Attachment D4

PCWA Alternative Condition No. 28 – Monitoring Program
Benthic Macroinvertebrate Monitoring Plan

Placer County Water Agency
Middle Fork American River Project
(FERC Project No. 2079)

BENTHIC MACROINVERTEBRATE MONITORING PLAN

Placer County Water Agency
P.O. Box 6570
Auburn, CA 95604

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TABLE OF CONTENTS

Page

1.0 Introduction 1
2.0 BMIMP Organizaton 1
3.0 BMIMP Objective 1
4.0 Monitoring Approach 1
4.1 Monitoring Locations and Schedule 1
4.2 Monitoring Methods 2
4.2.1 Benthic Macroinvertebrate Sampling 2
4.2.2 Physical Conditions Characterization 2
4.2.3 Benthic Macroinvertebrate Sampling Processing 3
4.3 Analysis Methods 3
4.3.1 Benthic Macroinvertebrate Metrics 3
4.4 Electronic Databases 3
5.0 Reporting and Consultation 3
6.0 Literature Cited 4

List of Tables

BMIMP Table 1. Benthic Macroinvertebrate Monitoring Locations.

List of Maps

BMIMP Map 1. Benthic Macroinvertebrate Monitoring Locations.

List of Acronyms

BMI	benthic macroinvertebrates
BMIMP	Benthic Macroinvertebrate Monitoring Plan
CDFG	California Department of Fish and Game
FERC	Federal Energy Regulatory Commission
MFP	Middle Fork American River Project
PCWA	Placer County Water Agency
Project	Middle Fork American River Project
RWB	reachwide benthos
SAFIT	Southwest Association of Freshwater Invertebrate Taxonomists
SD	Supporting Document
State Water Board	State Water Resources Control Board
SWAMP	Surface Water Ambient Monitoring Program
TRC	targeted riffle composite
TSR	Technical Study Report
USDA-FS	United States Department of Agriculture-Forest Service
USGS	United States Geological Survey

1.0 INTRODUCTION

This Benthic Macroinvertebrate Monitoring Plan (BMIMP) was developed for the Placer County Water Agency's (PCWA) Middle Fork American River Project (MFP or Project) located on the west slope of the Sierra Nevada range primarily in Placer County, California.

The goal of the BMIMP is to periodically characterize benthic macroinvertebrates (BMI) at select sites in the bypass and peaking reaches associated with the MFP over the term of the new license. This information will be presented along with historical BMI data collected during the MFP relicensing (AQ 3 – Macroinvertebrate and Aquatic Mollusk Technical Study Report – 2008 [AQ 3 – TSR]; Supporting Document [SD] B) (PCWA 2011a; SD B).

2.0 BMIMP ORGANIZATON

The BMIMP is organized into the following sections:

Section 3.0 BMIMP Objective: This section defines the purpose of the BMIMP.

Section 4.0 Monitoring Approach: This section describes the approach for monitoring of BMIs over the term of the new license, including monitoring locations and schedule, and sampling and analyses methods.

Section 5.0 Reporting and Consultation: This section outlines reporting that will be required over the term of the new license and describes agency consultation that would be conducted following the completion of each monitoring period.

Section 6.0 Literature Cited: This section provides a list of documents or other resources that are referenced in the BMIMP.

3.0 BMIMP OBJECTIVE

The objective of the BMIMP is to monitor BMIs at select sites in the bypass and peaking reaches associated with the MFP over the term of the license.

4.0 MONITORING APPROACH

This section describes the approach for BMI monitoring, including monitoring locations and schedule, sampling methods, and analytical methods.

4.1 MONITORING LOCATIONS AND SCHEDULE

Benthic macroinvertebrate monitoring in the bypass and peaking reaches will be conducted at locations that were sampled in 2007 as part of relicensing studies completed for the MFP (AQ 3 – TSR) (PCWA 2011a; SD B). The specific macroinvertebrate monitoring locations are listed in BMIMP Table 1 and are depicted on BMIMP Map 1.

Benthic macroinvertebrate monitoring will be conducted following license issuance at each of the monitoring sites in years 2, 3, 7, 8, 13, 14, and thereafter for two consecutive years during every ten-year period for the term of the license (BMIMP Table 1). This schedule is consistent with the other aquatic monitoring plans, including fish populations, water temperature, foothill yellow-legged frogs, and geomorphology/riparian.

4.2 MONITORING METHODS

The methods for the BMI field sampling, physical conditions characterization, and sample processing are described below.

4.2.1 Benthic Macroinvertebrate Sampling

At the monitoring sites, benthic samples will be collected following the Surface Water Ambient Monitoring Program (SWAMP)[1] (Ode 2007) protocols. The sampling will be conducted during the late summer/early fall base flow period of each monitoring period (BMIMP Table 1). SWAMP sampling methods and field data forms will be consistent with those used during the 2007 relicensing studies (AQ 3 – TSR) (PCWA 2011a; SD B). Sampling will be coordinated with the late summer/early fall fish population monitoring (PCWA 2011b).

SWAMP includes two BMI sampling methods: (1) targeted riffle composite (TRC); and (2) reachwide benthos (RWB). The TRC sample consists of a composite of eight sub-samples randomly selected from the riffle habitats within the study site. The RWB sampling does not target any specific type of mesohabitat. RWB samples collected from each sampling site are a composite of 11 sub-samples, each taken from one of 11 equally spaced transects. The transects are spaced 15 meters apart, or 25 meters if the wetted width of the channel is greater than 10 meters wide. Sub-sampling alternates between left-center, center, and right-center locations on each sequential transect. Physical habitat measurements (e.g., length, width, and depth of area sampled; water temperature; and specific conductance) will also be collected at the transects.

4.2.2 Physical Conditions Characterization

Routine observations will be made of habitat and physical conditions at the monitoring sites. These observations will include physical measurements of water temperature and specific conductance. Length, width, and depth of the area sampled will also be recorded. Mesohabitat type data consistent with those used during the 2007 relicensing studies (AQ 3 – TSR) (PCWA 2011a; SD B) will be collected at the monitoring sites. Photographs illustrating the site characteristics will be collected during the field sampling.

[1] The survey protocol will only be modified through mutual agreement between PCWA, CDFG, State Water Board, and USDA-FS.

4.2.3 Benthic Macroinvertebrate Sampling Processing

The SWAMP samples will be processed at a reputable laboratory. At the laboratory, the samples will be processed following the same protocols as those used for the 2007 study (PCWA 2011a)[2]. The BMI taxonomy will be processed to the Southwest Association of Freshwater Invertebrate Taxonomists (SAFIT) taxonomic level 2 (Richards and Rogers 2006). Generally this is a genus-species level of taxonomic identification. The samples will be processed following SWAMP protocols and the samples will be prepared following the methods recommended by the United States Geological Survey (USGS) (Cuffney et al. 1993) and described in Vinson and Hawkins (1996).

4.3 ANALYSIS METHODS

4.3.1 Benthic Macroinvertebrate Metrics

Data will be provided for 300 and 500 organism count sub-samples, and will include species abundances and BMI metrics for each sampling site. A number of metrics can be calculated to describe the BMI community at a sampling site. The metrics that will be calculated for the BMI monitoring will be consistent of those calculated for the 2007 study (PCWA 2011a; SD B), and will include the hydropower metrics outlined in Rehn (2009). Additional information on each of these metrics is summarized in PCWA (2011a; SD B) and Rehn (2009).

The results will be presented along with those from previous sampling periods and compared between monitoring sites.

4.4 ELECTRONIC DATABASES

All macroinvertebrate sampling data (date, locations, species, abundance, etc.) will be entered and stored in electronic databases (Excel spreadsheet or similar). The databases will be provided to resources agencies upon request. Copies of the SWAMP datasheets will also be provided to resource agencies upon request.

5.0 REPORTING AND CONSULTATION

A Benthic Macroinvertebrate Monitoring Report will be prepared by PCWA and distributed to the United States Department of Agriculture – Forest Service (USDA-FS), State Water Resources Control Board (State Water Board), and California Department of Fish and Game (CDFG) for review and comment within 120 days following the completion of each monitoring year. The reports, where appropriate, will follow the general presentation layout for BMI sampling data provided in the AQ 3 – TSR (PCWA 2011a; SD B). A 60-day review period will be provided to the agencies. Based on the results of the monitoring and/or comments received during the review process, PCWA and the agencies may call a meeting to discuss the results or modify the monitoring

[2] The sampling processing methods will only be modified through mutual agreement between PCWA, CDFG, State Water Board, and USDA-FS.

program. Within 60 days of receipt of comments, or 60 days following any meeting, comments will be addressed and the final report will be filed by PCWA with the agencies (USDA-FS, State Water Board, and CDFG) and the Federal Energy Regulatory Commission (FERC).

6.0 LITERATURE CITED

Cuffney, T.F., Gurtz, M.E. and Meador, M.R. 1993. Methods for collecting benthic invertebrate samples as part of the National Water-Quality Assessment Program. United States Geological Survey Open-File Report 93-406 and Moulton, S.R. II, J.L. Carter, S.A. Grotheer, T.F. Cuffney and T.M. Short. 2000. Methods of analysis by the U.S. Geological Survey National Water Quality Laboratory - processing, taxonomy, and quality control of benthic macroinvertebrate samples. United States Geological Survey Open-File Report 00-212

Ode, P.R. 2007. Standard operating procedures for collecting macroinvertebrate samples and associated physical and chemical data for ambient bioassessments in California. California State Water Resources Control Board Surface Water Ambient Monitoring Program (SWAMP) Bioassessment SOP 001.

Placer County Water Agency (PCWA). 2011a. AQ 3 – Macroinvertebrate and Aquatic Mollusk Technical Study Report - 2007. Available in PCWA's Application for New License – Supporting Document B.

____. 2011b. Fish Population Monitoring Plan. Available in PCWA's Application for New License – Supporting Document A.

Rehn, A.C. 2009. Benthic macroinvertebrates as indicators of biological condition below hydropower dams on west slope Sierra Nevada streams, California, USA. River Research and Applications. 25(2):208-228..

Richards, A. B. and D. C. Rogers. 2006. List of Freshwater Macroinvertebrate Taxa from California and Adjacent States including Standard Taxonomic Effort Levels. Southwest Association of Freshwater Invertebrate Taxonomists (SAFIT). 215 pp.

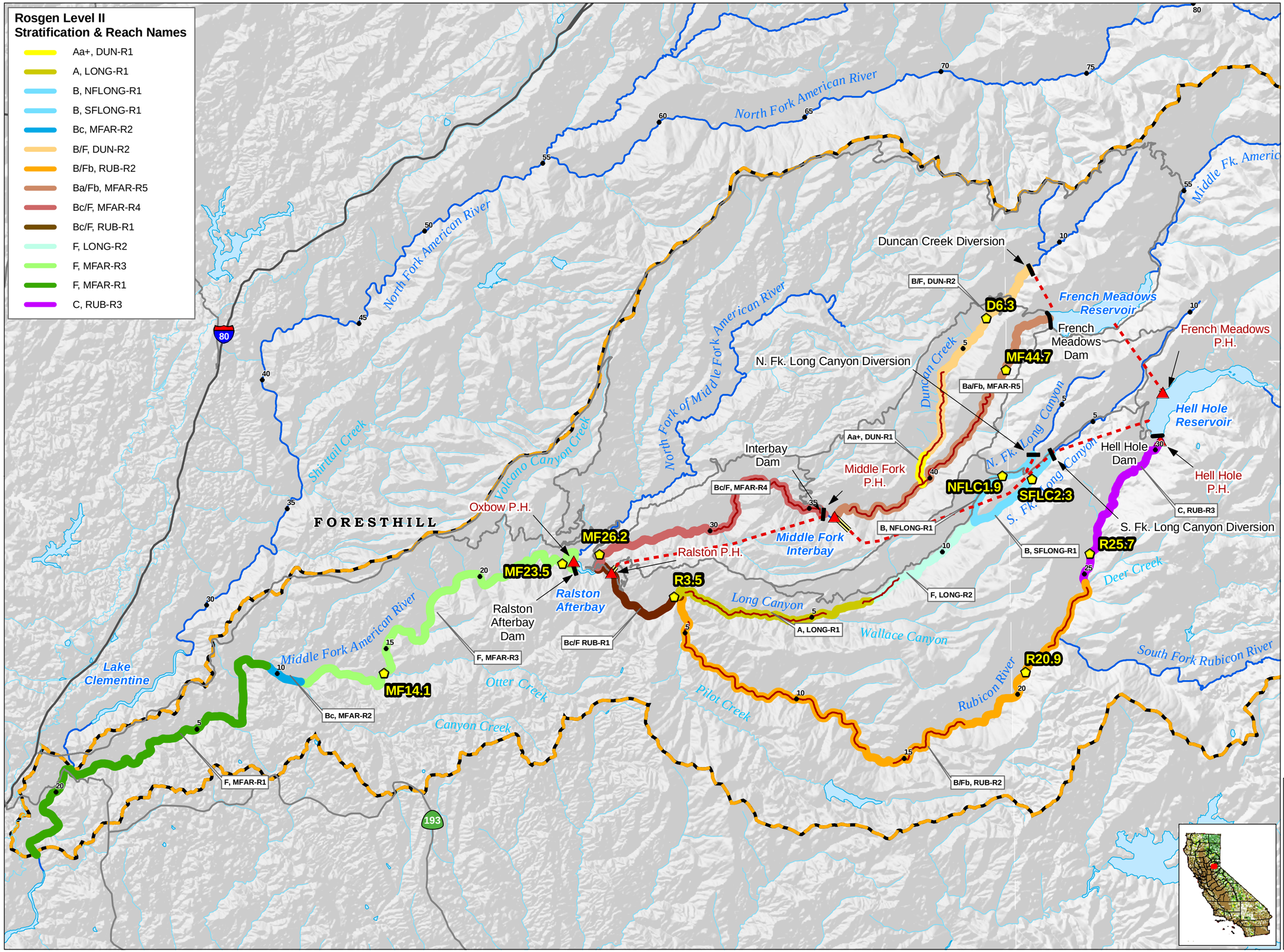
Vinson, M.R. and C.P. Hawkins 1996. Effects of sampling area and subsampling procedure on comparisons of taxa richness among streams. The Journal of the North American Benthological Society. 15:393-400.

TABLES

BMIMP Table 1. Benthic Macroinvertebrate Monitoring Locations.

Study Location Description	Monitoring Sites	Reach Type	
		Peaking Reach	Bypass Reach
Middle Fork American River Downstream of Ralston Afterbay			
Middle Fork American River from Volcano Canyon Creek confluence to Canyon Creek confluence	MF14.1	●	
Middle Fork American River from Ralston Afterbay to Volcano Canyon Creek confluence	MF23.5	●	
Middle Fork American River from Middle Fork Interbay to Ralston Afterbay			
Middle Fork American River from Middle Fork Interbay to Ralston Afterbay	MF26.2		●
Middle Fork American River Upstream of Middle Fork Interbay			
Middle Fork American River from French Meadows to confluence with Duncan Creek	MF44.7		●
Rubicon River			
Rubicon River from Long Canyon Creek confluence to Ralston Afterbay	R3.5		●
Rubicon River from Deer Creek to Long Canyon Creek confluence	R20.9		●
Rubicon River from Hell Hole Reservoir to Deer Creek	R25.7		●
South Fork Long Canyon Creek			
South Fork Long Canyon Creek from Diversion to confluence with Long Canyon Creek	SFLC2.3		●
North Fork Long Canyon Creek			
North Fork Long Canyon Creek from Diversion to confluence with Long Canyon Creek	NFLC1.9		●
Duncan Creek			
Duncan Creek from Diversion to confluence with Middle Fork American River	D6.3		●

MAPS



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