

WATER TEMPERATURE MONITORING STATION INSTALLATION PCWA MIDDLE FORK PROJECT

ADDENDUM



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**WATER TEMPERATURE
MONITORING STATION INSTALLATION
PCWA MIDDLE FORK PROJECT
FERC NO. 2079**

Addendum

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1.0 INTRODUCTION

1.1 BACKGROUND

The initial phase of the Placer County Water Agency (Agency) Middle Fork Project (MFP) water temperature monitoring program was implemented in Fall 2003 and is detailed in the report titled *“Water Temperature Monitoring Station Installation, PCWA Middle Fork Project, Draft Report, December 2003”* (PCWA 2003a). The initial program consisted of the installation of *Onset 32K StowAway Tidbit™* water temperature loggers at 22 strategically located sites throughout the MFP area. The principal objective of the MFP water temperature monitoring program is to consistently record instream water temperature at operationally and biologically important locations within the MFP area, thereby augmenting the present water temperature database. When combined with instream flow data (currently being monitored at several operationally significant locations in the MFP area), the continuous data sets will serve as explanatory parameters for the evaluation of biological and ecological functional relationships that can be utilized during the MFP relicensing process. Additionally, these data sets will assist in the identification of potential MFP operational schedule and infrastructure modifications, as appropriate.

1.2 PURPOSE AND NEED FOR SUPPLEMENTAL MONITORING LOCATIONS

As suggested in *“Water Temperature Monitoring and Modeling Considerations, PCWA Middle Fork Project, FERC No. 2079”* (PCWA 2003b), the initial set of 22 water temperature monitoring locations may need to be augmented to accurately characterize the MFP area water temperature regime or, if desired, to develop water temperature models. Similarly, discussions among members of the MFP FERC Relicensing Team suggested augmentation of the initial monitoring effort. Project Team members concluded that installing several additional water temperature loggers during summer 2004 would be appropriate for a reconnaissance-level data collection effort. Additionally, Project Team members concluded that ambient air temperature and relative humidity loggers also should be installed to generally characterize some meteorological parameters throughout the MFP area.

1.3 PURPOSE OF THIS DOCUMENT

This document is intended to update the document titled *“Water Temperature Monitoring Station Installation, PCWA Middle Fork Project, Draft Report, December 2003”* by detailing the installation of eight additional water temperatures loggers (**Table 1-1**) and six ambient air temperature/relative humidity loggers (**Table 1-2**) throughout the MFP area (**Figure 1-1**). The specific site selection and gage placement criteria, installation considerations and equipment used followed those described in *“Water Temperature Monitoring Station Installation, PCWA Middle Fork Project, Draft Report, December 2003.”*

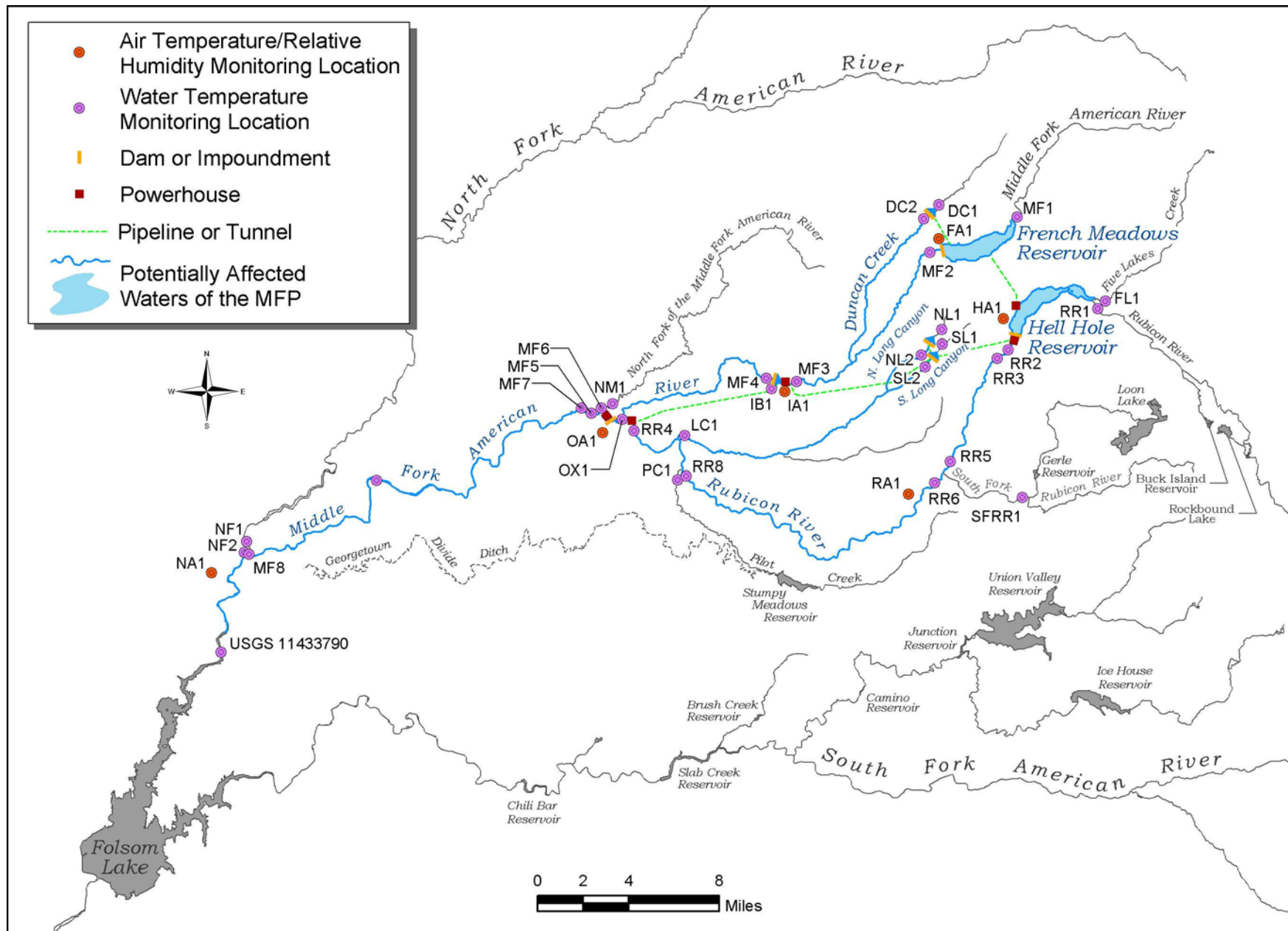


Figure 1-1. Overview of water temperature and air temperature/relative humidity monitoring locations.

Table 1-1. Water temperature monitoring locations (Bold indicates newly installed loggers).

STREAM	DESCRIPTION OF LOCATION	STATION ID	GEOGRAPHIC COORDINATES	FLOW GAGE ASSOCIATION USGS NUMBER PCWA NUMBER	DATE INSTALLED	MEASUREMENT OBJECTIVE
Middle Fork American River	Directly upstream of French Meadows Reservoir	MF1	N 39°08.105' W 120°41.530'	N/A	October 2, 2003	Continuously record water temperature in the Middle Fork American River upstream of its confluence with French Meadows Reservoir
Middle Fork American River	Directly downstream of Anderson Dam (French Meadows)	MF2	N 39°06.586' W 120°28.871'	11427500 R3	September 24, 2003	Continuously record water temperature in the Middle Fork American River downstream of French Meadows Reservoir
Middle Fork American River	Directly upstream of L.J. Stephenson Powerhouse	MF3	N 39°01.529' W 120°35.650'	11427760 R4	October 9, 2003	Continuously record water temperature in the Middle Fork American River before the influence of the water released from the Middle Fork Tunnel
Middle Fork American River	Directly downstream of L.J. Stephenson Powerhouse outlet	IB1	N 39°1.48' W 120°35.81'	N/A	August 17, 2004	Continuously record water temperature in the Middle Fork American River at the Stephenson Powerhouse outlet
Middle Fork American River	Directly downstream of Interbay Dam	MF4	N 39°01.570' W 120°36.181'	N/A	October 9, 2003	Continuously record water temperature in the Middle Fork American River downstream of Interbay Dam
Middle Fork American River	Directly downstream of Ralston Afterbay Dam	MF5	N 39°00.250' W 120°44.928'	N/A	October 9, 2003	Continuously record temperature of the water released from the bypass and/or over the dam spillway
Middle Fork American River	Directly downstream of Oxbow Powerhouse	MF6	N 39°00.380' W 120°44.834'	11433212	October 14, 2003	Continuously record temperature of the water released from the Oxbow Powerhouse
Middle Fork American River	Downstream of the North Fork of the Middle Fork American River confluence	MF7	N 38°59.998' W 120°45.203'	11433300 R11	October 15, 2003	Continuously record water temperature in the Middle Fork American River after the influence of the North Fork of the Middle Fork American River
Middle Fork American River	Directly upstream of North Fork American River confluence	MF8	N 38°54.835' W 121°02.195'	N/A	October 15, 2003	Continuously record water temperature in the Middle Fork American River before the influence of the North Fork American River
Middle Fork American River	Downstream of Ruck-a-Chucky rapids	MF9	N 38°57.82' W 120°56.33'	N/A	August 24, 2004	Continuously record water temperature in the Middle Fork American River between the North Fork American River and the North Fork of the Middle Fork American River
North Fork of the Middle Fork American River	Directly upstream of Middle Fork American River confluence	NM1	N 39°1.42' W 120°43.13'	N/A	August 16, 2004	Continuously record water temperature in the North Fork of the Middle Fork American River directly upstream of confluence with Middle Fork American River
Rubicon River	Directly upstream of Hell Hole Reservoir	RR1	N 39°04.695' W 120°20.851'	N/A	September 30, 2003	Continuously record water temperature in the Rubicon River upstream of its confluence with Hell Hole Reservoir

Table 1-1. (Cont.).

STREAM	DESCRIPTION OF LOCATION	STATION ID	GEOGRAPHIC COORDINATES	FLOW GAGE ASSOCIATION USGS NUMBER PCWA NUMBER	DATE INSTALLED	MEASUREMENT OBJECTIVE
Rubicon River	Directly downstream of Hell Hole Dam	RR2	N 39°03.299' W 120°24.539'	11428800 R6	October 14, 2003	Continuously record water temperature in the Rubicon River downstream of Hell Hole Dam
Rubicon River	Downstream of Hell Hole Dam and directly downstream of intermittent river segment	RR3	N 39°02.555' W 120°25.546'	N/A	October 14, 2003	Continuously record water temperature in the Rubicon River after the influence of subsurface streamflow
Rubicon River	Directly upstream of Ralston Powerhouse	RR4	N 39°00.060' W 120°43.230'	N/A	October 2, 2003	Continuously record water temperature in the Rubicon River after the influence of numerous tributary inflows and instream heating effects
Rubicon River	Directly downstream of Ralston Powerhouse outlet	OX1	N 39°0.07' W 120°43.52'	N/A	August 16, 2004	Continuously record water temperature in the Rubicon River directly downstream of the Ralston Powerhouse outlet
Rubicon River	Directly upstream of SF Rubicon River	RR5	N 38°58.22' W 120°28.16'	N/A	August 25, 2004	Continuously record water temperature in the Rubicon River prior to the influence of the South Fork Rubicon River
Rubicon River	Directly downstream of SF Rubicon River	RR6	N 38°58.13' W 120°28.22'	N/A	August 25, 2004	Continuously record water temperature in the Rubicon River after the influence of the South Fork Rubicon River
Rubicon River	Directly upstream of Pilot Creek	RR8	N 38°58.22' W 120°40.96'	N/A	August 18, 2004	Continuously record water temperature in the Rubicon River prior to the influence of Pilot Creek
South Fork Rubicon River ^a	Directly downstream of Gerle Creek confluence	SFRR1	N/A	SMUD	N/A	Continuously record water temperature in the South Fork Rubicon River downstream of Gerle Reservoir
North Fork American River	Directly upstream of Middle Fork American River confluence	NF1	N 38°55.323' W 121°02.316'	N/A	October 15, 2003	Continuously record water temperature in the North Fork American River before the influence of the Middle Fork American River
North Fork American River	Directly downstream of Middle Fork American River confluence	NF2	N 38°54.919' W 121°02.431'	N/A	October 15, 2003	Continuously record water temperature in the North Fork American River after the influence of the Middle Fork American River
North Fork American River	Former Auburn Dam site	N/A	N 38°51'06" W 121°03'26"	11433790	July 1999	Continuously record water temperatures in North Fork American River prior to confluence with Folsom Reservoir
Duncan Creek	Directly upstream of Duncan Creek Dam	DC1	N 39°08.419' W 120°28.753'	11427700 R1	September 24, 2003	Continuously record water temperature in Duncan Creek before the water diversion
Duncan Creek	Directly downstream of Duncan Creek Dam	DC2	N 39°07.972' W 120°29.045'	11427750 R2	September 24, 2003	Continuously record water temperature in Duncan Creek after the water diversion

Table 1-1. (Cont.).

STREAM	DESCRIPTION OF LOCATION	STATION ID	GEOGRAPHIC COORDINATES	FLOW GAGE ASSOCIATION USGS NUMBER PCWA NUMBER	DATE INSTALLED	MEASUREMENT OBJECTIVE
Long Canyon Creek	Directly Upstream of Confluence with Rubicon River	LC1	N 38°59.43' W 120°41.21'	N/A	August 24, 2004	Continuously record water temperatures Long Canyon Creek prior to confluence with the Rubicon River
North Fork Long Canyon Creek	Directly upstream of North Fork Dam	NL1	N 39°03.068' W 120°28.910'	N/A	October 2, 2003	Continuously record water temperatures in North Fork Long Canyon Creek upstream of North Fork Dam
North Fork Long Canyon Creek	Directly downstream of North Fork Dam	NL2	N 39°03.040' W 120°28.907'	11433085 R28	September 24, 2003	Continuously record water temperatures in North Fork Long Canyon Creek downstream of North Fork Dam
South Fork Long Canyon Creek	Directly upstream of South Fork Dam	SL1	N 39°03.077' W 120°28.230'	N/A	September 24, 2003	Continuously record water temperatures in South Fork Long Canyon Creek upstream of South Fork Dam
South Fork Long Canyon Creek	Directly downstream South Fork Dam	SL2	N 39°03.620' W 120°28.272'	11433065 R27	October 2, 2003	Continuously record water temperatures in South Fork Long Canyon Creek downstream of South Fork Dam
Pilot Creek	Directly upstream of Rubicon River confluence	PC1	N 38°58.241' W 120°40.996'	N/A	October 24, 2003	Continuously record water temperatures in Pilot Creek upstream of confluence with the Rubicon River
Five Lakes Creek	Directly upstream of Hell Hole Reservoir	FL1	N 39°04.680' W 120°20.540'	N/A	September 30, 2003	Continuously record water temperature in Five Lakes Creek upstream of its confluence with Hell Hole Reservoir
^a South Fork Rubicon River water temperature monitoring station maintained by SMUD Geographic coordinates of the eight newly installed water temperature loggers (bold) are approximate						

Table 1-2. Air temperature/relative humidity monitoring locations.

BASIN	DESCRIPTION OF LOCATION	STATION ID	GEOGRAPHIC COORDINATES	DATE INSTALLED	MEASUREMENT OBJECTIVE
North Fork American River	Auburn State Recreation Headquarters, El Dorado St., Auburn CA	NA1	N/A	August 31, 2004	Continuously record air temperature and relative humidity at the downstream extent water temperature data collection
Middle Fork American River	Oxbow Dam	OA1	N 39°0.22' W 120°44.83'	August 16, 2004	Continuously record air temperature and relative humidity in the Middle Fork American River basin downstream of Rubicon River confluence
Middle Fork American River	Stephenson Powerhouse	IA1	N 39°1.47' W 120°35.78'	August 17, 2004	Continuously record air temperature and relative humidity in the Middle Fork American River basin
Middle Fork American River	Anderson Dam, French Meadows Reservoir	FA1	N 39°6.94' W 120°28.50'	August 17, 2004	Continuously record air temperature and relative humidity in the Middle Fork American River basin at French Meadows Reservoir
Rubicon River	PCWA Hell Hole Dormitory	HA1	N/A	August 17, 2004	Continuously record air temperature and relative humidity in the Rubicon River basin near Hell Hole Reservoir
Rubicon River	South side of Ellicott Bridge, Rubicon River	RA1	N 38°57.61' W 120°28.96'	August 25, 2004	Continuously record air temperature and relative humidity in the Rubicon River between Hell Hole Dam and confluence with Middle Fork American River
Geographic coordinates of the air temperature/relative humidity loggers are approximate					

2.0 MONITORING STATION SITE ACCOUNTS

The following describes the location and a general description of each of the eight water temperature monitoring stations and six air temperature/relative humidity monitoring stations installed from August 16 through August 25, 2004. Descriptions of access to most of the water temperature monitoring sites are intentionally brief, as project area familiarity is assumed. Greater detail is given for those sites that are not generally visited by MFP personnel during normal project operations.

2.1 WATER TEMPERATURE MONITORING LOCATIONS

2.1.1 Middle Fork American River Downstream of Stephenson Powerhouse Outlet

Basin:	Middle Fork American River
Station ID:	IB1
Location:	Downstream outlet wall
GPS Coordinates:	~N 39°1.48' W 120°35.81'
Habitat Type:	Outlet Pool
Date Installed:	August 17, 2004

A water temperature logger was installed on the downstream outlet wall at Stephenson Powerhouse (Middle Fork Powerhouse) on August 17, 2004. The logger is located in a large, turbulent (when the powerhouse is operating) pool (**Photograph 1**) that mixes Middle Fork American River streamflow and powerhouse discharge. The logger can be accessed *via* a short walk from the road leading to the powerhouse facilities.



Photograph 1. Middle Fork American River at Stephenson Powerhouse outlet (IB1).

2.1.2 Middle Fork American River Downstream of Ruck-a-Chucky Rapids

Basin: Middle Fork American River
Station ID: MF9
Location: Approximately 1.0 mile downstream of Ruck-a-Chucky Rapids
GPS Coordinates: ~N 38°57.82' W 120°56.33'
Habitat Type: Run
Date Installed: August 24, 2004

A water temperature logger was installed in the Middle Fork American River downstream of Ruck-a-Chucky Rapids on August 24, 2004. The logger is mounted to a large boulder located on river right in a run and is facing downstream (**Photograph 2**). There are numerous bedrock outcroppings in the river downstream of the logger, and a large pool is upstream. The site is accessed *via* Drivers Flat Road off of Foresthill Road. The logger is located approximately one mile downstream of Ruck-a-Chucky Rapids and approximately 1/8 mile downstream of the first campsite along the river accessed by Drivers Flat Road.



Photograph 2. Middle Fork American River downstream of Ruck-a-Chucky rapids (MF9).

2.1.3 North Fork of the Middle Fork American River

Basin: North Fork of the Middle Fork American River
Station ID: NM1
Location: Approximately 2.5 miles upstream of Middle Fork American River
GPS Coordinates: ~N 39°1.42' W 120°43.13'
Habitat Type: Run
Date Installed: August 16, 2004

A water temperature logger was installed in the North Fork of the Middle Fork American River on August 16, 2004. The logger was anchored to a bedrock outcrop on river right (**Photograph 3**), approximately 400 meters upstream of the North Fork of the Middle Fork Bridge. The logger

is located in a run and is facing downstream. The site is accessed by parking on the west side of the bridge off of Mosquito Ridge Road and hiking a short dirt road (behind a locked gate) to the river.

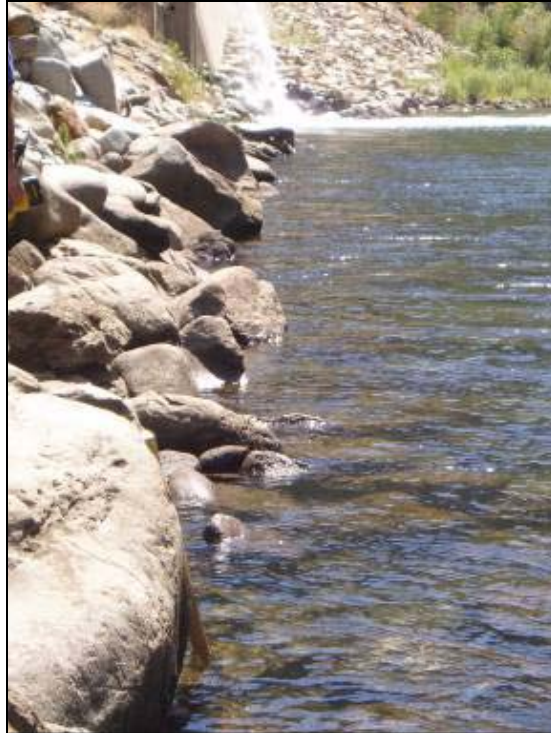


Photograph 3. North Fork of Middle Fork American River (NM1).

2.1.4 Rubicon River Downstream of Ralston Powerhouse Outlet

Basin:	Rubicon River
Station ID:	OX1
Location:	Approximately 100 meters downstream of Ralston Powerhouse outlet
GPS Coordinates:	~N 39°0.07' W 120°43.52'
Habitat Type:	Run
Date Installed:	August 16, 2004

A water temperature logger was installed in the Rubicon River downstream of the Ralston Powerhouse outlet on August 16, 2004. The logger is anchored to a large boulder located on the right side of the river in a run approximately 100 meters downstream of the powerhouse outlet (**Photograph 4**). The site is accessed *via* a scramble down the bank off of Ralston Ridge Road approximately 100 meters west (downstream) of the powerhouse.



Photograph 4. Rubicon River downstream of Ralston Powerhouse outlet (OX1).

2.1.5 Rubicon River Upstream of South Fork Rubicon River

Basin:	Rubicon River
Station ID:	RR5
Location:	Directly upstream of South Fork Rubicon River confluence
GPS Coordinates:	~N 38°58.22' W 120°28.16'
Habitat Type:	Pool
Date Installed:	August 25, 2004

A water temperature logger was installed in the Rubicon River approximately 200 meters upstream of the South Fork Rubicon River confluence on August 25, 2004. The logger is anchored, facing upstream, to a bedrock outcrop on river left, just downstream from a sheer bedrock wall that borders the left side of the river (**Photograph 5**). The logger is located near the tailout of the first major pool upstream of the South Fork Rubicon River confluence. The RR5 and RR6 sites are accessed *via* Eleven Pines Road south off of Ralston Ridge Road. Just south of Ellicott Bridge, a spur road going east leads to a parking area with several unimproved campsites. A decent, but unimproved trail heads northeast along, but approximately 200 feet above, the Rubicon River. Follow this trail approximately 1.6 miles until it reaches the South Fork Rubicon River. Upon reaching the South Fork Rubicon River, scramble downstream to the Rubicon River.



Photograph 5. Rubicon River upstream of South Fork Rubicon River confluence (RR5).

2.1.6 Rubicon River Downstream of South Fork Rubicon River

Basin:	Rubicon River
Station ID:	RR6
Location:	Directly downstream of South Fork Rubicon River confluence
GPS Coordinates:	~N 38°58.13' W 120°28.22'
Habitat Type:	Step run
Date Installed:	August 25, 2004

A water temperature logger was installed in the Rubicon River approximately 60 meters downstream of the South Fork Rubicon River confluence on August 25, 2004. The logger is anchored to a medium-large boulder sitting towards the left side of the channel (**Photograph 6**). The logger is facing downstream. Several larger boulders sit in the river in the surrounding area. The stream habitat in the area of the logger is steep with several small cascades and a short box canyon downstream. Access to the site is the same as for RR5 (above).



Photograph 6. Rubicon River downstream of South Fork Rubicon River confluence (RR6).

2.1.7 Rubicon River Upstream of Pilot Creek

Basin:	Rubicon River
Station ID:	RR8
Location:	Approximately 200 meters upstream of Pilot Creek confluence
GPS Coordinates:	~N 38°58.22' W 120°40.96'
Habitat Type:	Pool
Date Installed:	August 18, 2004

A water temperature logger was installed in the Rubicon River upstream of the Pilot Creek confluence on August 18, 2004. The logger is located river right, approximately 200 meters upstream of the Pilot Creek confluence. The logger is installed to a bedrock outcropping near the head of the first large pool upstream of Pilot Creek and is facing upstream (**Photograph 7**). Access to this site is the same as to Pilot Creek (see PCWA 2003a), followed by a short walk up the Rubicon River.



Photograph 7. Rubicon River upstream of Pilot Creek confluence (RR8).

2.1.8 Long Canyon Creek Upstream of Rubicon River

Basin:	Rubicon River
Station ID:	LC1
Location:	Approximately 80 meters upstream of Rubicon River
GPS Coordinates:	~N 38°59.43' W 120°41.21'
Habitat Type:	Pool tail
Date Installed:	August 24, 2004

A water temperature logger was installed in Long Canyon Creek approximately 80 meters upstream of the confluence with the Rubicon River on August 24, 2004. The logger is located on river right, in the tailout of a pool, downstream of a small cascade. The logger is mounted to a small bedrock outcropping facing slightly upstream and towards the opposite bank (**Photograph 8**). Access to the site is *via* Ralston Ridge Road. A spur road off of Ralston Ridge towards Pennsylvania Point/Squaw Flat/Buckeye Flat terminates close to the Rubicon-Long Canyon confluence. An approximately ½ mile walk upstream along the Rubicon River bank (no trail) leads to Long Canyon Creek.



Photograph 8. Long Canyon Creek (LC1).

2.2 AIR TEMPERATURE AND RELATIVE HUMIDITY MONITORING LOCATIONS

2.2.1 North Fork American River

Basin: North Fork American River
Station ID: NA1
Location: State Parks Headquarters, North Fork American River, Auburn, CA
GPS Coordinates:
Date Installed: August 31, 2004

An air temperature/relative humidity logger was installed at the California State Parks Headquarters (near Auburn) in the North Fork American River canyon on August 31, 2004.

2.2.2 Middle Fork American River at Oxbow Dam

Basin: Middle Fork American River
Station ID: OA1
Location: Middle Fork American River Oxbow Dam
GPS Coordinates: ~N 39°0.22' W 120°44.83'
Date Installed: August 16, 2004

An air temperature/relative humidity logger was installed at Oxbow Dam on the Middle Fork American River on August 16, 2004. The logger unit is attached to a building on the dam near the north end of the dam (**Photograph 9**) behind a locked gate. Access to Oxbow Reservoir is via Mosquito Ridge Road to Ralston Ridge Road.



Photograph 9. Air temperature/relative humidity logger at Oxbow Dam (OA1).

2.2.3 Middle Fork American River at Stephenson Powerhouse

Basin:	Middle Fork American River
Station ID:	IB1
Location:	Next to Stephenson Powerhouse penstock
GPS Coordinates:	~N 39°1.47' W 120°35.78'
Date Installed:	August 17, 2004

An air temperature/relative humidity logger was installed at the Stephenson Powerhouse on the Middle Fork American River on August 17, 2004. The logger is attached to an electric pole next to the powerhouse penstock (**Photograph 10**). The logger is located behind a locked gate. Stephenson Powerhouse is accessed *via* Mosquito Ridge Road.



Photograph 10. Air temperature/relative humidity logger at Stephenson Powerhouse (IA1).

2.2.4 French Meadows Reservoir at Anderson Dam

Basin:	Middle Fork American River
Station ID:	FA1
Location:	North end of Anderson Dam (French Meadows Reservoir)
GPS Coordinates:	~N 39°6.94' W 120°28.50'
Date Installed:	August 17, 2004

An air temperature/relative humidity logger was installed at the north end of Anderson Dam (French Meadows Reservoir) on the Middle Fork American River on August 17, 2004. The logger unit is attached to an electric pole inside of a PCWA gated area (**Photograph 11**). Anderson Dam is accessed *via* Mosquito Ridge Road approximately 39 miles from Foresthill.



Photograph 11. Air temperature/relative humidity logger at French Meadows Reservoir (FA1).

2.2.5 Hell Hole Reservoir at PCWA Dormitory

Basin: Middle Fork American River
Station ID: HA1
Location: Below front stairs at Hell Hole Dormitory
GPS Coordinates:
Date Installed: August 17, 2004

An air temperature/relative humidity logger was installed at the Hell Hole Dormitory near Hell Hole Reservoir on August 17, 2004. The logger is mounted to a beam supporting the dormitory's front deck (**Photograph 12**).



Photograph 12. Air temperature/relative humidity logger at Hell Hole Reservoir Dormitory (HA1).

2.2.6 Rubicon River at Ellicott Bridge

Basin:	Middle Fork American River
Station ID:	RA1
Location:	South side of Ellicott Bridge, Rubicon River
GPS Coordinates:	~N 38°57.61' W 120°28.96'
Date Installed:	August 25, 2004

An air temperature/relative humidity logger was installed near the Rubicon River at Ellicott Bridge on August 25, 2004. The logger unit was installed in a large oak tree approximately 12 feet off of the ground (**Photograph 13**). A ladder is required to access the unit. The tree is located on the south end of Ellicott Bridge near a pull out on the west side (downstream) of the Eleven Pines Road.



Photograph 13. Air temperature/relative humidity logger at Ellicott Bridge, Rubicon River (RA1).

3.0 REFERENCES

Placer County Water Agency (PCWA). 2003a. Water Temperature Monitoring Station Installation, PCWA Middle Fork Project, Draft Report, December 2003. Prepared by Surface Water Resources, Inc. (SWRI).

PCWA. 2003b. Water Temperature Monitoring and Modeling Considerations, PCWA Middle Fork Project, FERC No. 2079, October 2003. Prepared by Surface Water Resources, Inc. (SWRI).