# FISH OPERATIONS PLAN IMPLEMENTATION REPORT
# April 2015

**Submitted by the U.S. Army Corps of Engineers**
**Northwestern Division**
**Portland, OR.**

## Introduction

The U.S. Army Corps of Engineers (Corps) is submitting this report in accordance with the 2015 Fish Operations Plan (2015 FOP) posted to the TMT website on March 1, 2015. The 2015 FOP describes the Corps' project operations for fish passage at its Federal Columbia River Power System (FCRPS) dams during the spring and summer fish migration season, generally April through August. To the extent Corps project operations are not specified in the 2015 FOP, the FCRPS operations will be consistent with the 2014 NOAA Fisheries Supplemental Biological Opinion (2014 Supplemental BiOp), the USFWS 2000 and 2006 BiOps, and/or other operative documents, including the 2015 Water Management Plan (WMP), WMP seasonal updates, and the 2015 Fish Passage Plan (FPP).

The Corps' April 2015 lower Snake and Columbia River project and fish passage operations are contained in this report. In particular, information in this report includes the following:

- Hourly flow through the powerhouse at each dam;
- Hourly flow over the spillway compared to the spill target for that hour; and
- Daily average Total Dissolved Gas (TDG) levels (percent of saturation) in the tailwater at each project, and in the subsequent downstream project's forebay.[1]

This report also provides information on presented issues and unanticipated or emergency situations that arose during implementation of the 2015 FOP in April 2015.

## Data Reporting

I. For each project providing fish passage operations, this report contains two figures per operational week[2] in April displaying the performance of the fish passage spill program as follows:

(A) Average % TDG Values - displayed in the upper figure.
(B) Hourly Spill and Generation Flows - described in the lower figure.

[1] Averages reported are consistent with the current and applicable Oregon TDG standard modification (120% tailwater) and Washington TDG criteria adjustments (120% tailwater/115% forebay). The Oregon TDG standard modification and the Washington TDG criteria adjustments have different methodologies for calculating TDG. When the standards vary or conflict, the Corps applies the more stringent standard.
[2] Operations are implemented from Monday through Sunday.

The weekly figures begin on March 30 and end on April 26 for the following lower Snake River and lower Columbia River projects: Lower Granite, Little Goose, Lower Monumental, Ice Harbor, McNary, John Day, The Dalles, and Bonneville.

Each figure represents one week of a project's operation. The figures start at 0000 hours (%TDG graphs) and 0100 hours (flow/spill figures) on March 30 for the lower Snake River and the lower Columbia River projects.

| | |
|---|---|
| March 30 – April 5 | Figures 1 – 4 |
| April 6 – April 12 | Figures 5 – 12 |
| April 13 – April 19 | Figures 13 – 20 |
| April 20 – April 26 | Figures 21 – 28 |

A. Upper Figure: Displays the average daily %TDG for the Corps' lower Snake River and lower Columbia River projects. The Corps' objective is to operate each project in accordance with the spill levels in the 2015 FOP; and to the extent practicable, avoid exceeding the applicable state TDG limits.

1. The green dashed line represents the Oregon 120%TDG standard modification limit for the tailwater of the dam.
2. The blue dot-dash line represents the Washington 120%TDG criteria adjustment for the tailwater of the dam.
3. The black solid line represents the Washington 115%TDG criteria adjustment for the forebay of the next dam downstream.

B. Lower Figure: Displays the hourly flow and spill at each dam.

- The dashed blue line shows the flow through the powerhouse each hour, in thousand cubic feet per second (kcfs).
- The heavy grey line represents the average hourly total project outflow in kcfs.
- The dotted pink line represents the average hourly flow through the spillway in kcfs.
- The thin black line represents the hourly spill level as defined in the 2015 FOP.
- The heavy green line represents the target spill. This is the hourly maximum spill level. The hourly target spill may vary as a function of total project outflow, forebay elevation and generator capacity, subject to the following conditions:

    - spill percentage or flow rate specified in the 2015 FOP;
    - spill caps as set daily for TDG management;
    - test spill levels for fish passage research;
    - minimum generation for power system needs;
    - minimum spill at Bonneville Dam (50 kcfs);
    - minimum spill at John Day (25% of project outflow).

II. A table is included at the end of the figures that lists the average daily %TDG for all projects. The numbers in red indicate the project exceeded the %TDG cap -- i.e.115% (forebay of the next downstream dam) or 120% (tailwater) for each project. For the lower Columbia projects,

tailwater TDG values are presented by displaying the highest value %TDG (controlling limit), and the lower value is displayed with a strikethrough.

**General Implementation Remarks**

For all projects that spill for fish passage, the actual spill may vary from the target spill due to various conditions as described below. When spill levels briefly deviate below or above the level specified in the 2015 FOP, the dotted pink line will be below or above the heavy green line in the figures. Actual deviations from the target operation during voluntary spill hours are described below in the April 2015 Spill Variance Table.[3] The Spill Variance Table includes average hourly data; therefore, while spill may vary from target FOP spill for only a portion of an hour, the Spill Variance Table characterizes the variance as a full hour. There are instances when the hourly FOP spill levels are not achievable due to mechanical limitations in setting spill gates to implement the regionally coordinated spill pattern. The project operator sets the spill gate stops to most closely approximate the 2015 FOP level of spill while also avoiding exceeding the %TDG spill cap to the extent practicable.

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

The combination of these factors may result in instances when unanticipated changes to inflow result in forebay elevations dropping to the low end of the Minimum Operating Pool (MOP). Since these projects have limited operating flexibility, maintaining minimum generation, MOP elevation, and the target spill may not be possible throughout every hour. During low flow periods at Little Goose Dam, the overall project spill percentage appears to be reduced because the calculations do not account for the volume of water released during navigational lockages; however, the actual spill volume remains constant. When these variances occur, they are recorded in the monthly Spill Variance Table for Little Goose under the variance type "Navigation."

Actual spill levels at Corps projects with set flow targets may vary up to ±2 kcfs within the hour (except as otherwise noted in the 2015 FOP for Bonneville and The Dalles dams[4], which may

[3] Involuntary spill conditions appear in the figures, but are not considered variances and are not reported in the Spill Variance Table. Involuntary spill conditions result from lack of load, high river inflows that exceed available powerhouse capacity, scheduled or unscheduled turbine unit outages or transmission outages of various durations, passing debris, or any other operational and/or maintenance activities required to manage dam facilities for safety and authorized project uses.

[4] As specified in the 2015 FOP (p. 14), this applies when the spill level is below 40% of total flow at The Dalles Dam.

range up to ±3 kcfs) as compared to those specified in the 2015 FOP and the RCC spill priority list (defining the project %TDG spill caps). A number of factors influence actual spill, including hydraulic efficiency, exact gate opening calibration, spillway gate hoist cable stretch due to temperature changes, and forebay elevation (e.g. a higher forebay results in a greater volume of spill since more water can pass under the spill gate).

The 2015 FOP describes project "Operations during Rapid Load Changes" (p. 6). For reporting purposes, the notation "Transmission Stability" in the Spill Variance Table replaces "Rapid Load Changes," and identifies instances when hourly spill levels were not met as a result of load swing hours and other related within-hour load variability issues. "Transmission Stability" occurs because projects must be available to respond to within-hour load variability to satisfy North American Electric Reliability Corporation (NERC) reserve requirements ("on response"). In addition to within-hour load variability, projects on response must be responsive to within hour changes resulting from intermittent generation (such as wind generation). During periods of rapidly changing loads and intermittent generation, projects on response may have significant changes in turbine discharge within the hour while spill quantity remains the same within the hour. Under normal conditions, within-hour load changes primarily occur immediately preceding and following the peak load hours; however, within-hour changes in intermittent generation can occur at any hour of the day. Occasionally, several hours after peak load hours, the project may be decreasing total outflow and generation faster than the corresponding spill decreases causing the percent spill to be slightly higher. Due to the high variability of within-hour load, reporting actual spill percentages that vary by more than the ±1 percent within hour requirement (or other ranges specified in the 2015 FOP) may occur with greater frequency with "Transmission Stability" hours than other hours.

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

**April 2015 Operations**

The month of April was characterized by well below average flows for both the lower Snake and the lower Columbia rivers. The NOAA Northwest River Forecast Center's Runoff Processor indicated that the April 2015 adjusted volume runoff on the lower Snake River was below the 30 year average (1981-2010): 2.9 MAF (Million Acre Feet) or 64% of average as measured at Lower Granite Dam. For the lower Columbia, the Runoff Processor indicated the April 2015 adjusted volume runoff was below the 30 year average (1981-2010): 11.5 MAF or 83% of average as measured at The Dalles. The monthly precipitation summary for April was well below average at 53% on the Snake River above Ice Harbor Dam and also well below average on the Columbia River above The Dalles Dam at 51%.

During the April 2015 reporting period, the planned 2015 FOP spill operations were carried out as follows:

- Lower Granite Dam - The hourly target spill level was 20 kcfs, 24 hours/day.
- Little Goose Dam - The hourly target spill level was 30% of total project outflow, 24 hours/day.

- Lower Monumental Dam - The hourly target spill level was the %TDG cap, 24 hours/day.
- Ice Harbor Dam - The hourly target spill level was 45 kcfs during the daytime and the %TDG cap during the nighttime. From April 10 – 14, the hourly target spill level was 30% of total project outflow, 24 hours/day[5]. Nighttime spill hours are 1800-0500.
- McNary Dam - The hourly target spill level was 40% of total project outflow, 24 hours/day.
- John Day Dam - The hourly target spill level was 30% of total project outflow, 24 hours/day.
- The Dalles Dam - The hourly target spill level was 40% of total project outflow, 24 hours/day.
- Bonneville Dam - The hourly target spill level was 100 kcfs, 24 hours/day.

**Operational Adjustments**

No Operational Adjustments to report.

[5] Spill operation treatments were rearranged as discussed on page 12 of the 2015 FOP to accommodate a post-construction evaluation of modifications made to Ice Harbor spillbay 2 to improve juvenile fish passage survival. This evaluation is described in FPP Appendix A, and the rearrangement of spill operation treatments was further coordinated through the FPOM on April 9.

# April 2015 Spill Variance Table

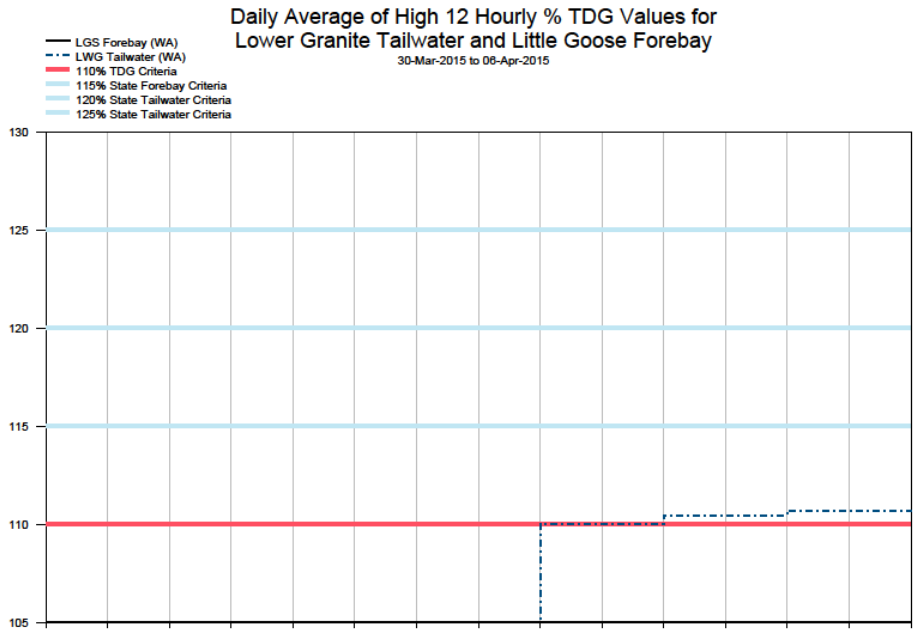
## Table 1: April 2015 (4/1 – 4/26) – FOP Implementation Report Table

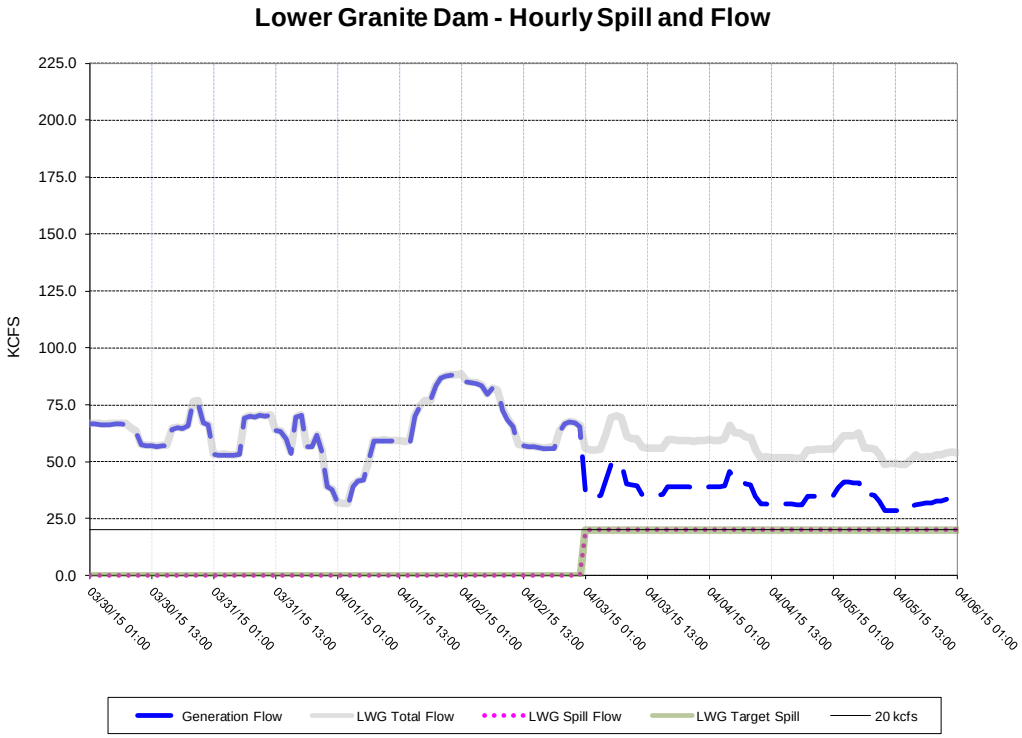
| Project | Parameter | Date | Time [6] | Hours | Type | Reason |
|---|---|---|---|---|---|---|
| Little Goose | Reduced Spill | 4/9/15 | 1700 | 1 | Maintenance | Hourly spill decreased to 28.6% (below 30.0% ±1% range) due to volume of water needed to empty the navigation lock for a dam safety inspection. 24-hr avg spill was 29.8%. |
| Little Goose | Reduced Spill | 4/11/15 | 1600 | 1 | Navigation | Hourly spill decreased to 28.9% (below 30.0% ±1% range). Reduced spill for safe passage of barge. 24-hr avg spill was 29.9%. |
| Little Goose | Reduced Spill | 4/13/15 | 1700 | 1 | Navigation | Hourly spill decreased to 28.0% (below 30.0% ±1% range) due to volume of water needed to empty the navigation lock. 24-hr avg spill was 30.0%. |
| Little Goose | Reduced Spill | 4/15/15 | 1900 | 1 | Navigation | Hourly spill decreased to 28.8% (below 30.0% ±1% range). Reduced spill for safe passage of fish barge. 24-hr avg spill was 29.9%. |
| Little Goose | Reduced Spill | 4/17/15 | 0300 | 1 | Navigation | Hourly spill decreased to 28.8% (below 30.0% ±1% range) due to volume of water needed to empty the navigation lock. 24-hr avg spill was 29.9%. |
| Little Goose | Reduced Spill | 4/21/15 | 1700 | 1 | Navigation | Hourly spill decreased to 28.8% (below 30.0% ±1% range) due to volume of water needed to empty the navigation lock. 24-hr avg spill was 29.9%. |
| Little Goose | Reduced Spill | 4/26/15 | 1600 | 1 | Navigation | Hourly spill decreased to 28.9% (below 30.0% ±1% range) due to volume of water needed to empty the navigation lock. 24-hr avg spill was 29.9%. |
| Ice Harbor | Additional Spill | 4/13/15 | 2000 – 2300 | 4 | Operational Limitations | Hourly spill ranged from 35.7% to 42.0% (above 30.0% ±1%). Hourly total project outflow ranged from 18.1 to 22.1 kcfs. Due to RSW, minimum spill is fixed at approx 7.5-8.4 kcfs, which results in spill >FOP target when total outflow is approx 17-26 kcfs. 24-hr avg spill was 31.6%. |

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

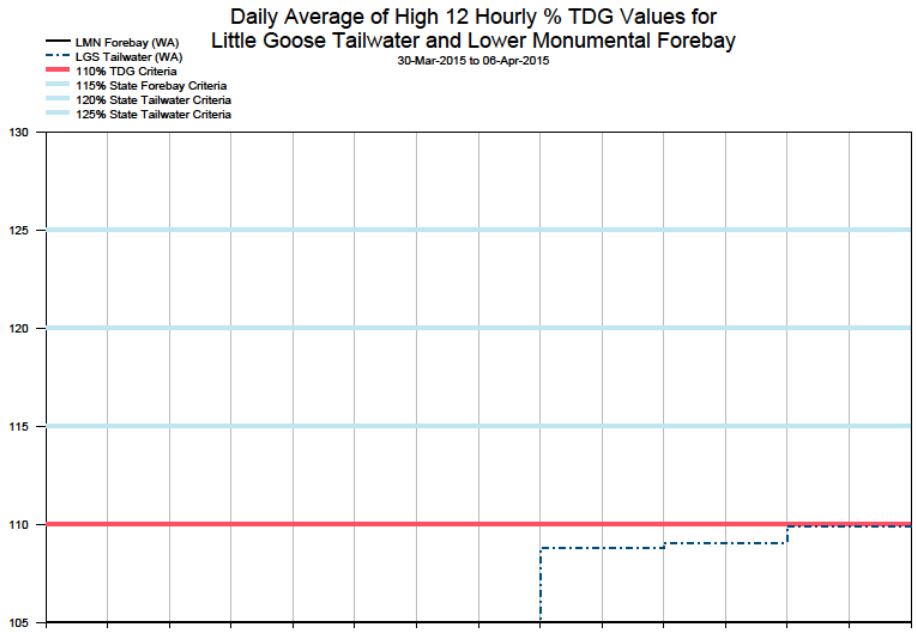
| Project | Parameter | Date | Time [6] | Hours | Type | Reason |
|---|---|---|---|---|---|---|
| Ice Harbor | Additional Spill | 4/23/15 | 1800 | 1 | Human/Program Error | Hourly spill increased to 50.5 kcfs (above 45 kcfs ±2 kcfs range) due to a miscalculation above minimum generation range (8.2-10.0 kcfs). |
| McNary | Additional Spill | 4/12/15 | 2300 | 1 | Human/Program Error | Hourly spill increased to 41.3% (above 40.0% ±1% range) due to a miscalculation. 24-hr avg spill was 40.3%. |
| John Day | Additional Spill | 4/10/15 | 1400 | 1 | Transmission Stability | Hourly spill increased to 31.1% (above 30.0% ±1% range). Project on response during rapidly changing load and/or intermittent generation (see p. 3-4). 24-hr avg spill was 29.9%. |
| John Day | Additional Spill | 4/23/15 | 2300 | 1 | Transmission Stability | Hourly spill increased to 31.3% (above 30.0% ±1% range). Project on response during rapidly changing load and/or intermittent generation (see p. 3-4). 24-hr avg spill was 30.0%. |
| The Dalles | Additional Spill | 4/13/15 | 2100 | 1 | Transmission Stability | Hourly spill increased to 41.3% (above 40.0% ±1% range). Project on response during rapidly changing load and/or intermittent generation (see p. 3-4). 24-hr avg spill was 39.9%. |

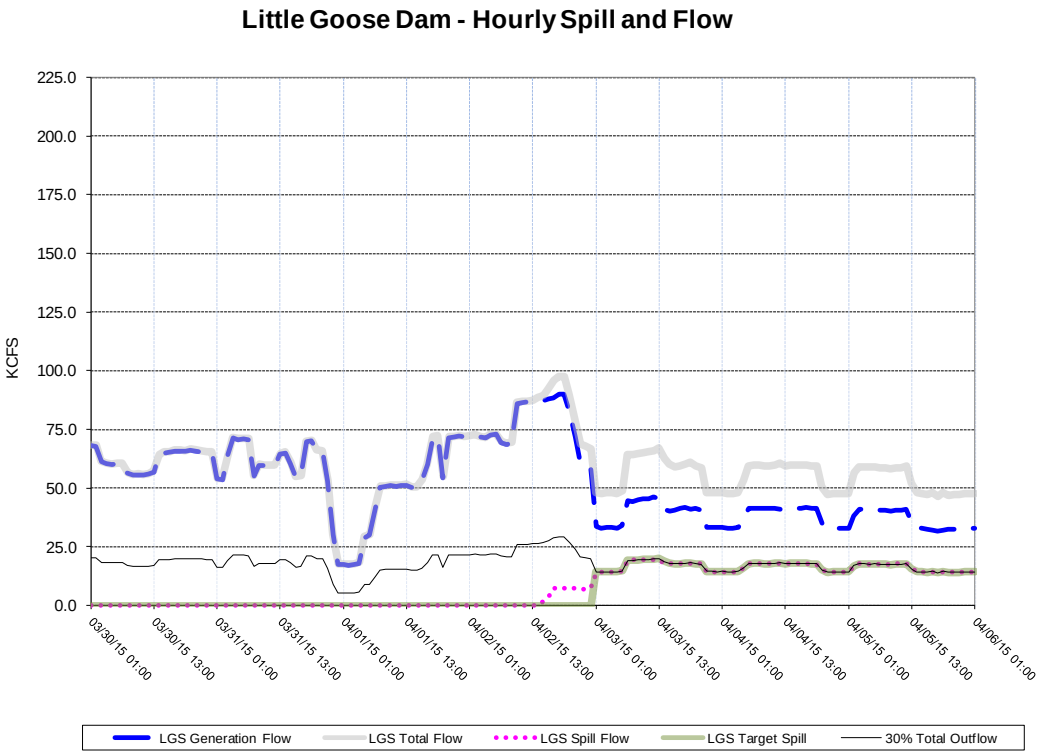
# Figure 1


Daily Average of High 12 Hourly % TDG Values for
Lower Granite Tailwater and Little Goose Forebay
30-Mar-2015 to 06-Apr-2015
LGS Forebay (WA)
LWG Tailwater (WA)
110% TDG Criteria
115% State Forebay Criteria
120% State Tailwater Criteria
125% State Tailwater Criteria
130
125
120
115
110
105

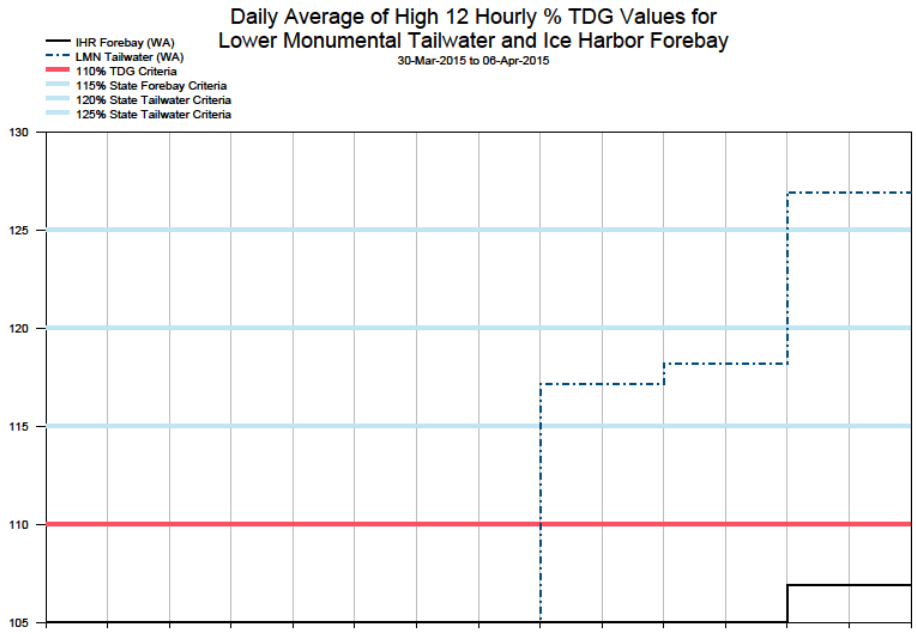

Lower Granite Dam - Hourly Spill and Flow
KCFS
225.0
200.0
175.0
150.0
125.0
100.0
75.0
50.0
25.0
0.0
03/30/15 01:00
03/30/15 13:00
03/31/15 01:00
03/31/15 13:00
04/01/15 01:00
04/01/15 13:00
04/02/15 01:00
04/02/15 13:00
04/03/15 01:00
04/03/15 13:00
04/04/15 01:00
04/04/15 13:00
04/05/15 01:00
04/05/15 13:00
04/06/15 01:00
Generation Flow
LWG Total Flow
LWG Spill Flow
LWG Target Spill
20 kcfs

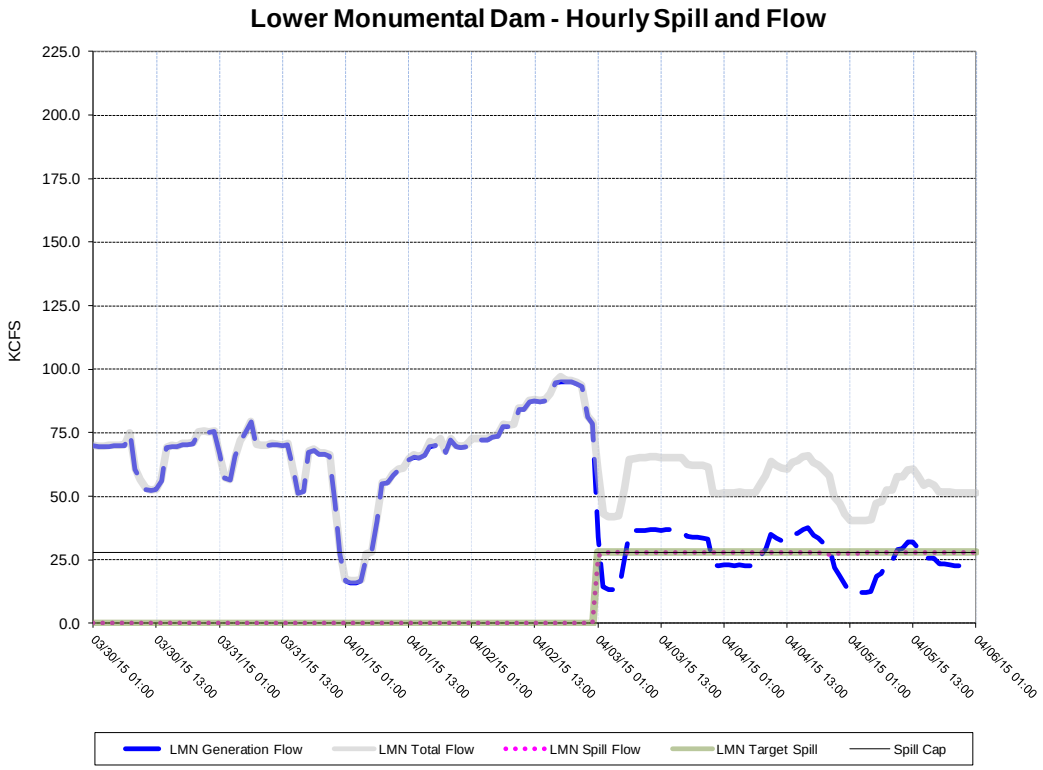
# Figure 2


Daily Average of High 12 Hourly % TDG Values for
Little Goose Tailwater and Lower Monumental Forebay
30-Mar-2015 to 06-Apr-2015
LMN Forebay (WA)
LGS Tailwater (WA)
110% TDG Criteria
115% State Forebay Criteria
120% State Tailwater Criteria
125% State Tailwater Criteria
130
125
120
115
110
105


Little Goose Dam - Hourly Spill and Flow
KCFS
225.0
200.0
175.0
150.0
125.0
100.0
75.0
50.0
25.0
0.0
03/30/15 01:00
03/30/15 13:00
03/31/15 01:00
03/31/15 13:00
04/01/15 01:00
04/01/15 13:00
04/02/15 01:00
04/02/15 13:00
04/03/15 01:00
04/03/15 13:00
04/04/15 01:00
04/04/15 13:00
04/05/15 01:00
04/05/15 13:00
04/06/15 01:00
LGS Generation Flow
LGS Total Flow
LGS Spill Flow
LGS Target Spill
30% Total Outflow

# Figure 3


Daily Average of High 12 Hourly % TDG Values for
Lower Monumental Tailwater and Ice Harbor Forebay
30-Mar-2015 to 06-Apr-2015
IHR Forebay (WA)
LMN Tailwater (WA)
110% TDG Criteria
115% State Forebay Criteria
120% State Tailwater Criteria
125% State Tailwater Criteria
130
125
120
115
110
105


Lower Monumental Dam - Hourly Spill and Flow
KCFS
225.0
200.0
175.0
150.0
125.0
100.0
75.0
50.0
25.0
0.0
03/30/15 01:00
03/30/15 13:00
03/31/15 01:00
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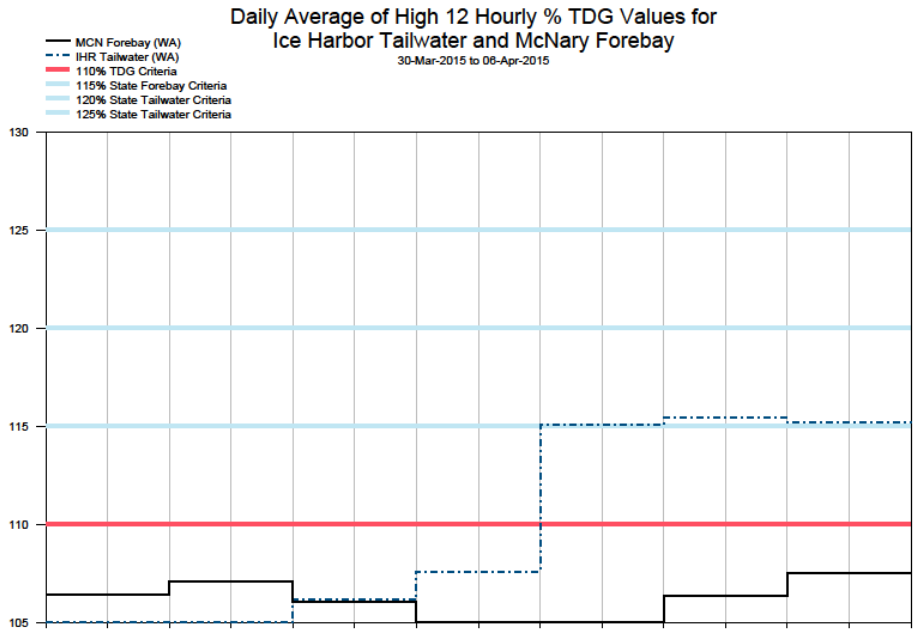
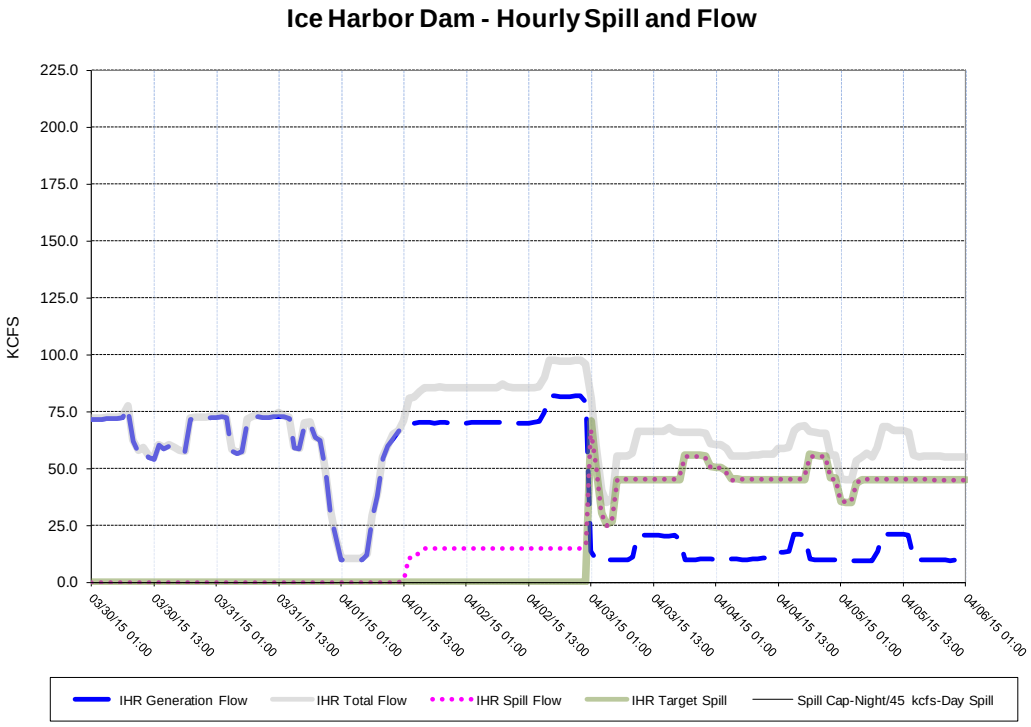
04/02/15 13:00
04/03/15 01:00
04/03/15 13:00
04/04/15 01:00
04/04/15 13:00
04/05/15 01:00
04/05/15 13:00
04/06/15 01:00
LMN Generation Flow
LMN Total Flow
LMN Spill Flow
LMN Target Spill
Spill Cap

# Figure 4


Daily Average of High 12 Hourly % TDG Values for
Ice Harbor Tailwater and McNary Forebay
30-Mar-2015 to 06-Apr-2015
MCN Forebay (WA)
IHR Tailwater (WA)
110% TDG Criteria
115% State Forebay Criteria
120% State Tailwater Criteria
125% State Tailwater Criteria
130
125
120
115
110
105


Ice Harbor Dam - Hourly Spill and Flow
KCFS
225.0
200.0
175.0
150.0
125.0
100.0
75.0
50.0
25.0
0.0
03/30/15 01:00
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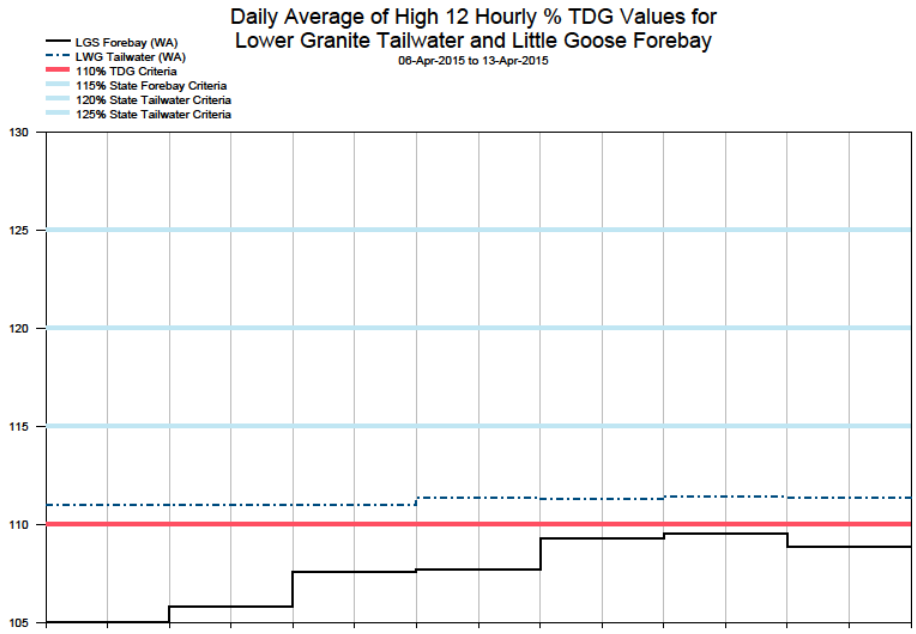
04/02/15 13:00
04/03/15 01:00
04/03/15 13:00
04/04/15 01:00
04/04/15 13:00
04/05/15 01:00
04/05/15 13:00
04/06/15 01:00
IHR Generation Flow
IHR Total Flow
IHR Spill Flow
IHR Target Spill
Spill Cap-Night/45 kcfs-Day Spill

# Figure 5


Daily Average of High 12 Hourly % TDG Values for
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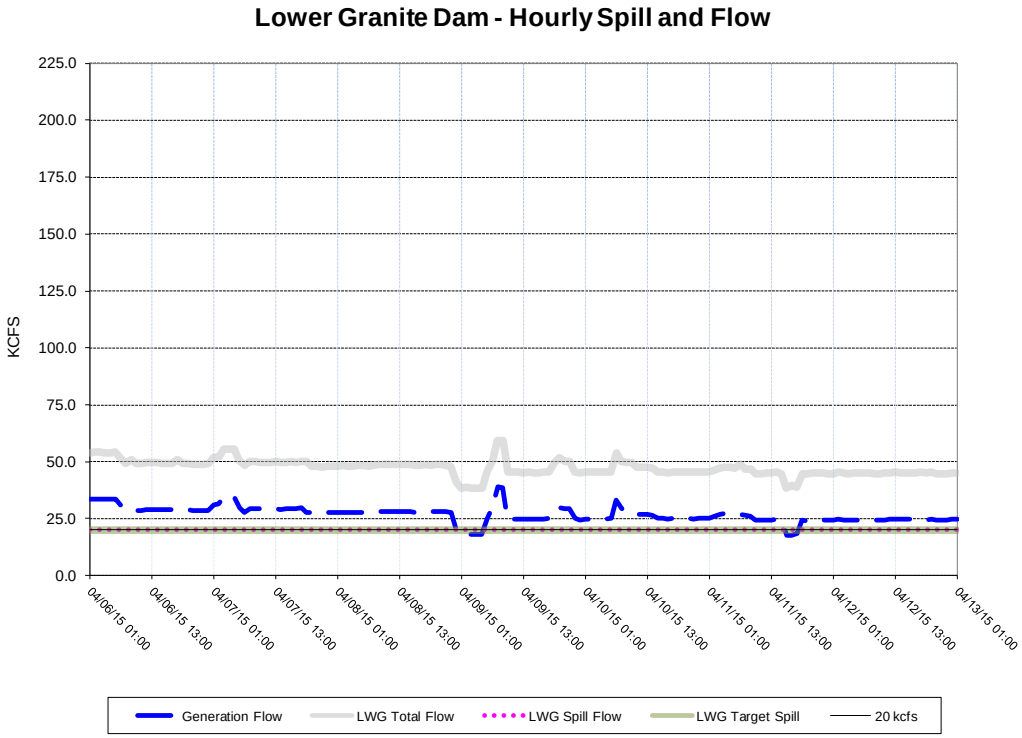
06-Apr-2015 to 13-Apr-2015
LGS Forebay (WA)
LWG Tailwater (WA)
110% TDG Criteria
115% State Forebay Criteria
120% State Tailwater Criteria
125% State Tailwater Criteria
130
125
120
115
110
105


Lower Granite Dam - Hourly Spill and Flow
KCFS
225.0
200.0
175.0
150.0
125.0
100.0
75.0
50.0
25.0
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04/06/15 01:00
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04/09/15 01:00
04/09/15 13:00
04/10/15 01:00
04/10/15 13:00
04/11/15 01:00
04/11/15 13:00
04/12/15 01:00
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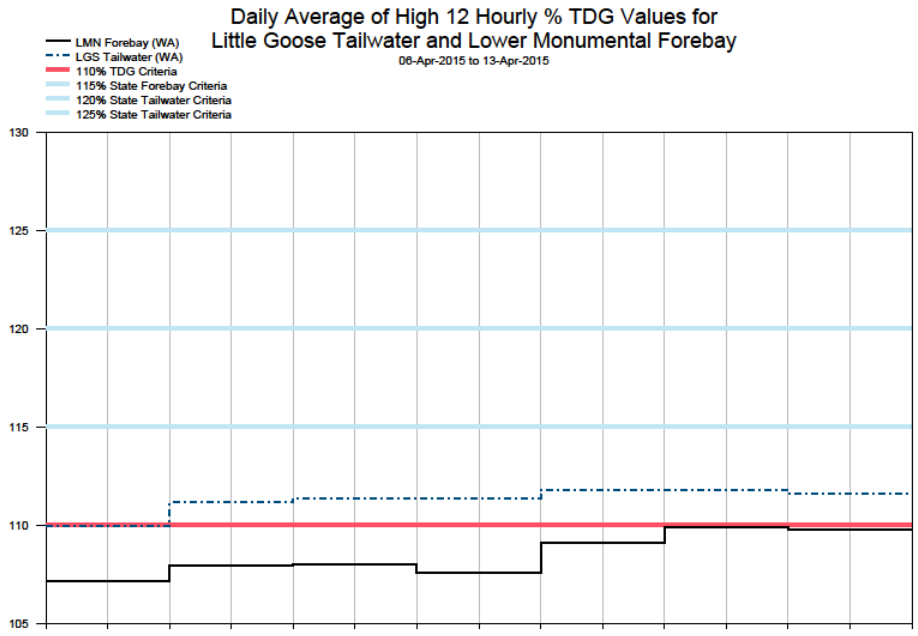
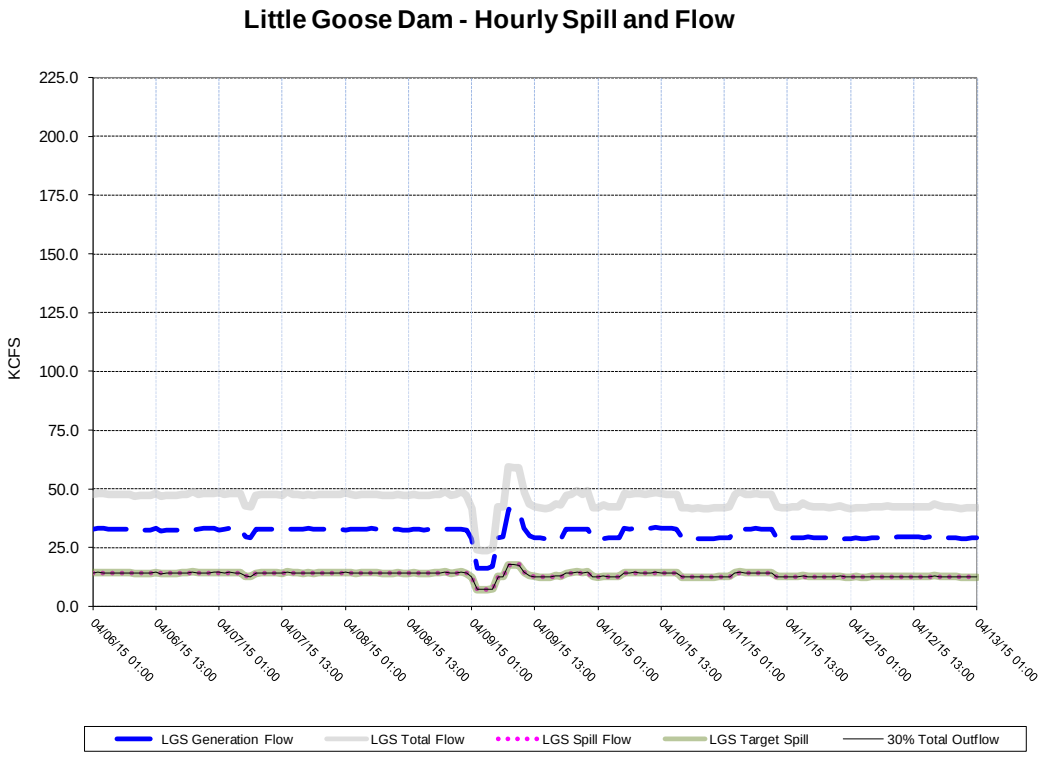
04/13/15 01:00
Generation Flow
LWG Total Flow
LWG Spill Flow
LWG Target Spill
20 kcfs

# Figure 6


Daily Average of High 12 Hourly % TDG Values for
Little Goose Tailwater and Lower Monumental Forebay
06-Apr-2015 to 13-Apr-2015
LMN Forebay (WA)
LGS Tailwater (WA)
110% TDG Criteria
115% State Forebay Criteria
120% State Tailwater Criteria
125% State Tailwater Criteria
130
125
120
115
110
105


Little Goose Dam - Hourly Spill and Flow
KCFS
225.0
200.0
175.0
150.0
125.0
100.0
75.0
50.0
25.0
0.0
04/06/15 01:00
04/06/15 13:00
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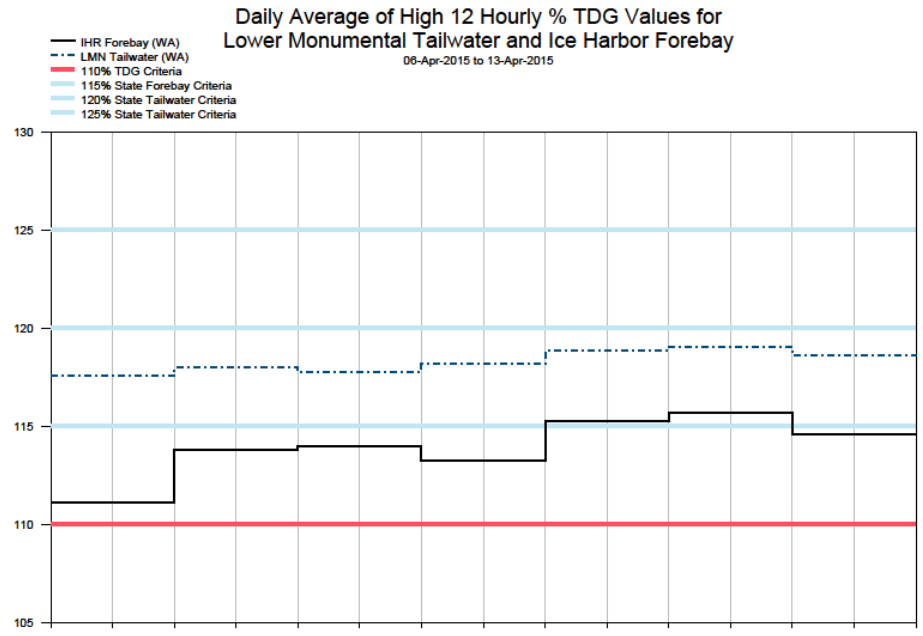
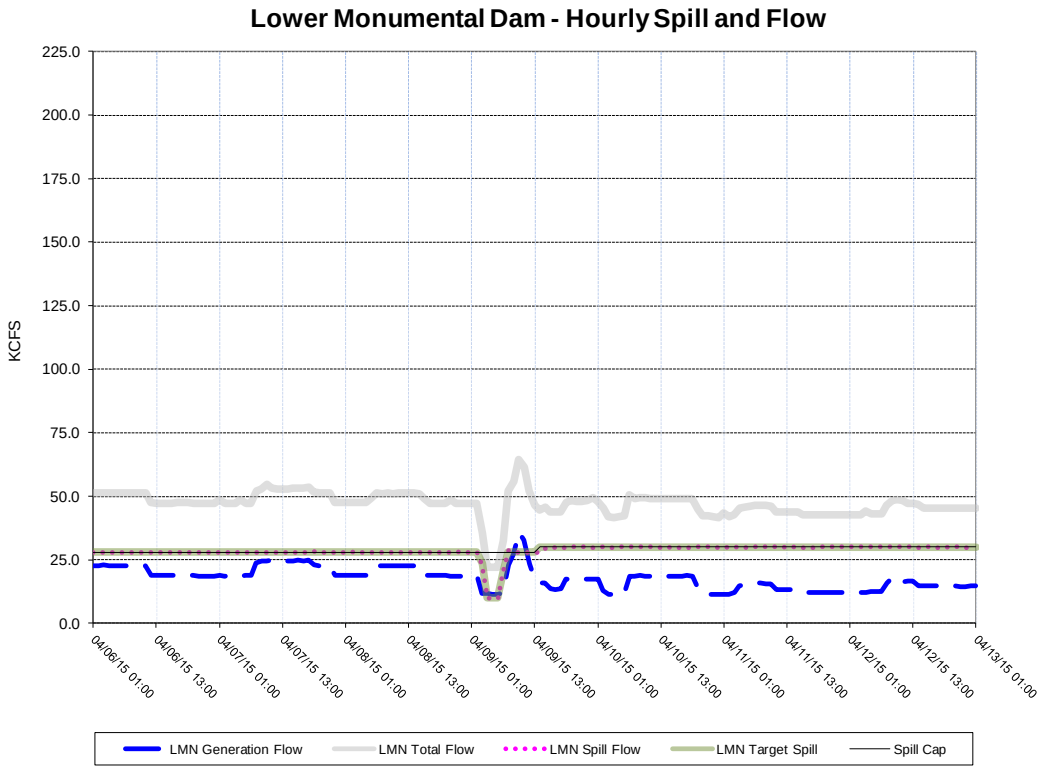
04/07/15 13:00
04/08/15 01:00
04/08/15 13:00
04/09/15 01:00
04/09/15 13:00
04/10/15 01:00
04/10/15 13:00
04/11/15 01:00
04/11/15 13:00
04/12/15 01:00
04/12/15 13:00
04/13/15 01:00
LGS Generation Flow
LGS Total Flow
LGS Spill Flow
LGS Target Spill
30% Total Outflow

# Figure 7


Daily Average of High 12 Hourly % TDG Values for
Lower Monumental Tailwater and Ice Harbor Forebay
06-Apr-2015 to 13-Apr-2015
IHR Forebay (WA)
LMN Tailwater (WA)
110% TDG Criteria
115% State Forebay Criteria
120% State Tailwater Criteria
125% State Tailwater Criteria
130
125
120
115
110
105


Lower Monumental Dam - Hourly Spill and Flow
KCFS
225.0
200.0
175.0
150.0
125.0
100.0
75.0
50.0
25.0
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04/06/15 01:00
04/06/15 13:00
04/07/15 01:00
04/07/15 13:00
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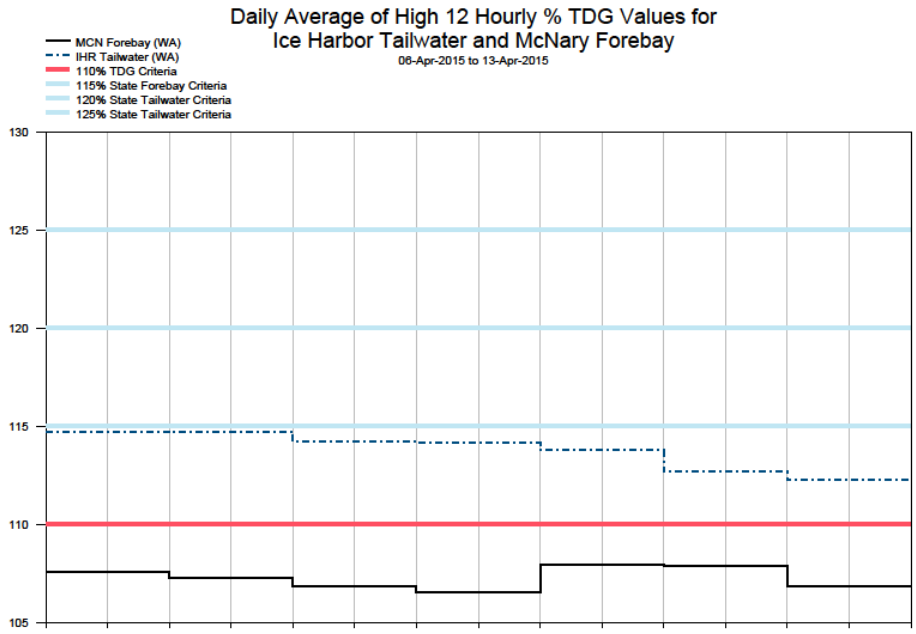
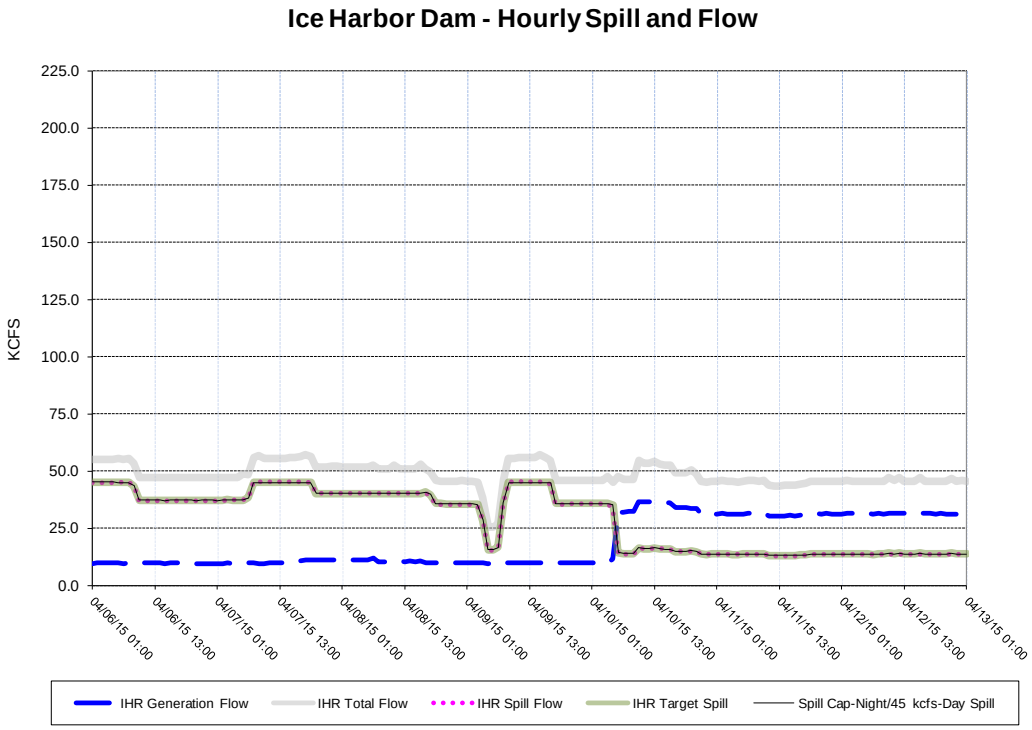
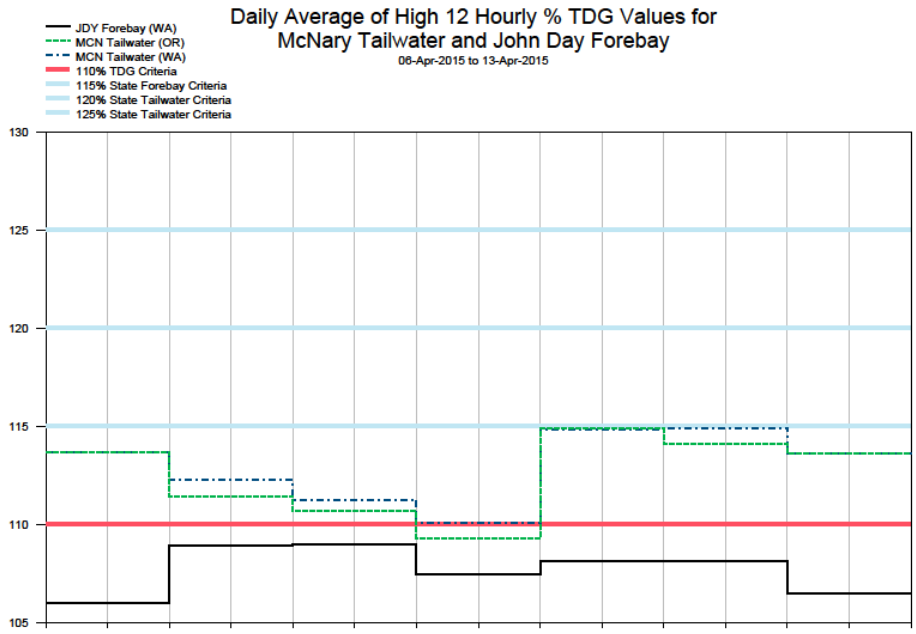
04/08/15 13:00
04/09/15 01:00
04/09/15 13:00
04/10/15 01:00
04/10/15 13:00
04/11/15 01:00
04/11/15 13:00
04/12/15 01:00
04/12/15 13:00
04/13/15 01:00
LMN Generation Flow
LMN Total Flow
LMN Spill Flow
LMN Target Spill
Spill Cap

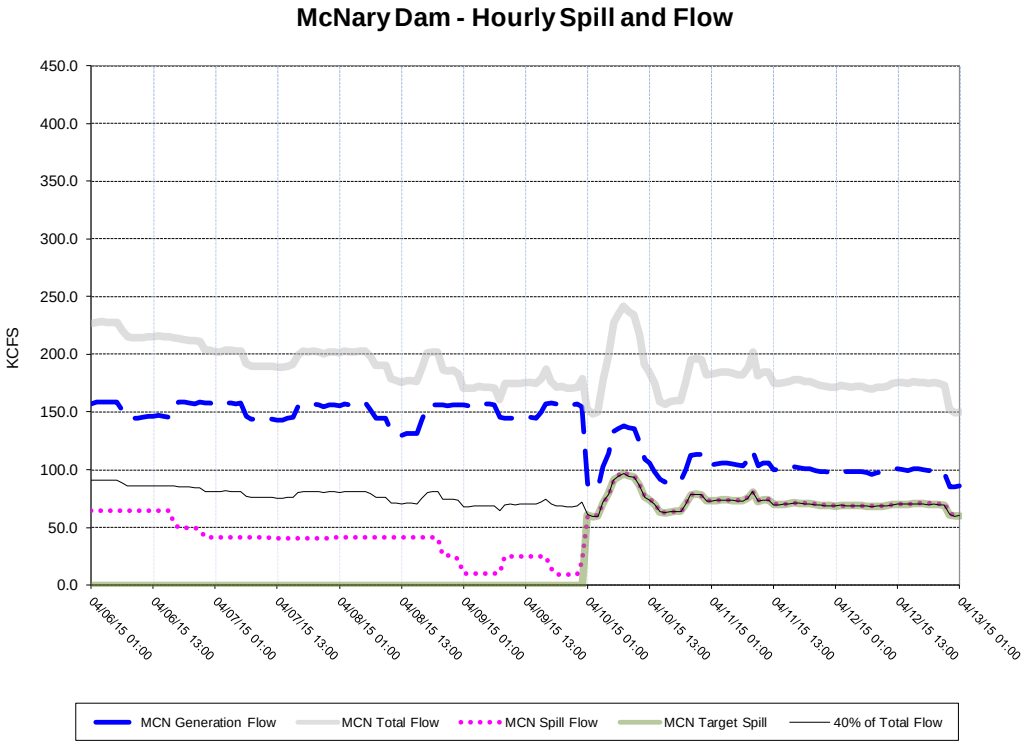
# Figure 8


Daily Average of High 12 Hourly % TDG Values for
Ice Harbor Tailwater and McNary Forebay
06-Apr-2015 to 13-Apr-2015
MCN Forebay (WA)
IHR Tailwater (WA)
110% TDG Criteria
115% State Forebay Criteria
120% State Tailwater Criteria
125% State Tailwater Criteria
130
125
120
115
110
105

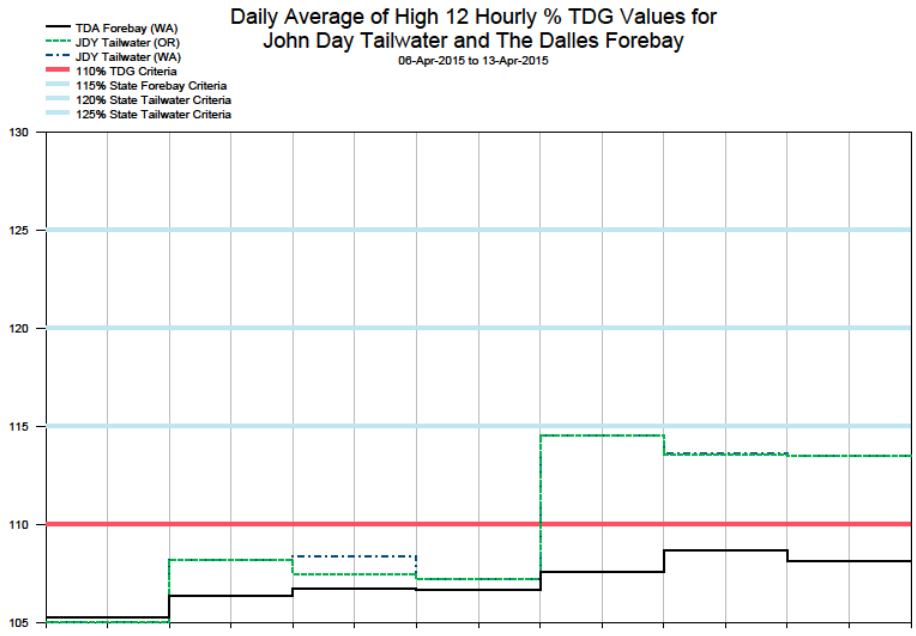

Ice Harbor Dam - Hourly Spill and Flow
KCFS
225.0
200.0
175.0
150.0
125.0
100.0
75.0
50.0
25.0
0.0
04/06/15 01:00
04/06/15 13:00
04/07/15 01:00
04/07/15 13:00
04/08/15 01:00
04/08/15 13:00
04/09/15 01:00
04/09/15 13:00
04/10/15 01:00
04/10/15 13:00
04/11/15 01:00
04/11/15 13:00
04/12/15 01:00
04/12/15 13:00
04/13/15 01:00
IHR Generation Flow
IHR Total Flow
IHR Spill Flow
IHR Target Spill
Spill Cap-Night/45 kcfs-Day Spill

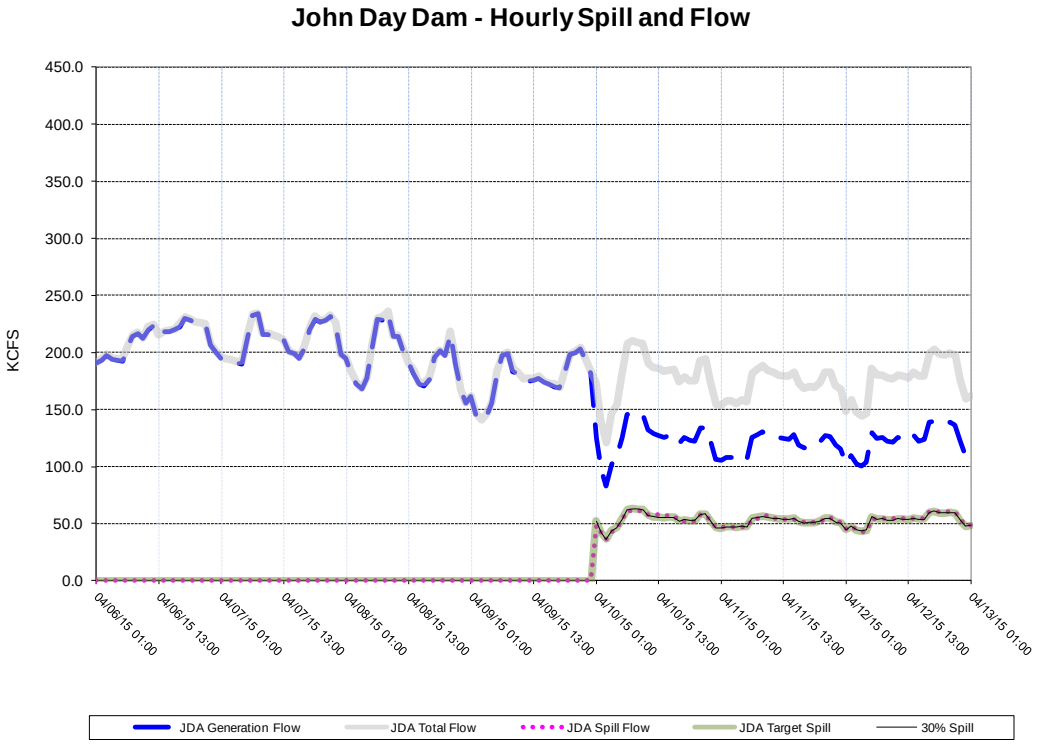
# Figure 9


Daily Average of High 12 Hourly % TDG Values for
McNary Tailwater and John Day Forebay
06-Apr-2015 to 13-Apr-2015
JDY Forebay (WA)
MCN Tailwater (OR)
MCN Tailwater (WA)
110% TDG Criteria
115% State Forebay Criteria
120% State Tailwater Criteria
125% State Tailwater Criteria
130
125
120
115
110
105

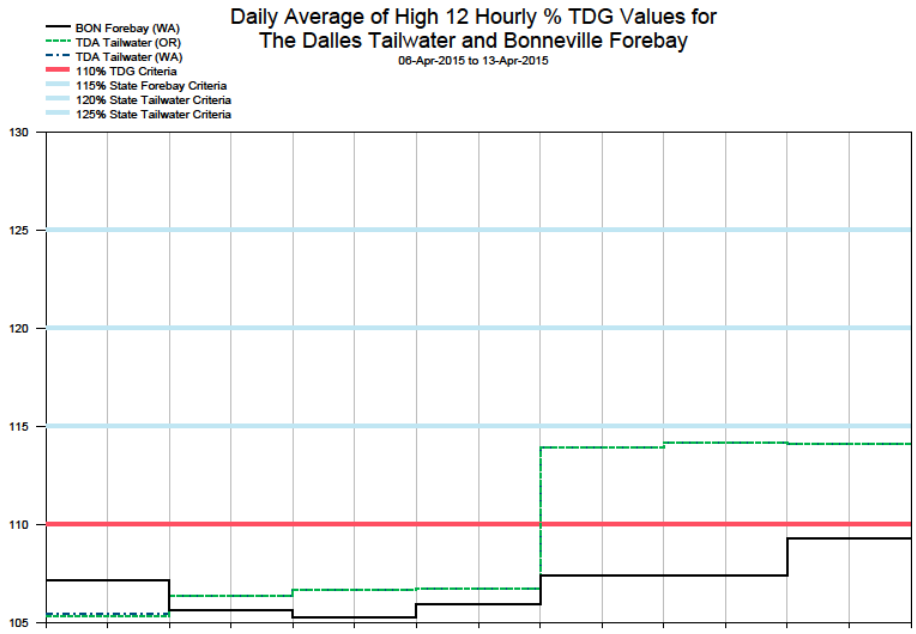

McNary Dam - Hourly Spill and Flow
KCFS
450.0
400.0
350.0
300.0
250.0
200.0
150.0
100.0
50.0
0.0
04/06/15 01:00
04/06/15 13:00
04/07/15 01:00
04/07/15 13:00
04/08/15 01:00
04/08/15 13:00
04/09/15 01:00
04/09/15 13:00
04/10/15 01:00
04/10/15 13:00
04/11/15 01:00
04/11/15 13:00
04/12/15 01:00
04/12/15 13:00
04/13/15 01:00
MCN Generation Flow
MCN Total Flow
MCN Spill Flow
MCN Target Spill
40% of Total Flow

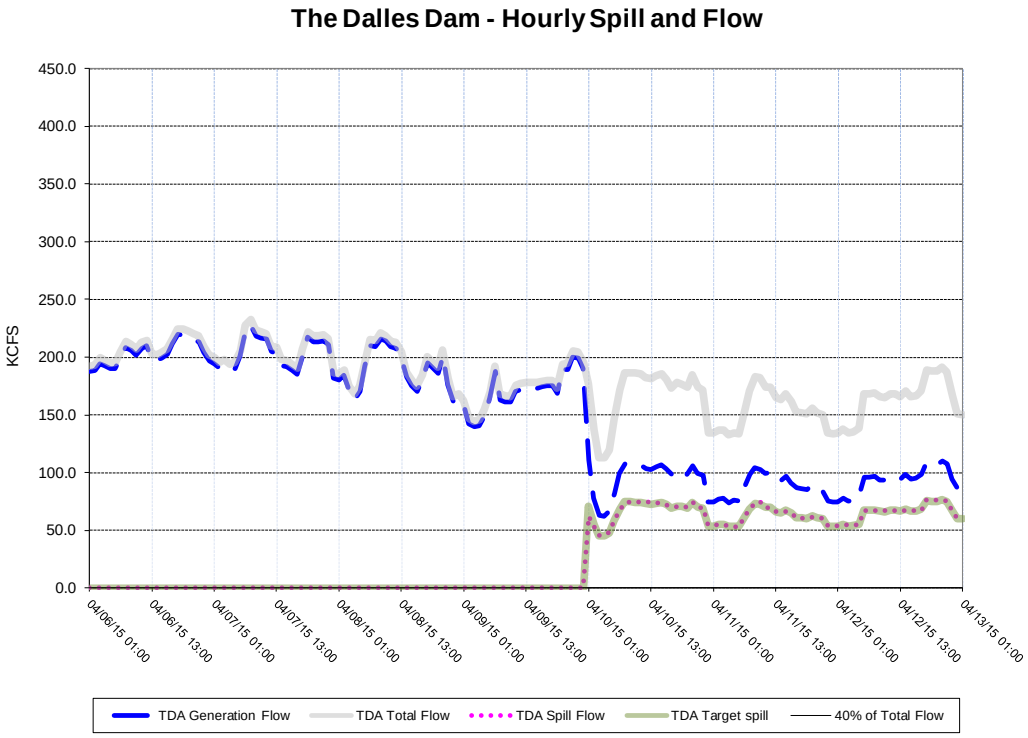
# Figure 10


Daily Average of High 12 Hourly % TDG Values for
John Day Tailwater and The Dalles Forebay
06-Apr-2015 to 13-Apr-2015
TDA Forebay (WA)
JDY Tailwater (OR)
JDY Tailwater (WA)
110% TDG Criteria
115% State Forebay Criteria
120% State Tailwater Criteria
125% State Tailwater Criteria
130
125
120
115
110
105

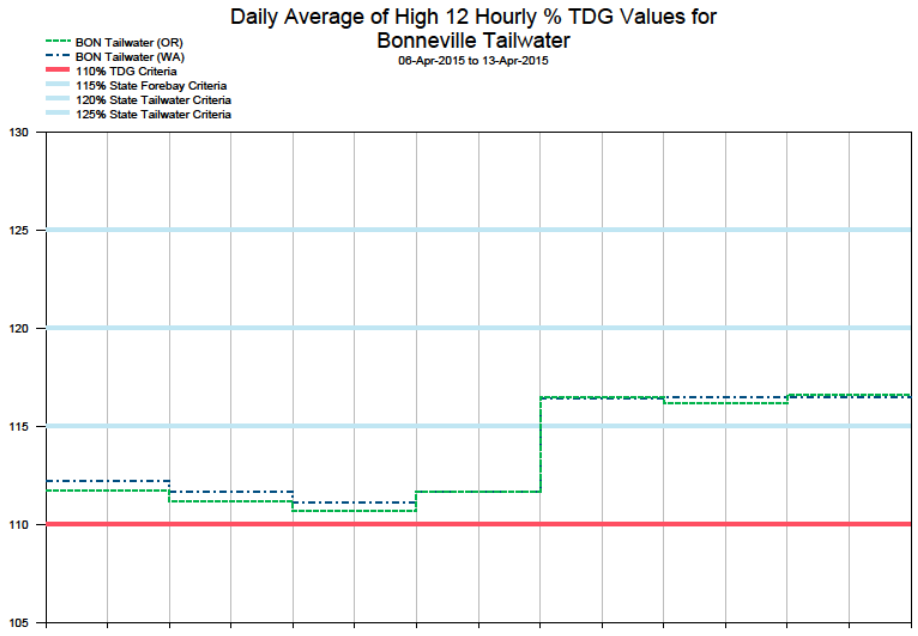

John Day Dam - Hourly Spill and Flow
KCFS
450.0
400.0
350.0
300.0
250.0
200.0
150.0
100.0
50.0
0.0
04/06/15 01:00
04/06/15 13:00
04/07/15 01:00
04/07/15 13:00
04/08/15 01:00
04/08/15 13:00
04/09/15 01:00
04/09/15 13:00
04/10/15 01:00
04/10/15 13:00
04/11/15 01:00
04/11/15 13:00
04/12/15 01:00
04/12/15 13:00
04/13/15 01:00
JDA Generation Flow
JDA Total Flow
JDA Spill Flow
JDA Target Spill
30% Spill

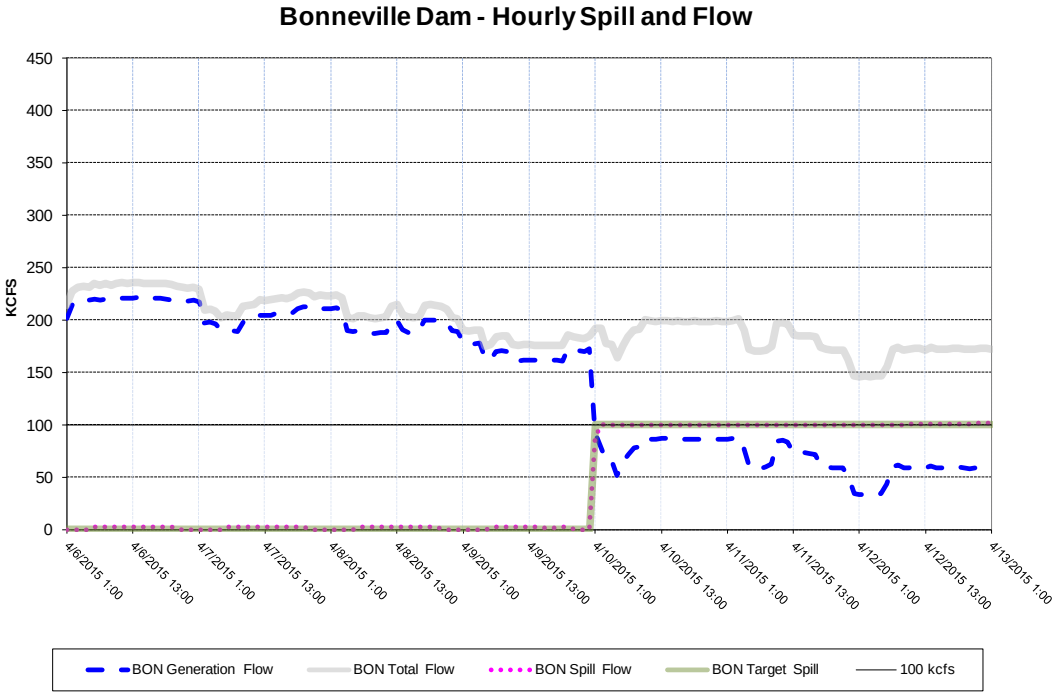
# Figure 11


Daily Average of High 12 Hourly % TDG Values for
The Dalles Tailwater and Bonneville Forebay
06-Apr-2015 to 13-Apr-2015
BON Forebay (WA)
TDA Tailwater (OR)
TDA Tailwater (WA)
110% TDG Criteria
115% State Forebay Criteria
120% State Tailwater Criteria
125% State Tailwater Criteria
130
125
120
115
110
105

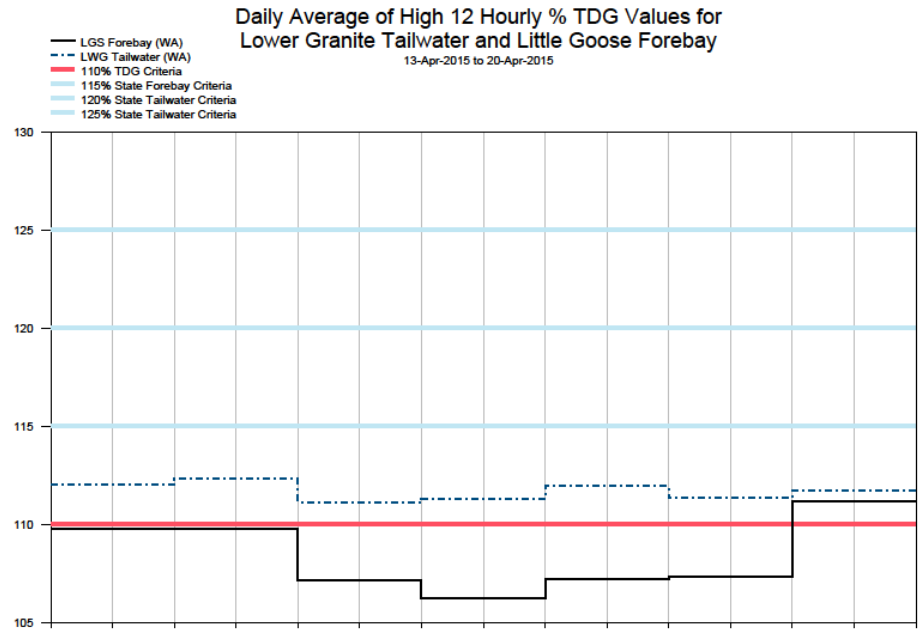

The Dalles Dam - Hourly Spill and Flow
KCFS
450.0
400.0
350.0
300.0
250.0
200.0
150.0
100.0
50.0
0.0
04/06/15 01:00
04/06/15 13:00
04/07/15 01:00
04/07/15 13:00
04/08/15 01:00
04/08/15 13:00
04/09/15 01:00
04/09/15 13:00
04/10/15 01:00
04/10/15 13:00
04/11/15 01:00
04/11/15 13:00
04/12/15 01:00
04/12/15 13:00
04/13/15 01:00
TDA Generation Flow
TDA Total Flow
TDA Spill Flow
TDA Target spill
40% of Total Flow

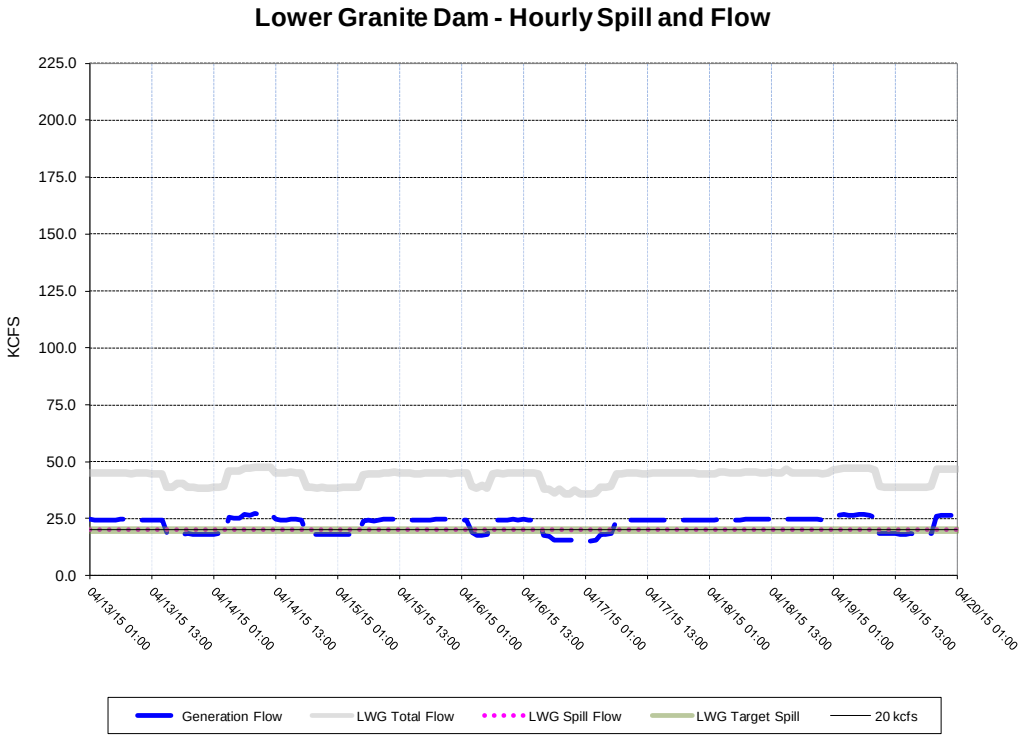
# Figure 12


Daily Average of High 12 Hourly % TDG Values for
Bonneville Tailwater
06-Apr-2015 to 13-Apr-2015
BON Tailwater (OR)
BON Tailwater (WA)
110% TDG Criteria
115% State Forebay Criteria
120% State Tailwater Criteria
125% State Tailwater Criteria
130
125
120
115
110
105

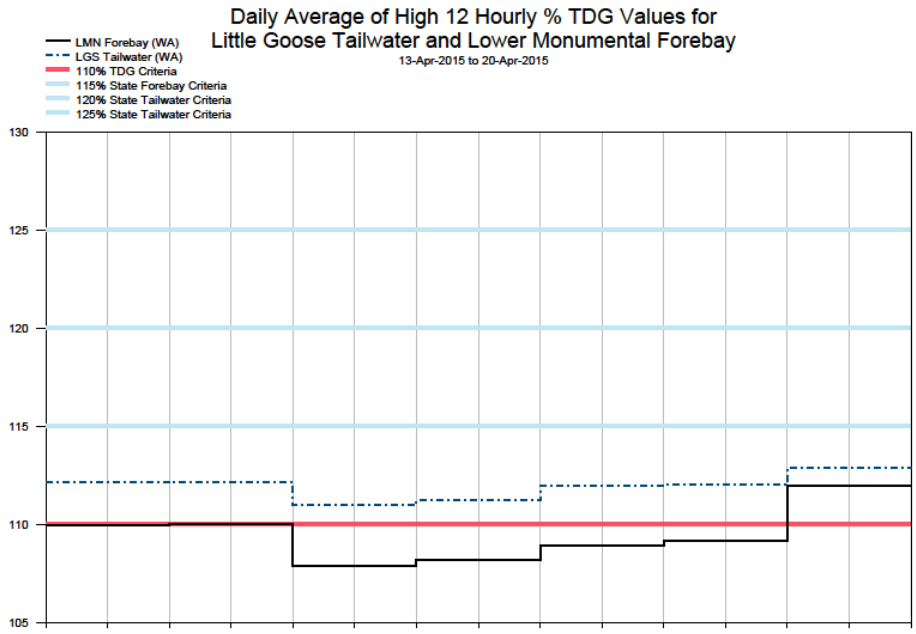

Bonneville Dam - Hourly Spill and Flow
KCFS
450
400
350
300
250
200
150
100
50
0
4/6/2015 1:00
4/6/2015 13:00
4/7/2015 1:00
4/7/2015 13:00
4/8/2015 1:00
4/8/2015 13:00
4/9/2015 1:00
4/9/2015 13:00
4/10/2015 1:00
4/10/2015 13:00
4/11/2015 1:00
4/11/2015 13:00
4/12/2015 1:00
4/12/2015 13:00
4/13/2015 1:00
BON Generation Flow
BON Total Flow
BON Spill Flow
BON Target Spill
100 kcfs

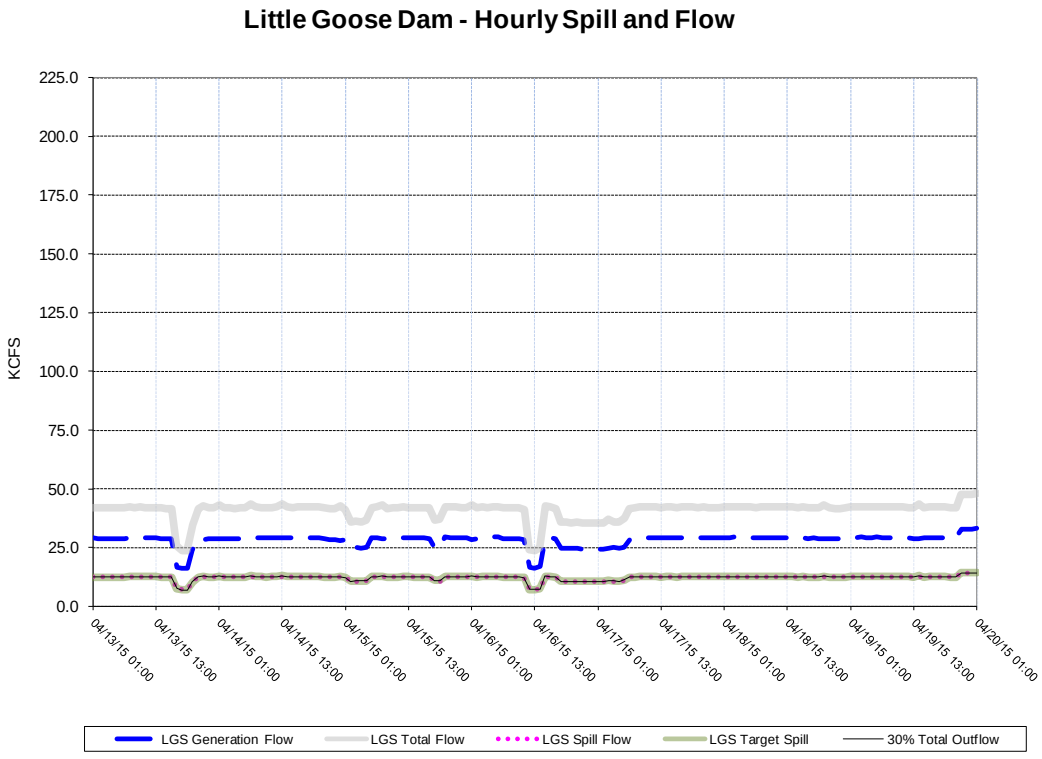
# Figure 13


Daily Average of High 12 Hourly % TDG Values for
Lower Granite Tailwater and Little Goose Forebay
13-Apr-2015 to 20-Apr-2015
LGS Forebay (WA)
LWG Tailwater (WA)
110% TDG Criteria
115% State Forebay Criteria
120% State Tailwater Criteria
125% State Tailwater Criteria
130
125
120
115
110
105

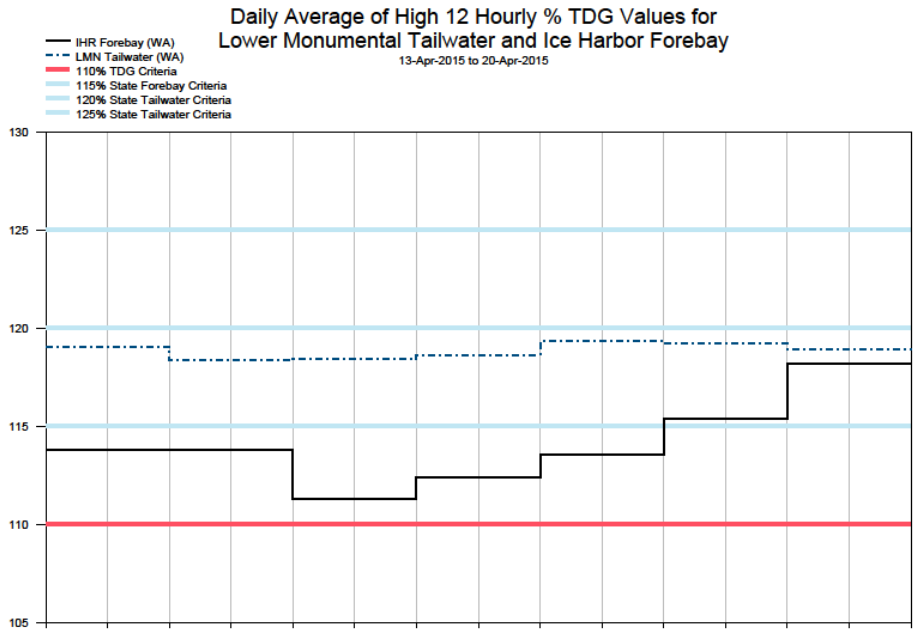

Lower Granite Dam - Hourly Spill and Flow
KCFS
225.0
200.0
175.0
150.0
125.0
100.0
75.0
50.0
25.0
0.0
04/13/15 01:00
04/13/15 13:00
04/14/15 01:00
04/14/15 13:00
04/15/15 01:00
04/15/15 13:00
04/16/15 01:00
04/16/15 13:00
04/17/15 01:00
04/17/15 13:00
04/18/15 01:00
04/18/15 13:00
04/19/15 01:00
04/19/15 13:00
04/20/15 01:00
Generation Flow
LWG Total Flow
LWG Spill Flow
LWG Target Spill
20 kcfs

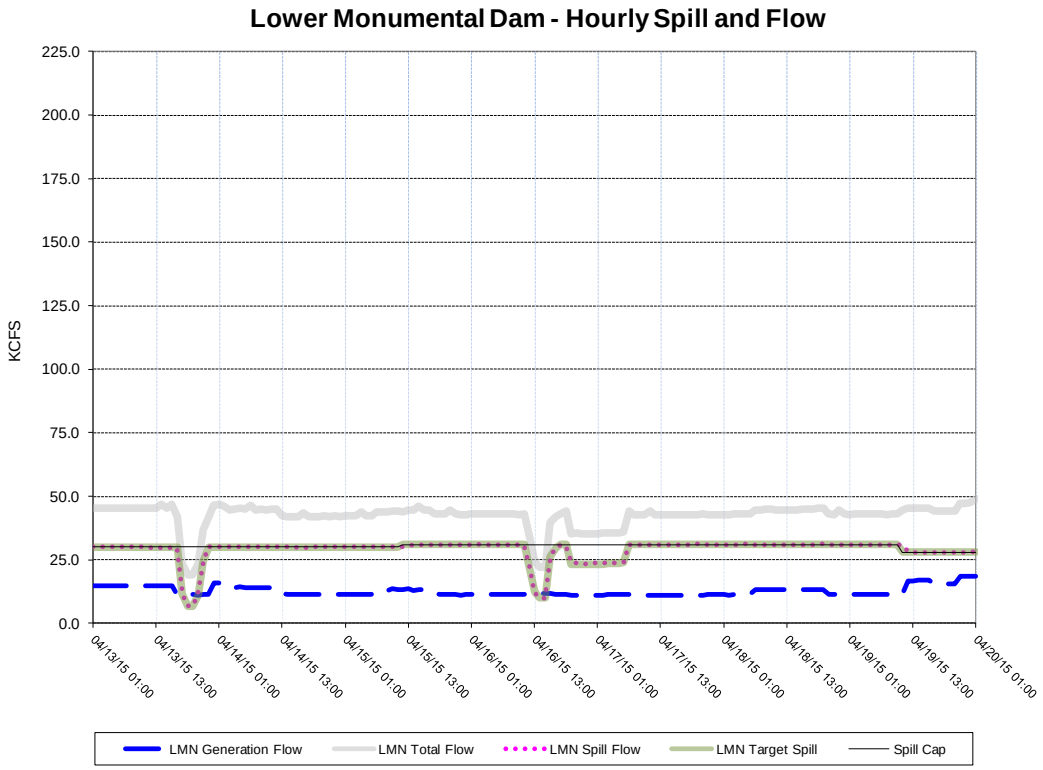
# Figure 14


Daily Average of High 12 Hourly % TDG Values for
Little Goose Tailwater and Lower Monumental Forebay
13-Apr-2015 to 20-Apr-2015
LMN Forebay (WA)
LGS Tailwater (WA)
110% TDG Criteria
115% State Forebay Criteria
120% State Tailwater Criteria
125% State Tailwater Criteria
130
125
120
115
110
105

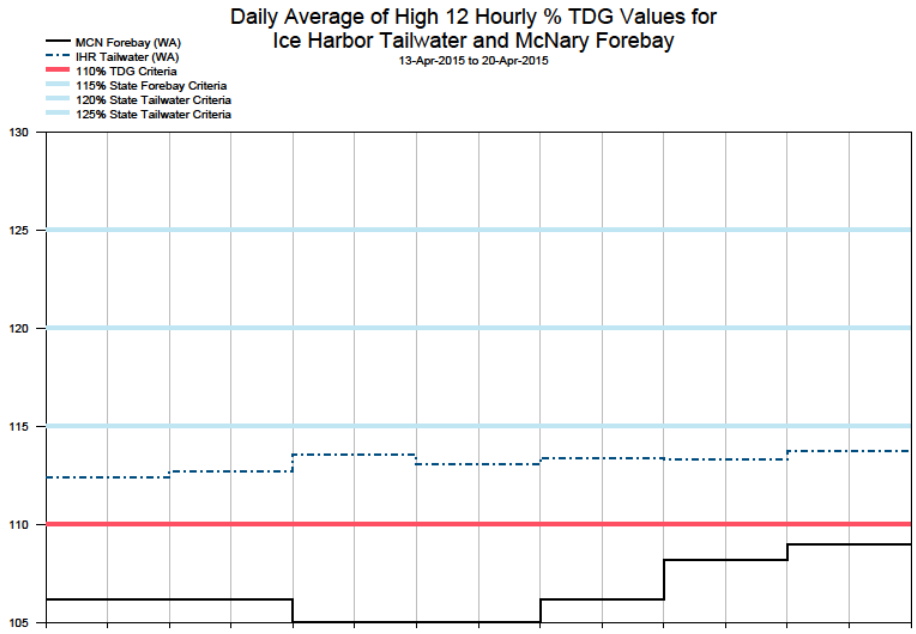

Little Goose Dam - Hourly Spill and Flow
KCFS
225.0
200.0
175.0
150.0
125.0
100.0
75.0
50.0
25.0
0.0
04/13/15 01:00
04/13/15 13:00
04/14/15 01:00
04/14/15 13:00
04/15/15 01:00
04/15/15 13:00
04/16/15 01:00
04/16/15 13:00
04/17/15 01:00
04/17/15 13:00
04/18/15 01:00
04/18/15 13:00
04/19/15 01:00
04/19/15 13:00
04/20/15 01:00
LGS Generation Flow
LGS Total Flow
LGS Spill Flow
LGS Target Spill
30% Total Outflow

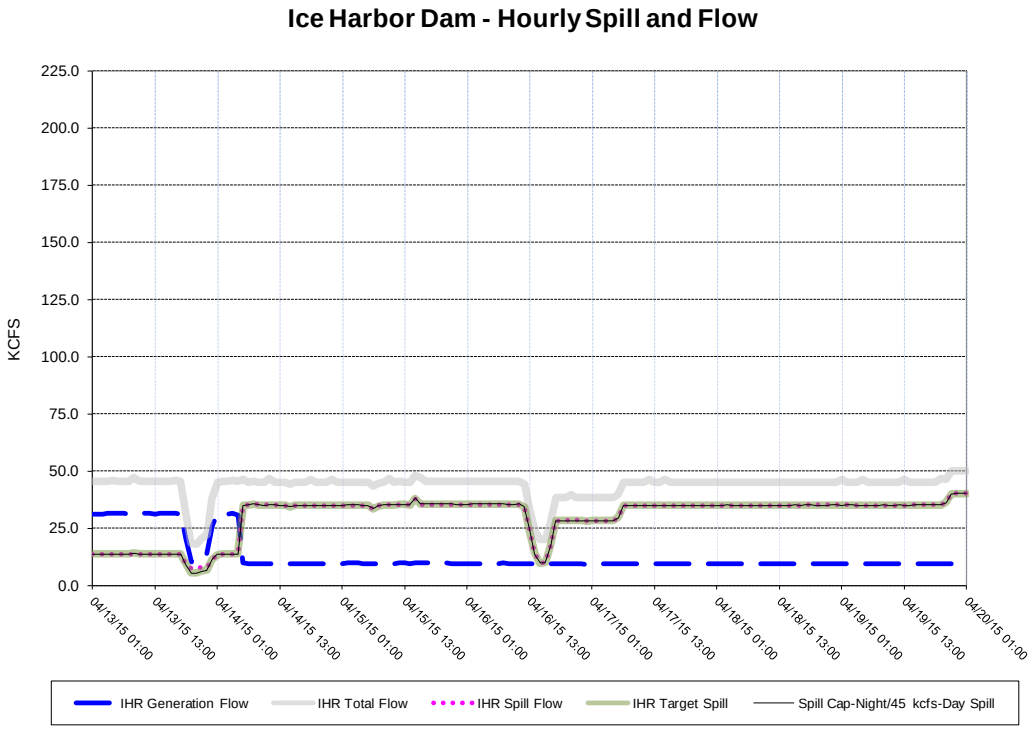
# Figure 15


Daily Average of High 12 Hourly % TDG Values for
Lower Monumental Tailwater and Ice Harbor Forebay
13-Apr-2015 to 20-Apr-2015
IHR Forebay (WA)
LMN Tailwater (WA)
110% TDG Criteria
115% State Forebay Criteria
120% State Tailwater Criteria
125% State Tailwater Criteria
130
125
120
115
110
105

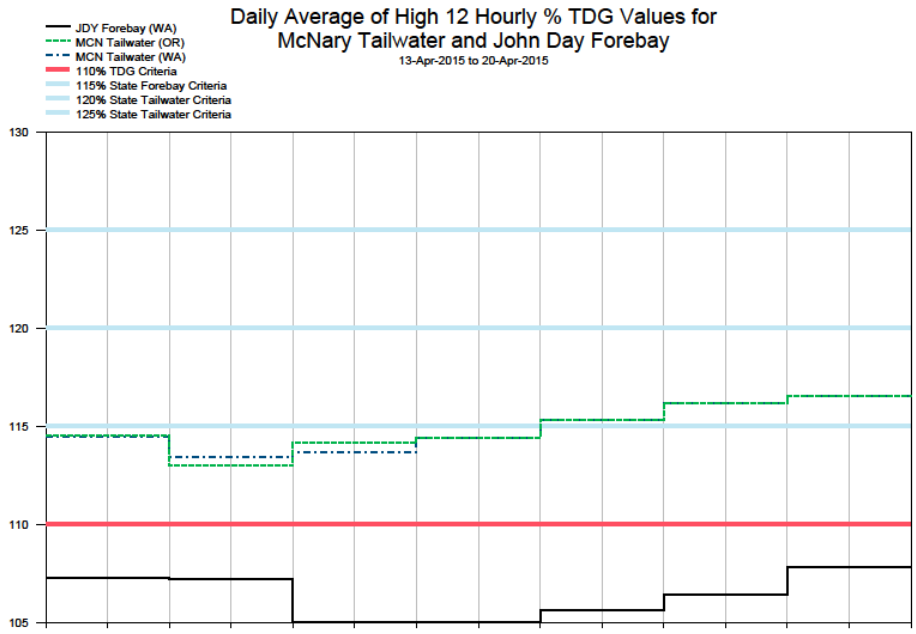

Lower Monumental Dam - Hourly Spill and Flow
KCFS
225.0
200.0
175.0
150.0
125.0
100.0
75.0
50.0
25.0
0.0
04/13/15 01:00
04/13/15 13:00
04/14/15 01:00
04/14/15 13:00
04/15/15 01:00
04/15/15 13:00
04/16/15 01:00
04/16/15 13:00
04/17/15 01:00
04/17/15 13:00
04/18/15 01:00
04/18/15 13:00
04/19/15 01:00
04/19/15 13:00
04/20/15 01:00
LMN Generation Flow
LMN Total Flow
LMN Spill Flow
LMN Target Spill
Spill Cap

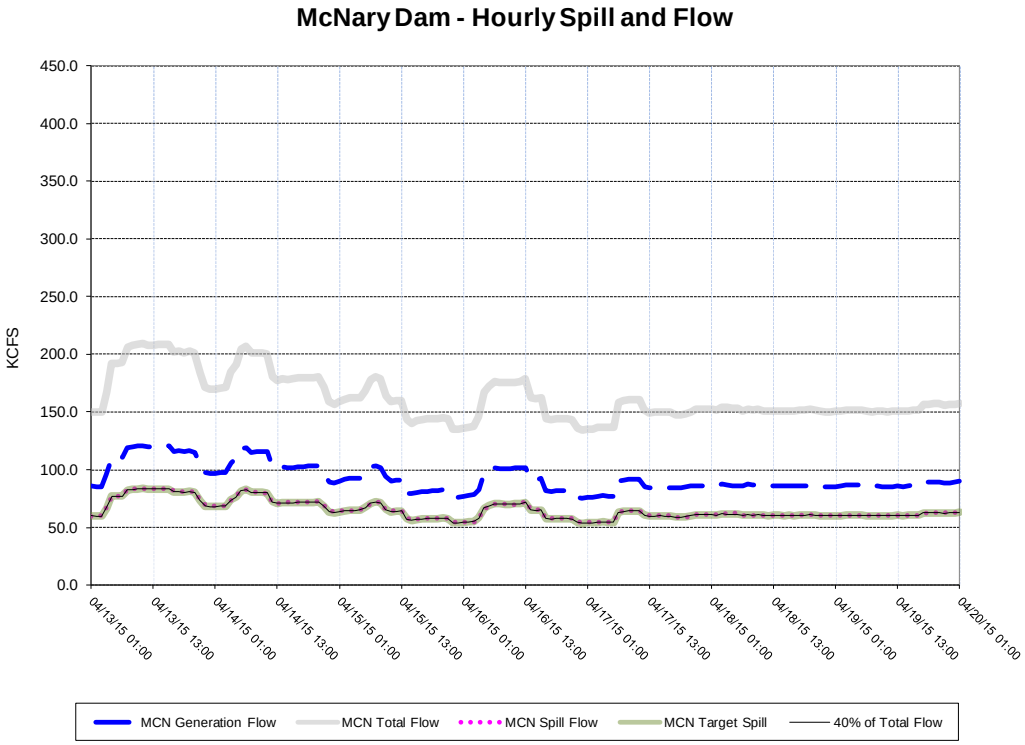
# Figure 16


Daily Average of High 12 Hourly % TDG Values for
Ice Harbor Tailwater and McNary Forebay
13-Apr-2015 to 20-Apr-2015
MCN Forebay (WA)
IHR Tailwater (WA)
110% TDG Criteria
115% State Forebay Criteria
120% State Tailwater Criteria
125% State Tailwater Criteria
130
125
120
115
110
105

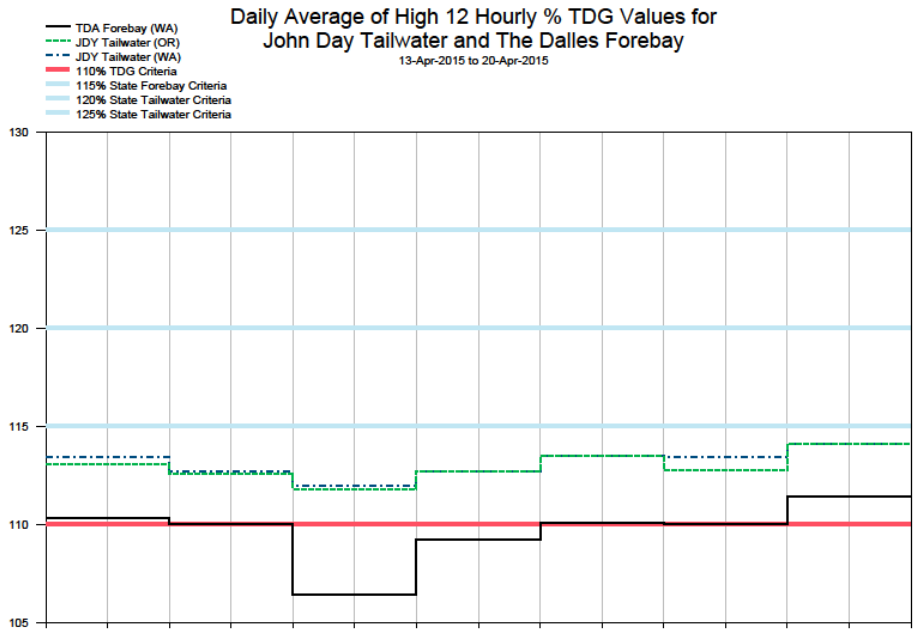

Ice Harbor Dam - Hourly Spill and Flow
KCFS
225.0
200.0
175.0
150.0
125.0
100.0
75.0
50.0
25.0
0.0
04/13/15 01:00
04/13/15 13:00
04/14/15 01:00
04/14/15 13:00
04/15/15 01:00
04/15/15 13:00
04/16/15 01:00
04/16/15 13:00
04/17/15 01:00
04/17/15 13:00
04/18/15 01:00
04/18/15 13:00
04/19/15 01:00
04/19/15 13:00
04/20/15 01:00
IHR Generation Flow
IHR Total Flow
IHR Spill Flow
IHR Target Spill
Spill Cap-Night/45 kcfs-Day Spill

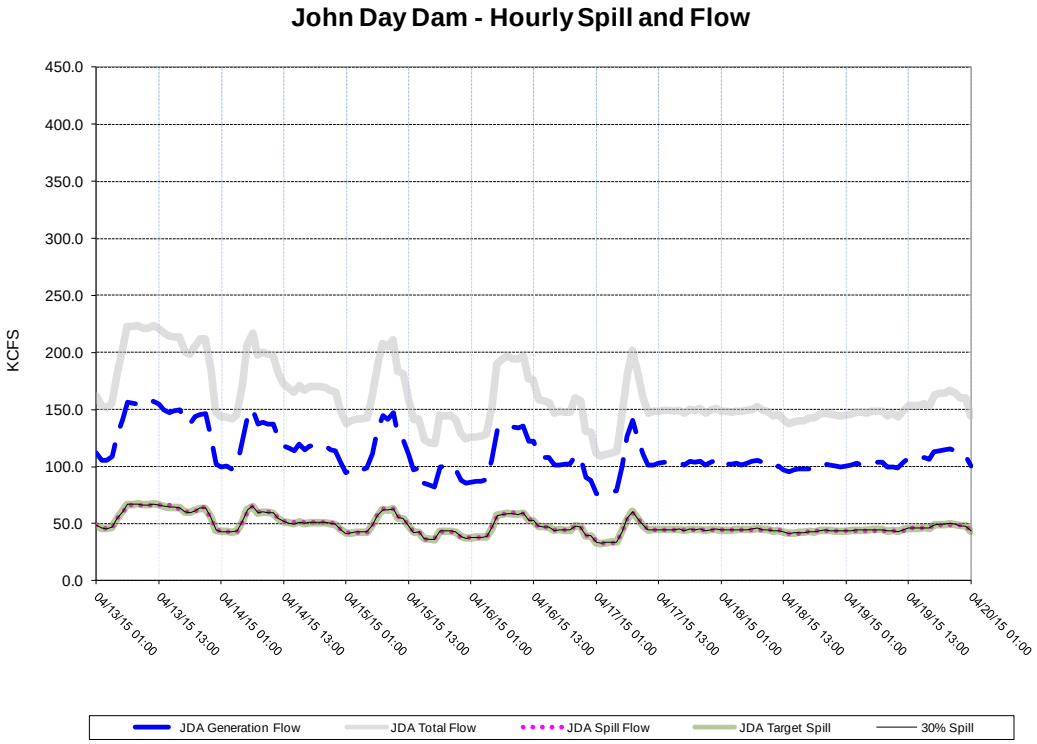
# Figure 17


Daily Average of High 12 Hourly % TDG Values for
McNary Tailwater and John Day Forebay
13-Apr-2015 to 20-Apr-2015
JDY Forebay (WA)
MCN Tailwater (OR)
MCN Tailwater (WA)
110% TDG Criteria
115% State Forebay Criteria
120% State Tailwater Criteria
125% State Tailwater Criteria
130
125
120
115
110
105

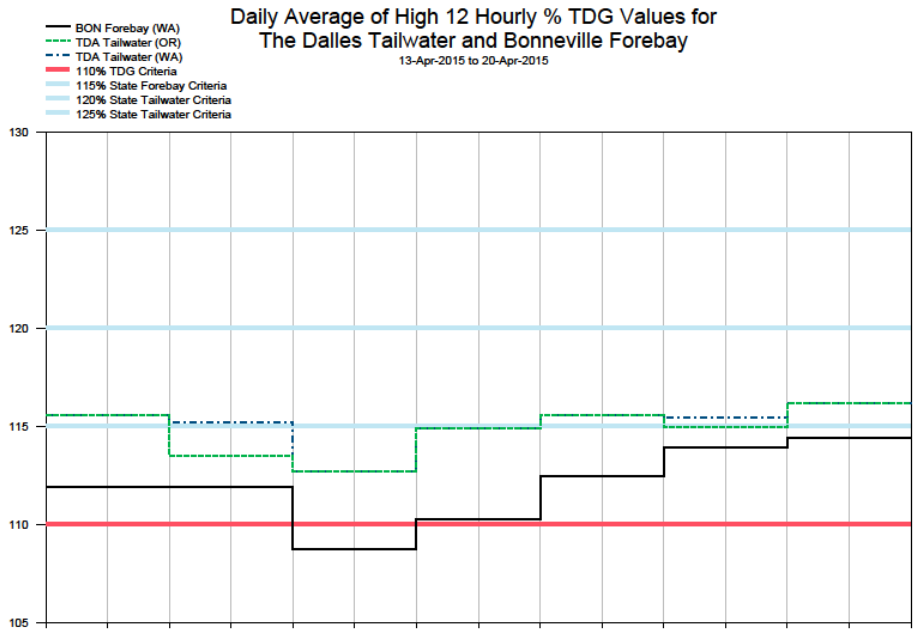

McNary Dam - Hourly Spill and Flow
KCFS
450.0
400.0
350.0
300.0
250.0
200.0
150.0
100.0
50.0
0.0
04/13/15 01:00
04/13/15 13:00
04/14/15 01:00
04/14/15 13:00
04/15/15 01:00
04/15/15 13:00
04/16/15 01:00
04/16/15 13:00
04/17/15 01:00
04/17/15 13:00
04/18/15 01:00
04/18/15 13:00
04/19/15 01:00
04/19/15 13:00
04/20/15 01:00
MCN Generation Flow
MCN Total Flow
MCN Spill Flow
MCN Target Spill
40% of Total Flow

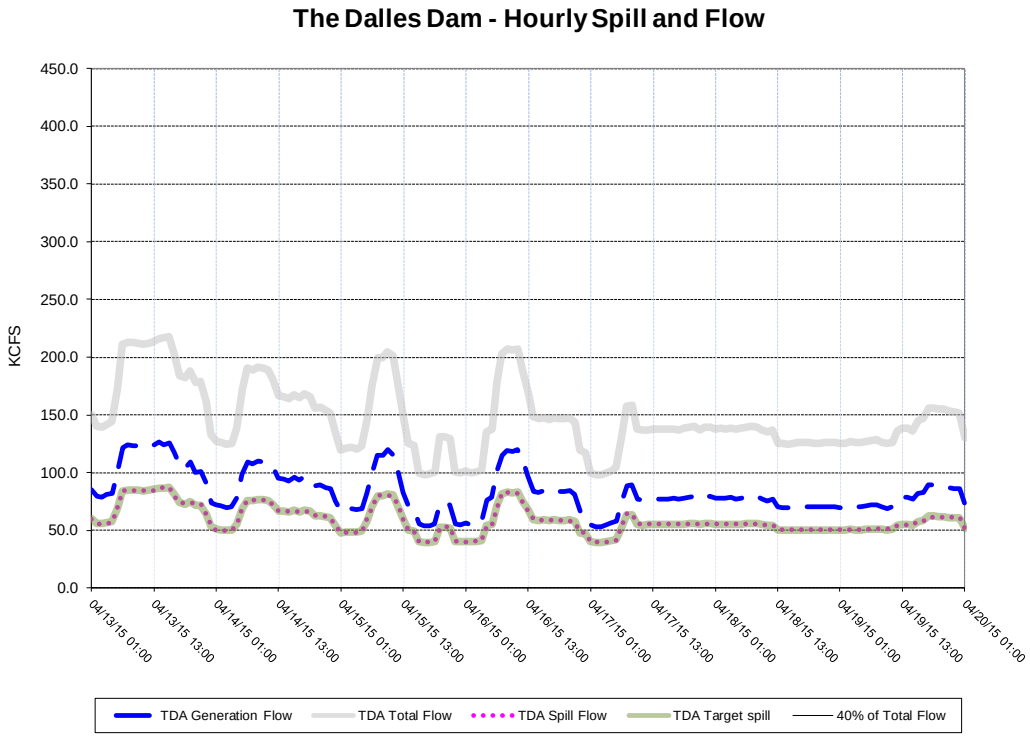
# Figure 18


Daily Average of High 12 Hourly % TDG Values for
John Day Tailwater and The Dalles Forebay
13-Apr-2015 to 20-Apr-2015
TDA Forebay (WA)
JDY Tailwater (OR)
JDY Tailwater (WA)
110% TDG Criteria
115% State Forebay Criteria
120% State Tailwater Criteria
125% State Tailwater Criteria
130
125
120
115
110
105

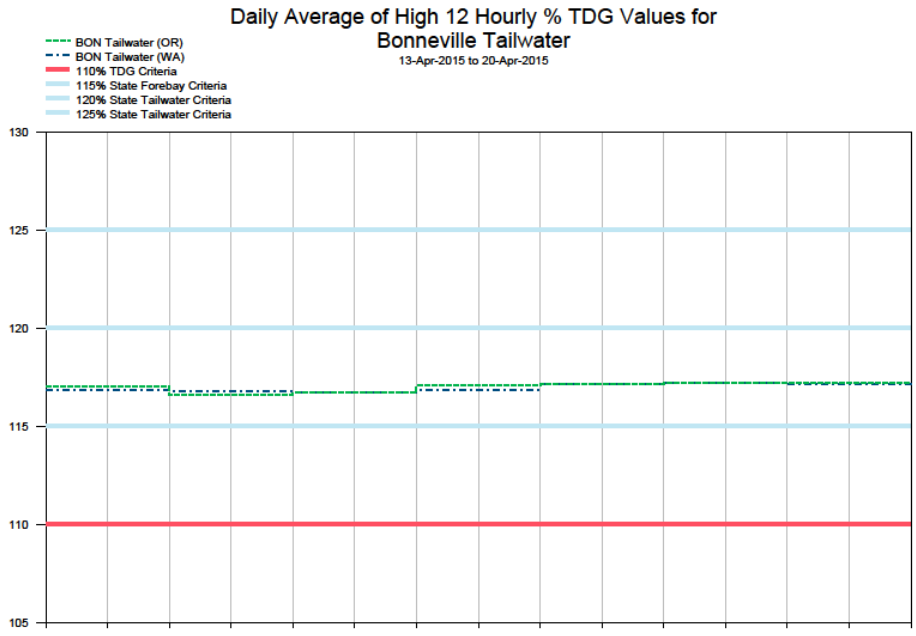

John Day Dam - Hourly Spill and Flow
KCFS
450.0
400.0
350.0
300.0
250.0
200.0
150.0
100.0
50.0
0.0
04/13/15 01:00
04/13/15 13:00
04/14/15 01:00
04/14/15 13:00
04/15/15 01:00
04/15/15 13:00
04/16/15 01:00
04/16/15 13:00
04/17/15 01:00
04/17/15 13:00
04/18/15 01:00
04/18/15 13:00
04/19/15 01:00
04/19/15 13:00
04/20/15 01:00
JDA Generation Flow
JDA Total Flow
JDA Spill Flow
JDA Target Spill
30% Spill

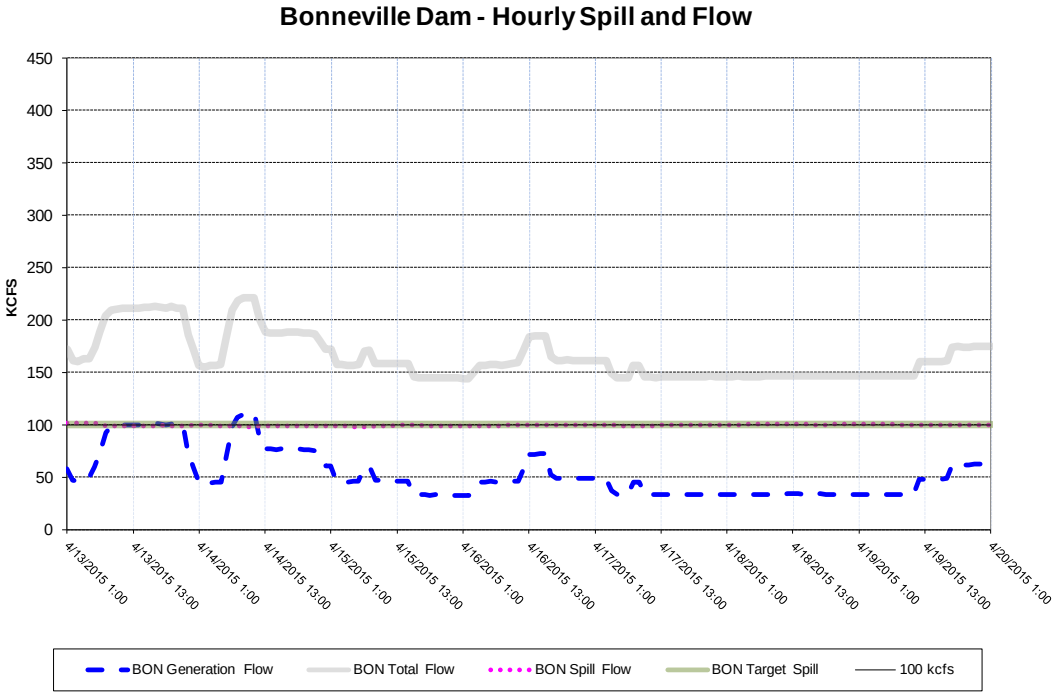
# Figure 19


Daily Average of High 12 Hourly % TDG Values for
The Dalles Tailwater and Bonneville Forebay
13-Apr-2015 to 20-Apr-2015
BON Forebay (WA)
TDA Tailwater (OR)
TDA Tailwater (WA)
110% TDG Criteria
115% State Forebay Criteria
120% State Tailwater Criteria
125% State Tailwater Criteria
130
125
120
115
110
105

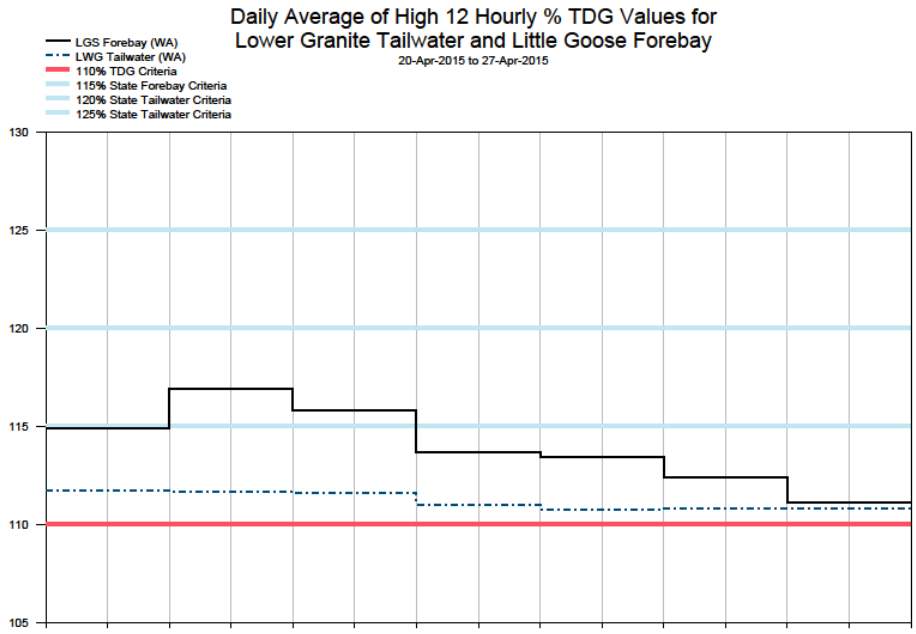

The Dalles Dam - Hourly Spill and Flow
KCFS
450.0
400.0
350.0
300.0
250.0
200.0
150.0
100.0
50.0
0.0
04/13/15 01:00
04/13/15 13:00
04/14/15 01:00
04/14/15 13:00
04/15/15 01:00
04/15/15 13:00
04/16/15 01:00
04/16/15 13:00
04/17/15 01:00
04/17/15 13:00
04/18/15 01:00
04/18/15 13:00
04/19/15 01:00
04/19/15 13:00
04/20/15 01:00
TDA Generation Flow
TDA Total Flow
TDA Spill Flow
TDA Target spill
40% of Total Flow

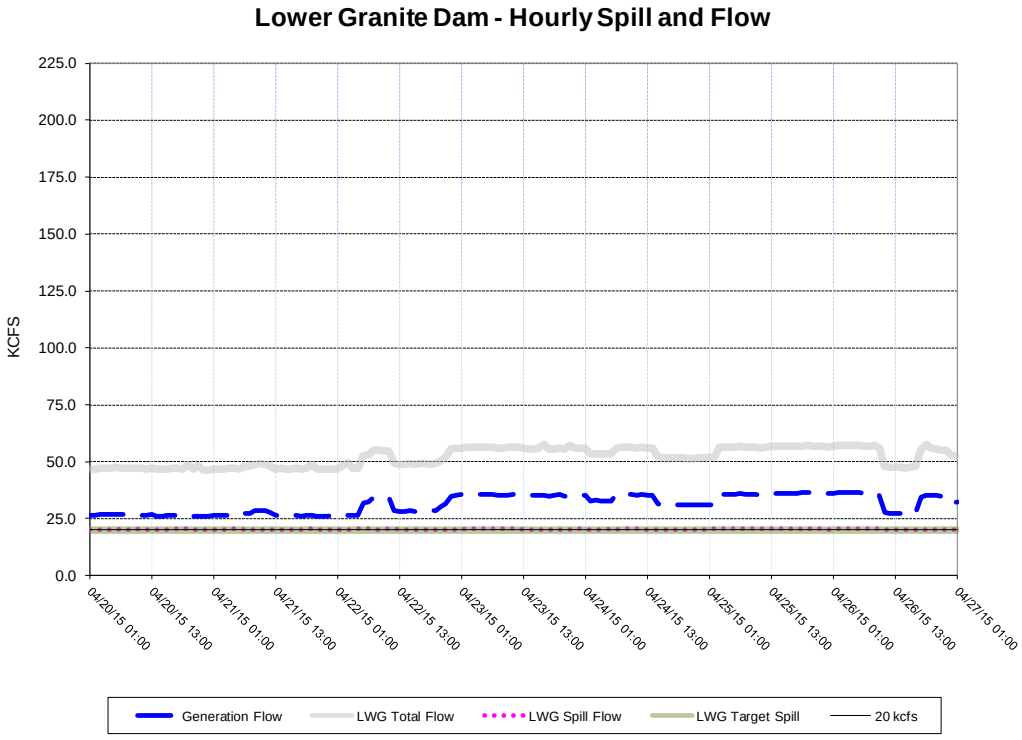
# Figure 20


Daily Average of High 12 Hourly % TDG Values for
Bonneville Tailwater
13-Apr-2015 to 20-Apr-2015
BON Tailwater (OR)
BON Tailwater (WA)
110% TDG Criteria
115% State Forebay Criteria
120% State Tailwater Criteria
125% State Tailwater Criteria
130
125
120
115
110
105

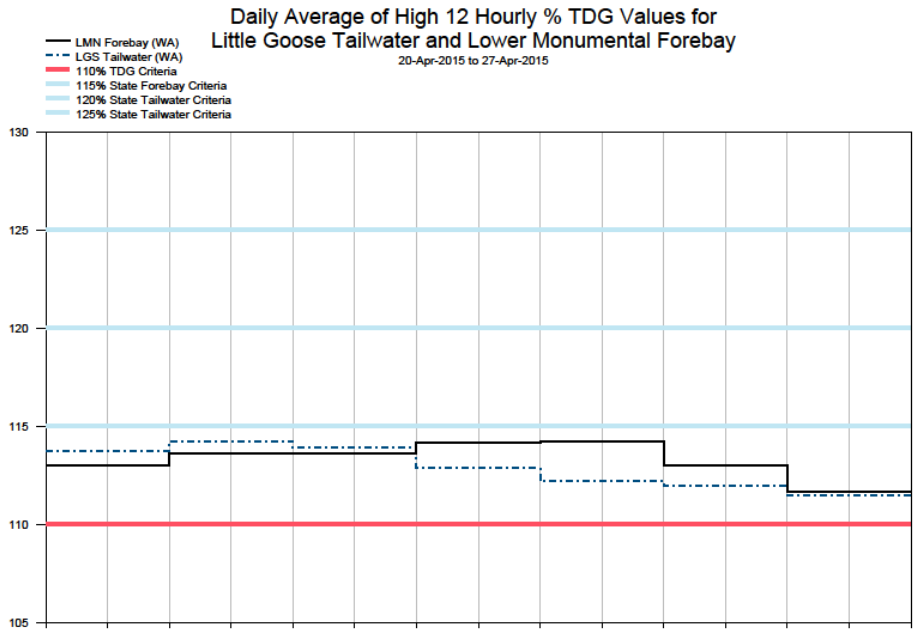

Bonneville Dam - Hourly Spill and Flow
KCFS
450
400
350
300
250
200
150
100
50
0
4/13/2015 1:00
4/13/2015 13:00
4/14/2015 1:00
4/14/2015 13:00
4/15/2015 1:00
4/15/2015 13:00
4/16/2015 1:00
4/16/2015 13:00
4/17/2015 1:00
4/17/2015 13:00
4/18/2015 1:00
4/18/2015 13:00
4/19/2015 1:00
4/19/2015 13:00
4/20/2015 1:00
BON Generation Flow
BON Total Flow
BON Spill Flow
BON Target Spill
100 kcfs

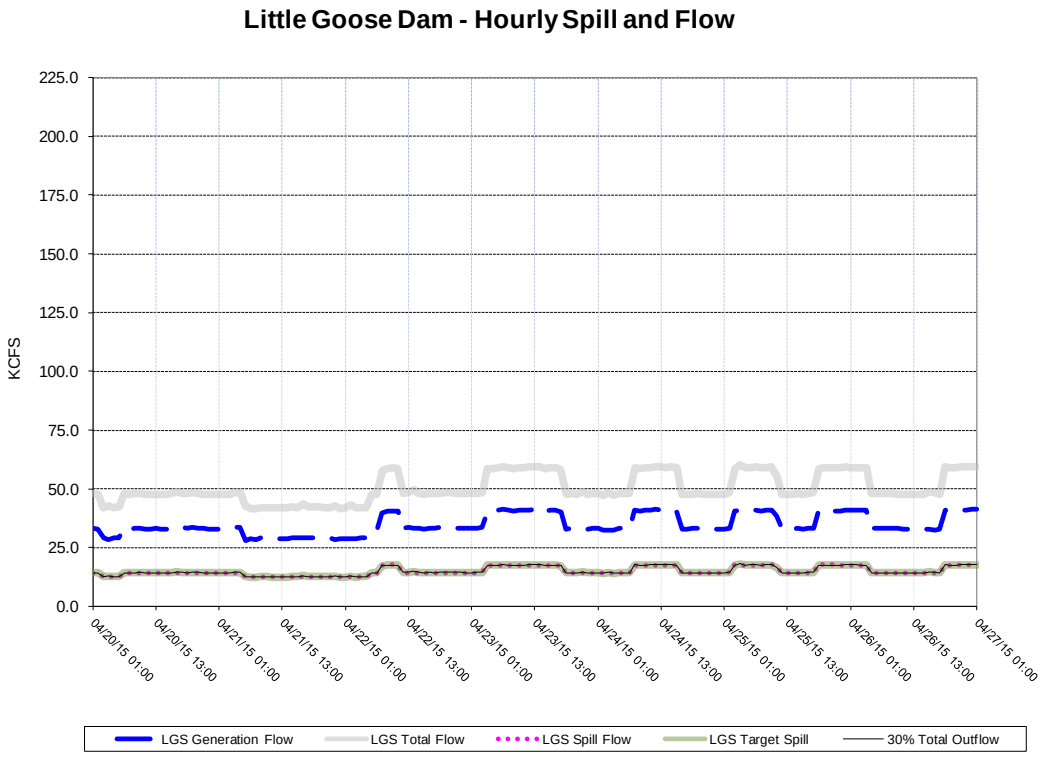
# Figure 21


Daily Average of High 12 Hourly % TDG Values for
Lower Granite Tailwater and Little Goose Forebay
20-Apr-2015 to 27-Apr-2015
LGS Forebay (WA)
LWG Tailwater (WA)
110% TDG Criteria
115% State Forebay Criteria
120% State Tailwater Criteria
125% State Tailwater Criteria
130
125
120
115
110
105

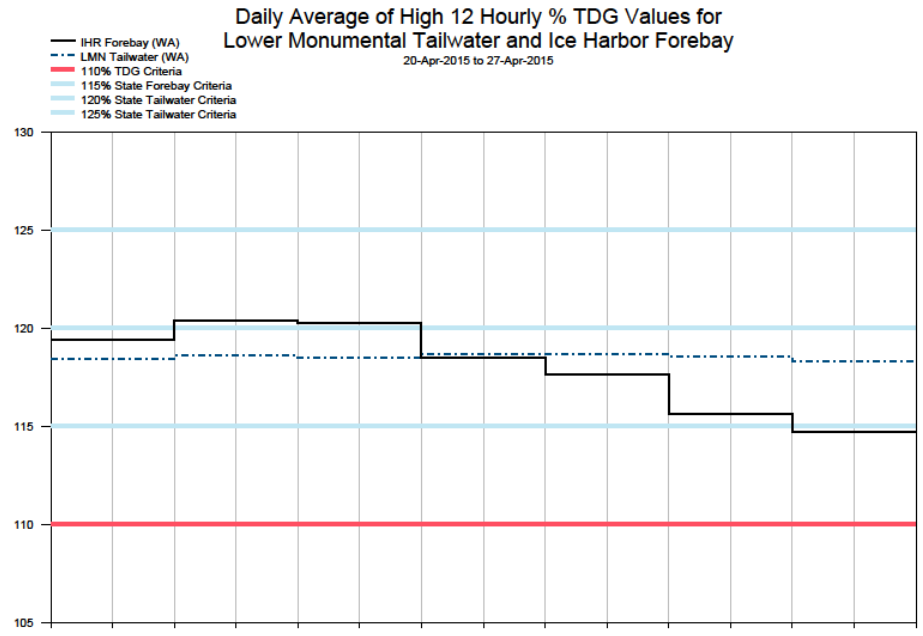

Lower Granite Dam - Hourly Spill and Flow
KCFS
225.0
200.0
175.0
150.0
125.0
100.0
75.0
50.0
25.0
0.0
04/20/15 01:00
04/20/15 13:00
04/21/15 01:00
04/21/15 13:00
04/22/15 01:00
04/22/15 13:00
04/23/15 01:00
04/23/15 13:00
04/24/15 01:00
04/24/15 13:00
04/25/15 01:00
04/25/15 13:00
04/26/15 01:00
04/26/15 13:00
04/27/15 01:00
Generation Flow
LWG Total Flow
LWG Spill Flow
LWG Target Spill
20 kcfs

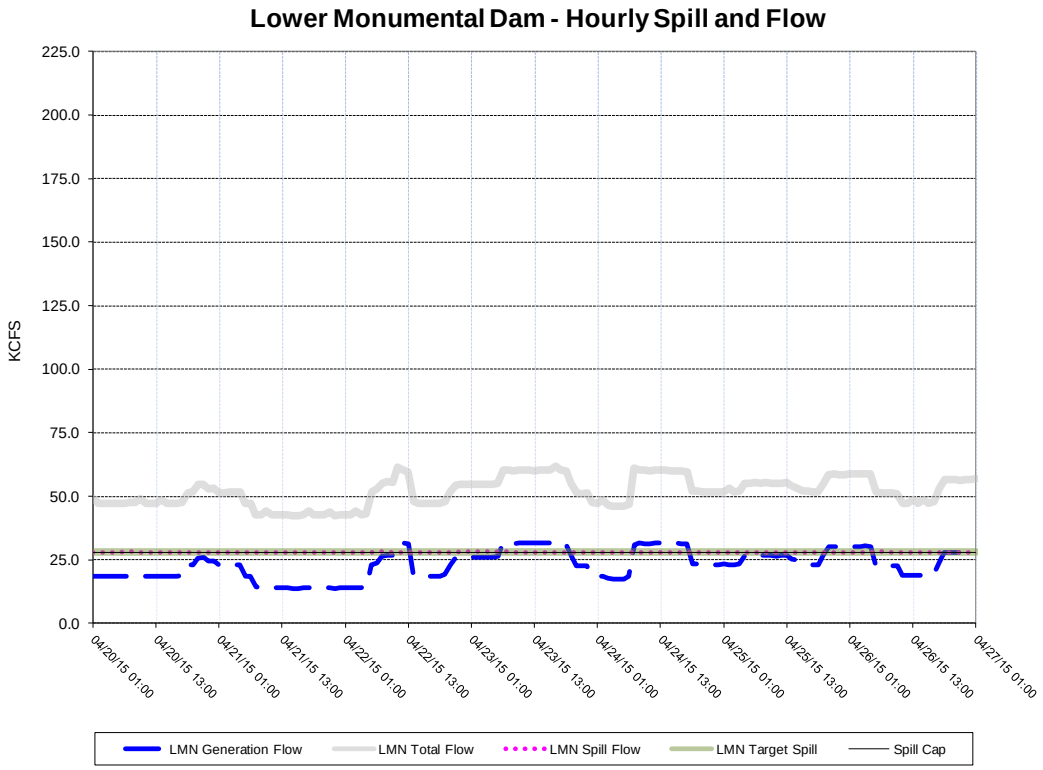
# Figure 22


Daily Average of High 12 Hourly % TDG Values for
Little Goose Tailwater and Lower Monumental Forebay
20-Apr-2015 to 27-Apr-2015
LMN Forebay (WA)
LGS Tailwater (WA)
110% TDG Criteria
115% State Forebay Criteria
120% State Tailwater Criteria
125% State Tailwater Criteria
130
125
120
115
110
105

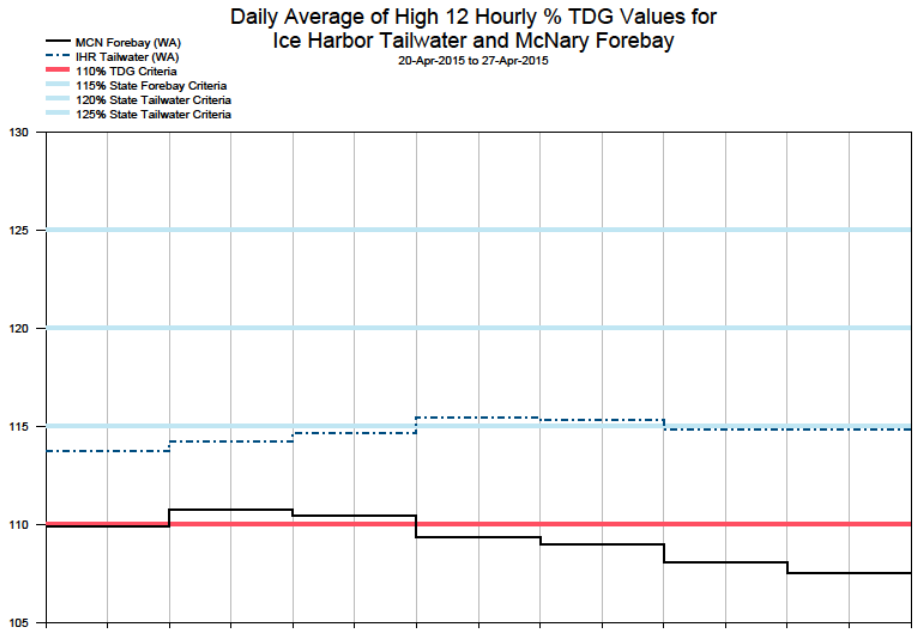

Little Goose Dam - Hourly Spill and Flow
KCFS
225.0
200.0
175.0
150.0
125.0
100.0
75.0
50.0
25.0
0.0
04/20/15 01:00
04/20/15 13:00
04/21/15 01:00
04/21/15 13:00
04/22/15 01:00
04/22/15 13:00
04/23/15 01:00
04/23/15 13:00
04/24/15 01:00
04/24/15 13:00
04/25/15 01:00
04/25/15 13:00
04/26/15 01:00
04/26/15 13:00
04/27/15 01:00
LGS Generation Flow
LGS Total Flow
LGS Spill Flow
LGS Target Spill
30% Total Outflow

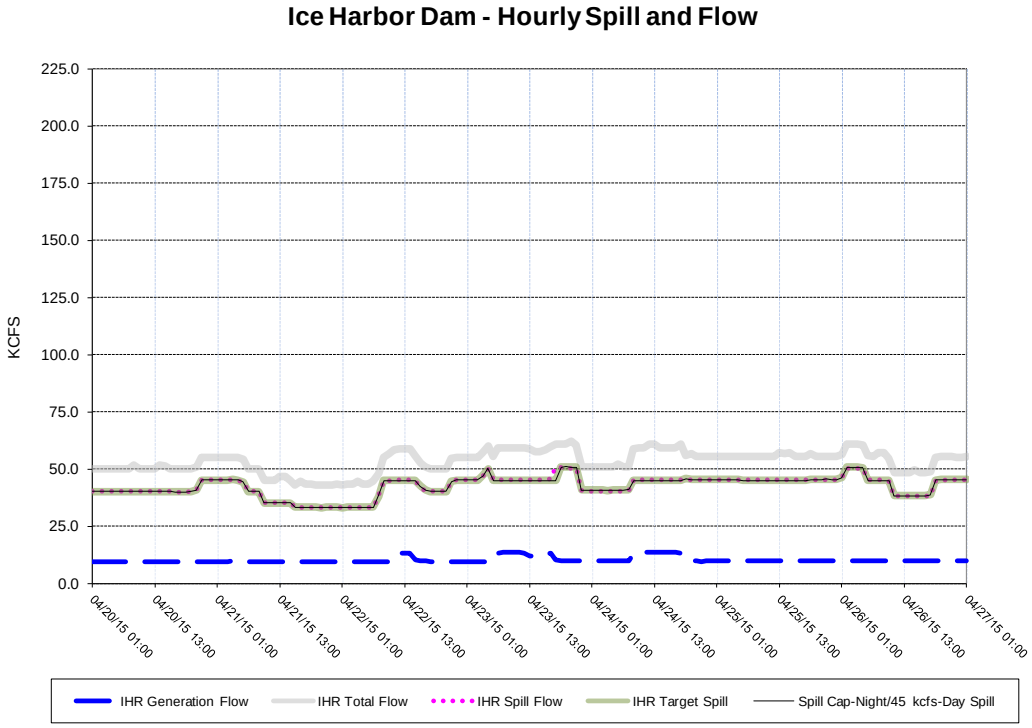
# Figure 23


Daily Average of High 12 Hourly % TDG Values for
Lower Monumental Tailwater and Ice Harbor Forebay
20-Apr-2015 to 27-Apr-2015
IHR Forebay (WA)
LMN Tailwater (WA)
110% TDG Criteria
115% State Forebay Criteria
120% State Tailwater Criteria
125% State Tailwater Criteria
130
125
120
115
110
105

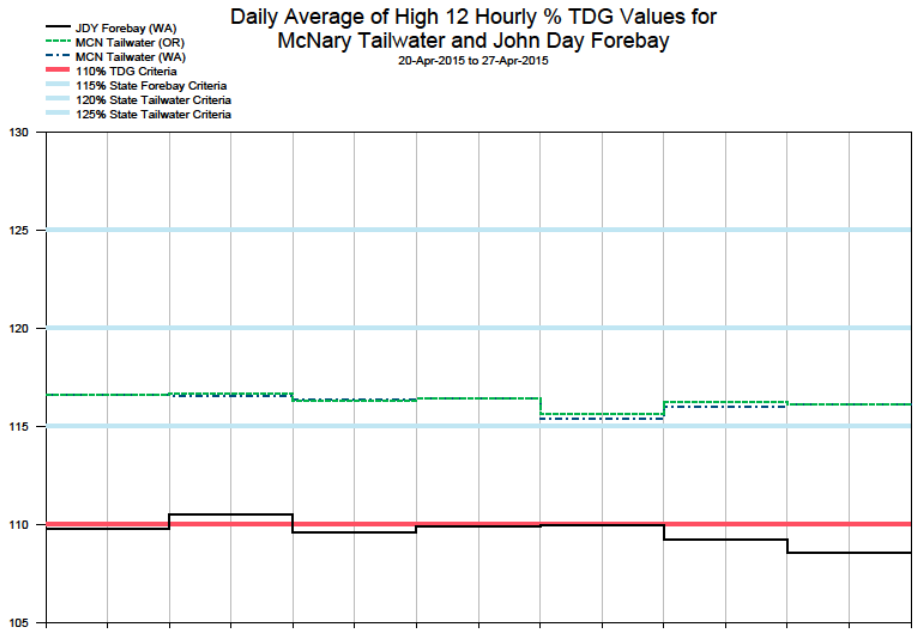

Lower Monumental Dam - Hourly Spill and Flow
KCFS
225.0
200.0
175.0
150.0
125.0
100.0
75.0
50.0
25.0
0.0
04/20/15 01:00
04/20/15 13:00
04/21/15 01:00
04/21/15 13:00
04/22/15 01:00
04/22/15 13:00
04/23/15 01:00
04/23/15 13:00
04/24/15 01:00
04/24/15 13:00
04/25/15 01:00
04/25/15 13:00
04/26/15 01:00
04/26/15 13:00
04/27/15 01:00
LMN Generation Flow
LMN Total Flow
LMN Spill Flow
LMN Target Spill
Spill Cap

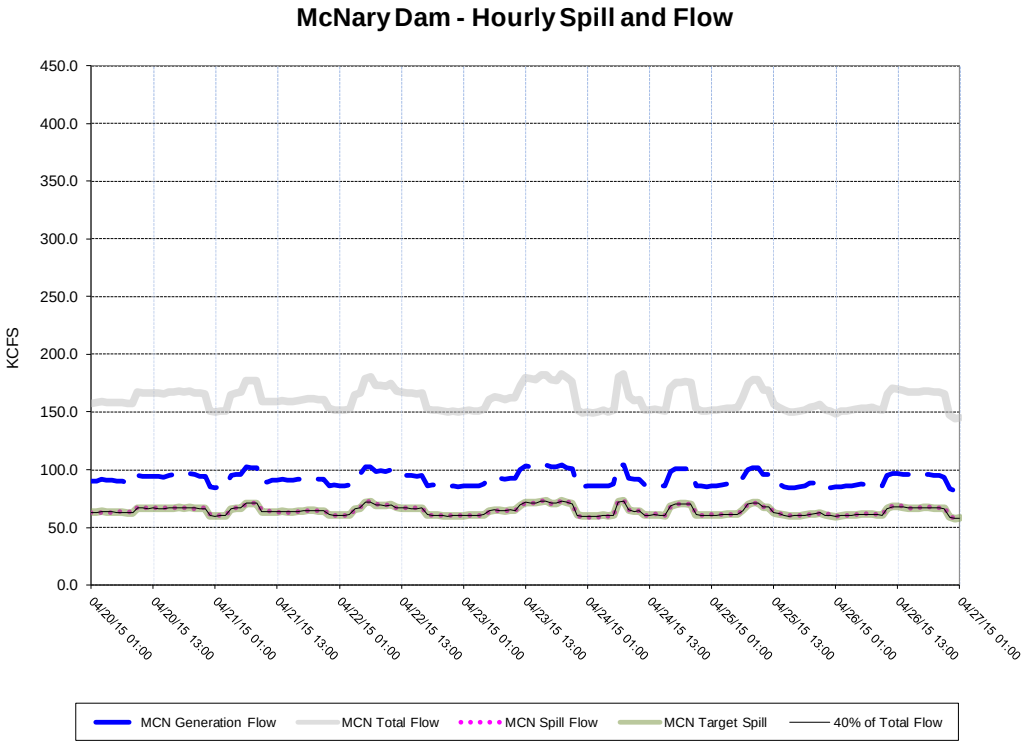
# Figure 24


Daily Average of High 12 Hourly % TDG Values for
Ice Harbor Tailwater and McNary Forebay
20-Apr-2015 to 27-Apr-2015
MCN Forebay (WA)
IHR Tailwater (WA)
110% TDG Criteria
115% State Forebay Criteria
120% State Tailwater Criteria
125% State Tailwater Criteria
130
125
120
115
110
105

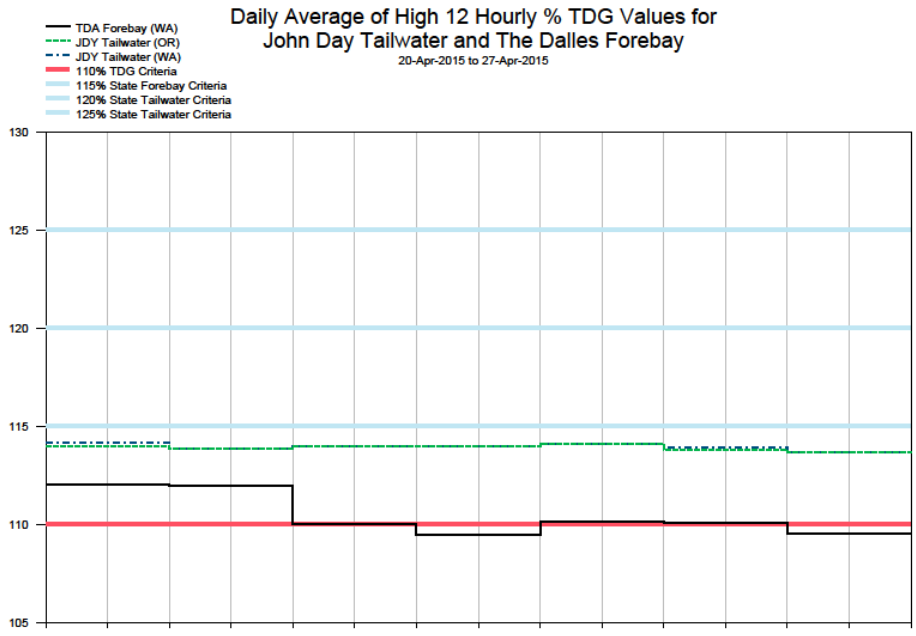

Ice Harbor Dam - Hourly Spill and Flow
KCFS
225.0
200.0
175.0
150.0
125.0
100.0
75.0
50.0
25.0
0.0
04/20/15 01:00
04/20/15 13:00
04/21/15 01:00
04/21/15 13:00
04/22/15 01:00
04/22/15 13:00
04/23/15 01:00
04/23/15 13:00
04/24/15 01:00
04/24/15 13:00
04/25/15 01:00
04/25/15 13:00
04/26/15 01:00
04/26/15 13:00
04/27/15 01:00
IHR Generation Flow
IHR Total Flow
IHR Spill Flow
IHR Target Spill
Spill Cap-Night/45 kcfs-Day Spill

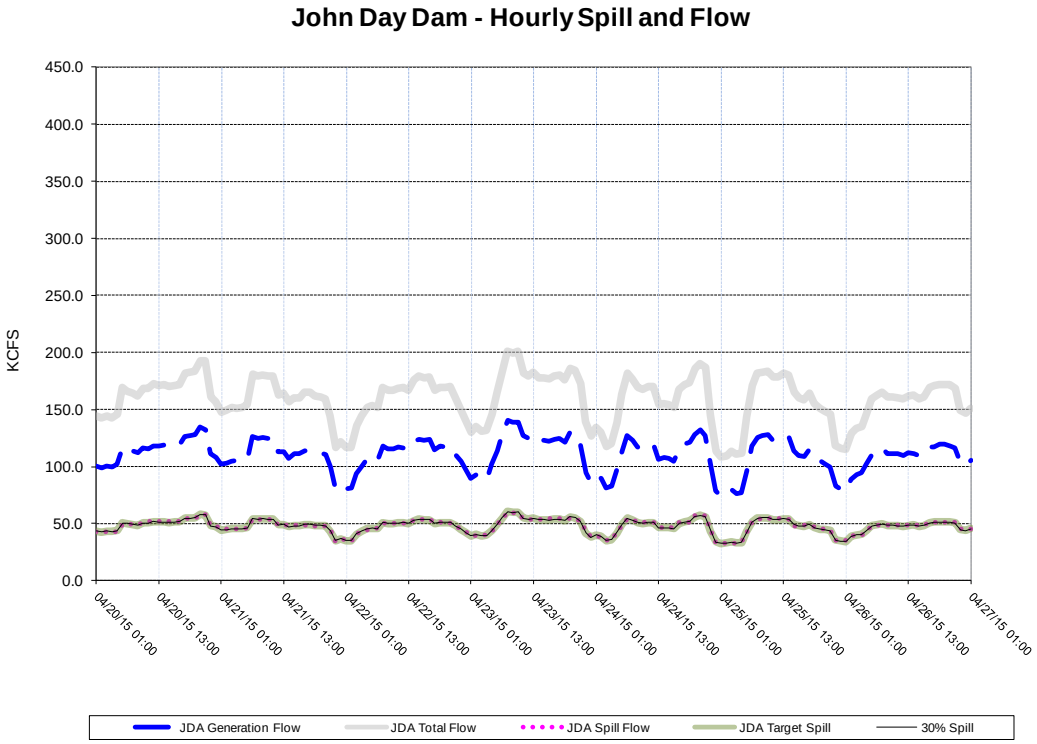
# Figure 25


Daily Average of High 12 Hourly % TDG Values for
McNary Tailwater and John Day Forebay
20-Apr-2015 to 27-Apr-2015
JDY Forebay (WA)
MCN Tailwater (OR)
MCN Tailwater (WA)
110% TDG Criteria
115% State Forebay Criteria
120% State Tailwater Criteria
125% State Tailwater Criteria
130
125
120
115
110
105

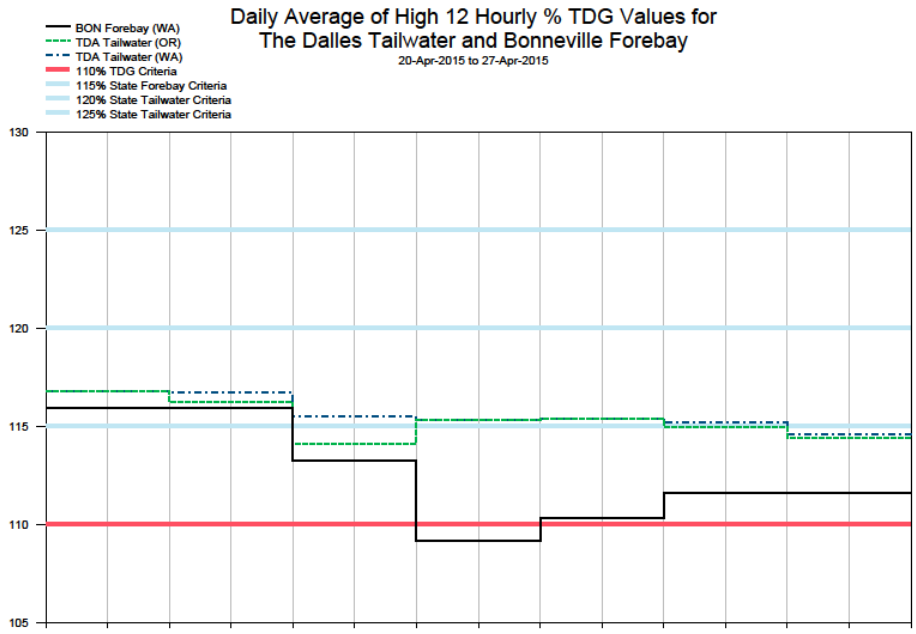

McNary Dam - Hourly Spill and Flow
KCFS
450.0
400.0
350.0
300.0
250.0
200.0
150.0
100.0
50.0
0.0
04/20/15 01:00
04/20/15 13:00
04/21/15 01:00
04/21/15 13:00
04/22/15 01:00
04/22/15 13:00
04/23/15 01:00
04/23/15 13:00
04/24/15 01:00
04/24/15 13:00
04/25/15 01:00
04/25/15 13:00
04/26/15 01:00
04/26/15 13:00
04/27/15 01:00
MCN Generation Flow
MCN Total Flow
MCN Spill Flow
MCN Target Spill
40% of Total Flow

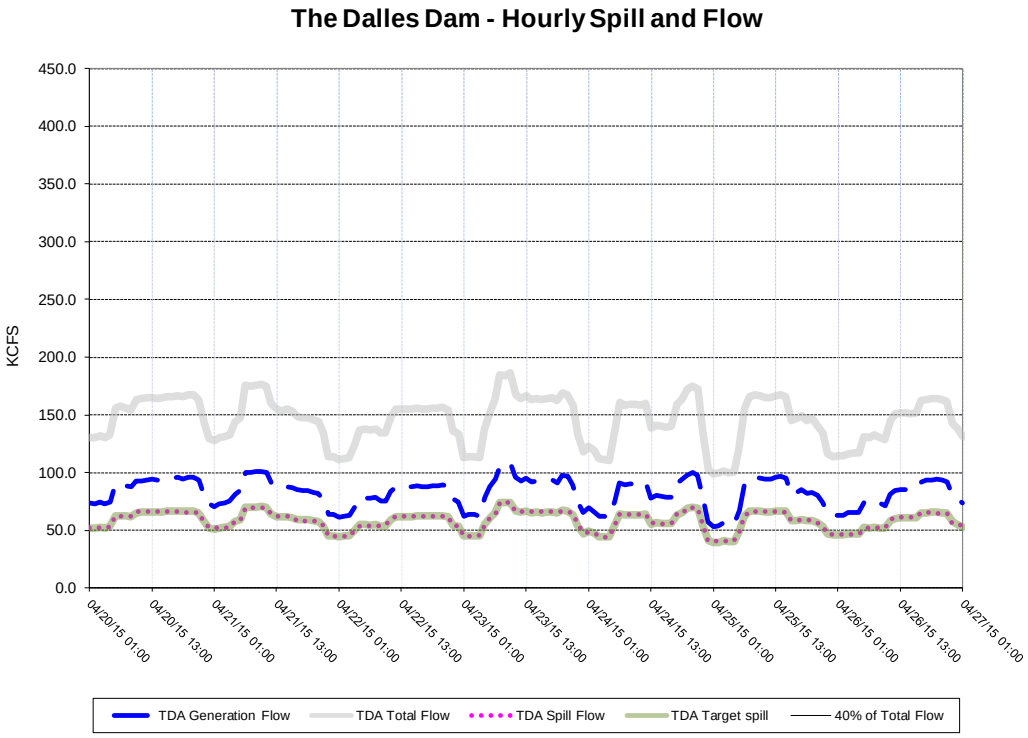
# Figure 26


Daily Average of High 12 Hourly % TDG Values for
John Day Tailwater and The Dalles Forebay
20-Apr-2015 to 27-Apr-2015
TDA Forebay (WA)
JDY Tailwater (OR)
JDY Tailwater (WA)
110% TDG Criteria
115% State Forebay Criteria
120% State Tailwater Criteria
125% State Tailwater Criteria
130
125
120
115
110
105

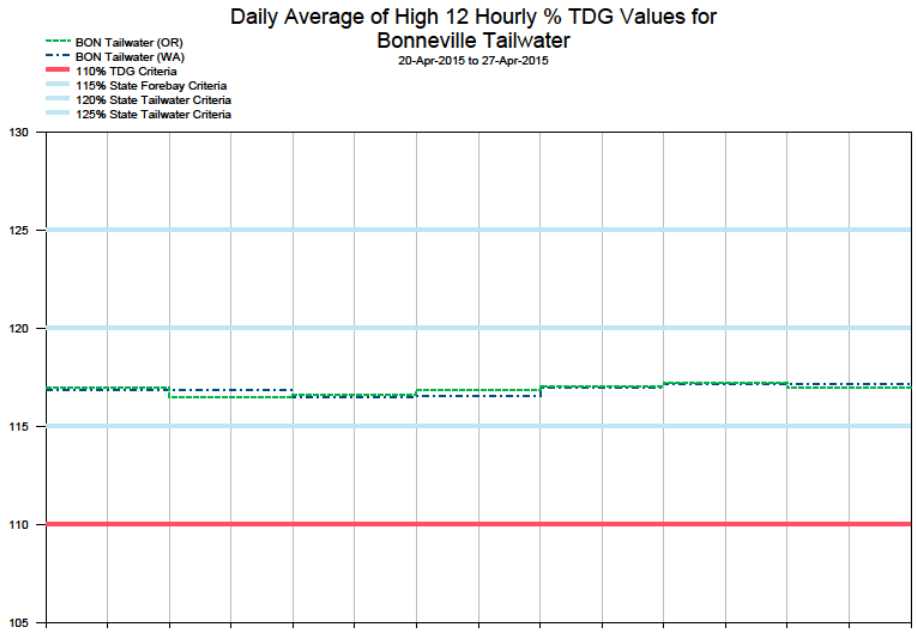

John Day Dam - Hourly Spill and Flow
KCFS
450.0
400.0
350.0
300.0
250.0
200.0
150.0
100.0
50.0
0.0
04/20/15 01:00
04/20/15 13:00
04/21/15 01:00
04/21/15 13:00
04/22/15 01:00
04/22/15 13:00
04/23/15 01:00
04/23/15 13:00
04/24/15 01:00
04/24/15 13:00
04/25/15 01:00
04/25/15 13:00
04/26/15 01:00
04/26/15 13:00
04/27/15 01:00
JDA Generation Flow
JDA Total Flow
JDA Spill Flow
JDA Target Spill
30% Spill

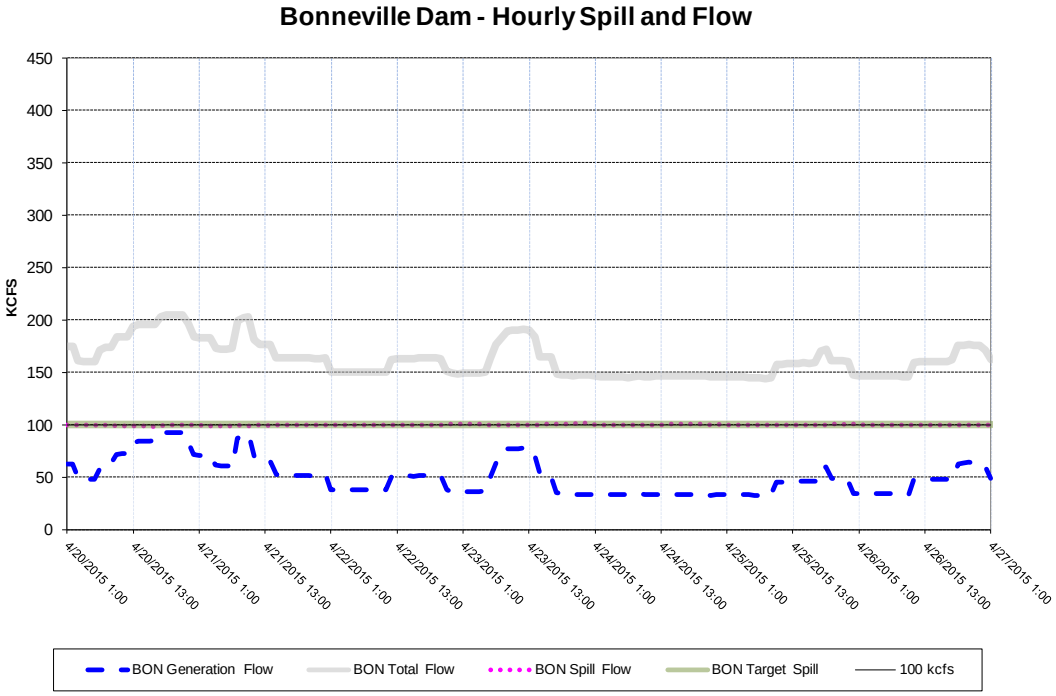
# Figure 27


Daily Average of High 12 Hourly % TDG Values for
The Dalles Tailwater and Bonneville Forebay
20-Apr-2015 to 27-Apr-2015
BON Forebay (WA)
TDA Tailwater (OR)
TDA Tailwater (WA)
110% TDG Criteria
115% State Forebay Criteria
120% State Tailwater Criteria
125% State Tailwater Criteria
130
125
120
115
110
105


The Dalles Dam - Hourly Spill and Flow
KCFS
450.0
400.0
350.0
300.0
250.0
200.0
150.0
100.0
50.0
0.0
04/20/15 01:00
04/20/15 13:00
04/21/15 01:00
04/21/15 13:00
04/22/15 01:00
04/22/15 13:00
04/23/15 01:00
04/23/15 13:00
04/24/15 01:00
04/24/15 13:00
04/25/15 01:00
04/25/15 13:00
04/26/15 01:00
04/26/15 13:00
04/27/15 01:00
TDA Generation Flow
TDA Total Flow
TDA Spill Flow
TDA Target spill
40% of Total Flow

# Figure 28


Daily Average of High 12 Hourly % TDG Values for
Bonneville Tailwater
20-Apr-2015 to 27-Apr-2015
BON Tailwater (OR)
BON Tailwater (WA)
110% TDG Criteria
115% State Forebay Criteria
120% State Tailwater Criteria
125% State Tailwater Criteria
130
125
120
115
110
105


Bonneville Dam - Hourly Spill and Flow
KCFS
450
400
350
300
250
200
150
100
50
0
4/20/2015 1:00
4/20/2015 13:00
4/21/2015 1:00
4/21/2015 13:00
4/22/2015 1:00
4/22/2015 13:00
4/23/2015 1:00
4/23/2015 13:00
4/24/2015 1:00
4/24/2015 13:00
4/25/2015 1:00
4/25/2015 13:00
4/26/2015 1:00
4/26/2015 13:00
4/27/2015 1:00
BON Generation Flow
BON Total Flow
BON Spill Flow
BON Target Spill
100 kcfs

# Table 1
# Average Percent TDG Values For April 1 – April 26

| Date | FIXED MONITORING STATIONS | | | | | | | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | LWG | LGNW | LGSA | LGSW | LMNA | LMNW | IHRA | IDSW | MCNA | MCPW | | JDY | JHAW | | TDA | TDDO | | BON | CCIW | |
| Method: | WA | WA | WA | WA | WA | WA | WA | WA | WA | OR | WA | WA | OR | WA | WA | OR | WA | WA | OR | WA |
| Gas Cap % | 115 | 120 | 115 | 120 | 115 | 120 | 115 | 120 | 115 | 120 | 120 | 115 | 120 | 120 | 115 | 120 | 120 | 115 | 120 | 120 |
| 4/1/2015 | 102.5 | 102.1 | 102 | 101.3 | 101.9 | 101.5 | 102 | 106.6 | 105.9 | ~~111.5~~ | 111.5 | 104.8 | ~~108.3~~ | 109.5 | 104.5 | ~~105~~ | 107.1 | 104.4 | 110.3 | ~~110.2~~ |
| 4/2/2015 | 102.1 | 101.6 | 101.7 | 103.1 | 101.4 | 101.1 | 101.5 | 107.6 | 104.7 | 116.5 | ~~116.5~~ | 104.1 | 114.3 | ~~114.3~~ | 103.9 | 108.1 | ~~108.1~~ | 105.2 | ~~110.6~~ | 110.7 |
| 4/3/2015 | 100.9 | 110.1 | 102.2 | 108.8 | 101.3 | 117.1 | 101.4 | 115.1 | 104.4 | ~~113.2~~ | 116.2 | 104.7 | ~~112.6~~ | 114.3 | 106.6 | 108.4 | ~~108.4~~ | 105 | 111 | ~~110.8~~ |
| 4/4/2015 | 101.6 | 110.4 | 102.5 | 109.1 | 101.8 | 119.2 | 101.7 | 115.4 | 106.6 | 113.4 | ~~113.4~~ | 105 | ~~104.1~~ | 104.7 | 106.4 | ~~105.9~~ | 107.5 | 108.8 | 112.7 | ~~112.5~~ |
| 4/5/2015 | 103.2 | 110.7 | 103.2 | 109.9 | 105.1 | **126.9** | 107.2 | 115.1 | 107.5 | 113.7 | ~~113.7~~ | 106 | 104.9 | ~~104.9~~ | 105.3 | 105.6 | ~~105.5~~ | 108.8 | 112.9 | ~~112.9~~ |
| 4/6/2015 | 103.4 | 111 | 103.3 | 110 | 107.1 | 117.6 | 111.3 | 114.6 | 107.5 | 113.7 | ~~113.7~~ | 106 | 105.1 | ~~105.1~~ | 105.2 | ~~105.3~~ | 105.4 | 106.9 | ~~111.8~~ | 112.2 |
| 4/7/2015 | 103.1 | 111 | 105.8 | 111.1 | 107.9 | 118 | 113.9 | 114.7 | 107.3 | ~~111.4~~ | 112.1 | 108.9 | 108.2 | ~~108.2~~ | 106.4 | 106.4 | ~~106.4~~ | 105.6 | ~~111.4~~ | 111.8 |
| 4/8/2015 | 103.2 | 111 | 107.6 | 111.3 | 108 | 117.7 | 114 | 114 | 106.8 | ~~110.6~~ | 111.2 | 108.9 | ~~107.4~~ | 108.4 | 106.7 | 106.7 | ~~106.7~~ | 105.3 | ~~110.8~~ | 111.2 |
| 4/9/2015 | 101.7 | 111.3 | 107.8 | 111.4 | 107.7 | 118.1 | 113.4 | 114.1 | 106.6 | ~~109.2~~ | 109.8 | 107.5 | ~~107.2~~ | 107.2 | 106.7 | 106.8 | ~~106.8~~ | 106.1 | 111.9 | ~~111.9~~ |
| 4/10/2015 | 102.9 | 111.3 | 109.3 | 111.8 | 109.1 | 118.8 | 115.3 | 113.6 | 107.9 | 114.9 | ~~114.8~~ | 108.1 | 114.5 | ~~114.5~~ | 107.7 | ~~113.9~~ | 113.9 | 107.4 | 116.7 | ~~116.7~~ |
| 4/11/2015 | 103 | 111.4 | 109.5 | 111.8 | 109.9 | 119 | **115.7** | 112.6 | 107.9 | ~~114.1~~ | 114.9 | 108.1 | 113.5 | ~~113.5~~ | 108.6 | 114.2 | ~~114.2~~ | 107.4 | ~~116.4~~ | 116.6 |
| 4/12/2015 | 102.3 | 111.3 | 108.7 | 111.6 | 109.7 | 118.5 | 114.5 | 112.1 | 106.7 | 113.7 | ~~113.7~~ | 106.4 | 113.5 | ~~113.5~~ | 108.2 | ~~114.1~~ | 114.1 | 109.4 | 116.7 | ~~116.6~~ |
| 4/13/2015 | 103.1 | 112.1 | 109.8 | 112.2 | 110 | 119 | 113.8 | 112.4 | 106.2 | ~~114.4~~ | 114.5 | 107.3 | ~~113~~ | 113.4 | 110.3 | 115.6 | ~~115.6~~ | 111.9 | 117.2 | ~~117~~ |
| 4/14/2015 | 103.1 | 112.3 | 109.8 | 112.1 | 110 | 118.3 | 113.8 | 112.7 | 106.1 | ~~113~~ | 113.3 | 107.1 | ~~112.6~~ | 112.6 | 109.8 | ~~113.4~~ | 115 | 111.9 | ~~116.8~~ | 117 |
| 4/15/2015 | 101.2 | 111.1 | 107 | 110.9 | 107.8 | 118.5 | 111.2 | 113.5 | 103.7 | 114.2 | ~~113.9~~ | 104.4 | ~~111.8~~ | 111.9 | 106.5 | 112.7 | ~~112.7~~ | 108.6 | ~~117~~ | 117 |
| 4/16/2015 | 101 | 111.4 | 106.3 | 111.2 | 108.2 | 118.6 | 112.4 | 113 | 105 | ~~114.4~~ | 114.4 | 104.7 | 112.7 | ~~112.7~~ | 109.3 | 114.9 | ~~114.9~~ | 110.3 | 117.2 | ~~117~~ |
| 4/17/2015 | 102.5 | 111.9 | 107.2 | 111.9 | 108.9 | 119.3 | 113.6 | 113.4 | 106.3 | ~~115.3~~ | 115.3 | 105.6 | 113.5 | ~~113.5~~ | 110.1 | 115.6 | ~~115.6~~ | 112.5 | 117.4 | ~~117.3~~ |
| 4/18/2015 | 102.5 | 111.3 | 107.3 | 112 | 109.2 | 119.2 | **115.5** | 113.3 | 108.3 | 116.2 | ~~116.2~~ | 106.6 | ~~112.7~~ | 113.4 | 109.9 | ~~114.9~~ | 115.3 | 113.9 | 117.4 | ~~117.4~~ |
| 4/19/2015 | 103.2 | 111.7 | 111.3 | 112.8 | 112 | 118.9 | **118.3** | 113.7 | 109.1 | 116.5 | ~~116.5~~ | 107.9 | ~~114.1~~ | 114.1 | 111.4 | 116.2 | ~~116.2~~ | 114.5 | 117.3 | ~~117.3~~ |
| 4/20/2015 | 106.2 | 111.7 | 114.9 | 113.7 | 113 | 118.4 | **119.4** | 113.7 | 110 | 116.6 | ~~116.6~~ | 109.9 | ~~113.9~~ | 114.1 | 112 | 116.8 | ~~116.8~~ | **115.9** | 117.2 | ~~117~~ |
| 4/21/2015 | 106.1 | 111.6 | **116.9** | 114.2 | 113.6 | 118.6 | **120.4** | 114.2 | 110.7 | 116.7 | ~~116.5~~ | 110.5 | 113.9 | ~~113.8~~ | 111.9 | ~~116.2~~ | 116.6 | **115.9** | ~~116.7~~ | 117 |
| 4/22/2015 | 105.3 | 111.5 | 115.4 | 113.7 | 113.6 | 118.4 | **120.2** | 114.6 | 110.4 | 116.3 | ~~116.3~~ | 109.5 | 114 | ~~114~~ | 109.7 | ~~114.1~~ | 115.2 | 112.9 | 116.9 | ~~116.7~~ |
| 4/23/2015 | 103.7 | 110.9 | 113.6 | 112.8 | 114.2 | 118.7 | **118.4** | 115.4 | 109.3 | 116.4 | ~~116.4~~ | 109.9 | 114 | ~~113.9~~ | 109.5 | 115.3 | ~~115.3~~ | 109.1 | 117.1 | ~~116.8~~ |
| 4/24/2015 | 103.6 | 110.8 | 113.4 | 112.2 | 114.2 | 118.7 | **117.5** | 115.1 | 108.9 | 115.7 | ~~115.4~~ | 109.9 | 114.1 | ~~114.1~~ | 110.1 | 115.4 | ~~115.4~~ | 110.4 | 117.2 | ~~117.2~~ |
| 4/25/2015 | 102.6 | 110.8 | 112.4 | 111.9 | 112.9 | 118.5 | **115.6** | 114.8 | 108 | 116.2 | ~~116~~ | 109.2 | ~~113.8~~ | 113.8 | 110 | ~~114.9~~ | 115.1 | 111.6 | 117.5 | ~~117.4~~ |
| 4/26/2015 | 101.7 | 110.8 | 111.1 | 111.4 | 111.6 | 118.2 | 114.6 | 114.8 | 107.5 | 116.1 | ~~116.1~~ | 108.4 | 113.6 | ~~113.6~~ | 109.5 | ~~114.4~~ | 114.4 | 111.6 | ~~117.1~~ | 117.3 |

# Total Dissolved Gas Monitoring Stations

| Code | Station Name |
|---|---|
| **LWG** | Lower Granite Forebay |
| **LGNW** | Lower Granite Tailwater |
| **LGSA** | Little Goose Forebay |
| **LGSW** | Little Goose Tailwater |
| **LMNA** | Lower Monumental Forebay |
| **LMNW** | Lower Monumental Tailwater |
| **IHRA** | Ice Harbor Forebay |
| **IDSW** | Ice Harbor Tailwater |
| **MCNA** | McNary Forebay |
| **MCPW** | McNary Tailwater |
| **JDY** | John Day Forebay |
| **JHAW** | John Day Tailwater |
| **TDA** | The Dalles Forebay |
| **TDDO** | The Dalles Tailwater |
| **BON** | Bonneville Forebay |
| **CCIW** | Bonneville Tailwater (Cascade Island) |
| **CWMW** | Camas / Washougal |