MEMORANDUM

TO: Fish Passage Advisory Committee

FROM: Michele DeHart

DATE: September 12, 2019

SUBJECT: Follow-up on Calibration Questions at The Dalles Dam in 2019

During the 2019 spring spill season, several modifications were made to spill operations at The Dalles (TDA) and John Day (JDA) to address concerns with total dissolved gas (TDG) in the tailrace at TDA. As part of the ongoing discussions about TDG management at TDA and JDA, the Fish Passage Advisory Committee (FPAC) discussed the possibility that the spill gates at TDA may have been miscalibrated. Furthermore, it is our understanding that this issue was also discussed at meetings of the Flex Spill Operations Technical Team in July and August 2019. However, we have not heard of any resolution to this potential miscalibration issue. The purpose of this memo is to follow-up on these discussions by providing additional information on this issue and highlight possible ramifications of the actions that were taken in 2019. Below is a summary of our findings, followed by a more detailed discussion.

- Our analyses of total discharge during pre- and post-spill operations, compared to those from the spill period, confirm that there may have been an issue with the calibration of the spill gates at TDA.
  - First, total discharge at TDA during the spill period was always lower than that at JDA, which is counterintuitive and this consistent pattern only appears when spill is occurring.
  - Second, discrepancies in discharge between TDA and JDA volumes changed dramatically and immediately with the implementation (Apr. 10) and termination (Sept. 1) of spill.
- The potential miscalibration at TDA may have meant that spill at TDA was actually higher than what was being reported, therefore causing TDG in the tailrace to exceed 120% more often than expected.
As a solution to these exceedances, the action agencies decided to manage spill at JDA and TDA in tandem, which often resulted in reductions in spill at JDA in order to maintain 40% spill at TDA.

These analyses raise questions and concerns about the operational decisions that were made in 2019 to reduce spill at JDA to below the 120% spill cap in order to maintain 40% spill at TDA when the exceedances at TDA may have been due to incorrect estimates of spill volumes at this project.

Background

During the 2019 spring spill season, several modifications were made to spill operations at The Dalles (TDA) and John Day (JDA) to address concerns with total dissolved gas (TDG) in the tailrace at TDA. Following a discussion at the April 24, 2019 Technical Management Team (TMT) meeting, a decision was made to switch the Gas Cap operation at TDA from a targeted spill volume to a targeted spill proportion. The intent of this modification was to better meet, but not exceed, the 120% TDG target at TDA (April 24, 2019 TMT notes). However, the COE continued to experience problems with meeting, but not exceeding, the 120% TDG target at TDA and noted that it was likely due to TDG from spill at JDA and a lack of degassing in the reach between JDA and TDA (May 8, 2019 TMT notes). After a special TMT meeting on May 10, 2019, a decision was made to manage spill at JDA and TDA in tandem to meet three goals: 1) 120% TDG in the tailrace at TDA, 2) spill cap of greater than or equal to 40% at TDA, and 3) 120% TDG in the tailrace at JDA. If it was not possible to meet all three goals, the first two goals would be prioritized by possibly reducing spill at JDA to below the 120% spill cap (May 10, 2019 TMT notes and May 15, 2019 TMT minutes). The management of spill at JDA and TDA in tandem continued through the rest of the spring spill season (June 15). This tandem management resulted in several instances throughout the rest of the spring spill season when the 12-hour average TDG in the tailrace at JDA was in the 118-119% range while spill of 40% at TDA was maintained, sometime resulting in exceedances of the 120% standard in the tailrace at TDA.

As part of the ongoing discussion about TDG management at TDA and JDA, the FPAC discussed the possibility that the spill gates at TDA may have been miscalibrated, as total discharge at TDA had routinely been 14-15 Kcfs lower than what was observed at JDA and Bonneville Dam (BON) and that this discrepancy first appeared at the start of the spill season. Following the FPAC discussion, FPAC members decided that this issue would be discussed at a later TMT Process meeting (May 14, 2019 FPAC notes). Furthermore, it is our understanding that this issue was also discussed at meetings of the Flex Spill Operations Technical Team in July and August 2019.

Methods

To investigate the possibility of a miscalibration at TDA, Fish Passage Center (FPC) staff compared estimates of daily average total discharge at JDA to those at TDA from January 1, 2019 through September 10, 2019. We understand that total discharge between the two projects should not be exactly the same. However, differences in total discharge should be relatively consistent throughout the year, including periods of spill versus periods of no spill. To illustrate
this, we divided the January 1-September 10 period into three distinct periods: 1) pre-spill (Jan. 1-April 9), 2) during spill (April 10-August 31), and post-spill (September 1-10) and calculated the average difference in total discharge (TDA Discharge-JDA Discharge) for each period. A similar analysis was conducted by comparing total discharge at BON versus TDA.

Results

The Dalles vs. John Day

Daily total discharge between JDA and TDA tracked very closely during periods of no spill (Figure 1). In fact, the difference in discharge between the two projects was generally between -6.0 and 8.0 Kcfs during the pre-spill period (average 0.65 Kcfs) and between -1.0 and 2.0 Kcfs during the post-spill period (average 0.46) (Figure 1). However, once the spill season began, and throughout the entire spill season, the difference in discharge between the two projects ranged from -0.4 to -22.5 Kcfs (average -12.1 Kcfs). Furthermore, during this time, total discharge at TDA was always lower than that at JDA, which was not the case during the pre- and post-spill periods. During these periods total discharge at TDA was sometimes greater than JDA (i.e., positive values) but less than JDA (i.e., negative values) at other times. This analysis indicates that the amount of spill reported as occurring at TDA is not accurate.

![Figure 1. Daily average discharge (Kcfs) at The Dalles (grey) versus John Day (orange) dams, Jan. 1-Sept. 10, 2019. Differences in daily discharge volumes are also provided (blue lines), as are the averages of the differences for three distinct periods: 1) pre spill (Jan 1-Apr. 9), 2) during spill (Apr. 10-Aug. 31), and 3) post spill (Sept. 1-10) (red lines).]
**The Dalles vs. Bonneville**

Daily total discharges between BON and TDA were more variable during periods of no spill than what was observed between TDA and JDA (Figure 2). However, this was to be expected, as there are many more tributaries that empty into this reach than in the reach between JDA and TDA. For example, several larger tributaries empty into the Columbia River between TDA and BON, including: the Klickitat River, Hood River, the Wind River, the White Salmon River, and the Little White Salmon River. There is only one large tributary in the reach between JDA and TDA: the Deschutes River. For this reason, we would expect the pattern observed between TDA and JDA to be less severe when comparing BON and TDA.

During the pre-spill and post-spill periods, the difference in discharge between BON and TDA was generally between -4.0 and 35.0 Kcfs (average 12.1 Kcfs) and 4.5 and 17.3 Kcfs (average 10.8 Kcfs), respectively (Figure 2). However, during the spill season, the difference in discharge between BON and TDA ranged from 3.6 to 42 Kcfs (average 19.3 Kcfs). Although less clear, there is still an indication that something associated with the implementation of spill caused estimates of total discharge at TDA and BON to become more different than what had occurred pre- and post-spill operations.

![Figure 2. Daily average discharge (Kcfs) at The Dalles (grey) versus Bonneville (orange) dams, Jan. 1-Sept. 10, 2019. Differences in daily discharge volumes are also provided (blue lines), as are the averages of the differences for three distinct periods: 1) pre spill (Jan 1-Apr. 9), 2) during spill (Apr. 10-Aug. 31), and 3) post spill (Sept. 1-10) (red lines).](image)

**Conclusions**

Based on the analyses of total discharge during pre- and post-spill operations, compared to those from the spill period, it appears there may have been an issue with the calibration of the
spill gates at TDA. First, the fact that total discharge at TDA during the spill period was always lower than that at JDA is counterintuitive and this consistent pattern only appears when spill is occurring. Second, the fact that the discrepancies in discharge between TDA and JDA changed dramatically and immediately with the implementation (Apr. 10) and termination (Sept. 1) of spill, indicates that there may have been an issue with the estimation of spill volumes, and therefore total discharge, at TDA during spill operations.

This potential miscalibration at TDA may have meant that spill at TDA was actually higher than what was being reported, therefore causing TDG in the tailrace to exceed 120% more often than expected. Instead of addressing this potential issue, the exceedances at TDA were attributed to high TDG from spill at JDA, changes in environmental conditions at TDA, and a lack of degassing between the projects. As a solution, the action agencies decided to manage spill at JDA and TDA in tandem, which often resulted in reductions in spill at JDA in order to maintain 40% spill at TDA. This analysis raises questions and concerns about the operational decisions that were made in 2019 to reduce spill at JDA to below the 120% spill cap in order to maintain 40% spill at TDA when the exceedances at TDA may have been due to incorrect estimates of spill volumes at this project.