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Figure 5-30. The specific conductance profiles in Ralston Afterbay Reservoir on July 10, August 9, and October 1, 2006.

5.0 WATER QUALITY

This section describes water quality in the waters affected by the Middle Fork American River Project (MFP or Project). The Federal Energy Regulatory Commission's (Commission's or FERC's) content requirements for water resources, which also covers water quality, are specified in Title 18 of the Code of Federal Regulations (CFR) Chapter I § 5.6(d)(3)(iii).

The information presented in this section provides an overview of the existing physical and chemical water quality conditions within the streams and reservoirs associated with the MFP. General water quality information presented in this section was derived mainly from existing published reports and publicly available data bases. More specific information regarding stream water temperature and reservoir conditions (water temperature, dissolved oxygen (DO) and specific conductance) was developed by Placer County Water Agency (PCWA) during studies conducted during 2005 and 2006, and is also summarized in this section.

In general, the existing information sources indicate that the physical and water chemistry conditions in the streams and rivers associated with the MFP are of high quality and conform to regulatory water quality objectives and standards. No persistent, widespread water quality issues were found. The Middle Fork American River Watershed (Watershed) does not contain any urban areas that often are the source of water quality degradation. In addition, there are no active landfills or municipal wastewater systems permitted to discharge treated effluent into any of the surface waters in the Watershed. Historical mining activity has occurred in the Watershed but no water quality issues have been identified to date.

5.1 INFORMATION SOURCES

Existing information regarding water quality along the streams and in the reservoirs associated with the MFP was collected, compiled, and reviewed. Relevant information used to prepare this section is summarized in the following.

Previously Published Study Reports

- The U.S. Geological Survey's (USGS) National Water Information System (NWIS) online database provided water quality information that was collected by the USGS at sampling locations along the Middle Fork American River and tributaries in the general vicinity of the Auburn Dam site.

- The U.S. Environmental Protection Agency's (USEPA) storage and retrieval (STORET) online database provided water quality information that was obtained by the Bureau of Reclamation (USBR) from sampling locations on the Middle Fork American River and the North Fork American River, and the California Regional Water Quality Board (RWQCB) from sampling locations located along the Middle Fork American River and tributaries.

- The 1998 and 2003 updates to the American River Watershed Sanitary Survey provided water quality condition information for the North Fork American River.

- Documents prepared by the Sacramento Municipal Utility District (SMUD) in association with the relicensing of the Upper American River Project (UARP) (FERC Project No. 2101) provided information on water quality conditions in the upper Rubicon River watershed area.

PCWA also consulted with the local RWQCB to inquire about any available water quality data in the Watershed. The RWQCB did not have any pertinent water quality data or reports, nor were they aware of any water quality issues in the Watershed.

5.2 RECENT STUDIES

During 2005 and 2006, PCWA conducted stream and reservoir water temperature monitoring studies in accordance with the objectives and methods outlined in the 2005-2006 Existing Environment Study Plan Package (PCWA 2005). The results of these studies are summarized later in this section and are documented in detail in PCWA's 2005 Water Temperature Study Report (PCWA 2006) and 2006 Water Temperature Study Report (PCWA 2007). The study plan and study reports are included in Supporting Document G (SD-G) for reference.

5.3 OVERVIEW OF FEDERALLY APPROVED WATER QUALITY STANDARDS APPLICABLE TO PROJECT WATERS

The State of California has responsibility for maintaining water quality standards through implementation of the Federal Clean Water Act (CWA). The RWQCB has established water quality objectives for specific beneficial water uses. The MFP is located in the Central Valley Region - RWQCB. Existing and potential beneficial uses that apply to surface waters within the Watershed are identified in *The Sacramento River Basin and San Joaquin River Basin Water Quality Control Plan (Basin Plan) for the California Regional Water Quality Control Board - Control Valley Region (Fourth Edition revised September 2004)*. Beneficial uses identified in the Basin Plan that pertain to the MFP include: (1) municipal and domestic supply; (2) agricultural supply; (3) hydropower generation; (4) water contact recreation; (5) non-contact water recreation; (6) cold freshwater fish habitat; (7) spawning, reproduction and/or early development habitat for fisheries; and (7) wildlife habitat. The definition of each of these beneficial uses is provided in Table 5-1.

The water quality objectives identified in the Basin Plan include both numeric and narrative standards for surface water. Applicable categories of standards include bacteria, biostimulatory substances, chemical constituents, color, DO, floating material, oil and grease, pH, pesticides, sediment, suspended material, taste and odors, temperature, toxicity, and turbidity (Table 5-2).

The Basin Plan provides specific numeric objectives for bacteria, to protect the contact recreation beneficial uses. Biostimulatory substances refer mainly to nutrients such as nitrogen, phosphorous, and organic carbon which can promote aquatic plant growth that may degrade aquatic habitat and diminish recreational values. This is mainly a narrative standard, as are the standards for color, floating material, oil and grease, sediment, suspended material, and taste and odors.

The Basin Plan for chemical constituents provides numeric water quality objectives that are derived from various sources. These objectives include references to maximum contaminant levels (MCLs) that are provided in Title 22 of the California Code of Regulations which sets standards for waters designated for domestic or municipal use. Additional, and often more stringent criteria are provided by the California Toxics Rule (CTR) and the National Toxics Rule (NTR) to protect aquatic life, and human health in the case of mercury. The CTR and NTR provide pertinent toxicity standards (Table 5-2).

Specific numeric objectives for DO, pH, and turbidity provided in the Basin Plan are applicable to the Project. The Basin Plan also specifies a water temperature thermal heating criteria that states “Natural water temperatures shall not be altered unless it can be demonstrated to the satisfaction of the Regional Board that such alteration does not adversely affect beneficial uses. At no time or place shall the temperature be increased more than 5°F (2.8°C) above the natural receiving water.”

In addition to the Basin Plan, the RWQCB also enforces the water quality objectives published in the California Inland Surface Waters Plan (SWRCB 1991). The water quality objectives in both the Basin Plan and the Inland Surface Waters Plan consider background levels and are based on criteria that protect both human health and aquatic life. If water quality is maintained at levels below these objectives the beneficial uses are considered to be protected.

5.4 Existing Water Quality Information

The results of relevant water quality information reviewed are summarized below. The historical water quality data (pre-1985) obtained from NWIS (USGS data) and STORET (USBR and SWRCB data) databases are discussed collectively. This is followed by a summary of the results from the American River Watershed Sanitary Surveys, and the results of water quality studies performed in association with the relicensing of the SMUD’s UARP.

5.4.1 Historical Water Quality Study Results

Historical water quality data (1960’s - 1980’s) consists of data collected by the USGS, SWRCB and the USBR. This data was obtained from online databases and is provided in Tables 5-3 through 5-5. The locations of the water quality sampling stations identified in these tables are depicted on Map 5-1 by the map code letter provided in the tables.

Review of the USGS data from the NWIS database indicate that generally all of the constituents analyzed comply with current regulatory standards with the exception of iron and manganese constituents. Elevated concentrations of iron and manganese were detected in water samples collected from the Middle Fork American River above French Meadows in 1979 (Table 5-3). Iron was reported in two samples at concentrations of 370 ug/l and 650 ug/l and manganese was detected in three samples at concentration of 60 ug/l, 90 ug/l and 140 ug/l. These concentrations are above the secondary MCL taste and odor threshold levels for iron and manganese (300 ug/l and 50 ug/l, respectively).

Review of the USBR sampling data from the Middle Fork American River and the North Fork American River indicate that generally all of the constituents analyzed complied with current regulatory standards with the exception of a few pH measurements. Seven measurements of pH were either above or below the current regulatory standard of 6.5 to 8.5 (Table 5-4). Over a 13-year period between 1968 and 1981 the USBR collected 222 pH measurements from waters in the vicinity of the MFP. Of these pH measurements five measurements were below the 6.5 regulatory level ranging between 5.8 and 5, and two measurements were above the 8.5 regulatory level ranging between 8.6 and 9.2.

Review of the SWRCB data collected between 1960 and 1969 from waters in the vicinity of the MFP indicate that the sampling results comply with current regulatory standards (Table 5-5).

5.4.2 American River Watershed Sanitary Survey Results

PCWA collects and analyzes water quality samples collected in the North Fork American River at their water intake for the Foothill Water Treatment Plant. These data are published in a report entitled the American River Watershed Sanitary Survey, which is updated every five years. These data represent raw water quality conditions in the North Fork American River prior to treatment and distribution into the PCWA water delivery system.

The 1998 sanitary survey includes tabulated data from the ambient water quality monitoring program. The data summarized was collected between 1993 and 1997 and are presented in Table 5-6. The results indicate that chromium was the only inorganic constituent tested which exceeded the current regulatory standard of 0.05 mg/l between 1993 and 1997. However, most of the samples for chromium were well below the regulatory standard. The 1998 sanitary survey states: *"PCWA is currently in compliance with all regulations at both water treatment plants"* (Archibald & Wallberg Consultants 2003).

The 2003 update to the sanitary survey provided an overview of the water quality for the raw influent water from the North Fork American River to the Foothill Water Treatment Plant between 1998 and 2002. The sanitary survey stated: *"The raw water has excellent quality……Fecal coliform and E. coli levels are generally very low."* (Archibald & Wallberg Consultants 2003).

PCWA is continuing to collect water samples at the intake for the Foothilll Water Treatment Plant. Data from this ongoing monitoring effort will be reported in the next American River Watershed Sanitary Survey, due to be published in 2008.

5.4.3 SMUD UARP Water Quality Study

SMUD conducted a water quality study for their UARP during 2002 as part of their hydroelectric relicensing process (SMUD 2005). Study results from monitoring sites located on the Rubicon River above Hell Hole Reservoir (six sites), the South Fork Rubicon River (four sites), and Gerle Creek (nine sites) are of interest for the MFP because they represent water quality conditions for the water entering MFP reservoirs or water downstream of MFP facilities. Most of these monitoring sites are located within stream reaches, but a few are within smaller reservoirs (i.e., Buck Island Reservoir, Rubicon Reservoir, Gerle Creek Reservoir).

SMUD collected measurements of in-situ parameters as well as water samples that were analyzed by laboratory methods for chemical constituents. Parameters generally included standard in-situ measurements, nutrients, dissolved ions, organic compounds, metals, bacteria, and fish tissue analysis. In general, results of analyses for most water quality constituents evaluated in the study were within Basin Plan standards. The exceptions are described below.

- The results of SMUD's pH measurements revealed that most values were within the range of 6.0-8.0, with 21 values in the upper Watershed stream reaches that were less than 6.5 (SMUD 2005). During spring runoff sampling events, the majority of pH measurements were less than 6.5, which included monitoring sites in both SMUD project-affected and non project-affected reaches.

- Laboratory analysis of total metals concentrations indicated that the primary MCL criteria were not exceeded (SMUD 2005). However, the secondary MCL criteria for aluminum (200 µg/L) and iron (300 µg/L) were exceeded during some sampling events (SMUD 2005). An aluminum concentration of 230 µg/L was observed on the Rubicon River in 2002. Iron concentrations of 390 µg/L and 340 µg/L were observed in 2003 in the Rubicon Reservoir. Iron concentrations were exceeded in 2004 in Rockbound Reservoir (330 µg/L), Rubicon Reservoir (540 µg/L), and the Rubicon River (340 µg/L).

- Dissolved metals analyses were performed on water samples collected by SMUD during summer/fall 2004 to determine compliance with aquatic life toxicity criteria. The parameters tested include cadmium, copper, lead, nickel, silver, and zinc. The acute and chronic toxicity criteria for these parameters must be calculated on a sample-by-sample basis because they are hardness-dependent. Exceedances of the criteria occurred for all parameters (except nickel) in both SMUD project-affected and non project-affected reaches (Table 5-7).

- Fish tissue samples were collected from Loon Lake and Gerle Creek Reservoir in 2003 and analyzed for trace metals in the edible portion (i.e., filet) of the fish.

Analyses included arsenic, aluminum, cadmium, chromium, copper, lead, mercury, manganese, nickel, selenium, and zinc. None of the SWRCB's Maximum Tissue Residue Levels (MTRL's) were exceeded in these samples. There was one exceedance of the USEPA's 0.3 parts per million (ppm) mercury criterion from Gerle Creek Reservoir: one brown trout contained 0.32 ppm of mercury in the fish filet.

5.5 Summary of Recent Water Temperature Monitoring Studies

The following summarizes PCWA's recent water temperature monitoring efforts. The stream monitoring program is discussed first, followed by reservoir profiling. More detailed information, including temperature plots and reservoir profiles, is included in the 2005 and 2006 Water Temperature Study Reports (PCWA 2006; PCWA 2007).

5.5.1 Stream Temperature Monitoring

In 2003, PCWA began installing water temperature loggers in the streams and rivers upstream and downstream of the MFP dams, reservoirs and powerhouses. After reviewing data from the original loggers, PCWA installed loggers at additional sites, installed redundant loggers to ensure data quality, and also replaced loggers that have either been lost to vandalism or to high flows. Currently, PCWA monitors water temperature at 49 different locations, as shown on Map 5-2. The loggers at 48 of these locations were installed and are maintained by PCWA. One site is maintained by the USGS. All of the water temperature monitoring study sites are identified in Table 5-8, along with latitude and longitude coordinates, river mile information, and old and new site identifications (IDs). Note that the site IDs were changed in 2006 at the request of the resource agencies so that each site ID included letters indicating the stream and numbers indicating the stream mile above its confluence.

PCWA regularly retrieved stream water temperature data from each monitoring site during the summer and fall of 2005. In July of 2006, PCWA began downloading water temperature data recorded during the previous winter and spring. At this time, it was revealed that numerous water temperature loggers were lost due to high winter and spring flows or were buried in sediment mobilized by the high flows. The lost gages were replaced during the summer and water temperature monitoring was reestablished. PCWA continued to retrieve stream water temperature data from each monitoring site during the summer and fall of 2006. PCWA is continuing to monitor water temperature in the streams and rivers associated with the MFP.

The 2005 water temperature monitoring results are discussed in detail in the 2005 Water Temperature Monitoring Study Report (PCWA 2006). Similarly, the 2006 water temperature monitoring results are discussed in detail in the 2006 Water Temperature Monitoring Study Report (PCWA 2007). These reports include numerous graphs showing water temperatures with respect to flow. In addition, Appendix B of the 2006 study report (PCWA 2007) contains a comparison of the daily average water temperature observed at each monitoring site during 2005 and 2006.

The 2005 and 2006 stream water temperature regimes were relatively similar for all Project streams. In general, at sites where complete (or mostly complete) data sets are available for both years, water temperatures during 2006 warmed slightly earlier in the summer, and peaked at slightly higher temperatures a few days later. The only difference in water temperatures correlated to the timing of reservoir spills, maintenance outages, and an outage that occurred during the Ralston Ridge Fire in September 2006. The water temperature results are discussed further below, by stream.

5.6 STREAM WATER TEMPERATURE RESULTS

5.6.1 Middle Fork American River

Water temperature was monitored at 17 locations in the Middle Fork American River, from upstream of French Meadows Reservoir (MF51.9) to immediately upstream of the confluence with the North Fork American River (MF0.1). Water temperature also was monitored in three tributaries (not including Duncan Creek or the Rubicon River) to the Middle Fork American River: the North Fork of the Middle Fork American River (NM2.3); Otter Creek (OC0.1); and Canyon Creek (CC0.1).

The following provides a description of water temperature by reach based on data collected at representative sites.

Daily average water temperatures in the Middle Fork American River at the following representative sites are shown in Figure 1:

- MF51.9 - Upstream of French Meadows Reservoir
- MF46.6 - Downstream of French Meadows Reservoir
- MF39.4 - Upstream of Duncan Creek
- MF36.1 - Upstream of Middle Fork Interbay

In this Middle Fork American River reach during 2006, the warmest water temperatures were observed upstream of French Meadows Reservoir (MF51.9) and upstream of Middle Fork Interbay (MF36.1), where daily average water temperatures were as high as approximately 70°F. Water temperatures were as much as 22°F cooler downstream of French Meadows Reservoir (MF51.9) than upstream (MF46.6), illustrating the cooling effect of the reservoir due to low-level releases of water from French Meadows Reservoir. Water temperatures were as much as 22°F warmer upstream of Middle Fork Interbay than downstream of French Meadows Reservoir, illustrating the ambient heating that occurred in the approximately 10 river miles between these two sites.

Daily average water temperatures in the Middle Fork American River at the following representative sites are shown in Figure 2:

- MF36.1 - Upstream of Middle Fork Interbay
- MF35.5 - Downstream of Middle Fork Interbay

- MF29.4 - Between French Meadows and Duncan Creek
- MF26.0 - Downstream of Brushy Canyon Creek

In this Middle Fork American River reach during 2006, the warmest water temperatures were observed upstream of Middle Fork Interbay (MF36.1) and upstream of Ralston Afterbay (MF26.0), where daily average water temperatures were as high as approximately 70°F. Water temperatures were as much as 25°F cooler downstream of Middle Fork Interbay (MF35.5) than upstream (MF36.1), illustrating the cooling effect of Middle Fork Powerhouse, which is operated with water that originates near the bottom of Hell Hole Reservoir and is routed through the Hell Hole-Middle Fork Tunnel. Water temperatures were as much as 25°F warmer upstream of Ralston Afterbay than downstream of Middle Fork Interbay, illustrating the ambient heating that occurred in the approximately 10 river miles between these two sites. The increase in water temperature that was observed during early to mid-September and October downstream of Middle Fork Interbay (MF35.5) was due to the Ralston Fire and the annual maintenance outage, respectively, when Project operations were suspended.

Daily average water temperatures in the Middle Fork American River (and the Rubicon River for reference) at the following representative sites are shown in Figure 3:

- RR0.7 - Upstream of Ralston Powerhouse
- MF26.0 - Upstream of Ralston Afterbay
- MF24.3 - Downstream of Oxbow Powerhouse
- MF23.1 - Downstream of the North Fork of the Middle Fork American River
- MF8.9 - Downstream of Ruck-a-Chucky Rapids
- MF0.1 - Upstream of the North Fork American River

During the warmest months of 2006, daily average water temperatures in the Middle Fork American River (MF26.0) and Rubicon River (RR0.7) upstream of Ralston Afterbay were as warm as 72°F and 77°F, respectively, whereas daily water temperature during that same time downstream of Oxbow Powerhouse was approximately 50°F. In the approximately 24 river miles between Oxbow Powerhouse and the confluence with the North Fork American River, daily average water temperature in the Middle Fork American River warmed by as much as approximately 10°F. The warmest water temperatures downstream of Oxbow Powerhouse were observed during early and mid-September when Project operations were suspended during the Ralston Ridge Fire. During the fire, daily average water temperature was as high as 67°F in the Middle Fork American River upstream of the confluence with the North Fork American River (MF0.1).

5.6.2 Duncan Creek

Water temperature was monitored at three locations in Duncan Creek, from immediately upstream of the Duncan Creek Diversion Pool (DC8.8) to immediately upstream of the confluence with the Middle Fork American River (DC0.1).

Water temperatures in Duncan Creek from RM 8.8 downstream to RM 0.1 and the Middle Fork American River upstream of Duncan Creek (for reference) are shown in Figure 4. The trends in the data for the Duncan Creek sites during mid to late summer indicate that daily average water temperatures increased from RM 8.8 to 8.4, and then decreased from RM 8.4 to 0.1. The warmest observed daily average water temperature at DC8.4 was 68°F. Despite being located approximately 0.4 miles apart, water temperature upstream of the Duncan Creek Diversion was as much as 4°F cooler than downstream of the diversion. The ambient warming of water temperature in this short reach may have been exacerbated in 2006 due to an excessive amount of sediment that accumulated behind the diversion dam resulting from a culvert and road failure that occurred approximately ¼ mile upstream during winter 2005/2006 that reduced the depth of the channel behind the diversion.

The cooling of water temperature that was observed during the summer and early fall between DC8.4 and DC0.1 may be explained by the contribution of cooler water from springs and other small tributaries during a “wet” year. The warmest observed daily average water temperature at DC0.1 was 65°F. For reference, where the data records overlap during the summer and fall, daily average water temperature in the Middle Fork American River upstream of Duncan Creek (MF39.4) generally was similar or slightly warmer (up to 3°F) than Duncan Creek at the confluence with the Middle Fork American River (DC0.1).

5.6.3 Rubicon River

Water temperature was monitored at 12 locations in the Rubicon River, from upstream of Hell Hole Reservoir (RR35.9) to Ralston Afterbay (RR0.7) (the confluence with the Middle Fork American River), and in the South Fork Rubicon River immediately upstream of the Rubicon River confluence (SF0.1). Water temperature also was monitored in Pilot Creek (PC0.1), a major tributary to the Rubicon River, and Five Lakes Creek (FL0.1), a major tributary to Hell Hole Reservoir.

The following provides a description of water temperature based on data collected at representative sites.

Daily average water temperatures in the Rubicon River at the following representative sites are shown in Figure 5:

- RR35.9 - Upstream of Hell Hole Reservoir
- RR30.2 - Downstream of Hell Hole Reservoir
- RR22.5 - Downstream of the South Fork Rubicon River
- RR14.3 - Between the South Fork Rubicon River and Big Grizzly Canyon Creek
- RR0.7 - Upstream of Ralston Powerhouse

In the Rubicon River during 2006, water temperatures were as much as approximately 25°F cooler in the Rubicon River downstream of Hell Hole Reservoir (RR30.2) than upstream (RR35.9), illustrating the cooling effect of the reservoir due to low-level releases of water from Hell Hole Reservoir. In the approximately 29 river miles between RR30.2 (downstream of Hell Hole Reservoir) and RR0.7 (upstream of Ralston Afterbay), water temperatures warmed by as much as 34°F, illustrating the ambient heating that occurred. The warmest water temperatures were observed near Ralston Afterbay (RR0.7), where daily average water temperatures were as high as approximately 77°F.

5.6.4 Long Canyon Creek

Water temperature was monitored at seven locations in Long Canyon Creek (two locations each in the South Fork and North Fork Long Canyon creeks and three locations on the main stem), from immediately upstream of the diversions on South Fork (SL3.4) and North Fork (NL3.2) Long Canyon creeks to immediately upstream of the confluence with the Rubicon River (LC0.1). Water temperature also was monitored in Wallace Canyon Creek (WC1.2), a major Long Canyon Creek tributary.

Daily average water temperatures in Long Canyon Creek (and the Rubicon River for reference) at the following representative sites are shown in Figure 6:

- NL3.2 - Upstream of North Fork Diversion Dam
- SL3.4 - Upstream of South Fork Diversion Dam
- LC11.1 - Downstream of the North Fork and South Fork Long Canyon Creek confluence
- LC0.1 - Upstream of the Rubicon River
- RR5.3 - Upstream of Long Canyon Creek

During the warmest period of the summer, daily average water temperature in North Fork Long Canyon Creek upstream of the diversion (NL3.2) was as high as 68°F and the South Fork Long Canyon Creek upstream of the diversion (SL3.4) was as high as 60°F. The warmest temperatures were observed at LC0.1, where daily average water temperature was as high as 77°F. Daily average water temperature increased as much as 10°F in the 11 river mile reach between the confluence of the North Fork and South Fork Long Canyon creeks (LC11.1) and the mouth (LC0.1). The daily average water temperatures in Long Canyon Creek (LC0.1) and the Rubicon River (RR5.3) near their confluence were similar.

5.6.5 North Fork American River

Water temperature was monitored at four locations in the North Fork American River. PCWA maintains sites in the North Fork American River upstream of Shirttail Creek (NF48.0), and immediately upstream (NF21.4) and downstream (NF20.8) of the Middle Fork American River.

Daily average water temperatures in the North Fork American River (and the Middle Fork American River for reference) at the following representative sites are shown in Figure 7:

- NF48.0 - Upstream of Shirttail Creek
- NF21.4 - Upstream of the Middle Fork American River (downstream of Lake Clementine)
- MF0.1 - Upstream of the North Fork American River
- NF20.8 - Downstream of the Middle Fork American River

The site in the North Fork American River upstream of Shirttail Creek was established on August 1, 2006. Daily average water temperature in the North Fork American River downstream of Lake Clementine at RM21.4 exceeded 80°F, and was almost 20°F warmer than downstream of the Middle Fork American River at RM 20.8, indicating that the Middle Fork American River had a substantial cooling influence on the North Fork American River. The highest daily average water temperatures in the North Fork American River downstream of the Middle Fork American River occurred coincident with the Ralston Fire and the suspension of MFP operations in early to mid-September.

5.7 Reservoir Profiles

During 2005 and 2006, PCWA profiled water temperature, DO, and specific conductance at various locations in Hell Hole and French Meadows reservoirs, and in Ralston Afterbay. These profiles were conducted monthly during the summer and fall. The primary objective of the reservoir profiling program was to characterize water temperatures in the MFP reservoirs and to identify the occurrence, timing, and nature of the thermal processes, such as thermal stratification. PCWA will continue reservoir profiles during the summer and fall of 2007.

The results of PCWA's reservoir profiling efforts are summarized below, by reservoir. Additional information, is available in the 2005 and 2006 Water Temperatures Study Reports (PCWA 2006; PCWA 2007).

French Meadows Reservoir

Temperature Profiling

The shapes of the water temperature profiles during 2005 and 2006 are very similar (Figures 8-11). During 2005 and 2006, the depths of the thermoclines were nearly identical during July, August, and October, and were within a few feet in September. The coldest temperatures measured near the bottom of the reservoir were within a few degrees in 2005 and 2006. Surface water temperatures observed were generally warmer each month in 2005 than in 2006, except during August, when it was warmer in 2006.

Dissolved Oxygen

The DO concentrations and profiles in the French Meadows Reservoir were similar in 2005 and 2006 (Figures 12-15). The shapes of the DO profiles at French Meadows were similar during July, August, and September in 2005 and 2006, where DO increased from the surface to the thermocline and then slowly decreased. During the July, August, and September surveys, DO concentrations were at or above 7 mg/L at all depths sampled except at the bottom of the reservoir during the July survey. The low oxygen levels recorded during the July survey (<4 mg/L) represent those at the bottom of the reservoir at the sediment-water interface where DO levels are typically reduced and anaerobic activity is prominent.

During the October survey, DO was highest at the surface (approximately 8.2 mg/L) and slowly decreased to the thermocline where DO levels had a point of rapid (but not large) decrease from approximately 8 mg/L to approximately 7 mg/L, and then again slowly decreased to approximately 6 mg/L at the deepest point measured.

Specific Conductance

With some minor variation, specific conductance measurements were relatively similar throughout 2005 and 2006 and throughout the water column (Figures 16-19). Overall, specific conductance slightly increased from July through October and slightly decreased from the surface to the deepest point measured.

Hell Hole Reservoir

Temperature Profiling

The shapes of the water temperature profiles during 2005 and 2006 are generally similar, although some differences were observed (Figures 20-23). Although the shape of the thermograph and the depth of the thermocline were similar during July 2005 and 2006, the surface water temperature was approximately 4°F warmer during 2005. During August of 2005 and 2006 the characteristics of the observed thermograph were similar. The thermocline was less distinct and the surface water temperature was approximately 6°F warmer during September 2006 than during September 2005. The primary difference observed during October 2005 and 2006 was that the thermocline was approximately 10 feet deeper during 2006.

Dissolved Oxygen

The DO profiles in Hell Hole Reservoir have similar patterns in 2005 and 2006, but overall DO concentrations were slightly higher in 2006 than in 2005 (Figure 24). Overall, DO concentrations were highest in July and lowest in October. During July and August, the lowest DO concentrations were found at the surface where the water temperatures were the warmest and the highest concentrations were observed in the middle of the water column. During the July and August surveys, DO was greater than approximately 7.5 mg/L at all depths sampled and was as high as 9.75 mg/L.

During September, DO concentration decreased from the surface (approximately 8.5 mg/L) to approximately 100 feet (approximately 7.5 mg/L), then increased from 100 feet to 200 feet (approximately 9.0 mg/L), and then decreased again to the deepest depth sampled (approximately 260 feet) (approximately 8.25 mg/L). This pattern was not observed during any other month.

The shape of the DO profile in October also was unique. DO slowly decreased from the surface (approximately 8.0 mg/L) to approximately 170 feet (approximately 7.5 mg/L), and then more quickly decreased to approximately 200 feet (approximately 6.75 mg/L), the deepest depth sampled.

<u>Specific Conductance</u>

Specific conductance measurements were slightly lower in 2006 than 2005, but showed similar patterns throughout the water column (Figure 25). Overall, specific conductance slightly increased July through October and slightly decreased from the surface to the deepest point measured.

Ralston Afterbay

<u>Temperature Profiling</u>

The largest notable difference between 2005 and 2006 was the maximum depth observed, and where the profile sampling occurred (Figure 26-28). Ralston Afterbay was almost 15 feet deeper in 2006 than 2005, resulting in several more measurements taken on each sampling occasion in 2006. This difference in depth may be the result of sediment mobilization and scour that resulted from the high stream flows that occurred during the winter of 2005/2006.

The coldest temperatures observed at the deepest measurements were very similar between 2005 and 2006. However, the water temperatures observed at the surface were greater during each month in 2005 than in 2006. During July, August, and October, the surface water temperature in 2005 was approximately 11°F, 10°F, and 5°F warmer, respectively, than observed in 2006.

<u>Dissolved Oxygen</u>

The DO profiles in Ralston Afterbay generally increased with increasing depth (and with decreasing water temperature (Figure 29)). The DO concentrations measured at the surface were similar during the three sampling events during 2006. The concentration of DO generally increased with increasing depth (and with decreasing water temperature) and was greater than 10 mg/L during each sampling event at all depths sampled. An anoxic layer was not observed at the bottom of Ralston Afterbay during reservoir profiling.

Specific Conductance

Specific conductance measurements varied between 2005 and 2006 (Figure 30). In 2005, specific conductance varied between each sampling event, but only varied slightly within the water column. While in 2006, specific conductance measurements were similar between each sampling event and did not vary considerably from the surface to the bottom.

5.8 References

Archibald & Wallberg Consultants. 2003. American River Watershed Sanitary Survey, 2003 Update. Prepared by Archibald & Wallberg Consultants, in association with MWH, Americas. December 2003.

California Division of Mines and Geology (CDMG). 1970. Gold Districts of California. Bulletin 193.

Placer County Water Agency (PCWA). 2005. 2005-2006 Existing Environment Study Plan Package. June 17, 2005.

PCWA. 2006. 2005 Water Temperature Study Report. January 30, 2006.

PCWA. 2007. 2006 Water Temperature Study Report. June 20, 2007.

Regional Water Quality Control Board (RWQCB). 2004. The Sacramento River Basin and San Joaquin River Basin Water Quality Control Plan (Basin Plan) for the California Regional Water Quality Control Board - Central Valley Region (Fourth Edition revised September 2004).

Sacramento Municipal Utility District (SMUD). 2005. Sacramento Municipal Utility District Upper American River Project (FERC Project No. 2101) and Pacific Gas and Electric Company Chili Bar Project (FERC Project No. 2155) Water Quality Technical Report. Prepared by Devine Tarbell and Associates, Inc. May 2005.

State Water Resources Control Board (SWRCB). 1991. California Inland Surface Waters Plan: Water Quality Control Plan for Inland Surface Waters in California. Water Resources Control Board of California. April 1991.

United States Environmental Protection Agency (USEPA). 2001. Water Quality Criterion for the Protection of Human Health: Methylmercury - Final. Office of Science and Technology, Office of Water.

USEPA STOrage and RETrieval (STORET). http://www.epa.gov/storet/.

United States Geological Survey (USGS). 1999. Mercury Contamination from Hydraulic Placer-Gold Mining in the Dutch Flat Mining District, California. USGS Water-Resources Investigations Report 99-4018B, p. 179-189.

USGS. 2000. Mercury Contamination from Historic Gold Mining in California. Fact Sheet FS-061-00.

USGS National Water Information System (NWIS). http://waterdata.usgs.gov/nwis.

TABLES

Table 5-1. The Sacramento River Basin and San Joaquin River Basin Water Quality Control - Definition of Beneficial Uses.

Beneficial Use	**Definition**
Municipal and Domestic Supply (MUN)	Uses of water for community, military, or individual water supply systems including, but not limited to, drinking water supply.
Agricultural Supply (AGR)	Uses of water for farming, horticulture, or ranching including, but not limited to, irrigation (including leaching of salts), stock watering, or support of vegetation for range grazing.
Hydropower Generation (POW)	Uses of water for hydropower generation.
Water Contact Recreation (REC-1)	Uses of water for recreational activities involving body contact with water, where ingestion of water is reasonably possible. These uses include, but are not limited to, swimming, wading, water-skiing, skin and scuba diving, surfing, whitewater activities, fishing, or use of natural hot springs.
Non-contact Water Recreation (REC-2)	Uses of water for recreational activities involving proximity to water, but where there is generally no body contact with water, nor any likelihood of ingestion of water. These uses include, but are not limited to, picnicking, sunbathing, hiking, beachcombing, camping, boating, tidepool and marine life study, hunting, sightseeing, or aesthetic enjoyment in conjunction with the above activities.
Cold Freshwater Habitat (COLD)	Uses of water that support cold water ecosystems including, but not limited to, preservation or enhancement of aquatic habitats, vegetation, fish, or wildlife, including invertebrates.
Spawning, Reproduction and/or Early Development (SPWN)	Uses of water that support high quality aquatic habitats suitable for reproduction and early development of fish.
Wildlife Habitat (WILD)	Uses of water that support terrestrial or wetland ecosystems including, but not limited to, preservation and enhancement of terrestrial habitats or wetlands, vegetation, wildlife (e.g., mammals, birds, reptiles, amphibians, invertebrates), or wildlife water and food sources.

Source: Table II of *The Sacramento River Basin and San Joaquin River Basin Water Quality Control Plan (Basin Plan) for the California Regional Water Quality Control Board –Control Valley Region Fourth Edition revised September 2004*.

Table 5-2. Applicable Water Quality Objectives and Standards.

Analyte	Units	State and Federal Criteria		
		Basin Plan[1]	CA TOXIC RULE[2]	NATIONAL TOXIC RULE[3]
Acid Neutralizing Capacity		NS	NS	NS
Alkalinity (as $CaCO_3$)	mg/L	NS	NS	>20[5]
Aluminum	mg/L	0.2	NS	NS
Ammonia as NH_3	mg/L	1.5[6]	NS	1[6]
Antimony	µg/L	6	14	14
Arsenic – Total	µg/L	10	150/340[10]	150/340[10]
Benzene	µg/L	1	1.2	1.2
Beryllium	µg/L	4	NS	NS
Bicarbonate (as $CaCO_3$)		NS	NS	NS
Boron – Total		NS	NS	NS
Cadmium	µg/L	5	Hardness Dependent[10,11]	Hardness Dependent[10,11]
Calcium		NS	NS	NS
Carbonate (as $CaCO_3$)		NS	NS	>20[5]
Chemical Oxygen Demand		NS	NS	NS
Chloride	mg/L	250[4]	NS	NS
Chlorophyll-a		NS	NS	NS
Chromium - Total	µg/L	50	NS	NS
Cobalt		NS	NS	NS
Color		15 units[4,7]	NS	NS
Copper – Total	mg/L	1	1.3[13] and Hardness Dependent[11]	1.3[13] and Hardness Dependent[11]
Cryptosporidium		NS	NS	NS
Cyanide	µg/L	150	5.2/22[10]	100/110[10]
Ethyl-benzene	µg/L	300	3,100	3,100
Fecal Coliform (3x5)	MPN/ 100 mL	200	NS	NS
Fecal Streptococci		NS	NS	NS
Fluoride	mg/L	2	NS	NS
Foaming Agents	mg/L	0.5[4]	NS	NS
Giardia		NS	NS	NS
Hardness (as $CaCO_3$)		NS	NS	>20[5]
Iron – Total	mg/L	0.3[4]	NS	NS
Lead – Total	µg/L	15	NS	NS
Magnesium		NS	NS	NS

Table 5-2. Applicable Water Quality Objectives and Standards.

Analyte	Units	State and Federal Criteria		
		Basin Plan[1]	CA TOXIC RULE[2]	NATIONAL TOXIC RULE[3]
Manganese – Total	µg/L	50[4]	NS	NS
Mercury – Total	µg/L	2	0.05	0.77/1.4[10]
Methylmercury	mg/Kg fish			0.3[17]
Methyl-tertiary-butyl Ether (MtBE)	µg/L	5[4]	NS	NS
Nickel	µg/L	100	610[13], 4,600[14] and Hardness Dependent [10,11]	610[13], 4,600[14] and Hardness Dependent [10,11]
Nitrate (NO_3)	mg/L	45	NS	NS
Nitrite	mg/L	1.0	NS	NS
Nitrogen- Total Kjeldahl (TKN)		NS	NS	NS
Odor		3 units[4,7]	NS	NS
Organic Carbon		NS	NS	NS
Ortho-phosphate (o-PO_4-P)		NS	NS	NS
Oxygen, dissolved	mg/L	7.0[15]	NS	NS
pH	unitless	6.5 – 8.5	NS	6.5 – 9.0
Phosphorus		NS	NS	NS
Potassium		NS	NS	NS
Selenium	µg/L	50	5/20[10]	5/20[10]
Silica		NS	NS	NS
Silver	µg/L	100[4]	Hardness Dependent [10,16]	Hardness Dependent [10,16]
Sodium		NS	NS	NS
Sulfate (SO_4)	mg/L	250[4]	NS	NS
Thallium	µg/L	2	1.7[13], 6.3[14]	1.7[13], 6.3[14]
Toluene	µg/L	40	6.8[13], 20[14]	20[14]
Total Coliform (3x5, 6 hr hold)		NS	NS	NS
Total Dissolved Solids	mg/L	500[4]	NS	NS
Total Petroleum Hydrocarbons (as gasoline and as diesel)		NS	NS	Narr[8]
Total Suspended Solids		NS	NS	NS
Turbidity	NTU	Narr[9]	NS	NS

Table 5-2. Applicable Water Quality Objectives and Standards.

Analyte	Units	State and Federal Criteria		
		Basin Plan[1]	CA TOXIC RULE[2]	NATIONAL TOXIC RULE[3]
Xylenes – Total	µg/L	1750	NS	NS
Zinc – Total	mg/L	5[4]	Hardness Dependent[10]	Hardness Dependent[10]

[1]The Basin Plan for the Sacramento and San Joaquin River Basins rely on California primary and secondary Maximum Concentration Level objectives as criteria for water quality to be used as a municipal & domestic supply for human consumption.

[2]California Toxics Rules are based primarily on USEPA standards developed under the Clean Water Act for human consumption of water and aquatic organisms with an adult risk for carcinogens estimated to be one in one million as contained in the Integrated Risk Information System (IRIS) as of October 1, 1996.

[3]The National Toxics Rules are based on USEPA standards developed under the Clean Water Act for human consumption of water and aquatic organisms with an adult risk for carcinogens estimated to be one in one million as contained in the IRIS as of October 1, 1996. These criteria are to be applied to all states not complying with the Clean Water Act section 303(c)(2)(B).

[4]The criteria listed are secondary Maximum Concentration Levels for California drinking water quality objectives that do not necessarily indicate a toxic amount of contaminate. Rather these standards dictate water quality objectives designed to preserve taste, odor, or appearance of drinking water.

[5]20 mg/L or more as $CaCO_3$ for freshwater aquatic life except where natural concentrations are less (USEPA's 1976 'Red Book). The 'Red Book' also recommends that natural alkalinity not be reduced by more than 25%.

[6]Taste and odor threshold.

[7]Water shall be free of discoloration that causes nuisance or adversely affects beneficial uses. Water shall not contain taste- or odor-producing substances in concentrations that impart undesirable tastes or odors to domestic or municipal water supplies or to fish flesh or other edible products of aquatic origin, or that cause nuisance, or otherwise adversely affect beneficial uses. (Sacramento and San Joaquin River Basin Plan, Chapter III: Water Quality Objectives, pgs. 5 and 7, 6 September 2002).

[8]From Compilation of Water Quality Goals – TPH-diesel: taste and odor threshold and USEPA SNARL = 100 ug/L. TPH-gasoline: taste and odor threshold and proposed USEPA SNARL = 5 µg/L.

[9]Increases in turbidity attributable to controllable water quality factors shall not exceed the following limits: where natural turbidity is between 0 and 5 NTU's, increases shall not exceed 1 NTU. Where natural turbidity is between 5 and 50 NTU's, increases shall not exceed 20%. Where natural turbidity is between 50 and 100 NTU's, increases shall not exceed 10 NTU's. Finally, where natural turbidity is greater than 100 NTU's, increases shall not exceed 10%.

[10]Freshwater Aquatic Life Protection, continuous concentration (4-day average)/maximum concentration (1-hour average).

[11]Criteria is expressed as a function of hardness and decreases as hardness decreases. The actual criteria is calculated based in the hardness (as $CaCO_3$) of the sample water.

[12]California primary maximum contaminant level (MCL) for inorganic mercury.

[13]Califorina Toxic Rule (CTR) human health (30-day average) drinking water sources (consumption of water an aquatic organisms).

[14]Califorina Toxic Rule (CTR) human health (30-day average) other waters (aquatic organism consumption only).

[15]For water designated as COLD.

[16]Instantanous maximum.

[17]This value is an Ambient Water Quality Criteria (AWQC) for methylmercury and was published by the U.S. EPA in a document titled Water Quality Criterion for the Protection of Human Health: Methylmercury – Final (EPA – 823-R-01-001, January 2001). This AWQC replaces the AWQC for total mercury published in 1980 and partially updated in 1997.

NS - no standard available

Table 5-3. Summary of Surface Water Analyses at Sampling Stations on the Middle Fork American River and North Fork American River - U.S. Geological Survey Sampling (Highlighted samples do not comply with the regulatory standards).

Map Code	Station Location Name / Latitude & Longitude	Date	Time	Parameter																																										
				Acid Neutralizing capacity	Ammonia (filtered mg/L as NH4)	Ammonia (mg/L as N)	Arsenic (ug/L)	Beryllium (ug/L)	Bicarbonate (mg/L)	Boron (mg/L)	Cadmium (ug/L)	Calcium (mg/L)	Carbonate (mg/L)	Chemical oxygen demand (mg/L)	Chloride (mg/L)	Chromium (ug/L)	Copper (ug/L)	Dissolved Oxygen (mg/L)	Fecal Coliform	Fecal streptococci	Fluoride (mg/L)	Iron (ug/L)	Lead (ug/L)	Magnesium (mg/L)	Manganese (ug/L)	Mercury (ug/L)	Nickel (ug/L)	Nitrate (filtered mg/L)	Nitrite (mg/L as N)	Nitrite plus nitrate filtered	Organic carbon (mg/L)	Organic nitrogen (mg/L)	Orthophosphate filtered (mg/L)	pH (Standard Units)	Phosphorus (mg/L)	Potassium (mg/L)	Selenium (ug/L)	Silica (mg/L)	Sodium (mg/L)	Specific Conductivity	Sulfate (mg/L)	Suspended sediment (mg/L)	Total nitrogen (mg/L)	Water Hardness (mg/L as CaCO3)	Water Temperature (C)	Zinc (ug/L)
Middle Fork American River																																														
B	MFAR above French Meadows 39 06' 35" 120 28' 49"	4-Jun-79	13:00	9		0.04				20		2.2			0.4			8.9	1	6	0.1	290		0.5	60					0.029	1.6	0	0	7.7	0.01	0.4		10	1.3	30	1.3		0.05	8	12	
		31-Jul-79	10:47	12		0.01				20		3.1			0.3			9.6	2	1	0.1	370		0.7	90					0.004	1.3	0.11	0.01	7.2	0.09	0.6		12	1.2	32	4.2		0.14	11	9	
		26-Oct-79	11:00	12		0.05				0		3.6			0.4			10.3			0	650		0.7	140				0.02	0.04	1.2	0.32	0.01	7.1	0	0.6		11	1.4	30	2.3		0.42	12	7	
P	MFAR Near Foresthill 39 00' 23" 120 45' 40"	6-Mar-79	12:30	19		0.01				40		7.5			1.3			12	1	3	0.1	80		1.3	10						0.9	0.25		7.8	0.01	0.5		12	2.3	48	4.9	2	0.27	24	8	
		31-May-79	16:30	13		0.01				30		5.3			1.1			11.2	1	3	0.1	100		0.8	10					0.033	1	0.1	0.01	7.6	0.01	0.8		9.8	2	33	2.9		0.12	17	10	
		30-Jul-79	10:00	15		0.01				30		3.7			1			11.2	1	3	0.1	90		0.7	20					0.006	1.1	0.15	0	7.2	0.01	0.8		11	1.6	34	0.6	3	0.17	12	10	
		24-Oct-79	10:20	18		0						5.2			1.6			10.2	47	70	0.1	90		1.4	10				0.02	0.015	2	0.51	0.04	7.2	0.01	0.9		11	2.2	48	2.9	2	0.53	19	12	
T	MFAR Near Auburn 38 55' 05" 121 00' 51"	25-Oct-56	14:00																																							1				
		9-Jan-57	11:50																																							1			3.3	
		1-Feb-57	11:50																																							1			5	
		24-Feb-57	10:00																																							50			8.9	
		7-Mar-57	9:50																																							32			8.9	
		7-May-57	16:40																																							9				
		23-May-57	8:40																																							11			12.2	
		3-Jun-57	13:35																																							10				
		19-Oct-57	11:00																																							1			14.4	
		2-Jan-58	13:30																																							23			6.1	
		2-Jan-58	13:45																																							17				
		5-Feb-58	13:00																																							37			10	
		18-Mar-58	(blank)																																							8			10	
		2-Apr-58	10:20																																							47			6.7	
		18-Apr-58	9:50																																							53			12.2	
		7-May-58	12:50																																							40			16.1	
		26-Aug-58	10:00																																							1			15	
		11-Dec-58	11:10																																							1			8.3	
		13-Jan-59	10:25																																							31			7.8	
		11-Feb-59	10:05																																							12			5	
		20-Feb-59	10:00																																							5			7.2	
		27-Apr-59	17:30																																							4			12.8	
		19-Jan-60	9:05																																							1			3.9	
		26-Jan-60	10:25																																							72			7.8	
		3-Feb-60	17:15																																							11				
		11-Feb-60	11:55																																							20				
		1-Mar-60	14:30																																							2			8.9	
		7-Mar-60	14:45																																							537			8.9	
		31-Mar-60	11:25																																							7			8.3	
		28-Apr-60	13:45																																							5			10.6	
		7-Oct-60	(blank)						38	100					5.5																			7.4					3	93				38		
		3-Nov-60	(blank)						36	0					5																			7.6					2.9	92				36		
		8-Dec-60	(blank)						34	0					2.5																			7.6					2.6	72				30		
		3-Jan-61	(blank)						34	0					2.5																			7.6					2.5	75				29		
		31-Jan-61	10:25																																							42			8.9	
		10-Feb-61	(blank)						22	0					1.5																			7.3					2.4	52				21		
		3-Mar-61	(blank)						24	0					3.4																			7.7					3.4	54				22		

Table 5-3. Summary of Surface Water Analyses at Sampling Stations on the Middle Fork American River and North Fork American River - U.S. Geological Survey Sampling (Highlighted samples do not comply with the regulatory standards).

Map Code	Station Location Name / Latitude & Longitude	Date	Time	Parameter																																								
				Acid Neutralizing capacity	Ammonia (filtered mg/L as NH4)	Ammonia (mg/L as N)	Arsenic (ug/L)	Beryllium (ug/L)	Bicarbonate (mg/L)	Boron (mg/L)	Cadmium (ug/L)	Calcium (mg/L)	Carbonate (mg/L)	Chemical oxygen demand (mg/L)	Chloride (mg/L)	Chromium (ug/L)	Copper (ug/L)	Dissolved Oxygen (mg/L)	Fecal Coliform	Fecal streptococci	Fluoride (mg/L)	Iron (ug/L)	Lead (ug/L)	Magnesium (mg/L)	Manganese (ug/L)	Mercury (ug/L)	Nickel (ug/L)	Nitrate (filtered mg/L)	Nitrite (mg/L as N)	Nitrite plus nitrate filtered	Organic carbon (mg/L)	Organic nitrogen (mg/L)	Orthophosphate filtered (mg/L)	pH (Standard Units)	Phosphorus (mg/L)	Potassium (mg/L)	Selenium (ug/L)	Silica (mg/L)	Sodium (mg/L)	Specific Conductivity	Sulfate (mg/L)	Suspended sediment (mg/L)	Total nitrogen (mg/L)	Water Hardness (mg/L as CaCO3)	Water Temperature (C)	Zinc (ug/L)
Middle Fork American River (continued)																																														
T	MFAR Near Auburn 38 55' 05" 121 00' 51" (cont'd)	15-Mar-61	9:55																																							22			6.7	
		4-Apr-61	16:15																																							58				
		5-Apr-61	(blank)						13	0					1.8																			7.1					0.6	28				12		
		1-May-61	(blank)						15	0		3.4			1.6						0			0.9				0						7.4		0.5		8.9	1.7	31	0			12		
		12-Jun-61	(blank)						17	0					0.6																			7.3					1.3	32				13		
		5-Jul-61	(blank)						28	0					2.4																			7.6					2	57				24		
		14-Aug-61	(blank)						45	0					3.7																			7.8					2.2	83				34		
		12-Sep-61	(blank)						39	0		11			7						0.1			2.3				0.1						7.7		0.9		13	3.3	94	4			37		
		10-Oct-61	(blank)						39	100					7																			7.8					3.6	98				37		
		2-Nov-61	(blank)						32	0					7.8																			7.7					3.2	85				34		
		21-Nov-61	10:00																																							1			7.8	
		1-Dec-61	16:45																																							43			8.9	
		5-Dec-61	(blank)						29	0					3.6																			7.3					2.4	68				29		
		28-Dec-61	9:15																																							3			5	
		2-Jan-62	14:25																																							1			5.6	
		9-Jan-62	(blank)						30	0					3.5																			7.3					2.5	68				26		
		1-Feb-62	9:30																																							4				
		6-Feb-62	10:20																																							2			5.6	
		8-Feb-62	(blank)						24	0					3.6																			7.6					2.5	54				22		
		11-Feb-62	16:50																																							63			7.2	
		13-Feb-62	11:30																																							33			8.9	
		28-Feb-62	12:30																																							1				
		1-Mar-62	9:40																																							2			3.3	
		15-Mar-62	(blank)						30	0					2.6																			7.7					2.1	67				26		
		30-Mar-62	15:10																																							11			9.4	
		3-Apr-62	(blank)						17	0					2.2																			7.4					2	36				14		
		11-Apr-62	10:25																																							16			10.6	
		19-Apr-62	10:30																																							25			8.9	
		20-Apr-62	15:50																																							11				
		30-Apr-62	10:15																																							5				
		10-May-62	(blank)						12	0		3.2			2.5						0			0.5				0						7.2		0.3		9	1.4	28	1			10		
		18-May-62	9:15																																							4			11.1	
		6-Jun-62	(blank)						13	0					0.2																			7					1.2	26				10		
		26-Jun-62	8:00																																							1			16.1	
		5-Jul-62	(blank)						20	0					3.2																			7.5					2.4	42				16		
		30-Jul-62	9:10																																							1			23.9	
		9-Aug-62	(blank)						36	0					4																			7.4					4.6	79				29		
		7-Sep-62	10:10																																							1			22.2	
		11-Sep-62	(blank)						37	0		9.9			4.4						0.1			2.3				0						7.8		0.7		13	3.2	87	6			34		
		2-Oct-62	(blank)						45	100					6																			7.6					4.7	100				40		
		9-Oct-62	15:15																																							1			20.6	
		7-Nov-62	(blank)						33	0					2.2																			7.3					2.7	71				29		
		10-Nov-62	11:00																																							5			12.2	

Table 5-3. Summary of Surface Water Analyses at Sampling Stations on the Middle Fork American River and North Fork American River - U.S. Geological Survey Sampling (Highlighted samples do not comply with the regulatory standards).

				Parameter																																										
Map Code	Station Location Name / Latitude & Longitude	Date	Time	Acid Neutralizing capacity	Ammonia (filtered mg/L as NH4)	Ammonia (mg/L as N)	Arsenic (ug/L)	Beryllium (ug/L)	Bicarbonate (mg/L)	Boron (mg/L)	Cadmium (ug/L)	Calcium (mg/L)	Carbonate (mg/L)	Chemical oxygen demand (mg/L)	Chloride (mg/L)	Chromium (ug/L)	Copper (ug/L)	Dissolved Oxygen (mg/L)	Fecal Coliform	Fecal streptococci	Fluoride (mg/L)	Iron (ug/L)	Lead (ug/L)	Magnesium (mg/L)	Manganese (ug/L)	Mercury (ug/L)	Nickel (ug/L)	Nitrate (filtered mg/L)	Nitrite (mg/L as N)	Nitrite plus nitrate filtered	Organic carbon (mg/L)	Organic nitrogen (mg/L)	Orthophosphate filtered (mg/L)	pH (Standard Units)	Phosphorus (mg/L)	Potassium (mg/L)	Selenium (ug/L)	Silica (mg/L)	Sodium (mg/L)	Specific Conductivity	Sulfate (mg/L)	Suspended sediment (mg/L)	Total nitrogen (mg/L)	Water Hardness (mg/L as CaCO3)	Water Temperature (C)	Zinc (ug/L)
Middle Fork American River (continued)																																														
T	MFAR Near Auburn 38 55' 05" 121 00' 51" (cont'd)	23-Nov-62	17:10																																			1			8.3	
		3-Dec-62	(blank)						20	0					3																			7					2.4	47				17		
		8-Dec-62	10:30																																							1			7.2	
		18-Dec-62	10:45																																							101				
		28-Dec-62	15:30																																							1			4.4	
		5-Jan-63	10:35																																							1			3.3	
		14-Jan-63	(blank)						32	0					3																			7.6					2.6	70				28		
		25-Jan-63	15:20																																							1			3.9	
		30-Jan-63	17:10																																							81			8.9	
		7-Feb-63	10:25																																							47			9.4	
		7-Feb-63	(blank)						21	0					2.8																			7.4					1.9	44				16		
		28-Feb-63	9:20																																							4			9.4	
		18-Mar-63	(blank)						29	0					3.4																			7.5					2.5	61				25		
		28-Mar-63	17:00																																							117			7.2	
		29-Mar-63	16:35																																							16			8.3	
		8-Apr-63	13:10																																							309			8.3	
		13-Apr-63	12:20																																							12			8.9	
		15-Apr-63	16:30																																							27			8.9	
		16-Apr-63	(blank)						25	0					1																			7.7					2.2	52				20		
		6-May-63	11:20																																							46			10.6	
		6-May-63	15:00																																							29			10.6	
		15-May-63	(blank)						20	0		4			1						0			1.1				1.2						7.2		0.4		14	1.9	39	1			14		
		3-Jun-63	(blank)						17	0					1.1																			7.3					1.9	35				18		
		6-Jun-63	8:35																																							6			12.8	
		8-Jul-63	(blank)						26	0					1.8																			7.6					2.2	55				21		
		16-Jul-63	9:20																																							1			22.2	
		6-Aug-63	9:10																																							3			23.9	
		10-Sep-63	9:20																																							3			22.8	
		12-Sep-63	(blank)						42	0		11			4						0.1			2.9				0.6						7.8		1.2		12	3.5	95	6			40		
		11-Oct-63	9:10																																							5			18.9	
		4-Nov-63	(blank)						36	0					6.2																			7.7					3.2	87				34		
		5-Nov-63	9:00																																							2			12.8	
		6-Nov-63	15:15																																							174			10.6	
		30-Nov-63	16:00																																							1			7.8	
		3-Dec-63	9:55																																							1			6.7	
		20-Dec-63	17:15																																							1				
		6-Jan-64	(blank)						27	100					4.4																			7.8					2.4	63				24		
		9-Jan-64	9:45																																							1			5	
		20-Jan-64	15:55																																							5				
		21-Jan-64	11:40																																							138			4.4	
		23-Jan-64	12:50																																							5				
		6-Feb-64	10:40																																							6			5.6	
		25-Feb-64	16:45																																							2				

Table 5-3. Summary of Surface Water Analyses at Sampling Stations on the Middle Fork American River and North Fork American River - U.S. Geological Survey Sampling (Highlighted samples do not comply with the regulatory standards).

Map Code	Station Location Name / Latitude & Longitude	Date	Time	Acid Neutralizing capacity	Ammonia (filtered mg/L as NH4)	Ammonia (mg/L as N)	Arsenic (ug/L)	Beryllium (ug/L)	Bicarbonate (mg/L)	Boron (mg/L)	Cadmium (ug/L)	Calcium (mg/L)	Carbonate (mg/L)	Chemical oxygen demand (mg/L)	Chloride (mg/L)	Chromium (ug/L)	Copper (ug/L)	Dissolved Oxygen (mg/L)	Fecal Coliform	Fecal streptococci	Fluoride (mg/L)	Iron (ug/L)	Lead (ug/L)	Magnesium (mg/L)	Manganese (ug/L)	Mercury (ug/L)	Nickel (ug/L)	Nitrate (filtered mg/L)	Nitrite (mg/L as N)	Nitrite plus nitrate filtered	Organic carbon (mg/L)	Organic nitrogen (mg/L)	Orthophosphate filtered (mg/L)	pH (Standard Units)	Phosphorus (mg/L)	Potassium (mg/L)	Selenium (ug/L)	Silica (mg/L)	Sodium (mg/L)	Specific Conductivity	Sulfate (mg/L)	Suspended sediment (mg/L)	Total nitrogen (mg/L)	Water Hardness (mg/L as CaCO3)	Water Temperature (C)	Zinc (ug/L)
Middle Fork American River (continued)																																														
T	MFAR Near Auburn 38 55' 05" 121 00' 51" (cont'd)	2-Mar-64	(blank)						27	0					3.9																			7.9					3.6	62				24		
		3-Mar-64	9:35																																							2			5.6	
		23-Mar-64	17:00																																							3				
		8-Apr-64	10:35																																							6			10	
		4-May-64	(blank)						19	0		4.8			2.2						0			1				0.7						7.7		0.2		12	1.9	39	1			16		
		11-May-64	11:15																																							74			12.2	
		15-Jun-64	8:45																																							6			17.8	
		3-Jul-64	(blank)						28	0					3																			7.8					3.3	60				24		
		23-Jul-64	9:00																																							1			23.9	
		27-Aug-64	8:55																																							1			22.8	
		18-Sep-64	(blank)						46	0		12			5.4									2.7				0.9						7.7		1.4		11	4.7	108	7			41		
		29-Sep-64	8:45																																							2			18.3	
		3-Nov-64	8:50																																							5			12.8	
		12-Nov-64	(blank)						30	0					3.8																			7.3					4	92				34		
		2-Dec-64	15:00																																							271			10	
		10-Dec-64	9:45																																							4			8.9	
		22-Dec-64	13:20																																							2550			8.9	
		14-Jan-65	(blank)						29	0					2																			7.8					3.3	64				26		
		11-Feb-65	11:00																																							25			4.4	
		15-Mar-65	(blank)						28	0					1.3																			7.7					2.4	61				23		
		18-Mar-65	9:55																																							8			9.4	
		18-Mar-65	11:15																																							6			9.4	
		20-Apr-65	11:50																																							248			11.1	
		14-May-65	(blank)						21	0		5			0.8									0.9				0.3						7.3		0.2		12	1.8	42	2			16		
		17-May-65	9:20																																							208			13.9	
		22-Jun-65	8:15																																							8			18.3	
		13-Jul-65	(blank)						40	0					2.7																			8.1					3.5	90				34		
		3-Aug-65	8:45																																							1			23.9	
		2-Sep-65	(blank)						60	0		15			3.3									2.8				0.2						7.9		2.5		12	3.2	123	6			49		
		14-Sep-65	9:00																																							3			18.9	
		29-Oct-65	10:20																																							2			12.2	
		2-Nov-65	(blank)						49	0			0		3.7																			8					3.8	110				44		
		24-Nov-65	12:04																																							36			10.6	
		24-Nov-65	12:05																																							36			10.6	
		14-Dec-65	12:45																																							1			7.2	
		5-Jan-66	(blank)						42	0			0		1.8																			7.7					4.7	98				41		
		1-Mar-66	10:15																																							3			7.8	
		24-Mar-66	(blank)						28	0			0		1.2																			7.8					2.2	59				24		
		31-Mar-66	10:30																																							31			13.9	
		12-May-66	(blank)						32	0		10	0		2									0.7				0.6						7.4		1.3		11	2.5	71	5			28		
		19-May-66	9:45																																							10			17.2	
		8-Jul-66	10:00																																							1			21.7	
		25-Aug-66	14:00																																							1			24.4	

Table 5-3. Summary of Surface Water Analyses at Sampling Stations on the Middle Fork American River and North Fork American River - U.S. Geological Survey Sampling (Highlighted samples do not comply with the regulatory standards).

				Parameter																																									
Map Code	Station Location Name / Latitude & Longitude	Date	Time	Acid Neutralizing capacity	Ammonia (filtered mg/L as NH4)	Ammonia (mg/L as N)	Arsenic (ug/L)	Beryllium (ug/L)	Bicarbonate (mg/L)	Boron (mg/L)	Cadmium (ug/L)	Calcium (mg/L)	Carbonate (mg/L)	Chemical oxygen demand (mg/L)	Chloride (mg/L)	Chromium (ug/L)	Copper (ug/L)	Dissolved Oxygen (mg/L)	Fecal Coliform	Fecal streptococci	Fluoride (mg/L)	Iron (ug/L)	Lead (ug/L)	Magnesium (mg/L)	Manganese (ug/L)	Mercury (ug/L)	Nickel (ug/L)	Nitrate (filtered mg/L)	Nitrite (mg/L as N)	Nitrite plus nitrate filtered	Organic carbon (mg/L)	Organic nitrogen (mg/L)	Orthophosphate filtered (mg/L)	pH (Standard Units)	Phosphorus (mg/L)	Potassium (mg/L)	Selenium (ug/L)	Silica (mg/L)	Sodium (mg/L)	Specific Conductivity	Sulfate (mg/L)	Suspended sediment (mg/L)	Total nitrogen (mg/L)	Water Hardness (mg/L as CaCO3)	Water Temperature (C)	Zinc (ug/L)
Middle Fork American River (continued)																																													
T	MFAR Near Auburn 38 55' 05" 121 00' 51" (cont'd)	4-Oct-66	10:50																																							2			19.4	
		7-Nov-66	13:50																																							2			12.2	
		22-Nov-66	12:20																																							66			9.4	
		29-Nov-66	12:45																																							218			8.3	
		9-Jan-67	12:40																																							3			5.6	
		7-Feb-67	13:10																																							50			9.4	
		16-Mar-67	9:45																																							1080			11.1	
		16-Mar-67	15:15																																							1500			9.4	
		29-Mar-67	11:40																																							30			6.7	
		2-May-67	12:45																																							30			8.3	
		19-Jun-67	12:00																																							72			14.4	
		29-Aug-67	11:30																																							6			14.4	
		27-Sep-67	10:45																																							2			17.8	
		11-Jul-77	9:30	31														8.8																8						80					23.5	
		11-Aug-77	10:00	16														10.2																7.5						47					16	
		7-Sep-77	9:55	21														10.1																7.5						56					17	
		6-Dec-77	13:45	26														11.9																7.3						450					9	
		5-Mar-79	13:30	26		0.01	1	10			2	7.5		2	2.7			12.2	1	1	0.1	70		2.2	10	0.1	3			0.008	2.6	0.06	0	7.8	0.01	0.5	1	11	2.3	60	6.8	2	0.07	28	9.5	20
		30-May-79	13:30	16		0.01	1	10				4.6		5	1.1			10.5	3	3	0.1	70		1	10	0.3	4			0.008	1	0.07	0	7.4	0.02	0.7	1	9.9	1.6	39	3.3		0.09	16	13	20
		27-Jul-79	14:30	16		0.01				20		3.8			1.1			10.2	5	9	0.1	90		0.8	10					0.1	1.4	0.15	0	7.7	0.05	0.7		11	1.7	38	1.1	3	0.16	13	14	
		22-Oct-79	12:45	19		0.01				10		4.9			1.6			10.5	19	21	0	60		1.2					0.02	0.032	3	0.54	0.02	7.3	0	0.7		10	2	46	5.1	2	0.58	17	13.5	
North Fork American River																																													
U	NFAR Above NF Dam 11427000 38 56' 10" 121 01' 22"	11-Jul-77	12:00	37														9.2																8.3						101					24	
		11-Aug-77	11:00	44														9.1																8.3						106					23.5	
		7-Sep-77	11:30	48														9.7																8.2						113					23.5	
		5-Mar-79	12:00	36		0.01				20		11			2.3			11.8	6	13	0.1	170		4.6	10					0.052	0.9	0.12	0	7.3	0.01	0.3		14	3	99	9.2	4	0.16	46	9.5	
		30-May-79	12:00	18		0.01				30		6.8			0.8			10.1	1	4	0.1	100		1.2	10					0.015	1	0.13	0.01	7.6	0.01	0.8		9.4	1.3	41	3.3		0.15	22	16	
		27-Jul-79	13:00	45		0.01				60		12			1.9			8.6	2	3	0.1	70		3.5	10					0.002	1.7	0.04	0	8.1	0.05	0.7		14	2.9	108	2.4	4	0.04	44	24.5	
		22-Oct-79	12:00	46		0.01				20		15			2.7			9.6	26	58	0	60		4.4					0.02	0.03	0.6	0.71	0.01	7.9	0	0.8		12	3.2	100	11	2	0.73	56	17	
V	NFAR below Auburn Damsite near Auburn 38 52'20" 121 03'18"	25-May-78	8:57	18		0.01			22			5.7	0		1			11.4			0.1			1.3						0.02		0.19	0	8.2	0.01	0.5		10	1.5	42	2.8		0.21	20	10.5	
		29-Aug-78	9:15	17		0.01			21			5.5	0		1.3			9.6			0.1			1.1						0.03		0.24	0	7.8	0.02	0.5		10	1.7	42	2.3		0.28	18	16	
		5-Mar-79	8:30	28		0.01	1	10		20	2	11		2	2		10	12.3	5	12	0.1	200		3.3	10	0.1	2			0.04	1.3	0.1	0	7.5	0.01	0.5	1	13	2.6	72	6.8	4	0.15	41	8	30
		30-May-79	9:30	13		0.09	1	10		20		5.2		2	0.9	20	10	10.6	2	17	0.1	140		0.1	20	0.1	4			0.009	0.8	0.07	0	7.7	0.01	0.5	1	9.7	1.6	41	2.9		0.18	13	14	30
		27-Jul-79	11:00	19		0.01						4.7			1.1			10	8	5	0.1	60		1.1	10					0.001	1.3	0.06	0	7.8	0.06	0.8		11	1.8	41	0.6	2	0.06	16	17	
		22-Oct-79	10:30	30		0.03				10		9			2.3			9.6	24	4	0	110		2.3					0.02	0.02	1.5	0.26	0.02	7.4	0.01	0.7		11	2.6	81	10	2	0.31	32	15	
		29-Feb-80	9:00	20	0	0											12.2													0.04		0	0.03	7.8	0.02					57					9.5	
		26-Mar-80	10:30	24	0	0											12													0.01		0.41	0	7.3	0.01					63					9	
		7-May-80	8:45	9	0.04	0.08											11.1													0.02		0.81	0	7.5	0.02					40					12	
		5-Nov-80	8:00		0.04	0											10.9													0		0.32	0	7.8	0.01											11	

Source: USGS National Water Information System (NWIS) Database

Table 5-4. Summary of Surface Water Analyses at Sampling Stations on the Middle Fork American River and North Fork American River - Bureau of Reclamation Sampling (Highlighted samples do not comply with regulatory standards).

				Parameter																																
Map Code	Station Location Name / Latitude & Longitude	Date	Time	Alkalinity (mg/L)	Boron (ug/L)	Cadmium (ug/L)	Calcium (mg/L)	Chloride (mg/L)	Chlorophyll-A (ug/L)	Chromium (ug/L)	Copper (ug/L)	Hardness (mg/L)	Iron (ug/L)	Lead (ug/L)	Magnesium (mg/L)	Manganese (ug/L)	Mercury (ug/L)	Nickel (ug/L)	Nitrate (mg/L)	Nitrite plus Nitrate (mg/L)	Nitrogen, Ammonia (mg/L)	Nitrogen (mg/L)	Oxygen, Dissolved (mg/L)	pH (standard units)	Phosphate, Total Soluble (mg/L)	Phosphorus, Dissolved Ortho-P (mg/L)	Potassium (mg/L)	Selenium (ug/L)	Silica (mg/L)	Silver (ug/L)	Sodium (mg/L)	Specific Conductance (µmhos/cm @ 25	Sulfate (mg/L)	Temperature, Water (Degrees Centigrad	Turbidity (Formazin Turb Unit)	Zinc (ug/L)
Middle Fork American River																																				
Q	MFAR upstream with NFAR 38.916667 121.035278	4-Jan-68	1020																0.1	0.10	0.37	7.7	13.6	6.7	0.3	0.00						68		4	1.5	
		15-Feb-68	1115	25			6.6	2.6				22			1.3				0.1	0.10	0.35	0.9	12.3	7.1	0.2	0.01	0.8				3.0	59	1.0	8	5.0	
		13-Mar-68	1300																0.2	0.20	0.06	0.4	12.2	7.7	0.2	0.04								10	15.0	
		8-Apr-68	1235																				12.0	7.6										12	0.0	
		7-May-68	1230	26			9.6	3.1				31			1.6				0.0	0.00	0.05	0.5	10.3	7.9	0.5	0.08	0.6				3.2		4.0	14		
		4-Jun-68	1230																				10.4	7.5										16	5.0	
		10-Jul-68	1025																0.1	0.10	0.10	0.8		7.8	0.5	0.16										
		4-Aug-68	1230																	0.00																
		7-Aug-68	1215	33			9.2	3.1				33			2.4				0.1	0.10	0.10	0.6	8.4	8.0	0.5	0.16	0.4				2.0	84	5.0	23	1.0	
		12-Sep-68	1200																0.1	0.10	0.10	0.4	10.4	7.5	0.4	0.03								14	0.4	
		8-Oct-68	1330																				10.8	7.5										14	1.0	
		7-Nov-68	1305	23	500		6.8	3.0				23			1.4				0.7	0.70	0.20	1.0	11.5	8.2	0.0	0.01	1.0		10.2		3.0	60	4.0	14	1.5	
		5-Dec-68	1335																0.1	0.10	0.08	0.5	12.7	7.8	0.0	0.01						60		11	2.0	
		7-Jan-69	1045																0.1	0.10	0.08	0.3	12.8	7.4	0.2	0.01						70		7	1.0	
		20-Feb-69	1330	21	500		5.1	0.0				18			1.2				0.1	0.10	0.08	0.8	12.9	7.2	0.1	0.01	0.8		12.0		2.2	54	1.0	8	4.0	
		11-Mar-69	1150																0.1	0.10	0.19	0.8	13.2	7.2	0.1	0.01						60		9	0.8	
		8-Apr-69	1105																0.1	0.10	0.08	0.5	13.0	7.4	0.1	0.00						45		10	1.0	
		9-May-69	1345	13	300		3.4	0.3				12			0.9				0.1	0.10	0.08	0.9	11.7	7.4	0.1	0.01	0.6		8.0		1.2	27	2.9	16	1.3	
		5-Oct-70	1000																0.1	0.10	0.08	0.4	11.1	7.0	0.0	0.00						37		13	1.1	
		9-Nov-70	950	20	200		6.2	2.0				20			1.0				0.1	0.10	0.08	0.6	11.4	7.0	0.1	0.00	0.7		11.0		2.2	47	1.0	13	3.2	
		11-Mar-71	940																	0.10	0.01	0.1	12.5	6.8	0.0	0.00						58		8	1.6	
		12-Apr-71	1030																	0.02	0.02	0.6	11.7	7.7		0.01						62		12	4.1	
		13-May-71	1045	16	200		5.2	1.0				18			1.2					0.02	0.02	0.3	11.2	7.6		0.01	0.9		12.0		1.9	43	3.0	14	1.5	
		8-Jun-71	1055																	0.02	0.06	0.2	10.1	7.2		0.01						55		17	0.4	
		9-Jul-71	940																				11.0	7.4								47		15	0.9	
		13-Aug-71	1030	17	200		4.5	1.0				16			1.2					0.30			10.2	7.7		0.01	0.7		11.0		1.3	41	3.0	16	1.4	
		10-Sep-71	955																	0.01	0.01	0.2	11.3	7.3		0.01						40		13	1.0	
		7-Oct-71	955																	0.01	0.01	0.2	10.7	7.8		0.01						39		15	0.6	
		9-Nov-71	950	18	200		5.5	3.0				19			1.2					0.01	0.01	0.1	12.3	7.8		0.01	0.6		11.0		2.1	49	1.0	10	1.5	
		7-Mar-72	1005																	0.01	0.01	0.1	13.2	7.4		0.00						41		10	2.1	
		3-Apr-72	1000																	0.01	0.01	0.3	12.6	7.7		0.00						66		12	2.7	
		3-May-72	1050	19	200		5.5	2.0				20			1.4					0.01	0.01	0.2	10.5	7.8		0.00	0.7		11.0		1.1	47	2.0	14	1.0	
		14-Jun-72	1010																	0.01	0.01	0.3	9.6	7.7		0.01						71		20	0.9	
		12-Jul-72	1110																	0.01	0.01	0.3	9.5	7.9		0.01						63		23	0.9	
		10-Aug-72	950	16				1.0												0.01	0.01	0.1	11.5	8.1		0.01			10.5			39		13	2.0	
		14-Sep-72	1000																	0.02	0.03	0.4	11.2	6.9		0.01						42		13	1.0	
		10-Oct-72	1010																	0.02	0.01	0.3	10.6	7.5		0.01						44		14	0.6	
		9-Nov-72	1015	20			5.3	0.7				18			1.2					0.02	0.01	0.2	11.7	7.5		0.01	0.6		11.0		1.7	50	2.3	11	2.0	

Table 5-4. Summary of Surface Water Analyses at Sampling Stations on the Middle Fork American River and North Fork American River - Bureau of Reclamation Sampling (Highlighted samples do not comply with regulatory standards).

Map Code	Station Location Name / Latitude & Longitude	Date	Time	Alkalinity (mg/L)	Boron (ug/L)	Cadmium (ug/L)	Calcium (mg/L)	Chloride (mg/L)	Chlorophyll-A (ug/L)	Chromium (ug/L)	Copper (ug/L)	Hardness (mg/L)	Iron (ug/L)	Lead (ug/L)	Magnesium (mg/L)	Manganese (ug/L)	Mercury (ug/L)	Nickel (ug/L)	Nitrate (mg/L)	Nitrite plus Nitrate (mg/L)	Nitrogen, Ammonia (mg/L)	Nitrogen (mg/L)	Oxygen, Dissolved (mg/L)	pH (standard units)	Phosphate, Total Soluble (mg/L)	Phosphorus, Dissolved Ortho-P (mg/L)	Potassium (mg/L)	Selenium (ug/L)	Silica (mg/L)	Silver (ug/L)	Sodium (mg/L)	Specific Conductance (μmhos/cm @ 25	Sulfate (mg/L)	Temperature, Water (Degrees Centigrad	Turbidity (Formazin Turb Unit)	Zinc (ug/L)
Middle Fork American River (continued)																																				
W	MFAR upstream	13-Dec-72	945																	0.01	0.01	0.1	13.6	7.1		0.01						50		3	0.6	
	with NFAR	6-Feb-73	1030	20	0		5.6	0.7				20			1.4					0.04	0.01	0.2	13.0	7.7		0.01	0.5				1.6	54	3.0	7	4.0	
	38.916667	20-Mar-73	1025																	0.01	0.01	0.1	12.9	7.6		0.01								7	4.5	
	121.035278	18-Apr-73	1010																	0.01	0.01	0.1	11.6	7.6		0.01								9	1.0	
	(cont'd)	31-May-73	1030				7.0					24			1.6				0.2	0.02	0.01	0.1	9.1	7.6		0.01	1.4				1.6	58	3.8	13	0.9	
		28-Jun-73	1050																	0.03	0.03	0.1	8.2	7.2		0.01								25	1.4	
		24-Jul-73	1120																	0.01	0.01	0.1	9.1	8.1		0.01								23	1.5	
		14-Aug-73	1130	16	0		3.8	1.5				16			1.6				0.1	0.01	0.01	0.1	10.6	7.4		0.01	0.5				1.6	42	2.3	35	0.9	
		19-Sep-73	1110																	0.02	0.01	0.1	9.2	7.5		0.01								15	3.0	
		17-Oct-73	1330																	0.01	0.01	0.1	8.4	8.1		0.01								15	2.0	
		29-Nov-73	1035		0		9.3	3.3				37			3.4				0.1	0.05	0.01	0.2	11.6	5.9		0.01	0.5				2.8	88	41.0	7	4.0	
		14-Dec-73	905	16																0.03	0.01	0.2	12.0	6.6		0.01								6	4.0	
		22-Jan-74	1200																	0.03	0.01	0.2	12.6	7.3		0.01						29		11	5.0	
		26-Feb-74	1320																	0.01	0.01	0.2	12.4	7.1		0.01						34		7	2.1	
		21-Mar-74	1110																	0.02	0.01	0.1	11.6	7.4		0.01						48		13	2.4	
		23-Apr-74	1215																	0.01	0.01	0.1	11.1	7.3		0.01						33		10	1.5	
		21-May-74	1145																	0.01	0.01	0.2	10.8	6.8		0.01						32		12	1.7	
		26-Jun-74	1210																	0.01	0.01	0.1	10.4	7.2		0.01						35		15	1.0	
		24-Jul-74	1045																	0.02	0.02	0.1	9.9	7.1		0.01						42		17	1.2	
		19-Aug-74	1115					1.0												0.01	0.01	0.1	9.2	7.3		0.01						62		19	0.8	
		20-Sep-74	1100																	0.02	0.01	0.1	10.1	7.9		0.01						32		15	2.0	
		22-Oct-74	1140																	0.01	0.01	0.2	10.6	7.6		0.01						28		13	0.9	
		20-Nov-74	1115					1.0												0.01	0.01	0.1	10.7	7.7		0.01						37		11	0.9	
		11-Dec-74	1200																	0.01	0.01	0.1	12.1	7.8		0.01						55		9	2.0	
		29-Jan-75	1235																	0.01	0.01		12.3	7.5		0.01						41		6	1.0	
		19-Feb-75	1145																	0.02	0.01		12.1	7.3		0.01						58		6	4.5	
		24-Mar-75	1127																	0.01	0.01		12.3	7.4		0.01						54		8	4.5	
		21-Apr-75	1350																	0.01	0.01		11.5	7.9		0.01						48		12	1.4	
		20-May-75	1400																	0.01	0.01		11.8	7.4		0.01						31		15	1.4	
		4-Aug-75	1105																	0.07	0.03		9.9	7.8		0.01						40		16	1.6	
		22-Aug-75	1155																	0.01	0.01		10.7	7.6		0.01						47		18	1.3	
		18-Sep-75	1045																	0.02	0.01		10.2	9.2		0.01						37		18		
		22-Oct-75	1235																	0.01	0.01		10.5	8.3		0.01						35		17	1.5	
		20-Nov-75	1320																	0.01	0.01		12.8	7.3		0.01						61		10	2.5	
		17-Dec-75	910																	0.01	0.05		9.2	7.1		0.03						35		7	3.1	
		14-Jan-76	1215																	0.01	0.01		12.4	8.0		0.01						89		7	1.0	
		12-Feb-76	1215																	0.01	0.01		11.8	8.6		0.01						41		9	1.0	
		30-Mar-76	1205																	0.05	0.01		11.3	8.4		0.01						51		11	1.6	

Table 5-4. Summary of Surface Water Analyses at Sampling Stations on the Middle Fork American River and North Fork American River - Bureau of Reclamation Sampling (Highlighted samples do not comply with regulatory standards).

Map Code	Station Location Name / Latitude & Longitude	Date	Time	Alkalinity (mg/L)	Boron (ug/L)	Cadmium (ug/L)	Calcium (mg/L)	Chloride (mg/L)	Chlorophyll-A (ug/L)	Chromium (ug/L)	Copper (ug/L)	Hardness (mg/L)	Iron (ug/L)	Lead (ug/L)	Magnesium (mg/L)	Manganese (ug/L)	Mercury (ug/L)	Nickel (ug/L)	Nitrate (mg/L)	Nitrite plus Nitrate (mg/L)	Nitrogen, Ammonia (mg/L)	Nitrogen (mg/L)	Oxygen, Dissolved (mg/L)	pH (standard units)	Phosphate, Total Soluble (mg/L)	Phosphorus, Dissolved Ortho-P (mg/L)	Potassium (mg/L)	Selenium (ug/L)	Silica (mg/L)	Silver (ug/L)	Sodium (mg/L)	Specific Conductance (µmhos/cm @ 25	Sulfate (mg/L)	Temperature, Water (Degrees Centigrad	Turbidity (Formazin Turb Unit)	Zinc (ug/L)
Middle Fork American River (continued)																																				
W	MFAR upstream with NFAR 38.916667 121.035278 (cont'd)	27-Apr-76	1240																				9.9	7.8								57		15	1.3	
		25-May-76	1250																	0.01	0.01		8.9	8.4		0.01						67		23	0.9	
		1-Jul-76	1140																	0.03	0.03		9.5	7.4		0.01						66		21	1.3	
		28-Jul-76	825																	0.01	0.01		8.0	6.8		0.01						52		25	1.6	
		24-Aug-76	1245																	0.02	0.01		9.1			0.01						88		24	2.8	
		20-Sep-76	1400																	0.01	0.01		10.0	8.5		0.01						54		20	0.7	
		18-Oct-76	1315																	0.01	0.01		10.6	7.6		0.01						63		16	0.2	
		29-Nov-76	1330																	0.01	0.01		12.4	8.0		0.01						70		7	0.2	
		21-Dec-76	1315																	0.01	0.01		13.4	8.1		0.01						71		4	0.2	
		17-Jan-77	1335																	0.05	0.01		12.6	8.1		0.01						76		6	0.3	
		23-Feb-77	1200																	0.02	0.01		11.2	7.7		0.01						67		10	0.6	
		22-Mar-77	1225																	0.01	0.01		10.9	7.1		0.01						73		11	0.4	
		18-Apr-77	1310						0.3											0.01	0.01		9.8	6.4		0.01						82		18	0.3	
		23-May-77	1400																	0.01	0.01	0.1	9.7	6.8		0.01						84		17	0.4	
		14-Jun-77	1420																	0.01	0.01	0.3	8.9	7.1		0.01						87		23	0.3	
		18-Jul-77	1150						0.3											0.01	0.01	0.1	8.1	7.5		0.01						101		25	0.3	
		22-Aug-77	1300																	0.01	0.01	0.2	9.7	7.3		0.01						49		19	0.4	
		26-Sep-77	1250																	0.01	0.01	0.1	9.7	6.9		0.01						60		18	0.3	
		19-Oct-77	1245						0.6											0.01	0.01	0.1	10.3	7.1		0.01						72		16	0.3	
		28-Nov-77	1315						0.3											0.01	0.01	0.0				0.01						91		10	0.5	
		19-Dec-77	1400						0.5											0.07	0.01	0.2	11.6			0.01						56		7	7.3	
		27-Feb-78	1330																				11.7									48		8	26.0	
		28-Mar-78	1300																				11.2									47		11	11.4	
		24-Apr-78	1230																	0.01	0.01	0.1	11.2			0.01						55		10	4.0	
		8-Jun-78	1420						0.5											0.03	0.01	0.1	10.2	7.8		0.01						45		15	0.9	
		29-Jun-78	1315						0.4											0.01	0.01	0.5	9.3	7.9		0.01						43		21	0.3	
		6-Sep-78	1035				5.0	1.0	1.3			17			1.0					0.04	0.02	0.3	10.0	6.7		0.01	1.0				2.0	44	5.0	13	5.3	
		18-Oct-78	950						0.9											0.01	0.01	0.1	9.8	6.3		0.01						71		15	1.0	
		21-Nov-78	1005						2.4											0.02	0.01	0.4	9.6			0.01						51		10	3.0	
		15-Dec-78	930				15.0	3.0	0.8			54			4.0					0.04	0.05	0.2	11.5	7.4		0.01	1.0				3.0	129	8.0	8	1.5	
		17-Jan-79	1045						1.2											0.06	0.01	0.3	12.8			0.01								5	4.0	
		1-Mar-79	1100				6.0	1.0	2.0			23			2.0					0.07	0.01	1.0	13.2			0.03	1.0				2.0	62	5.0	6	9.0	
		16-Apr-79	1105						0.5											0.01	0.01	0.2	11.0	7.4		0.01								10	2.2	
		16-May-79	845				5.0	1.0	0.5			17			1.0					0.01	0.01	0.1	11.0	7.0		0.02	1.0				1.0	43	5.0	11	2.0	
		14-Jun-79	1000						1.3											0.01	0.02	0.1	9.8	6.6		0.01								13	1.5	
		18-Jul-79	930						0.5											0.03	0.01	0.1	13.0	7.2		0.01								11	4.0	
		7-Aug-79	1000				4.0	1.0	0.6			14			1.0					0.04	0.01	0.4	9.4	7.2		0.02	1.0				2.0	38	8.0	11	1.0	
		11-Sep-79	1115						0.5											0.02	0.01	0.4	10.5	7.7		0.02								14	0.6	

Table 5-4. Summary of Surface Water Analyses at Sampling Stations on the Middle Fork American River and North Fork American River - Bureau of Reclamation Sampling (Highlighted samples do not comply with regulatory standards).

Map Code	Station Location Name / Latitude & Longitude	Date	Time	Alkalinity (mg/L)	Boron (ug/L)	Cadmium (ug/L)	Calcium (mg/L)	Chloride (mg/L)	Chlorophyll-A (ug/L)	Chromium (ug/L)	Copper (ug/L)	Hardness (mg/L)	Iron (ug/L)	Lead (ug/L)	Magnesium (mg/L)	Manganese (ug/L)	Mercury (ug/L)	Nickel (ug/L)	Nitrate (mg/L)	Nitrite plus Nitrate (mg/L)	Nitrogen, Ammonia (mg/L)	Nitrogen (mg/L)	Oxygen, Dissolved (mg/L)	pH (standard units)	Phosphate, Total Soluble (mg/L)	Phosphorus, Dissolved Ortho-P (mg/L)	Potassium (mg/L)	Selenium (ug/L)	Silica (mg/L)	Silver (ug/L)	Sodium (mg/L)	Specific Conductance (µmhos/cm @ 25	Sulfate (mg/L)	Temperature, Water (Degrees Centigrad	Turbidity (Formazin Turb Unit)	Zinc (ug/L)
				Parameter																																
North Fork American River																																				
W	NFAR Upstream of Middle Fork American River 38.926111 121.038889	29-Oct-79	1310				3.0	2.0	0.8			12			1.0								11.4	7.9			1.0				2.0	66	1.0	13	0.0	
		26-Nov-79	1420						2.8											0.01	0.01	0.3	10.8	7.8		0.01								11	8.0	
		18-Dec-79	1250						1.1											0.01	0.01	0.2	11.5	6.9		0.02								9	1.0	
		8-Jan-80	1345						0.7											0.01	0.01	0.2	11.1	7.2		0.01								10	3.0	
		13-Feb-80	1035				4.0	2.0	0.3			14			1.0					0.03	0.01	0.2	10.9	6.7		0.02	1.0				2.0	44	1.0	7	1.0	
		13-Mar-80	1410						0.2											0.02	0.01	0.3	10.6	7.5		0.02								8	2.0	
		9-Apr-80	1230						0.9											0.01	0.01	0.2	10.4	7.7		0.01								9	1.0	
		14-May-80	1345																	0.01	0.02	0.1	9.4	7.7		0.02								14	2.0	
		4-Nov-80	1217				4.0	1.0	0.5			14			1.0					0.02	0.02	0.1	9.9	7.5		0.01	1.0				1.0	40	2.0	11	0.2	
		16-Dec-80	1212						1.1											0.01	0.01	0.1	12.1	6.4		0.01								8	0.8	
		16-Mar-81	1116				6.0	2.0	0.8			23			2.0					0.01	0.01	0.1	11.2	6.9		0.01	2.0				2.0	62	6.0	10	1.6	
		8-Jun-81	1500				8.0	3.0	0.3			28			2.0					0.03	0.02	0.1	8.3	7.1		0.01	1.0				2.0	76	4.0	26	1.0	
		15-Sep-81	945			10	5.0	2.0	0.6	20.0	20.0	17	50.0	10.0	1.0	50.0	1.0	30.0		0.01	0.01	0.1	9.6	7.5		0.01	1.0			10.0	2.0	50	1.0	18	0.4	10.0
		7-Jan-69	1110																0.1	0.10	0.08	0.8	13.1	7.6	0.0	0.01						110		7	5.0	
		20-Feb-69	1300	33	500		7.4	1.0				31			2.5				0.1	0.10	0.42	1.1	12.7	7.3	0.1	0.01	0.6		13.0		3.0	70	4.0	9	65.0	
		11-Mar-69	1125																0.1	0.10	0.13	0.7	13.3	7.5	0.1	0.01						100		10	1.0	
		8-Apr-69	1045																0.1	0.10	0.08	0.7	12.7	7.5	0.1	0.00						60		10	6.0	
		9-May-69	1300	16	200		4.8	0.7				17			1.2				0.1	0.10	0.08	0.9	12.6	7.4	0.0	0.01	0.5		9.0		0.9	40	1.7	14	8.0	
		5-Oct-70	945																0.1	0.10	0.08	0.3	9.9	7.6	0.0	0.00						127		17	0.7	
		9-Nov-70	930	49	200		16.0	5.0				57			4.1				0.1	0.10	0.08	0.6	11.3	7.3	0.1	0.00	1.0		12.0		3.8	127	10.0	13	10.0	
		11-Mar-71	915																	0.10	0.02	0.2	12.6	7.1	0.0	0.01						89		8	1.2	
		12-Apr-71	1050																	0.02	0.02	0.3	11.9	7.5		0.01						44		11	2.0	
		13-May-71	1020	16	200		5.2	1.0				19			1.4					0.02	0.02	0.3	11.8	7.5		0.01	0.7		10.0		1.7	73	4.0	13	2.4	
		8-Jun-71	1030																	0.02	0.05	0.4	10.4	7.3		0.01						45		15	1.6	
		13-Aug-71	1000	43	200		11.0	2.0				42			3.4					0.10			8.4	7.6		0.04	1.0		15.0		2.8	123	7.0	25	0.9	
		10-Sep-71	935																	0.01	0.01	0.2	9.1	7.8		0.12						112		20	1.0	
		7-Oct-71	935																	0.01	0.01	0.2	9.9	7.8		0.01						119		18	1.3	
		9-Nov-71	930	38	400		12.0	4.0				44			3.4					0.02	0.01	0.1	12.1	7.9		0.01	0.8		12.0		2.8	100	6.0	10	3.4	
		7-Mar-72	940																	0.06	0.09	1.2	13.0	7.2		0.01						69		10	4.6	
		3-Apr-72	940																	0.02	0.01	0.4	12.7	7.2		0.00						51		11	3.1	
		3-May-72	1010	21	200		6.6	2.0				23			1.6					0.01	0.01	0.1	10.8	7.7		0.00	0.6		11.0		1.1	54	2.0	14	2.5	
		14-Jun-72	945																	0.02	0.01	0.2	9.8	7.5		0.01						81		19	2.5	
		12-Jul-72	1050																	0.02	0.01	0.5	8.9	8.1		0.01						96		27	0.8	
		10-Aug-72	920	43				2.0												0.01	0.01	0.1	8.3	8.1		0.01			13.8			118		24	1.3	
		14-Sep-72	940																	0.07	0.01	0.3	9.6	7.6		0.01						118		19	0.7	
		10-Oct-72	950																	0.03	0.02	0.3	9.4	7.3		0.01						130		18	0.7	
		9-Nov-72	950	41			13.0	1.1				46			3.3					0.05	0.01	0.3	11.4	7.7		0.01	0.7		10.0		3.2	109	7.0	11	9.5	

Table 5-4. Summary of Surface Water Analyses at Sampling Stations on the Middle Fork American River and North Fork American River - Bureau of Reclamation Sampling (Highlighted samples do not comply with regulatory standards).

				Parameter																																
Map Code	Station Location Name / Latitude & Longitude	Date	Time	Alkalinity (mg/L)	Boron (ug/L)	Cadmium (ug/L)	Calcium (mg/L)	Chloride (mg/L)	Chlorophyll-A (ug/L)	Chromium (ug/L)	Copper (ug/L)	Hardness (mg/L)	Iron (ug/L)	Lead (ug/L)	Magnesium (mg/L)	Manganese (ug/L)	Mercury (ug/L)	Nickel (ug/L)	Nitrate (mg/L)	Nitrite plus Nitrate (mg/L)	Nitrogen, Ammonia (mg/L)	Nitrogen (mg/L)	Oxygen, Dissolved (mg/L)	pH (standard units)	Phosphate, Total Soluble (mg/L)	Phosphorus, Dissolved Ortho-P (mg/L)	Potassium (mg/L)	Selenium (ug/L)	Silica (mg/L)	Silver (ug/L)	Sodium (mg/L)	Specific Conductance (μmhos/cm @ 25	Sulfate (mg/L)	Temperature, Water (Degrees Centigrad	Turbidity (Formazin Turb Unit)	Zinc (ug/L)
North Fork American River (continued)																																				
W	NFAR Upstream of Middle Fork American River 38.926111 121.038889 (cont'd)	13-Dec-72	920																	0.03	0.01	0.2	13.1	6.8		0.01						119		13	2.2	
		6-Feb-73	1015	30			8.7	2.7				35			3.2					0.08	0.01	0.2	12.8	7.8		0.01	0.5				2.8	90	5.1	8	10.0	
		20-Mar-73	1000																	0.01	0.01	0.1	12.5	7.0		0.01								9	3.2	
		18-Apr-73	940																	0.01	0.02	0.1	11.4	7.2		0.01								10	1.9	
		31-May-73	955				4.8	0.9				16			1.0				0.1	0.01	0.01	0.1	9.6	7.7		0.01	1.2				1.2	39	5.1	11	1.7	
		28-Jun-73	1120																	0.03	0.03	0.1	8.7	7.8		0.01								24	0.6	
		24-Jul-73	1140																	0.03	0.02	0.1	9.8	7.9		0.01								18	1.4	
		14-Aug-73	1100	47			11.0	3.1				47			4.7				0.1	0.02	0.02	0.1	9.0	8.2		0.01	0.9				2.8	109	6.6	19	0.6	
		19-Sep-73	1040																	0.02	0.01	0.1	8.2	7.9		0.01								18	1.2	
		17-Oct-73	1215																	0.01	0.02	0.2	8.4	8.2		0.01								19	2.0	
		29-Nov-73	1100				12.0	2.4				41			2.7				0.2	0.03	0.01	0.1	11.7	**5.8**		0.01	1.4				4.2	103	4.4	7	2.0	
		14-Dec-73	855	33																0.05	0.01	0.2	12.3	7.1		0.01								6	4.5	
		22-Jan-74	1130																	0.05	0.02	0.3	12.1	7.3		0.01						42		12	19.0	
		26-Feb-74	1300																	0.02	0.01	0.2	11.9	7.6		0.01						62		8	4.5	
		21-Mar-74	1050																	0.01	0.01	0.1	11.0	7.4		0.01						52		11	2.4	
		23-Apr-74	1150																	0.01	0.01	0.1	10.5	7.4		0.01						48		12	1.7	
		21-May-74	1120																	0.01	0.01	0.3	9.8	7.0		0.01						42		13	2.5	
		26-Jun-74	1140																	0.01	0.01	0.1	9.0	8.1		0.01						54		21	1.1	
		24-Jul-74	1015																	0.01	0.01	0.1	8.5	7.6		0.01						80		24	1.9	
		19-Aug-74	1050					2.0												0.02	0.01	0.1	8.7	7.3		0.01						85		21	1.0	
		20-Sep-74	1030																	0.02	0.01	0.1	9.4	7.6		0.01						68		19	1.0	
		22-Oct-74	1110																	0.01	0.01	0.2	9.7	8.0		0.01						90		17	2.7	
		20-Nov-74	1050					3.0												0.05	0.01	0.2	11.0	8.0		0.01						115		12	0.8	
		11-Dec-74	1135																	0.03	0.02	0.1	11.8	7.8		0.01						84		9	5.0	
		29-Jan-75	1210																	0.01	0.01		12.5	8.1		0.01						91		7	2.6	
		19-Feb-75	1130																	0.06	0.01		11.9	7.2		0.01						86		7	15.0	
		24-Mar-75	1100																	0.04	0.01		12.0	7.8		0.01						79		9	17.0	
		21-Apr-75	1325																	0.01	0.01		11.6	8.2		0.01						85		13	1.6	
		20-May-75	1340																	0.01	0.01		10.7	7.4		0.01						34		13	5.5	
		4-Aug-75	1050																	0.01	0.01		8.6	7.7		0.01						82		25	1.2	
		22-Aug-75	1135																	0.01	0.01		9.5	7.8		0.01						104		21	2.1	
		18-Sep-75	1030																	0.01	0.01		8.6	8.8		0.01						35		22		
		22-Oct-75	1230																	0.02	0.02		10.0	8.2		0.01						110		17	0.7	
		20-Nov-75	1335																	0.02	0.01		11.3	7.6		0.01						77		11	2.4	
		17-Dec-75	900																	0.03	0.08		9.1	7.1		0.04						32		7	3.1	
		14-Jan-76	1155																	0.01	0.01		12.6	7.8		0.01						81		9	2.6	
		12-Feb-76	1210																	0.01	0.01		11.8	8.6		0.01						108		8	0.7	
		30-Mar-76	1145																	0.01	0.01		10.5	8.4		0.01						86		12	0.0	

Table 5-4. Summary of Surface Water Analyses at Sampling Stations on the Middle Fork American River and North Fork American River - Bureau of Reclamation Sampling (Highlighted samples do not comply with regulatory standards).

Map Code	Station Location Name / Latitude & Longitude	Date	Time	Parameter																																
				Alkalinity (mg/L)	Boron (ug/L)	Cadmium (ug/L)	Calcium (mg/L)	Chloride (mg/L)	Chlorophyll-A (ug/L)	Chromium (ug/L)	Copper (ug/L)	Hardness (mg/L)	Iron (ug/L)	Lead (ug/L)	Magnesium (mg/L)	Manganese (ug/L)	Mercury (ug/L)	Nickel (ug/L)	Nitrate (mg/L)	Nitrite plus Nitrate (mg/L)	Nitrogen, Ammonia (mg/L)	Nitrogen (mg/L)	Oxygen, Dissolved (mg/L)	pH (standard units)	Phosphate, Total Soluble (mg/L)	Phosphorus, Dissolved Ortho-P (mg/L)	Potassium (mg/L)	Selenium (ug/L)	Silica (mg/L)	Silver (ug/L)	Sodium (mg/L)	Specific Conductance (μmhos/cm @ 25	Sulfate (mg/L)	Temperature, Water (Degrees Centigrad	Turbidity (Formazin Turb Unit)	Zinc (ug/L)
North Fork American River (continued)																																				
W	NFAR Upstream of Middle Fork American River 38.926111 121.038889 (cont'd)	27-Apr-76	1210																				9.6	7.8								70		15	1.1	
		25-May-76	1235																	0.02	0.01		8.9	8.3		0.01						68		21	1.1	
		1-Jul-76	1115																	0.02	0.03		9.2			0.01						105		21	0.8	
		28-Jul-76	815																	0.01	0.01		7.6	6.9		0.01						52		26	1.4	
		24-Aug-76	1230																				9.5											23	1.7	
		25-Aug-76	1230																	0.01	0.01					0.01										
		20-Sep-76	1315																	0.01	0.01		10.0	8.1		0.01						135		22	0.5	
		18-Oct-76	1230																	0.01	0.01		10.6	8.4		0.01						133		22	0.3	
		29-Nov-76	1245																	0.01	0.01		12.0	7.7		0.01						132		10	1.3	
		21-Dec-76	1240																	0.02	0.01		12.8	8.1		0.01						130		7	0.5	
		17-Jan-77	1250																	0.01	0.01		12.6	7.6		0.01						147		7	4.3	
		23-Feb-77	1120																	0.01	0.01		11.2	7.2		0.01						146		10	3.1	
		22-Mar-77	1200																	0.01	0.01		10.8	7.1		0.01						37		11	0.3	
		18-Apr-77	1240						0.4											0.01	0.01		9.7	6.4		0.01						94		16	0.6	
		23-May-77	1330																	0.12	0.01	0.3	9.6	6.7		0.01						76		16	0.6	
		14-Jun-77	1345																	0.01	0.01	0.1	9.2	6.7		0.01						73		21	0.6	
		18-Jul-77	1120						0.2											0.01	0.01	0.1	9.3	7.2		0.01						96		25	0.4	
		22-Aug-77	1230																	0.01	0.01	0.2	9.6	7.5		0.01						106		26	0.4	
		26-Sep-77	1220																	0.01	0.01	0.1	10.5	6.6		0.01						115		21	0.3	
		19-Oct-77	1210						0.2											0.01	0.01	0.2	10.7	7.0		0.01						119		17	0.3	
		28-Nov-77	1245						0.4											0.01	0.01	0.1	10.7			0.01						153		12	0.4	
		19-Dec-77	1340						0.8											0.19	0.01	0.4	11.5			0.01						104		8	13.2	
		27-Feb-78	1315																				11.6									88		10	0.8	
		28-Mar-78	1230																				11.2									69		11	0.8	
		24-Apr-78	1220																	0.02	0.01	0.1	11.2			0.01						76		10	0.8	
		8-Jun-78	1400						0.4											0.01	0.01	0.1	10.3	7.8		0.01						36		16	1.8	
		29-Jun-78	1300						0.5											0.01	0.01		9.6	7.8		0.01						35		19	0.3	
		6-Sep-78	1020				13.0	2.0	0.7			45			3.0					0.03	0.03	0.4	8.4	6.9		0.01	1.0				3.0	110	8.0	21	1.4	
		18-Oct-78	940						1.0											0.05	0.03	0.5	9.2	6.6		0.02						136		17	2.0	
		21-Nov-78	1000						1.3											0.07	0.03	0.3	10.2			0.01						111		11	4.0	
		15-Dec-78	1000				5.0	2.0	0.9			17			1.0					0.01	0.01	0.1	11.7	7.3		0.01	1.0				2.0	50	8.0	8	0.0	
		17-Jan-79	1035																	0.14	0.01	0.4	13.2	6.5		0.01								6	17.0	
		1-Mar-79	1050					3.0	0.7						4.0					0.06	0.01	0.4	12.2			0.01	1.0				3.0	99	5.0	7	7.0	
		16-Apr-79	1055						0.4											0.01	0.01	0.2	11.2	7.3		0.01								11	1.5	
		16-May-79	825				5.0	1.0	0.4			17			1.0					0.01	0.01	0.1	11.0	7.0		0.02	1.0				1.0	47	5.0	10	3.0	
		14-Jun-79	945						0.6											0.02	0.03	0.1	9.4	6.6		0.01								16	1.0	
		18-Jul-79	915						0.5											0.02	0.01	0.1	9.8	6.6		0.02								21	3.0	
		7-Aug-79	945				13.0	2.0	0.8			45			3.0					0.01	0.01	0.5	8.3	7.1		0.01	1.0				3.0	107	8.0	21	1.0	

Table 5-4. Summary of Surface Water Analyses at Sampling Stations on the Middle Fork American River and North Fork American River - Bureau of Reclamation Sampling (Highlighted samples do not comply with regulatory standards).

Map Code	Station Location Name / Latitude & Longitude	Date	Time	Parameter																																		
				Alkalinity (mg/L)	Boron (ug/L)	Cadmium (ug/L)	Calcium (mg/L)	Chloride (mg/L)	Chlorophyll-A (ug/L)	Chromium (ug/L)	Copper (ug/L)	Hardness (mg/L)	Iron (ug/L)	Lead (ug/L)	Magnesium (mg/L)	Manganese (ug/L)	Mercury (ug/L)	Nickel (ug/L)	Nitrate (mg/L)	Nitrite plus Nitrate (mg/L)	Nitrogen, Ammonia (mg/L)	Nitrogen (mg/L)	Oxygen, Dissolved (mg/L)	pH (standard units)	Phosphate, Total Soluble (mg/L)	Phosphorus, Dissolved Ortho-P (mg/L)	Potassium (mg/L)	Selenium (ug/L)	Silica (mg/L)	Silver (ug/L)	Sodium (mg/L)	Specific Conductance (µmhos/cm @ 25	Sulfate (mg/L)	Temperature, Water (Degrees Centigrad	Turbidity (Formazin Turb Unit)	Zinc (ug/L)
North Fork American River (continued)																																						
W	NFAR Upstream of	11-Sep-79	1100						0.5											0.01	0.01	0.2	9.3	7.7		0.01								21	1.0	
	Middle Fork	29-Oct-79	1245				9.0	3.0	0.4			39			4.0								10.8	8.1			1.0				3.0	78	2.0	15	3.0	
	American River	26-Nov-79	1400						0.7											0.04	0.01	0.1	10.6	7.6		0.01								11	4.0	
	38.926111	18-Dec-79	1310						0.3											0.02	0.01	0.3	11.9	7.0		0.02								8	3.0	
	121.038889	8-Jan-80	1330						0.2											0.03	0.01	0.1	10.8	7.3		0.01								10	3.0	
	(cont'd)	13-Feb-80	1045				9.0	2.0	0.1			35			3.0					0.01	0.01	0.1	10.6	6.4		0.01	1.0				3.0	89	9.0	6	1.0	
		13-Mar-80	1400						0.1											0.04	0.01	0.4	10.4	7.6		0.02								10	3.0	
		9-Apr-80	1215						0.4											0.01	0.01	0.1	11.9	7.7		0.01								11	4.0	
		14-May-80	1400						0.9											0.01	0.01	0.1	9.8	7.7		0.03								15	1.0	
		4-Nov-80	1210				14.0	3.0	0.4			51			4.0					0.01	0.03	0.1	8.6	7.4		0.01	1.0				3.0	123	7.0	16	0.2	
		16-Dec-80	1205						0.7											0.03	0.01	0.2	11.6	7.0		0.01								8	9.0	
		16-Mar-81	1110				11.0	3.0	0.5			40			3.0					0.01	0.01	0.5	11.0	6.6		0.01	1.0				2.0	96	9.0	10	5.5	
		8-Jun-81	1455				8.0	2.0	0.3			28			2.0					0.03	0.02	0.1	8.2	7.0		0.01	1.0				2.0	79	7.0	26	2.0	
		15-Sep-81	930			10	16.0	3.0	0.4	20.0	20.0	56	60.0	10.0	4.0	20.0	1.0	30.0		0.01	0.01	0.1	8.3	7.9		0.01	1.0			10.0	3.0	138	8.0	22	0.5	10.0

Source: USEPA STORET Database

Table 5-5. Summary of Surface Water Analyses at Sampling Stations on the Middle Fork American River/Rubicon River and Tributaries - State Regional Water Quality Board Sampling (Highlighted samples do not comply with regulatory standards).

				Parameter Long Name														
Map Code	**Station Location Name / Latitude & Longitude**	**Date**	**Time**	**Alkalinity (mg/L)**	**Boron (ug/L)**	**Calcium (mg/L)**	**Chloride (mg/L)**	**Fluoride (mg/L)**	**Hardness (mg/L)**	**Magnesium (mg/L)**	**Oxygen, Dissolved (mg/L)**	**pH (Standard Units)**	**Phosphorus, Dissolved Ortho-P (mg/L)**	**Potassium (mg/L)**	**Silica (mg/L)**	**Sodium (mg/L)**	**Specific Conductance (μmhos/cm @ 25C**	**Temperature, Water (Degrees Centigrade**
D	Duncan Crk Above Mosquito Ridge Rd. 39.121944 120.491944	5-Jun-69	1040									7.1						7.8
N	N. Fork of MFAR Near Foresthill 39.024167 120.7175	10-Sep-59	1145	30	0	9.3	0.3	0	32	2.2	8.7			0.5	14	2.5	84	21.1
		9-May-60	1330	13	30	4.8	0.1	0.1	14	0.5	9.2	7.1		0.1	9.4	0.2	40	15.0
		26-Sep-60	1215	31	20	9.9	0	0.1	33	2.1	8.8			0.4	17	2.4	82	17.2
		27-Apr-61	1130	14	40	4.5	2	0	15	1	10.6			0.3	9.4	1.3	36	9.4
		4-Jun-69	1330	12		3.8	0.1		13	0.9	10.7	7.3	0			1	33	18.1
		22-Oct-69	1415	25		8.3	0.6		26		11	7.2	0			1.5	66	11.7
E	MFAR above Rubicon River 39.015556 120.703333	22-Oct-69	1545	38		16	2.1		44		11.2	7.4				1.8	101	11.7
B	MFAR below French Meadow Dam 39.111944 120.470556	5-Jun-69	1005	11		2.7	0.5		10			6.9				1.2	26	5.6
		23-Oct-69	1500	11		2.5	0.2		12		10.5	6.8				0.9	26	6.1
K	Long Canyon Crk at Mouth 38.99 120.686389	9-May-60	1405	16	20	4.3	0.3	0	12	0.4		7.1		1	21	1.8	42	13.9
		27-Sep-60	1255	33	400	11	5.6	0.1	36	21	8.8			1.4	25	4	99	19.4
		26-May-61	1000	19	0	5	0.5	0	14	0.4	10.1			1	22	2.4	42	12.2

Table 5-5. Summary of Surface Water Analyses at Sampling Stations on the Middle Fork American River/Rubicon River and Tributaries - State Regional Water Quality Board Sampling (Highlighted samples do not comply with regulatory standards).

				Parameter Long Name														
Map Code	Station Location Name / Latitude & Longitude	Date	Time	Alkalinity (mg/L)	Boron (ug/L)	Calcium (mg/L)	Chloride (mg/L)	Fluoride (mg/L)	Hardness (mg/L)	Magnesium (mg/L)	Oxygen, Dissolved (mg/L)	pH (Standard Units)	Phosphorus, Dissolved Ortho-P (mg/L)	Potassium (mg/L)	Silica (mg/L)	Sodium (mg/L)	Specific Conductance (μmhos/cm @ 25C	Temperature, Water (Degrees Centigrade
G	Long Canyon Crk above Ramsey Xing 38.998333 120.552778	4-Jun-69	1655								9.6	7.1						13.6
		24-Oct-69	915	20		4.2	1.7		15		11.1	7				3.1	50	5.6
J	Rubicon River at Ellicott Rd. 38.960278 120.481667	24-Oct-69	1510	13		5.2	7.8		15		10.4	7				3.4	59	10.0
		30-May-85	1045								8.9	7.1	0					11.7
L	Rubicon River below Ralston PH 39.000556 120.723333	4-Jun-69	1405	11		3.3	0.5		12		12.4	6.9	0.17			1.2	28	9.4
		22-Oct-69	1515	12		3.5	1.3		11		11.4	7.2	0			1.1	32	13.3
I	Rubicon River below Hell Hole Dam 39.056944 120.4075	5-Jun-69	740	5		1.1	0		5		10.1	6.9				1.3	12	11.1
		24-Oct-69	1300	13		4	0.7		12		9.5	6.8				1.9	33	10.0
H	Rubicon River near Foresthill 38.989722 120.687222	30-Sep-52	1215	19	40	5.6	4.8	0	16	0.6	9			1	13	4	53	16.0
		11-Sep-59	1300	20	10	7.5	11	0	23	1.1	8.8			1.3	14	5.2	87	21.1
		9-May-60	1315	8	20	2.4	0	0	5	0	10.4	6.9		0.5	8	1.2	21	12.2
			1405	16	20	4.3	0.3	0	12	0.4		7.1		1	21	1.8	42	13.9
		27-Sep-60	1310	17	20	6.6	9.2	0	21	1.1	9.1			1.1	13	4.6	74	17.2
		26-May-61	940	11	10	2.8	0.3	0	7	0	10.4			0.4	9.5	1.6	25	11.1

Source: USEPA STORET Database

Table 5-6. Summary of Water Quality Data Collected Between 1993 and 1997 from the North Fork American River at the Source Water Intake for the PCWA Foothill Water Treatment Plant (highlighted sample does not comply with regulatory standards).

Parameter	Units	Minimum	Maximum	Average	Median	95th Percentile
INORGANIC						
Alkalinity	mg/L-CaCO3	16	34	23	na	na
Aluminum	mg/L	<0.05	0.15	0.08	<0.05	0.14
Antimony	mg/L	<0.005	<0.006	0.005	<0.005	0.006
Arsenic	mg/L	<0.001	<0.002	0.001	<0.001	0.002
Barium	mg/L	<0.01	<0.1	0.04	<0.01	0.09
Beryllium	mg/L	<0.001	<0.001	<0.001	<0.001	<0.001
Bicarbonate	mg/L	20	34	26	24	33
Cadmium	mg/L	<0.001	<0.001	<0.001	<0.001	<0.001
Calcium	mg/L	3.6	6	4.8	4.8	5.9
Carbonate	mg/L	<1.0	<1.2	1.1	<1.2	<1.2
Chloride	mg/L	1.1	1.6	1.3	1.3	1.6
Chromium	mg/L	<0.01	0.054[c]	0.021[c]	<0.01	0.047
Specific Conductance	umhos/cm	42	46	44	43	46
Copper	mg/L	<0.01	<0.05	0.025	0.019	0.047
Cyanide	mg/L	<0.003	<0.1	0.027	<0.003	0.085
Fluoride	mg/L	<0.1	0.1	0.1	<0.1	0.1
Hardness	mg/L-CaCO3	12	20	16	16	20
Iron	mg/L	<0.03	<0.1	0.057	0.050	0.094
Lead	mg/L	<0.001	<0.005	0.002	<0.001	0.005
Magnesium	mg/L	0.84	1.3	1.05	1.00	1.27
Manganese	mg/L	<0.01	<0.03	0.01	0.0086	0.03
Mercury	mg/L	<0.0002	<0.001	0.0005	<0.0002	0.0009
Nickel	mg/L	<0.005	<0.01	0.006	<0.005	0.009
Nitrate	mg/L-N	<0.05	<2.0	0.80	<0.5	1.70
Nitrite	mg/L-N	<0.15	<0.4	0.23	<0.15	0.38
pH [b]	-	6.8	7.7	7.2	7.1	7.5
Potassium	mg/L	0.5	0.65	0.58	0.58	0.64
Selenium	mg/L	<0.001	<0.005	0.002	<0.001	0.005
Silver	mg/L	<0.01	<0.01	<0.01	<0.01	<0.01
Sodium	mg/L	1.7	5.1	2.9	2.0	4.8
Sulfate	mg/L	1.7	2	1.8	1.7	2.0
Thallium	mg/L	<0.001	<0.001	<0.001	<0.001	<0.001
Total Dissolved Solids	mg/L	36	53	42	38	52
Zinc	mg/L	<0.01	<0.05	0.02	0.01	0.05
ORGANIC						
Total Organic Carbon	mg/l	1.2	1.6	1.4	1.4	1.6
VOCs (64444-A)	ug/L	ND	ND	na	na	na
SOCs (64444-B)	ug/L	ND/W	ND/W	na	na	na
VOCs (64450-A)	ug/L	ND	ND	na	na	na
Unregulated Organics (64450-B, 64450-C)	ug/L	ND/W	ND/W	na	na	na
PHYSICAL						
Color	-	<3.0	<3.0	<3.0	<3.0	<3.0
Foaming Agent (MBAS)	mg/L	<0.01	<0.02	0.01	<0.01	0.02
Odor	TON	<1.0	<1.0	<1.0	<1.0	<1.0
Temperature[b]	C	7.78	26.67	14.07	14.44	20.47
Turbidity[b]	NTU	0.19	401.1	24.14	1.43	188.90
MICROBIOLOGICAL						
Giardia	#/100 L	NA	NA	na	na	na
Cryptosporidium	#/100 L	NA	NA	na	na	na
Total Coliform[b]	MPN/100ml	2	>1600	140	50	840

[a]Based on available data from January 1993 through December 1997.
[b]Based on monthly data from April 1994 through December 1997, when plant in operation.
[c]Although one sample did exceed the chromium MCL, the average is well below the MCL.
ND - Non Detection, NA - Not Available, na - not applicable, W - Waived
Source: 1998 American River Sanitary Survey by Archibald and Walberg

Table 5-7. Summary of Dissolved Metal Analyses Results from the SMUD UARP that Exceed the Regulatory Criteria.

Site ID	Cadmium (µg/L)		Copper (µg/L)		Lead (µg/L)		Silver (µg/L)		Zinc (µg/L)	
	Result	CCC/CMC[1]	Result	CCC/CMC[1]	Result	CCC/CMC[1]	Result	CMC[1]	Result	CCC/CMC[1]
Rubicon #1					0.13 0.08 0.03	0.04/0.98 0.07/1.87 0.02/0.44				
Rubicon #2			0.75	0.34/0.37	0.31 0.08	0.04/1.01 0.02/0.50				
Rubicon #3a			0.52	0.34/0.37	0.06	0.02/0.50				
Rubicon #5					0.035 0.020	0.01/0.33 0.02/0.44				
Rubicon #6					0.028 0.025 0.05	0.02/0.49 0.02/0.42 0.03/0.74				
Gerle #7	0.14 & 0.043	0.06/0.02	0.42 & 0.32	0.18/0.18	0.016 & 0.019	0.01/0.18			4.7	2.37/2.39
Gerle #14	0.040	0.06/0.02	0.33	0.18/0.18	0.07	0.01/0.18	0.009	0.008		
Gerle #15			0.61	0.45/0.49	0.030	0.03/0.74				
S.F. Rubicon #20			0.85	0.55/0.62	0.07 0.11	0.04/1.01 0.04/1.14			3.4	2.37/2.39
Highland #4			0.30	0.18/0.18	0.025 & 0.045	0.01/0.18				
Gerle Creek Reservoir #R-5	0.07	0.06/0.02	0.21	0.18/0.18						
Rockbound Reservoir #R-2H							0.012	0.004		
Snow Sample	0.19	0.06/0.02	1.90	0.18/0.18	0.13	0.01/0.18				

[1]CCC = Criteria Continuous Concentration or Chronic Criteria; CMC = Criteria Maximum Concentration or Acute Criteria; The CCC and CMC are expressed as a function of the hardness of the water. The actual criteria for these dissolved metals are calculated based on the hardness (as $CaCO_3$) of the water sample.

Source: Sacramento Municipal Utility District (SMUD) – Upper American River Project

Table 5-8. PCWA Water Temperature Study Site Locations.

New Site ID[1]	Old Site ID	Site Name	River Mile	Site Location (UTM)[2]		Installation Date
				N	E	
CC0.1	CC1	Canyon Cr Immediately Upstream of MF American R	0.1	681766	4313543	8/11/2005
DC8.8	DC1	Duncan Cr Immediately Upstream of Diversion Dam	8.8	717877	4334888	9/24/2003
DC8.4	DC2	Duncan Cr Downstream of Diversion Dam	8.4	717486	4334533	9/24/2003
DC0.1	DC3	Duncan Cr Immediately Upstream of MF American R	0.0	712401	4323832	9/22/2005
LC0.1	LC1	Long Canyon Cr Immediately Upstream of Rubicon R	0.0	700326	4318266	8/24/2004
LC11.1	LC2	Long Canyon Cr Immediately Downstream of North and South Fork Long Canyon Crs	11.1	714694	4321749	7/7/2005
LC6.8	LC3	Long Canyon Cr Immediately Upstream of Wallace Canyon Cr	6.8	709614	4318063	7/21/2005
MF51.9	MF1	MF American R Upstream of French Meadows Reservoir	51.9	724150	4335051	10/2/2003
MF46.6	MF2	MF American R Downstream of French Meadows Reservoir	46.6	717787	4331970	9/24/2003
MF36.1	MF3	MF American R Immediately Upstream of MF Powerhouse	36.1	708245	4322433	10/9/2003
MF35.9	IB1	MF American R Immediately Downstream of MF Powerhouse Outlet	35.9	708045	4322282	8/17/2004
MF35.5	MF4	MF American R Immediately Downstream of Interbay Dam	35.5	707472	4322410	10/9/2003
MF24.6	MF5	MF American R Downstream of Ralston Afterbay Dam	24.6	694919	4319599	10/9/2003
MF24.3	MF6	MF American R Immediately Downstream of Oxbow Powerhouse	24.3	695064	4319894	10/14/2003
MF23.1	MF7	MF American R Downstream of NF of the MF American R	23.1	694003	4319890	10/15/2003
MF0.1	MF8	MF American R Immediately Upstream of NF American R	0.1	670230	4309051	10/15/2003
MF8.9	MF9	MF American R Downstream of Ruck-a-Chucky Rapids	8.9	678811	4314844	8/24/2004
MF26.0	MF10	MF American R Immediately Upstream of Ralston Afterbay Reservoir	26.0	696446	4320054	7/7/2005
MF39.7	MF11	MF American R Immediately Upstream of Duncan Cr	39.7	712524	4323980	9/22/2005
MF44.6	MF12	MF American R Midway Between French Meadows Reservoir and Duncan Cr	44.6	716586	4329530	7/8/2005
MF29.4	MF13	MF American R Downstream of Brushy Canyon Cr	29.4	701020	4321465	9/13/2005
MF19.6	MF14	MF American R Downstream of Volcano Canyon Cr	19.6	689844	4319176	8/11/2005
OC0.1	OC1	Otter Cr Immediately Upstream of MF American R	0.1	685812	4314064	8/11/2005
MF14.3	MF15	MF American R Immediately Upstream of Otter Cr	14.3	686039	4314393	8/11/2005
MF11.0	MF16	MF American R Immediately Upstream of Canyon Cr	11.0	681917	4313637	8/11/2005
NF21.4	NF1	NF American Immediately Upstream of MF American R	21.4	670077	4309845	10/15/2003

Table 5-8. PCWA Water Temperature Study Site Locations (continued).

New Site ID[1]	Old Site ID	Site Name	River Mile	Site Location (UTM)[2]		Installation Date
				N	E	
NF20.8	NF2	NF American Immediately Downstream of MF American R	20.8	669884	4309201	10/15/2003
NF48.0	---	NF American R Upstream of Shirttail Creek				8/01/2006
NF14.9	NFA[1]	NF American R at Auburn Dam Site (USGS No 11433800)	14.9	668483	4304903	7/21/1999
NL3.2	NL1	NF Long Canyon Cr Immediately Upstream of Diversion Dam	3.2	717936	4325485	10/2/2003
NL3.1	NL2	NF Long Canyon Cr Immediately Downstream of Diversion Dam	3.1	717941	4325450	9/24/2003
NM2.3	NM1	NF of the MF American R Upstream of MF American R	2.3	697272	4321900	7/7/2005
FL0.1	FL1	Five Lakes Cr Upstream of Hell Hole Reservoir	0.0	729486	4329029	9/30/2003
RR0.5	OX1	Rubicon R Immediately Downstream of Ralston Powerhouse	0.5	696902	4319401	7/7/2005
PC0.1	PC1	Pilot Cr Immediately Upstream of Rubicon R	0.1	700717	4316068	10/24/2003
RR35.9	RR1	Rubicon R Upstream of Hell Hole Reservoir	35.9	729446	4328809	9/30/2003
RR30.2	RR2	Rubicon R Immediately Downstream of Hell Hole Reservoir	30.2	724199	4326074	10/14/2003
RR28.8	RR3	Rubicon R Downstream of Intermittent Reach	28.8	722789	4324656	10/13/2003
RR0.7	RR4	Rubicon R Immediately Upstream of Ralston Powerhouse	0.7	697187	4319108	10/2/2003
RR22.7	RR5	Rubicon R Upstream of SF Rubicon R	22.7	719244	4316581	8/25/2004
RR22.5	RR6	Rubicon R Immediately Downstream of SF Rubicon R	22.5	719150	4316361	8/25/2004
RR14.3	RR7	Rubicon R Between SF Rubicon R and Big Grizzly Canyon Cr	14.3	710726	4310041	9/13/2005
RR5.3	RR8	Rubicon R Immediately Upstream of Pilot Cr	5.3	700778	4315974	8/18/2004
RR3.7	RR9	Rubicon R Immediately Upstream of Long Canyon Cr	3.7	700418	4318194	7/7/2005
RR25.3	RR10	Rubicon R Upstream of Deer Cr	25.3	720865	4319940	9/13/2005
RR9.5[3]	RR11	Rubicon R Downstream of Big Grizzly Canyon Cr	9.5	705591	4313422	9/13/2005
---	SFRR1[4]	Rubicon R Downstream of Gerle Creek	---	---	---	---
SF0.1	SF1	SF Rubicon R Immediately Upstream of Rubicon R	0.1	719302	4316374	7/1/2005
SL3.4	SL1	SF Long Canyon Cr Immediately Upstream of Diversion Dam	3.4	719006	4325570	9/24/2003
SL3.3	SL2	SF Long Canyon Cr Immediately Downstream of Diversion Dam	3.3	718818	4325494	10/2/2003
WC1.2	WC1	Wallace Canyon Cr Upstream of Long Canyon Cr	1.2	709527	4317055	7/21/2005

[1]Nomenclature changed in 2006.
[2]WGS83/NAD84.
[3]Gage location abandoned in 2006 following high flows
[4]Operated by SMUD, site abandoned in 2005.

FIGURES

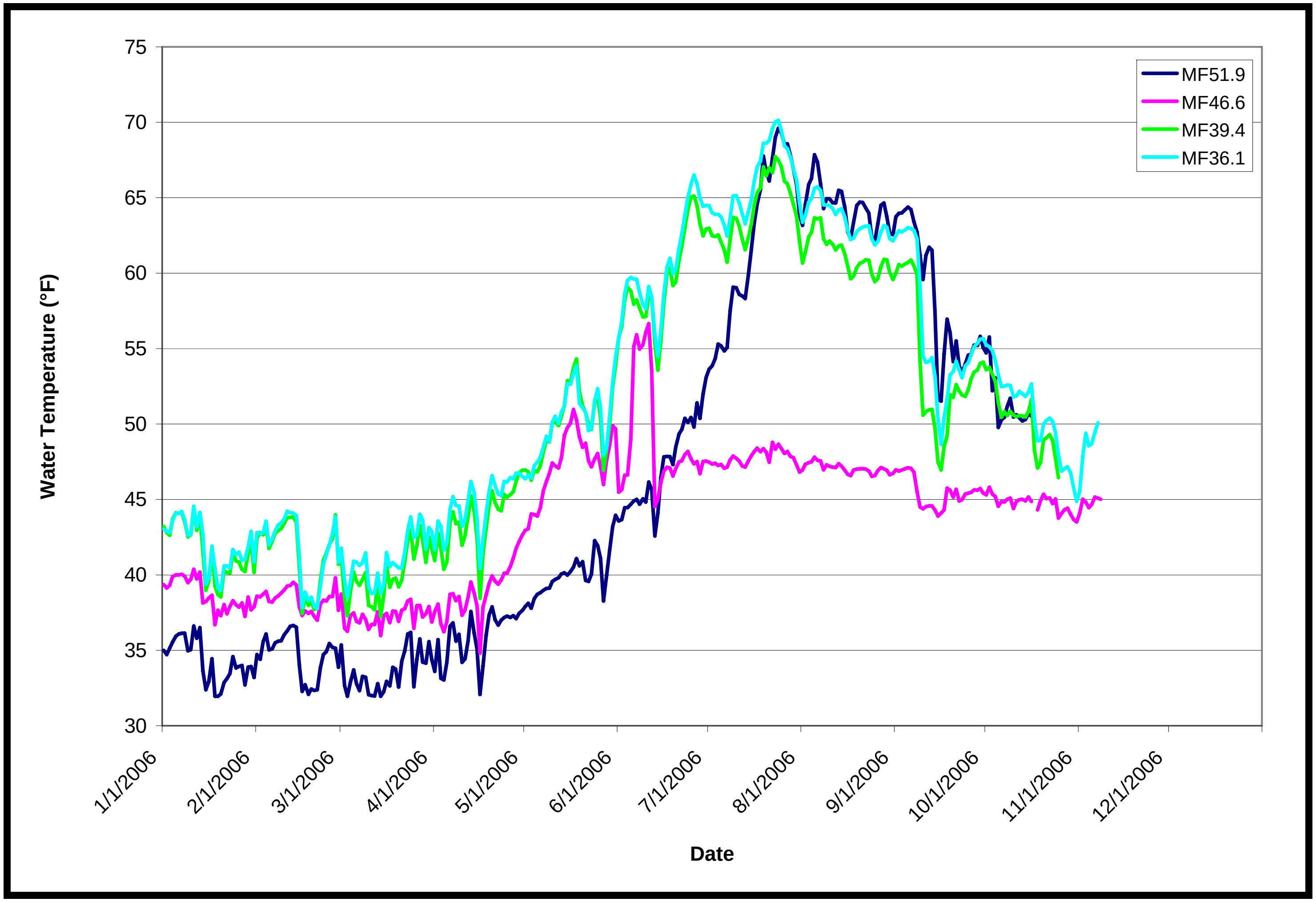

Figure 5-1. The 2006 daily average water temperature at four sites in the Middle Fork American River, from upstream of French Meadows Reservoir (MF51.9) to upstream of Middle Fork Interbay (MF36.1). MF46.6 is located immediately downstream of French Meadows Dam.

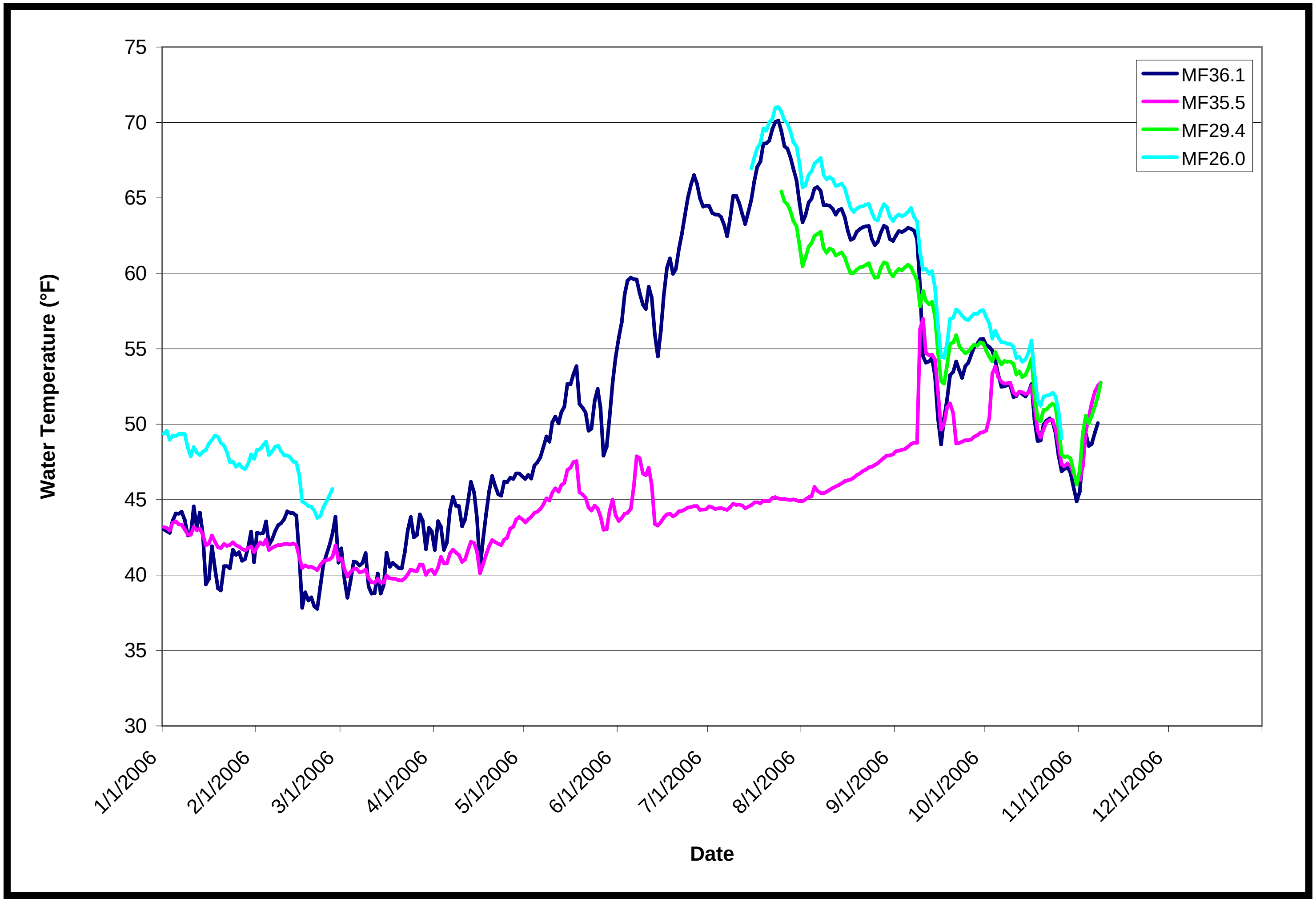

Figure 5-2. The 2006 daily average water temperature at four sites in the Middle Fork American River, from upstream of Middle Fork Interbay (MF36.1) to upstream of Ralston Afterbay (MF26.0). MF35.5 is located immediately downstream of Middle Fork Interbay Dam.

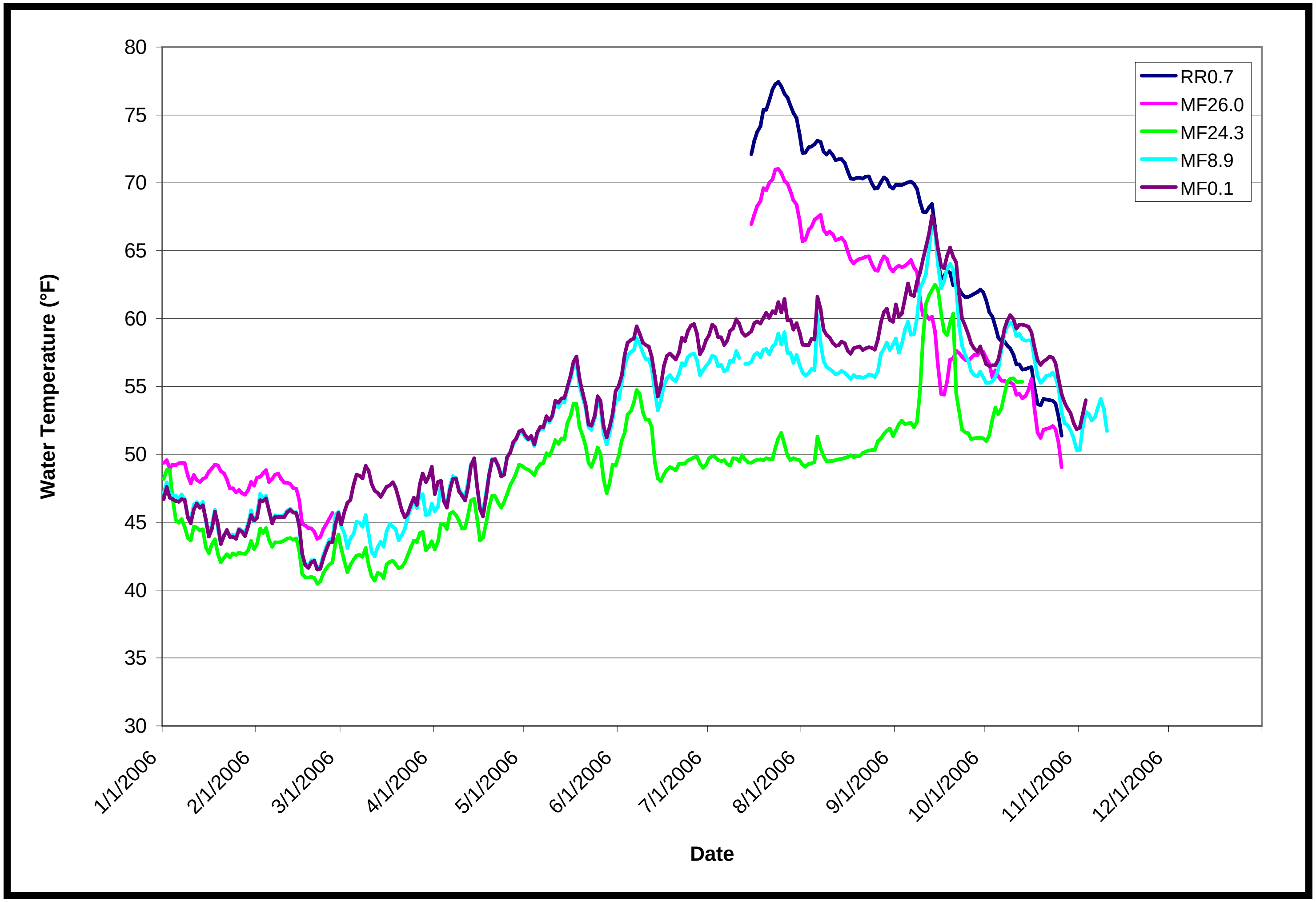

Figure 5-3. The 2006 daily average water temperature at four sites in the Middle Fork American River, from upstream of Ralston Afterbay (MF26.0) to upstream of the North Fork American River (MF0.1). MF24.3 is located immediately downstream of Oxbow Powerhouse and RR0.7 is the Rubicon River immediately upstream of Ralston Afterbay.

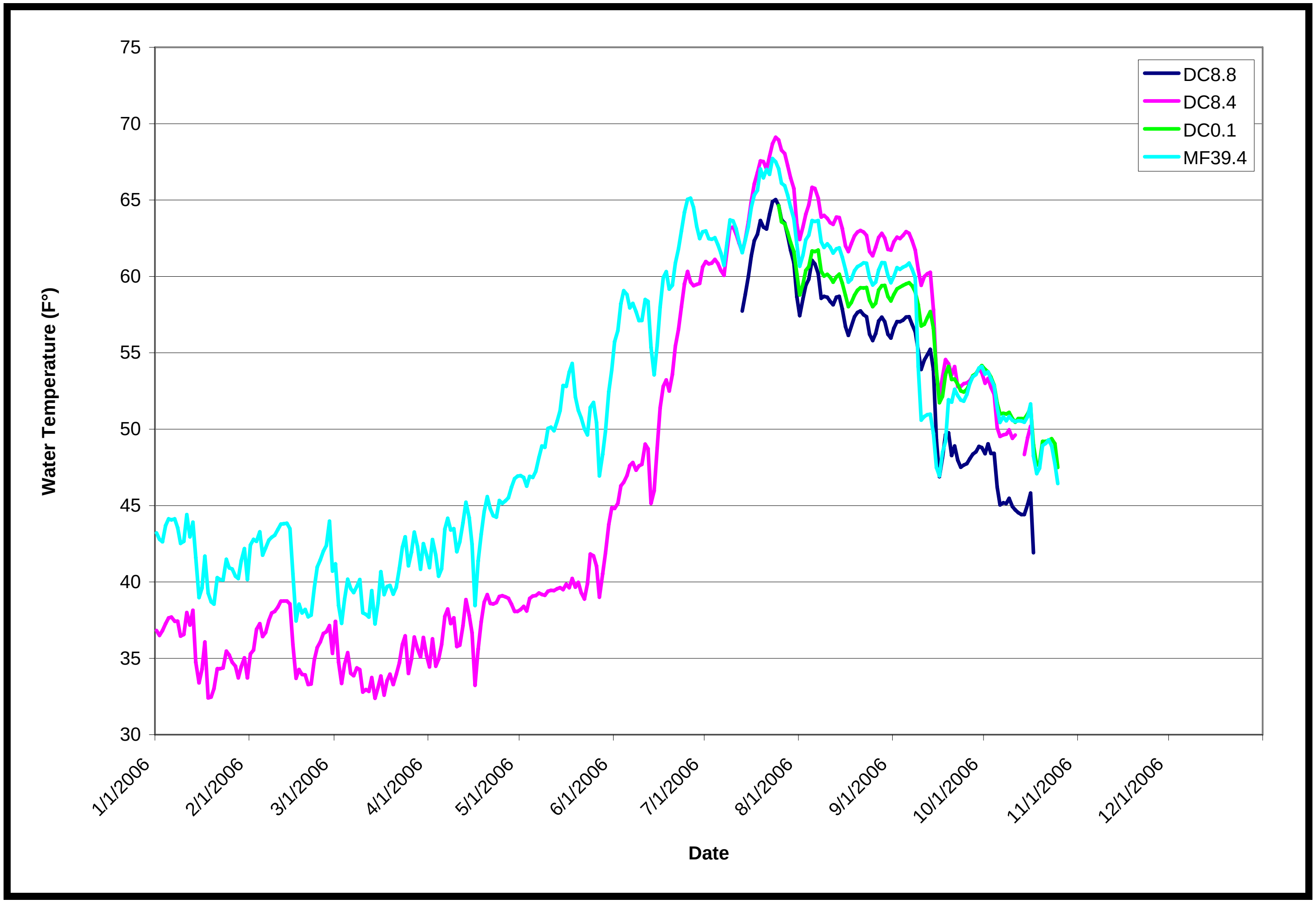

Figure 5-4. The 2006 daily average water temperature at three sites in Duncan Creek, from upstream of the Duncan Diversion Dam (DC8.8) to upstream of the confluence with the Middle Fork American River (DC0.12). MF39.4 is the Middle Fork American River immediately upstream of Duncan Creek.

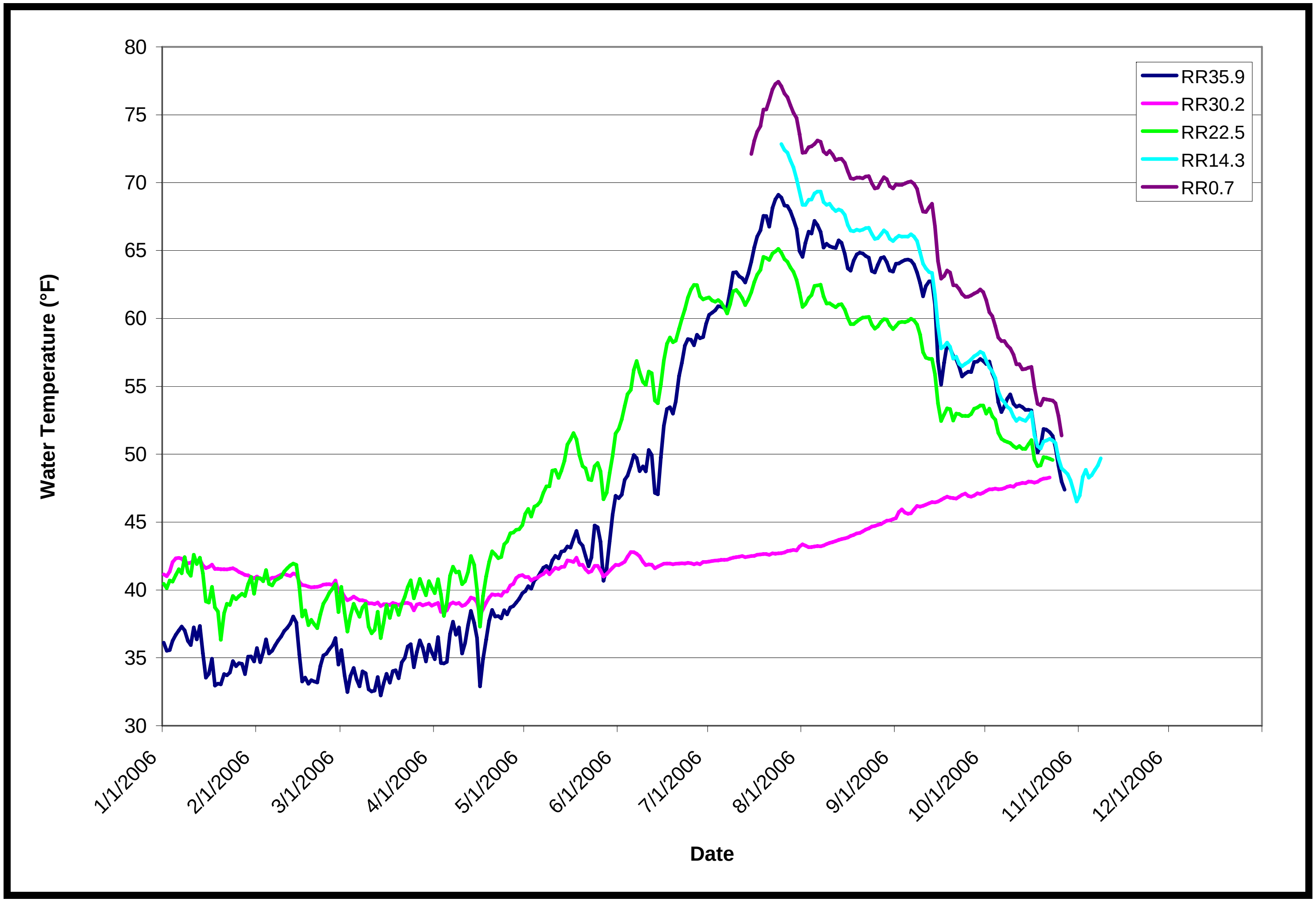

Figure 5-5. The 2006 daily average water temperature at five sites in the Rubicon River, from upstream of the Hell Hole Reservoir (RR35.9) to upstream of Ralston Afterbay (RR0.7). RR3.02 is the Rubicon River immediately downstream of Hell Hole Reservoir.

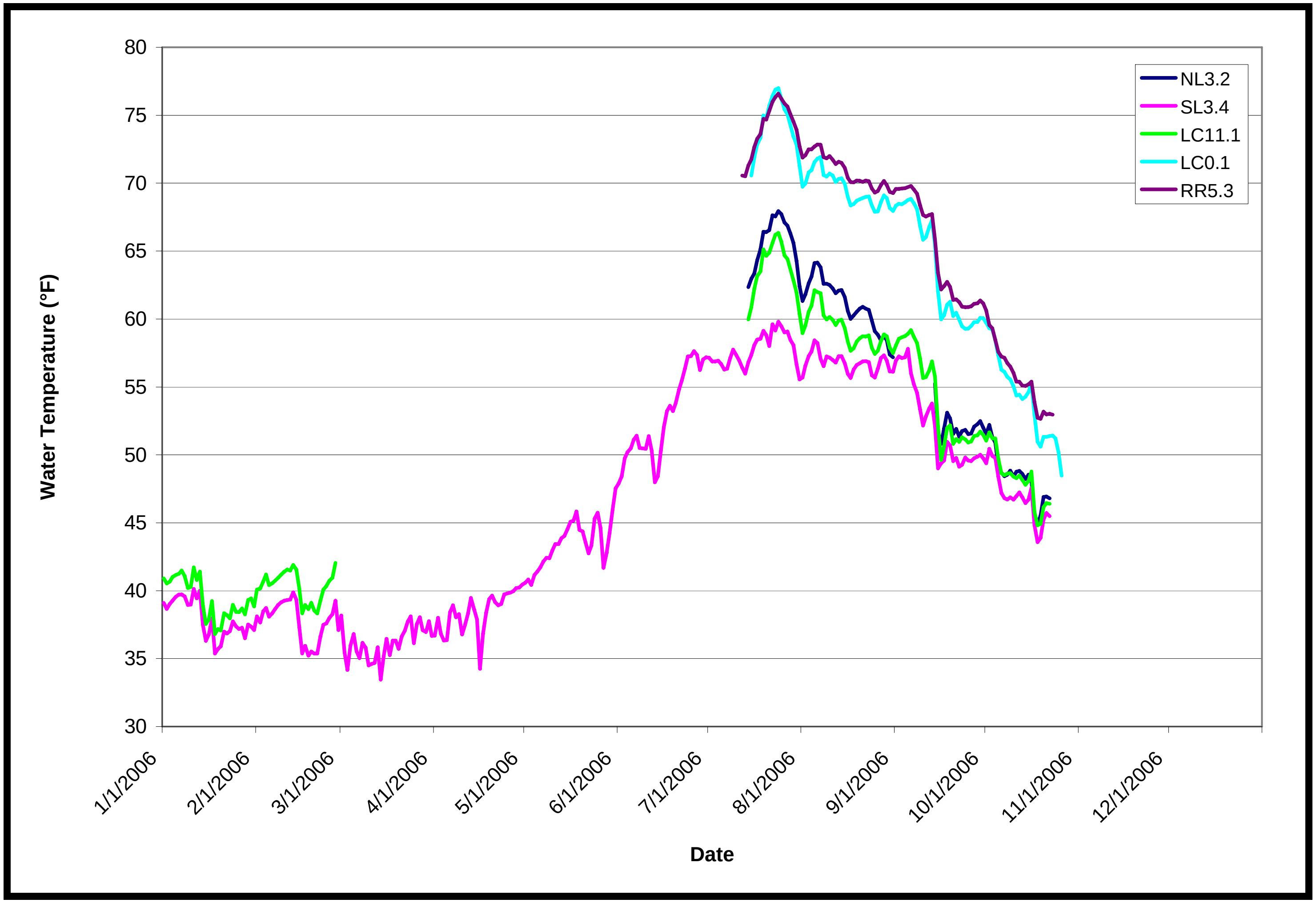

Figure 5-6. The 2006 daily average water temperature at four sites in Long Canyon Creek, from upstream the North Fork (NL3.2) and South Fork (SL3.4) diversion dams to upstream the Rubicon River confluence (LC0.1). LC11.1 is Long Canyon Creek downstream of the North Fork – South Fork confluence, and RR5.3 is the Rubicon River upstream of Long Canyon Creek.

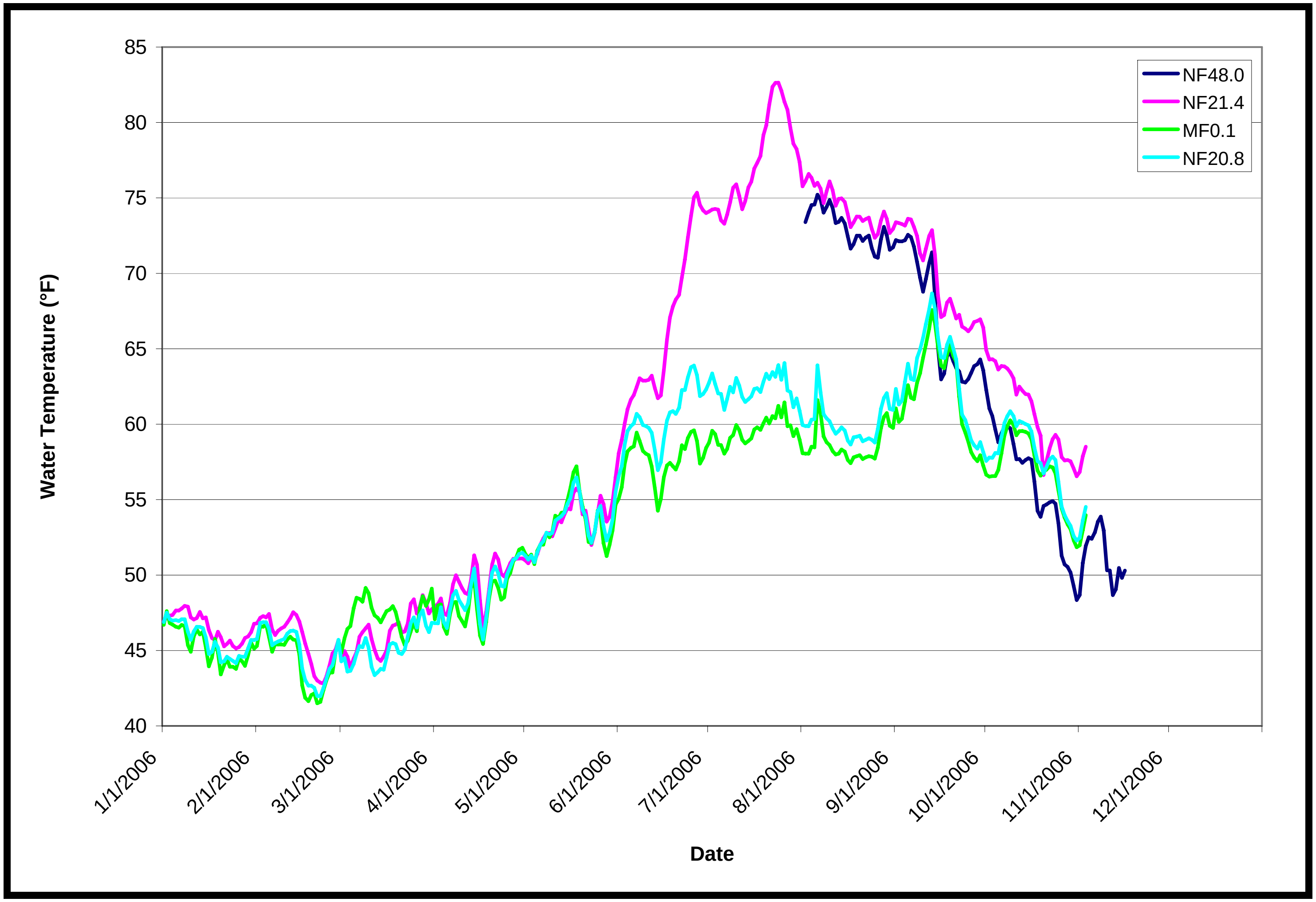

Figure 5-7. The 2006 daily average water temperature at four sites in the North Fork American River, from upstream of Shirttail Creek (MF48.0) to downstream of the Middle Fork American River confluence (MF20.8). MF0.1 is the Middle Fork American River upstream of the North Fork American River confluence.

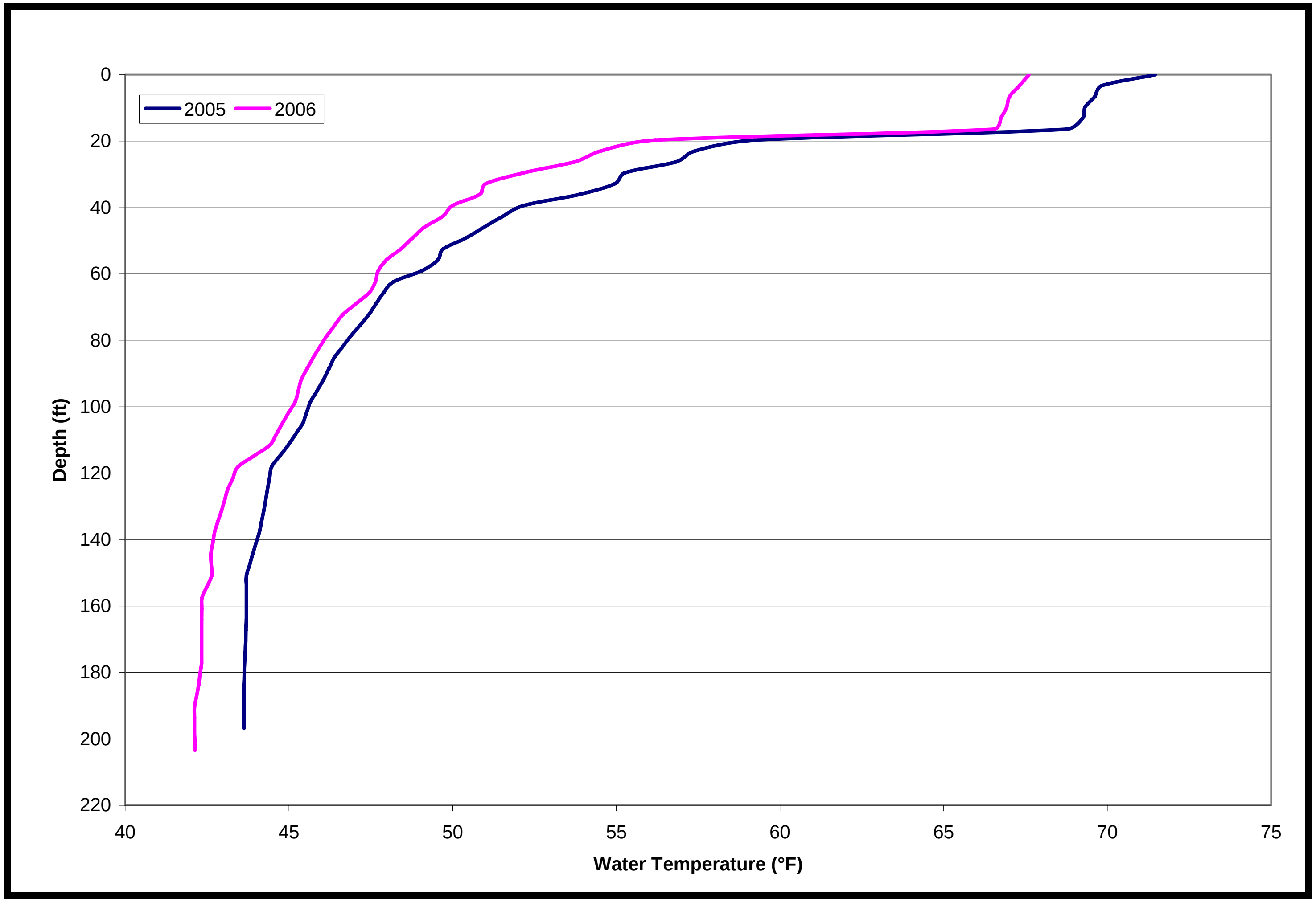

Figure 5-8. A comparison of the water temperature profiles from French Meadows Reservoir (site FM1) on July 15, 2005 and July 7, 2006.

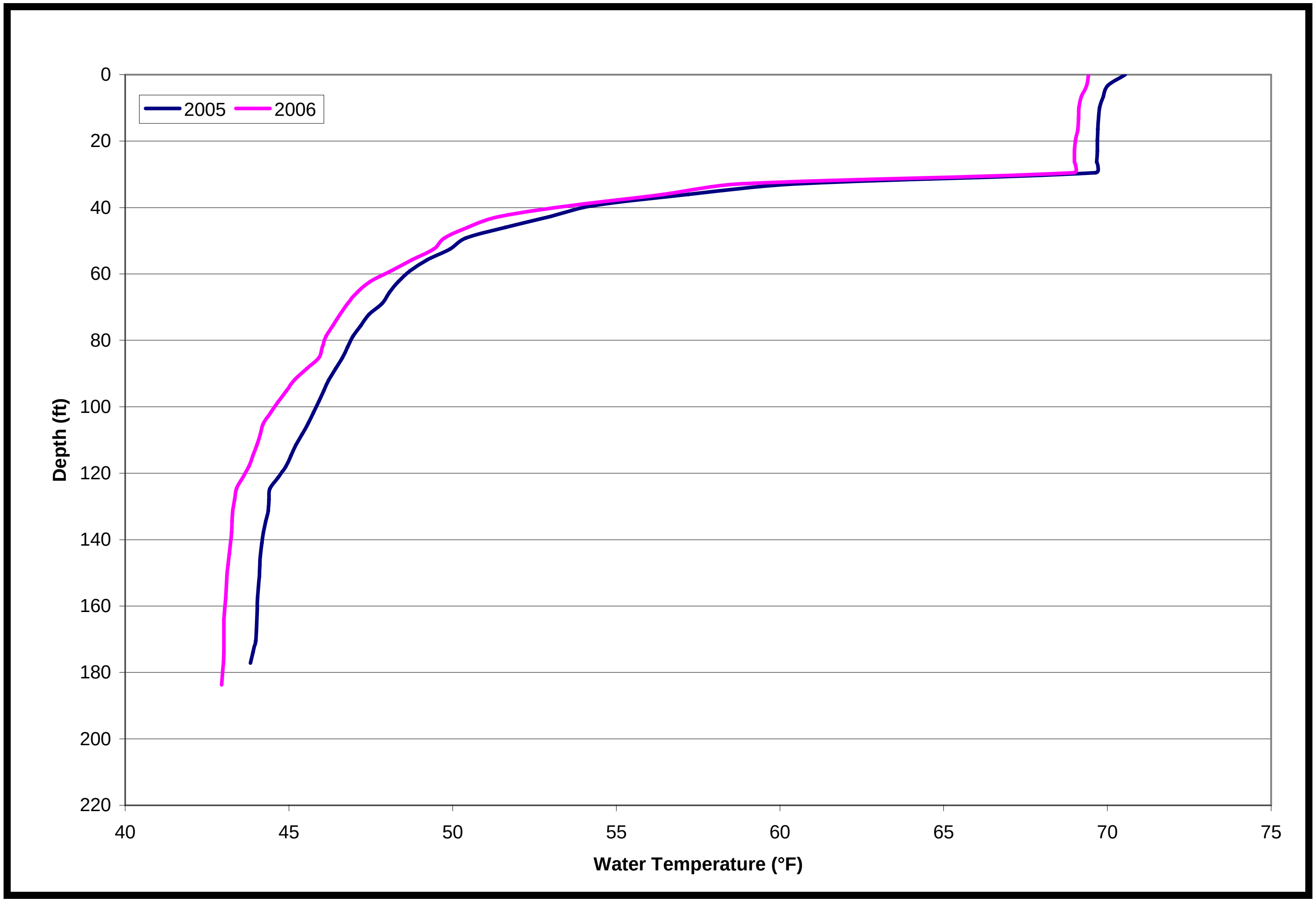

Figure 5-9. A comparison of the water temperature profiles from French Meadows Reservoir (site FM1) on August 16, 2005 and August 10, 2006.

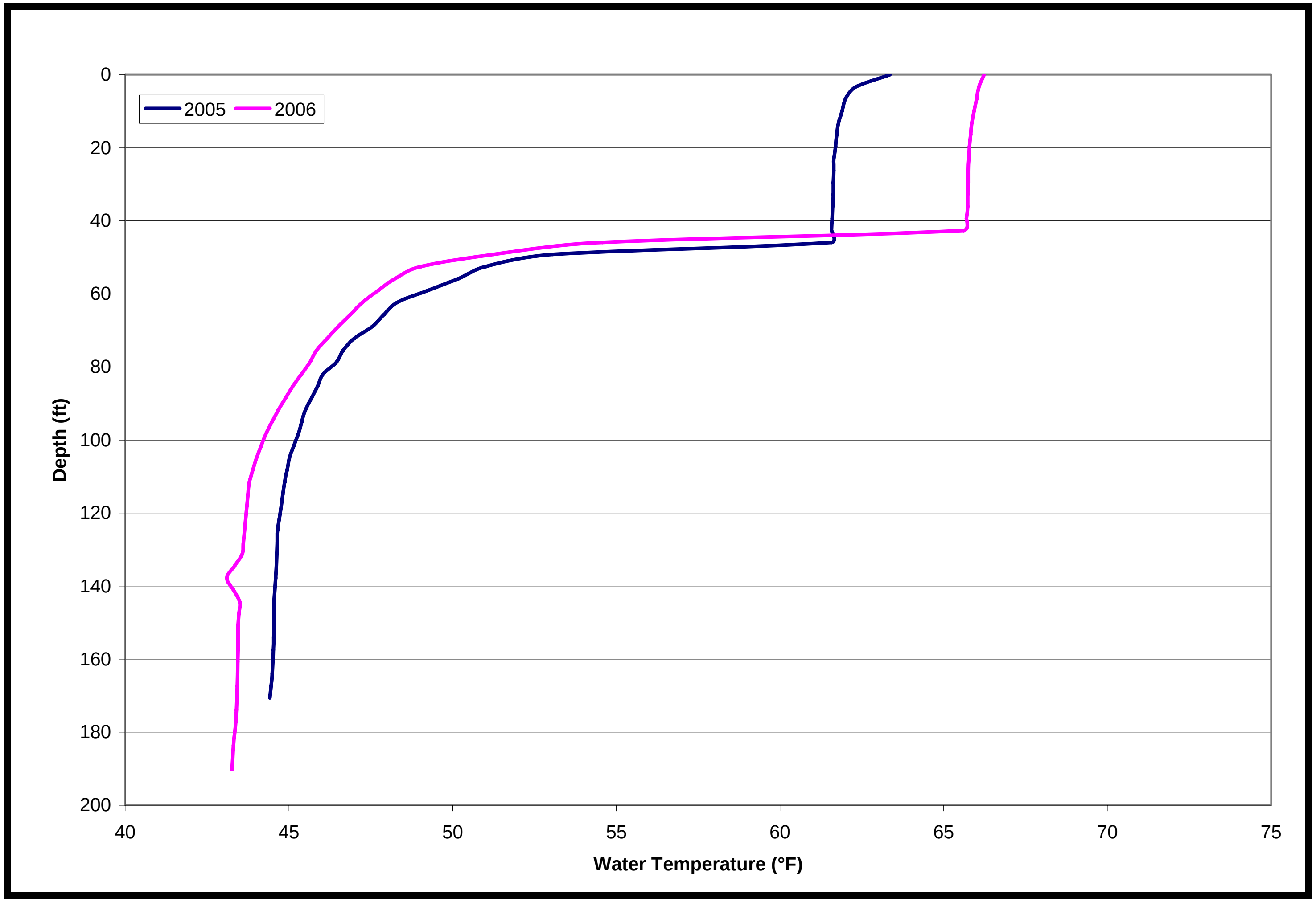

Figure 5-10. A comparison of the water temperature profiles from French Meadows Reservoir (site FM1) on September 19, 2005 and September 9, 2006.

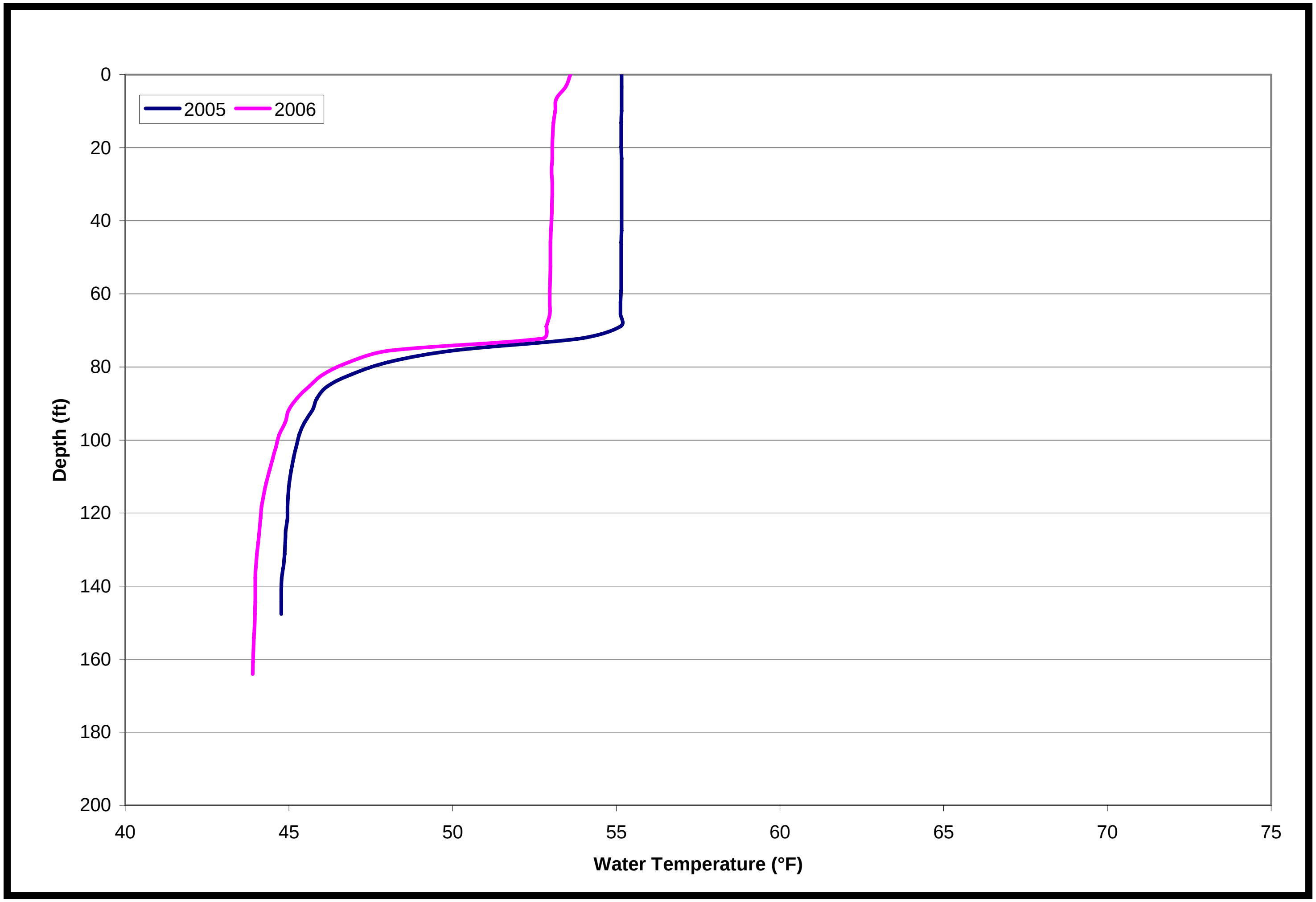

Figure 5-11. A comparison of the water temperature profiles from French Meadows Reservoir (site FM1) on October 25, 2005 and October 28, 2006.

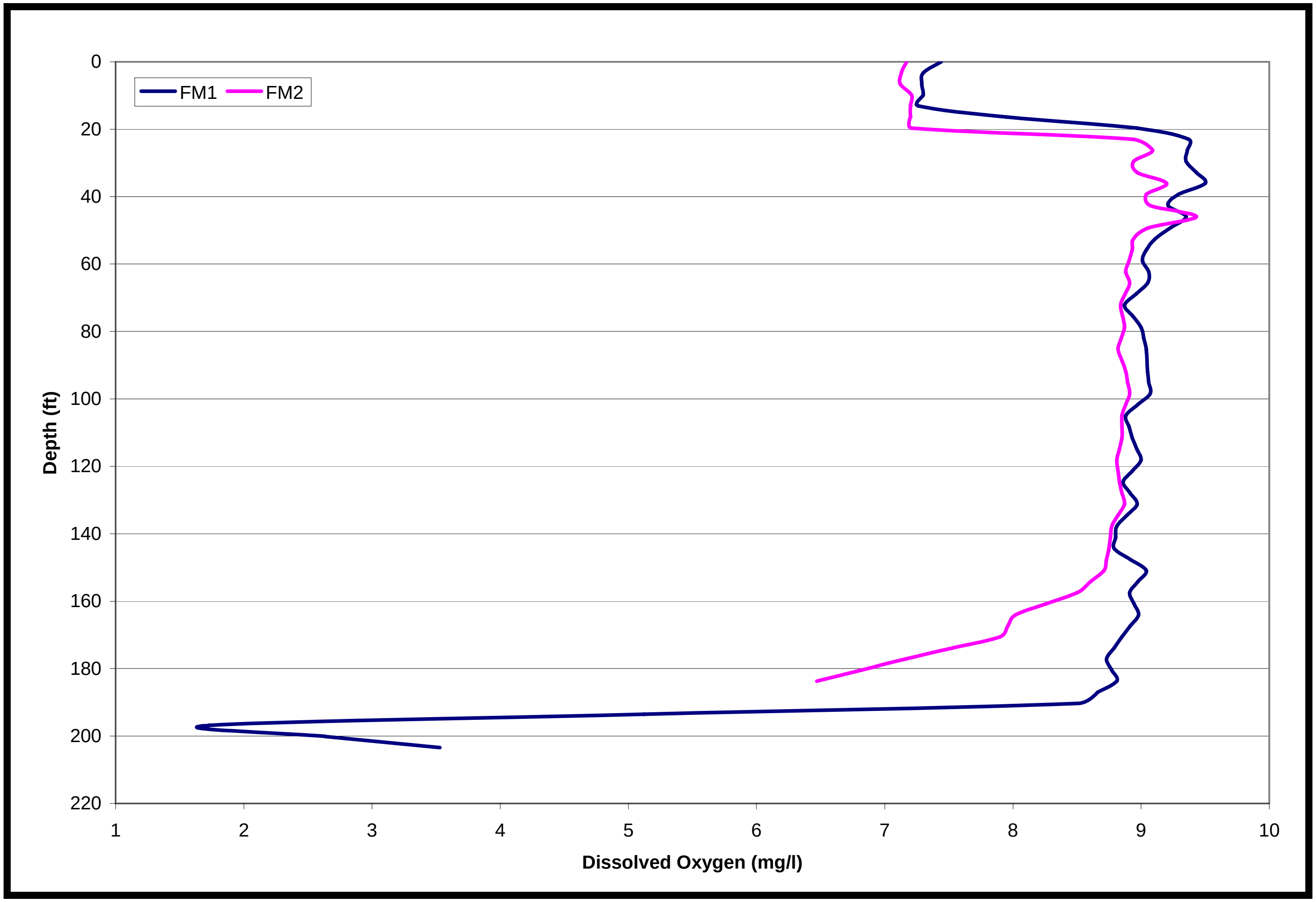

Figure 5-12. The dissolved oxygen profiles observed in French Meadows Reservoir at FM1 and FM2 on July 7, 2006.

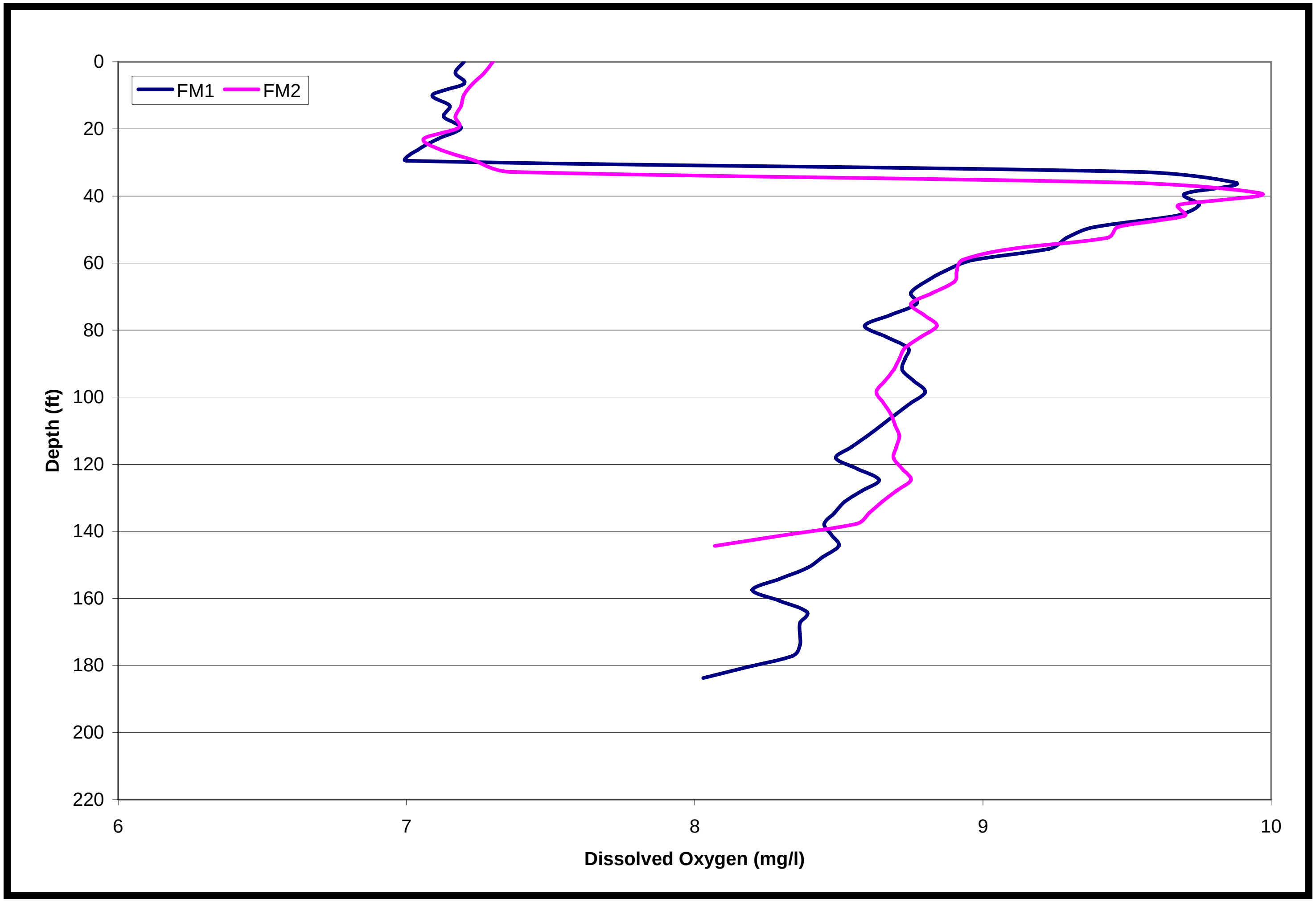

Figure 5-13. The dissolved oxygen profiles observed in French Meadows Reservoir at FM1 and FM2 on August 10, 2006.

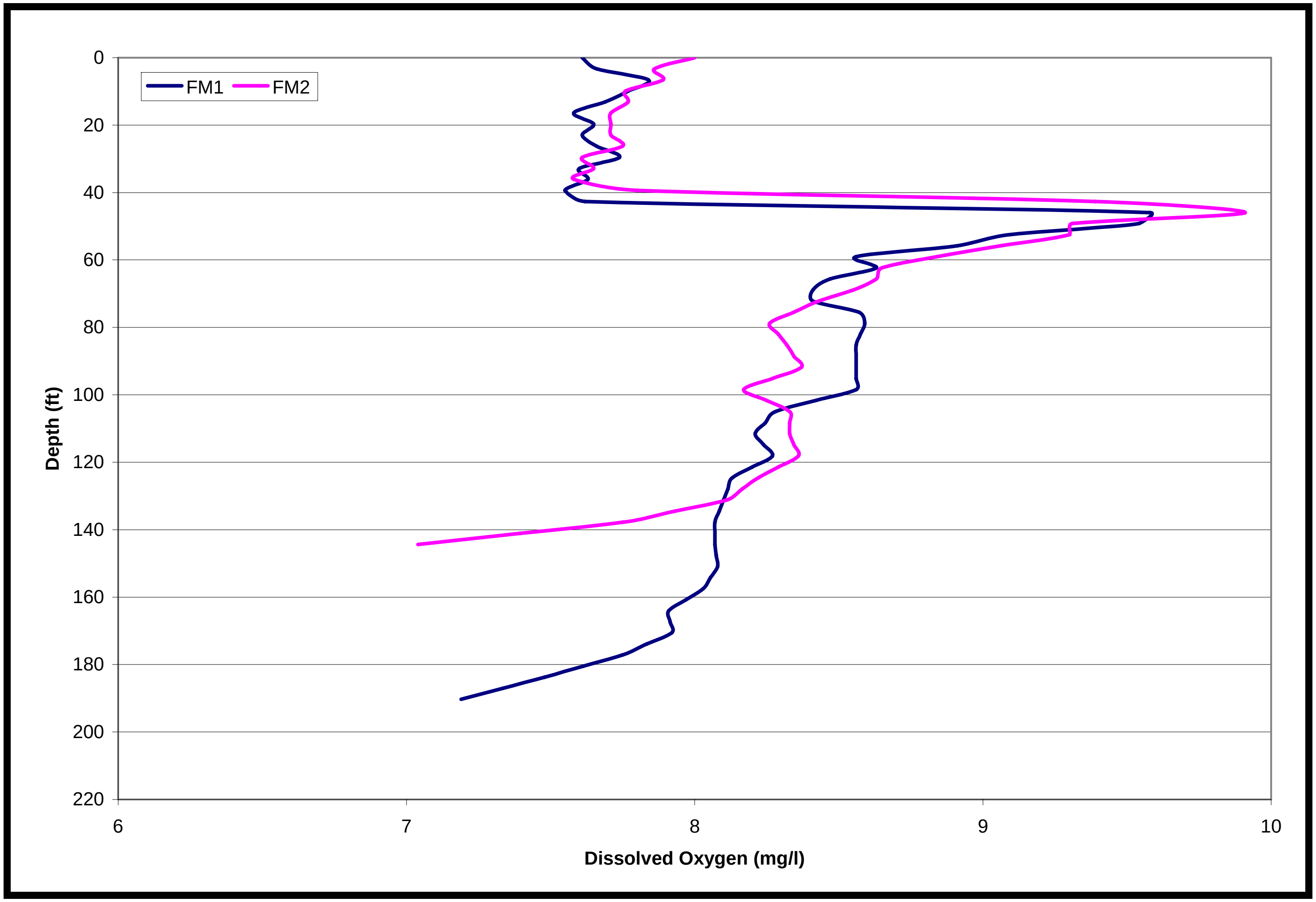

Figure 5-14. The dissolved oxygen profiles observed in French Meadows Reservoir at FM1 and FM2 on September 9, 2006.

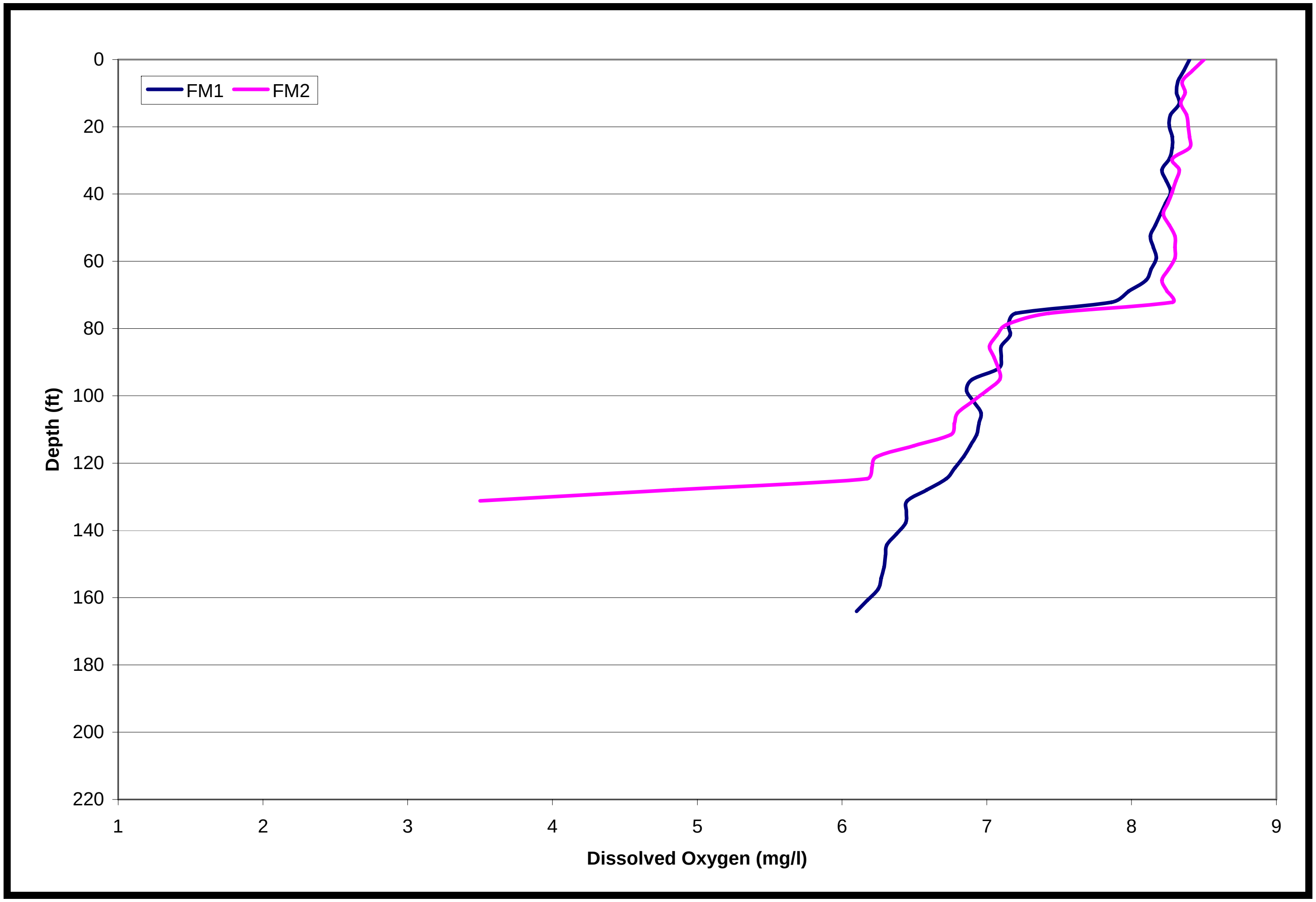

Figure 5-15. The dissolved oxygen profiles observed in French Meadows Reservoir at FM1 and FM2 on October 28, 2006.

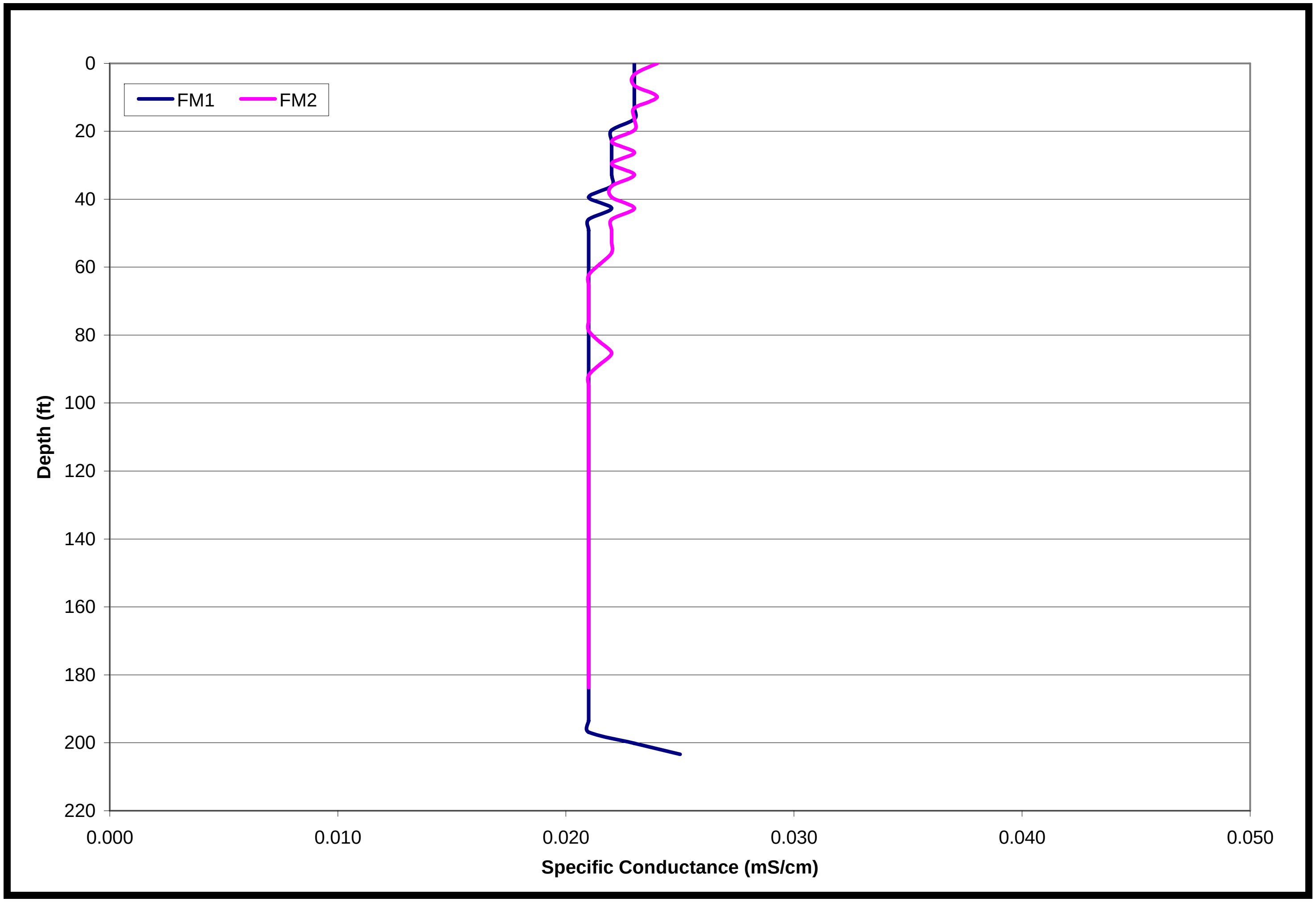

Figure 5-16. The specific conductance profiles observed in French Meadows Reservoir at FM1 and FM2 on July 7, 2006.

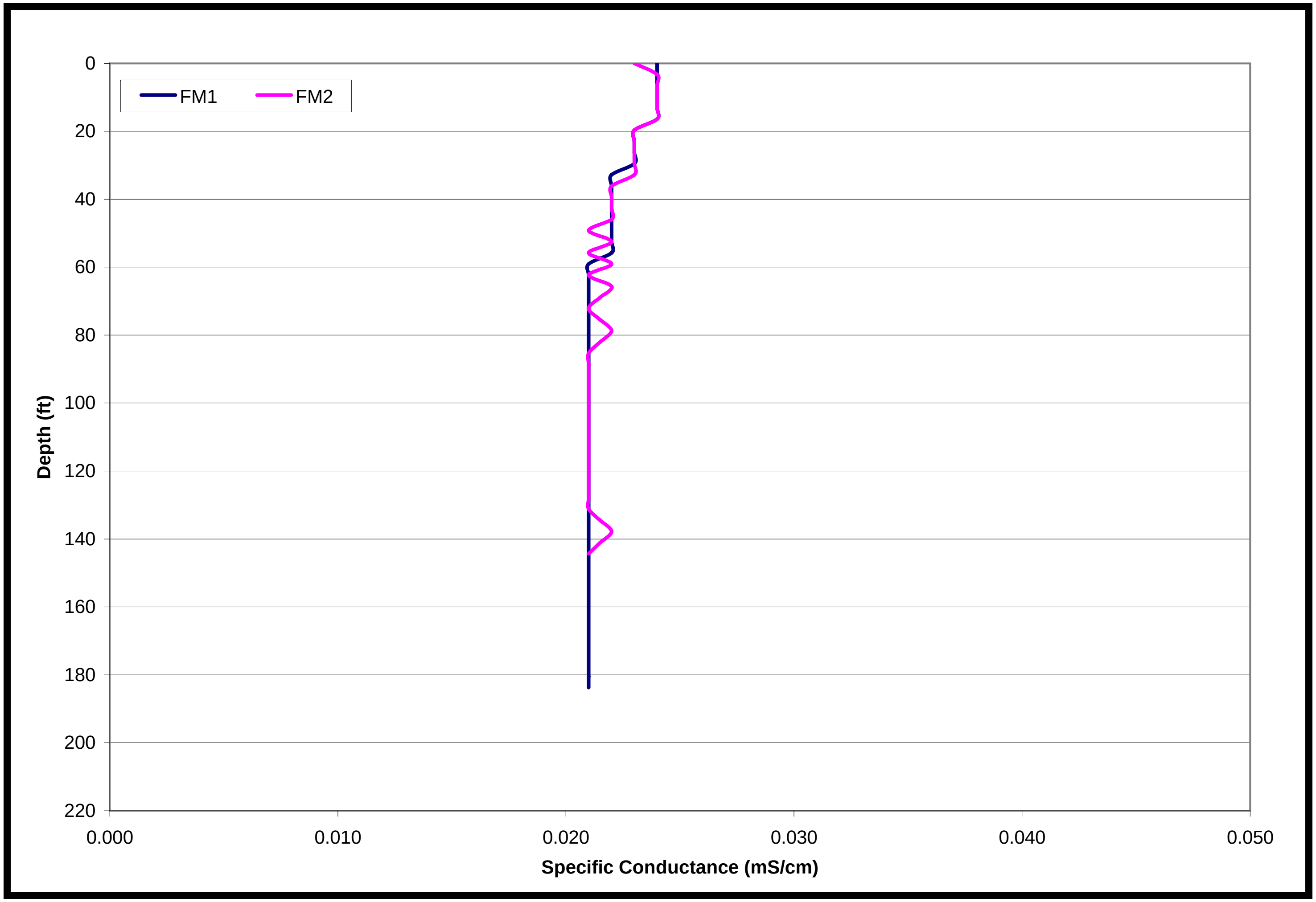

Figure 5-17. The specific conductance profiles observed in French Meadows Reservoir at FM1 and FM2 on August 10, 2006.

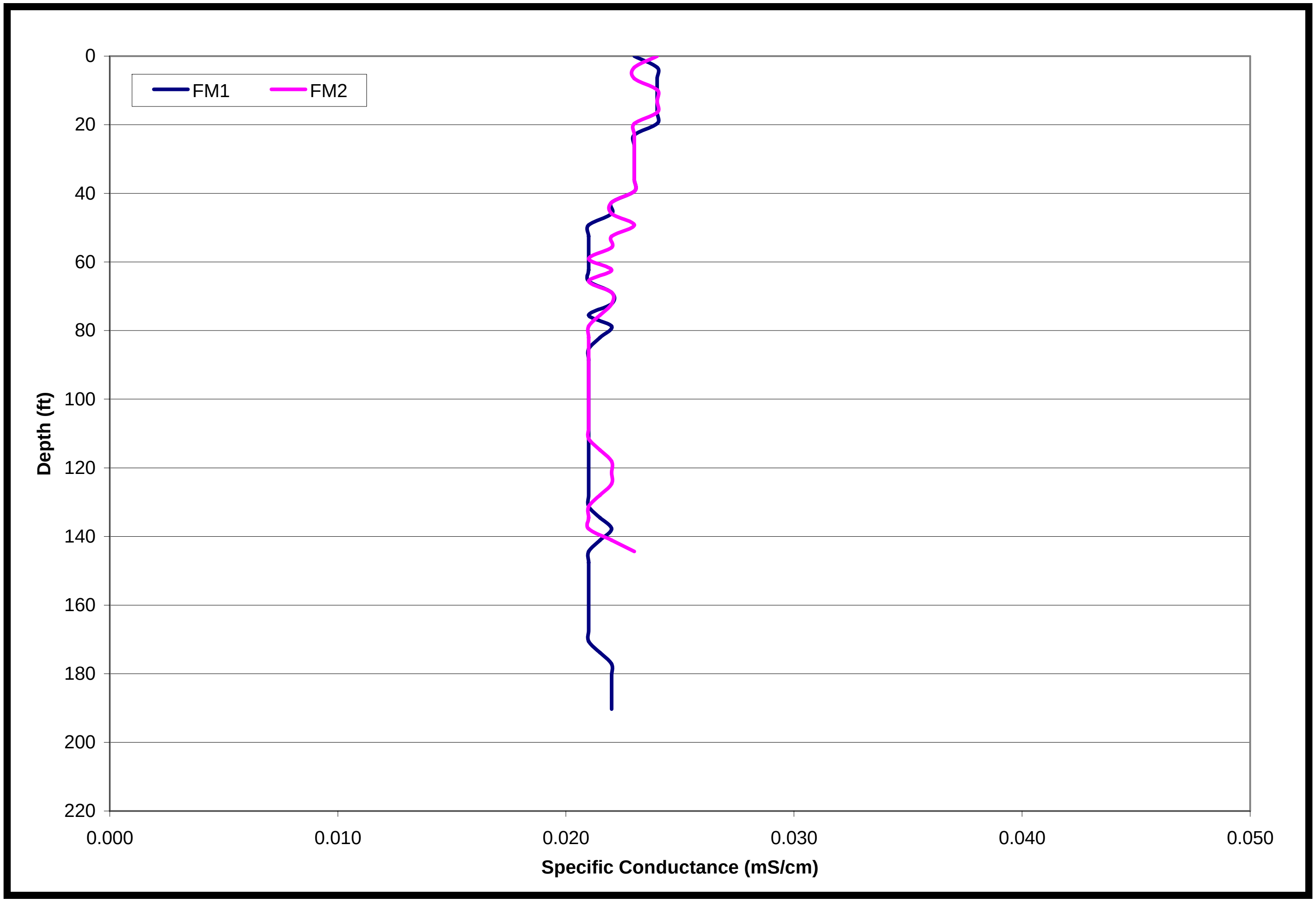

Figure 5-18. The specific conductance profiles observed in French Meadows Reservoir at FM1 and FM2 on September 9, 2006.

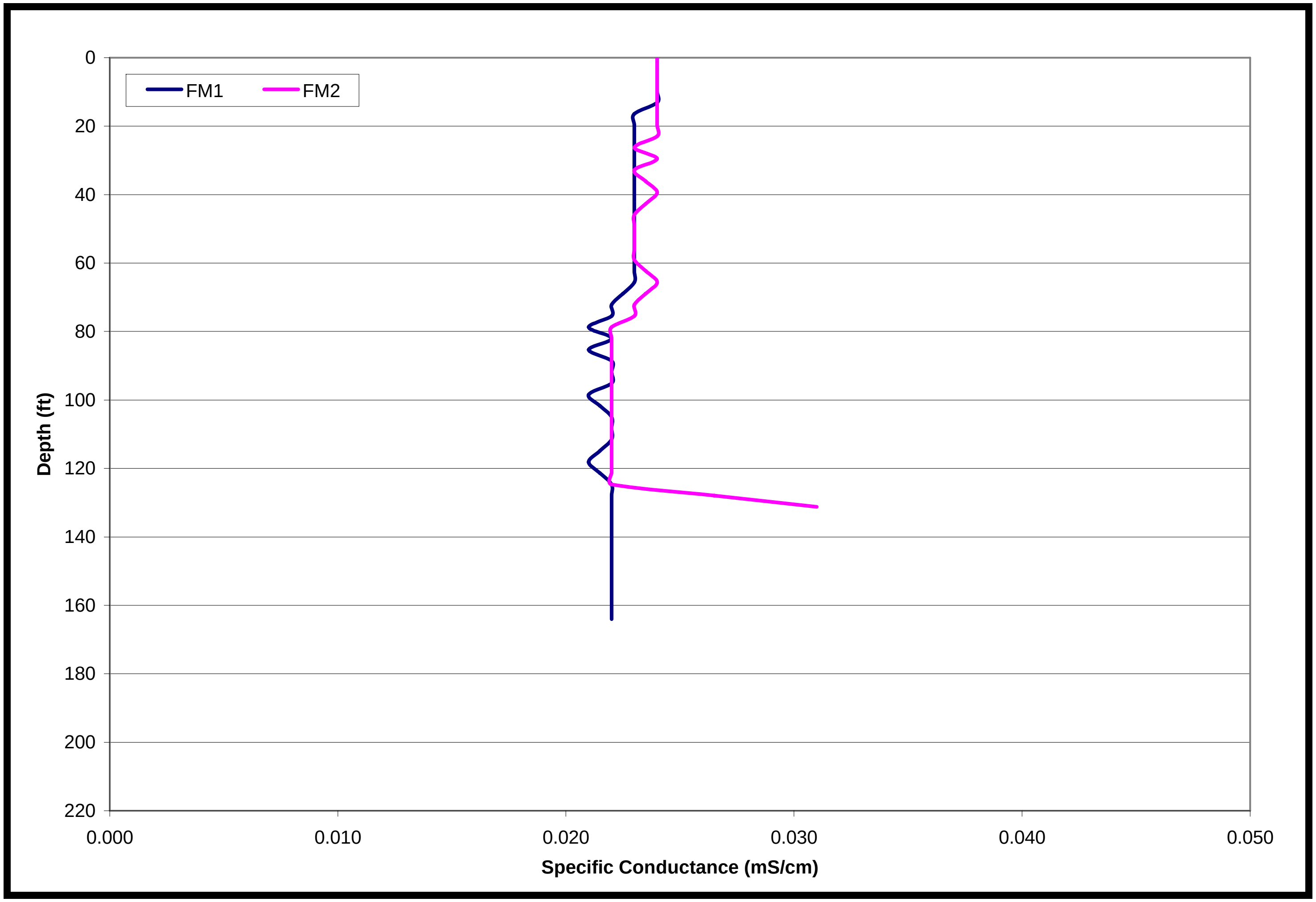

Figure 5-19. The specific conductance profiles observed in French Meadows Reservoir at FM1 and FM2 on October 28, 2006.

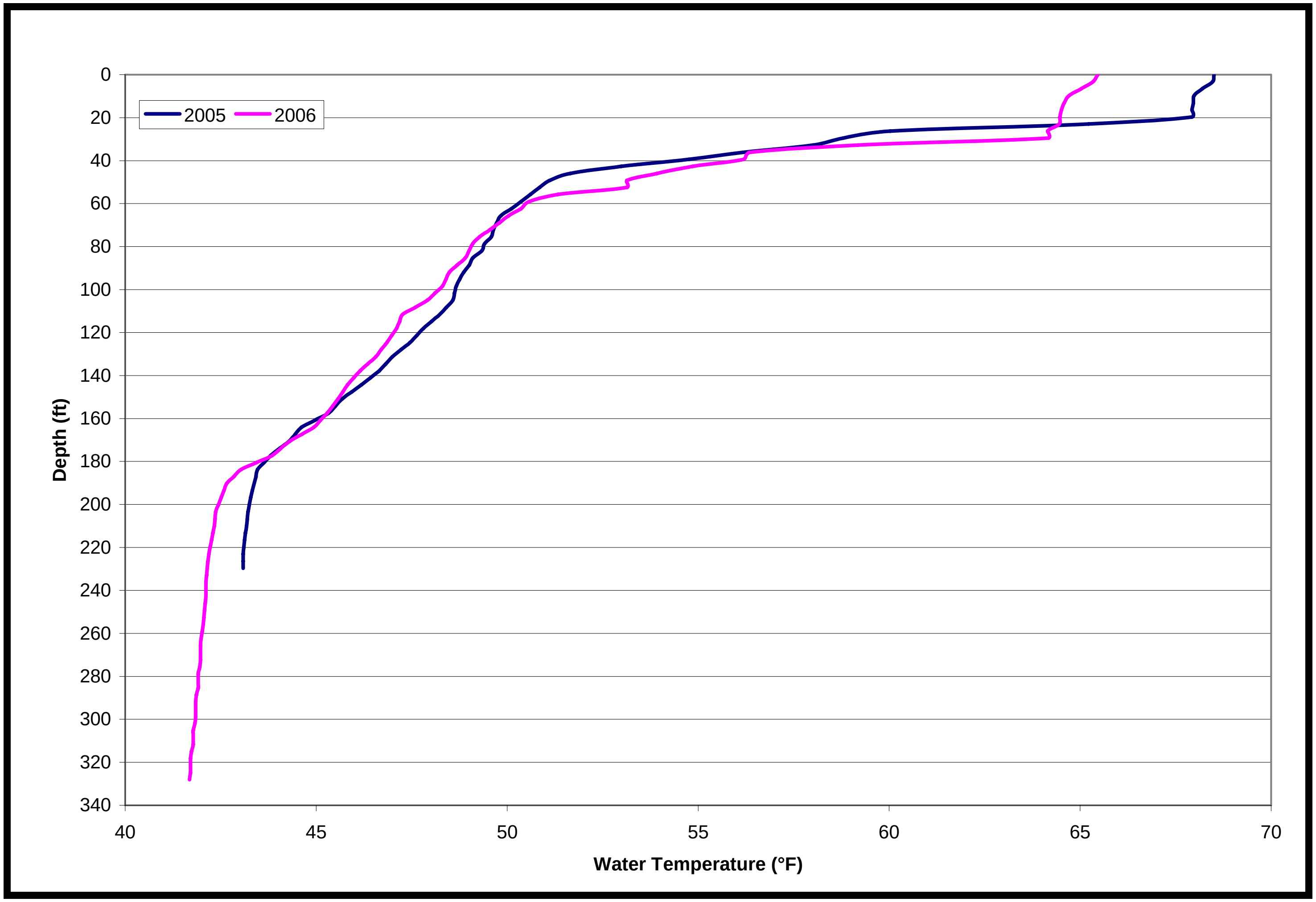

Figure 5-20. A comparison of the water temperature profiles from Hell Hole Reservoir (site HH1) on July 15, 2005 and July 7, 2006.

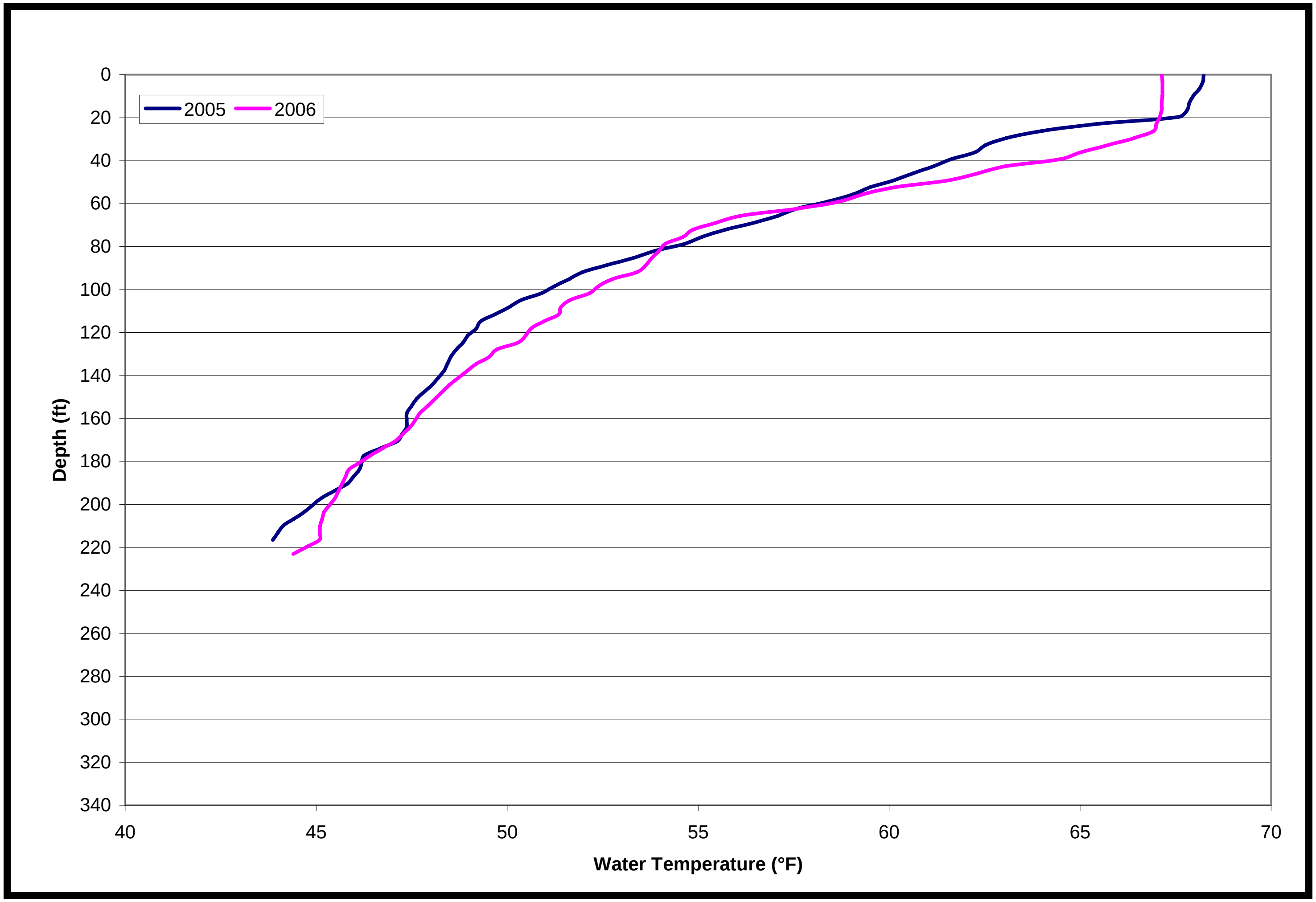

Figure 5-21. A comparison of the water temperature profiles from Hell Hole Reservoir (site HH1) on August 16, 2005 and August 10, 2006.

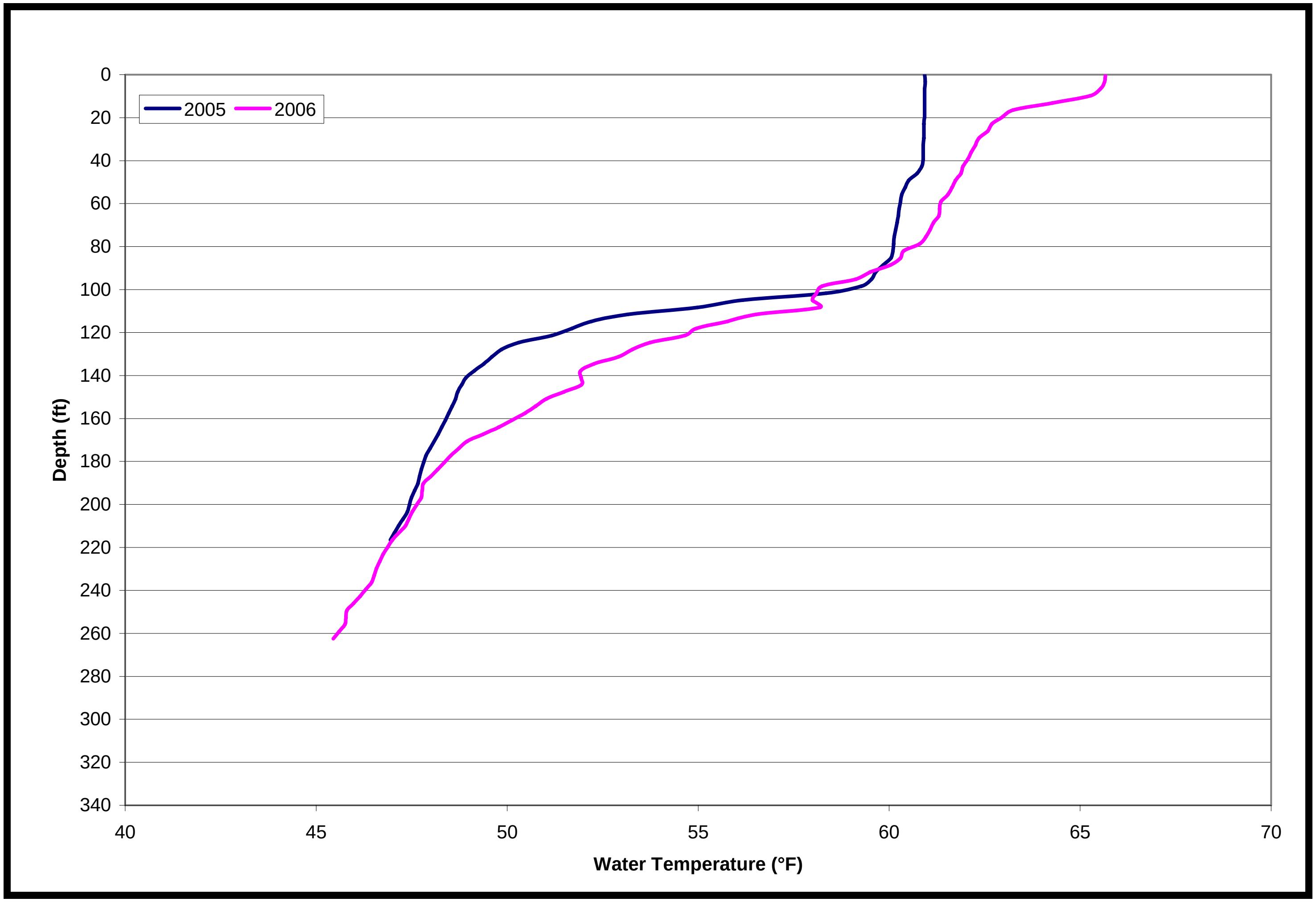

Figure 5-22. A comparison of the water temperature profiles from Hell Hole Reservoir (site HH1) on September 19, 2005 and September 9, 2006.

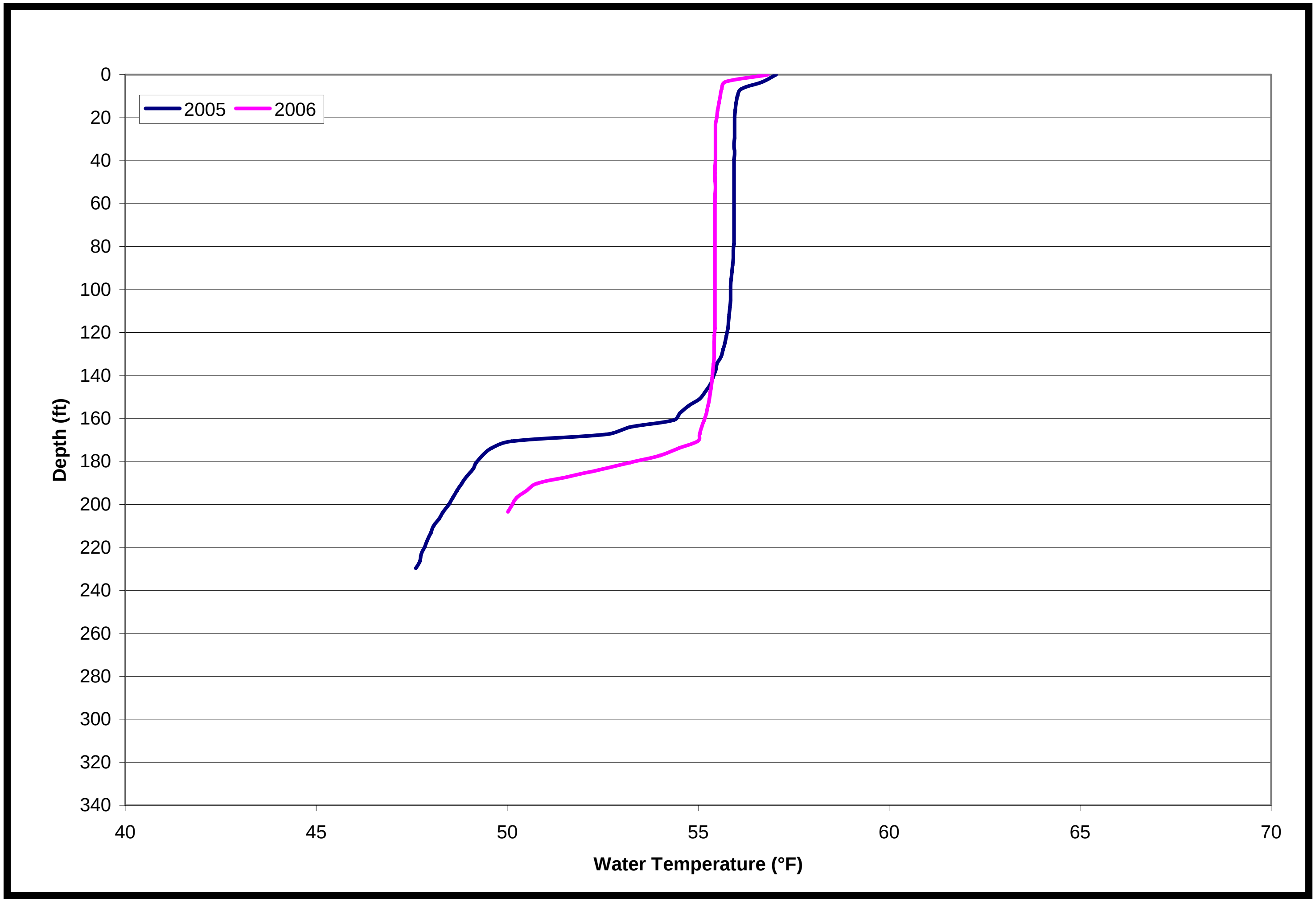

Figure 5-23. A comparison of the water temperature profiles from Hell Hole Reservoir (site HH1) on October 25, 2005 and October 28, 2006.

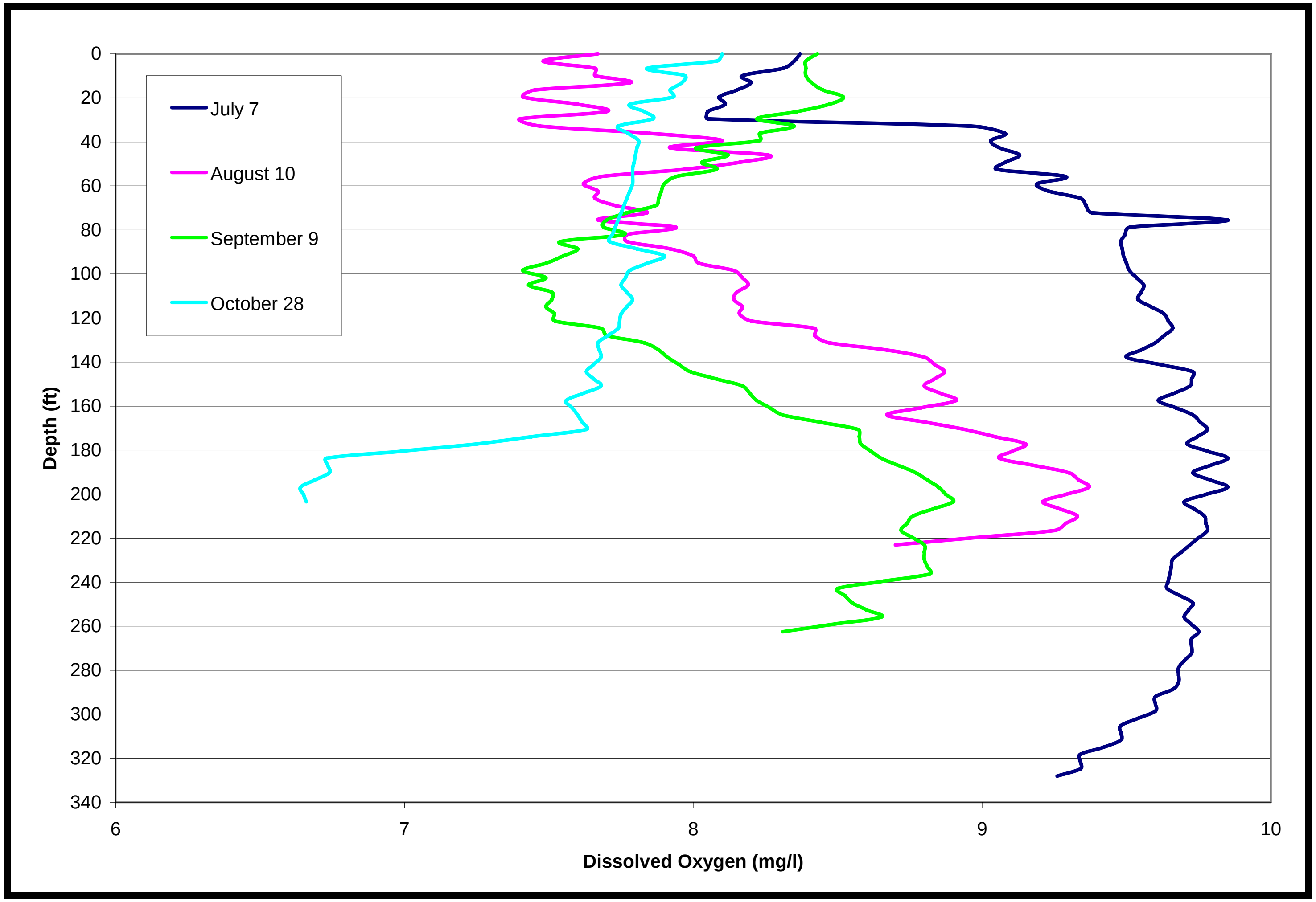

Figure 5-24. The dissolved oxygen profiles in Hell Hole Reservoir at HH1 on July 7, August 10, September 9, and October 28, 2006.

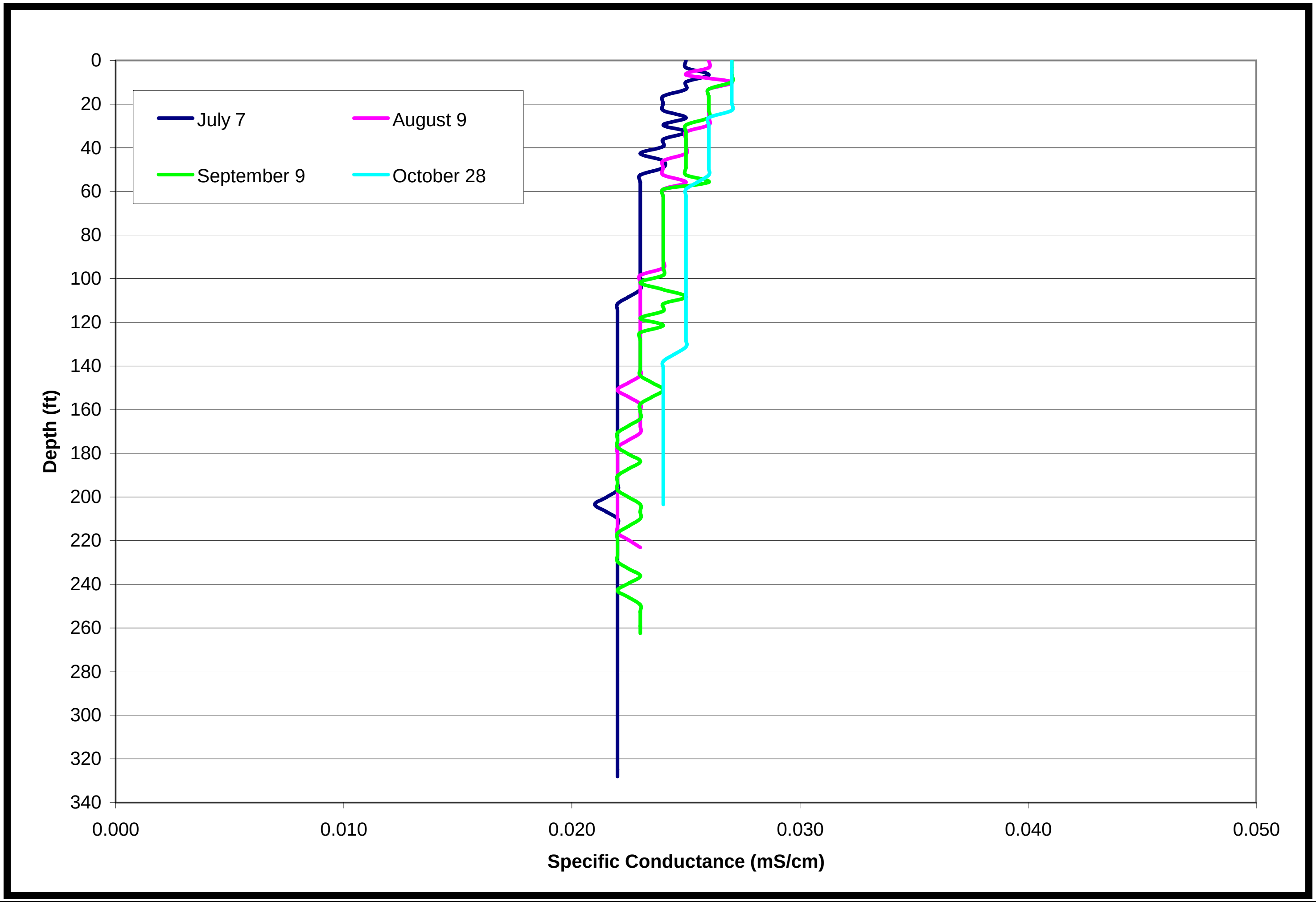

Figure 5-25. The specific conductance profiles in Hell Hole Reservoir at HH1 on July 7, August 10, September 9, and October 28, 2006.

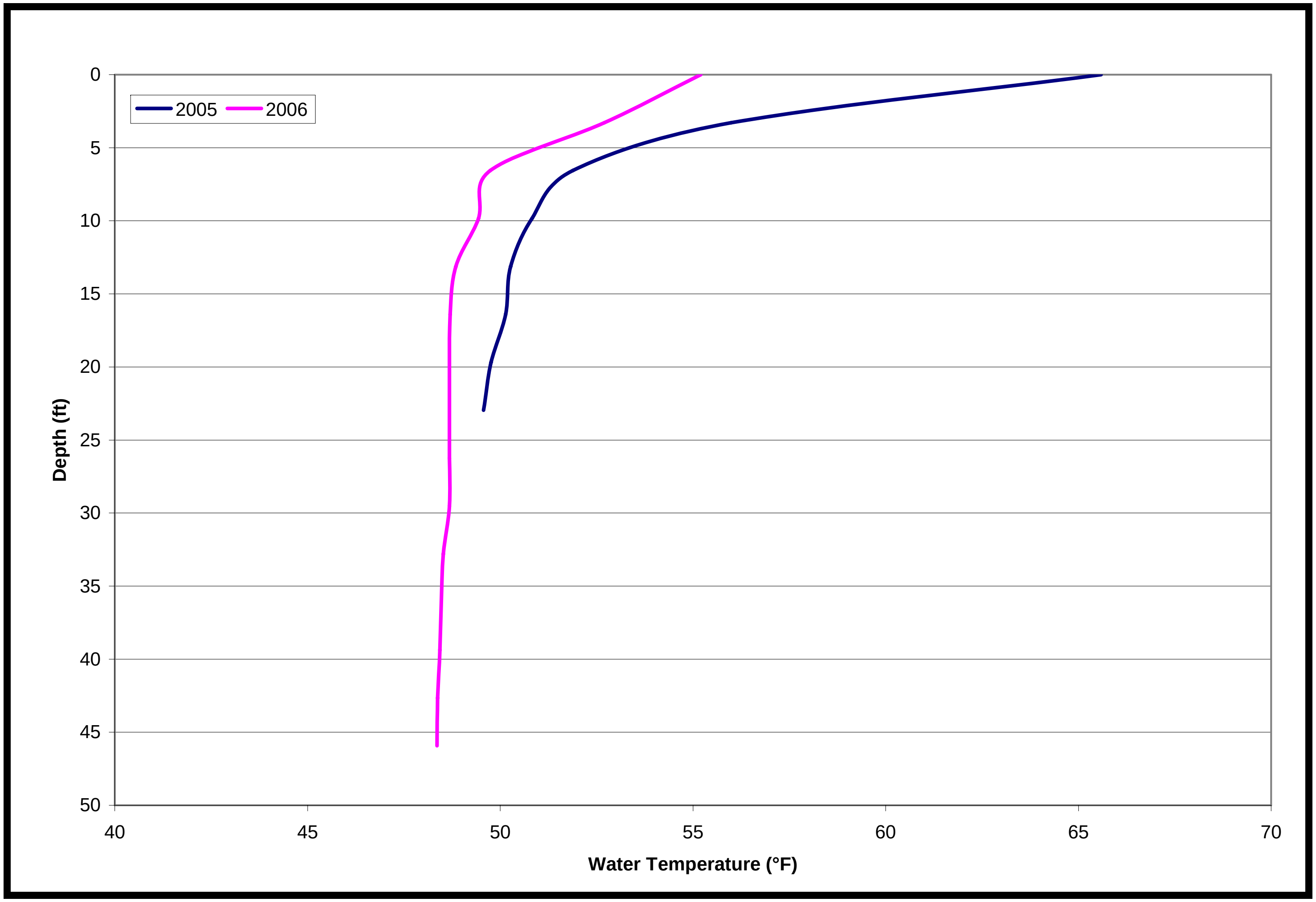

Figure 5-26. A comparison of the water temperature profiles from Ralston Afterbay Reservoir on July 14, 2005 and July 10, 2006.

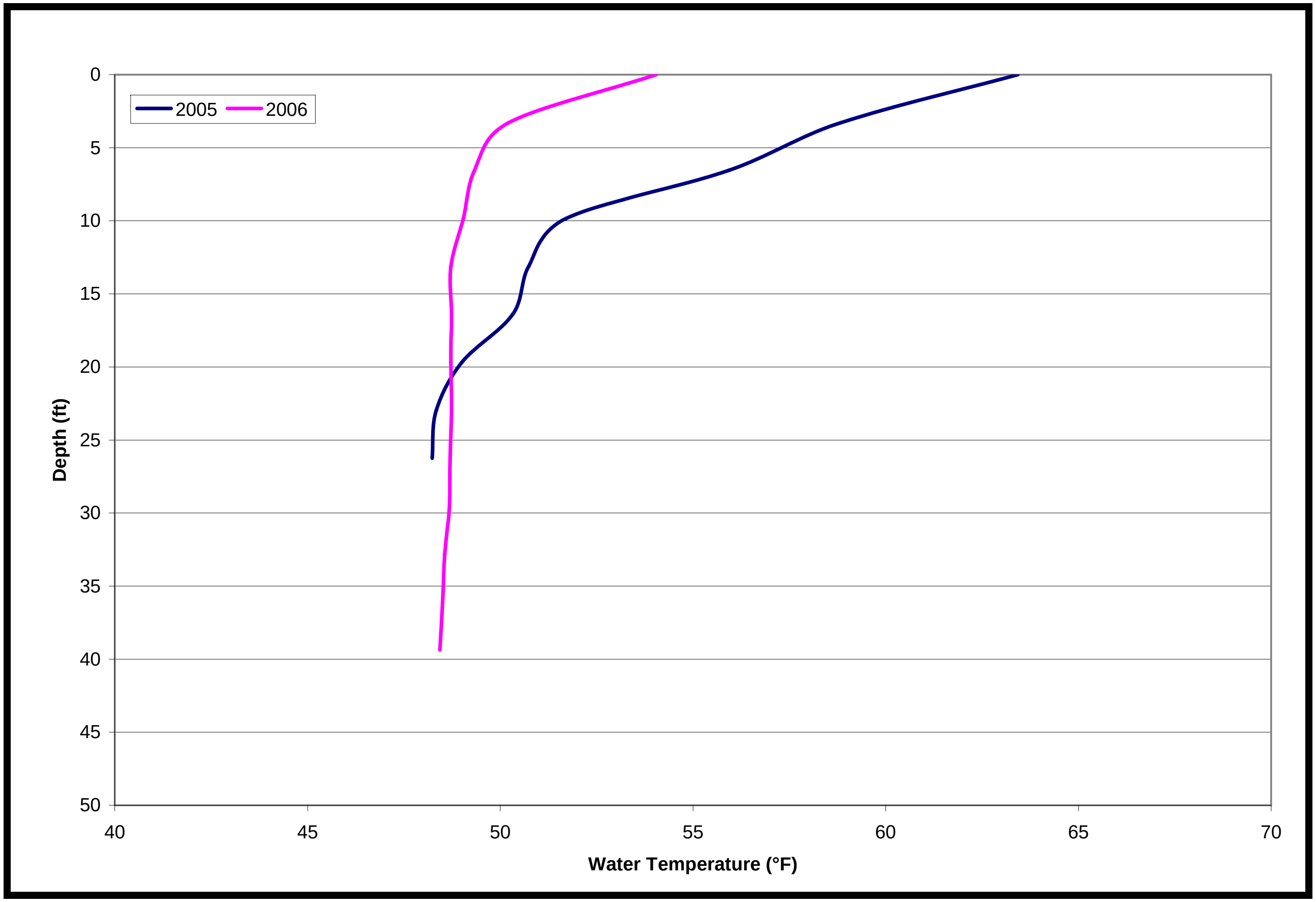

Figure 5-27. A comparison of the water temperature profiles from Ralston Afterbay Reservoir on August 16, 2005 and August 9, 2006.

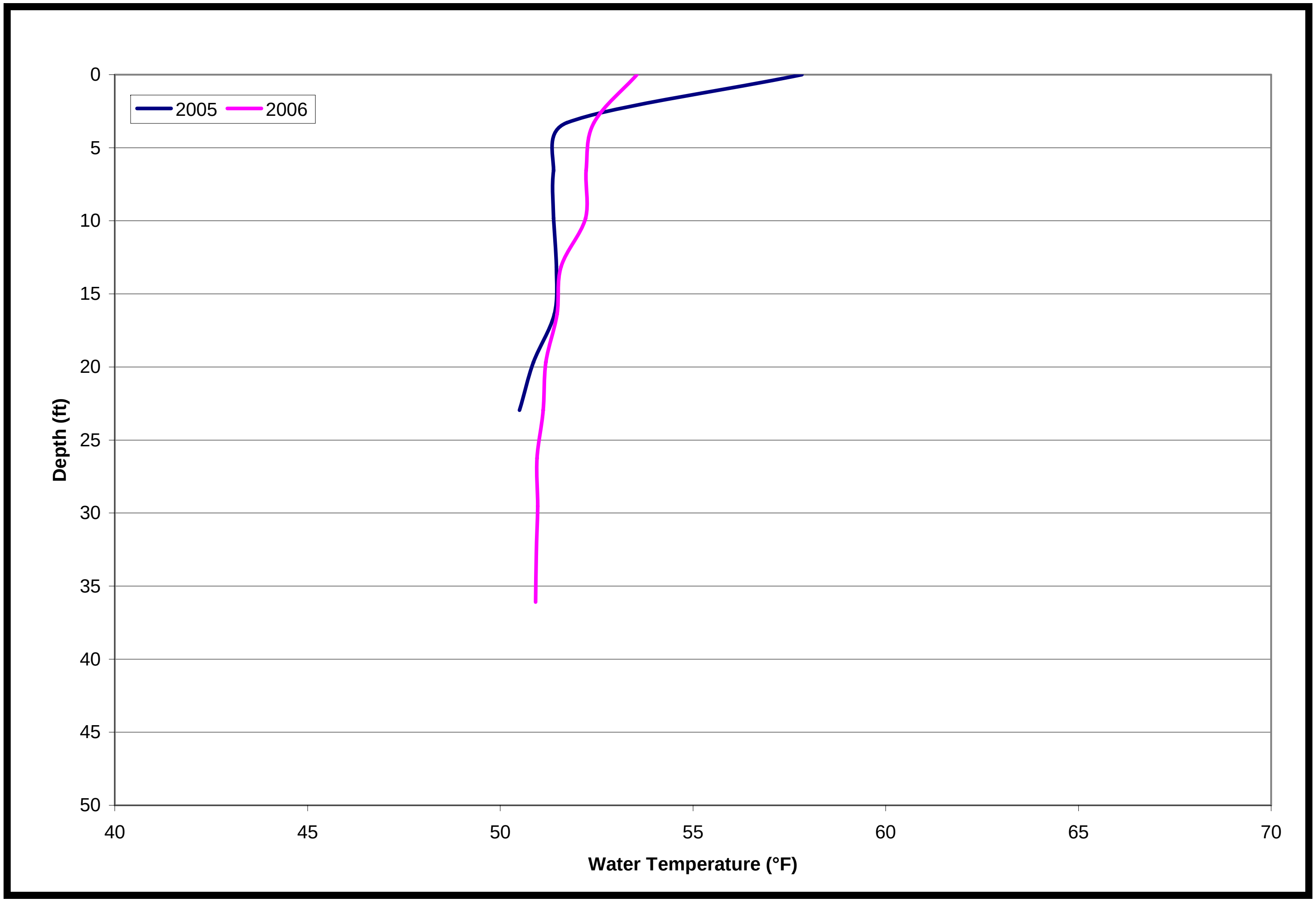

Figure 5-28. A comparison of the water temperature profiles from Ralston Afterbay Reservoir on October 25, 2005 and October 1, 2006.

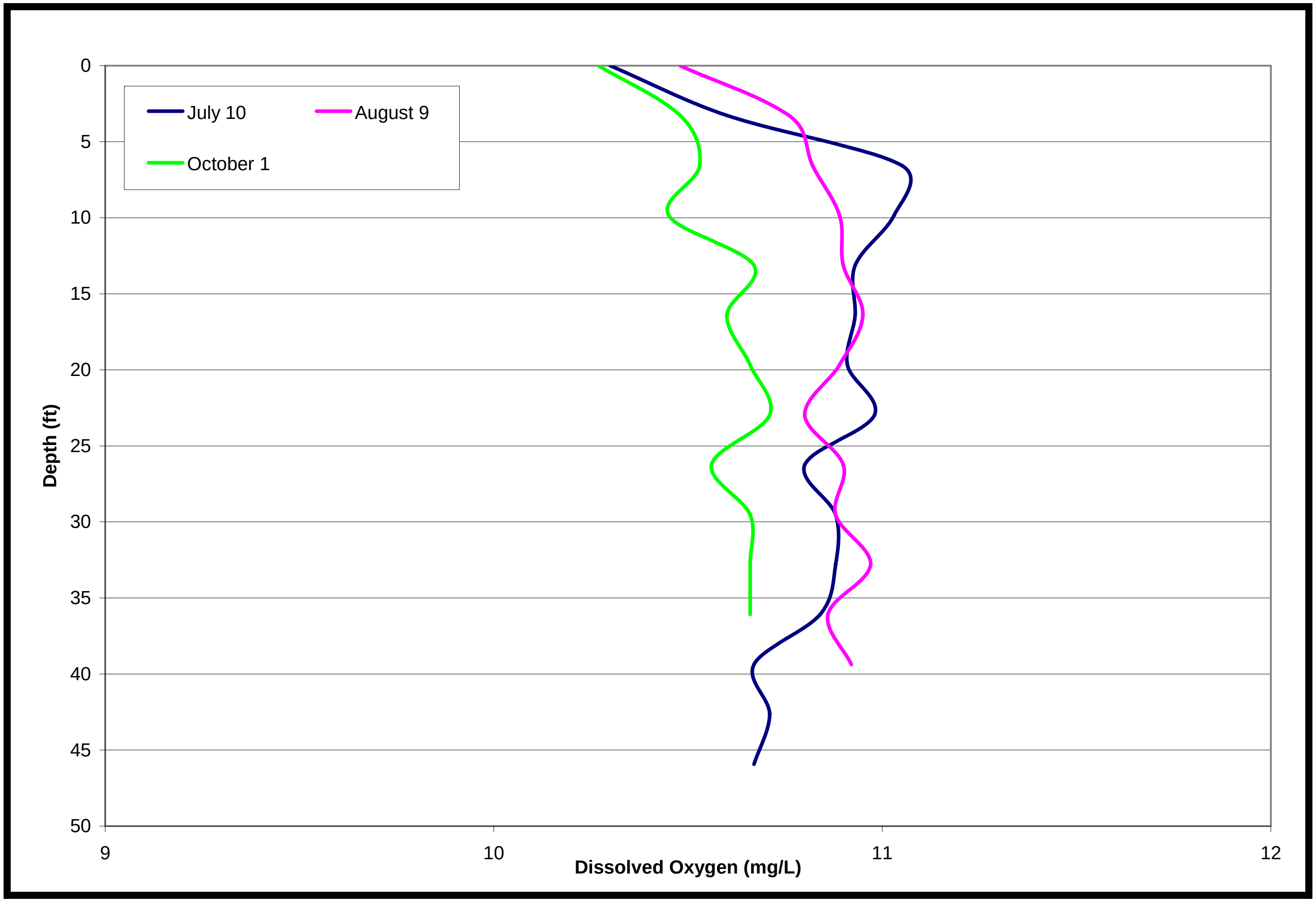

Figure 5-29. The dissolved oxygen profiles in Ralston Afterbay Reservoir on July 10, August 9, and October 1, 2006.

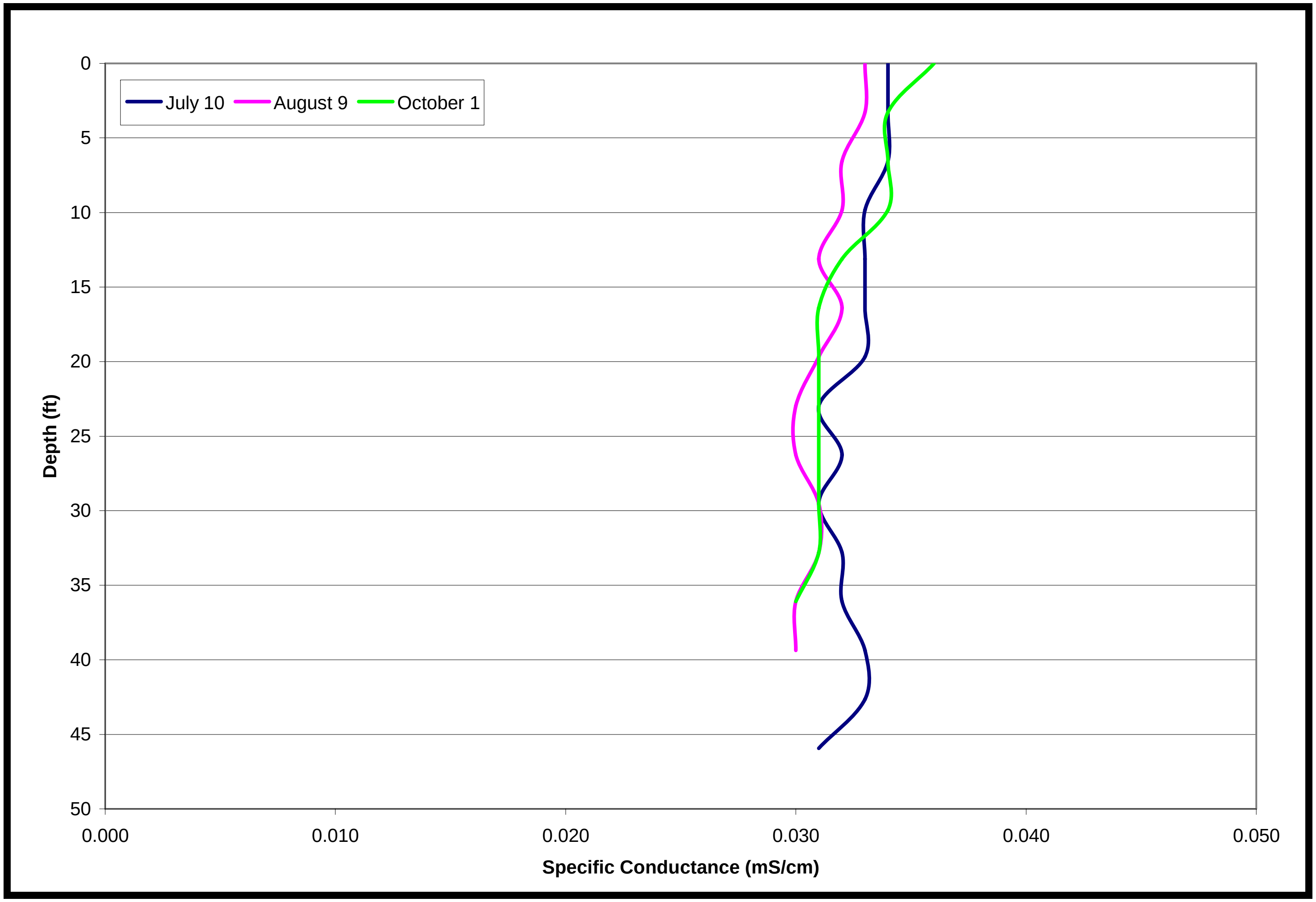

Figure 5-30. The specific conductance profiles in Ralston Afterbay Reservoir on July 10, August 9, and October 1, 2006.

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