THE SECRETARY OF THE INTERIOR
WASHINGTON

OCT 17 2016

The Honorable Kimberly D. Bose
Secretary, Federal Energy Regulatory Commission
888 First Street, N.E.
Washington, DC 20426

Dear Madam Secretary:

The Department of the Interior (Department) supports the applications submitted by PacifiCorp and the Klamath River Renewal Corporation on September 23, 2016, and urges the Federal Energy Regulatory Commission (Commission) to approve these applications as a critical step toward resolving the significant water-related issues in the Klamath Basin (Basin).

Since time immemorial, the Indian tribes of the Basin have been sustained by the bounty of the Klamath River (River). Once home to the third-largest salmon runs on the West Coast, the River and the fishery it supports are at the core of the cultural, spiritual, and economic well-being of six federally recognized Indian tribes. The River changed, however, in the early twentieth century when the first of four hydroelectric facilities now owned by PacifiCorp was constructed. While these dams brought prosperity to many, their construction came at a steep cost to tribes and fishing communities. The returning runs of salmon repeatedly bludgeoning themselves against the new dam walls were a harbinger of a declining fishery that cast a cloud over those who, for millennia, have called the Klamath home.

More than 100 years later, we have a unique opportunity to restore this magnificent River. Importantly, we recognize that dam removal must be undertaken in a manner that protects all the uses of the River, including the farming and ranching interests that are interwoven into the fabric of the Basin. In short, dam removal can re-write a painful chapter in our history, and it can be done in a manner that protects the many interests in the Basin.

In April of this year, I stood on the bank of the Klamath River with Governor Brown of Oregon, Governor Brown of California, Under Secretary of Commerce for Oceans and Atmosphere Sullivan, representatives of three Basin tribes, irrigators, non-governmental organizations, and local officials to sign the amended Klamath Hydroelectric Settlement Agreement (KHSA) and the Klamath Power and Facilities Agreement. These two agreements, in conjunction with each other, provide a path forward for the Klamath Basin that seeks to both restore the River and preserve ranching and farming for future generations. The promise of that April morning took a significant step forward September 23, 2016, with the filing of the above-captioned applications, which propose the transfer, decommissioning, and removal of the four lower Klamath River dams. This letter and enclosures are being filed in support of those applications, which I respectfully ask the Commission to approve.

The filing of the applications is the first step of a multi-faceted approach to restore the resources of the River while also ensuring a sustainable future for all the communities of the Basin. The recommendation and determination I am making today are not entered into lightly. Rather, I do so in reliance on the most comprehensive and robust analysis of dam removal ever undertaken. Under the leadership of the U. S. Geological Survey and the Bureau of Reclamation, in conjunction with partners at the Federal, state, local, and tribal levels, the Department carried out an extensive engineering, scientific, and environmental study that was comprehensive in scope, subjected to multiple levels of independent peer review, and done in an open and transparent manner.

These studies were conducted over the course of 4 years and produced 50 new scientific reports, convened 4 independent science panels, finalized an environmental impact statement under the National Environmental Policy Act, and produced the Klamath Dam Removal Overview Report that was subject to a second level of independent peer review from a panel of 6 subject-matter experts from across the Nation. The science and public participation processes and major findings from these studies are provided in more detail in the enclosure to this letter. In addition to the Department's bureaus, the National Oceanic and Atmospheric Administration (NOAA) brought their expertise to many of these studies and reports. Importantly, NOAA Fisheries and the U.S. Fish and Wildlife Service prepared an integrated Preliminary Biological Opinion under section 7(a)(3) of the Endangered Species Act that evaluated the potential impact of removing the four lower Klamath dams. The Agencies found that removal of the dams would not be likely to jeopardize the continued existence of any listed species and, in fact, dam removal would advance the recovery of Southern Oregon/Northern California Coast coho salmon.

Our study findings are consistent with other independent findings from recent dam removals worldwide that show rivers healing very quickly following dam removal, fish instinctively returning to their historical spawning grounds and thriving, tribes once again able to harvest fish lost to them for more than 100 years, new recreational opportunities opening up, and local economies and jobs growing. Tangible benefits like these have been seen following recent dam removals on the Elwha and White Salmon Rivers in Washington and the Penobscot and Kennebec Rivers in Maine. While there are a number of significant and highly influential findings from our Klamath River studies, four merit emphasis here:

1) The most likely cost of facilities removal, $292 million, is well below the $450 million available for dam removal obtained from PacifiCorp customer surcharges and California bond funding;

2) After extensive testing of reservoir bottom sediments, no chemicals were detected in concentrations exceeding human or biological health screening levels or for the safe release of sediments to downstream freshwater or marine environments;

3) As a result of dam removal, more than 420 miles of historic spawning and rearing habitat for salmonids will be reopened. These critical cold water streams will help protect fish and the River ecosystem from the effects of climate change, provide benefits to many salmonids in the basin, and is expected to increase adult

Chinook salmon production about 80 percent, which will benefit tribal, commercial, and sport fisheries, and create jobs, and

4) Dam removal is expected to immediately improve water quality by eliminating reservoirs that produce serious temperature and dissolved-oxygen problems for salmonids and promote the growth of summer and fall algal blooms that can be toxic to humans and animals exposed to the water in the reservoirs and the downstream River.

Some oppose dam removal due to fears that this will set a precedent for removal of major dams throughout the West. I contend that the facts in the Klamath Basin – the interrelationship of tribal rights, the resolution of water disputes, the engagement of two States that are financially supporting this effort, and the private property owner agreeing to dam removal as part of a Basin-wide solution – make this proceeding unique. The Department believes that each dam removal or decommissioning proposal must be evaluated on the facts, circumstances, and support that exist within the specific watershed.

Others argue that the best solution is to move forward with relicensing, which would require expensive and extensive infrastructure, including fish ladders. In contrast, our studies show that creating a free-flowing River will optimize the upstream and downstream migration of salmonids, reduce the devastating impacts of juvenile salmon disease below Iron Gate Dam, and improve degraded water-quality caused by the dams and reservoirs, including the growth of toxic algal blooms in the two largest reservoirs.

We are, today, exceptionally well positioned to preserve and protect a culture, an economy, an ecosystem, and a way of life not just for the tribes but for ranchers and farmers as well. The adverse effects of the recent Basin drought on both water supplies and the fishery, combined with long-term climate trends, drive home that the need to act is now. Only a Basin-wide approach – where dam removal is joined with actions to support farming and ranching – is sustainable in the long-term.

For all of these reasons, and in accordance with section 3.1 of the KHSA, I believe that removal of the 4 lower Klamath River dams will advance restoration of the salmonid fisheries of the Klamath Basin and is in the public interest. That action, in conjunction with the implementation of Klamath Power and Facilities Agreement, is a critical step toward addressing the fisheries, water supply, and economic issues of the Basin. I therefore respectfully ask this Commission to approve the above-captioned applications.

Sincerely,

Sally Jewell

Sally Jewell

Enclosures

cc: The Honorable Edmund G. Brown, Governor of California
The Honorable Kate Brown, Governor of Oregon
Thomas O'Rourke, Sr, Chairman, Yurok Tribe
Russell Attebery, Chairman, Karuk Tribe
The Honorable Kathryn Sullivan, Administrator, NOAA
Stefan Bird, President and CEO, PacificCorp d/b/a Pacific Power
Chuck Bonham, Director, Department of Fish and Game, State of California
John Laird, Secretary of Natural Resources, State of California
Peter Shepherd, Director, Department of Environmental Quality, State of Oregon
Curt Melcher, Director, Department of Fish and Wildlife, State of Oregon
Thomas Byler, Director, Department of Water Resources, State of Oregon
Mark Lovelace, Board of Supervisors, Humboldt County, California
W. Robert Irvin, President, American Rivers
Curtis Knight, Executive Director, California Trout
Glen Spain, NW Regional Director, Pacific Coast Federation of Fishermen's Association
Lowell Ashbaugh, V.P. for Conservation, N. CA Council, Federation of Fly Fishers
Brian Johnson, California Director, Trout Unlimited
Greg Block, President, Sustainable Northwest

ENCLOSURE

Summary of Findings Informing the Secretarial Statement of Support

Background:

The Klamath Basin (Basin) covers over 12,000 square miles in southern Oregon and northern California and contains vast natural resources and economic opportunities related to fisheries, farming, ranching, timber harvest, mining, and recreation. These resources have economically sustained communities throughout the basin for many years. The Klamath Basin is also home to six federally recognized Indian tribes who depend on many of these same natural resources to support their way of life and spiritual wellbeing, as they have for thousands of years. The Basin's natural resources, including clean water, abundant and reliable supplies of fish, and terrestrial plants and animals, are central to Indian cultural identity, livelihood, and health.

Multiple physical changes in the basin over the past 150 years, including construction and operation of hydroelectric dams, overharvest of fish, loss of wetlands, water diversion for agricultural uses, mining operations, road building, and timber harvest, have contributed to the decline in fisheries. These activities have created barriers to fish passage blocking access to hundreds of miles of streams in the Upper Klamath Basin, diminished flows in streams, degraded spawning and rearing habitat, and degraded water quality. The resulting declines in fisheries have created hardships for Indian tribes and other commercial and sport fishing interests. The Klamath Tribes (Tribes) in the upper basin have been most adversely affected by these changes due to the complete loss of their salmon fishery for over 100 years and the loss of the Tribes' sucker fishery in the upper basin for the past 30 years.

Prior to 1912, before construction activities of Copco No. 1 Dam fully excluded salmon passage to the Upper Klamath Basin, Chinook salmon runs were considerable, providing for large upper basin tribal and subsistence fisheries, in particular in the upper reaches of the Sprague River above Upper Klamath Lake. These Chinook salmon migrations also provided for recreational and small scale commercial harvest of Chinook salmon as described by Hamilton and others (2016) in their exhaustive historical analysis. This analysis of Klamath River Chinook salmon clearly documents the impacts of dam construction on the loss of an important upper basin fishery and its contribution to the 90-plus percent decline of the basin-wide Chinook runs. It clearly points to the value of dam removal for reversing damage and helping to restore fisheries for future generations.

Although rich in historical natural resources, communities throughout the Basin have faced repeated hardships in more recent years related to water shortages, degraded water-quality, and declining fisheries. These hardships have been most strongly felt by tribal, commercial, and sport fishing communities, as well as agricultural communities, but they also affect the overall economic viability of the region and have created deep conflicts among communities. Although hardships and conflicts have been prevalent for decades, they became particularly acute beginning in 2001, including the curtailment of irrigation water deliveries to the Bureau of Reclamation's (Reclamation) Klamath Project; a major die-off of Klamath River salmon (at least 33,000 pre-spawned adults); ongoing outbreaks of juvenile salmon disease; severe restrictions on commercial and recreational ocean fishing along 700

miles of the Oregon and California coast; major reductions in Klamath River tribal fisheries; and beginning in 2005, annual public health warnings against physical contact with the water in Iron Gate and Copco No. 1 reservoirs due to toxic algal blooms. These hardships, coinciding with the relicensing of PacifiCorp's Klamath River Hydroelectric Project, prompted the long process of negotiating the Klamath Hydroelectric Settlement Agreement (KHSA) and the Klamath Basin Restoration Agreement (KBRA), both signed in February 2010 by over 40 stakeholders.

The KHSA provided for the study and evaluation of the potential removal of the 4 lower dams on the Klamath River (herein called the Four Facilities), which includes J.C. Boyle, Copco No. 1, Copco No. 2, and Iron Gate dams, all owned by PacifiCorp. Under terms of the KHSA, if the Four Facilities are removed, Keno Dam (upstream of the Four Facilitates) would remain in place but ownership would be transferred from PacifiCorp to Reclamation. In addition, operation of Link River Dam (owned by Reclamation and located on Upper Klamath Lake), would be shifted from PacifiCorp to Reclamation. The KBRA contained numerous programs and actions for fish habitat restoration, assisting tribal and local communities, rebalancing how water is used in the upper basin, and settling many contested water rights that have not been fully adjudicated. The KHSA and KBRA were developed by a broad range of Federal, State, local, and tribal stakeholders to resolve a broad range of water and fisheries issues and to break the cycle of repeated crises in the basin.

PacifiCorp also signed the KHSA, stating "*Our company owns and manages several hydropower resources and we see hydropower as an important part of our energy mix. In recognition of the broad stakeholder interest in the future of Pacific Power's dams, our company, with the support of utility regulators, consumer advocates and businesses determined that removal of the Klamath dams* [the Four Facilities] *under a carefully negotiated agreement protects our customers from uncertain costs and risks of other alternatives*." PacifiCorp estimated that it would incur relicensing capital costs in excess of $400 million and $60 million in additional operating costs (in 2010 dollars). In addition, relicensing requirements would reduce the potential power generation capacity by approximately 20 percent and would decrease peaking operations to only one day a week, which would decrease the economic value of operating the Four Facilities.

The Four Facilities provide an average of 82 megawatts of electricity for PacifiCorp customers in a 6 state area. Although these facilities provide some recreational opportunities for the local communities, their primary purpose is for power generation. The Four Facilities are not flood control structures nor do they store irrigation or drinking water for downstream communities; these reservoirs are generally operated at or near full pool year-round to maximize power generation. Reclamation's Link River Dam on Upper Klamath Lake is the primary facility for storing irrigation water and controlling floods in the upper basin.

Under terms of the agreement, the KBRA terminated because Congress failed to pass authorizing legislation by the December 31, 2015, termination date. The KHSA, however, did not terminate on this date, but under terms of the KHSA, removal of the Four Facilities could not precede without Congressional authorization. Because some parties to the KHSA believed congressional authorization was unlikely in the future, they undertook the task of amending the KHSA so decommissioning of the Four Facilities could be pursued through the Federal Energy Regulatory

Commission (FERC) process, which does not require new congressional action. An amended KHSA was signed on April 6, 2016, which established a process for PacifiCorp and the newly formed Klamath River Renewal Corporation (KRRC) to jointly file with FERC for license transfer and license amendment for the Klamath Hydroelectric Project, No. 2082, and application for license surrender for the purpose of removing the Four Facilities. This joint application was filed with FERC on September 23, 2016.

Purpose and Scope of Secretarial Statement of Support:

The amended KHSA includes the opportunity for the Secretary of the Interior to make a Statement of Support for removal of the Four Facilities. The amended KHSA defines the Secretarial Statement of Support as follows: *"In cooperation with the Secretary of Commerce and other federal agencies as appropriate, the Secretary may make an affirmative statement of support for Facilities Removal if, in the Secretary's judgment, Facilities Removal (1) will advance restoration of the salmonid fisheries of the Klamath Basin, and (2) is in the public interest, which includes but is not limited to consideration of potential impacts on affected local communities and Tribes."*

A Secretarial Statement of Support does not constitute a Federal action authorizing removal of the Four Facilities as described in the amended KHSA nor does it authorize take of listed species or otherwise replace the requirements of Section 7 of the Endangered Species Act. Under the amended KHSA, the Federal authority for approving or denying facilities removal resides solely with FERC. Rather, a Secretarial Statement of Support constitutes the judgement of the Secretary of the Department of the Interior (DOI) on whether removal of the Four Facilities will advance salmonid fisheries and whether it would be in the public interest based on the best available scientific, engineering, and other technical information. This judgement culminates six years of fact finding by an interdisciplinary, multi-agency team. This team conducted new studies and synthesized existing information covering a broad range of subjects relevant to removal of the Four Facilities, including dam removal engineering, fish biology, hydrology, sediment transport, water quality, tribal and cultural resources, and economics; this body of information served to inform this Secretarial Statement of Support.

Science and Engineering Process:

The science and engineering process was guided by dedication to high quality, rigorous, and objective research and reliable results. The focus on rigorous research and results was essential to meet the Federal guidelines for scientific integrity articulated in the 2009 White House Memorandum on Scientific Integrity as well as to follow peer review requirements for individual Federal agencies and the Office of Management and Budget's 2004 Bulletin on Peer Review. In addition, the science review process complied with DOI's 2011 Policy on Scientific Integrity.

A Federal Technical Management Team (TMT) of top scientists and engineers was formed to provide coordination and inter-agency collaboration to address needs and questions raised in the KHSA. Under the guidance of the TMT and its sub teams, technical reports were developed by scientists and engineers from Federal agencies working within DOI, Department

of Commerce, and the Environmental Protection Agency (USEPA), as well as independent consulting firms. These agency scientists and engineers, worked collaboratively with state agencies from California and Oregon to review existing reports and to design and conduct studies to fill information gaps in order to address four primary questions: (1) will removal of the Four Facilities advance restoration of salmonid fisheries; (2) what would facilities removal entail and cost; (3) what are the potential risks and liabilities associated with facilities removal; and (4) is facilities removal in the public interest?

A wide range of studies were undertaken by seven Federal technical teams covering the important following topics: economics, biology, engineering and geomorphology, hydrology, water quality, tribal/cultural, real estate, and recreation. Four independent expert panels were also commissioned to generate reports analyzing potential impacts on fish and fisheries, including Chinook salmon, coho salmon and steelhead, resident fish (e.g. trout and suckers), and lamprey. An Overview Report (U.S. Department of the Interior and U.S. Department of Commerce, National Marine Fisheries Service, 2012) was prepared, which summarizes findings from the new topical reports, existing reports, and expert panel reports to address the four primary questions. Finally, an environmental compliance team was assembled that produced a final Environmental Impact Statement (EIS) that was informed by these reports. The decision was made to prepare an EIS because the original KHSA called for a Federal action, namely a Secretarial Determination on whether or not to remove of the Four Facilities. These reports are available at KlamathRestoration.gov and are listed in Appendix A.

Each team conducted independent scientific peer reviews of their products, and had discretion as to what specific peer review process was best suited for their reports. Peer reviewers were subject-matter technical experts, independent of the study being reviewed, and had no conflict of interest. The agency overseeing the peer review ensured that authors fully addressed review comments and made the final determination on when a report was ready for dissemination.

The Overview Report underwent an additional level of peer review as a Highly Influential Scientific Assessment, as defined by OMB's 2004 Final Information Quality Bulletin for Peer Review. This peer review was conducted by a panel of six subject-matter experts. During the review process the public had an opportunity to submit written technical comments for the six peer reviewers to consider during their deliberations. Much of the peer review process, including the collection of written comments from the public regarding the draft Overview Report, was run by an independent contractor (Atkins, North America) that specializes in conducting peer reviews. Atkins North America was also used to independently verify that all peer review comments obtained from the panel of subject-matter-experts were adequately addressed in the final Overview Report. This Secretarial Statement of Support draws heavily on the summaries and conclusions contained in the Overview Report (U.S. Department of the Interior and U.S. Department of Commerce, National Marine Fisheries Service, 2012).

Public and Stakeholder Participation:

Stakeholder and public participation in the science process was a high priority for the TMT in order to benefit from local subject-matter experts, acquire knowledge and data from the public who live in the basin, and to make the science process as accessible and transparent as possible. To inform the science and environmental compliance processes regarding removal of the Four Facilities, the TMT held or attended about 70 meetings between March 2010 and April 2012

with a broad range of stakeholders throughout the basin. The TMT held 13 public meetings regarding scoping and review of the Environmental Impact Statement. The TMT held an additional 13 public meetings and workshops to report on progress and solicit ideas and feedback regarding scientific studies and preliminary findings. A total of 20 meetings were held with the six federally recognized Indian Tribes in the basin during the design and execution of the scientific studies. The TMT attended seven meetings held by the stakeholders who signed the original KHSA (Technical Coordinating Committee) in order to obtain individual input from these agencies, tribes, or organizations. In addition, 10 meetings were held with county officials to provide them updates of studies, obtain information, and to listen to their ideas and concerns. A partial listing of these meetings, plus other meetings, is available in Appendix B.

Besides the public meetings, the public was given other opportunities to participate in the science process. The public was allowed to participate during the technical presentations made to the four fish Expert Panels and to provide input and review comments on the Expert Panel's four draft reports. The panel peer review of the Overview Report included a period of public comment; these comments were made available to the peer reviewers to inform their deliberations. In addition, the public provided many written and oral comments during the preparation of the Klamath Facilities Removal Final Environmental Impact Statement (FEIS). Although most scientific investigations do not include this degree of public participation, a concerted effort was made by the TMT to integrate public input and transparency into the process. This public input did improve the quality and thoroughness of the TMT's final scientific reports.

Summary of Key Findings:

Klamath River Dam Removal

Removal of the Four Facilities required development of a detailed deconstruction plan, titled *Detailed Plan for Dam Removal – Klamath River Dams* (Bureau of Reclamation 2012a). This Detailed Plan largely integrates requirements in the amended KHSA for hydroelectric operations through 2019; considers the full range of flow conditions that could be encountered during dam removal; considers the unique features of each dam and each reservoir; and to the extent possible includes measures to minimize impacts on the ecosystem.

- In order to minimize impacts on fish, particularly Endangered Species Act listed coho salmon, removal of all four dams is targeted for a single year (2020), which will prevent sequential stresses from suspended sediment releases from the reservoirs on various life stages of fish (e.g. returning adult salmon, rearing salmon, or out-migrating juveniles). In addition, drawdown of the three largest reservoirs (behind J.C. Boyle, Copco No. 1, and Iron Gate dams) would occur in the winter months, thereby releasing the largest loads of sediments from the reservoirs when the most sensitive fish species are in the ocean or in tributaries of the Klamath River and therefore not exposed to sediment being transported through the main-stem river. The process of reservoir drawdown releases the majority of sediments; the actual removal of dams and associated structures later in the year would release relatively small amounts of reservoir sediments. Reservoir drawdown rates would range from 1 to 3 feet per day to minimize reservoir bank slumping and erosion of sediments downstream. A winter drawdown of the three largest reservoirs was also selected because higher flows in the winter would initially erode the fine-grained sediments in the reservoirs

and continued high flows throughout the basin during the spring months would carry those sediments to the ocean. Copco No. 2 reservoir contains very little sediment so reservoir drawdown and dam removal at this site can begin later in the year without significantly increasing sediment loads and adversely affecting fish.

- Identified in the FEIS as the Preferred Alternative, full dam removal is recommended rather than a partial dam removal. Both partial and full dam removal are described in the Detailed Plan (Reclamation 2012a). Partial dam removal would create a free-flowing river at all four dams but would leave some structures in place along the Klamath River, such as powerhouses, spillways, and penstocks. In contrast, full dam removal would remove nearly all structures associated with the Four Facilities. Removing most structures would improve the scenic quality of the river and surrounding areas, reduce the cost of long-term maintenance of remaining structures by land-management agencies, and would be more effective at ensuring safety of the public.

- Each dam is unique and requires a carefully considered and custom process for reservoir drawdown and removal.
    - J.C. Boyle is a 68-foot tall dam, which includes some concrete and some earthfill embankment. Some localized blasting may be needed to reopen the culverts under the spillway to facilitate reservoir drawdown. But the majority of dam removal would occur in the summer via mechanical means (e.g. excavation).
    - Copco No. 1 is a 135-foot tall concrete dam. After drawdown is underway through rehabilitation of the old diversion tunnel, the concrete dam would be removed in 8-foot layers via blasting and mechanical means beginning in the winter and extending into April. This dam can be removed beginning in the high flow season because overtopping a concrete structure during the deconstruction period poses no risk to dam failure.
    - Copco No. 2 is a 33-foot tall concrete dam. The small reservoir would be drawn down in April and removal of the dam via mechanical means would begin in May.
    - Iron Gate Dam is a 189-foot tall earthfill embankment dam. During the year prior to reservoir drawdown, the original diversion tunnel would be rehabilitated and reestablished to allow reservoir drawdown in the early winter in coordination with the drawdown of J.C. Boyle and Copco No. 1 reservoirs. Beginning in the following June, and extending into September, the embankment material would be excavated by mechanical means. Excavation would not begin until June in order to avoid any risk of overtopping an earthfill structure during deconstruction.

- With dam removal, there would be significant potential for erosion of the newly exposed reservoir sediment along the shores of the river. Active revegetation efforts would begin soon after reservoir drawdown with the goal of establishing sustainable riparian, wetland, and upland habitats on the exposed reservoir sediment. Reclamation provided a detailed revegetation plan for each reservoir (Bureau of Reclamation 2011a). To limit the impacts of erosion, various methods of hydroseeding are recommended (e.g. application from ground, barge, and aerial-based equipment). Seed mixes would include specific applications for native grasses, riparian plantings, and wetland vegetation. Fencing would be used to protect newly revegetated areas.

- Many mitigation measures before, during, and following dam removal have been anticipated and their costs were included in the most probable cost for removal in the Detailed Plan. Major mitigation measures include: (1) working with the City of Yreka to relocate their drinking-water pipeline that crosses under Iron Gate Reservoir; (2) capturing and relocating potentially impacted aquatic species, such as out-migrating salmonids, suckers, Pacific Lamprey, and freshwater mussels; (3) protecting culturally and historically significant sites, including known sites, to be identified sites, and inadvertently discovered sites; (4) relocating some culverts under roads and Jenny Bridge on Copco Road near Iron Gate Reservoir; (5) deepening any affected groundwater wells after reservoirs are drawn down; (6) relocating, modifying, or elevating structures for willing landowners in an expanded floodplain stretching 18 miles downstream of Iron Gate Dam; (7) remedying any downstream water intake problems caused by release sediments; and (8) removal of recreational facilities and development of new or modifications of existing recreational facilities.

- The most likely cost of full removal of the Four Facilities is about $95 million (costs reported in 2020 dollars). In addition to physically removing dams, there are many other necessary costs, including engineering design, permitting, contract management, contingencies, mitigations, and site restoration activities including revegetation of newly exposed sediments. The total cost of dam removal would likely fall between $238 to $493 million dollars, with the most probable cost of $292 million dollars (Bureau of Reclamation 2012). The most probable cost is well below the $450 million dollars that will be available to the KRRC for removal of the Four Facilities. However, Reclamation's estimates assumed Federal legislation to provide various parties indemnity and litigation protection under the original KHSA (2010). Under the FERC process in the amended KHSA, indemnity and litigation protections will be achieved through various other means (e.g. insurance, bonding, and environmental liability protection) using private entities; these costs were not included in Reclamation's cost estimates for removal of the Four Facilities.

Sediments behind the dams

One of the primary areas of investigation associated with any dam removal is the amount, characteristics, and disposition of reservoir bottom sediments following dam removal and the likely effects of these sediments on humans and the environment. Multiple studies were conducted that characterized the physical and chemical properties of these sediments and determined the transport and fate of eroded bottom sediments given different hydrologic conditions.

- During reservoir drawdown and return to riverine conditions, 36 to 57 percent of the reservoir bottom sediments will be eroded and transported downstream, partly depending on the hydrologic conditions at the time of drawdown. Sediment transport modeling predicts that 1.5 to 2.3 million tons of sediment (5.3 to 8.6 million cubic yards) would be eroded from the three largest reservoirs (Bureau of Reclamation 2012b); Copco No. 2 reservoir contains a negligible amount of sediment. A large proportion (85 percent) of the eroded sediment will be silts and clays that would remain in suspension and would be largely transported during the first year through the Klamath River and into the Pacific Ocean where it would be

dispersed by ocean currents (Bureau of Reclamation 2012b). A small portion of the eroded silts and clays would remain in the river as overbank deposits along the river channel or in temporary storage in deeper river pools until flushed from the system in subsequent years.

- The remaining 15 percent of the eroded reservoir sediment is composed of sand and larger size material that would be transported through the Klamath River system more slowly, over a period of years or decades, largely depending on flow conditions during and after dam removal. Based upon sediment transport models, about 1.5 feet of coarser sediment is expected to deposit along a five-mile reach downstream of Iron Gate Dam soon after dam removal. Deposits would get progressively thinner further downstream, becoming less than 0.25 feet thick about 10 miles downstream of Iron Gate Dam. The movement of this coarse bedload material following dam removal would help resupply salmon spawning gravels below Iron Gate Dam.

- Within the general uncertainty of model predictions (Reclamation 2012b), removal of the Four Facilities would result in suspended sediment concentrations (SSCs) below Iron Gate Dam with peak concentrations of 7,000 to 14,000 milligrams per liter (mg/l) occurring sometime in the first few months of reservoir drawdown, depending on water year type (dry, average, or wet) and the timing of storm events. SSCs in excess of 1,000 mg/L would occur on a timescale of weeks to months. Predicted SSCs would remain greater than or equal to 100 mg/L for 5 to 7 months following reservoir drawdown, and concentrations would remain greater than or equal to 30 mg/L for 6 to 10 months following drawdown.

- Model results also indicate that while dilution in the lower river would decrease SSCs to 40 percent of their initial value downstream from river mile 59 (Orleans, CA), it can be conservatively assumed that SSCs in the Lower Klamath River would be sufficient ($\geq$30 mg/L) to adversely affect beneficial uses (fish health and water quality) throughout the lower River and the Klamath Estuary for 6 to 10 months following reservoir drawdown.

- Monitoring studies of reservoir bottom sediments (Shannon and Wilson Inc. 2006; Reclamation 2011b) generated multiple lines of evidence that were used collectively to evaluate the chemistry of reservoir sediments and their potential to affect the environment and human health during or after dam removal. These lines of evidence and the possible effects were designed following the tenets of the interagency Sediment Evaluation Framework and the Dredged Material Management Program that guide decision making for dredging and disposal of sediments in the Pacific Northwest. Multiple potential exposure pathways were analyzed for both humans and aquatic biota, including short-term exposure to sediments flushing downstream during dam removal, long-term exposure to exposed reservoir sediments and river-bank deposits, long-term exposure to sediments deposited in the river channel, and long-term exposure to sediments deposited in the marine and near-shore environment (CDM 2011a). Employing multiple lines of evidence for assessing chemical toxicity, and analyzing multiple exposure pathways, demonstrate that significant adverse effects would be avoided if the Four Facilities are removed and the chemicals associated with these reservoir sediments are allowed to erode downstream.

- No chemicals were detected in reservoir sediments at concentrations exceeding available human health screening levels or the Dredge Materials Management Levels, and no other preclusions to releasing the reservoir sediments to the freshwater or marine environment were identified for human or aquatic biota exposure. A number of chemicals and common classes of chemicals were detected; however, the results were neither surprising nor unusual. Absolute concentrations of most chemicals in the reservoir sediments were generally low compared to the screening levels. No chemicals were identified at levels associated with significant adverse effects for humans or biota under any of the exposure pathways analyzed (CDM 2011a).

- Relative to the likely environmental effects of chemicals in reservoir bottom sediments, Environmental Protection Agency (EPA) Region 9 stated that the "The Klamath Dams sediment quality evaluation was based on a robust data set." EPA's three overall conclusions were "……levels of chemical contaminants in sediments behind the dams largely fell below screening thresholds used to assess sediment disposition; the sediments likely to be released during dam removal are not likely to have significant contaminant-related effects on downstream fish, wildlife, or human receptors especially after mixing and dilution; and fish, wildlife, and human exposures to sediment contaminants would actually be reduced overall compared to the with-dams scenario….." (Woo 2015).

Short-term (< 2 years) adverse effect of dam removal on salmonids and water quality

Dam removal can be viewed as a trade-off of short-term adverse effects in order to achieve long-term benefits. The primary adverse effect would occur in the first year of dam removal when large suspended sediment concentrations (SSCs) would be eroded from the reservoirs and transported downstream, beginning at J.C. Boyle Reservoir and extending through the Klamath Estuary. Peak concentrations of 7,000 to 14,000 mg/L would occur in the first few months of reservoir drawdown and predicted SSCs would remain greater than or equal to 30 mg/L for 6 to 10 (Reclamation 2012b). Studies were conducted to determine if dredging reservoirs prior to drawdown would be feasible (CDM 2011b) and would significantly reduce adverse effects on salmonids (Stillwater Sciences 2011). Based on a number of factors, including the relatively small reductions in mortality of fish, the large land disturbance that would be needed for sediment containment structures (about 300 acres), the potential disturbance of cultural resources, and the high cost of the dredging operation, dredging was deemed infeasible. In lieu of dredging, more cost effective measures were identified to minimize effects of released sediment on aquatic species.

- The high SSCs anticipated in the Klamath River during reservoir drawdown are likely to reach lethal levels for some fish during the winter and early spring of the first year following drawdown. The timing of drawdown (winter months) was selected to coincide with periods of naturally high SSC in the Klamath River, to which aquatic species have adapted to by avoiding or tolerating. However, some mortality is predicted to occur for salmonids and other fish in the short term and SSCs would exceed water-quality standards in the states of Oregon and California.

- Under a low flow (worst case) or median flow (average) year, eight percent basin-wide mortality of fall-run Chinook salmon adults is predicted in the year of dam removal.

Negligible impacts on spring-run adult and juvenile Chinook salmon are predicted regardless of water year type during reservoir drawdown. Under the worst-case conditions, lethal conditions are predicted for less than one percent of adult coho salmon and eight percent of juvenile coho salmon basin wide. Steelhead would be most impacted of the salmonids, with predicted basin-wide mortalities of up to 28 percent and 19 percent for adult and juvenile steelhead, respectively, under worst-case conditions. Under average flow conditions (reservoir drawdown during a median flow year), however, basin-wide mortalities are predicted to be 14 percent for both adult and juvenile steelhead (Stillwater Science 2011).

- Short-term adverse effects to habitat features such as spawning gravels are also anticipated downstream of Iron Gate Dam as some fine material and sand are temporarily deposited. However, the stream channel would largely return to its pre-dam form in two years or less and sediment-transport processes would reestablish suitable habitat for salmon spawning and rearing, including the downstream transport of trapped spawning gravels released following dam removal.

- A recent dam removal overview article (O'Connor and others 2015), synthesizing lessons learned from over 100 dam removals in the U.S. and abroad, concluded the following. "A major finding is that rivers are resilient, with many responding quickly to dam removal. Most river channels stabilize within months or years, not decades, particularly when dams are removed rapidly; phased or incremental removals typically have longer response times. The rapid physical response is driven by the strong upstream/downstream coupling intrinsic to river systems. Substantial fractions of stored reservoir sediment—50% or more—can be eroded within weeks or months of breaching. Sediment eroded from reservoirs rapidly moves downstream. Some sediment is deposited downstream, but is often redistributed within months. Many rivers soon trend toward their pre-dam states." Although adverse impacts from sediment release during dam removal are real, and should be minimized and mitigated when possible, the impacts are short lived and are a necessary step toward long-term river restoration.

- The adverse short-term effects of high SSCs on mainstem spawning could be reduced by capturing migrating adult fish (Chinook salmon, coho salmon, steelhead, and Pacific lamprey) in the mainstem Klamath River during the fall preceding dam removal (2019) and relocating them to suitable habitat. The protection of out-migrating juvenile salmon is particularly important to offset the likelihood of direct mortality of a portion of juvenile Chinook salmon, coho salmon, and steelhead present during dam removal activities. This could be accomplished by capturing and relocating them before they enter the mainstem Klamath River when high SSC concentrations are present. Deleterious short-term effects on out-migrating hatchery coho salmon and steelhead trout yearling releases could be reduced by adjusting or delaying their release during the year of reservoir drawdown. Any and all of these actions, as well as other mitigation measures, could reduce the lethal and sub-lethal effects on all life stages of salmonids. In addition to salmonids, removal of the Four Facilities could have adverse impacts on Lost River and shortnose suckers in these reservoirs. Capturing and relocating these suckers to Upper Klamath Lake prior to dam removal could reduce this impact.

Long-term (>2 years) benefits of dam removal on water quality

Removal of Copco No. 1 and Iron Gate reservoirs would produce the largest improvements in water quality associated with dam removal. Currently, these reservoirs produce a lake-like environment by impounding Klamath River water for weeks or months. Impounding water in these reservoirs allows blooms of toxic phytoplankton (blue-green algae) to grow, produces low dissolved-oxygen (DO) water in and downstream of the reservoirs in the summer and fall, and disrupts the natural patterns of water temperatures below Iron Gate Dam.

- Particular phytoplankton species (i.e., blue-green algae or cyanobacteria) frequently reach nuisance levels within these reservoirs in the summer and fall, often producing toxins at levels potentially harmful to both humans and animals. Exposure to contaminated water can cause eye irritation, skin rashes, vomiting, diarrhea, and flu-like symptoms. In rare cases, when large amounts of contaminated water are ingested, nerve damage, liver failure, and death have occurred. During large blooms, annually posted health advisories on Copco No. 1 and Iron Gate reservoirs warn against recreational contact with the water such as wading, swimming, or water skiing; using the water for drinking, cooking, or washing dishes; or consuming fish or bivalves such as mussels that are exposed to the toxins. These toxins have also been transported downstream and prompted similar health advisories in the lower Klamath River. Elimination of Copco No. 1 and Iron Gate reservoirs would result in the immediate and long-term reduction in the growth of toxic algal blooms, which would reduce the risk to human health of those exposed to these waters.

- Removing Copco No. 1 and Iron Gate reservoirs would immediately improve DO concentrations downstream of Iron Gate Dam from July through November, improving conditions for salmonids and other aquatic biota in the long term. Currently, thermal stratification of the reservoirs results in severe oxygen depletion in the bottom waters due to microbial decomposition of settling algae. Releases from Iron Gate Dam do not meet California State water quality standards and produce harmful water-quality conditions for salmonids and other biota. Removal of the Four Facilities would restore natural reaeration of the Klamath River from Keno Dam to the Pacific Ocean and would benefit salmonids.

- A primary benefit of dam removal would be the immediate improvement in water temperatures for 160 miles of the Klamath River (form J.C. Boyle Reservoir to Salmon River), returning the river to a more natural thermal regime. Downstream in the Klamath River, water temperatures are currently degraded by the presence Copco No.1 and Iron Gate reservoirs, which delay the natural warming and cooling of riverine water temperatures on a seasonal basis. Temperature modeling (Perry and others 2011) shows that the annual temperature cycle just downstream of Iron Gate Dam is about 1 to 2°C colder in the spring and early summer and up to 4°C warmer in late summer and fall than would occur in a free-flowing river. Available information suggests that re-establishment of a natural thermal regime in the springtime would result in faster growth and earlier outmigration of rearing juvenile salmon and may decrease the frequency and magnitude of large-scale outbreaks of lethal disease in juvenile salmon populations below Iron Gate Dam. The return of cooler water temperatures during the late summer and early fall would more closely mimic natural conditions and would benefit rearing, migrating, and spawning salmon, particularly fall-run Chinook salmon.

Long-term benefits of dam removal on salmonids

Removal of the Four Facilities would result in multiple benefits to salmonids and other fish species in the Klamath Basin by creating a free-flowing river that opens up former spawning and rearing habitat in the hydroelectric reach and in the upper basin, restoring natural sediment transport processes that create healthy spawning beds, reducing juvenile fish disease below the dams, improving water quality and water temperature conditions for fish, opening up cold-water refugia in the upper basin to help offset the impacts of climate change, and creating a more natural hydrograph. These benefits individually are likely to make significant improvements regarding the size, genetic diversity, health, and resilience of fish populations, particularly salmonids. Taken collectively, however, the benefits of dam removal will clearly improve the Klamath River salmonid fishery (Chinook salmon, steelhead and redband trout) as well as benefit ESA-listed coho salmon.

- Historically, the Klamath Basin above Iron Gate Dam provided spawning and rearing habitat for large populations of salmon and steelhead. Dams currently block access to over 420 miles of this historical salmonid habitat, including critical habitat inundated by the reservoirs (Hamilton and others 2011). Access will be opened to the main-stem Klamath River and side channels, Upper Klamath Lake, and in as many as 49 significant tributaries. Not all species historically used this full range of habitat; ESA-listed coho salmon would likely reoccupy habitat in the main-stem river (including low gradient critical habitat inundated by the reservoirs) and tributaries downstream of Keno Dam. Chinook salmon and steelhead would likely reoccupy these same areas plus much more historical habitat, including Upper Klamath Lake as well as the Sprague, Williamson, and Wood rivers and their tributaries. The geographic expansion of habitat would increase the overall abundance of salmonids, their genetic diversity, and their resilience to droughts, effects of climate change, and other environmental stresses.

- How quickly salmon and steelhead return to reopened historical habitat would depend somewhat on the suitability of the habitat and the success of habitat restoration and salmon reintroduction plans. Lessons learned from over 100 dam removals in the U.S. and abroad (O'Connor and others), however, concluded that "Migratory fish have also responded quickly to restored river connectivity.....Within days of the blast removing the last of Glines Canyon Dam [in the State of Washington], Elwha River Chinook salmon swam upstream past its rocky abutments." Pess and others (2014) noted that "The last two decades have seen a rapid increase in barrier removals on rivers of the Northern Hemisphere, often for the explicit purpose of expanding the abundance, spatial distribution, and life history diversity of migratory fishes." Based on their analysis of many factors and case studies, they concluded that salmonids "have the capacity to rapidly re-colonize newly available habitats, though the life history patterns of each species, the proximity to source populations in the same or nearby river systems, and the diversity of habitats available may control the patterns and rates of re-colonization." And specifically referencing the Klamath Basin, Quiñones and others (2015) concluded with a high degree of certainty, using a numerical scoring system of many factors applied to 24 fish-barrier dams in California, that removal of the Four Facilities would be highly beneficial to salmonids and the ecosystem, irrespective of new restoration

actions. Implementation of new habitat restoration actions would serve to further the benefits of dam removal for the Klamath salmonid fisheries.

- A free-flowing Klamath River, stretching 250 mile from the Keno Dam to the Pacific Ocean, would optimize upstream and downstream passage of salmonids. While fish ladders on the four dams would facilitate upstream migration of adult salmonids, they are not as effective as volitional passage in a free-flowing river. Similarly, downstream migration of juvenile salmonids through four reservoirs, spillways, turbines, or turbine bypass structures is not as effective, and has a higher mortality, than juvenile passage in a free-flowing river.

- Dam removal would help offset the impacts of climate change by providing access to cold-water refugia above Iron Gate Dam. In contrast to the lower basin, much of the upper basin is fed by groundwater that keeps streamflows relatively high and stream temperatures cool into the summer months. These upper-basin stream characteristics will become increasingly important for the resilience of salmonids in the Klamath Basin as climate change decreases snowpack runoff and warms stream water temperatures.

- Dam removal would decrease lethal juvenile salmon disease in the highly infectious zones below Iron Gate Dam, likely within a year of dam removal. The presence of the dams and reservoirs contribute to high juvenile infection rates and mortality in many years. Removal of dams would disrupt the life cycle requirements of the host parasites through increased flow variability, increased stream-bed mobility, downstream transport of gravels trapped in the reservoirs, and a wider dispersal of spawned-out adult salmon carcasses. In addition to reducing juvenile fish disease, released gravels trapped in the reservoirs will resupply main-stem salmon spawning beds below Iron Gate Dam.

- The presence of the fish hatchery below Iron Gate Dam, which was required as mitigation for blocking the 16 miles of fish habitat between Iron Gate Dam and Copco No. 2 Dam, dilutes natural spawning populations and thereby reduces diversity of Chinook, coho, and steelhead. Dam removal, and the possible cessation of hatchery augmentation, could increase the numbers and diversity of wild fish because salmonids would naturally spawn, rear, and return to a wider geographic area.

- Copco No. 1 and Iron Gate reservoirs create unfavorable water temperatures, producing warmer than normal temperatures in late summer and fall that are stressful to adult salmonids, and colder than normal temperatures in the spring that delay growth and the outmigration of salmonid juveniles. Removal of the Four Facilities would eliminate these seasonal temperature lags, restore beneficial daily water temperature fluctuations, and return the river to a more natural temperature regime for fish.

- The presence and current operation of Copco No. 1 and Iron Gate reservoirs create an environment that supports the growth of harmful algal blooms and the development of anoxia in reservoir bottom waters. Release of algal toxins and low-dissolved oxygen water from Iron Gate reservoir in the summer and fall can produce unfavorable conditions for salmonids. Removal of the Four Facilities would eliminate these environmental stresses on fish.

- Hydroelectric peaking operations, primarily at J.C. Boyle Dam, diminish resident trout habitat and their food supply. Turbine entrainment at the Four Facilities causes mortality to resident fish, including trout. Removing the Four Facilities would eliminate these problems, reconnect habitats, and increase the number and geographical extent of redband trout.

- Exact benefits to any single species are hard to quantify, but Hendrix (2011) modeled long-term (2021 to 2061) benefits to Chinook salmon following removal of the Four Facilities and habitat restoration from implementation of KBRA. Chinook salmon are the primary tribal and commercial salmonid fishery. This modeling showed Chinook salmon adult production would increase about 80 percent. Harvest for tribal and ocean fisheries (commercial and sport) would increase about 50 percent. If salmon habitat restoration in the basin proceeds more slowly because of the expiration of KBRA, these increases to salmon production and harvest may be reduced by 10 to 12 percent.

Potential long-term adverse impacts of dam removal if unmitigated

- Dam removal and draining Iron Gate and Copco No. 1 reservoirs could affect the land values of about 668 land parcels that have frontage, proximity, or view of the reservoirs. Of these parcels, about 19 percent (127 parcels) have been developed as single-family residences. About 518 parcels are currently vacant residential land. Two studies (Bender Rosenthal Inc. 2011 and 2012) concluded a likely discount in land values due to a change in visual amenity or reservoir frontage would range from 25 to 45 percent. In aggregate, the change in amenities associate with dam removal would decrease the value of these 668 land parcels by about $2.2 to 2.7 million dollars, or about 30 percent on average.

- Dam removal would eliminate some existing recreation opportunities, including power boating, waterskiing, lake swimming, and flat-water boat angling at J.C. Boyle, Copco No. 1, and Iron Gate reservoirs. These reservoirs are also popular areas for sightseeing, camping, and wildlife viewing, attracting visitors primarily from the surrounding communities in Klamath and Jackson counties in Oregon and Siskiyou County in California. Dam removal would also adversely impact prime whitewater rafting below J.C. Boyle Dam, which currently benefits from peaking-power releases of water during the daytime.

- Removal of the Four Facilities could affect property tax revenues to Siskiyou and Klamath Counties from PacifiCorp. PacifiCorp owns property around the reservoirs and pays property taxes annually to Siskiyou and Klamath Counties. PacifiCorp pays in the range of $290,000 to $305,000 in property taxes on land attributable to hydroelectric facilities at Copco No. 1 and 2 and Iron Gate Dams, and about $132,000 in property taxes for land attributable to hydroelectric facilities at J.C. Boyle Dam. Under the amended KHSA, the States would assume ownership of these lands and PacifiCorp would not pay property taxes on the relinquished land to the counties. The States of California and Oregon may pay in-lieu payments on the transferred land, if payments are authorized.

- Removing the Four Facilities in 2020 would result in a substantial increase in greenhouse gas emissions from likely replacement power sources, thereby contributing to climate change. On average, the Four Facilities are estimated to generate about 910,000 MWh annually over the 42-year period analyzed after dam removal (2020 through 2061) (Reclamation 2012c). With

removal of the Four Facilities, approximately 526,000 metric tons of carbon dioxide equivalent ($MTCO_2e$) per year would be emitted from replacement power assuming PacifiCorp's current resource generation mix. This number would decrease to approximately 451,000 $MTCO_2e$ per year (14 percent reduction) under a scenario where PacifiCorp met California's Renewable Portfolio Standard goal. Further reductions in new greenhouse gas emissions are possible if PacifiCorp's replacement power was comprised primarily of renewable energy sources.

Economic and financial effects

Dam removal actions would have short-term and long-term effects on jobs and the regional economy. Construction activities associated with dam removal and mitigation actions would add jobs, labor income, and economic output to the region in the short-term. Over the longer term, dam removal would result in the addition of jobs in the region primarily related to commercial fishing, in-river sport fishing, and ocean sport-fishing. In addition, increased tribal harvest of salmonids would improve their standard of living as well as the health of many tribal families. Some jobs would be lost in the areas of reservoir recreation, whitewater boating, and operations and maintenance of the Four Facilities. However, the net addition of jobs in the region (both short term and long term) would increase regional labor income and economic output, producing a long-term positive effect on regional economic development. In addition, decommissioning the Four Facilities through a FERC process under the amended KHSA would save PacifiCorp's electricity customers significant costs when compared to the high costs and fiscal risks of relicensing the dams.

- The largest short term increases in jobs and regional output would occur with removal of the Four Facilities and associated mitigation actions. Dam removal would result in an estimated 1,400 regional jobs and a regional output of $163 million; these would occur during the single year of dam removal, targeted for 2020. Implementing mitigation measures would result in an estimated 217 short-term jobs and regional output of $31 million per year for the 2018 to 2025 timeframe.

- Dam removal would improve tribal, commercial, and sport salmon fishing opportunities. Commercial fishing in five management areas along the Oregon and California coastlines would increase, adding about 450 jobs during the timeframe of 2012 to 2061 and increasing regional economic output about $13.4 million per year. Improvements in ocean sport fishing and in-river sport salmon fishing would add an additional 10 jobs and increase regional economic output about $0.7 million per year. With the termination of KBRA, which provided funding for salmon habitat restoration, increases in regional economic output and fisheries-related jobs could proceed more slowly and be up to 10 or 12 percent less than these estimates.

- Dam removal would also increase in-river sport fishing opportunities for steelhead and resident redband trout. Although the change in jobs and regional economic output from these fisheries could not be quantified, dam removal provides notable potential to increase the economic value of a trophy redband fishery and a steelhead fishery with a current present value of $31 million.

- Some decreases in jobs would also occur. The largest decrease in jobs (estimated at 49) and loss of annual regional economic output ($5 million) would occur because of reduced spending on operation and maintenance of the Four Facilities between 2020 and 2061. In addition, a long-term decrease in jobs would occur in the recreational areas of whitewater boating (14 jobs) and reservoir recreation (4 jobs) in the 2020 to 2061 timeframe, decreasing annual regional economic output by about $0.9 and $0.3 million, respectively.

- Equally important but not easily quantified in dollars, dam removal would improve harvest opportunities for Klamath Basin Indian tribes for Chinook salmon, steelhead, and lamprey. A 50 percent increase in tribal harvest of fall and spring run Chinook would substantially increase the supply of traditional food to tribal families, improving health, and improving their standard of living. The return of salmon and steelhead above the Four Facilities would create the first opportunity for the upper basin Klamath Tribes to partake in salmon harvest for over a century.

- PacifiCorps electricity customers would also benefit financially from removing the Four Facilities under the terms of the amended KHSA when compared with PacifiCorp pursuing FERC relicensing. FERC relicensing could cost PacifiCorp customers in excess of $460 million over a 40-year license term, and this cost could be higher owing to uncertainties with remedying water quality issues in order to meet Clean Water Act requirements. In contrast, under the amended KHSA, PacifiCorp customers would have to pay about $251 million for removal of the Four Facilities, which includes the cost of Interim Measures contained in the amended KHSA. PacifiCorp's analysis submitted to California and Oregon Public Utilities Commissions (PUCs) demonstrates that the KHSA resulted in less cost and less fiscal risk to their customers than proceeding with FERC relicensing even when costs of developing replacement power are included. Both PUCs concluded that removal of the Four Facilities under terms of the KHSA provided better financial protection to PacifiCorp's customers in Oregon and California.

Tribal Resources impacts for all six tribes

Removal of the Four Facilities would help restore and protect tribal trust resources and address numerous social, economic, cultural, and health problems identified by the six federally recognized Indian tribes in the basin (Klamath, Karuk, Yurok, Resighini Rancheria, Quartz Valley, and Hoopa Valley). Indian tribes of the Klamath Basin self-characterize themselves around a "Salmon Culture," with historical ways of life and spiritual beliefs inseparable from the natural resources in the basin. Klamath Basin tribes have social, cultural, and economic ties to each other due, in large part, to their shared reliance on a healthy Klamath River for food, clean water, and other resources. Tribal social fabric and culture are tied to the Klamath River as evidenced by their traditional ceremonial and spiritual practices that focus on the river, its fish, wildlife, and plants. Salmon far exceed other resources in its importance to the diet, culture, and standard of living of Klamath Basin Indian tribes. The presence of the Four Facilities has severely disrupted this "Salmon Culture" and created great hardship for all the Klamath Basin tribes. Although the six Federally recogiznied tribes in the Klamath Basin each have a unique history, culture, and relationship with the land, water, and natural resources in the basin, they collectively believe that removal of the Four Facilities will improve the ecosystem, thereby

improving the physical, mental, and spiritual health and wellbeing of their tribal members, their standard of living, and their tribal unity.

- The Klamath Basin was once the third largest producer of salmon in the United States outside of Alaska. Historically, the basin produced substantial runs of Chinook salmon, coho salmon, steelhead, green sturgeon, eulachon, and Pacific lamprey, all harvested by Indian tribes. Most of these species have undergone long-term population declines caused by the cumulative effects of dam construction, diversion of water, land-use changes, overfishing, and degraded ocean conditions. Fall and spring runs of Chinook salmon have declined by over 90 percent. Stocks of coho salmon have declined 52 to 95 percent and are now listed as threatened. Steelhead runs are only about one third of historical levels. The Yurok Tribe projects that 2016 will see the second lowest Chinook salmon harvest on record, producing less than one fish per tribal member. Although fishery declines are not solely due to the presence of the Four Facilities, their removal would be a major step forward in restoring tribal fisheries while leaving dams in place would likely result in further declines in fish and tribal fisheries.

- The Federal government has the responsibility to safeguard the fishery to ensure that tribes with fishing rights are able to practice those rights. Removal of the Four Facilities would increase the abundance, diversity, health, and resilience of fish populations by optimizing passage of salmonids to over 420 stream-miles of historical upstream spawning and rearing habitats, restoring the natural run-timing of salmonids by eliminating the temperature impacts of large reservoirs, providing access to cool-water streams that would help safeguard salmon stocks against the effects of climate change, reducing the prevalence of devastating disease outbreaks in juvenile salmon, and improving water quality for fish in the lower river. Providing salmonid access to upstream habitats will allow the Klamath Tribes to participate in the harvest of salmon and steelhead, a cultural and spiritual practice lost to them for over a century.

- Removal of the Four Facilities would also result in the immediate and long-term reduction in the growth of toxic algal blooms in Copco No. 1 and Iron Gate reservoirs and the transport of those toxins to the lower river and estuary. These toxins pose a significant risk to human health of those exposed to these waters. Annual health advisories warn against recreational use, drinking, and cooking with water from Copco No. 1 and Iron Gate reservoirs, as well as consumption of fish and shellfish (e.g. riverine clams and mussels) that are exposed to these toxins. In addition to these water quality concerns, tribal members limit their harvest and use of riverine plants for food, baskets, and medicine potentially exposed to these toxins. The presence and concern of algal toxins have directly affected tribal cultural practices and disrupted river-based spiritual ceremonies and other traditional cultural practices.

- Expanding and restoring salmonid fisheries and water quality for tribes will increase their supply of affordable traditional foods, improve their standard of living and reduce their high poverty rate, and decrease tribal health issues (e.g. diabetes, hypertension, and obesity) associated with diets where traditional foods such as salmon have been replaced with non-traditional foods. Improved fisheries will also allow tribes to reinstate and continue to practice ceremonies in their historical forms at the appropriate times of the year. These traditional cultural practices (e.g. ceremonies to insure abundant fish populations and use of water for ceremonial bathing and drinking) are intertwined with the Klamath River and its

natural resources and are viewed as essential to the very survival of the tribes and to the continuation of the natural resources. In addition, improved fisheries would bolster opportunities for transmitting traditional knowledge to successive generations, including the important practice of giving fish to elders, thereby improving social cohesion and function among Indian populations through a strengthened sense of tribal identity.

Summary of Secretarial Statement of Support:

Salmonid Fisheries: In the long-term, removal of the Four Facilities would advance restoration of salmonid fisheries. Dam removal would open up over 420 miles of blocked spawning and rearing stream habitat in the upper basin, including excellent habitat under Copco No. 1 and Iron Gate reservoirs; allow the most effective passage of salmonids upstream and downstream through a 250-mile, unobstructed, free-flowing reach of the Klamath River; provide salmonid access to cool groundwater-fed streams in the upper basin that will help offset impacts of climate change; reduce or eliminate serious juvenile fish disease problems below Iron Gate Dam; and restore the natural sediment-transport processes that would improve and create spawning and rearing habitat within the footprint of the reservoirs and below Iron Gate Dam. In addition, removal of the Four Facilities would immediately improve water quality by eliminating reservoirs that create serious problems for salmonids, including low dissolved-oxygen concentrations, elevated fall water temperatures, excessively cool spring water temperatures, and algal toxins below Iron Gate Dam. Collectively, all these benefits of dam removal would increase the abundance, health, and genetic diversity of salmonid populations and the fisheries they support, as well as increase their resilience to future droughts and effects of climate change. For Chinook salmon, one of the key tribal, commercial, and sport fisheries, removal of the Four Facilities, along with fish reintroduction and restoration of habitat, would increase Chinook adult production about 80 percent and increase harvest opportunities for tribal fisheries and commercial and sport ocean fisheries about 50 percent. Although not quantified, significant improvements in steelhead and trout fisheries would also occur following removal of the Four Facilities.

Coho salmon are listed as threatened under the Endangered Species Act in the Klamath River and are currently not part of a salmon fishery nor are they expected to be in the foreseeable future. However, the benefits of dam removal for coho salmon go beyond likely modest increases in abundance. Coho recolonization of the Klamath River between Keno and Iron Gate dams would also improve their viability by increasing genetic diversity, productivity, spatial distribution, and resilience to climate change, thereby reducing the risk of extinction and increasing chances for recovery as a species and as a fishery.

A Detailed Plan for removal of the Four Facilities has shown that dam removal can be accomplished in a single year, beginning with the drawdown of the three largest reservoirs in the January to March timeframe. This timing ensures that the majority of suspended sediment eroding from drained reservoirs and moving downstream will reach the Pacific Ocean quickly, primarily affecting fish populations in a single year and occurring during the time of year when adult and juvenile salmonids are adapted to elevated suspended sediment concentrations or are found primarily in the ocean or rearing in tributaries. In the short term (1 to 2 years), however, there would be some fish mortality from suspended sediment. In the absence of mitigation measures, basin-wide mortality in the year of dam removal would be less than 10 percent for adult and juvenile coho and Chinook salmon. Basin-wide mortality for adult and juvenile

steelhead would likely be higher, between 10 and 30 percent depending on flow conditions during reservoir drawdown. However, methods have been identified to help mitigate for some of this mortality, such as relocating potentially impacted fish out of the main-stem river. It is expected that the salmonid populations would recover to pre-dam removal levels within one to two years following dam removal, and that populations would increase in the years to follow as they utilize new habitat, water quality improves, and disease outbreaks diminish. Recent dam removals on other western rivers have demonstrated that released sediment has only a short-term impact on salmonids and that fish quickly migrate to previously blocked upstream habitat.

Full dam removal and partial dam removal were analyzed in the FEIS and Detailed Plan, both of which would remove the four dams, create a free-flowing river, and provide the same benefits for salmonid fisheries. Full removal, however, is preferred because it would remove nearly all structures associated with the Four Facilities, which would improve the scenic quality of the river and surrounding areas, reduce the cost of long-term maintenance of remaining structures by land-management agencies, and would be more effective at ensuring the safety of the public. Partial dam removal would be acceptable if cost savings were needed to stay within the funding that will be available from PacifiCorp's customers and a California bond measure.

Public Interest: In the long-term, and based on many recent studies, removal of the Four Facilities is in the overall public interest, particularly considering likely benefits to fishing communities, Indian tribes, electricity customers, and public health. However, not all sectors of the public will be affected equally. There are some resource areas or communities that could be affected negatively in the absence of mitigation actions. Potential negative impacts could occur from increases in greenhouse gases if replacement power is primarily from fossil fuels; decreased land values for people living on or near Copco No. 1 or Iron Gate reservoirs; and the loss of reservoir recreational opportunities for local communities, including boating, fishing, camping, and hiking. It is important to note that the primary purpose of the Four Facilities is to generate hydroelectric power; they do not store water for downstream irrigation, drinking water, or maintaining flows for fish. They also are not operated as flood control structures. Link River Dam (owned by Reclamation) on Upper Klamath Lake is the primary facility for storing irrigation water, providing flood protection, and releasing water to sustain fisheries. These beneficial functions of Link River Dam will continue, unaffected, by the removal of the Four Facilities.

The Four Facilities have contributed to reduced salmon stocks and have negatively impacted regional and tribal economies. Improving commercial and sport fisheries, of which removal of the Four Facilities is a critical step, will create over 450 jobs and increase annual regional economic output by about $13.4 million dollars (2012 dollars). Equally important, but not quantified in terms of jobs and economic output, improved salmon and steelhead harvests for tribal communities would improve their standard of living, benefit tribal member health, and protect their cultural values. Poor salmon stocks have contributed to high levels of poverty and diet-based health problems in Klamath Basin tribal communities. These tribes self-characterize themselves around a "Salmon Culture", with ways of life and an economy tied to historical runs of salmon and other fish. Removal of the Four Facilities would serve to strengthen their salmon culture and most notably for the Klamath Tribes in the upper basin for whom salmon have been blocked by dams for over 100 years.

The presence of Copco No. 1 and Iron Gate reservoirs have created an environment where summer and fall algal blooms produce toxins that are potentially harmful to humans. Health advisories posted annually by the State of California warn against recreational use, drinking, and cooking with water from Copco 1 and Iron Gate reservoirs, as well as consumption of fish that are exposed to the toxins. Blooms of toxic algae and their toxins have also been transported to downstream river reaches and have prompted similar health advisories. The presence of these algal toxins have directly affected tribal cultural practices and disrupted river-based spiritual ceremonies and other traditional cultural practices.

PacifiCorp's electricity customers also benefit from removing the Four Facilities under the terms of the amended KHSA rather than PacifiCorp pursuing FERC relicensing. FERC relicensing could cost PacifiCorp customers in excess of $460 million over a 40-year license term, and this cost could be higher owing to uncertainties with remedying water quality issues and providing successful fish passage. In contrast, under the amended KHSA, PacifiCorp customers have to pay about $251 million for removal of the Four Facilities. PacifiCorp's analysis submitted to California and Oregon Public Utilities Commissions (PUC) demonstrates that the KHSA resulted in less cost and less financial risk to customers than FERC relicensing. Both PUCs concluded that removal of the Four Facilities under terms of the KHSA provided better financial protection to PacifiCorp's customers in Oregon and California.

Although there are some potential long-term adverse impacts associated with the removal of the Four Facilities (e.g. increased green-house gas emissions from replacement power, loss of reservoir and whitewater recreational opportunities, and a decline in property values near Copco No. 1 and Iron Gate reservoirs), the public benefit for the broader region in term of jobs, regional economic output, improved standard of living and quality of life for tribal communities, improved ecosystem and public health, and new recreational opportunities far outweigh these impacts. Moreover, there may be opportunities in the future to mitigate or reduce some or all of these adverse impacts.

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Appendix B:

Partial List of Meetings with Stakeholders, Indian Tribes, and the Public [EIS/EIR -- Environmental Impact Statement/Environmental Impact Report; TCC -- Technical Coordination Committee comprised of non-Federal KHSA signatory parties]

Date	Participating Entity or Meeting Type	Location
March 23–24, 2010	Stakeholder/Public Workshop	Klamath Falls, OR
April 1, 2010	Board of Supervisors, Siskiyou County	Yreka, CA
May 6, 2010	Stakeholder/Public Workshop	Mt. Shasta, CA
May 18, 2010	National River Management Society Conference	Portland, OR
July 7, 2010	EIS/EIR Scoping Meeting	Copco Village, CA
July 7, 2010	EIS/EIR Scoping Meeting	Yreka, CA
July 8, 2010	EIS/EIR Scoping Meeting	Klamath Falls, OR
July 9, 2010	EIS/EIR Scoping Meeting	Chiloquin, OR
July 13, 2010	EIS/EIR Scoping Meeting	Brookings, OR
July 14, 2010	EIS/EIR Scoping Meeting	Arcata, CA
July 15, 2010	EIS/EIR Scoping Meeting	Orleans, CA
July 9, 2010	Board of Commissioners, Klamath County	Klamath Falls, OR
July 16, 2010	Hoopa Valley Tribe	Hoopa, CA
July 21, 2010	TCC Meeting	Redding, CA
September 3, 2010	Hoopa Valley Tribe	Conference Call
September 9, 2010	TCC Meeting	Eureka, CA
September 28, 2010	Yurok Tribe	Yurok Tribal Office Klamath, CA
September 28, 2010	Stakeholder/Public Workshop	Klamath Falls, OR
September 29, 2010	Resighini Rancheria	Resighini Rancheria Klamath, CA
September 29, 2010	Karuk Tribe	Orleans, CA
September 29, 2010	Public Informational Meeting	Eureka, CA
September 30, 2010	Quartz Valley Indian Reservation	Quartz Valley Reservation Near Fort Jones, CA
September, 2010	Siskiyou County Assessor's Office (Mike Mallory)	Siskiyou County, CA
September, 2010	Siskiyou County Assessor's Office (Mike Mallory)	Siskiyou County, CA
September, 2010	Michele Duchi (Lake Shastina Real Estate Center)	Siskiyou County, CA
October 4, 2010	The Klamath Tribes	Chiloquin, OR
October 5, 2010	Stakeholder/Public Information Technical Workshop	Klamath Falls, OR
October 6, 2010	TCC Meeting	Klamath Falls, OR
October 13, 2010	Stakeholder/Public Information Technical Workshop	Yreka, CA
October, 2010	Siskiyou County Assessor's Office (Dan Weale)	Siskiyou County, CA
October, 2010	Siskiyou County Public Health & Community Development (Wendy Lucky)	Siskiyou County, CA
October, 2010	Siskiyou County Planning Department (Roland Hickel)	Siskiyou County, CA
October, 2010	Ray Singleton (Siskiyou County Broker/Appraiser)	Siskiyou County, CA
October, 2010	Kathy Hayden (Siskiyou County Agent)	Siskiyou County, CA
October, 2010	Sharon Grace (Siskiyou County Association of Realtors)	Siskiyou County, CA
November 8, 2010	Hoopa Valley Tribe	Hoopa, CA
December 9, 2010	Public Information Meeting	Copco Village, CA
December 9, 2010	Public Information Meeting	Yreka, CA
December 14, 2010	TCC Meeting	Redding, CA
January 24, 2011	Klamath Tribes	Chiloquin, OR
January 25, 2011	Resighini Rancheria	Resighini Rancheria Klamath, CA

Date	Participating Entity or Meeting Type	Location
January 25, 2011	Hoopa Valley Tribe	Hoopa, CA
January 26, 2011	Yurok Tribe	Klamath, CA
January 27, 2011	Karuk Tribe	Orleans, CA
January 27, 2011	Quartz Valley Indian Community	Quartz Valley Reservation Fort. Jones, CA
February 8, 2011	Board of Supervisors, Siskiyou County	Yreka, CA
February 23, 2011	TCC Meeting	Klamath Falls, OR
March 3, 2011	Hoopa Valley Tribe	Medford, OR
March 15, 2011	American Society of Civil Engineers, Southern Oregon Group	Klamath Falls, OR
March 16, 2011	Public Information Meeting	Klamath Falls, OR
April 4, 2011	Klamath Tribes	Chiloquin, OR
April 5, 2011	Karuk Tribe	Orleans, CA
April 6, 2011	TCC Meeting	Fortuna, CA
April 7, 2011	Resighini Rancheria	Klamath, CA
April 14, 2011	Hoopa Valley Tribe	Medford, OR
May 2, 2011	Hoopa Valley Tribe	Medford, OR
June 15, 2011	Public Information Meeting	Orleans, CA
June 16, 2011	TCC Meeting	Ashland, OR
July 13, 2011	ESRI User Conference	San Diego, CA
August 29, 2011	Pacific States Marine Fisheries Commission	Portland, OR
September 22, 2011	Association of Environmental and Engineering Geologists	Anchorage, AK
October 18, 2011	EIS/EIR Public Hearing	Klamath Falls, OR
October 19, 2011	EIS/EIR Public Hearing	Chiloquin, OR
October 20, 2011	EIS/EIR Public Hearing	Yreka, CA
October 25, 2011	EIS/EIR Public Hearing	Orleans, CA
October 26, 2011	EIS/EIR Public Hearing	Arcata, CA
October 27, 2011	EIS/EIR Public Hearing	Klamath, CA
December 1, 2011	Copco Lake Fire Protection District	Copco Village, CA
February 9, 2012	Copco Lake Fire Protection District	Yreka, CA
April 10, 2012	Copco Lake Fire Protection District	Copco Village, CA