

FISH OPERATIONS PLAN IMPLEMENTATION REPORT

July 2023

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 2023 Fish Operations Plan¹ (2023 FOP). The 2023 FOP describes the Corps' planned operations for juvenile fish passage at its four lower Snake River and four lower Columbia River dams during the 2023 spring and summer fish migration seasons, generally April 3 through August 31. The 2023 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 Record of Decision for the Columbia River System Operations Environmental Impact Statement (CRSO EIS ROD) dated September 28, 2020, CRSO Final EIS, 2020 National Marine Fisheries Service (NMFS) Columbia River System and U.S. Fish and Wildlife Service Biological Opinions (2020 BiOps)², the Extensions of the 2008 Columbia Basin Fish Accords (Accord Extensions)³, the Corps' requirements under the Endangered Species Act (ESA), and the ongoing consultation and communications with the relevant wildlife agencies to ensure consistency with the Act. The 2023 FOP also incorporates spill operations agreed to in the Term Sheet for Stay of Preliminary Injunction Motion and Summary Judgment Schedule⁴ for the *NWF et al. v. NMFS et al.* (3:01-cv-00640-SI) litigation, as extended and modified through the Administration's Commitments in Exhibit 2 of the Joint Motion to Extend the Litigation Stay filed August 4, 2022 (referred to collectively as 2022 Agreement). Other project operations and water management actions not specifically addressed in this document will be consistent with other guiding operative documents, including the 2023 Water Management Plan (WMP), seasonal WMP updates, and the 2023 Fish Passage Plan (FPP).

¹ The 2023 FOP was posted to the Technical Management Team (TMT) website on March 27, 2023 (<http://pweb.crohms.org/tmt/documents/fpp/2023/>).

² The Corps, in coordination with the other Action Agencies, and NMFS, employs the Regional Implementation Oversight Group (RIOG) and technical teams including the Technical Management Team (TMT) and Fish Passage Operations & Maintenance (FPOM) coordination group, to coordinate with state, tribal and other federal experts for recommendations for implementing operations consistent with the 2020 BiOps.

³ The 2020 Amendment to and 2018 Extension of the 2008 Columbia Basin Fish Accords are available at <https://www.salmonrecovery.gov/Partners/FishAccords.aspx>

⁴ 2022 Agreement: https://pweb.crohms.org/tmt/JointMotion_TermSheet_CourtOrder_OCT2021.pdf

This report describes the Corps' implementation of the 2023 FOP during the month of July. 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 (see 2023 FOP, Section 4.1);
- actual spill: the hourly flow over the spillway; and,
- resultant 12-hour average TDG for the tailwater at each project.

This report also provides information on issues and unanticipated or emergency situations that arose during implementation of the 2023 FOP in July 2023.

Data Reporting

I. For each project providing fish passage operations, this report contains a graph displaying the performance of the spring fish passage spill program for the month of July, with hourly spill, target spill, adjusted spill, generation, and total flows. The monthly graphs begin on July 1 and end on July 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 dashed blue line represents the spill cap portion of the target spill estimated to reach the gas cap or target TDG.
- The thick light blue line represents the performance standard spill level portion of the target spill.
- 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 (2023 FOP section 4.1).

II. The average daily %TDG for the 12 highest hours for all projects is shown in the July 2023 Average Percent TDG Values Table (Table 4). Red numbers indicate that the project exceeded the %TDG cap - i.e. 125% (tailwater) on that day.

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 July 2023 Spill Variance Table (Table 2).⁵ 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 inflow 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 nonfederal projects upstream are variable and 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 2023 FOP for Bonneville and The Dalles dams,⁶ 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). Transition periods between gas cap spill and performance standard spill hours may result in actual hourly spill levels that are slightly higher or lower than target spill levels. Occurrences requiring an adjustment in operations and/or regional coordination are described in greater detail in the "Operational Adjustments" section below.

⁵ Forced spill conditions shown in the graphs are not considered variances and are not reported in the Spill Variance Table. Forced 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.

⁶ As specified in the 2023 FOP Section 3.

July Operations

The month of July was characterized by below average precipitation and flows for the lower Snake and lower Columbia rivers. The July 2023 observed precipitation was 25% of average on the Snake River above Ice Harbor and 32% of average on the Columbia River above The Dalles.⁷ The NOAA Northwest River Forecast Center runoff summary for July indicated that the adjusted runoff for the Snake River at Lower Granite was 75% of the 30-year average (1991-2020) with a volume of 1.6 MAF (Million acre-feet). The July 2023 adjusted runoff for the Columbia River at The Dalles was 53% of the 30-year average (1991-2020) with a volume of 7.5 MAF.⁸

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. The Corps initiates spill at 0001 hours, or shortly after midnight, at each of the projects on the start date. Target spill levels for summer 2023 at each project are defined in Table 1. At the Snake River Projects spill may range up to ±1 kcfs during the summer spill operation from August 15–August 31.

Table 1: Summary of 2023 summer target spill levels at lower Snake River and lower Columbia River projects.

PROJECT	SUMMER SPILL^A (June 21/16 – August 14) (24 hrs/day)	SUMMER SPILL^A (August 15 – August 31) (24 hrs/day)
Lower Granite ^B	18 kcfs	SW flow (as river flow allows)
Little Goose ^{B, C}	30%	SW flow or 7 kcfs spill
Lower Monumental ^{B, D}	17 kcfs	SW flow or 8 kcfs spill
Ice Harbor ^{B, E}	30%	SW flow or 9 kcfs spill
McNary ^F	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. Late summer spill August 15-August 31 will be through the surface weir (SW) or a constant spill rate through conventional spillbays using the appropriate FPP spill pattern. The SW spill rate is a function of forebay elevation (as pool elevation increases, more water is spilled over the SW), as defined in the FPP. The SWs will be operated per FPP criteria and closed when low flow criteria are met. When the SW is closed, the spill target will transition to a constant spill rate through conventional spillbays and will not vary with a fluctuating forebay elevation.

⁷ Retrieved August 2, 2023: https://www.nwrfc.noaa.gov/water_supply/wy_summary/wy_summary.php?tab=5

⁸ Retrieved August 2, 2023: https://www.nwrfc.noaa.gov/runoff/runoff_summary.php

- C. Flow corresponds to the SW high crest elevation as adjusted relative to the forebay operating range (see FPP Chapter 8, section 2.3.2.7).
- D. Flow corresponds to a forebay elevation of 538.5 feet, the mid-point of the forebay range from 537-540 feet.
- E. Flow corresponds to a forebay elevation of 438.5 feet, the mid-point of the forebay range from 437-440 feet.
- F. From June 16-August 14, McNary will adjust spill once a day to 57% of the previous day's average project outflow. The intent is to reduce the frequency of spillgate changes while implementing a more uniform pattern to the extent it can be done safely (see FPP Chapter 5, section 2.2.1.1).

In its implementation of the 2023 FOP in July, 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).⁹ 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).

⁹ See 2023 FOP, Section 2.2

Operational Adjustments

1. Lower Monumental Dam

Beginning June 28 at 1200 hours, the uniform spill pattern¹⁰ was applied to spill at Lower Monumental Dam in place of the bulk spill pattern specified in the 2023 FOP section 8.2.3. This action was in response to TDG exceeding state standards in the Ice Harbor Dam forebay resulting from summer spill (17 kcfs) at Lower Monumental dam using the bulk spill pattern.¹¹ Regional salmon managers were informed of this operational adjustment at TMT on June 28. The spill pattern was returned to bulk on July 12. Regional salmon managers were informed of the return to the bulk spill pattern at TMT on July 12.

¹⁰ See 2023 FPP, Table LMN-8, Lower Monumental Dam Uniform Spill Patterns with RSW.

¹¹ See 2023 FPP, Table LMN-7, Lower Monumental Dam Bulk Spill Patterns with RSW.

Table 2: Spill Variance Table – July 2023

Project	Parameter	Date	Time¹²	# of Hours	Type	Reason
Little Goose	Additional Spill	7/7	1200	1	Human Error	Hourly spill increased to 32% (greater than adjusted spill target of 30% ± 1%) due to a miscalculation of spill.
Little Goose	Additional Spill	7/25	0100-2400	24	Human Error	Hourly spill remained at 11 kcfs (greater than adjusted spill target of 9 kcfs) due to failure to change to a new spill target based on the previous day's average outflow.
McNary	Additional Spill	7/27	1000	1	Debris Spill	Hourly spill increased to 89 kcfs (greater than adjusted spill target of 86 kcfs) to pass forebay debris. Regionally coordinated via 2023 FPP, MCN Section 5.
John Day	Reduced Spill	7/11	1000	1	Human Error	Hourly spill decreased to 33% (less than adjusted spill target of 35% ± 1%) due to a delay in changing to the appropriate spill level.

¹² 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 Pre-Coordinated Operations Table as an hour.

Table 3: Pre-Coordinated Operations – July 2023

Project	Parameter	Date	Time¹³	# of Hours	Type	Reason
Little Goose	Reduced Spill	7/2	0400	1	Navigation	Hourly spill decreased to 28% (less than adjusted spill target of 30% ± 1%) for navigation. Regionally coordinated via 2023 FOP, Sections 4.1 and 4.6.
		7/5	1100	1		
Little Goose	Additional Spill	7/31	0500-1600	12	Maintenance	Hourly spill increased to between 15 and 21 kcfs (greater than adjusted spill target of 11 kcfs) to perform transformer maintenance. Regionally coordinated via the 2023 FPP LGS Section 4.3.10 and Appendix A.
Ice Harbor	Reduced Spill	7/1	1300	1	Navigation	Hourly spill decreased to 28% (less than adjusted spill target of 30% ± 1%) for navigation. Regionally coordinated via 2023 FOP, Sections 4.1 and 4.6.
		7/5	0700	1		
		7/8	0500	1		
		7/9	1000	1		
		7/12	0500	1		
		7/13	1200-1300, 1600	3		
		7/16	1900	1		
		7/21	2200	1		
		7/22	0500	1		
7/25	1000	1				

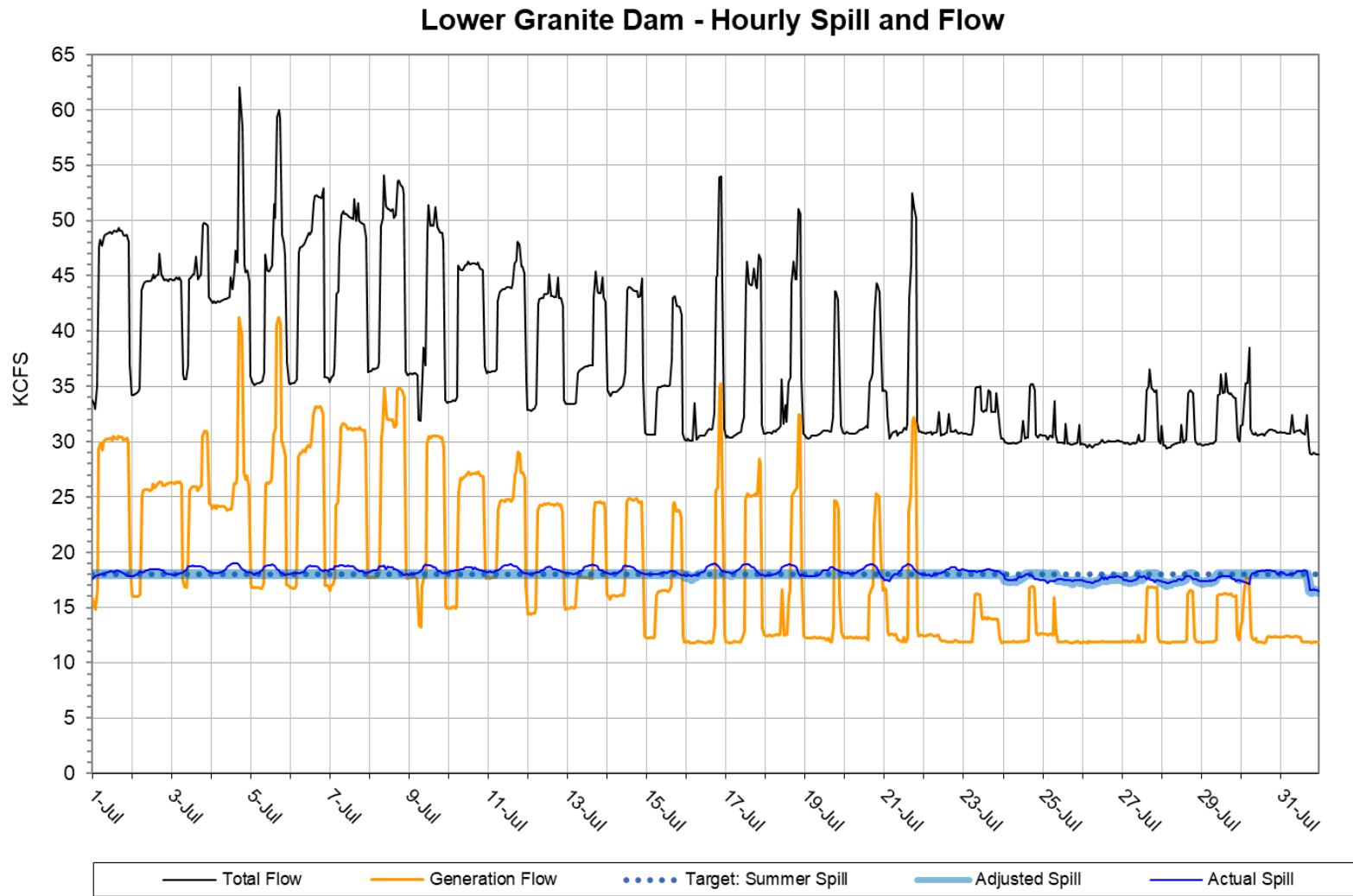
¹³ Note: Data collected for reporting spill variances is reported using hourly-averaged data. Therefore, while spill may be increased or decreased for only a portion of an hour, it is represented in the Pre-Coordinated Operations Table as an hour.

Table 4: July 2023 Average Percent TDG Values

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
7/1/2023	102	111	111	113	113	114	115	113	110	114	110	115	109	114	108	117
7/2/2023	102	112	112	114	113	115	115	113	110	115	109	116	109	114	108	117
7/3/2023	103	112	112	114	113	114	114	113	111	114	109	116	112	116	109	117
7/4/2023	102	112	112	113	112	114	114	112	111	114	110	116	113	116	111	117
7/5/2023	101	112	111	113	113	115	114	•	111	115	111	116	113	117	114	117
7/6/2023	102	111	112	113	115	114	115	•	111	115	112	116	113	117	114	117
7/7/2023	102	111	113	113	115	114	115	114	113	116	111	116	111	115	111	117
7/8/2023	104	111	114	114	115	115	116	113	113	115	110	116	109	114	107	117
7/9/2023	104	112	113	113	115	115	115	114	113	115	109	115	108	114	105	117
7/10/2023	104	112	112	113	114	114	114	113	111	115	108	115	107	112	104	117
7/11/2023	105	112	110	113	113	114	113	113	109	116	106	115	106	112	105	115
7/12/2023	105	112	111	113	112	116	113	113	109	115	106	114	108	114	105	117
7/13/2023	104	112	109	112	111	117	112	113	107	117	105	114	108	113	107	117
7/14/2023	104	• ¹⁴	110	111	111	117	112	113	108	117	105	115	108	115	109	117
7/15/2023	104	•	109	111	111	•	112	113	109	117	105	115	109	115	111	117
7/16/2023	104	113	110	111	111	•	113	113	110	117	105	115	109	114	110	117
7/17/2023	103	112	111	111	111	•	113	113	110	115	104	114	107	113	107	117
7/18/2023	102	112	109	111	110	117	114	114	109	117	105	115	106	113	108	117
7/19/2023	103	112	109	110	110	117	114	113	108	116	107	115	110	116	110	117
7/20/2023	103	113	108	107	110	117	113	113	108	115	108	115	111	116	110	117
7/21/2023	102	112	109	109	111	117	112	112	109	115	107	114	109	114	108	117
7/22/2023	101	112	108	110	111	117	113	112	109	115	107	115	108	114	108	114
7/23/2023	102	112	108	108	111	117	114	113	109	115	107	115	109	114	109	114
7/24/2023	102	112	109	113	111	118	113	112	109	115	106	115	108	113	107	115
7/25/2023	102	112	109	114	110	118	112	112	108	116	105	116	107	113	107	116
7/26/2023	102	113	108	114	108	•	111	112	107	115	106	115	108	114	107	117
7/27/2023	102	•	108	114	108	119	111	112	107	116	105	115	109	114	107	117
7/28/2023	102	112	108	113	109	118	110	112	107	117	105	115	107	114	107	116
7/29/2023	102	112	108	114	110	119	110	112	108	117	105	115	107	113	106	117
7/30/2023	102	112	108	113	110	118	112	112	108	116	104	115	106	112	106	117
7/31/2023	103	112	109	117	110	117	112	113	107	116	104	114	107	113	106	117
Exceedances:							1									

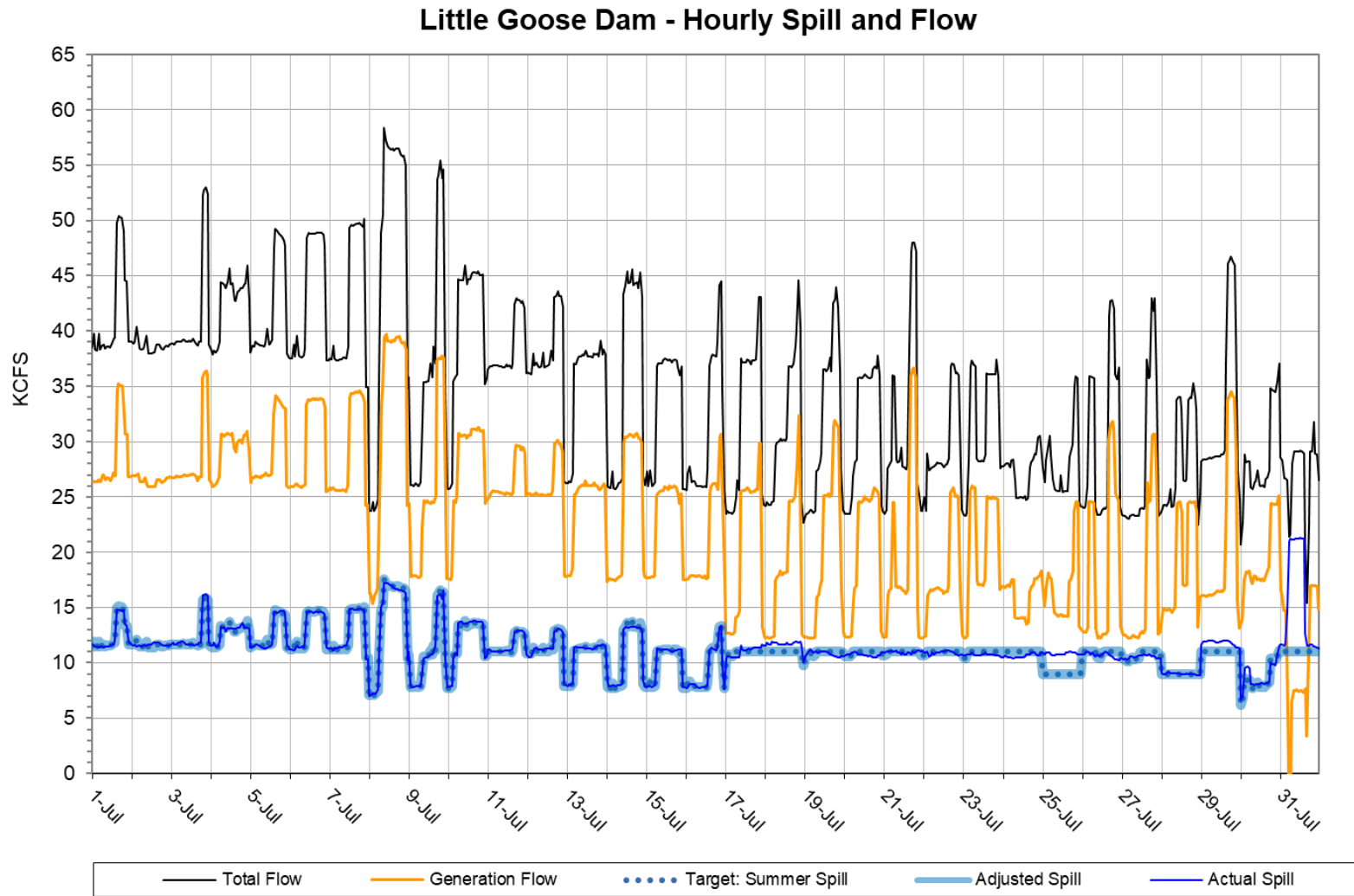
¹⁴ Indicates missing or erroneous data.

Figure 1¹⁵



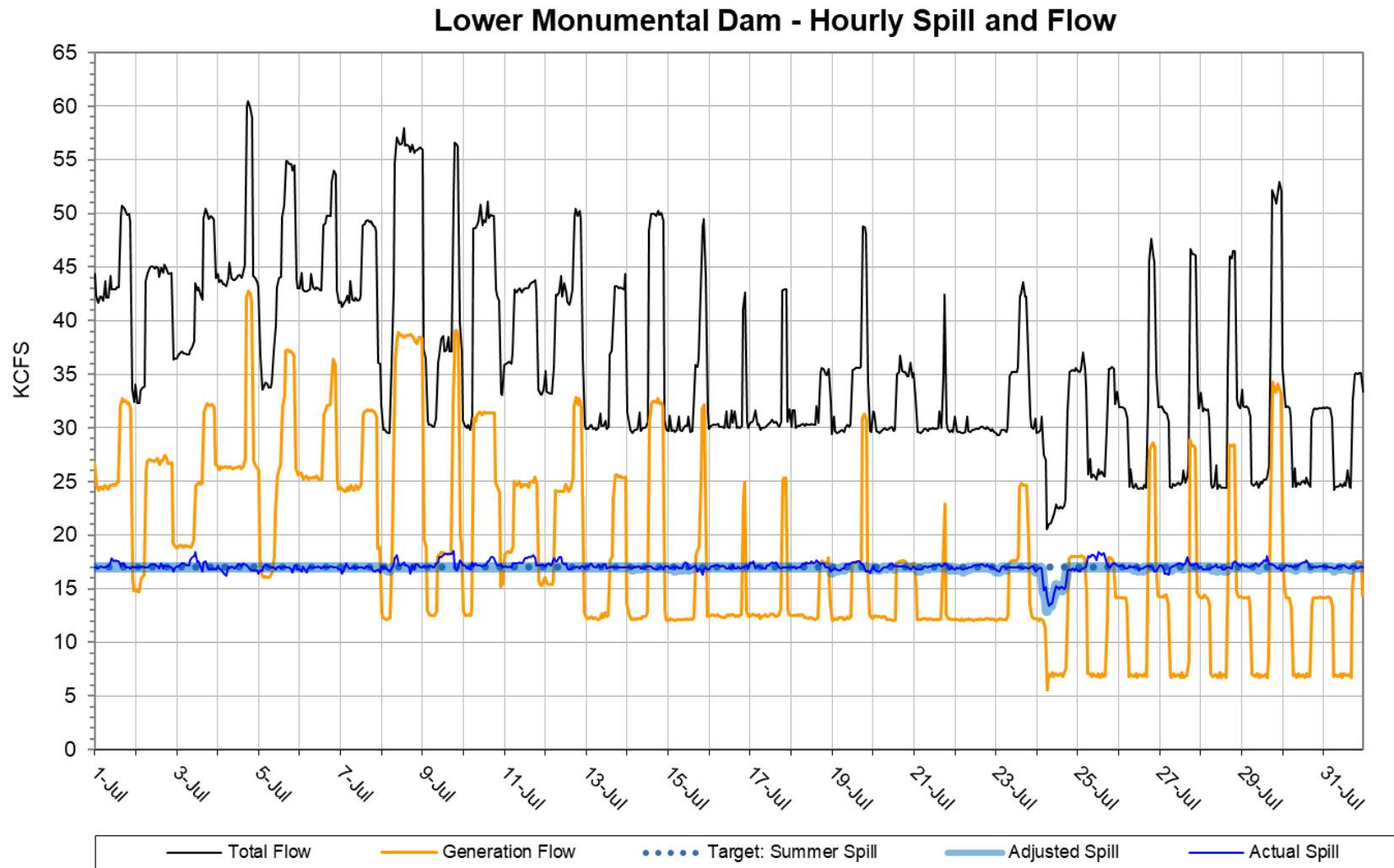
¹⁵ The adjusted spill line is a simplified representation due to limitations of representing a range of minimum generation values. See Tables 2 and 3 for spill variances and pre-coordinated operations.

Figure 2¹⁶



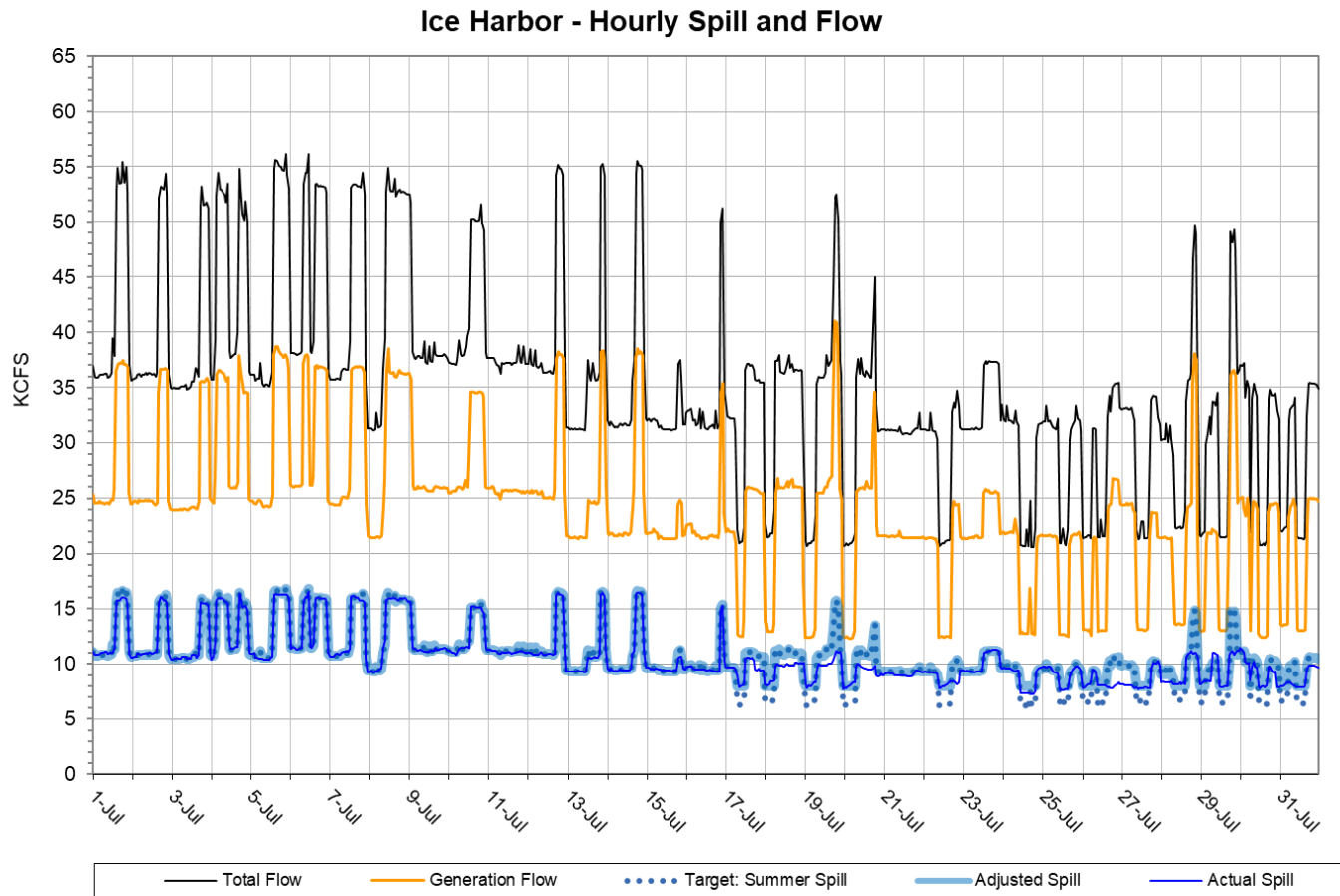
¹⁶ The adjusted spill line is a simplified representation due to limitations of representing a range of minimum generation values. See Tables 2 and 3 for spill variances and pre-coordinated operations.

Figure 3¹⁷



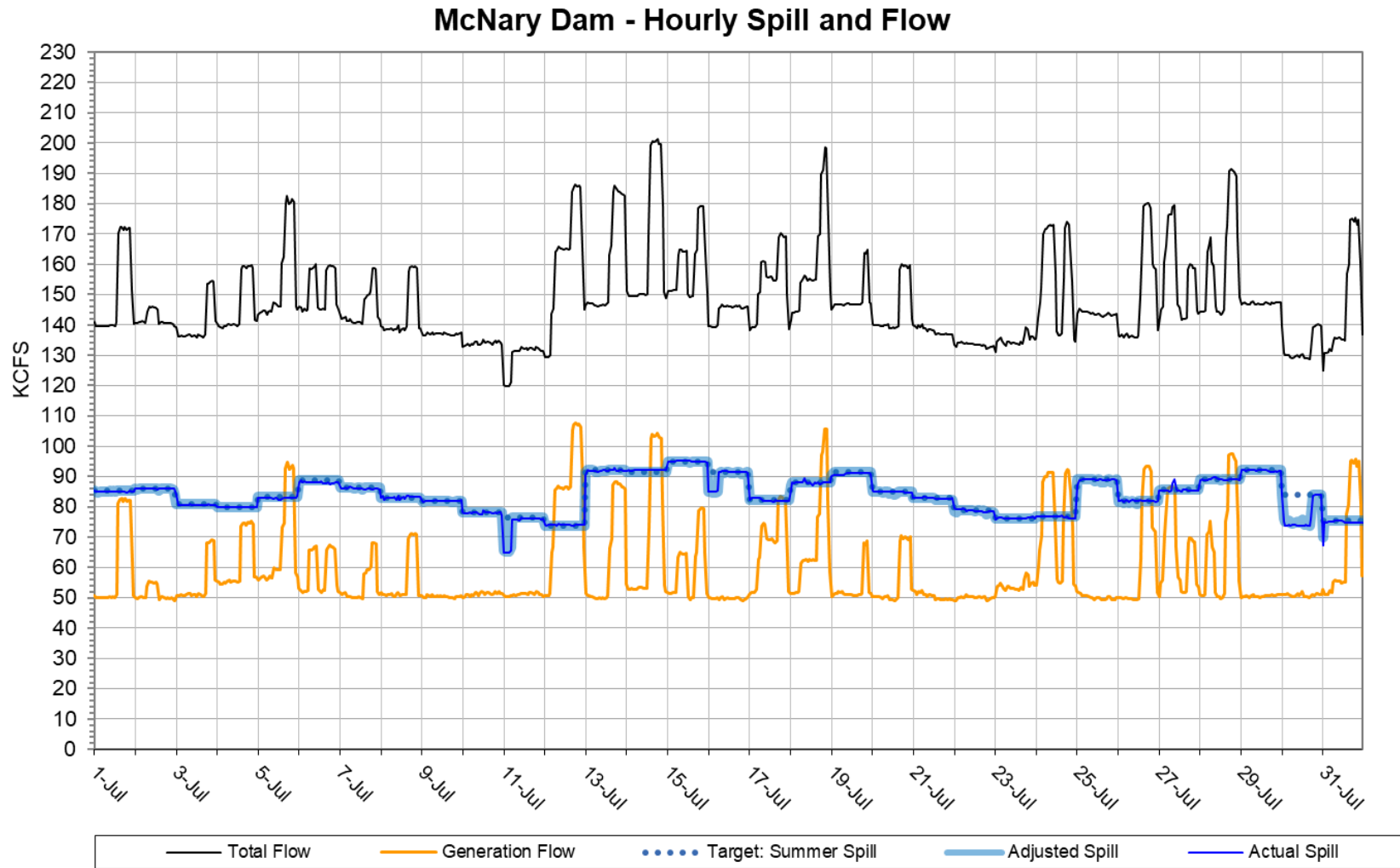
¹⁷ The adjusted spill line is a simplified representation due to limitations of representing a range of minimum generation values. See Tables 2 and 3 for spill variances and pre-coordinated operations.

Figure 4¹⁸



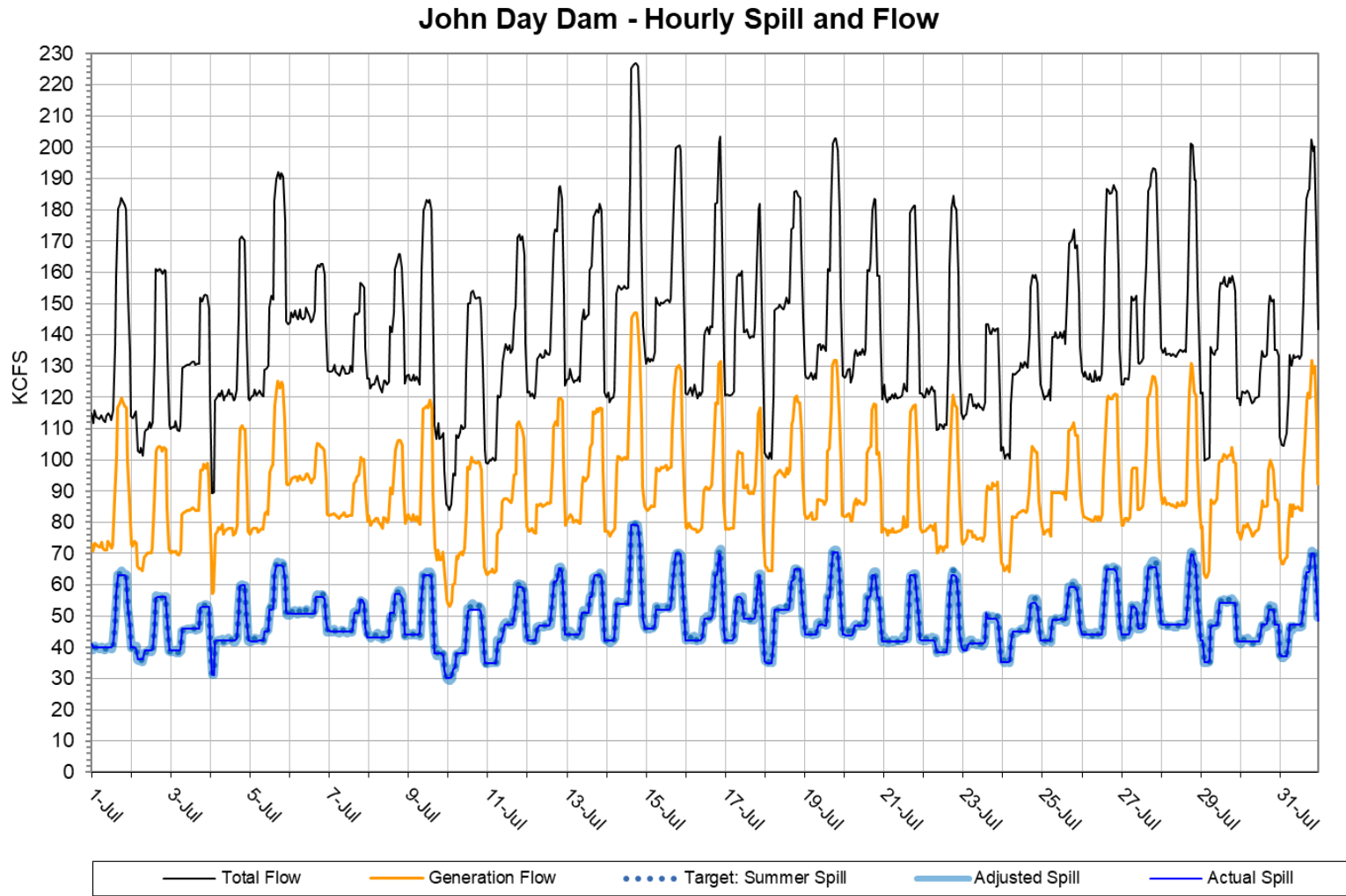
¹⁸ The adjusted spill line is a simplified representation due to limitations of representing a range of minimum generation values. See Tables 2 and 3 for spill variances and pre-coordinated operations. When the SW is open, the minimum project spill level is fixed at approximately 7.1-8.7 kcfs, depending on forebay elevation (i.e., spill cannot be reduced below the fixed volume through the SW). This operational limitation results in spilling more than 30% when total outflow drops below approximately 28 kcfs. Additionally, all but one of the five available turbine units at Ice Harbor have runner blades that are locked at a set angle (non-adjustable) and a smaller operating range (also referred to as “fixed-blade” or “locked-blade” units). Only Unit 1 has adjustable blades. As a result, turbine outflow cannot achieve some flow ranges, referred to as deadbands. When targeting spill as a percent of outflow, these deadbands will result in a spill percentage that is above or below the target percentage at certain outflows.

Figure 5¹⁹



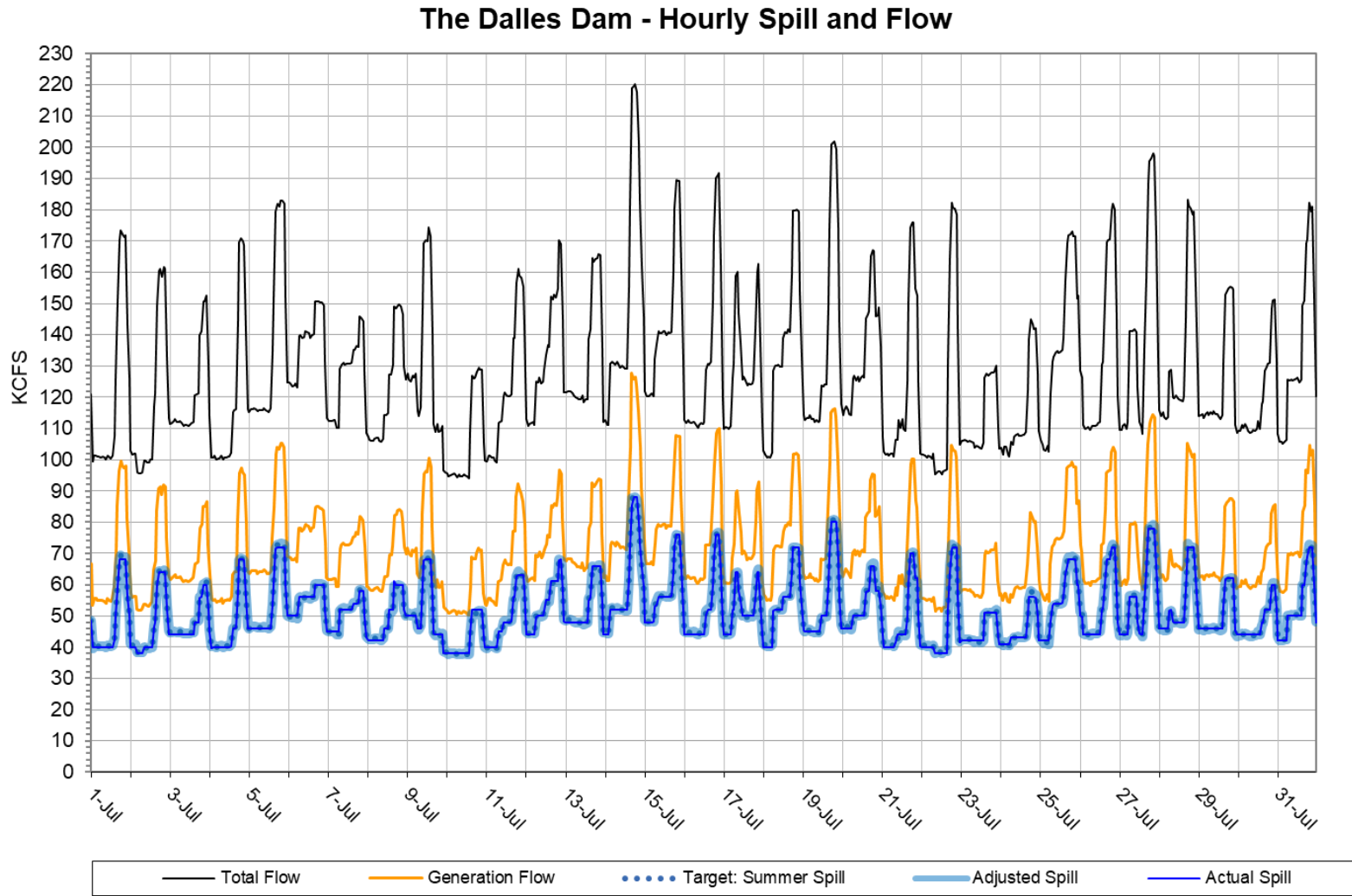
¹⁹ The adjusted spill line is a simplified representation due to limitations of representing a range of minimum generation values. See Tables 2 and 3 for spill variances and pre-coordinated operations.

Figure 6²⁰



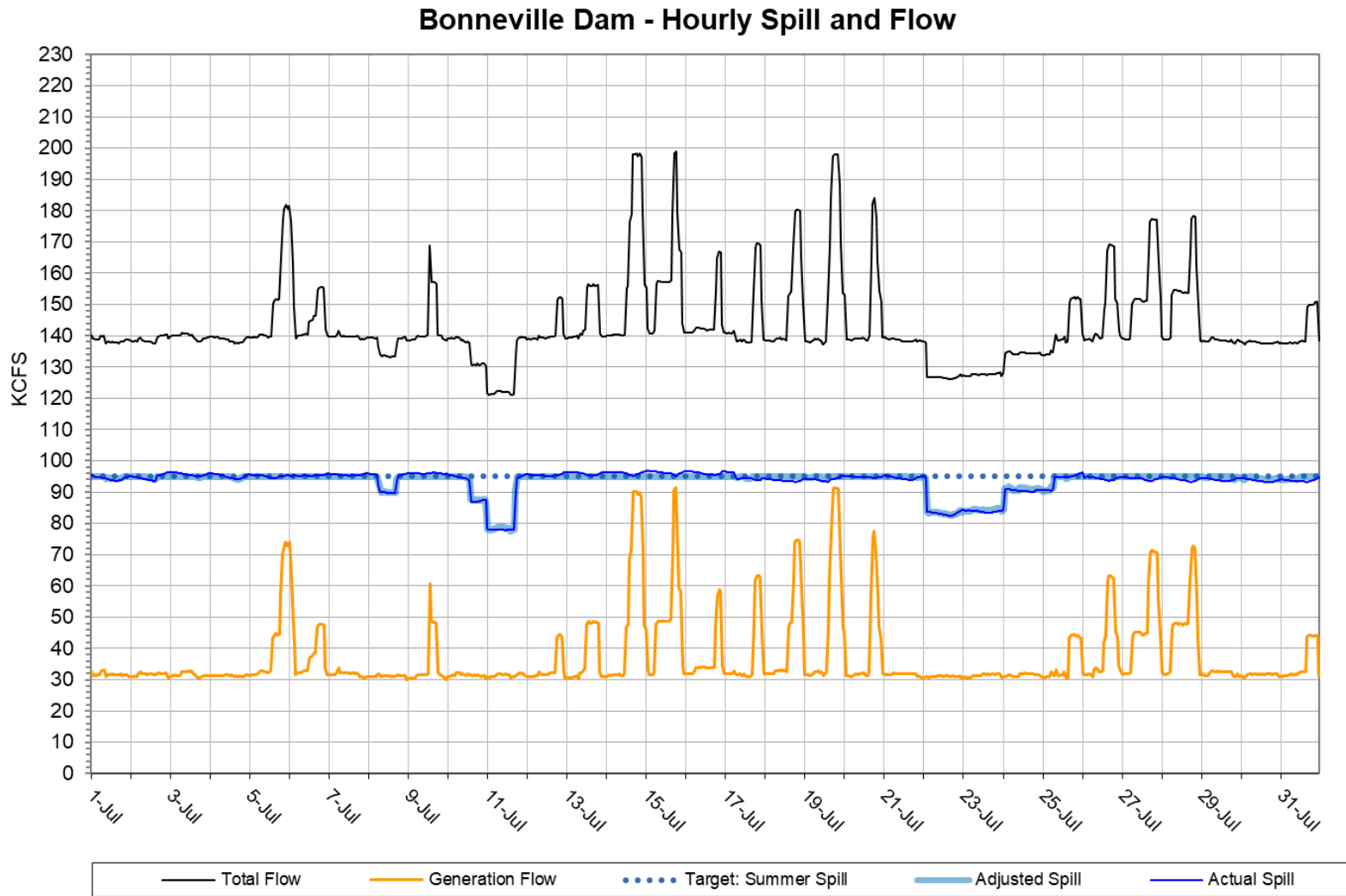
²⁰ The adjusted spill line is a simplified representation due to limitations of representing a range of minimum generation values. See Tables 2 and 3 for spill variances and pre-coordinated operations.

Figure 7²¹



²¹ 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 8²²



²² 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.