UNITED STATES OF AMERICA
BEFORE THE
FEDERAL ENERGY REGULATORY COMMISSION

Klamath River Renewal Corporation  Project Nos. 14803-001;
PacifiCorp  2082-063

AMENDED APPLICATION FOR SURRENDER OF LICENSE FOR MAJOR
PROJECT AND REMOVAL OF PROJECT WORKS

Attachment A-2

Lower Klamath Project Biological Assessment

Appendix A (Figures)
FIGURE 1-1

Klamath River Watershed and Facilities Locations
FIGURE 2-1
J.C. Boyle Dam Removal Features and Limits
Overview Sheet

Klamath River Renewal Corporation
Klamath River Renewal Project

DATA SOURCE
Esri, 2021; Kiewit, 2020
PROJECTION
NAD 1983 HARN
StatePlane California I
FIPS 0401 Feet
Fish Ladder
Gated Spillway
and Diversion Culvert
Intake Structure
Canal
Headgate
Storage Shed
Red Barn
14-Foot Diameter
Steel Pipeline
Power Canal
Timber Bridge
J.C. Boyle Reservoir
Historical Cofferdam
Potential Borrow Sites
Temporary Access Road to Left Bank
Gated Spillway and Diversion Culvert
Disposal Access Road
Right Adjacent Access Road
J.C. Boyle Powerhouse Access Road
Left Adjacent Access Road
Potential Borrow Sites

Transmission Lines
Project Features and Limits
Access Route
Staging Area
Fill Area
Cut Area
Disposal Site
Demolition
Demolition: Double-Walled Free Standing Section
Temporary Work Structures
Limits of Work

Klamath River Renewal Corporation
Klamath River Renewal Project

DATA SOURCE
Esri, 2021; Kiewit, 2020
PROJECTION
NAD 1983 HARN
StatePlane California I
FIPS 0401 Feet

FIGURE 2-1
J.C. Boyle Dam Removal Features and Limits
Sheet 2 of 9
J.C. Boyle Dam Removal Features and Limits

Sheet 5 of 9
FIGURE 2-1
J.C. Boyle Dam Removal Features and Limits
Sheet 6 of 9
J. C. Boyle Dam Removal Features and Limits

- Transmission Lines
- Project Features and Limits
- Access Route
- Demolition: Single-Walled Canal Section
- Demolition: Double-Walled Backfilled Section
- Demolition: Double-Walled Free Standing Section
- Limits of Work

FIGURE 2-1
J.C. Boyle Dam Removal Features and Limits
Sheet 7 of 9
FIGURE 2-2
J.C. Boyle Facility
Spillway Scour Hole

Source: Kiewit 2020

NOT TO SCALE
Disposal Areas
Final River Channel Grading (approximate future OHWM)

Source: Kiewit 2020

FIGURE 2-3
J.C. Boyle Facility
Disposal Areas and Final Channel Grading
FIGURE 2.2.2-1E

FIGURE 2-5

J.C. Boyle Facility Erosion Protection

Source: Kiewit 2020
FIGURE 2-7
Copco No. 1 and Copco No. 2 Dams Removal Features and Limits
Sheet 1 of 5
FIGURE 2-7
Copco No. 1 and Copco No. 2 Dams Removal Features and Limits
Sheet 3 of 5

Access Route
Staging Area
Cut Area
Cut/Fill Area
Fill Area
Conveyance Tunnel
Limits of Work

Conveyance Tunnel (Connects to Intake at Copco No. 2 Dam)
Proposed Borrow Site Excavation
Overflow Spillway
Copco No. 2 Wood-Stave Penstock
Conveyance Tunnel (Connects to Copco No. 2 Penstocks)
FIGURE 2-7
Copco No. 1 and Copco No. 2 Dams Removal Features and Limits
Sheet 5 of 5
FIGURE 2-8-a
Copco No. 1 Facility
Temporary Left Bank Access
Track - Phase 1

Source: Kiewit 2020

Excavation

Klamath River Renewal Corporation
Klamath River Renewal Project

PRIVELEGED AND CONFIDENTIAL DOCUMENT CONTAINS CEII INFORMATION – DO NOT RELEASE
FIGURE 2-8-b
Copco No.1 Facility
Spillway Work Platform – Phase 2

Source: Kiewit 2020
Final River Channel Grading (approximate future OHWM)

RIVERBED MATERIAL – TYPE E7

FIGURE 2-9
Copco No.1 Facility
Final Channel Grading and Erosion and Riverbed Placement

Source: Kiewit 2020
FIGURE 2-10
Copco No. 1 Facility
Powerhouse Final Grade

Source: Kiewit 2020
FIGURE 2-11
Copco No. 2 Facility
Temporary Apron Access Track
and Work Platform

Copco No. 2 Facility
Temporary Apron Access Track
and Work Platform

LEGEND:

DEMOLITION / REMOVAL

LIMITS OF WORK

OHWM (Approximate Existing Condition)

In-Water Work (Temporary Excavation)

In-Water Work (Temporary Fill)

*In-water work = work at or below the OHWM or NOPE

Source: Kiewit 2020
FIGURE 2-12
Copco No. 2 Facility
Historical Diversion Dam

LEGEND:

Demolition / Removal

Limits of Work

Ordinary High Water Mark (Approximate Existing Condition)

In-Water Work (Permanent Excavation)

In-Water Work (Temporary Fill)

*In-water work = work at or below the GHHW or NOPE

Source: Kiewit 2020
Final River Channel Grading (approximate future OHWM)

NOTE:
Grading shown through the reach upstream and downstream of Copco No. 2 will likely comprise only minor channel thalweg adjustment to provide continuity through the reach. It is plausible that natural river processes will shift bed material in such a manner that connectivity is achieved and intervention through grading will be unnecessary.

LEGEND:
- Erosion Protection (ETb/ETc)

Source: Kiewit 2020
Approximate OHWM

In-water Work (Permanent Fill)

*In-water work = work at or below the OHWM or NOPE

Source: Kiewit 2020

FIGURE 2-14
Copco No. 2 Facility
Tailrace Removal Plan
FIGURE 2-15
Iron Gate Dam Removal Features and Limits
Overview Sheet

DATA SOURCE
Esri, 2021; Kiewit, 2020
PROJECTION
NAD 1983 HARN
StatePlane California I FIPS 0401 Feet
FIGURE 2-15
Iron Gate Dam Removal Features and Limits
Sheet 2 of 2

Transmission Lines
Project Features and Limits
Access Route
Staging Area
Cut Area
Disposal Site
Demolition
Limits of Work

Iron Gate Dam Removal Features and Limits

Transmission Lines
Project Features and Limits
Access Route
Staging Area
Cut Area
Disposal Site
Demolition
Limits of Work

Upland Disposal Site

Iron Gate
Reservoir

Powerhouse Tailrace Disposal Site

Penstock Intake Structure

Powerhouse

Penstock

Aerator

Map Location
Final River Channel Grading (approximate future OHWM)

Disposal Areas

Source: Kiewit 2020

FIGURE 2-17
Iron Gate
Final Channel Grading Erosion and Riverbed Placement
FIGURE 2-18
Fall Creek Culvert at Daggett Road

Source: Kiewit 2020
FIGURE 2-19
Scotch Creek Culvert at Copco Road

Source: Kiewit 2020
FIGURE 2-20
Camp Creek Culvert at Copco Road
In-water work = work at or below the OHWM
$\mu_t$ is the mortality rate of infected salmon, estimated from weekly actinospore concentration (Foott et al., 2011)
Klamath River Renewal Corporation
Klamath River Renewal Project

**FIGURE 5-1**

U.S. Geological Survey Streamflow Gage Stations on the Klamath River Used to Develop the SRH-1D Hydraulic and Sediment Transport Model.
FIGURE 5-2

Comparison of Modeled Daily SSCs at the Iron Gate Station (RM 193.1) for the Coho Salmon Median Impact Year (1991) and Severe Impact Year (1970) Scenarios Under Background Conditions and the Proposed Action, Based on SRH-1D Model Described in Appendix I
FIGURE 5-3
Comparison of Modeled Daily SSCs at the Seiad Valley Station (RM 129.4) for the Coho Salmon Median Impact Year (1991) and Severe Impact Year (1970) Scenarios Under Background Conditions and the Proposed Action, Based on SRH-1D Model Described in Appendix I
**FIGURE 5-4**

Comparison of Modeled Daily SSCs at the Orleans Station (RM 59) for the Coho Salmon Median Impact Year (1991) and Severe Impact Year (1970) Scenarios Under Background Conditions and the Proposed Action, Based on SRH-1D Model Described in Appendix I
FIGURE 5-5

Median Flows at USGS Stream Gauges on the Klamath River for Two Hydroperiods; 1961 – 2008 and 2009 – 2018
(Source data USGS)
FIGURE 5-6
Geographic Designation of Listed Coho Salmon Populations with SSC Modeling Result Stations and Select Trap Locations Used in Determining Suspended Sediment Effects to Coho Salmon.
FIGURE 5-7

Simulated Hourly Water Temperature Downstream of Iron Gate Dam (RM 193.1) Based on Year 2004 for Existing Conditions Compared with Hypothetical Conditions without J.C. Boyle, Copco No. 1, Copco No. 2, and Iron Gate Dams (From PacifiCorp 2004b)
Simulated Hourly Water Temperature Downstream of the Scott River Confluence (RM 145.1) Based on Year 2004 for Existing Conditions Compared with Hypothetical Conditions without J.C. Boyle, Copco No. 1, Copco No. 2, and Iron Gate Dams (From PacifiCorp 2004b)
FIGURE 5-9
Simulated Hourly Water Temperature Downstream of the Salmon River Confluence (RM 66.3) Based on Year 2004 for Existing Conditions Compared with Hypothetical Conditions without J.C. Boyle, Copco No. 1, Copco No. 2, and Iron Gate Dams
(From PacifiCorp 2004b)
FIGURE 5-10
Flow Exceedances Downstream of Iron Gate Dam Associated with Background Conditions and the Proposed Action
(From USBR and CDFW 2012)
FIGURE 5-11
Flow Exceedances Downstream of Orleans Associated with Background Conditions and the Proposed Action
(From USBR and CDFW 2012)
Average Water Velocity in the J.C. Boyle to Iron Gate Reach for the Background Conditions and the Proposed Action at 3,000 Cubic Feet Per Second Flow

(From USBR 2011a)
Comparison of Modeled Daily SSCs at the Klamath Station (RM 5) for the sDPS Eulachon Median Impact Year (1974) and Severe Impact Year (1977) Scenarios Under Background Conditions and the Proposed Action, Based on SRH-1D Model Described in Appendix I
FIGURE 5-14
Longitudinal Profile of Change in Mean Bed Elevation for the Upstream Reach (RM 192 to RM 210). References Lines Represent the Approximate Limits of Copco No. 1 Reservoir and Iron Gate Reservoir.
FIGURE 5-15
Longitudinal Profile of Change in Mean Bed Elevation for the Downstream Reach (RM 170 to RM 192.7).
FIGURE 5-16
Reach-averaged Change in the Mean Bed Elevation for the Downstream Reach (Iron Gate Dam to Estuary).
FIGURE 5-17
Reach-averaged Fraction of Sand in Surface Sediments for Reaches in the Downstream Reach.