RPA Section that describes minimum flow criteria

Endangered Species Act
Section 7 Consultation

BIOLOGICAL OPINION

for

The proposed license amendment for the Potter Valley Project
(Federal Energy Regulatory Commission Project Number 77-110)

Action Agency: Federal Energy Regulatory Commission

Consultation Conducted By: National Marine Fisheries Service, Southwest Region

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especially for invertebrate communities. For salmonids, the benefits come from increased availability of forage and increased habitat complexity and function. *Not in mainstem upper Eel. Come & look at the river.*

NMFS expects that implementation of the RPA will avoid jeopardy to Eel River salmonids. When fully implemented, the RPA should provide Eel River salmonids with a quasi-natural hydrograph with sufficient flows for fall and winter migrations, spring emigrations, and in some years will provide improved summer rearing habitat in the mainstem Eel River below Cape Horn Dam. Project flows under the RPA will support salmonid recovery efforts by providing improved salmonid habitat conditions that will benefit multiple salmonid life stages. All three listed salmonids would be expected to benefit from better habitat conditions, especially Chinook salmon and steelhead.

The following RPA is described as various components. Each component described below must be implemented to ensure compliance with the RPA and to avoid jeopardizing SONCC coho salmon, CC Chinook salmon, and NC steelhead, and adverse modification of designated SONCC coho salmon critical habitat. The RPA modifies the proposed action's flows in the following specific ways:

The abbreviations that are used in the RPA are presented below.

MF11	=	minimum flow of the Eel River below Cape Horn Dam (cfs)
MF02	=	minimum flow of the Eel River below Scott Dam (cfs)
MF16	=	minimum flow of the East Branch Russian River (cfs)
Index	=	index flow (cfs)
Cap	=	cap on the index flow (cfs)
Floor	=	floor on the index flow (cfs)
SF	=	summer flow (cfs)
CLP(date)	=	cumulative inflow into Lake Pillsbury as of the given date (ac-ft)
EXCL(date)	=	exceptionally low inflow into Lake Pillsbury as of the given date (ac-ft)
CRIT(date)	=	critically dry inflow into Lake Pillsbury as of the given date (ac-ft)
DRY(date)	=	dry inflow into Lake Pillsbury as of the given date (ac-ft)
Bom	=	beginning-of-month
Day	=	day-of-month

A. Minimum Flows of the Eel River Below Cape Horn Dam

- Minimum flows of the Eel River below Cape Horn Dam, *MF11*, measured at the PG&E gage E-11, shall be computed as an index flow subject to the floor and cap limitations. If the index flow is between the cap and the floor, the minimum flow is equal to the index flow. If the index flow is less than the floor, the minimum flow is equal to the floor. If the index flow is greater than the cap, the minimum flow is equal to the cap. Mathematically, this can be expressed as:

$$MF11 = \min(\max(Index, Floor), Cap).$$

- The cap and the floor are specified in sections A.1 through A.8 below.

A.1.   October 1 - October 15

- $Cap = SF + (140 - SF) * Day / 15$
- If $SF < 25$ cfs, $Floor = SF + (25 - SF) * Day / 15$. Otherwise, $Floor = SF$

A.2.   October 16 - November 30

- $Cap = 140$ cfs
- If $SF < 25$ cfs, $Floor = 25$ cfs. Otherwise, $Floor = SF$

A.3.   December 1 - March 31

- $Cap = 140$ cfs
- $Floor = 100$ cfs, but if $CLP(Bom)$ is less than $EXCL(Bom)$ and if the previous month's $Floor$ was not equal to 100 cfs, $Floor = 25$ cfs.

A.4.   April 1 - May 15

- $Cap = 200$ cfs
- $Floor = 100$ cfs, but if $CLP(Bom)$ is less than $EXCL(Bom)$ and if the previous month's $Floor$ was not equal to 100 cfs, $Floor = 25$ cfs.

A.5.   May 16 - May 30

- $Cap = 200$ cfs
- $Floor = SF + (FM - SF) * \exp(-(Day - 15)/7)$, where FM is the May 1-15 floor defined in A.4

A.6.   June 1 - June 30

- $Cap = SF + (200 - SF) * \exp(-Day/7)$
- $Floor = SF + (FM - SF) * \exp(-(Day + 15)/7)$, where FM is the May 1 floor defined in A.4.

A.7.   July 1 - July 30

- $Cap = SF + (200 - SF) * \exp(-(Day + 30)/7)$
- $Floor = SF + (FM - SF) * \exp(-(Day + 45)/7)$, where FM is the May floor defined in A.4.

A.8.   August 1 - September 30

- Cap and $Floor$ are both equal to the summer flow SF

- Summer flow value depends on classification of both current and previous water years based on the cumulative inflow into Lake Pillsbury as of May 15. If the previous water year was not classified as "very wet", summer flow shall be equal to the singular summer flow. If the previous water year was classified as "very wet", summer flow shall be equal to the serial summer flow. Values of singular and serial summer flows are selected according to the classification of the current water year.

- Water year classification criteria and values of singular and serial summer flows are shown in the following table:

Cumulative into LKPills.

Classification			Summer Flow *SF*	
Water Year Classification	Probability Range	CLP as of May 15 (ac-ft)	Singular	Serial
Very Dry	0-20%	Less than 171,600	3 cfs	5 cfs
Dry	20-50%	171,600 to 309,400	9 cfs	20 cfs
Wet	50-80%	309,400 to 598,400	15 cfs	25 cfs
Very Wet	80-100%	More than 598,400	30 cfs	35 cfs

A.9. *CLP computation*

- *CLP* on a given day is defined as the cumulative unimpaired inflow into Lake Pillsbury from the beginning of the current water year to the end of the previous day, ignoring the net evaporation. *CLP* shall be computed as:

CLP=delta(E01)+cfs2af*sum(E02),

where *E01* is the Lake Pillsbury storage in ac-ft, *delta* indicates the change from the beginning of the current water year to the end of the previous day, *cfs2af*=1.98347, *E02* is the measured flow of the Eel River below Scott Dam in cfs, and *sum* indicates the summation of all daily flows from the beginning of the current water year to the end of the previous day.

A. 10. Exceptionally low inflows

- Exceptionally low inflows into Lake Pillsbury, *EXCL*, are defined in the following table:

Date	Dec 1	Jan 1	Feb 1	Mar 1	Apr 1	May 1
EXCL (ac-ft)	2,000	4,000	7,000	12,000	25,000	40,000

A.11. Index flow computation

- The following index flow equation defines the distribution of the overall water supply between the downstream Eel River and the Potter Valley Project diversion:

$$Index = 0.7*Eel,$$

where *Eel* is the unimpaired flow of the Eel River below Cape Horn Dam.

- The index flow variable *Eel* is estimated as:

$$Eel = avg[af2cfs*delta(E01) + E11 + E16],$$

where *avg* indicates the average over the last seven days, *af2cfs*=0.50417, *delta(E01)* is the daily change in storage of Lake Pillsbury in ac-ft, *E11* is the measured release below Cape Horn Dam in cfs, and *E16* is the measured Potter Valley Project diversion in cfs.

B. Minimum Flows of the Eel River Below Scott Dam

B.1. Minimum flows of the Eel River below Scott Dam, *MF02*, measured at the PG&E gage E-02, shall be computed as shown in the following table:

Minimum Flow of the Eel River below Scott Dam *MF02*				
Period		Classification		
From	Through	Normal	Dry	Critical
Dec 1	May 31	100 cfs	40 cfs	20 cfs
Jun 1	Nov 30	60 cfs	40 cfs	20 cfs

B.2. Classification

- January through June are classified as normal if $CLP(Bom) > DRY(Bom)$
- January through June are classified as dry if $CRIT(Bom) < CLP(Bom) < DRY(Bom)$
- January through June are classified as critical if $CLP(Bom) < CRIT(Bom)$

- July through December are classified based on the classification of the previous June
- *DRY(Bom)* and *CRIT(Bom)* are shown in the following table:

Date	Jan 1	Feb 1	Mar 1	Apr 1	May 1	Jun 1
DRY (ac-ft)	19,975	39,200	65,700	114,500	145,600	160,000
CRIT (ac-ft)	3,400	19,500	40,000	45,000	50,000	55,000

B.3. PG&E shall continue to cooperate in releasing warm water from the spillway of Scott Dam in the late winter/early spring period to promote the timely downstream migration of juvenile Chinook salmon from the Eel River between Scott and Cape Horn dams.

C. Minimum Flows to the East Branch Russian River

C.1. Minimum flows of the East Branch Russian River, *MF16*, measured at the PG&E gage E-16, but excluding flows released for the Potter Valley Irrigation District, shall be computed as shown in the following table:

Minimum Flow of the East Branch Russian River *MF16*				
Period		Classification		
From	Through	Normal	Dry	Critical
Sep 16	Apr 14	35 cfs	35 cfs	5 cfs
Apr 15	May 14	35 cfs	25 cfs	5 cfs
May 15	Sep 15	75 cfs	25 cfs	5 cfs

Handwritten notes in left margin:
PVID 5 cfs
OCT 15 - April 14
PVID 50 cfs
April 15 - Oct 15
drop to 25 cfs
April to Oct
if CPI = 125,000 acft
Apr 1.

Handwritten notes in right margin:
+ PVID 50 cfs.

C.2. Classification

Classification is the same as described in section B.2

C.3. Dry spring exception

- From June 1 through September 15, if the month is classified as normal and the inflow into Lake Pillsbury during the preceding April and May is less than 20,000 ac-ft, *MF16* = 40 cfs.

D. Blockwater

D.1. 2,500 ac-ft are reserved for release at the discretion of resource agencies each water year.

E. Operating Rules

E.1. Release to the Eel River below Cape Horn Dam shall be greater than or equal to the minimum flow *MF11* specified in section A.

E.2. Release to the Eel River below Scott Dam shall be greater than or equal to the minimum flow *MF02* specified in section B.

E.3. Release to the East Branch Russian River shall be greater than or equal to the minimum flow *MF16* specified in section C plus the release for the Potter Valley Irrigation District.

E.4. Release for the Potter Valley Irrigation District shall not exceed 5 cfs from October 16-April 14 and 50 cfs from April 15 to October 15. If *CLP*(April 1) is less than 25,000 ac-ft, this release shall not exceed 25 cfs during the following period from April 15 through October 15.

E.5. Diversions in excess of the sum of the minimum flow *MF16* specified in section C and the release to the Potter Valley Irrigation District specified in section E.4 can only be made when the Lake Pillsbury Storage is above the Target Storage Curve. Exceptions to this rule can occur only due to rare and brief emergency power and water demands.

E.6. Different Target Storage Curves shall be used depending on the water year classification as of May 15 for the purpose of the summer flow specification.