

# **Appendix 4**

## **2019 Total Dissolved Gas Management Plan**

**Updated April 2019**

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## 1.0 Introduction

Throughout the Columbia River System elevated levels of total dissolved gas (TDG) saturation are observed where spill occurs at U.S. Army Corps of Engineers (Corps) dams. This TDG Management Plan (Plan) describes voluntary and involuntary spill, use of the Spill Priority List, the process for setting spill caps, TDG management policies, and the TDG monitoring program. The TDG Management Plan is included as Appendix 4 in the annual Water Management Plan.

The Action Agencies also annually develop a Fish Operations Plan (FOP) that provides detailed information on the fish operations, including the fish passage spill program and its implementation, informed by adaptive management and the regional forum process. The FOP identifies target spill for spring spill operations and is included as Appendix E of the annual Fish Passage Plan.<sup>1</sup>

## 1.1 Background

During the 1990s, Snake and Columbia River salmonids were listed under the Endangered Species Act (ESA). Through ESA consultations, the Corps implemented a variety of operational and structural measures that were called for in biological opinions to improve the survival of listed salmonids. The 2008 NMFS Biological Opinion (RPA No. 29), as supplemented in 2010 and 2014, called for the Corps to provide levels of spill for juvenile fish passage at the Corps' four lower Snake River and the four lower Columbia River dams generally developed through performance standard testing.

The Corps recently completed consultation under the ESA with NOAA Fisheries on the ongoing operation and maintenance of the Columbia River System and received a new Biological Opinion (2019 BiOp) on March 29, 2019. The 2019 BiOp evaluated a change to spring spill operations, as described in the 2019-2021 Spill Operation Agreement (December 2018) (Spill Agreement).<sup>2</sup> For 2019, the Spill Agreement calls for a flexible spill operation in spring that varies spill throughout the day with gas cap spill for 16 hour per day and performance standard spill for up to 8 hours per day with a maximum spill rate set to achieve 120% TDG in the tailwater. This Plan is intended to be consistent with the Spill Agreement. Implementation of the Spill Agreement was dependent on the State of Washington Department of Ecology (WADOE) issuing a short-term modification to its water quality criteria for total dissolved gas (TDG) to make it consistent with the State of Oregon's water quality criteria for TDG. The Spill Agreement and WADOE's short-term criteria modification are intended to allow the Corps to provide spill for juvenile fish passage up to 120% TDG as measured directly below each dam in the tailrace during the spring juvenile fish passage spill season (April 3 through June 20 at the lower Snake River dams and April 10 through June 15 at the lower Columbia River dams). WADOE issued the short-term criteria modification for spring spill to the Corps on March 29, 2019. The 2019 FOP identifies target spill for spring in Table 3 of the 2019 FOP. Summer spill levels are identified in Table 4 of the 2019 FOP.

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<sup>1</sup> The Fish Passage Plan may be found at the following link: <http://www.nwd-wc.usace.army.mil/tmt/documents/fpp/>

<sup>2</sup> [https://www.bpa.gov/efw/FishWildlife/SpillOperationAgreement/doc/ECF-2298\\_Spill-Notice-and-Agreement.pdf](https://www.bpa.gov/efw/FishWildlife/SpillOperationAgreement/doc/ECF-2298_Spill-Notice-and-Agreement.pdf)

## 1.2 State Water Quality Standards

The Federal Clean Water Act (CWA) establishes the aquatic life criteria for TDG of 110 percent that have been adopted by the four states (Montana, Idaho, Washington, and Oregon) and regional tribal governments. The states of Washington and Oregon have authorized exceptions (short-term criteria modification/criteria adjustment and TDG standard modification, respectively) to these standards as long as the elevated TDG levels generated by fish passage spill for improved juvenile fish passage survival would not cause more harm to the fish than passing them through other passage routes, such as screened bypasses and turbines. The Corps will manage spill for fish passage in 2019 consistent with the current State of Washington and the State of Oregon's TDG water quality standards (WQS).<sup>3 4</sup>

For 2019 FOP spill (April 10 – August 31 for lower Columbia River dams), the Oregon Standard Modification (issued in 2015) states:

- 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.

For 2019 FOP spring spill (April 3 – June 20 (for lower Snake River dams); April 10 – June 15 (for lower Columbia River dams), the Washington Short-Term Criteria Modification states:

- TDG must not exceed an average of one hundred twenty percent as measured in the tailraces fixed-monitoring sites in the tailrace of each dam. These averages shall be measured as an average of the twelve highest hourly readings in a calendar day; and
- TDG must not exceed a two-hour instantaneous level of one hundred twenty-five percent of saturation for any two hours during the twelve highest hourly measurements per calendar day as measured in the fixed-monitoring sites in the tailrace of each dam.

For 2019 FOP summer spill (June 21 – August 31 (for lower Snake River dams); June 16 – August 31 (for lower Columbia River dams), the Washington Criteria Adjustment states:

- 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

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<sup>3</sup> WASH. ADMIN. CODE § 173-201A-200(l)(f) provides the maximum TDG criteria for each of the aquatic life use categories and displays Table 200 (l)(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.

<sup>4</sup> 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](http://pweb.crohms.org/tmt/wqnew/state_tdg_waivers/or/2015_5yr.pdf)

- A maximum TDG one hour average of 125% must not be exceeded during spillage for fish passage.

## 2.0 Fish Passage Spill and Involuntary Spill

TDG management measures differ depending on whether the spill occurring at Corps and Reclamation dams is voluntary, i.e. spill for the benefit of juvenile fish migration through the Columbia River System; or involuntary, i.e. spill that is dictated by conditions beyond the Corps' control and requires implementation of measures to manage TDG levels given these conditions. The following describes circumstances that result in various types of spill.

**Gas Cap** – refers to the applicable State TDG WQS (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. If each state uses different calculation methodologies for their standards, the Corps applies the more stringent standard when operating under all applicable state TDG standards.

**Gas Cap Spill** – spill to the maximum spill level that meets, but does not exceed, the TDG criteria allowed under state law. Gas cap spill is included in the Spill Agreement and 2019 FOP at each lower Snake River and lower Columbia River project for spring 2019.

**Performance Standard Spill** – The Performance Standard spill is defined as spill levels intended to meet NOAA's performance standard testing, as described in the 2008 Biological Opinion.

**Spill Cap** – 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.

**Fish passage spill (or Voluntary Spill)** - The Corps provides spill for the benefit of juvenile fish passage at the four lower Snake River and four lower Columbia River dams in accordance with the operative biological opinions and in a manner that is consistent with the Clean Water Act.

**Involuntary Spill (or Forced Spill)** - Involuntary spill is driven largely by hydrologic capacity at each dam; the quantity of water that exceeds the capacity of a dam to either temporarily store the water upstream of the dam or pass the water through its turbines. In these circumstances, water must be released through the spillway. Involuntary spill occurs due to either **Lack of Load Spill** or **Over Capacity Spill**, but can also occur as a result of the management of reservoirs for flood risk<sup>5</sup>, scheduled or unscheduled turbine unit outages or transmission outages

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<sup>5</sup> The Corps directs operations of storage projects in the Columbia Basin to manage flood risk. Storage reservoir pools are drafted in the winter and early spring to provide space to capture part of the spring runoff, reducing peak flows in the river. This flood risk management operation may require spill from storage reservoirs, which may result in elevated levels of TDG in the river system. The Corps and other action agencies work to manage system flood risk operations in a manner that reduces the need to spill at levels that exceed TDG water quality standards; however, there are conditions in which fulfilling the Corps' flood risk management authorities necessitates drafting storage reservoirs.

of various durations, passing debris, or any other operational and/or maintenance activities required to manage dam facilities for safety and authorized project uses.

- a) **Lack of Load Spill:** Occurs when the available market for hydropower is less than the power that could be produced by the current river flow with available turbine capacity. When BPA cannot access sufficient market to sell hydropower and there is insufficient storage capability, the river flow must be released over the spillway or through other regulating outlets. Lack of load spill generally occurs during times of high flows (e.g., in the spring when power demands are low both in California and the Pacific Northwest). Releases from upstream storage dams during high load periods (generally morning and evening) can result in high flows at downstream dams during low load periods (e.g., middle of the night), causing lack of load spill. Lack of load spill is managed on a system-wide basis to distribute TDG levels across the Federal projects using the Spill Priority List. The Spill Priority List is a lack of load TDG management plan that has been developed for involuntary spill that results in exceeding the TDG standard when lack of load conditions require spill. The Corps works with the region to develop the Spill Priority List that identifies the order in which projects spill in order to minimize TDG system wide. See additional information on the Spill Priority List in Section 3.0 below.
  
- b) **Over Capacity Spill:** Occurs when flows exceed the hydraulic capacity of the available power generation facilities at a specific dam. Over capacity spill can be affected by high river flows, planned and unplanned unit outages, planned and unplanned transmission outages, and other transmission constraints. Any of these conditions physically limit the potential for hydropower production. Over capacity spill will generally be the amount of project outflow in excess of the maximum amount that can be released through all available generators and other outlet structures (e.g., sluiceways and fish ladders). In general, when this condition occurs, the affected project will be operating at maximum generation, but within the Fish Passage Plan turbine operating criteria capability to minimize the amount of spill.

Over capacity spill can also occur when turbines cannot be used because their capacity must be held in reserve to provide mandatory reserve power capacity (reserves) for contingencies and load balancing. **Reserves** (Reserve Power Capacity) are the amount of generation capacity above the amount currently in use that is immediately available to maintain system reliability. At projects that must carry reserve power capacity, these projects can only be loaded to the maximum available generation minus the reserve capacity allocated to that project. Spill for maintaining reserves primarily occurs at Grand Coulee, Chief Joseph, The Dalles, John Day, Bonneville, and occasionally McNary dams.

- c) **Miscellaneous spill:** Occurs when water is passed through various dam structures for other purposes. These structures include the fish ladders, juvenile fish bypass, navigation locks, ice and trash sluiceways, Bonneville Powerhouse 2 corner collector, etc. Miscellaneous spill occurs most hours during the year and especially during April through August when fish are migrating.

- d) **Special Spill Events:** Occur for the purposes of passing debris or operational and/or maintenance activities required to manage dam facilities for safety and multiple uses. These are infrequent and generally of short duration.

### 3.0 Spill Priority List

The Spill Priority List identifies the order and amount of spill at the Corps’ Columbia River Basin dams and Grand Coulee Dam for management of lack of load spill and the expected TDG production system-wide. The Spill Priority List is used throughout the year during times of involuntary spill. The Spill Priority List consists of levels based on ascending TDG values, a spill rate for each project that is estimated to produce the TDG values and an order of projects.

#### 3.1 Spill Levels

Values on the Spill Priority List serve as a reference for expected TDG production at the dams. During the period of no fish passage, the levels of the Spill Priority list are shown below:

- Level 1 – Spill flows up to 110 percent TDG in the project tailrace
- Level 2 – Spill flows up to 115 percent TDG in the project tailrace
- Level 3 – Spill flows up to 120 percent TDG in the project tailrace
- Level 4 – Spill flows up to 122 percent TDG in the project tailrace
- Level 5 – Spill flows up to 125 percent TDG in the project tailrace
- Level 6 – Spill flows up to 130 percent TDG in the project tailrace
- Level 7 – Spill flows up to 135 percent TDG in the project tailrace

During the fish passage season, estimated spill levels are grouped into different TDG production levels on the Spill Priority List as shown in Table 1 and 2. Level 1 spill shown in the tables are consistent with the Spill Agreement and applicable State TDG standards. The TDG is evaluated at the appropriate fixed monitoring stations.

Table 1. The TDG target for each level of the Spill Priority List by project during spring spill.

Project	Level 1	Level 2	Level 3	Level 4	Level 5	Level 6
Fish passage projects	120%	122%	125%	130%	135%	--
Gas Cap						
CHJ	110%	120%*	122%	125%	130%	135%
GCL	110%	120%	122%	125%	130%	135%
DWR	110%	120%	122%	125%	130%	135%

\* At Chief Joseph Dam for Level 2, spill is managed to 120% TDG in the tailwater and 115% TDG as evaluated in the Wells forebay.

Table 2. The TDG target for each level of the Spill Priority List by project during summer spill.

Project	Level 1	Level 2	Level 3	Level 4	Level 5	Level 6	Level 7
Fish passage projects	120/115% Gas Cap	120%	122%	125%	130%	135%	--
CHJ	110%	115%	120%*	122%	125%	130%	135%
GCL	110%	115%	120%	122%	125%	130%	135%
DWR	110%	115%	120%	122%	125%	130%	135%

\* At Chief Joseph Dam for Level 3, spill is managed to 120% TDG in the tailwater and 115% TDG as evaluated in the Wells forebay.

### 3.2 Factors for Setting Spill Priority

When establishing the order dams will spill above that required for BiOp juvenile fish passage, the following factors are considered:

- Location of Fish: Location and number of adult and juvenile fish in the migratory corridor<sup>6</sup> is a factor in establishing the spill priority order on the Spill Priority List.
- Location of High TDG: When TDG levels are elevated (above 120 percent), dams may be shifted on the list to manage system-wide TDG levels.
- Location of Fish Research: When fish research is planned or in progress, those dams are low on the priority list to minimize detrimental impact to the studies.
- River Reaches: Dams are considered in one of three blocks: the lower Snake River, the lower Columbia River, and the middle Columbia River. For example, if several of the lower Snake dams need to be moved to a lower priority on the Spill Priority List, then the whole block of dams (Lower Granite, Little Goose, Lower Monumental and Ice Harbor dams) may be moved to last position on the list.
- Special Operations: Dams with special operations such as construction, maintenance or repair are placed last on priority list.
- Collector Dams: During low flow years, the collector dams where fish transport occurs (Lower Granite, Little Goose, Lower Monumental and Ice Harbor dams) are placed low on the priority list.
- Special Fish Conditions: If there are special fish conditions, such as disease or a special release, the dam may be moved higher or lower on the priority list depending on circumstances.
- System-wide TDG management: Grand Coulee, Chief Joseph, Dworshak and other projects are included on the Spill Priority List to help balance system-wide TDG levels during periods of lack of load involuntary spill.

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<sup>6</sup> This type of input is often provided through a regional forum, such as TMT.



## 4.0 TDG Management Policy, Guidance and Considerations

The Corps will consider water quality effects along with the results of spill studies, biological evaluations, and the relationship to achieving BiOp performance standards and incorporate the following TDG management policies in its decision making:

- Manage dam operations to the extent practical in accordance with CWA and state water quality standards, modified through standard modifications and rule adjustments.
- Provide voluntary spill for fish consistent with applicable biological opinion requirements while avoiding high TDG levels or adult fallback problems. Specific spill levels will be provided for juvenile fish passage at each dam in accordance with the Spill Agreement for the 2019 fish passage season consistent with the applicable State TDG WQS.
- Operate dams to the authorized project purposes.
- Regulate flows to maximize potential for voluntary/fish passage spill.
- Discontinue or postpone non-critical unit service and maintenance schedules that create (or have potential for creating) high localized TDG levels, especially when and where high numbers of listed fish are present.
- Accommodate special spill requirements/restrictions for research, adult passage, etc. that have been coordinated with the TMT.
- Manage the system in coordination with the Bureau of Reclamation and BPA to avoid involuntary spill and minimize TDG production when possible, without jeopardizing flood risk management objectives.
- Implement the Spill Priority List discussed in Section 3.0.
- Chief Joseph Dam is not included in the Washington TDG criteria adjustment or short-term criteria modification but it is used for managing system TDG during periods of involuntary spill. During periods of high runoff, it is managed up to, but to not exceed 120% TDG in the tailwater or 115% TDG in the next downstream forebay (Wells Dam forebay). Managing involuntary spill at Chief Joseph Dam is unique because TDG levels in its tailwater can be lower than in its forebay. Furthermore, Wells Dam, a non-federal dam directly downstream, has TDG requirements associated with its FERC license. These considerations are accounted for in the placement of Chief Joseph Dam ahead of Grand Coulee on the Spill Priority List, and managing for TDG in the Wells forebay (see footnotes in Tables 1 and 2).

The Corps will continue to coordinate with the States of Oregon and Washington on voluntary fish passage spill,<sup>7</sup> and provide technical information to inform the process. Future spill operations may be modified through the implementation planning process and adaptive management.

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<sup>7</sup> The Corps coordinates with the State of Washington on voluntary fish passage spill at the lower Snake and lower Columbia River projects; and with the State of Oregon on voluntary fish passage spill at the lower Columbia River projects.

## **5.0 TDG Monitoring Program**

The management of spill at each dam is based on TDG levels measured at specific forebay and tailwater fixed monitoring stations (FMS) as appropriate. The current locations of these gauges are based on extensive studies that have been conducted since 1996. In support of the spill management program, a TDG monitoring program has been established and is described in the TDG Monitoring Plan<sup>8</sup>. This monitoring program is revised to include changes in the FMS system and evaluated by regional representatives.

### **5.1 Malfunction TDG Gauges**

In the event that a Fixed Monitoring Station (FMS) monitor is out of service for an extended period of time, the Corps' RCC will use all available tools to estimate the TDG readings for the malfunctioning gauge. These tools may include one of the following:

- SYSTDG - the SYSTDG model can be used to provide estimated TDG levels for the malfunctioning gauge and those TDG estimations may be used for spill management. As needed, the Corps will share estimates of TDG. If there is a long term outage, results will be posted to the TMT website.
- An alternate gauge – the Warrendale gauge is considered an alternate gauge for the Cascade Island FMS.

## **6.0 Procedure for Setting Spill Caps**

As referenced in Section 2 of the 2019 FOP, the Corps will manage TDG as described in the attachment entitled "Current Procedures for Setting Spill Caps". Spring and summer spill operations will be consistent with levels specified in the Spill Agreement.

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<sup>8</sup> TDG Monitoring Plan can be found here: <http://www.nwd.usace.army.mil/Missions/Water/Columbia/Water-Quality/>

## Current Procedures for Setting Spill Caps

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

The 2019-2021 Spill Operation Agreement (December 2018) (Spill Agreement) lays out a flexible spill operation that provides gas cap spill for 16 hour per day and performance standard spill for up to 8 hours per day to occur in the spring 2019 migration season at the U.S. Army Corps of Engineers' (Corps) four lower Snake River and four lower Columbia River fish passage projects. Gas cap spill is the maximum spill level that meets, but does not exceed, the states' total dissolved gas (TDG) water quality standards (WQS). The Spill Agreement also specifies a summer spill operation. Both spring and summer fish passage spill operations are described in detail in the 2019 Fish Operations Plan (FOP).

Although the Corps has implemented gas cap spill (24-hrs/day at 120/115% TDG level in 2018) at the fish passage projects, the Corps has never implemented a flex spill operation. In order to successfully implement gas cap spill for the spring 2019 migration season (and set appropriate spill caps for summer 2019), the Corps will apply the following procedures.

1. TDG Water Quality Standards (WQS).
  - a. As anticipated in the Spill Agreement the state of Washington issued a short-term TDG criteria modification for spring spill to the Corps on March 29, 2019 which aligned their TDG criteria with the state of Oregon standard modification. This short-term modification applies during the spring. For the summer spill season, the 120/115% adjusted TDG Washington WQS applies, including use of the forebay gauges and consecutive 12-hour calculation method. The Corps will operate to the more restrictive state TDG WQS at these projects in order to maintain TDG within all applicable state standards.
  - b. Each day from April 3 to June 20 (lower Snake River projects) and from April 10 to June 15 (lower Columbia River projects), the project 120% TDG spill caps<sup>9</sup> will be reviewed and adjusted so as not to exceed the applicable State TDG WQS. Daily 12-hour TDG concentrations will be calculated using hourly TDG data from fixed monitoring stations (FMS) placed in the tailrace of each project, in accordance with the applicable state's methodology, which includes rounding TDG levels to the nearest whole number.
  - c. Similarly, each day from June 21 to August 31 (lower Snake River projects) and from June 16 to August 31 (lower Columbia River projects), the project 120/115% TDG spill caps will be reviewed and adjusted so as not to exceed the applicable State TDG WQS. At times, these spill caps can be less than the performance standard spill.
  - d. At the four lower Snake River projects, only the State of Washington TDG WQS applies.
  - e. 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.

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<sup>9</sup> 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. 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.

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 estimated to meet, but not exceed, TDG criteria allowed under state law.
  - 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 forebay<sup>10</sup>; 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. It may be necessary to adjust spill at John Day Dam to manage TDG levels in The Dalles tailwater since both spill and powerhouse TDG impact The Dalles tailwater gauge. Observed TDG responses to John Day Dam spill cap adjustments at The Dalles forebay will be evident within 24 hours.
  - e. The Corps will be considering the variability at each gauge when making spill cap decisions. The lower the variability, the higher the Corps' confidence that a spill cap change will have the intended result.
  
3. Daily Process used to Set Spill Caps.
  - a. Daily data review.<sup>11</sup> 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.<sup>12</sup> 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 simulate iteratively 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

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<sup>10</sup> Water travel time between John Day and The Dalles projects is a consideration since The Dalles forebay is very influential on The Dalles tailwater TDG levels.

<sup>11</sup> When the observed total river flows on the lower Snake and lower Columbia rivers reach a low level such that there is diminished likelihood of voluntary spill producing TDG above the State standards, RCC will conduct spill review and set daily spill caps for the weekend on the last working day of the week. These conditions usually occur in late July and August. Spill caps through the weekend will be set and recorded in the CWMS database.

<sup>12</sup> 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 project spill caps and resultant TDG 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 2019 Fish Operations Plan that may result in adjustments to spill levels that are different than gas cap spill. See Section 4.1 of the 2019 FOP for a list of these considerations.