Attachment A

Letter Report

Board of Consultants Meeting No. 4

Lower Klamath Project (FERC Nos. P-2082, P-14803)

September 2022

BOARD OF CONSULTANTS

Lower Klamath Project

Mr. Mark Bransom
Klamath River Renewal Corporation
2001 Addison Street, Suite 317
Berkeley, CA 94704

Date:

Re: Letter Report; Board of Consultants Meeting No. 4
Lower Klamath Project (FERC Nos. P-2082, P-14803)
Klamath River Renewal Corporation

Dear Mr. Bransom,

The Independent Board of Consultants for the review of the Lower Klamath Project respectively submits the following Meeting No. 4 Report.

INTRODUCTION

The Lower Klamath Project Independent Board of Consultants (BOC) convened a formal meeting via video conference on September 16, 2022. The purpose of the formal meeting was to discuss the BOC's final review comments and obtain any further recommendations with respect to the Klamath River Renewal Corporation (Renewal Corporation) June 22 Final Construction Documents (Final Construction Documents) submitted to the Federal Energy Regulatory Commission (FERC or Commission) on June 29, 2022. The Final Construction Documents for the safe removal of four dams and the restoration of volitional fish passage on the Lower Klamath River was prepared in support of the *Amended Application for Surrender of License for Major Project and Removal of Project Works*, FERC Nos. 14803-001, 2082-063 ("Amended Surrender Application").

The FERC advised the Renewal Corporation that FERC staff would not attend this formal meeting. Therefore, consistent with the FERC's May 22, 2018 directive, this formal meeting was not publicly noticed.

The BOC formal meeting was conducted in accordance with the Commission's Formal Meeting Protocol, and addressed the requirements of the Commission's March 15, 2018 order (referenced in FERC's May 22, 2018 letter), and February 4, 2020 letter.

The formal meeting agenda and attendee list is provided as Attachment A. Meeting No. 4 minutes are provided as Attachment B.

INFORMAL TECHNICAL CLARIFICATION MEETING

On August 3, 2022 an informal meeting was held prior to the formal meeting via video conferencing to address the BOC's request to provide further clarification of the following issues:

- The BOC's evaluation of the Renewal Corporation's response to BOC Meeting No. 3 recommendations.
- The BOC's assessment, questions, and comments from their evaluation of the 100% Design Report.
- The BOC's assessment, questions, and comments from their evaluation of the Temporary Construction Emergency Action Plan (TCEAP).
- The BOC's assessment, questions, and comments from their evaluation of the Material Specification.
- The BOC's questions and comments concerning construction costs.
- The BOC's assessment, questions, and comments from their evaluation of the Risk Register.

The Renewal Corporation's response, in the form of a PowerPoint presentation, to the BOC's assessment, questions, and comments are provided as Attachment C to this report.

This letter report presents the BOC's Findings, Conclusions and Recommendations following the review of the Final Construction Documents and information provided to the BOC during and following our informal meeting of August 3, 2022. This report incorporates our review of the documents, materials and correspondence provided by the Renewal Corporation and their Project Team regarding the technical aspects, risk mitigation, and dam and public safety for the proposed dam removal and river channel restoration associated with the Project.

REVIEW DOCUMENTS

In advance of the BOC formal meeting, the Renewal Corporation provided the BOC with the following documents. The BOC focused its review on the technical aspects of the removal of the dams related to dam and public safety:

- Lower Klamath Project, 100% Final Design, FERC Submittal, Summary of Design Changes, July 7, 2022
- 100% Design Report, with the following appendices:
    - Appendix A – Design Criteria
    - Appendix B – J.C. Boyle Design Details
    - Appendix C – Copco No. 1 Design Details
    - Appendix D – Copco No. 2 Design Details
    - Appendix E – Iron Gate Design Details
    - Appendix F – Roads, Bridges, and Culvert Design Details
    - Appendix G – Reservoir Drawdown Model Report
    - Appendix H – Erosion and Sediment Control – BMP CGP Compliance Evaluation
    - Appendix I – Implementation Schedule (90% GMP Compliance Evaluation)

    - Appendix J – Supporting Technical Information Document (STID)
    - Appendix K – Historic Drawings
    - Appendix L – KRRP Value Engineering Completion Summary and Advancement to 100% Design
    - Appendix M – PacifiCorp Equipment Register
- 100% Supporting Documents:
    - Existing Conditions Assessment Report
    - Dam Removal Erosion and Sediment Control Plans
    - 60% Reservoir Restoration Construction Plans
    - Quality Control Inspection Program
    - Temporary Construction Surveillance and Monitoring Plan (TCSMP)
    - Preliminary Dam Removal Blasting Plan
    - Temporary Construction Emergency Action Plan (TCEAP)
    - Project and Construction Schedule
    - Daggett Bridge Construction Drawings, Technical Specification, and Design Report
    - City of Yreka Permanent Water Pipeline Relocation Construction Plan, Technical Specifications, and Design Report
    - Fire Management Ramps and Dry Hydrants Construction Plans
    - Fall Creek Hatchery Construction Plans, Technical Specifications, and Design Report
- 100% Design Drawings
- 100% Material Specifications
- Risk Register (March 2022 and June 2022 revision)
- Klamath River Renewal Project - Construction Schedule, McMillian Jacobs Associates, June 23, 2022

At the request of the BOC, the Renewal Corporation provided the following documents to the BOC prior to the formal meeting:

- Klamath River Renewal Project, Responses to BOC Review Comments on the Final Construction Documents, August 3, 2022.
- Dr. Henry T. Falvey's Memorandum, Iron Gate Baffle Blocks, August 5, 2022.
- Knight Piesold Consulting Memorandum, Iron Gate Diversion Tunnel Baffle Structural Design, August 26, 2022.

UNDERSTANDING OF THE ASSIGNMENT

In accordance with the FERC's May 2018 directive and Section 14.3.7 of the 2017 FERC's 2017 *Energy Guidelines for the Evaluation of Hydropower Projects*, the BOC conducted an evaluation of the Final Construction Documents as a review of content, and to better understand the Renewal Corporation's risk mitigations, as well as public safety aspects, associated with the construction-related activities of the Renewal Corporation's Definite Plan (Definite Plan for Decommissioning and Removal of the Lower Klamath Project) and Amended Surrender Application.

It is the BOC's understanding that the May 22, 2018 FERC Directive states that at the end of the formal meeting "the BOC shall verbally present its conclusions, recommendations and answers to the questions posed." The following sections document the BOC's Findings, Conclusions and Recommendations resulting from our review of Renewal Corporation's Final Construction Documents issued on June 29, 2022, summarizing the content of the formal meeting.

FINDINGS

This section presents the findings of the BOC regarding the Final Construction Documents associated with the decommissioning and removal of each of the four dams are presented in this section.

Status of Klamath River Restoration and Recreation Design

The BOC understands from conversations with the Renewal Corporation that the Klamath basin and recreation restoration to be completed by RES is to remain at the 60% design level until the dam removals have been completed and final erosion patterns and site conditions have begun to be established. The BOC agrees with this approach and anticipates ongoing involvement in the review of the restoration and recreational design documents.

Site-Specific Risk Reduction Measures in Temporary Construction Surveillance and Monitoring Plan

In response to BOC's Report No. 3 recommendation, the Renewal Corporation stated that it would identify implementation dates for incorporating the construction potential failure modes (CPFMs) and associated risk reduction measures into the construction schedule, and convene a working group to review relevant CPFMs and risk reduction measures not less than sixty (60) days in advance of the commencement of construction activities. The Renewal Corporation also indicated that it would prepare a record (separate from the Risk Register) containing the CPFMs as a risk management measure to support final construction planning work activities and implementation activities during construction.

The Renewal Corporation indicated that it would incorporate a status review of the CPFMs into the monthly construction progress meeting as well as into specific construction work task coordination meetings and work plan preparation. During construction, the Renewal Corporation will monitor status updates of the CPFMs provided during the weekly site-specific construction meetings and coordinate work activities as necessary to implement risk reduction measures. The Renewal Corporation will implement any further guidance provided by the working group. The Renewal Corporation will file an updated Construction Management Plan with FERC on or before December 31, 2021 to incorporate the risk reduction measures proposed in this (BOC Report No. 3) recommendation.

The Renewal Corporation indicated in the informal meeting that the Temporary Construction Surveillance and Monitoring Plan (TCSMP), rather than the Construction Management Plan, was a more appropriate document to address CPFMs and identify site-specific risk reduction measures. The Renewal Corporation also indicated that the working group has already been established and is working through site-specific operations, flow management and work plan execution required at each dam, and is addressing risk management in terms of operation, dam safety, contractor safety and environmental protection. The Renewal Corporation will review the Project and Construction schedule specific to this activity. The TCSMP does not address risk management in terms of public safety, nor does it mention conceptual contingency measures in the event that unanticipated events occur. It is the BOC's understanding that contingency and work plans are being developed and will be appropriately shared with the BOC.

Erosion and Sediment Control

In response to the BOC Meeting No. 3 recommendation, Renewal Corporation indicated that the Final Construction Documents include measures to control erosion and gullying of waste fills and areas of uphill waste fills during construction and post-construction. These measures are incorporated into the construction documents as required under the Oregon and California National Pollution Stormwater Permits (NPDES). These permits will provide all necessary protection measures under their respective Storm Water Prevention and Protection Plan (SWPPP) requirements. The Final Design includes SWPPP Best Management Practices (BMPs) to provide long-term protection of the fill area. At the completion of construction, the Renewal Corporation will inspect the permanent BMPs in accordance with the SWPPP's and make corrective actions as site conditions dictate. The Renewal Corporation will monitor the permanent BMPs until site stability is achieved as evidenced when the states issue their NPDES termination of coverage. The Renewal Corporation will update its Construction Management Plan on or before December 31, 2021 to incorporate the risk reduction measure[~~d~~] proposed in this response to this recommendation.

During the informal meeting, the Renewal Corporation indicated waste fill areas that would be subject to runoff from upland areas were now eliminated, and that now fills are limited to mounded areas without upland runoff potential. The BOC concurs with this change, and recommends that the drawings and specifications also reflect surface water management may require field implementation as potential problem areas are observed during construction. The BOC recommends that an experienced civil site engineer field-review fill areas and slopes to assure proper grading and permanent erosion protection to mitigate the potential for gullying and erosion after project completion.

In BOC Report No. 3, the BOC indicated concurrence with Kiewit's approach to implement best practice measures to properly manage precipitation runoff from gullies and upslope areas above waste fill placements to mitigate erosion potential. The BOC recommends that these measures be configured to permanently protect these areas from erosion and gullying.

Subsurface Investigations and Placement of Fill in J.C. Boyle Scour Hole

In BOC Meeting No. 3, the BOC indicated that its the main concern was that prior to filling in the scour hole, that Renewal Corporation identify any potential loose/soft layers/deposits which could represent a potential failure plane affecting the global slope stability of the fill. The BOC Meeting No. 3 Report recommended the findings of investigations to identify such soft/loose be considered in calculations of the stability of the slope as appropriate, and reconfiguration of the fill be made as needed to maintain permanent stability. The fact that conditions of saturation of the fill that could occur during rainy seasons should be considered in analysis.

In response to this BOC Meeting No. 3 recommendation, the Renewal Corporation indicated that it would provide the BOC with a summary of the findings of these investigations and analyses on or before June 30 of the drawdown year. The Renewal Corporation indicated that it would address these findings in the calculations of slopes and the implementation of permanent slope stability measures proposed in the Reservoir Drawdown and Diversion Plan. The Renewal Corporation indicated that the site investigation would include completing explorations along the toe of the existing scour hole slope to characterize the subsurface geotechnical conditions. The Renewal Corporation indicated it would use this geotechnical information to update the design, if required, and to accommodate specific site conditions.

In the review of the Final Construction Documents, the BOC found that the Renewal Corporation has deferred explorations until construction. A drawback of this is that it also defers the knowledge of any unsatisfactory soil strata in the scour hole to the time of construction which could result in delays due to the need to change plans. During the informal meeting, the Renewal Corporation indicated that a site visit was made to the bottom of the scour hole, and it was found to be very bouldery at the toe which would likely make exploration difficult. During construction, an access road is to be a side-hill cut to access the toe, and further investigation of the area would be made at that time.

If the explorations are deferred, the BOC highly recommends that geotechnical engineering expertise be included in the engineering assessment of the slope stability of the scour hole fill. Also, materials-types to be placed in lifts, maximum lift thickness, placement and chinking of larger materials and concrete rubble, and compaction effort for the scour hole fill should be specified.

Considerations for Temporary Construction Emergency Action Plan

The BOC reviewed the Final Construction Documents, Temporary Construction Emergency Action Plan (TCEAP). In TOC, the “List of Figures” page is not populated. In the document itself, the Contacts Listed in Section 3, “Notification Procedures" should be more specific, and at a minimum, should also include Humboldt and Del Norte Counties, since the downstream reaches of the river are located there, unless dam break analyses indicate there are no incremental impacts for the worst-case dam break (e.g., overtopping breach of the full or near-full height of Iron Gate Dam). The BOC suggests that the Renewal Corporation review the PacifiCorp Iron

Gate dam break analyses used for their Emergency Action Plan (EAP) inundation maps and incorporate appropriate parts and inundation maps into the TCEAP.

The BOC notes that Chapter 6 of the FERC Guidelines states, Section 6-9 of "Temporary Construction Emergency Action Plans", a TCEAP should include "Action levels (based on the construction PFMA, if applicable), when the plan will be activated and when evacuation will occur". Also "A brief description of testing procedures for the plan", The FERC indicates in this section that "Periodic testing of the plan should be performed at least quarterly and be documented by contractor and Quality Control Staff". The BOC finds that the TCEAP does not sufficiently address the above issues. The BOC finds that the current revision of the TCEAP does not include sufficient consideration for the potential of a full height dam break, most critically, the Iron Gate Development. The CPFMA identified a few credible overtopping scenarios that were Classified as Category II, indicating a credible CPFM. An effective plan needs to be in place to trigger the appropriate responses, potentially including evacuation of the downstream public at risk should the remote but credible case of an accidental breach occur.

Development and Status of Contingency Plans

The Temporary Construction Surveillance and Monitoring Plan (TCSMP), Project Construction Schedule, and other documents do not adequately address specific works and contingencies associated with risks identified in the CPFMA and Risk Register.

It is the BOC's expectation that site-specific work plans and contingency plans will be developed and are in the development stages. As stated in the TCSMP, these plans will specifically address risks identified during the CPFMA, Risk Register, and other documents. It is the BOC's further understanding that these contingency plans will be shared with the BOC. It is paramount to project success that work plans and contingency plans contain specific means and methods, and that construction teams understand contingency plans and are in a position to respond in a timely manner, should contingency plan implementation be necessary.

Construction Schedule Risk Reduction Measures

Site-specific risk reduction measures have been identified, and include diversion tunnel gate testing and inspection at Iron Gate prior to drawdown. However, specific activities related to these risk reduction measures are not included in the current construction schedule.

It is the BOC's understanding that this activity, as well as other activities identified in the CPFMA, Work Plans, Contingency Plans, and TCSMP, will be added to the construction schedule as appropriate.

Hydraulic Performance of Iron Gate Diversion Gate and Tunnel

The Final Construction Documents indicate that "Pre-drawdown operation and testing is required to confirm that the hoist can be used to achieve the fully open condition", and that ". a review of the control gate operating systems indicated that the gate can be opened to 57 inches…". The

Final Construction Documents do not, however, provide specific testing procedures beyond what has already been performed, to ***confirm*** that the gate can be opened ***under unbalanced head conditions***.

During the informal meeting the Renewal Corporation also indicated that the releases from the gate will be monitored at the downstream gaging station and conceptual contingency plans have been identified should the gate fail to be fully opened, or that the discharge capacity is less than anticipated. These conceptual contingency plans include: 1) controlling the releases from the upstream US Bureau of Reclamation (BUREC) projects, 2) increasing the aeration supply, 3) revising the embankment dam removal sequencing to maintain, or increase, the design flood freeboard requirements, and 4) implementing means of controlled passage of flow over the embankment.

Drawing C4125 indicates that the air vent support spacing is 4 feet, and that the air vent piping is suspended by hangers and not placed in contact with the crown of the existing concrete lining. This is inconsistent with Drawing C4125 Note 1, which states that "Downstream vent pipe shall be as close to the ceiling as possible….", and Note 1.1, which states that "Pipe shall be in contact or clearance minimized where….". It is anticipated that the flow will be unsteady and highly turbulent not only in the downstream flow direction, but also laterally during the initial drawdown stage and potentially during the passage of an unanticipated flood event. The results of the Computational Fluid Dynamics (CFD) model also show that flow from the concrete orifice through the flange collar may directly and adversely impact and damage the suspended downstream air vent if not adequately secured, anchored, or even encased.

The Final Construction Documents further indicate that a value engineering alternative option involving installation of two floor baffles upstream of the grout curtain collar within the existing reinforced liner has been selected in lieu of extending a sidewall and invert reinforced concrete liner downstream. The purpose of this alternative is to initiate the hydraulic jump within the existing reinforced liner rather than in a downstream unlined tunnel reach.

The two concrete floor baffles will be steel wrapped and tapered laterally, and top sloping downward to direct the shock of vapor "bubble" collapse away from the floor baffle concrete and into the downstream flow to reduce the potential for supercavitation damage. The design does not address the potential for supercavitation damage to the tunnel concrete invert adjacent to the base of the floor baffles.

The floor baffles will be anchored through the reinforced concrete lining and underlying rock with three post-tensioned anchors. The two upstream post-tensioned anchors are anchored through the concrete lining and will be embedded eight feet into rock and post-tensioned to 20 kips, and the single downstream anchor will be embedded 5 feet into rock and will be post-tensioned to 5 kips.

The results of the three-dimensional CFD model indicate that the proposed floor baffles initiate the formation of a hydraulic jump within the existing concrete lining upstream of the grout curtain collar for the design condition of 4,000 cfs at 57-in full gate opening and reservoir elevation 2331.3

(side channel spillway crest). Documentation to support the hydraulic design loading and stability of the floor baffles was provided in Knight Piesold Consulting Memorandum, Iron Gate Diversion Tunnel Structural Design, August 26, 2022. It is not clear whether uplift along the base of the baffle and negative pressure along the top of the baffle were considered in the stability analysis. Drawing C4193 indicates that water stops will not be installed along the upstream base to reduce the uplift force resulting from the impact of flow on the vertical face.

The review of the hydraulic performance of the floor baffles was provided in Dr. Henry T. Falvey & Associates, Inc. Memorandum, Iron Gate Baffle Blocks, August 5, 2022. Dr. Falvey recommended that, based on the results of physical hydraulic model tests performed in the BUREC Hydraulic Laboratory (Reports HL-2009-06 and HL-2012-02), a ramp between the blocks be incorporated into the design to protect the floor against supercavitation damage. The BUREC model studies indicate that the floor ramp also be extended laterally from the floor baffle to the outer tunnel lining, and that half-baffles be located at the walls of the tunnel lining.

The BUREC studies show that the floor ramps help reduce the design tailwater requirement to 85% of the sequent depth. Dr. Falvey also indicated that during the initial opening of the gate the flow will sweepout because the tunnel will not be flowing full. Consequently, Dr. Falvey suggested that stoplogs be employed at the tunnel exit to raise the tailwater downstream of the floor baffles and ramp to help prevent sweepout during the initial opening of the gate.

The Iron Gate reservoir drawdown and the adequacy of the diversion tunnel during the conveyance of flow during the removal of Iron Gate Dam continues to rely primarily on the CFD modeling of the gate operations, aeration system supply, floor baffle performance, and tunnel flow conditions.

The BOC finds that the Renewal Corporation has made progress in developing conceptual contingency plans to mitigate risks associated with the failure to fully open the gate, and the floor baffle value engineering alternative to achieve most of the energy dissipation within the reinforced concrete-lined tunnel reach upstream of the cutoff grout collar. The BOC understands that Renewal Corporation is aware of the potential risks that could occur during the removal of the Iron Gate development, and that the TCSMP provides a basis for the working group to continually and closely monitor site conditions to allow implementation of contingency plans.

Removal of Copco No. 1 Adit Steel Conduit

The Final Construction Documents propose the elimination of the Copco No. 1 adit steel conduit extension. The steel conduit extension provided a working platform for the construction of the adit through the concrete dam, and provided access to the historic diversion tunnel intake structure. The 100% Design Report Section 3.2.3.5 states that the hydraulics of the adit “function acceptably with or without the steel conduit”.

The purpose for eliminating the steel conduit would be to lower the working platform height, and that the removal of some of the dam and historic diversion tunnel intake structure would be accessed from the left abutment. The results of the CFD model (Appendix C2) indicate that the

initial exit velocities leaving the adit would be approximately 60 fps +/- at reservoir level 2597.1, and reduce to 25 fps at reservoir level 2520. Based on these velocities it is the BOC finds that the working platform would erode and be unavailable once the adit upstream “plug” is opened.

During the informal meeting the Renewal Corporation indicated that the decision to eliminate the steel conduit will be “weighed against forecasted climatic conditions and schedule certainty during the pre-drawdown year”.

The BOC finds that the 100% Drawing 2225 indicates that the adit invert elevation exiting the dam is approximately 2484.2, while 100% Drawing 2057 showing mean monthly and Monthly Flow Duration 75% of Time Equaled or Exceeded tailwaters of approximately 2487 +/- during the period of mid-June-early-September (Klamath River Renewal Project – Construction Schedule, Activity IDs CO16010-CO10360). It is unclear to the BOC how the adit can be mined if the adit invert and working platform are three feet below the expected tailwater levels.

CONCLUSIONS

This section presents the conclusions of the BOC regarding the Final Construction Documents, Issued June 29, 2022, associated with the removal of each of the four dams.

J.C. Boyle Development

Best Management Practice (BMP), Erosion Control for spoil areas appears to be well thought out. However, the BOC recommends that site engineering personnel review all final grading in the field to assure that no erosional opportunities remain untreated/mitigated.

The BOC has commented on the prudence of investigation at the toe of the scour hole. Stability assessment with regard to weak/loose layers at the toe of the fill should be considered. Also, placement and compaction efforts should be specified and implemented using best industry practices.

The BOC concludes that the condition of the existing cofferdam embedded in the toe of the existing embankment is not known, and will need to be evaluated and potentially remediated once exposed to assure its water retaining integrity.

Copco No. 1 Development

The BOC understands that the Renewal Corporation is considering the elimination of the adit steel conduit and the lowering of the working platform to the level of the adit invert elevation. As a result, the Renewal Corporation plans to access the historic diversion tunnel intake structure from the left abutment. The lowering of the work platform may, however, be subjected to flooding during the projected tailwater levels during the mining of the adit. The final decision to eliminate the conduit will be “...weighed against forecasted climatic conditions and schedule certainty during the pre-drawdown year“. The BOC concludes that the potential for eliminating the adit steel conduit and delaying the decision to adopt this plan is reasonable.

The BOC understands that contingency plans for debris removal and access for these activities is still under development.

The BOC is of the understanding that work plans for opening the historic diversion tunnel are still in development, but may include suspending/hanging an excavator on the left abutment slope above the intake structure, and/or the use of divers.

Copco No. 2 Development

Kiewit has proposed that the removal of Copco No. 2 Project could potentially happen during the drawdown year. This could be accomplished if certain conditions are met, including releases from the upstream USBR projects to attenuate inflow to Copco No. 1.

The BOC agrees with this approach if conditions are appropriate, as this removal plan would be the most efficient and would reduce risk.

Iron Gate Development

The BOC concludes that the Renewal Corporation has performed numerous studies and tests to evaluate the ability to fully open the diversion tunnel gate successfully. The field tests, however, have been performed to fully open the gate under balanced head, or partially open the gate under unbalanced head. While not specifying, the Renewal Corporation will continue to study or test the ability to open the gate fully under unbalanced head conditions. The Renewal Corporation plans to monitor the flow through a partially opened gate and has identified conceptual contingency plans to safely pass flows through the project during the embankment removal. These conceptual contingency plans were discussed during the informal meeting. The BOC concludes that this approach is reasonable to mitigate risks during the pre-drawdown and drawdown stages.

BOC concludes that the Renewal Corporation is considering installing floor baffles in lieu of the extension of a downstream lining to dissipate energy prior to flow entering the unlined reach of the Iron Gate diversion tunnel. The design of the floor baffles relies primarily on the results of the CFD modeling and BUREC hydraulic model studies. However, the BOC opines that the concept of floor baffles in a diversion tunnel in this application is considered to be somewhat unprecedented.

The BOC understands that the Renewal Corporation will closely monitor the adequacy of flow through the tunnel, and have identified conceptual contingency plans in the event that tunnel damage reduces its discharge capacity. The introduction of air into the critical reach between the blind flange orifice and cutoff collar is essential for “cushioning” flow fluctuations which may hinder gate operation, improving energy dissipation, and further reducing the potential for floor baffle cavitation. The BOC concludes that the installation of floor baffles to dissipate energy within the lined tunnel reach is reasonable, with the understanding that the location and suspension (or encasement) of air vent pipes be re-evaluated, floor baffle ramps across the entire invert between

the baffles and laterally to the tunnel lining to reduce the potential for supercavitation damage and improve energy dissipation, and water stops be considered.

The BOC concludes that the current revision of the TCEAP includes insufficient consideration for the potential of a full height dam break, most critically, the Iron Gate Development. The CPFMA identified a few credible overtopping scenarios that were Classified as Category II, indicating credible PFMs that need to be risk mitigated. An effective plan needs to be in place to trigger the appropriate responses, potentially including evacuation of the downstream public at risk should the remote but credible case of an accidental breach occur.

BOC concludes that toe dam removal sequence is well thought out, and it appears the project team attuned to the fact that progress adjustments will be necessary based on weather and site conditions encountered.

The BOC concludes that the BMP Erosion Control Spoil areas appear to be well thought out. However, site engineering personnel should review all final grading to assure that no erosional opportunities remain untreated/mitigated.

Temporary Construction Emergency Action Plan

The BOC concludes that the TCEAP requires revision. The Contacts Listed in Section 3, "Notification Procedures" should also include Humboldt and Del Norte Counties as a minimum. The BOC notes that, as indicated in Chapter 6 of the FERC Guidelines, Section 6-9 of "Temporary Construction Emergency Action Plans" (Guidelines), a TCEAP should include "Action levels (based on the construction PFMA, if applicable), when the plan will be activated and when evacuation will occur". Also "A brief description of testing procedures for the plan" as requested in the Guidelines should be addressed. For that, the FERC indicates that "Periodic testing of the plan should be performed at least quarterly and be documented by contractor and Quality Control Staff". The BOC concludes that the current revision of the TCEAP includes insufficient consideration for the potential of a full height dam break, most critically at the Iron Gate Development. Other comments were provided in the "Findings" Section above.

Material Specifications

The BOC concludes that the Material Specifications did not contain sufficient direction with regard to placement (e.g., placement in "lifts" and lift thickness) and compaction effort. In Specification 31 23 00 (Excavation and Placement of Fills) and Specification 31 05 00 (Materials for Earthwork) there are no explicitly stated maximum lift thicknesses or compaction specifications stated for the various fill materials. It is the Board's recommendation that maximum lift thicknesses and compaction effort (Proctor-type compaction testing or number of passes with a certain energy compactor) be specified for the various fill types (JC Boyle scour hole, general site fills, disposal area fills, Iron gate spillway fills, etc.). The Board Recommends that dumped fill and rubble should be evenly spread into specified lift thicknesses and compacted. Not providing control of lift thicknesses and compaction of fill and rubble could result in differential settlements, poor surface

drainage, unsightly and potentially unsafe results. Rubbles should be well chinked to mitigate potential sinkhole development.

Comment Regarding Construction Costs

While this may not be pertinent since a Guaranteed Maximum Price (GMP) has been reported to have been reached with the Contractor(s). The BOC has not seen the final contracts with RES or Kiewit including GMP amounts. The BOC simply notes that construction costs have (and are) rising considerably in the past two years and since the contractor's cost models were reviewed by the BOC. The BOC notes that the Renewal Corporation and the States are co-licensees with full fiscal responsibility, and that some commitment exists from PacifiCorp to participate in cost overruns, should they occur.

Risk Register

The Risk Register has been properly maintained and periodically updated. The BOC notes that all risk reduction measures in the Risk Register should be incorporated in the TCSMP, TCEAP, Construction Schedule, Work Plans, Contingency Plans, and other planning documents as appropriate, in order that risk reduction measures are acted on and incorporated in the work as appropriate. The BOC anticipates that the Risk Register will continue to be a useful tool and will be reviewed by all stakeholders on a periodic basis through construction.

RECOMMENDATIONS

In this section the BOC presents the recommendations resulting from the review of the Final Construction Documents and its supporting documents issued on June 29, 2022.

Recommendation No. 1 - Site-Specific Risk Reduction Measures in Temporary Construction Surveillance and Monitoring Plan

The TCSMP discusses various risk reduction measures and related surveillance and monitoring. The BOC acknowledges the TCSMP is not meant to contain action plans associated with risk reduction; however, the BOC recommends that all risks identified in the TCSMP be addressed in site-specific work plans and contingency plans prior to the start of construction.

Recommendation No. 2 - Erosion and Sediment Control

The BOC recommends that the drawings and specifications also reflect that surface water management may require field adjustment to the design if potential problem areas are observed during construction. The BOC also recommends that an experienced civil site engineer field-review fill areas and slopes to achieve proper grading and permanent erosion protection to mitigate the potential for gullying and erosion after project completion.

Recommendation No. 3 - Subsurface Investigations and Placement of Fill in J.C. Boyle Scour Hole

If the explorations at the toe of the scour hole fill are deferred, the BOC highly recommends that geotechnical engineering expertise be included in any field investigation and engineering assessment of the slope stability of the scour hole fill. Also, materials-types to be placed in lifts, maximum lift thickness, placement and chinking of larger materials and concrete rubble, and compaction effort for the scour hole fill should be specified in the project specifications and/or drawings.

Recommendation No. 4 - Considerations for Temporary Construction Emergency Action Plan

Contacts Listed in Section 3, "Notification Procedures" at a minimum, should include Humboldt and Del Norte Counties. The BOC recommends that the enhancement of the TCEAP could include discussion of PacifiCorp's Iron Gate Dam Break Analyses and their EAP inundation maps. Chapter 6 of the FERC Guidelines, Section 6-9 of "Temporary Construction Emergency Action Plans" should be used to assure all appropriate content is included. "Action levels" for when the EAP will be enacted based on the construction PFMA, as applicable and when downstream evacuation will occur. Also, the FERC indicates that "Periodic testing of the plan should be performed at least quarterly and be documented by contractor and Quality Control Staff". The Board opines that the current revision of the TCEAP does not have sufficient consideration of the potential for a full height dam break, most critically at the Iron Gate Development. The BOC recommends that an effective plan needs to be in place to trigger the appropriate responses, potentially including evacuation of the downstream public and construction personnel at risk should the remote but credible case of an accidental breach occur.

Recommendation No. 5 - Development and Status of Contingency Plans

The BOC is of the understanding that Site-Specific Contingency Plans are in development by the Contractor, with review by the Renewal Corporation and McMillen Jacobs.

The BOC recommends that, in the development of these contingency plans, stakeholders make certain that all risks developed in project documents are adequately addressed.

Recommendation 6 - Material and Placement Specifications

In Specification 31 23 00 (Excavation and Placement of Fills) and Specification 31 05 00 (Materials for Earthwork) there are no explicitly stated maximum lift thicknesses or compaction specifications stated for the various fill materials. The BOC recommends that maximum lift thicknesses and compaction effort (Proctor-type compaction testing or number of passes with a certain energy compactor) be specified for the various fill types (J.C. Boyle scour hole, general site fills, disposal area fills, Iron gate spillway fills, etc.).

The BOC recommends that dumped fill and rubble should be evenly spread into specified lift thicknesses and compacted. Rubble should be well chinked to mitigate potential sinkhole

development. Not providing control of lift thicknesses and compaction of fill and rubble could result in differential settlements, poor surface drainage, unsightly and potentially unsafe results.

Recommendation No. 7 - Construction Schedule Risk Reduction Measure Milestones

The BOC recommends that milestones, consistent with attained risk reduction measures, be incorporated into the construction schedule. Similarly, the BOC recommends that various BOC touch points associated with either BOC site visits or BOC briefings, be identified and incorporated into the construction schedule for the purpose of notifying and informing the BOC accordingly.

Recommendation No. 8 - Hydraulic Performance of Iron Gate Diversion Gate and Tunnel

The BOC recommends that the Renewal Corporation further develop specific pre-drawdown operation and testing procedures to confirm that the hoist can be used to achieve the fully opened position under unbalanced head conditions occurring under the initial drawdown stage.

The BOC recommends that the conceptual contingency plans discussed during the informal meeting be further developed to consider various partial gate opening scenarios. The BOC recommends CFD simulations of partial gate openings and corresponding tunnel discharges be used to better identify contingency plans and the on-site availability of means, methods and materials required to pass flows effectively and safely around Iron Gate for a series of unanticipated flood events.

The BOC recommends that the contingency plans include review of the sequencing of the embankment removal activities to consider a staged excavation of a controlled breach channel at an earlier stage.

Considerable design work has gone into the selection of an air vent system suspended from the crown of the tunnel to improve flow conditions within the tunnel. The loss of the air vent system would compromise the operation of the tunnel during the initial drawdown by introducing unsteady flow conditions and negative pressures which could result in gate vibrations and prevent it from being fully opened. The introduction of air not only helps achieve the flow capacity of the tunnel, but also improves energy dissipation in the critical lined tunnel reach and reduces the potential for floor baffle and tunnel lining cavitation.

The most vulnerable location of the air vents is between the blind flange and grout curtain collars, where the air vents will be subjected to the highly turbulent and laterally fluctuating flow conditions during the initial drawdown. Drawing C4125 shows that the air vent is suspended from, rather than against, the crown of the tunnel lining. Drawings C4191 and C4192 apparently show that the air vent is closely aligned with the new upstream vent hole, which may cause additional loads on the air vent piping. The BOC has not seen contingency plans related to the potential loss of the vent system.

The BOC recommends that Renewal Corporation revisit their design of the anchorage of the air vent system to resist laterally fluctuating flow conditions, and that sufficient space is provided

between the new upstream vent hole and downstream air vent pipe. The BOC opines that the air vent piping will be subjected to lateral flow fluctuations during operation and recommends that the Renewal Corporation consider totally encasing the air vent piping in this critical reach. Since the aeration of the flow is imperative to the initial operation of the gate, achieving the tunnel flow capacity, and preventing supercavitation damage of the floor baffles and tunnel lining, the BOC recommends that consideration should be given to driving a vertical shaft/casing to improve air flow should the air vent piping be damaged and aeration becomes unavailable.

Drawing C4050 indicates that the diversion tunnel could potentially pass the design flow of 4,000 cfs for up to four months (Max Simulated WSL), and approximately 3,000 cfs for a total of up to one month (50^{thP} Simulated WSL). The BOC opines that the Renewal Corporation take every precaution to prevent supercavitation damage to the floor baffles and tunnel lining over the extended duration of operation. Consequently, the BOC recommends that the Renewal Corporation consider incorporating the floor ramps between the floor baffles recommended by Dr. Falvey to reduce the potential for supercavitation damage along the floor, and extending the floor ramps laterally to the tunnel lining sidewall. The BOC recommends that the Renewal Corporation consider Dr. Falvey's recommendation to use removeable stoplogs at the tunnel exit to help raise the tailwater levels during the initial gate opening. The BOC recommends that the Renewal Corporation consider installing additional half-floor baffles along the lining sidewalls to achieve the desired energy dissipation, and water stops along the base of the upstream face of the floor baffles (and potentially along the sides) to further reduce uplift pressure along the base "cold joint" and to increase floor baffle stability.

Recommendation No. 9 - Removal of Copco No. 1 Adit Steel Conduit

The BOC recommends that the Renewal Corporation review the potential for flooding the work platform and delaying the mining of the adit, and develop contingency plans for mitigating this risk.

NEXT MEETING

During implementation of the work in accordance with the FERC May 22, 2018 Directive, it is the BOC's understanding that it is the FERC's intent that the BOC involvement is to remain in effect through the approved dam removal process. The BOC recognizes that the field conditions encountered during the removal of the projects may require design, contingency plan and work plan revisions to the Final Construction Document. The BOC understands that the FERC Directive includes the Renewal Corporation's notification and submission of such revisions to the BOC for review, and that appropriate BOC members be present on site to observe or be provided timely information remotely at critical milestones, such as the adit penetration of Copco 1, the assessment of foundation conditions and placement of fill at the toe of the J.C. Boyle scour hole, improvements to the Iron Gate tunnel and gate operations, the implementation of emergency or contingency planning or activities, restoration measures following dam removal, or other important milestones and/or activities. This is intended to inform the BOC of the key milestones to assist in formulating the final report summarizing the work. The Renewal Corporation suggested providing the weekly construction reports to the BOC, and the BOC concurs with this.

CLOSURE

Based on the BOC's review of the information provided at this stage of the Project, the BOC respectfully submits Letter Report No. 4 providing our findings, conclusions, and recommendations regarding the Final Construction Documents in support of the Renewal Corporation's Amended Application for Surrender of License for Major Project and Removal of Project Works.

The Renewal Corporation and Kiewit have assembled an experienced and technically competent team of planners, designers, and contractors capable of achieving a safe and efficient removal of the projects. The BOC appreciates transparency, cooperation, open communication, and technical accomplishments.

Yours sincerely,



James E. Borg Craig Findlay Dan Hertel

Attachment A - Formal Meeting Agenda and Attendees
Attachment B – Informal Meeting BOC Requests for Additional Information and Renewal Corporation Response to BOC Request to BOC Requests for Additional Information.

ATTACHMENT A – BOC FORMAL MEETING No. 4 AGENDA AND ATTENDEES

LOWER KLAMATH PROJECT
FERC Board of Consultants: P-2082, P-14803 NATDAM-OR00559, CA00323, CA00234, CA00325
Formal Meeting No. 4 Agenda

Friday, September 16, 2022

Attendees:

- BOC: Jim Borg, Craig Findlay, Dan Hertel
- Renewal Corporation: Laura Hazlett, Olivia Mahony
- McMillen Jacobs Associates: Mort McMillen
- PacifiCorp: Dustin Till, Demian Ebert, Isaac Beakes
- FERC: Not Attending
- On-Record/Publicly Noticed: No

Start (PDT)	Duration	Topic	Leaders
9:00 AM	20 min	Call to Order • Role Call • Understanding of the Assignment • Responsibility of Meeting Minutes	Jim Borg
9:20 AM	10 min	Review Agenda • Additions/Deletions • Questions?	Jim Borg
9:30 AM	30 min	Review and Discussion of Final Construction Documents	BOC Members
10:00 AM	45 min	Preliminary Conclusions, Recommendations, and Answers to the Questions Posed	BOC Members
10:45 AM	15 min	Assignments/Responsibilities: • BOC Draft Report • Renewal Corporation Draft Report Review • BOC Final Report	Jim Borg
11:00 AM	TBD	Other Business and Further Discussion, as Needed	Participants

ATTACHMENT B

FORMAL MEETING NO. 4 MINUTES

LOWER KLAMATH PROJECT

FERC Independent Board of Consultants: P-2082, P-14803 NATDAM-OR00559, CA00323, CA00234, CA00325

Formal Meeting No. 4 Meeting Minutes

Call to Order

The Federal Energy Regulatory Commission (FERC) Independent Board of Consultants (BOC) Formal Meeting #4 was called to order at 9:00a.m. PT on Friday, September 16, 2022.

- Roll Call:
  - BOC: James Borg, Dan Hertel, Craig Findlay
  - Klamath River Renewal Corporation (Renewal Corporation): Laura Hazlett, Olivia Mahony, Mort McMillen (McMillen Jacobs Associates)
  - PacifiCorp: Demian Ebert, Dustin Till, Issac Beakes
  - FERC: It was noted that FERC advised the Renewal Corporation it would not attend the meeting.
  - On-Record/Publicly Noticed: No

- Understanding of the Assignment: Mr. Borg stated that, in accordance with the FERC's May 22, 2018 directive, the BOC reviewed the Final Construction Documents with a focus on the technical and engineering, risk mitigation, and dam and public safety aspects associated with dam removal and construction activities.

  Mr. Borg further stated that the BOC recognizes that modifications and revisions to the Final Construction Documents may be required to address unanticipated site conditions which may be encountered during the removal of the dams. The BOC's review at this point is based on the current development of the construction plans.

- Responsibility of the Minutes: Mr. Borg requested that Ms. Mahony prepare the minutes of the meeting.

Review of the Agenda

Mr. Borg asked for any revisions to or questions about the agenda. There were no revisions to or questions about the agenda.

Preliminary Conclusions, Recommendations, and Answers to Questions Posed

Mr. Borg, Mr. Hertel, and Mr. Findlay provided a read out of the draft Letter Report No. 4, including the BOC's findings, conclusions, and nine recommendations. There were no questions posed or further discussion.

Mr. Borg then stated it is BOC's understanding of the FERC directive that the BOC will be involved in the dam removal process through completion, and that KRRC will provide the BOC with any work or contingency plan deviations resulting from changes in field conditions encountered during the removal of the dams. It is also the BOC's understanding that appropriate BOC members may be on site, or involved remotely, for the review of work and contingency plan deviations at critical milestones, and that (as per the FERC's directive) the Renewal Corporation will provide the BOC with monthly progress reports throughout construction.

Mr. Borg noted the BOC finds the Renewal Corporation and its project team to be experienced, technically competent, and capable of achieving a safe and efficient removal of the project.

Assignments/Responsibilities

Per the FERC directive, the BOC will provide the Formal Meeting No. 4 Report to the Renewal Corporation by September 30, 2022, and the Renewal Corporation will then file the Report and its responses to the

BOC recommendations with the FERC by October 14.

Other Business and Further Discussion, as Needed
Mr. Hertel noted that damage to the Iron Gate diversion tunnel aeration system preventing the tunnel's anticipated performance during the removal of the dam continues to be one of the BOC's primary concerns. There was further discussion about the Iron Gate tunnel aeration venting system risks and approach for mitigating these risks.

Ms. Hazlett then offered appreciation on behalf of the Renewal Corporation and the full project team for the BOC's diligence in evaluating this complex project, noting that the BOC's feedback and recommendations have continued to enhance the project approach.

Adjournment
There being no more further items or discussion, the meeting was adjourned at 10:30a.m. PT.

ATTACHMENT C

INFORMAL MEETING
RENEWAL CORPORATION
RESPONSE TO BOC ASSESSMENTS, QUESTIONS, AND COMMENTS

Portions of Attachment C contained specific detailed information designated as Critical Energy/Electric Infrastructure Information (CEII). All CEII has been redacted from this public filing, consistent with the Commission's rules.

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Klamath River Renewal Project

BOC Informal Meeting

Wednesday August 3, 2022

KLAMATH
RIVER RENEWAL
CORPORATION

Proposed Agenda

Item No.	Topic	Time (PST)	Lead
1	Introductions, Review Meeting Agenda, Goals and Objectives	9:00 – 9:10	Olivia M
2	Opening Statements from BOC	9:10 – 9:20	Jim Borg
3	Response to BOC Questions and Comments	9:20 – 11:40	Mort M Nick Drury
4	Next Steps and Action Items	11:40 – 12:00	Olivia M
5	Adjourn	12:00	Olivia M

Introductions

- BOC
- KRRC
- McMillen Jacobs
- Kiewit/Knight-Piesold
- PacifiCorp

Meeting Objectives

- Review and respond to BOC comments, questions, and recommendations
- Outline next steps and any action items

Project Status

- The final design package was submitted to FERC in June. To date, KRRC has not received any comments from FERC on the design packages. We expect to see informal comments from FERC Portland Regional office after the FEIS is issued (September).
- Permitting and regulatory work activities are advancing. We expect most of this activity will be completed by January 2022.
- CA DSOD has reviewed and commented on the interim design submittals. DSOD has the final design package and will provide final comments and approval by December 2022. KRRC does not expect any significant remaining comments from DSOD.
- Once the License Surrender Order is issued, KRRC expects to issue a conformed Issued for Construction package along with supporting construction related documents which incorporate final comments from FERC, FERC license surrender order articles, final BOC comments, any final DSOD comments, and permit requirements, where appropriate.

Response to BOC Evaluation of KRRC Responses to BOC Meeting No. 3 Recommendations and 100% Design Package

KLAMATH
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BOC Recommendation 1

- If not on the project schedule or in the updated Construction Management Plan, where can the response to Recommendation 1 be found in the 100% Design Package?

BOC Recommendation 1 - Response

- Specific responses to the CPFMA requirements is in the Temporary Construction Surveillance Monitoring Plan (TCSMP). The Construction Management Plan was determined to not be the appropriate location for this information.
- A working group has been established consisting of members of the Kiewit, KRRC, and PacifiCorp teams, as well as coordination with the USBR. The working group is working through the site-specific operations, flow management, and workplan execution required at each dam and is addressing risk management in terms of operation, dam safety, contractor safety, and environmental protection. This work effort will continue through 2022 in preparation for a March 1, 2023 mobilization for field construction activities. The final risk management measures will be incorporated into the Kiewit site specific workplans and McMillen Jacobs monitoring plans.
- A specific line item will also be added to the Project schedule specific to this activity.

BOC Recommendation 2

- Where can the site-specific risk reduction measures for the Copco No. 1 adit work activities be found in the 100% Design Package?

BOC Recommendation 2 - Response

- The Construction Management Plan and TCEAP were determined to not be the appropriate location for this information.
- The Temporary Construction Surveillance Monitoring Plan (TCSMP) contains the site-specific risk reduction measures as outlined in the cPFMA report.

BOC Recommendation 3

- The BOC recommends that these measures be configured to permanently protect these areas from erosion and gullying. In review of the 100% Submittal, it is difficult to see where upslope areas or gullies may exist.

  The BOC recommends that the drawings and specifications reflect surface water management which may require field implementation as potential problem areas are observed. The BOC also recommends that a civil site engineer field review fill areas and slopes to assure proper grading and permanent erosion protection to mitigate the potential for gullying and erosion after project completion.

BOC Recommendation 3 - Response

- Erosion control plans provide berms and location specific collection points anticipated to be in areas prone to high erosion. Drainage control and protection measures were included in the final design and ESC drawings.
- McMillen Jacobs staff, which includes a geotechnical and civil engineer, will be reviewing the construction of the waste disposal sites and final site grading. They will review the construction work and ensure effective drainage is constructed and meets the requirements of the ESC plans to provide long term, stable conditions.

BOC Recommendation 4

- The BOC recommends the findings of the investigation be considered in calculations of the stability of the slope as appropriate, and reconfiguration of the fill be made as needed to maintain permanent stability. Conditions of saturation of the fill during the rainy season should be considered in analysis.

  In review of the 100% Submittal, the Board notes that "additional exploration" have been deferred until construction. This also defers knowledge of unsatisfactory soil strata under the toe, such as interlayered organic or otherwise soft/loose materials should they exist. This could significantly affect the feasibility of filling the scour hole at the time of construction, necessitating alternative solutions which could potentially cause schedule delays. Contract Specifications do not seem to address this.

  If the "additional explorations" are deferred, the BOC highly recommends that once they are finally made, the geotechnical engineering expertise is included in the engineering assessment of the slop stability of the scout hole fill. Also, maximum lift thickness and compaction effort for the scour hole should be specified.

BOC Recommendation 4 - Response

- Additional geotechnical investigations were recommended as part of the BOC Meeting 3. Subsequent site visits to the scour hole have revealed that it will be nearly impossible to conduct borings at the base of the scour hole due to the large boulders present at this site. As a result, the design as proposed will be implemented.

- A geotechnical engineer will be onsite during the material placement to monitor the site conditions and construction to ensure an effective and stable slope is constructed. Drainage control will be a key aspect of this onsite construction and monitoring work effort.

BOC Recommendation 5

- Please clarify the apparent contradiction of these two statements. Please also clarify when reference contingency plans would be available for BOC review.

BOC Recommendation 5 - Response

- It was determined that the Construction Management Plan was not the appropriate document for the risk management information, so it was moved to the TCSMP.
- As noted previously, a working group is working through the risk reduction measures as part of the operations and construction workplan coordination. The information from this analysis will be incorporated into the means and methods workplans prepared by Kiewit.
- The specific risk reduction measures are presented in the TCSMP. This document will also be updated to include any additional risk reduction measures developed by the working group and provided to the BOC prior to mobilization for construction in March 2022.

BOC Recommendation 6

- Comment: The BOC stresses that the contingency plan associated with the reduction of this risk be developed in advance of the start of construction activities at Iron Gate for BOC review. KRRC response indicated that a milestone will be added to the construction schedule, indicating testing of adequacy of the Iron Gate Tunnel. This milestone is not included in the updated Construction Schedule.

  The letter (KRRC to FERC, dated July 2, 2021) acknowledges the need to identify critical milestones for appropriate monitoring by some BOC members. The current Schedule does not include identification of these milestones.

- Recommendation: The BOC recommends KRRC and the Contractor work with the Board to identify and note these on the construction schedule, such that the BOC can be made aware of potential site visits for planning purposes, as appropriate.

BOC Recommendation 6 - Response

- Activity to test gate will be added to the construction schedule in the pre-drawdown year.
- A team consisting of Kiewit, PacifiCorp and McMillen are working through advanced workplan analysis to develop effective contingency planning. It should be noted that the Kiewit/KP design was developed considering risk management and contingency planning. The working group is focused on coordinating specific work activities to finalize flow management, operations, safety, and environmental management as well as risk management and contingency planning.
- We will add specific dates to the overall project schedule to incorporate BOC into the discussion of contingency planning. These meetings would be anticipated in early January prior to mobilization for construction in March 2023.

BOC Recommendation 7

- Has Dr. Falvey reviewed the option to substitute floor baffles for the extension of the tunnel lining? If so, are his review comments available in the 100% Design Package?

BOC Recommendation 7 - Response

- Yes, Dr. Falvey reviewed the preliminary design for the floor baffles and provided recommendations to address potential cavitation, which have been addressed in the Final Design as shown in the memo.

Review of Responses to Board's Questions about the 100% Design Report – J.C. Boyle

KLAMATH
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CORPORATION

2.4.6 Final River Channel

- Who will be responsible for the final sizing and when? Has a pilot channel been considered to assist fish passage?

2.4.6 Final River Channel - Response

- The final river channel location and grading for the "volitional fish passage" has been completed. The hold was noted due to new guidance provided by the USACE as part of the permitting coordination to use 2D modeling approach be incorporated into the design. This analysis was completed and the design updated to reflect this USACE guidance.
- Updated drawings will be provided.

Review of Responses to Board's Questions about the 100% Design Report – Copco No. 1

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3.2.3.5 Project Company Alternative Removal of Steel Conduit - Question

- What information of event would trigger implementing this alternative?

Drawings for the alternative for removal of the (downstream) steel lining and access to the historic diversion tunnel are not provided. Where is the design backup to "confirm that the hydraulics of the low-level outlet function acceptably with and without the steel conduit? Appendix C2 show velocities varying from 25 to 50 fps in the steel lined conduit. If removed, these velocities will be over the working platform fill which will erode. No CFD modeling has been performed for the steel conduit removal alternative. How will erosion of the working platform affect access to the left abutment and downstream shoreline?

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3.3.2 Opening of Low-Level Outlet Tunnel - Question

- What measures, access, or techniques will be in place as a contingency? Earlier discussions included development of contingency plans should the tunnel opening be blocked with debris. Have contingency plans been developed?

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3.4.6 Final River Channel - Question

- Will the removal only “not create a fish barrier”, or provide “volitional fish passage (not mentioned in the report)?” Has a pilot channel been considered to assist fish passage during low flow conditions (Drawings 2100 and 2230)?

3.4.6 Final River Channel - Response

- The dam removal work includes final excavation of the river channel, placement of bank protection, and establishment of the final volitional fish passage channel.
- Hydraulic modeling was completed for the final channel configuration and confirmation of the volitional fish passage conditions throughout the flow range.
- Pilot channels were not considered necessary for the channel. The design was developed considering the full channel width to ensure volitional fish passage conditions.

Review of Responses to Board's Questions about the 100% Design Report – Copco No. 2

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4.4.5 Final River Channel - Question

- Has a pilot channel been considered to assist fish passage during low flow conditions (Drawings C3232 and C3234)?

4.4.5 Final River Channel - Response

- The dam removal work includes final excavation of the river channel, placement of bank protection, and establishment of the final volitional fish passage channel.
- Hydraulic modeling was completed for the final channel configuration and confirmation of the volitional fish passage conditions throughout the flow range.
- Pilot channels were not considered necessary for the channel. The design was developed considering the full channel width to ensure volitional fish passage conditions.

Review of Responses to Board's Questions about the 100% Design Report – Iron Gate

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CORPORATION

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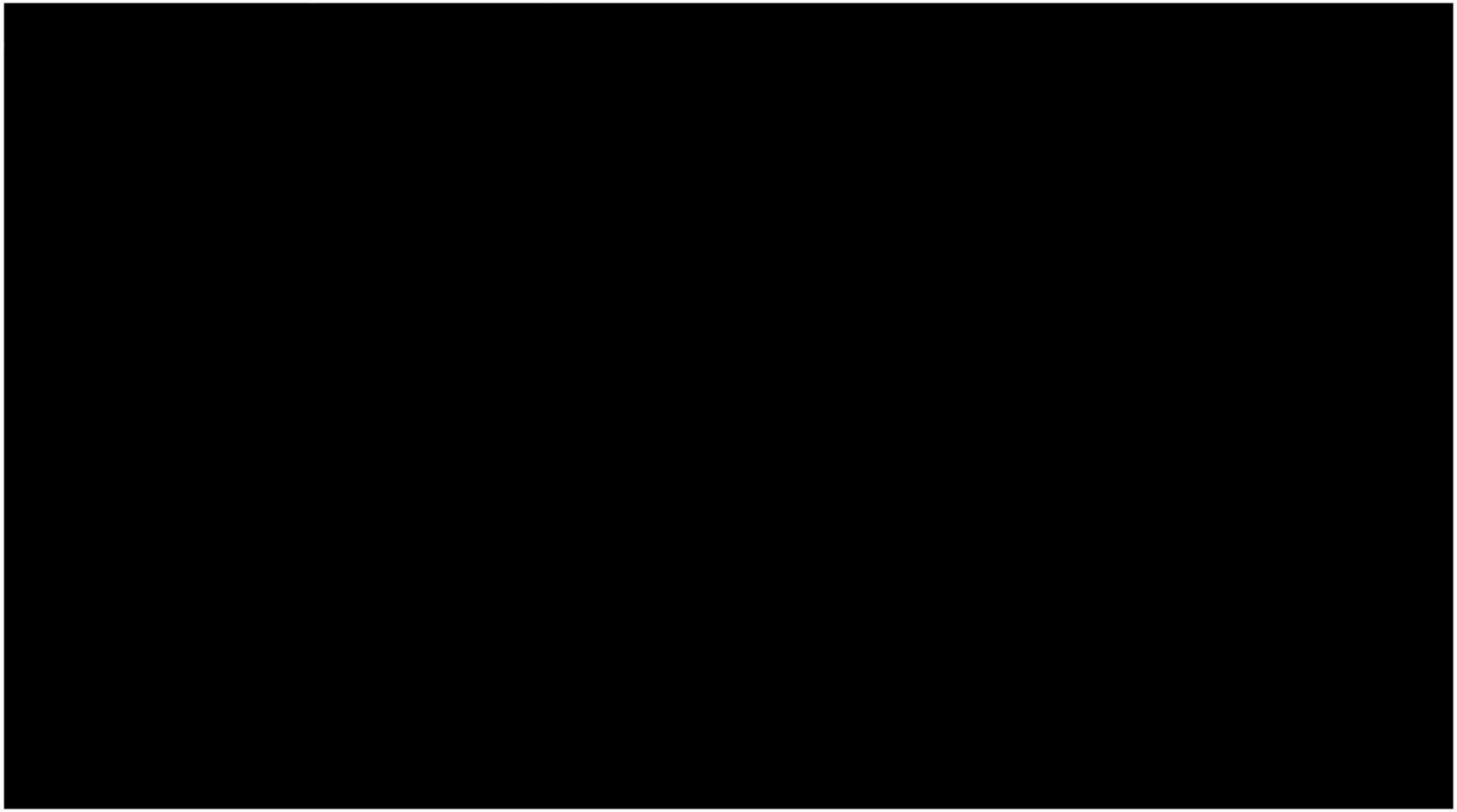

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5.4.3.2 Breach Modeling Recommendations - Questions

- What is the purpose of the riprap-lined trench. How will the rip rap trench be excavated through the historic cofferdam if the mean water levels are above the invert of the trench? What is the contingency plan if the available tunnel discharge capacity is less than predicted?

5.4.3.2 Breach Modeling Recommendations - Response

- The purpose of the riprap lined trench is to avoid rapid erosion of the breach plug when the breach is initiated. The trench will be constructed downstream of the plug before breach is initiated. If the tunnel capacity is lower than predicted, then the breach will be timed to coincide with a lower inflow rate.

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KLAMATH RIVER RENEWAL CORPORATION

5.4.3.4 Dam Embankment Removal Sequencing - Comment

- The sequencing plan should include provisions that the existing spillway remain unobstructed until such time as the dam embankment level is below the spillway entrance level.

5.4.3.4 Dam Embankment Removal Sequencing- Response

- The project will place fill in the spillway until the risk of a 100-year event entering the spillway has passed. Should material be removed from the dam prior to the 100-year flood level dropping below the spillway crest, fill will be placed in the alternate disposal area to keep the spillway clear.

Review of Responses to Board's Questions about the TCEAP

KLAMATH
RIVER RENEWAL
CORPORATION

TCEAP – Comment 1

- The list of figures and pages not defined in the Table of Contents.

TCEAP Comment 1 - Response

- We will add a list of figures and pages to the Table of Contents.

TCEAP – Comment 2

- Contacts (Section 3, notification procedures) should include Humboldt and Del Norte Counties, since downstream reaches of the river are located there, (unless dam break analyses indicate there are no incremental impacts for the worst-case dam break (e.g. overtopping breach of the full or near-full height of Iron Gate Dam). Could check PacifiCorp Iron Gate dambreak analysis used for their EAP inundation maps and incorporate into the TCEAP.

TCEAP Comment 2 - Response

- TCEAP builds on the PacifiCorp plans which include full dam break. We will expand to include the BOC recommendations.

TCEAP – Comment 3

- As indicated in Chapter 6 of the FERC Guidelines, Section 6-9 of "Temporary Construction Emergency Action Plans" should include "Action levels (based on the construction PFMA, if applicable), when the plan will be activated and when evacuation will occur". Also "A brief description of testing procedures for the plan." The FERC indicates in this section that "Periodic testing of the plan should be performed at least quarterly and be documented by contractor and Quality Control Staff." In the Boards opinion, the TCEAP should address the above issues. The Board believes the current revision of the TCEAP includes insufficient consideration for the potential of a full or near-full height dam break, and most critically at the Iron Gate Development. The CPFMA identified a few credible overtopping scenarios that were Classified as Category II (credible). An effective plan needs to be in place to trigger the appropriate evacuation of the downstream public at risk, should the remote, but credible case (based on the CPFMA classification of an accidental breach occur).

TCEAP Comment 3 - Response

- We will expand the TCEAP to include the BOC recommendations.

Review of Responses to Board's Questions about the Material Specifications

KLAMATH
RIVER RENEWAL
CORPORATION

Materials Spec - Recommendation

- The Board Recommends that dumped fill and rubble should be evenly spread into minimum lift thicknesses and compacted. Not providing control of lift thicknesses and compaction of fill and rubble could result in differential settlements, poor surface drainage, unsightly and potentially unsafe results. Rubbles should be well chinked to mitigate potential sinkhole development.

Materials Spec - Response

- Specification section 31 05 00 details compaction and lift thickness requirements for each type of material with the exception of material E9a. Even E10 random fill shows "track walk to achieve nominal compaction." The only material that does not require a compaction is E9a, and this material is used exclusively to provide for a more suitable surface for final planting. It is not preferred to overly compact fill that is anticipated to receive seeding.

Review of Responses to Board's Questions about the Construction Costs

KLAMATH
RIVER RENEWAL
CORPORATION

Construction Cost - Comment

- Construction costs have risen considerably in the past two years and since the contractor's cost models were reviewed by the BOC. Recognizing that the Corporation and the States are co-licensees with full fiscal responsibility, and that some commitment exists from PacifiCorp to participate in cost overruns, the BOC would like to understand the overall contractual risk and GMP status. Have these cost overrun concerns been discussed between stakeholders?

Construction Cost - Response

- KRRC signed GMPs with Kiewit (and RES) and the majority of costs are locked in. The only remaining allowance in the Kiewit GMP is for temporary power at the project site. KRRC, Kiewit, and PacifiCorp are discussing temporary power drops and we anticipate a resolution soon.

- KRRC will sign a final GMP amendment with Kiewit after the License Surrender Order. This amendment will only address the resolution of power drops and any items that may be required in the final Environmental Impact Statement or as part of the Surrender Order. All other costs have been fully negotiated in the GMP.

Review of Responses to Board's Questions about the Risk Register

KLAMATH
RIVER RENEWAL
CORPORATION

Risk 224 - Question

- Changes to Rock Conditions in Iron Gate Tunnel, was retired. With the elimination of concrete tunnel lining, the BOC would like to better understand the reasoning for retiring this risk.

Risk 224 - Response

- This risk was identified due to the unknown conditions in the Iron Gate Outlet tunnel due to lack of access for field inspections and data collection. Access to both the inlet tunnel for an ROV inspection, as well as outlet tunnel for mapping scanning and condition assessment, was provided and data collection completed during the final design process. The unknown conditions were eliminated allowing the design to be completed with confidence.
- The risk was retired due to elimination of the unknown conditions as well as reduction of the design flow rate from the 60% design submittal (approaching 12,000 cfs) to the final design flow rate of 4000 cfs maximum. Reduction in the design flow rate corresponds with a reduction in flow velocity and required protection measures in the outlet tunnel which are reflected in the final design.

Risk 33 - Question

- Cofferdam Failure of temporary cofferdams result in demolition delays states a risk management measure of “Requires real-time adjustments in the field to complete additional rock excavation and concrete placement for liner.” How does this reconcile with the concept of eliminating the concrete liner?

Risk 33 - Response

- For Iron Gate tunnel, the temporary cofferdam is a low head structure designed to isolate the outlet of the tunnel from the river. The location of the cofferdam is protected and has no risk of failure due to high water conditions. The design modifications based on observed field conditions and mapping have removed the risk of unforeseen risks due to changed conditions, so the risk of cofferdam failure and subsequent delay has been essentially been eliminated.
- At Copco No. 1, the work pad is located below the existing spillway. There is not cofferdam being constructed at this location and the risk if unforeseen spill onto the work pad which would cause erosion. Repairs to the work pad would be the potential delay risk, not a cofferdam failure.

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Risk 223 - Question

- Change in Iron Gate Flow Conditions from CFD Model. The risk management measure states: "Requires real-time adjustments in the field." How are these measures addressed in the drawings and specifications? What contingency plans are envisioned or developed?

Risk 223 - Response

- Model provides best known data for predicting results in the field and the plan is built upon those predicted results. Real time adjustments will be made to account for unforeseen conditions. As unforeseen conditions arise, the construction team will consult with EOR and make a plan to address. The plan enacted will be moved forward in conjunction with safe engineering judgement.
- Risk management is also included within the Construction Management oversight provided by McMillen Jacobs. Risk management will be reviewed in the initial field kickoff meeting immediately following mobilization, as well as during monthly construction planning meetings.
- It should be noted that the design was developed considering the specific characteristics of each individual dam, and the risk assessment and management process which was used to develop the Project wide risk register. As noted previously, a working group has been formed which is advancing the flow management analysis, operations coordination, dam safety, worker safety, and environmental protection measures which will be incorporated into the site specific workplans for the major work activities in the field.

Risk 55 - Question

- Diversion Tunnel Intake Blocked Copco No. 1 and/or Iron Gate Dam diversion tunnel intake blocked by debris during drawdown reducing flow capacity. This may lead to schedule delays and increased costs. Risk management measure states: “Maximizing the size of the intakes to match the size of the gates; Design debris grating for intake with ability to clear debris from grating.” Has this been done? Has debris sizing or avoidance been addressed? Have debris removal plans been conceived or developed?

Risk 55 - Response

- Grating and screens were considered, but not incorporated into the design. This was due to the high probability that the screens would lead to higher debris accumulation and potential complete blockage of the outlet. The team focused on risk mitigation measures design to remove obstructions including mechanically removing with long reach excavator if possible, or to blast obstruction out if too deep.
- Monitoring of the outlets will be implemented to ensure debris removal is occurring at the appropriate time and frequency to maintain flow releases and the intended hydraulic capacity.

Next Steps and Action Items

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Adjourn

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Attachment B

Lower Klamath Project 100% Final Design FERC Submittal Summary of Design Changes

July 7, 2022 and revised July 18, 2022

Attachment B has been redacted in its entirety because it contains specific detailed information designated as Critical Energy/Electric Infrastructure Information under the Commission's rules.

Attachment C

Dr. Henry T. Falvey's Memorandum, Iron Gate Baffle Blocks

August 5, 2022

Attachment C has been redacted in its entirety because it contains specific detailed information designated as Critical Energy/Electric Infrastructure Information under the Commission's rules.

Attachment D

Knight Piesold Consulting Memorandum, Iron Gate

Diversion Tunnel Baffle Structural Design

August 26, 2022.

Attachment D has been redacted in its entirety because it contains specific detailed information designated as Critical Energy/Electric Infrastructure Information under the Commission's rules.