BIO-4 BENTHIC MACROINVERTEBRATE STUDY PLAN

KERN RIVER NO. 3 HYDROELECTRIC PROJECT
FERC PROJECT NO. 2290

PREPARED FOR:

SOUTHERN CALIFORNIA EDISON®

Energy for What's Ahead®

KERNVILLE, CALIFORNIA

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1.0 POTENTIAL RESOURCE ISSUE

- Kern River No. 3 (KR3) Hydroelectric Project (Project) operations alter flow in the Fairview Dam Bypass Reach (the 16-mile bypass reach of the North Fork Kern River [NFKR] between Fairview Dam and the KR3 Powerhouse tailrace) and have the potential to alter water quality, which may influence benthic macroinvertebrate (BMI) populations.

2.0 PROJECT NEXUS AND HOW THE RESULTS WILL BE USED

- Project diversions influence flow in the bypass reach and have the potential to influence water quality and BMI populations.
- BMI study results will supplement existing BMI data from within the Project Area to further characterize BMI populations within the Fairview Dam Bypass Reach.
- BMI is an indicator that can be used to evaluate water quality habitat for trout and wildlife along the NFKR within the Project Vicinity.

3.0 STUDY GOALS AND OBJECTIVES

- Conduct an inventory and assessment of BMI diversity and abundance in the bypass reach using an aquatic ecosystem health index.

4.0 STUDY AREA AND STUDY SITES

BMI samples will be collected at the following locations within the NFKR:

- Upstream of Fairview Dam (control site)
- Downstream of Gold Ledge Campground
- Immediately upstream of KR3 Powerhouse

The control site upstream of Fairview Dam will be used to characterize nearby BMI assemblages outside of Project influence.

5.0 EXISTING INFORMATION

There are no available data regarding BMI communities within the Fairview Dam Bypass Reach; however, historical data within a few miles of the Project were identified in the Pre-Application Document (SCE, 2021; Section 5.3.5, *Benthic Macroinvertebrates*) and could be utilized for reference. These data include BMI samples collected at a site on the NFKR 0.5 mile upstream of Johnsondale Bridge, a site on Salmon Creek approximately 5.5 miles upstream of the Federal Energy Regulatory Commission (FERC) Project Boundary, and three sites on the South Fork Kern River upstream of Isabella Lake (State Water Board, 2020a). Additional BMI samples were collected on tributaries to the NFKR upstream of the Project (State Water Board, 2020b).

6.0 STUDY APPROACH

6.1.1. Benthic Macroinvertebrate Sampling and Physical Habitat Data Collection

Sampling will be conducted using procedures based on the standard reach-wide benthos method for documenting and describing BMI assemblages and physical habitat outlined by the Surface Water Ambient Monitoring Program (SWAMP; Ode et al., 2016). Sites will be placed as close as possible to the general locations described in Section 4.0; however, site locations may need to be adjusted slightly upstream or downstream to comply with contiguity of sampleable habitat recommendations described in the SWAMP protocol (Ode et al., 2016). To maximize wadeable habitat during surveys, sample collection will occur in the fall, when flows in the NFKR are at their lowest.

6.1.1.1. Benthic Macroinvertebrate Collection Methods

The SWAMP protocol was developed for wadeable streams, and collection procedures will be modified as necessary to accommodate stream conditions in the NFKR. Modifications may include sample collectors wearing dry suits instead of waders to increase accessibility, adjusting the standard length of sample reaches (typically based on average wetted width), and partitioning sample reaches if necessary within a site (e.g., adjusting transect placement to omit inaccessible or unsampleable habitat) due to safe accessibility limitations (e.g., swift water) and/or lack of contiguously sampleable aquatic habitat (e.g., large deep pools).

Sites will be divided into 11 equidistant transects arranged perpendicular to the direction of flow, and a single inter-transect will be located between main transects. A total of 11 (1 per main transect) BMI subsamples will be collected by rubbing cobble and boulder substrates and disturbing finer sediments upstream of a D-frame kicknet fitted with 0.02-inch-diameter (0.5 millimeter) mesh to form a single composite sample for each site. Subsamples will be taken from 1 square foot of the stream bottom with a 1-square-foot frame used for calibration, as necessary. The BMI subsample position will alternate between the left, center, and right positions along each main transect (25 percent, 50 percent, and 75 percent of wetted width, respectively). If a subsample cannot not be made at the designated point due to deep water or unsafe conditions, the point will be relocated as close as possible to the designated position. Samples will be taken moving upstream from the downstream end of the sample site in order to minimize instream disturbance.

Incidental observations of native freshwater mussels—*Gonidea angulata* and *Margaritifera falcata*—and the invasive Asian clam (*Corbicula fluminea)* will be recorded at each site. If freshwater mussels are observed, a new transect will be established at minimum 20 meters upstream.

Biologists will also note any incidental observations of other non-native invasive aquatic species (e.g., bullfrog, crayfish, and invasive fishes) and other key species of interest (e.g., aquatic reptiles and amphibians, Bald Eagle, Osprey, and Great Blue Heron) on

data sheets and will report this information in the Technical Report for use by other studies during the relicensing process.

6.1.1.2. Physical Habitat, Water Quality, and Instream Habitat Complexity Measurements

In accordance with the SWAMP protocol (Ode et al., 2016), physical habitat, water quality parameters, and instream habitat complexity and riparian cover data will also be recorded, as listed below. Physical habitat data (e.g., substrate size) from points along transects that are not safely accessible (e.g., in a rapid) will not be collected and will be noted as inaccessible on the datasheet. Physical habitat and water quality parameters that will be measured include percent gradient; discharge; average wetted width; canopy cover; dominant and subdominant habitat and substrate types; and water temperature, pH, dissolved oxygen, and specific conductivity. Instream habitat complexity will be characterized by recording the amount of filamentous algae, aquatic macrophytes, emergent vegetation, large boulders, woody debris, undercut banks, overhanging vegetation, and live tree roots.

6.1.2. LABORATORY METHODS

Laboratory methods will follow procedures outlined in the *Standard Operating Procedures for Laboratory Processing and Identification of Benthic Macroinvertebrates in California* (Woodard et al*.,* 2012). At least 600 BMIs will be subsampled from each composite sample and identified using standard aquatic BMI identification keys (e.g*.,* Merritt et al., 2008; Stewart and Stark, 2002; Thorp and Covich, 2001; Wiggins, 1996) and other appropriate references. All organisms from the subsample will be identified to a minimum Level 1 taxonomic effort as specified in the Southwestern Association of Freshwater Invertebrate Taxonomists (Richards and Rogers, 2011), and an independent laboratory will be contracted to conduct an external quality control of the BMI identification for 10 percent of the samples.

6.1.3. DATA ANALYSIS

As recommended by SWAMP, the California Stream Condition Index (CSCI; Rehn et al., 2015) and a suite of standard metrics describing richness, composition, and other characteristics that are often used to describe BMI assemblages (Karr and Chu 1999) will be calculated for each sample. The CSCI is based on predictive modeling generated from a state-wide BMI database, utilizing geographic information system (GIS) and statistical software (R Core Team, 2022) for its calculation (Rehn et al., 2015). The CSCI is used as a composite biological response variable to evaluate aquatic habitat quality at sites and identify overall trends related to stream condition as reflected by the BMI community.

The CSCI integrates two measures for evaluating sites: BMI taxonomic completeness, which is based on an observed-to-expected (O/E) ratio, and a multi-metric index (MMI). The O/E is a measure of taxonomic completeness between observed (O) taxa collected at a site and expected (E) taxa generated through predictive modeling from the input of site-specific environmental variables (e.g., climate, topography, and geology) that are

known to influence BMI communities (Rehn et al., 2015). Based on these site-specific environmental variables, the MMI component of the CSCI generates anticipated values for six metrics[1] demonstrated to have a high signal to noise response (Rehn et al., 2015) and compares results with empirical values from the BMI sample collected from a given site. As observed taxa and metric values deviate from those predicted from reference sites using the site-specific environmental variables described above, scores for each measure (i.e., MMI and O/E) decrease. Conversely, as observed taxa and metric values approach similar distributions of expected taxa and metric values from reference sites, scores for each measure increase.

CSCI calculation integrates O/E taxonomic richness and MMI results into a single score typically ranging from 0.1 (great deviation from reference condition) to 1.4 (exceeding quality of reference condition). CSCI scores are further divided into three thresholds based on the 30th, 10th, and 1st percentiles of CSCI scores at reference sites in the state-wide database. These three thresholds divide the CSCI scoring range into four categories of biological condition:

1. ≥0.92 = likely intact condition
2. 0.91 to 0.80 = possibly altered condition
3. 0.79 to 0.63 = likely altered condition
4. ≤0.62 = very likely altered condition (Rehn et al., 2015)

7.0 REPORTING

SCE will file an Initial Study Report (ISR) within 1 year following FERC's Study Plan Determination (estimated August 3, 2023) and an Updated Study Report (USR) no later than 2 years after FERC's Study Plan Determination. The ISR and USR will provide an update on SCE's overall progress in implementing the Study Plan and schedule and the data collected, including an explanation of any variance from the Study Plan and schedule. A Technical Memo will be appended to either the ISR or USR filing, as applicable. Standard GIS shapefiles, including metadata, will be provided to relevant agencies upon request. The information provided in the Technical Memo will be summarized in, and appended to, the Application for New License.

In addition, SCE may prepare interim reports during the study year to apprise Stakeholders on study implementation progress and to support consultation with Stakeholders.

[1] (1) Percent Clinger Taxa; (2) Percent Coleoptera Taxa; (3) Percent Ephemeroptera, Plecoptera, and Trichoptera (EPT) Taxa; (4) Percent Intolerant Individuals; (5) Shredder Taxa Richness; and (6) Taxonomic Richness

8.0 SCHEDULE

Date	Activity
Fall 2022	Conduct field survey
Winter 2022/2023	Analyze data and prepare Technical Memo
August 2023	Provide Technical Memo with ISR

ISR = Initial Study Report

9.0 LEVEL OF EFFORT AND COST

The estimated cost (2022 dollars) for the study is $70,000, which includes study-specific consultation, field work, data compilation and analysis, and reporting.

10.0 REFERENCES

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