flow release rates.

Release temperatures in Philbrook Creek below Philbrook Reservoir ranged from 6.4 to 21.6°C in 1992 and from 5.2 to 18.3°C in 1993. Average July temperatures were 9.2°C in 1992 and 6.7°C in 1993. Average August temperatures were 17.5 and 12.1°C for 1992 and 1993, respectively.

Temperatures in the WBFR at Hendricks Head Dam ranged from 8.0 to 19.7°C in 1992 and from 5.8 to 16.8°C in 1993. Average July temperatures were 14.7°C in 1992 and 13.8°C in 1993. Average August temperatures were 15.7 and 13.8°C for 1992 and 1993, respectively.

Hendricks/Toadtown Canal

Water temperatures in Hendricks Canal at Hendricks Diversion Dam ranged from 12.9 to 18.5°C in 1992 and 6.1 to 16.8°C in 1993. Average July temperatures were 15.4°C in 1992 and 13.9°C in 1993. Average August temperatures in 1992 were 15.5°C, and 13.9°C in 1993. The 1992 data is incomplete because the datapod was stolen. However, based on the remaining data it is apparent that there is little measurable difference between temperatures at Hendricks Head Dam and this location. Additionally, the data for August and September 1992 was affected by the canal being shut down for repairs from August 18 to September 16. Figure 6-4 shows mean monthly data from each station on Hendricks/Toadtown Canal.

Water temperatures in Toadtown Canal below Toadtown Powerhouse ranged from 12.6 to 22.5°C in 1992 and 6.3 to 17.1°C in 1993. July temperatures averaged 15.9°C and 14.3°C in 1992 and 1993, respectively. Average August temperatures were 16.9°C in 1992 and 14.3°C in 1993.

Water temperatures in Toadtown Canal above the confluence with Butte Canal ranged from 10.4 to 19.9°C in 1992 and 6.2 to 17.1°C in 1993. July temperatures averaged 15.6°C and 14.3°C in 1992 and 1993, respectively. Average August temperatures were 16.7°C in 1992 and 14.3°C in 1993. The 1992 data is incomplete because the datapod was stolen when it became visible during an outage. To avoid potential theft, a datapod was not installed in 1993 and data is based on mass balance calculations using Butte Canal temperature data and flow data from Butte and Toadtown canals. Based on remaining data it is apparent that there is little difference between temperatures at Toadtown Powerhouse and this location.

Butte Creek

Water temperatures in Butte Creek at Butte Head Dam ranged from 8.8 to 18.9°C in 1992 and 6.6 to 17.1°C in 1993. Average July temperatures were 15.4°C in 1992 and 14.2°C in 1993. Average August

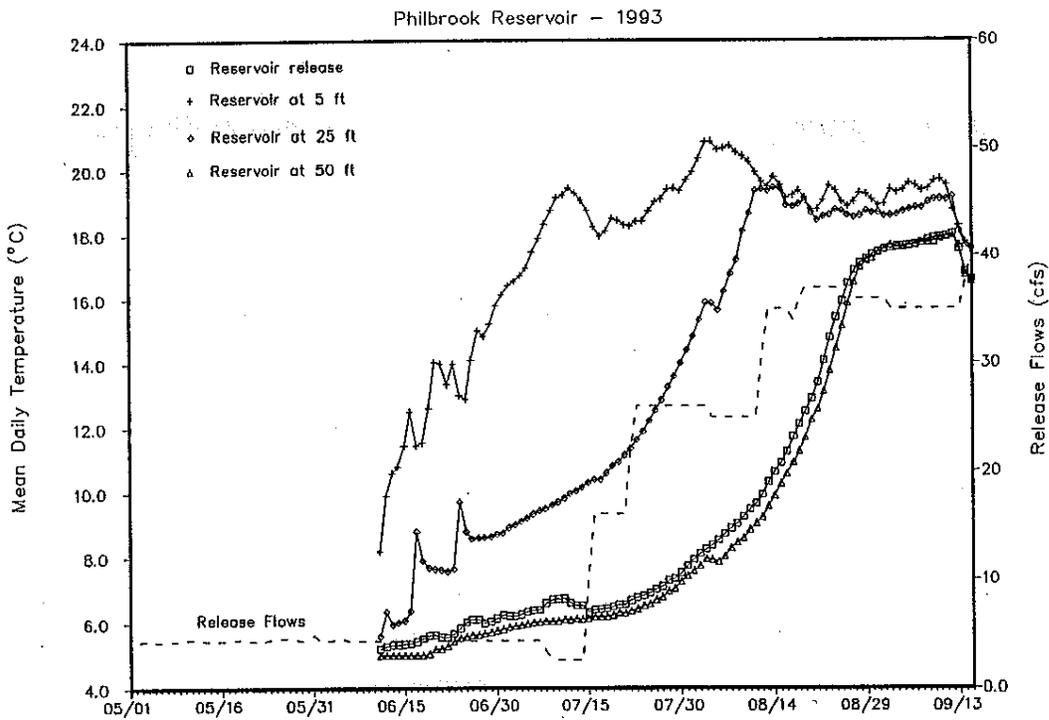
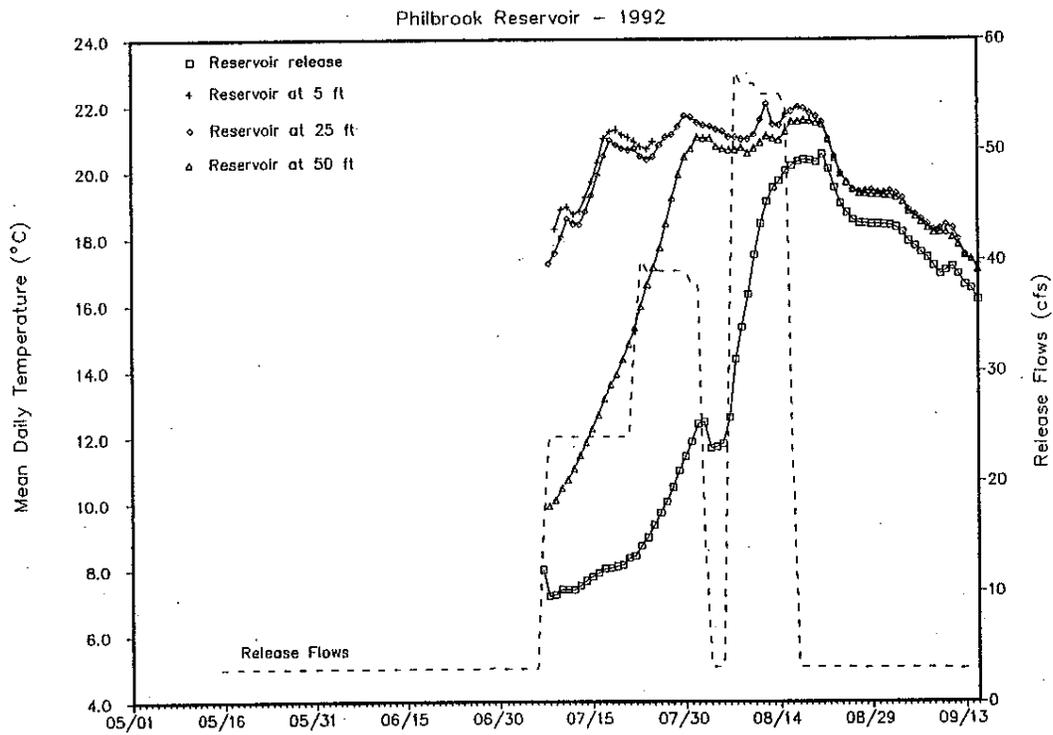


Figure 6-3. Mean daily temperatures from recorders in Philbrook Reservoir.

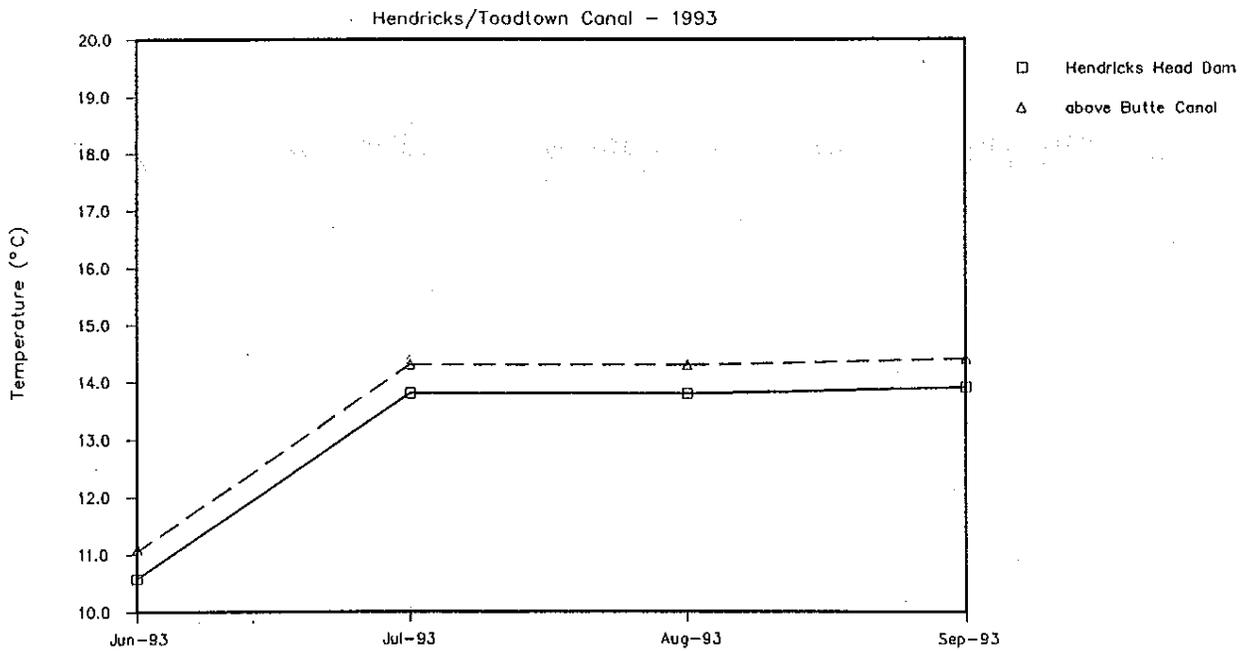
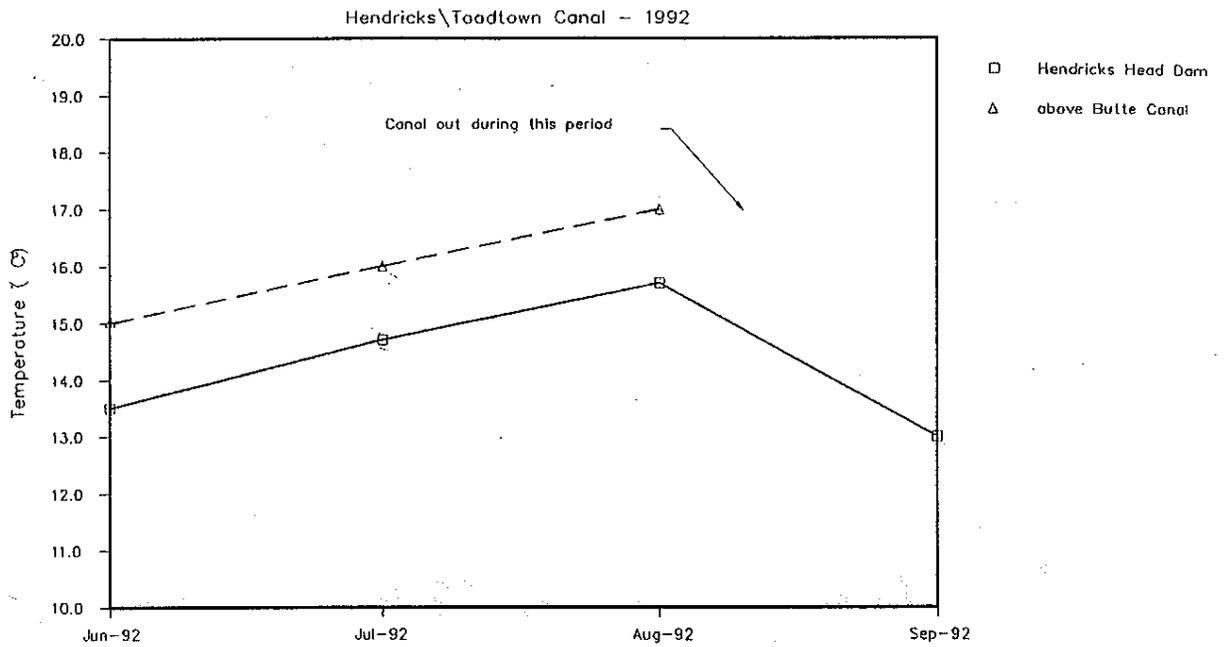


Figure 6-4. Mean monthly temperature plots for stations in Hendricks/Toadtown Canal.

temperatures were 15.1°C in 1992 and 13.9°C in 1993. Figure 6-5 shows mean monthly data from each station in Butte Canal and upper Butte Creek.

Stream temperatures in Butte Creek above the Forks of Butte Powerhouse ranged from 13.1 to 23.0°C in 1992 and 8.8 to 21.2°C in 1993. July temperatures averaged 19.0 and 17.5°C in 1992 and 1993, respectively. Average August temperatures were 18.8°C in 1992 and 17.3°C in 1993.

Butte Canal

Water temperatures in Butte Canal above the confluence with Toadtown Canal ranged from 10.9 to 20.8°C in 1992 and 7.2 to 18.5°C in 1993. July temperatures averaged 16.1°C and 14.6°C in 1992 and 1993, respectively. Average August temperatures were 16.1°C in 1992 and 14.4°C in 1993. The data for September 1992 was affected by the canal being shut down for repairs from September 1 to 31.

Water temperatures in Butte Canal above DeSabra Forebay ranged from 10.8 to 20.5°C in 1992 and 6.6 to 17.7°C in 1993. Average July temperatures were 15.7°C in 1992 and 14.4°C in 1993. Average August temperatures in 1992 were 16.3°C, and 14.3°C in 1993.

DeSabra Forebay

Lake temperatures in DeSabra Forebay were monitored near the intake for DeSabra Powerhouse. Temperatures were monitored at the surface (3-5 foot depth) and near the bottom (18-20 ft depth).

Water temperatures near the surface of the forebay ranged from 11.7 to 21.4°C in 1992 and 7.5 to 19.0°C in 1993. July temperatures averaged 17.3°C and 15.4°C in 1992 and 1993, respectively. Average August temperatures were 18.4°C in 1992 and 15.6°C in 1993.

Water temperatures near the bottom of the forebay ranged from 11.3 to 19.8°C in 1992 and 7.4 to 17.9°C in 1993. July temperatures averaged 15.9°C and 14.9°C in 1992 and 1993, respectively. Average August temperatures were 16.9°C in 1992 and 14.7°C in 1993.

Thermal stratification within DeSabra Forebay was greatest in 1992 averaging 1.5°C, with a maximum of 3.5°C. Stratification in 1993 averaged 0.7°C, with a maximum of 1.8°C. The reduced stratification that occurred in 1993 is directly attributable to the increased average flows through the forebay (72 cfs in 1992 versus 133 in cfs 1993, June 1-September 15). Figure 6-6 compares data from the recorders in DeSabra Forebay.

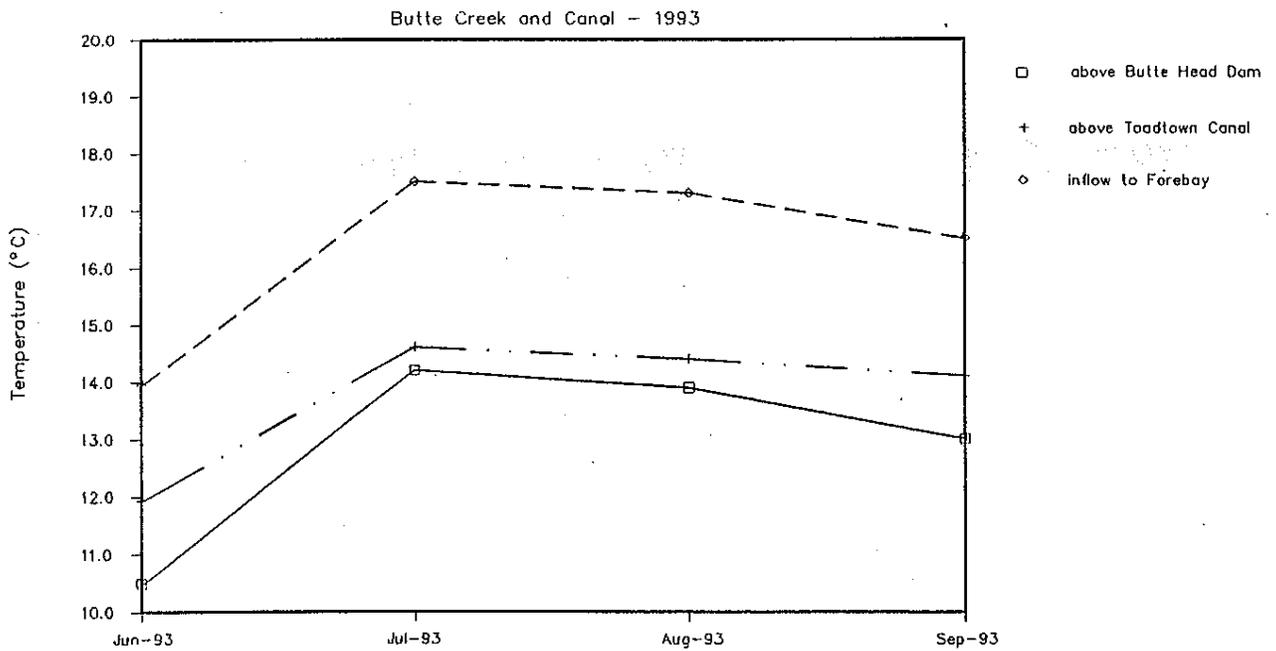
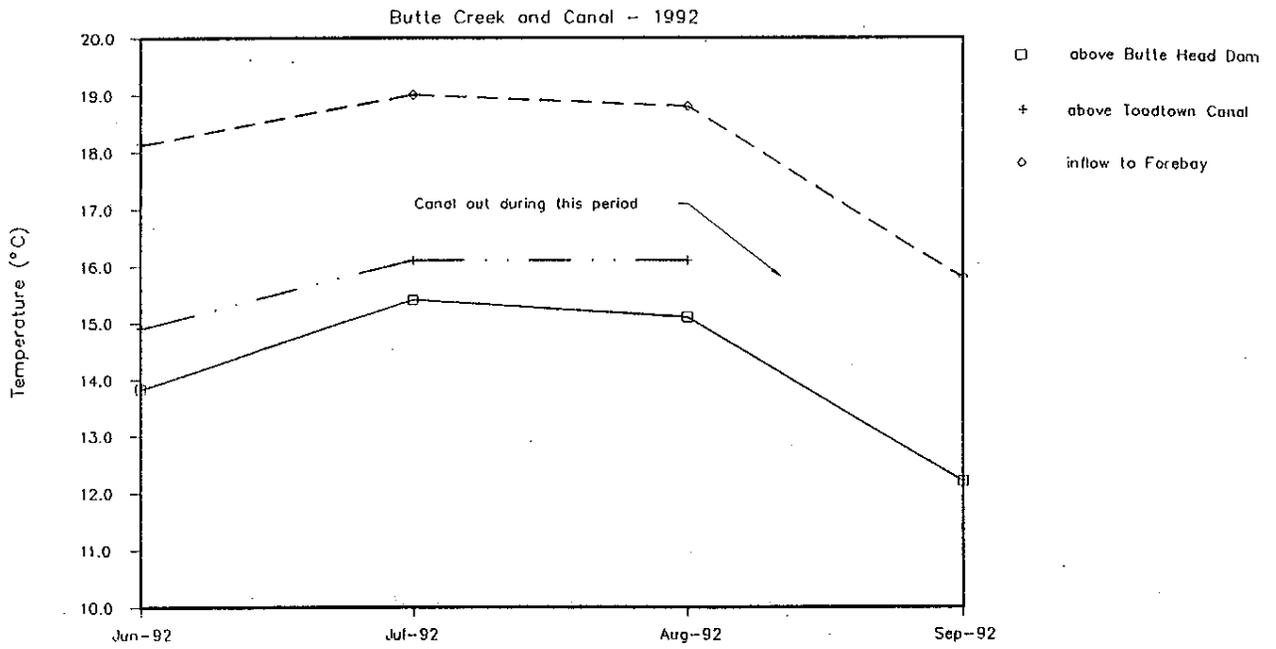


Figure 6-5. Mean monthly temperature plots for stations in Butte Canal and Butte Creek.

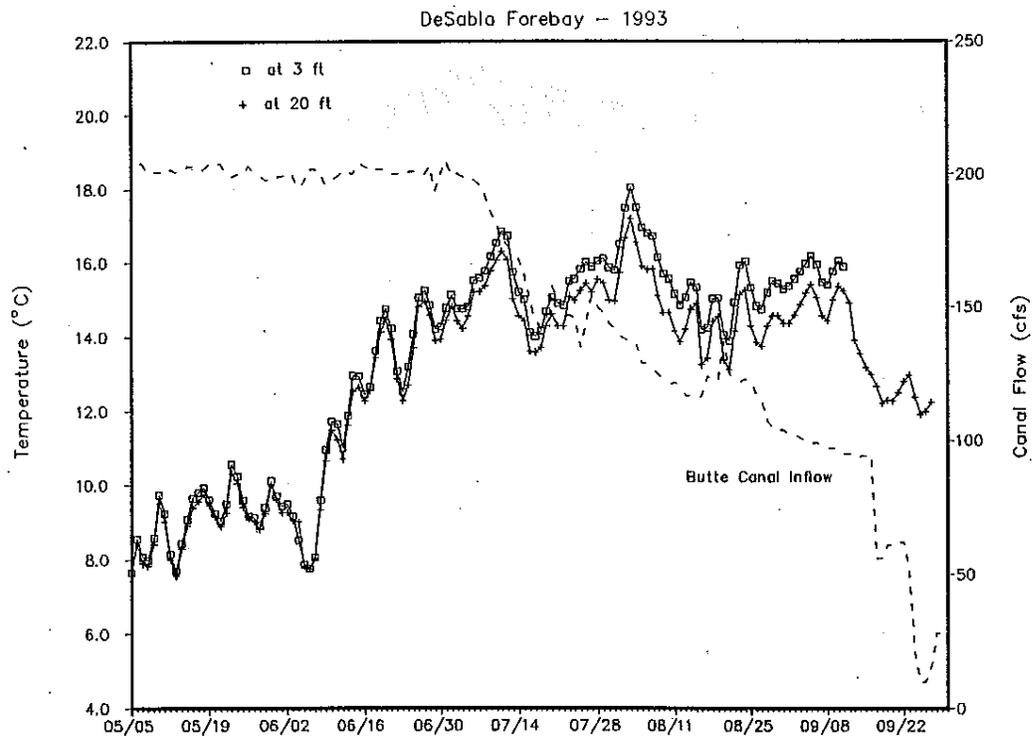
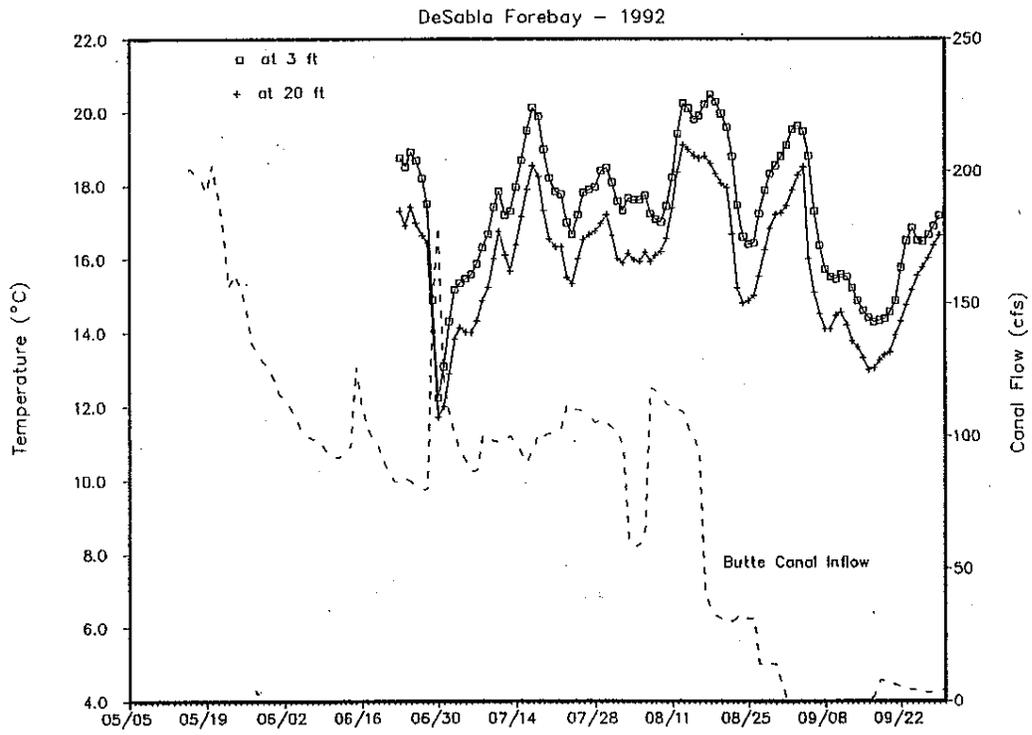


Figure 6-6. Mean daily temperatures from recorders in DeSabra Forebay.

DeSabra Powerhouse

Water temperatures at DeSabra Powerhouse tailrace ranged from 14.0 to 20.3°C in 1992 and 7.5 to 18.2°C in 1993. July temperatures averaged 17.5°C and 15.2°C in 1992 and 1993, respectively. Average August temperatures were 17.9°C in 1992 and 15.2°C in 1993. Figure 6-7 compares mean monthly data from the powerhouse tailrace with Butte Canal above DeSabra Forebay.

Lower Butte Creek

Stream temperatures in Butte Creek at LCDD ranged from 12.4 to 21.0°C in 1992 and 8.3 to 18.9°C in 1993. Average July temperatures were 17.3°C in 1992 and 15.8°C in 1993. Average August temperatures in 1992 were 18.1°C, and 15.8°C in 1993. Figure 6-8 compares mean monthly temperatures from all stations in lower Butte Creek.

Stream temperatures in Butte Creek at Pool 4 ranged from 12.6 to 24.1°C in 1992 and 9.0 to 22.3°C in 1993. July temperatures averaged 19.0°C and 17.8°C in 1992 and 1993, respectively. Average August temperatures were 19.5°C in 1992 and 17.8°C in 1993.

Stream temperatures in Butte Creek at Helltown Bridge ranged from 14.1 to 24.0°C in 1992 and 13.7 to 23.0°C in 1993. July temperatures averaged 19.8°C and 19.1°C in 1992 and 1993, respectively. Average August temperatures were 20.2°C in 1992 and 18.9°C in 1993.

Water temperatures in Lower Centerville Canal above Centerville Powerhouse ranged from 13.4 to 27.0°C in 1992 and 8.7 to 20.4°C in 1993. July temperatures averaged 18.8°C and 16.4°C in 1992 and 1993, respectively. Average August temperatures were 19.4°C in 1992 and 16.4°C in 1993. The maximum temperature (27.0°C) recorded in 1992 occurred during a canal outage when the canal was almost completely dry.

Stream temperatures in Butte Creek below Centerville Powerhouse ranged from 12.9 to 24.7°C in 1992 and 9.0 to 21.1°C in 1993. July temperatures averaged 19.3°C and 16.9°C in 1992 and 1993, respectively. Average August temperatures were 19.5°C in 1992 and 17.1°C in 1993.

STREAM FLOW AND RESERVOIR STORAGE

Tables 6-2 and 6-3 summarize the stream flow and lake storage data collected during the monitoring program. Appendix D presents the daily data from each station. Discussion of stream flow results are based on the period May through September. Maximum values listed for total flow in the natural stream channels are the maximum recorded value. High flows above specific maximum values are not rated at these gages and may significantly exceed the maximum reported values.

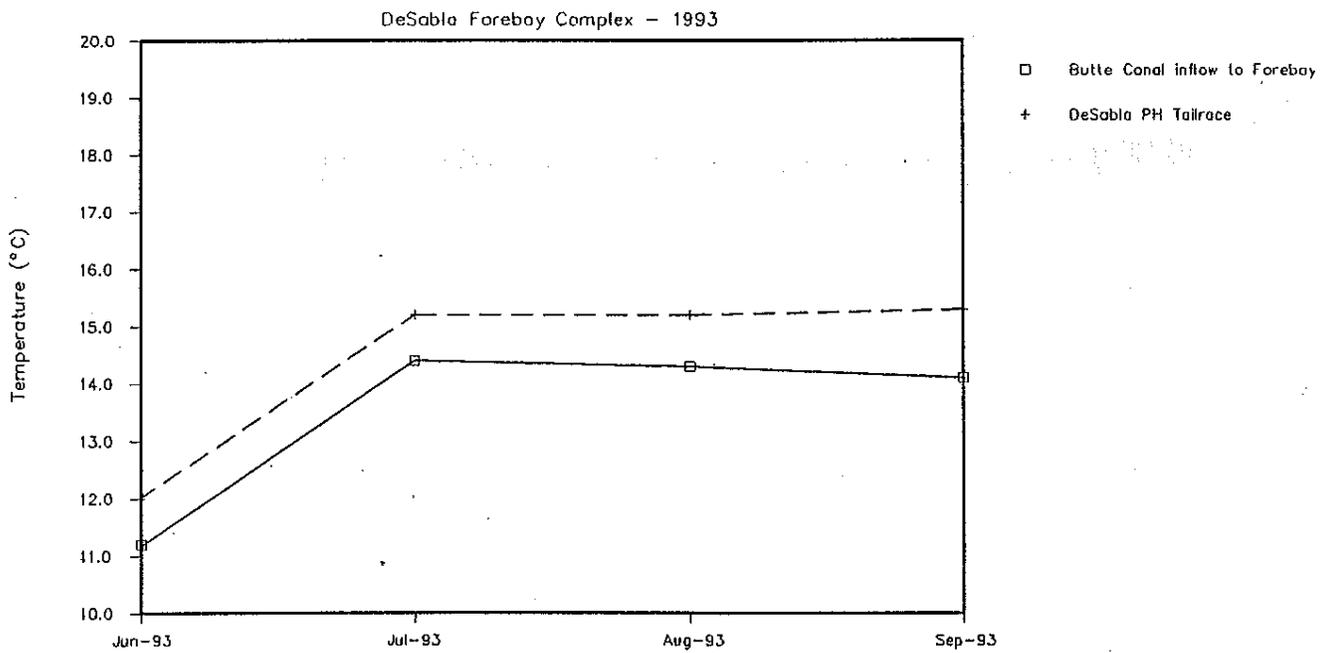
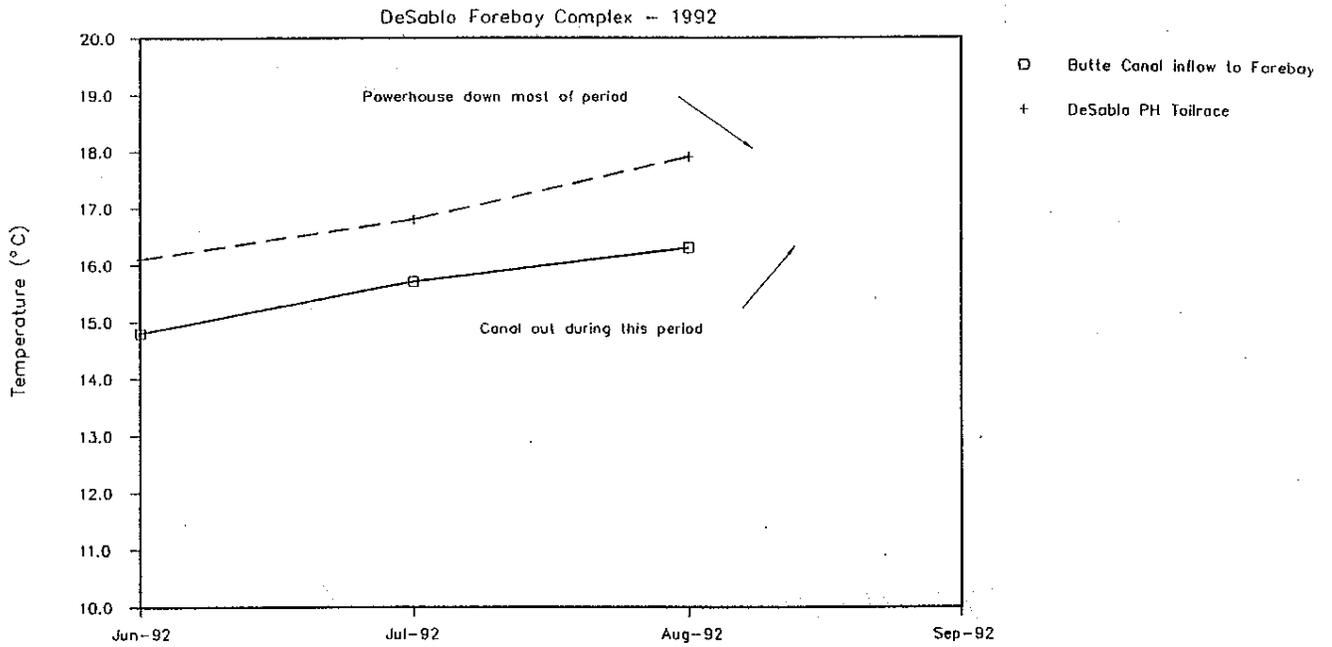


Figure 6-7. Mean monthly temperature plots for stations in DeSablo Forebay and DeSablo Powerhouse.

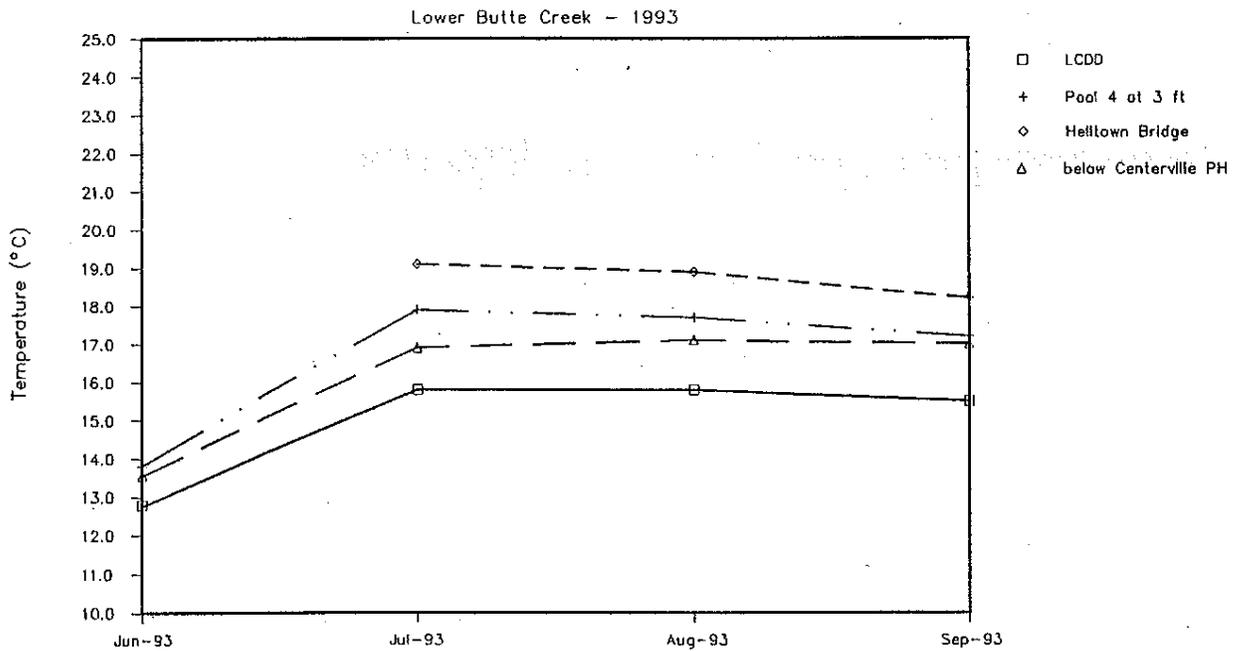
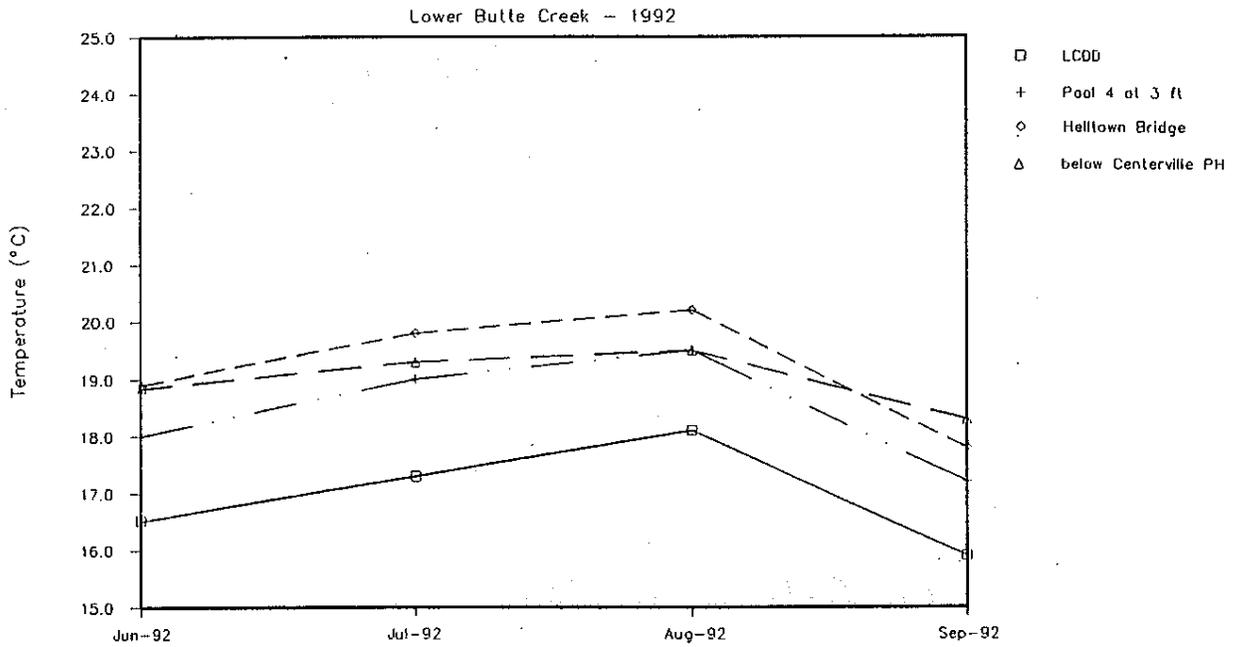


Figure 6-8. Mean monthly temperature plots for stations in lower Butte Creek.

Table 6-2

Monthly Stream Flow Summary for the DeSabra-Centerville Project

Station Description	Month	Year	Monthly Maximum (cfs)	Monthly Minimum (cfs)	Monthly Mean (cfs)
WBFR below Round Valley Reservoir	MAY	1992	1.0	1.0	1.0
	JUNE	1992	1.0	1.0	1.0
	JULY	1992	1.0	0.6	0.8
	AUG	1992	0.5	0.2	0.4
	SEPT	1992	0.4	0.2	0.3
	MAY	1993	1.4	1.4	1.4
	JUNE	1993	1.2	1.1	1.1
	JULY	1993	17.0	1.1	10.0
	AUG	1993	14.0	0.1	8.4
	SEPT	1993	0.0	0.0	0.0
Philbrook Crk below Philbrook Reservoir	MAY	1992	3.5	3.0	3.2
	JUNE	1992	3.1	3.0	3.0
	JULY	1992	40.0	3.0	24.0
	AUG	1992	57.0	3.1	22.0
	SEPT	1992	9.5	3.0	3.3
	MAY	1993	4.9	4.3	4.5
	JUNE	1993	4.5	4.4	4.4
	JULY	1993	26.0	2.6	13.0
	AUG	1993	27.0	25.0	32.0
	SEPT	1993	40.0	3.0	23.0
WBFR above Hendricks Head Dam	MAY	1992	spill	78.0	124.0
	JUNE	1992	122.0	47.0	62.0
	JULY	1992	90.0	51.0	72.0
	AUG	1992	105.0	25.0	56.0
	SEPT	1992	33.0	27.0	28.0
	MAY	1993	spill	spill	spill
	JUNE	1993	spill	134.0	165.0
	JULY	1993	135.0	88.0	106.0
	AUG	1993	98.0	76.0	87.0
	SEPT	1993	78.0	37.0	60.0

Table 6-2 (continued)

Monthly Stream Flow Summary for the DeSabra-Centerville Project

Station Description	Month	Year	Monthly Maximum (cfs)	Monthly Minimum (cfs)	Monthly Mean (cfs)
Hendricks Canal below	MAY	1992	125.0	68.0	110.0
Hendricks Head Dam	JUNE	1992	105.0	36.0	50.0
	JULY	1992	80.0	41.0	61.0
	AUG	1992	92.0	8.3	44.0
	SEPT	1992	14.0	8.8	11.0
	MAY	1993	125.0	120.0	124.0
	JUNE	1993	125.0	114.0	121.0
	JULY	1993	115.0	70.0	89.0
	AUG	1993	81.0	59.0	70.0
	SEPT	1993	61.0	20.0	44.0
Toadtown Canal above Butte Canal	MAY	1992	122.0	66.0	107.0
	JUNE	1992	100.0	36.0	49.0
	JULY	1992	75.0	42.0	60.0
	AUG	1992	83.0	0.0	32.0
	SEPT	1992	7.7	0.0	2.2
	MAY	1993	122.0	113.0	118.0
	JUNE	1993	123.0	112.0	118.0
	JULY	1993	116.0	71.0	88.0
	AUG	1993	82.0	60.0	71.0
	SEPT	1993	62.0	9.8	45.0
Butte Creek above Butte Head Dam	MAY	1992	spill	70.0	94.0
	JUNE	1992	97.0	54.0	66.0
	JULY	1992	80.0	48.0	56.0
	AUG	1992	50.0	40.0	49.0
	SEPT	1992	--	--	--
	MAY	1993	spill	spill	spill
	JUNE	1993	spill	spill	spill
	JULY	1993	123.0	76.0	95.0
	AUG	1993	76.0	65.0	70.0
	SEPT	1993	64.0	61.0	63.0

Table 6-2 (continued)

Monthly Stream Flow Summary for the DeSabra-Centerville Project

Station Description	Month	Year	Monthly Maximum (cfs)	Monthly Minimum (cfs)	Monthly Mean (cfs)
Butte Canal above	MAY	1992	81.0	56.0	74.0
Toadtown Canal	JUNE	1992	79.0	44.0	51.0
	JULY	1992	58.0	34.0	41.0
	AUG	1992	35.0	6.9	30.0
	SEPT	1992	0.0	0.0	0.0
	MAY	1993	84.0	82.0	83.0
	JUNE	1993	84.0	79.0	82.0
	JULY	1993	83.0	56.0	70.0
	AUG	1993	55.0	40.0	50.0
	SEPT	1993	40.0	0.0	15.0
Butte Canal above	MAY	1992	202.0	122.0	180.0
DeSabra Forebay	JUNE	1992	179.0	80.0	101.0
	JULY	1992	122.0	87.0	101.0
	AUG	1992	118.0	6.9	62.0
	SEPT	1992	7.7	0.0	2.2
	MAY	1993	205.0	195.0	201.0
	JUNE	1993	205.0	194.0	201.0
	JULY	1993	198.0	135.0	158.0
	AUG	1993	137.0	100.0	117.0
	SEPT	1993	99.0	9.8	60.0
DeSabra Powerhouse Tailrace	MAY	1992	193.0	122.0	174.0
	JUNE	1992	136.0	79.0	98.0
	JULY	1992	169.0	85.0	102.0
	AUG	1992	118.0	17.0	65.0
	SEPT	1992	43.0	0.0	21.0
	MAY	1993	185.0	180.0	182.0
	JUNE	1993	185.0	167.0	179.0
	JULY	1993	183.0	130.0	152.0
	AUG	1993	134.0	98.0	115.0
	SEPT	1993	102.0	0.0	65.0

Table 6-2 (continued)

Monthly Stream Flow Summary for the DeSabra-Centerville Project

Station Description	Month	Year	Monthly Maximum (cfs)	Monthly Minimum (cfs)	Monthly Mean (cfs)
Butte Creek above	MAY	1992	spill	141.0	213.0
Lower Centerville	JUNE	1992	200.0	102.0	130.0
Diversion Dam	JULY	1992	155.0	109.0	126.0
	AUG	1992	144.0	47.0	87.0
	SEPT	1992	96.0	43.0	54.0
	MAY	1993	spill	spill	spill
	JUNE	1993	spill	spill	spill
	JULY	1993	spill	176.0	213.0
	AUG	1993	182.0	143.0	161.0
	SEPT	1993	213.0	77.0	125.0
Butte Creek below	MAY	1992	spill	15.0	46.0
Lower Centerville	JUNE	1992	49.0	41.0	45.0
Diversion Dam	JULY	1992	44.0	43.0	44.0
	AUG	1992	46.0	42.0	44.0
	SEPT	1992	45.0	31.0	37.0
	MAY	1993	spill	spill	spill
	JUNE	1993	spill	spill	spill
	JULY	1993	spill	45.0	52.0
	AUG	1993	47.0	44.0	45.0
	SEPT	1993	45.0	44.0	45.0
Lower Centerville	MAY	1992	178.0	104.0	170.0
Canal at head works of Centerville P.H.	JUNE	1992	178.0	59.0	87.0
	JULY	1992	111.0	65.0	82.0
	AUG	1992	99.0	3.8	46.0
	SEPT	1992	52.0	5.8	18.0
	MAY	1993	177.0	175.0	176.0
	JUNE	1993	177.0	174.0	176.0
	JULY	1993	177.0	129.0	162.0
	AUG	1993	133.0	98.0	115.0
	SEPT	1993	168.0	33.0	82.0

Table 6-2 (continued)

Monthly Stream Flow Summary for the DeSabra-Centerville Project

Station Description	Month	Year	Monthly Maximum (cfs)	Monthly Minimum (cfs)	Monthly Mean (cfs)
<i>Mass Balance Estimates</i>					
Ungage flow in WBFR (Coon Hollow Creek and other acretion)	MAY	1992	spill	74.0	120.0
	JUNE	1992	118.0	43.0	58.0
	JULY	1992	69.0	34.0	47.0
	AUG	1992	71.0	22.0	35.0
	SEPT	1992	29.0	24.0	25.0
	MAY	1993	spill	spill	spill
	JUNE	1993	spill	129.0	160.0
	JULY	1993	130.0	55.0	85.0
	AUG	1993	53.0	40.0	47.0
	SEPT	1993	41.0	30.0	37.0
Butte Creek above Forks of Butte PH. (ungaged)	MAY	1992	spill	19.0	41.0
	JUNE	1992	89.0	18.0	30.0
	JULY	1992	33.0	16.0	25.0
	AUG	1992	46.0	14.0	25.0
	SEPT	1992	96.0	43.0	54.0
	MAY	1993	spill	spill	spill
	JUNE	1993	spill	spill	spill
	JULY	1993	spill	43.0	64.0
	AUG	1993	56.0	31.0	46.0
	SEPT	1993	124.0	21.0	61.0

Table 6-3

Monthly Lake Storage Summary for WBFR Reservoirs

Station Description	Month	Year	Monthly Maximum (acre/ft)	Monthly Minimum (acre/ft)
Round Valley Reservoir	MAY	1992	1102	1037
	JUNE	1992	1102	1000
	JULY	1992	990	547
	AUG	1992	471	207
	SEPT	1992	207	189
	MAY	1993	1177	1149
	JUNE	1993	1187	1159
	JULY	1993	1159	739
	AUG	1993	512	0
	SEPT	1993	0	0
Philbrook Reservoir	MAY	1992	5009	5009
	JUNE	1992	5009	4973
	JULY	1992	5009	3804
	AUG	1992	3594	2480
	SEPT	1992	2340	2227
	MAY	1993	5009	4379
	JUNE	1993	4956	4660
	JULY	1993	5027	4643
	AUG	1993	4330	3018
	SEPT	1993	2480	1203

West Branch Feather River

Lake Storage at Round Valley Reservoir ranged from 189 to 1102 ac-ft in 1992 and from 0 to 1187 ac-ft in 1993. Stream flow in the WBFR below Round Valley Reservoir ranged from 0.2 to 1.0 cfs 1992 and from 0.0 to 17 cfs in 1993. July flows averaged 0.8 cfs in 1992 and 10 cfs in 1993. Average August flows were 0.4 cfs and 8.4 cfs for 1992 and 1993, respectively.

Stream flows for unregulated Coon Hollow Creek and any other ungaged flows in the WBFR were estimated for the monitoring period. The total ungaged WBFR flows in 1992 ranged from 24 to more than 180 cfs, and from 30 to more than 180 cfs in 1993. Calculated July flows averaged 47 cfs in 1992 and 85 cfs in 1993. Calculated August flow averaged 35 and 47 cfs for 1992 and 1993, respectively.

Lake Storage in Philbrook Reservoir ranged from 2227 to 5009 ac-ft in 1992 and from 1203 to 5027 ac-ft in 1993. Stream flows in Philbrook Creek below Philbrook Reservoir ranged from 3.0 to 57 cfs in 1992 and from 2.6 to 40 cfs in 1993. Average July flows were 24 cfs in 1992 and 13 cfs in 1993. Average August flows were 22 and 32 cfs for 1992 and 1993, respectively.

Total stream flow in the WBFR above Hendricks Head Dam ranged from 25 to more than 190 cfs in 1992 and from 37 to more than 190 cfs in 1993. Average July flows were 72 cfs in 1992 and more than 106 cfs in 1993. Average August stream flows were 56 and 87 cfs for 1992 and 1993, respectively.

Hendricks/Toadtown Canal

Flows in Hendricks Canal below Hendricks Head Dam ranged from 8.3 to 125 cfs in 1992 and from 20 to 125 cfs in 1993. Average July canal flows were 61 cfs in 1992 and 89 cfs in 1993. Average August flows were 44 cfs in 1992 and 70 cfs in 1993.

Flows in Toadtown Canal above the confluence with Butte Canal ranged from 0.0 to 122 cfs in 1992 and 9.8 to 123 cfs in 1993. July canal flows averaged 60 cfs and 88 cfs in 1992 and 1993, respectively. Average August flows were 32 cfs in 1992 and 71 cfs in 1993.

Butte Creek

Stream flow in Butte Creek above Butte Head Dam ranged from 40 to more than 130 cfs in 1992 and from 61 to more than 130 cfs in 1993. Average July flows were 56 cfs in 1992 and 95 cfs in 1993. Average August flows were 49 cfs in 1992, and 70 cfs in 1993.

Stream flows in Butte Creek above the Forks of Butte Powerhouse were estimated by subtracting flows from DeSabra Powerhouse from total Butte Creek flow at LCDD. These calculated flows ranged from 14

to more than 96 cfs in 1992 and 21 to more than 124 cfs in 1993. Calculated July flows averaged 25 cfs and more than 64 cfs in 1992 and 1993 respectively. Average August flows were estimated at 25 cfs in 1992 and 46 cfs in 1993.

Butte Canal

Canal flows in Butte Canal above the confluence with Toadtown Canal ranged from 0 to 81 cfs in 1992 and 0 to 84 cfs in 1993. July flows averaged 41 cfs and 70 cfs in 1992 and 1993 respectively. Average August flows were 30 cfs in 1992 and 50 cfs in 1993.

Flows from Butte Canal into DeSabra Forebay ranged from 0.0 to 202 cfs in 1992 and 9.8 to 205 cfs in 1993. Average July flows were 101 cfs in 1992 and 158 cfs in 1993. Average August flows were 62 cfs in 1992 and 117 cfs in 1993.

DeSabra Powerhouse

Flows through DeSabra Powerhouse ranged from 0 to 193 cfs in 1992 and 0 to 185 cfs in 1993. July flows averaged 102 cfs and 152 cfs in 1992 and 1993, respectively. Average August flows were 65 cfs in 1992 and 115 cfs in 1993.

Lower Butte Creek

Stream flows in Butte Creek above LCDD ranged from 43 to more than 267 cfs in 1992 and from 77 to more than 267 cfs in 1993. Average July flows were 126 cfs in 1992 and more than 213 cfs in 1993. Average August flows were 87 cfs in 1992 and 161 cfs in 1993.

Release flows to Butte Creek below LCDD ranged from 15 to more than 90 cfs in 1992 and 44 to more than 90 cfs in 1993. Average July flows were 44 cfs in 1992 and 52 cfs in 1993. Average August flows were 44 cfs in 1992 and 45 cfs in 1993.

Flows in ^{Centerville} Butte Canal above Centerville Powerhouse ranged from 3.8 to 178 cfs in 1992 and from 33 to 177 cfs in 1993. July flows averaged 82 cfs and 162 cfs in 1992 and 1993, respectively. Average August flows were 46 cfs in 1992 and 115 cfs in 1993.

METEOROLOGY

Meteorological conditions during the two monitoring years were significantly different. Data collected during the 1992 field season reflected below-normal precipitation, while the 1993 season reflected the end of a six-year drought and a rainy season that resulted in more than 130% of normal precipitation. The

snow pack at 5,000 ft lasted well into June 1993 and produced spill flows throughout the system that lasted into July.

Table 6-4 summarizes the meteorology data collected from the temporary stations during the two-year monitoring program. Appendix E presents the daily data from each temporary station along with data from the PG&E Chico station. Since meteorological data was collected primarily as support for the stream temperature and flow portion of the monitoring program, only air temperature data from the temporary stations installed at Philbrook and DeSabra will be discussed.

Air temperatures at the Philbrook Dam station ranged from 2.5 to 30.2°C in 1992 (July-September) and from 0.8 to 28.5°C in 1993. Average July air temperatures were 17.0°C in 1992 and were not recorded in 1993. Average August air temperatures in 1992 were 17.5°C, and 15.2°C in 1993. The temperature data for 1993 from this station is incomplete because of periodic recorder failure from June through July 1993.

Air temperatures at the DeSabra Forebay station ranged from 9.1 to 37.0°C in 1992 (July-September) and from 6.7 to 33.1°C in 1993 (May-September). Average July air temperatures were 21.9°C in 1992 and 21.0°C in 1993. Average August air temperatures in 1992 were 23.3°C, and 19.8°C in 1993.

TIME-OF-TRAVEL STUDY

Table 6-5 summarizes the time-of-travel data collected during the monitoring program. Appendix F presents graphical representations of the continuous data from each station for both low and high flows.

West Branch Feather River

Low-flow time-of-travel in the WBFR from Round Valley Reservoir to the confluence with Philbrook Creek was approximately 8 hours. As a reference, this value equates to a velocity of 0.8 ft/sec. Round Valley Reservoir was completely empty on the day of the test; WBFR flows were 0.1 cfs plus flows of approximately 40 cfs from Coon Hollow Creek. As a result of these conditions, this data is not representative of actual Round Valley Reservoir release travel time.

Philbrook release flows of 36 cfs required 2.2 hrs for the peak to reach the confluence with the WBFR. This value equates to a velocity of 0.7 ft/sec. From the confluence of WBFR and Philbrook Creek to Hendricks Head Dam required 12.6 hrs at 80 cfs. This value equates to a velocity of 0.8 ft/sec. No high-flow tests were performed on this watershed.

Table 6-4

Summary of Meteorological Data from Temporary Monitoring Stations

Station	Month	Year	Monthly Maximum	Monthly Minimum	Monthly Mean	Number of data days
<i>Air Temperature (°C):</i>						
DeSabra Forebay	JULY	1992	34.7	10.0	21.9	29
	AUG	1992	37.0	9.1	23.3	31
	SEPT	1992	30.2	10.1	18.5	12
	MAY	1993	27.8	2.5	14.0	29
	JUNE	1993	33.1	7.7	18.2	30
	JULY*	1993	30.5	12.8	21.0	6
	AUG	1993	31.7	7.6	19.8	23
	SEPT	1993	32.8	6.7	18.4	26
Philbrook Dam	JULY	1992	27.4	7.1	17.0	24
	AUG	1992	30.2	2.5	17.5	31
	SEPT	1992	26.7	4.3	13.9	30
	AUG*	1993	25.3	5.9	15.2	15
	SEPT	1993	28.5	0.8	12.7	26
	<i>Relative Humidity (%):</i>					
DeSabra Forebay	JULY	1992	95	14	53	29
	AUG	1992	88	10	41	31
	SEPT	1992	83	15	51	12
	MAY	1993	100	20	68	29
	JUNE	1993	100	13	58	30
	JULY*	1993	80	19	50	6
	AUG	1993	100	17	54	26
	SEPT	1993	94	12	51	26
Philbrook Dam	JULY	1992	96	12	59	24
	AUG	1992	93	12	46	31
	SEPT	1992	95	11	47	30
	AUG*	1993	93	19	55	15
	SEPT	1993	97	10	53	26

* record a failure during this period.

Table 6-4 (continued)

Station	Month	Year	Monthly Maximum	Monthly Minimum	Monthly Mean	Number of data days
<i>Wind Speed (MPH):</i>						
DeSabra Forebay	JULY	1992	3.7	0.0	1.1	29
	AUG	1992	3.1	0.0	1.3	31
	SEPT	1992	2.5	0.0	0.8	12
	MAY	1993	2.9	0.0	1.0	29
	JUNE	1993	4.1	0.0	1.0	30
	JULY*	1993	2.9	0.2	1.2	6
	AUG	1993	3.8	0.0	1.1	28
	SEPT	1993	2.6	0.0	1.0	24
Philbrook Dam	JULY	1992	3.3	0.0	0.7	24
	AUG	1992	4.6	0.0	0.5	31
	SEPT	1992	14.4	0.0	0.7	30
	AUG*	1993	4.2	0.0	0.7	15
	SEPT	1993	6.0	0.0	0.4	26

Solar Radiation:

Station	Month	Year	Monthly Maximum (Ly/min)	Monthly Minimum (Ly/min)	Mean Daily Total (Ly/day)	Number of data days
DeSabra Forebay	JULY	1992	1.4	0.0	668	29
	AUG	1992	1.4	0.0	565	31
	SEPT	1992	1.2	0.0	493	12
	MAY	1993	1.4	0.0	535	28
	JUNE	1993	1.5	0.0	620	30
	JULY*	1993	1.4	0.0	672	6
	AUG	1993	1.5	0.0	538	25
	SEPT	1993	1.2	0.0	472	25
Philbrook Dam	JULY	1992	1.5	0.0	637	24
	AUG	1992	1.5	0.0	574	31
	SEPT	1992	1.4	0.0	470	29
	AUG*	1993	1.4	0.0	542	15
	SEPT	1993	1.3	0.0	477	26

Table 6-5

Time-of-Travel Dye Study Test Summary

Stream or Canal Study Reach	Date	Flow (cfs)	Time to		Time to 50% Passage (hours)	Time to Total Passage (hours)	Average Velocity [Peak] (ft/sec)	Reach Length (miles)
			Initial Detect (hours)	Peak (hours)				
Round Valley Reservoir to Philbrook Creek confluence	06/08/93 08/25/93	spill 0.1	NT 8.0	NT	NT	NT	0.8	4.5 4.5
Philbrook Reservoir to WBFR	06/08/93 08/25/93	spill 36	NT* 1.9	2.2	2.2	3.2	0.7	1.1 1.1
WBFR/Philbrook Creek confluence to Hendricks Head Dam	06/08/93 08/24/93	spill 80	NT 11.0	12.6	12.8	15.2	0.8	7.0 7.0
Hendricks Head Dam to Hendricks Diversion Dam	06/08/93 see entire canal	123	0.7	1.1	1.1	1.9	3.3	2.4 2.4
Hendricks Diversion Dam to above Butte Canal	06/09/93 see entire canal	119	2.7	2.9	2.9	3.2	4.3	8.6 8.6
Hendricks Head Dam to above Butte Canal (entire canal)	06/09/93 08/26/93	121 62	3.4 4.6	4.0 4.8	4.0 4.9	5.1 5.2	4.1 3.3	11.0 11.0
Butte Head Dam to above Toadtown Canal	06/09/93 08/26/93	81 42	4.1 5.0	4.3 5.2	4.3 5.2	4.6 5.7	3.6 3.0	10.7 10.7
DeSabra Forebay, from canal inflow to DeSabra PH Tailrace	06/08/93 08/24/93	201 107	1.4 2.4	2.2 3.4	4.8 5.9	8.9 18.9	1.2 0.8	1.8 1.8
Butte Head Dam to above Forks of Butte Dam	06/08/93 08/26/93	spill 19	NT 19.7	22.3	24.9	44.0 +	0.3	5.0 5.0
Butte Creek below Forks of Butte Dam to DeSabra PH	06/08/93 08/26/93	spill 41e**	NT 7.9	8.8	8.9	10.7	0.7	4.5 4.5
LCDD to Pool 4 (previous study test)	1988 1988	10 45	-- --	33 10	-- --	-- --	0.2 0.6	3.8 3.8

* No test performed at this flow.
** Flow is an estimate based on mass balance calculations.

Hendricks/Toadtown

Peak time-of-travel in Hendricks Canal from the Head Dam to the confluence with Butte Canal required 4.0 hrs at high flow (121 cfs), while low flow (62 cfs) conditions required 4.8 hrs. These values equate to velocities of 4.1 and 3.3 ft/sec for high and low flow conditions, respectively.

Butte Canal

Peak time-of-travel in Butte Canal from the Head Dam to the confluence with Hendricks/Toadtown Canal at high flow (81 cfs) required 4.3 hrs, while low flow (42 cfs) required 5.2 hrs for the peak to pass. These values equate to velocities of 3.6 and 3.0 ft/sec for high and low flow conditions, respectively.

DeSabra Forebay

Peak dye passage at high flows (201 cfs in, 182 cfs out) into DeSabra Forebay required 2.2 hrs, while low flow (107 cfs in, 104 cfs out) required 3.4 hrs. These values equate to velocities of 1.2 and 0.8 ft/sec for high and low flow conditions, respectively. Total time for complete dye passage was 8.9 and 18.9 hours for high and low flow conditions, respectively.

Upper Butte Creek

Low flow (19 cfs) time-of-travel in Butte Creek from the Head Dam to Forks of Butte Diversion required 22.3 hrs for passage of the peak. Similar low flow (estimated at 41 cfs) time-of-travel in Butte Creek from the Forks of Butte Diversion to above DeSabra Powerhouse required 8.8 hrs for passage of the peak. These values equate to velocities of 0.3 and 0.7 ft/sec for above and below the Forks of Butte Diversion, respectively. This test was conducted when the Forks of Butte Powerhouse was not operational. No high flow test was attempted during this study.

Lower Butte Creek

Previous time-of-travel studies in Lower Butte Creek were conducted in 1983 (Kimmerer 1988). During these low-flow tests (10 cfs) time-of-travel in Butte Creek from LCDD to Pool 4 required 33 hrs for peak dye passage. A higher flow test (45 cfs) required 10 hours for peak dye passage. These values equate velocities of 0.2 and 0.6 ft/sec for low and higher flow conditions, respectively. These velocity values are very similar to upper Butte Creek values at similar flows.

SPECIAL STUDIES

Tests of Various Butte Creek Flow Releases

Various other studies were conducted during the monitoring program. The first was an experiment to determine the effect of different flow releases on temperatures in both Butte Canal and Butte Creek. This test was conducted in August 1992 and involved splitting flows between the canal and the creek at Butte

Head Dam. Table 6-6 summarizes the results of the flow-split tests. Hourly data from this test is presented in Appendix G.

When 85% of Butte Creek was allowed to pass Butte Head Dam and remain in Butte Creek, temperatures increased an average of 3.2°C between Butte Head Dam and the Forks of Butte Powerhouse. During this same period, Butte Canal temperatures increased 2.1°C on average between Butte Head Dam and the confluence with Toadtown Canal. For comparison, when the situation was reversed (as occurs under normal operations) and only 24% of Butte Creek flow was released to Butte Creek, Butte Creek and Butte Canal temperatures increased 3.4 and 0.7°C on average, respectively. When 67% of the flow was allowed to pass, Butte Creek temperatures increased 3.3°C and Butte Canal temperatures increased 1.4°C. Stream flow in Butte Creek above Butte Head Dam during these tests was approximately 40 cfs. Figure 6-9 compares the relative change in temperatures occurring in Butte Creek and Butte Canal downstream of Butte Head Dam during these flow tests.

Temperature monitoring during 1993 showed similar heating trends during periods when flows in the creek were significantly higher than those used in the special 1992 test. During a five day period beginning on June 15, 1993, flows in Butte Canal averaged 84 cfs, while those in Butte Creek were more than 50 cfs. The average temperature change in the canal during this period was 0.5°C while the average change in the creek was 2.8°C.

Altered Release of Round Valley Reservoir

The second special investigation was the attempted early release of water from Round Valley Reservoir. Because of the above-normal precipitation in 1993, this experiment proved inconclusive, because releases were not begun any earlier than would have been done normally. However, the potential effects of various release scenarios are discussed in the following section.

DeSabra Forebay Bathymetry

The bathymetric investigation of DeSabra Forebay was conducted during the 1993 monitoring program. This investigation was conducted to determine the bottom topography of the forebay to aid in analyzing the affect that the forebay has on stream temperatures. Table 6-7 presents a stage-volume table developed from this information.

The original maximum capacity of DeSabra Forebay is 188 ac-ft. Based on the bathymetric investigation conducted in 1993, the maximum capacity was calculated to be 124 ac-ft, with an average depth of 7.8 ft.

Table 6-6

Summary of Test-flow Experiment in Upper Butte Creek - 1992

		1992 Butte Creek Flow Split (canal %/creek %)			
Station	Parameter	Units	76/24	33/67	15/85
			Aug. 24-26*	Aug. 26-31	Sept. 1-2
Butte Creek at Head Dam	Mean Temperature	(°C)	13.2	14.2	14.1
	Mean Flow	(cfs)	40.6	42.0	44.9
	Mean Delta-t	(°C)	--	--	--
Butte Canal above Toadtown Canal	Mean Temperature	(°C)	13.9	15.6	16.2
	Mean Canal Flow	(cfs)	31.0	14.0	6.9
	Mean Delta-t	(°C)	0.7	1.4	2.1
Butte Creek above Forks of Butte Powerhouse	Mean Temperature	(°C)	16.6	17.5	17.2
	Mean Release Flow **	(cfs)	9.6	28.0	38.0
	Mean Delta-t	(°C)	3.4	3.3	3.2
DeSabra PH Tailrace ***	Mean Temperature	(°C)	16.1	17.9	17.7
	Mean Flow	(cfs)	32.0	20.0	12.0
	Mean Delta-t	(°C)	2.9	3.6	6.1

* Pre-test, under normal operating conditions

** Total flow would include flows from West Branch Butte Creek (which were estimated to be about 10 cfs during test) in addition to the release from Butte Head Dam.

*** Resultant affect of less flows through DeSabra Forebay

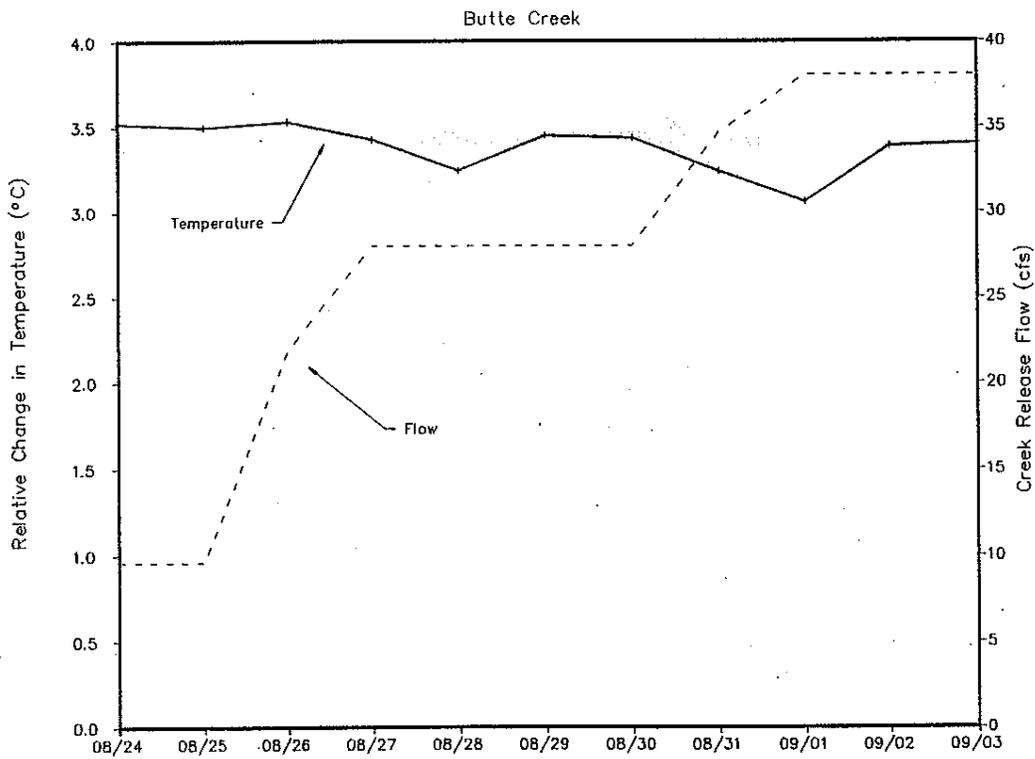
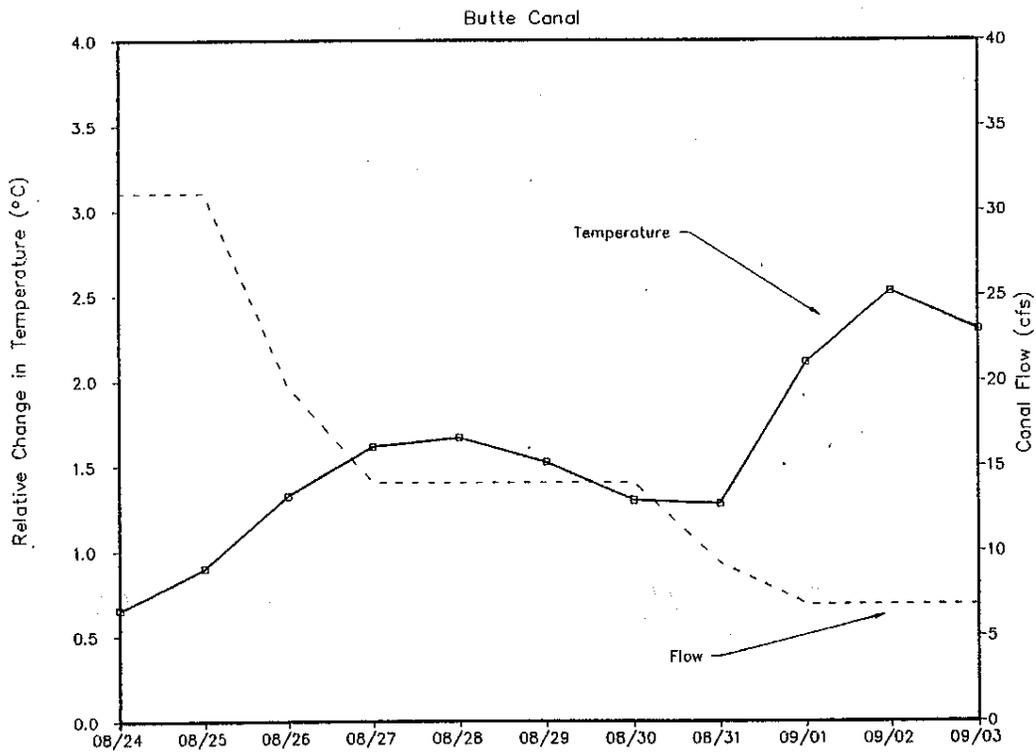


Figure 6-9. Results of Butte Creek flow split test.

Table 6-7

Summary of Bathymetric Data from DeSabra Reservoir

Relative Reservoir Elevation (ft amsl)	Storage Capacity (ac-ft)	Remarks
2762.5	124.1 *	Estimates based on regression curve.
2762	118.1	
2761	105.4 **	
2760	93.9 **	Calculations based on August bathymetry data
2750	48.2	
2745	24.4	
2740	9.5	
2735	1.8	
2730	0.0	

* Calculated maximum capacity (no spill); rated maximum capacity is 188 ac-ft.

** Range of normal operating capacity.

Section 7

DISCUSSION

Water temperatures within a particular stream reach are influenced by a variety of factors including temperature of the source water, volume and temperature of tributary stream flows, ambient meteorological conditions, stream geometry and associated topographic characteristics (shading, stream azimuth, topographic angles).

This section presents a discussion of existing temperature conditions, as well as an analysis of potential temperature effects based on various operational alternatives. As discussed earlier, these alternate operational regimes were originally outlined in the two-year monitoring program study plan (PG&E 1992a).

WEST BRANCH FEATHER RIVER

Stream temperatures in the WBFR above Hendricks Head Dam are primarily driven by temperatures in Philbrook Creek and Coon Hollow Creek. Under the current operational regime, flows in the WBFR are maintained after the runoff period by manipulating releases at both Round Valley and Philbrook reservoirs. This practice provides maximum flows in Hendricks Canal and still meets minimum flows in the WBFR below Hendricks Head Dam and any other water rights agreements.

Figures 7-1 and 7-2 compare stream temperatures in the WBFR system for July and August 1992-93. These profiles illustrate the different trends in stream temperature exhibited between Round Valley Reservoir releases, Philbrook Reservoir releases, and WBFR flows at Hendricks Head Dam. The upper WBFR system currently provides relatively cool water to the Hendricks Head Dam diversion for delivery into the Butte Creek watershed.

Round Valley Reservoir Release

Below Round Valley Reservoir, WBFR flow is primarily derived from Coon Hollow Creek, with a limited regulated contribution from Round Valley Reservoir. Stream flows in Coon Hollow Creek are not impacted by man-made diversions or dams and therefore reflect natural ambient conditions. During the 1992 and 1993 monitoring program, Coon Hollow Creek had significant sustained summer flows which strongly influenced temperatures in the WBFR.

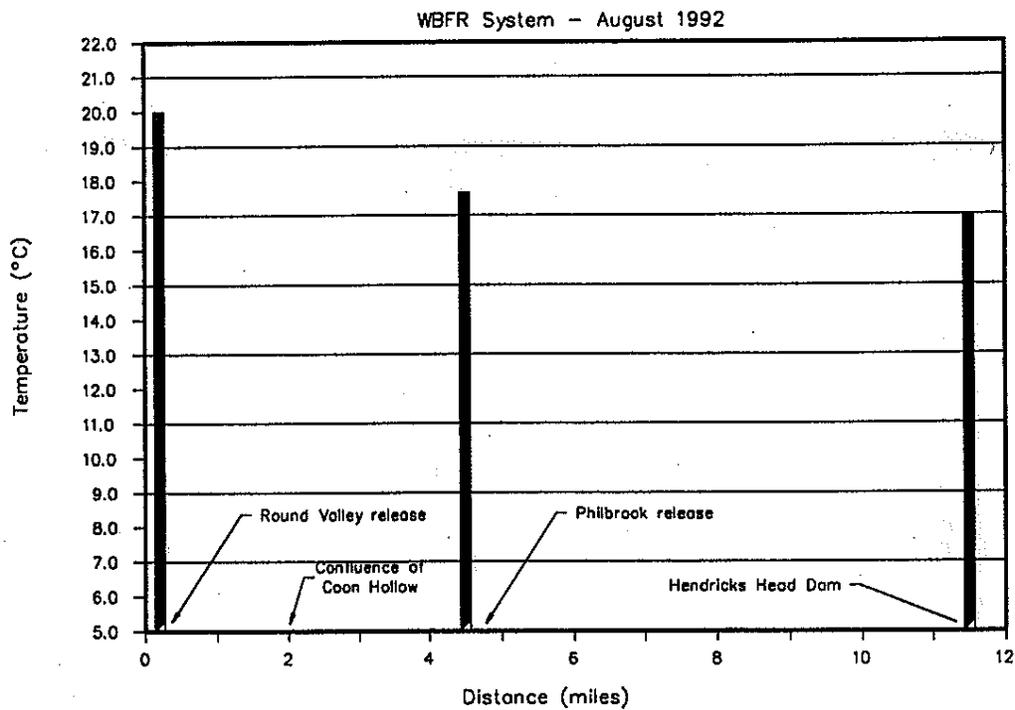
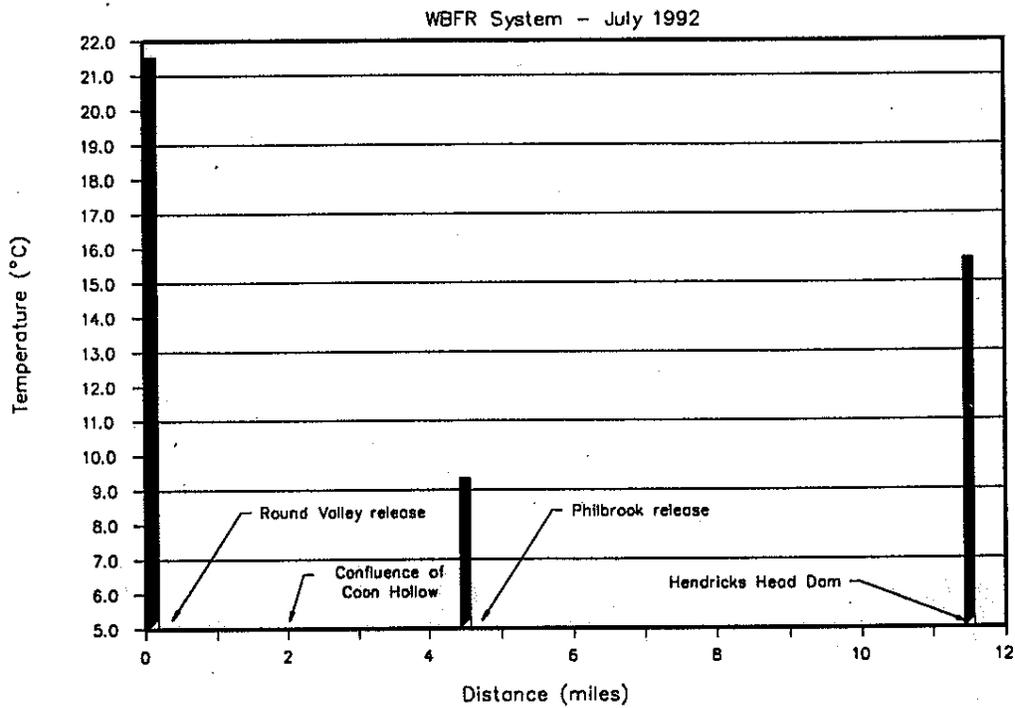


Figure 7-1. Comparison of 1992 mean monthly water temperatures in WBFR system.

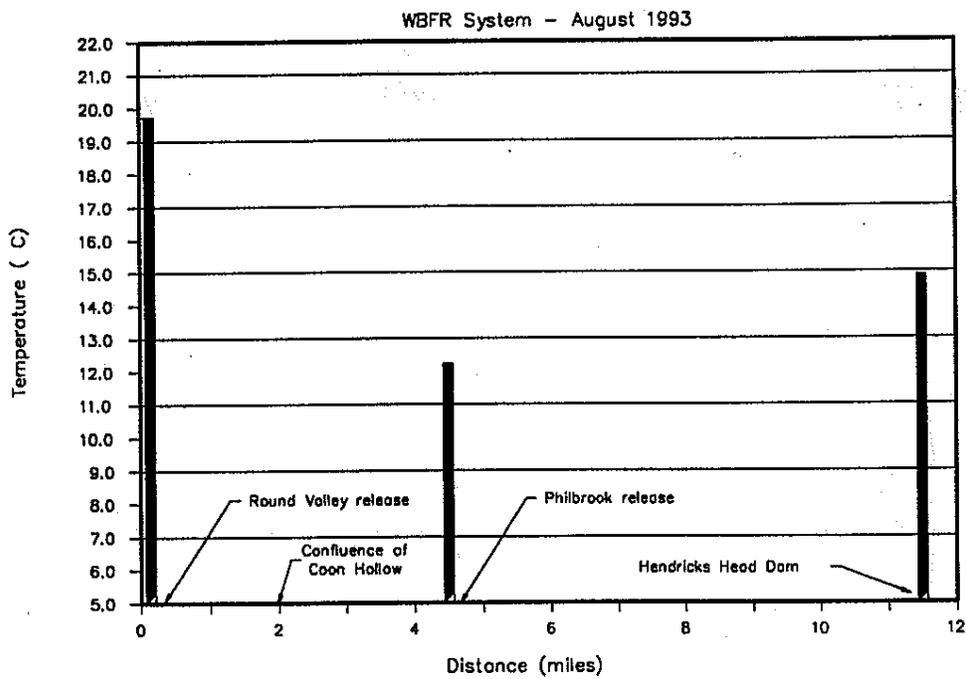
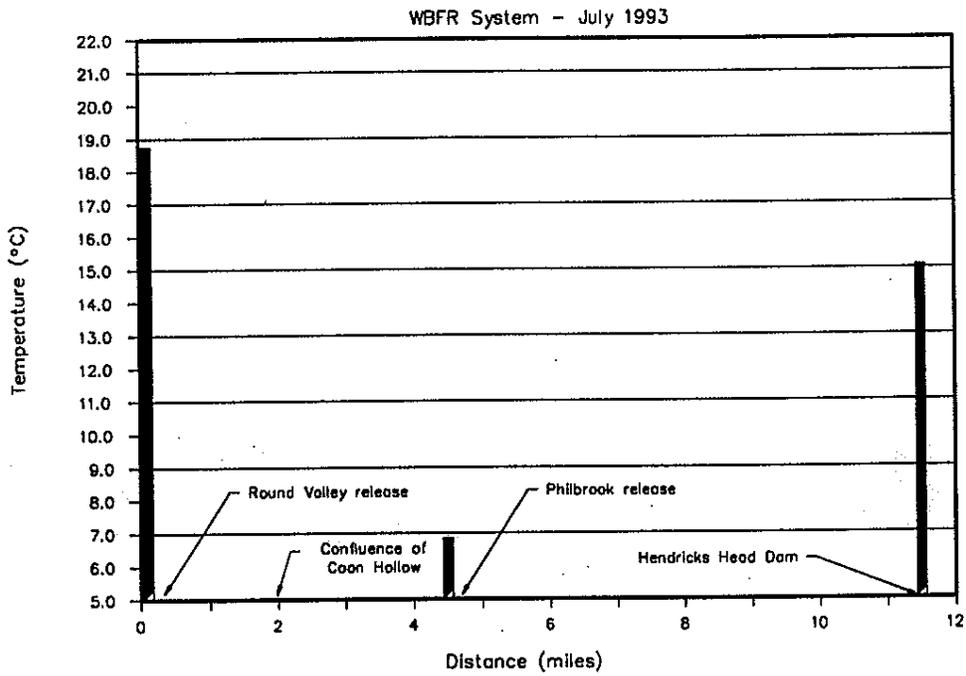


Figure 7-2. Comparison of 1993 mean monthly water temperatures in WBFR system.

Based on mass balance considerations, even at the increased release rates of normal summertime operations, Round Valley Reservoir releases are small enough that their influence on stream temperatures downstream of the confluence with Coon Hollow Creek is small. In addition, the volume of water retained in Round Valley Reservoir is too small and too warm to provide any reduction in downstream water temperatures.

Later release of water from Round Valley Reservoir would be diluted by natural flows in Coon Hollow Creek. Additionally, due to its shallow depth, the longer water is held in Round Valley Reservoir the warmer it becomes. Any increase in release rates late in the season would tend to slightly elevate WBFR stream temperatures. Also, a considerable amount of water would be lost to evaporation and percolation, thereby reducing the amount available for release.

An earlier release of water from Round Valley Reservoir would also be diluted by natural flows in Coon Hollow Creek. However, a slight benefit may be gained by avoiding evaporation and percolation losses associated with a later release. This option would require CDF&G to release PG&E from its obligation under the 1983 Agreement to delay drawdown until after July 15 each year.

Philbrook Reservoir

Release temperatures in Philbrook Creek are controlled by releases from Philbrook Reservoir, which receives and stores runoff from the headwaters of Philbrook Creek. Thermal stratification within the reservoir and the bottom location of the release structure provides a cool but limited source of water to Philbrook Creek during the summer release period. The stored volume of cool water is relatively small and once release rates are increased it is depleted rapidly. Table 7-1 presents the total available volume of water in Philbrook Reservoir at various lake stage elevations. Release duration calculations included in this table are based on the existing stage-area relationship and theoretical release rates.

At times, releases from Philbrook Reservoir provide a cooling effect on the WBFR. However, the affect of these releases on temperatures in the WBFR downstream of their confluence is controlled in large part by temperature and flow in the WBFR upstream of the confluence. Any determination of potential temperature benefits to the WBFR downstream of their confluence must consider the combined effect of the WBFR and Philbrook Creek. Once the two streams combine, there is a relatively long travel time (12.6 hours at 80 cfs) through a natural stream channel before arrival at Hendricks Head Dam.

Operational options such as the earlier release of water from Philbrook Reservoir would have a minimal impact on temperatures downstream because flows in the WBFR would undoubtedly also be high and any temperature benefit would be small. In addition, earlier releases would reduce recreation opportunities at

Table 7-1

Philbrook Reservoir Stage-Capacity Table

Reservoir Elevation (ft amsl)*	Reservoir Storage (ac-ft)	Estimated Duration (days) of Lake Storage at Specified Release Flows (cfs)				
		5 cfs	10 cfs	20 cfs	30 cfs	40 cfs
5420	4990	504	242	126	84	63
5415	4165	420	210	105	70	53
5410	3402	343	172	86	57	43
5405	2695	272	136	68	45	34
5400	2116	213	107	53	36	27
5395	1615	163	81	41	27	20
5390	1203	121	61	30	20	15
5385	874	88	44	22	15	11
5380	600	61	30	15	10	8
5375	379	38	19	10	6	5
5370	199	20	10	5	3	3
5365	67	7	3	2	1	1
5360	0	0	0	0	0	0

* Feet above PG&E datum.

the lake. Early releases would also reduce the amount of water available later in the season, at which time increased temperatures would likely occur downstream.

A delayed release schedule of water from Philbrook Reservoir (other than that currently used) would not yield any benefit since the reservoir becomes warmer the longer water is stored. Delayed releases would also potentially result in less water available for salmon below Centerville Powerhouse due to evaporative losses during storage.

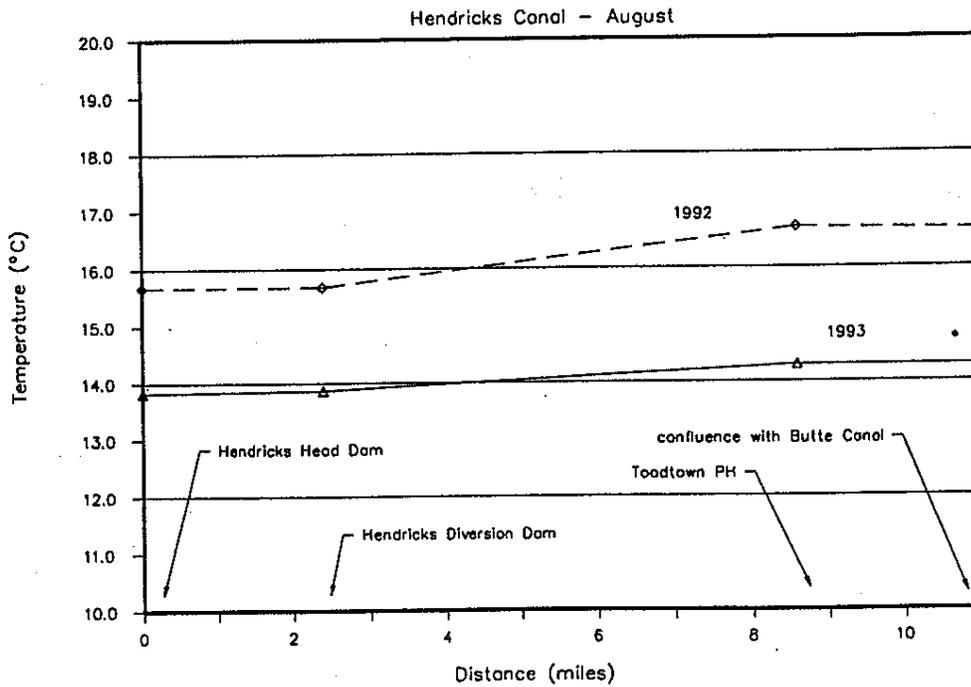
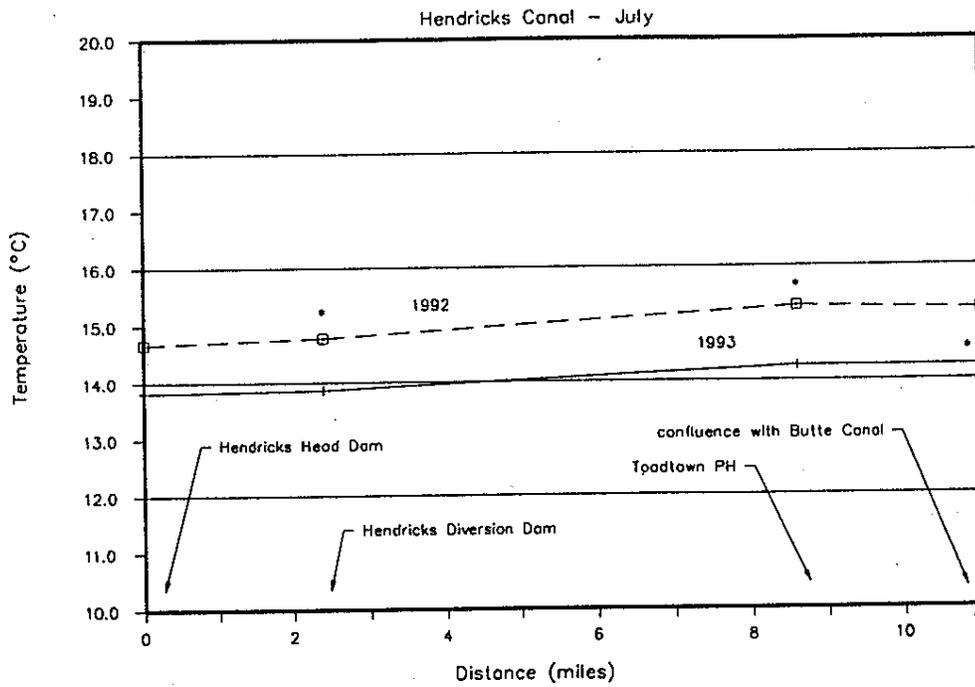
Release temperatures from Philbrook Reservoir are not always cooler than the WBFR receiving waters. Synoptic temperature data collected from the WBFR and Philbrook Creek at their confluence during the 1993 time-of-travel investigation (August 25, 1993) indicated that WBFR temperatures were cooler than those in Philbrook Creek. Temperatures in Philbrook Creek at this time were 16.4°C, while those in the WBFR were 12.4°C. Temperatures in the WBFR at this time were entirely the result of flows from Coon Hollow Creek, since Round Valley Reservoir was dry and had only a 0.1 cfs release flow.

In general, the temperature of release flows from Philbrook Reservoir were 0.5°C or more cooler than the WBFR at Hendricks Head Dam for 32 of the 41 days (78%) in the 1992 monitoring period and 36 of the 58 days (62%) in the 1993 monitoring period (counted from the first day of increased Philbrook releases through September 15). For the rest of the period Philbrook Reservoir releases had no beneficial impact on temperatures in the WBFR.

Hendricks/Toadtown Canal

Temperature changes that occur in the Hendricks and Toadtown canals over the 11 miles from the Head Dam to its confluence with Butte Canal are small, averaging less than 0.5°C for the period July 1 through September 15, in both 1992-93. This is a result of the short travel time (approximately 4.8 hours at 62 cfs) and the extensive shading the canal receives. Since no storage facility is associated with Toadtown Powerhouse it has no measurable effect on temperatures. Figure 7-3 presents longitudinal temperature profiles in the Hendricks Canal for July and August. These profiles illustrate the trends in canal temperatures exhibited between Hendricks Head Dam and the confluence with Butte Canal upstream of DeSabra Forebay.

Increased diversions into Hendricks Canal would not necessarily reduce water temperature in the canal since travel time in the canal is not appreciably affected by flow volume. Increased flows would help reduce heating in DeSabra Forebay slightly, as will be discussed in a following section. However, increased diversion of water into the Hendricks Canal is not a feasible option unless the present instream flow release of 15 cfs (for a normal water year) is decreased. This option would also be constrained in dry



• Some data reconstructed using mass balance calculations

Figure 7-3. Average July and August longitudinal temperature profiles from Hendricks Head Dam to Toadtown Canal above Butte Canal.

years by the April 19, 1927 agreement between PG&E and the California Water Service to deliver water downstream on the West Branch Feather River. In addition, the amount of aquatic habitat in the WBFR below the Hendricks Head Dam would be negatively impacted by a reduction in the minimum flow release.

Since the WBFR is typically slightly cooler than Butte Creek, any reduction in diversion flows would result in warmer waters arriving at LCDD. Decreased diversion of water into Hendricks Canal would result in less total flow to Butte Creek below Centerville Powerhouse, which would affect farming interests in the Butte Creek basin as well as the total flow available to salmon in this reach. Decreasing diversions would also significantly decrease power generation (about 37,000 kwh/10 cfs/day). Again, as discussed later, maximum flows should be maintained through the canal to DeSabra Forebay to keep heating in the forebay to a minimum.

Butte Canal

Temperature changes in Butte Canal over the 10 miles from the Butte Head Dam to its confluence with Toadtown Canal are small, averaging less than 0.9°C for the period July 1 to September 15, 1992-93. This small change in temperature is the result of the short travel time (approximately 5.2 hours at 42 cfs) and the extensive shading the canal receives. Figure 7-4 presents longitudinal temperature profiles in Butte Canal for July and August. Figure 7-5 presents longitudinal temperature profiles in upper Butte Creek for July and August. These profiles illustrate the trends in canal and creek temperatures exhibited downstream of Butte Head Dam.

Increased Butte Canal diversions would not necessarily reduce canal temperatures since travel time in the canal is not appreciably affected by flow volume. However, increased flows through the canal would slightly reduce heating in DeSabra Forebay, although the amount of aquatic habitat in Butte Creek below Butte Head Dam would be negatively impacted by the corresponding reduction in the minimum flow release. Additionally, increased diversion of water into Butte Creek Canal is not feasible unless the present instream flow release of 16 cfs (normal water year) is decreased.

Decreased diversions into the Butte Canal would increase temperatures at LCDD. Temperatures would increase because relative to Butte Canal, travel time in the creek is much longer (31 hours at minimum release flows from Butte Head Dam to above DeSabra Powerhouse) and has less shading, which results in more heat transfer to the water. Typical increases in temperature in Butte Creek between Butte Head Dam and DeSabra Powerhouse are around 3°C compared to less than 1°C in the canal.

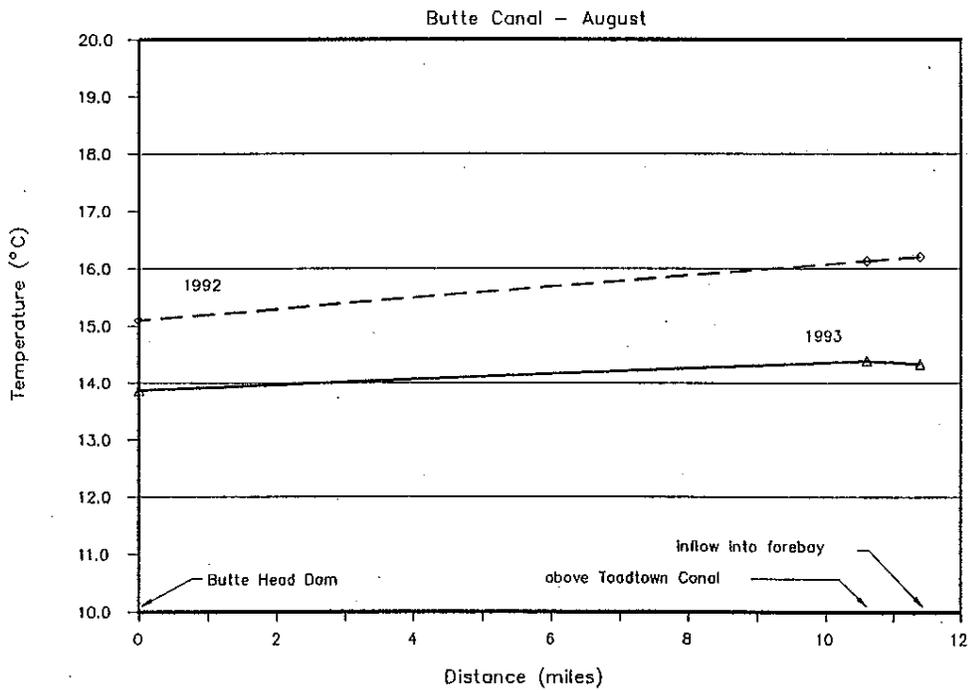
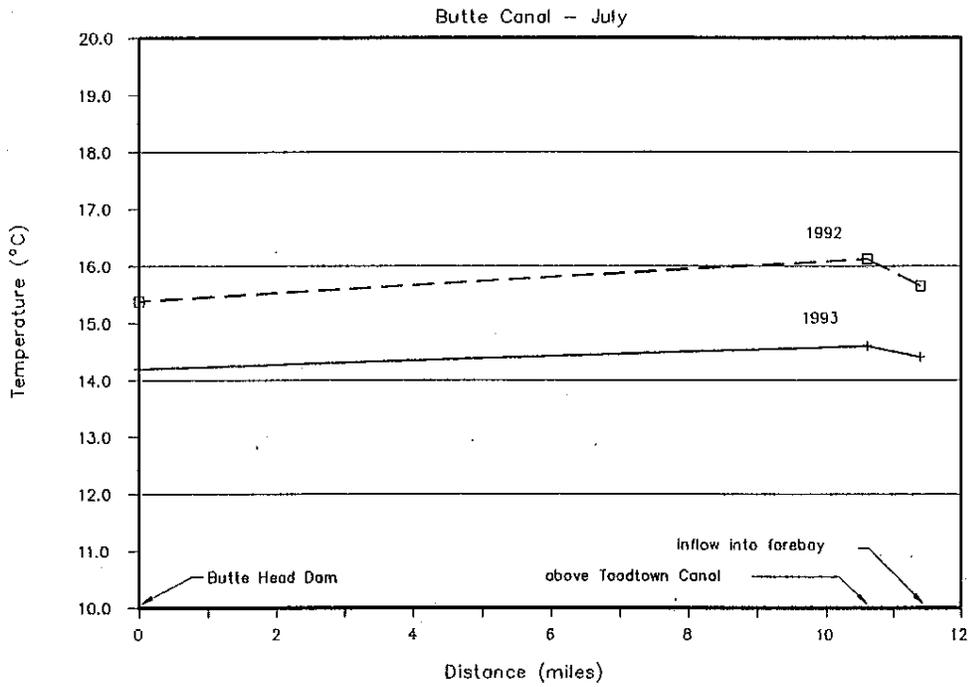


Figure 7-4. Average July and August longitudinal temperature profiles from Butte Head Dam to Butte Canal above DeSabra Forebay.

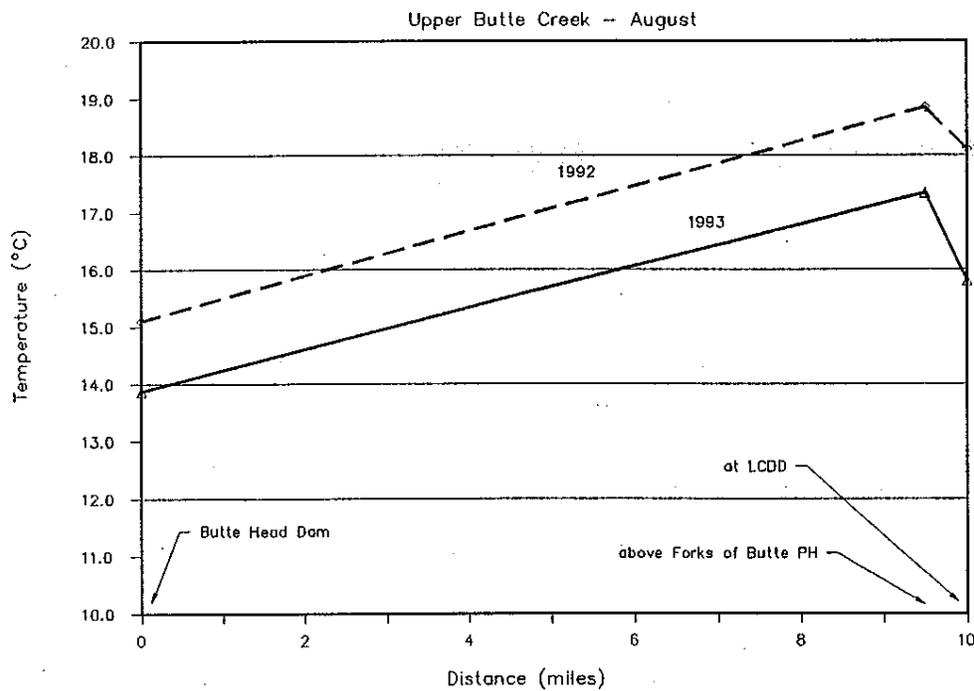
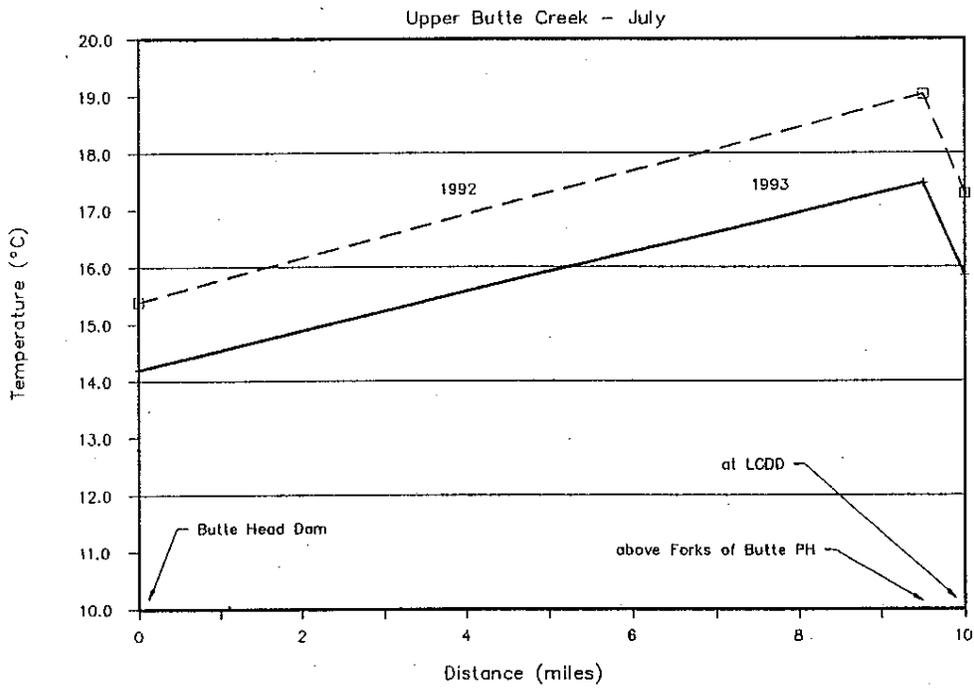


Figure 7-5. Average July and August longitudinal temperature profiles from Butte Head Dam to Butte Creek above LCDD.

A summary of 1992-93 temperature data comparing the difference in heating related to the canal and creek is presented in Table 7-2. In general, heating in Butte Creek during the period July 1 to September 15 averaged 3.7°C in 1992 and 3.4°C in 1993. Comparatively, heating in Butte Canal for the same period averaged 0.9 and 0.5°C for 1992 and 1993, respectively.

DeSabra Forebay

The FERC license amendment alludes to significant heating occurring in DeSabra Forebay. Based on data collected during the 1992-1993 monitoring program, average heating in DeSabra Forebay was less than 1.1°C for the July 1 through September 15 period in both 1992 and 1993. Temperature differences between DeSabra Powerhouse tailrace and incoming canal flows during the monitoring program ranged from 0.4°C cooler to 2.6°C warmer. Figure 7-6 presents longitudinal temperature profiles through DeSabra Forebay for July and August. These profiles illustrate the trend in temperatures exhibited between Butte Canal inflow into the forebay and the DeSabra Powerhouse tailrace.

Retention time in DeSabra Forebay is significantly influenced by the volume of incoming water. Travel-time through the reservoir during periods of maximum inflow is 8.9 hours at 201 cfs, compared with 18.9 hours at 107 cfs. Any period of reduced canal flows (such as a scheduled maintenance outage or natural low flow conditions) during the critical summer period will significantly impact forebay retention time with a corresponding increase in water temperatures. Once temperatures have been increased in the forebay it becomes extremely difficult to reduce temperatures using upstream flow releases.

Analysis of flow and temperature data showed that when flows into the forebay are reduced below 50 cfs, water temperatures greatly increase and tailrace temperatures begin to approximate surface temperatures in the forebay. Inflows above 50 cfs are more likely to produce tailrace temperatures which are an average of top and bottom forebay temperatures (as would be expected from a full column intake). Table 7-3 presents an analysis of temperature changes occurring within the forebay with respect to incoming flows. Using data from 1992 and 1993, a regression analysis of canal flow versus change in temperature through the forebay was performed. The results of this analysis are presented in Figure 7-7. This analysis indicates that to keep temperature changes less than 1°C through the forebay, flows must be 108 cfs or greater. A temperature change of less than 2°C must have inflows greater than 46 cfs. Figure 7-7 also illustrates the temperature benefit that would be realized if more water was diverted into Hendricks and Butte canals. The amount of cooling is dependent on both the total flow through the forebay and the increase in flow being evaluated. It is apparent from Figure 7-7 that large flow increases are necessary to produce appreciable temperature benefits. A flow increase of only 10 cfs would cool forebay temperatures by only about 0.1-0.3°C.

Table 7-2

Temperature Changes in Butte Creek and Butte Canal

Period		Difference in Mean Daily Temperature (°C)	
		Butte Canal	Butte Creek
June-92	Maximum	1.0	4.7
	Minimum	0.4	3.0
	Mean	0.6	3.8
June-93	Maximum	0.8	3.1
	Minimum	0.2	1.6
	Mean	0.5	2.5
July-92	Maximum	0.9	4.3
	Minimum	0.4	3.2
	Mean	0.7	3.7
July-93	Maximum	0.5	3.7
	Minimum	0.2	2.8
	Mean	0.4	3.3
August-92	Maximum	1.7 *	4.3
	Minimum	0.7 *	3.3
	Mean	1.0 *	3.7
August-93	Maximum	0.7	4.1
	Minimum	0.3	3.1
	Mean	0.5	3.5
Sept-92**	Maximum	2.5 *	4.3
	Minimum	0.8 *	3.1
	Mean	1.2 *	3.6
Sept-93**	Maximum	0.9	3.9
	Minimum	0.6	3.4
	Mean	0.7	3.6

* Butte Canal shut down during portions of this period.

** Through September 15.

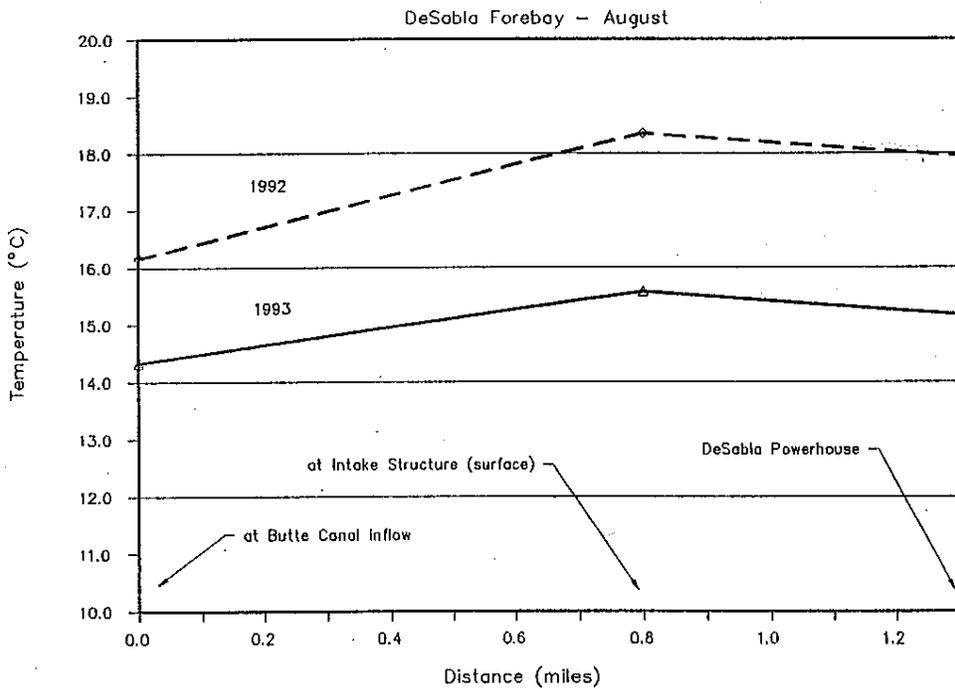
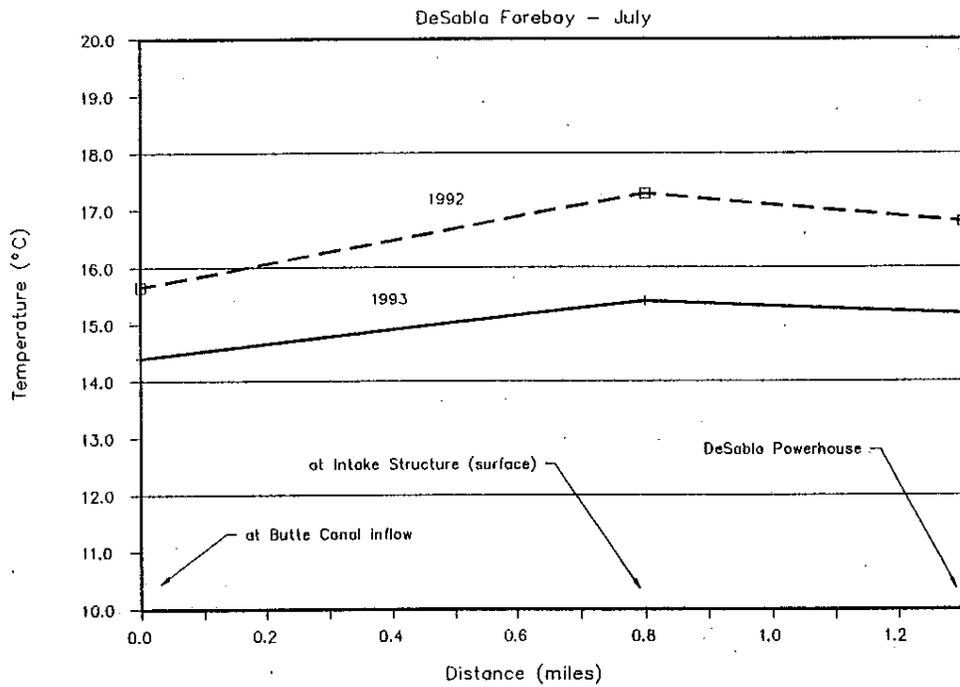


Figure 7-6. Average July and August longitudinal temperature profiles from Butte Canal to DeSabra Powerhouse Tailrace.

Table 7-3

Summary of Temperature Changes in DeSabra Forebay

Year	Parameter	Units	Range of Forebay Inflows (cfs)				
			< 20	20-50	50-100	100-150	> 150
1992	Mean Delta-T *	C	2.4	2.3	1.3	1.0	1.3
	Average Flow	cfs	13.7	33.4	88.8	110.0	169.0
	Days of flow	#	7.0	28.0	38.0	23.0	1.0
1993	Mean Delta-T *	C	--	--	0.9	0.8	0.6
	Average Flow	cfs	0.0	0.0	93.6	126.7	195.2
	Days of flow	#	0.0	0.0	14.0	46.0	72.0

* Mean Delta-T equals average tailrace temperature (°C) minus inflow temperature (°C) within the indicated flow range.

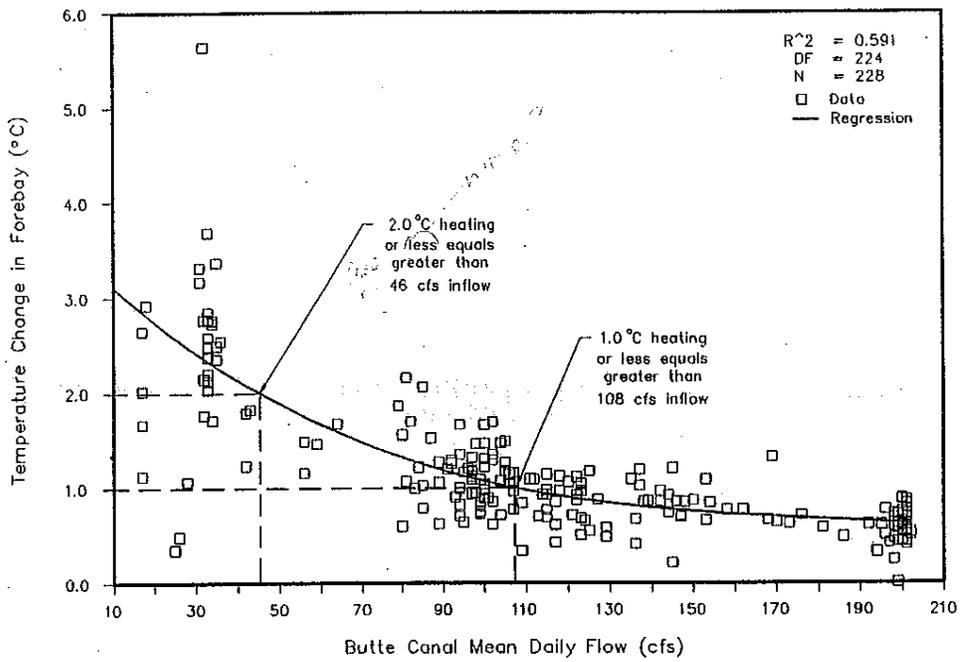


Figure 7-7. Regression analysis of flow versus change in temperature in DeSabra Forebay.

As seen in 1992, elevated flows are not always available for diversion into DeSabra Forebay. Under these conditions, heating in the forebay is not under the control of PG&E operations.

Figure 7-8 presents longitudinal profiles comparing relative changes in temperatures in Butte Creek and Butte Canal downstream of Butte Head Dam under different flow regimes. This figure illustrates the effect that different flows have on the ultimate temperature of waters arriving at LCDD, and specifically the effect flows have on temperature changes occurring in DeSabra Forebay. Temperature and flow data indicates that flow rates have little influence on temperature changes in Butte Canal or Butte Creek. However, as seen in Figure 7-8, large changes in flow rates into DeSabra Forebay have a significant effect on temperature changes in the forebay.

A bathymetric investigation of the forebay did not reveal any type of physical barrier between the intake and the greater body water. However, the historical forebay capacity has been reduced by accumulated sediment except for a relatively small deep-water area immediately adjacent to the intake. Figure 7-9 is a map of the bottom topography of the forebay based on the bathymetric information. As a result of the shallow area created by this accumulated sediment, it is likely that the cooler incoming water is thoroughly mixed with the warmer water in storage by the time it reaches the intake. Lower flow rates compound this problem by increasing retention time in the forebay and thus increasing temperatures. Figure 7-10 presents two bottom profiles of the forebay: one that is longitudinal and extends from the canal inflow to the dam, and one that is transverse, parallel with the dam in front of the intake.

It has been suggested that decreasing retention time in DeSabra Forebay would reduce the temperature of water arriving at LCDD. As stated earlier, heating in the forebay currently averages around 1°C, so any operational alternative will produce only incremental changes in the amount of heating in the forebay.

One suggested alternative to reduce reservoir retention is the elimination of the forebay. This alternative would involve routing the canal flow directly to the intake via a canal or penstock. While this would theoretically slightly decrease water temperatures at LCDD, it would also eliminate a portion of FERC 803 recreation project along with a very popular fishing area that is presently stocked with trout purchased by PG&E for planting by CDF&G. Operational constraints at DeSabra Powerhouse also render this option infeasible (the forebay provides a buffering effect of flows from both watersheds, and thus prevents spills and the accompanying erosion that would occur when DeSabra Powerhouse shuts down).

A more appropriate alternative would be to improve the rate at which canal flows get routed to the intake. As demonstrated in the preceding discussion, the most effective method currently available for reducing heating in DeSabra Forebay is to maintain incoming flows at relatively high rates (greater than 50 cfs).

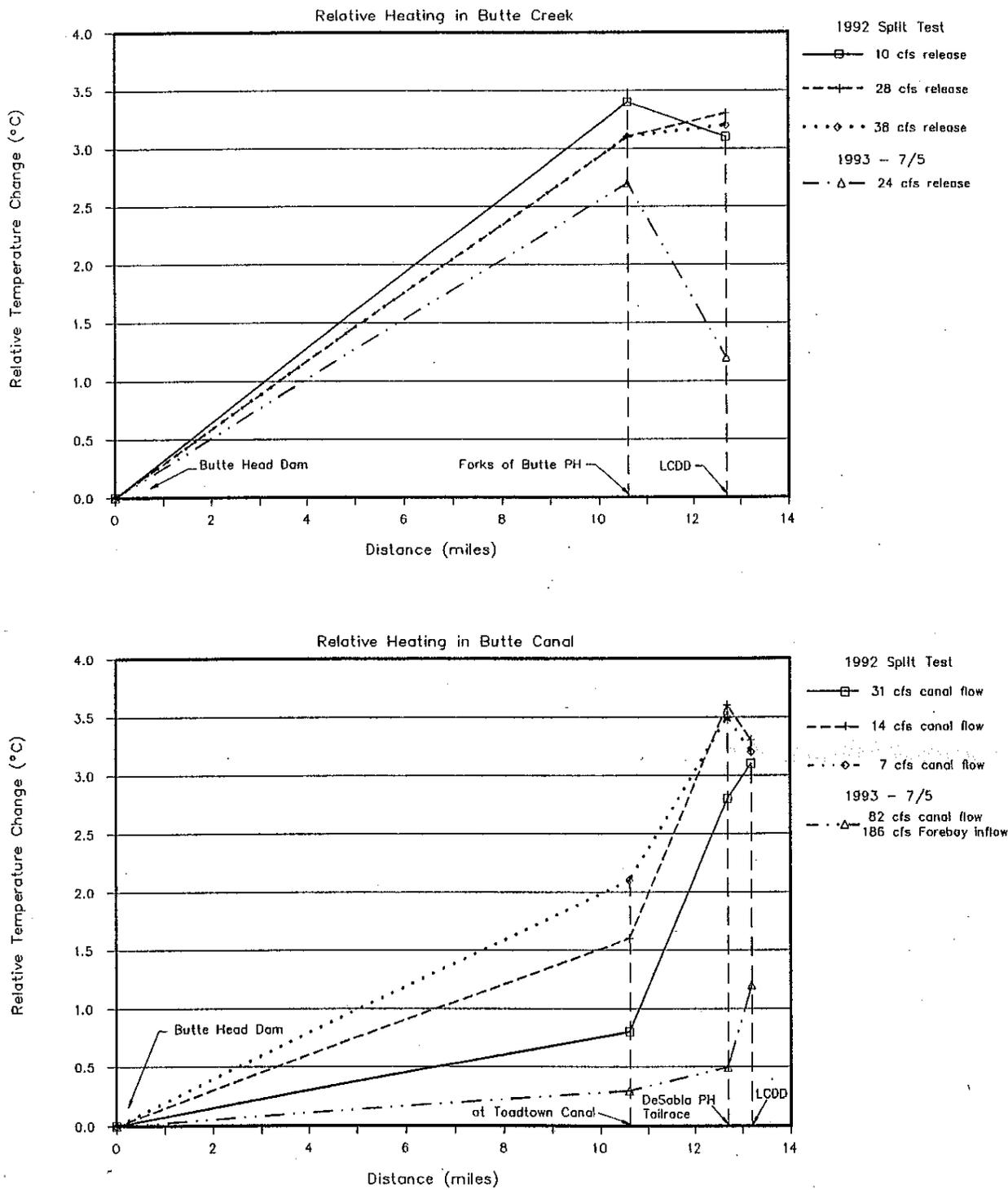


Figure 7-8. Mean daily longitudinal temperature profiles through Butte Creek and Butte Canal comparing affects of different flows in each system.

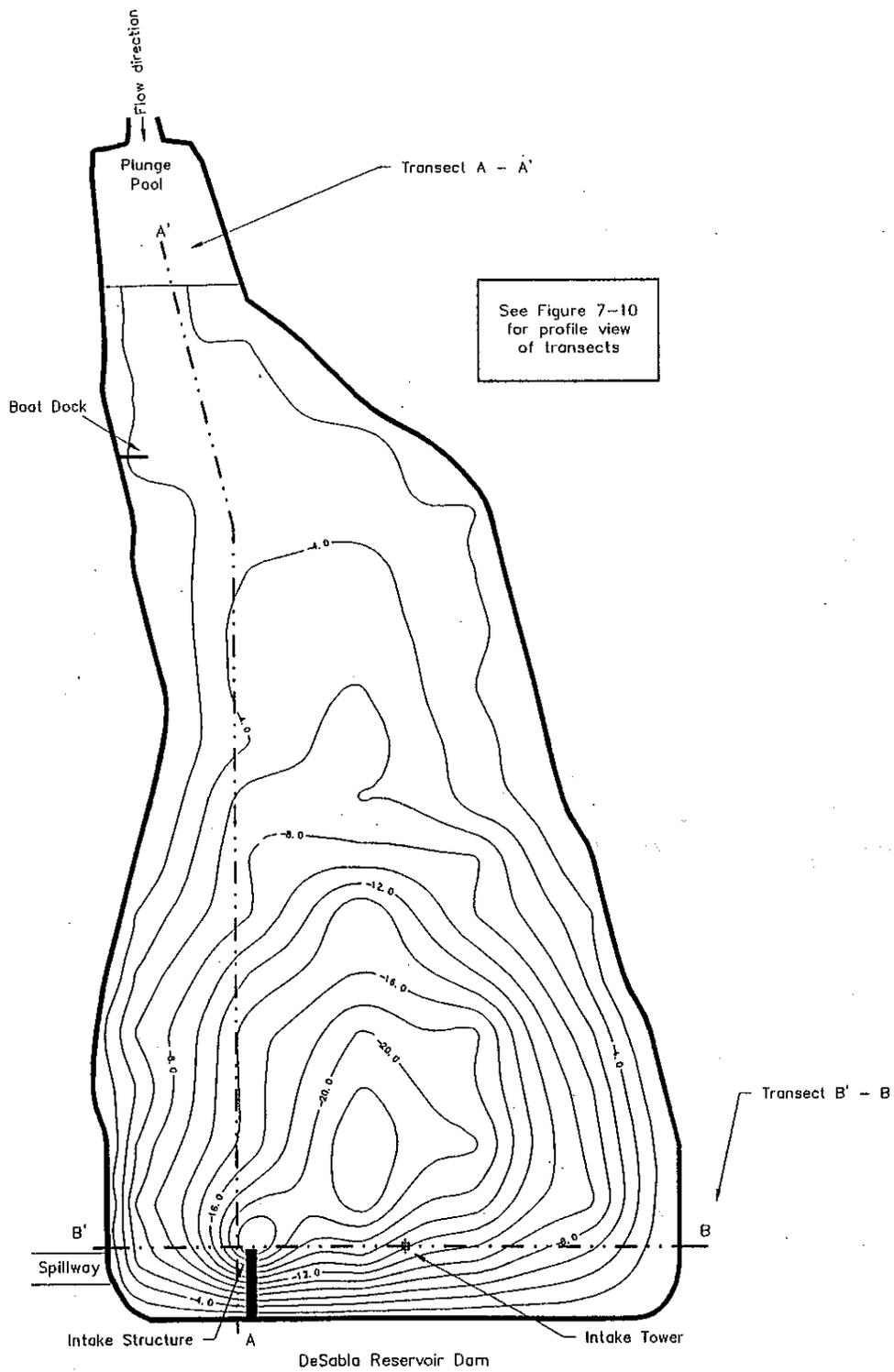
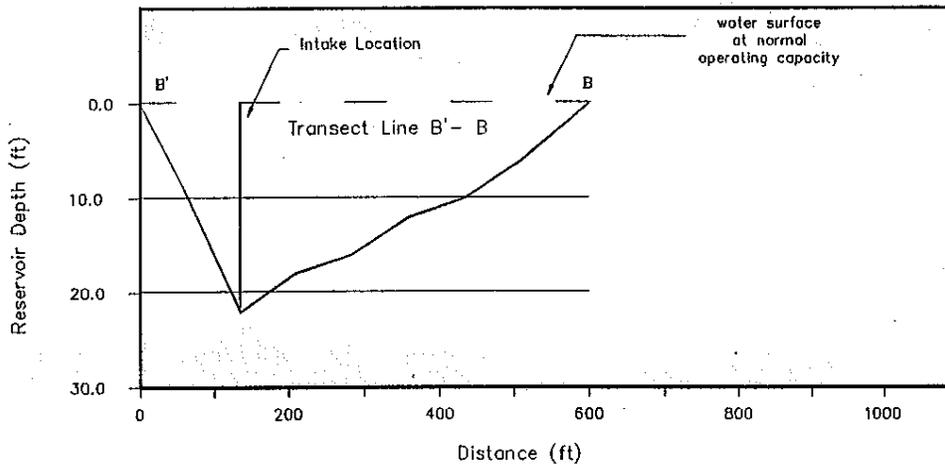
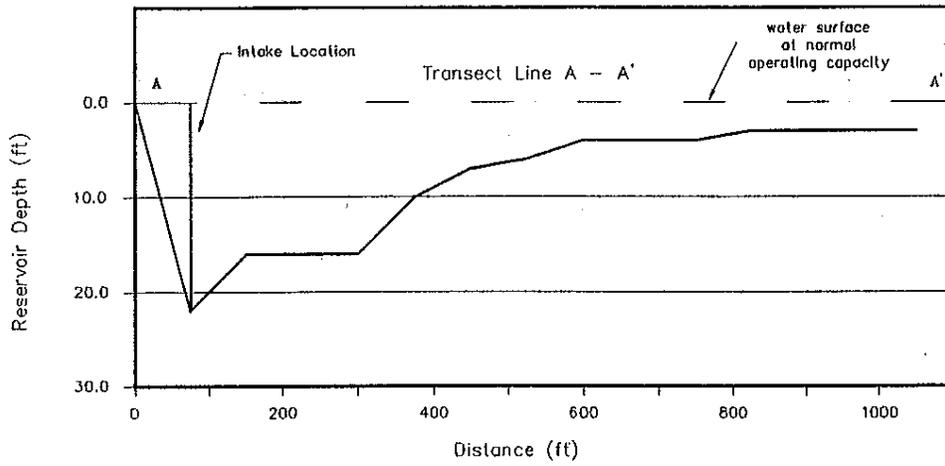


Figure 7-9. DeSabra Forebay bottom topography map.



See Figure 7-9 for location and orientation of transect profiles

Figure 7-10. DeSabra Forebay bottom profiles.

Any improvement over that offered by maintaining flows above 50 cfs would require channelizing flow to the intake by dredging the forebay. The effect on temperatures associated with channelized flow would be incremental over that achieved using sustained inflows.

Dredging of the forebay bottom would have to be sufficient to channel incoming water toward the intake. It is speculated that this option would have both positive and negative benefits. The primary positive benefit would be the reduction of the extensive shallow area in front of the intake, which would reduce the mixing of cool and warm waters. Negative impacts associated with dredging would primarily be that the increased volume would increase retention time and thereby raise temperatures during canal outages or low flow periods. In addition, the cost of dredging and disposing of the sediment would be prohibitive with respect to the small benefit in temperature reduction (estimated to average less than 0.5°C). Dredging would also temporarily increase the suspended sediment levels in the forebay and possibly downstream during the dredging activities. Finally, dredging would prove to be of temporary benefit since the forebay would eventually re-accumulate the sediments.

Lower Butte Creek System

Temperatures in the Lower Butte Creek section were evaluated and the 1992-93 results compared with previous years data as presented in previous PG&E reports (PG&E 1990, 91, 92b).

Stream temperatures in Butte Creek below LCDD are driven by stream temperatures arriving at LCDD and ambient meteorological conditions. Arriving temperatures are determined by temperatures in Butte Creek upstream of DeSabra Powerhouse and temperatures in DeSabra Forebay. Temperature data from 1992 and 1993 demonstrates the effect of various water-years on temperatures in Lower Butte Creek. 1992 represents the effect of below-normal precipitation, with average July and August temperatures in excess of 17°C. 1993 was an above-normal water-year, as a result average July and August temperatures were below 16°C. Figure 7-11 compares mean July and August temperature profiles in lower Butte Creek from 1992-93. Table 7-4 presents a comparison of temperature data from 1989-1993.

During the 1986-88 temperature modeling study of the Lower Butte Creek reach, it was determined using regression analysis that daily maximum temperatures at LCDD of less than 16.7°C would maintain the following day's maximum Pool 4 temperature below 20°C (when release flows are 40 cfs). Temperatures at LCDD exceeded the 16.7°C threshold necessary for maintaining temperatures at Pool 4 (below 20°C) on 60 of 77 days in 1992. In 1993 the 16.7°C threshold temperature was exceeded on only 21 of 77 days during the same July 1 to September 15 period.

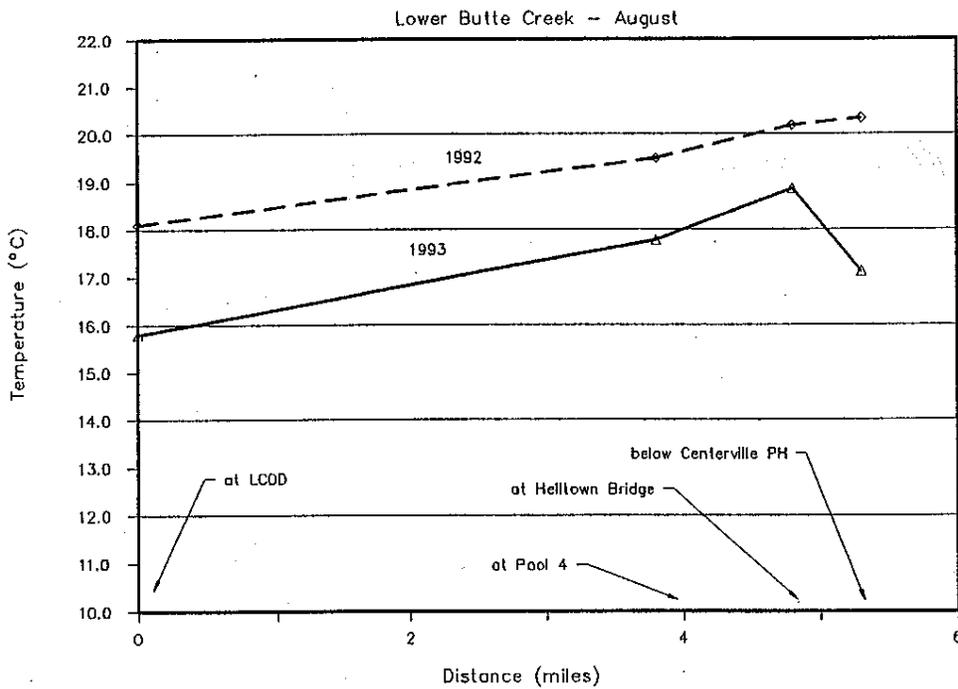
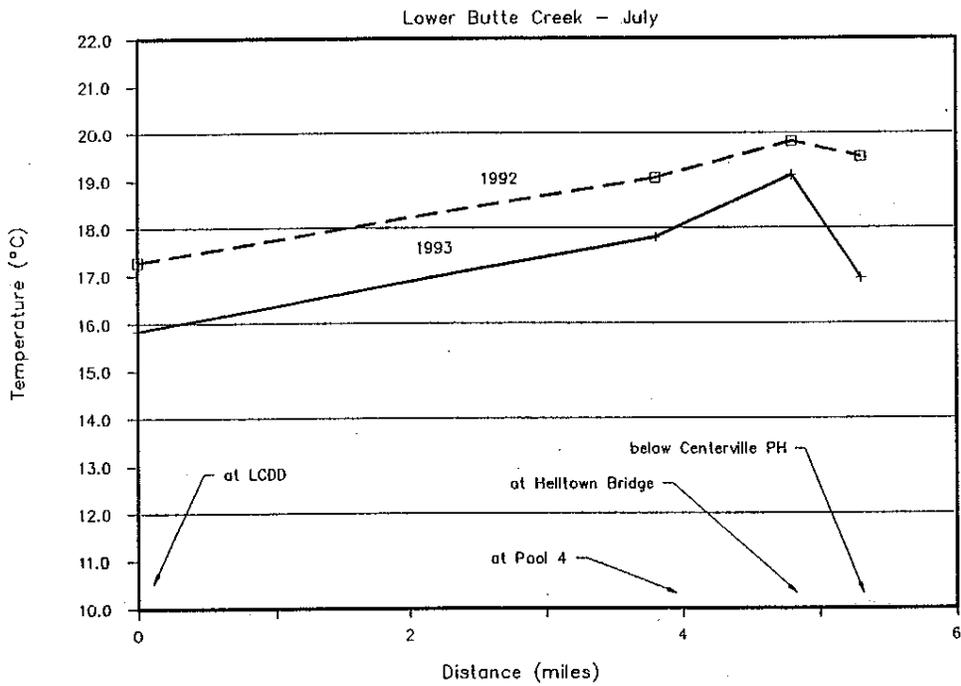


Figure 7-11. Average July and August longitudinal temperature profiles from LCDD to Butte Creek below Centerville Powerhouse.

Table 7-4

Comparison of recent stream temperature data from
Butte Creek below LCDD

Station	Month	1989	1990	1991	1992	1993
		Monthly Mean (°C)	Monthly Mean (°C)	Monthly Mean (°C)	Monthly Mean (°C)	Monthly Mean (°C)
LCDD	June	16.2	14.1	13.8	16.5	12.7
	July	17.4	18.2	18.1	17.3	15.8
	August	16.8	17.7	17.5	18.1	15.8
	September	14.8	15.1	15.7	15.9	15.5
Pool 4 at 3 ft depth	June	18.1	15.8	15.8	17.7	13.6
	July	18.7	21.0	19.8	19.0	17.9
	August	18.2	20.4	18.9	19.5	17.8
	September	16.0	17.5	17.7	17.2	17.2
Helltown Bridge	June	19.4	16.6	16.9	18.9	13.8
	July	20.2	22.6	20.9	19.8	19.1
	August	19.7	21.9	19.7	20.2	18.9
	September	16.9	18.9	18.7	17.8	17.2

Pool 4 stream temperatures dynamics from 1989-93 are compared in Table 7-5. Hourly temperatures (from July 1 to September 15) exceeded 20°C for 4-hours or more on 54 of 77 days in 1992; and only 28 of 77 days in 1993. During this same period a daily maximum of 23°C was exceeded on only 10 days in 1992, 23°C was not exceeded on any day in 1993. Flows during this period were always in excess of 40 cfs (averaging 44 and 45 cfs in 1992 and 1993, respectively).

Table 7-5

Pool 4 Temperature Dynamics 1989-1993.

Parameter	1989	1990*	1991	1992	1993
Average July temperature (°C)	18.7	18.9	17.9	19.9	17.8
Average July flow (cfs)	42.7	14.2	40.7	44.0	> 52.0
Average August temperature (°C)	18.2	18.6	17.1	19.5	17.8
Average August flow (cfs)	38.8	12.6	39.9	44.0	45.0
Average thermal gradient ** (°C)	0.0	0.4	0.0	0.0	0.0
Thermal gradient range (°C)	-0.8 to +2.1	-1.1 to +4.0	-0.3 to +3.9	-0.4 to +0.2	-0.2 to +0.2
Number of Days 20°C Exceeded ***	42	--	50	54	28
Number of Days 23°C Exceeded ****	3	--	10	10	0

* Dry year release.

** Gradient equals 3 ft depth minus the 8 ft depth; "-" equals surface cooler than, and "+" equals surface warmer than bottom, for period July 1 to September 15.

*** Days when 20°C was exceeded for 4-hours or more and flows were over 40 cfs, July 1 to September 15.

**** Days when daily maximum exceeded 23°C and flows were over 40 cfs.

Section 8

SUMMARY AND CONCLUSION

The purpose of this two-year monitoring program was to evaluate the potential for providing cooler water at LCDD using operational modifications at PG&E's WBFR and Butte Creek storage and diversions facilities.

In general, the ability of the upstream project (primarily diversion from the WBFR) to provide cooler water at LCDD is determined by the amount of water available for diversion. It has been demonstrated that the most effective method of providing cooler water at LCDD is to maintain flows through DeSabra Forebay at relatively high rates (greater than 50 cfs). During below-normal water years (as in 1992), the ability to divert available water is constrained by the amount of water available, the minimum release schedules, and various other water rights agreements. This reduces the total volume of water delivered to the forebay and thus increases heating in the system. During above-normal water years (as in 1993) the increased runoff provides sufficient water for all commitments and still allows adequate flows to DeSabra Forebay to keep heating in the forebay to a minimum.

Specifically, the operational alternatives suggested in Section 2 are evaluated as follows:

Round Valley Reservoir storage is too small and warms up too early in the season to provide any significant positive benefit to temperatures at LCDD, regardless of operations. However, an earlier release may reduce evaporation and percolation losses, making slightly more water available through the system. An earlier release will also minimize heating in the reservoir. The effect of any operational change on the WBFR will be small.

Philbrook Reservoir stores a limited supply of cool water which is depleted rapidly once increased releases are begun. The combined effect of unregulated WBFR flows and Philbrook releases currently produces relatively cool water for diversion to Butte Creek at LCDD.

Increased diversion of the WBFR into Hendricks Canal would not lower temperatures in the canal, however, residence time in DeSabra Forebay would be reduced which would reduce heating in the forebay and provide the coolest possible temperatures at LCDD. Increased diversion would negatively impact the amount of aquatic habitat in the WBFR downstream of Hendricks Head Dam because of reduced instream flow releases.

Decreased diversion into Hendricks Canal would produce warmer temperatures at LCDD by reducing the total flow through DeSabra Forebay and by reducing the amount of cool WBFR water delivered to Butte Creek at LCDD.

Increased diversion of Butte Creek into Butte Canal would not lower temperatures in the canal, however, residence time in DeSabra Forebay would be reduced which would reduce heating in the

forebay and provide the coolest possible temperatures at LCDD. Increased diversion would negatively impact the amount of aquatic habitat in Butte Creek downstream of Butte Head Dam because of reduced instream flow releases.

Decreased diversion of Butte Creek into Butte Canal would produce negative temperature impacts at LCDD by reducing the total flow through DeSabra Forebay and by leaving the water in the natural Butte Creek channel, which warms up more than Butte Canal.

Eliminating DeSabra Forebay to reduce retention time is not feasible because of operational constraints associated with DeSabra Powerhouse. Channelizing inflow to the intake to reduce mixing and thereby indirectly reduce retention time would produce only incremental benefits with regard to temperatures at LCDD. The resultant increased capacity would increase retention time during periods of low inflow and may increase temperatures arriving at LCDD.

There do not appear to be any feasible operational changes in the upper watershed reservoirs which would provide cooler water at LCDD, because the volume of cool water is relatively small. This, combined with the effect of unregulated WBFR flows and the long travel time, tends to moderate any potential temperature benefits at LCDD. In general, PG&E's current operations already maintain flows at the maximum possible level, which reduces residence time in the system and results in the coolest possible temperatures arriving at LCDD. Suggested operational considerations are presented below:

The suggested option for Round Valley Reservoir is to begin releases as soon as canal space is available downstream and maintain a moderate release rate (5 to 10 cfs) until the reservoir is empty (approximately 100 to 50 days). This will minimize heating in the reservoir, and any negative impact associated with the inevitable warm release flows will be minimized by the moderate release rate.

The current method of operating Philbrook Reservoir based on water demand downstream appears to be the most beneficial regime. As discussed, the most important factor in minimizing temperature increases in DeSabra Forebay is to maintain flows at moderate to high rates (greater than 50 cfs).

There are no operational changes in either Butte or Hendricks/Toadtown canals which will reduce temperatures in these canals. However, increased diversions into the canals will slightly reduce residence time in DeSabra Forebay and temperatures at LCDD, at the expense of instream flow releases.

Reduction of residence time in DeSabra Forebay should be achieved using canal inflow rates. The current operational objective of maintaining maximum flows into the forebay should be maintained.

It is recommended that any scheduled maintenance outages on Butte Canal or in the WBFR system not take place during the critical temperature period between July 1 and September 15, to maintain the maximum possible flows to the forebay.

Section 9

AGENCY COMMENTS AND PG&E RESPONSES

A complete draft of this report was sent by overnight mail to the California Department of Fish and Game (CDF&G), the US Fish and Wildlife Service (USF&WS), and the National Marine Fisheries Service (NMFS) on December 20, 1993 (see enclosed letter, Appendix H). The agencies were asked to review the study results and submit comments by January 21, 1994.

The CDF&G responded with comments in a letter dated January 20, 1994, and the USF&WS commented in a letter dated January 24, 1994. Copies of these letters are enclosed in Appendix H. PG&E contacted the NMFS by telephone prior to the deadline, and was informed that due to staffing constraints the NMFS would not be providing comments on the temperature study at this time.

The CDF&G and USF&WS comments are repeated below, grouped into five subject areas: Round Valley releases, Philbrook releases, WBFR/Butte Creek diversions, DeSabra Forebay, and LCDD flow releases. PG&E's response to the agency comments on each subject is provided below.

ROUND VALLEY RESERVOIR RELEASES

Agency Comments

CDF&G. "There appears to be some benefit suggested by altering the Round Valley/Philbrook Reservoir releases and releasing Round Valley Reservoir water prior to the period specified in the agreement with the Department. This should be evaluated further as you were unable to accomplish this action during 1993."

USF&WS. "We concur with your conclusion regarding Round Valley and recommend that you continue to study the values of earlier annual releases. We understand that this may be complicated by an existing agreement you have with the California Department of Fish and Game. Under this agreement you do not draft water until after July 15 in normal water years."

PG&E Response

As discussed in the report, the small volume and release rate associated with Round Valley Reservoir is such that their influence on stream temperatures downstream of the confluence with Coon Hollow Creek is relatively insignificant. However, giving PG&E the option of releasing flows as early as possible would potentially minimize temperature impacts associated with drafting Round Valley Reservoir later in the year. This will require that PG&E amend its 1983 Fish and Wildlife Agreement with CDF&G in order to draft Round Valley Reservoir prior to July 15.

One point of clarification regarding the early release of PG&E's WBFR reservoirs is that releases from either Round Valley or Philbrook reservoirs are contingent on available capacity in both Hendricks and Lower Centerville canals. Releases made before canal space is available will result in lost generation due to spill, and would provide little temperature benefit to the Butte Creek system since this is a non-critical temperature period (canals flowing full from snowmelt, combined with cool starting temperatures, help to keep Butte Creek temperatures well below critical levels even though ambient temperatures may be high). A more practical solution is to begin releases as soon as space is available and maintain these releases at a moderate rate (5 to 10 cfs) until the reservoir is empty. This will minimize heating in the reservoir, and preclude any negative impact (however small) on temperatures in the WBFR associated with warm Round Valley release flows.

PHILBROOK RESERVOIR RELEASES

Agency Comment

USF&WS. "It is not clear to what extent the value of earlier releases of Philbrook water were evaluated. Your data show that drafting did not begin until July of both study years. While it may be that it is best to hold Philbrook's cooler water in reserve until July, some June release of flow may be of some value. Please describe any evaluation of June Philbrook Reservoir releases you performed, and discuss their effects on temperature control in the late summer months."

PG&E Response

PG&E did not perform any special release studies regarding the early release of Philbrook Reservoir during this monitoring program because they were not part of the approved study plan. During 1992 (dry year), releases were not begun until July to extend the period in which elevated flows could be maintained to DeSabra Powerhouse. In 1993 (wet year), spills occurred in the WBFR at Hendricks Head Dam through late June.

We believe that during dry years, June releases from Philbrook Reservoir would have limited benefit on temperatures, and this would be at the expense of higher temperatures in July and August. Since PG&E is now required to maintain a minimum pool in Philbrook Reservoir, any early release will reduce the amount of water available during the more critical temperature periods of late July, August, and early September. The historic practice of drafting after July also benefits recreation by maintaining Philbrook Reservoir at a higher level during heavy summer-use months.

PG&E maintains that the current method of operating Philbrook Reservoir based on water demand downstream also provides the most beneficial temperature regime downstream.

WBFR AND BUTTE CREEK DIVERSIONS

Agency Comments

CDF&G. "There appears to be some small benefit to increasing diversions from the West Branch of the Feather River into Hendricks Canal. Concern was expressed that by doing so there may be negative impacts to the amount of aquatic habitat in the West Branch and the potential for conflict with an existing contract with the California Water Service Company. This issue should be further evaluated to better identify the negative impact suggested."

USF&WS. "We do not believe that increased diversions from the WBFR or Butte Creek are a desirable or effective solution to the problem of warming in DeSabra Forebay."

PG&E Response

PG&E's suggestion that increased diversions would benefit temperatures at Lower Centerville Diversion Dam (LCDD) by reducing residence time in DeSabra Forebay was made as part of the complete analysis of available options. As stated in the report, the benefit associated with increased diversions would be slight (0.1 - 0.3°C for a 10 cfs increase). Using the instream flow studies conducted in the mid 1970s, PG&E could investigate the impacts to aquatic habitat in the WBFR associated with increased diversions at Hendricks Head Dam. However, the associated temperature impacts in the WBFR are unknown, and studies to determine those impacts could be costly. In light of the above USF&WS comment, PG&E does not envision a high likelihood of successfully negotiating reduced flows with all parties. Unless PG&E is given assurance from both agencies that the benefits of cooling Butte Creek below LCDD outweigh the impacts to WBFR, and that the likelihood of increasing diversions is real, we oppose doing any further impact evaluation and do not propose to alter the current WBFR and Butte Creek diversion schedules.

DESABLA FOREBAY

Agency Comments

CDF&G. "There appears to be some small benefit to altering flows through the DeSabra Forebay to reduce transit time. The methods of achieving this were suggested to be either eliminating or channelizing the existing Forebay. Both had resultant negative impacts such as operational constraints, elimination of recreational opportunities, and the potential for increased temperatures. It would appear that a third alternative exists which would provide a separate channel around the reservoir, either open or closed, while at the same time maintaining the existing reservoir and the resultant benefits of operational flexibility and recreational opportunity. This issue should be further evaluated."

USF&WS. "Our review of the study data indicates that significant warming of Butte Canal water occurs in the DeSabra Forebay. In June, July, August, and September of 1992, this increase was 1.8, 1.0, 1.4, and

2.4°C, respectively. In the same months for 1993, increases were 0.7, 0.8, 0.9, and 1.1°C. The smaller increases were probably a result of 1993's higher precipitation and runoff."

"You also indicated that residence time and subsequent warming in the forebay should be reduced, but state that this should be accomplished by altering canal inflow rates. However, as your study showed, flows of 46 cfs or greater are needed to keep flows passing through the forebay from warming more than 2°C, while inflows of 108 cfs are required to keep warming less than 1°C. However, monthly minimum inflows in 1992 fell to 6.9 and 0.0 cfs in August and September, respectively. In 1993, monthly minimums fell to 9.8 cfs by September. This indicates that the potential for controlling forebay warming using canal inflows is limited under the current diversion regime. As we have stated, we do not support increasing flow diversion from the WBFR or Butte Creek."

"You stated that the forebay could not be eliminated because of operational constraints associated with DeSabra Powerhouse, and that dredging in the forebay to establish a channel would be environmentally undesirable. While we concur with your conclusion regarding dredging, you have not explained why DeSabra Forebay could not be modified or eliminated. We request that you provide additional information regarding the forebay's role in DeSabra Powerhouse operations. In addition, please discuss the possibility of diverting some portion of Butte Canal flows around the forebay, thus reducing its warming effect."

PG&E's Response

In regards to the ability for diversions to meet the 46 cfs minimum inflow into the forebay and keep heating to a minimum, the data for August and September 1992 and 1993 are somewhat misleading. In late August and early September 1992, both Butte and Toadtown canals were shut down for maintenance improvements. It was also during this period that the Butte Creek/Butte Canal flow test-splits were performed, which further reduced flows into the forebay. These canal outages were also responsible for the increased heating that occurred in the forebay in September 1992 (2.4°C). The measurements from late September 1993 were also affected when Butte Canal was shut down for annual maintenance. These activities reduced flows into the forebay below what was actually available (even during the dry year of 1992).

The proposal to construct a canal around the forebay and tie it into the DeSabra Powerhouse penstock is thought to be infeasible and would probably result in unacceptable temperature conditions in the forebay. Since flows to the forebay would be drastically reduced, its temperature would increase. This increase could effectively eliminate or impair its use as a cold water fishery and its recreational value. There would also be potential risk for fish kills. Supplementing the penstock flows with the potentially warmer forebay water could result in negative temperature impacts downstream, or at least a nullification of any benefits

gained by the bypass. As a result of these impacts, any use of a bypass canal would likely eliminate the forebay as a cold water fishery and popular recreational area for the local community.

It is estimated that the average reduction in heating achieved with a bypass canal and elimination of the forebay would be less than 1°C.

Under current operations, DeSabra Forebay acts as a buffer for flows arriving from the WBFR and upper Butte Creek. In the event of an emergency shut-down of DeSabra Powerhouse, or a sudden increase in canal flows (storm event) above the level which the powerhouse can accommodate, the excess flow is now stored in DeSabra Forebay. Without the forebay, all or part of the excess canal flow would be spilled into Butte Creek via the earth/bedrock ravine below the forebay. We believe that the erosion associated with such spills would cause impacts to Butte Creek that are unacceptable to both PG&E and the resource agencies. It is anticipated that the number and duration of such events could be significant.

Eliminating the forebay would require that PG&E fill-in the existing site once it was drained, to eliminate a possible health and liability hazard. If the site was not filled-in, it would partially fill with water on an annual basis and require that this water be drained in some manner, adding to the mitigation cost.

In addition to the operational and logistical concerns associated with eliminating the forebay, there are also recreational aspects to be considered. Exhibit R of the project's FERC license requires PG&E to manage DeSabra Forebay for day-use recreation, including group picnicking and fishing. Exhibit S, prepared in consultation with the CDF&G, USF&WS, NMFS, and the US Forest Service requires that PG&E maintain the fishery resources by reimbursing the CDF&G for annually planting 14,435 trout in the forebay. The forebay's public access fishing facilities are heavily used by the local population, many of which are senior citizens from the nearby retirement community of Paradise. Public outcry over the loss of this locally popular recreational facility would be significant.

PG&E maintains that the cost of constructing and mitigating for a bypass canal and its associated impacts is not warranted given the estimated average reduction in heating through the forebay of 1°C or less. PG&E also believes that the most cost effective method of controlling heating in the forebay is to maintain flows as high as possible through the forebay. To that end, PG&E recommends that, following completion of the on-going Flume Replacement Program, scheduled maintenance on Butte and Hendricks/Toadtown canals be avoided during the critical temperature period of July 1 through September 15 and that diversions into Hendricks/Toadtown and Butte canals be maximized during this period.

As part of the Flume Replacement Program, PG&E has completed or is currently in the process of upgrading Hendricks, Toadtown, and Butte canals to reduce the number of unscheduled outages and canal failures. Completion of this program in 1998 will ensure that desired flows to the forebay can be maintained with little or no interruption.

The net benefits of maintaining the current operational regime with slight modifications to maintenance schedules are many. There would be no costly alterations to DeSabra Powerhouse and its penstock, no costly construction and maintenance of a new canal bypass section, no uncontrolled spills into Butte Creek as a result of unscheduled powerhouse shutdowns, and the recreational fishery in the forebay would be maintained.

MINIMUM FLOW RELEASES BELOW LCDD

Agency Comments

CDF&G. "Your report briefly discusses another significant issue relative to spring run chinook survival below Lower Centerville Head Dam. Article 402 of the FERC License Agreement includes a requirement for the review of both streamflow and water temperature impacts. The present flow criteria for the area is a minimum of 40 cfs from July 1 to September 15. We are in agreement that this is the absolute minimum flow necessary, however the September 15 cutoff data allows a reduction to 10 cfs. This reduction may occur during the spawning season and very likely dewater spawning redds. The result is a significant loss to the population, as in many years greater than half of all spring chinook spawn in that area. The Department recommends that flows be maintained at the minimum 40 cfs rate until after emergence, possibly as late as January 1."

USF&WS. "The existing minimum flow regime requires you, during normal water years, to release 40 cfs from the LCDD from December 15 to October 31, and 30 cfs from November 1 to December 14. However, during dry years the 40 cfs requirement is only in effect from June 1 to September 15. After September 15 you may reduce flows to 10 cfs. Stream temperatures in September may already be undesirable high, and lowering flows to 10 cfs would increase flow residence time in pools and thus probably increase temperatures. This may adversely affect chinook survival and subsequent spawning, incubation, and hatching success, particularly for those salmon holding in lower sections of Butte Creek. We appreciate your company's previous assistance in maintaining flows in Butte Creek above those required by the FERC license. However, we feel that codification of a more biologically appropriate flow regime would be both desirable and effective at reducing temperatures. Please discuss the potential for improving stream temperatures by maintaining the 40 cfs minimum flow beyond the current requirement, particularly in dry years."

PG&E Response

This issue appears to be one involving the dry year minimum release requirements. Currently during normal water years, PG&E maintains a minimum release of 40 cfs year round with the exception of November 1 to December 14, when flows are reduced to 30 cfs. The 30 cfs release represents the required minimum flow for salmon egg incubation habitat. This flow was recommended by CDF&G, USF&WS, and PG&E biologists, and was based on instream flow studies conducted specifically to address requirements for spawning salmon.

During dry years, PG&E releases 40 cfs between June 1 and September 15, and at other times of the year, flows can be reduced to 10 cfs. With regard to the effect of flow reductions on temperature after September 15, stream temperatures are typically on a steady decline due to ambient conditions (primarily reduced length of daily solar cycle) and are not likely to be elevated significantly as a result of reductions in release flows. However, PG&E does recognize that the reduction in release flows after September 15 may impact available spawning habitat and spawning success. 1992 was the first year that the new flow release schedule was in effect and it was classified as a dry year. However, PG&E maintained release flows from LCDD at 30 cfs (instead of 10 cfs) for an extended period after September 15 at the request of the resource agencies. PG&E prefers to maintain the current flow release schedule without changes. However, PG&E will continue to work with the resource agencies during dry years to provide appropriate flow releases below LCDD provided that suitable water supplies and over-summering salmon are present.

Section 10

REFERENCES

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- Pacific Gas and Electric Company. 1990. Evaluation of 1989 Water Temperatures in Butte Creek from Lower Centerville Diversion Dam to Centerville Powerhouse. Pacific Gas and Electric Company, Technical and Ecological Services, San Ramon California. Report 026.11-89.10.
- _____. 1991. Report of 1990 Water Temperatures in Butte Creek from Lower Centerville Diversion Dam to Honey Run Bridge. Pacific Gas and Electric Company, Technical and Ecological Services, San Ramon California. Report 026.11-90.8.
- _____. 1992a. DeSabra-Centerville Project Temperature Monitoring Study Plan. Pacific Gas and Electric Company, Technical and Ecological Services, San Ramon California.
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Appendix A

CONTINUOUS WATER TEMPERATURE DATA

1992

PACIFIC GAS AND ELECTRIC COMPANY
 TECHNICAL AND ECOLOGICAL SERVICES
 TEMPERATURE DATA FOR STATION AT-Round Valley Release
 1982

DATE	HOURLY DATA																Corrected Daily Values			Corr- Value									
	0000	100	200	300	400	500	600	700	800	900	1000	1100	1200	1300	1400	1500	1600	1700	1800		1900	2000	2100	2200	2300	MAX	MIN	MEAN	
8-27-82	11.7	11.6	11.4	11.3	11.2	11.1	11.1	11.1	11.1	11.1	11.4	12.3	13.2	13.9	15.2	17.0	18.2	14.7	13.8	13.3	12.9	12.5	12.2	11.9	08/27	18.0	12.1	13.5	1.0
8-28-82	11.7	11.6	11.5	11.4	11.3	11.3	11.3	11.3	11.3	11.3	11.6	12.4	13.4	14.2	15.7	17.3	18.6	15.2	14.3	13.8	13.3	12.9	12.4	12.2	08/28	18.3	12.3	13.9	1.0
8-29-82	12.1	12.1	12.2	12.3	12.2	12.1	12.0	11.9	12.0	12.5	13.4	14.1	14.7	15.8	16.5	16.5	15.8	14.8	14.3	14.0	13.6	13.2	13.0	12.9	08/29	17.5	12.9	14.3	1.0
8-30-82	12.9	13.0	13.0	12.9	12.7	12.7	12.6	12.6	12.6	12.5	12.5	13.4	14.1	14.7	15.8	16.5	15.8	14.8	14.3	14.0	13.6	13.2	13.0	12.9	08/30	14.0	13.8	13.9	1.0

PACIFIC GAS AND ELECTRIC COMPANY
 TECHNICAL AND ECOLOGICAL SERVICES
 TEMPERATURE DATA FOR STATION AT Philbrook Release
 1982

DATE	HOURLY DATA																								Corrected Daily Values			Corr. Value
	0000	100	200	300	400	500	600	700	800	900	1000	1100	1200	1300	1400	1500	1600	1700	1800	1900	2000	2100	2200	2300	MAX	MIN	MEAN	
5 14 92	12.2	12.1	12.1	12.0	11.9	11.8	11.8	11.8	11.9	12.2	12.4	12.6	12.6	13.1	13.1	13.2	13.3	13.4	13.5	13.1	12.9	12.8	12.5	12.3	13.6	12.4	13.1	0.1
5 15 92	12.2	12.4	12.4	12.4	12.0	12.0	12.0	12.0	12.2	12.2	12.4	12.6	12.6	13.1	13.1	13.2	13.3	13.4	13.5	12.8	12.4	12.7	12.5	12.4	13.6	11.9	12.6	0.1
5 16 92	12.7	12.6	12.5	12.4	12.4	12.3	12.2	12.2	12.2	12.2	12.4	12.6	12.6	13.1	13.1	13.2	13.3	13.4	13.5	13.6	13.5	13.1	12.9	12.8	13.7	12.3	12.9	0.1
5 17 92	13.2	13.1	13.1	12.9	12.8	12.7	12.7	12.7	12.7	12.7	12.8	12.9	13.1	13.5	13.5	13.6	13.7	13.8	14.0	13.9	13.6	13.5	13.3	13.1	13.7	12.3	13.3	0.1
5 18 92	13.2	13.1	13.1	12.9	12.8	12.7	12.7	12.7	12.7	12.7	12.8	12.9	13.1	13.5	13.5	13.6	13.7	13.8	14.0	13.9	13.6	13.5	13.3	13.1	13.7	12.3	13.3	0.1
5 19 92	12.7	12.6	12.5	12.4	12.4	12.4	12.4	12.4	12.4	12.4	12.5	12.6	12.8	12.8	13.0	13.1	13.2	13.2	13.2	13.1	12.8	12.7	12.5	12.4	13.4	12.5	13.2	0.1
5 20 92	12.3	12.2	12.1	12.0	11.9	11.8	11.8	11.8	11.9	11.9	12.0	12.3	12.6	12.8	12.8	13.0	13.1	13.2	13.2	13.1	12.8	12.7	12.5	12.4	13.4	12.5	13.2	0.1
5 21 92	12.3	12.1	12.0	12.0	11.9	11.8	11.8	11.8	11.9	11.9	12.0	12.3	12.6	12.8	12.8	13.0	13.1	13.2	13.2	13.1	12.8	12.7	12.5	12.4	13.4	12.5	13.2	0.1
5 22 92	12.3	12.1	12.0	12.0	11.9	11.8	11.8	11.8	11.9	11.9	12.0	12.3	12.6	12.8	12.8	13.0	13.1	13.2	13.2	13.1	12.8	12.7	12.5	12.4	13.4	12.5	13.2	0.1
5 23 92	12.7	12.7	12.7	12.6	12.6	12.5	12.5	12.5	12.5	12.5	12.6	12.7	12.8	13.1	13.1	13.2	13.3	13.3	13.3	13.2	13.1	12.9	12.8	12.7	13.4	12.1	12.7	0.1
5 24 92	13.2	13.1	13.1	13.1	13.1	13.1	13.1	13.1	13.1	13.1	13.2	13.2	13.2	13.2	13.2	13.2	13.2	13.2	13.2	13.2	13.1	12.9	12.8	12.7	13.4	12.1	12.7	0.1
5 25 92	13.8	13.8	13.8	13.8	13.8	13.8	13.8	13.8	13.8	13.8	13.7	13.7	13.7	13.7	13.7	13.7	13.7	13.7	13.7	13.7	13.7	13.7	13.7	13.7	13.4	12.1	12.7	0.1
5 26 92	11.4	11.4	11.3	11.2	11.2	11.2	11.2	11.2	11.2	11.2	11.1	11.1	11.1	11.1	11.1	11.1	11.1	11.1	11.1	11.1	11.1	11.1	11.1	11.1	11.1	11.1	11.1	0.1
5 27 92	11.4	11.4	11.3	11.2	11.2	11.2	11.2	11.2	11.2	11.2	11.1	11.1	11.1	11.1	11.1	11.1	11.1	11.1	11.1	11.1	11.1	11.1	11.1	11.1	11.1	11.1	11.1	0.1
5 28 92	11.7	11.7	11.7	11.7	11.7	11.7	11.7	11.7	11.7	11.7	11.7	11.7	11.7	11.7	11.7	11.7	11.7	11.7	11.7	11.7	11.7	11.7	11.7	11.7	11.7	11.7	11.7	0.1
5 29 92	11.7	11.7	11.7	11.7	11.7	11.7	11.7	11.7	11.7	11.7	11.7	11.7	11.7	11.7	11.7	11.7	11.7	11.7	11.7	11.7	11.7	11.7	11.7	11.7	11.7	11.7	11.7	0.1
5 30 92	12.5	12.4	12.4	12.4	12.4	12.4	12.4	12.4	12.4	12.4	12.4	12.4	12.4	12.4	12.4	12.4	12.4	12.4	12.4	12.4	12.4	12.4	12.4	12.4	12.4	12.4	12.4	0.1
6 1 92	13.1	13.0	13.0	12.9	12.8	12.8	12.8	12.8	12.8	12.8	12.8	12.8	12.8	12.8	12.8	12.8	12.8	12.8	12.8	12.8	12.8	12.8	12.8	12.8	12.8	12.8	12.8	0.1
6 2 92	12.9	12.9	12.9	12.9	12.9	12.9	12.9	12.9	12.9	12.9	12.9	12.9	12.9	12.9	12.9	12.9	12.9	12.9	12.9	12.9	12.9	12.9	12.9	12.9	12.9	12.9	12.9	0.1
6 3 92	12.9	12.8	12.8	12.8	12.8	12.8	12.8	12.8	12.8	12.8	12.8	12.8	12.8	12.8	12.8	12.8	12.8	12.8	12.8	12.8	12.8	12.8	12.8	12.8	12.8	12.8	12.8	0.1
6 4 92	12.9	12.8	12.8	12.8	12.8	12.8	12.8	12.8	12.8	12.8	12.8	12.8	12.8	12.8	12.8	12.8	12.8	12.8	12.8	12.8	12.8	12.8	12.8	12.8	12.8	12.8	12.8	0.1
6 5 92	10.7	10.6	10.5	10.4	10.4	10.4	10.4	10.4	10.4	10.4	10.4	10.4	10.4	10.4	10.4	10.4	10.4	10.4	10.4	10.4	10.4	10.4	10.4	10.4	10.4	10.4	10.4	0.1
6 6 92	10.5	10.4	10.4	10.4	10.4	10.4	10.4	10.4	10.4	10.4	10.4	10.4	10.4	10.4	10.4	10.4	10.4	10.4	10.4	10.4	10.4	10.4	10.4	10.4	10.4	10.4	10.4	0.1
6 7 92	10.5	10.4	10.4	10.4	10.4	10.4	10.4	10.4	10.4	10.4	10.4	10.4	10.4	10.4	10.4	10.4	10.4	10.4	10.4	10.4	10.4	10.4	10.4	10.4	10.4	10.4	10.4	0.1
6 8 92	10.5	10.4	10.4	10.4	10.4	10.4	10.4	10.4	10.4	10.4	10.4	10.4	10.4	10.4	10.4	10.4	10.4	10.4	10.4	10.4	10.4	10.4	10.4	10.4	10.4	10.4	10.4	0.1
6 9 92	8.1	8.1	8.1	8.0	8.0	8.0	8.0	8.0	8.0	8.0	8.0	8.0	8.0	8.0	8.0	8.0	8.0	8.0	8.0	8.0	8.0	8.0	8.0	8.0	8.0	8.0	8.0	0.1
6 10 92	8.1	8.1	8.1	8.0	8.0	8.0	8.0	8.0	8.0	8.0	8.0	8.0	8.0	8.0	8.0	8.0	8.0	8.0	8.0	8.0	8.0	8.0	8.0	8.0	8.0	8.0	8.0	0.1
6 11 92	7.5	7.5	7.4	7.4	7.4	7.4	7.4	7.4	7.4	7.4	7.4	7.4	7.4	7.4	7.4	7.4	7.4	7.4	7.4	7.4	7.4	7.4	7.4	7.4	7.4	7.4	7.4	0.1
6 12 92	7.1	7.0	7.0	7.0	6.9	6.9	6.9	6.9	6.9	6.9	6.9	6.9	6.9	6.9	6.9	6.9	6.9	6.9	6.9	6.9	6.9	6.9	6.9	6.9	6.9	6.9	6.9	0.1
6 13 92	6.7	6.6	6.5	6.5	6.5	6.5	6.5	6.5	6.5	6.5	6.5	6.5	6.5	6.5	6.5	6.5	6.5	6.5	6.5	6.5	6.5	6.5	6.5	6.5	6.5	6.5	6.5	0.1
6 14 92	6.4	6.4	6.4	6.4	6.4	6.4	6.4	6.4	6.4	6.4	6.4	6.4	6.4	6.4	6.4	6.4	6.4	6.4	6.4	6.4	6.4	6.4	6.4	6.4	6.4	6.4	6.4	0.1
6 15 92	6.5	6.5	6.5	6.5	6.5	6.5	6.5	6.5	6.5	6.5	6.5	6.5	6.5	6.5	6.5	6.5	6.5	6.5	6.5	6.5	6.5	6.5	6.5	6.5	6.5	6.5	6.5	0.1
6 16 92	6.6	6.6	6.6	6.6	6.6	6.6	6.6	6.6	6.6	6.6	6.6	6.6	6.6	6.6	6.6	6.6	6.6	6.6	6.6	6.6	6.6	6.6	6.6	6.6	6.6	6.6	6.6	0.1
6 17 92	6.9	6.8	6.8	6.8	6.8	6.8	6.8	6.8	6.8	6.8	6.8	6.8	6.8	6.8	6.8	6.8	6.8	6.8	6.8	6.8	6.8	6.8	6.8	6.8	6.8	6.8	6.8	0.1
6 18 92	7.0	7.0	7.0	7.0	7.0	7.0	7.0	7.0	7.0	7.0	7.0	7.0	7.0	7.0	7.0	7.0	7.0	7.0	7.0	7.0	7.0	7.0	7.0	7.0	7.0	7.0	7.0	0.1
6 19 92	7.1	7.0	7.0	7.0	7.0	7.0	7.0	7.0	7.0	7.0	7.0	7.0	7.0	7.0	7.0	7.0	7.0	7.0	7.0	7.0	7.0	7.0	7.0	7.0	7.0	7.0	7.0	0.1
6 20 92	7.4	7.4	7.4	7.4	7.4	7.4	7.4	7.4	7.4	7.4	7.4	7.4	7.4	7.4	7.4	7.4	7.4	7.4	7.4	7.4	7.4	7.4	7.4	7.4	7.4	7.4	7.4	0.1
6 21 92	7.5	7.4	7.4	7.4	7.4	7.4	7.4	7.4	7.4	7.4	7.4	7.4	7.4	7.4	7.4	7.4	7.4	7.4	7.4	7.4	7.4	7.4	7.4	7.4	7.4	7.4	7.4	0.1
6 22 92	7.8	7.8	7.8	7.8	7.8	7.8	7.8	7.8	7.8	7.8	7.8	7.8	7.8	7.8	7.8	7.8	7.8	7.8	7.8	7.8	7.8	7.8	7.8	7.8	7.8	7.8	7.8	0.1
6 23 92	8.1	8.1	8.1	8.1	8.1	8.1	8.1	8.1	8.1	8.1	8.1	8.1	8.1	8.1	8.1	8.1	8.1	8.1	8.1	8.1	8.1	8.1	8.1	8.1	8.1	8.1	8.1	0.1
6 24 92	8.4	8.4	8.4	8.4	8.4	8.4	8.4	8.4	8.4	8.4	8.4	8.4	8.4	8.4	8.4	8.4	8.4	8.4	8.4	8.4	8.4	8.4	8.4	8.4	8.4	8.4	8.4	0.1
6 25 92	8.0	8.0	8.0	8.0	8.0	8.0	8.0	8.0	8.0	8.0	8.0	8.0	8.0	8.0	8.0	8.0	8.0	8.0	8.0	8.0	8.0	8.0	8.0	8.0	8.0	8.0	8.0	0.1
6 26 92	8.0	8.0	8.0	8.0	8.0	8.0	8.0	8.0	8.0	8.0	8.0	8.0	8.0	8.0	8.0	8.0	8.0	8.0	8.0	8.0	8.0	8.0	8.0	8.0	8.0	8.0	8.0	0.1
6 27 92	7.9	7.8	7.8	7.8	7.8	7.8	7.8	7.8	7.8	7.8	7.8	7.8	7.8	7.8	7.8	7.8	7.8	7.8	7.8	7.8	7.8	7.8	7.8	7.8	7.8	7.8	7.8	0.1
6 28 92	7.9	7.8	7.8	7.8	7.8	7.8	7.8	7.8	7.8	7.8	7.8	7.8	7.8	7.8	7.8	7.8	7.8	7.8	7.8	7.8	7.8	7.8	7.8	7.8	7.8	7.8	7.8	0.1
6 29 92	7.9	7.8	7.8	7.8	7.8	7.8	7.8	7.8	7.8	7.8	7.8	7.8	7.8	7.8	7.8	7.8	7.8	7.8	7.8	7.8	7.8	7.8	7.8	7.8	7.8	7.8	7.8	0.1
6 30 92	11.4	11.6	11.8	11.9	12.0	12.1	12.1																					

PACIFIC GAS AND ELECTRIC COMPANY
 TECHNICAL AND ECOLOGICAL SERVICES
 TEMPERATURE DATA FOR STATION AT Phibrook Reservoir
 1982

DATE	HOURLY DATA																				Corrected Daily Values			Corr. Value								
	0000	100	200	300	400	500	600	700	800	900	1000	1100	1200	1300	1400	1500	1600	1700	1800	1900	2000	2100	2200		2300	MAX	MIN	MEAN				
7 21 92	7.9	8.1	8.2	8.4	8.4	7.9	7.8	7.9	7.9	8.1	8.3	8.4	8.5	8.7	8.7	8.8	8.8	8.5	8.4	8.1	8.1	8.1	8.1	8.1	8.1	8.1	8.3	7.9	8.3	0.1		
7 22 92	8.1	8.3	8.3	8.3	8.3	8.1	7.9	7.9	7.9	8.1	8.3	8.5	8.7	8.7	8.8	8.8	8.8	8.8	8.5	8.4	8.2	8.2	8.1	8.1	8.1	8.1	8.3	8.0	8.4	0.1		
7 23 92	8.5	8.6	8.6	8.6	8.3	8.2	8.2	8.2	8.3	8.4	8.8	8.8	8.8	8.9	8.9	8.8	8.8	8.8	8.7	8.8	8.7	8.5	8.5	8.5	8.6	8.7	8.7	8.0	8.7	0.1		
7 24 92	8.7	8.5	8.6	8.7	8.9	8.8	8.7	8.5	8.5	8.7	8.8	8.8	9.0	9.2	9.4	9.3	9.2	9.1	9.1	9.1	9.0	8.7	8.6	8.6	8.7	8.7	8.0	8.6	0.1			
7 25 92	8.0	9.1	9.1	9.1	9.2	9.1	8.9	8.8	8.8	8.8	8.9	9.1	9.5	9.7	9.8	9.6	9.7	9.5	9.4	9.7	9.5	9.0	9.0	9.0	9.2	9.2	8.9	9.3	0.1			
7 26 92	9.5	9.4	9.4	9.5	9.6	9.5	9.3	9.0	9.1	9.3	9.5	9.7	9.9	10.0	10.0	10.0	10.0	9.9	9.6	9.6	9.7	9.7	9.7	9.7	9.8	9.8	9.7	9.7	0.1			
7 27 92	9.8	9.7	9.7	9.6	9.6	9.5	9.5	9.6	9.6	9.9	10.0	10.2	10.3	10.2	10.2	10.2	10.1	10.1	10.2	10.0	10.0	10.1	10.2	10.2	10.2	10.2	10.2	10.4	9.8	10.1	0.1	
7 28 92	10.1	10.1	10.0	10.0	10.0	10.0	10.0	10.1	10.2	10.3	10.4	10.6	10.7	10.7	10.9	10.7	10.5	10.5	10.6	10.5	10.6	10.5	10.6	10.5	10.5	10.5	10.5	10.5	10.5	10.0	10.5	0.1
7 29 92	10.6	10.6	10.6	10.5	10.4	10.4	10.4	10.6	10.8	10.8	10.9	11.1	11.2	11.2	11.2	11.0	11.0	11.1	11.2	11.2	11.1	11.1	11.1	11.1	11.1	11.1	11.1	11.1	11.1	10.8	11.4	0.1
7 30 92	10.8	11.2	11.1	11.0	11.1	10.8	10.7	11.1	11.4	11.3	11.2	11.5	11.8	11.9	12.0	12.0	12.0	12.0	12.2	12.3	11.8	11.8	12.0	12.0	12.0	12.0	12.0	12.0	12.4	11.3	11.9	0.1
7 31 92	11.5	11.4	11.4	11.2	11.2	11.5	11.6	11.5	11.6	11.7	11.9	12.3	12.5	12.5	12.5	12.6	12.5	12.5	12.5	12.5	12.2	12.0	11.4	11.3	11.4	11.0	11.5	11.5	12.5	11.3	12.5	0.1
8 1 92	12.0	11.8	11.8	12.0	12.0	12.1	12.1	11.9	11.9	12.1	12.3	12.3	12.3	12.2	12.3	12.2	12.2	12.5	12.2	12.3	12.0	11.4	11.3	11.4	11.0	11.4	11.4	12.9	10.7	11.7	0.1	
8 2 92	12.6	12.5	12.3	12.4	12.6	12.7	12.6	12.5	12.5	12.6	12.6	12.7	12.8	12.8	12.7	12.8	12.5	12.4	12.2	12.0	11.8	11.3	11.4	11.0	11.3	11.3	11.3	12.9	10.7	11.7	0.1	
8 3 92	11.7	11.1	10.6	10.9	10.9	10.8	10.9	11.0	10.9	11.0	11.3	11.9	12.2	12.4	12.5	12.8	12.8	12.4	12.3	12.0	11.9	11.7	11.3	11.3	11.3	11.3	11.3	12.9	10.8	11.8	0.1	
8 4 92	10.9	11.2	11.2	10.7	10.6	11.0	11.2	11.0	10.8	10.7	11.0	11.7	13.2	13.3	13.6	13.5	13.4	13.6	13.5	13.6	13.7	13.8	13.7	13.8	13.7	13.8	13.8	13.9	13.9	12.8	0.1	
8 5 92	11.3	11.3	10.7	11.0	11.2	11.0	10.8	10.7	10.9	11.4	11.9	12.2	12.4	12.5	12.8	12.8	12.4	12.3	12.0	11.9	11.7	11.3	11.3	11.3	11.3	11.3	11.3	13.9	10.8	11.8	0.1	
8 6 92	11.4	11.6	11.5	11.5	11.6	11.5	11.6	11.5	11.6	11.7	11.9	12.3	12.5	12.5	12.6	12.5	12.5	12.5	12.5	12.2	12.0	11.4	11.3	11.4	11.0	11.4	11.4	12.9	10.7	11.7	0.1	
8 7 92	13.8	13.9	13.8	13.8	13.8	13.8	13.8	14.0	14.0	14.0	14.2	14.4	14.4	14.4	14.5	14.6	14.3	14.4	14.8	14.5	14.8	14.7	14.8	14.8	14.7	14.8	14.8	14.9	14.4	0.1		
8 8 92	14.6	14.9	14.5	14.7	15.0	14.9	14.8	14.8	14.9	15.0	15.1	15.2	15.4	15.4	15.5	15.6	15.5	15.2	15.6	15.6	15.6	15.6	15.6	15.6	15.6	15.6	15.6	15.6	15.3	0.1		
8 9 92	15.4	15.5	15.7	15.8	15.9	15.7	15.8	16.0	16.1	16.1	16.2	16.3	16.3	16.3	16.3	16.5	16.6	16.5	16.8	16.8	16.8	16.8	16.8	16.8	16.8	16.8	16.8	16.9	16.9	16.3	0.1	
8 10 92	16.8	16.9	16.9	16.9	16.9	16.9	17.0	17.0	17.0	17.1	17.3	17.5	17.7	17.8	17.7	17.7	17.7	17.8	17.8	17.8	17.8	17.8	17.8	17.8	17.8	17.8	17.8	17.9	17.5	0.1		
8 11 92	17.8	17.9	18.1	18.1	18.1	18.1	18.1	18.1	18.1	18.2	18.4	18.6	18.8	18.8	18.8	18.7	18.5	18.8	18.7	18.5	18.4	18.4	18.4	18.4	18.4	18.4	18.4	18.4	18.4	18.4	0.1	
8 12 92	18.5	18.7	18.7	18.8	18.8	18.8	18.9	18.9	18.9	19.0	19.2	19.2	19.2	19.2	19.1	19.1	19.2	19.2	19.2	19.2	19.1	18.4	18.4	18.4	18.4	18.4	18.4	18.4	18.4	18.4	0.1	
8 13 92	19.0	19.1	19.1	19.2	19.2	19.3	19.2	19.2	19.2	19.3	19.4	19.5	19.6	19.6	19.6	19.6	19.6	19.6	19.6	19.6	19.5	19.5	19.5	19.5	19.5	19.5	19.5	19.5	19.5	19.5	0.1	
8 14 92	19.4	19.2	19.3	19.5	19.6	19.5	19.5	19.5	19.3	19.4	19.5	19.6	19.7	19.7	19.7	19.8	19.8	19.8	19.8	19.8	19.8	19.8	19.8	19.8	19.8	19.8	19.8	19.8	19.7	19.7	0.1	
8 15 92	19.6	19.6	19.6	19.7	19.7	19.8	19.9	19.8	19.8	19.7	19.8	19.8	19.8	19.8	19.9	20.0	20.6	21.5	19.8	19.8	19.8	19.8	19.8	19.8	19.8	19.8	19.8	19.8	19.8	19.8	0.1	
8 16 92	19.6	19.6	19.6	19.7	19.7	19.8	19.9	19.8	19.8	19.7	19.8	19.8	19.8	19.8	19.9	20.0	20.6	21.5	19.8	19.8	19.8	19.8	19.8	19.8	19.8	19.8	19.8	19.8	19.8	19.8	0.1	
8 17 92	19.6	19.6	19.6	19.7	19.7	19.8	19.9	19.8	19.8	19.7	19.8	19.8	19.8	19.8	19.9	20.0	20.6	21.5	19.8	19.8	19.8	19.8	19.8	19.8	19.8	19.8	19.8	19.8	19.8	19.8	0.1	
8 18 92	19.6	19.6	19.6	19.7	19.7	19.8	19.9	19.8	19.8	19.7	19.8	19.8	19.8	19.8	19.9	20.0	20.6	21.5	19.8	19.8	19.8	19.8	19.8	19.8	19.8	19.8	19.8	19.8	19.8	19.8	0.1	
8 19 92	19.6	19.6	19.6	19.7	19.7	19.8	19.9	19.8	19.8	19.7	19.8	19.8	19.8	19.8	19.9	20.0	20.6	21.5	19.8	19.8	19.8	19.8	19.8	19.8	19.8	19.8	19.8	19.8	19.8	19.8	0.1	
8 20 92	19.6	19.6	19.6	19.7	19.7	19.8	19.9	19.8	19.8	19.7	19.8	19.8	19.8	19.8	19.9	20.0	20.6	21.5	19.8	19.8	19.8	19.8	19.8	19.8	19.8	19.8	19.8	19.8	19.8	19.8	0.1	
8 21 92	19.6	19.6	19.6	19.7	19.7	19.8	19.9	19.8	19.8	19.7	19.8	19.8	19.8	19.8	19.9	20.0	20.6	21.5	19.8	19.8	19.8	19.8	19.8	19.8	19.8	19.8	19.8	19.8	19.8	19.8	0.1	
8 22 92	19.6	19.6	19.6	19.7	19.7	19.8	19.9	19.8	19.8	19.7	19.8	19.8	19.8	19.8	19.9	20.0	20.6	21.5	19.8	19.8	19.8	19.8	19.8	19.8	19.8	19.8	19.8	19.8	19.8	19.8	0.1	
8 23 92	19.6	19.6	19.6	19.7	19.7	19.8	19.9	19.8	19.8	19.7	19.8	19.8	19.8	19.8	19.9	20.0	20.6	21.5	19.8	19.8	19.8	19.8	19.8	19.8	19.8	19.8	19.8	19.8	19.8	19.8	0.1	
8 24 92	19.6	19.6	19.6	19.7	19.7	19.8	19.9	19.8	19.8	19.7	19.8	19.8	19.8	19.8	19.9	20.0	20.6	21.5	19.8	19.8	19.8	19.8	19.8	19.8	19.8	19.8	19.8	19.8	19.8	19.8	0.1	
8 25 92	19.6	19.6	19.6	19.7	19.7	19.8	19.9	19.8	19.8	19.7	19.8	19.8	19.8	19.8	19.9	20.0	20.6	21.5	19.8	19.8	19.8	19.8	19.8	19.8	19.8	19.8	19.8	19.8	19.8	19.8	0.1	
8 26 92	19.6	19.6	19.6	19.7	19.7	19.8	19.9	19.8	19.8	19.7	19.8	19.8	19.8	19.8	19.9	20.0	20.6	21.5	19.8	19.8	19.8	19.8	19.8	19.8	19.8	19.8	19.8	19.8	19.8	19.8	0.1	
8 27 92	19.6	19.6	19.6	19.7	19.7	19.8	19.9	19.8	19.8	19.7	19.8	19.8	19.8	19.8	19.9	20.0	20.6	21.5	19.8	19.8	19.8	19.8	19.8	19.8	19.8	19.8	19.8	19.8	19.8	19.8	0.1	
8 28 92	19.6	19.6	19.6	19.7	19.7	19.8	19.9	19.8	19.8	19.7	19.8	19.8	19.8	19.8	19.9	20.0	20.6	21.5	19.8	19.8	19.8	19.8	19.8	19.8	19.8	19.8	19.8	19.8	19.8	19.8	0.1	
8 29 92	19.6	19.6	19.6	19.7	19.7	19.8	19.9	19.8	19.8	19.7	19.8	19.8	19.8	19.8	19.9	20.0	20.6	21.5	19.8	19.8	19.8	19.8	19.8	19.8	19.8	19.8	19.8	19.8	19.8	19.8	0.1	
8 30 92	19.6	19.6	19.6	19.7	19.7	19.8	19.9	19.8	19.8	19.7	19.8	19.8	19.8	19.8	19.9	20.0	20.6	21.5	19.8	19.8	19.8	19.8	19.8	19.8	19.8	19.8	19.8	19.8	19.8	19.8	0.1	
8 31 92	19.6	19.6	19.6	19.7	19.7	19.8	19.9	19.8	19.8	19.7	19.8	19.8	19.																			

PACIFIC GAS AND ELECTRIC COMPANY
 TECHNICAL AND ECOLOGICAL SERVICES
 TEMPERATURE DATA FOR STATION AT Phipbrook Reservoir at 5 ft depth
 1982

DATE	HOURLY DATA																								Corrected Daily Values				Corr. Value	
	0000	100	200	300	400	500	600	700	800	900	1000	1100	1200	1300	1400	1500	1600	1700	1800	1900	2000	2100	2200	2300	MAX	MIN	MEAN			
7 6 92	18.1	17.9	17.7	17.7	17.6	17.4	17.3	17.3	17.3	17.4	17.7	18.1	18.3	18.1	18.1	18.2	18.2	18.1	18.1	18.2	18.2	18.5	18.4	18.1	18.1	07/08	18.7	18.3	18.4	0.2
7 9 92	18.3	18.4	18.3	18.1	18.1	18.0	17.9	17.8	17.8	18.0	18.2	18.4	18.6	18.6	18.0	18.4	18.4	18.4	18.5	18.8	18.8	18.7	18.6	18.4	18.2	07/09	19.1	17.5	18.3	0.2
7 10 92	18.8	18.7	18.6	18.6	18.5	18.5	18.4	18.4	18.4	18.5	18.6	18.6	18.8	18.8	18.9	19.0	19.0	19.0	19.0	19.1	19.1	19.3	19.4	19.4	19.2	07/10	19.7	18.0	18.9	0.2
7 11 92	18.6	18.6	18.5	18.5	18.4	18.4	18.3	18.3	18.3	18.3	18.3	18.4	18.4	18.4	18.5	18.7	18.8	18.8	18.8	18.8	18.8	18.7	18.5	18.4	18.7	07/11	19.3	18.6	18.9	0.2
7 12 92	18.3	18.3	18.2	18.2	18.1	18.1	18.1	18.1	18.1	18.1	18.1	18.1	18.1	18.1	18.0	18.2	18.3	18.3	18.3	18.3	18.3	18.3	18.4	18.4	18.4	07/12	19.0	18.5	18.7	0.2
7 13 92	18.3	18.3	18.2	18.2	18.1	18.1	18.1	18.1	18.1	18.1	18.1	18.1	18.1	18.1	18.0	18.2	18.3	18.3	18.3	18.3	18.3	18.3	18.4	18.4	18.4	07/13	19.1	18.5	18.8	0.2
7 14 92	19.0	19.0	18.9	18.8	18.7	18.7	18.6	18.6	18.6	18.6	18.6	18.6	18.6	18.6	18.5	18.4	18.3	18.3	18.3	18.3	18.3	18.3	18.4	18.4	18.4	07/14	19.7	18.8	19.2	0.2
7 15 92	19.5	19.5	19.4	19.3	19.2	19.1	19.0	19.0	19.0	19.0	19.2	19.4	19.5	19.8	19.6	19.8	20.0	20.0	20.0	20.0	20.0	20.0	20.1	20.1	20.1	07/15	20.2	19.2	19.7	0.2
7 16 92	20.1	20.0	20.0	19.9	19.9	19.7	19.8	19.8	19.5	19.8	20.0	20.2	20.5	20.5	20.4	20.4	20.3	20.3	20.3	20.3	20.3	20.2	20.1	20.1	20.1	07/16	20.8	19.7	20.3	0.2
7 17 92	20.5	20.4	20.4	20.4	20.4	20.4	20.4	20.4	20.4	20.4	20.4	20.4	20.4	20.4	20.4	20.4	20.4	20.4	20.4	20.4	20.4	20.4	20.4	20.4	20.4	07/17	22.1	20.3	21.0	0.2
7 18 92	21.1	21.1	21.0	20.9	20.8	20.6	20.5	20.4	20.4	20.4	20.6	20.9	21.1	21.1	21.3	21.5	21.8	21.8	21.8	21.8	21.8	21.8	21.9	21.9	21.9	07/18	22.1	20.8	21.2	0.2
7 19 92	21.1	21.0	20.9	20.8	20.8	20.6	20.5	20.4	20.4	20.4	20.6	20.9	21.1	21.1	21.3	21.4	21.5	21.5	21.5	21.5	21.5	21.5	21.5	21.5	21.5	07/19	22.1	20.6	21.3	0.2
7 20 92	21.1	21.0	20.9	20.8	20.8	20.6	20.5	20.4	20.4	20.4	20.6	20.9	21.1	21.1	21.3	21.4	21.5	21.5	21.5	21.5	21.5	21.5	21.5	21.5	21.5	07/20	21.8	20.4	21.1	0.2
7 21 92	20.9	20.8	20.7	20.5	20.4	20.4	20.3	20.2	20.2	20.2	20.3	20.6	20.8	21.1	21.2	21.3	21.4	21.4	21.4	21.4	21.4	21.4	21.4	21.4	21.4	07/21	21.6	20.4	21.0	0.2
7 22 92	20.9	20.8	20.7	20.5	20.4	20.4	20.3	20.2	20.2	20.2	20.3	20.6	20.8	21.1	21.2	21.3	21.4	21.4	21.4	21.4	21.4	21.4	21.4	21.4	21.4	07/22	21.5	20.4	20.9	0.2
7 23 92	20.5	20.4	20.3	20.2	20.2	20.1	20.0	20.0	20.0	20.0	20.2	20.4	20.6	20.8	21.1	21.2	21.3	21.3	21.3	21.3	21.3	21.3	21.3	21.3	21.3	07/23	21.6	20.2	20.8	0.2
7 24 92	20.4	20.3	20.2	20.2	20.1	20.0	20.0	20.0	20.0	20.0	20.2	20.4	20.6	20.8	21.1	21.2	21.3	21.3	21.3	21.3	21.3	21.3	21.3	21.3	21.3	07/24	21.6	20.1	20.7	0.2
7 25 92	20.3	20.2	20.1	20.0	20.0	20.0	20.0	20.0	20.0	20.0	20.2	20.4	20.6	20.8	21.1	21.2	21.3	21.3	21.3	21.3	21.3	21.3	21.3	21.3	21.3	07/25	22.0	20.1	20.9	0.2
7 26 92	21.0	20.9	20.8	20.8	20.8	20.6	20.5	20.4	20.4	20.4	20.6	20.9	21.1	21.1	21.3	21.4	21.5	21.5	21.5	21.5	21.5	21.5	21.5	21.5	21.5	07/26	22.0	20.1	20.9	0.2
7 27 92	21.1	20.9	20.8	20.8	20.8	20.6	20.5	20.4	20.4	20.4	20.6	20.9	21.1	21.1	21.3	21.4	21.5	21.5	21.5	21.5	21.5	21.5	21.5	21.5	21.5	07/27	22.6	20.6	21.5	0.2
7 28 92	21.1	20.9	20.8	20.8	20.8	20.6	20.5	20.4	20.4	20.4	20.6	20.9	21.1	21.1	21.3	21.4	21.5	21.5	21.5	21.5	21.5	21.5	21.5	21.5	21.5	07/28	22.6	20.6	21.5	0.2
7 29 92	21.2	21.1	21.0	20.9	20.8	20.6	20.5	20.4	20.4	20.4	20.6	20.9	21.1	21.1	21.3	21.4	21.5	21.5	21.5	21.5	21.5	21.5	21.5	21.5	21.5	07/29	23.6	20.7	21.9	0.2
7 30 92	21.7	21.6	21.5	21.4	21.3	21.2	21.1	21.0	20.9	20.8	20.7	21.1	21.7	22.1	22.5	22.9	23.4	23.4	23.4	23.4	23.4	23.4	23.4	23.4	23.4	07/30	24.9	21.2	22.6	0.2
7 31 92	21.4	21.3	21.3	21.1	21.0	20.9	20.7	20.5	20.5	20.5	20.8	21.5	22.6	22.9	23.7	24.2	24.5	24.7	24.5	24.1	23.5	23.7	23.1	22.4	21.8	07/31	23.1	20.7	21.4	0.2

water level below recorder position

PACIFIC GAS AND ELECTRIC COMPANY
 TECHNICAL AND ECOLOGICAL SERVICES
 TEMPERATURE DATA FOR STATION AT-Hendricks Canal at Diversion Dam
 1982

DATE	HOURLY DATA												Corrected Daily Values				Cort.													
	0000	100	200	300	400	500	600	700	800	900	1000	1100	1200	1300	1400	1500		1600	1700	1800	1900	2000	2100	2200	2300	MAX	MIN	MEAN	Value	
7 10 92	15.2	14.8	14.7	14.6	14.6	14.4	14.3	14.2	14.2	14.2	14.4	14.8	14.8	14.6	15.1	15.4	15.6	15.8	15.8	15.8	15.7	15.6	15.4	15.3	16.1	14.9	15.8	0.3		
7 11 92	14.3	14.2	14.1	14.1	14.0	13.9	13.8	13.8	13.8	13.8	13.8	13.9	14.0	14.1	14.1	14.8	14.8	14.7	14.7	14.6	14.6	14.5	14.5	14.5	15.5	14.5	14.9	0.3		
7 12 92	14.0	13.8	13.6	13.5	13.3	13.2	13.1	12.9	12.9	12.9	13.2	13.5	14.0	14.0	14.5	15.1	15.2	15.5	15.6	15.4	14.5	14.5	14.5	14.0	14.9	14.1	14.4	0.3		
7 13 92	14.8	14.7	14.6	14.4	14.3	14.2	14.0	13.9	13.8	13.8	14.0	14.4	15.0	15.0	15.8	16.0	16.0	16.0	16.0	16.0	16.0	16.0	16.0	15.0	15.9	13.2	14.5	0.3		
7 14 92	15.4	15.3	15.2	15.0	14.9	14.8	14.6	14.4	14.4	14.4	14.8	14.9	15.4	16.0	16.5	16.8	17.0	17.1	17.0	16.9	16.8	16.8	16.8	16.8	17.4	14.7	16.0	0.3		
7 15 92	16.2	16.1	16.0	15.9	15.8	15.7	15.5	15.4	15.2	15.1	15.0	15.2	15.8	16.1	16.7	17.2	17.5	17.4	17.4	17.4	17.4	17.4	17.1	17.1	17.0	17.8	15.3	16.6	0.3	
7 16 92	16.8	16.7	16.6	16.4	16.2	16.1	15.9	15.7	15.5	15.5	15.7	16.0	16.5	17.1	17.5	17.7	17.8	17.8	17.8	17.8	17.8	17.8	17.4	17.1	17.0	17.7	18.1	15.8	17.0	0.3
7 17 92	16.8	16.7	16.6	16.4	16.2	16.1	15.9	15.7	15.5	15.5	15.7	16.0	16.5	17.1	17.5	17.7	17.8	17.8	17.8	17.8	17.8	17.8	17.4	17.1	17.0	17.7	18.1	15.8	17.0	0.3
7 18 92	16.8	16.7	16.6	16.4	16.2	16.1	15.9	15.7	15.5	15.5	15.7	16.0	16.5	17.1	17.5	17.7	17.8	17.8	17.8	17.8	17.8	17.8	17.4	17.1	17.0	17.7	18.1	15.8	17.0	0.3
7 19 92	15.9	15.8	15.6	15.5	15.3	15.1	14.9	14.6	14.4	14.4	14.1	14.5	14.9	15.5	16.0	16.2	16.3	16.3	16.3	16.3	16.3	16.2	16.0	15.8	15.7	17.3	15.2	16.4	0.3	
7 20 92	15.4	15.3	15.1	14.9	14.6	14.4	14.1	13.8	13.6	13.4	13.4	13.6	13.9	14.4	14.9	15.4	15.7	15.8	15.8	15.8	15.8	15.7	15.6	15.4	15.4	16.2	13.7	15.1	0.3	
7 21 92	15.3	15.2	15.0	14.9	14.7	14.5	14.3	14.1	13.9	13.8	13.7	13.9	14.2	14.8	15.3	15.8	16.0	16.2	16.2	16.2	16.2	16.2	16.0	15.8	15.4	16.2	13.7	15.1	0.3	
7 22 92	15.3	15.2	15.0	14.9	14.7	14.5	14.3	14.1	13.9	13.8	13.7	13.9	14.2	14.8	15.3	15.8	16.0	16.2	16.2	16.2	16.2	16.2	16.0	15.8	15.4	16.2	13.7	15.1	0.3	
7 23 92	14.4	14.3	14.2	14.0	13.8	13.6	13.3	13.2	12.9	12.7	12.7	12.8	13.1	13.8	14.2	14.8	15.3	15.7	15.9	16.0	16.2	16.2	16.1	16.0	15.9	16.2	13.7	15.1	0.3	
7 24 92	14.8	14.5	14.2	14.0	13.8	13.6	13.3	13.2	12.9	12.7	12.7	12.8	13.1	13.8	14.2	14.8	15.3	15.7	15.9	16.0	16.2	16.2	16.1	16.0	15.9	16.2	13.7	15.1	0.3	
7 25 92	15.4	15.2	15.0	14.9	14.6	14.4	14.1	13.8	13.6	13.3	13.3	13.4	13.8	14.2	14.8	15.3	15.7	15.9	16.0	16.2	16.2	16.1	16.0	15.9	16.2	13.7	15.1	0.3		
7 26 92	15.9	15.6	15.4	15.2	14.9	14.6	14.3	14.0	13.8	13.6	13.3	13.4	13.8	14.2	14.8	15.3	15.7	15.9	16.0	16.2	16.2	16.1	16.0	15.9	16.2	13.7	15.1	0.3		
7 27 92	15.8	15.7	15.5	15.3	15.0	14.7	14.4	14.1	13.9	13.7	13.7	13.9	14.1	14.5	15.1	15.6	15.9	16.1	16.2	16.2	16.2	16.2	16.0	15.8	15.9	16.2	13.7	15.1	0.3	
7 28 92	16.1	15.9	15.8	15.6	15.4	15.2	14.9	14.6	14.3	14.0	13.8	13.8	13.9	14.1	14.5	15.1	15.6	15.9	16.1	16.2	16.2	16.2	16.0	15.8	15.9	16.2	13.7	15.1	0.3	
7 29 92	16.1	15.9	15.8	15.6	15.4	15.2	14.9	14.6	14.3	14.0	13.8	13.8	13.9	14.1	14.5	15.1	15.6	15.9	16.1	16.2	16.2	16.2	16.0	15.8	15.9	16.2	13.7	15.1	0.3	
7 30 92	16.5	16.3	16.2	16.0	15.8	15.5	15.2	14.9	14.6	14.3	14.0	13.8	13.8	13.9	14.1	14.5	15.1	15.6	15.9	16.1	16.2	16.2	16.0	15.8	15.9	16.2	13.7	15.1	0.3	
8 1 92	15.3	15.1	14.9	14.6	14.3	14.1	13.8	13.4	13.1	12.9	13.3	13.7	14.2	14.8	15.3	15.8	16.1	16.4	16.7	16.8	16.9	16.7	16.7	16.7	16.6	17.1	14.4	15.9	0.3	
8 2 92	15.2	15.0	14.9	14.7	14.4	14.2	14.0	13.7	13.4	13.2	13.1	13.4	13.9	14.5	15.1	15.7	16.0	16.3	16.6	16.7	16.8	16.5	16.3	16.3	16.2	17.0	14.5	16.0	0.3	
8 3 92	14.9	14.8	14.4	14.2	14.0	13.8	13.5	13.2	12.9	12.8	12.9	13.1	13.4	13.9	14.4	15.1	15.7	16.0	16.3	16.6	16.7	16.5	16.3	16.3	16.2	17.0	14.5	16.0	0.3	
8 4 92	14.6	14.4	14.1	13.8	13.6	13.4	13.2	13.1	13.1	13.1	13.1	13.4	13.9	14.4	15.1	15.7	16.0	16.3	16.6	16.7	16.8	16.5	16.3	16.3	16.2	17.0	14.5	16.0	0.3	
8 5 92	14.5	14.4	14.2	13.9	13.7	13.5	13.3	13.2	13.1	13.1	13.1	13.4	13.9	14.4	15.1	15.7	16.0	16.3	16.6	16.7	16.8	16.5	16.3	16.3	16.2	17.0	14.5	16.0	0.3	
8 6 92	14.8	14.7	14.5	14.2	14.0	13.8	13.6	13.4	13.2	13.2	13.2	13.5	14.0	14.6	15.1	15.4	15.8	16.3	16.6	16.7	16.8	16.5	16.3	16.3	16.2	17.0	14.5	16.0	0.3	
8 7 92	13.0	12.8	12.7	12.5	12.3	12.1	11.9	11.7	11.5	11.3	11.3	11.6	12.0	12.5	13.0	13.5	14.0	14.6	15.1	15.6	16.1	16.6	17.1	17.6	18.1	15.8	14.1	15.4	0.3	
8 8 92	15.7	15.5	15.3	15.1	14.9	14.6	14.3	14.1	13.9	13.8	13.8	13.9	14.2	14.7	15.2	15.6	16.0	16.4	16.8	17.1	17.4	17.7	18.0	18.2	18.2	17.9	14.4	15.4	0.3	
8 9 92	15.8	15.6	15.3	15.1	14.9	14.6	14.3	14.1	13.9	13.8	13.8	13.9	14.2	14.7	15.2	15.6	16.0	16.4	16.8	17.1	17.4	17.7	18.0	18.2	18.2	17.9	14.4	15.4	0.3	
8 10 92	16.4	16.3	16.1	15.9	15.8	15.6	15.4	15.2	14.9	14.8	14.8	14.9	15.2	15.7	16.2	16.7	17.2	17.7	18.1	18.4	18.7	19.0	19.2	19.2	18.9	14.4	15.4	0.3		
8 11 92	17.5	17.3	17.2	16.9	16.6	16.3	16.0	15.7	15.4	15.3	15.3	15.5	15.8	16.0	16.5	17.0	17.5	17.9	18.1	18.1	18.1	18.2	18.2	18.2	18.2	18.2	17.9	14.4	15.4	0.3
8 12 92	18.2	18.1	18.0	17.7	17.5	17.3	17.0	16.6	16.3	16.0	15.7	15.4	15.3	15.5	15.8	16.0	16.5	17.0	17.5	17.9	18.1	18.2	18.2	18.2	18.2	18.2	17.9	14.4	15.4	0.3

pod stolen

PACIFIC GAS AND ELECTRIC COMPANY,
TECHNICAL AND ECOLOGICAL SERVICES
TEMPERATURE DATA FOR STATION AT: Toadown Canal below Toadown Powerhouse
1992

DATE	HOURLY DATA																		Corrected Daily Values			Corr. Value										
	0000	100	200	300	400	500	600	700	800	900	1000	1100	1200	1300	1400	1500	1600	1700	1800	1900	2000		2100	2200	2300	MAX	MEAN	Yate				
	06/13 shaded area equals mass balance calculations																															
6 13 92	15.6	15.5	15.3	15.2	15.0	14.9	14.8	14.8	14.8	14.8	14.8	14.8	14.4	14.9	15.0	15.2	15.3	15.3	16.7	16.6	16.3	16.2	16.1	16.0	16.0	15.8	07/10	17.0	14.7	16.3	0.3	
6 14 92	14.7	14.6	14.5	14.4	14.4	14.4	14.4	14.8	14.8	14.8	14.8	14.8	14.4	14.8	14.9	15.0	15.1	15.2	15.3	16.7	16.6	16.3	16.2	16.1	16.0	16.0	15.8	07/10	17.0	14.7	16.3	0.3
6 15 92	14.4	14.3	14.2	14.1	14.0	13.9	13.8	13.7	13.6	13.5	13.4	13.3	13.2	13.1	13.0	12.9	12.8	12.7	12.6	12.5	12.4	12.3	12.2	12.1	12.0	11.9	07/09	17.0	14.7	16.3	0.3	
6 16 92	14.3	14.2	14.1	14.0	13.9	13.8	13.7	13.6	13.5	13.4	13.3	13.2	13.1	13.0	12.9	12.8	12.7	12.6	12.5	12.4	12.3	12.2	12.1	12.0	11.9	07/09	17.0	14.7	16.3	0.3		
6 17 92	14.2	14.1	14.0	13.9	13.8	13.7	13.6	13.5	13.4	13.3	13.2	13.1	13.0	12.9	12.8	12.7	12.6	12.5	12.4	12.3	12.2	12.1	12.0	11.9	07/09	17.0	14.7	16.3	0.3			
6 18 92	14.1	14.0	13.9	13.8	13.7	13.6	13.5	13.4	13.3	13.2	13.1	13.0	12.9	12.8	12.7	12.6	12.5	12.4	12.3	12.2	12.1	12.0	11.9	07/09	17.0	14.7	16.3	0.3				
6 19 92	14.0	13.9	13.8	13.7	13.6	13.5	13.4	13.3	13.2	13.1	13.0	12.9	12.8	12.7	12.6	12.5	12.4	12.3	12.2	12.1	12.0	11.9	07/09	17.0	14.7	16.3	0.3					
6 20 92	13.9	13.8	13.7	13.6	13.5	13.4	13.3	13.2	13.1	13.0	12.9	12.8	12.7	12.6	12.5	12.4	12.3	12.2	12.1	12.0	11.9	07/09	17.0	14.7	16.3	0.3						
6 21 92	13.8	13.7	13.6	13.5	13.4	13.3	13.2	13.1	13.0	12.9	12.8	12.7	12.6	12.5	12.4	12.3	12.2	12.1	12.0	11.9	07/09	17.0	14.7	16.3	0.3							
6 22 92	13.7	13.6	13.5	13.4	13.3	13.2	13.1	13.0	12.9	12.8	12.7	12.6	12.5	12.4	12.3	12.2	12.1	12.0	11.9	07/09	17.0	14.7	16.3	0.3								
6 23 92	13.6	13.5	13.4	13.3	13.2	13.1	13.0	12.9	12.8	12.7	12.6	12.5	12.4	12.3	12.2	12.1	12.0	11.9	07/09	17.0	14.7	16.3	0.3									
6 24 92	13.5	13.4	13.3	13.2	13.1	13.0	12.9	12.8	12.7	12.6	12.5	12.4	12.3	12.2	12.1	12.0	11.9	07/09	17.0	14.7	16.3	0.3										
6 25 92	13.4	13.3	13.2	13.1	13.0	12.9	12.8	12.7	12.6	12.5	12.4	12.3	12.2	12.1	12.0	11.9	07/09	17.0	14.7	16.3	0.3											
6 26 92	13.3	13.2	13.1	13.0	12.9	12.8	12.7	12.6	12.5	12.4	12.3	12.2	12.1	12.0	11.9	07/09	17.0	14.7	16.3	0.3												
6 27 92	13.2	13.1	13.0	12.9	12.8	12.7	12.6	12.5	12.4	12.3	12.2	12.1	12.0	11.9	07/09	17.0	14.7	16.3	0.3													
6 28 92	13.1	13.0	12.9	12.8	12.7	12.6	12.5	12.4	12.3	12.2	12.1	12.0	11.9	07/09	17.0	14.7	16.3	0.3														
6 29 92	13.0	12.9	12.8	12.7	12.6	12.5	12.4	12.3	12.2	12.1	12.0	11.9	07/09	17.0	14.7	16.3	0.3															
6 30 92	12.9	12.8	12.7	12.6	12.5	12.4	12.3	12.2	12.1	12.0	11.9	07/09	17.0	14.7	16.3	0.3																
7 1 92	12.8	12.7	12.6	12.5	12.4	12.3	12.2	12.1	12.0	11.9	07/09	17.0	14.7	16.3	0.3																	
7 2 92	12.7	12.6	12.5	12.4	12.3	12.2	12.1	12.0	11.9	07/09	17.0	14.7	16.3	0.3																		
7 3 92	12.6	12.5	12.4	12.3	12.2	12.1	12.0	11.9	07/09	17.0	14.7	16.3	0.3																			
7 4 92	12.5	12.4	12.3	12.2	12.1	12.0	11.9	07/09	17.0	14.7	16.3	0.3																				
7 5 92	12.4	12.3	12.2	12.1	12.0	11.9	07/09	17.0	14.7	16.3	0.3																					
7 6 92	12.3	12.2	12.1	12.0	11.9	07/09	17.0	14.7	16.3	0.3																						
7 7 92	12.2	12.1	12.0	11.9	07/09	17.0	14.7	16.3	0.3																							
7 8 92	12.1	12.0	11.9	07/09	17.0	14.7	16.3	0.3																								
7 9 92	12.0	11.9	07/09	17.0	14.7	16.3	0.3																									
7 10 92	11.9	07/09	17.0	14.7	16.3	0.3																										
7 11 92	07/09	17.0	14.7	16.3	0.3																											
7 12 92	17.0	14.7	16.3	0.3																												
7 13 92	14.7	16.3	0.3																													
7 14 92	16.3	0.3																														
7 15 92	0.3																															
7 16 92	16.3	0.3																														
7 17 92	0.3																															
7 18 92	16.3	0.3																														
7 19 92	0.3																															
7 20 92	16.3	0.3																														
7 21 92	0.3																															
7 22 92	16.3	0.3																														
7 23 92	0.3																															
7 24 92	16.3	0.3																														
7 25 92	0.3																															
7 26 92	16.3	0.3																														
7 27 92	0.3																															
7 28 92	16.3	0.3																														
7 29 92	0.3																															
7 30 92	16.3	0.3																														
7 31 92	0.3																															
8 1 92	16.3	0.3																														
8 2 92	0.3																															
8 3 92	16.3	0.3																														
8 4 92	0.3																															
8 5 92	16.3	0.3																														
8 6 92	0.3																															
8 7 92	16.3	0.3																														
8 8 92	0.3																															
8 9 92	16.3	0.3																														
8 10 92	0.3																															
8 11 92	16.3	0.3																														
8 12 92	0.3																															
8 13 92	16.3	0.3																														
8 14 92	0.3																															
8 15 92	16.3	0.3																														
8 16 92	0.3																															
8 17 92	16.3	0.3																														
8 18 92	0.3																															
8 19 92	16.3	0.3																														

PACIFIC GAS AND ELECTRIC COMPANY
TECHNICAL AND ECOLOGICAL SERVICES
TEMPERATURE DATA FOR STATION AT DeSablé Forebay at 3 ft depth
1992

Table with columns: DATE, HOURLY DATA (0000-2300), MAX, MIN, MEAN, and Corr. Value. The table contains multiple rows of temperature data for each hour of the day, organized in blocks of 24 hours. The 'MAX', 'MIN', and 'MEAN' columns represent the highest, lowest, and average temperatures for that hour, while 'Corr. Value' represents the correction factor.

PACIFIC GAS AND ELECTRIC COMPANY
 TECHNICAL AND ECOLOGICAL SERVICES
 TEMPERATURE DATA FOR STATION AT-Desable Forebay at 18 ft depth
 1992

DATE	HOURLY DATA																			Concorted Daily Values				Corr. Value						
	0000	100	200	300	400	500	600	700	800	900	1000	1100	1200	1300	1400	1500	1600	1700	1800	1900	2000	2100	2200		2300	2400	MAX	MIN	MEAN	
8 30 92	16.2	16.3	16.2	16.3	16.3	16.3	16.3	16.3	16.3	16.3	16.3	16.3	16.3	16.3	16.3	16.3	16.3	16.3	16.3	16.3	16.3	16.3	16.3	16.4	16.4	17.3	17.1	17.2	0.9	
8 31 92	16.3	16.4	16.3	16.4	16.5	16.4	16.4	16.4	16.3	16.3	16.3	16.4	16.3	16.3	16.3	16.3	16.3	16.3	16.3	16.3	16.3	16.3	16.3	16.4	16.4	17.4	17.1	17.2	0.9	
9 1 92	16.3	16.3	16.4	16.3	16.3	16.3	16.4	16.4	16.4	16.5	16.5	16.6	16.6	16.6	16.7	16.7	16.7	16.8	16.7	16.7	16.7	16.8	16.8	16.8	16.8	16.8	17.7	17.2	17.4	0.9
9 2 92	16.7	16.7	16.8	16.8	16.8	16.8	16.8	16.8	16.9	17.0	17.1	16.9	17.0	17.1	17.1	17.2	17.2	17.2	17.2	17.1	17.1	17.2	17.2	17.2	17.1	17.1	18.1	17.6	17.9	0.9
9 3 92	17.1	17.2	17.2	17.2	17.2	17.2	17.2	17.2	17.3	17.4	17.5	17.3	17.3	17.3	17.5	17.6	17.6	17.6	17.6	17.5	17.5	17.6	17.6	17.6	17.5	17.5	18.5	18.0	18.3	0.9
9 4 92	17.6	17.6	17.6	17.6	17.7	17.6	17.6	17.6	17.7	17.6	17.7	17.6	17.7	17.7	17.7	17.7	17.7	17.8	17.7	17.7	17.7	17.7	17.7	17.7	17.7	17.7	18.5	18.0	18.3	0.9
9 5 92	18.6	18.5	18.3	18.0	15.8	15.7	15.8	15.4	14.4	14.4	14.2	14.1	14.1	14.1	14.0	14.0	14.0	14.0	14.0	14.0	14.0	14.0	14.0	14.0	14.1	14.1	15.6	14.8	15.1	0.9
9 6 92	14.6	14.7	14.7	14.7	14.5	14.5	14.4	14.4	14.4	14.4	14.4	14.4	14.4	14.4	14.4	14.4	14.4	14.4	14.4	14.4	14.4	14.4	14.4	14.4	14.1	14.1	15.0	14.1	14.5	0.9
9 7 92	14.1	14.1	14.1	14.1	14.1	14.1	14.1	14.1	14.1	14.1	14.1	14.1	14.1	14.1	14.1	14.1	14.1	14.1	14.1	14.1	14.1	14.1	14.1	14.1	14.1	14.1	15.0	14.1	14.5	0.9
9 8 92	13.7	13.6	13.6	13.5	13.5	13.5	13.3	13.3	13.3	13.3	13.2	12.9	12.8	12.8	12.9	13.0	13.1	13.2	13.1	13.0	13.0	13.0	13.0	13.0	13.0	13.0	14.1	13.7	14.1	0.9
9 9 92	13.2	13.3	13.4	13.4	13.5	13.5	13.4	13.3	13.2	13.1	13.1	13.2	12.9	12.9	13.1	13.1	13.2	13.1	13.1	13.0	13.0	13.0	13.0	13.0	13.0	13.0	14.4	13.8	14.1	0.9
9 10 92	13.4	13.4	13.5	13.5	13.6	13.5	13.5	13.6	13.6	13.6	13.5	13.5	13.5	13.4	13.4	13.6	13.6	13.6	13.6	13.6	13.6	13.6	13.6	13.6	13.6	14.8	14.3	14.5	0.9	
9 11 92	13.7	13.7	13.8	13.8	13.8	13.8	13.7	13.7	13.7	13.7	13.7	13.7	13.7	13.7	13.7	13.7	13.7	13.7	13.7	13.7	13.7	13.7	13.7	13.7	13.7	14.7	14.2	14.5	0.9	
9 12 92	13.7	13.8	13.8	13.8	13.8	13.7	13.6	13.5	13.5	13.5	13.4	13.2	13.1	13.0	12.9	12.9	12.8	12.8	12.8	12.8	12.8	12.8	12.8	12.8	12.8	14.5	13.3	13.8	0.9	
9 13 92	13.3	13.3	13.5	13.5	13.5	13.5	13.5	13.5	13.5	13.5	13.5	13.5	13.5	13.5	13.5	13.5	13.5	13.5	13.5	13.5	13.5	13.5	13.5	13.5	13.5	14.5	13.3	13.8	0.9	
9 14 92	12.8	12.8	12.9	12.9	12.9	12.9	12.7	12.7	12.7	12.5	12.5	12.4	12.4	12.4	12.4	12.4	12.4	12.4	12.4	12.4	12.4	12.4	12.4	12.4	12.4	14.5	13.3	13.8	0.9	
9 15 92	12.9	12.9	12.9	12.9	12.9	12.9	12.8	12.8	12.7	12.6	12.5	12.5	12.4	12.4	12.4	12.4	12.4	12.4	12.4	12.4	12.4	12.4	12.4	12.4	12.4	14.5	13.3	13.8	0.9	
9 16 92	12.4	12.4	12.4	12.4	12.4	12.4	12.4	12.4	12.4	12.4	12.4	12.4	12.4	12.4	12.4	12.4	12.4	12.4	12.4	12.4	12.4	12.4	12.4	12.4	12.4	14.5	13.3	13.8	0.9	
9 17 92	12.3	12.3	12.3	12.4	12.4	12.5	12.4	12.4	12.4	12.4	12.4	12.4	12.4	12.4	12.4	12.4	12.4	12.4	12.4	12.4	12.4	12.4	12.4	12.4	12.4	14.5	13.3	13.8	0.9	
9 18 92	12.3	12.3	12.4	12.4	12.5	12.5	12.5	12.5	12.5	12.5	12.5	12.5	12.5	12.5	12.5	12.5	12.5	12.5	12.5	12.5	12.5	12.5	12.5	12.5	12.5	14.5	13.3	13.8	0.9	
9 19 92	12.5	12.5	12.6	12.7	12.7	12.7	12.7	12.7	12.7	12.7	12.7	12.7	12.7	12.7	12.7	12.7	12.7	12.7	12.7	12.7	12.7	12.7	12.7	12.7	12.7	14.5	13.3	13.8	0.9	
9 20 92	12.7	12.7	12.7	12.7	12.7	12.7	12.7	12.7	12.7	12.7	12.7	12.7	12.7	12.7	12.7	12.7	12.7	12.7	12.7	12.7	12.7	12.7	12.7	12.7	12.7	14.5	13.3	13.8	0.9	
9 21 92	12.7	12.7	12.7	12.7	12.7	12.7	12.7	12.7	12.7	12.7	12.7	12.7	12.7	12.7	12.7	12.7	12.7	12.7	12.7	12.7	12.7	12.7	12.7	12.7	12.7	14.5	13.3	13.8	0.9	
9 22 92	12.7	12.7	12.7	12.7	12.7	12.7	12.7	12.7	12.7	12.7	12.7	12.7	12.7	12.7	12.7	12.7	12.7	12.7	12.7	12.7	12.7	12.7	12.7	12.7	12.7	14.5	13.3	13.8	0.9	
9 23 92	13.2	13.2	13.2	13.2	13.2	13.2	13.2	13.2	13.2	13.2	13.2	13.2	13.2	13.2	13.2	13.2	13.2	13.2	13.2	13.2	13.2	13.2	13.2	13.2	13.2	14.5	13.3	13.8	0.9	
9 24 92	14.0	14.0	14.0	14.1	14.1	14.0	14.0	14.0	14.0	14.1	14.1	14.1	14.1	14.1	14.1	14.1	14.1	14.1	14.1	14.1	14.1	14.1	14.1	14.1	14.1	15.5	14.3	14.7	0.9	
9 25 92	14.4	14.4	14.4	14.4	14.4	14.4	14.4	14.4	14.4	14.4	14.4	14.4	14.4	14.4	14.4	14.4	14.4	14.4	14.4	14.4	14.4	14.4	14.4	14.4	14.4	15.5	14.3	14.7	0.9	
9 26 92	14.8	14.8	14.7	14.7	14.7	14.7	14.7	14.7	14.7	14.7	14.7	14.7	14.7	14.7	14.7	14.7	14.7	14.7	14.7	14.7	14.7	14.7	14.7	14.7	14.7	15.5	14.3	14.7	0.9	
9 27 92	14.9	15.0	15.0	15.0	15.0	15.0	15.0	15.0	15.0	15.0	15.0	15.0	15.0	15.0	15.0	15.0	15.0	15.0	15.0	15.0	15.0	15.0	15.0	15.0	15.0	15.5	14.3	14.7	0.9	
9 28 92	15.3	15.3	15.3	15.3	15.3	15.3	15.3	15.3	15.3	15.3	15.3	15.3	15.3	15.3	15.3	15.3	15.3	15.3	15.3	15.3	15.3	15.3	15.3	15.3	15.3	15.5	14.3	14.7	0.9	
9 29 92	15.7	15.7	15.7	15.7	15.7	15.7	15.7	15.7	15.7	15.7	15.7	15.7	15.7	15.7	15.7	15.7	15.7	15.7	15.7	15.7	15.7	15.7	15.7	15.7	15.7	15.5	14.3	14.7	0.9	
9 29 92	15.7	15.7	15.7	15.7	15.7	15.7	15.7	15.7	15.7	15.7	15.7	15.7	15.7	15.7	15.7	15.7	15.7	15.7	15.7	15.7	15.7	15.7	15.7	15.7	15.7	15.5	14.3	14.7	0.9	

1993

PACIFIC GAS AND ELECTRIC COMPANY
 TECHNICAL AND ECOLOGICAL SERVICES
 TEMPERATURE DATA FOR STATION AT Round Valley Release
 1993

DATE	HOURLY DATA																			Corrected Daily Values			Corr. Value					
	0000	100	200	300	400	500	600	700	800	900	1000	1100	1200	1300	1400	1500	1600	1700	1800	1900	2000	2100		2200	2300	MAX	MIN	MEAN
8 18 93	17.5	17.5	17.5	17.5	17.5	17.5	17.4	17.2	17.1	17.0	16.9	17.1	17.4	17.5	17.3	18.1	18.2	18.5	18.7	18.7	18.7	18.7	18.9	19.1	19.3	17.1	18.1	0.2
8 19 93	19.2	19.0	18.9	18.8	18.7	18.5	18.4	18.0	17.7	17.5	17.8	17.8	17.8	17.9	18.0	18.1	18.1	18.2	18.1	18.1	18.1	18.0	17.9	17.8	19.4	17.7	18.4	0.2
8 20 93	17.6	17.5	17.2	17.1	16.8	16.6	16.4	16.1	15.9	15.7	15.7	15.6	15.8	15.9	15.8	15.9	16.0	16.0	16.1	16.2	16.3	16.4	16.4	16.4	16.4	15.4	16.4	0.2

08/20 reservoir dry

PACIFIC GAS AND ELECTRIC COMPANY
 TECHNICAL AND ECOLOGICAL SERVICES
 TEMPERATURE DATA FOR STATION AT: WBER at Hendricks Head Dam
 1993

DATE	HOURLY DATA																			Corrected Daily Values			Coor. Value					
	0000	100	200	300	400	500	600	700	800	900	1000	1100	1200	1300	1400	1500	1600	1700	1800	1900	2000	2100		2200	2300	MAX	MIN	MEAN
9 18 93	11.3	11.2	11.0	10.8	10.7	10.5	10.3	10.1	10.0	9.9	9.9	10.0	10.3	10.8	11.3	11.7	11.9	12.0	12.1	12.2	12.2	12.1	12.1	11.9	12.4	10.1	11.3	0.2
9 19 93	11.9	11.8	11.6	11.4	11.1	10.8	10.8	10.4	10.1	10.0	10.0	10.1	10.3	10.8	11.2	11.8	11.8	11.8	11.7	11.8	11.5	11.5	11.4	11.3	12.1	10.2	11.3	0.2
9 20 93	11.1	10.9	10.8	10.6	10.4	10.3	10.1	9.9	9.8	9.7	9.7	9.8	10.2	10.8	11.2	11.8	11.7	11.6	11.4	11.3	11.2	11.1	11.0	10.9	11.9	9.9	10.9	0.2
9 21 93	10.7	10.5	10.4	10.2	10.1	9.9	9.7	9.6	9.5	9.4	9.4	9.4	9.8	10.2	10.8	11.2	11.3	11.3	11.0	10.9	10.8	10.7	10.6	10.5	11.5	9.6	10.5	0.2
9 22 93	10.3	10.2	10.0	9.8	9.7	9.5	9.4	9.3	9.1	9.0	9.0	9.2	9.5	9.9	10.4	10.9	11.1	11.1	11.0	10.9	10.8	10.7	10.6	10.5	11.3	8.2	10.3	0.2
9 23 93	10.3	10.1	10.0	9.8	9.7	9.5	9.3	9.2	9.0	8.9	8.9	8.9	9.2	9.7	10.2	10.5	10.7	10.8	10.4	10.2	10.1	10.0	9.9	9.7	10.9	8.1	10.0	0.2
9 24 93	9.6	9.4	9.3	9.1	8.9	8.8	8.6	8.5	8.5	8.4	8.5	8.8	8.9	9.4	10.0	10.4	10.5	10.5	10.3	10.1	10.1	10.0	9.9	9.8	10.7	8.6	9.6	0.2
9 25 93	9.7	9.5	9.4	9.3	9.2	9.0	8.9	8.8	8.6	8.6	8.6	8.8	9.1	9.6	10.2	10.8	10.8	10.8	10.5	10.3	10.1	10.0	10.1	10.1	11.0	8.8	9.8	0.2
9 26 93	10.0	9.9	9.7	9.6	9.4	9.3	9.2	9.1	9.0	9.0	9.0	9.2	9.4	9.8	10.5	10.9	11.1	11.0	10.9	10.7	10.6	10.6	10.5	10.5	11.3	9.2	10.2	0.2
9 27 93	10.4	10.3	10.2	10.1	9.9	9.8	9.7	9.5	9.4	9.3	9.3	9.3	9.5	9.8	10.3	10.8	11.1	11.2	11.0	10.9	10.8	10.8	10.8	10.5	11.5	9.5	10.5	0.2
9 28 93	10.4	10.2	10.1	9.9	9.8	9.7	9.6	9.4	9.3	9.2	9.3	9.4	9.6	10.3	10.8	11.1	11.3	11.2	11.0	10.9	10.7	10.8	10.6	10.5	10.6	9.4	9.9	0.2

PACIFIC GAS AND ELECTRIC COMPANY
 TECHNICAL AND ECOLOGICAL SERVICES
 TEMPERATURE DATA FOR STATION AT: Hendricks Canal at Diversion Dam
 1983

DATE	HOURLY DATA																Corrected Daily Values			Conc.								
	0000	100	200	300	400	500	600	700	800	900	1000	1100	1200	1300	1400	1500	1600	1700	1800		1900	2000	2100	2200	2300	MAX	MIN	MEAN
9 18 83	11.3	11.1	11.0	10.9	10.7	10.5	10.4	10.2	10.1	9.9	9.8	9.9	10.2	10.6	11.1	11.5	11.7	11.8	11.9	12.0	12.1	12.1	12.0	11.8	12.4	10.1	11.3	0.3
9 19 83	11.8	11.7	11.6	11.4	11.2	11.0	10.7	10.5	10.2	10.1	10.0	10.0	10.2	10.6	11.0	11.4	11.8	11.7	11.8	11.8	11.5	11.3	11.2	11.1	12.1	10.3	11.3	0.3
9 20 83	11.0	10.8	10.6	10.5	10.3	10.1	10.0	9.9	9.8	9.7	9.7	9.8	10.0	10.5	10.9	11.3	11.5	11.8	11.8	11.5	11.1	10.9	10.8	10.5	11.9	10.0	10.9	0.3
9 21 83	10.7	10.5	10.4	10.2	10.0	9.8	9.7	9.5	9.4	9.3	9.3	9.4	9.7	10.1	10.6	11.0	11.1	11.2	11.3	11.1	10.9	10.7	10.6	10.5	11.4	9.8	10.6	0.3
9 22 83	10.3	10.2	10.0	9.8	9.7	9.5	9.4	9.2	9.1	9.0	9.0	9.0	9.3	9.7	10.2	10.6	10.8	10.9	10.6	10.5	10.2	10.0	9.8	9.7	10.9	9.0	10.0	0.3
9 23 83	10.3	10.1	9.9	9.7	9.6	9.4	9.3	9.1	9.0	8.8	8.7	8.8	9.1	9.5	10.0	10.3	10.6	10.5	10.5	10.4	10.2	10.0	9.8	9.7	10.8	8.7	9.7	0.3
9 24 83	9.5	9.4	9.2	9.1	8.9	8.8	8.6	8.5	8.4	8.4	8.4	8.5	8.8	9.3	9.8	10.2	10.4	10.5	10.5	10.4	10.2	10.0	9.8	9.6	10.8	8.7	9.7	0.3
9 25 83	8.7	8.5	8.4	8.3	8.1	8.0	8.9	8.7	8.6	8.5	8.5	8.6	8.9	8.4	8.9	10.3	10.6	10.7	10.7	10.6	10.4	10.2	10.1	10.1	11.4	9.2	10.3	0.3
9 26 83	10.0	9.8	9.7	9.6	9.5	9.4	9.3	9.2	9.1	9.0	8.9	9.0	9.4	9.8	10.2	10.7	10.9	11.0	11.1	11.0	10.8	10.6	10.5	10.5	11.6	9.6	10.8	0.3
9 27 83	10.4	10.3	10.2	10.0	9.8	9.7	9.6	9.5	9.4	9.3	9.3	9.4	9.7	10.1	10.6	10.9	11.1	11.3	11.2	11.0	10.8	10.6	10.5	10.5	10.7	9.5	10.0	0.3
9 28 83	10.4	10.2	10.1	9.9	9.8	9.7	9.6	9.4	9.3	9.2	9.2	9.3	9.6	10.1	10.6	10.9	11.1	11.3	11.2	11.0	10.8	10.6	10.5	10.5	10.7	9.5	10.0	0.3

PACIFIC GAS AND ELECTRIC COMPANY
 TECHNICAL AND ECOLOGICAL SERVICES
 TEMPERATURE DATA FOR STATION AT Butte Creek at Butte Head Dam
 1993

DATE	HOURLY DATA																				Corrected Daily Values				Cont. Value					
	0000	100	200	300	400	500	600	700	800	900	1000	1100	1200	1300	1400	1500	1600	1700	1800	1900	2000	2100	2200	2300		MAX	MIN	MEAN		
9 18 93	9.1	9.1	9.2	9.2	9.2	9.1	9.0	8.9	8.7	8.6	8.5	8.5	8.7	8.1	8.4	8.5	8.6	8.6	8.3	10.0	9.8	9.7	9.8	9.4	10.6	9.1	9.8	0.8		
9 19 93	9.4	9.4	9.5	9.5	9.5	9.5	9.4	9.3	9.1	9.0	8.8	8.8	9.0	9.3	9.5	9.7	9.6	9.6	8.7	9.8	9.7	9.5	9.4	9.4	10.4	9.4	10.0	0.6		
9 20 93	9.5	9.5	9.5	9.4	9.4	9.3	9.2	9.0	8.9	8.8	8.7	8.6	8.8	9.1	9.3	9.4	9.4	9.4	9.6	9.7	9.5	9.3	9.3	9.4	10.3	9.2	9.8	0.6		
9 21 93	9.4	9.4	9.4	9.4	9.3	9.2	9.1	8.9	8.8	8.6	8.5	8.5	8.6	8.9	9.2	9.3	9.2	9.2	9.4	9.4	9.5	9.3	9.1	9.1	10.1	9.1	9.7	0.8		
9 22 93	9.2	9.2	9.2	9.1	9.0	9.0	8.9	8.7	8.5	8.4	8.3	8.2	8.4	8.7	9.0	9.2	9.2	9.2	9.4	9.4	9.5	9.4	9.1	9.0	9.1	9.9/22	10.1	8.8	9.5	0.6
9 23 93	9.1	9.0	9.0	9.0	8.9	8.9	8.8	8.6	8.5	8.3	8.2	8.1	8.2	8.5	8.7	8.8	8.7	8.7	8.9	9.0	8.8	8.5	8.5	8.5	9.7	8.7	9.3	0.6		
9 24 93	8.5	8.5	8.5	8.4	8.3	8.2	8.2	8.1	7.9	7.7	7.7	7.9	8.2	8.5	8.6	8.5	8.5	8.6	8.7	8.9	8.9	8.5	8.5	8.5	9.5	8.5	9.3	0.6		
9 25 93	8.6	8.7	8.7	8.6	8.6	8.6	8.5	8.4	8.3	8.2	8.1	8.0	8.2	8.5	8.6	8.6	8.6	8.7	8.9	9.1	9.2	9.1	8.9	8.9	9.8	8.8	9.2	0.6		
9 26 93	9.0	9.1	9.1	9.1	9.0	9.0	8.9	8.8	8.6	8.5	8.5	8.5	8.7	9.1	9.5	9.8	9.5	9.6	9.8	10.0	9.9	9.7	9.6	9.7	10.6	9.1	9.8	0.6		
9 27 93	9.8	9.8	9.8	9.8	9.7	9.7	9.6	9.5	9.3	9.2	9.0	9.0	9.1	9.4	9.7	9.8	9.7	9.7	9.8	10.0	9.9	9.8	9.7	9.7	10.6	9.6	10.2	0.6		
9 28 93	9.7	9.7	9.7	9.7	9.6	9.5	9.4	9.3	9.2	9.1	8.9	8.9	9.1	9.4	9.7	9.8	9.7	9.7	9.8	10.0	9.9	9.8	9.7	9.7	10.3	9.5	10.0	0.6		

PACIFIC GAS AND ELECTRIC COMPANY
 TECHNICAL AND ECOLOGICAL SERVICES
 TEMPERATURE DATA FOR STATION AT: Buite Canal above DeSabia Forebay
 1988

DATE	HOURLY DATA																			Corrected Daily Values			Corr. Value						
	0000	100	200	300	400	500	600	700	800	900	1000	1100	1200	1300	1400	1500	1600	1700	1800	1900	2000	2100		2200	2300	MAX	MIN	MEAN	
9 18 88	11.7	11.6	11.5	11.3	11.2	11.0	10.9	10.8	10.6	10.5	10.5	10.5	10.7	11.1	11.5	11.7	11.9	12.0	12.1	12.1	12.1	12.1	12.1	12.1	12.0	12.2	10.8	11.5	0.1
9 19 88	12.0	11.9	11.8	11.7	11.5	11.4	11.3	11.2	11.0	10.9	10.9	10.9	11.0	11.3	11.7	11.8	12.0	12.1	12.1	12.2	12.2	12.2	12.1	12.0	11.9	12.3	11.0	11.6	0.1
9 20 88	11.7	11.5	11.3	11.2	10.9	10.8	10.5	10.3	10.3	10.3	10.3	10.5	10.8	11.4	12.3	12.2	12.1	12.2	12.4	12.6	12.6	12.4	12.2	12.0	12.0	12.7	10.4	11.6	0.1
9 21 88	11.8	11.6	11.4	11.1	10.9	10.7	10.4	10.2	10.1	10.0	10.0	10.2	10.6	11.3	12.3	13.1	12.7	12.4	12.3	12.3	12.3	12.0	11.8	11.7	11.4	13.2	10.1	11.5	0.1
9 22 88	11.5	11.2	11.0	10.8	10.6	10.4	10.1	9.9	9.7	9.6	9.6	9.8	10.2	10.9	11.8	12.7	12.5	12.3	12.1	12.1	11.9	11.7	11.5	11.4	11.4	12.6	9.4	10.9	0.1
9 23 88	11.2	11.0	10.8	10.6	10.4	10.2	10.0	9.7	9.5	9.4	9.3	9.6	10.0	10.7	11.8	12.5	12.2	11.8	11.8	11.5	11.3	11.3	11.2	10.9	11.0	11.6	9.3	10.5	0.1
9 24 88	10.7	10.5	10.3	10.0	9.8	9.6	9.5	9.3	9.2	9.2	9.2	9.3	9.7	10.3	11.0	11.1	11.0	11.3	11.5	11.4	11.5	11.5	11.4	11.0	11.0	11.7	9.3	10.6	0.1
9 25 88	10.8	10.6	10.4	10.1	9.9	9.7	9.5	9.3	9.2	9.2	9.2	9.3	9.7	10.3	11.0	11.2	11.2	11.4	11.6	11.5	11.5	11.5	11.4	11.3	11.3	11.7	9.3	10.6	0.1
9 26 88	11.1	10.9	10.8	10.5	10.4	10.2	10.1	10.0	9.9	9.9	9.9	10.0	10.4	11.0	11.7	11.7	11.7	11.9	12.1	12.1	12.0	12.0	11.9	11.8	11.8	12.2	10.0	11.1	0.1
9 27 88	11.6	11.4	11.3	11.0	10.8	10.7	10.5	10.4	10.3	10.2	10.2	10.4	10.4	11.0	11.7	11.7	11.7	11.9	12.1	12.1	12.0	12.0	11.9	11.8	11.8	11.7	10.3	10.8	0.1

PACIFIC GAS AND ELECTRIC COMPANY
 TECHNICAL AND ECOLOGICAL SERVICES
 TEMPERATURE DATA FOR STATION AT Butte Creek above Forks of Butte PH
 1993

DATE	HOURLY DATA																			Corrected Daily Values			Corr. Value						
	0000	100	200	300	400	500	600	700	800	900	1000	1100	1200	1300	1400	1500	1600	1700	1800	1900	2000	2100		2200	2300	MAX	MIN	MEAN	
9 18 93	13.1	12.9	12.7	12.5	12.3	12.2	12.1	12.0	11.8	11.7	11.8	11.8	12.0	12.4	12.8	13.2	13.4	13.5	13.8	13.5	13.4	13.3	13.1	13.1	13.7	11.8	12.8	0.1	
9 19 93	13.0	12.8	12.6	12.4	12.3	12.2	12.1	12.0	11.9	11.8	11.7	11.8	12.1	12.5	12.9	13.2	13.5	13.5	13.5	13.3	13.3	13.2	13.1	13.0	13.0	13.8	11.8	12.8	0.1
9 20 93	12.8	12.8	12.4	12.2	12.0	11.9	11.8	11.7	11.5	11.4	11.5	11.9	12.2	12.6	13.0	13.2	13.3	13.4	13.4	13.3	13.2	13.1	13.0	12.9	13.2	13.5	11.5	12.5	0.1
9 21 93	12.7	12.6	12.3	12.2	12.0	11.8	11.5	11.4	11.3	11.2	11.2	11.6	12.0	12.4	12.8	13.0	13.1	13.1	13.1	13.0	12.9	12.8	12.7	12.6	12.8	13.2	11.3	12.3	0.1
9 22 93	12.5	12.3	12.1	11.9	11.7	11.5	11.4	11.2	11.1	11.0	10.9	10.9	11.2	11.5	12.0	12.4	12.7	12.7	12.8	12.7	12.7	12.6	12.4	12.3	12.9	12.9	11.0	12.0	0.1
9 23 93	12.2	12.0	11.8	11.6	11.4	11.2	11.1	10.9	10.7	10.7	10.6	10.6	11.1	11.4	11.8	12.2	12.3	12.4	12.5	12.3	12.2	12.1	11.9	11.8	12.8	10.7	11.7	0.1	
9 24 93	11.6	11.4	11.1	11.0	10.8	10.7	10.6	10.4	10.3	10.3	10.3	10.3	10.7	11.1	11.5	11.8	12.0	12.2	12.4	12.2	12.1	11.9	11.9	11.7	12.4	10.4	11.4	0.1	
9 25 93	11.6	11.4	11.2	11.0	10.9	10.8	10.7	10.6	10.4	10.3	10.4	10.8	11.2	11.5	12.0	12.2	12.3	12.4	12.4	12.3	12.2	12.2	12.1	12.1	12.5	10.4	11.5	0.1	
9 26 93	11.9	11.8	11.6	11.4	11.3	11.1	11.0	10.9	10.8	10.7	10.7	10.7	11.1	11.5	11.9	12.3	12.6	12.7	12.7	12.7	12.7	12.6	12.5	12.9	12.8	10.8	11.8	0.1	
9 27 93	12.4	12.3	12.1	11.9	11.7	11.6	11.5	11.4	11.2	11.1	11.1	11.3	11.6	12.0	12.5	12.8	13.0	13.1	13.2	13.2	13.1	13.1	13.0	12.9	13.3	11.2	12.3	0.1	
9 28 93	12.7	12.5	12.3	12.1	12.0	11.9	11.7	11.6	11.5	11.5	11.5	11.3	11.6	12.0	12.5	12.8	13.0	13.1	13.2	13.2	13.1	13.1	13.0	12.9	12.8	11.5	12.1	0.1	

PACIFIC GAS AND ELECTRIC COMPANY
 TECHNICAL AND ECOLOGICAL SERVICES
 TEMPERATURE DATA FOR STATION AT: Butte Creek at LCDD
 1993

DATE	HOURLY DATA																Corrected Daily Values			Corr. Value										
	0000	100	200	300	400	500	600	700	800	900	1000	1100	1200	1300	1400	1500	1600	1700	1800		1900	2000	2100	2200	2300	2400	MAX	MIN	MEAN	
9 18 93	12.6	12.5	12.4	12.3	12.2	12.1	12.1	12.1	12.0	11.9	11.9	12.1	12.2	12.4	12.5	12.6	12.5	12.5	12.5	12.5	12.5	12.4	12.4	12.4	12.4	12.4	12.9	12.2	12.6	0.3
9 19 93	12.4	12.4	12.4	12.3	12.3	12.2	12.1	12.1	12.0	12.0	12.0	12.2	12.4	12.6	12.8	12.9	13.1	12.9	12.8	12.8	12.6	12.5	12.4	12.4	12.3	12.3	13.4	12.3	12.7	0.3
9 20 93	12.2	12.2	12.2	12.2	12.3	12.2	12.1	12.1	11.7	11.6	11.7	11.9	12.1	12.4	12.5	12.5	12.5	12.5	12.4	12.3	12.1	12.1	12.1	12.0	12.0	12.0	12.8	11.9	12.4	0.3
9 21 93	12.1	12.1	12.0	11.9	11.7	11.7	11.6	11.5	11.4	11.4	11.5	11.7	12.0	12.3	12.4	12.4	12.4	12.3	12.1	12.1	12.1	12.0	11.9	11.8	11.8	11.5	12.7	11.7	12.2	0.3
9 22 93	11.8	11.8	11.7	11.6	11.5	11.4	11.3	11.2	11.1	11.1	11.2	11.4	11.7	12.0	12.1	12.1	12.0	12.0	11.9	11.8	11.8	11.7	11.6	11.5	11.5	11.5	12.4	11.4	11.9	0.3
9 23 93	11.5	11.4	11.4	11.4	11.2	11.1	11.0	10.9	10.8	10.8	10.8	11.1	11.4	11.7	11.8	12.0	12.0	11.9	11.8	11.8	11.8	11.7	11.5	11.4	11.4	11.4	13.0	11.1	11.9	0.3
9 24 93	11.3	11.3	11.3	11.3	11.2	11.1	11.0	10.9	10.8	10.9	11.0	11.3	11.5	11.8	11.9	12.0	12.0	11.9	11.8	11.8	11.8	11.7	11.5	11.4	11.4	11.4	12.3	11.2	11.7	0.3
9 25 93	11.4	11.4	11.4	11.4	11.4	11.3	11.2	11.1	11.0	11.0	11.2	11.5	11.8	12.1	12.2	12.3	12.3	12.2	12.2	12.1	12.0	11.9	11.9	11.9	11.9	11.9	12.3	11.2	11.7	0.3
9 26 93	11.5	11.5	11.5	11.5	11.4	11.4	11.3	11.2	11.2	11.2	11.2	11.3	11.5	11.8	12.1	12.2	12.2	12.2	12.1	12.0	11.9	11.8	11.8	11.9	11.9	11.9	12.6	11.5	12.0	0.3
9 27 93	11.9	11.9	11.9	11.9	11.8	11.8	11.7	11.6	11.6	11.6	11.6	11.8	12.0	12.2	12.5	12.6	12.7	12.7	12.6	12.5	12.4	12.3	12.3	12.3	12.3	12.3	13.0	11.9	12.4	0.3
9 28 93	12.2	12.2	12.2	12.2	12.1	12.1	12.0	11.9	11.8	11.8	11.8	12.0	12.2	12.5	12.6	12.7	12.7	12.6	12.5	12.4	12.3	12.3	12.3	12.3	12.3	12.2	12.5	12.1	12.4	0.3

PACIFIC GAS AND ELECTRIC COMPANY
 TECHNICAL AND ECOLOGICAL SERVICES
 TEMPERATURE DATA FOR STATION AT: Butte Creek at Pool 4 3 ft depth
 1993

DATE	HOURLY DATA												Corrected Daily Values			Corr. Value												
	0000	100	200	300	400	500	600	700	800	900	1000	1100	1200	1300	1400		1500	1600	1700	1800	1900	2000	2100	2200	2300	MAX	MIN	MEAN
9/18/93																									15.7	12.9	14.1	
9/19/93																										15.8	12.9	14.2
9/20/93																										15.6	12.9	14.0
9/21/93																										15.3	12.8	13.8
9/22/93																										14.8	12.3	13.5
9/23/93																										14.6	11.9	13.1
9/24/93																										14.7	11.7	12.9
9/25/93																										14.7	11.9	13.1
9/26/93																										14.7	11.9	13.2
9/27/93																										15.1	12.4	13.5
9/28/93																										15.1	12.5	13.7
9/29/93																										15.4	12.7	13.9
9/30/93																										14.6	13.0	13.8

PACIFIC GAS AND ELECTRIC COMPANY
 TECHNICAL AND ECOLOGICAL SERVICES
 TEMPERATURE DATA FOR STATION AT: Butte Creek at Pool 4 15 ft depth
 1983

DATE	HOURLY DATA																								Corrected Daily Values			Cont. Value	
	0000	100	200	300	400	500	600	700	800	900	1000	1100	1200	1300	1400	1500	1600	1700	1800	1900	2000	2100	2200	2300	MAX	MIN	MEAN		
7 12 93																													
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PACIFIC GAS AND ELECTRIC COMPANY
 TECHNICAL AND ECOLOGICAL SERVICES
 TEMPERATURE DATA FOR STATION AT: Butte Creek at Pool 4 15 ft depth
 1993

DATE	HOURLY DATA												Corrected Daily Values			Corr. Value												
	0000	100	200	300	400	500	600	700	800	900	1000	1100	1200	1300	1400		1500	1600	1700	1800	1900	2000	2100	2200	2300	MAX	MIN	MEAN
9 18 93																									15.7	12.9	14.1	
9 19 93																										15.8	12.9	14.2
9 20 93																										15.6	12.9	14.0
9 21 93																										15.3	12.8	13.8
9 22 93																										14.8	12.3	13.5
9 23 93																										14.6	11.9	13.1
9 24 93																										14.7	11.7	12.9
9 25 93																										14.7	11.9	13.1
9 26 93																										14.7	11.9	13.2
9 27 93																										15.1	12.4	13.5
9 28 93																										15.1	12.5	13.7
9 29 93																										15.4	12.7	13.9
9 30 93																										14.6	13.0	13.6

PACIFIC GAS AND ELECTRIC COMPANY
 TECHNICAL AND ECOLOGICAL SERVICES
 TEMPERATURE DATA FOR STATION AT: Butte Creek at Helltown Bridge
 1993

DATE	HOURLY DATA												Corrected Daily Values				Corr. Value											
	0000	100	200	300	400	500	600	700	800	900	1000	1100	1200	1300	1400	1500		1600	1700	1800	1900	2000	2100	2200	2300	MAX	MIN	MEAN
9 19 93	13.3	13.1	13.0	12.9	12.7	12.5	12.4	12.1	12.0	11.7	11.7	11.5	11.2	12.7	13.4	13.9	14.2	14.3	14.1	14.0	13.9	13.8	13.7	13.5	16.5	13.9	15.2	2.2
9 20 93	13.2	13.1	12.9	12.7	12.5	12.4	12.2	12.0	11.8	11.7	11.7	11.5	11.2	12.6	13.3	13.8	14.1	14.1	13.9	13.8	13.7	13.6	13.4	13.2	16.3	13.9	15.1	2.2
9 21 93	13.2	13.0	12.8	12.7	12.5	12.4	12.1	12.0	11.7	11.5	11.4	11.2	11.8	12.4	13.0	13.5	13.7	13.8	13.8	13.4	13.3	13.2	13.0	12.8	16.0	13.8	14.9	2.2
9 22 93	12.8	12.7	12.5	12.3	12.1	12.0	11.8	11.6	11.4	11.2	11.1	11.2	11.5	12.0	12.6	13.1	13.3	13.3	13.2	13.0	13.0	13.0	12.8	12.7	15.5	13.3	14.5	2.2
9 23 93	12.4	12.3	12.1	11.9	11.7	11.6	11.4	11.2	11.0	10.8	10.7	10.8	11.2	11.7	12.3	12.8	13.1	13.1	12.9	12.7	12.7	12.7	12.4	12.2	15.3	12.9	14.2	2.2
9 24 93	12.0	11.8	11.6	11.4	11.3	11.2	10.9	10.7	10.5	10.5	10.5	10.8	11.0	11.6	12.2	12.8	13.1	13.2	13.0	12.9	12.8	12.7	12.5	12.5	15.4	12.7	14.0	2.2
9 25 93	12.3	12.1	12.0	11.8	11.7	11.6	11.4	11.2	11.0	10.8	10.7	10.8	11.2	11.7	12.4	12.9	13.2	13.2	13.1	13.0	12.9	12.8	12.7	12.5	15.4	12.9	14.2	2.2
9 26 93	12.3	12.1	12.0	11.8	11.7	11.5	11.3	11.1	11.0	10.8	10.7	10.8	11.1	11.7	12.2	13.3	13.6	13.6	13.4	13.3	13.2	13.1	12.9	12.7	15.8	13.4	14.6	2.2
9 27 93	12.5	12.4	12.2	12.1	12.0	11.8	11.7	11.5	11.3	11.2	11.2	11.3	11.7	12.2	12.8	13.4	13.6	13.6	13.4	13.4	13.3	13.2	13.1	12.9	15.8	13.5	14.7	2.2
9 28 93	12.7	12.5	12.4	12.3	12.1	12.0	11.9	11.7	11.6	11.3	11.3	11.4	11.8	12.3	12.9	13.4	13.6	13.6	13.4	13.4	13.4	13.4	13.3	13.1	16.1	13.7	15.0	2.2
9 29 93	12.9	12.8	12.6	12.5	12.4	12.3	12.1	11.9	11.7	11.5	11.5	11.8	12.0	12.5	13.1	13.7	13.9	13.9	13.7	13.6	13.6	13.6	13.5	13.3	16.1	13.7	15.0	2.2
9 30 93	13.1	12.9	12.8	12.7	12.6	12.5	12.4	12.2	12.0	11.9	11.8	12.0	12.5	13.1	13.7	13.9	13.9	13.9	13.7	13.6	13.6	13.6	13.5	13.3	16.3	14.0	14.6	2.2

PACIFIC GAS AND ELECTRIC COMPANY
 TECHNICAL AND ECOLOGICAL SERVICES
 TEMPERATURE DATA FOR STATION AT: Butte Creek below Centerville PH
 1993

DATE	HOURLY DATA																								Corrected Daily Values			Corr. Value	
	0000	100	200	300	400	500	600	700	800	900	1000	1100	1200	1300	1400	1500	1600	1700	1800	1900	2000	2100	2200	2300	MAX	MIN	MEAN		
	9 18 93	13.7	13.6	13.6	13.6	13.5	13.3	13.2	13.2	13.1	13.0	12.9	13.1	13.4	13.9	14.4	14.7	15.0	15.1	15.1	15.0	14.7	14.3	14.0	13.8	15.2	13.0		14.0
9 19 93	13.6	13.6	13.5	13.5	13.4	13.3	13.2	13.2	13.1	13.0	12.9	13.1	13.5	14.0	14.5	14.9	15.2	15.5	15.6	15.3	14.9	14.5	14.2	13.9	15.7	13.1	14.1	0.1	
9 20 93	13.7	13.6	13.5	13.4	13.2	13.1	13.0	12.9	12.9	12.9	12.9	13.0	13.2	14.1	14.7	15.1	15.7	16.0	16.2	16.3	16.2	16.0	15.7	15.2	14.7	16.4	13.0	14.5	0.1
9 21 93	14.4	14.1	14.0	13.8	13.7	13.5	13.4	13.2	13.1	13.0	13.0	13.1	13.7	14.3	15.0	15.5	15.8	15.9	16.0	15.9	15.7	15.3	14.9	14.5	16.1	13.1	14.5	0.1	
9 22 93	14.2	14.0	13.8	13.6	13.5	13.3	13.1	13.0	12.8	12.7	12.7	12.8	13.2	13.9	14.6	15.1	15.4	15.5	15.6	15.5	15.3	15.1	14.6	14.2	15.7	12.8	14.2	0.1	
9 23 93	13.9	13.6	13.5	13.3	13.1	12.9	12.7	12.5	12.4	12.3	12.2	12.5	12.9	13.6	14.3	14.8	15.1	15.3	15.3	15.0	14.7	14.1	13.7	13.2	15.4	12.3	13.7	0.1	
9 24 93	13.0	12.9	12.8	12.6	12.5	12.4	12.3	12.2	12.1	12.1	12.1	12.3	12.7	13.3	13.8	14.3	14.6	14.9	14.9	14.8	14.5	14.1	13.7	13.3	15.0	12.2	13.4	0.1	
9 25 93	13.1	12.9	12.8	12.6	12.5	12.4	12.3	12.2	12.1	12.1	12.1	12.3	12.7	13.4	14.0	14.5	14.8	15.0	15.0	14.9	14.7	14.3	13.8	13.5	15.1	12.2	13.4	0.1	
9 26 93	13.2	13.1	12.9	12.8	12.7	12.6	12.5	12.4	12.3	12.2	12.2	12.3	12.8	13.5	14.1	14.6	14.9	15.2	15.2	15.1	14.9	14.5	14.1	13.7	15.3	12.3	13.6	0.1	
9 27 93	13.6	13.4	13.2	13.2	13.1	12.9	12.8	12.8	12.7	12.6	12.7	12.8	13.3	13.9	14.5	15.0	15.3	15.5	15.6	15.4	15.2	14.8	14.4	14.1	15.7	12.7	14.0	0.1	
9 28 93	13.9	13.7	13.5	13.4	13.2	13.2	13.0	12.9	12.9	12.9	12.9	13.0	13.5	14.1	14.7	15.1	15.4	15.6	15.7	15.6	15.3	15.0	14.5	14.2	16.0	13.0	14.2	0.1	
9 29 93	14.0	13.9	13.7	13.6	13.5	13.3	13.2	13.2	13.0	13.0	13.0	13.2	13.7	14.3	14.9	15.3	15.7	15.9	15.9	15.8	15.6	15.2	14.8	14.5	16.0	13.1	14.4	0.1	
9 30 93	14.2	14.1	14.0	13.8	13.7	13.5	13.3	13.3	13.4	13.3	13.4	13.3	13.7	14.3	14.9	15.3	15.7	15.9	15.9	15.8	15.6	15.2	14.8	14.5	14.3	13.4	13.8	0.1	

PACIFIC GAS AND ELECTRIC COMPANY
 TECHNICAL AND ECOLOGICAL SERVICES
 TEMPERATURE DATA FOR STATION AT Lower Centerville Canal
 1983

DATE	HOURLY DATA																								Corrected Daily Values			Coor. Value
	0000	100	200	300	400	500	600	700	800	900	1000	1100	1200	1300	1400	1500	1600	1700	1800	1900	2000	2100	2200	2300	MAX	MIN	MEAN	
	9 18 83	12.7	12.6	12.6	12.5	12.5	12.4	12.3	12.2	12.2	12.1	12.2	12.2	12.4	12.8	13.2	13.6	13.9	14.0	14.0	13.8	13.4	13.0	12.7	12.6	14.3	12.4	
9 19 83	12.5	12.4	12.4	12.3	12.3	12.3	12.3	12.2	12.2	12.1	12.1	12.2	12.5	12.9	13.3	13.7	14.1	14.4	14.5	14.2	13.7	13.2	12.9	12.7	14.8	12.4	13.2	0.3
9 20 83	12.5	12.4	12.3	12.2	12.2	12.1	12.0	12.0	12.0	12.0	12.1	12.2	12.5	13.2	13.8	14.2	15.0	15.3	15.1	14.8	14.2	13.6	13.1	15.6	12.3	13.5	0.3	
9 21 83	12.8	12.5	12.3	12.1	11.9	11.9	11.8	11.7	11.6	11.5	11.5	11.6	12.0	12.7	13.4	14.1	14.7	15.0	15.1	14.9	14.8	14.1	13.5	12.9	15.4	11.8	13.2	0.3
9 22 83	12.5	12.3	12.1	11.9	11.8	11.6	11.5	11.4	11.3	11.2	11.2	11.3	11.7	12.3	13.0	13.7	14.3	14.7	14.8	14.2	13.8	13.2	12.7	15.0	11.5	12.9	0.3	
9 23 83	12.3	12.0	11.8	11.6	11.4	11.3	11.1	11.1	11.0	10.9	10.9	11.3	12.0	12.8	13.5	14.2	14.5	14.5	14.1	13.8	13.0	12.6	12.2	14.8	11.2	12.8	0.3	
9 24 83	12.1	11.9	11.8	11.7	11.6	11.5	11.5	11.4	11.4	11.4	11.4	11.5	11.9	12.3	12.8	13.3	13.8	14.0	14.0	13.9	13.4	12.9	12.4	14.3	11.7	12.8	0.3	
9 25 83	11.8	11.7	11.5	11.4	11.3	11.2	11.2	11.2	11.1	11.1	11.1	11.2	11.6	12.1	12.7	13.2	13.8	14.1	14.1	13.9	13.5	13.0	12.5	12.2	14.4	11.4	12.5	0.3
9 26 83	12.0	11.8	11.7	11.5	11.5	11.4	11.4	11.3	11.3	11.3	11.3	11.4	11.8	12.3	12.9	13.5	14.1	14.3	14.3	14.2	13.8	13.3	12.8	12.5	14.6	11.6	12.7	0.3
9 27 83	12.4	12.2	12.2	12.1	12.0	11.9	11.8	11.8	11.8	11.8	11.8	11.9	12.2	12.7	13.3	13.9	14.4	14.8	14.7	14.5	14.1	13.7	13.2	12.9	15.0	12.1	13.1	0.3
9 28 83	12.7	12.5	12.4	12.2	12.1	12.1	12.1	12.0	12.0	12.0	12.1	12.1	12.5	13.0	13.5	14.1	14.6	14.9	14.8	14.7	14.3	13.8	13.3	13.0	15.2	12.3	13.3	0.3
9 29 83	12.9	12.7	12.5	12.4	12.2	12.2	12.2	12.2	12.1	12.1	12.1	12.2	12.5	13.1	13.7	14.3	14.8	15.1	15.1	14.9	14.6	14.1	13.6	13.2	15.4	12.4	13.5	0.3
9 30 83	13.0	12.9	12.7	12.6	12.5	12.4	12.4	12.3	12.3	12.3	12.3	12.3	12.3	13.1	13.7	14.3	14.8	15.1	14.9	14.6	14.1	13.6	13.2	13.3	12.6	12.6	12.8	0.3

PACIFIC GAS AND ELECTRIC COMPANY
 TECHNICAL AND ECOLOGICAL SERVICES
 TEMPERATURE DATA FOR STATION AT DeseSabia Forebay at 15 ft
 1993

DATE	HOURLY DATA																								Corrected Daily Values			Corr. Value		
	0000	100	200	300	400	500	600	700	800	900	1000	1100	1200	1300	1400	1500	1600	1700	1800	1900	2000	2100	2200	2300	MAX	MIN	MEAN			
9-18-93	12.4	12.3	12.3	12.3	12.2	12.1	12.0	11.9	11.8	11.7	11.6	11.5	11.5	11.5	11.5	11.5	11.6	11.7	11.8	11.9	11.9	11.8	12.0	12.1	12.1	12.1	12.7	11.8	12.2	0.3
9-19-93	12.0	12.2	12.1	12.1	12.0	12.0	12.0	11.9	11.9	11.7	11.7	11.7	11.7	11.8	11.8	11.9	11.8	11.8	12.0	12.0	12.1	12.2	12.3	12.3	12.3	12.7	12.6	12.0	12.3	0.3
9-20-93	12.3	12.3	12.4	12.4	12.4	12.3	12.2	12.1	12.0	11.9	11.7	11.7	11.6	11.6	11.6	11.7	11.8	11.7	11.8	12.0	11.8	12.0	11.8	11.9	11.9	12.7	11.9	12.3	0.3	
9-21-93	11.5	11.9	12.0	12.0	12.1	12.1	12.1	12.0	12.1	12.1	12.1	12.2	12.3	12.3	12.2	12.2	12.3	12.4	12.4	12.4	12.4	12.4	12.4	12.4	12.4	13.0	12.7	12.8	0.3	
9-22-93	12.4	12.4	12.5	12.5	12.5	12.5	12.4	12.5	12.5	12.5	12.5	12.5	12.6	12.6	12.4	12.5	12.4	12.5	12.7	12.6	12.6	12.6	12.5	12.7	12.7	13.1	12.8	13.0	0.3	
9-23-93	12.5	12.5	12.7	12.7	12.6	12.6	12.6	12.7	12.6	12.7	12.7	12.7	12.6	12.5	12.5	12.6	12.7	12.7	12.8	12.8	12.8	12.6	12.7	12.8	12.8	13.0	12.8	13.0	0.3	
9-24-93	12.7	12.7	12.7	12.6	12.5	12.4	12.4	12.3	12.2	12.2	11.9	11.8	11.9	11.5	11.5	11.8	11.6	11.7	11.8	11.8	11.9	12.0	12.0	12.0	12.0	12.4	11.5	11.9	0.3	
9-25-93	12.1	12.0	12.1	11.9	11.8	11.8	11.7	11.6	11.5	11.4	11.2	11.2	11.2	11.2	11.2	11.3	11.4	11.4	11.4	11.5	11.5	11.5	11.5	11.5	11.7	12.2	11.7	12.0	0.3	
9-26-93	11.7	11.7	11.8	11.8	11.8	11.8	11.7	11.7	11.5	11.5	11.5	11.5	11.6	11.4	11.4	11.8	11.5	11.5	11.7	11.8	11.8	11.8	11.7	11.8	11.9	12.3	11.7	12.1	0.3	
9-27-93	11.9	12.0	12.0	12.0	12.0	12.0	12.0	12.0	12.0	11.8	11.9	11.8	11.8	11.4	11.4	11.8	11.5	11.5	11.7	11.8	11.8	11.8	11.7	11.8	11.9	12.3	12.1	12.2	0.3	

Appendix B

**MEAN DAILY WATER TEMPERATURE, AIR TEMPERATURE,
AND FLOW DIAGRAMS**

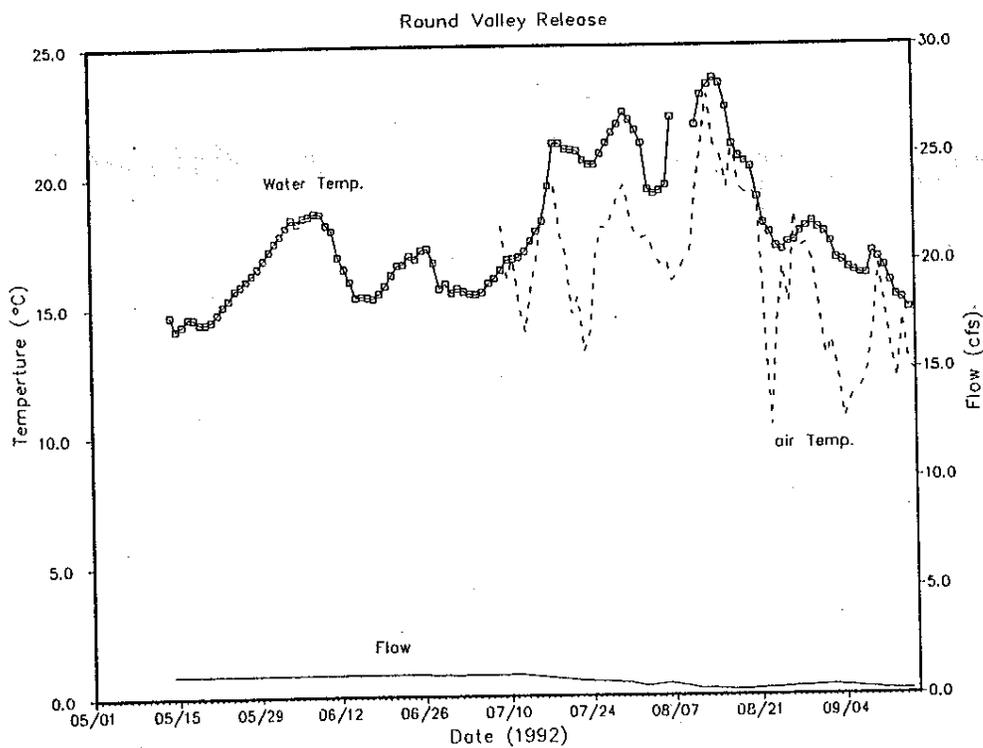
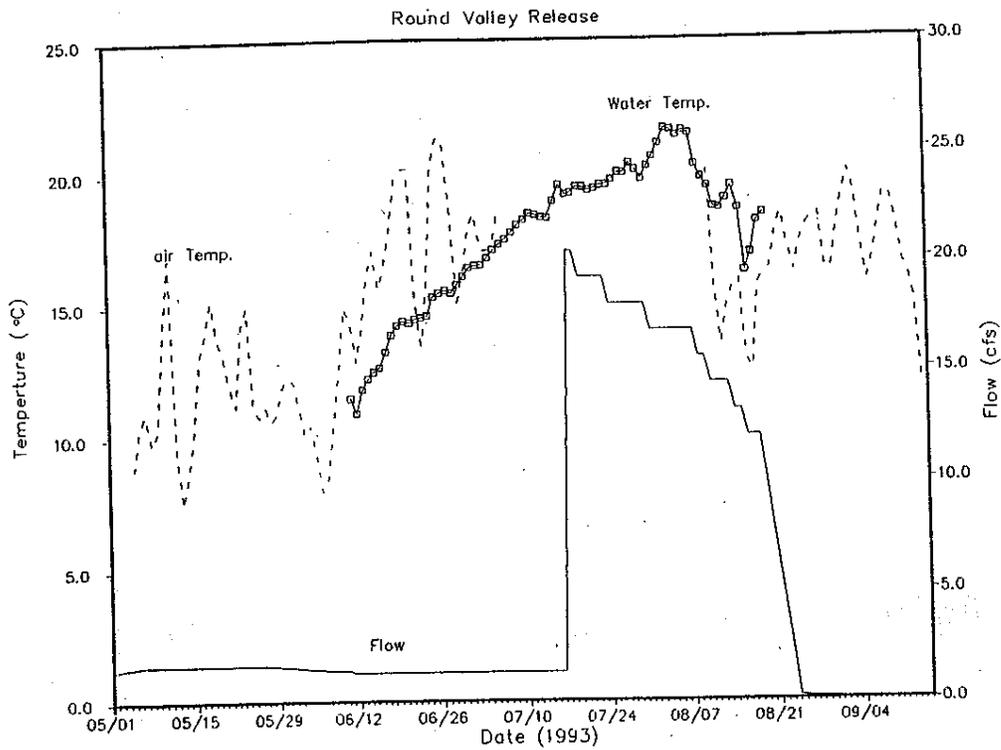


Figure B-1. Mean daily water and air temperature, and flow data from Round Valley Reservoir release - 1992, 1993.

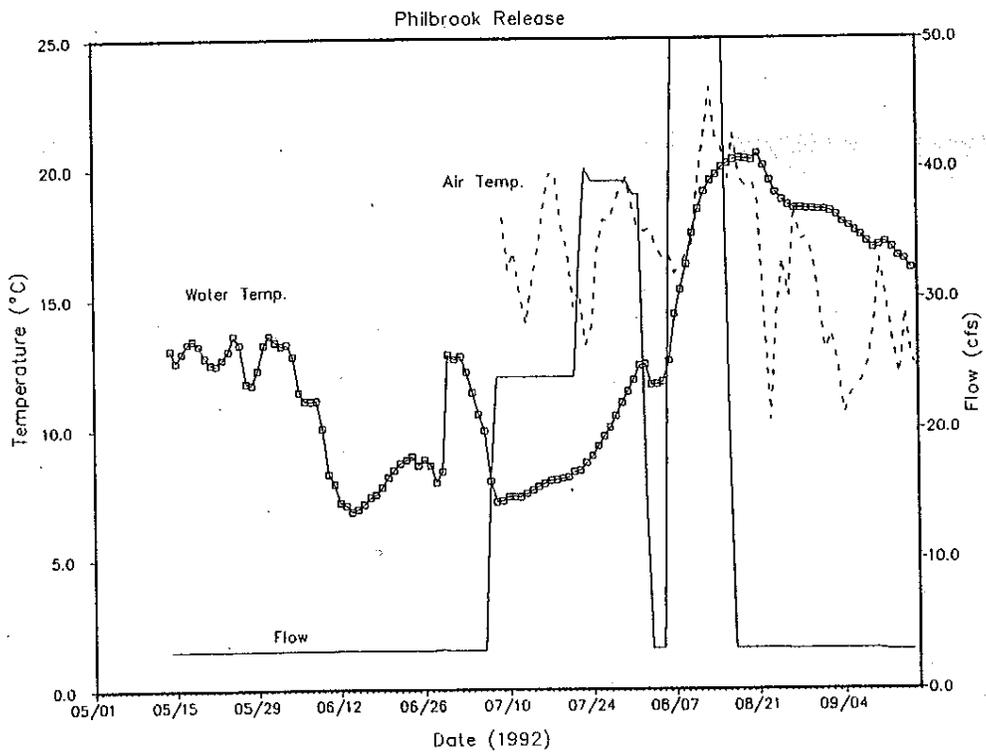
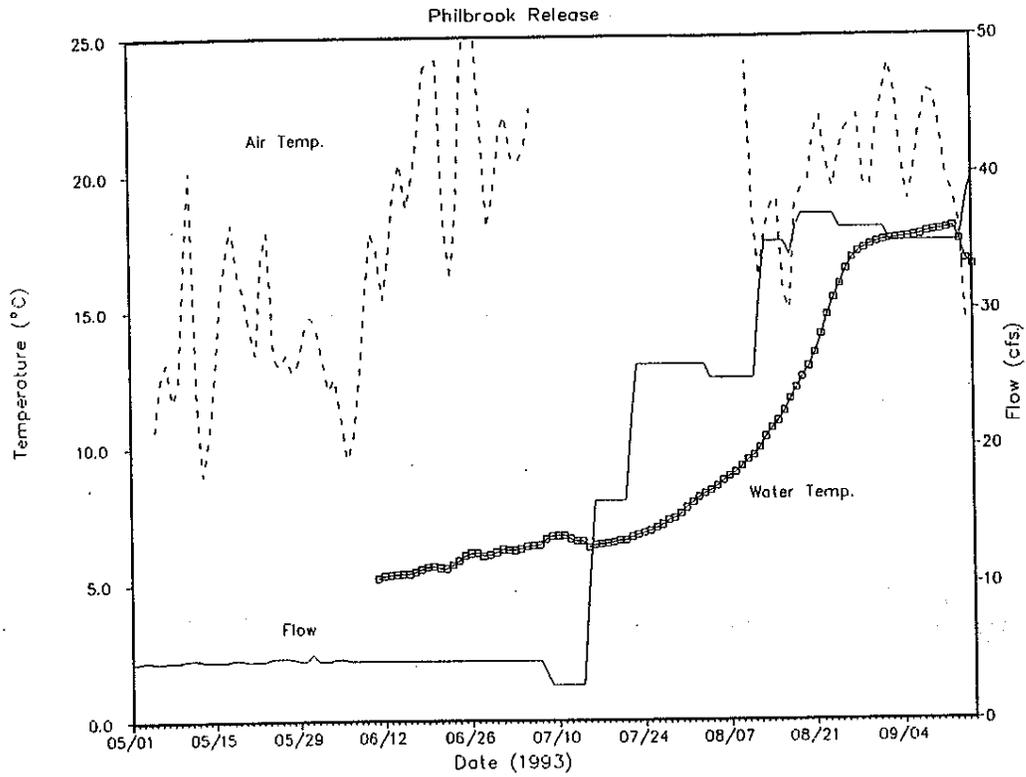


Figure B-2. Mean daily water and air temperature, and flow data from Philbrook Reservoir release – 1992, 1993.

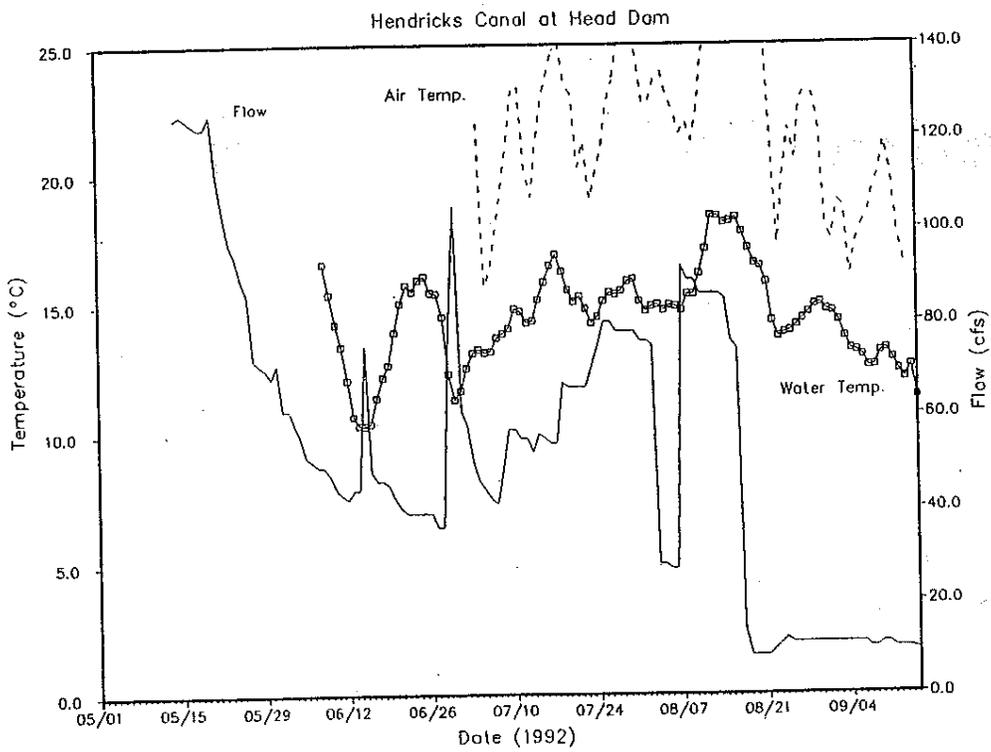
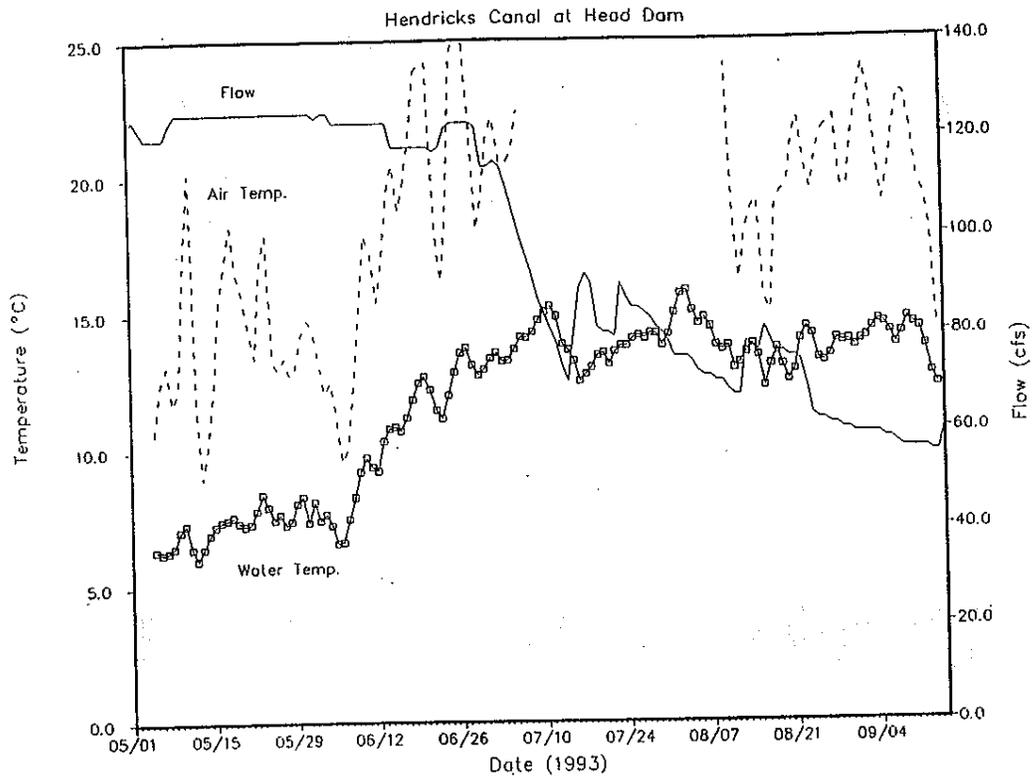


Figure B-3. Mean daily water and air temperature, and flow data from Hendricks Canal at Hendricks Head Dam – 1992, 1993.

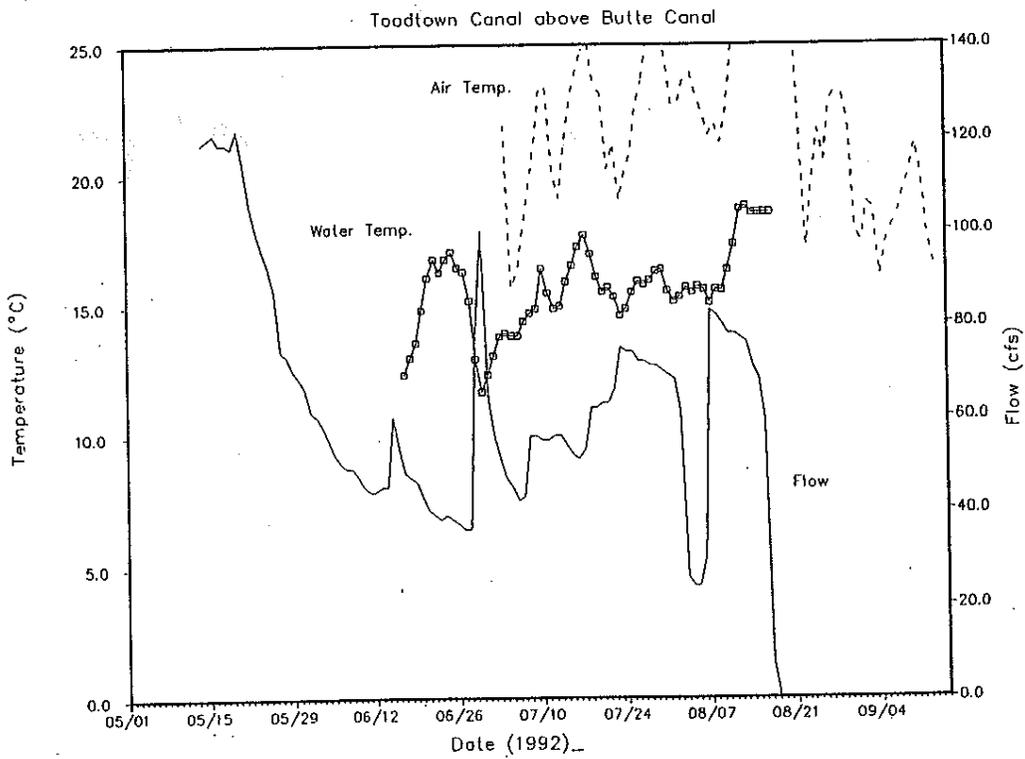
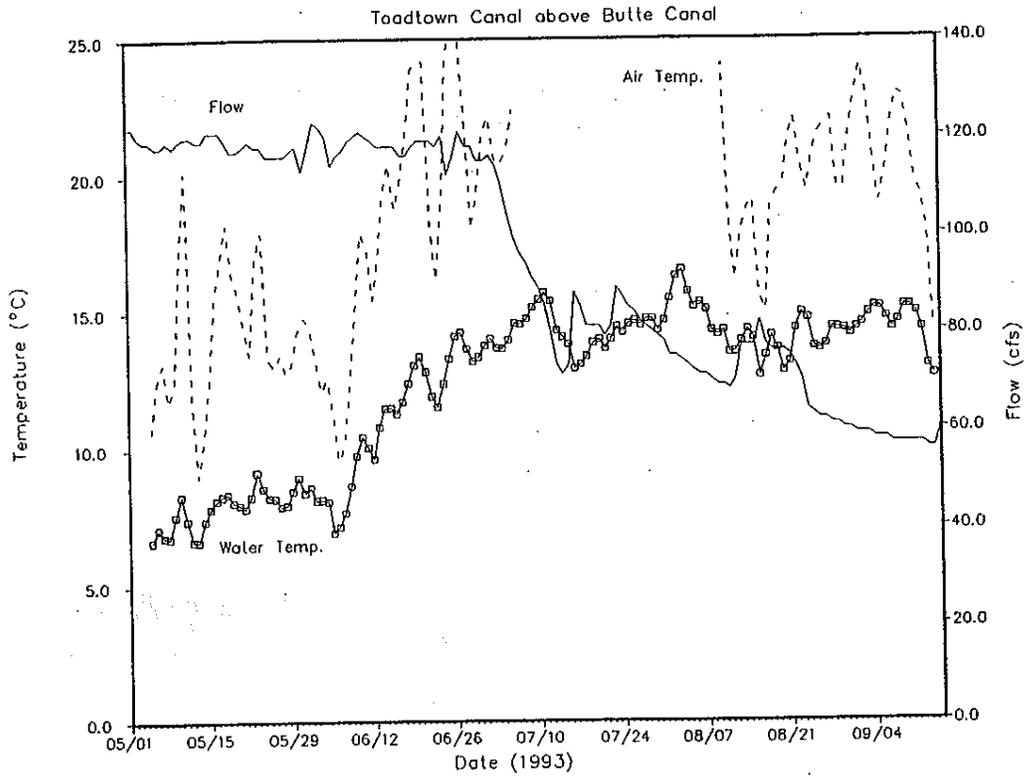


Figure B-4. Mean daily water and air temperature, and flow data from Toadtown Canal above Butte Canal – 1992, 1993.

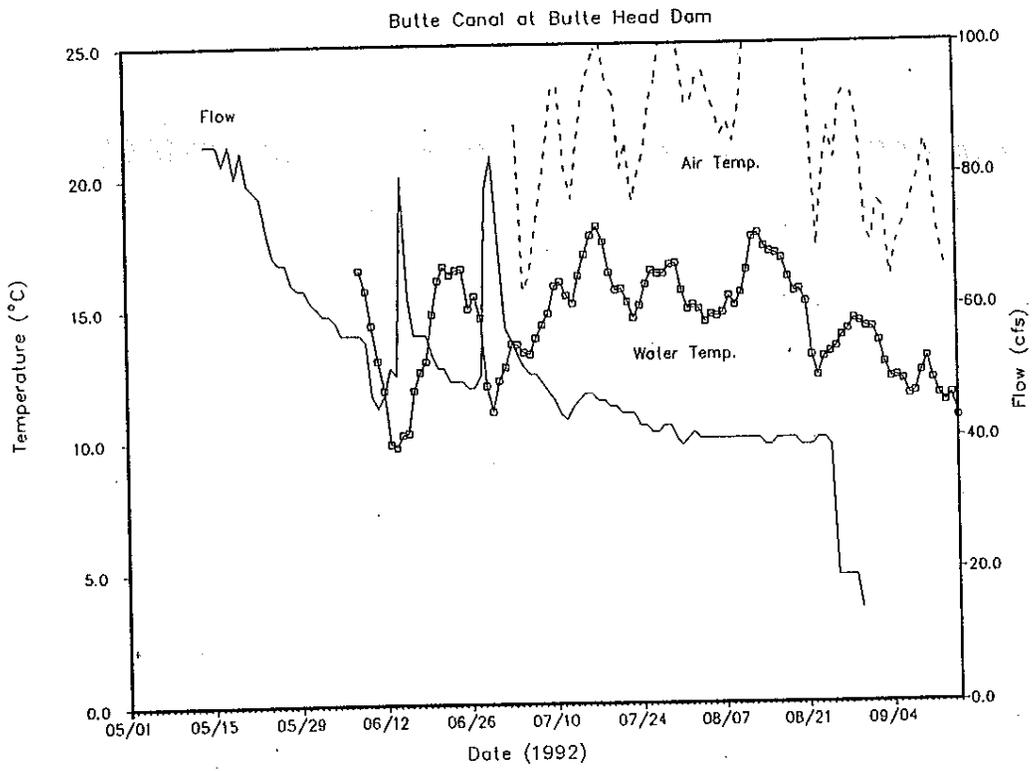
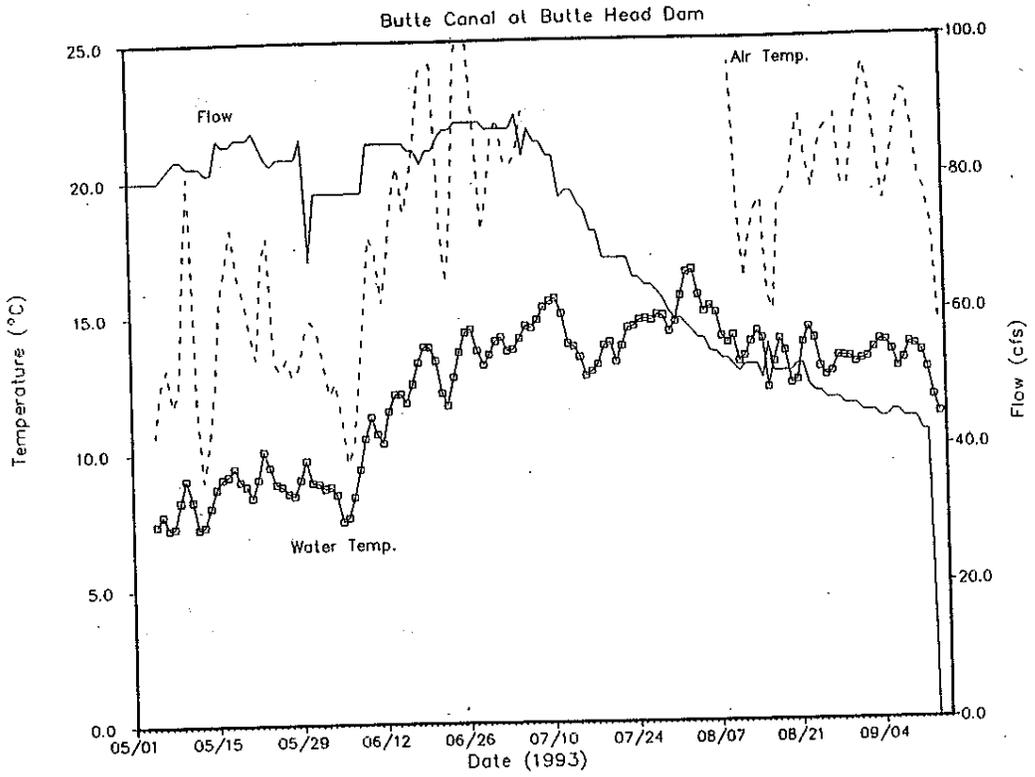


Figure B-5. Mean daily water and air temperature, and flow data from Butte Canal at Butte Head Dam – 1992, 1993.

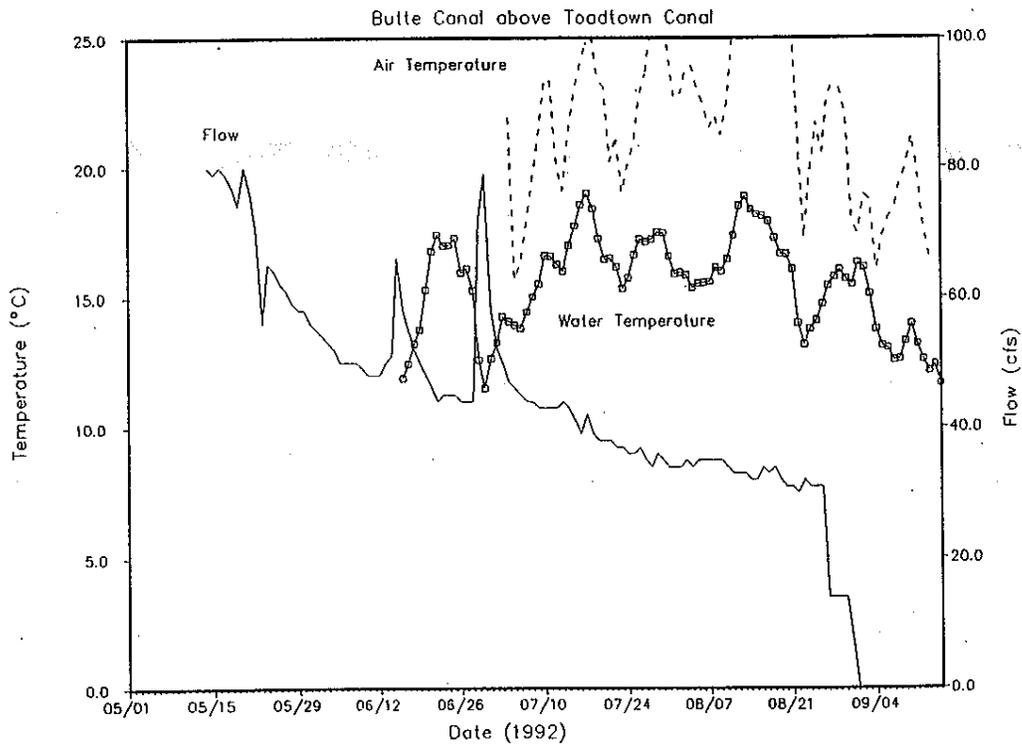
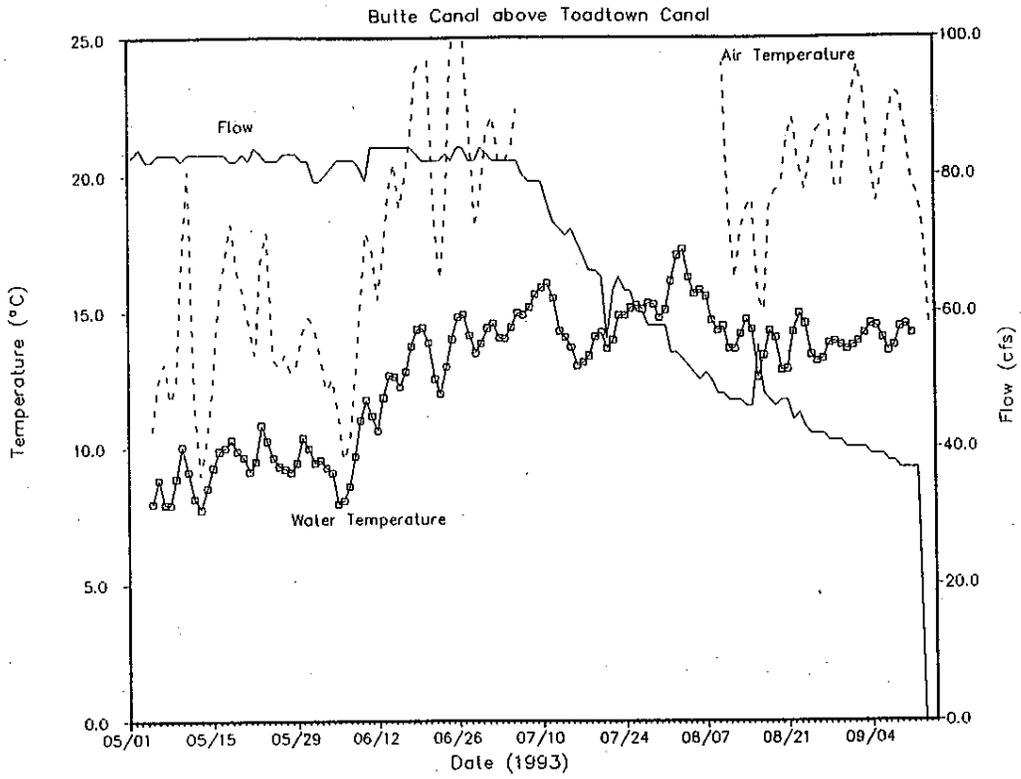


Figure B-6. Mean daily water and air temperature, and flow data from Butte Canal above Toadtown Canal – 1992, 1993.

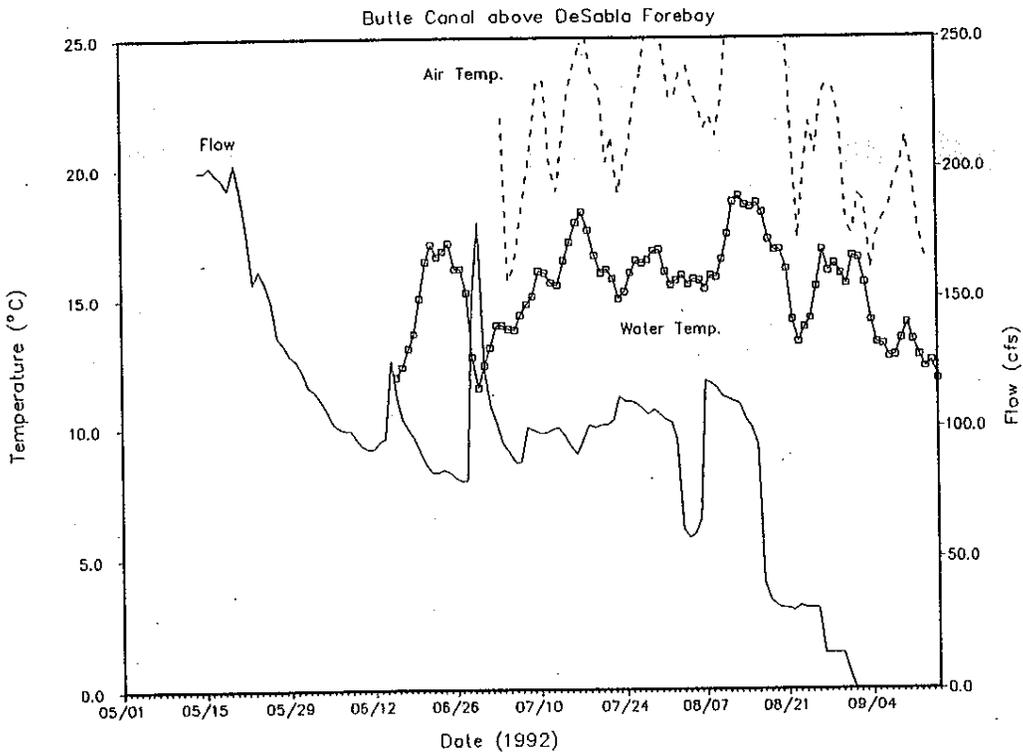
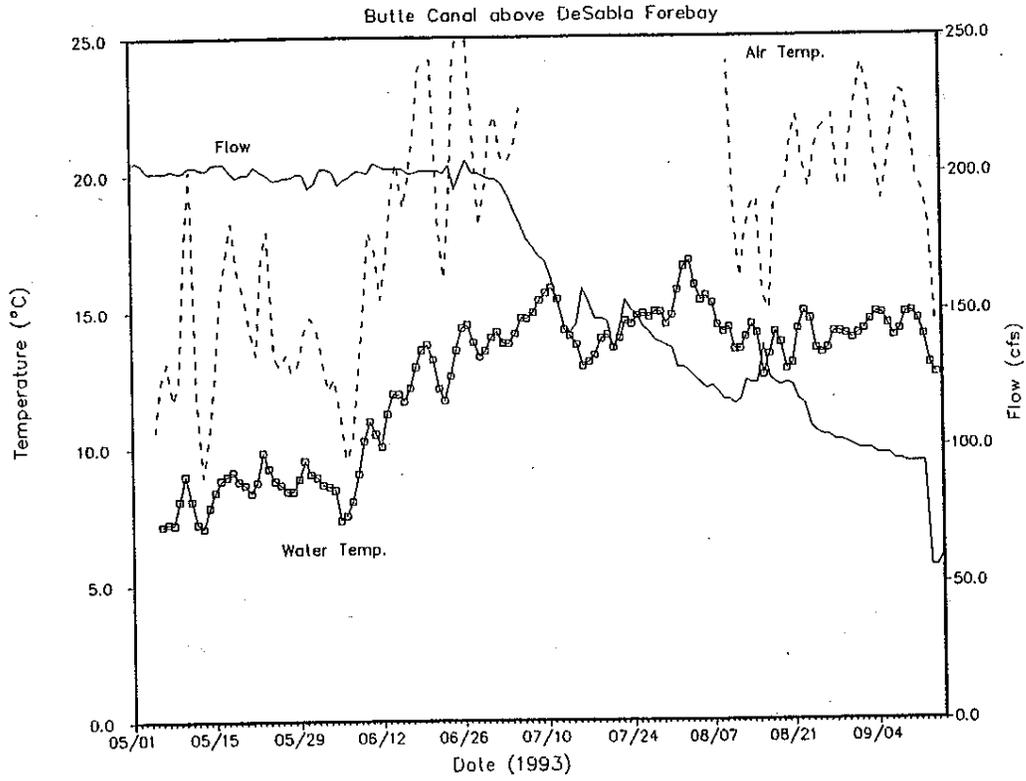


Figure B-7. Mean daily water and air temperature, and flow data from Butte Canal above DeSabra Forebay - 1992, 1993.

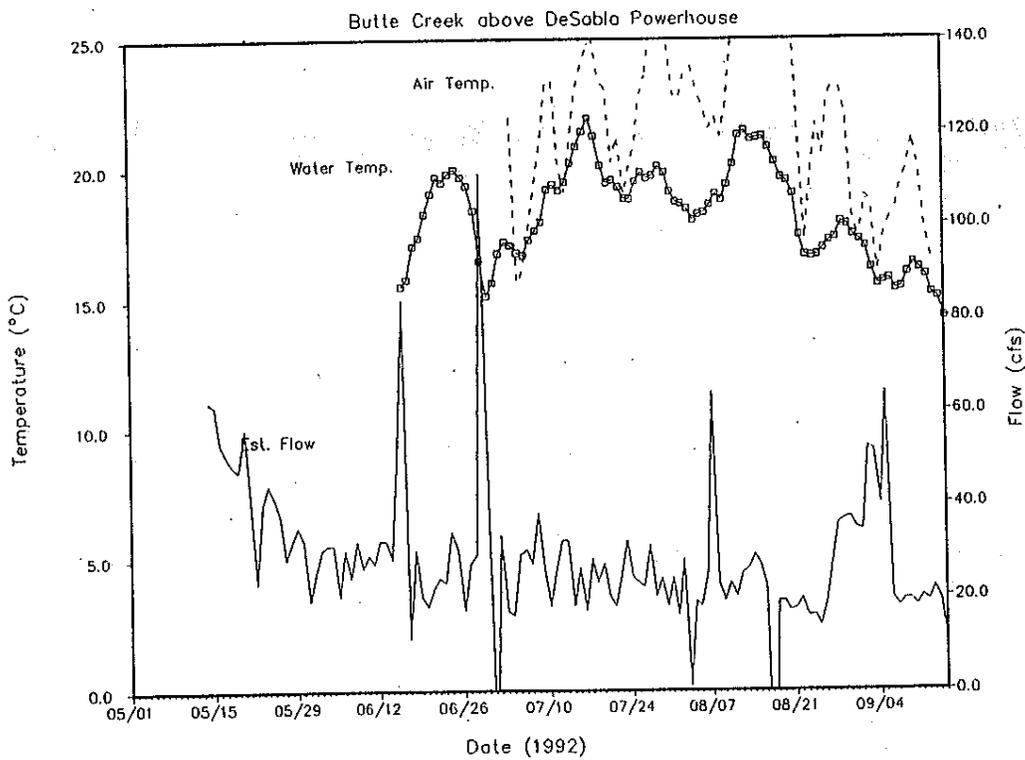
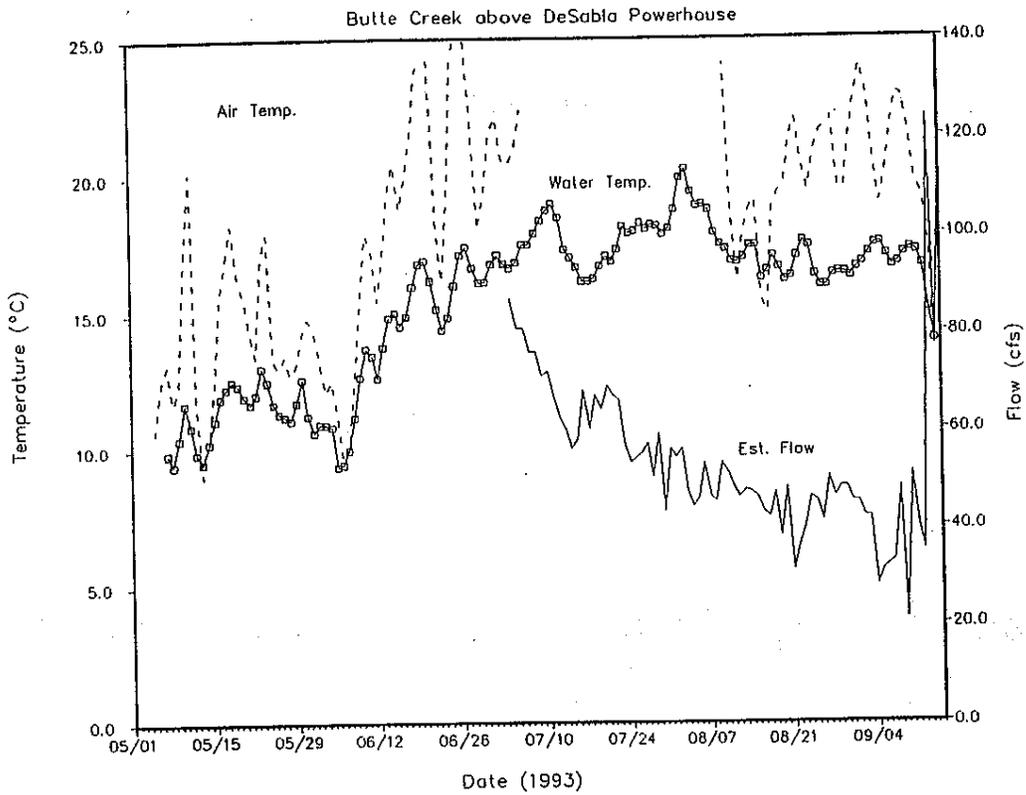


Figure B-8. Mean daily water and air temperature, and flow data from Butte Creek above DeSabra Powerhouse – 1992, 1993.

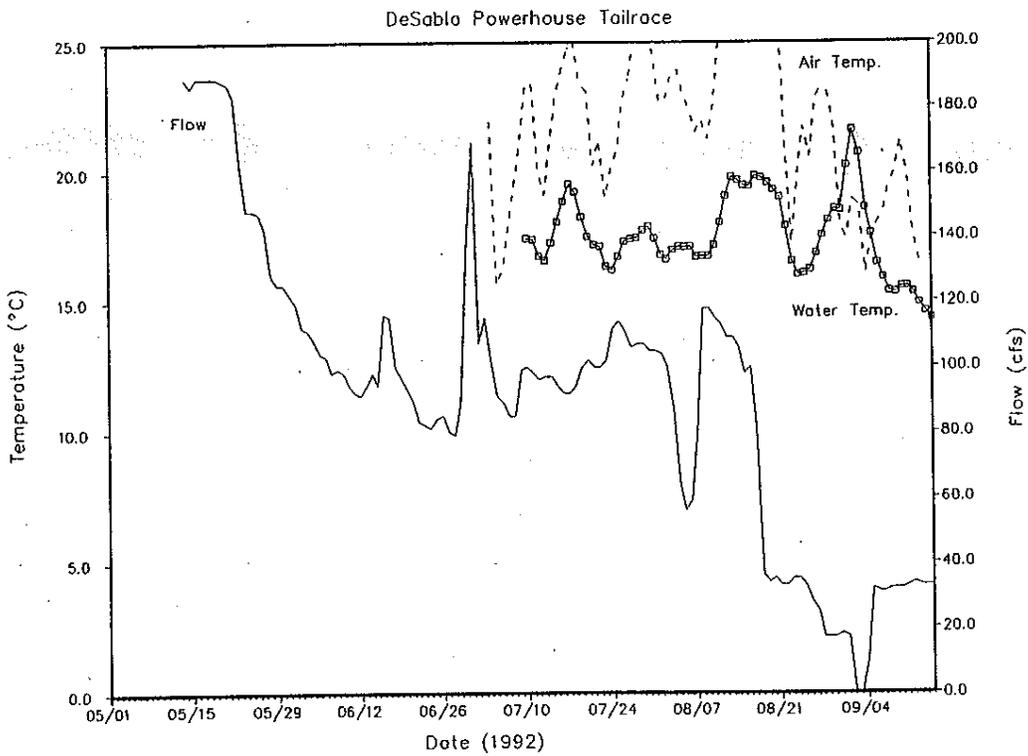
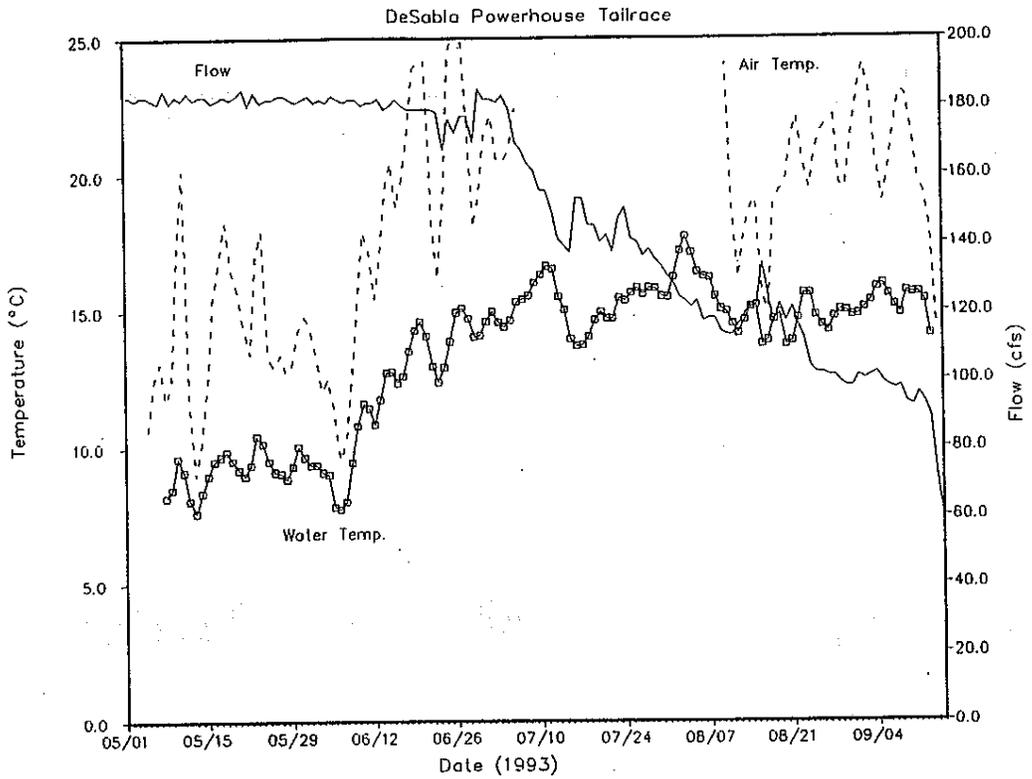


Figure B-9. Mean daily water and air temperature, and flow data from DeSablo Powerhouse Tailrace - 1992, 1993.

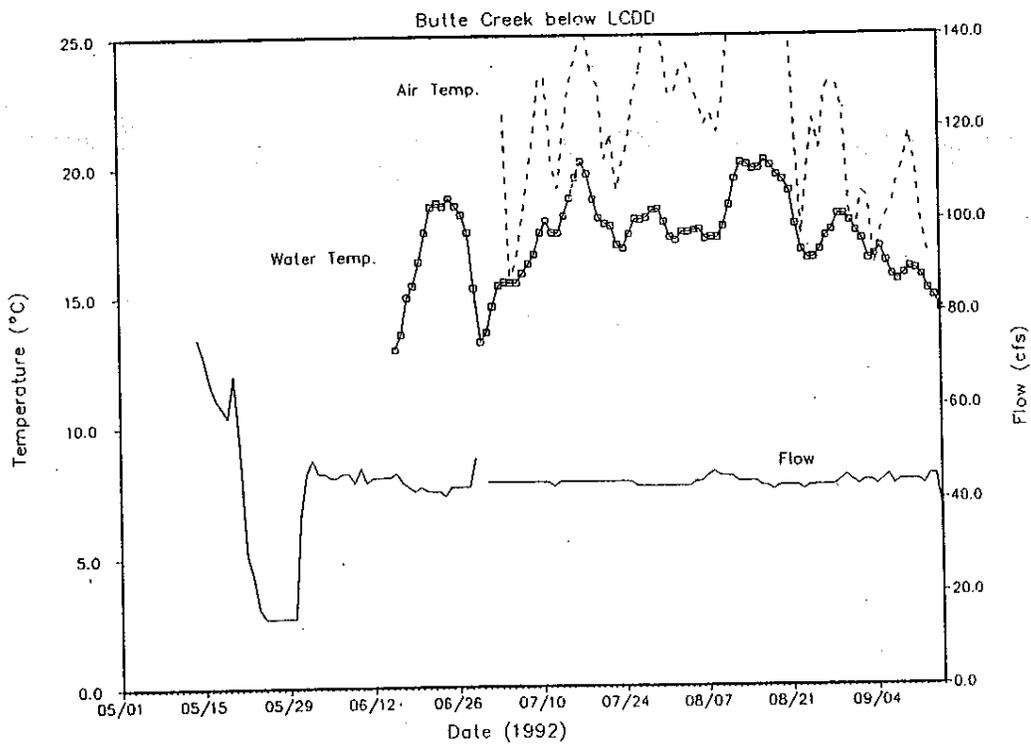
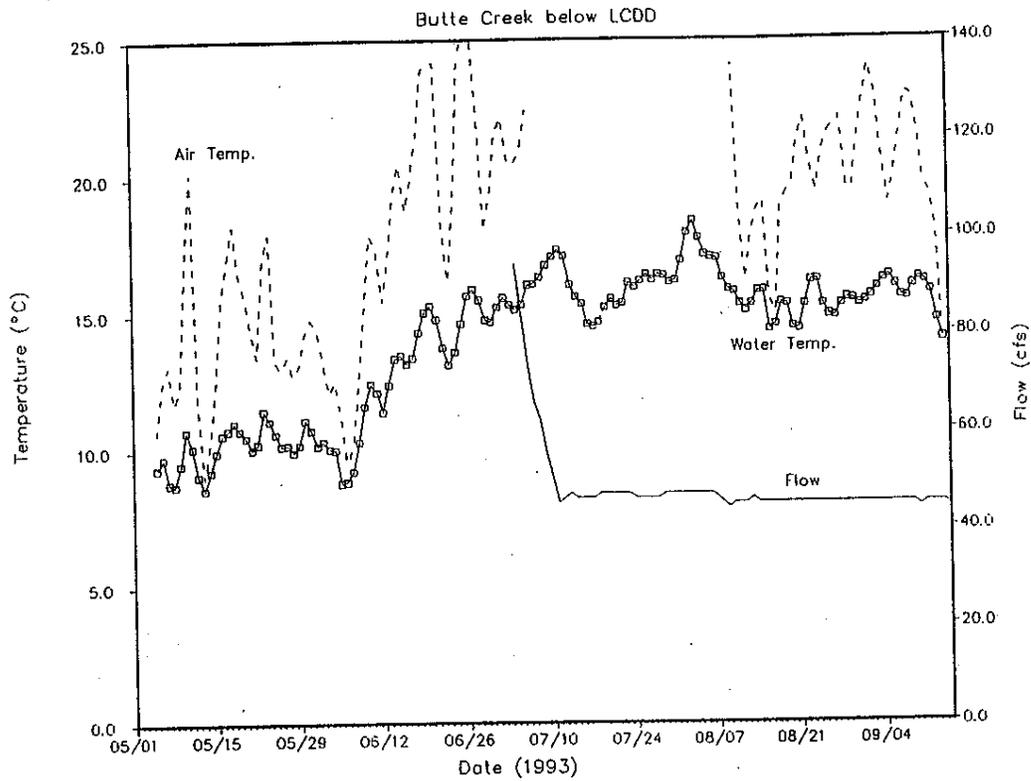


Figure B-10. Mean daily water and air temperature, and flow data from Butte Creek below LCDD - 1992, 1993.

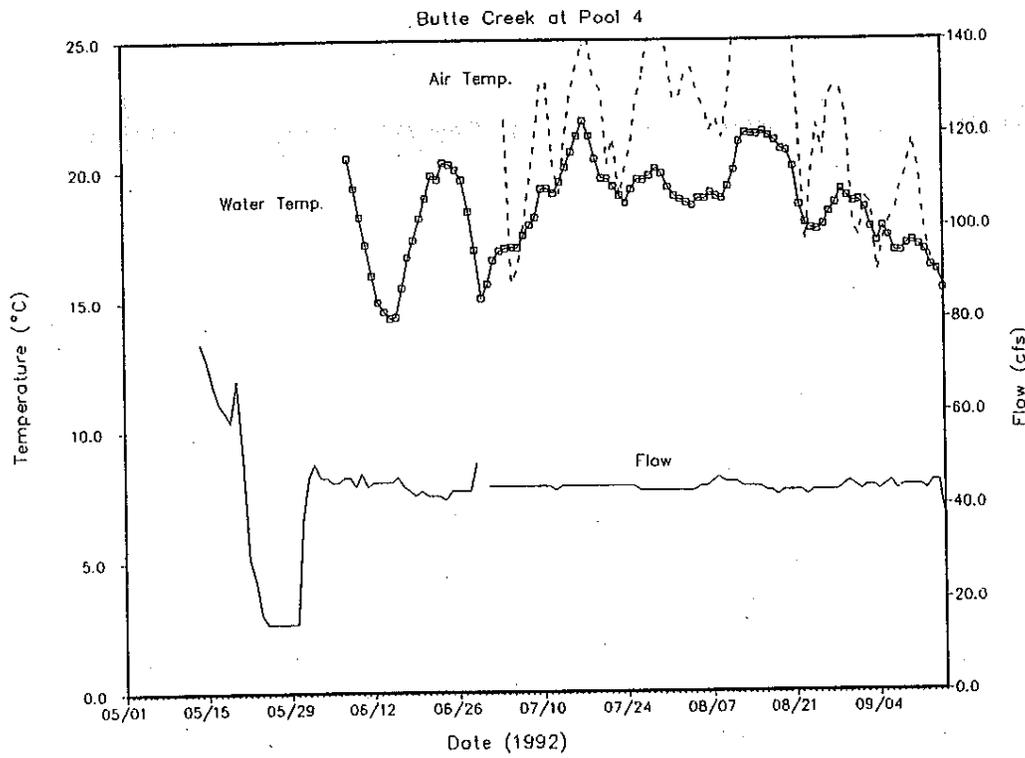
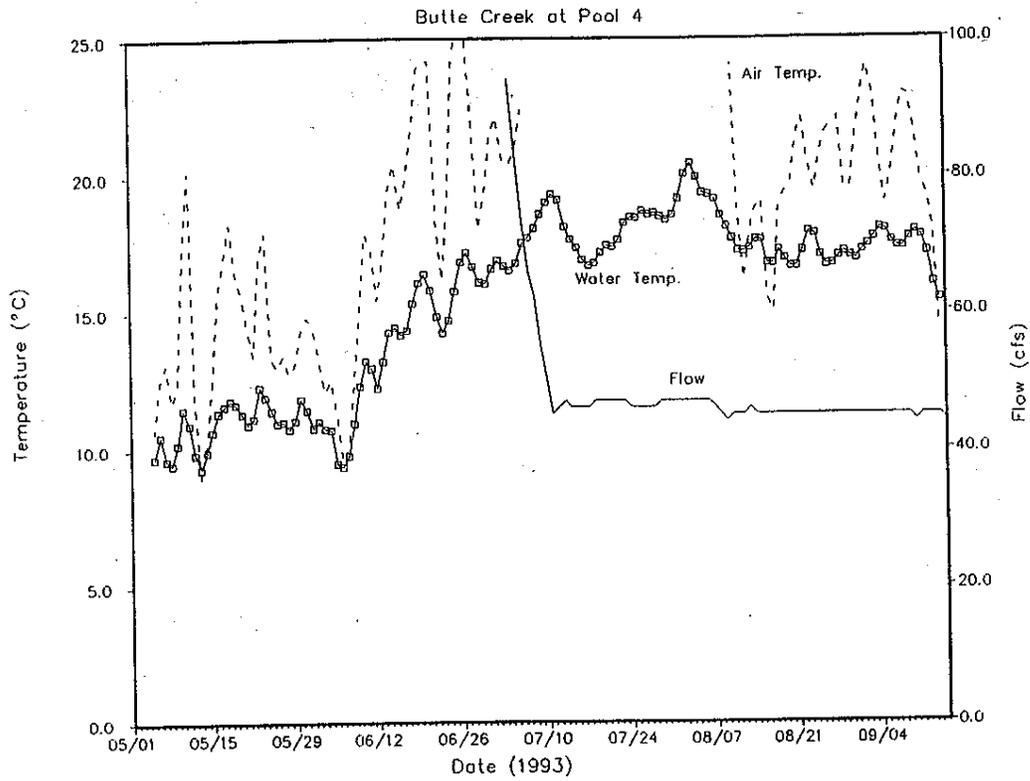


Figure B-11. Mean daily water and air temperature, and flow data from Butte Creek at Pool 4 - 1992, 1993.

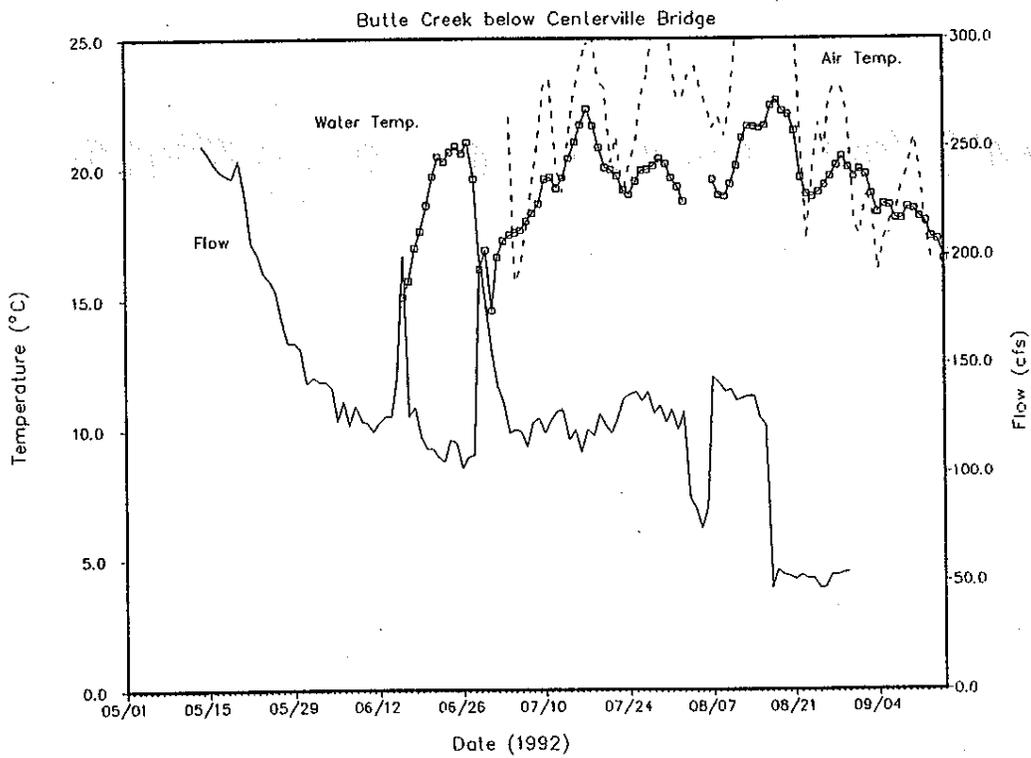
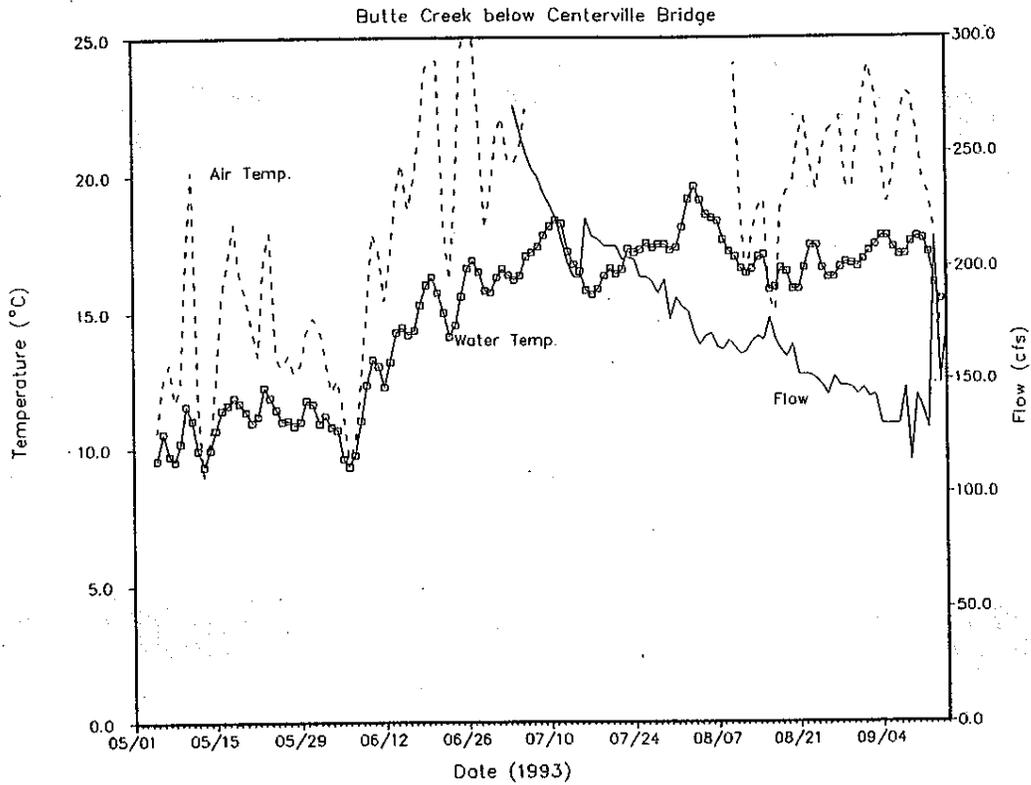


Figure B-12. Mean daily water and air temperature, and flow data from Butte Creek below Centerville Powerhouse – 1992, 1993.

Appendix C

**TEMPERATURE PROFILES OF ROUND VALLEY
AND PHILBROOK RESERVOIRS**

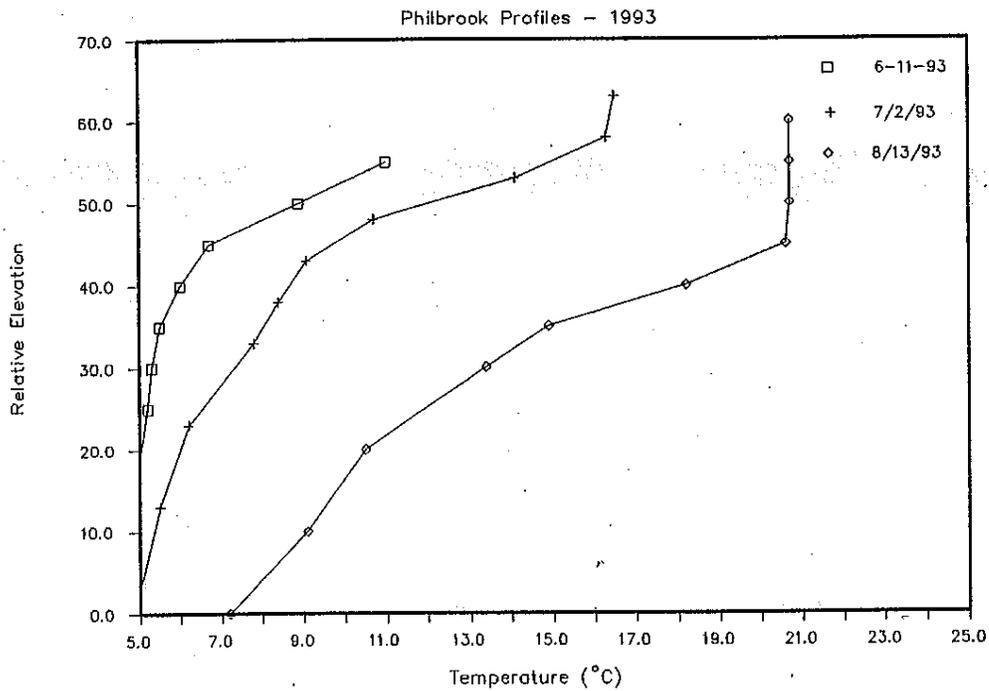
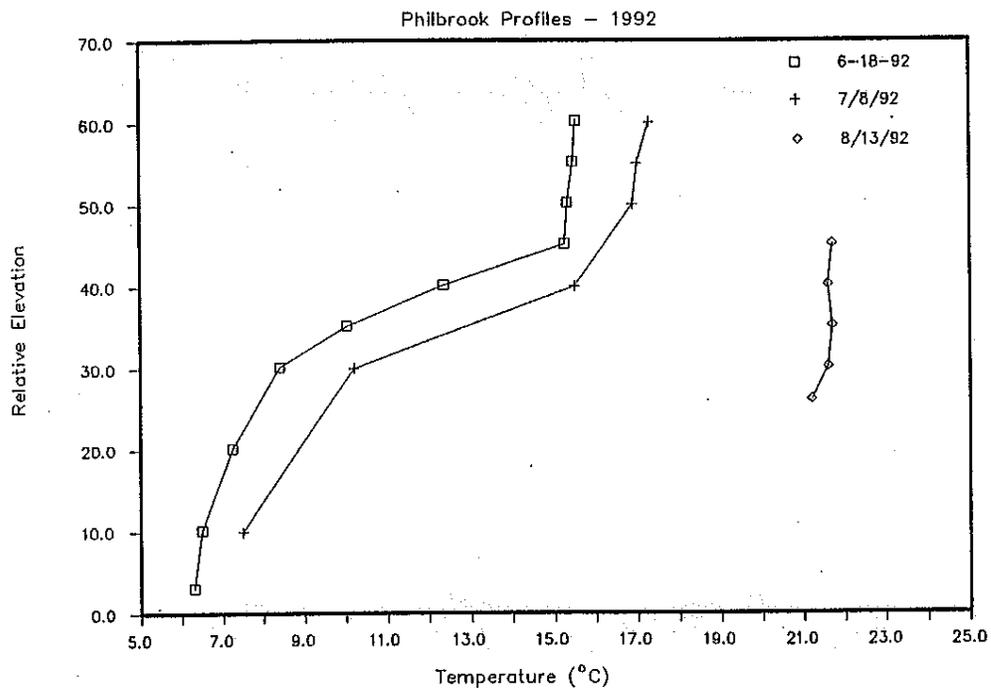


Figure C-1. Temperature profiles from Philbrook Reservoir - 1992 and 1993.

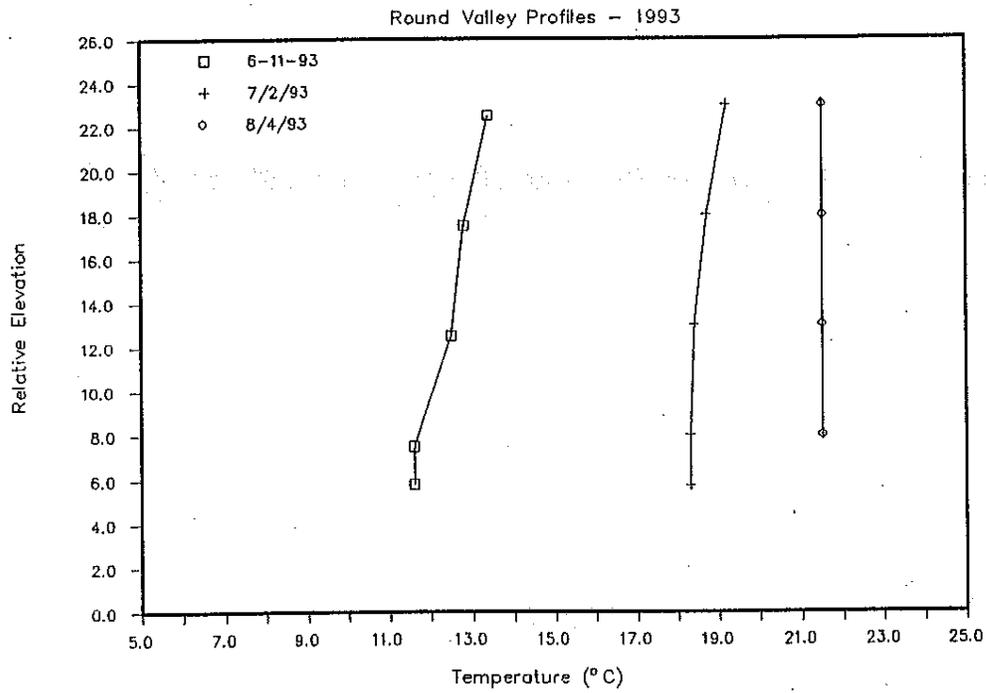
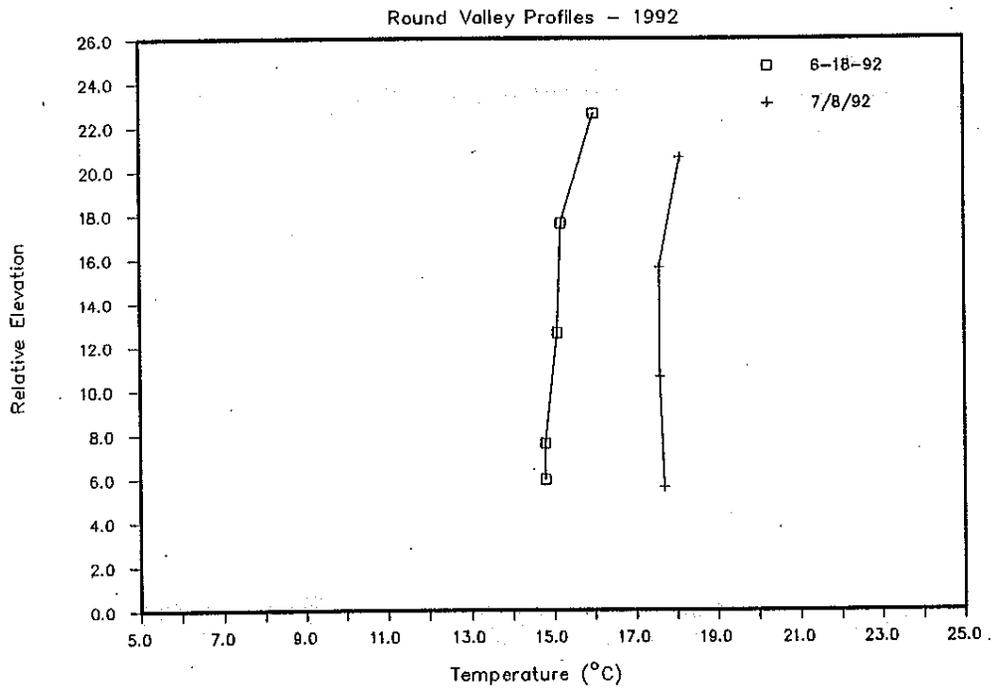


Figure C-2. Temperature profiles from Round Valley Reservoir - 1992 and 1993.

Appendix D

FLOW DATA

Mean Daily Flow Data for 1992

1992 date	Round Valley Release	Philbrook Release	Hendricks Canal at		WBFR Release at Head Dam	Hendricks Canal at		Butte Canal @ Head Dam	Butte Crk Release at Head Dam	Butte Canal above		DeSabra PH Tailrace	Butte Creek Release at LCDD	Lower Centerville Canal
			Head Dam	Canal at Head Dam		Head Dam	Forebay			Hendricks	Forebay			
05/01	1.0	3.5	124	118	spill	81	81	spill	81	199	189	spill	177	
05/02	1.0	3.5	125	116	spill	81	81	spill	81	197	190	spill	177	
05/03	1.0	3.5	125	116	spill	81	81	spill	81	197	193	spill	177	
05/04	1.0	3.5	125	117	spill	81	81	spill	81	198	193	spill	177	
05/05	1.0	3.5	125	117	spill	81	81	spill	81	198	193	spill	176	
05/06	1.0	3.5	125	117	spill	81	81	spill	81	198	192	spill	177	
05/07	1.0	3.5	125	117	spill	81	81	spill	81	198	189	spill	177	
05/08	1.0	3.5	125	118	spill	81	81	spill	81	199	189	spill	176	
05/09	1.0	3.5	125	118	spill	85	85	46	80	198	189	spill	176	
05/10	1.0	3.5	125	117	spill	85	85	36	80	197	188	spill	176	
05/11	1.0	3.5	125	118	spill	85	85	32	80	198	188	91	176	
05/12	1.0	3.5	125	118	65	85	85	28	81	199	188	85	176	
05/13	1.0	3.2	124	119	52	85	85	23	81	200	189	79	176	
05/14	1.0	3.0	124	119	40	85	85	20	80	199	189	75	176	
05/15	1.0	3.0	125	120	35	85	85	17	79	199	186	71	176	
05/16	1.0	3.0	124	121	29	85	85	13	80	201	189	66	176	
05/17	1.0	3.0	123	119	23	82	82	12	79	198	189	62	177	
05/18	1.0	3.0	122	119	16	85	85	11	77	196	189	60	177	
05/19	1.0	3.0	122	118	14	80	80	12	74	192	189	58	178	
05/20	1.0	3.0	125	122	18	84	84	15	80	202	188	67	177	
05/21	1.0	3.0	112	115	13	79	79	11	76	191	187	51	177	
05/22	1.0	3.0	104	106	13	78	78	17	70	176	183	29	177	
05/23	1.0	3.0	97	100	13	77	77	19	56	156	161	24	177	
05/24	1.0	3.0	94	96	13	72	72	11	65	161	148	17	175	
05/25	1.0	3.0	89	92	13	68	68	11	64	156	148	15	174	
05/26	1.0	3.0	86	87	13	67	67	10	62	149	147	15	169	
05/27	1.0	3.0	72	74	13	67	67	10	61	135	142	15	155	
05/28	1.0	3.0	71	73	12	64	64	10	59	132	128	15	145	
05/29	1.0	3.0	70	70	12	63	63	10	58	128	125	15	145	
05/30	1.0	3.0	68	68	10	63	63	10	58	126	125	15	142	
05/31	1.0	3.0	71	66	11	61	61	9	56	122	125	37	104	
06/01	1.0	3.0	61	61	12	59	59	9	55	116	119	46	98	
06/02	1.0	3.0	61	60	12	59	59	9	54	114	112	49	93	
06/03	1.0	3.0	58	58	12	59	59	9	53	111	111	46	96	
06/04	1.0	3.0	55	55	12	58	58	9	52	107	108	46	93	
06/05	1.0	3.0	51	52	12	56	56	9	50	102	104	45	79	
06/06	1.0	3.0	50	50	12	56	56	9	50	100	103	45	88	
06/07	1.0	3.0	49	49	12	56	56	9	50	99	98	46	76	
06/08	1.0	3.0	49	49	12	56	56	9	50	99	99	46	85	

Mean Daily Flow Data for 1992

1992 date	Round Valley Release	Philbrook Release	Hendricks Canal at Head Dam	WBFR Release at Head Dam	Hendricks Canal at Butte Canal @ Head Dam	Butte Canal @ Head Dam	Butte Crk Release at Head Dam	Butte Canal above Hendricks	Butte Canal above Forebay	DeSabra PI Tailrace	Butte Creek Release at LCDD	Lower Centerville Canal
06/09	1.0	3.0	47	12	47	55	9	49	96	98	44	80
06/10	1.0	3.0	44	12	45	47	9	48	93	94	47	76
06/11	1.0	3.0	43	11	44	45	9	48	92	92	44	75
06/12	1.0	3.0	42	12	44	47	9	48	92	91	45	78
06/13	1.0	3.0	44	12	45	51	9	50	95	94	45	81
06/14	1.0	3.0	44	12	45	50	9	51	96	98	45	81
06/15	1.0	3.0	75	12	60	80	10	66	126	94	45	99
06/16	1.0	3.0	48	12	53	62	10	58	111	116	46	154
06/17	1.0	3.0	46	12	48	56	9	55	103	115	44	82
06/18	1.0	3.0	46	11	47	56	9	52	99	100	43	87
06/19	1.0	3.0	45	11	46	56	9	50	96	97	42	75
06/20	1.0	3.0	42	11	43	53	9	48	91	93	43	68
06/21	1.0	3.0	40	11	40	51	9	46	86	89	42	69
06/22	1.0	3.0	39	11	39	51	9	44	83	83	42	65
06/23	1.0	3.0	39	11	38	49	9	45	83	82	42	63
06/24	1.0	3.0	39	11	39	49	9	45	84	81	41	74
06/25	1.0	3.0	39	11	38	49	9	45	83	84	43	71
06/26	1.0	3.0	39	11	37	48	9	44	81	85	43	59
06/27	1.0	3.0	36	11	36	48	9	44	80	80	43	64
06/28	1.0	3.0	36	11	36	50	9	44	80	79	43	65
06/29	1.0	3.1	78	18	78	78	16	72	150	89	49	151
06/30	1.0	3.0	105	17	100	83	14	79	179	136	44	178
07/01	1.0	3.0	61	12	64	70	10	58	122	169	44	111
07/02	1.0	3.0	58	11	56	57	9	52	108	107	44	96
07/03	1.0	3.0	50	11	51	55	9	50	101	115	44	88
07/04	1.0	3.0	46	10	47	53	9	47	94	102	44	74
07/05	1.0	3.0	44	10	45	51	9	46	91	91	44	76
07/06	1.0	3.0	42	10	42	50	9	45	87	89	44	75
07/07	1.0	16.0	41	10	43	50	9	44	87	85	44	68
07/08	1.0	24.0	49	11	56	49	9	44	100	85	44	79
07/09	1.0	24.0	57	11	56	47	9	43	99	99	44	81
07/10	1.0	24.0	57	11	55	46	9	43	98	100	44	74
07/11	1.0	24.0	55	11	55	44	9	43	98	98	44	80
07/12	1.0	24.0	55	11	56	43	9	43	99	96	43	85
07/13	0.9	24.0	52	11	56	45	9	44	100	97	44	85
07/14	0.9	24.0	56	10	54	46	9	43	97	97	44	71
07/15	0.9	24.0	55	10	52	47	9	41	93	94	44	76
07/16	0.9	24.0	54	10	51	47	10	39	90	92	44	65
07/17	0.8	24.0	54	10	53	46	10	42	95	92	44	76

Mean Daily Flow Data for 1992

1992 date	Round Valley Release	Philbrook Release	Hendricks Canal at Head Dam	WBFR Release at Head Dam	Hendricks Canal at Butte Canal	Butte Canal @ Head Dam	Butte Canal @ Head Dam	Butte Crk Release at Head Dam	Butte Canal above Hendricks	Butte Canal above Forebay	DeSabia PH Tailrace	Butte Creek Release at LCDD	Lower Centerville Canal
07/18	0.8	24.0	67	10	62	46	10	10	39	101	94	44	73
07/19	0.8	24.0	66	10	62	45	10	10	38	100	100	44	83
07/20	0.7	24.0	66	10	63	45	10	10	38	101	102	44	78
07/21	0.7	24.0	66	10	63	44	10	10	38	101	100	44	74
07/22	0.7	33.0	66	9	66	44	10	10	37	103	100	44	81
07/23	0.7	40.0	71	10	75	44	10	10	37	112	102	44	90
07/24	0.7	39.0	75	10	74	42	10	10	36	110	112	44	92
07/25	0.7	39.0	80	10	74	42	10	10	36	110	114	44	93
07/26	0.6	39.0	80	10	72	41	10	10	37	109	111	43	90
07/27	0.6	39.0	78	10	72	41	10	10	35	107	106	43	94
07/28	0.6	39.0	78	9	71	42	10	10	34	105	107	43	84
07/29	0.6	39.0	78	9	71	42	10	10	36	107	107	43	88
07/30	0.6	39.0	78	9	70	40	9	9	35	105	105	43	80
07/31	0.5	38.0	76	9	69	39	9	9	34	103	105	43	86
08/01	0.5	38.0	76	9	68	40	9	9	34	102	104	43	77
08/02	0.4	16.0	75	10	61	41	9	9	34	95	100	43	85
08/03	0.5	3.2	28	10	26	40	9	9	35	61	87	43	45
08/04	0.5	3.2	28	10	24	40	9	9	34	58	64	43	40
08/05	0.5	3.2	27	10	24	40	10	10	35	59	56	44	30
08/06	0.5	34.0	27	12	30	40	10	10	35	65	59	44	40
08/07	0.5	57.0	92	13	83	40	10	10	35	118	80	45	99
08/08	0.5	56.0	89	13	82	40	10	10	35	117	118	46	95
08/09	0.4	56.0	89	13	80	40	10	10	35	115	118	45	92
08/10	0.4	56.0	86	13	78	40	10	10	34	112	115	45	93
08/11	0.3	55.0	86	13	78	40	10	10	33	111	113	45	88
08/12	0.3	55.0	86	13	77	40	10	10	33	110	109	44	90
08/13	0.3	55.0	86	13	76	40	10	10	33	109	109	44	91
08/14	0.3	55.0	85	18	71	39	10	10	32	103	106	44	91
08/15	0.3	54.0	76	21	68	39	10	10	32	100	98	44	81
08/16	0.3	23.0	74	20	59	40	10	10	34	93	100	43	79
08/17	0.2	3.2	14	17	0	40	10	10	33	33	81	43	4
08/18	0.3	3.2	8	17	0	40	10	10	34	34	36	42	13
08/19	0.3	3.2	8	17	0	40	10	10	32	32	34	43	10
08/20	0.3	3.2	8	17	0	39	10	10	31	31	35	43	9
08/21	0.3	3.2	8	17	0	39	10	10	31	31	33	43	8
08/22	0.3	3.2	10	17	0	39	10	10	30	30	33	43	10
08/23	0.3	3.2	11	17	0	40	10	10	32	32	35	42	9
08/24	0.3	3.2	12	17	0	40	10	10	31	31	35	43	8
08/25	0.3	3.2	11	17	0	39	10	10	31	31	33	43	4

Mean Daily Flow Data for 1992

1992 date	Round Valley Release	Philbrook Release	Hendricks Canal at Head Dam	WBFR Release at Head Dam	Hendricks Canal at Butte Canal	Butte Canal @ Head Dam	Butte Canal @ Head Dam	Butte Crk Release at Head Dam	Butte Canal above Hendricks	Butte Canal above Forebay	DeSabra PH Tailrace	Butte Creek Release at LCDD	Lower Centerville Canal
08/26	0.3	3.1	11	17	0	19	21	21	31	31	28	43	4
08/27	0.4	3.1	11	17	0	19	28	28	14	14	25	43	10
08/28	0.4	3.1	11	17	0	19	28	28	14	14	17	43	10
08/29	0.4	3.1	11	17	0	19	28	28	14	14	17	44	10
08/30	0.4	3.1	11	17	0	14	28	28	14	14	17	45	9
08/31	0.4	3.1	11	17	0	0	34	34	7	7	18	44	9
09/01	0.4	3.1	11	17	0	0	38	38	0	0	17	43	8
09/02	0.4	3.1	11	17	0	0	38	38	0	0	0	44	8
09/03	0.4	3.1	11	17	0	0	38	38	0	0	0	44	7
09/04	0.4	3.1	11	17	0	0	20	20	0	0	10	43	7
09/05	0.4	3.1	11	17	0	0	11	11	0	0	32	44	52
09/06	0.3	3.1	11	17	0	0	11	11	0	0	31	45	6
09/07	0.3	3.1	10	17	0	0	11	11	0	0	31	43	6
09/08	0.3	3.1	10	17	0	0	10	10	0	0	32	44	7
09/09	0.3	3.1	11	17	0	0	10	10	0	0	32	44	7
09/10	0.3	3.1	11	17	0	0	10	10	0	0	32	44	6
09/11	0.2	3.0	10	17	0	0	10	10	0	0	33	44	9
09/12	0.2	3.0	10	17	0	0	10	10	0	0	34	43	10
09/13	0.2	3.0	10	17	0	0	10	10	0	0	33	45	10
09/14	0.2	3.0	10	23	0	0	10	10	0	0	33	45	7
09/15	0.2	3.0	9	21	0	0	10	10	0	0	33	36	7
09/16	0.2	3.1	9	17	0	0	10	10	0	0	33	31	17
09/17	0.2	3.1	9	17	2	0	10	10	0	2	33	31	18
09/18	0.2	3.1	9	17	8	0	10	10	0	8	34	31	20
09/19	0.2	3.0	9	17	8	0	10	10	0	8	42	31	31
09/20	0.2	3.0	9	17	7	0	10	10	0	7	43	31	31
09/21	0.2	3.0	9	16	6	0	40	40	0	6	42	31	28
09/22	0.2	3.0	14	14	5	0	39	39	0	5	26	31	19
09/23	0.2	3.0	14	14	5	0	40	40	0	5	0	31	40
09/24	0.2	3.0	14	14	4	0	41	41	0	4	0	31	23
09/25	0.2	3.0	14	14	4	0	40	40	0	4	0	31	23
09/26	0.2	3.0	14	14	4	0	40	40	0	4	0	31	23
09/27	0.2	3.0	13	14	3	0	40	40	0	3	0	31	22
09/28	0.2	3.0	13	14	4	0	40	40	0	4	0	31	22
09/29	0.2	3.0	13	14	4	0	39	39	0	4	0	31	23
09/30	0.2	9.5	13	14	5	0	39	39	0	5	0	31	22

Meand Daily Flow Data for 1993

1993	Round	Philbrook	Hendricks	WBFR at	Hendricks	Butte Canal	Butte Canal	Butte Canal	Butte Canal	Butte Canal	Butte Canal	DeSabra	Butte Creek	Lower
Date	Valley	Release	Canal at	Head Dam	Canal at	at Butte	at Butte	below Butte	at Hendricks	at DeSabra	Forebay	Powerhouse	below	Centerville
	Release	Release	Head Dam	Head Dam	Butte Canal	Head Dam	Head Dam	Head Dam	Canal	at DeSabra	Tailrace	LCDD	Canal	Canal
05/01	1.2	4.3	123	spill	122	80	spill	spill	82	204	183	spill	spill	176
05/02	1.3	4.3	124	spill	122	80	spill	spill	83	205	183	spill	spill	176
05/03	1.3	4.4	122	spill	120	80	spill	spill	84	204	182	spill	spill	176
05/04	1.3	4.4	120	spill	119	80	spill	spill	82	201	183	spill	spill	176
05/05	1.4	4.3	120	spill	119	80	spill	spill	82	201	183	spill	spill	176
05/06	1.4	4.3	120	spill	118	80	spill	spill	83	201	182	spill	spill	176
05/07	1.4	4.4	120	spill	118	81	spill	spill	83	201	181	spill	spill	176
05/08	1.4	4.4	123	spill	119	82	spill	spill	83	202	185	spill	spill	176
05/09	1.4	4.4	125	spill	118	83	spill	spill	83	201	181	spill	spill	176
05/10	1.4	4.5	125	spill	119	83	spill	spill	82	201	183	spill	spill	175
05/11	1.4	4.5	125	spill	120	82	spill	spill	83	203	182	spill	spill	175
05/12	1.4	4.5	125	spill	120	82	spill	spill	83	203	184	spill	spill	175
05/13	1.4	4.4	125	spill	119	82	spill	spill	83	202	182	spill	spill	175
05/14	1.4	4.4	125	spill	119	81	spill	spill	83	202	183	spill	spill	175
05/15	1.4	4.4	125	spill	121	81	spill	spill	83	204	183	spill	spill	175
05/16	1.4	4.4	125	spill	121	86	spill	spill	83	204	181	spill	spill	175
05/17	1.4	4.4	125	spill	121	85	spill	spill	83	204	182	spill	spill	175
05/18	1.4	4.5	125	spill	119	85	spill	spill	82	201	183	spill	spill	176
05/19	1.4	4.5	125	spill	117	86	spill	spill	82	199	182	spill	spill	177
05/20	1.4	4.4	125	spill	117	86	spill	spill	83	200	183	spill	spill	176
05/21	1.4	4.4	125	spill	118	86	spill	spill	82	200	185	spill	spill	176
05/22	1.4	4.4	125	spill	119	87	spill	spill	84	203	180	spill	spill	176
05/23	1.4	4.4	125	spill	118	85	spill	spill	83	201	184	spill	spill	177
05/24	1.4	4.5	125	spill	118	83	spill	spill	82	200	181	spill	spill	177
05/25	1.4	4.6	125	spill	116	82	spill	spill	82	198	182	spill	spill	176
05/26	1.4	4.6	125	spill	116	83	spill	spill	82	198	182	spill	spill	176
05/27	1.4	4.6	125	spill	116	83	spill	spill	83	199	183	spill	spill	176
05/28	1.4	4.5	125	spill	116	83	spill	spill	83	199	183	spill	spill	176
05/29	1.4	4.4	125	spill	117	83	spill	spill	83	200	182	spill	spill	176
05/30	1.3	4.4	125	spill	118	86	spill	spill	82	200	181	spill	spill	176
05/31	1.3	4.9	125	spill	113	68	spill	spill	82	195	182	spill	spill	176
06/01	1.3	4.4	125	spill	118	78	spill	spill	79	197	183	spill	spill	176
06/02	1.3	4.4	124	spill	123	78	spill	spill	79	202	181	spill	spill	176
06/03	1.3	4.4	125	spill	122	78	spill	spill	80	202	182	spill	spill	176
06/04	1.3	4.5	125	spill	120	78	spill	spill	81	201	181	spill	spill	176
06/05	1.2	4.5	123	spill	114	78	spill	spill	82	196	183	spill	spill	176
06/06	1.2	4.4	123	spill	116	78	spill	spill	82	198	182	spill	spill	176
06/07	1.2	4.4	123	spill	117	78	spill	spill	82	199	181	spill	spill	176
06/08	1.2	4.4	123	spill	119	78	spill	spill	82	201	182	spill	spill	176
06/09	1.2	4.4	123	spill	120	78	spill	spill	81	201	182	spill	spill	176

Meand Daily Flow Data for 1993

1993	Round	Philbrook	Hendricks	WBFR at	Hendricks	Butte Canal	Butte Canal	Butte Creek	Butte Canal	Butte Canal	DeSabra	Butte Creek	Lower
Date	Valley	Release	Canal at	Head Dam	Canal at	at Butte	at Butte	below Butte	at Hendricks	at DeSabra	Powerhouse	below	Centerville
	Release		Head Dam	Head Dam	Butte Canal	Head Dam	Head Dam	Head Dam	Canal	Forebay	Tailrace	LCDD	Canal
06/10	1.2	4.4	123	spill	121	85	spill	spill	79	200	180	spill	176
06/11	1.1	4.4	123	spill	120	85	spill	spill	84	204	181	spill	176
06/12	1.1	4.4	123	spill	119	85	spill	spill	84	203	181	spill	176
06/13	1.1	4.4	123	spill	118	85	spill	spill	84	202	182	spill	176
06/14	1.1	4.4	123	spill	118	85	spill	spill	84	202	179	spill	176
06/15	1.1	4.4	118	spill	118	85	spill	spill	84	202	180	spill	176
06/16	1.1	4.4	118	spill	118	85	spill	spill	84	202	182	spill	176
06/17	1.1	4.4	118	spill	116	84	spill	spill	84	200	180	spill	176
06/18	1.1	4.4	118	spill	116	84	spill	spill	84	200	179	spill	176
06/19	1.1	4.4	118	spill	118	82	spill	spill	83	201	179	spill	176
06/20	1.1	4.4	118	spill	119	84	spill	spill	82	201	179	spill	176
06/21	1.1	4.4	118	spill	119	84	spill	spill	82	201	179	spill	175
06/22	1.1	4.4	117	spill	119	86	spill	spill	82	201	179	spill	175
06/23	1.1	4.4	118	spill	118	87	spill	spill	82	200	178	spill	175
06/24	1.1	4.4	122	spill	120	87	spill	spill	83	203	167	spill	175
06/25	1.1	4.4	123	spill	112	88	spill	spill	82	194	176	spill	174
06/26	1.1	4.4	123	spill	116	88	spill	spill	84	200	172	spill	175
06/27	1.1	4.4	123	64	121	88	spill	spill	84	205	177	spill	175
06/28	1.1	4.4	123	55	118	88	spill	spill	82	200	177	spill	176
06/29	1.1	4.4	122	39	118	88	spill	spill	82	200	169	spill	177
06/30	1.1	4.4	114	20	115	87	40	40	84	199	185	spill	177
07/01	1.1	4.4	114	19	115	87	36	36	83	198	182	spill	177
07/02	1.1	4.4	115	20	116	87	33	33	82	198	182	spill	176
07/03	1.1	4.4	114	19	114	87	29	29	82	196	181	spill	176
07/04	1.1	4.4	110	18	110	87	26	26	82	192	183	spill	176
07/05	1.1	4.4	105	18	104	89	24	24	82	186	179	spill	177
07/06	1.1	4.4	100	19	99	83	22	22	82	181	169	spill	177
07/07	1.1	4.4	96	18	96	87	21	21	80	176	167	spill	177
07/08	1.1	3.4	92	17	94	85	21	21	79	173	163	spill	177
07/09	1.1	2.6	87	17	91	85	20	20	79	170	161	spill	177
07/10	1.1	2.6	84	17	89	83	19	19	79	168	155	spill	177
07/11	1.1	2.6	81	16	86	83	19	19	76	162	155	spill	177
07/12	1.1	2.6	78	17	80	77	19	19	73	153	149	spill	166
07/13	1.1	2.6	73	18	73	78	19	19	72	145	141	spill	154
07/14	1.1	2.6	70	18	71	78	19	19	71	142	139	spill	149
07/15	1.1	10	80	18	73	76	19	19	72	145	137	spill	149
07/16	1.1	16	89	19	88	75	19	19	70	158	153	spill	175
07/17	17.0	16	92	19	85	72	19	19	68	153	153	spill	167
07/18	17.0	16	90	19	81	72	19	19	66	147	145	spill	165
07/19	16.0	16	81	19	81	68	19	19	66	147	145	spill	162

Meand Daily Flow Data for 1993

1993 Date	Round Valley Release	Hendricks Canal at Head Dam	WBFR at Hendricks Head Dam	Hendricks Canal at Butte Head Dam	Butte Canal at Butte Head Dam	Butte Creek below Butte Head Dam	Butte Canal at Hendricks Canal	Butte Canal at DeSaba Forebay	DeSaba Powerhouse Tailrace	Butte Creek below LCDD	Lower Centerville Canal
07/20	16.0	80	19	81	68	19	65	146	140	47	162
07/21	16.0	80	19	79	68	19	56	135	142	47	162
07/22	16.0	79	18	81	68	18	63	144	137	47	156
07/23	16.0	90	17	89	68	18	65	154	147	47	157
07/24	15.0	87	17	87	65	18	63	150	150	46	157
07/25	15.0	85	17	85	65	18	63	148	141	46	149
07/26	15.0	85	17	84	64	18	60	144	140	46	149
07/27	15.0	84	17	82	64	18	60	142	136	46	147
07/28	15.0	83	17	81	63	18	58	139	138	46	142
07/29	15.0	81	17	80	62	18	58	138	135	47	147
07/30	15.0	80	17	79	60	17	58	137	133	47	129
07/31	14.0	78	17	78	59	17	58	136	130	47	139
08/01	14.0	75	17	75	59	17	54	129	128	47	135
08/02	14.0	75	17	75	58	17	54	129	124	47	133
08/03	14.0	75	17	74	57	17	53	127	123	47	123
08/04	14.0	74	17	73	56	17	52	125	121	47	118
08/05	14.0	72	17	72	56	18	51	123	123	47	122
08/06	14.0	71	17	71	54	18	50	121	117	47	123
08/07	14.0	71	17	71	54	18	51	122	118	46	118
08/08	13.0	70	17	70	53	18	50	120	118	45	118
08/09	13.0	70	17	69	53	19	48	117	114	44	123
08/10	12.0	68	17	69	52	19	48	117	113	45	119
08/11	12.0	67	17	68	51	19	47	115	113	45	116
08/12	12.0	67	17	70	52	19	47	117	116	45	117
08/13	12.0	78	17	77	52	19	47	124	119	46	121
08/14	11.0	77	17	77	52	19	46	123	122	45	124
08/15	11.0	76	17	77	50	19	46	123	121	45	122
08/16	10.0	81	17	82	55	19	55	137	134	45	132
08/17	10.0	78	17	77	51	19	48	125	125	45	122
08/18	10.0	75	17	76	51	19	47	123	116	45	118
08/19	8.4	76	17	76	51	19	46	122	122	45	115
08/20	6.7	75	17	76	51	19	47	123	117	45	120
08/21	5.1	75	17	75	52	19	47	122	121	45	107
08/22	3.4	74	17	73	52	19	44	117	116	45	107
08/23	1.8	69	17	70	49	19	45	115	112	45	107
08/24	0.1	63	17	64	48	19	43	107	104	45	105
08/25	0.1	62	17	63	48	19	42	105	102	45	102
08/26	0.1	62	17	62	47	19	42	104	102	45	98
08/27	0.1	61	17	62	47	19	42	104	101	45	106
08/28	0.1	61	17	61	47	19	41	102	101	45	102

Meand Daily Flow Data for 1993

1993	Round	Philbrook	Hendricks	WBFR at	Hendricks	Butte Canal	Butte Canal	Butte Dam	Butte Dam	Butte Canal	Butte Canal	Butte Canal	DeSabra	Butte Creek	Lower
Date	Valley	Release	Canal at	Hendricks	Canal at	at Butte	below Butte	Head Dam	Head Dam	at Hendricks	at DeSabra	Powerhouse	below	LCDD	Centerville
	Release	Head Dam	Butte Canal	Head Dam	Butte Canal	Head Dam	Head Dam			Canal	Forebay	Tailrace			Canal
08/29	0.1	36	60	17	61	46	19	41	102	99	45	102	45	102	
08/30	0.0	36	60	17	60	46	19	41	101	98	45	101	45	101	
08/31	0.0	36	59	17	60	46	19	40	100	98	45	100	45	98	
09/01	0.0	36	59	17	59	45	19	40	99	101	45	99	45	101	
09/02	0.0	35	59	17	59	45	18	40	99	100	45	99	45	97	
09/03	0.0	35	59	17	59	45	18	40	99	101	45	99	45	98	
09/04	0.0	35	58	17	58	44	18	39	97	102	45	97	45	85	
09/05	0.0	35	58	17	58	44	19	39	97	99	45	97	45	85	
09/06	0.0	35	58	17	58	45	19	39	97	98	45	97	45	85	
09/07	0.0	35	57	17	57	45	19	38	95	97	45	97	45	85	
09/08	0.0	35	56	17	57	44	19	38	95	98	45	98	45	101	
09/09	0.0	35	56	17	57	44	19	37	94	93	45	94	45	69	
09/10	0.0	35	56	17	57	44	19	37	94	92	44	94	44	99	
09/11	0.0	35	56	17	57	42	19	37	94	96	45	94	45	91	
09/12	0.0	35	56	17	57	42	19	37	94	93	45	94	45	83	
09/13	0.0	35	55	17	56	0	0	0	56	89	45	56	45	168	
09/14	0.0	38	55	17	56	0	0	0	56	71	45	56	45	103	
09/15	0.0	40	61	17	61	0	0	0	61	57	44	61	44	132	
09/16	0.0	39	61	17	61	0	0	0	61	63	44	61	44	93	
09/17	0.0	39	61	17	62	0	0	0	62	65	45	62	45	103	
09/18	0.0	39	61	17	62	0	0	0	62	66	44	62	44	103	
09/19	0.0	13	24	19	51	0	0	0	51	64	44	51	44	103	
09/20	0.0	3	23	21	20	0	0	0	20	47	44	20	44	68	
09/21	0.0	3	23	19	9.8	0	0	0	9.8	0	44	0	44	33	
09/22	0.0	3	23	17	10	0	0	0	10	0	44	0	44	33	
09/23	0.0	3	22	17	16	0	0	0	16	50	44	16	44	33	
09/24	0.0	3	22	17	28	0	0	0	28	42	45	28	45	67	
09/25	0.0	3	21	17	28	0	0	0	28	34	44	28	44	53	
09/26	0.0	3	22	17	28	0	0	0	28	26	44	28	44	53	
09/27	0.0	3	20	17	27	0	0	0	27	29	45	27	45	53	
09/28	0.0	3	20	17	26	0	0	0	26	28	45	26	45	53	
09/29	0.0	3	20	17	26	0	0	0	26	27	44	26	44	53	
09/30	0.0	3	20	17	26	0	0	0	26	26	44	26	44	53	

Appendix E

METEOROLOGICAL DATA

1992

PACIFIC GAS AND ELECTRIC COMPANY
 TECHNICAL AND ECOLOGICAL SERVICES
 METEOROLOGICAL DATA FOR STATION AT:

DesSable Forebay
 1982 Air Temperature

DATE	HOURLY DATA												Corrected Daily Values														
	0000	100	200	300	400	500	600	700	800	900	1000	1100	1200	1300	1400	1500	1600	1700	1800	1900	2000	2100	2200	2300	MAX	MIN	MEAN
9 9 92	16.2	15.7	15.4	15.2	14.9	14.5	14.5	14.2	14.3	15.9	21.8	26.0	27.0	28.2	29.1	29.6	30.2	30.0	29.2	27.6	21.8	19.3	19.0	19.4	30.2	14.2	21.2
9 10 92	18.8	16.5	15.9	15.5	15.4	15.3	15.8	16.0	17.6	16.5	20.0	23.4	24.3	25.1	23.0	25.6	27.2	27.6	26.5	24.7	19.8	17.8	16.1	15.8	27.8	15.3	20.0
9 11 92	15.9	15.0	13.6	13.0	12.8	12.4	12.1	12.0	12.2	13.9	19.0	20.6	21.2	22.0	22.9	23.7	24.5	25.3	24.8	22.9	19.4	14.8	14.8	13.6	25.3	12.0	17.7
9 12 92	13.4	13.2	12.4	11.8	11.3	11.1	10.6	11.0	10.8	13.9	18.4	21.1	22.4	23.3	24.3	25.7	25.6								26.9	10.6	16.5

PACIFIC GAS AND ELECTRIC COMPANY
 TECHNICAL AND ECOLOGICAL SERVICES
 METEOROLOGICAL DATA FOR STATION AT:

DeSabiá Forebay
 1992 Solar Radiation

DATE	HOURLY DATA																								Generated Daily Values																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																
	0000	100	200	300	400	500	600	700	800	900	1000	1100	1200	1300	1400	1500	1600	1700	1800	1900	2000	2100	2200	2300	MAX	MIN	MEAN	Daily Total																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																													
7 3 92	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.436	0.729	0.909	1.174	1.445	1.717	1.992	2.268	2.545	2.822	3.100	3.377	3.655	3.932	4.210	4.487	4.765	5.043	5.321	5.599	5.877	6.155	6.433	6.711	6.989	7.267	7.545	7.823	8.101	8.379	8.657	8.935	9.213	9.491	9.769	10.047	10.325	10.603	10.881	11.159	11.437	11.715	11.993	12.271	12.549	12.827	13.105	13.383	13.661	13.939	14.217	14.495	14.773	15.051	15.329	15.607	15.885	16.163	16.441	16.719	16.997	17.275	17.553	17.831	18.109	18.387	18.665	18.943	19.221	19.499	19.777	20.055	20.333	20.611	20.889	21.167	21.445	21.723	22.001	22.279	22.557	22.835	23.113	23.391	23.669	23.947	24.225	24.503	24.781	25.059	25.337	25.615	25.893	26.171	26.449	26.727	27.005	27.283	27.561	27.839	28.117	28.395	28.673	28.951	29.229	29.507	29.785	30.063	30.341	30.619	30.897	31.175	31.453	31.731	32.009	32.287	32.565	32.843	33.121	33.399	33.677	33.955	34.233	34.511	34.789	35.067	35.345	35.623	35.901	36.179	36.457	36.735	37.013	37.291	37.569	37.847	38.125	38.403	38.681	38.959	39.237	39.515	39.793	40.071	40.349	40.627	40.905	41.183	41.461	41.739	42.017	42.295	42.573	42.851	43.129	43.407	43.685	43.963	44.241	44.519	44.797	45.075	45.353	45.631	45.909	46.187	46.465	46.743	47.021	47.299	47.577	47.855	48.133	48.411	48.689	48.967	49.245	49.523	49.801	50.079	50.357	50.635	50.913	51.191	51.469	51.747	52.025	52.303	52.581	52.859	53.137	53.415	53.693	53.971	54.249	54.527	54.805	55.083	55.361	55.639	55.917	56.195	56.473	56.751	57.029	57.307	57.585	57.863	58.141	58.419	58.697	58.975	59.253	59.531	59.809	60.087	60.365	60.643	60.921	61.199	61.477	61.755	62.033	62.311	62.589	62.867	63.145	63.423	63.701	63.979	64.257	64.535	64.813	65.091	65.369	65.647	65.925	66.203	66.481	66.759	67.037	67.315	67.593	67.871	68.149	68.427	68.705	68.983	69.261	69.539	69.817	70.095	70.373	70.651	70.929	71.207	71.485	71.763	72.041	72.319	72.597	72.875	73.153	73.431	73.709	73.987	74.265	74.543	74.821	75.099	75.377	75.655	75.933	76.211	76.489	76.767	77.045	77.323	77.601	77.879	78.157	78.435	78.713	78.991	79.269	79.547	79.825	80.103	80.381	80.659	80.937	81.215	81.493	81.771	82.049	82.327	82.605	82.883	83.161	83.439	83.717	83.995	84.273	84.551	84.829	85.107	85.385	85.663	85.941	86.219	86.497	86.775	87.053	87.331	87.609	87.887	88.165	88.443	88.721	88.999	89.277	89.555	89.833	90.111	90.389	90.667	90.945	91.223	91.501	91.779	92.057	92.335	92.613	92.891	93.169	93.447	93.725	94.003	94.281	94.559	94.837	95.115	95.393	95.671	95.949	96.227	96.505	96.783	97.061	97.339	97.617	97.895	98.173	98.451	98.729	99.007	99.285	99.563	99.841	100.119	100.397	100.675	100.953	101.231	101.509	101.787	102.065	102.343	102.621	102.899	103.177	103.455	103.733	104.011	104.289	104.567	104.845	105.123	105.401	105.679	105.957	106.235	106.513	106.791	107.069	107.347	107.625	107.903	108.181	108.459	108.737	109.015	109.293	109.571	109.849	110.127	110.405	110.683	110.961	111.239	111.517	111.795	112.073	112.351	112.629	112.907	113.185	113.463	113.741	114.019	114.297	114.575	114.853	115.131	115.409	115.687	115.965	116.243	116.521	116.799	117.077	117.355	117.633	117.911	118.189	118.467	118.745	119.023	119.301	119.579	119.857	120.135	120.413	120.691	120.969	121.247	121.525	121.803	122.081	122.359	122.637	122.915	123.193	123.471	123.749	124.027	124.305	124.583	124.861	125.139	125.417	125.695	125.973	126.251	126.529	126.807	127.085	127.363	127.641	127.919	128.197	128.475	128.753	129.031	129.309	129.587	129.865	130.143	130.421	130.699	130.977	131.255	131.533	131.811	132.089	132.367	132.645	132.923	133.201	133.479	133.757	134.035	134.313	134.591	134.869	135.147	135.425	135.703	135.981	136.259	136.537	136.815	137.093	137.371	137.649	137.927	138.205	138.483	138.761	139.039	139.317	139.595	139.873	140.151	140.429	140.707	140.985	141.263	141.541	141.819	142.097	142.375	142.653	142.931	143.209	143.487	143.765	144.043	144.321	144.599	144.877	145.155	145.433	145.711	145.989	146.267	146.545	146.823	147.101	147.379	147.657	147.935	148.213	148.491	148.769	149.047	149.325	149.603	149.881	150.159	150.437	150.715	150.993	151.271	151.549	151.827	152.105	152.383	152.661	152.939	153.217	153.495	153.773	154.051	154.329	154.607	154.885	155.163	155.441	155.719	155.997	156.275	156.553	156.831	157.109	157.387	157.665	157.943	158.221	158.499	158.777	159.055	159.333	159.611	159.889	160.167	160.445	160.723	160.999	161.277	161.555	161.833	162.111	162.389	162.667	162.945	163.223	163.501	163.779	164.057	164.335	164.613	164.891	165.169	165.447	165.725	166.003	166.281	166.559	166.837	167.115	167.393	167.671	167.949	168.227	168.505	168.783	169.061	169.339	169.617	169.895	170.173	170.451	170.729	171.007	171.285	171.563	171.841	172.119	172.397	172.675	172.953	173.231	173.509	173.787	174.065	174.343	174.621	174.899	175.177	175.455	175.733	176.011	176.289	176.567	176.845	177.123	177.401	177.679	177.957	178.235	178.513	178.791	179.069	179.347	179.625	179.903	180.181	180.459	180.737	181.015	181.293	181.571	181.849	182.127	182.405	182.683	182.961	183.239	183.517	183.795	184.073	184.351	184.629	184.907	185.185	185.463	185.741	186.019	186.297	186.575	186.853	187.131	187.409	187.687	187.965	188.243	188.521	188.799	189.077	189.355	189.633	189.911	190.189	190.467	190.745	191.023	191.301	191.579	191.857	192.135	192.413	192.691	192.969	193.247	193.525	193.803	194.081	194.359	194.637	194.915	195.193	195.471	195.749	196.027	196.305	196.583	196.861	197.139	197.417	197.695	197.973	198.251	198.529	198.807	199.085	199.363	199.641	199.919	200.197	200.475	200.753	201.031	201.309	201.587	201.865	202.143	202.421	202.699	202.977	203.255	203.533	203.811	204.089	204.367	204.645	204.923	205.201	205.479	205.757	206.035	206.313	206.591	206.869	207.147	207.425	207.703	207.981	208.259	208.537	208.815	209.093	209.371	209.649	209.927	210.205	210.483	210.761	211.039	211.317	211.595	211.873	212.151	212.429	212.707	212.985	213.263	213.541	213.819	214.097	214.375	214.653	214.931	215.209	215.487	215.765	216.043	216.321	216.599	216.877	217.155	217.433	217.711	217.989	218.267	218.545	218.823	219.101	219.379	219.657	219.935	220.213	220.491	220.769	221.047	221.325	221.603	221.881	222.159	222.437	222.715	222.993	223.271	223.549	223.827	224.105	224.383	224.661	224.939	225.217	225.495	225.773	226.051	226.329	226.607	226.885	227.163	227.441	227.719	227.997	228.275	228.553	228.831	229.109	229.387	229.665	229.943	230.221	230.499	230.777	231.055	231.333	231.611	231.889	232.167	232.445	232.723	232.999	233.277	233.555	233.833	234.111	234.389	234.667	234.945	235.223	235.501	235.779	236.057	236.335	236.613	236.891	237.169	237.447	237.725	238.003	238.281	238.559	238.837	239.115	239.393	239.671	239.949	240.227	240.505	240.783	241.061	241.339	241.617	241.895	242.173	242.451	242.729	243.007	243.285	243.563	243.841	244.119	244.397	244.675	244.953	245.231	245.509	245.787	246.065	246.343	246.621	246.899	247.177	247.455	247.733	248.011	248.289	248.567	248.845	249.123	249.401	249.679	249.957	250.235	250.513	250.791	251.069	251.347	251.625	251.903	252.181	252.459	252.737	253.015	253.293	253.571	253.849	254.127	254.405	254.683	254.961	255.239	255.517	255.795	256.073	256.351	256.629	256.907	257.185	257.463	257.741	258.019	258.297	258.575	258.853	259.131	259.409	259.687	259.965	260.243	260.521	260.799	261.077	261.355	261.633	261.911	262.189	262.467	262.745	263.023	263.301	263.579	263.857	264.135	264.413	264.691	264.969	265.247	265.525	265.803	266.081	266.359	266.637	266.915	267.193	267.471	267.749	268.027	268.305	268.583	268.861	269.139	269.417	269.695	269.973	270.251	270.529	270.807	271.085	271.363	271.641	271.919	272.197	272.475	272.753	273.031	273.309	273.587	273.865	274.143	274.421	274.699	274.977	275.255	275.533	275.811	276.089	276.367	276.645	276.923	277.201	277.479	277.757	278.035	278.313	278.591	278.869	279.147	279.425	279.703	279.981	280.259

PACIFIC GAS AND ELECTRIC COMPANY
 TECHNICAL AND ECOLOGICAL SERVICES
 METEOROLOGICAL DATA FOR STATION AT:
 DeSaba Forebay
 1992 Solar Radiation

DATE	HOURLY DATA																			Corrected Daily Values			Daily Total																
	100	200	300	400	500	600	700	800	900	1000	1100	1200	1300	1400	1500	1600	1700	1800	1900	2000	2100	2200		2300	MAX	MIN	MEAN												
9 9 92	0.000	0.000	0.000	0.000	0.000	0.000	0.002	0.033	0.062	0.437	0.838	1.023	1.134	1.148	1.058	0.925	0.696	0.451	0.170	0.009	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000			
9 10 92	0.000	0.000	0.000	0.000	0.000	0.000	0.002	0.053	0.117	0.337	0.457	0.490	0.523	0.639	1.070	0.948	0.728	0.486	0.181	0.008	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	
9 11 92	0.000	0.000	0.000	0.000	0.000	0.000	0.001	0.030	0.058	0.454	0.837	1.021	1.128	1.151	1.067	0.947	0.734	0.485	0.157	0.007	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	
9 12 92	0.000	0.000	0.000	0.000	0.000	0.001	0.001	0.035	0.071	0.428	0.805	0.958	1.115	1.148	1.075	0.927																				1.148	0.000	0.388	8.6

PACIFIC GAS AND ELECTRIC COMPANY
 TECHNICAL AND ECOLOGICAL SERVICES
 METEOROLOGICAL DATA FOR STATION AT: DesSaba Forebay
 1992 Relative Humidity

DATE	HOURLY DATA																								Corrected Daily Values		
	0000	100	200	300	400	500	600	700	800	900	1000	1100	1200	1300	1400	1500	1600	1700	1800	1900	2000	2100	2200	2300	MAX	MIN	MEAN
	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28	29	30	75	35	50
7 3 92	70	71	68	66	61	60	68	62	77	66	61	67	64	61	61	42	39	35	38	42	44	59	73	75	82	75	80
7 4 92	52	53	55	54	57	58	58	68	82	66	56	59	58	51	51	44	48	48	49	49	56	74	81	82	90	48	64
7 5 92	55	54	54	54	54	54	54	78	78	66	63	66	66	63	63	50	50	31	24	28	45	65	58	55	90	24	63
7 6 92	77	77	77	77	77	78	78	78	66	66	47	46	46	46	46	32	33	35	35	35	50	71	75	74	79	26	55
7 7 92	46	45	46	46	46	46	46	59	74	66	47	46	46	46	46	28	26	19	19	20	46	66	38	38	79	19	45
7 8 92	38	36	34	33	34	38	40	42	53	54	39	35	35	35	32	28	30	25	24	36	44	39	61	64	64	24	38
7 9 92	60	62	64	65	68	70	71	74	78	62	49	46	44	44	42	40	40	40	41	44	46	52	61	65	78	40	58
7 10 92	68	69	71	73	76	75	77	78	78	78	68	69	74	72	68	62	62	66	71	70	73	74	81	86	87	62	73
7 11 92	86	85	86	86	86	89	89	90	88	86	82	81	79	79	75	72	72	67	64	63	63	67	83	90	92	80	80
7 12 92	82	82	82	82	84	84	84	84	84	84	67	63	63	63	52	50	47	41	41	44	52	78	80	80	92	41	72
7 13 92	80	81	81	81	81	80	88	89	88	88	67	63	63	63	49	48	48	43	42	42	47	70	74	73	86	42	66
7 14 92	80	81	81	81	81	80	88	89	88	88	67	63	63	63	49	48	48	43	42	42	47	70	74	73	86	42	66
7 15 92	82	82	82	82	82	82	82	82	82	82	67	63	63	63	49	48	48	43	42	42	47	70	74	73	86	42	66
7 16 92	73	83	85	83	81	82	83	84	86	72	54	51	48	48	43	42	42	38	36	38	55	59	68	72	82	38	58
7 17 92	74	82	72	72	72	75	77	80	79	66	52	45	44	44	43	40	32	30	31	33	48	71	66	63	82	38	58
7 18 92	61	61	65	62	60	67	77	78	81	65	46	42	41	43	36	27	23	21	22	22	37	61	43	43	81	21	51
7 19 92	46	43	43	41	41	42	40	54	65	57	41	37	40	39	33	26	21	20	19	21	31	42	43	49	65	19	39
7 20 92	50	48	49	49	41	42	40	54	65	57	41	37	40	39	33	26	21	20	19	21	31	42	43	49	65	19	39
7 21 92	50	48	49	49	41	42	40	54	65	57	41	37	40	39	33	26	21	20	19	21	31	42	43	49	65	19	39
7 22 92	66	65	64	67	68	76	71	74	75	72	61	59	55	49	45	42	38	38	38	28	36	68	64	65	82	55	55
7 23 92	63	68	73	68	67	67	67	67	69	63	47	42	40	41	39	32	30	29	27	26	34	68	64	65	82	55	55
7 24 92	62	67	69	68	64	59	71	74	75	70	72	72	68	68	63	36	35	32	33	34	44	68	64	65	82	55	55
7 25 92	68	62	59	71	74	75	70	72	78	79	70	44	40	40	38	36	36	36	35	32	33	44	60	58	82	55	55
7 26 92	55	59	73	72	72	72	72	72	72	78	68	44	37	37	35	30	30	21	24	24	38	58	57	57	82	55	55
7 27 92	42	39	37	36	35	34	38	42	40	60	55	41	27	25	21	19	19	15	14	15	36	52	56	50	82	55	55
7 28 92	40	39	39	36	35	35	45	54	63	63	61	29	25	25	20	18	17	15	14	14	17	52	50	50	82	55	55
7 29 92	46	44	42	40	39	38	41	60	61	58	32	31	28	25	24	23	25	24	22	22	43	36	38	38	82	55	55
7 30 92	37	38	39	39	37	36	35	35	52	52	30	28	28	28	25	20	25	24	24	22	28	45	45	45	82	55	55
7 31 92	42	37	32	32	32	41	44	45	45	51	20	22	22	25	24	24	21	21	21	21	43	61	55	47	82	55	55
8 1 92	40	34	50	49	45	42	46	51	52	57	32	26	28	28	26	20	12	13	15	15	33	53	33	33	82	55	55
8 2 92	40	53	49	35	27	29	49	54	59	63	39	19	22	21	20	18	15	13	14	17	32	47	37	35	82	55	55
8 3 92	35	32	33	34	32	31	31	31	38	47	25	13	12	14	11	11	11	11	11	10	29	46	27	21	82	55	55
8 4 92	27	28	20	20	22	20	41	49	52	52	26	19	16	16	14	14	15	15	15	10	36	50	37	37	82	55	55
8 5 92	32	31	31	31	49	48	50	49	47	55	56	44	34	27	26	20	15	15	15	15	16	36	50	37	82	55	55
8 6 92	56	59	60	59	58	62	61	65	64	72	66	41	36	35	30	24	28	27	29	32	44	62	62	61	82	55	55
8 7 92	52	52	52	52	57	58	65	65	64	72	66	41	36	35	30	24	28	27	29	32	44	62	62	61	82	55	55
8 8 92	62	59	60	59	60	62	63	63	63	68	59	34	37	33	33	33	34	34	34	28	46	68	68	67	82	55	55
8 9 92	63	69	70	71	70	67	57	55	60	57	47	38	34	34	33	27	24	23	25	24	27	47	60	68	82	55	55
8 10 92	69	68	71	71	72	73	73	73	71	73	55	50	49	29	28	22	21	20	19	20	29	42	49	48	82	55	55
8 11 92	60	59	65	65	63	64	63	63	56	45	58	47	38	36	30	20	20	18	15	15	28	41	45	46	82	55	55
8 12 92	43	43	43	41	38	37	38	50	55	47	44	35	28	28	24	23	24	24	22	22	28	53	53	58	82	55	55
8 13 92	47	48	48	48	48	47	69	69	69	64	62	40	32	30	29	27	25	24	23	23	35	53	53	58	82	55	55
8 14 92	64	57	54	54	64	64	64	64	64	64	64	32	30	29	27	25	24	23	23	23	24	26	42	46	82	55	55
8 15 92	43	41	49	49	49	49	49	49	49	49	49	49	49	49	49	49	49	49	49	49	49	49	49	49	82	55	55
8 16 92	40	36	35	35	37	35	43	43	41	40	46	43	43	43	43	43	43	43	43	43	43	43	43	43	82	55	55
8 17 92	40	48	48	48	48	48	48	48	48	48	48	48	48	48	48	48	48	48	48	48	48	48	48	48	82	55	55
8 18 92	41	48	48	48	48	48	48	48	48	48	48	48	48	48	48	48	48	48	48	48	48	48	48	48	82	55	55
8 19 92	28	24	22	24	23	23	23	23	23	23	23	23	23	23	23	23	23	23	23	23	23	23	23	23	82	55	55
8 20 92	28	27	25	39	43	47	50	49	41	46	44	44	44	44	44	44	44	44	44	44	44	44	44	44	82	55	55
8 21 92	56	48	44	45	45	46	46	51	56	57	44	44	44	44	44	44	44	44	44	44	44	44	44	44	82	55	55
8 22 92	42	39	38	39	39	39	39	39	39	39	39	39	39	39	39	39	39	39	39	39	39	39	39	39	82	55	55
8 23 92	47	46	46	46	46	46	46	46	46	46	46	46	46	46	46	46	46	46	46	46	46	46	46	46	82	55	55
8 24 92	32	30	35	30	27	27	26	25	30	35	41	24	23	22	21	17	18	18	15	15	19	31	48	50	82	55	55
8 25 92	35	40	47	46	49	49	49	49	49	49	49	49	49	49	49	49	49	49	49	49	49	49	49	49	82	55	55
8 26 92	52	44	44	49	51	49	47	47	51	47	47	47	47	47	47	47	47	47	47	47	47	47	47	47	82	55	55
8 27 92	47	49	53	51	51	54	52	54	55	52	52	30	27	26	23	20	21	22	21	22	31	52	56	58	82	55	55
8 28 92	53	51																									

PACIFIC GAS AND ELECTRIC COMPANY
 TECHNICAL AND ECOLOGICAL SERVICES
 METEOROLOGICAL DATA FOR STATION AT: Desabla Forebay
 1992 Relative Humidity

DATE	HOURLY DATA																			Corrected Daily Values								
	0000	100	200	300	400	500	600	700	800	900	1000	1100	1200	1300	1400	1500	1600	1700	1800	1900	2000	2100	2200	2300	MAX	MIN	MEAN	
9 9 92	54	55	55	55	55	57	55	59	61	66	42	29	27	25	24	23	23	23	25	26	29	49	60	54	50	65	23	44
9 10 92	52	63	61	66	66	65	62	57	53	69	55	43	39	37	48	36	30	26	29	36	58	65	70	64	70	25	52	
9 11 92	61	65	71	72	74	73	71	72	74	75	51	46	48	46	43	41	37	33	34	39	51	55	68	71	75	33	58	
9 12 92	69	71	72	73	75	76	76	71	75	62	48	43	41	42	41	36	28								75	29	59	

PACIFIC GAS AND ELECTRIC COMPANY
 TECHNICAL AND ECOLOGICAL SERVICES
 METEOROLOGICAL DATA FOR STATION AT:

DesSaba Forebay
 1962 Wind Speed

DATE	HOURLY DATA																							Corrected Daily Values				
	0000	100	200	300	400	500	600	700	800	900	1000	1100	1200	1300	1400	1500	1600	1700	1800	1900	2000	2100	2200	2300	MAX	MIN	MEAN	
7 3 92	2.1	2.1	2.1	2.0	1.5	0.9	0.8	0.9	0.3	0.4	1.0	1.4	1.8	1.2	0.8	2.3	0.9	0.9	0.9	0.6	0.4	1.0	1.6	2.2	2.3	2.3	0.4	1.2
7 4 92	2.1	0.8	0.8	0.1	0.2	1.2	1.0	0.0	0.1	0.3	1.0	1.5	2.2	1.7	1.3	1.1	0.8	1.1	0.9	1.1	0.8	0.3	0.5	0.7	2.1	0.3	1.1	
7 5 92	1.0	0.8	1.4	1.1	1.2	1.4	1.4	0.0	0.4	0.3	1.0	2.0	1.8	1.2	1.1	1.0	1.3	0.8	0.7	0.5	1.4	1.5	0.8	1.3	2.2	0.0	0.9	
7 6 92	0.3	0.2	0.2	0.0	0.0	0.2	0.9	1.2	0.7	0.4	1.1	1.4	1.1	1.5	1.0	1.0	1.3	0.8	0.8	1.0	1.2	1.8	1.3	0.2	2.0	0.2	1.1	
7 7 92	0.0	0.2	0.3	0.7	0.1	0.8	0.1	0.9	0.3	0.6	1.4	1.7	1.1	1.5	1.0	1.0	1.0	0.7	1.2	0.9	1.2	1.0	1.2	1.7	2.1	0.0	0.8	
7 8 92	1.5	1.6	1.5	1.4	1.5	1.4	1.0	1.0	1.0	1.6	1.5	1.0	0.9	1.0	1.0	1.3	1.5	1.0	0.9	0.8	0.5	1.9	1.1	1.2	1.9	0.0	1.2	
7 9 92	1.1	1.0	1.1	1.5	1.0	1.3	1.4	1.0	0.7	0.7	0.7	0.9	1.3	0.8	0.8	1.4	1.1	1.2	0.9	0.5	0.8	1.7	1.5	1.7	1.9	0.1	1.0	
7 10 92	1.5	0.9	1.1	1.5	1.6	1.0	0.5	0.1	0.4	0.6	0.9	0.9	1.2	0.8	0.8	0.7	0.5	1.1	0.7	0.2	0.3	0.3	0.6	1.6	0.1	0.8		
7 11 92	0.3	0.6	0.4	0.4	0.1	0.8	0.1	0.3	0.3	0.9	1.2	2.2	1.9	1.9	1.9	1.4	0.6	1.1	0.9	0.9	0.5	0.5	0.7	2.2	0.1	0.8		
7 12 92	0.4	0.5	0.5	0.3	0.3	0.3	0.3	0.3	0.3	0.5	1.2	1.4	1.5	1.9	0.7	1.2	1.4	1.5	0.9	0.8	0.3	1.8	1.2	0.9	1.9	0.0	0.9	
7 13 92	0.9	1.0	1.3	1.0	1.1	1.2	0.9	0.7	0.4	0.2	0.9	1.3	1.9	1.8	1.2	1.3	1.3	1.1	1.8	0.7	0.5	1.3	0.5	1.2	1.9	0.0	1.1	
7 14 92	1.3	1.0	1.8	1.8	1.9	1.4	0.9	0.4	0.4	0.2	1.2	1.4	1.6	1.4	1.2	1.4	1.5	2.1	1.0	0.7	0.7	0.5	1.2	2.1	0.2	1.2		
7 15 92	0.7	1.0	1.2	0.8	0.3	0.2	0.7	1.5	0.6	0.5	1.0	1.8	1.4	1.5	1.9	1.2	1.2	1.6	1.4	0.2	0.3	1.0	1.3	1.8	0.2	1.0		
7 16 92	0.5	0.8	0.4	2.0	1.3	0.7	0.8	0.8	0.5	0.3	2.0	1.1	1.8	2.0	1.9	1.2	0.9	0.7	0.7	0.7	1.0	2.3	0.8	0.9	2.3	0.3	1.1	
7 17 92	1.1	0.2	1.2	1.7	0.8	0.2	0.5	0.3	0.4	0.1	0.7	1.4	2.7	1.8	1.2	1.0	1.2	1.3	0.8	0.8	1.1	0.9	1.1	2.3	0.1	1.0		
7 18 92	1.3	1.2	1.2	1.7	1.5	1.4	1.4	0.1	0.9	0.8	2.1	2.3	2.1	2.3	2.2	2.0	1.8	1.3	1.2	1.1	0.3	1.1	0.9	2.7	0.1	1.2		
7 19 92	0.7	1.5	1.6	1.2	1.0	0.2	0.5	0.2	0.6	1.4	2.3	1.8	2.4	2.2	2.0	2.0	1.8	1.3	1.1	0.8	0.3	1.0	1.1	2.4	0.2	1.2		
7 20 92	0.4	0.7	0.8	0.5	1.0	0.1	0.1	0.5	0.3	1.2	2.1	2.0	2.0	2.0	1.7	1.3	2.0	1.5	0.9	0.9	0.5	1.9	1.0	2.1	0.0	1.0		
7 21 92	0.8	1.6	1.5	0.5	0.8	1.0	0.1	0.5	0.3	1.2	1.4	2.3	1.5	1.8	1.5	2.0	1.5	0.5	0.8	0.5	1.8	0.8	1.2	0.8	1.9	0.0	1.0	
7 22 92	0.5	0.2	0.3	0.0	1.4	1.5	1.4	1.3	1.2	0.4	1.1	1.5	1.3	1.6	1.7	0.8	1.3	1.8	1.2	1.2	2.0	1.5	1.4	1.0	2.0	0.0	1.0	
7 23 92	0.8	0.4	0.7	0.0	0.1	0.2	0.4	0.4	0.5	0.4	1.1	1.5	1.3	1.6	1.7	0.8	1.3	1.8	1.5	1.8	1.2	2.0	0.8	1.2	2.1	0.1	0.9	
7 24 92	0.7	1.4	1.4	0.4	0.5	0.8	0.7	1.1	0.7	0.6	1.0	1.0	1.5	1.5	1.7	2.1	1.6	0.9	1.0	0.9	0.3	1.1	0.9	1.2	2.1	0.3	1.0	
7 25 92	1.2	1.1	1.0	0.5	0.8	0.8	0.1	0.6	0.9	0.4	0.4	1.4	2.0	1.5	1.5	1.5	1.5	0.6	1.7	0.6	0.8	1.1	2.2	0.9	1.1	0.1	1.0	
7 26 92	1.5	1.9	1.9	1.6	1.7	1.7	1.7	1.7	1.0	1.2	0.4	1.1	1.7	1.5	3.7	1.8	1.7	1.2	1.3	1.2	3.4	2.5	1.9	1.6	1.7	0.4	1.8	
7 27 92	1.0	1.3	1.2	1.2	1.6	0.4	0.1	1.0	0.7	1.2	0.3	1.6	1.4	1.3	1.5	1.0	1.4	1.0	1.3	1.0	0.6	0.2	1.7	1.2	1.2	0.1	1.1	
7 28 92	1.5	1.5	1.6	1.3	1.2	0.9	1.4	0.8	0.8	0.4	0.6	1.7	1.4	1.7	1.5	2.0	1.4	1.7	1.1	1.1	0.9	0.8	1.1	1.6	1.2	0.4	1.3	
7 29 92	1.4	1.4	1.2	1.8	1.5	1.4	1.8	1.4	0.6	1.8	1.8	1.8	1.8	1.8	1.6	2.1	1.1	1.1	1.0	0.9	0.8	1.1	1.3	1.3	2.2	0.4	1.2	
7 30 92	1.4	1.7	1.5	1.2	0.4	0.4	0.4	0.5	0.6	0.5	1.7	2.2	2.1	2.2	2.1	2.2	1.2	1.2	0.9	0.9	1.2	0.5	1.3	1.1	2.3	0.0	0.9	
7 31 92	0.8	1.5	0.2	0.7	0.5	0.0	0.2	0.5	0.3	0.7	0.3	1.3	2.0	2.0	2.0	0.6	0.7	1.2	0.8	0.8	2.3	0.5	1.3	1.1	2.3	0.0	0.9	
8 1 92	0.4	0.4	0.5	1.0	1.6	1.0	0.8	1.8	1.2	0.8	0.4	0.4	2.4	2.3	1.8	1.8	1.7	1.8	2.1	1.2	1.2	2.2	1.0	1.4	2.4	0.3	1.3	
8 2 92	1.0	0.4	0.5	1.1	1.3	1.8	1.8	1.8	1.2	0.8	1.2	2.5	2.3	2.4	2.5	2.1	2.8	2.2	2.0	1.0	2.0	2.2	1.0	1.4	2.8	0.8	1.7	
8 3 92	1.6	1.5	1.5	1.1	1.3	1.8	1.8	1.8	1.2	0.8	1.2	2.5	2.3	2.4	2.1	2.2	2.0	2.0	2.0	1.3	1.9	2.5	1.6	1.3	2.8	0.2	1.6	
8 4 92	0.6	0.7	1.9	2.0	1.2	0.9	0.9	1.9	1.3	0.2	1.1	1.9	2.3	2.8	2.4	2.1	2.2	2.0	2.0	1.0	1.3	1.7	1.5	1.5	2.9	0.5	1.5	
8 5 92	1.3	0.7	1.9	1.4	0.5	0.8	0.6	0.9	1.0	0.5	0.9	1.9	2.4	2.9	2.3	2.0	2.2	2.5	1.7	1.3	1.7	2.1	1.5	0.5	2.9	0.1	1.5	
8 6 92	1.1	0.9	0.5	0.4	0.6	1.2	0.1	0.2	0.8	0.3	0.9	2.4	2.0	2.4	2.1	1.3	1.8	1.8	1.8	1.5	1.8	1.8	1.3	1.3	2.4	0.1	1.3	
8 7 92	1.2	0.9	0.4	0.3	0.5	1.1	1.7	1.4	0.4	0.7	2.2	2.1	1.9	2.6	2.8	2.7	1.8	2.3	2.1	1.7	1.0	2.0	0.7	0.7	2.8	0.4	1.7	
8 8 92	1.9	1.5	1.3	1.2	1.4	1.5	1.7	1.4	0.4	0.7	2.2	2.1	1.9	2.6	2.8	2.7	1.5	2.2	2.3	2.1	1.0	1.9	1.1	1.7	2.1	0.5	1.2	
8 9 92	1.3	0.8	0.7	1.5	0.8	0.6	1.1	1.1	1.5	0.5	0.6	1.6	1.0	1.5	1.5	1.2	1.2	0.9	0.8	0.8	0.6	0.4	1.5	2.7	0.2	1.0		
8 10 92	0.8	1.5	0.2	1.0	1.5	1.0	0.9	0.6	0.6	0.5	0.2	1.1	0.7	1.4	1.2	1.2	0.9	1.1	1.3	1.1	0.6	0.4	1.5	2.7	0.2	0.9		
8 11 92	0.5	0.2	1.2	1.0	0.5	0.7	1.9	0.8	0.8	0.5	0.2	1.1	0.7	1.4	1.2	1.2	0.9	1.0	1.1	1.3	0.6	1.2	0.3	1.4	1.9	0.1	1.0	
8 12 92	0.5	0.2	1.0	1.3	1.1	0.3	1.4	0.1	0.5	1.0	0.9	0.5	1.2	1.1	1.0	1.4	1.8	0.9	1.0	1.0	1.0	1.1	0.3	0.8	2.4	0.3	1.2	
8 13 92	1.2	0.9	1.8	1.2	1.0	1.3	1.3	1.2	1.2	0.7	0.4	1.6	2.4	1.6	1.9	1.5	1.5	1.0	1.0	0.9	1.3	1.0	0.9	0.7	1.9	0.1	1.0	
8 14 92	1.4	0.7	0.2	0.2	1.9	1.4	1.0	1.4	1.0	0.6	0.5	1.2	1.6	1.3	0.9	0.9	1.6	0.9	1.4	0.9	1.3	0.9	1.0	0.4	1.4	0.4	0.9	
8 15 92	1.2	1.2	0.8	0.7	1.3	1.0	0.6	0.8	0.6	1.2	0.4	0.8	0.7	0.7	0.9	1.0	1.0	1.0	0.8	0.5	0.1	1.5	1.7	0.9	1.4	0.4	0.9	
8 16 92	0.6	0.6	0.8	0.8	0.7	0.7	0.8	0.2	0.5	0.2	0.5	1.2	1.3	1.6	1.5	1.0	1.0	0.8	1.4	0.7	0.5	1.7	0.9	1.5	1.7	0.1	0.9	
8 17 92	1.4	1.3	1.1	1.0	1.4	1.0	1.2	1.7	1.9	0.9	0.3	1.5	2.2	1.8	1.5	1.5	0.8	1.4	0.7	0.5	1.7	2.0	0.8	0.1	2.2	0.1	1.2	
8 18 92	1.6	0.3	0.8	1.0	0.2	0.7	0.6	1.0	0.8	0.7	0.3	1.4	1.7	2.1	2.1	2.1	0.4	0.7	1.0	0.5	1.4	1.4	1.3	1.5	2.2	0.2	1.0	
8 19 92	1.7	1.4	1.6	1.6	2.0	1.3	0.3	0.5	1.7	1.3	1.2	2.4	2.6	2.1	2.6	2.1	0.4	0.7	1.4	0.5	1.8	1.3	1.2	1.0	2.6	0.3	1.5	
8 20 92	1.1	0.8	1.1	0.7	0.8	0.6	0.7	0.6	1.2	1.2	1.1	1.4	2.0	1.7	1.8	1.3	1.9	1.7	1.5	1.7	1.5	1.7	0.8	1.5	2.0	0.5	1.2	
8 21 92	0.7	1.5	1.7	1.2	1.5	1.1	1.1	0.1	0.5	3.1	1.4	0.8	1.0	1.7	1.8	1.5	1.5	2.7	3.1	2.4	1.9	1.9	2.0	1.3	3.1	0.1	1.8	
8 22 92	0.4	0.4	0.1	1.3	0.1	0.2	0.1	0.1	0.1	0.1	0.8	1.7	2.4	2.0	2.2	2.2	2.6	3.0	2.9	2.3	0.9	1.6	1.3	2.0	2.7	0.1	1.2	
8 23 92	1.3	1.0	1.7	2.0	1.2	0.9	0.8	1.1	1.5	1.9	1.9	1.9	1.9	2.5	3.0	2.6</												

PACIFIC GAS AND ELECTRIC COMPANY
 TECHNICAL AND ECOLOGICAL SERVICES
 METEOROLOGICAL DATA FOR STATION AT:

DesSable Forebay
 1992 Wind Speed

DATE	HOURLY DATA																Corrected Daily Values											
	0000	100	200	300	400	500	600	700	800	900	1000	1100	1200	1300	1400	1500	1600	1700	1800	1900	2000	2100	2200	2300	MAX	MIN	MEAN	
9 9 92	0.7	0.5	0.8	0.8	0.9	1.0	0.7	0.8	1.1	0.8	0.2	1.4	1.7	1.8	1.6	1.7	1.5	1.7	1.2	0.5	1.1	1.1	1.1	0.8	1.0	1.8	0.2	1.0
9 10 92	0.7	0.6	0.7	0.7	0.8	0.6	1.1	0.3	0.4	1.4	0.0	0.5	0.5	1.4	1.7	1.3	1.2	1.3	1.3	0.7	0.8	0.5	0.4	1.0	1.7	0.0	0.8	
9 11 92	0.8	0.3	0.2	0.3	0.6	0.1	0.2	0.8	0.6	0.3	0.7	1.6	2.4	2.4	2.2	1.0	0.8	0.9	0.9	0.7	0.4	1.0	0.6	0.4	2.4	0.1	0.8	
9 12 92	1.2	0.9	0.4	0.3	0.5	0.7	0.1	0.3	0.2	1.2	0.5	1.5	1.4	1.5	1.3	1.3	1.0	0.9	0.9	0.7	0.4	1.0	0.6	0.4	1.5	0.1	0.8	

PACIFIC GAS AND ELECTRIC COMPANY
 TECHNICAL AND ECOLOGICAL SERVICES
 METEOROLOGICAL DATA FOR STATION AT:

Philbrook Dam
 1992 Air Temperature

DATE	HOURLY DATA																								Corrected Daily Values							
	0000	100	200	300	400	500	600	700	800	900	1000	1100	1200	1300	1400	1500	1600	1700	1800	1900	2000	2100	2200	2300	07/03	07/04	07/05	07/06	07/07			
	MAX	MIN	MAX	MIN	MAX	MIN	MAX	MIN	MAX	MIN	MAX	MIN	MAX	MIN	MAX	MIN	MAX	MIN	MAX	MIN	MAX	MIN	MAX	MIN	MAX	MIN	MAX	MIN	MAX	MIN	MAX	
7 3 92	11.5	10.7	10.2	9.8	9.5	8.1	9.5	12.9	17.7	18.9	19.3	20.0	20.6	21.1	20.8	20.6	20.9	21.3	20.9	20.3	20.0	18.1	15.1	13.6	12.4	21.3	12.4	18.4	21.3	9.1	12.4	16.1
7 4 92	14.5	12.4	12.3	13.2	12.7	12.3	14.0	12.1	16.7	19.6	20.1	21.3	21.7	21.9	21.7	21.0	21.6	20.5	21.0	20.9	20.5	18.0	16.4	15.0	15.2	22.1	15.0	16.4	22.1	9.1	12.4	16.1
7 5 92	15.0	15.1	14.8	14.7	14.6	14.8	14.5	14.7	15.8	16.2	17.3	18.8	18.6	18.6	18.6	18.6	18.6	18.6	18.6	18.6	18.6	18.6	18.6	18.6	18.6	18.6	18.6	18.6	18.6	18.6	18.6	18.6
7 6 92	12.7	12.5	12.6	11.8	11.0	11.7	13.5	14.6	13.8	14.8	15.3	15.4	16.2	16.8	16.5	16.2	16.2	16.2	16.2	16.2	16.2	16.2	16.2	16.2	16.2	16.2	16.2	16.2	16.2	16.2	16.2	16.2
7 7 92	12.1	11.5	10.8	10.8	10.8	10.4	10.8	13.5	16.1	17.2	18.7	19.5	20.0	20.6	20.8	20.8	20.8	20.8	20.8	20.8	20.8	20.8	20.8	20.8	20.8	20.8	20.8	20.8	20.8	20.8	20.8	20.8
7 8 92	12.9	12.0	11.5	11.1	11.1	11.1	11.5	14.2	17.8	19.5	20.7	21.1	21.8	22.1	21.8	21.8	21.8	21.8	21.8	21.8	21.8	21.8	21.8	21.8	21.8	21.8	21.8	21.8	21.8	21.8	21.8	21.8
7 9 92	14.3	13.8	13.3	12.4	12.0	11.8	11.8	12.2	14.9	19.9	22.8	23.4	23.3	23.0	23.1	23.1	23.1	23.1	23.1	23.1	23.1	23.1	23.1	23.1	23.1	23.1	23.1	23.1	23.1	23.1	23.1	23.1
7 10 92	16.6	17.1	16.8	16.6	16.6	15.1	15.3	15.6	15.3	15.3	15.3	15.3	15.3	15.3	15.3	15.3	15.3	15.3	15.3	15.3	15.3	15.3	15.3	15.3	15.3	15.3	15.3	15.3	15.3	15.3	15.3	
7 11 92	13.8	13.7	13.9	13.5	13.3	13.1	12.7	12.7	13.9	15.7	19.0	20.7	21.3	22.1	22.7	23.4	23.5	23.5	23.5	23.5	23.5	23.5	23.5	23.5	23.5	23.5	23.5	23.5	23.5	23.5	23.5	23.5
7 12 92	13.8	13.2	12.3	11.7	11.5	11.4	11.1	11.3	13.9	17.8	21.2	21.8	21.7	22.0	22.4	22.5	22.5	22.5	22.5	22.5	22.5	22.5	22.5	22.5	22.5	22.5	22.5	22.5	22.5	22.5	22.5	22.5
7 13 92	11.5	10.9	10.4	10.2	10.0	9.9	9.6	9.8	12.4	15.4	18.5	19.3	20.0	20.3	20.6	21.0	20.9	20.5	19.3	18.7	17.3	14.9	12.7	12.9	12.9	12.9	12.9	12.9	12.9	12.9	12.9	
7 14 92	13.2	12.4	12.3	12.3	12.3	12.3	12.3	12.3	12.3	12.3	12.3	12.3	12.3	12.3	12.3	12.3	12.3	12.3	12.3	12.3	12.3	12.3	12.3	12.3	12.3	12.3	12.3	12.3	12.3	12.3	12.3	
7 15 92	9.5	9.1	8.8	8.4	8.0	7.1	8.0	9.3	10.4	14.4	17.9	19.7	19.3	19.7	19.9	19.9	19.9	19.9	19.9	19.9	19.9	19.9	19.9	19.9	19.9	19.9	19.9	19.9	19.9	19.9	19.9	
7 16 92	11.2	10.8	10.2	9.6	9.1	9.0	10.7	10.8	12.2	15.3	17.7	19.9	21.2	22.2	22.9	22.6	22.7	22.6	22.6	22.6	22.6	22.6	22.6	22.6	22.6	22.6	22.6	22.6	22.6	22.6	22.6	
7 17 92	13.0	12.3	12.0	11.6	11.0	10.7	10.9	11.3	13.9	17.1	20.8	22.3	23.7	24.1	24.5	24.5	24.5	24.5	24.5	24.5	24.5	24.5	24.5	24.5	24.5	24.5	24.5	24.5	24.5	24.5	24.5	
7 18 92	13.3	12.9	12.4	12.0	11.8	11.5	11.3	11.4	13.8	17.8	21.8	23.2	24.0	25.0	25.7	26.0	26.3	26.2	26.2	26.2	26.2	26.2	26.2	26.2	26.2	26.2	26.2	26.2	26.2	26.2	26.2	
7 19 92	13.9	13.4	12.8	12.4	12.0	11.8	12.0	14.8	18.2	22.5	25.2	25.7	26.0	26.5	26.8	27.2	26.8	26.8	26.8	26.8	26.8	26.8	26.8	26.8	26.8	26.8	26.8	26.8	26.8	26.8	26.8	
7 20 92	14.8	14.2	13.8	13.4	12.9	12.6	12.5	12.7	15.1	18.9	22.8	23.6	24.6	25.4	25.4	25.4	25.4	25.4	25.4	25.4	25.4	25.4	25.4	25.4	25.4	25.4	25.4	25.4	25.4	25.4	25.4	
7 21 92	15.8	14.7	14.0	13.4	12.9	12.5	12.3	12.3	14.5	18.8	21.4	22.9	23.6	24.4	24.7	25.2	25.2	25.2	25.2	25.2	25.2	25.2	25.2	25.2	25.2	25.2	25.2	25.2	25.2	25.2	25.2	
7 22 92	13.9	12.7	11.7	11.1	10.1	10.1	10.1	8.8	9.9	12.2	18.4	22.3	24.4	24.7	25.2	25.2	25.2	25.2	25.2	25.2	25.2	25.2	25.2	25.2	25.2	25.2	25.2	25.2	25.2	25.2	25.2	
7 23 92	11.9	11.1	10.5	9.9	9.9	10.1	10.5	10.3	10.3	10.3	10.3	10.3	10.3	10.3	10.3	10.3	10.3	10.3	10.3	10.3	10.3	10.3	10.3	10.3	10.3	10.3	10.3	10.3	10.3	10.3		
7 24 92	12.6	12.0	11.6	11.2	11.1	10.8	10.4	10.8	13.2	16.9	20.8	23.1	24.3	24.4	24.8	24.8	24.8	24.8	24.8	24.8	24.8	24.8	24.8	24.8	24.8	24.8	24.8	24.8	24.8	24.8	24.8	
7 25 92	13.3	12.9	12.4	12.0	11.8	11.5	11.3	11.4	13.8	17.8	21.8	23.2	24.0	25.0	25.7	26.0	26.3	26.2	26.2	26.2	26.2	26.2	26.2	26.2	26.2	26.2	26.2	26.2	26.2	26.2	26.2	
7 26 92	13.9	13.4	12.8	12.4	12.0	11.8	12.0	14.8	18.2	22.5	25.2	25.7	26.0	26.5	26.8	27.2	26.8	26.8	26.8	26.8	26.8	26.8	26.8	26.8	26.8	26.8	26.8	26.8	26.8	26.8	26.8	
7 27 92	14.8	14.2	13.8	13.4	12.9	12.6	12.5	12.7	15.1	18.9	22.8	23.6	24.6	25.4	25.4	25.4	25.4	25.4	25.4	25.4	25.4	25.4	25.4	25.4	25.4	25.4	25.4	25.4	25.4	25.4	25.4	
7 28 92	15.8	14.7	14.0	13.4	12.9	12.5	12.3	12.3	14.5	18.8	21.4	22.9	23.6	24.4	24.7	25.2	25.2	25.2	25.2	25.2	25.2	25.2	25.2	25.2	25.2	25.2	25.2	25.2	25.2	25.2	25.2	
7 29 92	13.9	12.7	11.7	11.1	10.1	10.1	10.1	8.8	9.9	12.2	18.4	22.3	24.4	24.7	25.2	25.2	25.2	25.2	25.2	25.2	25.2	25.2	25.2	25.2	25.2	25.2	25.2	25.2	25.2	25.2	25.2	
7 30 92	11.9	11.1	10.5	9.9	9.9	10.1	10.5	10.3	10.3	10.3	10.3	10.3	10.3	10.3	10.3	10.3	10.3	10.3	10.3	10.3	10.3	10.3	10.3	10.3	10.3	10.3	10.3	10.3	10.3	10.3		
7 31 92	12.6	12.0	11.6	11.2	11.1	10.8	10.4	10.8	13.2	16.9	20.8	23.1	24.3	24.4	24.8	24.8	24.8	24.8	24.8	24.8	24.8	24.8	24.8	24.8	24.8	24.8	24.8	24.8	24.8	24.8	24.8	
8 1 92	11.8	11.0	10.5	10.1	9.9	9.6	9.3	8.0	9.0	11.3	15.2	20.4	21.8	21.5	21.5	21.5	21.5	21.5	21.5	21.5	21.5	21.5	21.5	21.5	21.5	21.5	21.5	21.5	21.5	21.5	21.5	
8 2 92	12.6	12.0	11.6	11.2	11.1	10.8	10.4	10.8	13.2	16.9	20.8	23.1	24.3	24.4	24.8	24.8	24.8	24.8	24.8	24.8	24.8	24.8	24.8	24.8	24.8	24.8	24.8	24.8	24.8	24.8	24.8	
8 3 92	13.3	12.9	12.4	12.0	11.8	11.5	11.3	11.4	13.8	17.8	21.8	23.2	24.0	25.0	25.7	26.0	26.3	26.2	26.2	26.2	26.2	26.2	26.2	26.2	26.2	26.2	26.2	26.2	26.2	26.2	26.2	
8 4 92	14.8	14.2	13.8	13.4	12.9	12.6	12.5	12.7	15.1	18.9	22.8	23.6	24.6	25.4	25.4	25.4	25.4	25.4	25.4	25.4	25.4	25.4	25.4	25.4	25.4	25.4	25.4	25.4	25.4	25.4	25.4	
8 5 92	15.8	14.7	14.0	13.4	12.9	12.5	12.3	12.3	14.5	18.8	21.4	22.9	23.6	24.4	24.7	25.2	25.2	25.2	25.2	25.2	25.2	25.2	25.2	25.2	25.2	25.2	25.2	25.2	25.2	25.2	25.2	
8 6 92	13.9	12.7	11.7	11.1	10.1	10.1	10.1	8.8	9.9	12.2	18.4	22.3	24.4	24.7	25.2	25.2	25.2	25.2	25.2	25.2	25.2	25.2	25.2	25.2	25.2	25.2	25.2	25.2	25.2	25.2	25.2	
8 7 92	11.9	11.1	10.5	9.9	9.9	10.1	10.5	10.3	10.3	10.3	10.3	10.3	10.3	10.3	10.3	10.3	10.3	10.3	10.3	10.3	10.3	10.3	10.3	10.3	10.3	10.3	10.3	10.3	10.3	10.3		
8 8 92	12.6	12.0	11.6	11.2	11.1	10.8	10.4	10.8	13.2	16.9	20.8	23.1	24.3	24.4	24.8	24.8	24.8	24.8	24.8	24.8	24.8	24.8	24.8	24.8	24.8	24.8	24.8	24.8	24.8	24.8	24.8	
8 9 92	13.3	12.9	12.4	12.0	11.8	11.5	11.3	11.4	13.8	17.8	21.8	23.2	24.0	25.0	25.7	26.0	26.3	26.2	26.2	26.2	26.2	26.2	26.2	26.2	26.2	26.2	26.2	26.2	26.2	26.2	26.2	
8 10 92	14.8	14.2	13.8	13.4	12.9	12.6	12.5	12.7	15.1	18.9	22.8	23.6	24.6	25.4	25.4	2																

PACIFIC GAS AND ELECTRIC COMPANY
 TECHNICAL AND ECOLOGICAL SERVICES
 METEOROLOGICAL DATA FOR STATION AT:
 Philbrook Dam
 1982 Air Temperature

DATE	HOURLY DATA												Corrected Daily Values																
	0000	100	200	300	400	500	600	700	800	900	1000	1100	1200	1300	1400	1500	1600	1700	1800	1900	2000	2100	2200	2300	MAX	MIN	MEAN		
9 9 92	11.1	10.8	10.2	9.7	9.4	8.9	8.7	8.3	10.2	13.7	18.7	22.2	24.4	25.4	25.3	25.1	25.2	24.3	23.4	20.8	17.8	16.1	14.0	12.5	09/09	25.4	8.7	16.5	
9 10 92	11.2	10.5	10.1	9.8	9.6	9.7	9.8	10.5	11.7	12.9	17.2	19.5	20.0	20.9	21.3	21.6	22.3	21.1	20.3	18.5	15.8	13.3	11.0	9.8	09/10	22.3	9.8	14.9	
9 11 92	9.5	10.1	10.9	8.7	7.5	6.5	6.9	7.3	8.4	13.5	17.7	18.9	18.5	19.9	20.3	19.8	19.8	18.6	17.9	16.3	12.8	9.4	8.5	8.8	08/11	20.3	6.5	13.2	
9 12 92	7.5	6.4	5.7	5.3	4.8	4.9	4.6	5.1	6.0	9.8	15.3	17.3	18.5	18.9	19.4	18.9	19.7	19.2	18.5	16.3	13.8	12.2	10.5	8.3	08/12	19.8	4.8	12.0	
9 13 92	9.6	9.3	11.6	11.0	11.4	10.9	10.6	11.0	12.3	13.2	14.4	16.3	18.1	20.6	20.4	20.7	20.9	19.9	18.5	16.7	13.4	13.0	12.2	11.5	09/13	20.9	9.3	14.5	
9 14 92	11.3	11.1	10.7	9.9	10.6	9.4	9.0	9.5	9.1	11.7	15.5	16.0	16.6	17.4	17.5	17.9	17.8	17.0	16.0	14.5	12.2	8.6	7.4	6.2	09/14	17.9	6.2	12.6	
9 15 92	7.3	6.2	6.5	6.0	7.4	7.7	9.2	8.4	9.2	12.4	15.6	18.8	17.4	17.8	18.5	18.9	18.8	18.2	17.2	15.0	12.7	9.6	7.5	6.8	09/15	18.6	6.2	12.3	
9 16 92	7.4	7.3	6.2	5.6	6.7	6.3	6.1	6.3	6.3	10.4	16.9	18.0	19.6	20.2	21.0	21.2	20.8	19.8	18.9	16.9	13.6	11.7	10.7	9.5	09/16	21.2	5.8	12.9	
9 17 92	8.6	8.1	7.5	7.4	7.1	7.0	8.5	5.9	8.8	9.8	17.0	20.3	21.4	22.1	23.0	23.2	22.7	21.8	20.8	18.7	15.0	12.8	12.0	10.9	09/17	21.7	5.9	13.5	
9 18 92	9.8	8.9	8.3	7.8	7.5	13.6	14.5	14.7	15.0	16.0	18.4	20.3	21.4	22.1	22.2	22.5	22.4	21.5	20.6	18.6	14.9	13.2	11.8	10.3	09/18	23.2	7.5	14.3	
9 19 92	10.1	9.4	8.8	8.2	8.0	7.7	7.6	7.5	8.1	11.1	17.1	19.8	21.2	24.1	25.5	25.8	25.1	24.2	23.0	22.0	18.5	15.1	14.8	13.3	12.6	09/20	25.8	7.3	15.5
9 20 92	9.3	8.7	8.6	8.3	8.0	7.4	7.9	7.5	7.3	10.7	18.5	21.4	22.7	24.1	25.5	25.8	25.1	24.2	23.0	22.0	18.5	15.1	14.8	13.3	12.6	09/21	25.7	12.7	19.1
9 21 92	12.7	14.2	15.8	15.8	15.5	16.0	15.4	15.7	14.9	16.3	20.5	21.9	22.5	22.6	22.9	22.8	22.2	20.8	19.9	18.4	16.8	15.4	14.4	14.3	09/22	22.9	10.4	16.5	
9 22 92	14.9	13.9	12.3	11.3	12.3	11.0	11.7	11.4	10.0	10.6	13.6	18.9	17.7	18.0	18.7	18.6	18.6	17.7	16.7	15.4	13.1	11.1	10.6	9.9	09/23	18.7	9.9	14.2	
9 23 92	14.9	13.9	12.3	11.3	12.3	11.0	11.7	11.4	10.0	10.6	13.6	18.9	17.7	18.0	18.7	18.6	18.6	17.7	16.7	15.4	13.1	11.1	10.6	9.9	09/24	14.4	7.4	10.4	
9 24 92	9.3	8.9	9.7	9.2	8.5	8.7	8.0	8.4	8.0	8.2	9.2	10.9	12.0	13.0	13.7	14.4	14.2	14.0	13.4	11.9	9.1	7.4	8.3	10.7	09/25	19.3	9.4	13.8	
9 25 92	10.3	10.1	9.4	9.7	9.4	9.7	9.6	9.9	9.8	10.7	11.8	13.6	15.8	16.9	16.7	19.3	19.3	18.8	18.1	17.0	15.0	15.6	15.6	15.7	09/26	15.3	9.4	13.8	
9 26 92	15.7	15.3	15.2	14.8	13.9	13.4	12.7	12.2	12.8	14.1	16.3	18.5	20.3	22.8	24.7	24.7	24.5	23.6	22.3	19.2	15.8	13.5	11.8	10.7	09/27	24.1	7.4	14.8	
9 27 92	10.3	9.8	9.2	8.7	8.3	7.7	7.6	7.4	7.7	10.3	15.7	21.0	22.8	23.2	23.8	24.1	23.7	23.8	21.9	18.7	15.4	13.0	11.2	10.0	09/28	24.1	7.4	14.8	
9 28 92	9.3	9.0	8.6	8.4	8.1	8.0	7.7	7.4	7.8	10.2	16.0	21.5	23.5	24.7	25.8	25.7	25.3	24.5	23.1	19.8	15.4	13.0	11.1	10.5	09/29	25.8	7.4	15.2	
9 29 92	9.5	10.8	10.3	10.2	10.9	11.1	10.3	9.9	10.4	12.3	16.8	23.0	24.8	25.2	25.3	24.0	22.4	21.4	20.9	18.3	14.3	13.0	16.2	16.9	09/30	15.0	10.3	12.7	
9 30 92	15.0	13.4	12.4	14.3	13.3	10.6	11.1	10.3	12.5	14.0	18.8	23.0	24.8	25.2	25.3	24.0	22.4	21.4	20.9	18.3	14.3	13.0	16.2	16.9	09/30	15.0	10.3	12.7	

PACIFIC GAS AND ELECTRIC COMPANY
 TECHNICAL AND ECOLOGICAL SERVICES
 METEOROLOGICAL DATA FOR STATION AT:

Phibbcock Dam
 1992 Solar Radiation

DATE	HOURLY DATA																				Corrected Daily Values			Daily Total						
	0000	0100	0200	0300	0400	0500	0600	0700	0800	0900	1000	1100	1200	1300	1400	1500	1600	1700	1800	1900	2000	2100	2200		2300	MAX	MIN	MEAN		
9 9 92	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.650	0.956	1.149	1.249	1.256	1.167	0.991	0.993	0.248	0.049	0.006	0.000	0.000	0.000	0.000	0.909	1.256	0.000	0.356	8.5
9 10 92	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.002	0.068	0.116	0.405	0.491	0.452	0.817	0.753	0.981	0.992	0.394	0.252	0.045	0.006	0.000	0.000	0.000	0.000	0.910	0.992	0.000	0.293	5.8
9 11 92	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.046	0.328	0.702	0.953	1.159	1.274	1.181	1.005	0.401	0.240	0.041	0.004	0.000	0.000	0.000	0.000	0.000	0.911	1.274	0.000	0.359	8.8
9 12 92	0.000	0.000	0.000	0.000	0.000	0.000	0.002	0.051	0.682	0.950	1.141	1.231	1.240	1.163	0.992	0.855	0.472	0.190	0.067	0.003	0.000	0.000	0.000	0.000	0.000	0.913	1.198	0.000	0.298	7.2
9 13 92	0.000	0.000	0.000	0.000	0.000	0.000	0.002	0.052	0.278	0.518	0.729	0.842	1.198	0.987	0.992	0.978	0.438	0.192	0.038	0.002	0.000	0.000	0.000	0.000	0.000	0.914	1.229	0.000	0.341	8.2
9 14 92	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.001	0.061	0.217	0.698	0.939	1.118	1.215	1.229	1.150	0.947	0.400	0.169	0.039	0.002	0.000	0.000	0.000	0.000	0.915	1.211	0.000	0.340	8.2
9 15 92	0.000	0.000	0.000	0.000	0.000	0.000	0.001	0.047	0.288	0.672	0.927	1.104	1.208	1.211	1.124	0.944	0.392	0.174	0.036	0.001	0.000	0.000	0.000	0.000	0.000	0.917	1.217	0.000	0.337	8.1
9 16 92	0.000	0.000	0.000	0.000	0.000	0.000	0.001	0.048	0.275	0.661	0.918	1.104	1.208	1.211	1.124	0.944	0.392	0.174	0.036	0.001	0.000	0.000	0.000	0.000	0.000	0.917	1.217	0.000	0.333	8.0
9 17 92	0.000	0.000	0.000	0.000	0.000	0.000	0.001	0.050	0.263	0.635	0.858	1.069	1.194	1.217	1.124	0.944	0.392	0.174	0.036	0.001	0.000	0.000	0.000	0.000	0.000	0.918	1.181	0.000	0.325	7.8
9 18 92	0.000	0.000	0.000	0.000	0.000	0.000	0.001	0.050	0.257	0.624	0.857	1.051	1.154	1.181	1.091	0.906	0.403	0.165	0.042	0.001	0.000	0.000	0.000	0.000	0.000	0.919	1.200	0.000	0.328	7.9
9 19 92	0.000	0.000	0.000	0.000	0.000	0.000	0.001	0.042	0.243	0.640	0.904	1.079	1.189	1.200	1.108	0.872	0.417	0.129	0.039	0.000	0.000	0.000	0.000	0.000	0.000	0.920	1.213	0.000	0.325	7.8
9 20 92	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.036	0.232	0.656	0.915	1.102	1.206	1.213	1.108	0.775	0.409	0.120	0.028	0.000	0.000	0.000	0.000	0.000	0.000	0.921	1.202	0.000	0.320	7.7
9 21 92	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.035	0.217	0.656	0.917	1.101	1.191	1.202	1.082	0.705	0.417	0.121	0.029	0.000	0.000	0.000	0.000	0.000	0.000	0.922	1.167	0.000	0.304	7.3
9 22 92	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.038	0.207	0.618	0.868	1.048	1.094	1.157	1.044	0.641	0.429	0.104	0.027	0.000	0.000	0.000	0.000	0.000	0.000	0.923	1.190	0.000	0.309	7.4
9 23 92	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.033	0.204	0.640	0.888	1.070	1.168	1.180	1.053	0.637	0.440	0.091	0.022	0.000	0.000	0.000	0.000	0.000	0.000	0.924	1.182	0.000	0.296	7.1
9 24 92	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.022	0.111	0.509	0.880	1.068	1.178	1.192	1.058	0.594	0.431	0.090	0.020	0.000	0.000	0.000	0.000	0.000	0.000	0.925	1.189	0.000	0.301	7.1
9 25 92	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.029	0.163	0.534	0.897	1.078	1.183	1.185	1.098	0.471	0.433	0.085	0.020	0.000	0.000	0.000	0.000	0.000	0.000	0.926	1.185	0.000	0.297	7.1
9 26 92	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.029	0.173	0.629	0.892	1.076	1.185	1.185	1.097	0.415	0.407	0.084	0.020	0.000	0.000	0.000	0.000	0.000	0.000	0.927	1.187	0.000	0.293	7.0
9 27 92	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.029	0.182	0.618	0.881	1.065	1.184	1.187	1.097	0.387	0.403	0.068	0.020	0.000	0.000	0.000	0.000	0.000	0.000	0.928	1.187	0.000	0.293	7.0
9 28 92	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.029	0.155	0.618	0.877	1.058	1.155	1.157	1.017	0.365	0.419	0.102	0.019	0.000	0.000	0.000	0.000	0.000	0.000	0.929	1.157	0.000	0.291	7.0
9 29 92	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.041	0.140	0.411	0.825	1.040	1.023	0.987	0.569	0.278	0.282	0.147	0.018	0.000	0.000	0.000	0.000	0.000	0.000	0.930	1.040	0.000	0.241	5.8

PACIFIC GAS AND ELECTRIC COMPANY
 TECHNICAL AND ECOLOGICAL SERVICES
 METEOROLOGICAL DATA FOR STATION AT:
 Philbrook Dam
 1992 Relative Humidity

DATE	HOURLY DATA																								Corrected Daily Values		
	0000	100	200	300	400	500	600	700	800	900	1000	1100	1200	1300	1400	1500	1600	1700	1800	1900	2000	2100	2200	2300	MAX	MIN	MEAN
7/ 3/92	57	64	66	65	69	73	76	76	67	49	44	41	36	29	27	22	27	32	31	41	58	58	54	58	58	22	39
7/ 4/92	72	83	86	85	88	90	91	93	76	62	37	35	33	30	30	30	33	34	36	44	57	58	65	70	76	30	52
7/ 5/92	75	78	82	84	85	86	89	85	85	55	52	49	53	56	58	59	55	55	59	66	70	77	70	70	70	49	69
7/ 6/92	88	88	89	93	94	94	96	92	85	80	87	82	82	82	82	77	79	86	86	79	83	84	84	87	89	65	79
7/ 7/92	88	93	94	95	94	94	95	94	85	73	71	68	67	63	63	57	59	63	64	82	80	80	88	89	95	57	86
7/ 8/92	86	88	88	88	88	89	89	89	84	74	63	63	63	60	60	57	55	59	63	69	60	60	68	68	89	55	75
7/ 9/92	88	88	88	88	88	88	88	88	84	74	63	63	63	60	60	57	55	59	63	69	60	60	68	68	89	55	75
7/10/92	86	86	86	86	86	86	86	86	82	72	61	61	61	58	58	55	54	54	46	57	66	62	62	62	85	40	64
7/11/92	84	77	79	80	85	85	85	86	74	52	45	41	40	40	40	40	48	45	46	60	59	75	73	75	69	42	64
7/12/92	82	74	77	79	81	81	81	81	77	53	42	35	31	34	30	30	29	27	31	36	40	47	47	47	67	27	51
7/13/92	82	74	77	79	81	81	81	81	77	53	42	35	31	34	30	30	29	27	31	36	40	47	47	47	67	27	51
7/14/92	82	74	77	79	81	81	81	81	77	53	42	35	31	34	30	30	29	27	31	36	40	47	47	47	67	27	51
7/15/92	82	74	77	79	81	81	81	81	77	53	42	35	31	34	30	30	29	27	31	36	40	47	47	47	67	27	51
7/16/92	82	74	77	79	81	81	81	81	77	53	42	35	31	34	30	30	29	27	31	36	40	47	47	47	67	27	51
7/17/92	82	74	77	79	81	81	81	81	77	53	42	35	31	34	30	30	29	27	31	36	40	47	47	47	67	27	51
7/18/92	82	74	77	79	81	81	81	81	77	53	42	35	31	34	30	30	29	27	31	36	40	47	47	47	67	27	51
7/19/92	82	74	77	79	81	81	81	81	77	53	42	35	31	34	30	30	29	27	31	36	40	47	47	47	67	27	51
7/20/92	82	74	77	79	81	81	81	81	77	53	42	35	31	34	30	30	29	27	31	36	40	47	47	47	67	27	51
7/21/92	82	74	77	79	81	81	81	81	77	53	42	35	31	34	30	30	29	27	31	36	40	47	47	47	67	27	51
7/22/92	82	74	77	79	81	81	81	81	77	53	42	35	31	34	30	30	29	27	31	36	40	47	47	47	67	27	51
7/23/92	82	74	77	79	81	81	81	81	77	53	42	35	31	34	30	30	29	27	31	36	40	47	47	47	67	27	51
7/24/92	82	74	77	79	81	81	81	81	77	53	42	35	31	34	30	30	29	27	31	36	40	47	47	47	67	27	51
7/25/92	82	74	77	79	81	81	81	81	77	53	42	35	31	34	30	30	29	27	31	36	40	47	47	47	67	27	51
7/26/92	82	74	77	79	81	81	81	81	77	53	42	35	31	34	30	30	29	27	31	36	40	47	47	47	67	27	51
7/27/92	82	74	77	79	81	81	81	81	77	53	42	35	31	34	30	30	29	27	31	36	40	47	47	47	67	27	51
7/28/92	82	74	77	79	81	81	81	81	77	53	42	35	31	34	30	30	29	27	31	36	40	47	47	47	67	27	51
7/29/92	82	74	77	79	81	81	81	81	77	53	42	35	31	34	30	30	29	27	31	36	40	47	47	47	67	27	51
7/30/92	82	74	77	79	81	81	81	81	77	53	42	35	31	34	30	30	29	27	31	36	40	47	47	47	67	27	51
7/31/92	82	74	77	79	81	81	81	81	77	53	42	35	31	34	30	30	29	27	31	36	40	47	47	47	67	27	51
8/ 1/92	82	74	77	79	81	81	81	81	77	53	42	35	31	34	30	30	29	27	31	36	40	47	47	47	67	27	51
8/ 2/92	82	74	77	79	81	81	81	81	77	53	42	35	31	34	30	30	29	27	31	36	40	47	47	47	67	27	51
8/ 3/92	82	74	77	79	81	81	81	81	77	53	42	35	31	34	30	30	29	27	31	36	40	47	47	47	67	27	51
8/ 4/92	82	74	77	79	81	81	81	81	77	53	42	35	31	34	30	30	29	27	31	36	40	47	47	47	67	27	51
8/ 5/92	82	74	77	79	81	81	81	81	77	53	42	35	31	34	30	30	29	27	31	36	40	47	47	47	67	27	51
8/ 6/92	82	74	77	79	81	81	81	81	77	53	42	35	31	34	30	30	29	27	31	36	40	47	47	47	67	27	51
8/ 7/92	82	74	77	79	81	81	81	81	77	53	42	35	31	34	30	30	29	27	31	36	40	47	47	47	67	27	51
8/ 8/92	82	74	77	79	81	81	81	81	77	53	42	35	31	34	30	30	29	27	31	36	40	47	47	47	67	27	51
8/ 9/92	82	74	77	79	81	81	81	81	77	53	42	35	31	34	30	30	29	27	31	36	40	47	47	47	67	27	51
8/10/92	82	74	77	79	81	81	81	81	77	53	42	35	31	34	30	30	29	27	31	36	40	47	47	47	67	27	51
8/11/92	82	74	77	79	81	81	81	81	77	53	42	35	31	34	30	30	29	27	31	36	40	47	47	47	67	27	51
8/12/92	82	74	77	79	81	81	81	81	77	53	42	35	31	34	30	30	29	27	31	36	40	47	47	47	67	27	51
8/13/92	82	74	77	79	81	81	81	81	77	53	42	35	31	34	30	30	29	27	31	36	40	47	47	47	67	27	51
8/14/92	82	74	77	79	81	81	81	81	77	53	42	35	31	34	30	30	29	27	31	36	40	47	47	47	67	27	51
8/15/92	82	74	77	79	81	81	81	81	77	53	42	35	31	34	30	30	29	27	31	36	40	47	47	47	67	27	51
8/16/92	82	74	77	79	81	81	81	81	77	53	42	35	31	34	30	30	29	27	31	36	40	47	47	47	67	27	51
8/17/92	82	74	77	79	81	81	81	81	77	53	42	35	31	34	30	30	29	27	31	36	40	47	47	47	67	27	51
8/18/92	82	74	77	79	81	81	81	81	77	53	42	35	31	34	30	30	29	27	31	36	40	47	47	47	67	27	51
8/19/92	82	74	77	79	81	81	81	81	77	53	42	35	31	34	30	30	29	27	31	36	40	47	47	47	67	27	51
8/20/92	82	74	77	79	81	81	81	81	77	53	42	35	31	34	30	30	29	27	31	36	40	47	47	47	67	27	51
8/21/92	82	74	77	79	81	81	81	81	77	53	42	35	31	34	30	30	29	27	31	36	40	47	47	47	67	27	51
8/22/92	82	74	77	79	81	81	81	81	77	53	42	35	31	34	30	30	29	27	31	36	40	47	47	47	67	27	51
8/23/92	82	74	77	79	81	81	81	81	77	53	42	35	31	34	30	30	29	27	31	36	40	47	47	47	67	27	51
8/24/92	82	74	77	79	81	81	81	81	77	53	42	35	31	34	30	30	29	27	31	36	40	47	47	47	67	27	51
8/25/92	82	74	77	79	81	81	81	81	77	53	42	35	31	34	30	30	29	27	31	36	40	47	47	47	67	27	51
8/26/92	82	74	77	79	81	81	81	81	77	53	42	35	31	34	30	30	29	27	31	36	40	47	47	47	67	27	51
8/27/92	82	74	77	79	81	81	81	81	77	53	42	35	31	34	30	30	29	27	31	36	40	47	47	47	67	27	51
8/28/92	82	74	77	79	81	81	81	81	77	53	42	35	31	34	30	30	29	27	31	36	40	47	47	47	67	27	51
8/29/92	82	74	77	79	81	81	81	81	77	53	42	35	31	34	30	30	29	27	31	36	40	47	47	47	67	27	51
8/30/92	82																										

PACIFIC GAS AND ELECTRIC COMPANY
 TECHNICAL AND ECOLOGICAL SERVICES
 METEOROLOGICAL DATA FOR STATION AT:

Philbrook Dam
 1992 Relative Humidity

DATE	HOURLY DATA																								Corrected Daily Values				
	0000	100	200	300	400	500	600	700	800	900	1000	1100	1200	1300	1400	1500	1600	1700	1800	1900	2000	2100	2200	2300	MAX	MIN	MEAN		
9 2 92	77	78	81	79	77	80	82	78	66	50	38	40	45	44	40	36	39	43	44	57	56	56	74	80	82	36	61	61	
9 3 92	81	79	82	84	80	81	78	78	56	43	38	40	45	44	40	36	39	43	44	57	56	56	74	80	82	36	61	61	
9 4 92	89	81	81	85	88	85	85	83	82	53	45	46	45	42	40	35	34	35	38	50	50	51	60	67	67	38	65	65	
9 5 92	73	79	82	85	88	88	91	89	75	51	47	45	40	34	29	30	34	39	44	55	61	65	71	71	93	29	62	62	
9 6 92	77	82	86	87	89	91	92	90	84	74	49	39	37	35	36	33	30	30	32	42	42	48	52	52	92	30	58	58	
9 7 92	53	63	62	68	58	53	57	54	54	42	27	24	21	21	21	21	21	22	23	32	42	46	48	56	68	21	43	43	
9 8 92	60	64	66	68	67	69	72	72	68	59	39	28	24	23	24	24	23	24	28	35	42	48	50	57	72	23	47	47	
9 9 92	63	66	66	68	70	75	80	71	62	50	38	33	33	24	32	31	31	31	34	44	56	58	60	59	82	24	54	54	
9 10 92	61	63	60	65	68	67	64	64	67	46	39	39	30	27	30	24	30	26	27	38	40	49	53	55	68	24	48	48	
9 11 92	54	51	55	59	71	75	71	72	73	54	34	33	27	25	28	32	28	32	34	40	52	52	56	52	75	25	48	48	
9 12 92	45	40	42	44	45	45	48	49	42	28	28	25	19	19	40	37	31	28	26	35	45	52	63	63	64	26	47	47	
9 13 92	45	40	42	44	45	45	48	49	42	28	28	25	19	19	40	37	31	28	26	35	45	52	63	63	64	26	47	47	
9 14 92	29	31	29	26	32	31	36	39	41	33	27	24	24	22	22	18	16	13	11	12	19	34	39	37	53	11	34	34	
9 15 92	44	45	43	47	51	53	51	48	41	33	27	29	27	27	28	28	28	28	31	33	44	56	61	63	63	24	34	34	
9 16 92	58	53	60	67	68	65	66	66	59	36	24	24	24	25	24	25	24	26	28	35	45	52	54	59	68	24	48	48	
9 17 92	62	64	67	70	71	71	73	70	67	42	31	29	25	25	22	21	19	18	20	27	38	46	50	54	58	21	49	49	
9 18 92	63	67	69	70	70	70	73	70	65	33	30	22	20	20	21	19	19	20	22	27	38	43	47	50	68	19	38	38	
9 19 92	63	67	69	70	70	70	73	70	65	33	30	22	20	20	21	19	19	20	22	27	38	43	47	50	68	19	38	38	
9 20 92	58	62	65	67	70	74	71	77	78	68	40	30	28	25	19	19	21	22	24	31	45	50	51	53	78	19	48	48	
9 21 92	54	50	42	43	44	43	45	39	42	42	36	31	24	19	20	20	20	23	25	29	45	52	53	49	85	19	37	37	
9 22 92	51	58	56	57	58	61	66	64	65	57	31	25	25	25	27	29	29	32	34	37	40	40	43	43	66	25	43	43	
9 23 92	34	38	45	51	56	56	61	69	63	52	42	37	36	36	34	32	30	36	35	36	44	54	62	66	88	30	46	46	
9 24 92	70	76	72	75	80	84	88	87	87	79	68	57	54	48	43	36	37	40	42	47	54	56	57	35	35	35	61	61	61
9 25 92	37	34	36	29	29	27	27	25	26	26	32	29	27	23	19	17	17	18	19	21	22	21	21	20	37	17	25	25	
9 26 92	20	21	22	24	28	32	33	35	32	31	28	25	22	23	15	15	15	15	17	18	19	19	21	21	20	15	27	27	
9 27 92	50	54	54	54	57	59	58	59	60	49	25	20	18	18	16	16	16	18	21	31	45	49	53	54	60	16	42	42	
9 28 92	55	57	55	54	58	59	61	63	65	63	50	27	19	18	16	16	17	18	19	31	45	46	44	46	65	16	42	42	
9 29 92	56	51	54	53	54	54	51	49	50	54	51	21	16	16	16	17	20	21	21	28	35	42	34	33	56	13	37	37	
9 30 92	43	47	50	48	48	54	52	58	52	51	21	16	14	13	13	17	20	21	21	28	35	42	34	33	56	13	43	43	

PACIFIC GAS AND ELECTRIC COMPANY
TECHNICAL AND ECOLOGICAL SERVICES
METEOROLOGICAL DATA FOR STATION AT:
Philbrook Dam
198 - Wind Speed

DATE	HOURLY DATA																								Corrected Daily Values				
	0000	100	200	300	400	500	600	700	800	900	1000	1100	1200	1300	1400	1500	1600	1700	1800	1900	2000	2100	2200	2300	MAX	MIN	MEAN		
7 8 92	0.8	0.2	0.0	0.1	0.1	0.1	0.1	0.3	0.0	0.4	0.5	1.7	0.2	0.4	0.4	0.2	1.7	0.7	0.6	0.3	0.0	1.3	1.2	0.7/08	1.7	0.0	0.6		
7 9 92	0.1	0.1	0.4	0.4	0.2	0.2	0.1	1.2	1.4	0.6	0.5	0.8	1.2	0.7	0.6	1.3	1.1	0.4	0.7	1.2	1.4	2.2	0.4	0.7/09	1.2	0.0	0.4		
7 10 92	0.1	0.2	0.0	0.1	0.2	0.9	1.2	0.3	1.3	0.5	1.4	0.1	1.5	1.1	0.4	0.8	0.4	0.7	0.8	0.4	0.7	0.3	1.6	0.2	0.7/10	2.2	0.1	0.8	
7 11 92	0.3	0.3	0.1	0.0	0.5	0.5	0.1	0.1	0.7	0.3	0.1	1.4	1.2	1.0	1.4	0.4	2.0	0.3	1.2	1.0	0.0	0.0	0.2	0.7/11	2.0	0.0	0.6		
7 12 92	0.7	1.3	0.7	0.9	0.5	0.5	1.3	0.3	0.3	2.1	0.5	1.0	1.7	1.5	1.4	0.3	2.3	1.3	1.3	0.3	0.0	0.5	0.9	0.7/12	2.0	0.0	1.0		
7 13 92	0.3	0.6	1.1	0.4	0.3	0.1	0.0	0.7	0.7	1.4	1.0	1.4	2.1	2.3	1.7	2.0	2.1	2.3	1.6	0.0	0.1	0.0	0.2	0.7/13	2.3	0.0	1.0		
7 14 92	1.3	1.8	0.6	0.1	0.4	0.3	0.1	0.0	1.0	0.5	0.4	1.2	2.1	2.1	1.8	1.6	1.4	1.9	2.5	2.1	0.4	0.0	1.1	1.0	0.7/14	2.3	0.0	1.1	
7 15 92	1.5	1.3	1.5	1.1	0.7	0.2	0.2	0.2	0.2	0.5	0.4	0.9	2.1	2.0	1.9	1.7	2.1	0.5	0.7	0.9	0.7	0.7	1.5	0.7/15	2.1	0.1	0.9		
7 16 92	0.3	0.4	0.4	0.0	0.1	0.1	0.0	0.1	0.0	0.1	0.0	0.1	0.5	0.5	0.4	0.9	0.7	0.5	0.3	0.2	0.2	0.1	0.8	0.6	0.7/16	1.6	0.1	0.6	
7 17 92	0.1	0.1	0.0	0.1	0.0	0.1	0.0	0.1	0.3	0.3	0.6	0.4	0.7	0.5	0.4	0.9	0.5	1.2	1.8	0.8	1.2	0.6	0.0	0.0	0.7/17	1.8	0.0	0.4	
7 18 92	0.4	0.4	1.2	1.6	1.4	0.8	0.8	1.0	1.2	0.2	0.2	0.7	0.5	0.5	1.3	0.4	0.5	0.2	1.0	0.2	0.1	0.1	1.2	0.2	0.7/18	1.8	0.0	0.4	
7 19 92	0.3	0.3	0.1	0.0	0.1	0.1	0.1	0.8	1.0	0.4	0.3	0.2	0.4	0.2	0.5	0.4	0.9	1.0	0.7	0.6	0.2	0.0	0.7	1.3	0.7/19	1.3	0.0	0.4	
7 20 92	0.0	0.0	0.2	0.2	0.0	0.0	0.0	0.5	0.4	0.3	0.6	0.3	0.2	0.4	0.9	0.3	0.3	1.1	1.1	0.1	0.6	0.2	0.0	0.2	0.7/20	1.3	0.0	0.4	
7 21 92	1.5	0.7	0.9	0.8	0.3	0.4	0.1	1.3	2.0	0.7	0.8	1.8	1.5	1.0	0.9	0.6	1.8	1.5	1.6	2.4	2.5	2.4	0.0	0.1	0.6	0.7/21	2.1	0.0	0.6
7 22 92	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.6	1.3	0.8	0.5	1.0	0.2	1.2	1.9	2.3	1.4	1.5	1.6	2.2	2.0	2.4	0.2	0.1	0.8	0.7/22	2.0	0.0	0.7
7 23 92	1.1	0.7	1.7	0.9	0.8	0.1	0.2	1.1	0.6	1.3	0.8	1.5	1.1	1.1	1.6	2.1	1.8	2.9	2.5	2.4	0.2	0.1	0.8	2.1	0.7/23	2.3	0.0	0.9	
7 24 92	0.8	0.6	0.2	0.2	0.2	0.2	0.3	0.3	0.7	1.1	0.5	1.5	1.3	1.7	1.6	1.9	1.7	2.3	0.9	1.0	0.0	0.0	0.4	1.2	0.4	0.7/24	1.9	0.0	0.5
7 25 92	0.3	0.0	0.0	0.1	0.1	0.3	0.3	0.0	0.0	0.1	0.3	1.4	1.3	1.9	0.3	0.2	1.0	0.7	0.6	0.2	0.4	1.2	0.4	0.7/25	2.3	0.0	0.9		
7 26 92	0.2	0.0	0.1	0.0	0.1	0.1	0.0	0.2	0.7	1.4	0.6	1.1	1.0	1.0	1.3	1.8	1.7	1.6	2.4	1.0	0.0	0.0	0.2	0.1	0.7/26	2.4	0.0	0.5	
7 27 92	0.0	0.1	0.0	0.0	0.1	0.0	0.0	0.0	0.0	0.0	0.3	0.5	0.7	1.7	2.0	1.8	1.7	1.4	0.9	1.1	0.0	0.0	0.4	0.0	0.7/27	2.0	0.0	0.7	
7 28 92	0.1	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.1	0.4	0.3	0.9	1.5	1.5	1.2	1.7	1.7	1.2	0.8	0.3	0.0	0.9	0.3	0.3	0.7/28	1.8	0.0	0.6	
7 29 92	0.4	0.3	0.1	0.1	0.0	0.0	0.0	0.0	0.0	0.4	1.4	1.9	0.1	0.4	0.4	0.4	0.5	1.4	0.5	1.1	0.5	0.6	0.0	0.0	0.7/29	1.9	0.0	0.4	
7 30 92	0.2	0.2	0.0	0.0	0.0	0.1	0.0	0.0	0.0	0.6	0.4	0.8	0.0	0.8	0.7	0.4	0.5	1.4	0.5	1.1	0.5	0.6	0.0	0.0	0.7/30	1.4	0.0	0.3	
7 31 92	0.6	0.2	0.1	0.0	0.0	0.1	0.0	0.0	0.8	1.3	1.1	0.2	0.7	0.4	0.3	1.2	0.2	0.3	0.3	0.2	0.0	0.4	1.0	0.3	0.6/01	1.3	0.0	0.4	
8 1 92	0.1	0.1	0.1	0.0	0.0	0.0	0.0	0.0	0.1	0.5	0.7	1.5	0.6	0.9	2.1	0.6	1.1	0.9	1.4	0.5	0.4	0.0	0.3	0.1	0.8/02	2.1	0.0	0.4	
8 2 92	0.1	0.1	0.0	0.0	0.0	0.0	0.0	0.0	0.0	1.7	1.1	0.4	0.5	1.0	0.9	1.1	1.2	0.7	0.8	0.8	0.1	0.1	0.0	0.1	0.0	0.8/03	1.7	0.0	0.5
8 3 92	0.0	0.0	0.1	0.1	0.1	0.0	0.0	0.0	0.0	0.1	0.2	0.2	0.7	0.3	0.1	0.6	0.5	0.5	0.0	0.1	0.3	1.7	0.2	0.6/04	1.7	0.0	0.3		
8 4 92	0.1	0.1	0.0	0.0	0.0	0.0	0.0	0.1	0.1	0.2	0.2	0.7	0.3	0.3	0.5	0.7	0.7	0.6	0.5	0.0	0.1	0.0	0.2	0.1	0.0	0.8/05	1.7	0.0	0.3
8 5 92	0.1	0.1	0.1	0.0	0.0	0.2	0.0	0.2	0.2	0.8	1.0	0.6	1.1	0.3	0.2	0.8	0.3	0.5	0.3	0.3	0.6	0.5	0.0	0.1	0.1	0.8/06	2.0	0.0	0.4
8 6 92	0.1	0.1	0.0	0.1	0.0	0.1	0.0	0.0	0.0	0.7	0.1	0.6	1.1	0.3	0.2	1.1	1.4	0.4	0.6	0.3	0.6	0.0	0.2	0.2	0.6/07	1.4	0.0	0.3	
8 7 92	0.0	0.0	0.1	0.0	0.0	0.0	0.0	0.0	0.0	1.8	0.1	0.5	0.5	1.4	0.8	0.4	0.9	0.6	1.0	1.2	0.5	0.0	0.2	0.2	0.6/08	3.0	0.0	0.9	
8 8 92	0.1	0.2	1.1	2.4	0.8	0.5	0.8	2.3	3.0	1.8	0.1	0.5	1.4	0.8	0.4	0.8	0.9	0.6	1.0	1.2	0.0	0.2	0.2	0.2	0.6/09	1.2	0.0	0.2	
8 9 92	0.1	0.1	0.1	0.0	0.0	0.0	0.0	0.0	0.0	0.7	0.4	1.1	0.6	0.7	1.9	2.1	2.4	2.2	1.4	0.8	0.0	0.3	0.6	0.0	0.1	0.8/10	2.4	0.0	0.7
8 10 92	0.0	0.0	0.0	0.0	0.1	0.0	0.0	0.0	0.0	0.4	0.5	0.3	0.1	0.3	0.3	1.2	1.1	1.3	0.2	0.1	0.0	0.0	0.2	0.1	0.1	0.8/11	1.6	0.0	0.4
8 11 92	0.0	0.0	0.0	0.0	0.0	0.1	0.0	0.0	0.0	0.3	0.3	0.0	0.2	1.7	0.3	1.8	1.6	1.7	1.2	0.3	0.0	0.0	0.2	0.2	0.6/12	2.4	0.0	0.7	
8 12 92	0.2	0.7	0.3	0.1	0.0	0.0	0.0	0.0	0.0	0.3	0.5	1.1	0.3	0.5	0.5	0.2	0.3	0.6	0.1	0.2	0.1	0.0	0.0	0.0	0.0	0.8/13	1.9	0.0	0.2
8 13 92	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.6	0.5	1.1	0.1	0.3	1.1	0.6	1.3	1.7	0.2	0.6	0.1	0.0	0.0	0.0	0.0	0.8/14	1.7	0.0	0.3
8 14 92	0.1	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.6	1.1	0.1	0.1	0.3	1.1	0.6	1.3	1.7	0.2	0.6	0.1	0.0	0.0	0.2	0.2	0.8/15	2.4	0.0	0.3
8 15 92	0.2	0.1	0.0	0.0	0.2	0.2	0.2	0.2	0.2	0.3	0.8	1.7	0.4	1.3	1.2	1.2	2.4	2.4	2.0	0.1	0.1	0.2	0.2	0.2	0.8/16	4.6	0.0	0.9	
8 16 92	3.9	4.6	0.8	0.1	0.3	1.5	1.0	0.6	0.3	0.9	0.3	0.8	1.7	0.4	1.3	1.2	0.5	0.9	0.3	0.1	0.0	0.0	0.0	0.0	0.8/17	1.2	0.0	0.3	
8 17 92	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.6	0.5	0.3	0.3	1.2	0.9	0.7	0.7	0.9	0.1	0.4	0.0	0.0	0.0	0.0	0.0	0.8/18	0.8	0.0	0.2
8 18 92	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.1	0.1	0.2	0.3	0.2	0.4	0.9	0.7	0.8	0.1	0.1	0.0	0.0	0.0	0.0	0.1	0.8/19	1.4	0.0	0.3
8 19 92	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.4	0.3	0.8	1.0	0.7	0.0	1.6	0.5	0.4	1.1	1.3	0.5	0.4	0.1	0.1	0.1	0.8/20	0.9	0.0	0.2
8 20 92	0.0	0.0	0.0	0.1	0.1	0.0	0.0	0.0	0.0	0.1	0.1	1.6	1.9	1.3	2.7	3.2	3.7	3.6	3.0	1.2	0.1	0.0	0.2	0.2	3.7	0.8/21	1.5	0.0	0.4
8 21 92	0.2	0.3	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.1	0.2	0.8	0.5	0.5	0.4	0.4	0.9	0.7	0.8	0.9	0.4	0.1	0.1	0.1	0.1	0.8/22	3.7	0.0	1.0
8 22 92	0.1	2.5	3.6	1.7	1.9	0.3	0.0	3.1	1.3	1.0	0.7	1.2	0.8	0.7	0.4	0.6	1.2	1.7	1.2	0.9	0.0	0.3	0.7	0.1	0.8/23	3.9	0.0	0.9	
8 23 92	0.1	0.7	0.7	0.5	0.6	0.6	0.7	0.9	0.8	1.0	0.9	0.5	0.5	0.4	0.6	1.2	1.7	1.8	2.5	1.4	0.1	0.1	0.0	0.0	0.1	0.8/24	2.6	0.0	0.5
8 24 92	3.9	1.3	0.7	0.0	0.0	0.0	0.0	0.0	0.0	0.1	0.1	0.2	0.2	0.6	0.8	1.4	2.6	1.8	2.5	1.4	0.1	0.0	0.0	0.0	0.0	0.8/25	2.3	0.0	0.8
8 25 92	1.1	0.1	0.9	0.2	0.3	1.8	0.6	0.2	2.3	1.0	1.0	1.0	0.9	1.3	1.0	1.1	1.4	1.1	1.3	0.9	0.0	0.0	0.0	0.0	0.0	0.8/26	2.3	0.0	0.8
8 26 92																													

PACIFIC GAS AND ELECTRIC COMPANY
 TECHNICAL AND ECOLOGICAL SERVICES
 METEOROLOGICAL DATA FOR STATION AT: Philbrook Dam
 1988: Wind Speed

DATE	HOURLY DATA																				Corrected Daily Values							
	0000	100	200	300	400	500	600	700	800	900	1000	1100	1200	1300	1400	1500	1600	1700	1800	1900	2000	2100	2200	2300	MAX	MIN	MEAN	
9 7 92	0.0	0.0	0.0	0.0	0.0	0.3	0.1	0.4	0.2	0.0	0.0	0.2	1.7	0.4	1.3	0.2	1.3	0.1	1.2	0.3	0.0	0.3	0.1	0.0	0.0	1.7	0.0	0.3
9 8 92	0.0	0.0	0.0	0.0	0.0	0.0	0.1	0.0	0.0	0.2	0.3	1.0	1.2	1.5	2.1	2.5	1.4	2.2	1.3	0.5	0.0	0.1	0.3	0.0	0.0	2.5	0.0	0.6
9 9 92	0.0	0.0	0.0	0.1	0.0	0.0	0.0	0.0	0.0	0.1	0.5	0.2	0.4	0.3	1.4	1.9	1.4	2.0	1.1	0.3	0.0	0.2	0.0	0.1	0.1	2.0	0.0	0.4
9 10 92	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.4	0.3	0.1	0.5	0.4	0.2	0.5	0.2	0.2	0.7	0.2	0.2	0.0	0.0	0.0	0.0	0.7	0.0	0.2
9 11 92	0.0	0.1	0.1	0.0	0.0	0.0	0.0	0.0	0.1	0.8	0.2	0.3	0.3	0.7	0.6	0.8	1.2	0.8	0.3	0.2	0.1	0.0	0.0	0.1	0.1	1.2	0.0	0.3
9 12 92	0.0	0.0	0.0	0.1	0.0	0.0	0.0	0.0	0.1	0.4	1.4	1.1	2.5	0.9	1.4	2.3	2.1	2.2	1.2	1.2	0.1	0.1	0.1	0.0	0.0	2.5	0.0	0.7
9 13 92	0.1	0.1	1.3	0.8	0.9	1.5	0.9	1.1	2.1	0.9	1.1	1.0	0.7	1.3	1.4	1.9	1.9	0.7	0.3	0.0	0.1	0.0	0.0	0.0	0.0	2.1	0.0	0.9
9 14 92	0.0	0.1	0.0	0.0	0.3	0.0	0.0	0.0	0.0	0.4	0.8	0.1	0.0	0.9	0.6	0.6	1.2	0.4	1.4	1.4	0.4	0.0	0.1	0.0	0.0	1.4	0.0	0.4
9 15 92	0.4	0.0	0.0	0.1	0.0	0.1	0.1	0.2	0.2	1.4	0.8	0.1	0.7	0.3	0.8	0.7	1.0	0.7	0.7	0.7	0.0	0.0	0.0	0.0	0.0	0.9	0.0	0.2
9 16 92	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.1	0.4	0.8	0.2	0.9	0.3	0.7	0.1	0.7	0.3	0.1	0.0	0.0	0.0	0.0	0.0	1.4	0.0	0.4
9 17 92	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.4	0.4	0.3	0.4	1.9	0.7	1.1	0.7	0.4	0.1	0.0	0.0	0.0	0.0	1.9	0.0	0.5	
9 18 92	0.0	0.0	0.0	0.1	0.0	4.6	4.5	5.3	4.4	2.0	0.3	0.5	0.7	0.4	1.2	2.1	2.6	2.4	2.2	0.3	0.1	0.1	0.0	0.0	5.3	0.0	1.4	
9 19 92	0.1	0.1	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.2	0.6	1.5	0.4	0.8	0.6	0.5	0.8	0.5	0.4	0.1	0.0	0.0	0.0	0.0	2.0	0.0	0.3	
9 20 92	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.1	1.0	0.4	0.3	0.3	1.5	1.9	2.0	1.8	2.0	0.5	0.1	0.0	0.0	2.0	0.0	0.4	
9 21 92	0.1	0.3	0.2	0.2	0.2	0.6	0.1	0.1	0.1	0.3	0.4	0.3	0.5	0.4	0.6	0.4	0.8	1.3	1.0	0.8	0.0	0.0	0.0	0.0	1.3	0.0	0.4	
9 22 92	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.2	0.0	0.2	1.0	0.5	0.5	0.7	1.0	0.6	0.5	0.3	0.6	0.3	0.4	0.2	0.1	0.2	1.0	0.0	0.3	
9 23 92	1.0	0.1	0.1	0.1	0.1	0.7	0.2	1.1	0.1	0.5	0.4	1.4	0.8	0.7	0.5	1.4	0.3	0.2	0.7	0.2	0.0	0.0	0.0	0.1	1.4	0.0	0.4	
9 24 92	0.0	0.2	0.5	0.1	0.1	0.1	0.7	1.1	0.8	1.0	2.2	1.7	1.8	3.0	1.9	2.1	1.7	2.9	2.4	1.6	0.1	0.0	0.8	4.5	4.8	0.0	1.3	
9 25 92	4.5	5.5	7.5	7.8	7.7	6.6	6.7	5.0	7.5	9.8	9.4	4.4	1.1	0.1	0.6	1.5	1.7	1.5	4.4	5.9	9.4	10.7	12.5	14.4	14.4	14.4	6.2	
9 26 92	10.0	5.7	2.5	1.0	0.8	0.9	1.7	2.0	1.5	1.4	1.1	1.2	1.4	0.3	0.4	1.0	2.3	2.1	1.8	0.0	0.0	0.2	0.0	0.1	10.0	0.0	1.7	
9 27 92	0.0	0.2	0.1	0.0	0.0	0.0	0.0	0.0	0.2	1.2	1.2	1.2	0.8	1.0	0.5	1.6	1.4	1.1	1.4	0.0	0.0	0.0	0.0	0.0	1.8	0.0	0.5	
9 28 92	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.1	0.8	0.7	0.9	0.7	0.4	0.4	0.2	1.0	0.4	0.4	0.2	0.0	0.0	0.0	0.0	1.0	0.0	0.2	
9 29 92	0.0	0.2	0.0	0.0	0.1	0.0	0.0	0.0	0.0	0.0	0.4	0.5	0.5	0.5	0.8	0.5	0.4	0.2	0.4	0.1	0.0	0.0	2.0	3.4	3.4	0.0	0.4	
9 30 92	0.2	0.1	0.1	1.1	1.0	0.1	0.1	0.1	0.8	3.3	0.0	0.4	0.5	0.5	0.8	0.5	0.4	0.2	0.4	0.1	0.0	0.2	2.0	3.3	3.3	0.1	0.7	

1993

PACIFIC GAS AND ELECTRIC COMPANY
 TECHNICAL AND ECOLOGICAL SERVICES
 METEOROLOGICAL DATA FOR STATION AT:

DeSabiola Forebay
 1893 Air Temperature

DATE	HOURLY DATA																Corrected Daily Values												
	0000	100	200	300	400	500	600	700	800	900	1000	1100	1200	1300	1400	1500	1600	1700	1800	1900	2000	2100	2200	2300	MAX	MIN	MEAN		
5 3 93	7.4	6.9	6.4	6.4	6.3	4.5	2.8	2.5	3.9	6.1	9.3	10.5	11.8	11.0	11.4	12.7	13.0	12.3	12.4	11.5	10.2	7.9	7.1	7.2	05/03	13.0	7.1	10.6	
5 4 93	7.4	6.9	6.4	6.4	6.3	4.5	2.8	2.5	3.9	6.1	9.3	10.5	11.8	11.0	11.4	12.7	13.0	12.3	12.4	11.5	10.2	7.9	7.1	7.2	05/04	13.0	7.1	10.6	
5 5 93	7.3	7.4	6.5	6.7	6.4	6.3	4.9	5.7	6.9	11.3	14.4	15.8	16.5	17.2	18.0	18.6	18.9	18.8	18.8	17.2	15.5	13.9	8.9	8.0	8.0	05/05	18.9	4.9	12.5
5 6 93	10.3	10.8	11.0	11.2	11.5	10.9	11.2	11.1	11.4	12.4	13.7	14.8	15.5	15.9	16.2	16.9	18.8	16.2	15.2	13.7	13.3	12.1	11.7	11.1	10.8	05/06	16.9	10.9	13.1
5 7 93	9.1	8.7	7.8	7.1	6.9	7.3	6.4	6.4	7.7	11.0	12.0	13.1	14.0	14.7	15.7	16.5	17.2	18.5	17.0	16.5	14.5	11.0	11.5	10.6	05/07	17.5	8.4	11.7	
5 8 93	8.4	7.8	6.7	5.9	6.2	6.0	4.0	4.9	6.1	10.7	12.5	14.7	15.0	16.0	17.0	18.0	18.2	19.2	19.3	19.3	15.3	13.1	12.5	10.6	05/08	19.3	4.0	12.3	
5 9 93	11.7	11.6	10.5	9.3	7.9	7.5	7.8	7.9	10.5	14.0	19.7	21.5	22.4	22.9	23.6	25.1	26.0	25.8	25.6	25.1	21.7	17.9	16.2	15.6	05/09	26.0	7.6	17.0	
5 10 93	15.9	15.3	15.0	14.7	14.8	11.9	14.4	14.5	15.6	18.6	22.1	24.5	25.5	26.0	26.8	27.2	27.8	27.3	26.1	21.8	18.8	16.8	15.9	05/10	27.8	14.4	20.2		
5 11 93	15.5	15.3	15.0	14.7	14.8	11.9	14.4	14.5	15.6	18.6	22.1	24.5	25.5	26.0	26.8	27.2	27.8	27.3	26.1	21.8	18.8	16.8	15.9	05/11	15.1	7.5	11.7		
5 12 93	15.5	15.3	15.0	14.7	14.8	11.9	14.4	14.5	15.6	18.6	22.1	24.5	25.5	26.0	26.8	27.2	27.8	27.3	26.1	21.8	18.8	16.8	15.9	05/12	14.3	5.0	9.0		
5 13 93	7.1	7.3	6.8	6.5	6.1	5.7	5.4	5.2	6.4	8.0	9.8	11.9	12.5	14.2	15.1	15.4	16.0	16.5	16.4	15.7	13.6	11.4	9.0	8.5	05/13	16.5	5.2	10.3	
5 14 93	8.7	7.2	6.6	6.3	6.3	6.0	5.6	6.0	7.4	11.9	12.5	14.2	15.9	16.9	17.9	18.7	19.2	18.3	19.7	18.0	16.3	12.1	11.7	11.1	05/14	18.7	5.6	12.4	
5 15 93	10.5	10.9	11.5	10.8	9.4	9.6	8.5	8.0	9.2	14.0	17.6	18.5	19.2	20.5	21.4	22.4	22.6	22.5	22.3	21.6	18.7	15.2	14.9	14.1	05/15	22.8	8.0	15.6	
5 16 93	10.5	10.9	11.5	10.8	9.4	9.6	8.5	8.0	9.2	14.0	17.6	18.5	19.2	20.5	21.4	22.4	22.6	22.5	22.3	21.6	18.7	15.2	14.9	14.1	05/16	26.4	8.7	16.9	
5 17 93	14.7	14.4	13.6	13.2	12.3	11.8	11.6	11.4	12.8	15.8	17.8	18.9	19.8	20.1	21.2	21.6	21.8	21.9	21.9	20.2	17.9	16.9	16.0	05/17	23.9	12.9	18.2		
5 18 93	14.4	14.5	14.1	13.2	13.3	13.1	13.0	14.7	15.1	15.0	15.2	17.3	17.9	18.3	18.8	20.1	21.2	21.6	21.9	21.5	21.2	19.2	16.2	14.7	05/18	21.9	11.4	16.5	
5 19 93	14.4	14.5	14.1	13.2	13.3	13.1	13.0	14.7	15.1	15.0	15.2	17.3	17.9	18.3	18.8	20.1	21.2	21.6	21.9	21.5	21.2	19.2	16.2	14.7	05/19	18.9	13.0	15.7	
5 20 93	14.4	14.5	14.1	13.2	13.3	13.1	13.0	14.7	15.1	15.0	15.2	17.3	17.9	18.3	18.8	20.1	21.2	21.6	21.9	21.5	21.2	19.2	16.2	14.7	05/20	17.5	12.0	14.4	
5 21 93	10.5	10.9	9.1	8.9	8.2	8.3	8.0	8.4	10.0	10.8	13.1	14.8	15.2	15.8	17.0	18.2	18.7	19.1	19.8	19.2	17.5	15.3	13.6	12.0	05/21	18.8	8.0	13.4	
5 22 93	10.5	10.9	9.1	8.9	8.2	8.3	8.0	8.4	10.0	10.8	13.1	14.8	15.2	15.8	17.0	18.2	18.7	19.1	19.8	19.2	17.5	15.3	13.6	12.0	05/22	26.0	8.2	17.0	
5 23 93	13.2	13.4	14.0	13.3	13.0	12.8	12.9	13.0	14.1	11.7	14.1	15.2	16.9	17.4	17.1	16.0	15.1	15.4	12.0	12.0	12.0	11.9	15.2	13.9	05/23	23.6	12.6	17.9	
5 24 93	12.7	12.3	12.3	12.2	11.7	11.3	10.9	10.1	11.7	14.1	15.0	16.9	17.4	17.1	16.0	15.1	15.4	12.0	12.0	12.0	11.9	15.2	13.9	05/24	17.4	10.0	13.9		
5 25 93	11.9	12.8	12.5	12.3	12.5	11.8	11.9	11.7	11.5	11.6	12.4	13.8	12.9	13.5	14.4	14.9	15.5	16.2	16.4	16.2	14.4	11.7	12.0	12.0	05/25	16.4	11.4	12.9	
5 26 93	12.3	12.6	12.6	12.3	12.5	11.8	11.9	11.7	11.5	11.6	12.4	13.8	12.9	13.5	14.4	14.9	15.5	16.2	16.4	16.2	14.4	11.7	12.0	12.0	05/26	17.0	11.6	13.4	
5 27 93	11.9	12.1	11.6	11.8	11.9	11.5	11.5	11.2	11.8	13.3	12.8	12.8	13.3	14.3	14.4	13.8	14.8	14.8	14.8	14.8	14.3	12.3	11.9	11.9	05/27	14.8	11.4	12.7	
5 28 93	12.0	11.4	11.3	11.5	11.4	11.5	11.5	11.2	11.8	13.3	12.8	12.8	13.3	14.3	14.4	13.8	14.8	14.8	14.8	14.8	14.3	12.3	11.9	11.9	05/28	16.9	10.2	13.1	
5 29 93	10.1	10.2	10.1	9.8	9.1	8.9	8.9	9.0	10.8	14.3	16.1	16.8	17.9	18.9	20.1	20.8	20.1	18.9	17.9	17.8	18.1	14.5	13.3	13.3	05/29	20.5	8.9	14.3	
5 30 93	13.6	12.8	12.6	12.6	12.6	12.7	12.5	13.0	13.7	14.4	14.4	14.4	15.5	17.5	19.1	18.8	18.1	16.9	16.0	14.7	14.5	14.7	14.4	14.4	05/30	19.1	12.5	14.8	
6 1 93	14.8	14.8	14.8	14.8	14.7	14.9	15.0	14.7	14.4	14.4	14.4	14.4	14.4	15.5	17.5	19.1	18.8	18.1	16.9	16.0	14.7	14.5	14.4	14.4	05/31	15.9	12.0	14.5	
6 2 93	10.2	10.1	11.2	11.2	11.2	11.2	11.2	11.5	12.0	12.2	13.4	14.1	13.7	13.5	14.2	15.4	16.2	16.3	16.2	16.2	14.4	11.7	11.2	10.5	06/01	16.8	9.0	12.1	
6 3 93	9.7	9.8	9.8	9.9	9.9	9.9	9.9	9.9	9.9	9.9	9.9	10.9	11.9	12.2	12.2	12.2	12.2	12.2	12.2	12.2	12.2	10.9	11.4	11.9	06/02	17.1	8.6	12.5	
6 4 93	9.3	9.3	9.3	9.2	9.1	8.6	8.0	7.7	9.8	8.8	9.9	10.1	10.4	10.7	10.8	11.0	11.2	11.2	11.2	11.2	11.2	10.9	10.6	10.7	06/03	12.7	9.1	11.2	
6 5 93	9.5	9.5	9.5	9.5	9.5	9.5	9.5	9.5	9.5	9.5	9.5	9.5	9.5	9.5	9.5	9.5	9.5	9.5	9.5	9.5	9.5	9.5	9.5	9.5	06/04	12.1	7.7	9.5	
6 6 93	10.7	10.8	10.7	10.7	10.8	10.8	10.8	10.9	11.2	11.5	11.8	11.9	12.1	12.6	13.5	14.6	15.3	15.9	15.8	15.8	14.9	12.4	11.6	11.7	06/05	15.9	10.6	12.5	
6 7 93	10.7	10.8	10.7	10.7	10.8	10.8	10.8	10.9	11.2	11.5	11.8	11.9	12.1	12.6	13.5	14.6	15.3	15.9	15.8	15.8	14.9	12.4	11.6	11.7	06/06	15.9	10.6	12.5	
6 8 93	11.2	10.8	10.0	9.4	8.9	8.5	8.4	8.1	9.8	13.7	16.5	17.4	18.5	19.2	20.1	21.6	22.1	22.3	22.2	21.9	20.2	18.2	17.4	15.8	06/08	26.5	10.7	17.9	
6 9 93	11.5	10.8	10.0	9.4	8.9	8.5	8.4	8.1	9.8	13.7	16.5	17.4	18.5	19.2	20.1	21.6	22.1	22.3	22.2	21.9	20.2	18.2	17.4	15.8	06/09	26.5	10.7	17.9	
6 10 93	14.9	15.7	15.5	14.4	14.8	14.5	13.4	12.8	13.9	16.9	17.8	18.2	18.4	20.1	20.8	21.3	22.0	22.8	22.9	22.1	19.8	15.5	13.8	12.3	06/10	22.9	12.8	17.3	
6 11 93	12.5	12.1	11.4	10.8	10.8	10.6	9.6	9.5	10.9	15.6	18.5	18.6	18.0	19.1	20.6	21.5	22.5	23.5	24.2	24.9	24.9	23.5	25.1	25.1	06/11	22.1	9.6	15.4	
6 12 93	11.7	10.9	10.0	9.6	9.6	9.3	9.5	9.5	10.9	15.6	18.5	18.6	18.0	19.1	20.6	21.5	22.5	23.5	24.2	24.9	24.9	23.5	25.1	25.1	06/12	24.9	9.3	16.9	
6 13 93	15.9	14.7	12.7	11.9	11.6	11.5	11.0	11.1	12.6	18.4	22.5	23.2	24.0	25.1	25.6	26.2	27.2	27.6	28.9	27.4	27.9	27.5	26.5	25.1	06/13	27.9	11.0	19.4	
6 14 93	15.5	14.5	14.1	13.7	13.7	12.9	12.7	12.7	14.9	19.9	23.0	24.9	25.4	26.2	27.2	27.6	28.9	28.1	28.2	28.3	27.3	24.7	19.7	17.5	06/14	28.3	12.7	20.4	
6 15 93	17.2	15.0	13.9	13.1	12.5	12.4	13.2	12.2	13.4	17.9	20.7	22.1	23.6	24.9	25.2	26.2	26.8	26.8	26.8	26.8	26.8	25.9	18.2	16.5	06/15	25.9	12.2	18.7	
6 16 93	13.9	13.5	13.8	14.0	13.7	13.1	13.2	12.2	14.4	20.0	22.7	23.9	25.2	26.2	27.0	27.3	28.1	28.8	29.4	29.8	29.1	25.9	21.4	20.9	06/16	27.3	12.2	19.8	
6 17 93	17.5	19.1	18.2	15.5	13.9	12.7	12.2	12.7	14.4	19.4	23.4	26.9	29.1	29.1	30.1	30.9	31.2	31.6	31.0	31.1	30.6	26.7	22.6	20.6	06/17	31.1	16.6	23.8	
6 18 93	19.3	1																											

PACIFIC GAS AND ELECTRIC COMPANY
 TECHNICAL AND ECOLOGICAL SERVICES
 METEOROLOGICAL DATA FOR STATION AT:
 DeSabiá Forebay
 1993 Air Temperature

DATE	HOURLY DATA																Corrected Daily Values												
	0000	100	200	300	400	500	600	700	800	900	1000	1100	1200	1300	1400	1500	1600	1700	1800	1900	2000	2100	2200	2300	2500	MAX	MIN	MEAN	
9 16 93	9.7	9.2	8.2	9.2	8.3	7.7	7.4	7.1	7.6	10.3	13.9	15.9	17.3	18.4	19.3	20.4	21.3	21.8	21.0	18.5	14.9	13.3	12.5	12.6	12.8	21.8	7.1	13.8	
9 19 93	11.9	10.8	11.5	11.3	10.9	9.3	8.4	8.5	8.7	11.2	16.9	19.0	19.9	20.7	21.4	21.9	22.5	22.5	21.5	17.4	14.2	13.1	12.2	11.2	11.2	22.5	8.4	14.9	
9 20 93	11.5	11.7	10.2	9.2	8.8	8.5	9.3	9.2	8.8	13.4	16.9	20.7	21.5	22.4	23.0	23.7	24.0	24.1	23.1	18.6	15.8	14.1	13.7	12.0	12.0	24.1	8.5	15.6	
9 21 93	11.3	10.9	10.3	9.4	9.0	8.8	9.1	8.7	10.1	11.9	18.1	20.5	21.2	22.5	23.2	23.7	23.9	24.1	23.3	18.8	15.4	13.9	12.8	12.1	12.1	24.1	8.7	15.5	
9 22 93	11.1	10.9	10.5	9.8	10.0	11.6	10.3	9.8	9.9	11.5	17.5	19.9	20.6	21.1	21.7	22.3	22.9	23.1	22.1	18.4	15.1	15.2	14.0	13.0	13.0	23.1	9.8	15.6	
9 23 93	11.7	11.7	10.5	10.5	9.7	9.2	9.2	9.5	10.6	12.7	17.2	21.8	22.8	23.5	24.1	24.7	25.1	25.3	24.5	19.0	15.4	14.7	14.7	14.5	14.5	25.3	9.2	16.4	
9 24 93	14.5	14.3	12.8	11.9	13.1	13.5	12.9	12.8	12.8	14.6	21.0	23.2	26.7	26.7	26.3	27.1	27.8	28.4	28.8	21.4	17.1	15.3	14.5	13.4	13.4	28.4	11.9	18.8	
9 25 93	12.6	12.1	11.7	11.4	11.4	10.7	10.7	10.8	10.8	13.2	18.5	24.3	25.7	27.0	27.8	27.9	28.4	28.7	27.2	21.4	17.8	17.6	18.5	16.0	16.0	28.7	10.7	18.4	
9 26 93	14.2	13.9	13.8	13.4	13.8	15.9	16.6	16.4	17.4	18.6	22.6	26.1	26.6	27.8	28.7	29.4	30.2	30.3	27.1	21.8	19.4	18.5	17.0	15.2	15.2	30.3	13.4	20.6	
9 27 93	14.5	14.2	14.2	13.8	13.5	13.2	13.0	13.7	16.8	17.9	21.7	26.9	27.9	29.5	29.5	29.9	30.2	30.0	25.9	21.4	20.7	20.0	19.7	19.3	19.3	30.2	13.0	20.7	
9 28 93	16.0	16.1	14.8	14.0	15.3	14.8	15.9	17.8																			17.8	14.0	15.6

PACIFIC GAS AND ELECTRIC COMPANY
 TECHNICAL AND ECOLOGICAL SERVICES
 METEOROLOGICAL DATA FOR STATION AT:
 DeSaba Forebay
 1993 Solar Radiation

DATE	HOURLY DATA																								Corrected Daily Values				Daily Total
	0000	100	200	300	400	500	600	700	800	900	1000	1100	1200	1300	1400	1500	1600	1700	1800	1900	2000	2100	2200	2300	MAX	MIN	MEAN		
5 4 93	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.02	0.08	0.57	1.12	1.29	1.38	1.39	1.32	1.18	0.94	0.57	0.37	0.07	0.00	0.00	0.00	0.00	0.00	0.00	0.48	11.0	
5 5 93	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.02	0.09	0.15	0.48	0.62	1.06	1.26	1.37	1.39	1.23	0.86	0.59	0.42	0.15	0.05	0.00	0.00	0.00	0.00	0.40	9.7	
5 6 93	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.02	0.09	0.24	0.52	1.02	1.20	1.16	1.19	0.90	0.68	0.61	0.29	0.10	0.04	0.00	0.00	0.00	0.00	0.00	0.35	8.4	
5 7 93	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.02	0.11	0.67	0.64	1.12	1.28	1.39	1.38	1.32	1.17	0.95	0.65	0.37	0.06	0.00	0.00	0.00	0.00	0.00	0.48	11.1	
5 8 93	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.02	0.10	0.67	0.74	1.13	1.28	1.38	1.39	1.32	1.17	0.94	0.68	0.38	0.06	0.00	0.00	0.00	0.00	0.00	0.47	11.2	
5 9 93	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.02	0.10	0.60	0.81	1.12	1.29	1.37	1.36	1.31	1.16	0.94	0.68	0.38	0.10	0.00	0.00	0.00	0.00	0.00	0.47	11.3	
5 10 93	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.02	0.12	0.57	0.81	1.09	1.25	1.37	1.36	1.29	1.13	0.83	0.54	0.09	0.00	0.00	0.00	0.00	0.00	0.00	0.46	11.0	
5 11 93	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.02	0.12	0.55	0.84	1.08	1.25	1.37	1.36	1.29	1.13	0.83	0.54	0.09	0.00	0.00	0.00	0.00	0.00	0.00	0.46	11.0	
5 12 93	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.02	0.12	0.55	0.84	1.08	1.25	1.37	1.36	1.29	1.13	0.83	0.54	0.09	0.00	0.00	0.00	0.00	0.00	0.00	0.46	11.0	
5 13 93	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.02	0.12	0.57	0.88	1.20	1.30	1.35	1.35	1.32	1.14	0.95	0.67	0.37	0.08	0.00	0.00	0.00	0.00	0.00	0.47	11.3	
5 14 93	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.02	0.12	0.57	0.86	1.10	1.27	1.36	1.38	1.30	1.16	0.95	0.68	0.38	0.11	0.00	0.00	0.00	0.00	0.00	0.47	11.3	
5 15 93	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.02	0.14	0.50	0.88	1.10	1.29	1.38	1.37	1.25	1.18	0.98	0.62	0.30	0.09	0.00	0.00	0.00	0.00	0.00	0.45	10.8	
5 16 93	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.02	0.14	0.50	0.88	1.10	1.29	1.38	1.37	1.25	1.18	0.98	0.62	0.30	0.09	0.00	0.00	0.00	0.00	0.00	0.47	11.4	
5 17 93	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.02	0.14	0.50	0.88	1.10	1.29	1.38	1.37	1.25	1.18	0.98	0.62	0.30	0.09	0.00	0.00	0.00	0.00	0.00	0.47	11.4	
5 18 93	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.02	0.16	0.50	0.87	1.08	1.24	1.35	1.30	1.09	0.71	0.55	0.45	0.24	0.09	0.00	0.00	0.00	0.00	0.00	0.40	9.8	
5 19 93	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.02	0.16	0.50	0.87	1.08	1.24	1.35	1.30	1.09	0.71	0.55	0.45	0.24	0.09	0.00	0.00	0.00	0.00	0.00	0.42	10.2	
5 20 93	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.02	0.15	0.19	0.13	0.21	0.82	0.79	0.72	0.77	0.32	0.12	0.05	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.20	4.7	
5 21 93	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.02	0.15	0.20	0.24	0.28	0.68	0.68	0.45	0.42	0.57	0.80	0.53	0.36	0.05	0.00	0.00	0.00	0.00	0.00	0.20	4.7	
5 22 93	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.02	0.13	0.58	0.93	1.02	1.04	0.91	1.18	1.34	1.10	0.96	0.71	0.42	0.13	0.01	0.00	0.00	0.00	0.00	0.49	10.5	
5 23 93	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.02	0.15	0.64	0.92	1.14	1.31	1.39	1.40	1.32	1.18	0.96	0.71	0.42	0.14	0.01	0.00	0.00	0.00	0.00	0.49	11.7	
5 24 93	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.02	0.15	0.62	0.90	1.13	1.28	1.37	1.39	1.33	1.18	0.97	0.71	0.42	0.11	0.01	0.00	0.00	0.00	0.00	0.48	11.6	
5 25 93	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.02	0.15	0.39	0.47	0.66	0.79	0.96	1.42	0.74	0.33	0.16	0.05	0.03	0.01	0.00	0.00	0.00	0.00	0.00	0.28	6.2	
5 26 93	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.02	0.15	0.07	0.30	0.74	0.44	1.08	0.87	0.77	0.68	0.47	0.17	0.03	0.00	0.00	0.00	0.00	0.00	0.00	0.28	6.8	
5 27 93	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.02	0.15	0.09	0.51	0.55	0.89	0.98	0.96	0.67	0.52	0.10	0.12	0.04	0.02	0.00	0.00	0.00	0.00	0.00	0.26	6.4	
5 28 93	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.02	0.15	0.15	0.19	0.43	0.53	0.63	0.54	0.70	0.21	0.75	0.39	0.41	0.16	0.01	0.00	0.00	0.00	0.00	0.22	5.2	
5 29 93	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.02	0.15	0.08	0.48	0.61	0.71	0.85	0.94	1.25	1.20	0.97	0.52	0.39	0.16	0.01	0.00	0.00	0.00	0.00	0.36	8.7	
5 30 93	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.02	0.13	0.48	0.49	0.61	0.71	0.85	0.94	1.25	1.20	0.97	0.52	0.39	0.16	0.01	0.00	0.00	0.00	0.00	0.36	8.7	
5 31 93	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.02	0.19	0.54	0.60	1.04	1.11	1.32	1.36	1.10	0.86	0.48	0.30	0.17	0.08	0.02	0.00	0.00	0.00	0.00	0.39	9.3	
6 1 93	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.02	0.13	0.34	0.34	0.44	0.68	0.80	0.86	1.10	1.11	0.86	0.48	0.30	0.17	0.08	0.02	0.00	0.00	0.00	0.39	9.3	
6 2 93	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.02	0.13	0.58	0.80	0.98	1.25	1.26	1.11	0.86	0.48	0.30	0.17	0.08	0.02	0.00	0.00	0.00	0.00	0.00	0.39	9.3	
6 3 93	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.02	0.08	0.34	0.34	0.44	0.68	0.80	0.86	1.10	1.11	0.86	0.48	0.30	0.17	0.08	0.02	0.00	0.00	0.00	0.39	9.3	
6 4 93	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.02	0.08	0.34	0.34	0.44	0.68	0.80	0.86	1.10	1.11	0.86	0.48	0.30	0.17	0.08	0.02	0.00	0.00	0.00	0.39	9.3	
6 5 93	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.02	0.08	0.34	0.34	0.44	0.68	0.80	0.86	1.10	1.11	0.86	0.48	0.30	0.17	0.08	0.02	0.00	0.00	0.00	0.39	9.3	
6 6 93	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.02	0.08	0.34	0.34	0.44	0.68	0.80	0.86	1.10	1.11	0.86	0.48	0.30	0.17	0.08	0.02	0.00	0.00	0.00	0.39	9.3	
6 7 93	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.02	0.09	0.15	0.27	0.27	0.31	0.32	0.53	0.99	1.15	0.92	0.56	0.41	0.16	0.01	0.00	0.00	0.00	0.00	0.24	6.2	
6 8 93	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.02	0.09	0.15	0.27	0.27	0.31	0.32	0.53	0.99	1.15	0.92	0.56	0.41	0.16	0.01	0.00	0.00	0.00	0.00	0.24	6.2	
6 9 93	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.02	0.15	0.63	0.86	1.12	1.31	1.41	1.40	1.31	1.18	1.01	0.75	0.47	0.16	0.01	0.00	0.00	0.00	0.00	0.49	11.8	
6 10 93	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.02	0.15	0.42	0.88	0.80	1.32	1.32	1.26	1.29	1.21	1.02	0.58	0.24	0.12	0.02	0.00	0.00	0.00	0.00	0.45	10.7	
6 11 93	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.02	0.15	0.63	0.86	1.12	1.31	1.41	1.40	1.31	1.18	1.01	0.75	0.47	0.16	0.01	0.00	0.00	0.00	0.00	0.45	10.7	
6 12 93	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.02	0.15	0.65	0.92	1.14	1.30	1.38	1.40	1.42	1.35	1.22	1.01	0.78	0.49	0.19	0.01	0.00	0.00	0.00	0.50	12.0	
6 13 93	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.02	0.15	0.65	0.92	1.14	1.30	1.38	1.40	1.42	1.35	1.22	1.01	0.78	0.49	0.19	0.01	0.00	0.00	0.00	0.50	12.0	
6 14 93	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.02	0.15	0.64	0.92	1.15	1.31	1.40	1.42	1.36	1.24	1.03	0.77	0.48	0.19	0.02	0.00	0.00	0.00	0.00	0.50	12.0	
6 15 93	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.02	0.15	0.64	0.92	1.15	1.31	1.40	1.42	1.36	1.24	1.03	0.77	0.48	0.19	0.02	0.00	0.00	0.00	0.00	0.50	12.0	
6 16 93	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.02	0.15	0.66	0.94	1.16	1.32	1.41	1.43	1.38	1.22	1.02	0.77	0.49	0.19	0.02	0.00	0.00	0.00	0.00	0.51	12.1	
6 17 93	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.02	0.15	0.66	0.94	1.16	1.32	1.41	1.43	1.38</													

PACIFIC GAS AND ELECTRIC COMPANY
 TECHNICAL AND ECOLOGICAL SERVICES
 DeSable Forebay
 1993 Solar Radiation

DATE	HOURLY DATA																			Corrected Daily Values			Daily Total						
	0000	100	200	300	400	500	600	700	800	900	1000	1100	1200	1300	1400	1500	1600	1700	1800	1900	2000	2100		2200	2300	MAX	MIN	MEAN	
9 19 93	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.03	0.05	0.87	0.92	1.07	1.13	1.11	1.01	0.84	0.60	0.28	0.03	-0.00	-0.00	0.00	0.00	0.00	0.00	1.13	-0.00	0.32	7.7
9 20 93	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.11	0.54	0.90	1.05	1.13	1.11	1.01	0.82	0.57	0.24	0.03	-0.00	-0.00	0.00	0.00	0.00	0.00	1.13	-0.00	0.32	7.8
9 21 93	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.03	0.05	0.87	0.91	1.08	1.13	1.11	1.01	0.82	0.57	0.22	0.03	-0.00	-0.00	0.00	0.00	0.00	0.00	1.13	-0.00	0.32	7.6
9 22 93	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.03	0.07	0.63	0.89	1.03	1.09	1.08	0.97	0.79	0.54	0.21	0.03	-0.00	-0.00	0.00	0.00	0.00	0.00	1.09	-0.00	0.31	7.4
9 23 93	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.03	0.08	0.58	0.92	1.07	1.14	1.12	1.00	0.82	0.57	0.17	0.02	-0.00	-0.00	0.00	0.00	0.00	0.00	1.14	-0.00	0.31	7.5
9 24 93	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.03	0.08	0.58	0.93	1.08	1.14	1.12	1.01	0.82	0.55	0.18	0.02	-0.00	-0.00	0.00	0.00	0.00	0.00	1.14	-0.00	0.31	7.5
9 25 93	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.02	0.07	0.53	0.91	1.06	1.13	1.10	0.99	0.80	0.53	0.16	0.02	-0.00	-0.00	0.00	0.00	0.00	0.00	1.13	-0.00	0.30	7.3
9 26 93	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.02	0.10	0.47	0.93	1.07	1.13	1.10	0.99	0.80	0.53	0.13	0.02	-0.00	-0.00	0.00	0.00	0.00	0.00	1.13	-0.00	0.30	7.3
9 27 93	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.04	0.13	0.45	0.86	0.96	1.14	0.99	0.86	0.71	0.51	0.11	0.02	-0.00	-0.00	0.00	0.00	0.00	0.00	1.14	-0.00	0.28	6.8

PACIFIC GAS AND ELECTRIC COMPANY
 TECHNICAL AND ECOLOGICAL SERVICES
 DeSable Forebay
 1983 Relative Humidity
 METEOROLOGICAL DATA FOR STATION AT:

DATE	HOURLY DATA												Corrected Daily Values																																																																																																																																																																			
	0000	100	200	300	400	500	600	700	800	900	1000	1100	1200	1300	1400	1500	1600	1700	1800	1900	2000	2100	2200	2300	MAX	MIN	MEAN																																																																																																																																																					
	07/10	07/11	07/12	07/13	07/14	07/15	07/16	07/17	07/18	07/19	07/20	07/21	07/22	07/23	07/24	07/25	07/26	07/27	07/28	07/29	07/30	07/31	08/01	08/02				08/03	08/04	08/05	08/06	08/07	08/08	08/09	08/10	08/11	08/12	08/13	08/14	08/15	08/16	08/17	08/18	08/19	08/20	08/21	08/22	08/23	08/24	08/25	08/26	08/27	08/28	08/29	08/30	08/31	09/01	09/02	09/03	09/04	09/05	09/06	09/07	09/08	09/09	09/10	09/11	09/12	09/13	09/14	09/15	09/16	09/17	09/18	09/19	09/20	09/21	09/22	09/23	09/24	09/25	09/26	09/27	09/28	09/29	09/30	09/31	10/01	10/02	10/03	10/04	10/05	10/06	10/07	10/08	10/09	10/10	10/11	10/12	10/13	10/14	10/15	10/16	10/17	10/18	10/19	10/20	10/21	10/22	10/23	10/24	10/25	10/26	10/27	10/28	10/29	10/30	10/31	11/01	11/02	11/03	11/04	11/05	11/06	11/07	11/08	11/09	11/10	11/11	11/12	11/13	11/14	11/15	11/16	11/17	11/18	11/19	11/20	11/21	11/22	11/23	11/24	11/25	11/26	11/27	11/28	11/29	11/30	12/01	12/02	12/03	12/04	12/05	12/06	12/07	12/08	12/09	12/10	12/11	12/12	12/13	12/14	12/15	12/16	12/17	12/18	12/19	12/20	12/21	12/22	12/23	12/24	12/25	12/26	12/27	12/28
7 10 93	7 11 93	7 12 93	7 13 93	7 14 93	7 15 93	7 16 93	7 17 93	7 18 93	7 19 93	7 20 93	7 21 93	7 22 93	7 23 93	7 24 93	7 25 93	7 26 93	7 27 93	7 28 93	7 29 93	7 30 93	7 31 93	8 1 93	8 2 93	8 3 93	8 4 93	8 5 93	8 6 93	8 7 93	8 8 93	8 9 93	8 10 93	8 11 93	8 12 93	8 13 93	8 14 93	8 15 93	8 16 93	8 17 93	8 18 93	8 19 93	8 20 93	8 21 93	8 22 93	8 23 93	8 24 93	8 25 93	8 26 93	8 27 93	8 28 93	8 29 93	8 30 93	8 31 93	9 1 93	9 2 93	9 3 93	9 4 93	9 5 93	9 6 93	9 7 93	9 8 93	9 9 93	9 10 93	9 11 93	9 12 93	9 13 93	9 14 93	9 15 93	9 16 93	9 17 93	9 18 93	9 19 93	9 20 93	9 21 93	9 22 93	9 23 93	9 24 93	9 25 93	9 26 93	9 27 93	9 28 93	9 29 93	9 30 93	9 31 93	10 1 93	10 2 93	10 3 93	10 4 93	10 5 93	10 6 93	10 7 93	10 8 93	10 9 93	10 10 93	10 11 93	10 12 93	10 13 93	10 14 93	10 15 93	10 16 93	10 17 93	10 18 93	10 19 93	10 20 93	10 21 93	10 22 93	10 23 93	10 24 93	10 25 93	10 26 93	10 27 93	10 28 93	10 29 93	10 30 93	10 31 93	11 1 93	11 2 93	11 3 93	11 4 93	11 5 93	11 6 93	11 7 93	11 8 93	11 9 93	11 10 93	11 11 93	11 12 93	11 13 93	11 14 93	11 15 93	11 16 93	11 17 93	11 18 93	11 19 93	11 20 93	11 21 93	11 22 93	11 23 93	11 24 93	11 25 93	11 26 93	11 27 93	11 28 93	11 29 93	11 30 93	11 31 93	12 1 93	12 2 93	12 3 93	12 4 93	12 5 93	12 6 93	12 7 93	12 8 93	12 9 93	12 10 93	12 11 93	12 12 93	12 13 93	12 14 93	12 15 93	12 16 93	12 17 93	12 18 93	12 19 93	12 20 93	12 21 93	12 22 93	12 23 93	12 24 93	12 25 93	12 26 93	12 27 93	12 28 93	12 29 93	12 30 93	12 31 93

PACIFIC GAS AND ELECTRIC COMPANY
 TECHNICAL AND ECOLOGICAL SERVICES
 METEOROLOGICAL DATA FOR STATION AT:

DeSaba Forebay
 1983 Relative Humidity

DATE	HOURLY DATA																			Corrected Daily Values								
	0000	100	200	300	400	500	600	700	800	900	1000	1100	1200	1300	1400	1500	1600	1700	1800	1900	2000	2100	2200	2300	MAX	MIN	MEAN	
9 18 93	52.2	53.3	51.5	55.7	55.9	50.1	51.4	50.7	54.4	55.1	53.3	59.1	55.6	51.4	47.5	45.2	43.0	45.7	55.9	55.9	77.5	83.0	82.8	80.7	83.0	83	43	73
9 19 93	82.0	85.4	81.3	81.0	82.1	86.9	91.4	91.5	88.4	84.4	85.1	84.6	84.8	86.1	81.9	38.0	36.5	36.3	36.9	50.1	78.5	74.2	74.4	80.7	80.7	82	36	68
9 20 93	65.4	64.1	77.0	78.3	79.4	79.7	75.1	76.8	75.6	72.8	56.4	35.7	35.8	33.5	32.2	33.0	32.8	33.9	55.7	67.4	67.4	67.4	60.5	70.7	69/20	80	32	58
9 21 93	71.3	72.3	70.0	69.3	71.1	73.0	74.0	74.4	66.8	74.2	44.1	37.3	37.0	33.2	30.4	27.4	24.0	28.4	48.7	48.7	53.7	58.8	58.5	66.1	66.1	74	24	55
9 22 93	56.2	55.3	57.8	57.8	58.5	45.3	56.3	56.8	59.5	62.7	34.6	34.5	36.4	39.3	33.0	31.6	29.2	27.9	32.7	50.9	51.9	47.5	49.6	53.4	53.4	66	28	48
9 23 93	57.5	45.8	54.7	47.7	50.4	51.3	50.2	46.8	43.8	47.9	43.1	22.8	20.5	19.1	17.1	15.8	14.5	11.8	13.4	33.1	46.8	38.9	28.8	28.9	28.9	58	12	35
9 24 93	26.8	28.2	30.0	30.5	25.1	25.3	28.0	28.7	36.8	41.4	26.1	15.6	13.0	13.1	13.9	13.5	13.1	12.8	16.2	32.1	45.5	46.5	39.9	48.2	48.2	48	13	27
9 25 93	52.0	49.7	50.7	51.7	54.2	49.7	53.8	57.7	57.1	52.3	45.1	21.3	20.2	18.2	17.2	16.3	15.7	18.8	38.8	48.2	48.2	28.7	43.1	43.1	43.1	62	18	39
9 26 93	52.8	52.2	51.5	50.9	48.5	29.4	24.2	24.5	23.9	34.2	29.2	20.9	18.9	18.7	17.5	16.4	15.7	15.6	24.8	43.2	47.1	40.3	53.4	60.4	60.4	60	16	34
9 27 93	51.5	50.5	54.1	53.7	54.5	58.2	59.3	48.0	37.2	46.5	45.5	24.6	19.8	18.7	18.4	17.9	18.9	31.2	48.5	41.7	34.7	28.6	27.0	27.0	62	18	39	
9 28 93	41.2	35.2	48.4	42.1	38.3	39.3	32.4	24.4	46.5	45.5	24.6	19.8	18.7	18.5	18.4	17.9	18.9	31.2	48.5	41.7	34.7	28.6	27.0	27.0	48	24	38	

PACIFIC GAS AND ELECTRIC COMPANY
 TECHNICAL AND ECOLOGICAL SERVICES
 METEOROLOGICAL DATA FOR STATION AT:

DeSaba Forebay
 1993 Wind Speed

DATE	HOURLY DATA																								Corrected Daily Values			
	0000	100	200	300	400	500	600	700	800	900	1000	1100	1200	1300	1400	1500	1600	1700	1800	1900	2000	2100	2200	2300	MAX	MIN	MEAN	
5 3 93	2.0	2.2	1.5	2.2	1.8	0.3	0.5	1.1	0.6	1.6	1.3	1.8	1.3	4.4	0.8	1.1	0.7	1.4	0.7	1.4	0.3	0.7	0.3	0.7	0.2	1.9	0.6	1.2
5 4 93	1.1	0.5	0.9	1.2	1.8	0.5	1.1	0.6	0.7	0.8	2.0	1.8	2.3	1.4	0.7	1.1	1.4	1.7	1.5	0.8	0.8	1.5	1.0	1.4	2.3	0.3	1.1	1.1
5 5 93	0.7	0.7	0.9	1.3	0.8	0.8	0.8	0.2	0.4	0.7	0.7	0.7	2.2	2.3	1.8	2.2	1.3	1.0	0.5	0.3	0.8	1.2	1.0	0.9	2.1	0.2	0.9	0.9
5 6 93	0.9	0.3	0.8	0.2	0.6	0.2	0.4	1.1	1.8	2.0	2.2	2.1	2.0	2.2	1.7	1.4	1.5	0.6	1.3	1.1	0.8	1.0	1.0	0.5	0.7	2.2	0.2	1.1
5 7 93	1.2	0.9	0.6	0.2	0.7	1.2	1.1	1.2	0.6	0.7	1.4	1.8	2.0	1.3	1.5	1.6	1.0	2.0	2.0	2.6	1.7	1.0	2.0	1.1	2.3	0.2	1.3	1.3
5 8 93	1.9	2.1	1.3	0.6	0.6	0.2	0.5	0.7	1.4	0.6	0.7	1.7	2.0	2.0	1.2	1.5	2.3	2.3	1.4	1.1	0.7	0.5	1.0	0.7	2.2	0.2	1.2	1.2
5 9 93	1.2	1.4	0.9	1.3	2.1	2.2	1.6	1.5	1.4	0.5	0.2	1.1	1.2	1.5	1.9	1.1	1.1	1.9	1.0	1.2	1.2	0.8	0.4	0.4	2.8	0.3	1.0	1.0
5 10 93	1.1	0.7	0.7	0.3	1.2	0.4	0.3	0.5	0.4	1.0	2.1	2.6	2.8	1.9	2.3	1.1	1.1	0.9	0.5	0.7	0.8	0.3	1.0	0.9	2.3	0.2	0.8	0.8
5 11 93	0.3	0.6	0.3	0.4	0.6	0.3	0.3	0.2	0.5	0.9	0.6	2.3	1.9	1.1	1.0	1.0	1.0	1.2	0.7	1.4	0.7	0.3	0.4	0.2	2.7	0.1	0.9	0.9
5 12 93	0.9	0.5	0.2	0.5	0.2	1.0	0.7	0.1	0.1	0.7	1.3	1.8	2.7	2.1	1.5	1.5	0.9	1.0	1.5	1.3	0.7	0.3	0.1	0.3	2.5	0.2	1.2	1.2
5 13 93	0.2	1.2	1.1	0.8	0.7	0.9	0.8	1.0	0.3	0.9	2.5	2.2	2.1	2.3	1.3	1.3	1.6	1.9	0.8	0.7	0.5	2.0	1.0	1.0	2.0	0.2	1.1	1.1
5 14 93	1.2	1.2	1.1	0.8	0.6	0.5	0.6	1.1	0.4	0.2	1.5	1.9	1.6	1.9	2.0	1.8	1.4	1.7	1.0	0.9	1.1	1.5	0.3	0.9	2.9	0.3	1.3	1.3
5 15 93	1.4	1.7	1.2	1.2	1.4	1.4	0.6	1.2	0.6	0.8	1.3	1.7	2.1	2.0	1.3	1.0	1.2	1.1	0.6	0.6	0.5	1.1	0.3	0.6	2.0	0.1	1.0	1.0
5 16 93	1.3	1.3	1.3	1.3	1.3	1.5	1.7	1.0	0.8	0.8	1.2	2.2	2.4	2.9	2.2	1.6	1.4	0.6	0.6	0.5	0.5	0.3	0.6	0.9	2.0	0.1	1.0	1.0
5 17 93	0.8	0.6	0.5	0.3	0.7	1.0	1.1	0.7	1.5	0.2	0.1	0.5	1.7	2.0	1.4	1.7	1.5	1.4	1.3	0.9	1.2	0.6	0.7	0.5	1.5	0.1	0.7	0.7
5 18 93	0.4	0.4	0.3	0.2	0.3	0.8	1.1	1.5	0.1	0.3	0.5	0.6	1.3	1.3	0.5	0.5	1.1	1.0	0.6	1.1	0.6	0.1	0.4	0.2	1.5	0.2	0.7	0.7
5 19 93	0.4	0.4	0.4	0.3	0.2	0.3	0.4	0.7	0.8	0.8	0.8	0.8	0.7	0.9	0.5	0.5	1.4	1.5	1.2	1.3	0.0	0.5	0.5	0.4	2.0	0.0	1.0	1.0
5 20 93	0.8	0.8	0.4	0.5	0.6	0.2	0.3	0.4	0.6	0.6	0.8	1.5	2.0	1.5	1.2	1.1	1.1	1.0	1.2	1.3	0.0	1.7	1.3	0.5	1.9	0.2	1.2	1.2
5 21 93	0.9	0.7	1.0	1.0	0.8	0.9	0.4	0.4	0.6	0.6	0.8	1.5	1.9	1.5	1.5	1.2	1.1	1.0	1.0	1.0	1.2	1.3	0.0	0.7	2.6	0.5	1.2	1.2
5 22 93	0.9	0.9	1.4	0.2	0.9	1.8	0.5	1.5	1.6	0.7	1.3	1.6	1.9	1.5	1.7	1.7	1.8	1.0	1.2	1.0	0.5	0.8	1.2	0.9	2.5	0.2	1.0	1.0
5 23 93	1.5	0.9	1.7	1.1	1.8	1.4	1.1	1.0	1.1	0.5	0.9	1.2	2.6	2.1	1.2	1.0	0.9	1.5	1.2	1.0	0.5	0.8	1.2	0.8	2.5	0.2	1.0	1.0
5 24 93	1.4	1.2	1.1	1.2	1.1	1.3	0.9	0.9	0.7	0.2	0.8	0.5	0.9	1.7	1.7	2.5	1.5	1.6	1.0	0.3	0.4	0.7	0.5	0.7	2.5	0.2	1.0	1.0
5 25 93	0.7	0.5	0.2	0.3	0.2	0.0	0.2	0.3	0.1	0.3	0.5	0.1	0.8	1.0	0.8	0.9	1.0	0.8	0.9	0.2	0.3	0.5	0.2	0.2	1.0	0.0	0.8	0.8
5 26 93	1.1	0.5	0.3	0.1	0.1	0.1	0.1	0.2	0.2	0.3	0.6	1.1	0.8	1.5	1.4	1.4	1.0	0.8	1.5	1.1	0.6	0.3	0.5	0.5	1.5	0.1	0.5	0.5
5 27 93	0.4	0.3	0.1	0.2	0.1	0.3	0.1	0.3	0.2	0.2	0.2	0.1	0.5	1.2	0.8	0.6	0.8	0.8	1.5	1.1	0.6	0.3	0.5	0.5	1.5	0.1	0.5	0.5
5 28 93	0.3	0.8	0.8	1.2	1.0	0.8	0.2	0.4	0.4	0.7	1.2	0.9	0.8	0.8	0.8	1.1	0.8	0.8	0.8	0.7	0.5	0.8	0.7	0.9	1.2	0.2	0.8	0.8
5 29 93	0.4	0.5	0.3	0.8	1.2	1.0	0.8	0.2	0.4	0.7	1.2	0.9	0.8	0.8	0.8	1.1	0.8	0.8	1.0	0.8	0.7	0.5	0.8	1.1	0.8	0.1	0.7	0.7
5 30 93	0.2	0.5	0.4	1.2	1.4	0.8	0.6	0.4	0.9	1.3	1.6	2.0	1.9	1.5	1.0	1.3	1.4	1.4	0.9	0.7	0.5	0.8	1.1	0.8	1.4	0.0	0.7	0.7
5 31 93	0.8	0.7	0.7	0.7	0.4	0.9	1.2	1.1	0.5	0.4	0.6	1.4	0.7	0.8	0.7	1.5	1.0	0.9	1.0	0.5	0.2	0.6	0.8	0.5	1.5	0.0	0.8	0.8
6 1 93	0.4	0.3	0.4	0.5	0.2	0.3	0.4	0.5	0.6	0.9	0.9	1.3	1.1	1.5	1.4	1.4	1.3	1.4	1.3	0.6	0.4	0.9	1.6	0.7	1.5	0.2	0.7	0.7
6 2 93	0.3	0.3	0.3	0.5	0.2	0.2	0.2	0.2	0.2	0.5	0.7	1.7	0.7	1.1	1.4	1.2	1.4	1.3	0.6	0.4	0.9	1.6	0.7	0.1	2.2	0.1	1.0	1.0
6 3 93	1.0	0.9	0.9	1.0	0.8	1.0	0.9	0.6	0.5	0.7	2.0	2.1	2.2	1.5	2.1	1.5	0.9	1.1	0.3	0.4	0.8	0.4	0.8	0.4	2.2	0.1	1.0	1.0
6 4 93	0.2	0.3	0.3	0.2	0.3	0.2	0.4	0.3	0.1	0.4	0.5	0.7	0.8	0.9	0.7	0.2	1.5	0.8	0.2	0.2	0.2	0.2	0.2	0.3	0.7	0.6	0.5	0.5
6 5 93	0.7	0.2	0.3	0.3	0.2	0.4	0.5	0.3	0.1	0.4	0.5	1.0	1.5	0.8	0.6	0.8	1.2	0.7	0.5	0.4	0.5	0.4	0.5	0.5	1.6	0.1	0.5	0.5
6 6 93	0.2	0.3	0.3	0.2	0.3	0.2	0.2	0.2	0.3	0.3	0.3	0.3	0.3	0.5	0.1	0.2	0.0	0.3	0.6	0.4	0.2	0.1	0.1	0.4	0.7	0.0	0.3	0.3
6 7 93	0.3	0.0	0.2	0.0	0.1	0.0	0.0	0.0	0.2	0.3	0.3	0.3	0.7	0.5	0.1	0.2	0.0	0.3	0.6	0.4	0.2	0.1	0.1	0.4	0.7	0.0	0.6	0.6
6 8 93	0.5	0.5	0.5	0.3	0.5	0.4	0.6	1.7	1.8	1.9	0.6	1.0	1.1	1.8	1.3	1.2	1.3	1.2	1.4	1.1	0.8	1.4	1.0	0.7	1.8	0.3	1.0	1.0
6 9 93	0.8	0.8	0.9	0.8	0.8	1.1	1.0	0.6	1.0	1.1	1.8	1.5	1.3	1.3	1.8	1.4	1.6	0.9	0.9	0.4	1.2	0.6	1.1	1.2	2.1	0.3	1.2	1.2
6 10 93	0.8	1.0	0.8	0.9	2.0	1.5	1.8	2.1	1.1	1.0	0.8	0.3	1.6	1.5	1.3	1.8	1.4	1.6	0.9	0.9	0.4	1.2	0.6	1.1	2.2	0.1	1.1	1.1
6 11 93	0.9	0.7	0.5	0.2	0.1	0.1	0.8	0.9	0.7	0.4	1.8	1.5	2.2	1.8	1.1	1.2	1.2	1.2	1.2	1.1	1.2	0.1	1.7	0.9	2.2	0.1	1.1	1.1
6 12 93	0.8	1.6	1.4	1.7	1.0	1.4	1.5	1.4	1.3	0.9	0.7	1.7	1.7	1.1	1.6	2.5	2.6	2.2	1.0	1.8	2.4	2.0	0.6	0.4	1.9	0.6	1.1	1.1
6 13 93	1.6	0.7	0.6	1.0	1.2	0.5	1.5	1.2	1.2	0.4	1.6	1.6	1.9	1.6	2.2	1.5	1.4	1.1	1.1	1.1	1.4	1.9	1.5	1.7	2.2	0.4	1.2	1.2
6 14 93	0.3	1.1	0.4	0.6	0.5	1.3	0.3	0.7	0.7	0.5	0.9	1.1	1.4	1.8	1.2	1.3	1.1	1.3	0.7	1.1	0.8	1.0	1.5	1.7	2.2	0.3	1.0	1.0
6 15 93	1.5	1.0	0.8	0.8	0.8	0.5	0.9	0.7	0.3	0.5	1.3	2.0	1.5	1.1	1.4	1.3	1.4	1.4	1.8	1.1	2.1	1.9	0.3	1.4	2.1	0.3	1.2	1.2
6 16 93	0.7	0.6	1.8	1.3	0.9	0.9	0.8	1.8	1.1	0.6	1.9	1.0	1.7	2.2	4.1	1.5	2.1	1.8	1.3	2.1	1.3	1.9	0.9	1.3	4.1	0.6	1.4	1.4
6 17 93	0.4	1.3	1.1	0.7	0.8	1.4	0.8	0.9	1.0	1.1	1.7	1.9	1.7	1.8	1.8	1.5	1.8	1.5	1.8	1.3	2.1	1.3	1.9	0.9	1.8	0.2	0.9	0.9
6 18 93	0.9	1.1	0.4	0.6	0.7	0.7	0.6	0.3	0.2	0.3	0.5	0.7	1.5	0.8	1.1	0.8	1.1	1.8	0.8	0.9	1.2	1.1	0.8	1.2	2.1	0.4	1.3	1.3
6 19 93	1.2	2.0	1.9	2.1	1.7	1.7	2.0	1.1	0.8	1.2	1.5	1.2	1.9	1.6	1.1	1.0	1.0	0.8	0.9	0.5	1.0	1.0	1.3	1.3	2.1	0.6	1.4	1.4
6 20 93	1.4	1.4	1.3	1.2	1.2	1.5	1.3	0.9	1.1	0.5	0.8	0.9	1.3	1.0	0.9	1.0	0.9	1.0	1.4	1.1	0.9	0.4						

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 1993 Wind Speed

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	0000	100	200	300	400	500	600	700	800	900	1000	1100	1200	1300	1400	1500	1600	1700	1800	1900	2000	2100	2200	2300	MAX	MIN	MEAN	
7 10 93	1.9	1.1	1.4	1.0	1.2	1.5	1.3	1.6	1.3	1.2	1.0	1.0	1.0	1.9	0.20	1.20	1.10	1.20	1.10	0.90	1.70	1.20	1.40	1.30	1.7	0.2	1.1	
7 11 93	1.0	1.4	1.0	1.2	1.5	1.3	1.6	1.3	1.2	1.0	1.0	1.0	1.0	1.9	1.8	1.1	1.3	1.0	1.1	1.1	0.2	1.9	2.3	0.7	1.1	1.6	1.0	1.3
7 12 93	0.6	0.3	1.5	0.5	1.3	0.5	0.6	0.6	1.0	1.2	0.3	1.6	1.7	1.8	1.6	0.9	1.0	1.0	0.9	1.2	1.1	2.2	0.3	0.2	2.3	0.2	0.2	1.2
7 13 93	0.5	1.0	1.1	0.7	0.1	0.5	0.0	0.0	0.0	0.2	1.8	1.8	1.9	2.3	1.7	1.9	1.3	1.5	1.1	1.0	0.8	0.3	1.4	0.6	1.8	0.3	0.0	1.0
7 14 93	0.3	0.8	0.3	0.3	0.7	0.2	0.1	0.2	0.9	0.2	1.0	2.4	3.8	2.2	1.5	1.3	1.5	1.1	0.7	0.7	1.5	0.9	0.9	0.5	2.3	0.0	1.1	1.4
7 15 93	1.7	1.1	0.7	1.3	0.7	0.2	0.1	0.2	0.8	0.5	1.2	1.7	1.3	1.5	1.8	1.7	1.9	0.9	0.9	1.0	0.8	1.7	0.4	1.3	1.9	0.1	1.1	1.1
7 16 93	1.7	0.9	1.2	1.4	1.0	0.5	0.7	0.3	0.6	0.1	1.3	2.1	2.4	2.8	1.4	1.0	1.3	1.1	1.2	0.4	1.1	0.4	1.1	0.4	2.6	0.1	1.1	1.1
7 17 93	0.2	0.6	0.1	0.4	0.8	0.1	0.4	0.5	0.7	0.1	0.3	0.9	1.5	1.2	1.3	1.4	1.1	0.9	1.1	0.8	3.7	0.4	1.0	1.0	3.7	0.1	0.9	0.9
7 18 93	0.4	0.9	1.3	0.8	0.0	1.1	0.2	0.4	0.3	0.2	0.5	0.8	1.8	1.2	1.0	1.4	1.7	1.0	0.8	1.0	1.6	0.8	0.8	1.6	1.8	0.0	0.9	1.1
7 19 93	0.4	0.9	1.3	0.8	0.0	1.1	0.2	0.4	0.3	0.2	0.5	0.8	1.8	1.2	1.0	1.4	1.7	1.0	0.8	1.0	1.6	0.8	0.8	1.6	1.8	0.0	0.9	1.1
7 20 93	1.8	1.5	1.1	0.5	0.8	0.5	0.8	0.9	1.1	0.8	0.6	1.3	1.5	1.9	1.7	1.3	2.0	1.0	0.7	1.0	2.0	1.9	1.1	1.2	2.0	0.0	1.1	1.1
7 21 93	1.3	1.0	1.0	0.9	0.7	0.8	0.6	1.3	0.7	0.4	0.8	1.1	1.4	1.7	1.3	2.0	1.0	0.7	1.0	0.0	2.0	1.9	1.1	1.2	2.0	0.0	1.1	1.1
7 22 93	1.2	1.3	1.3	1.3	1.3	1.3	1.3	1.3	1.3	1.2	0.3	1.4	1.0	1.3	0.7	1.0	1.8	1.3	2.3	1.9	1.8	1.2	0.9	1.7	2.3	0.3	1.3	1.3
7 23 93	1.4	1.4	1.5	0.5	1.2	1.3	1.6	2.0	1.4	1.4	0.8	0.5	1.4	1.4	1.3	1.5	1.1	0.8	1.1	0.4	2.2	1.6	0.5	1.9	2.2	0.4	1.3	1.2
7 24 93	1.2	1.9	2.2	0.5	1.6	0.4	0.9	1.6	1.9	1.9	0.7	1.4	1.8	1.0	1.2	1.1	1.1	0.7	0.8	1.5	1.9	2.2	0.8	1.8	2.2	0.4	1.3	1.2
7 25 93	1.2	1.8	1.4	1.8	1.4	0.7	1.1	1.1	1.1	1.3	0.5	0.9	1.7	1.4	1.1	1.3	1.3	1.4	0.8	0.8	1.4	0.8	1.8	1.8	2.2	0.5	1.2	1.2
7 26 93	1.5	1.8	1.4	1.5	1.4	1.4	1.5	1.5	1.6	1.3	0.8	0.9	1.7	1.4	1.1	1.6	1.7	0.7	0.9	0.9	1.7	2.0	1.8	2.3	2.1	0.3	1.3	1.3
7 27 93	1.5	1.8	1.4	1.5	1.4	1.4	1.5	1.5	1.6	1.3	0.8	0.9	1.7	1.4	1.1	1.6	1.7	0.7	0.9	0.9	1.7	2.0	1.8	2.3	2.1	0.3	1.3	1.3
7 28 93	1.5	1.8	1.4	1.5	1.4	1.4	1.5	1.5	1.6	1.3	0.8	0.9	1.7	1.4	1.1	1.6	1.7	0.7	0.9	0.9	1.7	2.0	1.8	2.3	2.1	0.3	1.3	1.3
7 29 93	1.5	1.8	1.4	1.5	1.4	1.4	1.5	1.5	1.6	1.3	0.8	0.9	1.7	1.4	1.1	1.6	1.7	0.7	0.9	0.9	1.7	2.0	1.8	2.3	2.1	0.3	1.3	1.3
7 30 93	1.5	1.8	1.4	1.5	1.4	1.4	1.5	1.5	1.6	1.3	0.8	0.9	1.7	1.4	1.1	1.6	1.7	0.7	0.9	0.9	1.7	2.0	1.8	2.3	2.1	0.3	1.3	1.3
7 31 93	1.5	1.8	1.4	1.5	1.4	1.4	1.5	1.5	1.6	1.3	0.8	0.9	1.7	1.4	1.1	1.6	1.7	0.7	0.9	0.9	1.7	2.0	1.8	2.3	2.1	0.3	1.3	1.3
8 1 93	1.5	1.8	1.4	1.5	1.4	1.4	1.5	1.5	1.6	1.3	0.8	0.9	1.7	1.4	1.1	1.6	1.7	0.7	0.9	0.9	1.7	2.0	1.8	2.3	2.1	0.3	1.3	1.3
8 2 93	1.5	1.8	1.4	1.5	1.4	1.4	1.5	1.5	1.6	1.3	0.8	0.9	1.7	1.4	1.1	1.6	1.7	0.7	0.9	0.9	1.7	2.0	1.8	2.3	2.1	0.3	1.3	1.3
8 3 93	1.5	1.8	1.4	1.5	1.4	1.4	1.5	1.5	1.6	1.3	0.8	0.9	1.7	1.4	1.1	1.6	1.7	0.7	0.9	0.9	1.7	2.0	1.8	2.3	2.1	0.3	1.3	1.3
8 4 93	1.5	1.8	1.4	1.5	1.4	1.4	1.5	1.5	1.6	1.3	0.8	0.9	1.7	1.4	1.1	1.6	1.7	0.7	0.9	0.9	1.7	2.0	1.8	2.3	2.1	0.3	1.3	1.3
8 5 93	1.5	1.8	1.4	1.5	1.4	1.4	1.5	1.5	1.6	1.3	0.8	0.9	1.7	1.4	1.1	1.6	1.7	0.7	0.9	0.9	1.7	2.0	1.8	2.3	2.1	0.3	1.3	1.3
8 6 93	1.5	1.8	1.4	1.5	1.4	1.4	1.5	1.5	1.6	1.3	0.8	0.9	1.7	1.4	1.1	1.6	1.7	0.7	0.9	0.9	1.7	2.0	1.8	2.3	2.1	0.3	1.3	1.3
8 7 93	1.5	1.8	1.4	1.5	1.4	1.4	1.5	1.5	1.6	1.3	0.8	0.9	1.7	1.4	1.1	1.6	1.7	0.7	0.9	0.9	1.7	2.0	1.8	2.3	2.1	0.3	1.3	1.3
8 8 93	1.5	1.8	1.4	1.5	1.4	1.4	1.5	1.5	1.6	1.3	0.8	0.9	1.7	1.4	1.1	1.6	1.7	0.7	0.9	0.9	1.7	2.0	1.8	2.3	2.1	0.3	1.3	1.3
8 9 93	1.5	1.8	1.4	1.5	1.4	1.4	1.5	1.5	1.6	1.3	0.8	0.9	1.7	1.4	1.1	1.6	1.7	0.7	0.9	0.9	1.7	2.0	1.8	2.3	2.1	0.3	1.3	1.3
8 10 93	1.5	1.8	1.4	1.5	1.4	1.4	1.5	1.5	1.6	1.3	0.8	0.9	1.7	1.4	1.1	1.6	1.7	0.7	0.9	0.9	1.7	2.0	1.8	2.3	2.1	0.3	1.3	1.3
8 11 93	1.5	1.8	1.4	1.5	1.4	1.4	1.5	1.5	1.6	1.3	0.8	0.9	1.7	1.4	1.1	1.6	1.7	0.7	0.9	0.9	1.7	2.0	1.8	2.3	2.1	0.3	1.3	1.3
8 12 93	1.5	1.8	1.4	1.5	1.4	1.4	1.5	1.5	1.6	1.3	0.8	0.9	1.7	1.4	1.1	1.6	1.7	0.7	0.9	0.9	1.7	2.0	1.8	2.3	2.1	0.3	1.3	1.3
8 13 93	1.5	1.8	1.4	1.5	1.4	1.4	1.5	1.5	1.6	1.3	0.8	0.9	1.7	1.4	1.1	1.6	1.7	0.7	0.9	0.9	1.7	2.0	1.8	2.3	2.1	0.3	1.3	1.3
8 14 93	1.5	1.8	1.4	1.5	1.4	1.4	1.5	1.5	1.6	1.3	0.8	0.9	1.7	1.4	1.1	1.6	1.7	0.7	0.9	0.9	1.7	2.0	1.8	2.3	2.1	0.3	1.3	1.3
8 15 93	1.5	1.8	1.4	1.5	1.4	1.4	1.5	1.5	1.6	1.3	0.8	0.9	1.7	1.4	1.1	1.6	1.7	0.7	0.9	0.9	1.7	2.0	1.8	2.3	2.1	0.3	1.3	1.3
8 16 93	1.5	1.8	1.4	1.5	1.4	1.4	1.5	1.5	1.6	1.3	0.8	0.9	1.7	1.4	1.1	1.6	1.7	0.7	0.9	0.9	1.7	2.0	1.8	2.3	2.1	0.3	1.3	1.3
8 17 93	1.5	1.8	1.4	1.5	1.4	1.4	1.5	1.5	1.6	1.3	0.8	0.9	1.7	1.4	1.1	1.6	1.7	0.7	0.9	0.9	1.7	2.0	1.8	2.3	2.1	0.3	1.3	1.3
8 18 93	1.5	1.8	1.4	1.5	1.4	1.4	1.5	1.5	1.6	1.3	0.8	0.9	1.7	1.4	1.1	1.6	1.7	0.7	0.9	0.9	1.7	2.0	1.8	2.3	2.1	0.3	1.3	1.3
8 19 93	1.5	1.8	1.4	1.5	1.4	1.4	1.5	1.5	1.6	1.3	0.8	0.9	1.7	1.4	1.1	1.6	1.7	0.7	0.9	0.9	1.7	2.0	1.8	2.3	2.1	0.3	1.3	1.3
8 20 93	1.5	1.8	1.4	1.5	1.4	1.4	1.5	1.5	1.6	1.3	0.8	0.9	1.7	1.4	1.1	1.6	1.7	0.7	0.9	0.9	1.7	2.0	1.8	2.3	2.1	0.3	1.3	1.3
8 21 93	1.5	1.8	1.4	1.5	1.4	1.4	1.5	1.5	1.6	1.3	0.8	0.9	1.7	1.4	1.1	1.6	1.7	0.7	0.9	0.9	1.7	2.0	1.8	2.3	2.1	0.3	1.3	1.3
8 22 93	1.5	1.8	1.4	1.5	1.4	1.4	1.5	1.5	1.6	1.3	0.8	0.9	1.7	1.4	1.1	1.6	1.7	0.7	0.9	0.9	1.7	2.0	1.8	2.3	2.1	0.3	1.3	1.3
8 23 93	1.5	1.8	1.4	1.5	1.4	1.4	1.5	1.5	1.6	1.3	0.8	0.9	1.7	1.4	1.1	1.6	1.7	0.7	0.9	0.9	1.7	2.0	1.8	2.3	2.1	0.3	1.3	1.3
8 24 93	1.5	1.8	1.4	1.5	1.4	1.4	1.5	1.5	1.6	1.3	0.8	0.9	1.7	1.4	1.1	1.6	1.7	0.7	0.9	0.9	1.7	2.0	1.8	2.3	2.1	0.3	1.3	1.3
8 25 93	1.5	1.8	1.4	1.5	1.4	1.4	1.5	1.5	1.6	1.3	0.8	0.9	1.7	1.4	1.1	1.6	1.7	0.7	0.9	0.9	1.7	2.0	1.8	2.3	2.1	0.3	1.3	1.3
8 26 93	1.5	1.8	1.4	1.5	1.4	1.4	1.5	1.5	1.6	1.3	0.8	0.9	1.7	1.4	1.1	1.6	1.7	0.7	0.9	0.9	1.7	2.0	1.8	2.3	2.1	0.3	1.3	1.3
8 27 93	1.5	1.8	1.4	1.5	1.4	1.4	1.5	1.5	1.6	1.3	0.8	0.9	1.7	1.4	1.1	1.6	1.7	0.7	0.9	0.9	1.7	2.0	1.8	2.3	2.1	0.3	1.3	1.3
8 28 93	1.5	1.8	1.4	1.5	1.4	1.4	1.5	1.5	1.6	1.3	0.8	0.9	1.7	1.4	1.1													

PACIFIC GAS AND ELECTRIC COMPANY
 TECHNICAL AND ECOLOGICAL SERVICES
 METEOROLOGICAL DATA FOR STATION AT:

DeSobia Forebay
 1993 Wind Speed

DATE	HOURLY DATA																			Corrected Daily Values							
	0000	100	200	300	400	500	600	700	800	900	1000	1100	1200	1300	1400	1500	1600	1700	1800	1900	2000	2100	2200	2300	MAX	MIN	MEAN
9 18 93	0.2	0.8	0.3	0.3	0.1	0.0	0.0	0.0	0.0	0.3	1.3	1.8	1.7	1.5	1.0	0.9	0.7	0.7	0.6	0.3	0.9	0.5	0.7	1.2	1.7	0.0	0.8
9 19 93	1.0	0.5	1.5	1.7	0.8	0.8	0.4	1.0	0.0	0.1	0.7	1.5	1.8	1.7	1.4	0.8	1.3	0.5	0.5	1.3	1.9	0.8	0.0	1.2	1.9	0.0	1.0
9 20 93	0.5	0.4	0.9	0.1	0.0	0.0	0.4	0.2	0.1	0.3	0.3	1.1	1.2	0.9	0.7	0.9	0.7	0.9	0.2	1.2	1.3	0.6	0.4	0.8	1.3	0.0	0.5
9 21 93	1.6	1.9	0.4	0.1	0.8	0.3	0.5	0.0	0.8	0.7	0.7	1.3	1.4	1.3	1.2	1.3	0.7	0.5	0.5	1.1	1.3	0.9	0.2	0.5	1.9	0.0	0.8
9 22 93	0.2	0.5	0.9	0.4	0.7	1.3	1.0	0.7	0.8	0.4	0.6	1.4	1.7	1.6	1.2	1.0	0.8	0.7	0.9	0.8	0.8	1.1	1.1	1.0	1.7	0.2	0.9
9 23 93	0.2	1.3	0.4	0.5	0.4	0.1	0.3	0.8	1.4	1.3	0.8	1.2	1.8	1.3	1.4	1.5	1.0	0.8	0.8	2.2	1.8	0.4	1.8	1.4	2.2	0.1	1.0
9 24 93	1.0	1.1	1.1	1.1	1.1	1.6	1.3	1.0	1.1	0.9	0.7	0.4	0.8	1.2	1.8	1.7	1.4	0.8	0.4	1.0	0.7	0.5	0.6	1.4	1.8	0.4	1.0
9 25 93	1.1	1.2	1.0	1.1	1.4	0.1	0.7	2.0	0.7	0.3	0.4	1.1	1.4	0.8	1.6	1.2	0.8	0.5	0.6	1.3	1.9	1.5	2.1	0.9	2.1	0.1	1.1
9 26 93	1.4	1.4	1.0	1.4	1.3	1.2	1.1	1.1	1.3	1.1	0.2	1.3	1.8	1.8	1.3	1.8	0.9	0.7	1.3	1.5	1.1	1.5	0.9	1.6	1.8	0.2	1.3
9 27 93	1.9	1.8	1.2	1.7	1.9	1.3	1.9	1.0	1.7	1.4	0.7	0.8	1.7	1.3	0.9	0.9	0.9	0.5	1.7	1.3	1.4	1.4	1.4	1.3	1.9	0.5	1.3
9 28 93	0.2	0.7	1.7	0.2	0.4	0.4	0.9	1.6	1.7	1.4	0.7	0.8	1.7	1.3	0.9	0.9	0.9	0.5	1.7	1.3	1.4	1.4	1.4	1.3	1.7	0.2	0.8

Appendix F

TIME-OF-TRAVEL RESULTS

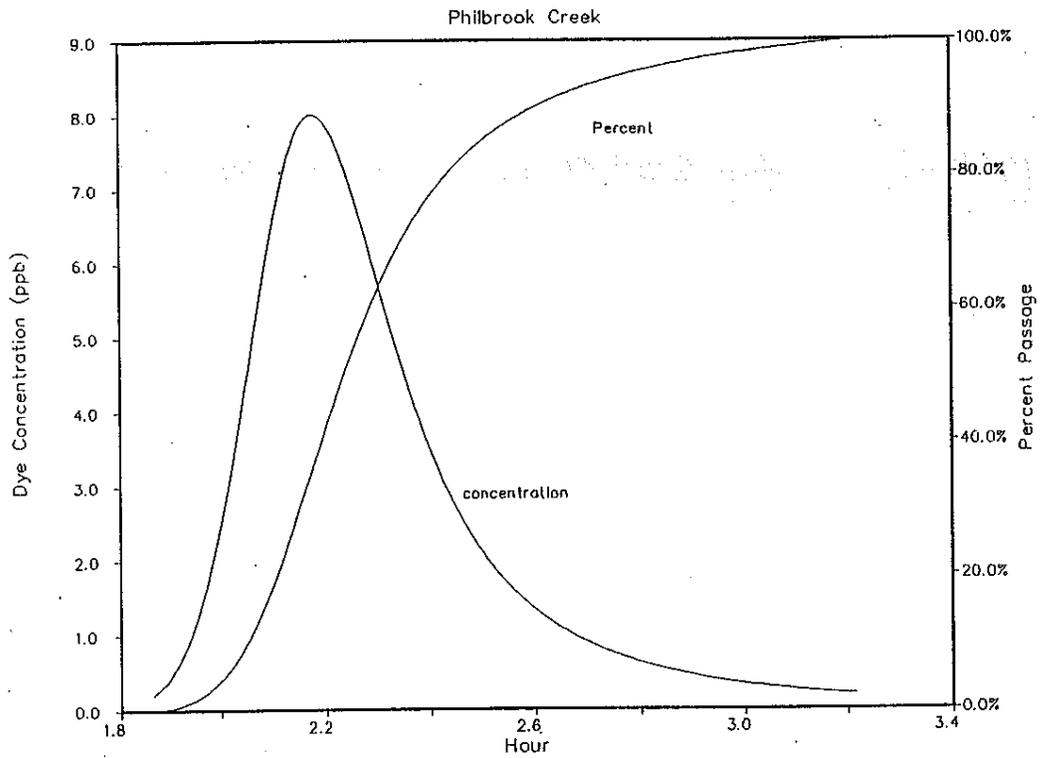
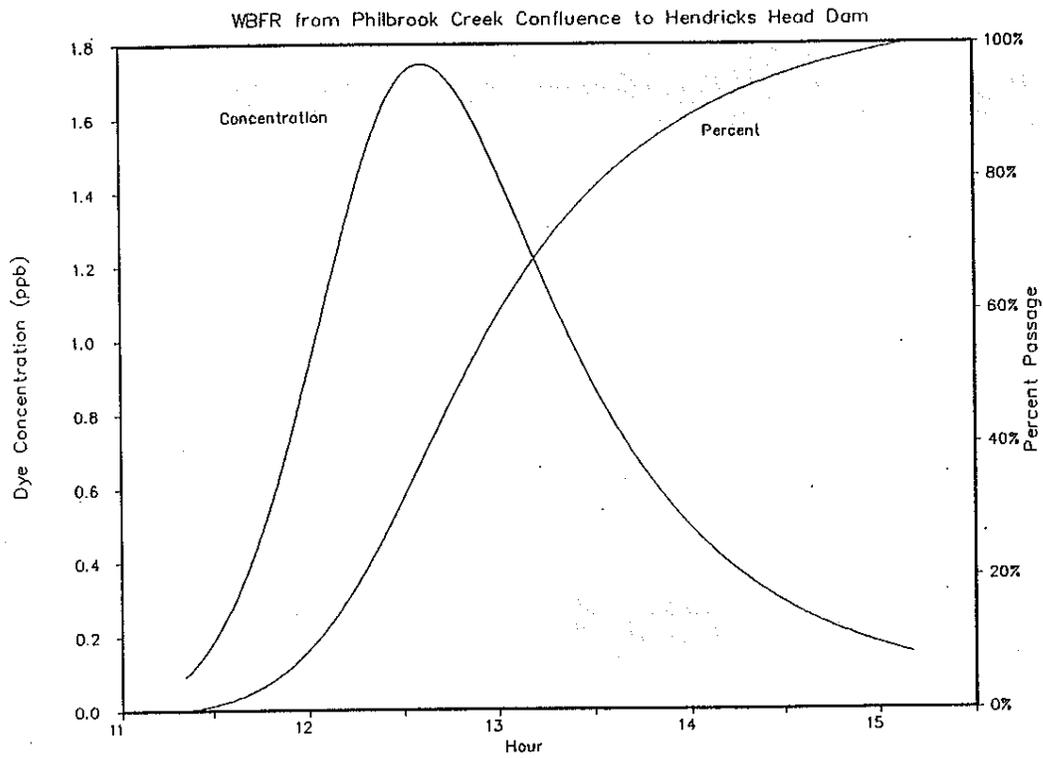


Figure F-1. Results of time-of-travel dye study for the WBFR from Philbrook Creek to Hendricks Head Dam and Philbrook Creek.

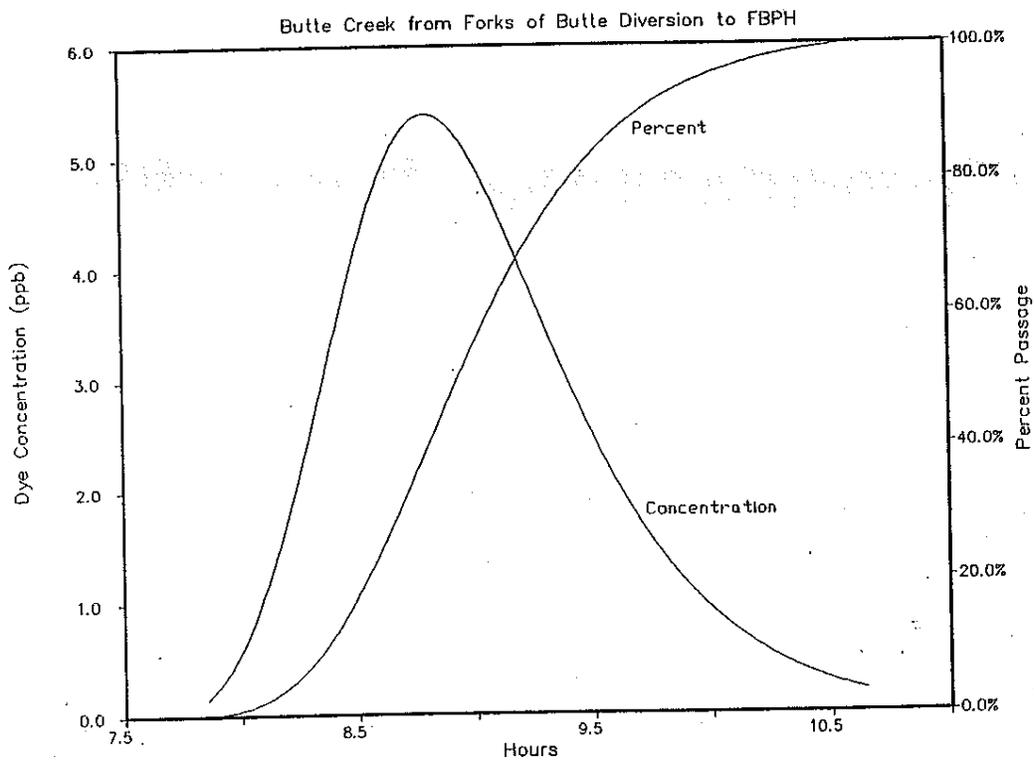
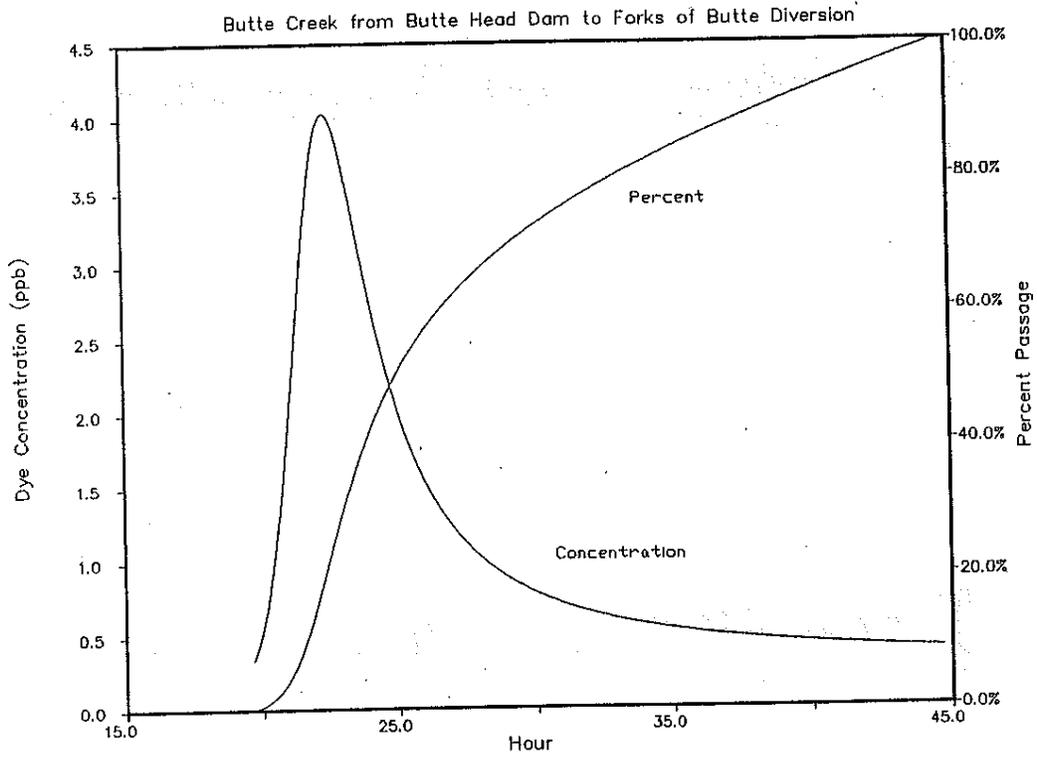


Figure F-2. Results of time-of-travel dye study for Butte Creek from Butte Head Dam to forks of Butte Dam and forks of Butte Dam to Forks of Butte Powerhouse.

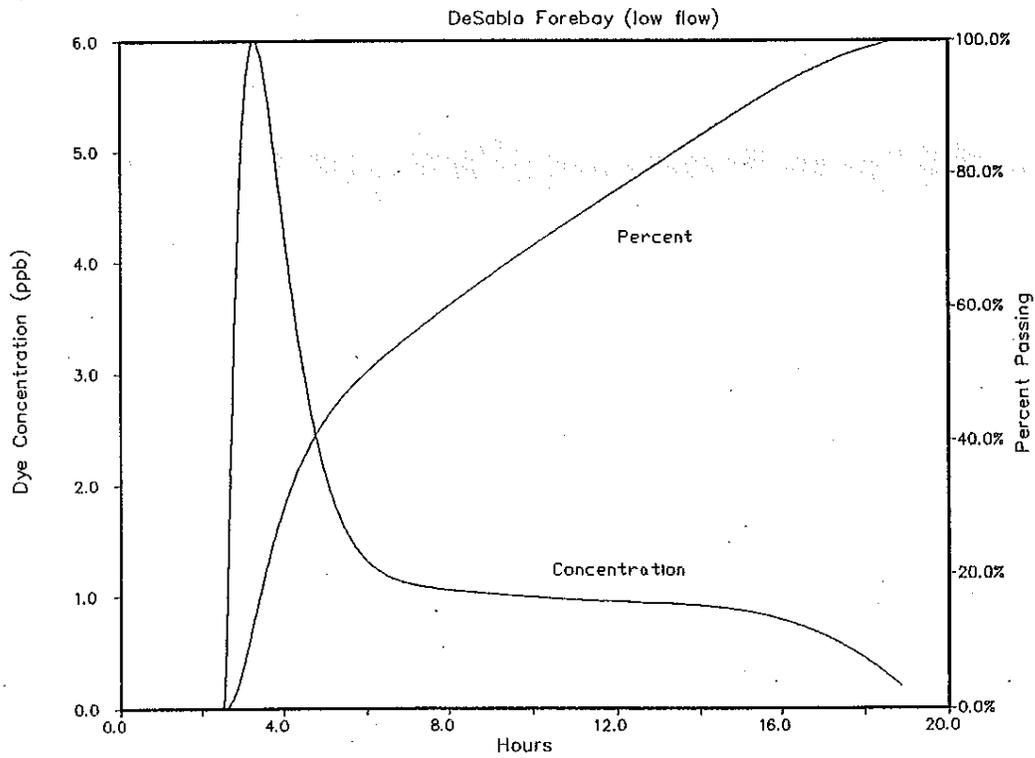
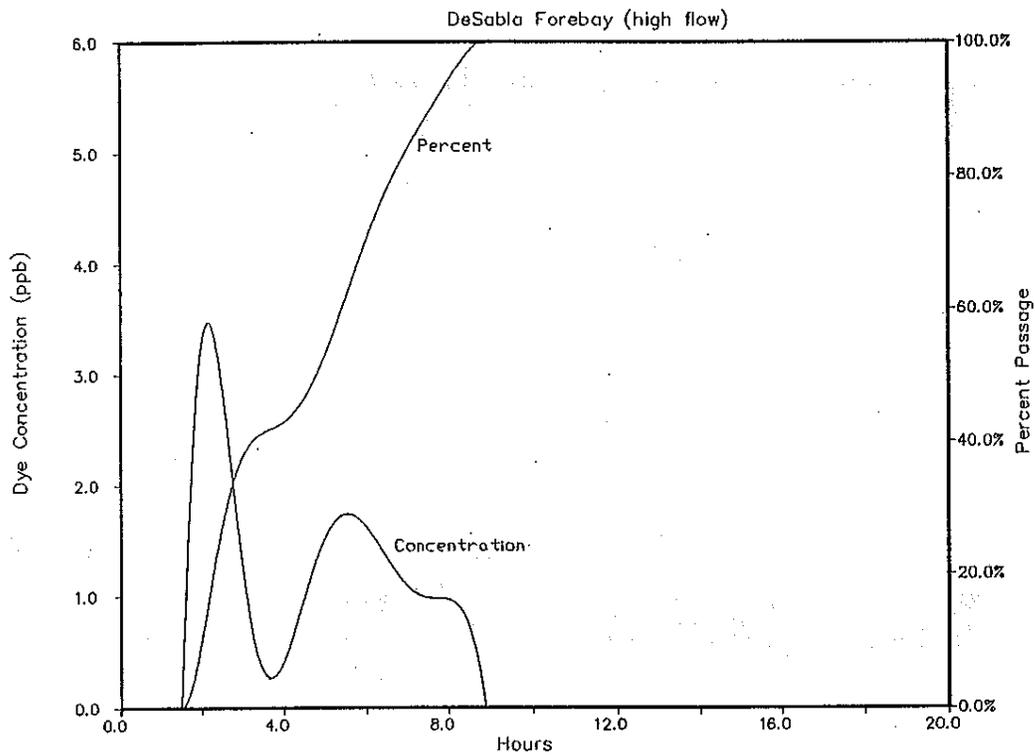


Figure F-3. Results of time-of-travel dye study for DeSabra Forebay at high and low flow rates.

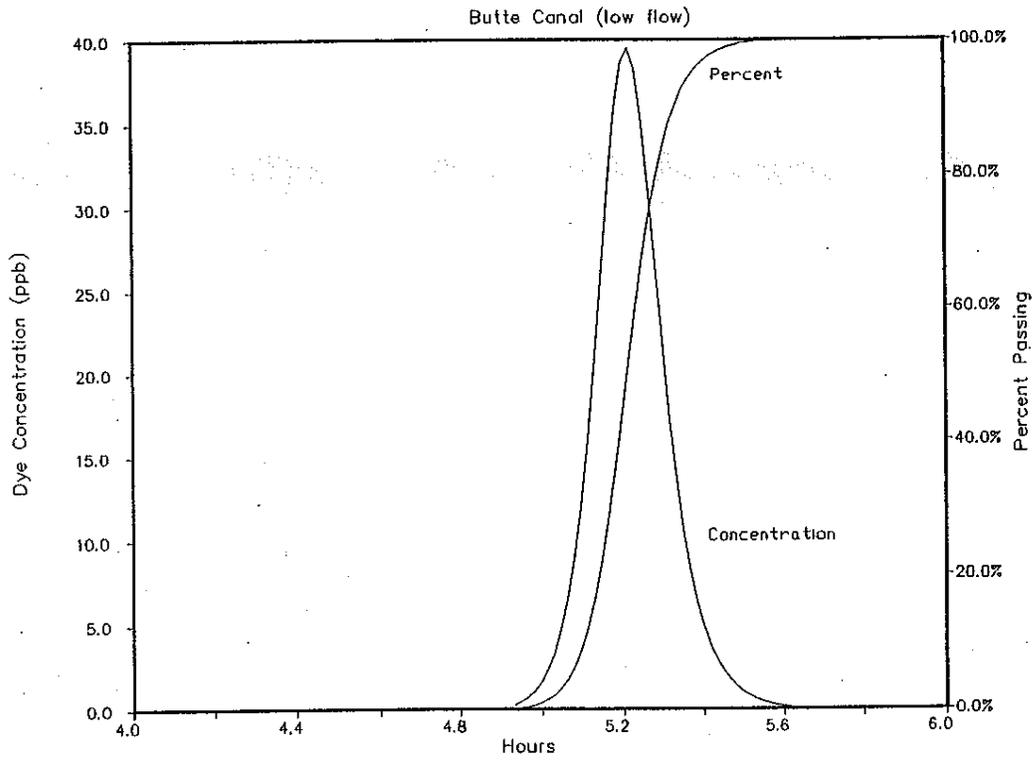
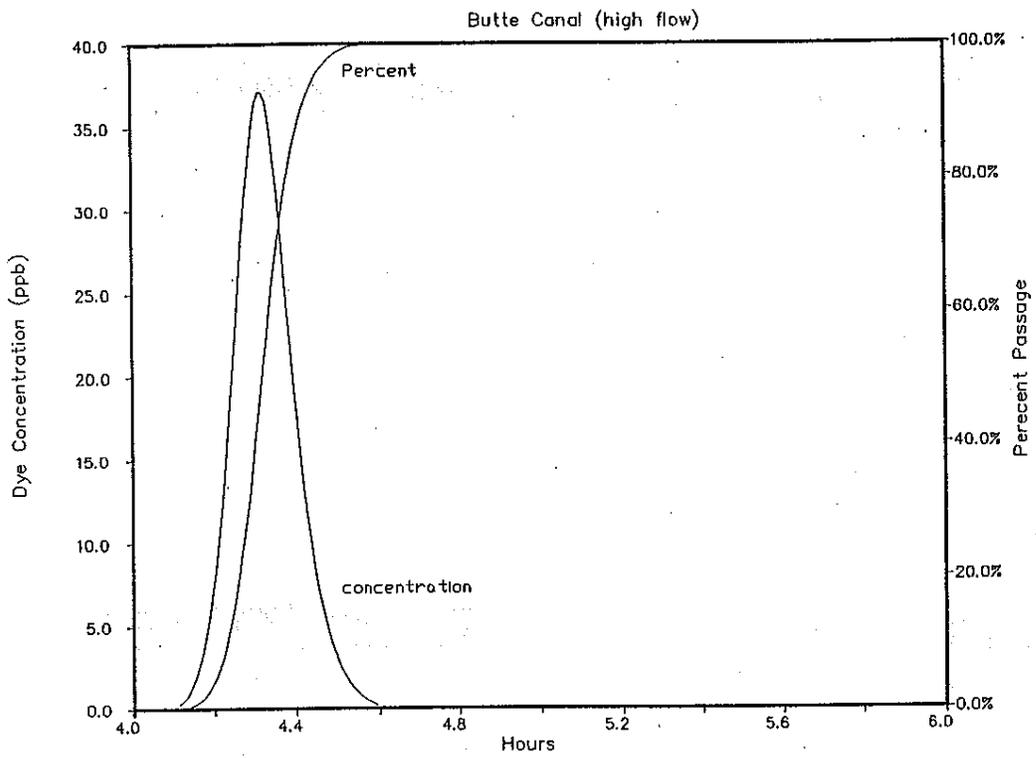


Figure F-4. Results of time-of-travel dye study for Butte Canal at high and low flow rates.

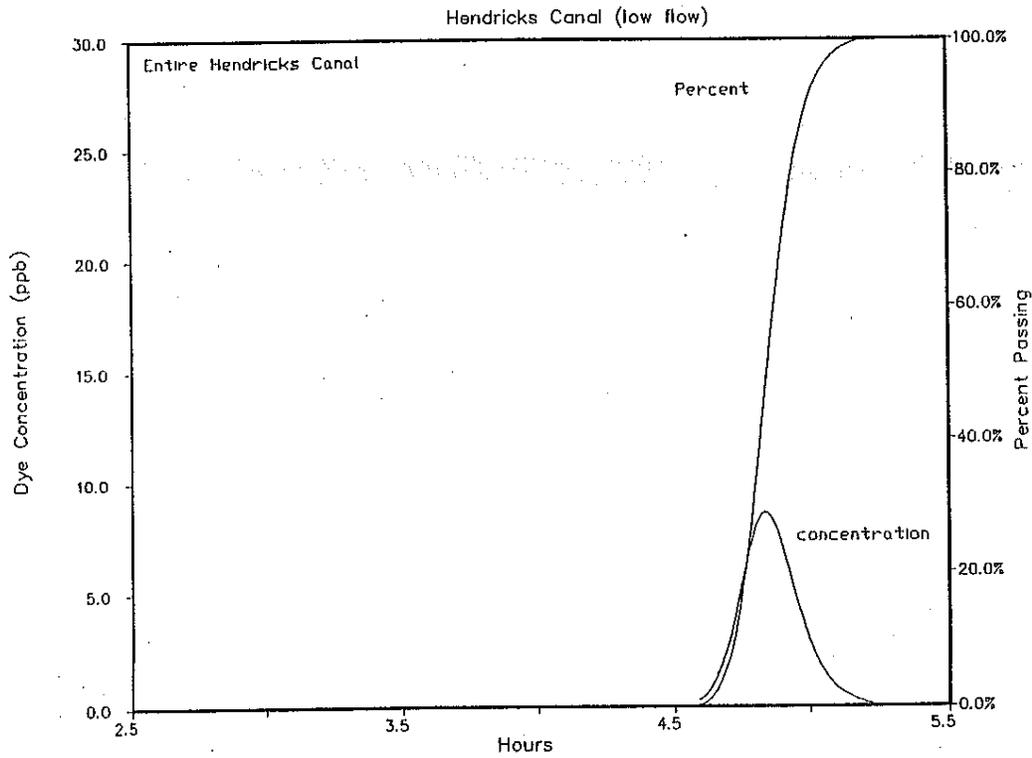
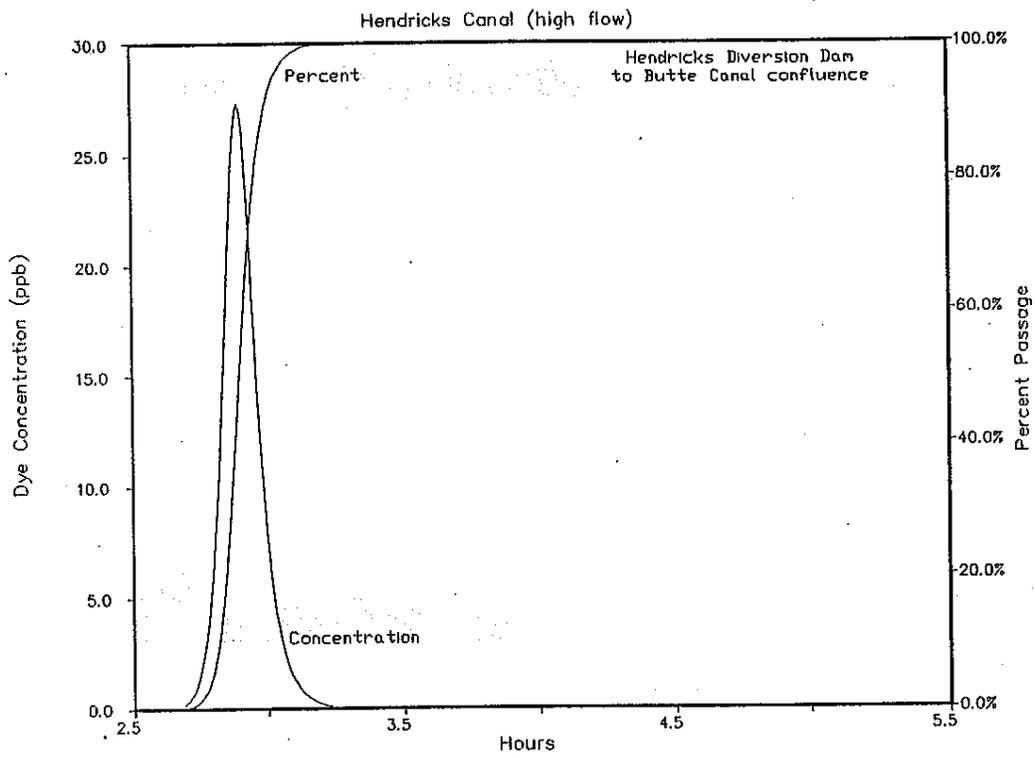


Figure F-5. Results of time-of-travel dye study for Hendricks Canal at high and low flow rates.

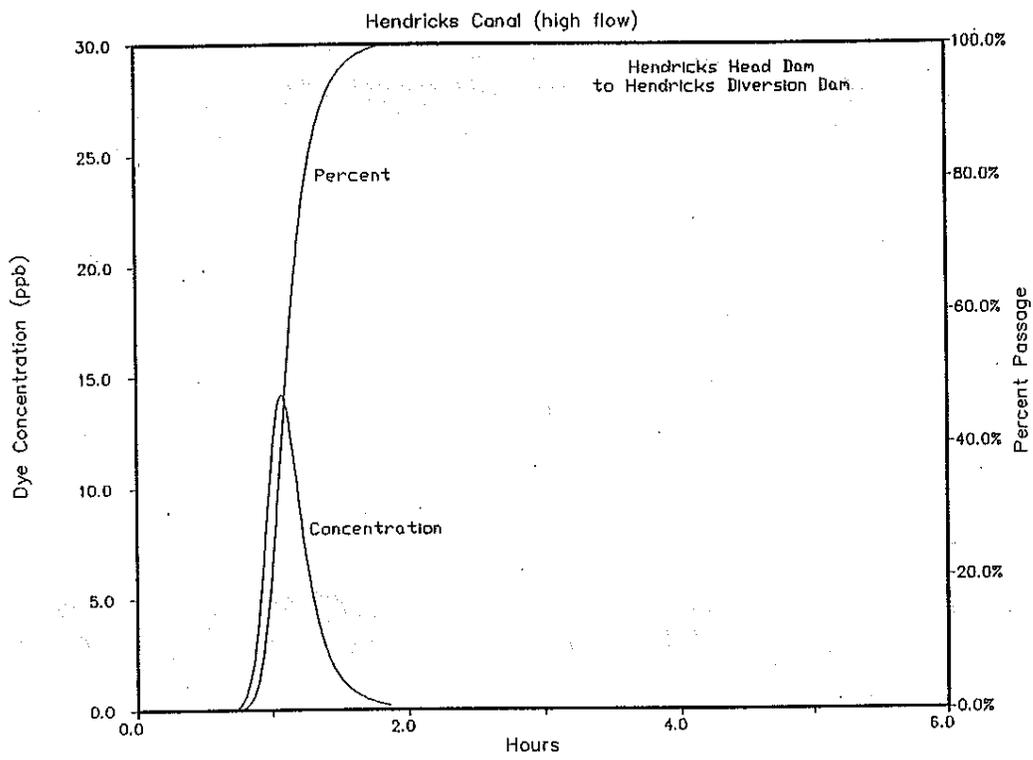


Figure F-6. Results of time-of-travel dye study for Hendricks Canal at high and low flow.

Appendix G

**CONTINUOUS WATER TEMPERATURE AND FLOW DATA
WHEN BUTTE CREEK AND BUTTE CANAL FLOWS WERE SPLIT**

Hourly Data from Butte Creek Flow Split Test

Flow Status	1992 Date	Time	Butte Creek at Head Dam			Butte Canal above Forebay	
			Total flow above Dam	Canal Flow	Temp. above Dam	Flow	Temp.
NORMAL	08/24	0	49.6	40.0	12.7	31	13.4
	08/24	100	49.6	40.0	12.6	31	13.3
	08/24	200	49.6	40.0	12.6	31	13.3
	08/24	300	49.6	40.0	12.6	31	13.1
	08/24	400	49.6	40.0	12.5	31	12.8
	08/24	500	49.6	40.0	12.5	31	12.7
	08/24	600	49.6	40.0	12.5	31	12.6
	08/24	700	49.6	40.0	12.4	31	12.6
	08/24	800	49.6	40.0	12.4	31	12.6
	08/24	900	49.6	40.0	12.4	31	12.6
	08/24	1000	49.6	40.0	12.4	31	12.6
	08/24	1100	49.6	40.0	12.5	31	12.7
	08/24	1200	49.6	40.0	12.8	31	12.9
	08/24	1300	49.6	40.0	13.2	31	13.2
	08/24	1400	49.6	40.0	13.5	31	13.8
	08/24	1500	49.6	40.0	13.9	31	14.4
	08/24	1600	49.6	40.0	13.9	31	14.8
	08/24	1700	49.6	40.0	13.9	31	15.2
	08/24	1800	49.6	40.0	13.9	31	15.5
	08/24	1900	49.6	40.0	14.1	31	15.8
	08/24	2000	49.6	40.0	14.2	31	15.8
	08/24	2100	49.6	40.0	14.1	31	15.5
	08/24	2200	49.6	40.0	13.8	31	14.9
	08/24	2300	49.6	40.0	13.5	31	14.5
08/25	0	48.6	39.0	13.4	31	14.2	
08/25	100	48.6	39.0	13.4	31	14.1	
08/25	200	48.6	39.0	13.3	31	14.0	
08/25	300	48.6	39.0	13.1	31	13.8	
08/25	400	48.6	39.0	13.0	31	13.5	
08/25	500	48.6	39.0	13.0	31	13.3	
08/25	600	48.6	39.0	12.9	31	13.1	
08/25	700	48.6	39.0	12.7	31	12.9	
08/25	800	48.6	39.0	12.6	31	12.9	
08/25	900	48.6	39.0	12.5	31	12.9	
08/25	1000	48.6	39.0	12.5	31	12.9	
08/25	1100	48.6	39.0	12.6	31	12.9	
08/25	1200	48.6	39.0	12.8	31	13.1	
08/25	1300	48.6	39.0	13.2	31	13.5	
08/25	1400	48.6	39.0	13.6	31	14.0	
08/25	1500	48.6	39.0	13.9	31	14.5	
08/25	1600	48.6	39.0	13.9	31	14.9	
08/25	1700	48.6	39.0	13.9	31	15.3	
08/25	1800	48.6	39.0	13.9	31	15.6	
08/25	1900	48.6	39.0	14.1	31	15.9	
08/25	2000	48.6	39.0	14.2	31	15.9	
08/25	2100	48.6	39.0	14.0	31	15.6	
08/25	2200	48.6	39.0	13.7	31	15.0	
08/25	2300	48.6	39.0	13.4	31	14.6	
08/26	0	48.6	39.0	13.4	31	14.3	
08/26	100	48.6	39.0	13.3	31	14.2	

Hourly Data from Butte Creek Flow Split Test

Flow Status	1992 Date	Time	Butte Creek at Head Dam			Butte Canal above Forebay	
			Total flow above Dam	Canal Flow above Dam	Temp.	Flow	Temp.
	08/26	200	48.6	39.0	13.3	31	14.1
	08/26	300	48.6	39.0	13.2	31	13.9
	08/26	400	48.6	39.0	13.1	31	13.6
	08/26	500	48.6	39.0	13.0	31	13.4
	08/26	600	48.6	39.0	12.9	31	13.3
	08/26	700	48.6	39.0	12.8	31	13.2
50/50 CHANGE	08/26	800	47.0	19.0	12.7	14	13.1
	08/26	900	47.0	19.0	12.6	14	13.1
	08/26	1000	47.0	19.0	12.6	14	13.1
	08/26	1100	47.0	19.0	12.6	14	13.1
	08/26	1200	47.0	19.0	13.0	14	13.3
	08/26	1300	47.0	19.0	13.5	14	13.9
	08/26	1400	47.0	19.0	14.0	14	14.7
	08/26	1500	47.0	19.0	14.2	14	15.5
	08/26	1600	47.0	19.0	14.2	14	16.0
	08/26	1700	47.0	19.0	14.2	14	16.3
	08/26	1800	47.0	19.0	14.2	14	16.7
	08/26	1900	47.0	19.0	14.4	14	16.9
	08/26	2000	47.0	19.0	14.6	14	17.1
	08/26	2100	47.0	19.0	14.4	14	17.2
	08/26	2200	47.0	19.0	14.1	14	16.9
	08/26	2300	47.0	19.0	13.9	14	16.4
	08/27	0	47.0	19.0	13.9	14	15.8
	08/27	100	47.0	19.0	13.9	14	15.3
	08/27	200	47.0	19.0	13.8	14	14.9
	08/27	300	47.0	19.0	13.7	14	14.6
	08/27	400	47.0	19.0	13.6	14	14.5
	08/27	500	47.0	19.0	13.5	14	14.3
	08/27	600	47.0	19.0	13.4	14	14.1
	08/27	700	47.0	19.0	13.4	14	13.9
	08/27	800	47.0	19.0	13.3	14	13.7
	08/27	900	47.0	19.0	13.2	14	13.7
	08/27	1000	47.0	19.0	13.2	14	13.7
	08/27	1100	47.0	19.0	13.2	14	13.8
	08/27	1200	47.0	19.0	13.5	14	14.1
	08/27	1300	47.0	19.0	13.9	14	14.7
	08/27	1400	47.0	19.0	14.3	14	15.4
	08/27	1500	47.0	19.0	14.5	14	16.1
08/27	1600	47.0	19.0	14.6	14	16.5	
08/27	1700	47.0	19.0	14.5	14	16.8	
08/27	1800	47.0	19.0	14.5	14	17.2	
08/27	1900	47.0	19.0	14.6	14	17.5	
08/27	2000	47.0	19.0	14.7	14	17.6	
08/27	2100	47.0	19.0	14.6	14	17.6	
08/27	2200	47.0	19.0	14.3	14	17.3	
08/27	2300	47.0	19.0	14.0	14	16.8	
08/28	0	47.0	19.0	13.9	14	16.2	
08/28	100	47.0	19.0	13.9	14	15.7	
08/28	200	47.0	19.0	13.8	14	15.3	
08/28	300	47.0	19.0	13.8	14	15.0	

Hourly Data from Butte Creek Flow Split Test

Flow Status	1992 Date	Time	Butte Creek at Head Dam			Butte Canal above Forebay	
			Total flow above Dam	Canal Flow above Dam	Temp.	Flow	Temp.
	08/28	400	47.0	19.0	13.7	14	14.9
	08/28	500	47.0	19.0	13.6	14	14.6
	08/28	600	47.0	19.0	13.5	14	14.4
	08/28	700	47.0	19.0	13.4	14	14.2
	08/28	800	47.0	19.0	13.4	14	14.1
	08/28	900	47.0	19.0	13.4	14	14.1
	08/28	1000	47.0	19.0	13.3	14	14.1
	08/28	1100	47.0	19.0	13.4	14	15.1
	08/28	1200	47.0	19.0	13.7	14	14.4
	08/28	1300	47.0	19.0	14.2	14	15.0
	08/28	1400	47.0	19.0	14.6	14	15.7
	08/28	1500	47.0	19.0	14.8	14	16.4
	08/28	1600	47.0	19.0	14.8	14	16.8
	08/28	1700	47.0	19.0	14.8	14	17.1
	08/28	1800	47.0	19.0	14.9	14	17.5
	08/28	1900	47.0	19.0	15.1	14	17.7
	08/28	2000	47.0	19.0	15.2	14	17.8
	08/28	2100	47.0	19.0	15.0	14	17.8
	08/28	2200	47.0	19.0	14.7	14	17.5
	08/28	2300	47.0	19.0	14.6	14	17.0
	08/29	0	47.0	19.0	14.6	14	16.4
	08/29	100	47.0	19.0	14.6	14	16.0
	08/29	200	47.0	19.0	14.5	14	15.7
	08/29	300	47.0	19.0	14.5	14	15.6
	08/29	400	47.0	19.0	14.5	14	15.5
	08/29	500	47.0	19.0	14.4	14	15.3
	08/29	600	47.0	19.0	14.4	14	15.1
	08/29	700	47.0	19.0	14.3	14	14.9
	08/29	800	47.0	19.0	14.2	14	14.7
	08/29	900	47.0	19.0	14.2	14	14.6
	08/29	1000	47.0	19.0	14.2	14	14.8
	08/29	1100	47.0	19.0	14.2	14	14.9
	08/29	1200	47.0	19.0	14.3	14	15.0
	08/29	1300	47.0	19.0	14.5	14	15.4
	08/29	1400	47.0	19.0	14.6	14	15.9
	08/29	1500	47.0	19.0	14.9	14	16.6
	08/29	1600	47.0	19.0	14.9	14	16.9
	08/29	1700	47.0	19.0	14.9	14	17.1
	08/29	1800	47.0	19.0	14.9	14	17.4
	08/29	1900	47.0	19.0	14.9	14	17.6
	08/29	2000	47.0	19.0	15.0	14	17.6
	08/29	2100	47.0	19.0	14.9	14	17.5
	08/29	2200	47.0	19.0	14.6	14	17.2
	08/29	2300	47.0	19.0	14.5	14	16.8
	08/30	0	47.0	19.0	14.5	14	16.3
	08/30	100	47.0	19.0	14.5	14	15.9
	08/30	200	47.0	19.0	14.3	14	15.5
	08/30	300	47.0	19.0	14.2	14	15.3
	08/30	400	47.0	19.0	14.1	14	15.2
	08/30	500	47.0	19.0	14.0	14	15.0

Hourly Data from Butte Creek Flow Split Test

Flow Status	1992		Butte Creek at Head Dam			Butte Canal above Forebay	
	Date	Time	Total flow above Dam	Canal Flow above Dam	Temp. above Dam	Flow	Temp.
	08/30	600	47.0	19.0	14.0	14	14.8
	08/30	700	47.0	19.0	14.0	14	14.6
	08/30	800	47.0	19.0	13.9	14	14.6
	08/30	900	47.0	19.0	13.9	14	14.5
	08/30	1000	47.0	19.0	13.9	14	14.6
	08/30	1100	47.0	19.0	14.0	14	14.6
	08/30	1200	47.0	19.0	14.1	14	14.7
	08/30	1300	47.0	19.0	14.4	14	15.1
	08/30	1400	47.0	19.0	14.8	14	15.6
	08/30	1500	47.0	19.0	14.9	14	16.2
	08/30	1600	47.0	19.0	15.0	14	16.4
	08/30	1700	47.0	19.0	14.9	14	16.7
	08/30	1800	47.0	19.0	14.9	14	17.0
	08/30	1900	47.0	19.0	15.0	14	17.1
	08/30	2000	47.0	19.0	15.1	14	17.1
	08/30	2100	47.0	19.0	14.9	14	17.0
	08/30	2200	47.0	19.0	14.6	14	16.7
	08/30	2300	47.0	19.0	14.5	14	16.2
	08/31	0	47.0	19.0	14.4	14	15.7
	08/31	100	47.0	19.0	14.4	14	15.2
	08/31	200	47.0	19.0	14.3	14	14.9
	08/31	300	47.0	19.0	14.2	14	14.7
	08/31	400	47.0	19.0	14.2	14	14.6
	08/31	500	47.0	19.0	14.0	14	14.4
	08/31	600	47.0	19.0	13.9	14	14.2
	08/31	700	47.0	19.0	13.8	14	14.0
90/10 CHANGE	08/31	800	52.0	14.0	13.7	6.9	13.8
	08/31	900	52.0	14.0	13.5	6.9	13.8
	08/31	1000	52.0	14.0	13.5	6.9	13.8
	08/31	1100	52.0	14.0	13.6	6.9	13.8
	08/31	1200	52.0	14.0	13.8	6.9	14.1
	08/31	1300	52.0	14.0	14.2	6.9	14.6
	08/31	1400	52.0	14.0	14.6	6.9	15.4
	08/31	1500	52.0	14.0	14.8	6.9	16.3
	08/31	1600	52.0	14.0	14.7	6.9	17.1
	08/31	1700	52.0	14.0	14.6	6.9	17.2
	08/31	1800	52.0	14.0	14.6	6.9	17.2
	08/31	1900	52.0	14.0	14.8	6.9	17.3
	08/31	2000	52.0	14.0	14.9	6.9	17.4
	08/31	2100	52.0	14.0	14.7	6.9	17.3
	08/31	2200	52.0	14.0	14.4	6.9	17.3
	08/31	2300	52.0	14.0	14.2	6.9	17.3
	09/01	0	52.0	14.0	14.2	6.9	17.1
	09/01	100	52.0	14.0	14.2	6.9	16.9
	09/01	200	52.0	14.0	14.2	6.9	16.6
	09/01	300	52.0	14.0	14.1	6.9	16.3
	09/01	400	52.0	14.0	14.0	6.9	16.0
	09/01	500	52.0	14.0	13.9	6.9	15.6
	09/01	600	52.0	14.0	13.9	6.9	15.2
	09/01	700	52.0	14.0	13.8	6.9	14.9

Hourly Data from Butte Creek Flow Split Test

Flow Status	1992 Date	Time	Butte Creek at Head Dam			Butte Canal above Forebay	
			Total flow above Dam	Canal Flow	Temp. above Dam	Flow	Temp.
	09/01	800	52.0	14.0	13.6	6.9	14.6
	09/01	900	52.0	14.0	13.6	6.9	14.5
	09/01	1000	52.0	14.0	13.6	6.9	14.5
	09/01	1100	52.0	14.0	13.6	6.9	14.5
	09/01	1200	52.0	14.0	13.8	6.9	14.7
	09/01	1300	52.0	14.0	14.3	6.9	15.3
	09/01	1400	52.0	14.0	14.6	6.9	16.2
	09/01	1500	52.0	14.0	14.8	6.9	17.1
	09/01	1600	52.0	14.0	14.7	6.9	17.7
	09/01	1700	52.0	14.0	14.7	6.9	17.7
	09/01	1800	52.0	14.0	14.7	6.9	17.6
	09/01	1900	52.0	14.0	14.9	6.9	17.7
	09/01	2000	52.0	14.0	15.0	6.9	17.7
	09/01	2100	52.0	14.0	14.8	6.9	17.7
	09/01	2200	52.0	14.0	14.4	6.9	17.7
	09/01	2300	52.0	14.0	14.2	6.9	17.6
	09/02	0	52.0	14.0	14.2	6.9	17.4
	09/02	100	52.0	14.0	14.2	6.9	17.0
	09/02	200	52.0	14.0	14.1	6.9	16.7
	09/02	300	52.0	14.0	13.9	6.9	16.4
	09/02	400	52.0	14.0	13.8	6.9	16.0
	09/02	500	52.0	14.0	13.7	6.9	15.6
	09/02	600	52.0	14.0	13.5	6.9	15.2
	09/02	700	52.0	14.0	13.3	6.9	14.9
	09/02	800	52.0	14.0	13.2	6.9	14.6
	09/02	900	52.0	14.0	13.0	6.9	14.4
	09/02	1000	52.0	14.0	13.0	6.9	14.3
	09/02	1100	52.0	14.0	13.0	6.9	14.3
	09/02	1200	52.0	14.0	13.2	6.9	14.6
	09/02	1300	52.0	14.0	13.6	6.9	15.2
	09/02	1400	52.0	14.0	14.0	6.9	16.0
	09/02	1500	52.0	14.0	14.2	6.9	16.9
	09/02	1600	52.0	14.0	14.1	6.9	17.4
	09/02	1700	52.0	14.0	13.9	6.9	17.4
	09/02	1800	52.0	14.0	13.9	6.9	17.2
	09/02	1900	52.0	14.0	14.1	6.9	17.2
	09/02	2000	52.0	14.0	14.1	6.9	17.3
	09/02	2100	52.0	14.0	13.9	6.9	17.1
	09/02	2200	52.0	14.0	13.5	6.9	17.0
	09/02	2300	52.0	14.0	13.3	6.9	16.9

Appendix H

PG&E AND AGENCY TRANSMITTAL LETTERS

Pacific Gas and Electric Company

201 Mission Street, Room 1012
Mail Code P10A
P.O. Box 770000
San Francisco, CA 94177
415/973-5310

Sran Bhattacharya
Manager
Hydro Generation

December 20, 1993

Mr. Ryan Broddrick, Region 2 Manager
California Department of Fish and Game
1701 Nimbus Road, Suite A
Rancho Cordova, CA 95670

Mr. Dale Pierce, Field Supervisor
U.S. Fish and Wildlife Service
2800 Cottage Way, Room E-1803
Sacramento, CA 95825-1846

Dr. Gary Matlock, Regional Director
National Marine Fisheries Service
501 West Ocean Blvd., Suite 4200
Long Beach, CA 90802-4213

Mr. Marcin Whitman
National Marine Fisheries Service
777 Sonoma Avenue, Room 325
Santa Rosa, CA 95404

Dear Sirs:

**De Sabla - Centerville Project, FERC No. 803
Review Of Water Temperature Monitoring Study Results**

PG&E has completed the water temperature monitoring study required by Article 402 of the FERC's January 31, 1992 "Order Amending License" for the De Sabla - Centerville Project. The attached draft summary report includes the collected data, a discussion of the results, and PG&E's conclusions. Please review this report and submit your comments by Friday, January 21, 1994. Comments received by that date will be included in the final report that PG&E plans to file with the FERC by January 30, 1994.

Article 402 of the FERC's January 31, 1992 order required PG&E to conduct a two-year water temperature and stream flow monitoring study to determine if operational changes in the upper portion of the De Sabla - Centerville Project could result in decreased water temperatures in Butte Creek below the Lower Centerville Diversion Dam. The study plan proposed by PG&E was reviewed by your agencies in 1992 and was approved by the FERC on June 30, 1993 (see attached "Order Approving Temperature Monitoring Plan").

The main conclusions of this study are that:

- 1) There are no feasible operational changes in the upper portion of the De Sabla - Centerville Project that would reduce water temperatures in Butte Creek below the Lower Centerville Diversion Dam.
- 2) The current procedure of maintaining the maximum possible canal flows reduces the amount of heating within the system and results in the coolest possible temperatures in Butte Creek below the Lower Centerville Diversion Dam.
- 3) Increasing the diversions into Hendricks Canal or Butte Canal would result in lower temperatures in Butte Creek below the Lower Centerville Diversion Dam, but would require reducing streamflow releases at Hendricks Head Dam and Butte Head Dam.



CDF&G, USF&WS, NMFS
December 20, 1993
Page 2

Please submit your comments on the attached report and its conclusions no later than Friday, January 21, 1993. If you have any questions about the report or this request, please contact Mr. Nicholas Markevich at (415) 973-5358. Thank you!

Sincerely,



cc: Ms. Lois D. Cashell, Secretary
Federal Energy Regulatory Commission
825 North Capitol Street, N.E.
Washington, D.C. 20426

Mr. J. Mark Robinson, Director
Division of Project Compliance and Administration
Federal Energy Regulatory Commission
825 North Capitol Street, N.E. (Room 1149 UPC)
Washington, D.C. 20426

Mr. Cliff Emmerling, Regional Director
Federal Energy Regulatory Commission
901 Market Street, Suite 350
San Francisco, CA 94103

Attachments: 1) FERC Order Approving Temperature Monitoring Plan (6/30/93)
2) Water Temperature and Stream Flow Monitoring Study (12/17/93)

UNITED STATES OF AMERICA
FEDERAL ENERGY REGULATORY COMMISSION

Pacific Gas and Electric Co.
Project No. 803-034
California

ORDER APPROVING TEMPERATURE MONITORING PLAN

(Issued June 30, 1993)

On September 8, 1992, Pacific Gas and Electric Company (licensee) filed a temperature monitoring study plan as required by article 402 of the license for the Desable-Centerville Project, FERC No. 803. Article 402 requires the licensee to conduct a 2-year water temperature and stream flow monitoring study to determine if operational changes in the upper portion of the project might enhance water temperatures below the Lower Centerville Diversion Dam for anadromous fish.

The licensee proposes to monitor tributaries, reservoirs, and diversions of Butte Creek and Butte Creek Canal to determine where and under what conditions water temperature increases occur. Based on this information, the licensee proposes to modify project operation to provide the coolest possible water for the anadromous fish. The licensee proposes to: continuously monitor water temperature at 18 creek, canal, and canal locations; record meteorological data for 3 sites; and collect flow or elevation records at 13 sites within the project area.

Operational changes including, increasing flows from Butte Head Dam and changing operations of Round Valley and Philbrook reservoirs will be conducted to determine their effect on downstream water temperature. The licensee proposes to file the report showing the results of the study by December 31, 1993.

The licensee consulted with the California Department of Fish and Game (CDFG), the National Marine Fisheries Service (NMFS) and the U.S. Fish and Wildlife Service (FWS) and incorporated the resource agency comments except as noted below.

CDFG recommended that temperature modeling be conducted for the reach of Butte Creek between Centerville diversion dam and Centerville powerhouse. The licensee notes that this stream reach was previously modeled and that the intent of the study is to look upstream for ways to reduce water temperature.

The proposed study will indicate what operational changes may be appropriate in the upstream basin to reduce temperatures in Butte Creek. Operational changes requested by the agencies will help to evaluate differential heating between Butte Creek and Butte canal. If after an evaluation of the study results, changes in project operation are identified that could reduce downstream temperatures, then additional modeling may be

appropriate to determine how to best implement those changes. It is premature to require additional modeling prior to the review of the study results to determine what, if any, changes in project operation may result in reduced downstream temperatures. The proposed plan should be approved.

The Director orders:

- (A) The temperature monitoring study plan filed on September 8, 1992, as required by article 402 of the license for the Desable-Centerville Project, is approved.
- (B) 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 18 C.F.R. §385.713.

J. Mark Robinson
J. Mark Robinson
Director, Division of Project
Compliance and Administration

12/1/93 NJM
LICENSING, COMPLIANCE,
AND WATER MANAGEMENT
LTL
TAJ JUL 07 1993 JRH
ACR LLH
FILE 026.116
FERG NO 803

DEPARTMENT OF FISH AND GAME

REGION 2
1701 NIMBUS ROAD, SUITE A
RANCHO CORDOVA, CA 95670

(916) 355-7020

HYDRO GENERATION				PETE WILSON, Governor	
SB	JAN 24 1994			NFS	
WDP				CAT	
GSK				TAJ	
PAE	LOG #	FJU		SAD	
SEC	SEE ME	COMMENT		LFW	
ROUTE	HANDLE	FYI	FILE	JAL	

January 20, 1994

Mr. Shan Bhattacharya, Manager Hydro Generation
Pacific Gas and Electric Company
201 Mission Street, Room 1012
San Francisco, California 94177

Dear Mr. Bhattacharya:

We have reviewed your draft report DeSabra-Centerville Project, Two Year Water Temperature and Stream Flow Monitoring Study, Report 026.1193.8. The data presented generally support the conclusions drawn. However, there here are several areas that either need clarification or further evaluation.

1. There appears to be some small benefit suggested by altering the Round Valley/Philbrook Reservoir releases and releasing Round Valley Reservoir water prior to the period specified in the agreement with the Department. This should be evaluated further as you were unable to accomplish this action during 1993.
2. There appears to be some small benefit to increasing diversions from the West Branch of the Feather River into the Hendricks Canal. Concern was expressed that by doing so there may be negative impacts to the amount of aquatic habitat in the West Branch and the potential for conflict with an existing contract with the California Water Service Company. This issue should be further evaluated to better identify the negative impacts suggested.
3. There appears to be some small benefit to altering flows through the DeSabra Forebay to reduce transit time. The methods of achieving this were suggested to be either eliminating or channelizing the existing Forebay. Both had resultant negative impacts such as operational constraints, elimination of recreational opportunities, and the potential for increased temperatures. It would appear that a third alternative exists which would provide a separate channel around the reservoir, either open or closed, while at the same time maintaining the existing reservoir and the resultant benefits of operational flexibility and recreational opportunity. This issue should be further evaluated.

Mr. Shan Bhattacharya
January 20, 1994
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It appears that in the aggregate, the potential incremental temperature decreases of the above actions might provide a positive benefit to temperatures below the Lower Centerville Diversion Dam.

Your report briefly discusses another significant issue relative to spring run chinook survival below Lower Centerville Head Dam. Article 402 of the FERC License Agreement includes a requirement for the review of both streamflow and water temperature impacts. The present flow criteria for that area is a minimum of 40 cfs from July 1 to September 15. We are in agreement that this is the absolute minimum flow necessary, however the September 15 cutoff date allows a reduction to 10 cfs. This reduction may occur during the spawning season and very likely dewateres spawning redds. The result is a significant loss to the population, as in many years greater than half of all spring chinook spawn in that area. The Department recommends that flows be maintained at the minimum 40 cfs rate until after emergence, possibly as late as January 1.

If you have questions or need further clarification of our comments, please contact either Mr. Nick Villa, Senior Fishery Biologist, at (916) 355-7006 or Mr. Paul Ward, Fishery Biologist, at (916) 865-9331.

Sincerely,



L. Ryan Broddrick
Regional Manager

cc: Mr. Nick Villa
Department of Fish and Game
Rancho Cordova, California

Mr. Paul Ward
Department of Fish and Game
Rancho Cordova, California

Mr. Gary Matlock, Regional Director
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501 West Ocean Blvd., Suite 4200
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2800 Cottage Way, Room E-1803
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United States Department of the Interior



FISH AND WILDLIFE SERVICE
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January 24, 1994

Mr. Shan Bhattacharya
Pacific Gas and Electric
Mail Code P10A
201 Mission Street, Room 1012
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Subject: Desabla-Centerville Project, Butte County, CA; FERC No. 803

Dear Mr. Bhattacharya:

We reviewed your December 20, 1993 Water Temperature Monitoring Report for the DeSabla-Centerville Project, No. 803. These studies were performed pursuant to the Federal Energy Regulatory Commission's (FERC) order approving your study plan. The study area included tributaries and reservoirs in both the Butte Creek and West Branch Feather River (WBFR) drainages.

The FERC's order required you to evaluate operational changes which would reduce water temperatures in Butte Creek below the Lower Centerville Diversion Dam (LCDD). An approximately 5.3-mile section of Butte Creek below the LCDD is used by spring chinook salmon for summer holding and fall spawning. A recent report stated that temperatures above 21 degrees Celsius (°C) block spawning migration (Guidance for Evaluating and Recommending Temperature Regimes to Protect Fish, 1991). This publication also stated that spawning adults become susceptible to lethal diseases when temperatures reach 16 °C. Temperature monitoring done from 1986 to 1988 revealed that if temperatures at LCDD were greater than 16.7 °C, then no increase in flow above the required 40 cubic feet per second (cfs) minimum flow could prevent temperatures in pool 4, located 3.8 miles below LCDD, from exceeding 20 °C. Data collected from 1989 to 1991 indicated that LCDD temperatures generally exceed 17 °C in late June and August. The FERC order stated that if study results indicate that changes in project operations could reduce temperatures, then additional modelling may be needed to assist in implementing those changes.

Study Conclusions and Recommendations

1. Round Valley Reservoir: You stated that the reservoir's storage was too small and that its water warmed too early to be of value in temperature reduction. However, you did feel that an earlier release could minimize heating in the reservoir, and thus its effect on Butte Creek. You suggested that releases could begin as soon as canal space is available. However, this option could not be evaluated due to 1993's above-normal precipitation.

Mr. Shan Bhattacharya

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2. Philbrook Reservoir: This reservoir has greater depth and storage than Round Valley Reservoir, and can provide cool water for diversion to Butte Creek. You stated that the current method of operation appears to be the most beneficial.

3. WBFR Diversions: Flows from the WBFR are diverted at the Hendricks Head Dam into the Hendricks Canal. These flows pass into the Toadtown Canal, which joins Butte Canal above Desabla Forebay. Flow from the forebay returns to Butte Creek at Desabla Powerhouse, which is located above the section of Butte Creek used by spring chinook. You stated that the only value in increasing diversions at the Hendricks Head Dam would be decreased residence time and warming in Desabla Forebay. Increased diversion would also decrease the amount of aquatic habitat below the dam.

4. Butte Creek Diversions: Flows from Butte Creek are diverted at the Butte Head Dam, and enter Desabla Forebay. You stated that the only value in increasing diversions at the dam would be decreased residence time and warming in Desabla Forebay. Increased diversion would also decrease the amount of aquatic habitat below the dam.

5. Desabla Forebay: The forebay receives all flow diverted from the WBFR and Butte Creek. You stated that residence time and subsequent warming in the forebay should be reduced using canal inflow rates. Also, that the forebay could not be eliminated because of operational constraints associated with Desabla Powerhouse.

U.S. Fish and Wildlife Service Analysis and Recommendations

Our comments will address your findings and recommendations as outlined above.

1. Round Valley Reservoir: We concur with your conclusions regarding Round Valley and recommend that you continue to study the value of earlier annual releases. We understand that this may be complicated by an existing agreement you have with the California Department of Fish and Game. Under this agreement you do not draft water until after July 15 in normal water years.

2. Philbrook Reservoir: It is not clear to what extent the value of earlier releases of Philbrook water were evaluated. Your data show that drafting did not begin until July of both study years. While it may be that it is best to hold Philbrook's cooler water in reserve until July, some June release of flow may be of value. Please describe any evaluation of June Philbrook Reservoir releases you performed, and discuss their effects on temperature control in the late summer months.

3 & 4. WBFR and Butte Creek Diversions: We do not believe that increased diversions from the WBFR or Butte Creek are a desirable or effective solution to the problem of warming in Desabla Forebay.

5. Desabla Forebay: Our review of the study data indicates that significant warming of Butte Canal water occurs in the Desabla Forebay. In June, July, August, and September of 1992, this increase was 1.8, 1.0, 1.4, and 2.4 °C, respectively. In the same months for 1993, increases were 0.7, 0.8, 0.9, and 1.1 °C. The smaller increases were probably a result of 1993's higher precipitation and runoff.

You also indicated that residence time and subsequent warming in the forebay should be reduced, but state that this should be accomplished by altering canal inflow rates. However, as your study showed, flows of 46 cfs or greater are needed to keep flows passing through the forebay from warming more than 2 °C, while inflows of 108 cfs are required to keep warming to less than 1 °C. However, monthly minimum inflows in 1992 fell to 6.9 and 0.0 cfs in August and September, respectively. In 1993, monthly minimums fell to 9.8 cfs by September. This indicates that the potential for controlling forebay warming using canal inflows is limited under the current diversion regime. As we have stated, we do not support increasing flow diversion from the WBFR or Butte Creek.

You stated that the forebay could not be eliminated because of operational constraints associated with Desabla Powerhouse, and that dredging in the forebay to establish a channel would be environmentally undesirable. While we concur with your conclusion regarding dredging, you have not explained why Desabla Forebay could not be modified or eliminated. We request that you provide additional information regarding the forebay's role in Desabla Powerhouse operations. In addition, please discuss the possibility of diverting some portion of Butte Canal flows around the forebay, thus reducing its warming effect.

6. Minimum Flow Regime: The existing minimum flow regime requires you, during normal water years, to release 40 cfs from the LCDD from December 15 to October 31, and 30 cfs from November 1 to December 14. However, during dry years the 40 cfs requirement is only in effect from June 1 to September 15. After September 15 you may reduce flows to 10 cfs. Stream temperatures in September may already be undesirably high, and lowering flows to 10 cfs would increase flow residence time in pools and thus probably increase temperatures. This may adversely affect chinook survival and subsequent spawning, incubation, and hatching success, particularly for those salmon holding in lower sections of Butte Creek. We appreciate your company's previous assistance in maintaining flows in Butte Creek above those required by the FERC license. However, we feel that codification of a more biologically appropriate flow regime would be both desirable and effective at reducing stream temperatures. Please discuss the potential for improving stream temperatures by maintaining the 40 cfs minimum flow beyond the current requirement, particularly in dry years.

Conclusion

We believe that additional study of several temperature-reducing measures is needed. These measures include manipulation of releases from Round Valley and

Mr. Shan Bhattacharya

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possibly Philbrook Reservoirs, modification or elimination of Desabla Forebay, and changes in the minimum flow regime. We hope these comments will be of assistance to you. If you have any questions, please contact staff biologist Peter Lickwar at (916) 978-5615 extension 311.

Sincerely,

Dale A. Pierce
Dale A. Pierce
Acting Field Supervisor

cc: Reg. Dir., ES, FWS, Portland, OR.
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