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MEMORANDUM

TO: Bob Heinith, CRITFC

FROM: Michele DeHart

DATE: March 26, 2007

RE: Review of "Columbia River Stage and Discharge at Vernita Bar Under Current and Unimpounded Scenarios, 2004-2006."

In response to your request, the FPC has reviewed the report prepared by Battelle Pacific Northwest Division for Grant County PUD titled "Columbia River Stage and Discharge at Vernita Bar Under Current and Unimpounded Scenarios, 2004-2006." The following is a brief study summary and our comments.

Study Summary:

The authors used Modular Aquatic Simulation System 1D (MASS1) to simulate river flow and stage through the Hanford reach of the Columbia River. Further, the authors developed two models 1) with the Grant County complex (Priest Rapids and Wanapum dams) in place and 2) without the Grant County complex in place. Three years of data from Priest Rapids and Rock Island Dams were utilized (2004, 2005, and 2006) with the focus on two annual periods 1) spring, defined as February 1 to July 1 and 2) fall, defined as October through November. The primary objective of the study was to compare modeled daily flow fluctuations in the Hanford Reach of the Columbia River under both with and without the Priest Rapids Complex in place.

Comments:

It would be useful if the authors included more information on the development of these models. For example, how many actual river cross-sections were used? It is assumed that many cross-sections are available in the heavily studied Hanford reach, however, how many were available between Rock Island and Priest Rapids Dams? There should be

some discussion of the river cross-section inputs to the model, and from past uses of the MASS1 model, how many cross-sections are needed to accurately model a river reach over 60 miles long. The authors should also have a discussion of the accuracy of their model. Has it been calibrated? The USGS gauge 12472800 COLUMBIA RIVER BELOW PRIEST RAPIDS DAM, WA is located 2.6 miles downstream from Priest Rapids Dam. This USGS gauge has both discharge and stage height data. The models developed by Battelle have MASS1 output for exactly the river mile that the USGS gauge is located (RM 394.5). The output from the MASS1 model with the Grant County Complex in place should contain very similar stage fluctuations as to the USGS gauge. This would be one way of validating the Battelle MASS1 model. The USGS gauge mentioned can be found at the following web address:

http://waterdata.usgs.gov/wa/nwis/uv/?site_no=12472800&PARAMeter_cd=00060,00065.

The start and end dates for the spring period in the Battelle study were 2-1 to 7-1. However, the study does not recognize the two different operational strategies that have been historically implemented over this period below Priest Rapids in any year. The first is a period of incubation that typically occurs from the end of spawning through February and March, and sometimes into April. During this period, the Vernita Bar minimum incubation flow needs to be met, this flow is typically between 55 and 70 Kcfs. Establishment of the minimum incubation flow limits river fluctuations below the minimum incubation flow. The incubation period is operationally much different than the period of emergence/rearing where operations attempt to minimize flow fluctuations and operate to flow bands. Because most of the spring runoff tends to occur from early April through June, the emergence/rearing period typically has greater flow fluctuations. These operations can be seen in the following figures that show both Rock Island and Priest Rapids actual hourly flows between February 1st and June 30th in 2004 and 2006.

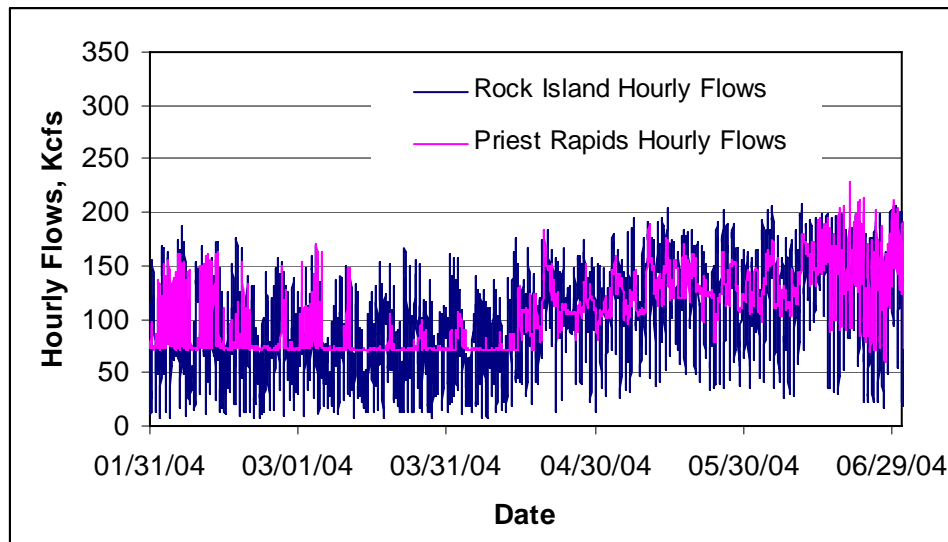


Figure 1. Priest Rapids and Rock Island Hourly flows between February and June of 2004.

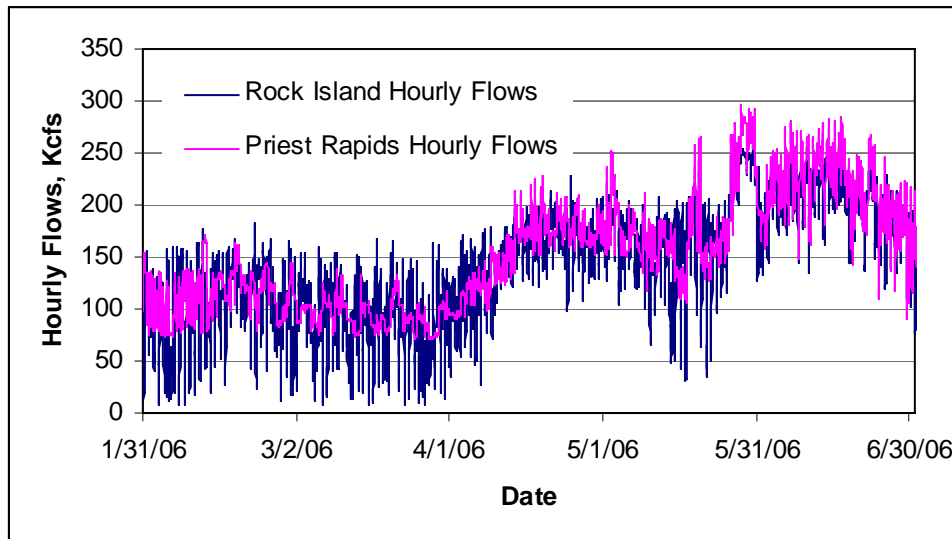


Figure 2. Priest Rapids and Rock Island Hourly flows between February and June of 2006.

The above figures display the two different operations that are targeted below Priest Rapids Dam over the period that Battelle labeled as spring. As most fish are not available to entrap or strand until the end of the incubation period, and flow fluctuations during the emergence/rearing are the primary fishery concern, the study is somewhat

misfocused on fluctuations also during the incubation period. The study should focus on only fluctuations during the emergence/rearing period.

The three years that Battelle selected to use in their study were 2004, 2005, and 2006. Both 2004 and 2005 were below average water years, at 84% and 78% of average at Rock Island Dam (April-August). 2006 was a near average water year at 99% of average at Rock Island (April –August). Battelle should consider revising their study to include a variety of water years, possibly between 1995 and 2006, which would include very high and very low water years.

In conclusion, the FPCs main concerns are:

1. The Battelle MASS1 model should be calibrated, a suggestion would be to use the USGS gauge below Priest Rapids Dam.
2. Concerning the definition of the spring period, the study should focus on only fluctuations during the emergence/rearing period. Flow fluctuations during the emergence/rearing are the primary fishery concern.
3. Battelle should include more years in their model runs. The three years selected were either average or below average water years.