FISH PASSAGE CENTER

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MEMORANDUM

TO: Fish Passage Advisory Committee

FROM: Michele DeHart

DATE: December 18, 2012

RE: Recommendation for future operations at Bonneville Dam with regard to open geometry.

The issue of operating the first powerhouse at Bonneville Dam (BON-PH1) at open geometry was raised during the 2012 juvenile out-migration. Specifically, this open geometry operation was proposed and implemented by the Action Agencies as a way to move excess flows from the second powerhouse (BON-PH2) to BON-PH1 in order to accommodate operation of BON-PH2 units at the mid-point of the 1% efficiency range without having to increase spill beyond the prescribed amount. In April of 2012, in response to high mortalities, the salmon managers submitted a System Operational Request (SOR 2012-1) for a special operation at BON during the peak passage of hatchery subyearling Chinook released from Spring Creek NFH on April 13th. The SOR requested that all units at BON-PH2 operate at the mid-point of the 1% efficiency range, establishing a lower hydraulic capacity for the project, and spill any additional water above this hydraulic capacity.

The Corps of Engineers (COE) proposed an alternative operation, which called for no additional spill and included the operation of BON-PH1 in open geometry to minimize the time that units at BON-PH2 would operate at the higher end of the 1% efficiency range. This action effectively reduced spill by forcing more water to BON-PH1 and therefore generating more electricity through BON-PH1. The issue with operating the project at open geometry is that there are no empirical data to suggest that forcing more fish through BON-PH1 presents the better fish operation. In addition, there is no monitoring at BON-PH1 and, therefore, if there was additional mortality imposed on these fish, there is no way of knowing or measuring the impact. Justification for the open geometry operation was based on limited data, including observational studies of turbine models and a balloon tag study that was conducted in 2000. In a July 30, 2012

memo (see attached), the FPC provided a review of these studies and concluded that rigorous testing of juvenile survival, and its relation to subsequent adult survival, would be necessary before open geometry is utilized as a permanent operation. In 2012, the Action Agencies open geometry operation was implemented on the afternoon of April 13th and continued off and on until the majority of the juvenile Snake River sockeye run had passed in mid-June.

During the May 16th TMT discussion, the agencies and tribes fishery managers raised serious concerns about the open geometry operation. The TMT initiated a review process in including members of the Fish Passage Operations Managers (FPOM), Fish Facility Design Review Work Group (FFDRWG), and Scientific Review Work Group (SRWG). An FPOM Task Group was convened in July to addresses the concerns with the open geometry operation and whether or not that operation was an effective response to high powerhouse/bypass mortality at BON-PH2. Discussions of this FPOM Task Group led to two data requests to the Fish Passage Center (FPC).

First, the FPC was asked to conduct analyses to investigate whether there was evidence that operating above the mid-range of the 1% efficiency curve at BON-PH2 in 2008 through 2012 resulted in increased levels of sample mortalities. Second, the FPC was asked to conduct analyses to investigate whether there was evidence of increased adult fallback with increased spill and/or increased discharge from BON-PH1. Below is a brief summary of the results from these analyses, followed by a recommendation on future operations at Bonneville Dam. The analyses conducted by the FPC in response to these FPOM data requests are also attached for more detail.

Juvenile Mortality and BON-PH2 Operations

- Based on these ANCOVA analyses, the percent of units operating above the mid-range often had a significant effect on sample mortalities, particularly for subyearling Chinook, sockeye, and yearling Chinook.
- In general, for subyearling Chinook, sockeye, and yearling Chinook, as the percent of units operating above the mid-range increased, average sample mortality also increased. In fact, sample mortality was often significantly higher when >95% of BON-PH2 units operated above the mid-range than when <5% of BON-PH2 units operated above the mid-range.

Adult Fallback (i.e., re-ascension) in Response to BON-PH1 and Spill Operations in 2012

- Based on multi-variate regression modeling of re-ascension rates versus spill and PH1 discharge, at flows in the range of 320 to 350 Kcfs, it appeared that decreasing spill and increasing PH1 discharge led to higher re-ascension rates in 2012 for both steelhead and spring/summer Chinook adults.
- Re-ascension rates were highest for all species of PIT-tagged adult salmon exiting the ladder into Bonneville PH1 forebay at 11.2%, while re-ascensions for adults exiting into PH2 forebay were only 1.5%.
- Adult steelhead had the highest re-ascension rate at Bonneville Dam from April 1 to July 1, at 9%, while 6% adult spring/summer Chinook re-ascended, followed by only 0.5% of sockeye adults.
- Between 40% and 46% of PIT-tagged adult salmon exited ladders into the forebay of PH1 compared to 54% to 60% exiting into the forebay of PH2.

- Patterns of discharge in PH1 and spill were not significant in explaining the variability in proportion of adults entering the ladder entrances that exit into the PH1 forebay (BO1 exit).

RECOMMENDATION:

Results from these analyses, suggest that the open geometry operation is not a good alternative for trying to limit BON-PH2 operations to the mid-range of the 1% efficiency curve, as increasing discharge from BON-PH1 resulted in higher re-ascension rates than increasing spill. Therefore, increasing spill is likely a better alternative, which is what was originally proposed by FPAC in SOR 2012-1. Based on these analyses and results, FPC recommends that hydraulic capacity for BON-PH2 should be capped at the mid-range of the 1% efficiency curve, particularly when subyearling Chinook, sockeye, and yearling Chinook are actively migrating past the project. Under current Total Dissolved Gas waivers, capping hydraulic capacity of BON-PH2 at this level would allow for additional spill from BON without violating water quality standards, as spill in excess of hydraulic capacity is not subject to these water quality standards. This would allow for BON-PH2 units to be operated at the mid-range, which benefits juveniles, while having a smaller impact on adults.