ADDENDUM TO TECHNICAL MEMORANDUM 6-2

Riparian Habitat Downstream of Englebright Dam

Additional Analysis

Yuba River Development Project
FERC Project No. 2246

February 2014

Table of Contents

List of Figures

List of Tables

List of Attachments

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TECHNICAL MEMORANDUM 6-2

ADDENDUM TO RIPARIAN HABITAT DOWNSTREAM OF ENGLEBRIGHT DAM

1.0 Introduction

On September 30, 2011, the Federal Energy Regulatory Commission (FERC) issued a Study Plan Determination for the Yuba County Water Agency's (YCWA) relicensing of its Yuba River Development Project, FERC Project Number 2246 (Project). The Determination included Study 6.2, *Riparian Habitat Downstream of Englebright Dam* (Study). The study, which was modified by FERC on December 8, 2011, provided that:

> *At the conclusion of Phase 1, YCWA will prepare a report summarizing Phase 1, provide the report to Relicensing Participants, and meet with Relicensing Participants to discus the need for additional data collection. If YCWA and Relicensing Participants collaboratively agree additional data are needed, YCWA and Relicensing Participants will collaboratively develop the methods for Phase 2 (the methods may include greenline survey-type data collection), and YCWA will provide the methods to FERC for consideration.*

YCWA completed the Study and on June 23, 2013, provided to Relicensing Participants Technical Memorandum 6-2, *Riparian Habitat Downstream of Englebright Dam,* which provided the results of Study 6.2, including germination and recruitment data.

Subsequently, YCWA and Relicensing Participants collaboratively agreed that YCWA would provide an additional analysis of Study 6.2 data in an addendum to Technical Memorandum 6-2.

On January 14, 2014, YCWA filed with FERC a letter that advised FERC that YCWA and Relicensing Participants consulted on Study 6.2 and collaboratively agreed on additional analysis. Relicensing Participants agreed that the additional analysis would be provided in an addendum to Technical Memorandum 6-2, and that it adequately addresses the Relicensing Participants' need for additional information from YCWA regarding Study 6.2 seed germination and recruitment.

This addendum provides the additional analysis.[1]

[1] This addendum in no way modifies Technical Memorandum 6-2, *Riparian Habitat Downstream of Englebright Dam*, which was posted to the Relicensing Website on June 23, 2013.

2.0 Methods

The additional analysis focuses on Fremont's cottonwood (*Populus fremontii*); assumes seed dispersal for Fremont's cottonwood is from April 1 through July 15; and that the maximum stage change per day for Fremont's cottonwood seedling germination, establishment and survival is 2.5 centimeters per day (cm/day). Such a rate is faster than maximum root follow rates (1 to 1.5 cm/day), but potentially allows for capillary action to provide water to root tips. Actual maximum recession rate for viable seed germination may be much less (Stella et al. 2010).

YCWA and Relicensing Participants jointly agreed to six existing Study 6.2 reaches. For each reach, Relicensing Participants selected minimum flow criteria, which limited the analysis to days when this threshold was exceeded. Table 2.0-1 lists the reaches agreed upon, as well as the starting river mile (RM), ending RM, total length of the study reach, and minimum flow criteria.

Table 2.0-1. Study reaches for additional analysis, as well as start and end RMs, total study reach length, and minimum flow criteria.

Reach Name	Description	Start (River Mile)	End (River Mile)	Length (miles)	Minimum Flow (cfs)
Marysville	Junction with Feather River to RM 3.3	0.0	3.3	3.3	600
Hallwood	RM 3.3 to slope break near Eddie Drive at RM 8.3	3.3	8.3	5.0	600
Daguerre Point Dam	RM 8.3 to Daguerre Point Dam	8.3	11.6	3.3	600
Dry Creek	Daguerre Point Dam to Dry Creek	11.6	13.9	2.3	1,000
Parks Bar	Dry Creek to 0.35 miles upstream of Hwy 20 Bridge	13.9	18.6	4.7	1,000
Timbuctoo	Upstream of Hwy 20 Bridge to end of emergent gravel bar by Blue Point Mine	18.6	22.3	3.8	1,000

At each of these six selected study reaches, YCWA and Relicensing Participants agreed to perform an additional analysis using reach average stage-discharge relationships developed in Study 7-10 using available hydrology data and modeling as appropriate. Using Study 7-10 data, for each of the six reaches and for the period between April 1 and July 15 in each of the 41 years in the relicensing hydrology period of record (Water Year 1970 through Water Year 2010), YCWA created Microsoft™ Excel tables with the following columns of output data:

- Date
- mean daily flow (cfs) With-Project Hydrology
- daily recession rate (%) With-Project Hydrology
- mean daily stage (cm) With-Project Hydrology
- daily stage change (cm) With-Project Hydrology
- mean daily flow (cfs) Without-Project Hydrology
- daily recession rate (%) Without-Project Hydrology

- mean daily stage (cm) Without-Project Hydrology
- daily stage change (cm) Without-Project Hydrology

The With-Project and Without-Project hydrologies used to develop the tables were obtained from the relicensing Water Balance/Operations Model (Study 2.2). YCWA highlighted table cells with a stage change of 2.5 cm or less, with additional highlights indicating 21 consecutive days of 2.5 cm or less. In addition, YCWA created 'spaghetti hydrographs' using stage in cm by water year type for With- and Without-Project hydrologies, and by five water year types (i.e., 10 charts per transect), for consecutive days with stage change between 0 and 2.5 cm. These tables and hydrographs, as well as the tool used to develop them are included in the attachments to this addendum.

YCWA developed summary tables of information from each of the 41 years of hydrologic record at each of the selected transects to describe:

- The number of years and percent of years for which stage recession was 2.5 cm or less for at least 21 consecutive days with flows exceeding the minimum flow threshold for the analysis period.
- A summary table with the total number of days in each year with a recession rate of 2.5 cm or less with flows exceeding the minimum flow threshold.
- A summary table with the average, maximum, and minimum by water year type, of the number of consecutive days with a recession rate of 2.5 cm/day or less with flows exceeding the minimum flow threshold.
- Two frequency distributions, one based on With-Project and one based on Without-Project hydrologies. One plot showing all decreasing stage increments with flows exceeding the minimum flow threshold for the period of record, and one plot showing all decreasing stage increments less than 2.5 cm/day**,** with flows exceeding the minimum flow threshold for the period of record.

3.0 Results

Results presented in this section include a summary of the Microsoft™ Excel tables. More detailed tables with information from each water year, spaghetti hydrographs, and a spreadsheet tool for various water elevations is included in the attachments. The analysis is limited to the period of the year when the majority of cottonwood seed distribution and germination is anticipated, between April 1 and July 15. The analysis is based on the recession rate (i.e., decreasing stage) of 2.5 cm or less, the rate at which germinating cottonwood seedlings are anticipated to be able achieve root-follow for down drawing water levels using capillary action. The analysis is also limited to days within the analysis period with daily average flow rates greater than the minimum flow criteria defined by Relicensing Participants.

4.0 List of Attachments to this Addendum

- Attachment A Spreadsheet Models [7 Microsoft Excel files: 26 MB]

5.0 References Cited

Stella, J.C., J.J. Battles, J.R. McBride and B.K. Orr. 2010. Riparian seedling mortality from simulated water table recession, and the design of sustainable flow regimes on regulated rivers. Restoration Ecology 18:284-294.