APPENDIX A

INFORMATION AND STUDY REQUESTS

1. Development of Decision Support Tools to Evaluate Potter Valley Project Decommissioning Alternatives
2. Quantification of Impacts of Reduced Diversions through the PVP on Regional Electrical Power Supply and Downstream Water Supply
3. Effects of Climate Change on Hydrology and Stream Temperatures in the Mainstem Eel River Basin
4. Recreation Facilities Assessment and Recreation Opportunities Study
5. Whitewater Boating Study
6. Investigation of Sediment Contamination and Bioaccumulation of Hazardous and Toxic Constituents in Aquatic Organisms
7. Assessment of Anadromous Fishery Potential Upstream of the Potter Valley Project

Study Request 1

Request for Information and Study

Development of Decision Support Tools to Evaluate Potter Valley Project Decommissioning Alternatives

Prepared for:

FERC

Potter Valley Project, FERC No. 77

Prepared by:

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California Trout, Inc (CalTrout) and Friends of the Eel River (FOER) hereby file this request for additional information and study with the Federal Energy Regulatory Commission (Commission or FERC) for PG&E's (Licensee) Potter Valley Hydroelectric Project (Project), FERC Project No.77.

1 BACKGROUND

Continued operation and maintenance (O&M) of the Potter Valley Project No. 77 (Project) diverts Eel River stream flow out-of-basin to the Russian River and creates numerous other impacts to the Eel River fishery including but not limited to impeding fish passage at both Cape Horn and Scott dams, blocking access to mainstem and tributary habitat, sustaining non-native fish populations, and altering natural hydrology, water quality, and water temperature. The combined effects of the Project are significant and detrimental to Eel River fishery, ultimately constraining fishery recovery within the basin.

This Study Request includes development of a decision-support tool that can help evaluate potential tradeoffs inherent with various alternatives of Project decommissioning (partial vs. full Project decommissioning). This Study Request also includes investigations of the potential effects of Project decommissioning on fisheries, related aquatic resources, water temperature, water supply, cold water pool, and other metrics.

2 STUDY AREA

The Study Area to be included for this Study Request includes the Eel River from the historic upstream extent of anadromous fish access (above Scott Dam) downstream to at least the Middle Fork of the Eel River. The Study Area shall also include the East Fork Russian River, Lake Mendocino, and affected reaches of the Russian River downstream to at least the confluence with Dry Creek.

3 FACILITIES AND OPERATIONS TO BE INVESTIGATED

Facilities to be investigated through this Study Request include:

- Lake Pillsbury,
- Van Arsdale Reservoir,
- Potter Valley Powerhouse,
- Scott Dam,
- Cape Horn Dam, and
- Van Arsdale Diversion.

Operations to be evaluated through this Study Request include the releases of water from Scott Dam and Cape Horn Dam into the mainstem Eel River, as well as diversion of water to the Potter Valley Powerhouse into Lake Mendocino and the upper Russian River.

In consultation with ILP participants, the Licensee should evaluate at least two decommissioning alternatives to evaluate constraints and benefits related to Project modification: partial decommissioning, and full decommissioning. Two example alternatives are provided below for illustration and linkage to specific study requests in subsequent sections.

3.1 Decommissioning Example Alternative 1: Full Facilities Decommissioning and Removal

Alternative 1 includes the decommissioning and removal of all Project facilities (Scott Dam, Cape Horn Dam, Potter Valley Powerhouse), restore full fish access for all native species, and restore the

Eel River within the footprint of project facilities. Evaluation should include evaluation of thermal changes on target aquatic and amphibian species due to loss of Lake Pillsbury cold water pool. Alternative 1 also includes evaluation of potential provisions for reducing impact to Russian River fisheries, water supply, and other beneficial uses in the Russian River.

3.2 Decommissioning Example Alternative 2: Remove Scott Dam and Retain Cape Horn Dam

Alternative 2 includes the removal of Scott Dam to restore fish access for all target species while retaining the Cape Horn Dam and diversion. Evaluation should include evaluation of thermal changes on target aquatic and amphibian species due to loss of Lake Pillsbury cold water pool. Alternative 2 includes the following:

- Fully removing Scott Dam to allow for full upstream and downstream passage of target species,
- Maintaining and improving the Cape Horn Dam fish ladder to support full upstream and downstream fish passage of target species,
- Retaining the Van Arsdale Diversion and Potter Valley Powerhouse, with operations to be modified to operate seasonally (December-April/May), and
- Investigating and recommending potential water management alternatives and fisheries improvements on the Russian River.

4 BIOLOGICAL AND PHYSICAL RESOURCES

Friends of the Eel River and California Trout request the Licensee evaluate project decommissioning and removal alternatives with respect to effects on the following anadromous fishery species and candidate listed amphibian species (hereafter collectively referred to as "target species"):

- Northern California (NC) Coast Steelhead (*Oncorhynchus mykiss*), including:
    - Summer Steelhead, and
    - Winter Steelhead;
- California Coastal (CC) Chinook salmon (*Oncorhynchus tshawytscha*);
- Southern Oregon/Northern California Coast (SONCC) Coho salmon (*Oncorhynchus kisutch)*;
- Pacific Lamprey (*Entosphenus tridentatus*); and
- Foothill Yellow-legged Frog *(Rana boylii)*

Additionally, effects to the native Western Pond Turtle (*Clemmys marmorata*) and the invasive Pikeminnow (*Ptychocheilus grandis*) should also be considered by the Licensee with respect to the Study Request Elements described below.

5 STUDY REQUEST ELEMENT #1: DEVELOP A WATER OPERATIONS MODEL

In coordination with ILP Participants, the Licensee shall develop a daily time step water operations model for the Project. This model can be used by the Licensee, in coordination with ILP participants, to evaluate potential alternatives to contemporary operations and assess various tradeoffs to fisheries, power generation, and water delivery. For example, the water operations model should be capable of analyzing winter diversions if Scott Dam were removed to allow anadromous fish access to the upper reaches of watershed (i.e., Alternative 2). The water

operations model should have a long time series (e.g., no less than 40 years) to enable robust comparison between different water year types, and incorporate the following elements:

- Estimates of unimpaired inflow to the project,
- Scott Dam and Lake Pillsbury operations,
- Evaluating the change in Project storage and storage timing across multiple water year types;
- The Van Arsdale Diversion and Potter Valley Powerhouse operations, and
- Changes in inflow to Lake Mendocino associated with the Van Arsdale Reservoir diversion and Potter Valley Powerhouse operations.

5.1 Unimpaired Hydrology Data Set

The licensee currently computes inflow to Lake Pillsbury via mass balance (inflow=change in storage - outflow). These computed inflows are analogous to unimpaired flows at Scott Dam; however, there is large error in the data due to inaccuracies in measuring change in storage (e.g., negative inflow values). To obtain a more realistic and robust inflow (unimpaired) flow data set suitable for ecological analyses, the Licensee shall install at least one continuous streamflow gage on the Eel River upstream of Project facilities to develop a continuous flow record that can be used to improve and reconstruct a long-term historical unimpaired flow data set, as well as for use in the fishery analysis upstream of the Project. These data can be used to expand and refine daily unimpaired flow estimates from historic inflow estimates.

Unimpaired hydrology should be developed in an open and transparent manner, with step-by-step, written accounting of the methods and processes used to develop the data set. Unimpaired hydrology for contributing reaches upstream of the Project (e.g., Mainstem Eel, Rice Fork) should be comprised of average daily flows at Scott Dam for no less than 40 continuous years that represent a range of hydrologic conditions and use as much empirical data (vs. synthesized) as possible for each scenario.

5.2 Modeling Parameters and Locations

The following parameters should be developed for operational modeling and unimpaired hydrology data; similar parameters for the Current scenario have already been developed in the PAD and can easily be aggregated into the information requested below.

1. Average annual flow
2. Monthly average flow for each month
3. 1, 3, 7-day maximum flow – mean for all years
4. 1, 3, 7-day minimum flow– mean for all years
5. Julian date and magnitude of annual maximum flow
6. Julian date and magnitude of annual minimum flow

The operations model should have the capacity to simulate and describe modeling parameters in an additive way through the project facilities and reaches. The model should be capable of developing a daily flow record for the following locations of interest:

1. Mainstem Eel above Lake Pillsbury
2. Rice Fork above Lake Pillsbury
3. Eel River below Scott Dam
4. Eel River above Van Arsdale Reservoir
5. Eel River below Van Arsdale Reservoir
6. Eel River below Tomki Creek

7. Eel River above Middle Fork Eel River Confluence
8. Russian River above Lake Mendocino
9. Russian River below Lake Mendocino

5.3 Climate Change

The Eel River watershed is at risk of losing its entire snowpack in most years within the next thirty years, resulting from climate change. The operations model must be able to adjust available hydrologic data to account for anticipated impacts from climate change, including projected changes in streamflow, shifting meteorology, and changes in runoff amounts and timing. At minimum, this should be conducted on a monthly time step. Operations models runs examining climate change effects must also consider likely increases in cumulative heating along the downstream riverine gradient below Project facilities.

We request the following series of steps:

1. The Licensee shall conduct a literature review on the magnitude and effects of climate change on streams in the Western U.S., with special focus on streams in landscapes most similar to the Eel River;
2. The Licensee shall review of available regional datasets and models that include the Eel River, including an assessment of their relative strengths and weaknesses;
3. The projected climate change datasets should include both flow and water temperature changes; and
4. In collaboration with agencies and stakeholders, the Licensee shall develop a plan to conduct new modeling and analysis, if existing data sets are insufficient.

The magnitude of climate change effects is uncertain, so we recommend that the modeling and analyses evaluate a range of potential climate scenarios. For example, the Licensee should consider using General Circulation Model (GCM) temperature projections of the western US that evaluate a moderate level of CO2 production and that have been regionally downscaled to account for California's topography and corrected for bias (e.g., Maurer et al. 2002). Daily data should be summarized into monthly mean maximum and minimum temperatures for 2050 and 2075. An historical data set of daily average temperatures should be developed for 1980 through 2000 or 2005, as well as monthly mean, maximum, and minimum temperatures.

The difference between the historical data and the 2050 and 2075 monthly temperatures will be used to adjust the historic data set in a simple comparison to reflect the effect of climate change at 2050 and 2075. These elevated "future" daily temperature time series will be used to force the reservoir and stream temperature models and also used to force the hydrologic model so that changes in rain-snow elevation and total snowpack in the basin will be simulated for 2050 and 2075.

A partial list of the most relevant models and datasets that should be assessed for potential use in this project include:

1. University of Idaho projected streamflow data, available at: https://climate.northwestknowledge.net/IntegratedScenarios/vis_streamflows.php
2. USGS Basin Characterization Model (Flint et al. 2013) water balance and hydrologic model for current conditions and climate change scenarios, including monthly data through 2016 for all of California (https://ca.water.usgs.gov/projects/reg_hydro/projects/dataset.html) and daily data for the Upper Eel River (https://ca.water.usgs.gov/projects/reg_hydro/projects/russian_river.html)
3. USGS Geo Data Portal (https://cida.usgs.gov/gdp/) provides easy access to a range of gridded meteorological datasets and downscaled climate scenarios

4. Western U.S. Stream Flow Metrics project (Wenger et al. 2010), available at: https://www.fs.fed.us/rm/boise/AWAE/projects/modeled_stream_flow_metrics.shtml)
5. Cal-adapt (http://cal-adapt.org/) provides daily, monthly, and annual downscaled gridded observed data (Livneh et al. 2015), climate scenarios (Pierce et al. 2014) and hydrologic simulations (Livneh et al. 2015).
6. NorWeST (Isaak et al. 2016, https://www.fs.fed.us/rm/boise/AWAE/projects/NorWeST.html) project from the US Forest Service Rocky Mountain Research Station combined observed data with spatial statistical models to estimate mean August stream temperature for each 1-kilometer reach in the North Coast of California, including the Eel River Basin.
7. Eel River Recovery Project compilation of observed stream temperatures in the Eel River Basin (Asarian et al. 2016)

6 STUDY REQUEST ELEMENT #2: EVALUATE HABITAT AND PRODUCTIVE CAPACITY FOR TARGET SPECIES

Evaluations of decommissioning must include an assessment of increased habitat availability and salmonid abundance resulting from changes to Project facilities or operations, and should be considered over a variety of water year types. Fish habitat shall be assessed for each target species by: (a) life stage, (b) habitat type with emphasis on rearing and spawning habitat, and (c) habitat availability based on predicted instream flow conditions resulting from Section 5, and (d) habitat quantity.

Fish habitat and productivity should be described by utilizing the habitat requirements for all life stages of target species, under different hydrologic conditions, and using general habitat suitability criteria for target species reintroduction.

6.1 Anadromous Salmonids

6.1.1 Above Project

Due to the large size and vast stream network of the upper Eel River watershed above Lake Pillsbury, mesohabitat mapping should be conducted by the Licensee using GPS and/or rectified aerial photography. Potential fish barriers within the watershed should be identified using remote sensing and aerial photography. Geographic Information Systems (GIS) should be used to delineate mesohabitat units downstream of migration barriers using polygon coverage. Center line stationing should be overlaid on to rectified aerial photography. Two to three sites representing different channel morphologies and at least one meander wavelength should be selected from mesohabitat mapping for habitat assessment. Ground surveys should be conducted to verify mesohabitat delineation at the potential study sites and to confirm that sites qualify as suitable for the habitat assessment approach.

Two complementary habitat assessment methodologies are recommended: Individual Based Modeling (IBM) and 2-D habitat modeling (2-D modeling). Topography, cover, substrate type, and spawning habitat polygons should be surveyed at selected study sites, and depths and velocities should be collected at various points within each modeling site to develop a two-dimensional (2-D) hydraulic model. In addition, depth and velocity data should be collected for at least two additional streamflows to calibrate and validate the 2-D models. In addition to the hydraulic variables from the 2-D models, additional data should be collected for input into the IBM, including benthic macroinvertebrate (BMI) drift densities, adult salmonid return data at Cape Horn Dam fish ladder, continuous streamflow data, and water temperature data. The 2-D habitat modeling and IBM should include re-created hydrology from historic inflow data and gage data as part of Study Request Element #1 to estimate the potential anadromous salmonid production, if anadromy is restored to reaches above Scott Dam. In addition, Pikeminnow predation behavior should be

included in the IBM to assess effects of predation on anadromous salmonid production. Lastly, the 2-D models and IBM should evaluate fall run chinook salmon, winter steelhead, and summer steelhead habitat and productive capacity.

The Licensee, in coordination with ILP participants, should also adjust streamflow and water temperature inputs to account for climate change predictions over no less than 40 years and resulting impacts to upper basin streamflows. As a result, the Licensee should evaluate fishery potential under (1) contemporary conditions, (2) future conditions within the timeframe of the renewed license, and (3) contemporary and future conditions as impacted by climate change.

This aspect of the study should also build upon recent habitat surveys conducted by Cooper (2017) and target data and analytical gaps identified in her report.

6.1.2 Below Project

The Licensee should evaluate fish habitat downstream of Cape Horn Dam downstream to at least the Middle Fork Eel River from Project operations resulting from various decommissioning alternatives. The VTN (1982) studies focused on 1-D PHABSIM modeling and critical riffle analysis for fish passage. The findings of the VTN study should be re-evaluated under contemporary conditions to validate and/or better characterize contemporary channel and habitat conditions, since that study is 35 years old. Specific elements that should be re-evaluated include:

1. The original VTN (1982) modeling did not include mesohabitat mapping. The Licensee should conduct updated mesohabitat mapping to ensure that the VTN study sites adequately capture important mesohabitat types, and as a context for recommended contemporary IBM modeling sites. Additionally, the original VTN (1982) modeling did not evaluate young of year (YOY) production for any target species. The modeling should be updated to include YOY for all target species and analyzed with appropriate habitat suitability curves (HSC).
2. The original VTN (1982) evaluation did not evaluation food availability. The Licensee should document benthic macroinvertebrate (BMI) at various habitats and streamflows to assess variation in macroinvertebrate availability and structure across various flow regimes. The assessment should also include study sites on key tributaries, such as Tomki Creek and the Eel River above the Project, for comparative purposes.

Assuming that the flow-habitat curves developed by the VTN study still appear reasonable, developing new flow-habitat relationships using 1-D PHABSIM or 2-D habitat modeling may not be necessary. However, the Licensee should, at minimum, conduct bioenergetics modeling to evaluate potential effects of flow management on growth of target fish species under different decommissioning alternatives. The Licensee can incorporate operations modeling hydrology results (Section 5) and water temperature modeling results (Section 7) to inform bioenergetics modeling and the flow-habitat relationships. Results from BMI investigations can also be incorporated into the bioenergetics model.

6.1.3 Mainstem Russian River below Lake Mendocino

The two project decommissioning alternatives may result in changes to water supply to the Russian River, which may in turn cause changes in release patterns from Lake Mendocino. The Licensee should evaluate flow release changes to the Russian River under different decommissioning alternatives, and evaluate potential implications to fish habitat on the Russian River. The Sonoma County Water Agency has a 1-D PHABSIM model for the reach below Lake Mendocino, such that projected flow changes from the operations model can be used to evaluate changes in fish habitat availability on the Russian River.

6.2 Pacific Lamprey Above and Below Project

Pacific Lamprey habitat should be assessed in the upper Eel River above Lake Pillsbury and in riverine habitats downstream of Scott Dam. High quality spawning and rearing habitat should be quantified by applying drainage area and channel gradient criteria to a channel network attributed with a drainage area and channel gradient overlay, created with GIS. Drainage area and channel gradient criteria for Pacific Lamprey are defined in Stillwater Sciences (2014).

6.3 FYLF Below Project

The Licensee should evaluate effects of Project decommissioning on FYLF distribution and abundance downstream of Cape Horn Dam. The Licensee should survey for FYLF egg masses at sites located between Cape Horn Dam and the Middle Fork of the Eel River. Multiple surveys should be conducted to capture various flow thresholds. Surveys should be distributed throughout the receding limb of the spring hydrograph. At each site, the location of egg masses relative to the water surface elevation and water temperature should be recorded.

FYLF survey data should be used to populate and run a FYLF reproduction model (e.g., Railsback et al. 2015), incorporating hydrology data generated from Study Request Element #1 and water temperature data generated from Study Request Element #2. The model should also incorporate anticipated climate change effects when predicting future FYLF reproduction success over the span of the proposed renewed license.

6.4 Pikeminnow Predation

The Licensee should evaluate potential changes to Pikeminnow predation on target species as a result of anticipated changes to water temperatures and streamflows likely to occur as a result of decommissioning, and should include consideration of climate change over the next fifty years (flow and water temperature changes). Pikeminnow predation rates should be evaluated both above and below Project facilities, with an emphasis on predation downstream of Cape Horn Dam. The Licensee should specifically address whether decommissioning will affect the rate of Pikeminnow predation, and to what extent.

7 STUDY REQUEST ELEMENT #3: RIVER WATER TEMPERATURE MODEL

Evaluation of decommissioning alternatives should include an assessment of effects on downstream water temperatures. Water temperature evaluations should consider likely climate change scenarios through the life of the renewed License. Water temperature-related study request sub-elements should be developed with hydrology data obtained from Study Request Element #1 (Water Operations Model) and include:

- A quantitative prediction of resulting changes to the cold water pool volume over a range of water year types that clearly accounts for anticipated changes to water supply and water temperature resulting from climate change;
- Evaluation of changes in water temperatures resulting from Project operations if the existing diversion to the Potter Valley Powerhouse is (a) fully removed and (b) partially removed (evaluating scenarios for changes in diversion volume and/or diversion timing). Water temperature predictions should be compared to current operational conditions; and,
- An assessment of implications to target species based on modeled or predicted changes in water temperature relative to established water temperature objectives for target species and water temperature objectives established for water temperature in the TMDL (USEPA 2004).

7.1 Data Collection for Modeling and Management

The Licensee has implemented a network of temperature monitoring stations listed in Section 5.2 of the PAD and within PG&E's Summer Water Temperature Monitoring Plan (PG&E 2005). In addition to these locations, the Licensee should install water temperature loggers that record water temperature at 15-minute intervals and provide continuous water temperature data at the following stream locations:

8. Eel River above Lake Pillsbury at Bloody Rocks (Roughs);
9. Eel River above Lake Pillsbury within the flowing portion of the Rice Fork;
10. within the flowing portion of the upper Eel River above Lake Pillsbury;
11. Eel River below Scott Dam;
12. Eel River immediately below Bucknell Creek;
13. Eel River Below Cape Horn Dam;
14. Eel River below Emandal;
15. Eel River below Outlet Creek
16. Eel River at Dos Rios.

All the gage locations listed in Table 5.2 of the PAD, within PG&E's Summer Water Temperature Monitoring Plan (PG&E 2005), in addition to those requested here, should record temperature data at 15-minute intervals for at least 5-years, consulting yearly with ILP participants after that. All new temperature gages requested should collect data year-round. Other temperature gages can be discussed for duration of deployment relative to the temperature objectives. Year-round gages should be downloaded seasonally and checked for quality assurance purposes. The raw gage data should be made available in Microsoft Excel format to ILP participants through a public website.

7.2 Water Temperature Model to Be Used

Water temperature modeling to predict water temperatures resulting from partial or full project decommissioning should be coordinated with input from agency and tribal representatives. PG&E should use a CE-QUAL-W2 or similar 2-D water quality model. This model should also include additional water quality parameters specified in Table 1 below.

The output of the water temperature model should be developed in consultation with ILP participants, but at a minimum should include average daily water temperature at the nodes listed in Table 1. The model should also be capable of simulating daily minimum and maximum water temperatures, which will necessitate the model operate on a sub-daily time step. For the Project reservoirs, including Lake Mendocino, the model should be able to accurately reproduce the vertical stratification of reservoir temperatures, and predict how the thermocline changes over time and with different operations. The vertical intervals and cross-section spacing in the reservoir models should be as small as feasible to run the model in a timely fashion. At minimum, the model should predict water temperatures on a daily time step for all cross-sections and depths for each reservoir.

The model should simulate Project operation alternatives for at least a 40-year period record, covering the most recent water years, and for current and future operations for various decommissioning alternatives. The model should use the best and most complete data available, include data collected to support other study requests for this FERC relicensing, as well as data resulting from other additional studies related this to relicensing effort.

Table 1. Model Nodes, Inputs, and Outputs for Project and Select Upstream and Downstream Locations. Friends of the Eel River and California Trout anticipate the same or similar model will be developed and used to evaluate flow, water temperature, and other key water quality parameters.

Upstream Project Nodes		**Downstream Project Nodes**	
Model Node	**Model Input**	**Model Node**	**Model Output**
Upper Basin Outflow (Mainstem)	Flow, Temperature, Water Quality	Eel River above Scott Dam	
Inflow to Lake Pillsbury (Mainstem)	Flow, Temperature, Water Quality	Eel River below Scott Dam	Flow, Temperature, Water Quality
Inflow to Lake Pillsbury (Rice Fork)	Flow, Temperature, Water Quality	Eel River above Van Arsdale Reservoir	Flow, Temperature, Water Quality
Lake Pillsbury (near dam face)	Elevation, Temperature, Water Quality	Eel River below Van Arsdale Res	Flow, Temperature, Water Quality
		Eel River above Middle Fork Confluence	Flow, Temperature, Water Quality
		East Fork Russian River inflow to Lake Mendocino	Flow, Temperature, Water Quality
		Lake Mendocino	Elevation, Temperature, Water Quality
		East Fork Russian River below Coyote Dam	Flow, Temperature, Water Quality

7.3 Water Temperature Model Validation

The Licensee should calibrate and validate the river water temperature model. The Licensee should meet with interested relicensing participants to review the model, and then refine and finalize the model based on adjustments resulting from the model calibration and validation process. The Licensee shall also provide Model Development and Validation reports to ILP relicensing participants. These reports should also be included in the Licensee's application for new license.

7.4 Develop Model Runs and Operational Scenarios

The Licensee should configure the model to represent how they currently operate the Project, including all physical, regulatory and contractual constraints. The Licensee should run the model as reasonably requested to evaluate decommissioning scenarios (full and partial decommissioning). The Licensee should then compare model results to evaluate differences between each scenario from baseline conditions (current operations under the present license). Output data from the water temperature model will be used for other ecological evaluations (e.g., FYLF reproduction model, bioenergetics model).

8 STUDY REQUEST ELEMENT #4: RESERVOIR WATER QUALITY MODEL

Evaluations of decommissioning alternatives must include an assessment of effects on water quality resulting from changes to Project facilities or operations. Water quality modeling should be conducted in consultation with ILP participants. The reservoir water quality model should focus on water temperature and dissolved oxygen and also include basic eutrophic processes such as

nutrients, algae, organic matter, and sediment within acceptable calibration standards over a range of hydrologic conditions. The Licensee should conduct water quality monitoring in Lake Pillsbury, as well as develop a predictive model for water quality in the reservoir and downstream reaches that can address various decommissioning alternatives.

The Licensee has collected some spot-check temperature information in Lake Pillsbury over the years. Additional continuous telemetric real-time vertical array temperature recorders should be placed in three separate locations within Lake Pillsbury. Locations should include areas near Scott Dam and the deepest sections of the lake. These points should be located in order to assess the spatial variability and cold water pools within Lake Pillsbury. Exact locations will be determined in a collaborative fashion but should be in the spaced in a manner to assess temperature profiles in proper locations with the lake. Temperatures should be measured at 15-minute intervals surface to bottom, every 10-feet. Data collection should be conducted during the early spring through late fall to capture seasonal anadromous fish migrations and summer rearing at all locations for 5-years, consulting yearly with ILP participants after that. Data should be checked for quality assurance purposes and made available to ILP participants in excel format through a public website. Assurance should also be made so that all temperature data is collected in a manner that is easily compatible with subsequent water temperature modeling efforts.

The Water quality modeling should also include a downstream river component, and be configured to show predicted changes in water quality after facilities removal and/or operational changes at (a) between Scott Dam and Cape Horn Dam, and (b) releases from Cape Horn Dam downstream, over a range of water year types. Water quality model predictions should be compared to current conditions. Water quality modeling should be conducted concurrent with other model efforts to support water temperature analysis, including the model overview summarized in Table 1. The water quality model should also be applied to account for anticipated water quality changes resulting from climate change.

9 STUDY REQUEST ELEMENT #5: FISH PASSAGE INVESTIGATIONS

Evaluations of decommissioning must include an assessment of effects to fish passage habitat resulting from changes to Project facilities or operations. Under § 18 of the Federal Power Act, 16 U.S.C. § 811, the Secretary of Commerce has the mandatory conditioning authority to prescribe fishways at FERC-licensed projects.

9.1 Fish Passage Upstream to Cape Horn Dam

The Licensee should complete a detailed evaluation of fish passage upstream to Cape Horn Dam, based on hydrology resulting from Section 5.1 that transparently uses contemporary CDFW Critical Riffle Analysis methodology (CDFW 2015), updating the earlier VTN work (1982).

9.2 Fish Passage Over Cape Horn Dam

The Licensee should develop a detailed description and assessment of proposed modifications to the Van Arsdale Dam facilities to enable full fish passage (fish ladder modifications or similar) for upstream passage of adult anadromous salmonids and Pacific lamprey, and downstream passage of juvenile salmonids and Pacific lamprey. Injury or death of juveniles passing over the dam crest should also be evaluated, and if needed, remedied to reduce injury or mortality to downstream migrants.

9.3 Diversion Fish Screen

As described in the PAD and Scoping Document #1, the existing diversion includes two fish screens. The current fish screens limit the maximum diversion to 240 cfs. To better evaluate different decommissioning alternatives, the Licensee should evaluate alternative diversion fish screening options that (a) successfully avoid entrainment and impacts to native target species and

(b) allow a larger maximum diversion when potential impacts to native target species may be less significant, such as periods of winter and spring high flow runoff.

9.4 Fish Passage Over Scott Dam to upper Eel River watershed

The Licensee should provide a detailed description of assessment for full adult anadromous salmonid and Pacific lamprey passage over Scott Dam (volitional passage, trap and haul), or through the restored river under Lake Pillsbury after Scott Dam decommissioning. Downstream fish passage by juvenile salmonids and Pacific lamprey should also be included in the evaluation.

9.5 Fish Passage Upstream of Scott Dam

A detailed assessment of natural fish passage barriers upstream of Scott Dam should be conducted by the Licensee. This work should reference Cooper (2017) as a basis, but shall not substitute this study for the entirety of this assessment. The Licensee should review past survey documents and conduct additional ground surveys to properly identify all natural and artificial barriers to salmonid upstream migration in the Upper Eel River above Lake Pillsbury. At minimum, field crews should conduct ground surveys in the Upper Eel and Rice Fork including major tributaries to identify any complete barriers to salmonid migration as well as any partial barriers to upstream salmonid migration.

Partial and complete barriers to migration for salmonids should be defined by the criteria used in Powers and Orsborn (1985) for natural jump barriers and CDFW (2015) for alluvial fish passage thresholds. Once a barrier is located, GPS coordinate points of its location should be recorded and a number of physical measurements should be taken which include: height of falls, depth of plunge pool, velocity, slope and depth of fish exit. While initial sampling should take place during annual low-flow conditions, once a barrier is located, the same physical measurements should be taken to the extent safely possible during flows typical of the migration season. Variations in the hydrograph at these barriers affects the hydraulic characteristics at the potential barrier, and therefore anadromous immigration potential. Analysis of the historical hydrology should be combined with the physical attributes of the barrier and species criteria (Chinook salmon and steelhead), to develop a comprehensive assessment of fish passage "windows", the dates and durations when salmonids would likely be able to ascend the barrier under varying hydrologic conditions. One product of this evaluation will be the length of new anadromous habitat accessible above Scott Dam under different water year types for each species.

10 STUDY REQUEST ELEMENT #6: INFRASTRUCTURE INVESTIGATIONS

To evaluate the two project decommissioning alternatives, the Licensee should investigate the feasibility, effects, and costs of infrastructure modifications associated with decommissioning elements. These assessments should include engineering and geotechnical evaluations as well as geomorphic and ecological implications of infrastructure modifications. The investigations should include the following Project facilities:

- Potential removal of Scott Dam,
- Potential removal of Cape Horn Dam,
- Management of accumulated and potentially contaminated sediments impounded behind each dam,
- Potential complete removal of the Van Arsdale Reservoir intake and diversion infrastructure,
- Modification of the Van Arsdale Reservoir intake and diversion infrastructure (including conduit or piping) to support higher rates of diversion during winter and spring months, and

- Potential decommissioning of Potter Valley Powerhouse,

The investigations should focus on the ecological, economic, and engineering-related opportunities and constraints associated with decommissioning of each Project element.

The Licensee may find similar contemporary studies and reports developed to support Klamath River dam decommissioning helpful, including:

- Bureau of Reclamation's Klamath dam removal Benefit Cost and Regional Economic Development Technical Report,
- NOAA Fisheries' Klamath dam removal Commercial Fishing Economics Technical Report, and
- Additional Economics Studies and Information developed for the Secretarial Determination, available here.

11 STUDY REQUEST ELEMENT #7: INTEGRATIVE DECISION SUPPORT TOOL

To integrate outcomes of Study Request Elements #1 through #5, the Licensee should develop an integrated decision support tool that incorporates model outputs and investigation results, including:

- Water operations modeling, including the Eel River and Upper Russian River below Lake Mendocino;
- Fish passage thresholds below and through the Project facilities, including riverine passage (critical riffle results) and passage alternatives to transport fish around Project facilities;
- Anadromous fish habitat and productive capacity from Scott Dam upstream;
- Anadromous fish and amphibian habitat and productive capacity below Scott Dam to Middle Fork Eel River and to the Estuary for fall-run chinook migration;
- Reservoir water quality and water temperature modeling results;
- Riverine water temperature modeling results, summarizing expected water temperatures with Project and without Project; and
- Climate change scenarios.

The integrated decision support tool will be used to comprehensively assess the opportunities and constraints presented by Project decommissioning alternatives across all evaluated ecological elements. The integrated decision support tool should also be able to synthesis results from additional Study Requests submitted by other ILP participants.

12 FERC STUDY REQUEST CRITERIA

12.1 Goals and Objectives of Request

The goal of this Study Request is to be able to evaluate various decommissioning scenarios based on the benefits and constraints they offer the Eel River fishery compared to the Licensee's existing operations. Evaluating Project decommissioning allows PG&E, in consultation with agencies, tribes, and other affected parties, to evaluate possible tradeoffs affecting the Eel River fishery. When complete, this Study will identify decommissioning tradeoffs and identify the most feasible path forward that will benefit the Eel River under present day and future conditions, taking longer term climate change impacts into consideration.

12.2 Resource Management Goals of California Trout and Friends of the Eel River

California Trout is a statewide non-profit organization dedicated to solving complex resource issues while balancing the needs of wild fish and people. We believe that abundant wild fish indicate healthy waters and that healthy waters mean a better California. California Trout pursues science-based solutions that work for diverse interests of fish, farms, commerce, and people.

California Trout organizes and facilitates the Eel River Forum, comprised of 23 stakeholder organizations. The Eel River Forum is a coalition of public agencies, Indian tribes, conservation partners, and other stakeholders with interest in or responsibility for the environmental stewardship of the Eel River. The Eel River Forum works collaboratively to:

- Understand the status of Eel River salmonid populations and other native fisheries resources.
- Identify and prioritize recovery issues and challenges.
- Promote specific research, restoration, and monitoring efforts in the Eel River basin
- Develop and recommend plans and policies that will promote the recovery of the Eel River ecosystem and its native fish populations.

Considerable efforts have been made in recent years by resource agencies, private industries, conservation organizations, and other stakeholders to promote watershed restoration and protect the Eel River's fisheries resources.

The mission of the Eel River Forum is to coordinate and integrate conservation and recovery efforts in the Eel River watershed to conserve its ecological resilience, restore its native fish populations, and protect other watershed beneficial uses. These actions are also intended to enhance the economic vitality and sustainability of human communities in the Eel River basin. The Eel River Forum's goal is to achieve consensus among a coalition of agency, tribal, and conservation partners regarding priority recovery actions and policy reform needed to recover salmonid populations in the Eel River basin, California's third largest watershed.

In June of 2016, the Eel River Forum, led by California Trout and our partners, released the Eel River Action Plan. The plan identifies priority actions needed to recover the Eel River watershed and its native fish. It aims to achieve these goals while maintaining multiple land uses and recreation in the watershed. Priority actions in the plan address water diversions, water quality issues, habitat restoration, community engagement and protecting the Eel River Delta.

Friends of the Eel River's purpose is to promote and protect the natural resilience of the Eel River and the community of life it supports; to encourage actions which serve the integrity, stability, and beauty of the river and its watershed, and to oppose those which tend otherwise. FOER uses public education, advocacy, and strategic litigation where necessary to protect critical public trust resources. Friends of the Eel River also participates in the Eel River Forum.

12.3 Relevant Public Interest Considerations

California Trout has 10,000 members statewide. Friends of the Eel River has 2,000 members across the country. Our memberships value the Eel River fishery and wishes to see a restored Eel River ecosystem that supports improved aquatic health, recovery of salmonids, lamprey, and other at-risk species, and restored stream flows to the Eel River watershed. PG&E has been able to operate and profit from their Project at the expense of our membership and public trust resources. Existing mitigation required of PG&E for Project operations to date has been insufficient to remedy detrimental impacts of the Project to the Eel River fishery, both economically and ecologically.

California Trout and Friends of the Eel River represent a broad membership dedicated to fisheries restoration and ecology sustainability. Furthermore, these organizations work to protect the ecology of the Eel River watershed itself. The Project continues to have a documented detrimental effect to the fisheries resources and fishery recovery of the entire Eel River watershed by blocking habitat access for target species, diminishing water quality, altering water temperatures, and diverting scarce streamflow out-of-basin, among other impacts. As PG&E works with FERC to renew its license for the Project, a thorough evaluation of decommissioning scenarios is essential to understanding and mitigating the effects of the Project to the membership of these organizations, the public as a whole, and the ecology of the Eel River watershed.

12.4 Existing Information and Need for Additional Information

The PAD provides no data or information pertaining to dam decommissioning. The Scoping Document 1 erroneously indicates Project decommissioning shall not be further evaluated because no party has expressed interest in decommissioning. Given multiple organizations, including California Trout and Friends of the Eel River, have formally requested a complete evaluation of Project decommissioning scenarios, there indeed has been a strong, consistent request to evaluate decommissioning of the Project.

Multiple scenarios exist for Project decommissioning, ranging from partial decommissioning to full project decommissioning. These scenarios must be evaluated relative to their potential benefits to Eel River fisheries resources. There is presently no available information evaluating partial or full Project decommissioning and the effects such actions would have on fisheries resources, including hydrology, water temperature, water quality, fish habitat, fish passage, potential contamination from reservoir sediments, and implications resulting from predatory pikeminnow. This analysis must be conducted by the Licensee through the FERC process to support a full evaluation of Project decommissioning and the likely effects of such actions on target species valued by our organizations.

12.5 Nexus Between Project Operations and effects on the Resources Studies, and How the Study Results Would Inform the Development of License Requirements

The Potter Valley Project facilities prevent upstream fish passage in the Eel River and seriously impairs and prevents safe and effective downstream fish passage. The construction of Scott Dam in 1922 permanently cut off access of anadromous salmonid to their historic spawning and rearing habitat. Currently, the Potter Valley Project continues to completely block access of anadromous fish to the upper Eel River watershed, which includes 100-300 miles of historic habitat for anadromous fish. This blocked habitat includes almost the entire historical extent of the Upper Mainstem Eel River steelhead population, which is identified as an *Essential* population for the NC steelhead DPS (NMFS 2016).

Under § 18 of the Federal Power Act, 16 U.S.C. § 811, the Secretary of Commerce has the mandatory conditioning authority to prescribe fishways at FERC-licensed projects. Based on other FERC proceedings (Condit Hydroelectric FERC No. 2342, Klamath Hydroelectric Project FERC No. 2082, Glines Canyon FERC No. 588, and Elwha River FERC No. 2683), the prohibitive costs of fishway installations relative to declining power generation profitability, has, in part, been a significant factor in ultimately choosing to decommission projects and restore anadromous fisheries as an alternative to pursing a renewed license under FERC.

Understanding the nature and characteristics of the target stream reaches, the Potter Valley Project facilities, and the reservoirs in the context of a comprehensive evaluation of decommissioning scenarios will assist our organizations in future coordination with FERC, the Licensee, and other ILP participants, evaluate future Project operations. This evaluation of decommissioning scenario

will determine which path forward will have the least impacts to the Eel River fishery, upon which our people depend, and the Eel River itself, which is of vast significance to our membership.

12.6 Consistency with Generally Accepted Practice

Proposed methodology and information requests are consistent with the goals and objectives outlined for recent FERC hydroelectric ILP studies in the Western U.S., and uses accepted methodologies from published scientific literature and protocols from the National Marine Fisheries Service, U.S. Fish and Wildlife Service, the California Water Board, and California Department of Fish and Game.

We are presenting a Request for Information or Study (under the ILP regulations at 18 CFR § 5.9), and therefore is not necessarily requiring any specific study methodology, although specific criteria and direction has been provided above (preferred data collection and analysis techniques, or objectively quantified information). This is because the Licensee's responsibility under the Federal Power Act is to either provide the requested information or to develop a more detailed Study Plan to obtain such information. It is anticipated that through the iterative study development process within the ILP that the Licensee and the Commission will work with ILP participants to develop a study that obtains the requested information, or that adequate information, approved by the Commission, is provided by the Licensee

12.7 Consideration of Level of Effort and Cost

The Friends of the Eel River and California Trout consider that the combined cost of these studies to be approximately $1 million. However, Request Element #7 (Integrated Decision Support Tool) alone is likely less than $100,000. To date, the PG&E have not submitted any proposal to assess Project decommissioning. The scope of the Project's potential effects is considered vast and long-term. Considering the potential for ongoing decimation of the Eel River's fishery, environmental disturbance, the potential to affect species listed under the Endangered Species Act, and the recent closure of Chinook fisheries on the West Coast of the United States, the level of effort and cost for the Applicant is commensurate with the revenues derived from sales of generated energy.

13 REFERENCES

Asarian, J.E., P. Higgins, P. Trichilo. 2016. Stream Temperatures in the Eel River Basin 1980-2015, Phase 1: Compilation and Preliminary Analysis. Prepared by Riverbend Sciences and the Eel River Recovery Project for State Water Resources Control Board, Sacramento, CA. 73p. + appendices. http://www.eelriverrecovery.org/documents/EelTemps_Final_20160417.pdf

California Department of Fish and Wildlife (CDFW). 2015. Critical Riffle Analysis for Fish Passage in California. California Department of Fish and Wildlife – Instream Flow Program.

Cooper. E. J. 2017. An Estimation of Potential Salmonid Habitat Capacity in the Upper Mainstem Eel River California. A Thesis presented to the Faculty of Humboldt State University in Partial Fulfillment of the Requirements for the Degree Master of Science in Natural Resources.

Livneh, B., T.J. Bohn, D.W. Pierce, F. Munoz-Arriola, B. Nijssen, R. Vose, D.R. Cayan, and L. Brekke. 2015. A Spatially Comprehensive, Hydrometeorological Data Set for Mexico, the U.S., and Southern Canada 1950–2013. Scientific Data 2:sdata201542. doi: 10.1038/sdata.2015.42.

Flint, L.E., A.L. Flint, J.H. Thorne, and R. Boynton. 2013. Fine-Scale Hydrologic Modeling for Regional Landscape Applications: The California Basin Characterization Model Development and Performance. Ecological Processes 2:1–21. doi: 10.1186/2192-1709-2-25.

Isaak, D.J.; Wenger, S.J.; Peterson, E.E.; Ver Hoef, J.M.; Hostetler, S.W.; Luce, C.H.; Dunham, J.B.; Kershner, J.L.; Roper, B.B.; Nagel, D.E.; Chandler, G.L.; Wollrab, S.P.; Parkes, S.L.; Horan, D.L. 2016. NorWeST modeled summer stream temperature scenarios for the western U.S. Fort Collins, CO: Forest Service Research Data Archive. https://doi.org/10.2737/RDS-2016-0033.

Maurer, E.P., Wood, A.W., Adam, J.C., Lettenmaier, D.P. and Nijssen, B. 2002. A long-term hydrologically based dataset of land surface fluxes and states for the conterminous United Stated. Journal of Climate 15 (22): 3237-3251.

NMFS (National Marine Fisheries Service). 2016. Coastal Multispecies Recovery Plan. West Coast Region. Santa Rosa, California.

Pacific Gas and Electric. 2005. Summer water temperature monitoring plan. Addressing NMFS Measure 8 (in part) and License Article 57. Potter Valley Hydroelectric Project FERC Project No.77.

Pierce, D.W., D.R. Cayan, and B.L. Thrasher. 2014. Statistical Downscaling Using Localized Constructed Analogs (LOCA). Journal of Hydrometeorology 15:2558–2585. doi: 10.1175/JHM-D-14-0082.1.

Powers, P. D. and J. F. Orsborn. 1985. Analysis of Barriers to Upstream Fish Migration- An Investigation of the Physical and Biological Conditions Affecting Fish Passage Success at Culverts and Waterfalls, Bonneville Power Administration, Contract DE-A179-82BP36523, 119 p.

Railsback, S.F., B.C. Harvey, S.J. Kupferberg, M.M. Lang, S. McBain, H.H. Welsh, Jr. 2016. Modeling potential river management conflicts between frogs and salmonids. Canadian Journal of Fisheries and Aquatic Sciences, 73(5):773-784.

Stillwater Sciences. 2014. Evaluation of barriers to Pacific lamprey migration in the Eel River basin. Prepared by Stillwater Sciences, Arcata, California for Wiyot Tribe, Loleta, California

U.S. Environmental Protection Agency (EPA). 2004. Upper Main Eel River and Tributaries (including Tomki Creek, Outlet Creek and Lake Pillsbury), Total Maximum Daily Loads for Temperature and Sediment.

VTN Oregon, Inc. 1982. Potter Valley Project (FERC No. 77) Fisheries Study Final Report. Prepared for Pacific Gas and Electric Company, San Ramon, California.

Wenger, S.J., C.H. Luce, A.F. Hamlet, D.J. Isaak, and H.M. Neville. 2010. Macroscale Hydrologic Modeling of Ecologically Relevant Flow Metrics. Water Resources Research 46:W09513. doi: 10.1029/2009WR008839.

915335.2

Study Request 2

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July 26, 2017

David Keller,
FOER

The purpose of the proposed study is to quantify the impacts of reduced diversions through the PVP on regional electrical power supply and downstream water supply.

The reasons for reduced diversions could be (a) climate-change impacts on Eel River hydrology, (b) drought conditions, and (c) increased releases from Cape Horn Dam to improve Eel River fisheries. At the extreme, the study will examine curtailment as a result of PVP decommissioning. However more likely reductions will be for (a) extended periods during droughts that could become more frequent with climate change, (b) critical fish migration periods, and (c) summer baseline increases in releases over Cape Horn Dam that might trend upwards with climate change. Additionally, partial daily diversions (e.g. more at night than during the day), and seasonal diversions (e.g. more in winter than in summer) might be effective in offsetting the economic impact of hydropower and water supply reductions.

The first step of the study is to examine the past 10 years of water supply and hydropower data, and identify correlations with FERC operating rules and weather/seasons. A parallel step would be to define overall local water and energy demands, and identify correlations with weather/seasons. These data sets would quantify the fraction of local water and energy demand contributed by the PVP diversions.

Climate down-scaling scenarios for Eel River hydrology would be developed to add into the existing water balance models used by parties in the previous FERC licensing procedures. The climate-change scenarios will change diversions over time, even under existing flow rules. Inputs from fisheries studies could change the flow rules – especially for summer baselines and during droughts.

Rather than simply estimate impacts on water and electricity supply, the study will consider alternatives to offset the physical and economic losses. Regional water and energy efficiency measures have a very large potential to mitigate losses cost-effectively, and the local region has a large potential for developing solar and wind power, coupled with a variety of storage technologies. The main components of the study's alternatives' evaluation are:

- For water:
    - end-use efficiency, including agricultural and landscape irrigation, and indoor usage by residential, commercial, and industrial water-related appliances/equipment.
    - wastewater reclamation
    - seasonal diversions and storage (e.g. winter to summer)
    - crop replacement
- For electricity:
    - end-use efficiency, including agricultural and municipal supply pumps, residential and commercial HVAC and appliances, and industrial processes and equipment.
    - distributed and utility-scale solar and wind power
    - power demand shifting by rescheduling agricultural and municipal water pumping/storage
    - storage including batteries for electricity, ice/chilled water for A/C and refrigeration, and water reservoirs/tanks.

- partial daily (e.g. night-time) operation of PVP

1 STUDY PLAN CRITERIA 18 CFR SECTION 5.9(B)

1.1 Describe the goals and objectives of each study proposal and the information to be obtained

The goals are to:

- Evaluate climate-change impacts on Eel River hydrology and the impacts of continued hydro-power diversions through PVP.
- Evaluate whether distributed or utility-scale solar energy generation could provide local grid needs when Eel River fisheries would benefit from less diversions through PVP.
- Evaluate the impact of modifying daily and/or seasonal diversions from PVP on downstream water balances and water rights obligations.

1.2 If applicable, explain the relevant resource management goals of the agencies or Indian tribes with jurisdiction over the resource to be studied

1.3 If the requester is not a resource agency, explain any relevant public interest considerations in regard to the proposed study

- Examine climate-change impacts on Eel River hydrology, and possible modifications to PVP operations – including decommissioning – to reduce future damage.
- Modifying PVP diversions could improve fisheries recovery and ESA goals in the Eel River.
- Providing distributed solar energy resources could improve local ecological and economic sustainability.

1.4 Describe existing information concerning the subject of the study proposal, and the need for additional information

To examine climate driven changes, "non power license" or decommissioning impacts, and modifications to project operations and diversions requires:

- Baseline water and energy profiles and balances, especially during droughts and extreme weather conditions.
- Baseline economic costs and benefits derived from water and energy, and their fraction of the local economy.
- Quantitative projections of changes in diversions, using models based on:
  - Baseline hydrology and weather
  - Potential climate-driven changes in hydrology
- Quantitative projections of costs and benefits, assuming:
  - No changes in projected water and energy demands
  - Feasible changes in projected demands, including:
    - water and energy efficiency
    - changes in irrigation and crops
    - additional local distributed and utility-scale renewable energy
    - increased wastewater reclamation

The data required to examine the baseline and make reasonable projections are:

- Existing accessible data:
  - Hourly flow gauges

    - Daily reservoir levels
    - Annual electrical energy generated by PVP
    - Hourly temperature, precipitation, and insolation
    - Daily evapotranspiration
- Existing data not yet accessible from interested parties:
    - Daily diversion volumes by PG&E to PVID (E5 and E6)
    - Daily storage volume in PVID reservoirs.
    - Hourly flow through PVP diversion tunnel (E16) – or daily average supplemented by indication of changes.
    - Hourly PVP by-pass flows – or daily average supplemented by indication of changes.
    - Fraction of daily releases from Lake Mendocino for flood control, water supply, and power generation (SCWA, ACE, USGS, City of Ukiah)
    - Daily flow volumes at gauges along the Russian River (SCWA, ACE, USGS, NCRWQCB).
- Additional data needed to evaluate modification of PVP diversions (from PG&E, City of Ukiah/NCPA and/or CAISO):
    - Hourly power generation by PVP and Lake Mendocino, and CAISO's wholesale electricity prices
    - Hourly demand at substations between Cloverdale and Willits
    - Hourly energy supplied by distributed renewables between Cloverdale and Willits
    - Hourly energy supplied by utility-scale renewables between Cloverdale and Willits

1.5 Explain any nexus between project operations and effects (direct, indirect, and/or cumulative) on the resource to be studied, and how the study results would inform the development of license requirements

The study will quantify the water and energy impacts of climate-driven changes to Eel River hydrology and diversions through PVP, including modifications to operational rules to protect Eel River fisheries, "non power" licensing, and/or decommissioning.

1.6 Explain how any proposed study methodology (including any preferred data collection and analysis techniques, or objectively quantified information, and a schedule including appropriate filed season(s) and the duration) is consistent with generally accepted practice in the scientific community or, as appropriate, considers relevant tribal values and knowledge

Several very similar acceptable models already exist for projecting water balances, based on different priorities in operating rules proposed by different parties in the previous re-licensing procedure. Additions based on widely acceptable practice would be:

- Projections of hydropower based on standard engineering calculations and the turbines' baseline performance characteristics.
- Projections of local renewable energy feasibility based on widely accepted models/software that combine weather, technology performance characteristics (including storage and efficiency), and grid impacts.
- Scenario modeling of changes in water demand, disaggregated by widely accepted projections of changes in sector end-uses (i.e. residential, agricultural, commercial, and industrial).
- Scenario modeling of climate change hydrological impacts based on widely accepted methods for down-scaling Global Climate Models; many local down-scaling efforts have already been performed in California.

1.7 Describe considerations of level of effort and cost, as applicable, and why proposed alternative studies would not be sufficient to meet the stated information needs

- Climate-change impacts are not included in FERC's evaluation. This study addresses the impact of climate-driven changes in hydrology on the ability to protect fisheries under current diversion rules.
- Non power license and decommissioning are dismissed from FERC's evaluation because parties have not requested such evaluations. However, it is in the public interest to evaluate climate change impacts in case the PVP becomes inoperable in order to protect Eel River fisheries. This study will quantify the water supply and hydropower impacts of climate change.
- This study will evaluate the impact of modifications to daily and seasonal diversion rules that could improve Eel River fisheries, while maintaining adequate water supply and providing other renewables to make up the local loss of hydropower. Such modifications might include time-of-day and daily changes in diversions which are not evaluated by FERC.

915325.1

Study Request 3

Friends of the Eel River

Request for Information and Study

Effects of Climate Change on Hydrology and Stream Temperatures in the Mainstem Eel River Basin

August 4, 2017

Friends of the Eel River (FOER) hereby files this request for additional information and study with the Federal Energy Regulatory Commission (Commission or FERC) for PG&E's (Licensee) Potter Valley Hydroelectric Project (Project), FERC Project No.77 California.

Background:

There is widespread scientific consensus that the climate is expected to warm substantially over the next 30-50 years. An adequate assessment of the effects of the Potter Valley Project on threatened and endangered coldwater fisheries and related public trust resources requires quantification of climate change effects on the Eel River's hydrology and stream temperature. A suite of scenarios reflecting the probable range of future conditions should then inform analysis of a broad range of resource issues, from fisheries conservation to power production.

Pursuant to CEQ guidance[1], FERC must consider the effects of climate change as they relate to the proposed relicensing. These will include potential and probable changes in precipitation, hydrology, stream flows, and potential water yield, as well as potential effects on energy production and fisheries.

FERC cannot adequately consider the potential effects, including cumulative effects, of the proposed thirty to fifty-year license renewal without carefully reviewing projected and potential changes in environmental conditions in the project region which are certain to affect project operations and public trust resources.

As one study of climate change impacts on river ecosystems has noted, "(r)egional patterns in precipitation and temperature are predicted to change and these changes have the potential to alter natural flow regimes. The ecological consequences and the required management responses for any given river will depend not only on the direct impacts of increased temperature but on how extensively the magnitude, frequency, timing, and duration of runoff events change relative to the historical and recent flow regime for that river, and how adaptable

[1] Council on Environmental Quality, *Final Guidance for Federal Departments and Agencies on Consideration of Greenhouse Gas Emissions and the Effects of Climate Change in National Environmental Policy Act Reviews*. August 1, 2016.

the aquatic and riparian species are to different degrees of alteration." (Palmer 2009)

We do not know what the future climate will be, in part because we do not know what will happen with global emissions, and in part because there are substantial uncertainties in how the climate will respond. What we do know is that the global climate is already warming and changing in response to past carbon emissions, and that past and current carbon emissions have already entrained a significant degree of additional warming, even if we were somehow to cease all carbon emissions today. Future temperatures will be higher. What is uncertain is how quickly temperatures will continue to climb, and how our climate will respond to this disturbance.

There is no right answer because the future has not happened yet. Hence, it is important to look at a range of scenarios. FERC should consider, at a minimum, best- and worst-case scenarios, as well as some less unlikely scenario between the extremes, over the next 30, 50, and 100 years. These scenarios should include projections of potential precipitation amounts and timing, stream flow, as well as air and water temperatures.

The results of this study should be factored into studies of hydrology and instream flows, fisheries life histories, power production, and water availability.

1. Potential Resource Issues

Probable and potential future precipitation amounts and timing, as well as air and water temperatures, are likely to be key limiting factors for salmon and steelhead in the mainstem Eel River.

2. Project Nexus

Variations in precipitation and temperature will affect fisheries, associated aquatic issues, water supply, and power production. Trends toward higher temperatures, lower and more variable precipitation are likely to constrain management options more sharply. The Endangered Species Act, among other laws, requires that federal agencies use the best available science when considering potential impacts, including cumulative impacts, on listed species.

3. Relevant Information

The basic sequence of steps required for this evaluation is: 1) choose global climate models (GCMs) and climate scenarios, 2) downscale climate scenarios to get local meteorology, 3) model hydrology based on meteorology, 4) model stream temperatures based on hydrology and meteorology, 5) assess effect of those changes in hydrology and meteorology on coldwater fish species and other resource issues.

A partial list of the most relevant models and datasets that should be assessed for potential use in this project include:

1) USGS Basin Characterization Model (Flint et al. 2013) water balance and hydrologic model for current conditions and climate change scenarios, including monthly data through 2016 for all of California (https://ca.water.usgs.gov/projects/reg_hydro/projects/dataset.html) and daily data for the Upper Eel River (https://ca.water.usgs.gov/projects/reg_hydro/projects/russian_river.html)

2) USGS Geo Data Portal (https://cida.usgs.gov/gdp/) provides easy access to a range of gridded meteorological datasets and downscaled climate scenarios

3) Western U.S. Stream Flow Metrics project (Wenger et al. 2010) provides predictions for how streamflow metrics such as August streamflow will change in response to climate change, based on a VIC (Variable Infiltration Capacity) simulation model: https://www.fs.fed.us/rm/boise/AWAE/projects/modeled_stream_flow_metrics.shtml)

4) Cal-adapt (http://cal-adapt.org/) provides daily, monthly, and annual downscaled gridded observed data (Livneh et al. 2015), climate scenarios (Pierce et al. 2014) and hydrologic simulations (Livneh et al. 2015) with high spatial resolution.

5) NorWeST (Isaak et al. 2016, https://www.fs.fed.us/rm/boise/AWAE/projects/NorWeST.html) project from the US Forest Service Rocky Mountain Research Station combined observed data with spatial statistical models to estimate mean August stream temperature for each 1-kilometer reach in the North Coast of California, including the Eel River Basin. The project also provides estimates of stream temperature under several future climate change scenarios, but these estimates are based on region-wide (rather than local) sensitivities to inter-annual variability to air temperature and streamflow, so may not be very accurate for the Eel River.

6) Eel River Recovery Project compilation of observed stream temperatures in the Eel River Basin (Asarian et al. 2016)

7) Additional documents are included in the References Cited section below

4. Potential Information Gaps

What is required is area-specific analysis for a suite of relevant scenarios.

Regional climate change assessment have already performed for some of these steps; however, to assess the applicability and reliability of these results for the Eel River, it is necessary to dig into the details of such projects and assess things such as: 1) do the previous projects adequately represent the landscape attributes and physical processes most relevant to the Eel River, 2) did the previous projects make full use of important local datasets including weather and stream temperature monitoring stations as well as habitat surveys, and 3) how well do predicted results match observed data?

5. Potential Studies

We recommend the following series of steps: 1) a literature review on the magnitude and effects of climate change on streams in the Western U.S., with special focus on streams in landscapes most similar to the Eel River, 2) review of available regional datasets and models that include the Eel River, including an assessment of their relative strengths and weaknesses, and 3) in collaboration with agencies and stakeholders, develop a plan to conduct new modeling and analysis, 4) implement the modeling and analysis plan developed in step 3.

We are presenting an information request and outlining the methodology we understand to be necessary and effective in producing the needed information. The applicant's responsibility under the FPA is to either provide the requested information or to develop a more detailed Study Plan to obtain such information.

We recommend that the applicant, agencies, and stakeholders collaborate on the final study plan; however our preliminary recommendation is that the analyses and modeling provide predictions for streamflow and minimum, maximum, and average stream temperatures at a variety of sites and time periods. Temporal resolution should be at least monthly, preferably daily. Sites would be dependent upon available data (and/or where reasonable estimates can be made) but should include at least: Eel River at Bloody Rock (above Lake Pillsbury), Eel River below Scott Dam, Eel River below Cape Horn Dam, Eel River below Outlet Creek, Eel River above Middle Fork (Dos Rios), Eel River above South Fork Eel River, and Eel River at Scotia, plus the mouths of all perennial Eel River tributaries from the headwaters of the mainstem all the way down to the estuary.

Methods for quantifying the effects of climate change on streamflow and temperature include process-based simulation modeling (Perry et al. 2011, Flint et al. 2013, Null et al. 2013) and statistical modeling (Mayer 2012, Luce et al. 2014). Process-based models may have difficulty accurately simulating conditions during low flow conditions and may require a prohibitive breadth of input data such as channel morphology which may not be available for all reaches especially small streams. Statistical modeling relies on large datasets of observed data for calibration, which may not be available in sufficient quantities. Thus, we recommend that both approaches be explored (and likely utilized) for this analysis.

18 CFR § 5.9 (a): *information and studies needed for consultation under section 7 of the Endangered Species Act*

Comments, including those by Commission staff, must be accompanied by any information gathering and study requests, and should include information and studies needed for consultation under section 7 of the Endangered Species Act

The information or study resulting from this Request would inform future ESA consultation between NMFS and FERC because the Project and related facilities and operations affect ESA-listed fish, and/or their ESA-designated critical habitat, in the Eel River.

ESA-protected anadromous fish and habitat (ESA resources) which could be the subject of ESA consultation regarding the effects of the Project include:

- Northern California (NC) steelhead Distinct Population Segment (DPS) (*Oncorhynchus mykiss*), ESA threatened (Sept 2, 2005; 70 FR 52488) and associated critical habitat;

- California Coastal (CC) Chinook salmon Evolutionarily Significant Unit (ESU) (*Oncorhynchus tshawytscha*), ESA threatened (Sept. 2, 2005; 70 FR 52488) and associated critical habitat;

- Southern Oregon/Northern California Coast (SONCC) coho salmon Evolutionarily Significant Unit (ESU) (*Oncorhynchus kisutch)* (September 2, 2005, 70 FR 52488) and associated critical habitat.

As yet unlisted Eel River summer steelhead will also be the subject of ESA consultation when they are listed. (See Prince 2017)

§ 5.9 (b): 1.0 Goals and Objectives of Request

Describe the goals and objectives of each study proposal and the information to be obtained;

Study Goals and Objectives:

1) To adequately address the potential and probable impacts of climate change on coldwater fisheries and other public trust resources, we need to quantify climate change effects on the Eel River's hydrology and stream temperature. We need a suite of scenarios which translate potential and probable precipitation and air temperature regimes to associated hydrologic and water temperature regimes on the Eel over the next 30, 50, and 100 years. These projections should include projections of potential precipitation amounts and timing, stream flow, as well as air and water temperatures.

2) The scenarios produced in this study should inform analyses of coldwater fisheries management needs, but also analyses of water quality, hydrology, available flows, and potential power production.

§ 5.9 (b): 2.0 Resource Management Goals

If applicable, explain the relevant resource management goals of the agencies or Indian tribes with jurisdiction over the resource to be studied;

While the resources to be studied include surface waters, coldwater fisheries and other public trust issues as noted above, it is not clear that the questions this study seeks to address fall squarely within the jurisdiction of any agencies or tribes. The State Water Resources Control Board has broad jurisdiction over water quality, which it delegates in part to the North Coast Regional Water Quality Control Board, and over which the federal EPA exercises a degree of oversight. The California Department of Fish and Wildlife and National Marine Fisheries Service share responsibility for the protection and recovery of native and imperiled fish.

§ 5.9 (b): 3.0 Relevant Public Interest Considerations

If the requester is not a resource agency, explain any relevant public interest considerations in regard to the proposed study;

Hydrologic shifts in response to precipitation changes, as well as rising temperatures, both driven by climate change, threaten to dramatically alter the capacity of the Eel River to support native species of salmon and steelhead. These fish are central to native and regional culture and identity, and are critical to the flows of nutrients which support both plant and animal communities. These impacts threaten to compound the past and present impacts of the Project and its operations on Eel River fisheries, making recovery less likely and extinction harder to prevent.

The waters, fish, and wildlife are all held by the state in trust for its citizens. The state has no higher duty than to protect these resources so that they will still exist in unimpaired form for future generations.

§ 5.9 (b): 4.0 Existing Information and Need for Additional Information

Describe existing information concerning the subject of the study proposal, and the need for additional information;

The PAD does not reflect any information about the likely and potential future conditions in the Project area and the mainstem Eel more generally. As noted above, while quite a bit of data are available which is relevant to these questions, further analysis is necessary to translate this information into useful projections of future conditions at the level of detail and accuracy needed.

Without meaningful projections of the range of conditions the area is likely to see in the next century, it would be impossible to make reliable estimates of the impacts of potential changes on Project operations, or the cumulative impacts of Project operations on resources – fisheries, aquatic ecosystems, clean water – likely to be affected by continued climate disruption.

§ 5.9 (b): 5.0 Nexus Between Project Operations and Effects on the Resource Studied, and How the Study Results would Inform the Development of License Requirements

Explain any nexus between project operations and effects (direct, indirect, and/or cumulative) on the resource to be studied, and how the study results would inform the development of license requirements;

Project operations affect the rate, timing, temperature, and magnitude of flows in the Eel River and East Branch Russian River. Project operations depend on precipitation to refill the Lake Pillsbury reservoir.

Climate change is likely to result in changes to the timing, magnitude, temperature, and rate of flows in the basin, with as-yet uncertain but likely deleterious effects on native cold-water fisheries and associated aquatic and terrestrial ecosystems already negatively affected by the existence and operations of the Project. Analyses of a range of climate-change scenarios would allow the development of license requirements protective of public trust resources under more severe conditions. Such an analysis could also help to identify the limits of potential adaptive management measures which may be imposed by Project structures and operations.

The Project's flow schedule uses Water Year Types (WYT) to specify minimum flows. While WYTs generally assume hyrdrologic stationarity, research has shown that "WYT distributions are expected to change with warming and that environmental water uses are disproportionately vulnerable to climate change if WYT definitions remain fixed by static numerical runoff thresholds, potentially harming river ecosystems. Adapting to climate change by regularly updating WYT definitions to maintain historical WYT distributions can more equitably allocate flows between water users." (Rheinheimer, 2016)

§ 5.9 (b): 6.0 Consistency with Generally Accepted Practice

Explain how any proposed study methodology (including any preferred data collection and analysis techniques, or objectively quantified information, and a schedule including appropriate field season(s) and the duration) is consistent with generally accepted practice in the scientific community or, as appropriate, considers relevant tribal values and knowledge;

The proposed methodology is generally consistent with the best available practices in the field at this time.

§ 5.9 (b): 7.0 Considerations of Level of Effort and Cost

Describe considerations of level of effort and cost, as applicable, and why any proposed alternative studies would not be sufficient to meet the stated information needs.

We estimate that performing the steps outlined in this request would cost approximately $50,000-$250,000. If a streamflow and water temperature simulation model will already be developed and calibrated as part of another study, then the upper range of our cost estimate would be reduced from $250,000 down to $100,000.

No alternative studies are proposed which address these issues.

References cited:

Asarian, J.E., P. Higgins, P. Trichilo. 2016. Stream Temperatures in the Eel River Basin 1980-2015, Phase 1: Compilation and Preliminary Analysis. Prepared by Riverbend Sciences and the Eel River Recovery Project for State Water Resources Control Board, Sacramento, CA. 73p. + appendices. http://www.eelriverrecovery.org/documents/EelTemps_Final_20160417.pdf

Asarian, J.E. and J. Walker. 2016. Long-Term Trends in Streamflow and Precipitation in Northwest California and Southwest Oregon, 1953-2012. Journal of the American Water Resources Association (JAWRA) 52: 241-261. DOI: 10.1111/1752-1688.12381.

Asarian, J.E. 2015. Long-Term Streamflow and Precipitation Trends in the Eel River Basin. Prepared by Riverbend Sciences for Friends of the Eel River, Arcata, CA. 30p. + appendices. https://eelriver.org/wp-content/uploads/2016/08/Streamflow-and-Precipitation-Trends.pdf

Asarian, E. 2015. Assessment of altered hydrologic function, dams, and diversions within the Southern Oregon/Northern California Coast evolutionarily significant unit of coho salmon, Version 2. Prepared for NOAA Fisheries, Arcata, CA. 73 p. + appendices. https://archive.org/details/soncc_hydrologic_report_20151002_revised

Livneh, B., T.J. Bohn, D.W. Pierce, F. Munoz-Arriola, B. Nijssen, R. Vose, D.R. Cayan, and L. Brekke. 2015. A Spatially Comprehensive, Hydrometeorological Data Set for Mexico, the U.S., and Southern Canada 1950–2013. Scientific Data 2:sdata201542. doi: 10.1038/sdata.2015.42.

Flint, L.E., A.L. Flint, J.H. Thorne, and R. Boynton. 2013. Fine-Scale Hydrologic Modeling for Regional Landscape Applications: The California Basin

Characterization Model Development and Performance. Ecological Processes 2:1–21. doi: 10.1186/2192-1709-2-25.

Isaak, D.J.; Wenger, S.J.; Peterson, E.E.; Ver Hoef, J.M.; Hostetler, S.W.; Luce, C.H.; Dunham, J.B.; Kershner, J.L.; Roper, B.B.; Nagel, D.E.; Chandler, G.L.; Wollrab, S.P.; Parkes, S.L.; Horan, D.L. 2016. NorWeST modeled summer stream temperature scenarios for the western U.S. Fort Collins, CO: Forest Service Research Data Archive. https://doi.org/10.2737/RDS-2016-0033.

Luce, C., B. Staab, M. Kramer, S. Wenger, D. Isaak, and C. McConnell. 2014. Sensitivity of Summer Stream Temperatures to Climate Variability in the Pacific Northwest. Water Resources Research 50:3428–3443. doi: 10.1002/2013WR014329.

Mayer, T.D., 2012. Controls of Summer Stream Temperature in the Pacific Northwest. Journal of Hydrology 475:323–335. doi: 10.1016/j.jhydrol.2012.10.012.

Null, S.E., J.H. Viers, M.L. Deas, S.K. Tanaka, and J.F. Mount. 2013. Stream Temperature Sensitivity to Climate Warming in California's Sierra Nevada: Impacts to Coldwater Habitat. Climatic Change 116:149–170. doi: 10.1007/s10584-012-0459-8.

Palmer, M.A., Lettenmaier, D.P., Poff, N.L., Postel, S., Richter, B., and R. Warner. 2009. Climate Change and River Ecosystems: Protection and Adaptation Options. Environmental Management 44:1053-168.

Perry, R.W., Risley, J.C., Brewer, S.J., Jones, E.C., and Rondorf, D.W. 2011. Simulating Daily Water Temperatures of the Klamath River under Dam Removal and Climate Change Scenarios. U.S. Geological Survey Open-File Report 2011-1243:78pp.

Pierce, D.W., D.R. Cayan, and B.L. Thrasher. 2014. Statistical Downscaling Using Localized Constructed Analogs (LOCA). Journal of Hydrometeorology 15:2558–2585. doi: 10.1175/JHM-D-14-0082.1.

Prince D. J., O'Rourke, S.M., Thompson, T.Q., Ali, O.A., Lyman, H.S., Saglam, I.K., Hotaling, T.J., Spidle, A.P., and M.R. Miller. 2017. The evolutionary basis of premature migration in Pacific salmon highlights the utility of genomics for informing conservation. In Press Aug 18 2017 Science Advances.

Rheinheimer, D.E., Null, S.E., and J.H. Viers. 2016. Climate-Adaptive Water Year Typing for Instream Flow Requirements in California's Sierra Nevada. Journal of Water Resources Planning Management, 142(11): 0406049.

Wenger, S.J., C.H. Luce, A.F. Hamlet, D.J. Isaak, and H.M. Neville. 2010. Macroscale Hydrologic Modeling of Ecologically Relevant Flow Metrics. Water Resources Research 46:W09513. doi: 10.1029/2009WR008839.

Study Request 4

Recreation Facilities Assessment and Recreation Opportunities Study

The following study request addresses each of the seven study criteria as required in 18 C.F.R. §5.9(b).

§5.9(b)(1) —Describe the goals and objectives of each study proposal and the information to be obtained.

The purpose of this study is to provide information about the need for maintenance or enhancement of existing recreation facilities to support current and future demand for public recreation on the Potter Valley Project. The objectives of the study are to:

- Provide recreation facility inventory including identification of existing on-site amenities for each facility.
- Assess the condition of existing developed recreation facilities and amenities within the Potter Valley Project, including dispersed use areas.
- Estimate present capacity of recreation facilities at the Project to support present and future demand for public recreation (i.e. facility carrying capacity).
- Describe recreation user experience including the preferences, attitudes and characteristics at each Project facility.
- Collect information about current Project recreation activities and future demand for activities.
- Provide report Summary

§5.9(b)(2) —If applicable, explain the relevant resource management goals of the agencies or Indian tribes with jurisdiction over the resource to be studied.

The NPS has authority to consult with the FERC and applicants concerning a proposed project's effects on outdoor recreation resources under the Federal Power Act (18 CFR §§ 4.38(a), 5.41(f)(4)-(6), and 16.8(a)); the Outdoor Recreation Act (PL 88-29) and the NPS Organic Act (16 USC et seq.). The WSR Act (section 11(b)) also directs the NPS to assist, advise, and cooperate with governments, landowners, or individuals to plan, protect, and manage river and river-related resources. This is especially important for designated rivers, such as the Eel. It is thus the policy of the NPS to represent the national interest regarding recreation and to assure that hydroelectric projects subject to licensing recognize the full potential for meeting present and future public outdoor recreation demands, while maintaining and enhancing a quality environmental setting for those projects. FERC guidelines and the Federal Power Act, also provide direction to give equal consideration to other non-hydropower resources.

Per the National Wild and Scenic Rivers Act Section 7(a) the managing agency, must determine whether the project either invades or unreasonably diminishes the scenic, recreational, fish or wildlife values present at the date of designation. In an integrated licensing process a preliminary Section 7 determination will need to be submitted by the river-administering agency. These agencies include State of California, USFS, Bureau of Land Management, Round Valley Indian Reservation and the National Park Service.

Additionally, the California Wild and Scenic Rivers Act (California Public Resources Code Division 5 Parks and Monuments Chapter 1.4, 5093.50 – 5093.70) directs State Agencies to insure "the extraordinary scenic, recreational, fishery, or wildlife values are preserved in their free-flowing state, together with their immediate environments, for the benefit and enjoyment of the people of the state."

§5.9(b)(3) —If the requester is not a resource agency, explain any relevant public interest considerations in regard to the proposed study.

Sections 4(e) and 10(a) of the Federal Power Act require the Commission to give equal consideration to all uses of the waterway on which a project is located. When reviewing a proposed action, the Commission must consider the environmental, recreational, fish and wildlife, and other non-developmental values of the project, as well as power and developmental values. To fully evaluate the Project's effect on recreation, a recreational facility assessment and opportunities study is relevant to the Commission's public interest determination.

§5.9(b)(4) — Describe existing information concerning the subject of the study proposal, and the need for additional information.

The PAD includes Table 5.9-2 which provides a list of all Potter Valley Project Recreation Facilities. Hover, the PAD does not provide an amenities inventory for each recreational facility that details the following:

- Number of tent campsites
- Number of full RV hook-up campsites
- Number of partial RV hook-up campsites
- Existence of Boat Launch Facility
- Existence of Individual and Group Picnic Areas
- Number of Restrooms and Showers
- Number of auto parking spaces
- Number of auto & trailer parking spaces
- Identify all concessionaire located on facility (i.e. full-service marina, houseboat dock, camp store or snack shack)

The PAD also lacks user experience feedback for each specific Project facility.

§5.9(b)(5) — Explain any nexus between project operations and effects (direct, indirect, and/or cumulative) on the resource to be studied, and how the study results would inform the development of license requirements.

FERC regulations require that the licensee include a description of the existing recreation measures or facilities to be continued and maintained during the term of the new license, propose new measures or facilities, as appropriate, to enhancing recreational opportunities at the Project, and identify public safety in the use of Project lands and waters. In addition, recreation is a recognized project purpose at FERC-licensed projects under Section 10(a) of the Federal Power Act.

§5.8(b)(6) — Explain how any proposed study methodology (including any preferred data collection and analysis techniques, or objectively quantified information, and a schedule including appropriate field seasons(s) and the duration) is consistent with generally accepted practice in the scientific community or, as appropriate, considers relevant tribal values and knowledge.

The methods presented in this study plan are consistent with those used in recent California hydropower relicensing projects, including the Merced Project 2179, Upper Drum-Spaulding Project 2310, the Yuba-Bear Project 2266 and the Don Pedro Project 2299.

Step 1A – Inventory and Evaluate the Existing Recreation Facilities for Condition, ADA Compliance, and Use Impacts PG&E will inventory and evaluate the Project's developed recreation facilities. This will include four subtasks: (1) a complete inventory of developed recreation facilities associated with the Project including campgrounds, boat launches, marinas, swimming lagoon, picnic areas, signs, and interpretive displays; (2) an assessment of the condition of each component (tables, fire rings, restrooms, walkways, parking areas, roads, etc.) of the developed recreation facilities; (3) an assessment of whether each component complies with current ADA accessibility guidelines; and (4) an assessment of the use impacts at each recreation facility.

Step 1B – Inventory and Evaluate Recurrent Dispersed Shoreline Recreation Use Locations Along Pilsbury Reservoir Shoreline during peak summer season. Specifically, this step includes identifying recurrent dispersed recreation use locations; and assessing the use impacts at the location.

Step 2 – Identify Recreation Uses and Visitor Attitudes, Beliefs, and Preferences. PG&E should conduct observations and visitor surveys to gather information from visitors at each of the facilities listed in Table 5.9-2. The visitor survey will address study objectives. Survey topics should address items such as visitors' perceptions of the following:

- Existing and desired recreation facilities (e.g., water access, trails, campground amenities)
- Reservoir water levels on experience
- Satisfaction with shoreline access and opportunities
- Comparison of Project recreation resources to other regional recreation resource areas that provide similar recreation opportunities
- Personal safety
- Crowding
- Conflict
- Visitor's actual and desired primary destination and activities, including a specific series of questions for anglers
- Actual and desired activities
- Constraints or barriers to participation that are potentially within the Projects control (e.g. lawlessness, trail conditions, campfire use, private property conflict and trespass, parking access and fees)

- Ways to enhance their recreation experience

Step 3 – Estimate Current Recreation Use

Step 4 – Identify Future Use and Demand Opportunities

Identify the future use and demand opportunities from three perspectives: (1) assessing the existing unmet demand; (2) assessing future recreation demand; and (3) assessing the regional uniqueness or significance of the Project for recreation

Step 5 – Data Analysis and Report Preparation

§5.9(b)(7) —Describe considerations of level of effort and cost, as applicable, and why any proposed alternative studies would not be sufficient to meet the stated information needs.

The cost will depend on what information is readily available and what requires additional work, and is estimated to be $185,000.

915477.1

Study Request 5

Whitewater Boating Study

The following study request addresses each of the seven study criteria as required in 18 C.F.R. §5.9(b).

§5.9(b)(1) —Describe the goals and objectives of each study proposal and the information to be obtained.

The purpose of this study is to evaluate the impacts of the hydropower project on existing and potential recreational whitewater boating use in major streams within the Project, including; the Upper Main Eel from Mt Road Bridge to Sunset Campground; the Pilsbury Run from below Scott Dam to Trout Creek Campground; Van Arsdale to Hearst from below Cape Horn Dam to Hearst; Hearst Run from Hearst to Highway 162 bridge over the Eel; and Outlet Creek Run from Highway 162 bridge over the Eel to Highway 162 milepost 14.5 just above the Middle Fork Eel.

Generally, the components of the study should include: (1) an analysis of the hydrology including Spill Cessation Analysis and a description of project operations and their impact on flows in the Eel Watershed; (2) conducting recreation user and stakeholder focus groups; (3) conducting a site visit; (4) the potential for conducting a controlled flow study to determine minimum and optimal flows for boating, if warranted by findings of the hydrologic analysis; and (5) a report on the outcome of these components, describing existing and potential recreation opportunities and improvements to access.

§5.9(b)(2) —If applicable, explain the relevant resource management goals of the agencies or Indian tribes with jurisdiction over the resource to be studied.

The Project has the potential to affect 64.4 river miles of whitewater resources including; the Upper Main Eel; the Pilsbury Run; Van Arsdale to Hearst; the Hearst Run; and the Outlet Creek Run.

The NPS has authority to consult with the FERC and applicants concerning a proposed project's effects on outdoor recreation resources under the Federal Power Act (18 CFR §§ 4.38(a), 5.41(f)(4)-(6), and 16.8(a)); the Outdoor Recreation Act (PL 88-29) and the NPS Organic Act (16 USC et seq.). The WSR Act (section 11(b)) also directs the NPS to assist, advise, and cooperate with governments, landowners, or individuals to plan, protect, and manage river and river-related resources. This is especially important for designated rivers, such as the Eel. It is thus the policy of the NPS to represent the national interest regarding recreation and to assure that hydroelectric projects subject to licensing recognize the full potential for meeting present and future public outdoor recreation demands, while maintaining and enhancing a quality environmental setting for those projects. FERC guidelines and the Federal Power Act, also provide direction to give equal consideration to other non-hydropower resources.

Per the National Wild and Scenic Rivers Act Section 7(a) the managing agency, must determine whether the project either invades or unreasonably diminishes the scenic, recreational, fish or wildlife values present at the date of designation. In an integrated licensing process a preliminary Section 7 determination will need to be submitted by the river-administering agency. These

agencies include State of California, USFS, Bureau of Land Management, Round Valley Indian Reservation and the National Park Service.

Additionally, the California Wild and Scenic Rivers Act (California Public Resources Code Division 5 Parks and Monuments Chapter 1.4, 5093.50 – 5093.70) directs State Agencies to insure "the extraordinary scenic, recreational, fishery, or wildlife values are preserved in their free-flowing state, together with their immediate environments, for the benefit and enjoyment of the people of the state."

§5.9(b)(3) —If the requester is not a resource agency, explain any relevant public interest considerations in regard to the proposed study.

Sections 4(e) and 10(a) of the Federal Power Act require the Commission to give equal consideration to all uses of the waterway on which a project is located. When reviewing a proposed action, the Commission must consider the environmental, recreational, fish and wildlife, and other non-developmental values of the project, as well as power and developmental values. To fully evaluate the Project's effect on recreation, a whitewater recreation study is relevant to the Commission's public interest determination.

Whitewater recreation takes place on the Eel River when flows allow, which are impacted by project operations. As part of the licensing effort, a comprehensive look at recreation needs should be conducted per FERC guidance to evaluate existing and potential future recreation needs (18 C.F.R. 4.51).

§5.9(b)(4) — Describe existing information concerning the subject of the study proposal, and the need for additional information.

The PAD utilizes existing information from *California Creeks Whitewater Boating Web Guide* (Tuthill et al. 2016) but does not include information from Cassidy and Calhoun's *California Whitewater. A Guide to the Rivers,* Holbeck and Stanley's *The Best Whitewater in California.* and Menten's *The New School Guide to Northern California Whitewater*

The PAD lacks information that would characterize Spill Cessation.

The PAD also lacks a description of potential improvements that could be conducted to help enhance real time hydrology information on boatable flows or other options for enhancing the experience.

§5.9(b)(5) — Explain any nexus between project operations and effects (direct, indirect, and/or cumulative) on the resource to be studied, and how the study results would inform the development of license requirements.

Project operations impact all flow-dependent recreational opportunities and the aesthetic experience of those who engage in river-based recreation in the project area. Results from a whitewater boating study will inform relevant license requirements that could address impacts

that are identified. The results will also inform the public interest determination regarding whether to relicense this project.

§5.8(b)(6) — Explain how any proposed study methodology (including any preferred data collection and analysis techniques, or objectively quantified information, and a schedule including appropriate field seasons(s) and the duration) is consistent with generally accepted practice in the scientific community or, as appropriate, considers relevant tribal values and knowledge.

The recommended study methodology is to follow those summarized in *Flows and Recreation: A Guide to Studies for River Professionals* (Whittaker, Shelby and Gangemi 2005). The methodology described in the guide is consistent with generally accepted practices in the scientific community. This is a phased approach where the results of a "Level 1" assessment are used to determine whether "Level 2" and "Level 3" assessments are warranted.

A **Level 1 Assessment** includes:

Hydrology Assessment. Summarize the hydrology of the Project area and the hydrologic relationship between river gages and the river flows of the relevant reaches. Characterize historic Spill Cessation. Describe how the project operations work and affect the hourly, daily, and monthly flows and potential recreation opportunities. This summary of information may also include interviews with people knowledgeable about the river system and the gages on the river.

Interviews, Recreation Focus Group, and Stakeholder Meetings. Interviews should be conducted with key resource experts and recreation users to gain additional information about recreational opportunities and the Project's hydrology. A stakeholder and focus group meeting should be conducted with recreation users with the purpose further identifying recreation flows, access to the project, and potential needs. The meeting should include a presentation on the results of the hydrologic analysis and existing information on recreation access and boatable flows. It should also serve as a way to gather input from recreation users on use, optimum boatable flows, access and other potential needs for improvements to enhance the experience.

The focus groups should include whitewater boaters, NGOs, and agency recreation staff. They should include questions about 1) how people use the river, with the goal to describe the character of recreation opportunities and identify flow-dependent attributes; 2) the effects of flows on those attributes and whether participants can identify specific flows that affect the quality of opportunities; and 3) how to prioritize opportunities and identify recreation users' need for improved access and flow information. Interviews with agency staff will include questions about facility and use information, as well as relevant hydrology information.

Report. The results of the two study components should be summarized in a report that describes the hydrology, optimum recreation boating flows, and project effects on recreation flows; recreation access to the project; and potential improvements and information needs to consider as part of the licensing process. The report should be released in draft form to interested stakeholders with an opportunity to provide comment.

The report should also include documentation of the recreational needs and explicit analysis for whether studies should progress to Level 2. The decision rests on the answers to these basic questions:

1) Are there flow-dependent recreation opportunities available in the subject stream reaches?
2) Are flow-dependent opportunities affected by project operations?
3) Are flow-dependent recreation opportunities "important" relative to other resources or foregone generation?
4) Does Level 1 information precisely define flow ranges?

If the answers to these questions are outstanding, a **Level 2 Assessment** will be necessary. This involves:

Site Visits: A site visit with experienced whitewater boaters will provide stakeholders with an enhanced understanding of Project operations and an opportunity for dialogue on what, if any, changes may be desirable. Participants should scout each river reach to examine the quality and characteristics of boating opportunities, estimate potential flow ranges, identify obvious hazards, and determine whether an on the water flow study is necessary to evaluate whitewater recreation opportunities.

A site visit should be planned for the spring or early summer. This will offer a greater probability of observing higher than base flow levels. It also provides sufficient time to develop preliminary hydrology information about higher flows, become familiar with the resource via interviews and existing literature, and set up logistics with local whitewater boaters who may help guide the site visit. The site visit should include evaluations of the three reaches for all recreation opportunities.

Report: The Level 2 report should include an assessment of the study participant's evaluations of the potential quality and characteristics of the boating opportunities, including difficulty, type of run, and the type of craft suitable for the run. The report should also describe potential flow ranges, obvious hazards, and recommendations for implementing an on the water flow study, if necessary.

If warranted, a **Level 3 Assessment** should involve an on the water controlled flow study where boaters can determine acceptable and optimal instream flow conditions. The Level 3 report should describe the whitewater boating attributes of the range of flows studied (including difficulty, unique features, and portage requirements), the acceptable and optimal flows for each reach, and the frequency of availability of the identified flows under current and any proposed project operation. The report should also incorporate results from the other studies that may be relevant to identifying competing uses or resource needs.

§5.9(b)(7) —Describe considerations of level of effort and cost, as applicable, and why any proposed alternative studies would not be sufficient to meet the stated information needs.

The cost will depend on what information is readily available and what requires additional work, and is estimated to be $50,000, based upon whether or not on the water flow studies are conducted.

915478.1

Study Request 6

Request for Information or Study

Investigation of Sediment Contamination and Bioaccumulation of Hazardous and Toxic Constituents in Aquatic Organisms

Prepared for:

FERC

Potter Valley Project, FERC No. 77

Prepared by:

California Trout
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August 4, 2017

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California Trout and Friends of the Eel River hereby file this request for additional information and study with the Federal Energy Regulatory Commission (Commission or FERC) for PG&E's (Licensee) Potter Valley Hydroelectric Project (Project), FERC Project No.77.

1 BACKGROUND

The Upper Main Eel River Hydrologic Area is included on the North Coast Regional Water Quality's 303 (d) list of impaired water bodies and is specifically cited for sediment/siltation and temperature. The Upper Main Eel River and Lake Pillsbury are also included on the 303(d) list as mercury impaired. TMDLs for siltation/sediment and temperature have also been developed for the Upper Eel River by the U.S. EPA (2004). The TMDL notes that Lake Pillsbury is a sediment trap and retains 94% of sediments delivered from the watershed above (Brown and Ritter 1971, cited by EPA 2004). Beneficial uses for the Upper Main Eel River Hydrologic Area are established in the North Coast Regional Water Quality Control Board's (NCRQCB) Basin Plan (2011) and include Rare, threatened and endangered species, Migration of aquatic organisms, Spawning habitat, and Cold freshwater habitat, among others.

Additionally, some tributaries in the Eel River watershed have been noted for their high levels of natural occurring aluminum, but most tributaries have not yet been sampled. When combined with water quality conditions that include low pH, aluminum can cause toxicity to fish and other aquatic organisms (Poléo 1995), which can lead to gill rot and other factors contributing to mortality. Naturally occurring aluminum is associated with erosion of clay soils, which occur at ecologically detrimental rates in the Eel River watershed (U.S. EPA 2004). Given the combination of naturally occurring high levels of aluminum and highly erosive soils, aluminum toxicity should be assessed by the Licensee.

Dioxins may also be present in sediments stored behind the dams and in the riverine environment downstream of Cape Horn Dam, as they are generated from naturally occurring forest fires. To date, dioxin sampling within the geographic scope of Project operations as been limited, if it has occurred at all.

This Study Request focuses on testing 1) sediments in both reservoirs for mercury contamination, and 2) pelagic and riverine species to assess current and potential mercury and dioxin bioaccumulation related to ongoing and/or modified Project operations, including assessing implications with partial or full Project decommissioning. The Study Request also includes sampling for aluminum to assess the risk of potential fish toxicity. In coordination with ILP participants, the Licensee will evaluate if testing should also include additional contaminant constituents, including but not limited to PCBs and other hazardous metals or toxins.

The Potter Valley Project No. 77 (Project) diverts Eel River stream flow out-of-basin to the Russian River and creates numerous other impacts to the Eel River fishing, including but not limited to impeding fish passage at both Cape Horn and Scott dams, blocking access to mainstem and tributary habitat, and altering natural hydrology, water quality, and water temperature. The combined effects of the Project are significant and detrimental to Eel River fishery, ultimately constraining fishery recovery within the basin.

Since Project construction and continuing through Project operations, sediments have been accumulating behind both Cape Horn Dam and Scott Dam beneath the surface of Van Arsdale Reservoir and Lake Pillsbury, respectively. In addition, fine sediment deposition in the Eel River Estuary may also cause contaminant deposition and bioaccumulation. These sediments have the potential to accumulate mercury and other hazardous substances. Sediments beneath both reservoirs must be sampled to characterize mercury contamination that would be released to the downstream riverine environment through Project modification or decommissioning necessary to mitigate impacts to the Eel River fishery.

Additionally, mercury bioaccumulation in aquatic species within the Project boundary, or related to Project operations, must be more thoroughly investigated to better understand implications to future Project operations, including partial or full decommissioning thereof. Already, Lake Pillsbury has been issued a mercury advisory by the Office of Environmental Health Hazard Assessment (OEHHA). Since 2000, samples from pelagic species have exceeded the U.S. Food and Drug Administration (FDA) Action Level of 1.0 ppm. Another investigation conducted by the California State Water Board also found methylmercury concentrations in Lake Pillsbury documented at 1.31 ppm, which exceeds the 0.44 ppm (wet weight) OEHHA threshold (Davis et al. 2010). Dioxin also bioaccumulates and is likely present due to the historic and contemporary occurrence of forest fires throughout the watershed.

This investigation will also help evaluate the potential for exposing or transporting contaminated sediment, should Project modification or decommissioning occur, to better support fishery or other resource objectives.

2 STUDY AREA

The Study Area to be included for this Study Request includes Lake Pillsbury, Van Arsdale Reservoir, and the mainstem Eel River downstream to at least the Middle Fork Eel River confluence, as well as the Eel River Estuary. Sediment and biological samples in reaches downstream of the Middle Fork confluence and the Eel River Estuary may also be necessary.

2.1 Facilities and Operations to Be Investigated

Facilities and operations to be investigated through this Study Request include:

- Lake Pillsbury,
- Van Arsdale Reservoir, and
- The Eel River downstream of Van Arsdale Reservoir to the Middle Fork Eel River confluence, and the Eel River Estuary.

Operations to be evaluated through this Study Request include the impoundment and diversion of water to support PVP operations and downstream releases to the mainstem Eel River below Cape Horn Dam.

Sedimentation is a significant issue within Project reservoirs. The Licensee's Scoping Document #1 indicates the capacity of Van Arsdale Reservoir has decreased from 1,457 acre feet to less than 390 acre feet (in 2006) as a result of sediment accumulation over time. Similar reductions in storage capacity resulting from sedimentation have been documented for Lake Pillsbury (EPA 2004). Sediment accumulation continues to be ongoing in both reservoirs.

3 BIOLOGICAL AND PHYSICAL ELEMENTS

California Trout and Friends of the Eel River request that the Licensee evaluate mercury, and, as needed, other hazardous constituents in reservoir sediments and downstream riverine environments with respect to effects and bioaccumulation on the following anadromous species (hereafter collectively referred to as "target species"):

- Northern California (NC) Coast Steelhead (*Oncorhynchus mykiss*), including:
    - Summer Steelhead, and
    - Winter Steelhead;
- California Coastal (CC) Chinook salmon (ESU) (*Oncorhynchus tshawytscha*);

- Southern Oregon/Northern California Coast (SONCC) Coho salmon (*Oncorhynchus kisutch);*
- Pacific Lamprey (*Entosphenus tridentatus*), which reside in sandy riverine deposits prior to outmigration to the ocean, are most vulnerable for bioaccumulation of mercury and similarly hazardous substances.

The following species will be sampled to evaluate bioaccumulation that may occur as a result of exposure to contaminated sediments or water, in addition to Pacific Lamprey ammocoetes, listed above as a target species.

- Largemouth bass (*Micropterus salmoides*)
- Midge (*Chironomus dilutes*)
- Freshwater epibenthic amphipod (*Hyalella azteca*)
- Freshwater clam (*Corbicula fluminea*)

4 STUDY REQUEST ELEMENT #1: DEVELOP A QUALITY ASSURANCE PROJECT PLAN

In coordination with ILP Participants, the Licensee shall develop sampling design and quality assurance guidelines for the sediment contamination and bioaccumulation study. The Quality Assurance Project Plan (QAPP) will include the following components:

4.1 Project Management

1. Distribution lists,
2. Project and task organization and descriptions,
3. Problem definition and background,
4. Quality objectives and criteria for laboratory analytical data,
5. Special training and certifications, and
6. Documents and records.

4.2 Data Generation and Acquisition

1. Sampling process design,
2. Sampling methods,
3. Sampling handling and custody,
4. Quality control,
5. Instrument and equipment testing, inspecting and maintenance,
6. Instrument and equipment calibration and frequency,
7. Inspection/acceptance for supplies and consumables,
8. Non-direct measurements, and
9. Data management.

4.3 Assessment and Oversight

1. Assessment and response actions, and
2. Reports to management

4.4 Data Validation and Usability

1. Data review, verification, and validation outcomes,

2. Verification and validation methods, and
3. Reconciliation with user requirements.

5 STUDY REQUEST ELEMENT #2: RESERVOIR SAMPLING AND LABORATORY ANALYSES

5.1 Sampling Locations

Sediment and elutriation sampling locations will occur in Van Arsdale Reservoir, Lake Pillsbury, and the Eel River between Cape Horn Dam and the Middle Fork confluence. No less than eight samples shall be collected from each reservoir, with the location of sites to be balanced between on and off thalweg sites, evenly distributed throughout the reservoir. In addition, to individual sampling, super-composite sampling may also be utilized. Sampling locations will be reviewed with ILP participants in advance of sampling.

Riverine sampling locations in the mainstem Eel River between Cape Horn Dam and the Middle Fork Eel River confluence will be average five miles apart, summing to no less than eight sampling sites. Sampling locations specified in the QAPP, and identified in consultation with ILP participations.

Sampling locations for reservoir and riverine sites can be co-located with study sites for bioaccumulation investigations, as appropriate (Section 6).

No less than two Eel River Estuary samples should be analyzed to give a coarse estimate of current (background) Eel River Estuary contaminant concentrations. Project decommissioning will likely release sediment downstream, and this material may ultimately discharge to the Pacific Ocean through the estuary. Estuary sediment analyses will provide a preliminary indication of background contaminant levels at the mouth of the Eel River, but are not meant to provide a complete or representative characterization of contaminant concentrations within Eel River or its estuary.

5.2 Sampling Methods

Reservoir sediments are to be obtained from drilling core samples or other appropriate methods, based on the location of the sampling site in accordance with the procedures established in the QAPP. Once collected, the samples are to be submitted for laboratory analysis, also in accordance with the QAPP.

5.3 Constituents to be Sampled

The Licensee shall, at minimum, focus investigations to sample for mercury, aluminum, and dioxins. The Licensee, in coordination with ILP participants, should evaluate if sampling for additional harmful constituents is warranted (e.g., PCBs and other regulated toxic substances). Sampling results are to be compared against established federal and state thresholds for safe concentrations, such as those established by the Northwest Regional Sediment Evaluation Team (2016), the U.S. EPA, and the California State Water Board, including thresholds cited in the Basin Plan (2011). Sampling results should also be evaluated relative to the California standards for Tribal and Subsistence Fishing Beneficial Uses and Mercury Provisions (4 ng/L total mercury), given there is more than one active tribal fishery in the basin.

5.4 Laboratory Analysis

All laboratory analyses shall be conducted as outlined in the QAPP.

6 STUDY REQUEST ELEMENT #3: BIOACCUMULATION INVESTIGATIONS

6.1 Sampling Locations

Organisms collected for bioaccumulation sampling locations are to be located in Lake Pillsbury, Van Arsdale Reservoir, and the mainstem Eel River from Cape Horn Dam downstream to the Middle Fork Eel River confluence.

6.1.1 Reservoir Bioaccumulation Sampling

The number of sampling locations in each of the two reservoirs will be no less than eight per reservoir, with sampling locations specified in the QAPP, and identified in consultation with ILP participations. Sampling locations may be co-located with sediment sampling investigation sites.

6.1.2 Riverine Bioaccumulation Sampling

The USFWS investigated bioaccumulation in two riverine filter feeders: Pacific Lamprey ammocoetes and pearlshell mussels *(Margaritifera falcate)* to evaluate mercury contamination in the Trinity River basin (Bettaso and Goodman 2008). Like the upper Eel River watershed, the upper Trinity River has experienced mining activities, leaving a legacy of contamination of mercury and other substances. The Trinity River investigation detected mercury at all sampled sites, and found that Pacific Lamprey ammocoetes contained levels of mercury 12 to 25 times those of mussels from the same site. Because Pacific Lamprey ammocoetes spend up to five to six years buried in fine sediments, they may be a superior bioindicator for mercury (Bettaso and Goodman 2008) and other sediment-based contaminants. The study also found that levels of mercury became more concentrated in the downstream direction (Bettaso and Goodman 2008).

Sampling locations in the mainstem Eel River between Cape Horn Dam and the Middle Fork Eel River confluence should average five miles apart, summing to no less than eight sampling sites. Sampling locations specified in the QAPP, and identified in consultation with ILP participants.

6.2 Sampling Methods and Organisms to be Sampled

Bioaccumulation sampling methods will be applied in accordance with the procedures established in the QAPP. Once collected, the samples are to be submitted for laboratory analysis, also in accordance with the QAPP. Species to be sampled include:

1. Largemouth bass
2. Northern California Coast Steelhead
3. Midge
4. Freshwater epibenthic amphipod
5. Freshwater clam
6. California blackworm
7. Pacific Lamprey ammocoetes

This species list is based on recent bioaccumulation studies and sampled species conducted in associated with the Klamath River dam removal investigations (BOR 2010) as well as the strong indication that lamprey ammocoetes are a bioindicator species for contamination (Bettaso and Goodman 2008).

Sampling methods will be applied to 4-day, 10-day, or 28-day elutriate or sediment bioassays and/or sediment bioaccumulation studies, based on which approach is most appropriate for specific species listed above, in accordance with the QAPP. Pelagic species listed above will be sampled within reservoir environments; riverine species will be sampled at riverine sampling sites.

6.3 Constituents to be Sampled

Organisms sampled or bioaccumulation investigations will be tested, at minimum, for mercury, aluminum, and dioxins. The Licensee, in coordination with ILP participants, should evaluate if sampling for additional harmful constituents is warranted (e.g., PCBs and other regulated toxic substances).

6.4 Laboratory Analysis

All laboratory analyses shall be conducted as outlined in the QAPP.

7 FERC STUDY REQUEST CRITERIA

7.1 Goals and Objectives of Request

The goal of this Study Request is to determine if, and to what extent, sediments and aquatic organisms in Lake Pillsbury, Van Arsdale Reservoir, and the mainstem Eel River are contaminated with hazardous materials, with an emphasis on mercury, aluminum, and dioxins. The Licensee should transparently evaluate if a broader investigation that also samples for PCBs, and others constituents that pose a risk to human and environmental health is necessary.

Sediment impounded behind Scott Dam and Cape Horn Dam may contain chemical or biological contaminants that if exposed or transported, could threaten local, regional, or down-stream environments. A significant volume of sediment is stored behind the dams and existing sampling data suggest the sediments may contain potential contaminants. The collection of additional data is critical to making an informed and responsible decision for or against partial or full Project decommissioning, determining associated cost estimates of Project modifications or decommissioning, and implications to potential engineering and design alternatives.

7.2 Resource Management Goals of California Trout and Friends of the Eel River

California Trout (CalTrout) is a statewide non-profit organization dedicated to solving complex resource issues while balancing the needs of wild fish and people. We believe that abundant wild fish indicate healthy waters and that healthy waters mean a better California. California Trout pursues science-based solutions that work for diverse interests of fish, farms, commerce, and people.

California Trout organizes and facilitates the Eel River Forum, comprised of 22 stakeholder organizations. The Eel River Forum is a coalition of public agencies, Indian tribes, conservation partners, and other stakeholders with interest in or responsibility for the environmental stewardship of the Eel River. The Eel River Forum works collaboratively to:

- Understand the status of Eel River salmonid populations and other native fisheries resources.
- Identify and prioritize recovery issues and challenges.
- Promote specific research, restoration, and monitoring efforts in the Eel River basin
- Develop and recommend plans and policies that will promote the recovery of the Eel River ecosystem and its native fish populations.

Considerable efforts have been made in recent years by resource agencies, private industries, conservation organizations, and other stakeholders to promote watershed restoration and protect the Eel River's fisheries resources.

The mission of the Eel River Forum is to coordinate and integrate conservation and recovery efforts in the Eel River watershed to conserve its ecological resilience, restore its native fish populations, and protect other watershed beneficial uses. These actions are also intended to enhance the economic vitality and sustainability of human communities in the Eel River basin. The Eel River Forum's goal is to achieve consensus among a coalition of agency, tribal, and conservation partners regarding priority recovery actions and policy reform needed to recover salmonid populations in the Eel River basin, California's third largest watershed.

In June of 2016, the Eel River Forum, led by California Trout and our partners, released the Eel River Action Plan. The plan identifies priority actions needed to recover the Eel River watershed and its native fish. It aims to achieve these goals while maintaining multiple land uses and recreation in the watershed. Priority actions in the plan address water diversions, water quality issues, habitat restoration, community engagement and protecting the Eel River Delta.

Friends of the Eel River's purpose is to promote and protect the natural resilience of the Eel River and the community of life it supports; to encourage actions which serve the integrity, stability, and beauty of the river and its watershed, and to oppose those which tend otherwise. FOER uses public education, advocacy, and strategic litigation where necessary to protect critical public trust resources. Friends of the Eel River also participates in the Eel River Forum.

7.3 Relevant Public Interest Considerations

California Trout has 10,000 members statewide. Friends of the Eel River has 2,000 members across the country. Our memberships value the Eel River fishery and wishes to see a restored Eel River ecosystem that supports improved aquatic health, recovery of salmonids, lamprey, and other at-risk species, and restored stream flows to the Eel River watershed. PG&E has been able to operate and profit from their Project at the expense of our membership and public trust resources. Existing mitigation required of PG&E for Project operations to date has been insufficient to remedy detrimental impacts of the Project to the Eel River fishery, both economically and ecologically.

Project dams impound water and sediments. These sediments may harbor harmful constituents that could further pollute the downstream environment if disturbed. Already, Project operations may be contributing to bioaccumulation of toxins and metals in biota and organisms utilizing reservoirs and the downstream riverine environment. If polluted sediments exist, the cost of removing these sediments or preventing further human exposure may very well be immense and a key factor in developing engineering guidelines and feasibility assessments for Project decommissioning. Understanding the extent of contaminated sediment and bioaccumulation in order to prevent risk of human exposure to toxins and metals is fundamental to the public interest.

7.4 Existing Information and Need for Additional Information

There is no available information related to sediment contamination or bioaccumulation of metals or other hazardous constituents in aquatic organisms described in the PAD. To our knowledge, reservoir sediment contamination investigations have never been conducted, and bioaccumulation studies have been limited and include those conducted by OEHHA as well as Davis et al. (2010); Bioaccumulation sampling has not yet investigated bioaccumulation of species downstream of Cape Horn Dam in riverine environments.

Determining if, and to what extent, reservoir sediments are contaminated is essential to evaluating the Licensee's application for a modified license. These sediments could be disturbed through construction necessary to achieve fish passage or through Project decommissioning. If contaminated sediments are disturbed, they could pollute downstream environments, cause harm to aquatic organisms, and put human health at risk.

Additionally, many known contaminants such as metals, PCBs, and dioxins bioaccumulate in aquatic invertebrates and other organisms, through the food chain. This bioaccumulation is also dangerous to human health. It is necessary to better understand the degree to which bioaccumulation in Project facilities and downstream environments is occurring, and how future rates of bioaccumulation could potentially increase as a result of continued Project operations.

7.5 Nexus Between Project Operations and effects on the Resources Studies, and How the Study Results Would Inform the Development of License Requirements

Ongoing Project operations without significant modifications would require Cape Horn Dam and Scott Dam to remain in place. These dams impound water and sediments, and these sediments may be polluted due to historic (pre-Project) and contemporary (within-Project) environmental factors, such as legacy mining and power generation. Many toxic substances most commonly found in reservoir and riverine environments (e.g., metals, PCBs, and dioxins) are persistent and do not degrade quickly, posing significant risk to human and environmental health.

We know, at minimum, mercury is a significant environmental and human health issue within the Project's geographic scope. OEHHA has detected harmful levels of mercury in fish in Lake Pillsbury and issued a health advisory. Mercury and other harmful constituents bioaccumulate through the food chain and may affect other aquatic organisms, including downstream salmonids which are regularly consumed through recreational and tribal harvest. This map present a serious human health risk.

In order to inform future license requirements and/or Project decommissioning, sediments must be thoroughly sampled. The degree to which bioaccumulation of harmful constituents occurring in downstream riverine environments needs to investigated, as such bioaccumulation is associated with current and future Project operations and would be a significant factor for consideration in developing future license requirements or assessing the feasibility of decommissioning in the EIS.

7.6 Consistency with Generally Accepted Practice

It is Licensee's responsibility under the Federal Power Act is to either provide the requested information or to develop a more detailed Study Plan to obtain such information. It is anticipated that the Licensee and FERC will work with ILP participants to develop a study that obtains the requested information, or that adequate information, approved by FERC, is provided by the Licensee.

All standards for sampling shall be drawn from the 2016 Sediment Evaluation Framework for the Pacific Northwest (SEF), the United States Army Corps of Engineers (USACE) Inland Testing Manual, the 2016 USACE Dredge Materials Evaluation and Disposal Procedures User's Manual (DMMP), California mercury standards for Tribal and Subsistence Fishing Beneficial Uses, and the 2008 National Oceanic and Atmospheric Administration (NOAA) Screening Quick Reference Tables (Squirts) (BOR 2010), or more recently updated version thereof. Elutriate data will be evaluated through comparison with regional, state and federal standards for water quality.

7.7 Consideration of Level of Effort and Cost

California Trout and Friends of the Eel River consider that the cost of these studies to be between $300,000 and $500,000. To date, the PG&E have not submitted any proposal to sample reservoir sediments or riverine environments/organisms for hazardous mercury or other constituents. The scope of the Project's potential effects is considered vast and long-term. Considering the potential for ongoing decimation of the Eel River's fishery, environmental disturbance, the potential to affect species listed under the Endangered Species Act, and the recent closure of Chinook fisheries on the

West Coast of the United States, the level of effort and cost for the Applicant is commensurate with the revenues derived from sales of generated energy.

8 REFERENCES

Bettaso, J. and D. H. Goodman. 2008. Mercury contamination in two long-lived filter feeders in the Trinity River basin: a pilot project. U. S. Fish and Wildlife Service, Arcata Fish and Wildlife Office, Arcata Fisheries Technical Report Number TR2008-09 Arcata, California.

Davis, J.A., A.R. Melwani, S.N. Bezalel, J.A. Hunt, G. Ichikawa, A. Bonnema, W.A. Heim, D. Crane, S. Swenson, C. Lamerdin, and M. Stephenson. 2010. Contaminants in Fish from California Lakes and Reservoirs, 2007-2008: Summary Report on a Two-Year Screening Survey. A Report of the Surface Water Ambient Monitoring Program (SWAMP). California State Water Resources Control Board, Sacramento, CA.

North Coast Regional Water Quality Control Board. 2011. Water Quality Control Plan for the North Coast Region.

Northwest Regional Sediment Evaluation Team (RSET). 2016. Sediment Evaluation Framework for the Pacific Northwest. Prepared by the RSET Agencies, July 2016, 160 pp plus appendices.

Poléo, A. 1995. Aluminum polymerization—a mechanism of acute toxicity of aqueous aluminum to fish. Aquatic Toxicology. Vol. 31, Issue 4: 347-356.

U.S. Bureau of Reclamation (Reclamation). 2010. Quality Assurance Project Plan. Sediment Contaminant Study, Klamath River Sediment Sampling Program.

U.S. Environmental Protection Agency (EPA). 2004. Upper Main Eel River and Tributaries (including Tomki Creek, Outlet Creek and Lake Pillsbury), Total Maximum Daily Loads for Temperature and Sediment.

Study Request 7

Request for Information or Study

Assessment of Anadromous Fishery Potential Upstream of the Potter Valley Project

Prepared for:

FERC

Potter Valley Project, FERC No. 77

California Trout
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August 4, 2017

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California Trout, Inc (CalTrout) and Friends of the Eel River (FOER) hereby files this request for additional information and study with the Federal Energy Regulatory Commission (Commission or FERC) for PG&E's (Applicants) Potter Valley Hydroelectric Project (Project), FERC Project No.77.

1 BACKGROUND

Continued operation and maintenance (O&M) of the Potter Valley Project No. 77 (Project) diverts Eel River stream flow out-of-basin to the Russian River and creates numerous other impacts to the Eel River fishing, including but not limited to impeding fish passage at both Cape Horn and Scott dams, blocking access to mainstem and tributary habitat, and altering natural hydrology, water quality, and water temperature. The combined effects of the Project are significant and detrimental to Eel River fishery, ultimately constraining fishery recovery within the basin.

This Study Requests includes investigations of fish habitat for target species (defined below) above Scott Dam and alternatives which would allow fish passage past Scott Dam. Previous work by VTN (1982) qualitatively evaluated habitat above the Project, and more recently, Cooper (2017) identified that there is substantial habitat available to anadromous salmonids above Scott Dam. This study request would build on the work of Cooper (2017) to assess anadromous fish and lamprey passage, anadromous fish production using individual based modeling (IBM) approaches, predation risk to any potential reintroduction of anadromous salmonids from non-native Pikeminnow, and water temperature.

2 STUDY AREA

The Study Area to be included for this Study Request includes the Eel River from Scott Dam to the natural end of fish use for the Eel River watershed, including a restored channel in the Lake Pillsbury inundation area if Scott Dam is decommissioned.

2.1 Facilities and Operations to Be Investigated

Facilities to be investigated through this Study Request include:

- Scott Dam
- Lake Pillsbury

Operations to be evaluated through this Study Request include the operation of Scott Dam, which is a barrier to fish passage, and the resultant impoundment (Lake Pillsbury).

3 BIOLOGICAL AND PHYSICAL ELEMENTS OF TARGET SPECIES

California Trout, Inc and Friends of the Eel River request the Licensee evaluate project removal scenario alternatives with respect to effects on the following anadromous species (hereafter collectively referred to as "target species"):

- Northern California (NC) Coast Steelhead (*Oncorhynchus mykiss*), including:
    - Summer Steelhead, and
    - Winter Steelhead;
- California Coastal (CC) Chinook Salmon (*Oncorhynchus tshawytscha);*
- Southern Oregon/Northern California Coast (SONCC) Coho Salmon (*Oncorhynchus kisutch)*
- Pacific Lamprey (*Entosphenus tridentatus).*

4 STUDY REQUEST ELEMENTS

The Potter Valley Project currently blocks anadromous fish passage into the Eel River upstream of Scott Dam. As part of the relicensing process, Licensee should assess the methods of passage over Scott Dam and into the Upper Eel River, model anadromous fish production under an Upper Eel River (above Lake Pillsbury) reintroduction scenario, quantify the impacts of predation on reintroduced salmonids in the Upper Eel River, develop a stream temperature time-series, and re-create unimpaired hydrology. These element requests should be examined under current and future climate change scenarios that will alter air temperature, water temperature, and hydrology.

4.1 Element #1: Anadromous Fish Passage Assessment of Project Facilities

Cape Horn Dam has a fish ladder that enables anadromous fish passage to the short reach between Van Arsdale Reservoir and the base of Scott Dam; Scott Dam is a complete barrier to any further upstream fish passage. The Licensee should conduct a detailed biological and engineering evaluation of providing fish passage around both Cape Horn Dam and Scott Dam to restore anadromous fish access to the Upper Eel River. With respect to Cape Horn Dam, the Licensee should review relevant literature to determine the current success of upstream and downstream passage of all life stages of target species over Cape Horn Dam and identify potential information gaps. The Licensee should conduct additional studies and/or engineering based on identified information gaps, including the survival of juvenile anadromous fishes (including smolts, macrophthalmia, and ammocoetes) when downstream passage occurs in spillover events at Cape Horn Dam.

Using information from the literature review, various methods should be assessed to determine a preferred alternative to successfully reintroduce and restore an anadromous fishery to reaches above Scott Dam. The preferred alternative will provide suitable upstream and downstream passage for all target fish species and life stages, including specific evaluation of how to route juveniles from the upper watershed through or around Lake Pillsbury. Alternatives to be evaluated by the Licensee should consider and compare:

- The construction of a fish ladder at Scott Dam,
- Fish conveyance pipes,
- Trap and haul around Scott Dam or around the Potter Valley Project
- Construction of an artificial channel for fish passage.
- Decommissioning of Scott Dam.

Alternatives should be comparatively evaluated based on the degree of expected upstream and downstream passage success, which include, anticipated number and percentage of passing individuals for each target species, expected upstream and downstream mortalities, entrainment potential, outstanding barriers to passage (in the case of partial facilities removal or modification only), feasibility (engineering and design), and cost. The value of fisheries resources (economic, ecosystem function, recreational, tribal subsistence, and tribal cultural) must also be considered by the Licensee when evaluating and comparing the cost of each alternative. For alternatives that leave Scott Dam in place, the Licensee should also evaluate the ability of target species to migrate through Lake Pillsbury (upstream and downstream migration by life stage and species) and potential impacts to target species.

4.2 Element #2: Fish Passage Assessment in the Upper Eel River Channel

4.2.1 Salmonids

The Licensee should review relevant literature, including past survey documents, and conduct ground surveys to identify all partial and complete, natural and artificial barriers to migration in the upper Eel River above Lake Pillsbury. For adult and juvenile passage over natural riffles, a critical riffle inventory should be conducted per standard CDFW procedures (CDFW 2015) during ground surveys to identify riffles in which water depth is particularly sensitive to changes in streamflow and are therefore potential impediments to upstream and downstream migration of adult and juvenile target species. Ground surveys will be conducted in the upper Eel River and major tributaries, to be identified by the Licensee in coordination with ILP participants. For jump barriers, passage analysis should use methods and criteria developed by Powers and Orsborn (1985). Minimum streamflows will be coupled with unimpaired hydrology developed as part of Element #6 to develop an understanding of passage potential during times when specific life stages are present (e.g. outmigration, adult upstream migration).

Initial ground surveys should take place during winter baseflow conditions. Once a potential barrier is located, the same physical measurements should be taken to the extent safely possible during flows typical of the migration seasons of target species. Physical characteristics should be coupled with unimpaired hydrology developed as part of Element #6, to develop a comprehensive assessment of fish passage "windows"—dates and durations when target species would likely be able to ascend the barrier under varying hydrologic conditions.

The CRA assessment done in this study request can be compared to CRA measurements made downstream of the Project in related investigations.

4.2.2 Pacific Lamprey

The North Coast Implementation Plan, developed under direction a multli-agency agreement to conserve Pacific Lamprey, identifies passage at Scott dam as a principle focus for actions that could benefit the species within the North Coast Regional Management Unit (Goodman and Reid 2015). Pacific Lamprey are currently the most abundant anadromous species passing Cape Horn Dam. Unpublished data from the U.S. Fish and Wildlife Service included observations of more than 6,000 individuals counted between March 31 and June 19, 2017, which emphasizes the importance of their consideration in this study request.

For Pacific Lamprey passage upstream of Scott Dam, partial and complete barriers to migration for target species should be defined by the criteria used in Powers and Orsborn (1985) and Stillwater Sciences (2014). Potential barriers will be identified using remote sensing data, including aerial photography, as part of Element #3 and then located in the field during ground surveys. Once a potential barrier is located, GPS coordinate points of its location should be recorded and the barrier should be described per standard protocols, including measurements of: height of falls, depth of plunge pool, velocity, slope, depth of fish exit, attachment substrate characteristics, etc. It is expected that the length of anadromous habitat for Pacific lamprey will be greater than for salmonids due to the ability of lamprey to climb up and over steep barriers.

4.3 Element #3: Assess Anadromous Fishery Production Potential

Due to the large size and vast stream network of the upper Eel River watershed above Lake Pillsbury, initial mesohabitat mapping could be conducted by the Licensee using orthorectified aerial photography. Potential fish barriers within the watershed will be identified using remote sensing and aerial photography and field verified as part of Element #2. Geographic Information Systems (GIS) will be used to delineate mesohabitat units downstream of migration barriers using polygon coverage and formatted as a .kmz file. Center line stationing will be overlaid on to orthorectified aerial photography. Two to three sites representing the most significant mesohabitat units and channel morphologies with an overall length of at least one meander wavelength should

be selected from mesohabitat mapping for two-dimensional (2-D) physical habitat modeling and individual based modeling (IBM) from Railsback (2016). Ground surveys will be conducted to verify mesohabitat delineation at the potential study sites and to confirm that sites qualify as suitable for the 2-D habitat modeling and IBM approach.

Topography, cover, substrate type, and spawning habitat polygons will be surveyed at each site, and depths and velocities will be collected at various points within each modeling site to develop a two-dimensional (2-D) hydraulic model required by the IBM. In addition, depth and velocity data will be collected at or near the, 20%, 50%, and 80% exceedance streamflow to calibrate and validate the 2-D models. Various data will be collected for input into the IBM's and will include, benthic macroinvertebrate (BMI) drift densities, density of juvenile salmonids, adult salmonid return data at Van Arsdale fish ladder, and temperature time series. The IBM will be run using re-created hydrology from historic inflow data and gage data as part of Element #6 to determine the potential anadromous salmonid production if anadromy is restored to reaches above Scott Dam. In addition, Pikeminnow predation behavior should be included in the IBM's to assess effects on anadromous salmonid production as part of Element #4.

The Licensee, in coordination with ILP participants, will transparently adjust streamflow and water temperature inputs to account for climate change predictions over the next fifty years and resulting impacts to upper basin streamflows. In summary, Element #3 will evaluate fishery potential under (1) contemporary conditions, (2) future condition alternatives within the timeframe of the renewed license, and 3) existing and future alternatives as impacted by climate change.

4.4 Element #4: Assess Predation Risk in the Upper Eel River Channel

Pikeminnow abundance and size classes should be assessed in Lake Pillsbury and in the upper Eel River above Lake Pillsbury to determine if Pikeminnow of sizes large enough to predate on juvenile anadromous salmonids are abundant enough to pose a threat to anadromous salmonid populations if anadromy is restored above Scott Dam. In Lake Pillsbury, Pikeminnow will be collected at sampling sites within the lake using gill nets. Above Lake Pillsbury in the Upper Eel River, Pikeminnow will be collected using backpack electrofishing in sites where potential juvenile anadromous salmonid rearing habitat is present. Sampling sites above Lake Pillsbury will be selected in reaches downstream of fish passage barriers assessed in Element #2 and in mesohabitat units most likely to be co-occupied by rearing salmonids and adult Pikeminnow. Mesohabitat mapping will be conducted as part of Element #3. In addition, physical characteristics measurement including, at minimum, water temperature, will be taken at all sampling sites.

Stream reaches where Pikeminnow potentially pose threats to rearing juvenile salmonids will be assessed and quantified using a water temperature time-series developed as part of Element #6, mesohabitat mapping (Element #3), and then mapped in GIS. Linear fish densities calculated from electrofishing surveys will be applied to stream reaches to calculate the total potential Pikeminnow habitat upstream of Lake Pillsbury. If Pikeminnow in size classes large enough to pose predation risk on rearing juvenile salmonids are present upstream of Lake Pillsbury, a Pikeminnow predation component will be added to the IBM developed as part of Element # 3 to determine effect on anadromous fishery production.

The impact of Pikeminnow on salmonids will also be assessed in the upper Eel River. The Licensee should collect Pikeminnow of large and small size classes to examine the concentrations of stable isotopes C^{13} and N^{15} (which are used to infer trophic position), and remove stomach contents (used to quantify prey species and abundance consumed). In addition, nonlethal fin clips (Hanisch et al. 2010) of juvenile Steelhead at different size classes shall be collected for stable isotope concentrations, which are needed to determine if Pikeminnow are consuming them (analyzed with isotopic mixing models; Moore and Seemens 2008). Previous studies (e.g. Cooper 2017) have not addressed the risk of predation to the potential reintroduction of salmonids in the upper Eel River and is a knowledge gap.

The Licensee should also evaluate potential changes to Pikeminnow habitat due to anticipated changes to water temperatures and streamflows likely to occur as a result of climate change over the next fifty years. The Licensee should specifically address whether predicated increases in water temperature, decreases in available streamflows, and changes in runoff timing will affect the rate of Pikeminnow predation, and to what extent, as a result of Project operations.

Results will be used to assess risk of future predation of anadromous fish under fish passage alternatives defined in Element #1.

4.5 Element #5: Habitat Availability for Pacific Lamprey

Pacific Lamprey habitat should be assessed in the upper Eel River above Lake Pillsbury in reaches deemed feasible for access based on the specific passage barriers identified as part or Element #2. We expect that there is abundant high quality habitat for Pacific lamprey above Lake Pillsbury. This study requests a simple, semi-quantitative confirmation that good habitat does indeed exist above Lake Pillsbury. High quality spawning and rearing habitat will be first estimated by applying drainage area and channel gradient habitat suitability criteria to the upstream channel network (attributed with a drainage area and channel gradient), created with GIS. Drainage area and channel gradient habitat suitability criteria for Pacific Lamprey are defined in Powers and Orsborn (1985) and Stillwater Sciences (2014). The Licensee will then conduct a ground based reconnaissance of predicted high quality habitat areas, and conduct photographic and narrative descriptions of habitat quality for Pacific lamprey, with specific emphasis on habitat needs for adult spawning and ammocoete rearing.

4.6 Element #6: Establish Streamflow Gaging and Water Temperature Monitoring

The Licensee shall install a minimum of one streamflow gaging station per 2-D modeling site in the upper Eel River above Lake Pillsbury to supplement the existing water temperature sensor network. Additional gaging and water temperature monitoring sites should be installed throughout the upper Eel River as needed to provide the spatial and temporal resolution necessary to determine where suitable anadromous habitat for target species and life-stages occurs under different hydrologic conditions. Data recorders should be spaced at sufficient intervals to generally characterize the thermal regime of each tributary. Gaging sites should be in installed to capture key streamflow inputs (e.g. tributaries, accretion). Streamflow data will be coupled with existing long-term data sets of computed inflows to Lake Pillsbury to develop a long-term unimpaired hydrograph in the upper Eel River. When applied to fish passage and fish habitat evaluations (Elements #1 - #6), streamflow and water temperature data should be appropriately adjusted to climate change scenarios over the duration of the renewed license.

5 FERC STUDY REQUEST CRITERIA

5.1 Goals and Objectives of Request

The goal of this Study Request is to be able to evaluate (1) fish passage alternatives to enable upstream and downstream passage of target species above Scott Dam and through Lake Pillsbury and (2) fish habitat for target species in the upper Eel River watershed above Scott Dam and Lake Pillsbury, including tributaries.

Under existing Project operations, Scott Dam and Lake Pillsbury entirely block access of target species to upstream habitats. Furthermore, the actual extent and condition of upstream habitats, including tributaries, to target species are not fully known, although initial assessments indicate a significant amount of suitable fish habitat does exist in the upper watershed and would be accessible with successful passage over or around Scott Dam (Cooper 2017).

Once complete, results of this Study Request will inform the preferred alternative for meeting fish passage requirements upstream of Scott Dam. Under § 18 of the Federal Power Act, 16 U.S.C. § 811, the Secretary of Commerce has the mandatory conditioning authority to prescribe fishways at FERC-licensed projects. California Trout, Inc. and Friends of the Eel River expect, at minimum, that as a direct result of § 18 of the Federal Power Act, 16 U.S.C. § 811, in combination with FERC's tribal trust obligation to our people, that fishways or an equally suitable method of fish passage will be provided above Scott Dam. Furthermore, it is our strong belief that the best and most appropriate preferred alternative for providing fish passage above Scott Dam is full decommissioning of the Scott Dam facility. An evaluation of decommissioning Scott Dam (or any other Project facility) has not yet been conducted and is essential to evaluating future Project operations under a renewed license and the associated impacts on our people, fisheries resources, and culture.

Obtaining a better understanding of the amount and quality of habitat for target species currently blocked by Project facilities is essential to understanding the impacts of future Project operations under a renewed license. An evaluation of alternatives for future modifications to Project operations to enable target species access to upstream habitats is fundamental to compliance with § 18 of the Federal Power Act, 16 U.S.C. § 811 as well as developing Project mitigation, should full passage to fish habitat in the upper Eel River fail to be fully achieved under a renewed license.

5.2 Resource Management Goals of California Trout and Friends of the Eel River

California Trout is a statewide non-profit organization dedicated to solving complex resource issues while balancing the needs of wild fish and people. We believe that abundant wild fish indicate healthy waters and that healthy waters mean a better California. California Trout pursues science-based solutions that work for diverse interests of fish, farms, commerce, and people.

California Trout organizes and facilitates the Eel River Forum, comprised of 23 stakeholder organizations. The Eel River Forum is a coalition of public agencies, Indian tribes, conservation partners, and other stakeholders with interest in or responsibility for the environmental stewardship of the Eel River. The Eel River Forum works collaboratively to:

- Understand the status of Eel River salmonid populations and other native fisheries resources.
- Identify and prioritize recovery issues and challenges.
- Promote specific research, restoration, and monitoring efforts in the Eel River basin
- Develop and recommend plans and policies that will promote the recovery of the Eel River ecosystem and its native fish populations.

Considerable efforts have been made in recent years by resource agencies, private industries, conservation organizations, and other stakeholders to promote watershed restoration and protect the Eel River's fisheries resources.

The mission of the Eel River Forum is to coordinate and integrate conservation and recovery efforts in the Eel River watershed to conserve its ecological resilience, restore its native fish populations, and protect other watershed beneficial uses. These actions are also intended to enhance the economic vitality and sustainability of human communities in the Eel River basin. The Eel River Forum's goal is to achieve consensus among a coalition of agency, tribal, and conservation partners regarding priority recovery actions and policy reform needed to recover salmonid populations in the Eel River basin, California's third largest watershed.

In June of 2016, the Eel River Forum, led by California Trout and our partners, released the Eel River Action Plan. The plan identifies priority actions needed to recover the Eel River watershed

and its native fish. It aims to achieve these goals while maintaining multiple land uses and recreation in the watershed. Priority actions in the plan address water diversions, water quality issues, habitat restoration, community engagement and protecting the Eel River Delta.

Friends of the Eel River's purpose is to promote and protect the natural resilience of the Eel River and the community of life it supports; to encourage actions which serve the integrity, stability, and beauty of the river and its watershed, and to oppose those which tend otherwise. FOER uses public education, advocacy, and strategic litigation where necessary to protect critical public trust resources. Friends of the Eel River also participates in the Eel River Forum.

5.3 Relevant Public Interest Considerations

California Trout has 10,000 members statewide. Friends of the Eel River has 2,000 members across the country. Our memberships value the Eel River fishery and wishes to see a restored Eel River ecosystem that supports improved aquatic health, recovery of salmonids, lamprey, and other at-risk species, and restored stream flows to the Eel River watershed. As PG&E works with FERC to renew its license for the Project, a thorough evaluation of fish passage alternatives above Scott Dam and an assessment of fish habitat for target species in the upper Eel River watershed is essential to understanding and mitigating the effects of the Project.

California Trout and Friends of the Eel River represent a broad membership dedicated to fisheries restoration and ecology sustainability. Furthermore, these organizations work to protect the ecology of the Eel River watershed itself.

5.4 Existing Information and Need for Additional Information

The PAD (Section 6.2.1.7) is unclear on which of the cited Potential Studies may be completed by the Licensee and cites work conducted by VTN 35 years ago as a basis for evaluating the fishery. While the PAD acknowledges Scott Dam blocks migration of target species, it fails to describe how this blockage will be mitigated with respect to the amount and quality of fish habitat for target species available upstream of Project facilities. The License must build upon more contemporary analyses it cites (e.g., Cooper 2017, Stillwater 2014) and augment the existing hydrology and water temperature data set to more appropriately assessment habitat availability in the upper Eel River watershed.

Additionally, the PAD fails to indicate how anticipated climate change impacts to streamflows, water temperature, and runoff timing will affect both upstream migration above Scott Dam, access to habitats in the upper Eel River watershed, and riverine barriers (critical riffle analyses accounting for climate change).

The Licensee must conduct a full evaluation of fish passage alternatives above Scott Dam and an assessment of fish habitat for target species in the upper Eel River watershed and the likely effects of implanting the Licensee's resulting preferred alternative on target species.

Additionally, the current and future impact of predation on target species by Pikeminnow is not fully understand. The predation assessments described in this Study Request are necessary to fill this fundamental information gap.

5.5 Nexus Between Project Operations and effects on the Resources Studies, and How the Study Results Would Inform the Development of License Requirements

The Potter Valley Project facilities prevent upstream fish passage in the Eel River and seriously impairs and prevents safe and effective downstream fish passage. The construction of Scott Dam in 1922 permanently cut off access of anadromous salmonid to their historic spawning and rearing habitat. Currently, the Potter Valley Project continues to completely block access of anadromous

fish to the upper Eel River watershed, which includes up to 300 miles of historic habitat for anadromous fish. This blocked habitat includes almost the entire historical extent of the Upper Mainstem Eel River steelhead population, which is identified as an *Essential* population for the NC steelhead DPS (NMFS 2016).

Under § 18 of the Federal Power Act, 16 U.S.C. § 811, the Secretary of Commerce has the mandatory conditioning authority to prescribe fishways at FERC-licensed projects. Based on other FERC proceedings (Condit Hydroelectric FERC No. 2342, Klamath Hydroelectric Project FERC No. 2082, Glines Canyon FERC No. 588, and Elwha River FERC No. 2683), the prohibitive costs of fishway installations relative to declining power generation profitability, has, in part, been a significant factor in ultimately choosing to decommission projects and restore anadromous fisheries as an alternative to pursing a renewed license under FERC. We expect this the full decommissioning of Scott Dam to provide upstream habitat access to target species to be fully evaluated under this Study Request.

Understanding the nature and extent of habitat in the upper Eel River watershed will our organizations, as the evaluation of both fish passage and fish habitat in the upper Eel River watershed will determine which path forward will be least impactful to the Eel River fishery, upon which our people depend, and the Eel River itself, which is of significance to our memberships.

5.6 Consistency with Generally Accepted Practice

Proposed methodology and information requests are consistent with the goals and objectives outlined for recent FERC hydroelectric ILP studies in the Western U.S., and uses accepted methodologies from published scientific literature and protocols from the National Marine Fisheries Service, U.S. Fish and Wildlife Service, the California State and Regional Water Quality Control Boards, and California Department of Fish and Wildlife. The methods described within this Study Request in Elements #1-#6 are consistent with this published literature and resource agency protocols and has been provided here to assist the Licensee in implementing this Study Request, in coordination with ILP participants.

However, California Trout, Inc. and Friends of the Eel River are presenting a Request for Information or Study (under the ILP regulations at 18 CFR § 5.9), and therefore is not necessarily requiring any specific study methodology, although specific criteria and direction has been provided above (preferred data collection and analysis techniques, or objectively quantified information). This is because the Licensee's responsibility under the Federal Power Act is to either provide the requested information or to develop a more detailed Study Plan to obtain such information. It is anticipated that through the iterative study development process within the ILP that the Licensee and the Commission will work with ILP participants to develop a study that obtains the requested information, or that adequate information, approved by the Commission, is provided by the Licensee

5.7 Consideration of Level of Effort and Cost

California Trout, Inc. and Friends of the Eel River consider that the cost of these studies to be between $ 650,000 and $850,000. To date, the PG&E have not submitted any proposal to model the water balance/operations of the Potter Valley Project, including hydrology, water temperature, or water quality, into the administrative record for this relicensing. The scope of the Project's potential effects is considered vast and long-term. Considering the potential for ongoing decimation of the traditional tribal fishery, environmental disturbance, the potential to affect species listed under the Endangered Species Act, and the recent closure of Chinook salmon fisheries on the West Coast of the United States, the level of effort and cost for the Applicant is commensurate with the revenues derived from sales of generated energy.

6 REFERENCES

California Department of Fish and Wildlife (CDFW). 2015. Critical Riffle Analysis for Fish Passage in California. California Department of Fish and Wildlife – Instream Flow Program.

Cooper. E. J. 2017. An Estimation of Potential Salmonid Habitat Capacity in the Upper Mainstem Eel River California. A Thesis presented to the Faculty of Humboldt State University in Partial Fulfillment of the Requirements for the Degree Master of Science in Natural Resources.

Goodman, D. and S. Reid. 2015. Regional Implementation Plan for Measures to Conserve Pacific Lamprey (*Entosphenus tridentatus*), California - North Coast Regional Management Unit. U.S. Fish and Wildlife Service, Arcata Fish and Wildlife Office, Arcata Fisheries Technical Report Number TR 2015-21, Arcata, California.

Hansich, J.R., Tonn, W.M., Paszkowski, C.A., Scrimgeour, G.J., 2010. δ13C and δ15N signature in muscle and fin tissues: nonlethal sampling methods for stable isotope analysis of salmonids. North American Journal of Fisheries Management. 31(1):11-30.

Moore, J.W. and Seemens, B.X. 2008. Incorporating uncertainty and prior information into stable isotope mixing models. Ecology Letters. 11: 470-480.

NMFS (National Marine Fisheries Service). 2016. Coastal Multispecies Recovery Plan. West Coast Region. Santa Rosa, California.

Powers, P.D. and J.F. Orsborn. 1985. Analysis of barriers to upstream fish migration. Final Project Report (Part 4 of 4). Bonneville Power Administration, Portland, OR. 61 p.

Railsback, S.F., B.C. Harvey, S.J. Kupferberg, M.M. Lang, S. McBain, H.H. Welsh, Jr. 2016. Modeling potential river management conflicts between frogs and salmonids. Canadian Journal of Fisheries and Aquatic Sciences, 73(5):773-784.

Stillwater Sciences. 2014. Evaluation of barriers to Pacific lamprey migration in the Eel River basin. Prepared by Stillwater Sciences, Arcata, California for Wiyot Tribe, Loleta, California.

VTN Oregon, Inc. 1982. Potter Valley Project (FERC No. 77) Fisheries Study Final Report. Prepared for Pacific Gas and Electric Company, San Ramon, California.