Klamath Secretarial Determination Process

MEMORANDUM

Date: August 30, 2011

From: Dennis D. Lynch, Program Manager, Klamath Secretarial Determination, Portland, Oregon

To: Federal Technical Management Team

Subject: Infeasibility of the mechanical removal of reservoir bottom sediments if Klamath River dams are removed in 2020

This memorandum documents my assessment and resulting determination that mechanical removal of reservoir bottom sediments from behind JC Boyle, Copco 1, and Iron Gate dams prior to their potential removal in 2020 would be infeasible. The primary documents to support this determination are included in the directory with this memorandum for easy access at KlamathRestoration.gov. These documents include: (1) a 2011 summary report by Scott Wright, P.E., River Design Group, Inc, entitled "Feasibility, Risk, and Uncertainty of Mechanical Sediment Removal with the Proposed Action (Full Facility Removal)" sent to me on June 13, 2011; (2) a 2011 report prepared by CDM entitled "Klamath Sediment Process, Sediment Management in the Reservoirs"; and (3) a 2011 report by Stillwater Sciences entitled "Klamath Dam Removal Drawdown Scenario 8: Potential impacts of suspended sediments on focal fish species with and without mechanical sediment removal. Final Technical Memorandum".

One of the biggest potential environmental consequences of Klamath dam removal is the rapid resuspension of sediments contained in these reservoirs. Upon reservoir drawdown, several million cubic yards of fine-grained material would be scoured by the river from its original stream channel and adjacent terraces, and transported downstream. It is known that high concentrations of suspended sediment can cause stress or mortality to fish. Therefore, as part of the Secretarial Determination process it was important to quantify the likely suspended-sediment concentrations fish would be exposed to if dams were removed as well as explore possible

actions to minimize or mitigate these effects and to assess their feasibility. This memorandum focuses on the feasibility of mechanically removing potentially erodible reservoir bottom sediments prior to dam removal as a possible mitigation action.

It is important to note that the plan for reservoir drawdown (scenario 8) if dams are removed in 2020 is designed to minimize impacts on critical life stages of coho salmon, a species listed as threatened under the Endangered Species Act. The timing of reservoir draw down in scenario 8, and thus the timing of the highest concentrations of suspended sediments, would occur between early January 2020 and mid- March 2020. This corresponds to a period of time soon after the majority of adult coho salmon have completed their upstream migration through the Klamath River to a tributary stream, and before the period of time when the majority of juvenile coho salmon begin their downstream migration from these tributaries. In addition, completing the drawdown of all three reservoirs in a single year is deemed more preferable than exposing multiple year classes of salmon to potentially stressful suspended-sediment concentrations. In short, the planned timing of reservoir draw down in a single winter season is designed to reduce overall impacts on all species of Klamath River salmon, with a particular attention to coho salmon.

Engineering studies showed that a barge-mounted suction dredge was the most viable technology for removing the fine-grained sediments from these reservoirs without causing large environmental problems. As water levels are dropped during reservoir drawdown, dredging would be concentrated along the former river and tributary channels, and the adjacent terraces that may eventually slump into these channels, in order to remove as much of the potentially erodible sediment as possible. When and where possible, dredges would be operated in less than 25 feet of water where they are most efficient, reliable, and cost effective. One dredge would be deployed in JC Boyle Reservoir and two each in Iron Gate and Copco 1 reservoirs. Sediment would be pumped as a slurry (15 percent sediment: 85 percent water) in a pipeline to one or more settling ponds near each reservoir.

Below are five important findings from the previously mentioned reports that speak to the feasibility of mechanically removing bottom sediment from these three reservoirs prior to dam removal:

(1) In the window of time most protective of coho salmon (early January through middle of March) only 43 percent of the potentially erodible reservoir sediment could be removed using this technology, under the best case circumstances, leaving behind 57 percent (or more) of the erodible sediment to be transported downstream. There is a high likelihood that the amount of erodible sediment actually removed would be less than 43 percent due to difficult winter conditions (e.g. reservoir ice cover), periodic equipment failures, or due to encountering cultural resources or human remains, which could shut down operations for an extended period of time.

(2) A best case scenario of 43 percent removal of potentially erodible sediments confers only marginal benefit to fish as compared to allowing the sediments to erode naturally downstream. High suspended sediment concentrations downstream of Iron Gate Dam would occur for several months following reservoir draw down with or without dredging. Under the most likely flow (and sediment release) scenario, dredging would reduce impacts to coho salmon outmigrant smolts from about 20 percent mortality of exposed individuals to sublehtal effects. Based on the fact that the majority of smolts would not be exposed to sediment during the spring of reservoir drawdown, this translates to a reduction in mortality due to dredging of about 3 percent of the total coho smolt production in the Klamath Basin. Impacts to juvenile steelhead rearing in the main-stem Klamath River would be reduced from around 52 percent mortality of exposed individuals to about 20 percent mortality. Based on the spatial distribution of juvenile steelhead in the basin, this translates to a reduction in mortality due to dredging from 14 percent of the total juvenile steelhead production in the Klamath Basin to about 5 percent. For fall and spring Chinook salmon, dredging would have negligible effects on their mortality as compared to the natural erosion of sediments.

(3) Impacts of dredging on terrestrial resources would be significant. Nearly 600 acres of land would be disturbed to create the necessary settling ponds. This disturbance includes clearing vegetation, excavating and building 20-foot dikes to contain the sediment/water slurry, and road building. Upon completion of the operation, these 600 acres would need to be replanted and restored.

(4) Impacts to cultural resources and human remains could occur. Excavation of land to create settling ponds and to build roads could encounter these resources, which could produce hardship for tribal communities, slow operations, and increase costs.

(5) The Opinion of Probable construction Cost (OPCC) produced by CDM for the designed sediment-removal operation is likely to be about $97 million in 2011 dollars. Escalating this figure to 2020 dollars (3 percent compounded annually), the cost could exceed $127 million dollars at the time of dredging. The CDM OPCC estimates did not include costs for design engineering, construction oversight, legal fees, land acquisition fees, and site restoration, all of which could increase costs by an additional 30 percent, for a total cost of about $165 million in 2020 dollars.

Based on the findings that dredging would only remove a maximum of 43 percent of the erodible sediment, would only provide a marginal benefit to fish during drawdown, would have a large environmental impact on terrestrial resources and possibly on cultural resources, and would cost on the order of $165 million in 2020 dollars, this mitigation measure is deemed infeasible. Consequently, it should not be explored further as a mitigation action in the Environmental Impact Statement or Environmental Impact Report for Klamath dam removal.

Mitigation measures other than mechanical sediment removal should be considered and developed to potentially limit the exposure of aquatic resources to high concentrations of suspended sediment if dams are removed.