



State Water Resources Control Board

MAR 16 2018

Ms. Kimberly D. Bose, Secretary
Federal Energy Regulatory Commission
888 First Street, NE
Washington, D.C. 20426

Dear Secretary Bose:

STUDY REQUESTS AND COMMENTS ON THE PRE-APPLICATION DOCUMENT AND SCOPING DOCUMENT 1 FOR KERCKHOFF HYDROELECTRIC PROJECT, FEDERAL ENERGY REGULATORY COMMISSION PROJECT NO. 96; FRESNO AND MADERA COUNTIES

Pacific Gas and Electric Company (PG&E or Licensee) owns and operates the Kerckhoff Hydroelectric Project (Project), also known as Federal Energy Regulatory Commission (Commission) Project No. 96. On November 16, 2017, PG&E filed its Project's Pre-Application Document (PAD) with the Commission. On January 16, 2018, the Commission issued Scoping Document 1 (SD1) for the Project. On February 13, 2018, the Commission and the State Water Resources Control Board (State Water Board) held joint meetings with the state and federal agencies, Tribes, and public (Code of Federal Regulation [CFR]: 18 CFR 4.38(b); 18 CFR 16.8(b)).

Under the Integrated Licensing (ILP) Process, resource agencies, Tribes, and members of the public must provide the Commission with written comments on the PAD and SD1, including information needs and study requests, not later than sixty days after the Commission's notice of commencement of proceeding and scoping (18 CFR 5.9(b)). State Water Board staff's comments on PG&E's PAD and the Commission's SD1 are provided in Attachment A and Attachment B, respectively. State Water Board staff's study requests are provided in Attachment C. PG&E and State Water Board staff discussed PG&E's PAD on December 21, 2017. A PG&E summary of that discussion and follow-up information provided to the State Water Board by PG&E is provided in Attachment D.

Items 1 and 3 of the *Pre-Application Filing Activities Under the Integrated Licensing Process* section of the Memorandum of Understanding (MOU) executed between the Commission and State Water Board on November 19, 2013¹ apply to this phase of the ILP process. Based upon

¹ A copy of the MOU is available online at:
http://www.waterboards.ca.gov/waterrights/water_issues/programs/water_quality_cert/ferc_mou/index.shtml.

the Process Plan and Schedule PG&E put forth in its PAD, State Water Board staff provides the following initial estimate of process milestones for water quality certification²:

- Application for water quality certification: March 2021
- Issuance of draft water quality certification for public review: July 2023
- Issuance of final water quality certification: July 2024

Regulatory Authority

Before the Commission can issue a new license, the Licensee must obtain water quality certification, or waiver thereof, from the State Water Board pursuant to section 401(a)(1) of the federal Clean Water Act (CWA) (33 U.S.C. §1341(a)(1)). Section 401 of the CWA requires any applicant for a federal license or permit, which may result in any discharge to navigable waters, to obtain water quality certification or waiver from the State Water Board that the discharge will comply with the applicable provisions of sections 301, 302, 303, 306, and 307 of the CWA, and other appropriate requirements of state law.

Under section 303 of the CWA and under the Porter-Cologne Water Quality Control Act, the Central Valley Regional Water Quality Control Board adopted, and the State Water Board and United States Environmental Protection Agency approved, the *Water Quality Control Plan for the Sacramento and San Joaquin River Basins* (Basin Plan). The Basin Plan designates the beneficial uses of waters to be protected along with the water quality objectives necessary to protect those uses. The Project facilities are located in the *San Joaquin River sources to Millerton Lake* identified in the Basin Plan, which have the following beneficial uses: municipal and domestic supply; irrigation; stock watering; power; contact recreation; canoeing and rafting; other noncontact recreation; warm freshwater habitat; cold freshwater habitat; and wildlife habitat.

The beneficial uses together with the water quality objectives that are contained in the Basin Plan, along with state and federal anti-degradation requirements, constitute California's water quality standards under section 303 of the CWA. The water quality objectives set or describe the water quality necessary to achieve and protect the beneficial uses. The State Water Board must evaluate the impacts of the Project on the associated water bodies to determine whether the Project complies with all applicable water quality objectives in the Basin Plan, and protects the designated beneficial uses. Water quality certification also may address a project's effects on public trust resources. In developing a water quality certification, the State Water Board looks not only at proposed modifications to project operations from the existing condition, but also on whether past, existing, or future operations may impair or degrade water quality.

PG&E must file an application for water quality certification once the Commission issues the Notice of Ready for Environmental Analysis for the Project. The State Water Board may request additional information to clarify, amplify, correct, or otherwise supplement the contents of the application (Cal. Code Regs., tit. 23, § 3836). A complete application for a water quality certification must include a description of any steps that have been, or will be taken to avoid,

² These milestones assume the draft National Environmental Policy Act (NEPA) document will provide substantial information to support the development of the State Water Board's California Environmental Quality Act document. The timeline assumes the draft NEPA document will be released approximately 12 months following the Commission's release of the Ready for Environmental Analysis.

minimize, or compensate for loss of or significant adverse impacts to beneficial uses of water (Cal. Code Regs. tit. 23, § 3856, subd. (h)(6)). If the Project does not comply with one or more of the water quality objectives or criteria, then PG&E must describe the actions that it will take to bring the Project into compliance in order to protect and maintain the beneficial uses of the State's waters. During the licensing process, State Water Board staff will act in an advisory role to inform PG&E of the information necessary for a complete application for water quality certification. Filing requirements for an application for water quality certification are specified in California Code of Regulations, title 23, section 3856. State Water Board staff cannot prejudge the outcome of any proceeding before the State Water Board on an application for water quality certification.

If you have questions regarding this letter, please contact me at (916) 341-5408 or by email at Philip.Choy@waterboards.ca.gov. Written correspondence should be directed to: State Water Resources Control Board, Division of Water Rights - Water Quality Certification Program, Attn: Philip Choy, P.O. Box 2000, Sacramento, CA 95812-2000.

Sincerely,

ORIGINAL SIGNED BY:

Philip Choy, Environmental Scientist
Water Quality Certification Unit
Division of Water Rights

Enclosures: Attachment A – Comments on the Pre-Application Document for the Kerckhoff Hydroelectric Project
Attachment B – Comments on Scoping Document 1 for the Kerckhoff Hydroelectric Project
Attachment C – Study Plan Requests for the Kerckhoff Hydroelectric Project
Attachment D – December 21, 2017 Call Notes and Follow-up for the Kerckhoff Hydroelectric Project

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ATTACHMENT A:
COMMENTS ON THE PRE-APPLICATION DOCUMENT
FOR THE KERCKHOFF HYDROELECTRIC PROJECT

Pre-Application Document Comments

The following comments are provided by State Water Resources Control Board (State Water Board) staff on the Pre-Application Document (PAD) for Pacific Gas and Electric Company's (PG&E) Kerckhoff Hydroelectric Project (Project), Federal Energy Regulatory Commission (Commission or FERC) Project No. 77. PG&E filed its PAD with the Commission on November 16, 2017.

PAD Volume 1, Section 2.2 – Proposed Communication Protocols

PG&E created a website³ that provides information regarding the Project. PG&E plans to update the website with additional information as the relicensing process for the Project progresses. State Water Board staff appreciates PG&E developing the Kerckhoff relicensing website. State Water Board staff requests the website include a calendar to display meeting dates and deadlines and a reference section containing Project-related documents and other pertinent information related to the relicensing of the Project.

For meetings conducted by PG&E that are not specifically required by FERC's regulations, PG&E states that an independent facilitator may be used. State Water Board staff recommends PG&E use an impartial facilitator for relicensing meetings to encourage and facilitate effective communication for all relicensing participants.

PAD Volume 1, Section 4.11.2 License Deviations

Section 4.11.2, page 4-60 states, "A total of two minimum flow deviations and three oil spills have been reported to date." Please discuss each oil spill incident and the corrective actions that were implemented to protect water quality.

PAD Volume 1, Section 4.11.3 Temporary Variance

Section 4.11.3, page 4-61 describes three temporary variances in 2001, 2014, and 2015 to suspend minimum shad flow requirements. Section 5.4.3.4, pages 5-141 to 5-150, discusses American shad and monitoring associated with the 2001 temporary variance. Please discuss any shad monitoring that was conducted in association with the 2014 and 2015 temporary variances.

PAD Volume 1, Section 5.4.3.4 Millerton Lake

Section 5.4.3.4, page 5-141 identifies a limited recreational fishery for American shad, citing a FERC 1979 Environmental Impact Statement for the Project⁴. Please discuss the current recreational fishery for American shad below Kerckhoff 2 Powerhouse to Millerton Reservoir

³ PG&E's website for the relicensing of the Kerckhoff Project can be found online at:
https://www.pge.com/en_US/safety/electrical-safety/safety-initiatives/kerckhoff-relicensing/kerckhoff-relicensing-project.page?WT.mc_id=Vanity_kerckhoff.

⁴ Federal Energy Regulatory Commission. 1979. Final Environmental Impact Statement, Kerckhoff Project No. 96. February 1979. Office of Electric Power Regulation.

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and in the Bypass Reach⁵. In addition, please identify primary fishing locations and access within or adjacent to the Project area.

PAD Volume 2, Study HYD 1– Operations Simulation Model

PG&E proposes Study HYD 1 *Operations Simulation Model*. State Water Board staff generally supports this draft study to model hydrology in the Project-affected area. State Water Board staff is interested in coordinating operations of the Project with upstream hydroelectric projects to enhance flow conditions, with an emphasis on spill recession. State Water Board staff requests that PG&E discuss potential coordinated operations with PG&E's Crane Valley Hydroelectric Project (FERC Project No. 1354) and Southern California Edison's Big Creek Hydroelectric System (FERC Project Nos. 2175, 67, 120, 2085, 2086, 2174, and 2017), and if possible and appropriate, incorporate potential coordinated operations in the operations simulation model.

PAD Volume 2, Study AQ 1– Aquatic Habitat Mapping

PG&E proposes Study AQ 1 *Aquatic Habitat Mapping*. State Water Board staff generally supports this draft study to characterize the aquatic habitat in the Project-affected area. State Water Board staff requests PG&E include background information on the species of riparian vegetation found in the Bypass Reach, specifically the flow rates that are necessary for establishment. It is necessary for State Water Board staff to understand what flow conditions are necessary to promote a native riparian community.

In additional, Study AQ 1 proposes to identify potential passage barriers to fishes (rainbow trout and native minnows) using aerial imagery, from helicopter, or on the ground. However, it is unclear if this study will also identify the potential for fish to be isolated in pools during the summer if the Bypass Reach is, to an extent, disconnected. Water temperatures in the Bypass Reach can exceed 27 degrees Celsius (PAD page 5-67). State Water Board staff is concerned that fishes will be unable to find thermal refuge if pools in the Bypass Reach are disconnected. State Water Board staff looks forward to discussions with PG&E and relicensing participants to determine if Study AQ 1 provides information on the potential isolation and suitability of summer aquatic habitat, or if an additional habitat study to collect this information is appropriate and feasible.

PAD Volume 2, Study AQ 2– Fish Populations

PG&E proposes Study AQ 2 *Fish Populations*. State Water Board staff generally supports this draft study to characterize the fish composition, distribution, and abundance in Kerckhoff Reservoir and the Bypass Reach. However, the current monitoring proposal does not target seasonal visitors into the Bypass Reach, which include spawning American shad (*Alosa sapidissima*) and striped bass (*Morone saxatilis*). Additional surveys for these species may be necessary, as both species spawn in the Project-affected areas (Bypass Reach and immediately downstream of Kerckhoff Powerhouse 2). State Water Board staff understands that high flows during the American shad and striped bass spawning seasons are a potential

⁵ The Bypass Reach includes the San Joaquin River from Kerckhoff Dam downstream to the Kerckhoff 1 Powerhouse and from Kerckhoff 1 Powerhouse to the Kerckhoff 2 Powerhouse.

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safety hazard for snorkel surveys, but requests that PG&E collaborate with relicensing participants and State Water Board staff to discuss a potential study that would be safe and provide information on spawning American shad and striped bass.

Historic information on these species is present but potentially outdated. The most recent American shad survey documented in the PAD occurred in 2011 (as discussed on page 5-150). Striped bass is discussed in the PAD on pages 5-137 and 5-139 to 5-141; the most recent referenced fish surveys that observed striped bass in the Bypass Reach occurred in 1982.

PAD Volume 2, Study WQ 1– Water Temperatures in Kerckhoff Reservoir and San Joaquin River Bypass Reach

PG&E proposes Study WQ 1 *Water Temperature in Kerckhoff Reservoir and San Joaquin River Bypass Reach*. State Water Board staff generally supports this draft study to characterize water temperatures in the Project-affected area. In addition to the sites proposed by PG&E⁶, State Water Board staff suggests a water temperature monitoring site approximately 0.1 km downstream of the Kerckhoff Powerhouse 1 tailrace, as determined by site access. This site is necessary to distinguish potential water temperature impacts resulting from Kerckhoff Powerhouse 1 discharge.

If data from Study WQ 1 suggests that the Project influences water temperature to an extent that could be detrimental to aquatic species, PG&E should develop a water temperature model. The purpose of the water temperature model would be to simulate current and potential future water temperature conditions. The model would: (1) simulate reservoir and stream water temperatures resulting from Project operations; (2) accurately reproduce observed reservoir and Project influenced stream water temperatures, within acceptable calibration standards over a range of water year types; and (3) demonstrate sensitivity to both stream flow and ambient weather conditions. If data from Study WQ 1 suggests Project operations influence water temperature, it is necessary for State Water Board staff to understand how water temperature is influenced by current and future Project operations.

PAD Volume 2, Study WQ 2– Water Quality Sampling in the Project Bypass Reach and Kerckhoff Reservoir

PG&E proposes Study WQ 2 *Water Quality Sampling in the Project Bypass Reach and Kerckhoff Reservoir*. State Water Board staff generally supports this draft study to characterize water quality in the Project-affected area. In addition to the parameters proposed by PG&E⁷, State Water Board staff suggests PG&E monitor an additional bacteria parameter, *E. coli* (*Escherichia coli*). *E. coli* is the bacterial indicator for contact recreation (beneficial use) in the

⁶ PG&E proposes to monitor water temperature in the Bypass Reach at 4 locations: Gage J-2 below Kerckhoff Dam; between J-2 and the Kerckhoff Powerhouse 1 tailrace (equivalent of J-7 location); immediately upstream of the Kerckhoff Powerhouse 2 tailrace; and approximately 0.1 km downstream of the Kerckhoff Powerhouse 2 tailrace.

⁷ PG&E's proposed parameters for the water quality assessment program (i.e., Study WQ 2) can be found in the PAD, Volume 2, Table WQ 2-1, page WQ 2-6.

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United States Environmental Protection Agency (1986) criteria⁸ and the proposed Bacteria Provisions for Inland Surface Waters⁹. The current parameter measured for the State Water Board's contact recreation beneficial use is fecal coliform and total coliform.

PG&E proposes to "characterize water quality in Kerckhoff Reservoir (one location near dam) and Project Bypass Reach (up to three locations if needed)." State Water Board staff recommends additional sites in Kerckhoff Reservoir and potential additional sites in the Bypass Reach. Monitoring locations and frequency should be collaboratively determined with relicensing participants to ensure adequate information is collected. At a minimum, PG&E should monitor bacteria levels at Smalley Cove and other primary recreation sites (i.e., informal recreation sites, whitewater put-in/take-out) in Project-affected areas.

PAD Volume 2, Study AQ 4– Entrainment

PG&E proposes Study AQ 4 *Entrainment*. State Water Board staff generally supports this draft study to characterize levels of entrainment into the Kerckhoff Powerhouse 1 and Kerckhoff Powerhouse 2 intakes. In addition to calculating potential loss of biota through the intakes, State Water Board staff suggests that PG&E also assess the potential for fish survival over Kerckhoff Dam. This additional information, collected through desktop assessment, would more accurately calculate the total net loss of biota that move downstream of Kerckhoff Reservoir. State Water Board staff believes it is necessary to understand how the Project affects the aquatic community in order to develop appropriate and commensurate mitigation measures.

PAD Volume 2, Study REC 1– Whitewater Boating Assessment

PG&E proposes Study REC 1 *Whitewater Boating Assessment*. State Water Board staff generally supports this draft study to assess whitewater boating opportunities in the Bypass Reach. PG&E has divided this study into three phases (initial information gathering and evaluation; hydrology assessment; and focus group sessions), with the latter two phases to be conducted if needed. The Project area includes the beneficial use for canoeing and rafting. American Whitewater has confirmed whitewater boating use in the Project area. State Water Board staff believes all phases of the study are necessarily to fully assess whitewater boating and recommends PG&E conduct them.

⁸ The E. coli concentration, based on a minimum of not less than five samples equally spaced over a 30 day period, shall not exceed a geometric mean of 126 most probable unit (MPN)/100 ml and shall not exceed 235 MPN/100 ml in any single sample.

⁹ The proposed Bacteria Provisions for Inland Surface Waters is being finalized for the State Water Board to consider adopting later this year. The bacteria water quality objective for all waters where the salinity is equal to or less than 1 parts per thousand (ppt) 95 percent or more of the time during the calendar year is: a six-week rolling geometric mean of E. coli not to exceed 100 colony forming units (cfu) per 100 milliliters (mL), calculated weekly, and a statistical threshold value of 320 cfu/100 mL not to be exceeded by more than 10 percent of the samples collected in a single month.

ATTACHMENT B:
COMMENTS ON SCOPING DOCUMENT 1
FOR THE KERCKHOFF HYDROELECTRIC PROJECT

Scoping Document 1 Comments

The following comments are provided by State Water Resources Control Board (State Water Board) staff on Scoping Document 1 (SD1) for Pacific Gas and Electric Company's (PG&E) Kerckhoff Hydroelectric Project (Project), Federal Energy Regulatory Commission (Commission or FERC) Project No. 96. The Commission issued SD1 on January 16, 2018.

Section 3.1.1 – Existing Project Facilities

Commission staff has identified one recreation development, Smalley Cove Recreation Area. An additional informal recreation area is located within the FERC Project Boundary on the north bank of Kerckhoff Reservoir, approximately a quarter of a mile upstream of Smalley Cove Recreation Area (identified in PG&E's Pre-Application Document on page 5-235). State Water Board staff visited the informal recreation area and identified significant public use and potential use by PG&E for operations and maintenance of Project facilities. State Water Board staff recommends the Commission include this informal recreation area as an existing Project recreation facility.

PG&E owns and maintains streamgauge stations J1 (Kerckhoff Reservoir 11-2466.50), J2 (San Joaquin R Nr Auberry), J3 (Kerckhoff Powerhouse #1), and J6 (Kerckhoff #2). State Water Board staff believes these streamgages are necessary for the continued operations and maintenance of the Project, and recommends the Commission include these streamgages as existing Project facilities.

Section 4.2.2– Aquatic Resources

Commission staff has identified dissolved oxygen, water temperature, aquatic habitat, fish, macroinvertebrates, and aquatic invasive species that could be affected by continued Project operation and maintenance. State Water Board staff recommends the Commission also include amphibians, turtles, and additional water quality parameters in its analysis. Amphibians and turtles are aquatic species present in the Project-affected area that could be affected by the Project. Additional water quality parameters include in situ (specific conductance, pH, turbidity), general water quality (dissolved organic carbon, solids, inorganic ions, nutrients, metals), bioaccumulation (metals), and recreation-related (bacteria) parameters. These water quality parameters are necessary to fully assess water quality in the Project area.

ATTACHMENT C:
STUDY PLAN REQUESTS FOR THE
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Study Plan Requests

Information collected through the implementation of study plans in the Federal Energy Regulatory Commission (Commission or FERC) process will be used by the Commission to develop license conditions and fulfill its requirements under the National Environmental Policy Act, and by other agencies that must take permitting actions during the Commission's relicensing proceedings. Study plan information will assist the State Water Resources Control Board (State Water Board) in developing water quality certification conditions to ensure compliance with the Clean Water Act and California Environmental Quality Act (CEQA). The State Water Board will act as lead agency for the Kerckhoff Hydroelectric Project's (Project) CEQA process.

As a mandatory conditioning agency under the Commission's relicensing process, the State Water Board will act in an advisory role to inform Pacific Gas and Electric Company (PG&E) of the information that is necessary to fulfill the requirements of the water quality certification process. The State Water Board exercises independent authority in issuing water quality certifications; therefore, its role in any pre-decisional activities is advisory, rather than reflective of the State Water Board's ultimate determinations.

In this advisory role, State Water Board staff will participate in the Study Plan Development process and submit study plan requests and comments in accordance with the Commission's Integrated Licensing Process (included below). If the study plans approved by the Commission do not include those requested by State Water Board staff, or are otherwise insufficient to provide information needed in connection with the issuance of the water quality certification, the State Water Board may choose to request such information under the Porter-Cologne Water Quality Control Act (Cal. Wat. Code, § 13000 et seq.), Water Code section 13383, or other applicable authority.

In an effort to avoid unnecessary delays in the Project's relicensing process, State Water Board staff strongly encourages PG&E to consider the below requested studies, and to work collaboratively with State Water Board staff and other relicensing participants to resolve differences. Working collaboratively with all relicensing participants often expedites resolution to issues.

State Water Board staff appreciates PG&E being proactive and developing a list of proposed draft study plans. In general, State Water Board staff supports the draft study plans and looks forward to working with PG&E and all relicensing participants to further develop the study plans and ensure studies adequately analyze potential Project impacts and meet the regulatory needs of all resource agencies. State Water Board staff comments regarding the draft study plans are included in Attachment B.

In addition to PG&E's proposed draft study plans, State Water Board staff requests the following three studies:

- 1) Bioaccumulation Study
- 2) Benthic Macroinvertebrate Study
- 3) Rare Aquatic Species Study

Study plan requests by State Water Board staff are described, using the study plan criteria outlined in Appendix A of the Commission's Scoping Document 1 for the Project, below.

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STUDY PLAN REQUESTS FOR THE
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1. Bioaccumulation Study

Goal and Objective of the Bioaccumulation Study

The goals of the Bioaccumulation Study are to: (1) collect information to develop fish consumption advisories for Kerckhoff Reservoir and (2) promote public safety.

The objective of the study is to characterize the concentration of methyl mercury, arsenic, cadmium, copper, selenium, silver, polychlorinated biphenyls(PCBs), legacy pesticides, polybrominated diphenyl ethers (PBDEs), dioxins, dibenzofurans, organophosphates, polycyclic aromatic hydrocarbons (PAHs), tributyltin (TBT), microcystin, Omega-3 fatty acids, and other emerging contaminants in resident, edible-sized sport fish in Kerckhoff Reservoir.

Resource Management Goal of the State Water Board

The State Water Board has broad authority under the federal Clean Water Act (33 U.S.C. § 1251-1387), the state constitution, and the state water code and regulations to restore and maintain the chemical, physical, and biological integrity of the state's waters, and to regulate water diversion and use through the water right priority system in accordance with the State Water Board's reasonable use and public trust responsibilities. Section 401 of the federal Clean Water Act allows for broad application of appropriate state and federal environmental laws when entities apply for new or renewed federal licenses that may result in a discharge to navigable waters of the state (33 U.S.C. § 1341).

Throughout the Commission's relicensing process, the State Water Board maintains independent regulatory authority to condition the operation of the Project to protect water quality and beneficial uses of stream reaches consistent with section 401 of the federal Clean Water Act, the *Water Quality Control Plan for the Sacramento and San Joaquin River Basins* (Basin Plan), State Water Board regulations, CEQA, and any other applicable state laws. The Project has the potential to impact water quality in the *San Joaquin River sources to Millerton Lake*, including multiple beneficial uses such as fishing.

Existing Information

The Pre-Application Document (PAD) does not contain information regarding bioaccumulation. State Water Board staff is not aware of any bioaccumulation data for fishes in Kerckhoff Reservoir. Office of Environmental Health Hazard Assessment (OEHHA) developed a fish consumption advisory for the San Joaquin River from Friant Dam to the Port of Stockton¹⁰, which is downstream of the Project area.

Project Nexus

Impoundment of water (with the incidental accumulation of sediment) and operation of Project facilities have the potential to increase the concentration of metals and methylated mercury in the system, making them available for bioaccumulation through various trophic levels of the aquatic ecosystem. Fishing occurs at Kerckhoff Reservoir, and consumption recommendations for target species should be developed to promote public safety.

¹⁰ The consumption advisory can be found at the following website: <https://oehha.ca.gov/advisories/san-joaquin-river-friant-dam-port-stockton>.

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Study Methodology

The study methods consist of the following four steps: 1) select fish/crayfish species for the study; 2) collect tissue samples; 3) analyze samples; and 4) prepare report. Target fish and/or crayfish species should be determined in consultation with relicensing participants, PG&E, and State Water Board staff. Tissue samples could be collected while implementing other relicensing studies, such as PG&E's proposed Study AQ 2 *Fish Populations*.

Bioaccumulation samples should be collected in a manner that can be used by OEHHA to prepare a consumption recommendation for Kerckhoff Reservoir. The appropriate methods can be found in the General Protocol for Sport Fish Sampling and Analysis (Gassel and Brodberg 2005)¹¹.

Level of Effort and Cost

Based upon previous relicensing processes in California that have conducted similar bioaccumulation studies, State Water Board staff estimates the cost of this study to be approximately \$15,000 to \$45,000.

2. Benthic Macroinvertebrate Study

Goal and Objective of the Benthic Macroinvertebrate Study

The goal and objective of the Benthic Macroinvertebrate Study is to characterize physical habitat characteristics and benthic macroinvertebrates (BMI) taxonomical, biomass, and density assemblages within Project-affected reaches downstream of Kerckhoff Dam using the Surface Water Ambient Monitoring Program (SWAMP) protocol (Ode et al. 2016) or a similar protocol deemed appropriate.

Resource Management Goal of the State Water Board

The State Water Board has broad authority under the federal Clean Water Act (33 U.S.C. § 1251-1387), the state constitution, and the state water code and regulations to restore and maintain the chemical, physical, and biological integrity of the state's waters, and to regulate water diversion and use through the water right priority system in accordance with the State Water Board's reasonable use and public trust responsibilities. Section 401 of the federal Clean Water Act allows for broad application of appropriate state and federal environmental laws when entities apply for new or renewed federal licenses that may result in a discharge to navigable waters of the state (33 U.S.C. § 1341).

Throughout the Commission's relicensing process, the State Water Board maintains independent regulatory authority to condition the operation of the Project to protect water quality and beneficial uses of stream reaches consistent with section 401 of the federal Clean Water Act, the Basin Plan, State Water Board regulations, CEQA, and any other applicable state laws.

The Project has the potential to impact BMI populations and composition. The State Water Board is charged with ensuring that Project operations are protective of the designated beneficial uses for cold freshwater habitat and warm freshwater habitat that support freshwater

¹¹ OEHHA's protocol to develop fish consumption advisories can be found at the following website: <https://oehha.ca.gov/media/downloads/fish/document/fishsamplingprotocol2005.pdf>.

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ecosystems including, but not limited to, preservation or enhancement of aquatic habitats, vegetation, fish, or wildlife, including invertebrates. Furthermore, BMI are important forage for other aquatic resources and can serve as spatial and temporal indicators of water quality.

Existing Information

PAD Volume 1 Section 5.4.5.2 provides minimal BMI data from the Project area. The PAD references one sample that was collected in 2012 in Kerckhoff Reservoir as part of the Environmental Protection Agency's National Lakes Assessment Program. The PAD does not contain BMI information or data from the Bypass Reach¹².

Project Nexus

Project operations and facilities, through habitat modification and altered flow regimes, have the potential to affect the composition, abundance, and distribution of BMI in Project-affected reaches. Information gathered will help State Water Board staff characterize stream health and adherence to water quality objectives.

Study Methodology

The study methods consist of the following five steps: 1) select sampling reaches from within the Project-affected area; 2) collect data; 3) analyze data; 4) QA/QC data; and 5) prepare report. Sampling sites should be developed in consultation with relicensing participants, PG&E, and State Water Board staff.

Sampling methods should conform to the standard reachwide benthic (RWB) method for documenting and describing BMI and algal assemblages and physical habitat contained in the State Water Board's SWAMP protocol (Ode et al. 2016)¹³, to the extent possible. Given the challenging access and constraints of the Bypass Reach, an alternative protocol that achieves SWAMP objectives could be considered in lieu of SWAMP protocol.

Level of Effort and Cost

State Water Board staff estimates the cost of this study to be approximately \$50,000 and \$150,000. The wide range of estimated cost is due to the specific protocol selected, number of sites, and number of BMI in each sample (or subsample) to identify.

3. Rare Aquatic Species Study

Goal and Objective of the Rare Aquatic Species Study

The goal of the Rare Aquatic Species Study is to determine species presence in the Project-affected area that are challenging to observe (i.e., rare or cryptic species).

¹² The Bypass Reach includes the San Joaquin River from Kerckhoff Dam downstream to the Kerckhoff 1 Powerhouse and from Kerckhoff 1 Powerhouse to the Kerckhoff 2 Powerhouse.

¹³ SWAMP. 2016. -- Ode, P.R., A.E., Fetscher, and L.B. Busse. 2016. Standard Operating Procedures for the Collection of Field Data for Bioassessments of California Wadeable Streams: Benthic Macroinvertebrates, Algae, and Physical Habitat. California State Water Resources Control Board Surface Water Ambient Monitoring Program (SWAMP) Bioassessment SOP 004.

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Specific study objectives include:

- Collect environmental DNA (eDNA) samples at sites in Kerckhoff Reservoir and the Bypass Reach, with sample collection focused on determining presence of foothill yellow legged frog (*Rana boylei*) and Kern brook lamprey (*Lampetra hubbsi*).
- Analyze samples to determine aquatic species presence, with a focus on foothill yellow legged frog and Kern brook lamprey.
- Identify the need for additional monitoring to determine rare species' abundances.
- Identify the need for additional studies to protect rare species from Project operation and maintenance, and other factors that are influenced by Project operations and maintenance (e.g., invasive species).

Resource Management Goal of the State Water Board

The State Water Board has broad authority under the federal Clean Water Act (33 U.S.C. § 1251-1387), the state constitution, and the state water code and regulations to restore and maintain the chemical, physical, and biological integrity of the state's waters, and to regulate water diversion and use through the water right priority system in accordance with the State Water Board's reasonable use and public trust responsibilities. Section 401 of the federal Clean Water Act allows for broad application of appropriate state and federal environmental laws when entities apply for new or renewed federal licenses that may result in a discharge to navigable waters of the state (33 U.S.C. § 1341).

Throughout the Commission's relicensing process, State Water Board staff maintains independent regulatory authority to condition the operation of the Project to protect water quality and beneficial uses of stream reaches consistent with section 401 of the federal Clean Water Act, the Basin Plan, State Water Board regulations, CEQA, and any other applicable state laws.

The Project-affected area has the potential to be inhabited by species that have not been or have not recently been observed in the Project-affected area. It is important that the Commission and the State Water Board are aware of all species, especially rare species in the Project-affected area, to ensure appropriate measures are taken to mitigate Project impacts. The State Water Board is charged with ensuring that Project operations are protective of the designated beneficial uses for cold freshwater habitat and warm freshwater habitat that support ecosystems including, but not limited to, preservation or enhancement of aquatic habitats, vegetation, fish, or wildlife, including invertebrates. In addition, the State Water Board is charged with ensuring that Project operations are protective of the designated beneficial uses for wildlife habitat that support terrestrial or wetland ecosystems including, but not limited to, preservation and enhancement of terrestrial habitats or wetlands, vegetation, wildlife (e.g., mammals, birds, reptiles, amphibians, invertebrates), or wildlife water and food sources.

Existing Information

PAD Volume 1, Table 5.4-1 identifies fish and mollusc species reported or suspected to currently occur in the Project Aquatic Study Area¹⁴ and nearby. PAD Volume 1, Table 5.4-15

¹⁴ The Aquatic Study Area includes areas within the FERC Project Boundary, along with the San Joaquin River from Kerckhoff Dam to immediately below the Kerckhoff 2 Powerhouse.

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identifies amphibians and aquatic reptile species occurring or potentially occurring in the Project Aquatic Study Area.

In regards to foothill yellow legged frog, the PAD Volume 1, Section 5.4.6.3 states “habitat was deemed suitable for foothill yellow-legged frog in the San Joaquin River Gorge, but current hydroelectric operations of the Project (BoR 2008b)¹⁵, as well as additional PG&E and Southern California Edison company (SCE) hydroelectric projects upstream have altered the natural hydrology in the San Joaquin River Watershed.” The PAD further states “the nearest known [foothill yellow legged frog] population resides upstream of SCE’s Big Creek No. 3 Powerhouse in Jose Creek, but it is over 24 km (15 mi.) away and upstream of two dams (SCE 2008)¹⁶. No other [foothill yellow legged frog] populations are known in the San Joaquin River Watershed.”

In regards to Kern brook lamprey, the PAD Volume 1, Section 5.4.3.3 states “Kern brook lamprey (*Lampetra hubbsi*) are potentially present in the [Project area]. Bureau of Reclamation studies (2008b) indicate that ammocoetes (larvae), possibly Kern brook lamprey, were collected in the upper San Joaquin River between Kerckhoff Dam and Millerton Lake from 1979 through 1982 (Wang 1986). The species is not expected to occur anywhere else in the Aquatic Study Area, but its current status is unknown.”

Project Nexus

The Project alters instream flows in the Bypass Reach, which affects aquatic habitat and aquatic species.

Study Methodology

The study area should include Kerckhoff Reservoir and the Bypass Reach. The number and location of sites should provide adequate assurance whether foothill yellow legged frog and Kern brook lamprey are present or absent in the area. A determined volume of water will be filtered at each site using a 0.22 micron filter, with replicates. In the lab, DNA should be extracted from the filter and analyzed. An established field protocol that prevents contamination should be employed¹⁷.

A genetic marker for foothill yellow legged frog has been developed. It is unclear if a marker for Kern brook lamprey has been developed; however, use of a genetic marker for the lamprey genus (*Lampetra*) can be developed at minimal cost and be used for this study.

Level of Effort and Cost

State Water Board staff estimates the cost of this study to be approximately \$25,000 to \$80,000. The cost is dependent on development of study specifics and the potential for eDNA samples to be collected while onsite for other studies. State Water Board staff estimates the cost to develop a marker for the lamprey genus (if not already available) would cost less than \$2,000.

¹⁵ United States Bureau of Reclamation Biological resource technical reports: Upper San Joaquin basin storage investigation; draft aquatic biological resources technical report.

¹⁶ Southern California Edison. 2008. Final Native Aquatic Species Management Plan (NASMP). Big Creek, CA. July.

¹⁷ The United States Geological Survey protocol for eDNA sample collection is available at the following website: <https://labs.wsu.edu/edna/documents/2015/05/field-protocol.pdf>

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Call Notes and Follow-up on Pre-Application Document

Background

On December 21, 2017, State Water Resources Control Board (State Water Board) staff discussed the Kerckhoff Hydroelectric Project (Project) Pre-Application Document (PAD) with Pacific Gas and Electric Company (PG&E). The purpose of the call was to respond to State Water Board staff questions and clarify information regarding the PAD in order to facilitate efficient State Water Board staff review of the PAD. On March 7, 2018, PG&E provided call notes and responses to follow-up items. That information is provided below and can be used by the Federal Energy Regulatory Commission and relicensing participants to supplement information in the PAD and understand State Water Board staff interests in the Project.

**Pacific Gas and Electric Company (PG&E)
Kerckhoff Hydroelectric Project Relicensing
Draft State Water Board Call Notes
December 21, 2017**

Participant	Affiliation
Lisa Whitman	PG&E
Gina Morimoto	PG&E
Wayne Lifton	Cardno
Katie Ross-Smith	Cardno
Philip Choy	State Water Board

The objective of the call was to discuss Philip Choy's (State Water Board) earlier questions regarding the Kerckhoff study plans and Pre-Application Document (PAD) and to see if he had any additional questions.

Philip had asked Lisa several questions prior to the call regarding the study schedule, woody debris management, and the existence of any previous sediment studies related to the recent low level outlet (LLO) construction activity. Lisa responded that PG&E proposed to start some studies in 2018, pending stakeholder agreement and PG&E authorization. She also noted that PG&E's preference is to pass all woody debris over the dam to the extent possible. The size of the wood gathered at the trash rack and boom ranges from 2-inch branches to full-sized trees. Gina discussed the types of data that were collected during the previous LLO activities. No quantitative measurements were performed; however, turbidity monitoring has been conducted when the gates were open. In 1998 and 2012, there were small, brief, spikes in turbidity when the LLOs were open, but it quickly dropped.

During the call, Philip asked for clarification on several topics in the PAD, and the proposed draft studies contained in the PAD. These questions and the responses are summarized below.

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AQ 2 – Fish Populations

The call participants discussed several topics related to the draft fish studies.

The group discussed the distribution and spawning timing of striped bass and shad, as well as the shad flows in the existing FERC license. Monitoring studies conducted in 2001 by PG&E concluded that successful shad spawning occurred in the early spawning season.

Philip asked if the proposed study included specific monitoring of the plunge pool below the dam to see if the fish population was different from the rest of the reach, in particular if hardhead might be found in it. PG&E did not include specific monitoring of the plunge pool because spill velocities are very high and there is very limited refuge habitat during spills.

The call participants discussed the background of the development and implementation of the shad flows. The license requirement is focused on the flow velocities, and PG&E can provide the shad flows from either K1 or K2 powerhouses. When Millerton Lake is higher, then higher flows are needed from K2 to achieve the velocities needed to keep the shad eggs suspended in the water column. Philip asked if PG&E had any data before and after the 1993 shad order, to determine if the shad population is improving and evaluate how dependent the shad are on the spawning flows. PG&E to confirm. *Follow up: PG&E has prepared a list of surveys to share with Philip.*

The call participants discussed the timing of the fish surveys near the K2 Powerhouse. Philip asked if the surveys would be timed with striped bass and shad movement upstream. Since the movement upstream occurs during spring runoff, for safety reasons PG&E has not proposed surveys during this time. Previous American shad surveys were done by splash counts from a boat due to this reason. PG&E's study plan proposes fish monitoring at the end of the summer to include young-of-the-year, as well as other life stages of native fish.

HYD 1 – Flow Balance Model

The call participants discussed the HEC-Res Sim model that PG&E proposed to use for modeling in the HYD 1 study plan. Philip asked if power generation could be calculated.

HYD 2 – Hydrology with and without the Project

The call participants discussed the types of analyses that would be completed for the proposed draft study. As proposed, the analysis includes use of indicators of hydrologic alteration (IHA) software. An evaluation of outputs that characterize spills and the rate of change would be used. PG&E noted that inflows into Kerckhoff Reservoir are dependent on upstream sources, the reservoir has a small storage capacity, and PG&E does not have much ability to control recession rates. The current license does not have a ramping rate requirement largely due to the small amount of storage and PG&E cannot buffer inflows.

GEO 2 – Project-related Sediment Management Practices in Kerckhoff Reservoir

The call participants discussed sediment information included in the PAD and proposed draft sediment studies for the reservoir and Project Bypass Reach. Sediment chemical analyses conducted in conjunction with previous a bathymetric survey were inadvertently omitted from the PAD. *Follow up: PG&E filed this information with FERC on 2/8/18, and also shared it with the*

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State Water Board. The State Water Board is interested in the amount of sediment that might be released through the LLOs. PG&E shared that the area of sediment entrainment is limited to the area near the outlets.

GEO 3 – Project-related Erosion and Sedimentation and LAND 1 – Project Roads and Trails Assessment

Philip asked about the estimated level of the frequency of road maintenance to help the State Water Board understand the potential for erosion from these activities and construction. PG&E to confirm. *Follow up: Road maintenance is conducted on an as-needed basis annually. Crews also address storm damage on access roads then needed to repair or prevent damage that may occur during the year.*

WQ 1 – Water Temperature in Kerckhoff Reservoir and the Project Bypass Reach of the SJR

The call participants discussed the potential for thermal stratification in large pools in the Project Bypass Reach. No data currently exist to suggest that there is thermal stratification. Philip noted that a water temperature model study was not proposed by PG&E. PG&E clarified the intent of the WQ 1 study is to collect enough data to determine whether temperature modeling is necessary. PG&E does not think that the reservoir typically stratifies and, if it does, it would be temporary due to the small size of the reservoir. The water temperature coming into Kerckhoff Reservoir comes from the upstream hydroelectric projects and PG&E will not likely be able to affect it. Philip indicated that he supports not doing a water temperature model at this time.

WQ 2 – Water Quality Sampling in SJR Bypass Reach and Kerckhoff Reservoir

The call participants discussed the methods and locations for water quality sampling. Philip suggested moving one of the fecal coliform sampling sites to the Smalley Cove area, and a couple of other places in the reservoir rather than just by the dam.

Philip indicated that the State Water Board would likely ask for a bioaccumulation study, which was not proposed by PG&E in the PAD, due to concerns about mercury, PCBs, and anything that could bioaccumulate. He added that one-time sampling would likely be requested.

AQ 4 – Entrainment

Philip asked for clarification on the focus of the proposed entrainment study. PG&E clarified that the proposed study is a desktop exercise to determine likely entrainment at the intakes and survival with turbine passage based on the available literature. The evaluation does not include an assessment of fish survival with spills over the dam.

BOT 2 – Riparian and Wetland Resources

The call participants discussed that the San Joaquin River below the dam is steep with limited floodplain development. It is a bedrock-boulder incised channel with few deposition bars that would not be supportive of extensive riparian habitat.

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WILD 1 – Special-status Wildlife

The call participants discussed the draft proposed WILD 1 study plan. Specific surveys for golden eagles and peregrine falcons were not proposed, but surveys would be conducted for their potential habitat within the Study Area. Potential recreation effects on special-status wildlife also were discussed. There are no existing data that document disturbance by recreation on special-status wildlife, but that would be evaluated in the proposed study.

Other studies

The call participants discussed two potential studies that were not proposed by PG&E in their PAD.

The call participants discussed the potential need for an amphibian study. Philip commented that some stakeholders may be interested in a bullfrog study, as well as a foothill-yellow legged frog (FYLF) and Kern brook lamprey survey (if a primer is available for eDNA). eDNA was mentioned as a possible tool for indicating potential presence of the species within the reach. Philip said that he would not advocate for a full survey [(e.g., visual encounter surveys) for FYLF [at this time]]. *Follow-up: no eDNA primer exists for Kern brook lamprey.*

Philip discussed the State Water Board's rationale for the potential need for a bullfrog study and the potential need to control for invasive species. He thought that the surveys could potentially be coupled with other studies already proposed. The group discussed potentially tying the need for a bullfrog ground survey to the results of the FYLF eDNA. If there are no FYLF in the reach, there would not seem to be a Project nexus.

Philip noted that the State Water Board usually wants protocol-level benthic macroinvertebrate (BMI) surveys to determine overall river health; however, looking at the reach, he noted the substrate may not be amenable to the SWAMP protocol sampling. The call participants discussed the possibility of a trigger-based approach, based on the condition of the fish for needing a BMI study. If the fish are in good condition, a BMI study may not be needed. Philip commented that neither a shad nor striped bass spawning study was proposed. The call participants discussed that fish population and distribution studies have been proposed; and extensive shad spawning studies were already conducted as part of the current license.

Process

Philip asked how PG&E sees the approval process moving forward for studies to be implemented in 2018. PG&E discussed that they are conducting initial outreach to the agencies to start the conversation about starting studies early. *Follow up: Studies will be conducted on the timeframe presented by FERC in Scoping Document 1.*

Beneficial Uses

The call participants discussed why shad and striped bass are of interest to the State Water Board, as one of the beneficial uses for waters associated with the project includes recreation. PG&E asked Philip how the State Water Board would look at the native versus non-native fish protection. Philip replied that shad spawn in May and June, and they assume that the native species spawn about the same time. He hopes that the spawning lines up for the species. He

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added that they would try to balance native species and shad/striped bass so it doesn't impede PG&E operations.

Action Items

- Cardno to provide the shad report references to Philip on CD.
- Gina and Wayne to check to see if there were surveys after the 2001 flow suspension.
- PG&E will follow up and determine if any data are available on the amount of sediment that may have been released with the low level outlets were opened.
- PG&E to check where information on chemical testing of the sediment in the reservoir is in the PAD
- PG&E to follow up on the frequency of road maintenance.
- Gina to send Philip a photo below the dam during spill.
- Gina to look for past shad studies.
- Gina to follow up with DWR and Forest Service on availability of eDNA primers for Kern brook lamprey.

Follow-up Items for Philip Choy (SWRCB), from 12/21/17 Call with PG&E Regarding Kerckhoff Relicensing PAD

- Were any American shad spawning surveys conducted after the 2001 flow suspension?
 - Monitoring conducted in May 2001 concluded that successful shad spawning occurred in the early spawning season; thus, no additional shad spawning surveys were conducted following the 2001 flow suspension.
- Cardno to provide the shad report references to Philip on CD.
 - A CDROM with American shad references was mailed to Philip.
- In regards to GEO-2, Philip was interested if there is sediment passage from Kerckhoff Dam, and if there is, how much, when the gates are opened. PG&E will follow up to see if there are any data.
 - Turbidity monitoring has been conducted at least twice when the low level outlets (LLO) were exercised.
 - On June 10, 1998, two LLOs were opened and closed one at a time to verify functionality of the LLOs and sluice a minor amount of sediment during heavy snowmelt. Representatives from FERC, USFWS, Reclamation, and CA State Parks/Millerton attended the site visit on June 10 to observe the LLO exercise. Inflows to Kerckhoff Reservoir were approximately 12,000 cfs. One LLO was opened and closed between 1000 to 1230 hours, while the second LLO was opened and closed between 1230 to 1430 hours. Turbidity, dissolved oxygen (DO), and settleable solids were measured at two stations: 1) 0.25-mile downstream of Kerckhoff Dam and 2) approximately 8 miles downstream near the Kerckhoff 1 Powerhouse. Turbidity peaked at 25.0 NTU at station 1, while turbidity measurements at station 2 ranged from 3.2 to 6.8 NTU. DO ranged from 10.1 to 11.3 mg/L at station 1 and from 11.2 to 11.6 mg/L at station 2. Background turbidity was 12.3 NTU and DO was 10.7 mg/L at station 1.

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- To support trunnion work at Kerckhoff Dam, LLO #2 was opened to lower the reservoir for safe worker access on November 5, 2012. Turbidity was monitored at the J-2 gage. LLO #2 was opened and closed from 0925 to 1350 hours. Background turbidity averaged 2.28 NTU. Turbidity peaked at 6.42 NTU at 1100 hours, but dissipated quickly. The daily average turbidity on November 5 was 2.83 NTU.
- Water quality was also monitored during the more recent replacement of the LLOs from September through November 2015. Approximately 800 cubic yards of sediment was removed in front of the LLOs and trash rack. A turbidity curtain was used to contain the material. The WDR and Streambed Alteration Agreement required the measurement of turbidity, DO, settleable solids, pH, water temperature, and specific conductance. These parameters were monitored at a downstream station (K-1) located just below the plunge pool and at the K1 Intake (K-2). Background turbidity was 0 NTU. The 24-hour average did not exceed 2.1 NTU during the construction work. The other parameters did not exceed Receiving Water Limitations required by the WDR.
- Send Philip sediment chemical analyses during the previous bathymetric survey (completed).
- Regarding GEO-3 – what is the frequency of road maintenance (as related to potential for erosion from road maintenance and construction activities)?
 - Road maintenance is conducted on an as-needed basis annually. Crews also address storm damage on access roads when needed to repair or prevent damage that may occur during the year.
- Provide a photo of the SJR below Kerckhoff Dam during spill in 2017.
 - Photos of similar angles are provided for comparison purposes.

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- Were any shad population surveys conducted prior to and after the 1993 FERC Order establishing the permanent shad flow regime?
 - American Shad surveys (and striped bass surveys) have been conducted in Millerton Lake/San Joaquin River from 1978 – 1992. Flow changes are also included in the list below.
 - 1978 – egg, larval, and young-of-year (YOY) surveys conducted throughout Millerton Lake up to Kerckhoff 2 Powerhouse (K2 PH) site; included a station in Friant-Kern Canal below Friant Dam (egg and larval survey, beach seining).
 - 1979 – 1982 – adult surveys (gill nets and Lake Merwin trap), fish migration survey (1979 only; radio transmitter), egg and larval surveys (stationary and plankton tows), YOY surveys (electrofishing, beach seines, midwater trawl, angler surveys, hydrological surveys (estimate transport time between K1 and K2 PHs and movement through Millerton Lake), water quality, Millerton Lake height, inflow measurements. Baseline survey was in 1979 (pre-K2 PH construction); 1980-1982 during construction of K2.
 - 1984-1985, 1986, 1987 – post-operational studies (K2 PH began operating in 1983): adult surveys (gill nets), egg and larval surveys, juvenile surveys (boat electrofishing), water quality.
 - 1988 – new FERC-mandated flows for shad (800 cfs from 2200-0200 hours and 400 cfs from 0200 hours until peak generation started from May 15 – June 30). Per FERC order - releases could be made from either powerhouse.
 - 1989 – FERC-mandated flows for shad (400 cfs from K2 PH from 2200-start of next day's peak generation from May 15-June 30. From June 6-30, release increased to 800 cfs from 2200-0200 hours due to low ratio of live:dead American shad eggs captured. Minimum 400 cfs flow continued after 0200 hours). *Note: FERC gave the option of releasing 400 cfs from K2 PH, K1 PH, or Kerckhoff Dam.
 - 1990 – FERC mandated flows released from K2 PH (400 cfs from May 15-June 30 from 2200 to 0200 hours, and 400 cfs or peak generation flows from 0200 to 2200 hours). Non-peaking flows of 474-706 cfs provided from May 15-21. From May 22-June 30, target flows of 775 cfs and greater were provided around the clock. Fourth consecutive dry year. Millerton Lake at 540 ft msl.
 - 1991 – FERC mandated flows released from K2 PH (775 cfs when Millerton Lake at or below 545 ft msl; 1,200-2,000 cfs from 2200-0200 hours and 775 cfs or peak generation flows from 0200-2200 hours when Millerton Lake above 545 ft msl).
 - 1988, 1989, 1990, 1991 - egg and larval survey, juvenile survey, adults incidentally captured (gillnetting and electrofishing), water temperature and dissolved oxygen measured.
 - 1992 – full pool conditions existed, yet shad were able to spawn (juvenile and adult sampling conducted via gillnets in fall 1992). FERC mandated flows released from K2 PH (1,200 cfs from 2200 to 0200 hours and 775 cfs remaining hours when Millerton Lake is at or above 545 ft msl). Full pool study conducted. According to May 6, 1992 FERC Order, if sampling indicated shad successfully spawned during full pool velocity study and 1991 and 1992 year classes found, further sampling in 1993

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and 1994 not needed, and studies per the 1981 Fishery Agreement between PG&E and CDFG were considered complete.

- 1993 February 17, 1993 letter from USFWS (attached to 1992 full pool study) indicated that their understanding was CDFG would conduct American shad status monitoring to verify if shad spawning flow releases adequate for remainder of license.
- Would it be possible to take eDNA samples for Kern brook lamprey? Is there a primer?
 - Based on feedback from Genidaqs and USFWS biologists, there does not appear to be any primers available for Kern brook lamprey. It is suspected that Kern brook lamprey in the Project Bypass Reach are rare. There may not be enough material available to develop primers.

Follow-up question from February 14 site visit:

- Is J2 a PG&E gage or USGS gage?
 - USGS has oversight of the gages below. These gages are owned and maintained by PG&E. USGS checks the gages and verifies/publishes the flow data on their website, so the gages have USGS numbers.

STATION	STNAME	SHORTNAME	LATITUDE	LONGITUDE	USGS_Number	CDEC_ID
J1	Kerckhoff Reservoir 11-2466.50	Kerckhoff Reservoir	37.12811	-119.52553	11246650	KRH
J2	San Joaquin R Nr Auberry	San Joaquin R Nr Aub	37.13294	-119.53345	11246700	SJA
J3	KERCKHOFF POWERHOUSE #1	Kerckhoff	37.092556	-119.552799	11246950	
J6	Kerckhoff #2	Kerckhoff #2	37.07247	-119.55785	11247050	