FISH OPERATIONS PLAN IMPLEMENTATION REPORT

August 2020

U.S. Army Corps of Engineers
Northwestern Division
Portland, OR.

Introduction

The U.S. Army Corps of Engineers (Corps) developed this report in accordance with the 2020 Fish Operations Plan[1] (2020 FOP). The 2020 FOP describes the Corps' planned operations for juvenile fish passage at its four lower Snake River and four lower Columbia River dams during the 2020 spring and summer fish migration seasons, generally April 3 through August 31. The 2020 FOP is consistent with spill operations for juvenile fish passage and the regional forum process for adaptive management and in-season management provisions outlined in the 2019 NOAA Fisheries Columbia River System Biological Opinion (2019 BiOp)[2], the 2018 Extensions of the 2008 Columbia Basin Fish Accords (Accord Extensions), the 2019-2021 Spill Operation Agreement (Agreement) and subsequent Addendum, the Corps' requirements under the Endangered Species Act (ESA), and is the subject of ongoing consultation and communications with the relevant wildlife agencies to ensure consistency with the ESA. Other project operations and water management actions not specifically addressed in this document will be consistent with the 2019 BiOp and other guiding operative documents, including the 2020 Water Management Plan (WMP), seasonal WMP updates, and the 2020 Fish Passage Plan (FPP).

This report describes the Corps' implementation of the 2020 FOP during the month of August 2020. In particular, information in this report includes the following:

- total flow: the total hourly river flow rate;
- generation flow: the hourly flow through the powerhouse units;
- target spill: the spill target for that hour (Table 1);
- adjusted spill: the hourly spill level that can be achieved taking into consideration that spill may vary as a function of total river flow, forebay elevation and generator capacity, and is subject to routine operational adjustments that limit the ability to spill to the target spill, including spill caps. (see 2020 FOP, section 4.1);
- actual spill: the hourly flow over the spillway; and,
- resultant 12-hour average TDG for the tailwater and next downstream forebay at each project.

This report also provides information on issues and unanticipated or emergency situations that arose during implementation of the 2020 FOP in August 2020.

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[1] The 2020 FOP was posted to the Technical Management Team (TMT) website on March 23, 2020 (http://pweb.crohms.org/tmt/documents/fpp/2020/).

[2] The Corps, in coordination with the other Action Agencies, and National Marine Fisheries Service (NMFS), employs the Regional Implementation Oversight Group (RIOG) and technical teams including the Technical Management Team (TMT) and Fish Passage Operations & Maintenance (FPOM), to coordinate with state, tribal and other federal experts for recommendations for implementing operations consistent with NMFS' Columbia River System Biological Opinions.

Data Reporting

I. For each project providing fish passage operations, this report contains a graph displaying the performance of the summer fish passage spill program for the month of August, with hourly spill, target spill, adjusted spill, generation, and total flows. The monthly graphs begin on August 1 and end on August 31 and reflect the following operations for the lower Snake River and the lower Columbia River projects:

- The black line represents the average hourly total river flow through the project in thousand cubic feet per second (kcfs).
- The orange line represents the average hourly generation flow through the powerhouse each hour in kcfs.
- The thin solid blue line represents the actual average hourly spill level through the spillway in kcfs.
- The dotted blue line represents the hourly target summer spill in kcfs (summer only).
- The thick dark blue line represents the adjusted spill cap spill: the hourly spill cap level that can be achieved taking into consideration that spill may vary as a function of total river flow, forebay elevation, and generator capacity, and is subject to routine operational adjustments that limit the ability to spill to the target spill (2020 FOP section 4.1).

II. The average daily %TDG for the 12 highest hours for all projects is shown in the August 2020 Average Percent TDG Values Table (Table 4). The numbers in red indicate the project exceeded the %TDG cap - i.e. 120% (tailwater), 115% (forebay of the next downstream dam) during summer spill.

General Implementation Remarks

For all projects that spill for fish passage, the actual spill may vary from the adjusted spill due to various conditions as described below. When actual spill varied from adjusted spill levels during periods of voluntary spill, the change in spill level is described below in the August 2020 Spill Variance Table (Table 2).[3] The Spill Variance Table includes average hourly data; but when spill varies from adjusted spill for a portion of an hour, it is characterized as a variance for a full hour. There are instances when the hourly adjusted spill levels are not achievable due to mechanical limitations in setting spill gates to implement the regionally coordinated spill pattern. The project operator sets the spill gate stops to most closely approximate the adjusted spill to the extent practicable. Other routine activities that changed spill levels, which were coordinated with regional partners, are identified in the monthly Pre-Coordinated Operations Table (Table 3).

"Low flow" operations at the lower Columbia and lower Snake projects are triggered when inflow is insufficient to provide both minimum generation and the target spill levels. For this report, the decrease in target spill is represented as adjusted spill. In these situations, the projects operate at minimum generation and pass the remainder of project outflow as spill and through other routes, such as fish ladders, sluiceways, and navigation locks. As flows transition from higher flows to low flows, there may be situations when flows recede at a higher rate than forecasted. In addition, inflows provided by non-federal projects upstream are variable and

[3] Involuntary spill conditions shown in the graphs are not considered variances and are not reported in the Spill Variance Table. Involuntary spill conditions may result from lack of load, high river inflows that exceed available powerhouse capacity, scheduled or unscheduled turbine unit outages or transmission outages of various durations, passing debris, etc.

uncertain.

The combination of these factors may result in instances when unanticipated changes to inflow result in forebay elevations dropping to the low end of the Minimum Operating Pool (MOP). Since these projects have limited operating flexibility, maintaining minimum generation, MOP elevation, and the target spill may not be possible throughout every hour.

Actual spill levels at Corps projects may vary up to ±2 kcfs within the hour (except as otherwise noted in the 2020 FOP for Bonneville and The Dalles dams,[4] which may range up to ±3 kcfs) as compared to a target spill. A number of factors influence actual spill, including hydraulic efficiency, exact gate opening calibration, spillway gate hoist cable stretch due to temperature changes, and forebay elevation (e.g., a higher forebay results in a greater level of spill since more water can pass under the spill gate).

Occurrences requiring an adjustment in operations and/or regional coordination are described in greater detail in the "Operational Adjustments" section below.

August Operations

The month of August was characterized by below average precipitation and flows on the lower Snake and Columbia Rivers. The August 2020 observed precipitation was 33% of average on the Snake River above Ice Harbor and 31% of average on the Columbia River above The Dalles[5]. The NOAA Northwest River Forecast Center runoff summary for August indicated that the adjusted runoff for the Snake River at Lower Granite was 86% of the 30-year average (1981-2010) with a volume of 1.1 MAF (Million acre-feet). The August 2020 adjusted runoff for the Columbia River at The Dalles was 95% of the 30-year average (1981-2010) with a volume of 72.6 MAF.[6]

[4] As specified in the 2020 FOP section 3.
[5] Retrieved September 1, 2020: https://www.nwrfc.noaa.gov/water_supply/wy_summary/wy_summary.php?tab=5
[6] Retrieved September 1, 2020: https://www.nwrfc.noaa.gov/runoff/runoff_summary.php

Summer spill operations occur June 21–August 31 at the four lower Snake River projects, and June 16–August 31 at the four lower Columbia River projects (Table 1).

Table 1: Summary of 2020 summer target spill levels at lower Snake River and lower Columbia River projects.

PROJECT	2020 SUMMER SPILL[A] (June 21/16 – August 14) (24 hrs/day)	2020 SUMMER SPILL[A] (August 15 – August 31) (24 hrs/day)
Lower Granite[B]	18 kcfs	Spillway weir (SW) flow or ~7 kcfs spill
Little Goose[B]	30%	SW flow or ~7 kcfs spill
Lower Monumental[B]	17 kcfs	SW flow or ~7 kcfs spill
Ice Harbor[B]	30%	SW flow or ~8.5 kcfs spill
McNary	57%	20 kcfs
John Day	35%	20 kcfs
The Dalles	40%	30%
Bonneville	95 kcfs	50 kcfs

A. Spill may be temporarily reduced below the FOP target summer spill level at any project if necessary to ensure navigation safety or transmission reliability, or to avoid exceeding State TDG standards.
B. Summer spill from August 15-August 31 may be through the SW or through conventional spillbays using the appropriate FPP spill pattern for each project. The SWs will be operated consistent with the SW operational criteria in the FPP.

In its implementation of the 2020 FOP in August, the Corps evaluated conditions every day to establish spill caps at a level that was estimated to meet, but not exceed, the gas cap or target TDG in the tailrace (see Table 4).[7] This evaluation considered: environmental conditions (e.g., river flow, wind, water temperature, barometric pressure, incoming TDG from upstream, and water travel time) and project operations (e.g., spill level, spill pattern, tailwater elevation, proportion of flow through the turbines, and project configuration).

Operational Adjustments

1. Lower Granite Dam

Effective August 7 through August 31, the Corps revised the Lower Granite Dam (LWG) criteria used to change the spill pattern as described in the 2020 Fish Passage Plan. The Corps changed the spill pattern criteria based on receipt of System Operational Request 2020-5, LWG Removable Surface Weir (RSW), dated August 6, 2020. This operational adjustment only changed the criteria used to change the spill pattern, and did not change the spill operation that was maintained at approximately 7 kcfs as specified in the 2020 FOP. This operation was coordinated during the August 7, TMT Meeting, and Regional Sovereigns either supported or did not object to this operational adjustment.

[7] See 2020 FOP section 2.2

Table 2: Spill Variance Table – August 2020 (8/1 to 8/31)

Project	Parameter	Date	Time[8]	# of Hours	Type	Reason
Little Goose	Reduced Spill	8/7	0300-0500	3	Human Error	Hourly spill remained at 7 kcfs (less than adjusted spill target of 11 ± 1 kcfs) due to a delay in changing to the appropriate target.
Little Goose	Additional Spill	8/10	0300-0700	5	Human Error	Hourly spill remained at 11 kcfs (greater than adjusted spill target of 9 ± 1 kcfs) due to a delay in changing to the appropriate target.[9]
Ice Harbor	Additional Spill	8/2	0500	1	Human Error	Hourly spill increased to 33% (greater than adjusted spill target of 30% ± 1%) due to a delay in changing to the appropriate target. Daily average spill was 30% of the total flow.
Ice Harbor	Additional Spill	8/9 8/10	0100-1500, 2100-2400 0100-1300	19 13	Human Error	Hourly spill increased to between 35% and 40% (greater than adjusted spill target of 30% ± 1%) due to a delay in closing the removable spillway weir (RSW).[10] Daily average spill was between 34% and 37% of the total flow.
John Day	Additional Spill	8/31	1300	1	Human Error	Hourly spill increased to 24 kcfs (greater than adjusted spill target of 20 kcfs ± 2 kcfs) due to a premature opening of spill gates during the annual closure of one of the temporary spillway weirs (TSW).

[8] Note: Data collected for reporting spill variances is reported using hourly-averaged data. Therefore, while spill may be increased or decreased for only a portion of an hour, it is represented in the Spill Variance Table as an hour.

[9] Per the 2020 FOP section 8.2.3, during the 30% spill operation when project outflows are ≤ 32 kcfs, the spill operation will transition from 30% to a constant spill level of approximately 7-11 kcfs to help stabilize project outflow, meet Lower Monumental target spill levels, and maintain MOP elevation at Little Goose. The constant spill level will be based on the previous day's average total project outflow, as follows: 11 kcfs when total outflow is 28.0 to 32.0 kcfs, 9 kcfs when total outflow is 24.0 to 27.9 kcfs, and 7 kcfs when total outflow is ≤ 23.9 kcfs. Actual spill may range up to ±1 kcfs from the target spill level. The Corps Reservoir Control Center monitors previous day average total outflow and communicates the appropriate spill target as necessary with the project.

[10] Per the 2020 FPP section 2.3.2.7, the SW is to be closed when day average outflow is below 30 kcfs and forecasted to stay below 30 kcfs for at least 3 days. In 2020, the RSW should have been closed on 8/9 by 0300 based on these specifications. The RSW was instead closed the following day (8/10) once the error was detected.

Table 3: Pre-Coordinated Operations – August 2020 (8/1 to 8/31)

Project	Parameter	Date	Time[11]	# of Hours	Type	Reason
Lower Granite	Additional Spill	8/3 8/4 8/5 8/6 8/8	0700-2400 0100-2400 0700-2000, 2200 0700-1900 0900-1300	18 24 15 13 5	Maintenance	Hourly spill increased to between 18 and 30 kcfs (greater than adjusted spill target of 10 to 18 kcfs) while generation was reduced due to units taken offline to perform transformer maintenance. Regionally coordinated via the 2020 FPP Appendix A.
Little Goose	Reduced Spill	8/4 8/5 8/7	0300, 1900, 2400 1300 0100	3 1 1	Navigation	Hourly spill decreased to 28% (less than adjusted spill target of 30% ± 1%) for safe navigation. Daily average spill was 30% of the total flow. Regionally coordinated via 2020 FOP, Sections 4.1 and 4.6.
Little Goose	Additional Spill	8/6	0600-1800	13	Maintenance	Hourly spill increased to between 36% and 99% of total flow (greater than adjusted spill target of 30% ±1 %) while generation was reduced for station service due to units taken offline to perform transformer maintenance. Daily average spill was 59% of total flow. Regionally coordinated via the 2020 FPP LGS Section 4.3.10 and Appendix A.
Ice Harbor	Reduced Spill	8/4 8/5 8/6 8/7 8/8 8/10 8/11 8/12 8/13 8/14	0200,1500 1600 1100 1000-1100, 2100 1600-1700 1500 0800 1700 0400, 0700, 1600 0100, 0300, 1000, 1300-1400, 1600	2 1 1 3 2 1 1 1 3 6	Navigation	Hourly spill decreased to between 27% and 28% (less than adjusted spill target of 30% ± 1%) for safe navigation. Daily average spill was between 30% and 34% of the total flow. Regionally coordinated via 2020 FOP, Sections 4.1 and 4.6.
John Day	Reduced Spill	8/3	1200	1	Navigation	Hourly spill decreased to 33% (less than adjusted spill target of 35% ± 1%) for safe navigation. Daily average spill was 35% of the total flow. Regionally coordinated via 2020 FOP, Sections 4.1 and 4.6.

[11] Note: Data collected for reporting spill variances is reported using hourly-averaged data. Therefore, while spill may be increased or decreased for only a portion of an hour, it is represented in the Spill Variance Table as an hour.

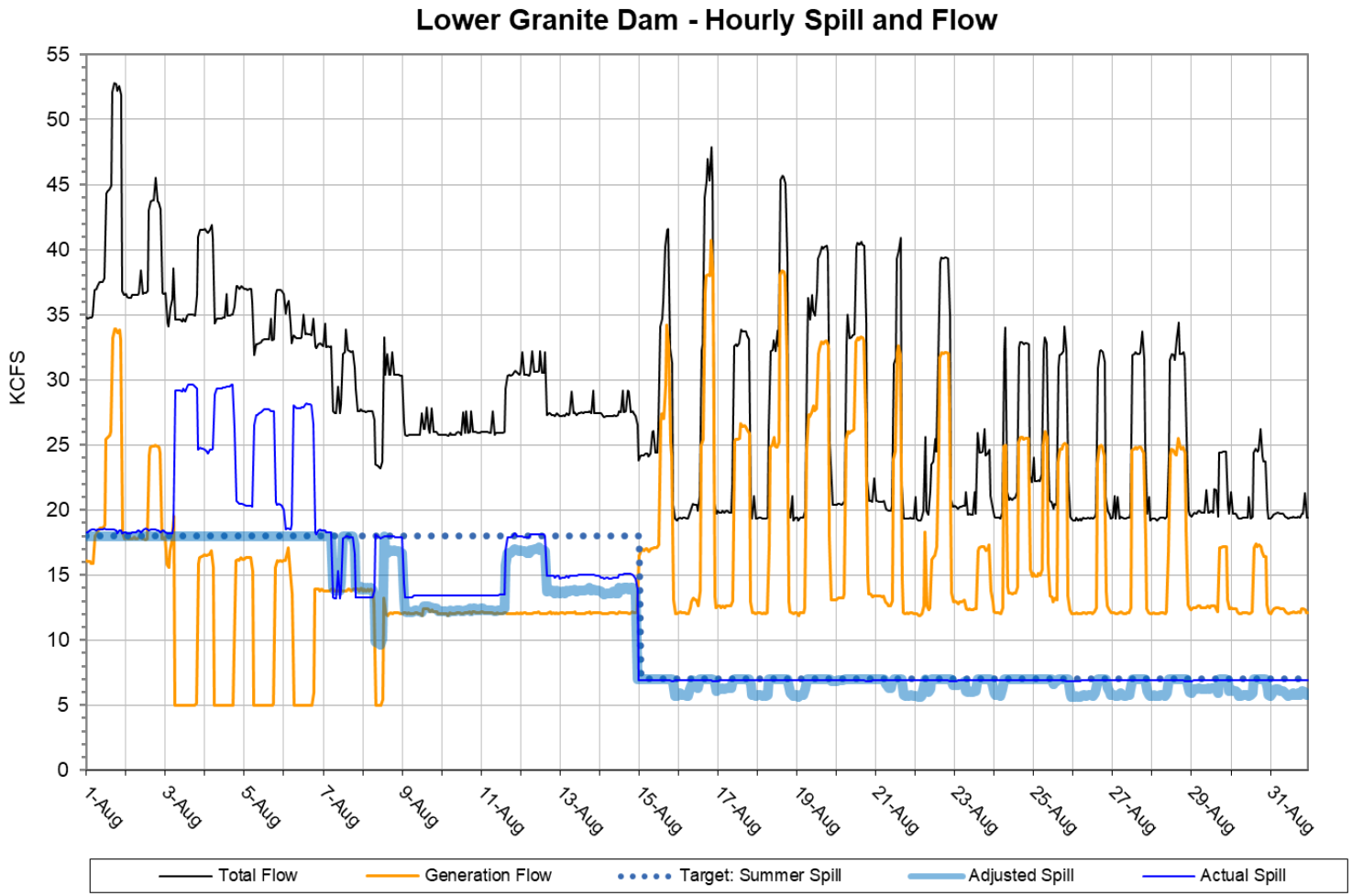
Project	Parameter	Date	Time[11]	# of Hours	Type	Reason
John Day	Reduced Spill	8/3	1500	1	Transmission Reliability	Hourly spill decreased to 32% (less than adjusted spill target of 35% ± 1%) due to an increase in generation in order to deploy reserves. Daily average spill was 35% of the total flow. Regionally coordinated via 2020 FOP, Section 4.4.1.
John Day	Additional Spill	8/5	2000	1	Transmission Reliability	Hourly spill increased to 37% (greater than adjusted spill target of 35% ± 1%) in order to provide reserves. Daily average spill was 35% of the total flow. Regionally coordinated via 2020 FOP, Section 4.4.1.
The Dalles	Reduced Spill	8/3 8/7 8/31	1200-1300 0600 0700	2 1 1	Transmission Reliability	Hourly spill decreased to 28% and 38% (less than adjusted spill target of 30% and 40% ± 1%) due to an increase in generation in order to deploy reserves. Daily average spill was 30% and 40% of the total flow. Regionally coordinated via 2020 FOP, Section 4.4.1.
The Dalles	Additional Spill	8/30	0200	1	Transmission Reliability	Hourly spill increased to 32% (greater than adjusted spill target of 30% ± 1%) in order to provide reserves. Daily average spill was 30% of the total flow. Regionally coordinated via 2020 FOP, Section 4.4.1.

Table 4: August 2020 Average Percent TDG Values Table (8/1 to 8/31)

FIXED MONITORING STATIONS																
Station:	**LWG**	**LGNW**	**LGSA**	**LGSW**	**LMNA**	**LMNW**	**IHRA**	**IDSW**	**MCNA**	**MCPW**	**JDY**	**JHAW**	**TDA**	**TDDO**	**BON**	**CCIW**
Gas Cap %:	**115**	**120**	**115**	**120**	**115**	**120**	**115**	**120**	**115**	**120**	**115**	**120**	**115**	**120**	**115**	**120**
8/1/2020	104	114	111	114	112	113	113	113	109	118	109	115	107	114	107	117
8/2/2020	105	114	111	114	111	113	111	112	109	117	109	115	108	114	107	116
8/3/2020	104	118	110	114	110	113	109	111	108	117	107	116	108	115	107	117
8/4/2020	104	118	111	115	110	117	109	112	108	119	107	116	110	116	109	117
8/5/2020	105	117	111	114	111	117	110	112	110	118	108	115	111	116	109	117
8/6/2020	104	117	112	117	111	117	110	111	109	116	106	115	108	113	108	117
8/7/2020	102	115	109	113	109	117	108	111	107	116	105	114	106	114	106	117
8/8/2020	103	116	109	110	110	115	109	111	106	116	104	114	108	114	106	117
8/9/2020	102	116	109	109	108	115	109	111	106	116	104	115	106	113	106	117
8/10/2020	101	117	110	110	109	115	110	111	107	118	106	115	110	116	108	117
8/11/2020	101	117	110	110	109	115	112	108	108	117	105	115	109	115	108	116
8/12/2020	101	114	108	109	108	114	111	107	108	116	104	115	106	113	106	117
8/13/2020	101	114	107	109	106	113	110	108	106	116	103	115	106	112	105	117
8/14/2020	101	114	107	109	106	113	110	108	106	116	104	115	107	114	106	117
8/15/2020	101	112	107	109	105	110	109	108	106	111	105	113	110	114	108	114
8/16/2020	101	113	108	109	105	109	109	108	106	111	107	114	109	113	112	114
8/17/2020	100	111	107	109	106	110	109	108	107	112	106	113	108	113	112	114
8/18/2020	102	112	107	109	107	110	110	108	108	113	106	113	108	113	110	114
8/19/2020	102	112	108	109	107	110	110	107	109	112	107	114	107	112	108	113
8/20/2020	103	112	108	109	107	110	109	107	110	112	108	116	107	112	107	113
8/21/2020	104	113	109	109	107	110	109	107	109	112	108	116	109	112	107	113
8/22/2020	102	113	107	109	106	110	108	106	108	112	106	115	108	113	107	113
8/23/2020	103	113	108	109	107	110	108	106	109	112	106	114	110	113	109	113
8/24/2020	103	113	108	109	106	110	107	105	108	111	105	113	107	[12]	108	113
8/25/2020	103	112	108	109	106	110	107	106	107	112	106	113	106	111	106	113
8/26/2020	102	113	108	109	106	110	106	106	107	111	106	113	106	111	105	113
8/27/2020	101	113	108	109	106	110	106	105	106	111	105	112	107	111	104	113
8/28/2020	101	112	108	109	106	110	107	106	106	110	105	112	106	112	105	113
8/29/2020	101	113	109	109	106	110	107	106	106	110	105	113	106	111	105	113
8/30/2020	100	112	107	108	106	110	106	105	104	110	104	112	104	109	103	113
8/31/2020	100	113	107	107	106	110	107	105	104	111	103	112	106	110	103	113
Exceedances:																

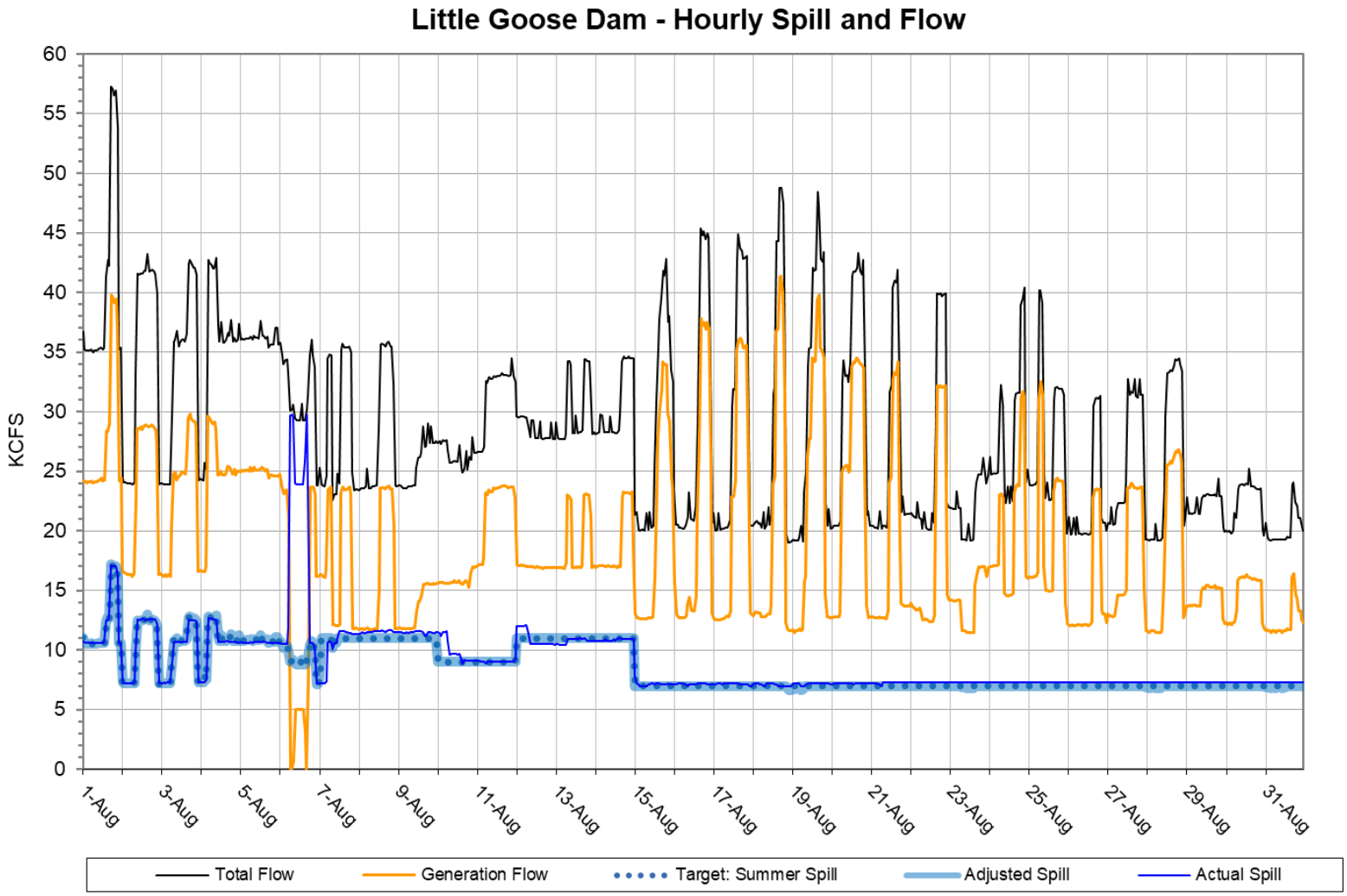
[12] Red shaded cells indicate no data due to malfunctioning gauge from a torn membrane.

Figure 1[13]



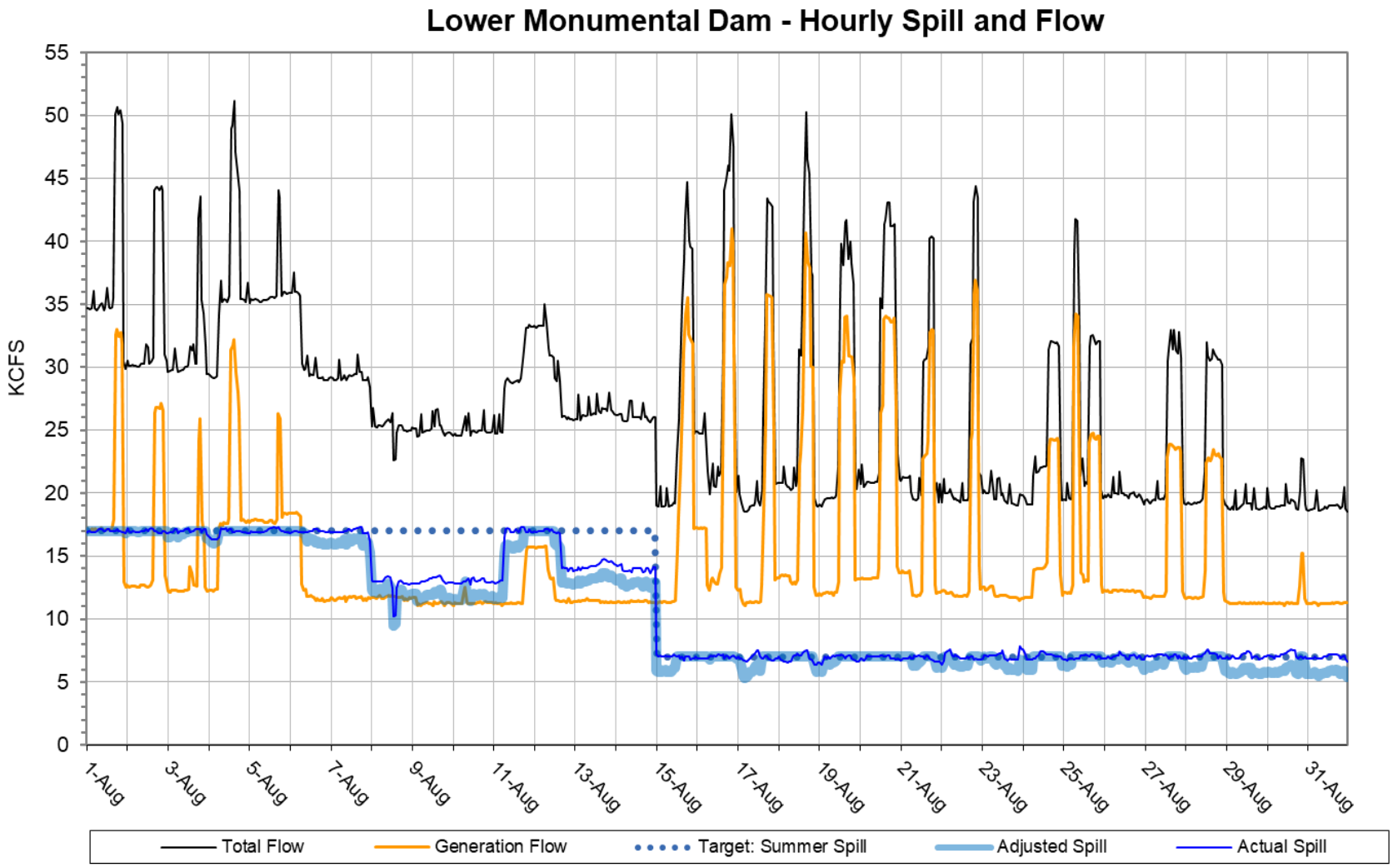
[13] The adjusted spill line is a simplified representation due to limitations of representing a range of minimum generation values. See Tables 2 and 3 for spill variances and pre-coordinated operations.

Figure 2[14]



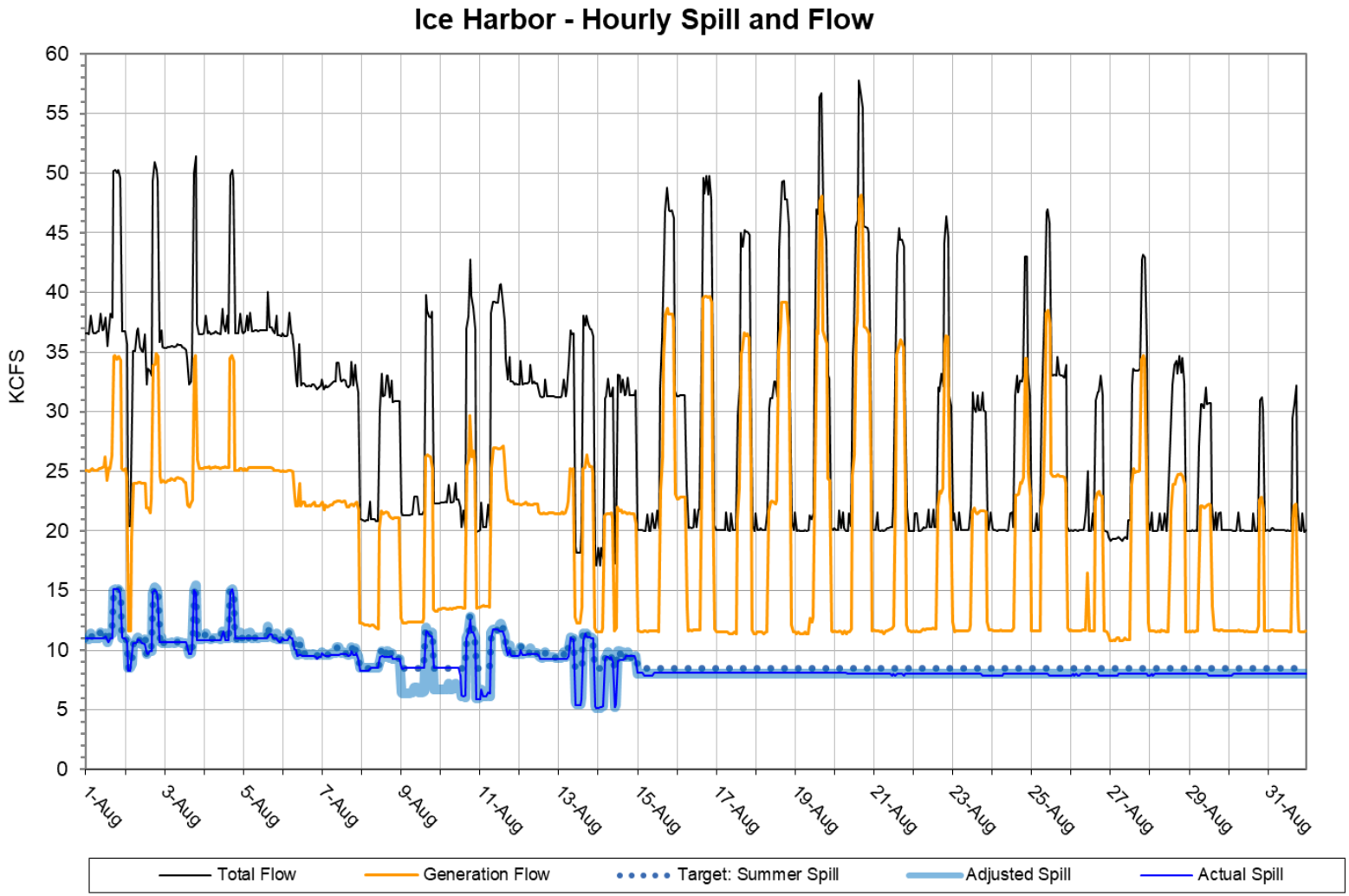
[14] The adjusted spill line is a simplified representation due to limitations of representing a range of minimum generation values. See Tables 2 and 3 for spill variances and pre-coordinated operations.

Figure 3[15]



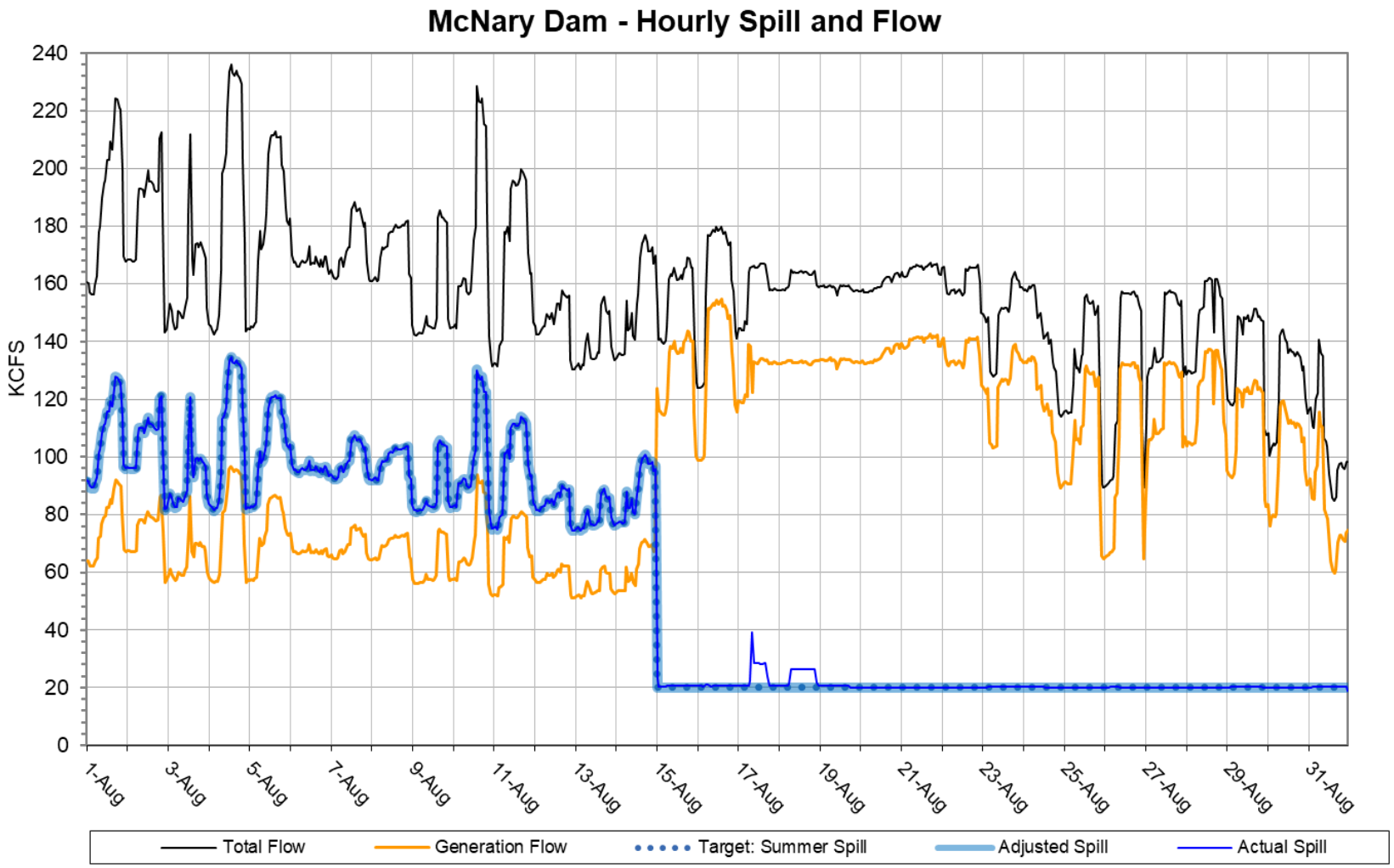
[15] The adjusted spill line is a simplified representation due to limitations of representing a range of minimum generation values. See Tables 2 and 3 for spill variances and pre-coordinated operations.

Figure 4[16]



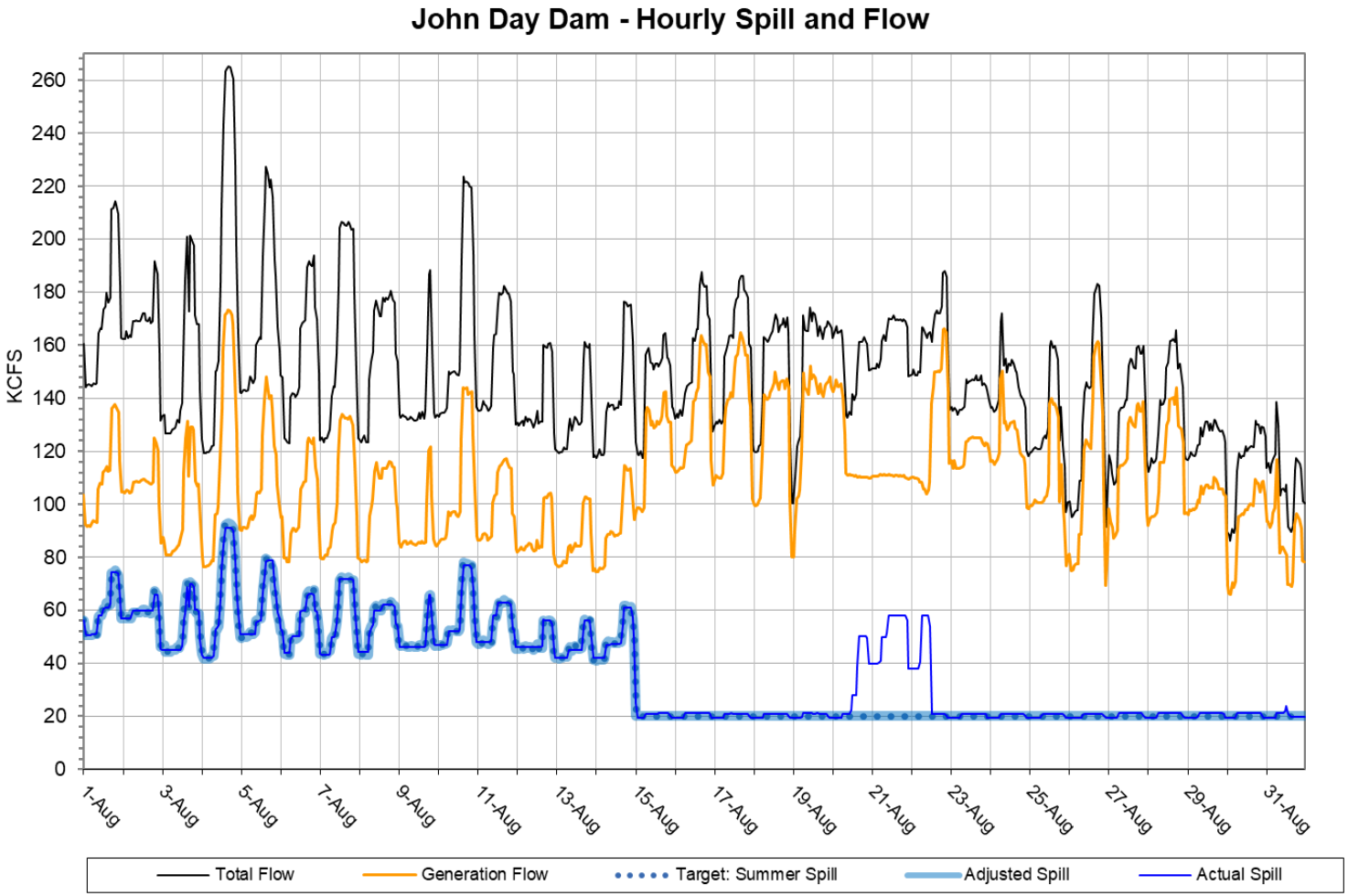
[16] The adjusted spill line is a simplified representation due to limitations of representing a range of minimum generation values. See Tables 2 and 3 for spill variances and pre-coordinated operations.

Figure 5[17]



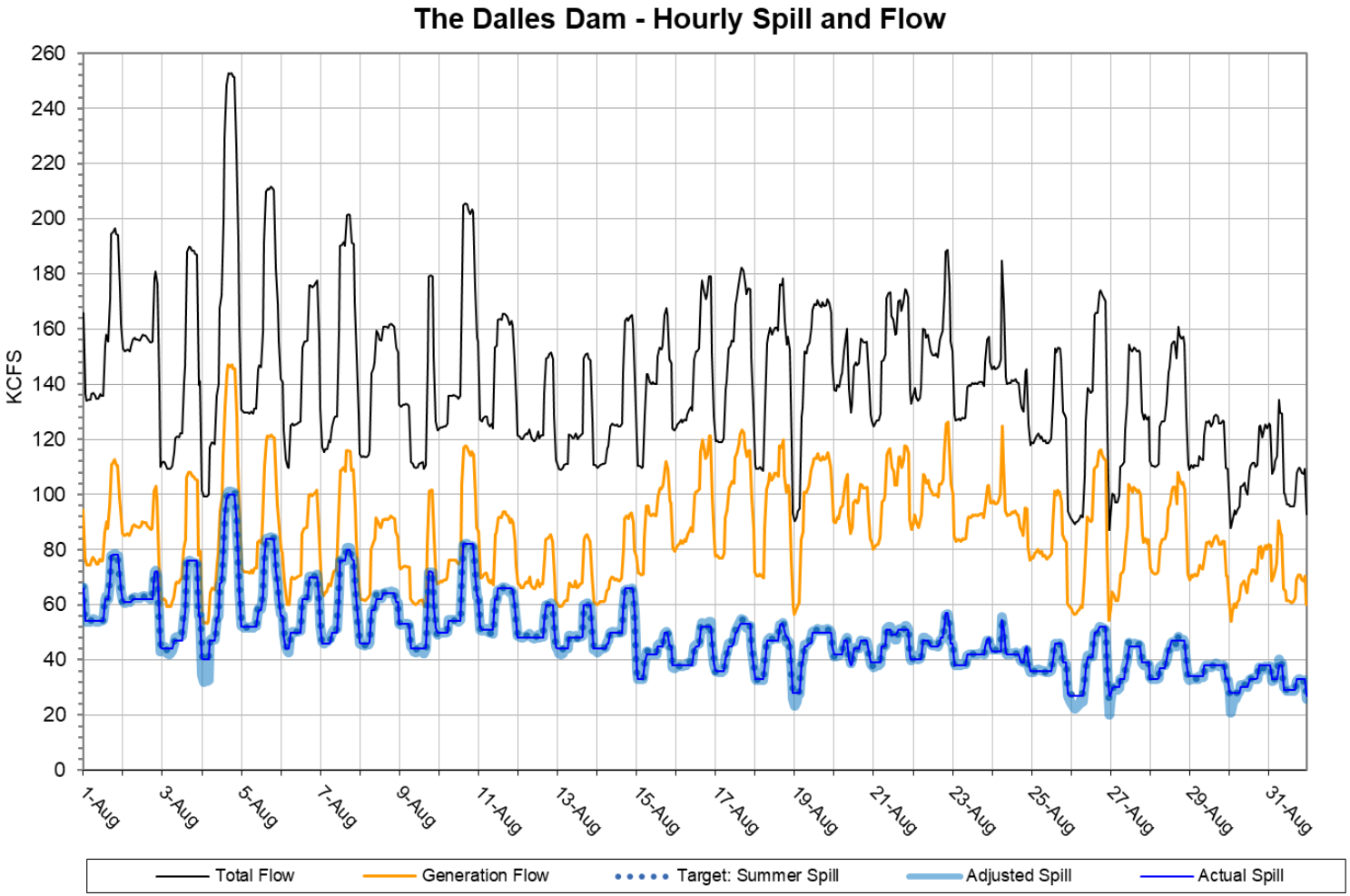
[17] The adjusted spill line is a simplified representation due to limitations of representing a range of minimum generation values. See Tables 2 and 3 for spill variances and pre-coordinated operations.

Figure 6[18]



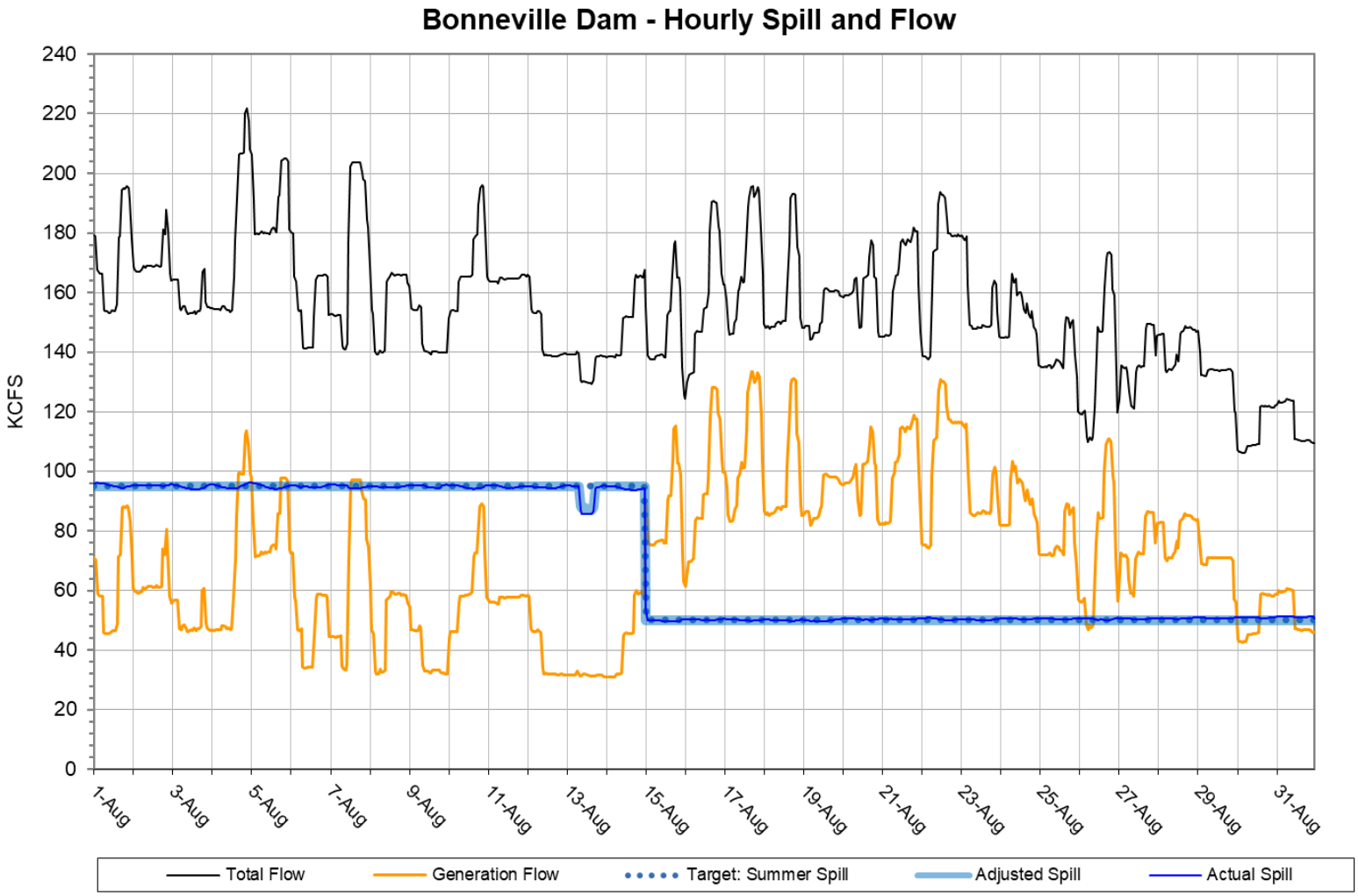
[18] The adjusted spill line is a simplified representation due to limitations of representing a range of minimum generation values. See Tables 2 and 3 for spill variances and pre-coordinated operations.

Figure 7[19]



[19] The adjusted spill line is a simplified representation due to limitations of representing a range of minimum generation values. See Tables 2 and 3 for spill variances and pre-coordinated operations.

Figure 8[20]



[20] The adjusted spill line is a simplified representation due to limitations of representing a range of minimum generation values. See Tables 2 and 3 for spill variances and pre-coordinated operations.