

Appendix E
2018 Fish Operations Plan (FOP)
SPRING

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IN THE UNITED STATES DISTRICT COURT
FOR THE DISTRICT OF OREGON

NATIONAL WILDLIFE FEDERATION, <i>et al.</i> ,	Case No. 3:01-CV-00640-SI
Plaintiffs,	ORDER FOR 2018 SPRING SPILL
and	OPERATIONS AND 2018 PIT
STATE OF OREGON,	MONITORING
Intervenor-Plaintiff,	
v.	
NATIONAL MARINE FISHERIES SERVICE,	
<i>et al.</i> ,	
Defendants	
and	
NORTHWEST RIVERPARTNERS, <i>et al.</i> ,	
Intervenor-Defendants.	

Pursuant to the Court’s April 3, 2017, Amended Opinion and Order (ECF 2194), regional sovereigns and their staff engaged in technical work with the aim of reaching consensus on a 2018 spring fish passage spill operation at the four lower Snake River and four lower Columbia River projects. Based on the recommendations resulting from this technical work, party conferral processes took place on a 2018 spring fish passage spill implementation plan and proposed order (*see, e.g.*, ECF 2197, 2201, 2215, 2216, 2234, 2235).

Between May and November 2017, the Regional Implementation Oversight Group (RIOG) charged various technical teams, including the spill operations team, with evaluating and developing recommended spill levels, and aiming to avoid unintended negative consequences at each of the eight lower Snake River and lower Columbia River dams. *See* ECF No. 2215; ECF

No. 2234-1; ECF Nos. 2234-2 to 2234-5. In October and November 2017, the spill operations team recommended that the RIOG support the technical team’s proposed 2018 Spring Spill Operations. On November 2, 2017, RIOG members were polled and unanimously supported the technical team’s recommendation for a 2018 spring fish passage spill operation that is responsive to the Court’s injunction ruling.

In addition, the sovereign collaborative process addressed March 1 PIT monitoring, *see* ECF 2215 at 3-4, where the sovereign representatives evaluated different options and considerations for March 1 PIT monitoring, *see, e.g.*, ECF 2214-1 at 136-154; ECF 2234-2 at 18-63. On October 10, 2017, the Fish Passage Advisory Committee (FPAC)—through representatives of the Columbia River Inter-Tribal Fish Commission, Oregon Department of Fish and Wildlife, Washington Department of Fish and Wildlife, Idaho Department of Fish and Game, the Confederated Tribes of the Colville Reservation, the Nez Perce Tribe, the U.S. Fish and Wildlife Service, and the National Marine Fisheries Service—recommended that the Fish Passage Operations and Maintenance (FPOM) team consider recommending that the U.S. Army Corps of Engineers (Corps) begin PIT monitoring at Little Goose Dam, John Day Dam, and Bonneville Dam on March 1, 2018. FPOM reviewed and endorsed this recommendation on October 12, 2017. RIOG addressed the recommendation on October 18, 2017, and no sovereign objected.

In view of the foregoing, the National Wildlife Federation, *et al.* Plaintiffs, Plaintiff-Intervenor the State of Oregon, amicus Nez Perce Tribe, and Federal Defendants (hereinafter, “parties”)¹ propose the following provisions be entered as an order:²

¹ A copy of this proposed order was circulated to the remaining parties and *amici*; with the exception of Columbia Snake River Irrigators Association, no party or *amici* indicated an objection to the proposed order. Northwest RiverPartners states that it has appealed the Court’s April 3, 2017 order and expresses no opinion as to the specifics of this Proposed Order, as RiverPartners was not part of the technical process that led to its development.

² In addition to the terms of Section II, Paragraph 7, Federal Defendants object to entry of any order governing 2018 spring fish passage spill operations or March 1 PIT monitoring that in any way adjusts or modifies the terms set forth herein and request notice and the opportunity to be heard if the Court considers modifications to the terms of this proposed order.

MARCH 1 PIT MONITORING

The parties agree and propose that the following provisions be entered as an order governing the Corps' March 1 PIT monitoring and, upon review and good cause appearing, IT IS ORDERED that:

1. Unless modified or vacated by this Court or modified or vacated by the U.S. Court of Appeals for the Ninth Circuit, the Corps shall commence PIT-tag monitoring at Little Goose Dam, John Day Dam, and Bonneville Dam according to the criteria endorsed by RIOG on October 18, 2017, and as set forth in the Proposed March 2018 Juvenile Bypass System Operations (Exhibit 1). This paragraph of this Order takes effect on March 1, 2018.

2018 SPRING FISH PASSAGE SPILL OPERATIONS

The parties propose the following provisions be entered as an order governing 2018 spring fish passage spill operations, where the following provisions are based on the intent of the parties that: (1) Federal Defendants may make adjustments in planned 2018 spring fish passage spill operations, as described in more detail below, without violating this Order; (2) the Federal Defendants will maximize fish passage spill to the extent feasible in a manner consistent with the state water quality standards for TDG during the 2018 spring fish passage spill period; and (3) Federal Defendants will aim to restore planned fish passage spill operations as soon as practicable after the condition or unintended biological consequence requiring adjustment to planned operations is addressed. Upon review, and good cause appearing, IT IS ORDERED that:

I. DEFINITIONS

1. "RIOG Recommendation" refers to the document providing recommendations for 2018 spring fish passage spill operations developed by the spill operations team and presented to RIOG on November 2, 2017, where all RIOG members present supported the technical team's recommendation. The document is entitled "Summary of Current 2017 Fish Operations Plan

Spring Spill and Spill Operations Team Recommendation to RIOG on Proposed 2018 Spring Spill Operations” and is attached as Exhibit 2.³

2. “2018 Spring FOP” refers to the U.S. Army Corps of Engineers’ (Corps) 2018 Fish Operations Plan, which is attached as Exhibit 3.

3. “Gas cap” refers to the applicable State Total Dissolved Gas (TDG) water quality standards (in percent TDG). The TDG standard for the states of Washington and Oregon is 110%. Both states have provided exceptions to the TDG standard for juvenile fish passage spill operations on the lower Snake and lower Columbia Rivers.⁴ Each state has different calculation methodologies for the different standards, and the Corps applies the more stringent standard when operating under all applicable state TDG standards.

4. As used in the RIOG Recommendation and herein, “Gas cap spill” means spill to the maximum spill level that meets, but does not exceed, the TDG criteria allowed under state

³ The RIOG Recommendation includes four columns for each of the eight lower Snake River and lower Columbia River projects. The first column identifies the 2017 Fish Operations Plan spring spill operations. The second column identifies the estimated spill cap range derived from the Corps’ SYSTDG modeling for a TDG gas cap operation; the Corps will develop actual spill caps in 2018 following the process and procedures set forth in the 2018 Fish Operations Plan and attachment, and actual spill caps may be within, above, or below the estimated spill cap range displayed in the second column. The third column describes constraints, concerns, or comments identified by the spill operations team based on existing information during the regional collaboration processes, where “constraint” identified a biological or safety condition that may warrant spill below gas cap spill levels and “concern” and “comment” identified conditions that do not rise to the level of “constraint” but should be monitored for potential in-season adaptive management. The fourth column identifies the proposed 2018 spring fish passage spill operation.

⁴ The current Washington Criteria Adjustment: TDG must not exceed an average of 115% as measured in the forebays of the next downstream dams and must not exceed an average of 120% as measured in the tailraces of each dam (these averages are measured as an average of the 12 highest consecutive hourly readings in any one day, relative to atmospheric pressure); and a maximum TDG one hour average of 125% must not be exceeded during spillage for fish passage. WASH. ADMIN. CODE §173-201A-200(l)(f)).

The current Oregon Standard Modification: Spill must be reduced when the average TDG concentration of the 12 highest hourly measurements per calendar day exceeds 120% of saturation in the tailraces of McNary, John Day, The Dalles, and Bonneville dams’ monitoring stations, and spill must be reduced when instantaneous TDG levels exceed 125% of saturation for any 2 hours during the 12 highest hourly measurements per calendar day in the tailraces of McNary, John Day, The Dalles, and Bonneville dams’ monitoring stations. OR. ADMIN. R. 340-041-0031 and 340-041-104(3).

law, and gas cap spill is a 24-hour operation at each lower Snake River and lower Columbia River project.

5. As used in the RIOG Recommendation and herein, “Spill cap” means the spill level (flow through the spillway measured in kcfs) at each project that is estimated to maximize spill to a level that meets, but does not exceed, the gas cap in the tailrace and the next downstream forebay. As set forth in Section 2 of the 2018 Spring FOP and the attachment entitled “Procedure for Setting 2018 Spring Spill Caps,” the Corps manages “Gas cap spill” by establishing spill caps for each project (which constitute the “target spill” levels for each project) and operates each project to achieve the target spill levels to the extent feasible.

6. “Lower Snake River projects” refers to Lower Granite, Little Goose, Lower Monumental, and Ice Harbor dams.

7. “Lower Columbia River projects” refers to McNary, John Day, The Dalles, and Bonneville dams.

8. “FPP spill patterns” means the project-specific spillbay gate openings reflected in the 2017 Fish Passage Plan (FPP) tables, as modified by approved change request forms coordinated through the Fish Passage Operations and Maintenance (FPOM) team, to incorporate the results of the spill pattern development team modeling at the Engineer Research and Development Center (ERDC). The modified FPP spill patterns will be reflected in the 2018 FPP, and the Corps will implement the 2018 spring fish passage spill patterns consistent with the 2018 FPP.

II. INJUNCTION

1. Spill Operations: Except as provided in Paragraphs 3 and 4 below, and as set forth in the RIOG Recommendation, the Corps shall implement a gas cap spill operation at each of the lower Snake River projects (from April 3 through June 20) and lower Columbia River projects (from April 10 through June 15) by using the FPP spill patterns and the process and procedures set forth in the 2018 Spring FOP to establish spill caps and target spill levels.

2. 2018 Spring FOP: The 2018 Spring FOP sets forth the Corps' operational plans for managing juvenile fish passage spill during the 2018 spring fish passage spill season, and the Corps will implement the gas cap spill operation by following the provisions of the 2018 Spring FOP. The parties have not stipulated to the 2018 Spring FOP but agree that the 2018 Spring FOP can be implemented consistently with the terms of this Order. As set forth in Section II, Paragraph 8, however, any party may challenge an action taken by Federal Defendants in implementing the 2018 Spring FOP that it views as inconsistent with this order or not warranted by the circumstances.

3. In-Season Adjustments: The Corps may adjust the gas cap spill operation set forth in Section II, Paragraph 1 to address conditions set forth in Section 4.1 of the 2018 Spring FOP. Any adjustments to gas cap spill taken under this paragraph shall be limited to addressing the condition(s) at issue and shall not otherwise modify the provisions of Section II, Paragraph 1.

4. Adaptive Management: The Corps shall utilize the existing RIOG coordination and adaptive management processes to address any unintended biological consequences that may arise in-season as a result of implementing the gas cap spill operations. The Corps' plans for adaptive management are described in Section 4 of the 2018 Spring FOP. Federal Defendants may adjust the gas cap spill operation set forth in Section II, Paragraph 1 to address an unintended biological consequence, and they may do so without consensus among all regional forum members. Any adjustments to the gas cap spill operation taken under this paragraph shall be limited to addressing the unintended consequence at issue and shall not otherwise modify the provisions of Section II, Paragraph 1. As set forth in Section II, Paragraph 8, any party may challenge an action taken by Federal Defendants under this paragraph that it views as inconsistent with this order or not warranted by the circumstances.

5. Reporting Requirement: Federal Defendants shall file with the Court a written monthly report describing the implementation of the gas cap spill operations set forth in Section II, Paragraphs 1-4 ("FOP Implementation Reports"). Sections 4.1 and 8.0 of the 2018 Spring FOP identify the information and events that will be included in monthly FOP Implementation

Reports, and Federal Defendants shall include that information in each report. In addition, for adjustment to planned gas cap spill operations during the 2018 spring fish passage spill season occurring under conditions 4-6 in the “Planned and Routine Operational Adjustments” portion of Section 4.1 of the 2018 Spring FOP, the FOP Implementation Reports shall include the project, parameter, date, time, hours, type, and reason for the adjustment (as those terms are used in the 2017 monthly FOP Implementation Reports’ Spill Variance Tables). Federal Defendants shall file monthly FOP Implementation Reports on or before: May 18, 2018 (for April spill operations); June 15, 2018 (for May spill operations), and July 20, 2018 (for June spill operations).

6. Starting and Termination Dates: For 2018 spring fish passage spill operations, and unless vacated or modified by this Court or modified or vacated by the U.S. Court of Appeals for the Ninth Circuit, this Order shall take effect on April 3, 2018, at 0001 hours, or shortly after midnight, for the Lower Snake River projects and on April 10, 2018, at 0001 hours, or shortly after midnight, for the Lower Columbia River projects, and this Order shall automatically terminate on June 20, 2018, at 2359 hours, or shortly before midnight, for the Lower Snake River projects and on June 15, 2018, at 2359 hours, or shortly before midnight, for the Lower Columbia River Projects.

7. Reservations: Federal Defendants propose this Order to comply with the Court’s April 3, 2017 Amended Opinion and Order. In doing so, Federal Defendants do not waive their right to contest any aspect of the Court’s April 3, 2017 Order or subsequent orders on appeal, and no party waives their rights under the Federal Rules of Civil Procedure, including Federal Rule of Civil Procedure 60(b), to seek to modify any order.⁵

⁵ The other parties that have appealed the Court’s April 3, 2017 Order—including the Kootenai Tribe of Idaho and the Confederated Salish and Kootenai Tribes—likewise do not waive their right to contest any aspect of the Court’s April 3, 2017 Order or subsequent orders on appeal.

8. Conferral: Prior to bringing any dispute regarding this Order to the Court, the parties shall meet and confer and make reasonable efforts to resolve the dispute or show good cause why such conferral was not possible.

DATED this 8th day of January, 2018.

/s/ Michael H. Simon
Michael H. Simon
United States District Judge

EXHIBIT 1

**Proposed March 2018 Juvenile Bypass System Operations
October 17, 2017**

After ongoing discussions within the Fish Passage Operations and Maintenance (FPOM) group and in response to the latest Fish Passage Advisory Committee (FPAC) memo dated October 10, 2017 on the subject, the FPOM recommendation to the RIOG on operating juvenile bypass systems in March, 2018 is as follows:

- Little Goose Dam
 - Three priority units will be screened by March 1, 2018.
 - The additional three lower priority units will be screened by April 1, as specified in the Fish Passage Plan.
 - Unscreened units may be operated between March 1 and April 1 if circumstances require.
- John Day Dam
 - Four priority units will be screened by March 1, 2018.
 - The remaining units will be screened by April 1, as specified in the Fish Passage Plan.
 - Unscreened units may be operated between March 1 and April 1 if circumstances require.
- Bonneville Dam
 - All Powerhouse II units will be screened by March 1, 2018 as currently specified in the Fish Passage Plan.
- All other projects will adhere to Fish Passage Plan criteria regarding the installation of bypass screens and operation of units in 2018.

EXHIBIT 2

**Summary of Current 2017 Fish Operations Plan Spring Spill and
Spill Operations Team Recommendation to RIOG on Proposed 2018 Spring Spill Operations
October 31, 2017**

PROJECT	2017 FISH OPERATIONS PLAN SPRING SPILL (day/night) ²	2018 ESTIMATED 120/115% TDG SPILL CAP RANGE (SYSTDG)	CONSTRAINT/CONCERN /COMMENT	2018 PROPOSED SPRING SPILL ^{1, 2}
LOWER GRANITE	20 kcfs/20 kcfs	20-60 kcfs (28-51%)	<u>Constraint:</u> None <u>Concern:</u> Potential for adult delay with day spill >40–45% due to powerhouse eddy ³ . <u>Comment:</u> FPP patterns are adequate.	120/115% Gas Cap ^{4, 5}

¹ Uncertainty remains about how the system will respond to these new operations, therefore existing adaptive management processes will be employed to help address any unintended consequences that may arise in-season as a result of implementing these proposed spill operations.

² Spill may be temporarily reduced at any project if necessary to ensure navigation safety.

³ Not unanimous regional consensus.

⁴ 120/115% Gas Cap spill is spill up to the maximum level that meets, but does not exceed, the Total Dissolved Gas (TDG) criteria allowed under state law.

⁵ If adult delay at Lower Granite is observed, existing adaptive management processes will be used to address the issue (e.g. reducing daytime spill to 40–45% for eight hours daily (0400-1200 hours)).

PROJECT	2017 FISH OPERATIONS PLAN SPRING SPILL (day/night) ²	2018 ESTIMATED 120/115% TDG SPILL CAP RANGE (SYSTDG)	CONSTRAINT/CONCERN /COMMENT	2018 PROPOSED SPRING SPILL ^{1,2}
LITTLE GOOSE	30%/30%	8-45 kcfs (29-43%)	<p><u>Constraint:</u> Higher risk of adult delay with day spill >30% under current FPP unit priority order.</p> <p><u>Concern:</u> Proposed operation has not been implemented and uncertainty remains concerning adult delay.</p> <p><u>Comment:</u> Model observations show that north unit priority may alleviate concerns with hydraulic conditions that often are associated with adult delay³. Unit 5 will be out of service for repair in spring 2018⁶.</p>	120/115% Gas Cap ^{4,7} (modified north unit priority ⁶)
LOWER MONUMENTAL	Gas Cap/Gas Cap (app. range 20-29 kcfs)	30-44 kcfs (uniform spill pattern) (31-50%)	<p><u>Constraint:</u> None</p> <p><u>Concern:</u> None</p> <p><u>Comment:</u> FPP uniform spill patterns adequate.</p>	120/115% Gas Cap ⁴ (uniform spill pattern)
ICE HARBOR	<p>April 3-28: 45 kcfs/Gas Cap;</p> <p>April 28-June 20: 30%/30% and 45 kcfs/Gas Cap (app. range: 75-95 kcfs)</p>	65-105 kcfs (59-82%)	<p><u>Constraint:</u> None</p> <p><u>Concern:</u> None</p> <p><u>Comment:</u> FPP spill patterns adequate, although some modification to patterns at low flow may improve tailwater hydraulics/egress.</p>	120/115% Gas Cap ⁴

⁶ Additional modeling of Little Goose unit priority and spill patterns will occur December 4-8, 2017 at ERDC.

⁷ If adult delay at Little Goose is observed, existing adaptive management processes will be used to address the issue (e.g., reduce daytime spill to 30% for 8 hours daily (0400-1200 hours) to provide adequate adult passage).

PROJECT	2017 FISH OPERATIONS PLAN SPRING SPILL (day/night) ²	2018 ESTIMATED 120/115% TDG SPILL CAP RANGE (SYSTDG)	CONSTRAINT/CONCERN /COMMENT	2018 PROPOSED SPRING SPILL ^{1,2}
MCNARY	40%/40%	145-190 kcfs (40-68%)	<u>Constraint</u> : None <u>Concern</u> : None <u>Comment</u> : FPP patterns adequate.	120/115% Gas Cap ⁴
JOHN DAY	Apr 10-28: 30%/30% Apr 28 to June 15: 30%/30% and 40%/40%	95-145 kcfs (33-60%)	<u>Constraint</u> : None anticipated ⁸ <u>Concern</u> : None anticipated ⁸ <u>Comment</u> : Pending ERDC model observations.	120/115% Gas Cap ⁴
THE DALLES	40%/40%	65-135 kcfs (37-45%)	<u>Constraint</u> : Gas Cap spill will be contained within spillbays 1-8 (north of spillwall). <u>Concern</u> : None. <u>Comment</u> : FPP spill patterns adequate. Gas Cap spill likely to be contained within the wall.	120/115% Gas Cap ⁴

⁸ Unless constraints/concerns identified during physical model observations.

PROJECT	2017 FISH OPERATIONS PLAN SPRING SPILL (day/night) ²	2018 ESTIMATED 120/115% TDG SPILL CAP RANGE (SYSTDG)	CONSTRAINT/CONCERN /COMMENT	2018 PROPOSED SPRING SPILL ^{1,2}
BONNEVILLE	100 kcfs/100 kcfs	85-130 kcfs (40-56%)	<p><u>Constraint:</u> Corps constraint not to exceed 150 kcfs spill during Gas Cap spill operation to avoid pulling rocks into stilling basin and causing erosion. Gas Cap spill expected to be below 150 kcfs.</p> <p><u>Concern:</u> None.</p> <p><u>Comment:</u> FPP spill patterns adequate; patterns at 150-200 kcfs spill are under review and may be modified to improve egress.</p>	120% Gas Cap ^{4,9} (no downstream forebay)

⁹ Spill to the 120% Gas Cap, not to exceed 150 kcfs.

EXHIBIT 3



DEPARTMENT OF THE ARMY
CORPS OF ENGINEERS, NORTHWESTERN DIVISION
 PO BOX 2870
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2018 Spring Fish Operations Plan

1. INTRODUCTION

The 2018 Spring Fish Operations Plan (2018 Spring FOP) describes the U.S. Army Corps of Engineers' (Corps) planned operations for fish passage at its four lower Snake River and four lower Columbia River dams during the 2018 spring fish migration season, generally April 3 through June 20. The 2018 Spring FOP is responsive to the U.S. District Court for the District of Oregon's Order for 2018 spring fish passage spill operations and the Corps will implement the 2018 Spring FOP consistent with these orders, and it is otherwise consistent with 2014 NOAA Fisheries FCRPS Supplemental Biological Opinion (2014 Supplemental BiOp)¹ including the regional forum process for adaptive management and in-season management,^{2,3} the Corps' Record of Consultation and Statement of Decision (ROCASOD) adopting actions recommended in the 2014 Supplemental BiOp, and the Columbia Basin Fish Accords (Accords). Other project operations and water management actions not specifically addressed in this document will be consistent with the 2014 Supplemental BiOp and other guiding operative documents, including the 2018 Water Management Plan (WMP), seasonal WMP updates, and the 2018 Fish Passage Plan (FPP).

In addition to discussing project specific fish passage spill operations, the 2018 Spring FOP identifies factors that the Corps, the U.S. Bureau of Reclamation, and the Bonneville Power

¹ The 2014 Supplemental BiOp states: "*Specific spill levels will be provided for juvenile fish passage at each project, not to exceed established TDG levels (either 110 percent TDG standard, or as modified by State water quality waivers, currently up to 115 percent TDG in the dam forebay and up to 120 percent TDG in the project tailwater....*"

² The 2014 Supplemental BiOp considered the Action Agencies' 2014-2018 Implementation Plan (2014-2018 IP) and incorporates the 2008 NOAA BiOp and Reasonable and Prudent Alternative (RPA), and the 2010 Supplemental BiOp.

³ 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 the 2014 Supplemental BiOp.

Administration (BPA) (collectively referred to as the “Action Agencies”) must address in the context of operating this complex system of fourteen multiple purpose projects. The 2018 Spring FOP includes a discussion of how the Corps manages fish passage spill and total dissolved gas (TDG), identifies Planned and Routine Operational Adjustments that influence fish passage spill, addresses adaptive management and in-season management processes for fish passage spill and other fish operations including the juvenile fish transportation program, and describes the Corps’ monthly implementation reports.

2. MANAGEMENT OF SPILL FOR FISH PASSAGE AND TDG

2.1. State Water Quality Standards for TDG

The Corps will manage spill for fish passage in spring 2018 consistent with the State of Washington and the State of Oregon’s TDG water quality standards (WQS).^{4 5} Both states have accommodated levels of TDG above 110% for fish passage spill operations for ESA-listed juvenile salmonids at the Corps’ projects on the lower Snake and lower Columbia rivers as follows:

Washington Criteria Adjustment:

- TDG must not exceed an average of 115% as measured in the forebays of the next downstream dams and must not exceed an average of 120% as measured in the tailraces of each dam (these averages are measured as an average of the 12 highest consecutive hourly readings in any one day, relative to atmospheric pressure); and
- A maximum TDG one hour average of 125% must not be exceeded during spillage for fish passage.

Oregon Standard Modification:

- Spill must be reduced when the average TDG concentration of the 12 highest hourly measurements per calendar day exceeds 120% of saturation in the tailraces of McNary, John Day, The Dalles, and Bonneville dams’ monitoring stations.
- Spill must be reduced when instantaneous TDG levels exceed 125% of saturation for any 2 hours during the 12 highest hourly measurements per calendar day in the tailraces of McNary, John Day, The Dalles, and Bonneville dams’ monitoring stations.

⁴ WASH. ADMIN. CODE §173-201A-200(1)(f) provides the maximum TDG criteria for each of the aquatic life use categories and displays Table 200 (1)(f) that states: “Total dissolved gas shall not exceed 110 percent of saturation at any point of sample collection.” The code also addresses exceptions and adjustments, including a provision allowing for an adjustment of the TDG criteria to aid fish passage over hydroelectric dams when consistent with an approved gas abatement plan.

⁵ OR. ADMIN. R. 340-041-0031 provides in part: “the concentration of TDG relative to atmospheric pressure at the point of sample collection may not exceed 110 percent of saturation.” OR. ADMIN. R. 340-041-104(3) identifies findings the Environmental Quality Commission must make for the purpose of allowing increased spill for salmon migration. See http://pweb.crohms.org/tmt/wqnew/state_tdg_waivers/or/2015_5yr.pdf

The terminology that has been adopted to refer to these higher State TDG WQS for fish passage spill are referred to as the “gas cap.” Through the RIOG process to develop recommended spill levels for spring 2018 to comply with the District Court order, the regional sovereigns described the 2018 spring “gas cap spill” as spill to the maximum level that meets, but does not exceed, the TDG criteria allowed under state law. In its implementation of “gas cap spill,” the Corps will operate its fish passage projects in accordance with the State TDG standards described above, including applying the different state calculation methodologies. When the standards vary or conflict, the Corps will apply the more stringent standard.

2.2. Spill Caps

The Corps’ Reservoir Control Center (RCC) is responsible for daily management of spill operations responsive to changing conditions to manage TDG within all applicable State standards. To accomplish this, the RCC sets “spill caps” for each of the Corps’ lower Columbia and lower Snake River projects on a daily basis throughout the fish passage spill season. Spill caps are the maximum spill level or “target spill” at each project that is estimated to meet, but not exceed, the gas cap in the tailrace and the downstream forebay.⁶ In spring 2018, the RCC will establish spill caps to implement the target spill level that is defined in section 6 for all lower Snake and lower Columbia River fish passage projects.

To calculate spill caps, the Corps evaluates observed and forecasted variables that influence TDG levels, including (1) environmental conditions (e.g., total flow, wind, ambient temperature, barometric pressure, incoming TDG from upstream, and travel time⁷ from the upstream project tailrace to the next downstream project forebay); and (2) project operations (e.g. spill level, spill pattern, tailwater elevation, proportion of flow through the turbines, and project configuration). These data are used as input variables into the System TDG (SYSTDG) model in order to estimate TDG levels several days into the future. The Corps runs SYSTDG as a real-time operations tool, when appropriate, to forecast TDG levels at the Corps’ projects. As warranted, the Corps will cross-check projected spill caps with SYSTDG results and consider observed data to make appropriate spill cap adjustments.

The Corps reviews spill caps on a daily basis and adjusts as necessary to maximize spill while maintaining TDG within applicable State standards. Because spill caps will be set to meet, but not exceed, the gas cap at both the tailrace and forebay fixed monitoring stations (FMS) (except at Bonneville Dam), the observed TDG may be at or near the applicable standard at one FMS, but below at the other. At several projects, for a given spill cap, TDG levels may approach the standard in the next downstream forebay prior to that project’s tailrace reaching the standard (i.e., the next downstream forebay is at or near 115%, but the project tailrace is below 120%).

⁶ The terms “spill caps” and “target spill” are typically synonymous and both mean the maximum spill level at each project that is estimated to meet, but not exceed, the gas cap in the tailrace and the downstream forebay; however, in the event the spill cap is constrained (e.g. 150 kcfs maximum spill for Bonneville Dam or containing fish passage spill within the spillwall (bays 1-8) at The Dalles), the monthly FOP Implementation Reports plots will display this level of spill rather than the gas cap spill level. In these specified instances in which the target spill differs from the spill cap, the Corps will provide the spill cap information at the regularly scheduled TMT meetings and reflected in the monthly FOP Implementation Reports.

⁷ Water travel time between projects varies depending on flow and can range from 1-5 days on the lower Snake River and from 1-3 days on the lower Columbia River.

Given these situations and because of the observed and forecasted variables that affect TDG production (such as the environmental conditions and project operations, defined above), spill caps, or target spill levels, will not always achieve the gas cap, and could result in TDG above or below the gas cap. Additional information about how the Corps will manage TDG is described in the “Procedure for Setting 2018 Spring Spill Caps.”

The fish passage projects may spill more than the target spill level due to high river flow that exceeds powerhouse hydraulic capacity. The fish passage projects may also spill more than the target spill level due to a lack of power demand (load). The Corps will attempt to manage excess TDG on a system-wide basis under lack of power demand conditions by incrementally increasing spill at projects throughout the system in the order of priority defined in the Spill Priority List. For this purpose, the RCC also defines spill levels to target TDG in project tailraces of 122%, 125%, 127%, 130%, and 135%. The order of priority is coordinated with regional sovereigns in the TMT to allocate spill to projects to best manage system TDG while also considering how best to protect fish and other aquatic biota.

3. SPILLWAY OPERATIONS AND SPILL LEVEL PRECISION

The Corps plans to achieve the spill cap to the extent feasible; however, actual hourly spill levels at each dam may vary slightly depending on the precision of the spillbay gate settings, real-time fluctuations in flow and/or project head, or automatic load following. At each project, spill is distributed across the spillway according to patterns defined in the project-specific chapters of the FPP⁸ to provide favorable fish passage conditions. Spillbay gates are opened to the settings identified in the FPP spill pattern table that correspond to the spill level that is closest to, but may be slightly higher or lower than, the target spill level. Due to these limitations in spill level precision, the observed hourly average spill level may range up to ± 2 kcfs from the target spill level (or ± 3 kcfs at The Dalles and Bonneville dams, as described in the project-specific sections below).⁹

4. MODIFICATIONS TO PLANNED OPERATIONS AND IN-SEASON MANAGEMENT

For planning purposes, the operations described in the 2018 Spring FOP assume average runoff conditions. Actual runoff varies in magnitude and timing, and observed river flow may be higher or lower than average at any time such that modifications to the planned operations may be required. To accommodate these varying runoff conditions and other routinely observed conditions as they arise, the Corps, in conjunction with the other Action Agencies and NOAA Fisheries, coordinates with regional sovereigns on these conditions and other planned operations through the review of the FOP prior to spring spill operations (see section 4.1). The Corps responds in real-time to these routine conditions and planned operations by implementing adjustments as conditions require without additional coordination.

⁸ The FPP is coordinated annually with regional sovereigns through the FPOM.

⁹ In the event a project operation is adjusted through adaptive management such that target spill is a percentage of total outflow, the hourly spill level is calculated to be within $\pm 1\%$ of the target percentage for the following hour (or more than $\pm 1\%$ as specified in FPP Chapters 3 and 8 spill pattern tables, respectively).

For unanticipated and unplanned conditions that are not pre-coordinated, the Corps will respond as necessary to redress the condition, and when possible, will use the existing regional coordination process¹⁰ to adaptively manage and make necessary in-season adjustments in spill and other fish operations (e.g., spill levels, spill caps, spill patterns, juvenile fish transportation, and minimum operating pool or “MOP” operations).

4.1. Conditions that May Require Adjustments to Planned Operations

Under certain conditions or circumstances, the Corps may be required to adjust spill higher or lower than the target spill level at one or more projects.

Planned and Routine Operational Adjustments:¹¹

1. High flow conditions that exceed powerhouse hydraulic capacity and require spilling more than the target spill level.
2. Low flow conditions that require adjustments in spill level while maintaining project minimum generation requirements (see section 4.3.1. below).
3. Lack of power demand (load) resulting in increased spill.
4. Scheduled turbine unit and/or transmission outages that reduce powerhouse hydraulic capacity and require spilling more than the target spill level.*
5. Standard operations for transmission reliability (see section 4.4.1. below)*
6. Navigation safety concerns (see section 4.6. below).*

Non-routine or Unplanned Operational Adjustments:¹²

1. Contingency operations for transmission reliability (see section 4.4.2 below).
2. Fish emergencies (e.g., high river temperatures that exceed levels safe for fish).

¹⁰ In-season adaptive management changes in spill levels could include adjustments that address unintended biological consequences caused by gas cap spill (e.g., adult passage delays), for the juvenile fish transportation program, for research activities for studies to evaluate fish passage facilities, survival, or other fish-related issues. Spill patterns and biological testing protocols that have not been coordinated to-date will be considered through the regional coordination process using the Corps’ Anadromous Fish Evaluation Program (AFEP) subcommittees, which include the TMT, the Studies Review Workgroup (SRWG), Fish Facility Design Review Work Group (FFDRWG), and FPOM.

¹¹ Planned and Routine Operational Adjustments are spill adjustments due to (1) conditions that occur routinely every year (e.g., high or low flow), or (2) planned operations (e.g., scheduled maintenance, transit of fish transport barge in the tailrace). These are considered pre-coordinated through regional sovereign review of the FOP and the FPP, and are implemented by the Action Agencies as conditions require and without additional coordination through the regional forum processes. Spill adjustments due to routine or planned operations are included in the monthly FOP Implementation Report in the hourly spill and flow charts (plots), and conditions with an (*) are reported in the “Pre-Coordinated Operations” Table. The FPP (Appendix A) identifies actions with pre-coordinated dates.

¹² Spill adjustments that occur due to non-routine or unplanned conditions or operations are implemented by the Action Agencies as conditions require and/or as coordinated with regional sovereigns through the in-season adaptive management process. Non-routine or Unplanned Operational Adjustments that affect spill levels are reported in the FOP Implementation Report Variance Table (and when warranted, a description may also be included in the Operational Adjustments section). When a Non-routine or Unplanned Operational Adjustment does not affect spill levels, information about this is provided in the Operational Adjustments section. If an adjustment continues into the next month, the adjustment is reported in the Pre-Coordinated Operations Table.

3. Conditions related to project safety (e.g., erosion), health and human safety, navigation, or other unforeseen events that require spilling more or less than the target spill level.
4. Other circumstances including human or programming error, unscheduled maintenance or outage, operational limitations (e.g., physical limitations of gate settings and spill patterns outside of the level of precision defined in section 3 above, forebay elevations), and other unanticipated events or emergencies.
5. In-season adjustments following adaptive management coordination through the existing regional coordination process (see section 4 & footnote 9).

4.2. TMT Emergency Protocols

The Corps, and the other Action Agencies, will operate the fourteen Columbia River System (or FCRPS) projects in emergency situations in accordance with the 2018 WMP Emergency Protocol (WMP Appendix 1). This protocol identifies the process the Action Agencies, in coordination with NOAA Fisheries, will use in the event of an emergency concerning project operations that impact planned fish protection measures. The emergency protocols also address the process for coordination with regional sovereigns. The most recent version of the Emergency Protocols is located at:

<http://pweb.crohms.org/tmt/documents/wmp/2018/Final/emerproto/>

4.3. Low Flow Operations

4.3.1. Minimum Generation

All lower Snake and lower Columbia River dams have a minimum generation requirement that has been established to support power system reliability (see section 4.4.). The Corps has identified minimum generation powerhouse outflow values derived from actual generation records (see Table 1). Values stated in Table 1 are approximations that account for varying head or other small adjustments in turbine unit operation that may result in variations from the reported minimum generation flow and spill amount. Conditions that may result in minor variations include:

1. Varying pool elevation: as reservoirs fluctuate within the operating range, flow rates through the generating unit change.
2. Generating unit governor “dead band”: the governor controls the number of megawatts the unit should generate, but cannot precisely control a unit flow; variations may be 1-2% of unit flow. These variations can affect minimum generation ranges included in Table 1.
3. System disturbances: once a generator is online and connected to the grid, it responds to changes in system voltage and frequency. These changes may cause the unit to increase or decrease flow and generation slightly within an hour. Individual units operate differently from each other and often have unit specific constraints.
4. Generation control systems regulate megawatt (MW) generation only; not flow through individual turbine units.

All of the lower Snake River powerhouses may be required to keep one generating unit on line at all times for power system reliability under low river flow conditions, which may result in a reduction of spill at that project if there is insufficient flow in the river. Generally, units 1–3 are the first priority units for operation during the fish passage season for adult fish attraction flow to

the fish ladders, but unit priority is also based on availability. During low river flow conditions, the Corps will operate the lower Snake River projects to the unit priority specified in the FPP and minimum generation ranges identified in Table 1.

Table 1. Minimum generation flow ranges for turbine units at Corps hydropower projects on the lower Snake and lower Columbia rivers.¹³

Project	Turbine Unit	Minimum Generation Flow Range^a (kcfs)
Lower Granite	1, 3	11.8 – 12.9
	2 ^b	17 – 19
	4, 5, 6	13.7 – 14.8
Little Goose	1, 2, 3	11.3 – 11.8
	4, 6	13.8 – 14.4
	5 ^c	16.2 – 17.3
Lower Monumental	1, 2b	10.8 – 12.3
	3 ^b	18.3 - 19.2
	4, 5, 6	14.1 – 14.9
Ice Harbor	1	8.4 – 9.8
	2 ^d	TBD
	3 ^b	11.4 – 12.5
	4, 6	9.4 – 10.6
	5 ^b	13.1 – 14.1
McNary	N/A	50 – 60
John Day	N/A	50 – 60
The Dalles	N/A	50 – 60
Bonneville	N/A	30 – 40

- a. “Minimum Generation” is the minimum number of megawatts (MW) that must be generated at each project in order to support power system reliability. This table defines the resulting flow range (kcfs) through turbines, which is a function of power output (MW), turbine efficiency, and project head.
- b. Lower Granite Unit 2, Lower Monumental Units 2 and 3, and Ice Harbor Units 3 and 5 are restricted due to runner blades that are fixed at a set angle (non-adjustable).
- c. Little Goose Unit 5 is restricted to the upper 1% range due to vibration issues at operating points <120 MW. Unit 5 is scheduled to be out of service for spring 2018 spill season.
- d. Ice Harbor Unit 2 is being rebuilt with a runner design that reduces impacts to fish, scheduled for completion in spring 2018. At that time, testing will be performed to determine the operating range.

There may be situations when river flows are insufficient to maintain minimum generation in Table 1 and the target spill level identified in Table 2 in every hour. Under these conditions, the lower Snake River projects will operate one turbine unit at minimum generation and spill the remainder of outflow. The lower Columbia River projects will also operate at minimum generation and pass the remaining outflow as spill down to minimum spill levels. Additionally,

¹³ The table is accurate as of December, 2017, but may change in-season, as coordinated through FPOM (see the FPP).

inflow provided by non-Federal projects upstream is often variable and uncertain, and in combination with low flow conditions, may result in instances where forebay elevations go outside of the normal MOP ranges for Snake River projects as provided for in the 2014 Supplemental BiOp.

4.3.1.1. Navigation Lock Operation During Low Flows

In the event that a project operation has been adjusted to a target spill level that is a percentage of total outflow through adaptive management during the 2018 spring migration season, emptying the navigation lock during low flow conditions may temporarily result in a reduced percentage of outflow that is reported as spill. During this time, the spill rate remains constant, but the spill reported as a percent of total outflow may be temporarily reduced below the target percentage. This occurs because the volume of water needed to empty the navigation lock during periods of low flow is a greater percentage of the total project outflow than during periods of higher flow.

4.4. Operations for Transmission System Reliability

In managing the fish passage spill operations, the Corps and BPA plan to allocate generation and spill at the eight Corps projects on the lower Columbia and Snake rivers in accordance with the 2018 Spring FOP. Periodically, to ensure the reliability of the transmission system when system conditions warrant, it is necessary to increase or decrease the amount of water flowing through a project's turbines and spillbays at one or more of these projects.

Consistent with past practice, if any of the transmission system conditions listed below are present and can be alleviated by temporarily modifying generation levels at one or more federal projects, the Action Agencies will adjust generation and spill levels to avoid the transmission system impact. These events could result in actual spill being temporarily higher or lower than the target fish passage spill level. Such events may occur coincident with the transmission system event or in subsequent hour(s) should the event impact water balance at a specific hydro project or river reach. The Corps and BPA will work to restore conditions to support target spill operations as soon as practicable. These actions are taken to minimize the risk and/or scope of a transmission system emergency and will be reported in the monthly FOP Implementation Report (see section 8 below).

4.4.1. Standard Operations for Transmission Reliability

Consistent with past practice, the Action Agencies manage the fourteen Columbia River System projects to be prepared to provide electric reliability support as follows:

1. Ensuring sufficient range of generation capability is available to provide the BPA balancing authority¹⁴ area with contingency reserves required by North American

¹⁴ A balancing authority is the responsible entity that maintains load-interchange-generation balance within a Balancing Authority Area, and supports interconnection frequency in real time. Balancing authority area is the collection of generation, transmission, and loads within the metered boundaries of the designated balancing authority. The balancing authority maintains load-resource balance within this area.

Electric Reliability Corporation (NERC) and Western Electricity Coordination Council (WECC) reliability standards.¹⁵

2. Ensuring generation is available to increase or decrease in order to balance load and generation within the BPA balancing authority area to support reliability.
3. Ensuring enough generating units are online and have sufficient capability to increase or decrease generation to meet the BPA balancing authority area frequency response obligations, consistent with reliability standard requirements.
4. Ensuring that there is generation operating at projects in specific locations sufficient for arming for Remedial Action Schemes (RAS).¹⁶ RAS schemes allow the transmission system to automatically respond to unplanned events on the power system by immediately dropping or reducing generation at those specified locations.
5. Maintaining minimum generation levels (see Table 1) at generators in specific locations to maintain correct voltage levels on the power system to ensure reliability.
6. Maintaining enough generation units online in diverse locations on the electrical grid to ensure system stability through rotating inertia.

4.4.2. Contingency Operations for Transmission Reliability

If the routine reliability tools described above are insufficient to resolve the transmission condition, the Action Agencies will implement the preemptive actions detailed in the Power System Emergency Action Plan (Attachment 1 to the TMT Emergency Protocols referenced in section 4.2 above) if time permits. Where necessary, the fourteen Columbia River System projects will be called upon to relieve the following conditions:

1. Increasing or decreasing generation at projects (redispatch) in specific geographic locations to relieve heavily loaded transmission lines if required by system conditions. This includes adjusting generation that flows over specific transmission facilities in order to keep flows over those paths within the requirements of NERC and WECC reliability standards.
2. Increasing or decreasing generation to ensure transmission system stability and/or reliable load service in local areas under specific system conditions. (For example, increasing generation at Ice Harbor Dam to support transmission stability, including providing load service to the Tri-Cities area of Washington, when system conditions require.)
3. Responding to unanticipated significant events, including NERC Energy Emergency Alerts or other system emergencies, consistent with the Power System Emergency Action Plan included as Attachment 1 to the TMT Emergency Protocols.
4. Other unanticipated significant events (e.g. powerhouse fires, earthquakes, etc.)

¹⁵ The Federal Energy Regulatory Commission has certified the NERC as the Electric Reliability Organization responsible for establishing and enforcing national reliability standards. NERC has delegated some of its authority to the WECC as the regional entity responsible for monitoring reliability standards compliance and enforcement in the Western Interconnection.

¹⁶ Remedial Action Schemes are sets of automatic control circuits that switch various types of power system components on or off in response to disturbances on the interconnected transmission system.

These actions will be implemented consistent with the TMT Emergency Protocols (see section 4.2 above).

4.5. Turbine Unit Testing for Maintenance

Turbine units may be operationally tested prior to maintenance and prior to return to service for up to 60 minutes by running the unit at speed no load, various loads within the 1% of peak efficiency range, and, if necessary, up to full load, to allow for measurements and testing. Testing of a unit under maintenance is in addition to a unit operating at minimum generation required for power system reliability. Testing may deviate from unit operating priorities specified in FPP Chapters 2-9 and may use water that would otherwise be used for spill if the running unit for reliability is at the bottom of the $\pm 1\%$ of best efficiency range. Water will be used from the powerhouse outflow allocation if possible, and water diverted from spill for operational testing will be minimized. The Corps coordinates this testing with the region through the FPOM, which is included in Chapters 2-9 of the FPP. Unit outages for required maintenance are described in FPP Appendix A. Maintenance dates are subject to change.

4.6. Navigation Safety

Short-term adjustments in spill or MOP may be required at any of the fish passage projects to address navigation safety concerns.¹⁷ This may include changes in spill patterns, reductions in spill, short-term spill curtailment, or operating above MOP. For instance, some flow conditions may require a 2 ft. operating range at Ice Harbor to accommodate barge traffic in order to provide conditions for navigation safety at the Ice Harbor forebay navigation lock exit. These adjustments may be necessary for both commercial traffic and fish barges.

Additionally, during low flow conditions, adjustments in spill and MOP operations have been necessary at several fish passage projects. For example, unsteady or low flow at Little Goose and Ice Harbor dams (approximately 50 kcfs or less) may impact reservoir elevations and cause inadequate navigation depths at the downstream entrances to the Lower Granite and Lower Monumental navigation locks, respectively. As addressed in the 2014-2018 IP, adjustments to pool elevations at Little Goose and Ice Harbor of up to 1.0 ft. above the MOP range may be necessary to accommodate safe entrance to the upstream navigation locks at Lower Granite and Lower Monumental dams.

High spill levels may create unsafe hydraulic conditions for commercial, non-commercial, and fish transportation barges entering and exiting the tailrace and/or while moored at the fish loading facility. Under these conditions, spill may be reduced temporarily as necessary to maintain safe navigation conditions for commercial, non-commercial, or fish transportation barges, which may result in temporarily filling the pool above the MOP range, depending on river flow.

¹⁷ The Corps conducts annual surveys to assess sedimentation in the reservoirs and under certain conditions. To ensure safe navigation, there may be a need to operate the pools above the MOP range.

5. JUVENILE FISH TRANSPORTATION PROGRAM

The 2014 Supplemental BiOp calls for an annual review of the previous year's fish survival information, recent transport rates, and available smolt to adult return rates (SARs) (for both inriver and transport smolts) for discussion with the RIOG to inform transport/spill operations for the subsequent year. The best available information will be considered in the Corps' implementation of the juvenile fish transportation program operations at the Snake River collector projects in 2018. Should regional sovereigns recommend adjustments in transportation start dates that differ from those stated herein, the Corps will use the existing regional adaptive management process to make a determination on recommended operational changes.

The following describes the proposed transportation operations for the lower Snake River projects. Detailed descriptions of project and transport facility operations to implement the juvenile fish transportation program are contained in the FPP Appendix B.

5.1. Lower Snake River Dams – Transport Operation and Timing

Transportation will be initiated at Lower Granite, Little Goose, and Lower Monumental dams no later than May 1, or as coordinated with the TMT and RIOG.

The collection of fish at lower Snake River projects for transportation will commence no later than May 1. Barging of fish will begin the following day and collected juvenile fish will be transported from each facility on a daily or every-other-day basis (depending on the number of fish) throughout the migration season. Transportation operations will be carried out at each project in accordance with all relevant FPP operating criteria.

Transportation and spill operations may be adjusted due to research, conditions at fish collection facilities (e.g. overcrowding or temperature extremes), or through the adaptive management process with FPOM and/or the TMT (e.g., to respond to expected environmental conditions, to respond to recent transport vs in-river research results, to better match juvenile outmigration, or to achieve/maintain performance standards).

5.2. Transport Research - Seasonal Effects of Transport

An ongoing annual study will be conducted again in 2018 to determine seasonal effects of transporting fish from the Snake River to optimize a transportation strategy. At Lower Granite, fish will be collected for this study starting on April 2, with marking beginning on April 3.

Depending on the number of fish available, fish will be collected 1-2 days each week with tagging occurring on the day following collection. A barge will leave each Thursday morning with all fish collected during the previous 1-3 days. By barging all fish (minus the in-river group) during 1 to 3 days of collection, barge densities will be maintained at a level similar to what would occur under normal transport operations that time of year. This pattern will occur in the weeks preceding general transportation and will be incorporated into general transportation once that operation begins. The desired transported sample size is 6,000 wild Chinook, 4,000-6,000 wild steelhead, and 4,000-6,000 hatchery steelhead weekly for approximately eight weeks.

6. 2018 SPRING FISH PASSAGE SPILL OPERATIONS

Spring spill operations will 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 will initiate spill at 0001 hours, or shortly after midnight, at each of the projects on the start date. Target spill levels for spring 2018 at each project are defined in Table 2.

Table 2. Summary of 2018 spring spill levels at lower Snake and Columbia River projects.

PROJECT	2018 SPRING SPILL ^{1, 2, 3}
Lower Granite	120/115% Gas Cap ⁴
Little Goose	120/115% Gas Cap ⁵ (modified north unit priority) ⁶
Lower Monumental	120/115% Gas Cap (uniform spill pattern)
Ice Harbor	120/115% Gas Cap
McNary	120/115% Gas Cap
John Day	120/115% Gas Cap ⁷
The Dalles	120/115% Gas Cap ⁸
Bonneville	120% Gas Cap ⁹ (no downstream forebay)

1. Uncertainty remains about how the system will respond to these new operations, therefore existing adaptive management processes will be employed to help address any unintended consequences that may arise in-season as a result of implementing these proposed spill operations.

2. Spill may be temporarily reduced at any project if necessary to ensure navigation safety or transmission reliability.

3. 120/115% Gas Cap spill is spill to the maximum level that meets, but does not exceed, the TDG criteria allowed under state law.

4. If adult delay at Lower Granite is observed, existing adaptive management processes will be used to address the issue (e.g. reducing daytime spill to 40–45% for eight hours daily (0400-1200 hours)).

5. If adult delay at Little Goose is observed, existing adaptive management processes will be used to address the issue (e.g., reduce daytime spill to 30% for 8 hours daily (0400-1200 hours) to provide adequate adult passage).

6. Additional modeling of Little Goose unit priority and spill patterns will occur December 4-8, 2017 at ERDC.

7. Unless constraints/concerns identified during physical model observations.

8. Gas cap fish passage spill restricted to spillbays 1-8.

9. Spill to the 120% Gas Cap, not to exceed 150 kcfs.

7. PROJECT-SPECIFIC OPERATIONS

The following sections describe 2018 spill operations for each project. The Corps will implement established spill patterns for all projects as described in the FPP.

7.1. Lower Granite Dam

7.1.1. Spring Spill April 3–June 20: Gas Cap (see section 2.1), 24 hours/day.

7.1.2. Operational Considerations: None known for spring 2018.

7.2. Little Goose Dam

7.2.1. Spring Spill April 3–June 20: Gas Cap (see section 2.1), 24 hours/day.

7.2.2. Operational Considerations: None known for spring 2018

7.3. Lower Monumental Dam

7.3.1. Spring Spill April 3–June 20: Gas Cap (see section 2.1), 24 hours/day using the uniform spill pattern.

7.3.2. Operational Considerations:

- Transit of the juvenile fish barge across the Lower Monumental tailrace, docking, and departure from the collection facility, may require a reduction in spill below the target spill level for safety concerns. The towboat captain may request spill be reduced or eliminated during transit. During juvenile fish loading operations, spill is typically reduced to 15 kcfs, but can be reduced further if necessary for safety reasons. Barge loading duration can be up to 3.5 hours. Reducing spill may cause the Lower Monumental pool to briefly operate outside of MOP elevations.¹⁸

7.4. Ice Harbor Dam

7.4.1. Spring Spill April 3–June 20: Gas Cap (see section 2.1), 24 hours/day.

7.4.2. Operational Considerations: None known for spring 2018.

7.5. McNary Dam

7.5.1. Spring Spill April 10–June 15: Gas Cap (see section 2.1), 24 hours/day. A spillway weir will be operated in both spillbay 19 and spillbay 20 for the period April 10 through June 7. As in past years, both spillway weirs will be removed from service on June 8 (or next business day as coordinated through the FPOM) for the benefit of subyearling Chinook. This operational change will be coordinated through the FPOM. Temporary spill pattern changes to allow removal of the spillway weirs will occur, however spill will continue at gas cap during the spillway weir removal process using the spill pattern identified in FPP Table MCN-10. Following removal of the spillway weirs, the spill

¹⁸ With spill levels in 2018 targeting TDG spill caps, reducing spill for long durations could pose problems staying within MOP at Ice Harbor Dam -- the downstream project.

pattern contained in Table MCN-9 in FPP Chapter 5 will be used for the remainder of the spring.

7.5.2. Operational Considerations: None known for spring 2018.

7.6. John Day Dam

7.6.1. Spring Spill April 10–June 15: Gas Cap (see section 2.1), 24 hours/day.

7.6.2. Operational Considerations: None known for spring 2018.

7.7. The Dalles

7.7.1. Spring Spill April 10–June 15: Gas Cap (see section 2.1), 24 hours/day.

7.7.2. Operational Considerations:

- Actual hourly average spill levels at The Dalles may range up to ± 3 kcfs according to the spill pattern tables in FPP Chapter 3.
- Gas cap spill will be contained within spillbays 1-8.
- Spill bays 9, 10, 11, 13, 16, 18, 19, and 23 are operationally restricted due to wire rope, structural and concrete erosion concerns.
- The sluiceway is operated for fish passage Mar 1-Nov 30 pursuant to FPP Chapter 3.

7.8. Bonneville Dam

7.8.1. Spring Spill April 10–June 15: Gas Cap (see section 2.1), 24 hours/day.

7.8.2. Operational Considerations:

- Maximum fish passage spill level is 150 kcfs. This constraint is based on physical model observations indicating an increased incidence of rock deposition into the spillway stilling basin at spill ≥ 150 kcfs, which has caused erosion to the structure in the past.
- Minimum spill level is 50 kcfs;¹⁹ however, as observed in past years, to provide acceptable juvenile fish egress conditions in the tailrace under extreme low flow conditions, lower spill levels may be considered and coordinated through the TMT and/or FPOM.
- In April, the TMT will consider the possible effects of TDG on emerging chum salmon downstream of Bonneville Dam. The TMT may request special operations such as flow increases or spill reductions to protect ESA-listed fish.
- Actual hourly average spill levels at Bonneville Dam may range up to ± 3 kcfs according to spill pattern tables in FPP Chapter 2.

¹⁹ Flows at this level are unlikely to occur in during the spring.

- The second powerhouse Corner Collector (5 kcfs flow) will begin operation no later than the morning of April 10 and continue through the remainder of the spill season as coordinated through the FPOM.

8. FOP IMPLEMENTATION REPORTING

The Corps posts monthly FOP Implementation Reports on the following website:

http://pweb.crohms.org/tmt/documents/FOP_Implementation_Reports/. The updates will include monthly project plots containing the following information:

- 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, i.e. the spill cap (see footnote 5);
- 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 section 4.1 above);
- actual spill: the hourly flow over the spillway; and,
- the resultant 12-hour average TDG for the tailwater at each project and for the next project's forebay downstream.

The reports will also provide information on substantial issues that arise as a result of the spill program (e.g. Little Goose adult passage issues), and will address any emergency situations, including spill adjustments for contingency operations for transmission reliability.

The Corps will continue to provide the following data to the public regarding project flow, spill rate, TDG level, and water temperature.

- Hourly flow, generation, and spill quantity data for the lower Snake and Columbia River dams are posted to the following website:
 - <http://www.nwd-wc.usace.army.mil/report/projdata.htm> (web reports with the most recent 8 days of hourly project data and the current month of daily project data)
 - <http://pweb.crohms.org/tmt/wq/historical/> (links to historic hourly project data files in csv-format organized by month back to 2004 including temperature and TDG information).
- Water Quality: Water quality data are received via satellite from FMS in the Columbia and Snake rivers every hour, and placed on a Corps public website upon receipt. Hourly TDG and water temperature data are posted to the following websites:
 - <http://pweb.crohms.org/report/total.html> (web reports with hourly TDG, project outflow and spill for the previous 3 days)
 - http://www.nwd-wc.usace.army.mil/ftppub/water_quality/tdg/ (links to historic hourly water quality data files for each FMS including barometric and total gas pressure, TDG and project outflow and spill in csv-format organized by month back to 2005)
 - Using the hourly TDG readings for each station in the lower Snake and Columbia rivers, the Corps will calculate both the highest 12-hour average TDG levels

(Oregon method) and the highest consecutive 12-hour average TDG levels (Washington method) on a daily basis. These averages are reported at:

http://www.nwd-wc.usace.army.mil/ftppub/water_quality/12hr/

- Spill cap information will be posted to the following site each day:
<http://pweb.crohms.org/tmt/documents/ops/spill/caps/>.

In addition to the monthly FOP Implementation Reports, as represented to RIOG throughout the development of the 2018 spring spill plan, during the 2018 spring fish passage spill season, the Corps will continue to provide status updates at the regularly scheduled TMT meetings about the 2018 spring fish passage spill operations, including reasonably detailed information that is relevant to the Corps' process for implementing spring fish passage spill. At these meetings, the Corps will respond to questions regarding the Corps' process for setting spill caps and the assumptions made in that process.

ATTACHMENT

Procedure for Setting 2018 Spring Spill Caps

U.S. Army Corps of Engineers, Northwestern Division
Columbia Basin Water Management - Reservoir Control Center

In its April 3, 2017, Amended Opinion and Order, the U.S. District Court for the District of Oregon ordered increased spill (spill to the maximum spill level that meets, but does not exceed, the Total Dissolved Gas (TDG) criteria allowed under state law,¹ referred to as “gas cap” hereafter) to begin in the spring 2018 migration season at the U.S. Army Corps of Engineers’ (Corps) four lower Snake River and four lower Columbia River fish passage projects. Consistent with the Court’s order, the Corps, the other Action Agencies, and NOAA Fisheries, in coordination with regional sovereigns, developed fish passage spill operations for the 2018 spring migration season at the eight fish passage projects.

Although the Corps has implemented fish passage spill to meet performance standards in the 2008 NOAA Fisheries Biological Opinion, as supplemented in 2010 and 2014, including up to gas cap levels at certain fish passage projects, the Corps has never operated to the gas cap spill level at all fish passage projects throughout the spring migration season. In order to successfully implement gas cap spill for the spring 2018 migration season, the Corps will apply the following procedures.

1. TDG Water Quality Standards (WQS).
 - a. Each day from April 3 to June 20 (lower Snake River projects) and from April 10 to June 15 (lower Columbia River projects), project spill caps² will be reviewed and adjusted so as not to exceed the applicable State TDG water quality standards (WQS). Daily 12-hour TDG concentrations will be calculated using hourly TDG data from fixed monitoring stations (FMS) placed in the tailrace and next downstream forebay of each project, in accordance with the applicable state’s methodology, which includes rounding TDG levels to the nearest whole number.
 - b. At the four lower Snake River projects, only the State of Washington TDG WQS of 120/115% TDG apply.
 - c. The lower Columbia River borders the states of Washington and Oregon, therefore both states’ TDG WQS apply to McNary, John Day, The Dalles, and Bonneville projects. The

¹ Washington Criteria Adjustment: TDG must not exceed an average of 115% as measured in the forebays of the next downstream dams and must not exceed an average of 120% as measured in the tailraces of each dam (these averages are measured as an average of the 12 highest consecutive hourly readings in any one day, relative to atmospheric pressure); and a maximum TDG one hour average of 125% must not be exceeded during spillage for fish passage. WASH. ADMIN. CODE §173-201A-200(1)(f)).

Oregon Standard Modification: Spill must be reduced when the average TDG concentration of the 12 highest hourly measurements per calendar day exceeds 120% of saturation in the tailraces of McNary, John Day, The Dalles, and Bonneville dams’ monitoring stations, and spill must be reduced when instantaneous TDG levels exceed 125% of saturation for any 2 hours during the 12 highest hourly measurements per calendar day in the tailraces of McNary, John Day, The Dalles, and Bonneville dams’ monitoring stations. OR. ADMIN. R. 340-041-0031 and 340-041-104(3).

² Spill cap is the maximum spill level (flow through the spillway measured in kcfs) at each project that is estimated to meet, but not exceed, the gas cap in the tailrace and the downstream forebay. The Corps manages “gas cap spill” by establishing spill caps for each project (which constitute the “target spill” levels for each project) and operates each project to achieve the target spill levels to the extent feasible.

Corps will operate to the more restrictive state TDG WQS at these projects in order to maintain TDG within all applicable state standards.

2. Spill Caps.

- a. Spill caps will be set starting at Lower Granite Dam (the most upstream fish passage project) and adjusted in downstream order to Bonneville Dam in response to resulting TDG levels.
- b. Spill caps at a project will be set at the maximum level to meet, but not exceed, TDG criteria allowed under state law in the tailrace and the downstream forebay; therefore the Corps will set each project's spill cap using whichever FMS is most likely to exceed the gas cap at each project on a given day. At many projects, the downstream forebay often limits spill caps, rather than the tailrace (i.e., the next downstream forebay is at or near 115%, but the project tailrace is below 120%).
- c. Spill cap estimates are influenced by several factors that cannot be precisely predicted, including (1) environmental conditions, such as total flow, wind, ambient temperature, barometric pressure, incoming TDG from upstream projects, and travel time from the upstream project tailrace to the next downstream project forebay³; and (2) project operations, such as spill level, spill pattern, tailwater elevation, proportion of flow through the turbines, and project configuration. As a result, in many instances, spill caps will not always meet gas cap (i.e., actual TDG levels may be above or below the gas cap).
- d. Specifically, maintaining gas cap spill at all eight projects will be challenging as water travel time to the next downstream project must be factored into making spill cap adjustments. Observed TDG responses to spill cap adjustments at a project will be evident within 24 hours in the tailrace, however it can take up to 5 days, depending on water travel time, to reach the next downstream forebay.

3. Daily Process used to Set Spill Caps.

- a. Daily data review. Each day Corps staff will review observed spill levels and resulting TDG data, flow and weather forecast information, tailwater elevation, unit outage information, and other water quality data. In addition, staff will assess the need for a spill cap adjustment.
- b. Run SYSTDG Model.⁴ The SYSTDG model will be used when appropriate as a real-time operations tool to forecast the TDG production levels for all the projects. As warranted, Corps staff will cross-check projected spill caps with SYSTDG model simulation results to make appropriate spill cap adjustments. It may be necessary to run several simulations until the appropriate spill caps for all projects are determined, since a change at one project affects projects downstream.
- c. Determine spill cap. Corps staff will use the data review and SYSTDG modeling steps described above to determine the appropriate spill caps based on their best professional judgment. Initially, the Corps anticipates making relatively small adjustments in spill

³ Water travel time between projects varies depending on flow and can range from 1-5 days on the lower Snake River and from 1-3 days on the lower Columbia River during gas cap spill operations.

⁴ Comprehensive spill review, which includes SYSTDG modeling when appropriate, will occur during regular work week hours. The Corps will continue the current spill review process for holidays and weekends, i.e., a condensed spill review process will be implemented considering observed data and applied engineering judgment. SYSTDG model runs are not likely to occur for the condensed review.

caps to allow TDG levels to equilibrate because large and frequent adjustments at multiple projects could lead to overcompensation in setting spill caps and result in fluctuations of high or low TDG levels.

- d. Notification. Spill cap adjustments will be provided to each project and BPA duty schedulers daily or as changes are made. Corps staff will typically complete the daily spill cap process by 1400 hours.
 - e. Coordination with regional sovereigns. Spill caps will be posted to the Corps website each day. Updates on spill operations will be provided at Technical Management Team (TMT) meetings.
4. Other Considerations. In addition to the factors described above that may influence spill levels, there are other considerations described in the 2018 Fish Operations Plan that may result in adjustments to spill levels that are different than gas cap spill. See Section 4.1 for a list of these considerations.