Appendix K

2019 Calculation of 7Q10 Flows

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INTRODUCTION

The Washington water quality standards for TDG are applicable during river flows up to the high seven-day average flow with a return period of 10 years (7Q10). 7Q10 values for the lower Snake and Columbia River projects were last updated for the 2010 Gas Abatement Plan. Based on the expected return interval of the 7Q10 flows, the lack of observed exceedances on the Lower Snake prompted re-calculation of the values for the Snake and Columbia River fish passage projects using the methodology outlined below.

METHODOLOGY

The methodologies presented generally reflect Washington Department of Ecology (WDOE) guidelines and methods described in the 2010 Gas Abatement Plan and the 2002 Columbia River TMDL.

Previous documents cite the U.S. Geological Survey (USGS) gauge *(Snake River below Ice Harbor Dam, Station No. 13353000)* as the primary source of data for the Snake River 7Q10 flows. However, the Ice Harbor discharge gauge was discontinued in 2000. While USGS determines the streamflow through measurement of velocity and stage, USACE projects determine the total project outflow by summing computed flows through the spillway bays, powerhouse generators, and other miscellaneous discharges through the use of rating tables and curves. Updated 7Q10 flows for the four lower Snake River fish passage projects were computed using USACE project data, and as such, results may reflect errors associated with the computation of flow parts.

Unlike the lower Snake River, the Lower Columbia River flow is measured by a USGS gauge below The Dalles. Flows measured by USGS at The Dalles are significantly different than the computed project data. Mass balance calculations utilizing McNary Reservoir and John Day Reservoir outflow data combined with measured and estimated tributary inflow indicate that the USGS streamflow data is more likely representative of actual Columbia River streamflow conditions at The Dalles than the project data. Therefore, 7Q10 values for the four lower Columbia River fish passage projects were computed using the modified USGS data sets described below.

From Columbia River TMDL (2002):

> • *USGS flows at The Dalles were used for The Dalles Dam and as a starting point for the other three dams.*
> • *For Bonneville Dam, flows from the major tributaries below The Dalles (Hood, Klickitat, and White Salmon rivers) were added on a day-by-day basis to create a synthetic time series for Bonneville, and then followed the process for fitting the distribution and calculating the 7Q10.*
> • *For John Day Dam, Deschutes River flows were subtracted from The Dalles flows, lagging The Dalles data by two days. The lag was determined by the best*

fit to a linear regression from a series of different lags using the 90 percent highest flows.

• For McNary Dam, John Day River flows and Umatilla River flows were subtracted from the John Day Dam flow series, lagging the John Day Dam and River flows by three days. The lag was determined as described above.

Methodology applied to both the Snake and Columbia River 7Q10 flows followed the guidelines of the U.S. Water Resources Council (1981). Annual peak 7-day average flows were calculated (using the October-September Water Year from 1975 through 2019), and then the 10-year return flow was determined by ranking the years and using the interpolating the Weibull plotting position.

RESULTS

Table K-1 summarizes the updated 7Q10 flows derived using the methodology described above as well as the previous values computed in 201.

TABLE K-1

	2010 7Q10 Flow (kcfs) Criteria	**2019 7Q10 Flow (kcfs) Criteria**
Bonneville	454	454
The Dalles	448	446
John Day	441	440
McNary	433	437
Ice Harbor	203	197
Lower Monumental	203	196
Little Goose	203	196*
Lower Granite	203	196
Chief Joseph	209	N/A
Grand Coulee	209	N/A

**Computed LGS value using CBT data was 192 kcfs, however, because the other three Lower Snake River projects had the same value, LGS CBT data was assumed to be less accurate.*

Updated values for both the Snake and Columbia River projects were generally lower than previous values. The 7Q10 flows at the four lower Snake River projects were 5-6 kcfs lower than previous values. Values for the Columbia River projects were all within 4 kcfs of the previous values.