FISH OPERATIONS PLAN IMPLEMENTATION REPORT

April 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 Plan[1] (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 Schedule[4] 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).

This report describes the Corps' implementation of the 2023 FOP during the month of April. 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);

[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

- 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 April 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 April, with hourly spill, target spill, adjusted spill, generation, and total flows. The monthly graphs begin on April 1 and end on April 30 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 April 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 April 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.

April Operations

The month of April was characterized by below average precipitation and flows for the lower Snake and lower Columbia rivers. The April 2023 observed precipitation was 68% of average

[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.

on the Snake River above Ice Harbor and 88% of average on the Columbia River above The Dalles.[7] The NOAA Northwest River Forecast Center runoff summary for April 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 3.6 MAF (Million acre-feet). The April 2023 adjusted runoff for the Columbia River at The Dalles was 64% of the 30-year average (1991-2020) with a volume of 9.4 MAF.[8]

Spring spill operations occur April 3–June 20 at the four lower Snake River projects, and April 10–June 15 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 spring 2023 at each project are defined in Table 1 (Table 3 in the 2023 FOP). If deleterious impacts of the proposed spill operations are observed in-season, existing adaptive management processes may be employed to address the cause of the impacts. Spill may be temporarily reduced at any project to ensure navigation safety or transmission reliability. In order to operate consistently with state water quality standards, spill may also be reduced if observed GBT levels exceed those identified in state water quality standards (*See* WASH. ADMIN. CODE § 173-201A-200(l)(f)(ii)(B)(III) and *Order Approving a Modification to the Oregon's Water Quality Standard for Total Dissolved Gas in the Columbia River Mainstem*, page 5).

Spill up to the 125% Gas Cap is spill to the maximum level that meets, but does not exceed, the TDG criteria allowed under state laws. This includes a criterion for not exceeding 126% TDG for the average of the two greatest hourly values within a day.

[7] Retrieved May3, 2023: https://www.nwrfc.noaa.gov/water_supply/wy_summary/wy_summary.php?tab=5
[8] Retrieved May 3, 2023: https://www.nwrfc.noaa.gov/runoff/runoff_summary.php

Table 1.– Summary of 2023 spring target spill levels at lower Snake River (April 3 – June 20) and lower Columbia River (April 10 – June 15) projects (Table 3 in the 2023 FOP).

PROJECT	SPRING SPILL DATES	SPRING SPILL OPERATION
Lower Granite [A, C]	April 3 until adult criteria met (no later than April 24)	24 hours/day: 125% Gas Cap
	Adult criteria met (no later than April 24) – June 20	16 hours/day: 125% Gas Cap 8 hours/day: 20 kcfs Performance Standard
Little Goose [B, C]	April 3 – June 20	16 hours/day: 125% Gas Cap 8 hours/day: 30% Performance Standard
Lower Monumental [A, C]	April 3 until adult criteria met (no later than April 24)	24 hours/day: 125% Gas Cap
	Adult criteria met (no later than April 24) – June 20	16 hours/day: 125% Gas Cap 8 hours/day: 40%
Ice Harbor	April 3 – June 20	24 hours/day: 125% Gas Cap
McNary	April 10 – June 15	24 hours/day: 125% Gas Cap
John Day [D]	April 10 – June 15	16 hours/day: 125% Gas Cap 8 hours/day: 32% Performance Standard
The Dalles [E]	April 10 – June 15	24 hours/day: 40% Performance Standard
Bonneville [F]	April 10 – June 15	24 hours/day: 125% Gas Cap

A. Lower Granite and Lower Monumental Adult Criteria – Within 1 business day of when the earliest of the following conditions occurs: (1) a cumulative total of 25 adult spring Chinook salmon (not including jacks) pass Lower Monumental Dam; or (2) a cumulative total of 50 adult spring Chinook salmon (not including jacks) pass Ice Harbor Dam; or (3) April 24, 2023, the Corps will implement 20 kcfs performance standard spill, up to 40% spill to manage high flows, at Lower Granite and 40% spill at Lower Monumental for 8 consecutive AM hours, 0400–1200, to target hours of peak adult passage. If lack of load conditions precludes the implementation of 20 kcfs performance standard spill at Lower Granite and 40% spill at Lower Monumental during the targeted AM period, those blocks will begin as soon as practicable during AM hours and continue for up to 8 consecutive hours. If a second block is needed, it will start as soon as load conditions allow, continue for at least two consecutive hours, and conclude no later than 2000. During periods of high river flow, the 8-hour Lower Granite performance standard spill may increase from 20 kcfs up to 40% of total river outflow if needed to improve conditions to meet performance standard blocks.

B. Little Goose – The 8 hours of performance standard spill will occur between the hours of 0300 and 2200 in one or two blocks per calendar day. Within 1 business day of a cumulative total of 25 adult spring Chinook salmon (not including jacks) passing Lower Monumental Dam, the Corps will implement performance standard spill at Little Goose Dam for 8 consecutive AM hours (April 3–15 starting at 0500 hours; April 16–June 20 starting at 0400 hours) to target hours of peak adult passage. If lack of load conditions preclude the implementation of performance standard spill during the targeted periods, performance standard spill will begin as soon as practicable during AM hours and continue for up to 8 consecutive

hours. If a second block is needed, it will start as soon as load conditions allow, continue for at least two consecutive hours, and conclude no later than 2000.

C. During periods of high river flow that exceeds powerhouse hydraulic capacity, implementing 8 consecutive hours of spill as described in Footnotes A and B may result in storing additional inflow in the forebay above MOP. If it is necessary to pond water to achieve the 8-hour block of spill during high inflow, water stored above MOP should be drafted out over the remaining hours by increasing spill to pass inflow from 1200-1600 hours, then increasing spill as necessary from 1600-0400 to draft the pool back to MOP. If it is forecasted that the drafting spill will result in exceeding 130% TDG in the tailrace, all 16 hours will be used to return the pool to MOP. In lack of load conditions performance standard spill blocks will be prioritized at Little Goose, Lower Monumental, and Lower Granite dams, in that order.

D. John Day Dam – The 8 hours/day of performance standard spill may occur with some flexibility, in either a single 8-hour block or two separate blocks per calendar day. Performance standard spill will not be implemented between 2200-0300 hours.

E. The Dalles Dam –TDG in The Dalles tailrace may fluctuate up to 125% prior to reducing spill at upstream projects or reducing spill at The Dalles below 40%. Maintain 40% spill for 24 hours at The Dalles and reduce John Day spill below the 125% TDG spill cap as needed for TDG management. Spill above 40%, up to 125% TDG, may occur for TDG management or for carrying reserves.

F. Bonneville Dam – Spill for fish passage should not exceed 150 kcfs due to erosion concerns.

In its implementation of the 2023 FOP in April, 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 2022 FOP, Section 2.2

Operational Adjustments

1. Lower Granite

Adult spring Chinook counts at Ice Harbor did not exceed the trigger of 50 fish prior to Friday, April 21. Therefore, Lower Granite transitioned to an 8-hour block of performance standard spill daily with a target start time of 0400, or as soon as practicable, and target end time of 1200 starting April 24 pursuant to Table 1, footnote A.

2. Little Goose

Adult spring Chinook counts at Lower Monumental exceeded the trigger of 25 fish on April 23, initiating the transition at Little Goose to an 8-hour block of performance standard spill in the morning starting April 24 pursuant to Table 1, footnote B.

3. Lower Monumental

Adult spring Chinook counts at Ice Harbor did not exceed the trigger of 50 fish prior to Friday, April 21. Therefore, Lower Monumental transitioned to an 8-hour block of performance standard spill daily with a target start time of 0400, or as soon as practicable, and a target end time of -1200 starting April 24 pursuant to Table 1, footnote A.

Table 2: Spill Variance Table – April 2023 (4/1 to 4/30)

Project	Parameter	Date	Time[10]	# of Hours	Type	Reason
John Day	Reduced Spill	4/20	1400-1800	5	Maintenance	Hourly spill was 69 kcfs (less than adjusted spill target of 72 kcfs) due to testing on Unit 5 before returning to service.
The Dalles	Reduced Spill	4/23	2000	1	Program Error	Hourly spill decreased to 35% (less than adjusted spill target of 40% ± 1%) due to GDACS error.
The Dalles	Additional Spill	4/21	1500-1600	2	Human Error	Hourly spill increased to between 43 and 44% (greater than adjusted spill target of 40% ± 1%) due to a delay in changing to the appropriate spill target.

Table 3: Pre-Coordinated Operations – April 2023 (4/1 to 4/30)

Project	Parameter	Date	Time[11]	# of Hours	Type	Reason
Lower Monumental	Reduced Spill	4/12	1100	1	Maintenance	Hourly spill was 65 kcfs (less than adjusted spill target of 68 kcfs) due to Remedial Action Scheme (RAS) testing on Unit 6. Regionally coordinated via 2023 FOP, Section 4.4.1.
Lower Monumental	Reduced Spill	4/24	0600	1	Navigation	Hourly spill decreased to 38% (less than adjusted spill target of 40% ± 1%) for navigation. Regionally coordinated via 2023 FOP, Sections 4.1 and 4.6.
The Dalles	Reduced Spill	4/12	2300	1	Transmission Reliability	Hourly spill decreased to between 35 and 38% (less than adjusted spill target of 40% ± 1%) due to an increase in generation to deploy reserves. Regionally coordinated via 2023 FOP, Section 4.4.1.

[10] 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.

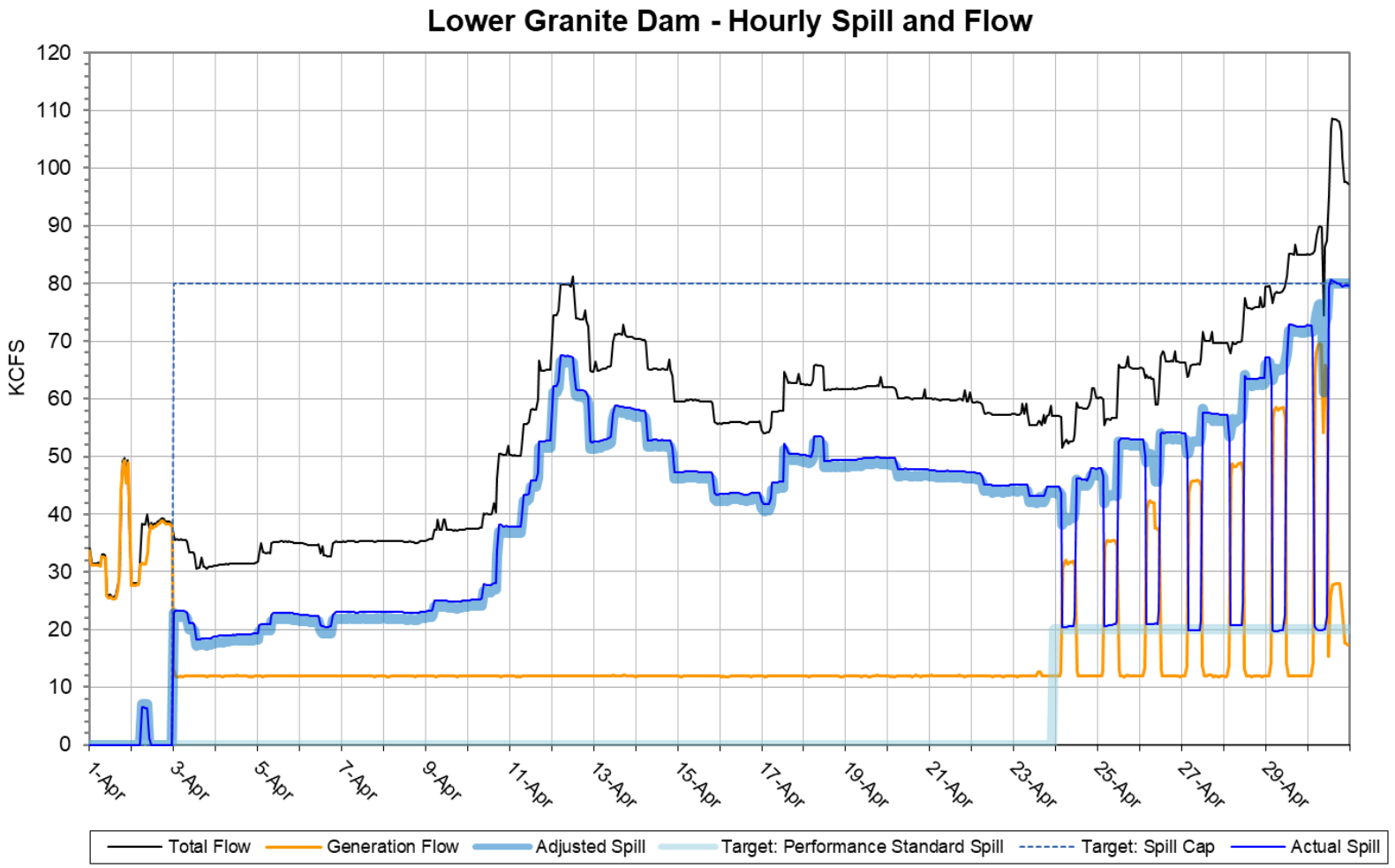
[11] Note: Data collected for reporting spill variances is reported using hourly-averaged data. Therefore, while spill may be increased or decreased for only a portion of an hour, it is represented in the Pre-Coordinated Operations Table as an hour.

Table 4: April 2023 Average Percent TDG Values Table (4/1 to 4/30)

Station:	LWG	LGNW	LGSA	LGSW	LMNA	LMNW	IHRA	IDSW	MCNA	MCPW	JDY	JHAW	TDA	TDDO	BON	CCIW
Gas Cap %:		125		125		125		125		125		125		125		125
4/1/2023	104	102	106	104	106	106	105	105	106	105	•[12]	103	•	104	•	•
4/2/2023	104	103	104	105	106	108	105	106	105	106	•	103	•	104	•	•
4/3/2023	103	109	104	111	105	113	105	113	104	104	•	102	•	103	•	•
4/4/2023	102	109	103	111	104	116	104	113	103	103	•	102	•	102	•	•
4/5/2023	101	111	103	112	103	116	104	113	104	105	•	102	•	103	104	111
4/6/2023	102	112	103	112	103	116	105	114	106	105	104	104	105	104	•	112
4/7/2023	103	112	104	113	104	116	109	114	108	108	104	104	105	104	105	113
4/8/2023	102	111	104	113	105	116	110	114	108	106	103	104	104	103	105	112
4/9/2023	102	112	105	112	108	116	111	114	108	109	104	104	104	103	106	113
4/10/2023	104	114	110	115	110	118	113	115	109	117	105	115	104	110	106	115
4/11/2023	102	116	110	117	111	117	113	116	108	116	104	114	109	111	105	117
4/12/2023	102	120	111	121	111	119	114	117	107	117	104	117	112	115	107	120
4/13/2023	103	119	111	120	114	118	114	116	107	115	105	117	113	115	111	120
4/14/2023	101	119	112	120	116	118	116	116	108	115	105	117	114	116	113	118
4/15/2023	101	117	114	119	118	117	116	116	110	116	105	116	114	116	114	117
4/16/2023	102	116	117	118	118	116	117	114	110	115	106	115	115	116	115	117
4/17/2023	103	118	117	119	119	117	117	116	110	116	107	115	113	116	114	118
4/18/2023	103	118	117	119	117	118	116	116	110	115	107	116	113	114	113	117
4/19/2023	102	118	115	119	115	117	113	116	108	115	107	115	112	114	113	117
4/20/2023	100	117	113	119	114	117	111	116	106	115	108	115	112	114	111	117
4/21/2023	100	117	113	119	115	117	112	116	106	115	108	114	114	115	111	117
4/22/2023	101	117	115	118	118	117	115	116	107	115	110	115	115	117	114	117
4/23/2023	103	117	118	118	120	117	117	115	109	115	111	115	117	117	115	117
4/24/2023	103	117	117	118	118	117	116	115	109	115	109	114	113	115	114	117
4/25/2023	102	117	117	120	116	118	114	116	111	115	108	114	112	114	113	117
4/26/2023	102	118	116	121	116	118	115	116	111	116	109	115	116	116	113	117
4/27/2023	101	118	116	120	119	119	116	116	112	116	110	117	115	116	115	118
4/28/2023	103	119	117	121	121	120	118	116	114	116	113	117	117	118	115	119
4/29/2023	103	121	118	122	123	121	119	116	114	118	115	118	117	118	118	121
4/30/2023	104	123	120	124	124	122	121	118	116	118	114	118	117	117	117	121
Exceedances:		0		0		0		0		0		0		0		0

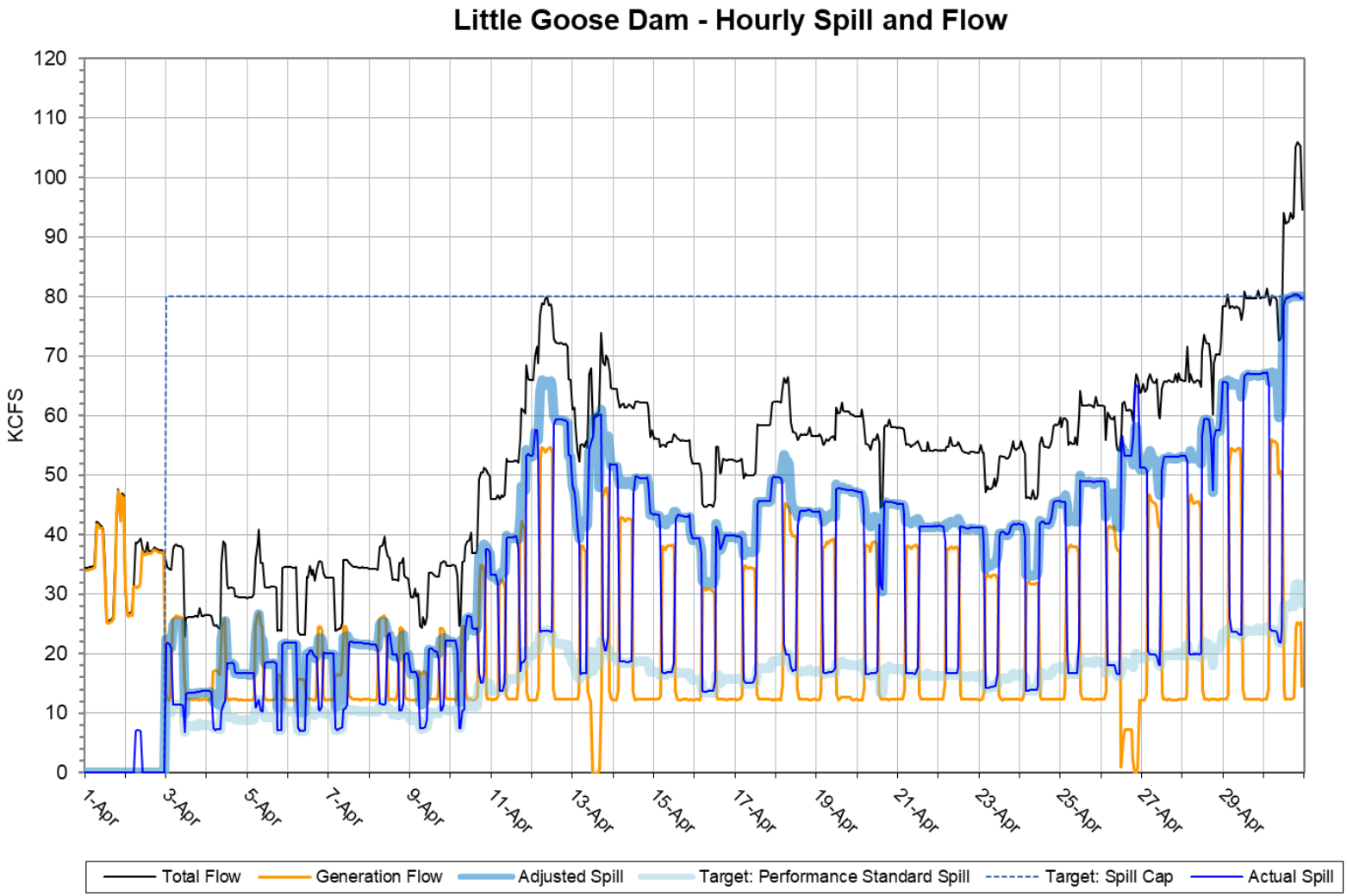
[12] Indicates gauge had not yet been installed.

Figure 1[13]



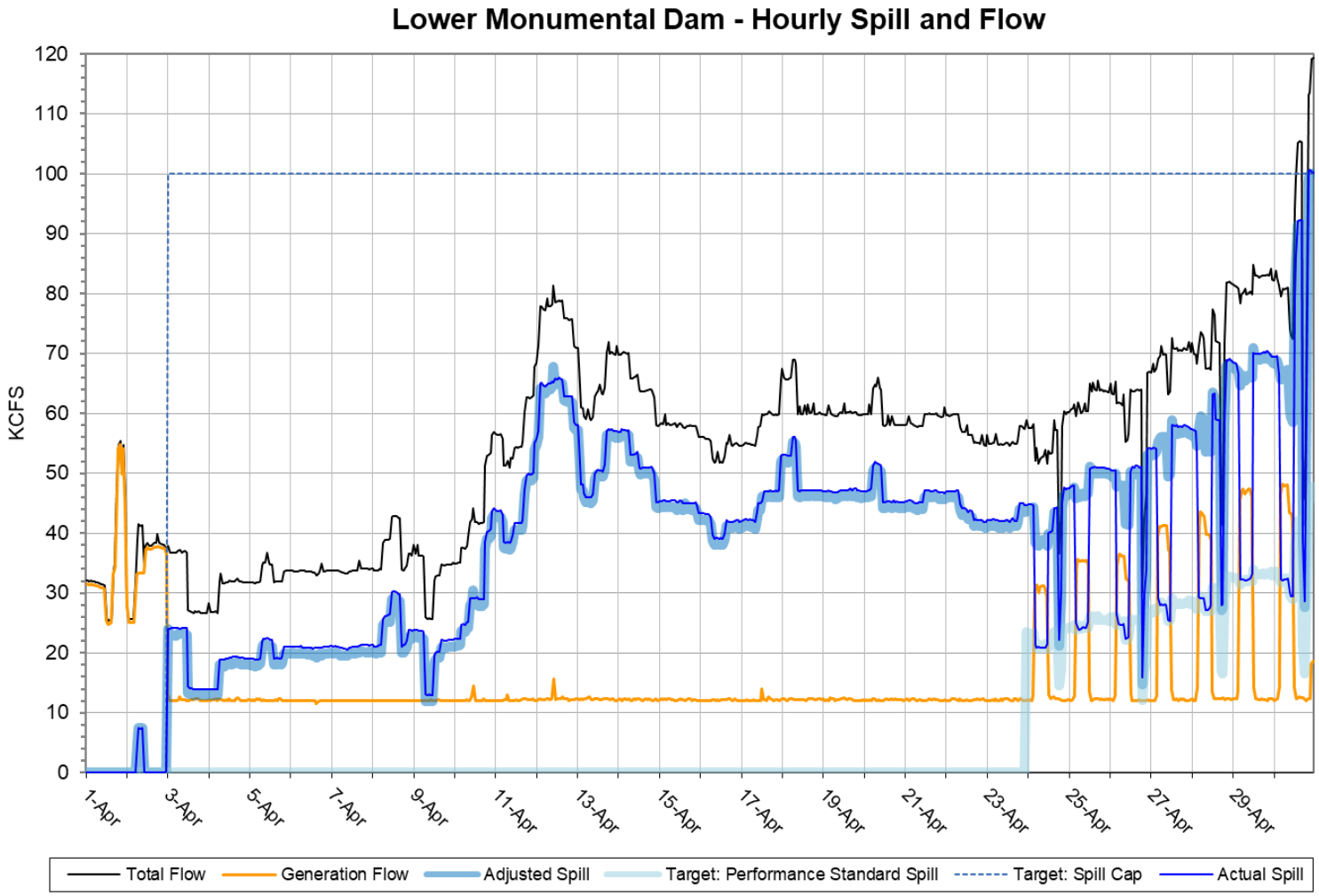
[13] The adjusted spill line is a simplified representation due to limitations of representing a range of minimum generation values. See Tables 2 and 3 for spill variances and pre-coordinated operations.

Figure 2[14]



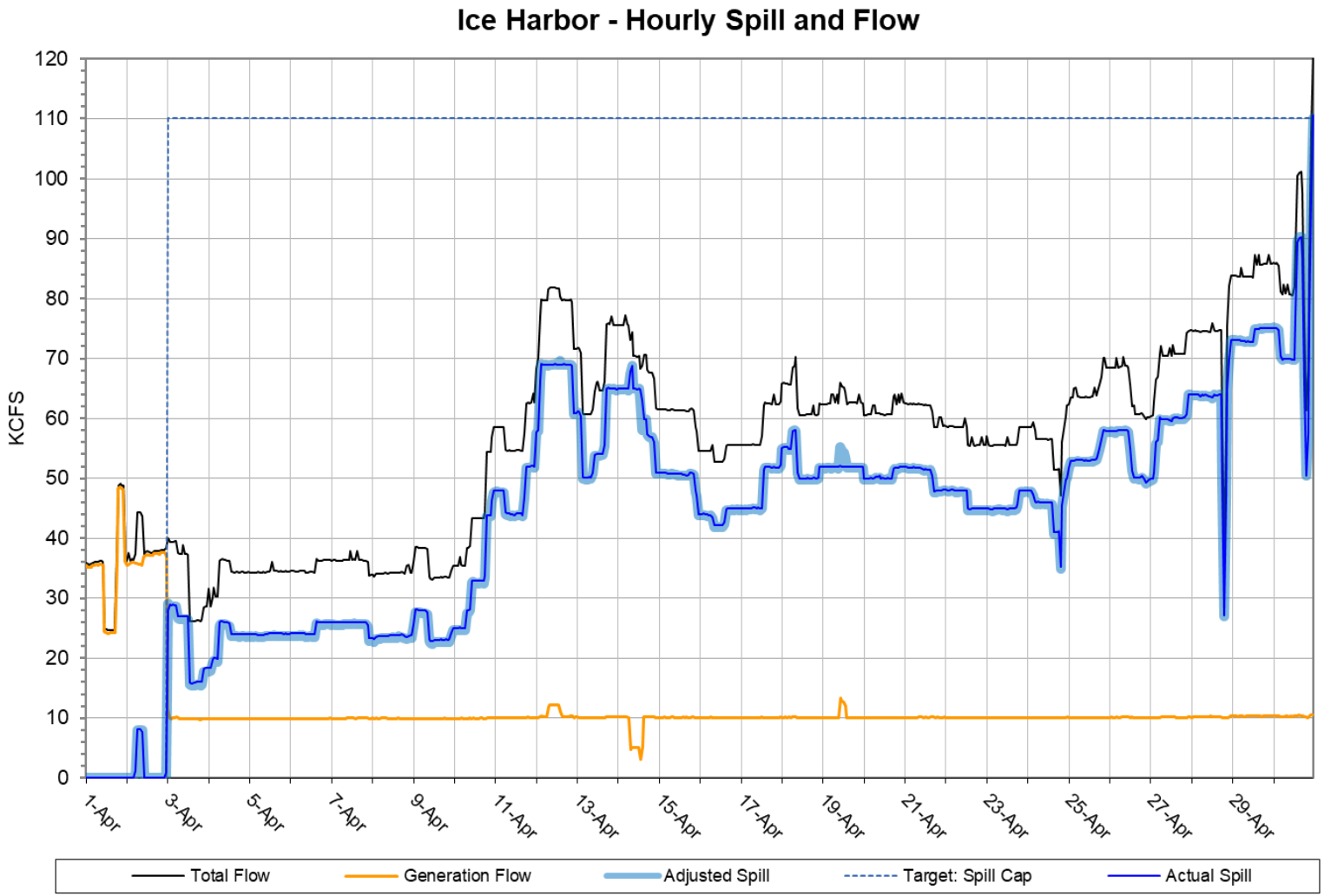
[14] The adjusted spill line is a simplified representation due to limitations of representing a range of minimum generation values. See Tables 2 and 3 for spill variances and pre-coordinated operations.

Figure 3[15]



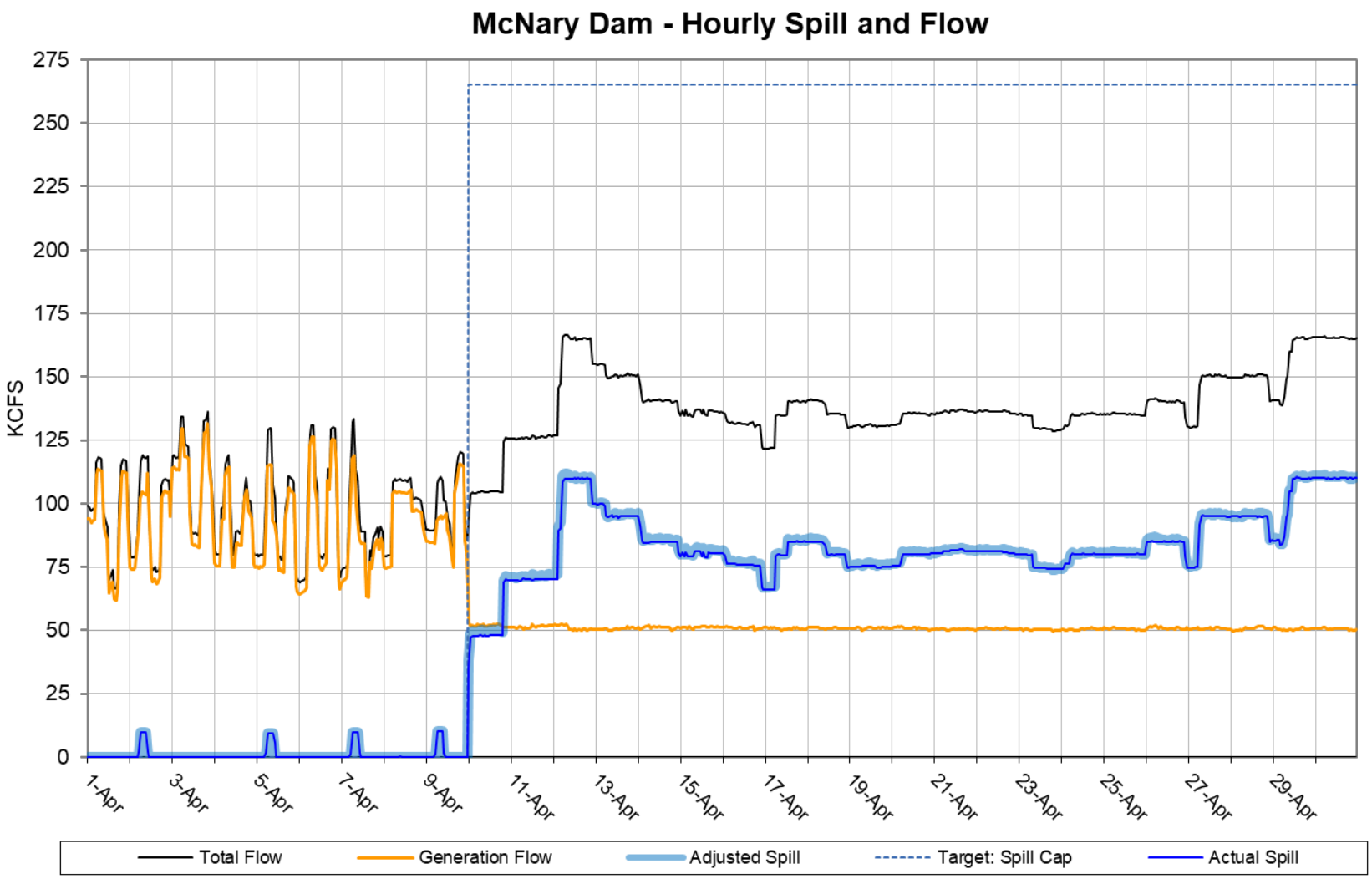
[15] The adjusted spill line is a simplified representation due to limitations of representing a range of minimum generation values. See Tables 2 and 3 for spill variances and pre-coordinated operations.

Figure 4[16]



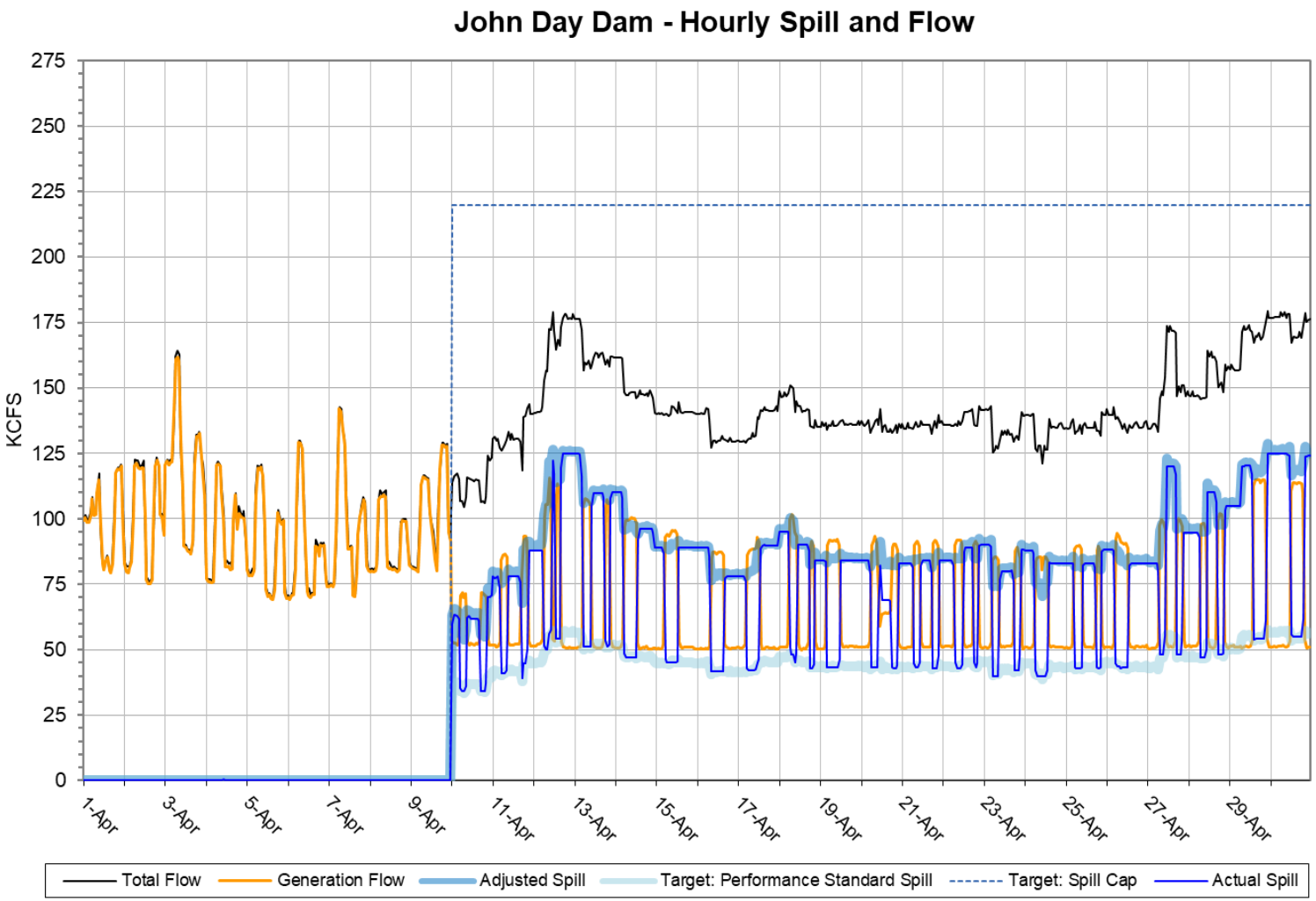
[16] The adjusted spill line is a simplified representation due to limitations of representing a range of minimum generation values. See Tables 2 and 3 for spill variances and pre-coordinated operations.

Figure 5[17]



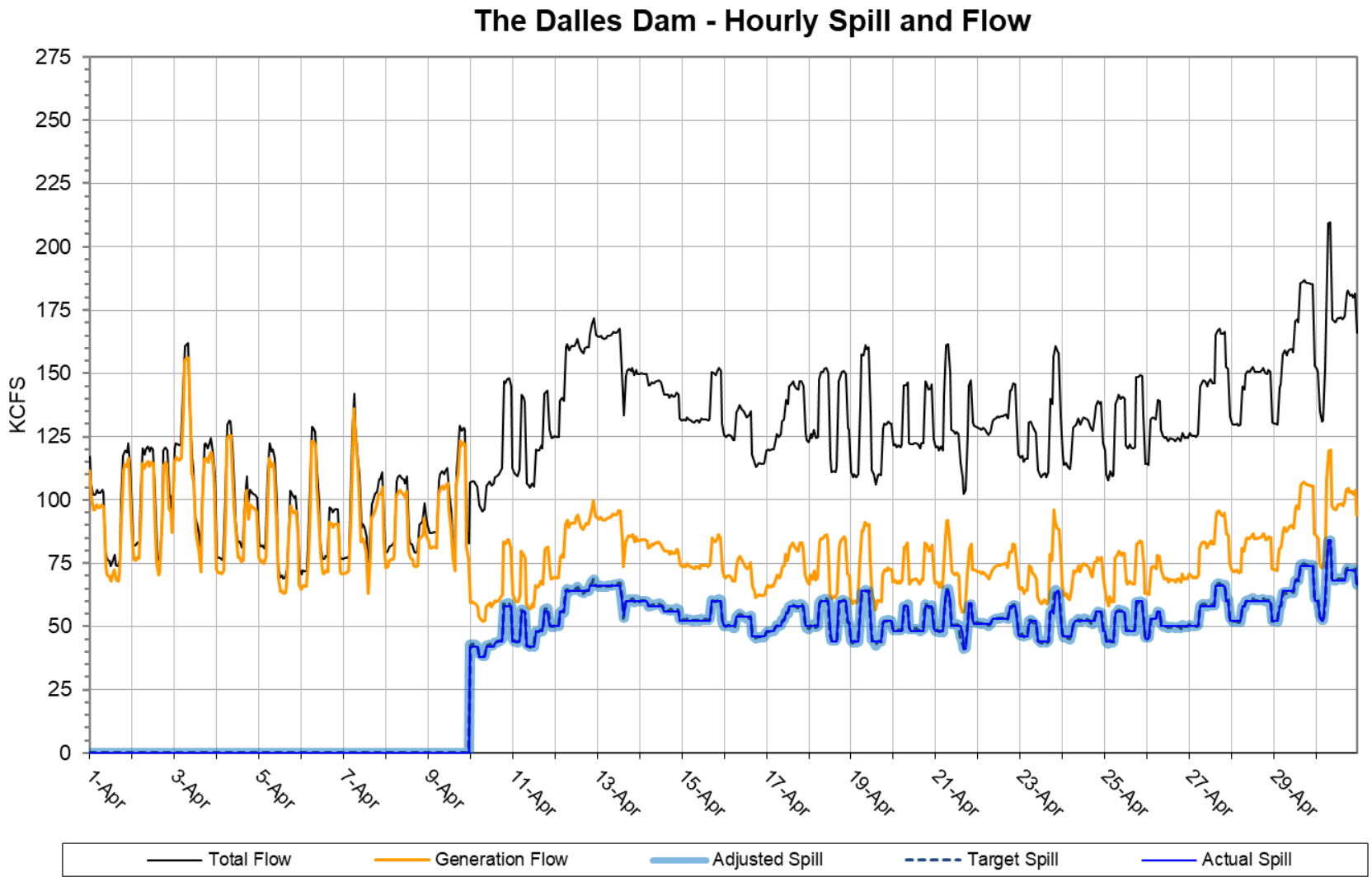
[17] The adjusted spill line is a simplified representation due to limitations of representing a range of minimum generation values. See Tables 2 and 3 for spill variances and pre-coordinated operations.

Figure 6[18]



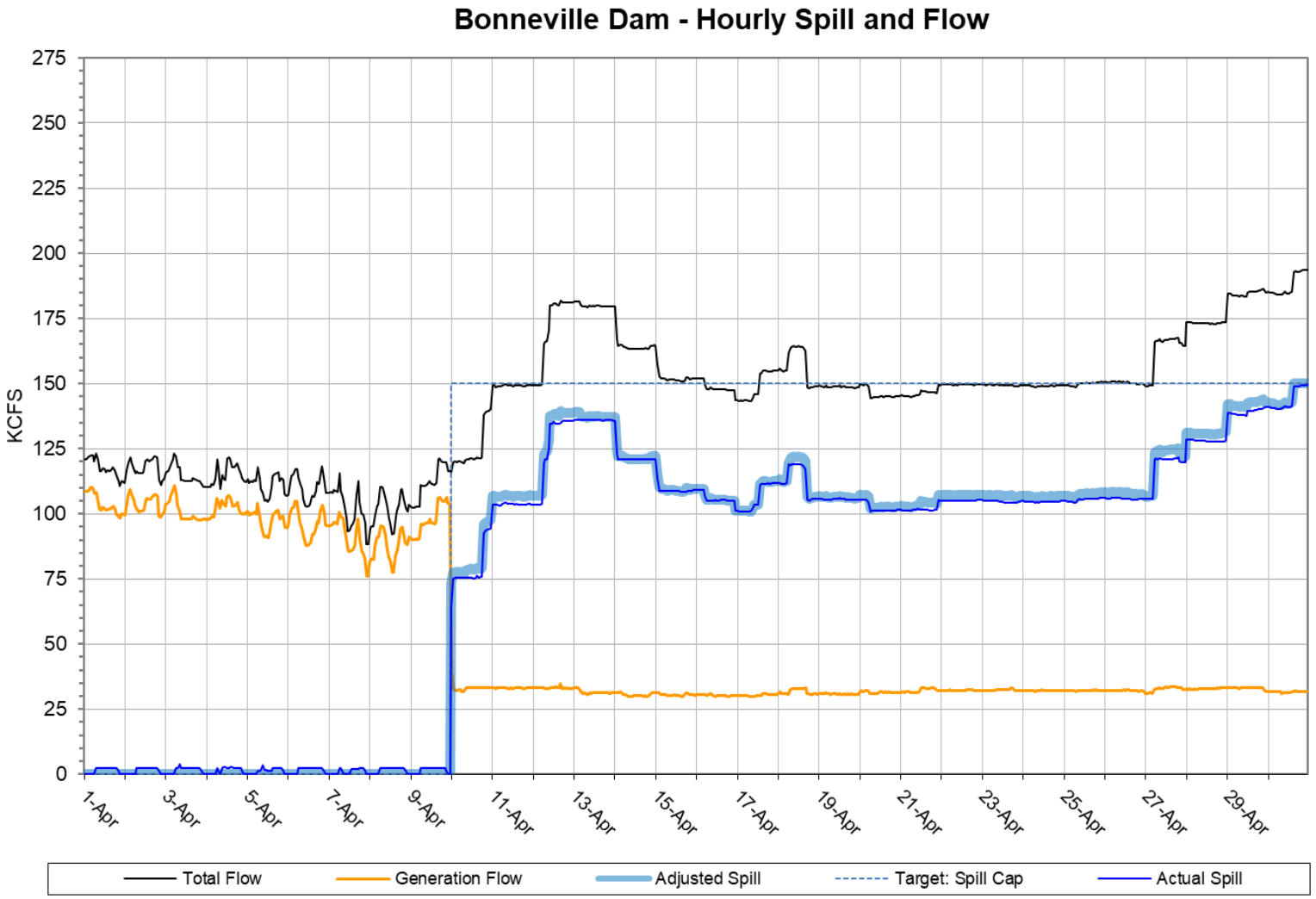
[18] The adjusted spill line is a simplified representation due to limitations of representing a range of minimum generation values. See Tables 2 and 3 for spill variances and pre-coordinated operations.

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.