FISH OPERATIONS PLAN IMPLEMENTATION REPORT
June 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' June 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 June 2015.

Data Reporting

I. For each project providing fish passage operations, this report contains two figures per operational week[2] in June 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.

The weekly figures begin on June 1 and end on June 28 for the following lower Snake River and

[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.

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 June 1 for the lower Snake River and the lower Columbia River projects.

June 1 – June 7	Figures 1 – 8
June 8 – June 14	Figures 9 – 16
June 15 – June 21	Figures 17 – 24
June 22 – June 28	Figures 25 – 32

A. Upper Figure: Displays the daily average %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 observed percent TDG in the tailwater of the dam using the Oregon 120 %TDG standard calculated with the high 12-hour average.[1] Applies only to figures which include the lower Columbia dams.
2. The blue dot-dash line represents the observed percent TDG in the tailwater of the dam using the Washington 120 %TDG standard calculated with the high 12-hour average.[13]
3. The black solid line represents the observed percent TDG in the forebay of the next dam downstream using the Washington 115 %TDG standard calculated with the high 12-hour average.[1]

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).

[3] From June 23 at 1000 through June 24 at 1000, the Lower Monumental tailwater percent TDG data was erroneous due to a ruptured membrane in the sensor. This erroneous data is evident in Figure 27 for the high 12-hour averages.

II. A table is included at the end of the figures that lists the daily average of high %TDG values 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 June 2015 Spill Variance Table.[4] 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[5], which may

[4] 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.

[5] 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.

June 2015 Operations

The month of June 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 June 2015 adjusted volume runoff on the lower Snake River was below the 30 year average (1981-2010): 2.4 MAF (Million Acre Feet) or 39% of average as measured at Lower Granite Dam. For the lower Columbia, the Runoff Processor indicated the June 2015 adjusted volume runoff was below the 30 year average (1981-2010): 15.8 MAF or 61% of average as measured at The Dalles. The monthly precipitation summary for June was well below average at 32% on the Snake River above Ice Harbor Dam and also well below average on the Columbia River above The Dalles Dam at 44%.
During the June 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 through June 20. The operation transitioned to the summer hourly target spill level of 18 kcfs, 24 hours/day on June 21.
- Little Goose Dam - The hourly target spill level was 30% of total project outflow, 24

hours/day. Due to flow conditions, the operation transitioned to an hourly constant spill target[6] of 11 kcfs, 24 hours/day on June 16, 9 kcfs, 24 hours/day on June 22, and then on June 23, to the variable 7/9/11 kcfs operation, depending on the previous day's outflow.

- Lower Monumental Dam - The hourly target spill level was the %TDG cap, 24 hours/day. The operation transitioned to the summer hourly target spill level of 17 kcfs, 24 hours/day on June 21.
- Ice Harbor Dam - The hourly target spill level alternated in 2-day blocks between 30% of total project outflow, 24 hours/day and 45 kcfs during the day and the %TDG cap during the nighttime spill hours (1800-0500).[7]
- McNary Dam - The hourly target spill level was 40% of total project outflow, 24 hours/day. The operation transitioned to the summer hourly target spill level of 50%, 24 hours/day on June 16.
- John Day Dam - The hourly target spill level alternated in 2-day blocks between 40% and 30% of total project outflow, 24 hours/day[8] . Spill level changes occurred at 2000 hours.
- 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. The operation transitioned to the summer hourly target spill level alternating in 2-day blocks between 95 kcfs, 24 hours/day vs. 85 kcfs during the day and 121 kcfs during the nighttime on June 16.

Operational Adjustments

No Operational Adjustments to report.

[6] Low flow operations for Little Goose Dam are described in the 2015 FOP (see p. 6). This operation was coordinated with TMT via email on June 16 and discussed during TMT meetings on June 17, 24, and 25.

[7] In accordance with the 2015 FOP (see p. 12), the Ice Harbor spill operation on June 27 was changed from 45 kcfs day/TDG cap night to 30% of total project outflow during a period of higher power demand. This operation was discontinued on July 3, with the resumption of the alternating 2-day block operation (30% to 45 kcfs day/TDG cap at night).

[8] In accordance with the 2015 FOP (see p. 12), on June 24 and June 28, the John Day spill operation was changed from 40% to 30% during a period of higher power demand. On June 30 and July 4, the within week changes to operations were from 30% to 40%.

June 2015 Spill Variance Table

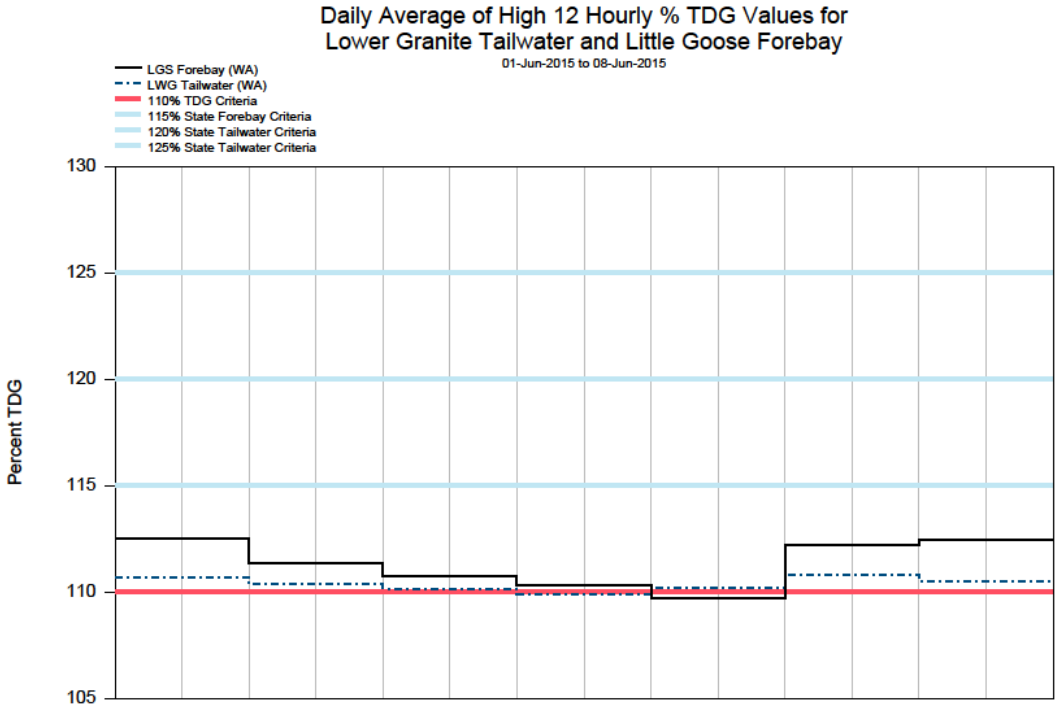
Project	Parameter	Date	Time[9]	Hours	Type	Reason
Little Goose	Reduced Spill	6/8/15	0800	1	Navigation	Hourly spill decreased to 28.9% (below 30.0% ±1% range) due to volume of water needed to empty the navigation lock. 24 hr avg. spill was 29.8%.
Little Goose	Reduced Spill	6/11/15	0300	1	Navigation	Hourly 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%.
Little Goose	Reduced Spill	6/12/15	0700	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%.
Little Goose	Reduced Spill	6/14/15	0400	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	6/15/15	1000-1300	4	Operational Limitation	Hourly spill decreased to 26.5, 27.4; 27.4, 27.4 % (below 30.0% ±1% range). Percent spill fluctuated due to low inflows and physical limits of spill gate settings. See p. 3 of FOP. 24 hr avg. spill was 29.4%.
Lower Monumental	Reduced Spill	6/1/15	1700-1800	2	Navigation	Hourly spill decreased to 12.2 and 18.5 kcfs (below 23 kcfs ±2 kcfs range). Reduced spill for safe passage of fish barge.
Lower Monumental	Reduced Spill	6/3/15	1700-1800	2	Navigation	Hourly spill decreased to 14.3 and 19.1 kcfs (below 23 kcfs ±2 kcfs range). Reduced spill for safe passage of fish barge.
Lower Monumental	Reduced Spill	6/5/15	1800-1900	2	Navigation	Hourly spill decreased to 16.4 and 21.7 kcfs (below 24 kcfs ±2 kcfs range). Reduced spill for safe passage of fish barge.
Lower Monumental	Reduced Spill	6/7/15	1800	1	Navigation	Hourly spill decreased to 14.0 kcfs (below 24 kcfs ±2 kcfs range). Reduced spill for safe passage of fish barge.
Lower Monumental	Reduced Spill	6/8/15	0400	1	Navigation	Hourly spill decreased to 20.9 kcfs (below 24 kcfs ±2 kcfs range). Reduced spill for safe passage of fish barge.
Lower Monumental	Reduced Spill	6/9/15	1800-1900	2	Navigation	Hourly spill decreased to 14.2 kcfs and 15.5 (below 20 kcfs ±2 kcfs range). Reduced spill for safe passage of fish barge.

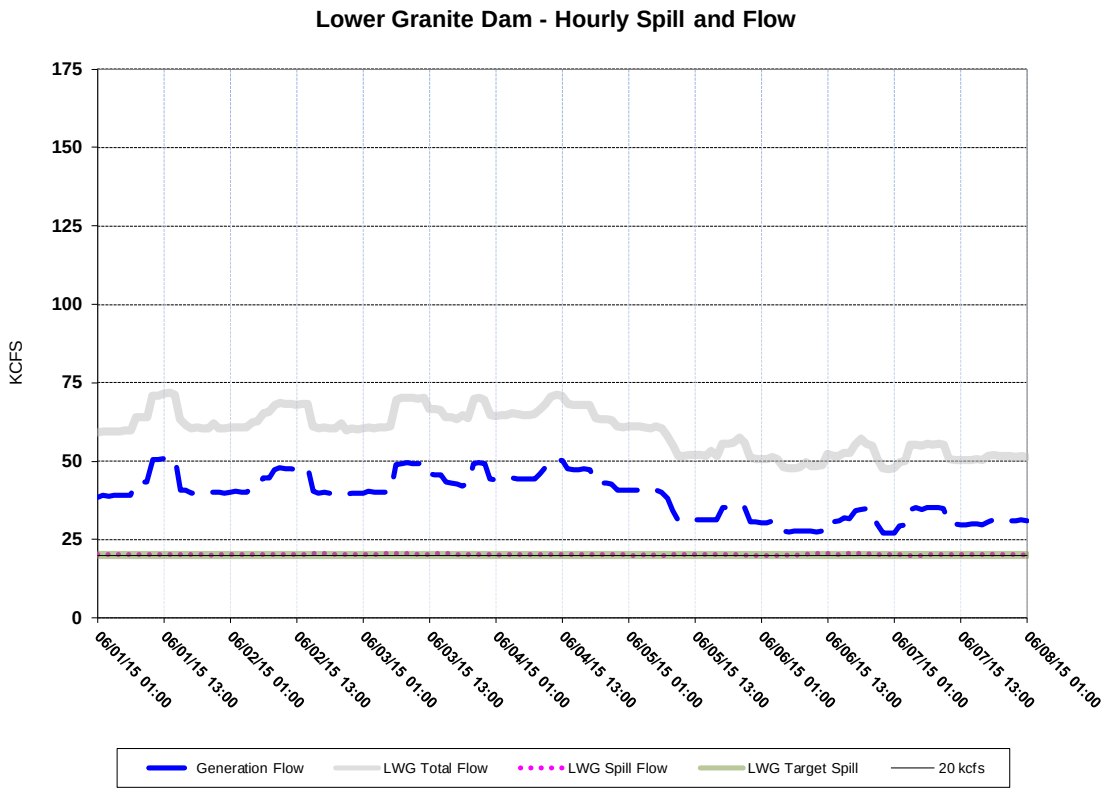
[9] Note: Data collected for reporting spill variances is reported using hourly-averaged data. Therefore, while spill may be increased or decreased for only a portion of an hour, it is represented in the Spill Variance Table as an hour.

Project	Parameter	Date	Time[9]	Hours	Type	Reason
Lower Monumental	Reduced Spill	6/11/15	1700-1800	2	Navigation	Hourly spill decreased to 10.8 kcfs and 15.3 kcfs (below 20 kcfs ±2 kcfs range). Reduced spill for safe passage of fish barge.
Lower Monumental	Reduced Spill	6/13/15	1800-1900	2	Navigation	Hourly spill decreased to 13.9 kcfs and 17.4 kcfs (below 20 kcfs ±2 kcfs range). Reduced spill for safe passage of fish barge.
Lower Monumental	Reduced Spill	6/21/15	1700-1800	2	Navigation	Hourly spill decreased to 11.6 kcfs and 13.9 kcfs (below 17 kcfs ±2 kcfs range). Reduced spill for safe passage of fish barge.
Lower Monumental	Reduced Spill	6/23/15	1800-1900	2	Navigation	Hourly spill decreased to 9.7 kcfs and 14.0 kcfs (below 17 kcfs ±2 kcfs range). Reduced spill for safe passage of fish barge.
Lower Monumental	Reduced Spill	6/25/15	1700-1800	2	Navigation	Hourly spill decreased to10.3 kcfs and 12.5 kcfs (below 17 kcfs ±2 kcfs range). Reduced spill for safe passage of fish barge.
Lower Monumental	Reduced Spill	6/27/15	2300-2400	2	Navigation	Hourly spill decreased to11.3 kcfs and 14.6 kcfs (below 17 kcfs ±2 kcfs range). Reduced spill for safe passage of fish barge.
Ice Harbor	Reduced Spill	6/13/15	1000	1	Navigation	Hourly spill decreased to 28.6% (below 30.0% ±1% range) due to volume of water needed to empty the navigation lock.
Ice Harbor	Reduced Spill	6/14/15	0200	1	Navigation	Hourly spill decreased to 28.5% (below 30.0% ±1% range) due to volume of water needed to empty the navigation lock.
Ice Harbor	Reduced Spill	6/14/15	0700	1	Operational Limitation	Hourly spill decreased to 25% (below 30.0% ±1% range). Percent spill fluctuated due to low inflows and physical limits of spill gate settings. See p. 3 of FOP.
Ice Harbor	Reduced Spill	6/17/15	2200	1	Navigation	Hourly spill decreased to 28.9% (below 30.0% ±1% range) due to volume of water needed to empty the navigation lock.
Ice Harbor	Reduced Spill	6/18/15	0900	1	Navigation	Hourly spill decreased to 28.8% (below 30.0% ±1% range) due to volume of water needed to empty the navigation lock.
Ice Harbor	Reduced Spill	6/22/15	0000	1	Navigation	Hourly spill decreased to 28.7% (below 30.0% ±1% range) due to volume of water needed to empty the navigation lock.
Ice Harbor	Reduced Spill	6/22/15	0600	1	Navigation	Hourly spill decreased to 28.9% (below 30.0% ±1% range) due to volume of water needed to empty the navigation lock.

Project	Parameter	Date	Time[9]	Hours	Type	Reason
Ice Harbor	Reduced Spill	6/22/15	1600	1	Navigation	Hourly spill decreased to 28.3% (below 30.0% ±1% range) due to volume of water needed to empty the navigation lock
Ice Harbor	Reduced Spill	6/23/15	0800-1000	3	Maintenance	Hourly spill remained at 11.6 kcfs while generation increased to 11.5 kcfs (above 8.2 to 10.0 kcfs minimum generation range for units 1 and 2) due to switching units for fish screen maintenance.
Ice Harbor	Reduced Spill	6/25/15	1100	1	Navigation	Hourly spill decreased to 28.5% (below 30.0% ±1% range) due to volume of water needed to empty the navigation lock.
Ice Harbor	Reduced Spill	6/25/15	2100-2200	2	Navigation	Hourly spill decreased to 28.6% (below 30.0% ±1% range) due to volume of water needed to empty the navigation lock.
Ice Harbor	Reduced Spill	6/26/15	0500	1	Navigation	Hourly spill decreased to 28.5% (below 30.0% ±1% range) due to volume of water needed to empty the navigation lock.
Ice Harbor	Reduced Spill	6/26/15	0900	1	Navigation	Hourly spill decreased to 28.5% (below 30.0% ±1% range) due to volume of water needed to empty the navigation lock.
Ice Harbor	Reduced Spill	6/26/15	1500	1	Navigation	Hourly spill decreased to 28.6% (below 30.0% ±1% range) due to volume of water needed to empty the navigation lock.
Ice Harbor	Reduced Spill	6/27/15	0500	1	Navigation	Hourly spill decreased to 28.6% (below 30.0% ±1% range) due to volume of water needed to empty the navigation lock.
Ice Harbor	Reduced Spill	6/27/15	1600	1	Navigation	Hourly spill decreased to 28.5% (below 30.0% ±1% range) due to volume of water needed to empty the navigation lock.
Ice Harbor	Reduced Spill	6/27/15	2200	1	Navigation	Hourly spill decreased to 28.7% (below 30.0% ±1% range) due to volume of water needed to empty the navigation lock.
Ice Harbor	Reduced Spill	6/28/15	1200	1	Navigation	Hourly spill decreased to 28.6% (below 30.0% ±1% range) due to volume of water needed to empty the navigation lock.

Figure 1


Daily Average of High 12 Hourly % TDG Values for
Lower Granite Tailwater and Little Goose Forebay
01-Jun-2015 to 08-Jun-2015
LGS Forebay (WA)
LWG Tailwater (WA)
110% TDG Criteria
115% State Forebay Criteria
120% State Tailwater Criteria
125% State Tailwater Criteria
Percent TDG
130
125
120
115
110
105


Lower Granite Dam - Hourly Spill and Flow
KCFS
175
150
125
100
75
50
25
0
06/01/15 01:00
06/01/15 13:00
06/02/15 01:00
06/02/15 13:00
06/03/15 01:00
06/03/15 13:00
06/04/15 01:00
06/04/15 13:00
06/05/15 01:00
06/05/15 13:00
06/06/15 01:00
06/06/15 13:00
06/07/15 01:00
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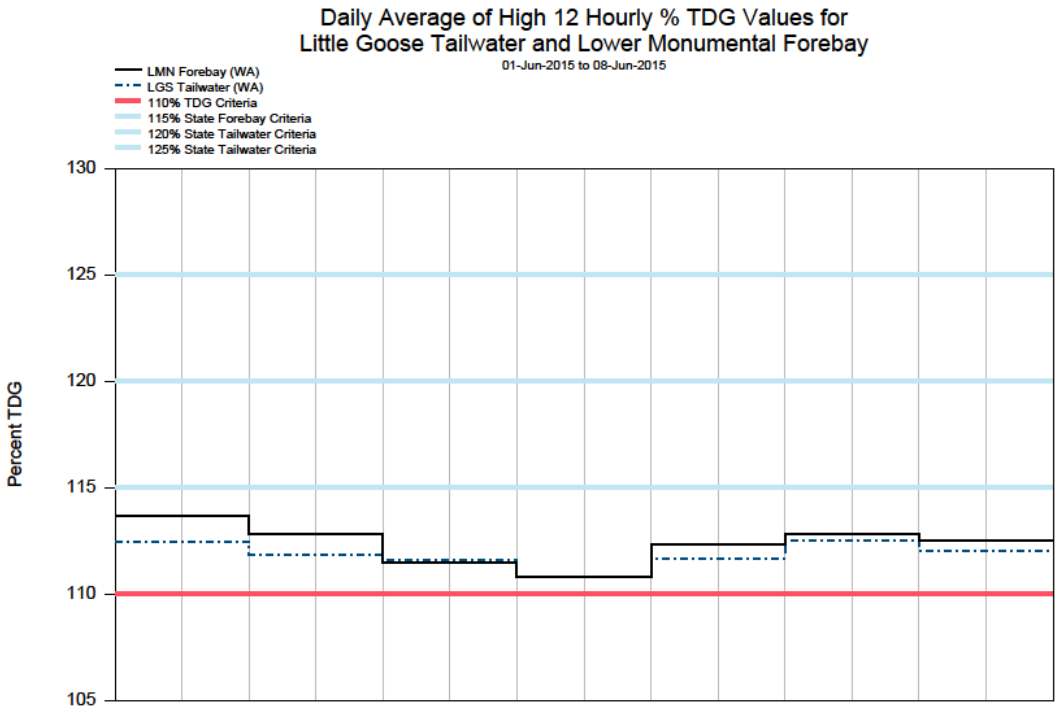
06/08/15 01:00
Generation Flow
LWG Total Flow
LWG Spill Flow
LWG Target Spill
20 kcfs

Figure 2


Daily Average of High 12 Hourly % TDG Values for
Little Goose Tailwater and Lower Monumental Forebay
01-Jun-2015 to 08-Jun-2015
LMN Forebay (WA)
LGS Tailwater (WA)
110% TDG Criteria
115% State Forebay Criteria
120% State Tailwater Criteria
125% State Tailwater Criteria
Percent TDG
130
125
120
115
110
105

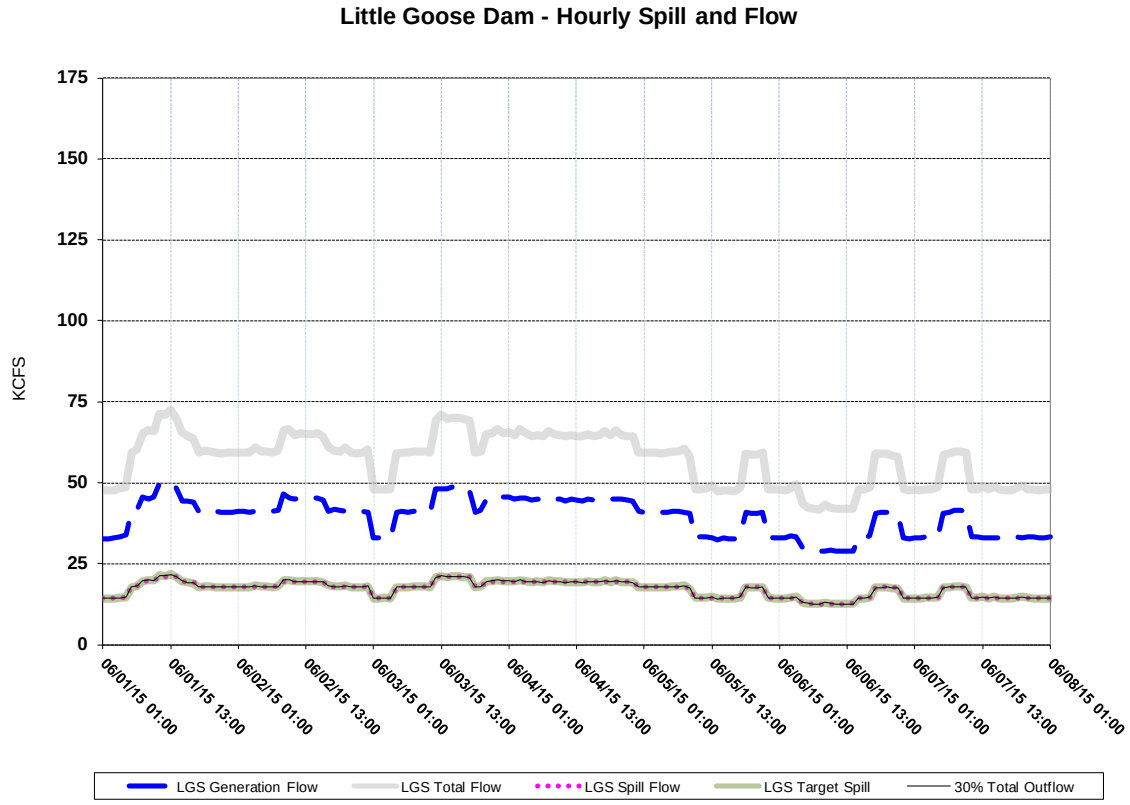
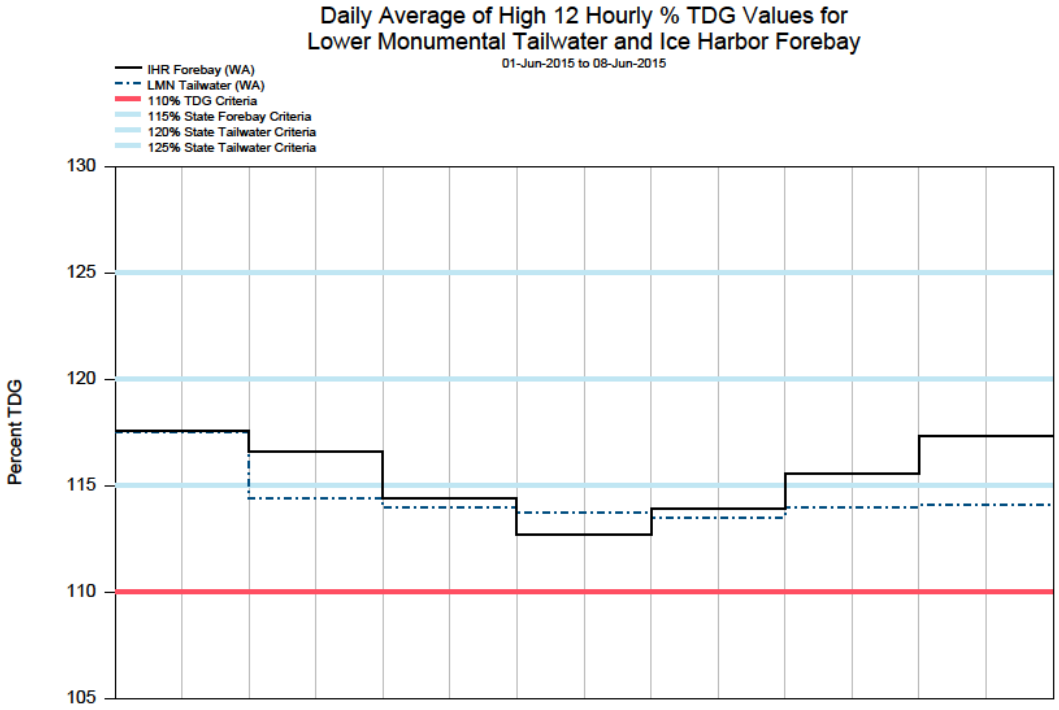
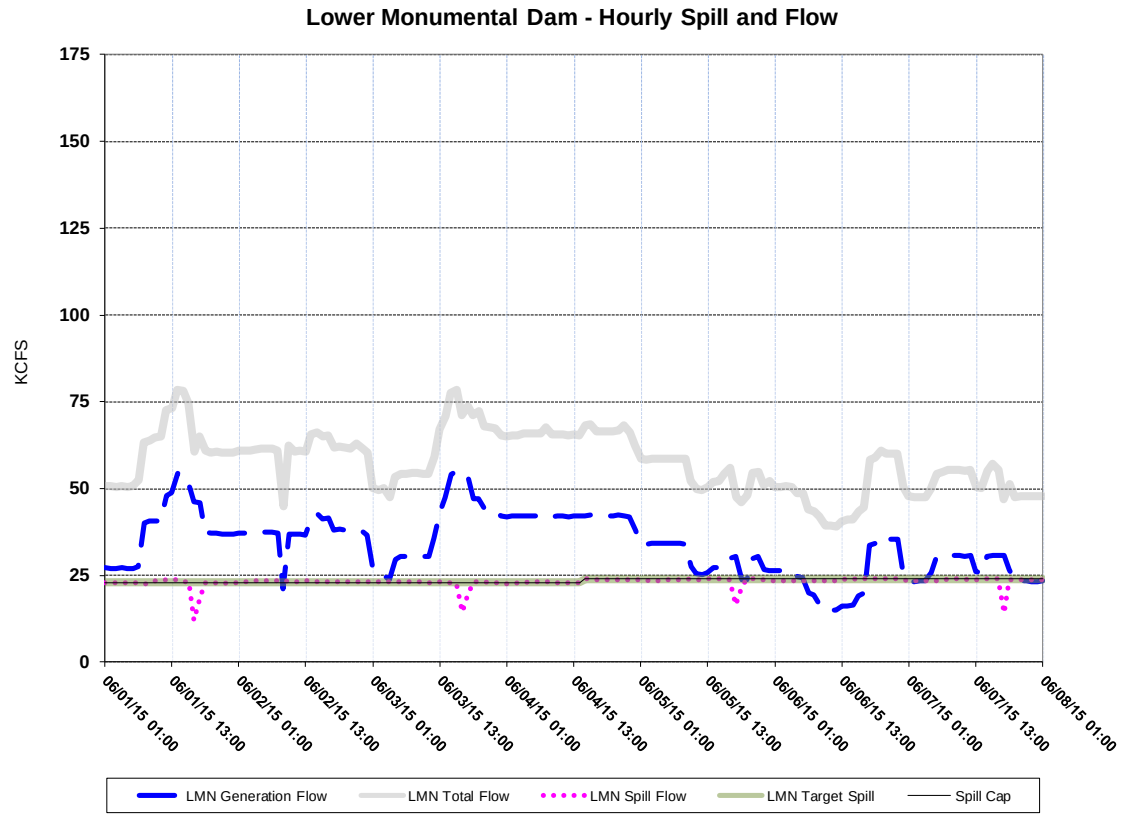

Little Goose Dam - Hourly Spill and Flow
KCFS
175
150
125
100
75
50
25
0
06/01/15 01:00
06/01/15 13:00
06/02/15 01:00
06/02/15 13:00
06/03/15 01:00
06/03/15 13:00
06/04/15 01:00
06/04/15 13:00
06/05/15 01:00
06/05/15 13:00
06/06/15 01:00
06/06/15 13:00
06/07/15 01:00
06/07/15 13:00
06/08/15 01:00
LGS 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
01-Jun-2015 to 08-Jun-2015
IHR Forebay (WA)
LMN Tailwater (WA)
110% TDG Criteria
115% State Forebay Criteria
120% State Tailwater Criteria
125% State Tailwater Criteria
Percent TDG
130
125
120
115
110
105


Lower Monumental Dam - Hourly Spill and Flow
KCFS
175
150
125
100
75
50
25
0
06/01/15 01:00
06/01/15 13:00
06/02/15 01:00
06/02/15 13:00
06/03/15 01:00
06/03/15 13:00
06/04/15 01:00
06/04/15 13:00
06/05/15 01:00
06/05/15 13:00
06/06/15 01:00
06/06/15 13:00
06/07/15 01:00
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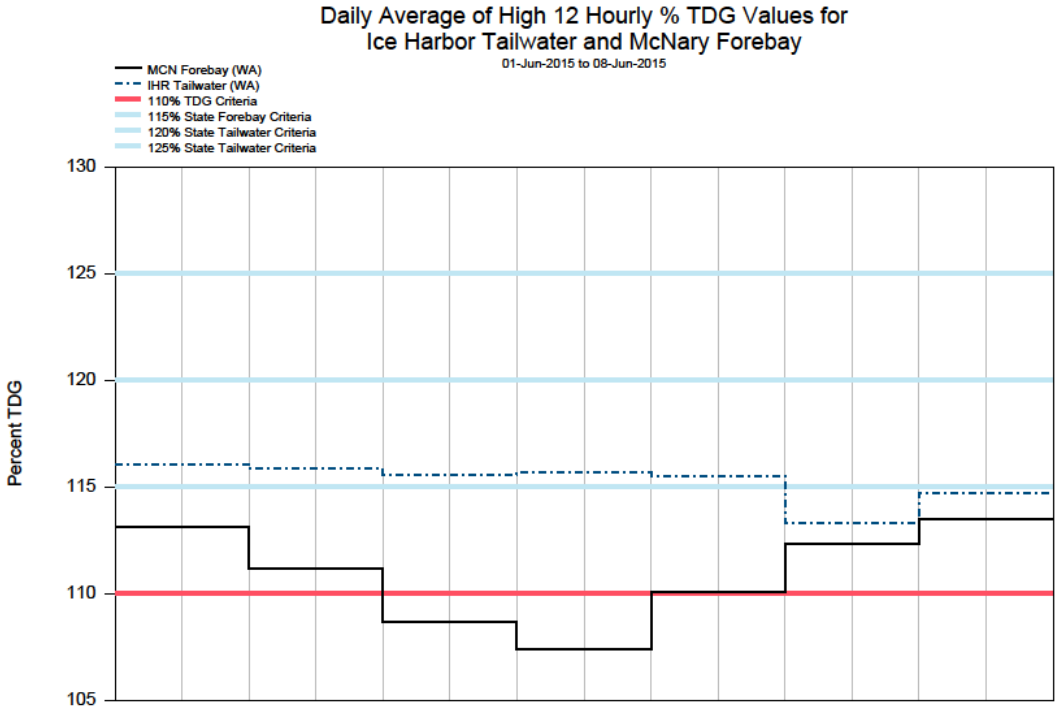
LMN Generation Flow
LMN Total Flow
LMN Spill Flow
LMN Target Spill
Spill Cap

Figure 4


Daily Average of High 12 Hourly % TDG Values for
Ice Harbor Tailwater and McNary Forebay
01-Jun-2015 to 08-Jun-2015
MCN Forebay (WA)
IHR Tailwater (WA)
110% TDG Criteria
115% State Forebay Criteria
120% State Tailwater Criteria
125% State Tailwater Criteria
Percent TDG
130
125
120
115
110
105

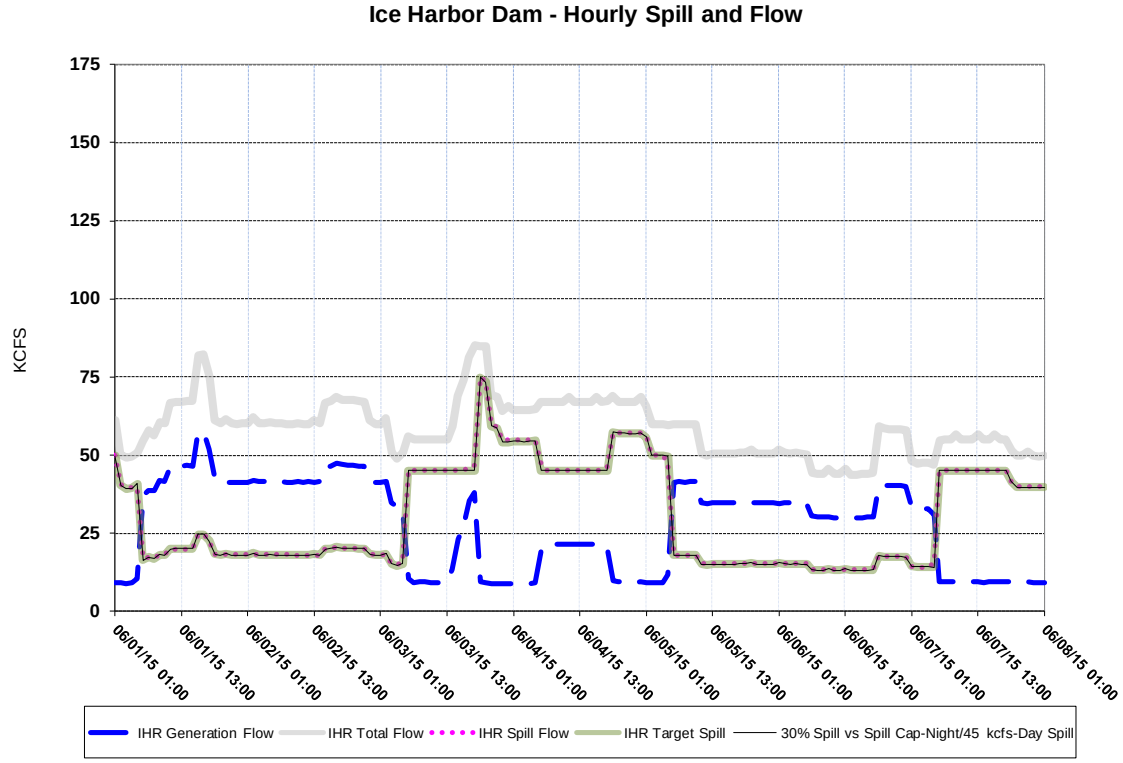
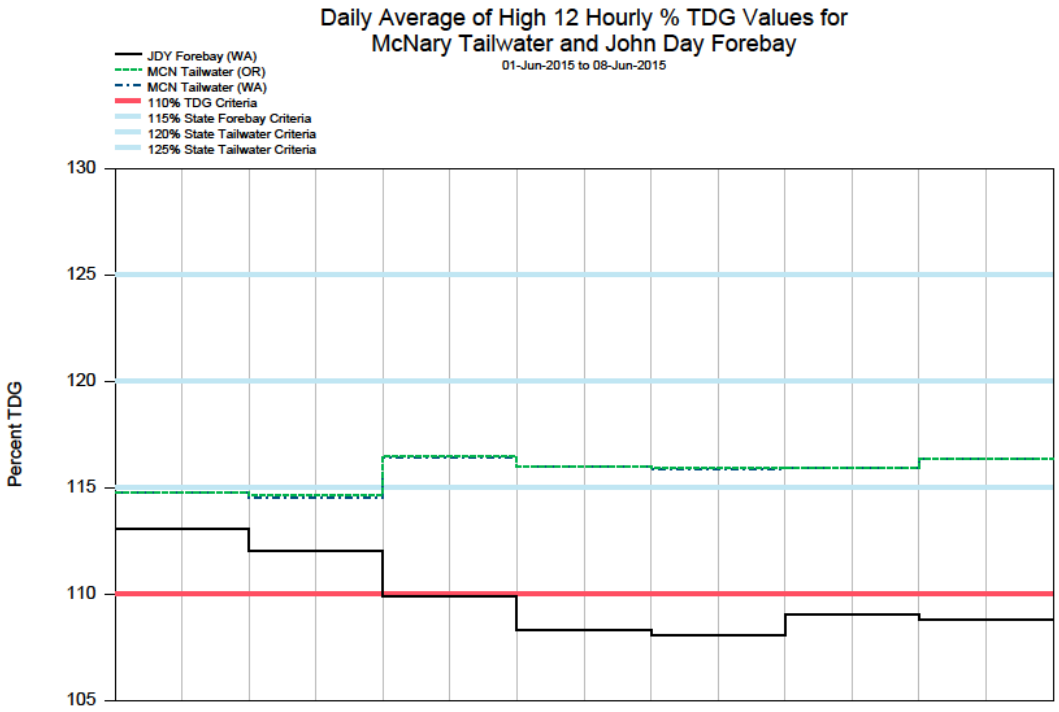

Ice Harbor Dam - Hourly Spill and Flow
KCFS
175
150
125
100
75
50
25
0
06/01/15 01:00
06/01/15 13:00
06/02/15 01:00
06/02/15 13:00
06/03/15 01:00
06/03/15 13:00
06/04/15 01:00
06/04/15 13:00
06/05/15 01:00
06/05/15 13:00
06/06/15 01:00
06/06/15 13:00
06/07/15 01:00
06/07/15 13:00
06/08/15 01:00
IHR Generation Flow
IHR Total Flow
IHR Spill Flow
IHR Target Spill
30% Spill vs Spill Cap-Night/45 kcfs-Day Spill

Figure 5


Daily Average of High 12 Hourly % TDG Values for
McNary Tailwater and John Day Forebay
01-Jun-2015 to 08-Jun-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
Percent TDG
130
125
120
115
110
105

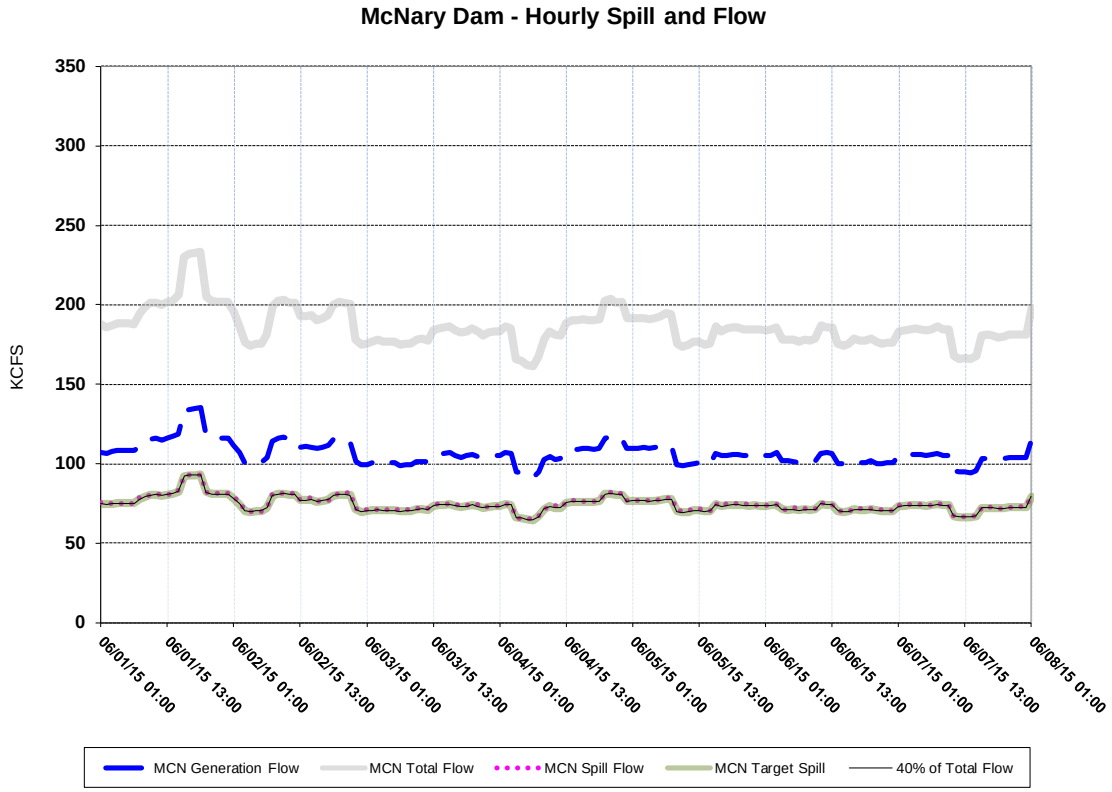
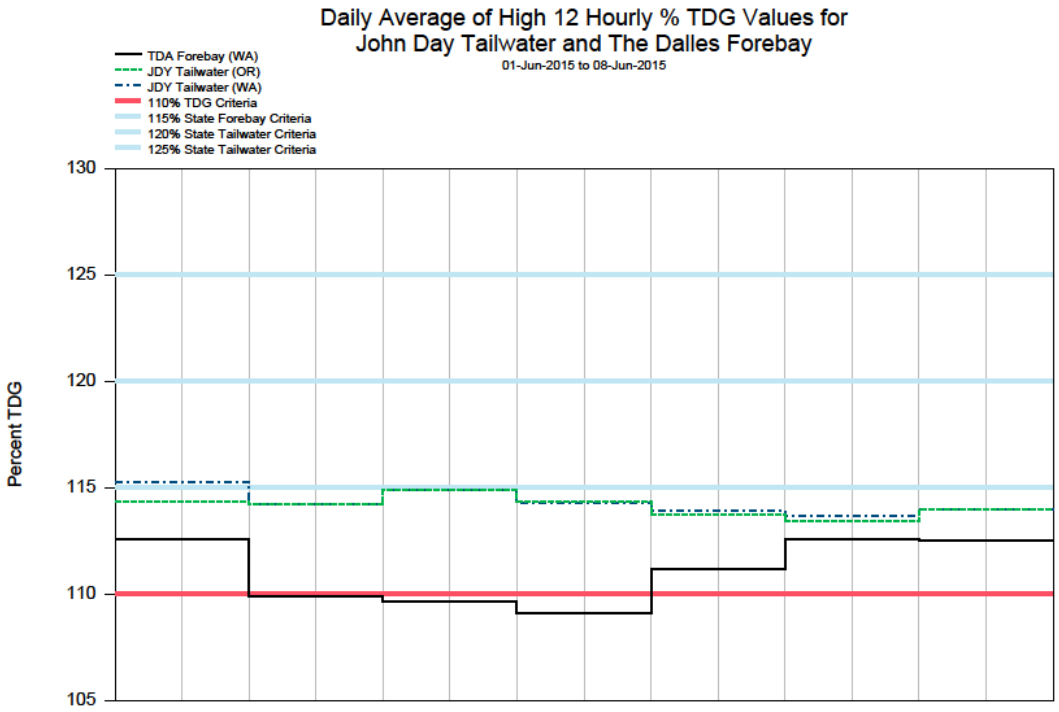

McNary Dam - Hourly Spill and Flow
KCFS
350
300
250
200
150
100
50
0
06/01/15 01:00
06/01/15 13:00
06/02/15 01:00
06/02/15 13:00
06/03/15 01:00
06/03/15 13:00
06/04/15 01:00
06/04/15 13:00
06/05/15 01:00
06/05/15 13:00
06/06/15 01:00
06/06/15 13:00
06/07/15 01:00
06/07/15 13:00
06/08/15 01:00
MCN Generation Flow
MCN Total Flow
MCN Spill Flow
MCN Target Spill
40% of Total Flow

Figure 6


Daily Average of High 12 Hourly % TDG Values for
John Day Tailwater and The Dalles Forebay
01-Jun-2015 to 08-Jun-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
Percent TDG
130
125
120
115
110
105

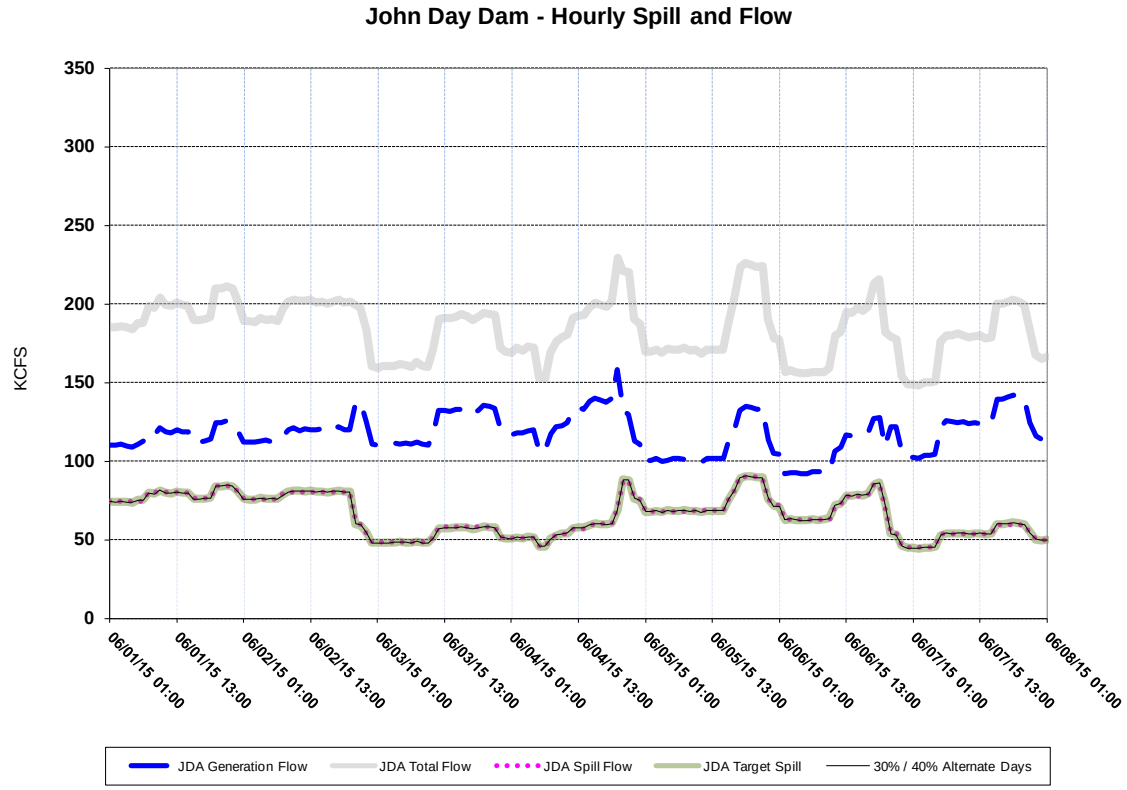
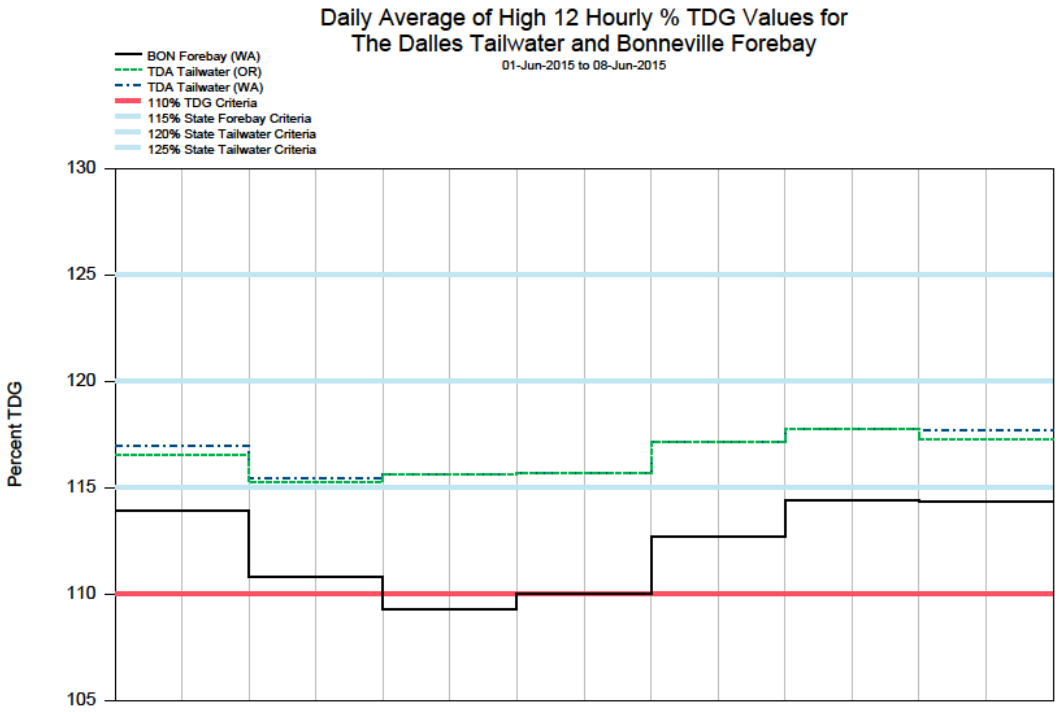

John Day Dam - Hourly Spill and Flow
KCFS
350
300
250
200
150
100
50
0
06/01/15 01:00
06/01/15 13:00
06/02/15 01:00
06/02/15 13:00
06/03/15 01:00
06/03/15 13:00
06/04/15 01:00
06/04/15 13:00
06/05/15 01:00
06/05/15 13:00
06/06/15 01:00
06/06/15 13:00
06/07/15 01:00
06/07/15 13:00
06/08/15 01:00
JDA Generation Flow
JDA Total Flow
JDA Spill Flow
JDA Target Spill
30% / 40% Alternate Days

Figure 7


Daily Average of High 12 Hourly % TDG Values for
The Dalles Tailwater and Bonneville Forebay
01-Jun-2015 to 08-Jun-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
Percent TDG
130
125
120
115
110
105

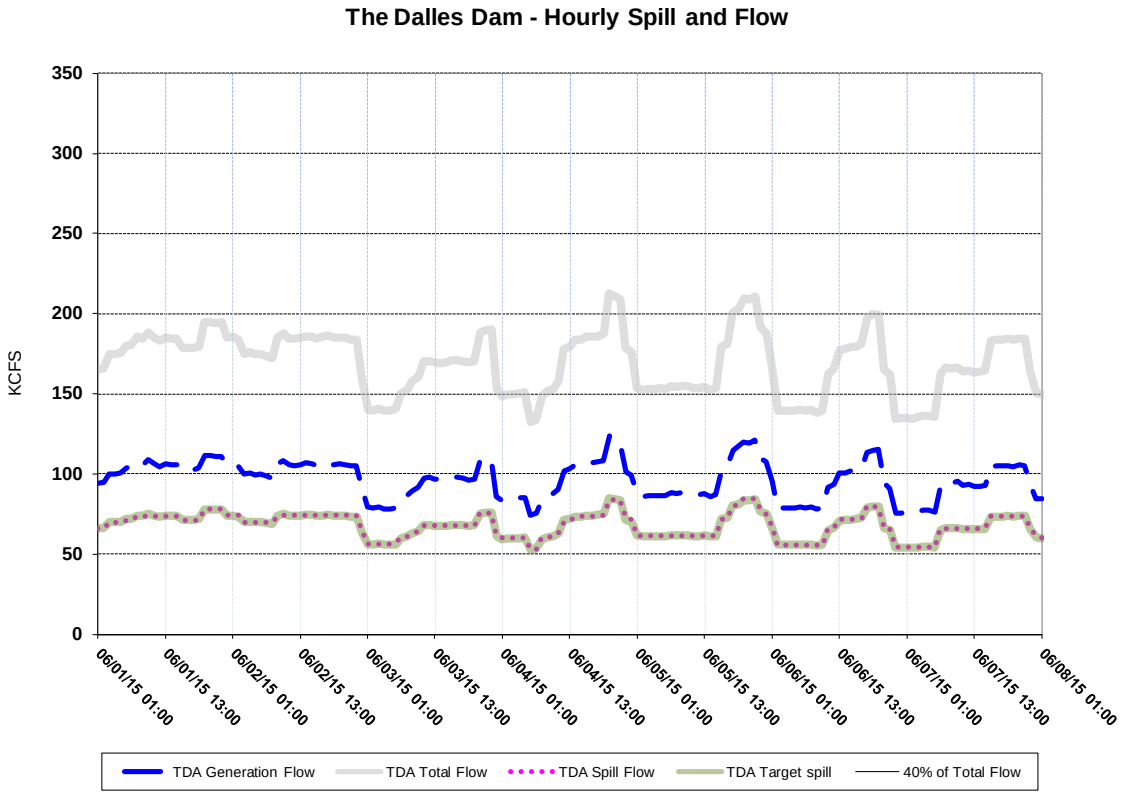
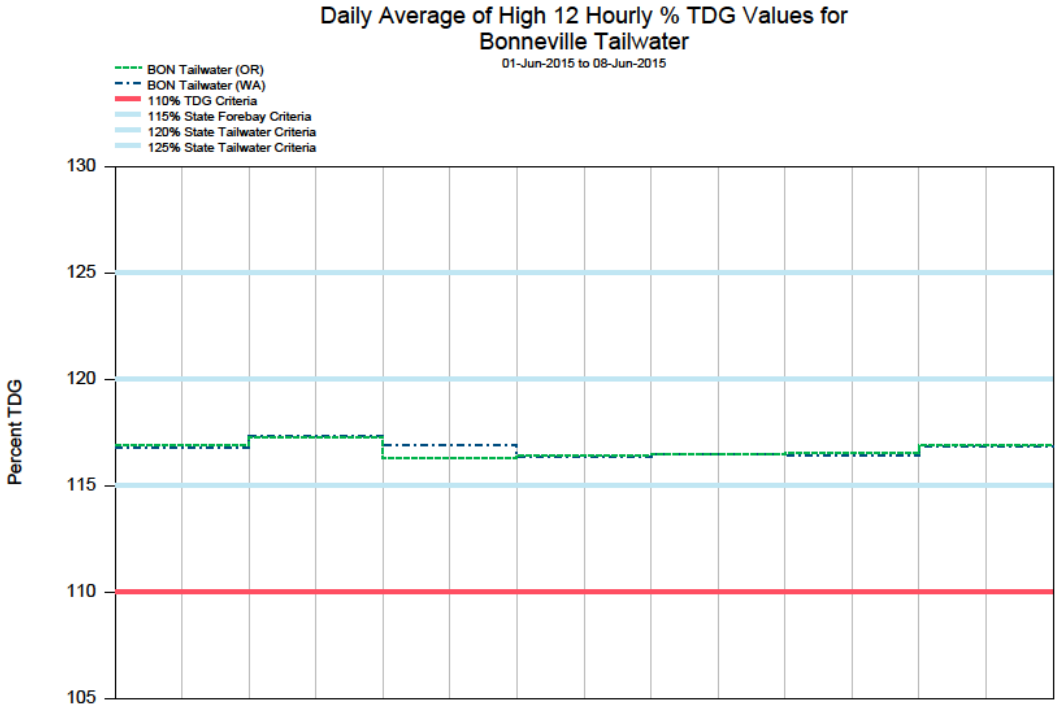

The Dalles Dam - Hourly Spill and Flow
KCFS
350
300
250
200
150
100
50
0
06/01/15 01:00
06/01/15 13:00
06/02/15 01:00
06/02/15 13:00
06/03/15 01:00
06/03/15 13:00
06/04/15 01:00
06/04/15 13:00
06/05/15 01:00
06/05/15 13:00
06/06/15 01:00
06/06/15 13:00
06/07/15 01:00
06/07/15 13:00
06/08/15 01:00
TDA Generation Flow
TDA Total Flow
TDA Spill Flow
TDA Target spill
40% of Total Flow

Figure 8


Daily Average of High 12 Hourly % TDG Values for
Bonneville Tailwater
01-Jun-2015 to 08-Jun-2015
BON Tailwater (OR)
BON Tailwater (WA)
110% TDG Criteria
115% State Forebay Criteria
120% State Tailwater Criteria
125% State Tailwater Criteria
Percent TDG
130
125
120
115
110
105

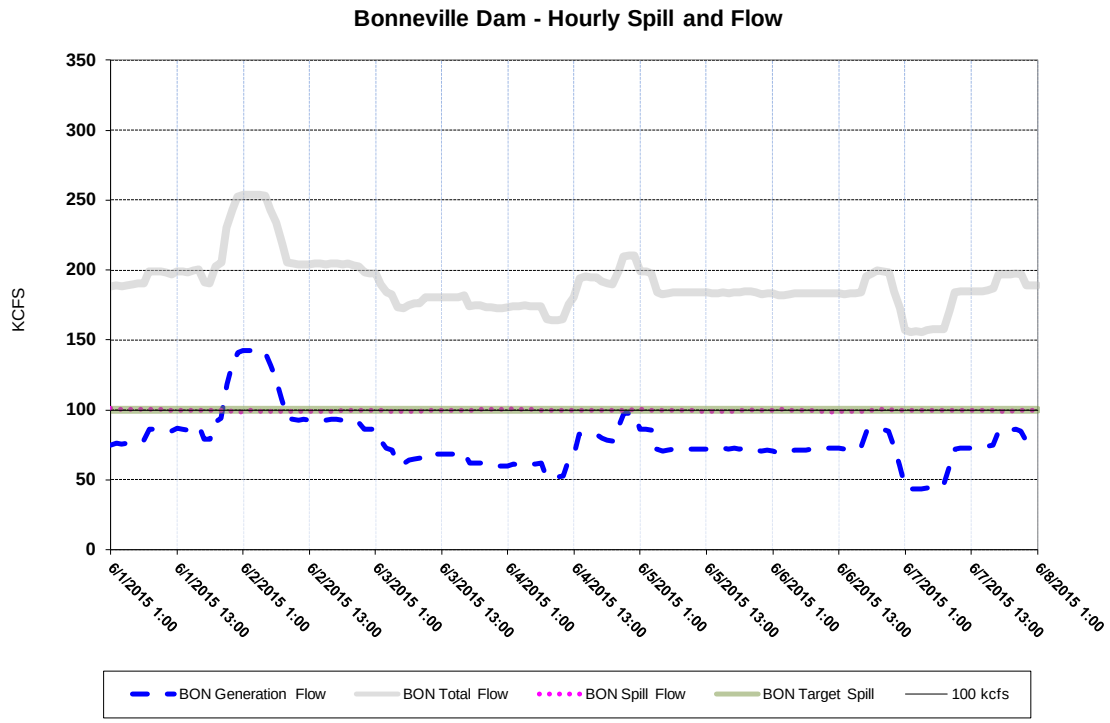
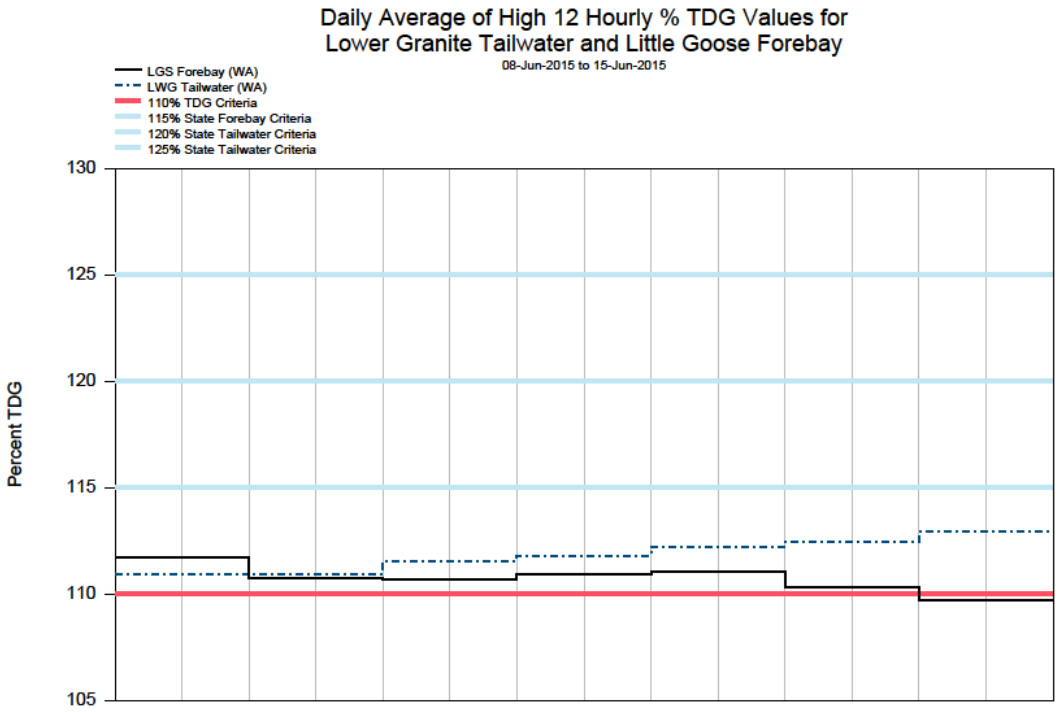

Bonneville Dam - Hourly Spill and Flow
KCFS
350
300
250
200
150
100
50
0
6/1/2015 1:00
6/1/2015 13:00
6/2/2015 1:00
6/2/2015 13:00
6/3/2015 1:00
6/3/2015 13:00
6/4/2015 1:00
6/4/2015 13:00
6/5/2015 1:00
6/5/2015 13:00
6/6/2015 1:00
6/6/2015 13:00
6/7/2015 1:00
6/7/2015 13:00
6/8/2015 1:00
BON Generation Flow
BON Total Flow
BON Spill Flow
BON Target Spill
100 kcfs

Figure 9


Daily Average of High 12 Hourly % TDG Values for
Lower Granite Tailwater and Little Goose Forebay
08-Jun-2015 to 15-Jun-2015
LGS Forebay (WA)
LWG Tailwater (WA)
110% TDG Criteria
115% State Forebay Criteria
120% State Tailwater Criteria
125% State Tailwater Criteria
Percent TDG
130
125
120
115
110
105

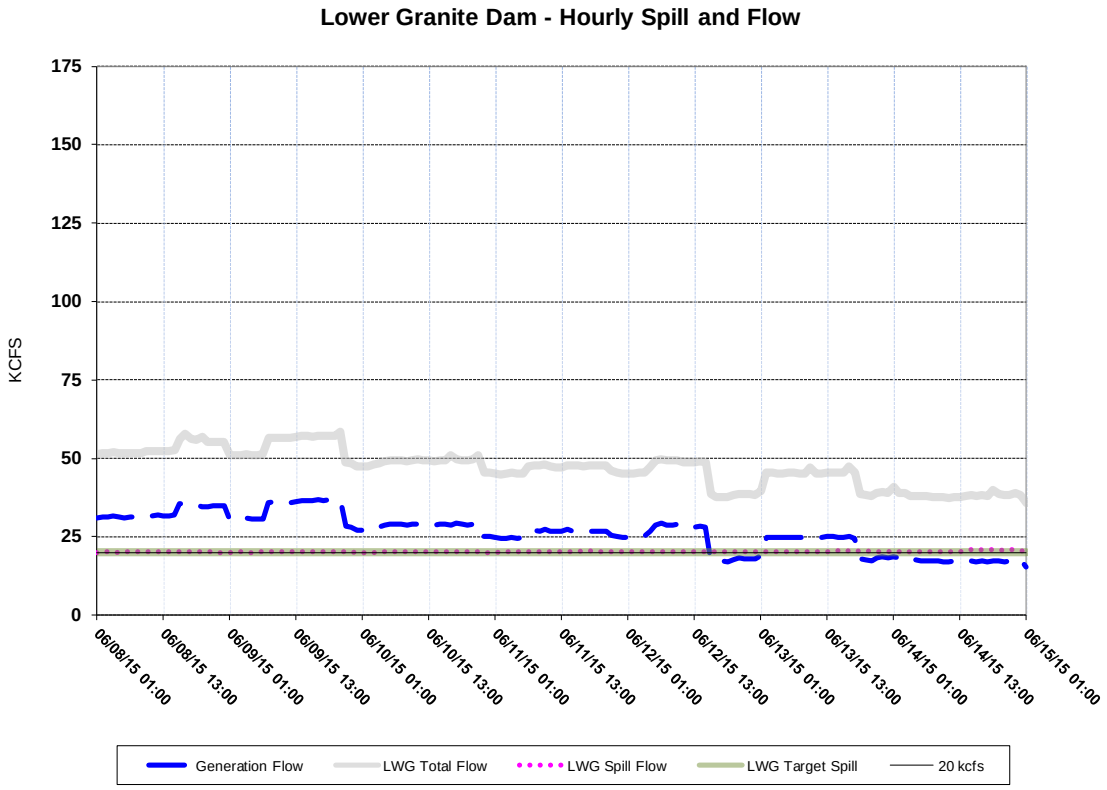
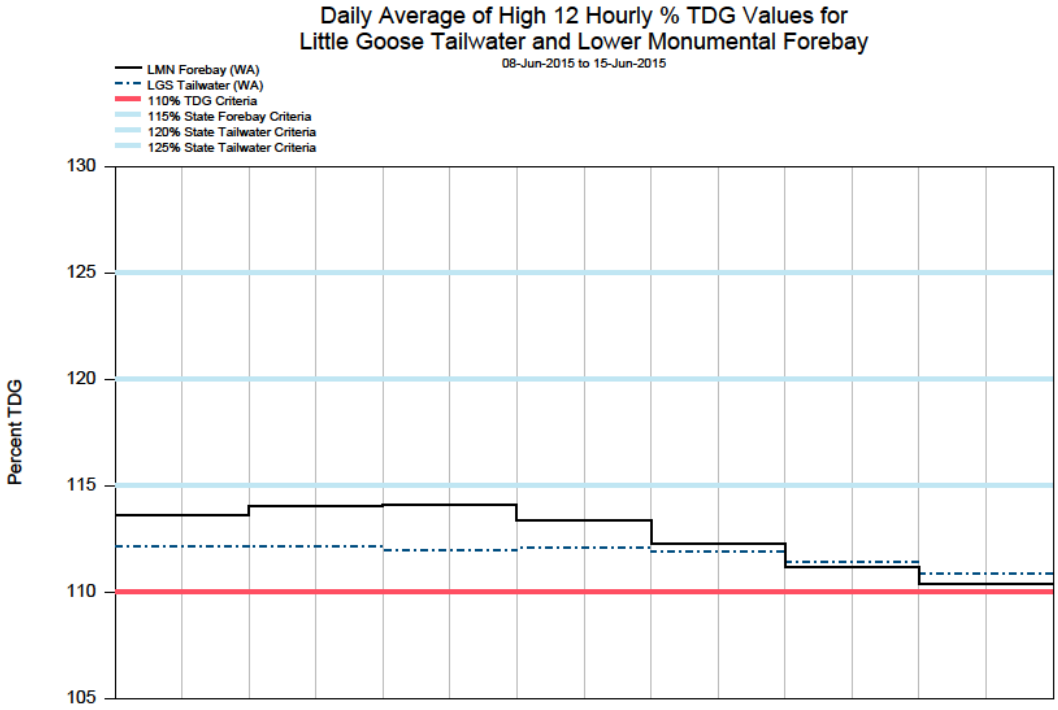

Lower Granite Dam - Hourly Spill and Flow
KCFS
175
150
125
100
75
50
25
0
06/08/15 01:00
06/08/15 13:00
06/09/15 01:00
06/09/15 13:00
06/10/15 01:00
06/10/15 13:00
06/11/15 01:00
06/11/15 13:00
06/12/15 01:00
06/12/15 13:00
06/13/15 01:00
06/13/15 13:00
06/14/15 01:00
06/14/15 13:00
06/15/15 01:00
Generation Flow
LWG Total Flow
LWG Spill Flow
LWG Target Spill
20 kcfs

Figure 10


Daily Average of High 12 Hourly % TDG Values for
Little Goose Tailwater and Lower Monumental Forebay
08-Jun-2015 to 15-Jun-2015
LMN Forebay (WA)
LGS Tailwater (WA)
110% TDG Criteria
115% State Forebay Criteria
120% State Tailwater Criteria
125% State Tailwater Criteria
Percent TDG
130
125
120
115
110
105

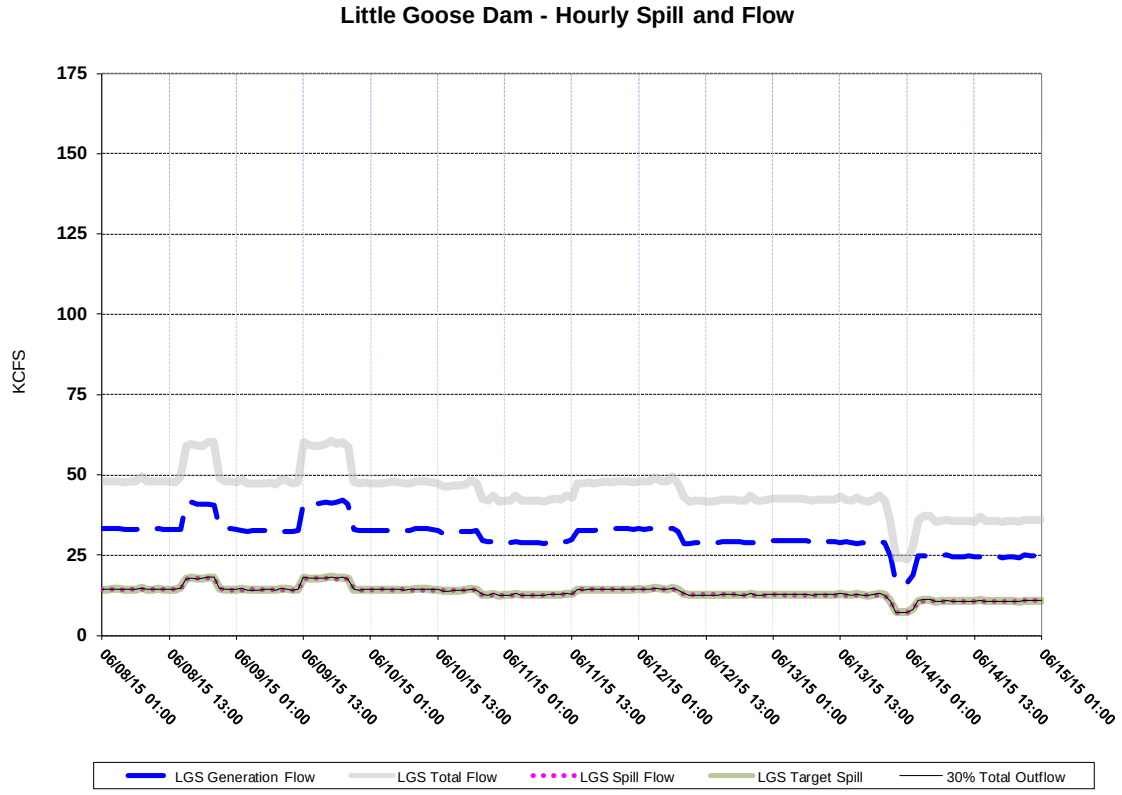
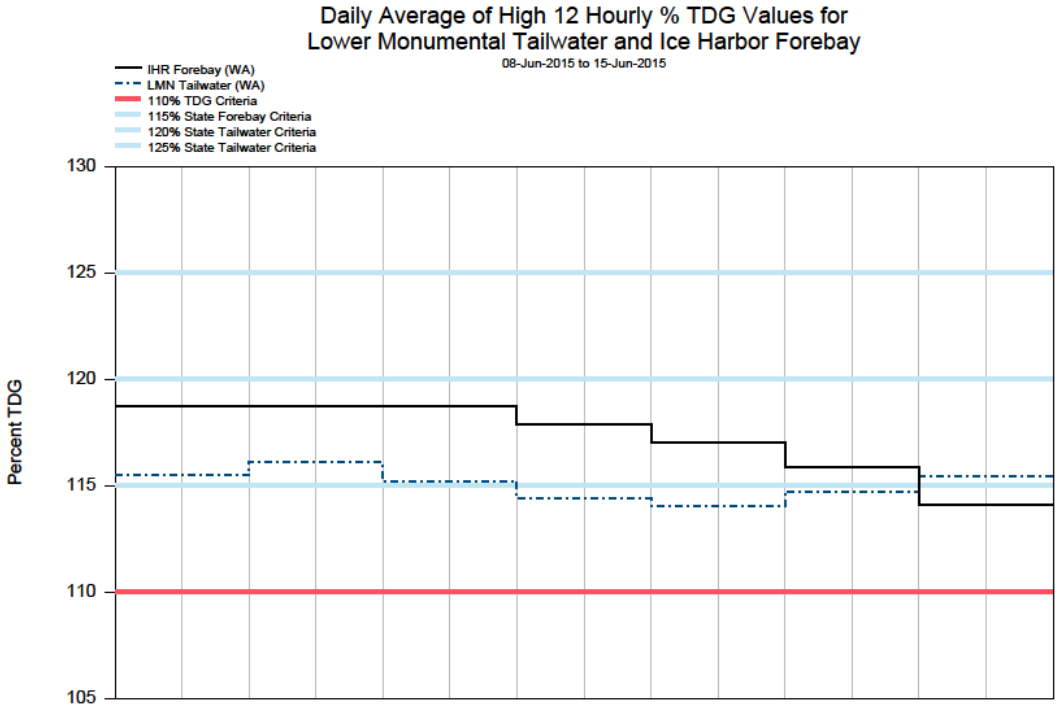

Little Goose Dam - Hourly Spill and Flow
KCFS
175
150
125
100
75
50
25
0
06/08/15 01:00
06/08/15 13:00
06/09/15 01:00
06/09/15 13:00
06/10/15 01:00
06/10/15 13:00
06/11/15 01:00
06/11/15 13:00
06/12/15 01:00
06/12/15 13:00
06/13/15 01:00
06/13/15 13:00
06/14/15 01:00
06/14/15 13:00
06/15/15 01:00
LGS Generation Flow
LGS Total Flow
LGS Spill Flow
LGS Target Spill
30% Total Outflow

Figure 11


Daily Average of High 12 Hourly % TDG Values for
Lower Monumental Tailwater and Ice Harbor Forebay
08-Jun-2015 to 15-Jun-2015
IHR Forebay (WA)
LMN Tailwater (WA)
110% TDG Criteria
115% State Forebay Criteria
120% State Tailwater Criteria
125% State Tailwater Criteria
Percent TDG
130
125
120
115
110
105

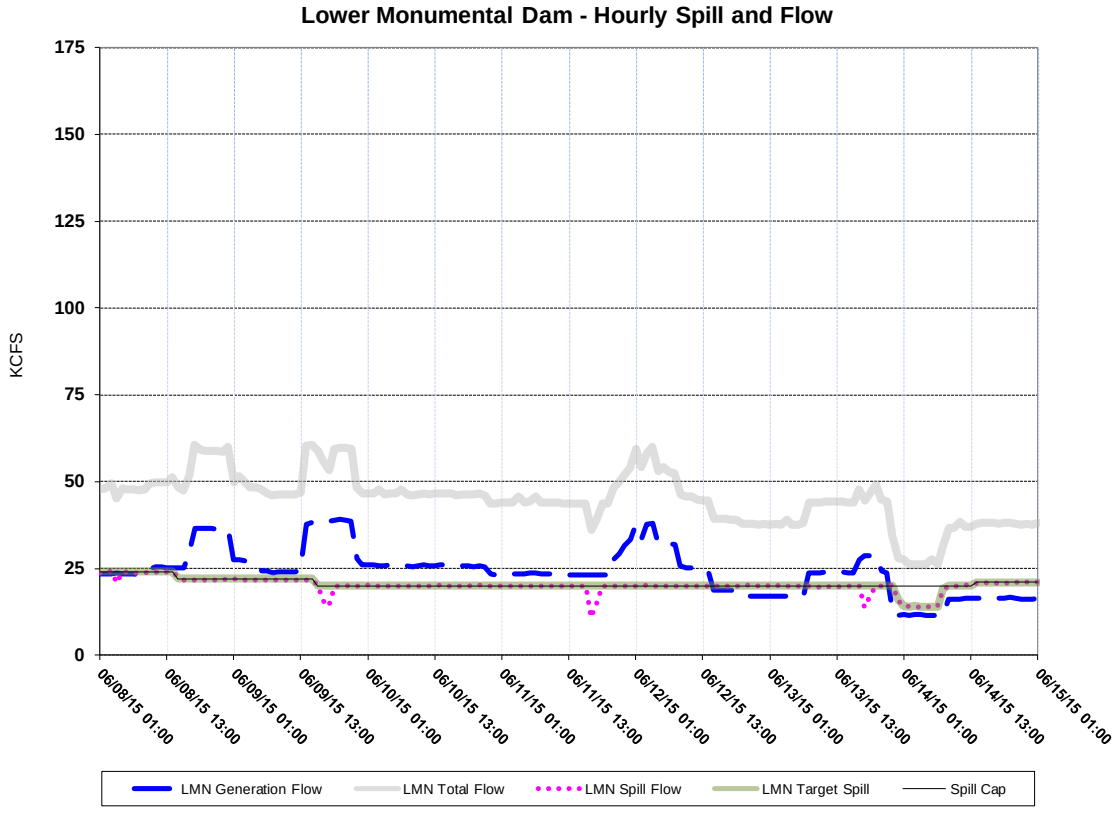
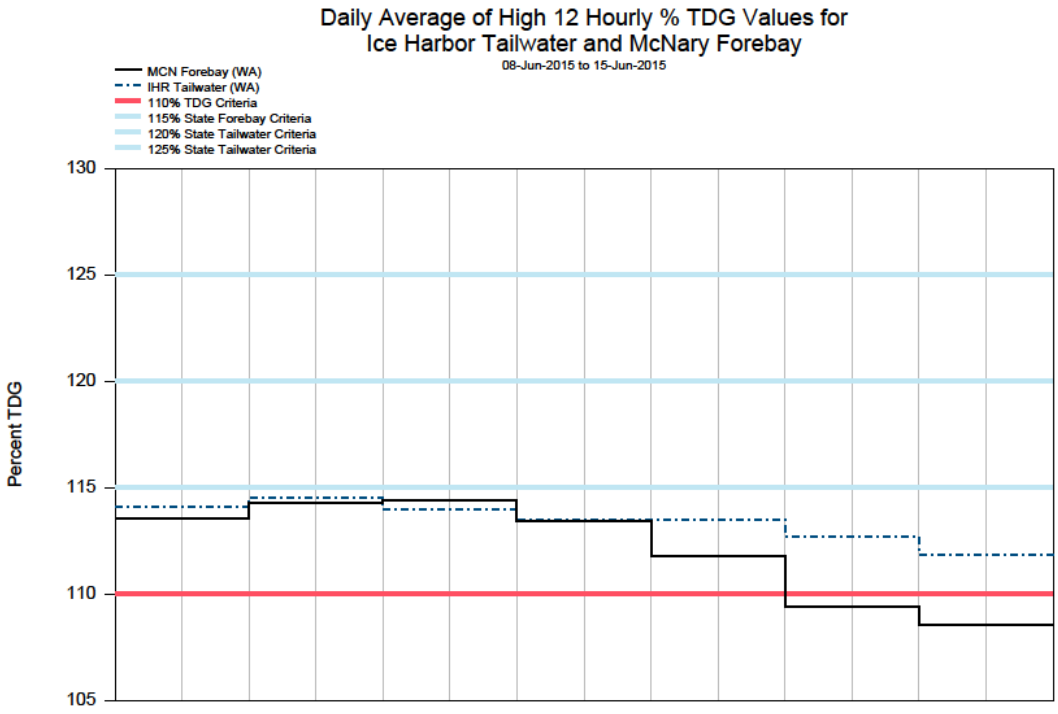

Lower Monumental Dam - Hourly Spill and Flow
KCFS
175
150
125
100
75
50
25
0
06/08/15 01:00
06/08/15 13:00
06/09/15 01:00
06/09/15 13:00
06/10/15 01:00
06/10/15 13:00
06/11/15 01:00
06/11/15 13:00
06/12/15 01:00
06/12/15 13:00
06/13/15 01:00
06/13/15 13:00
06/14/15 01:00
06/14/15 13:00
06/15/15 01:00
LMN Generation Flow
LMN Total Flow
LMN Spill Flow
LMN Target Spill
Spill Cap

Figure 12


Daily Average of High 12 Hourly % TDG Values for
Ice Harbor Tailwater and McNary Forebay
08-Jun-2015 to 15-Jun-2015
MCN Forebay (WA)
IHR Tailwater (WA)
110% TDG Criteria
115% State Forebay Criteria
120% State Tailwater Criteria
125% State Tailwater Criteria
Percent TDG
130
125
120
115
110
105

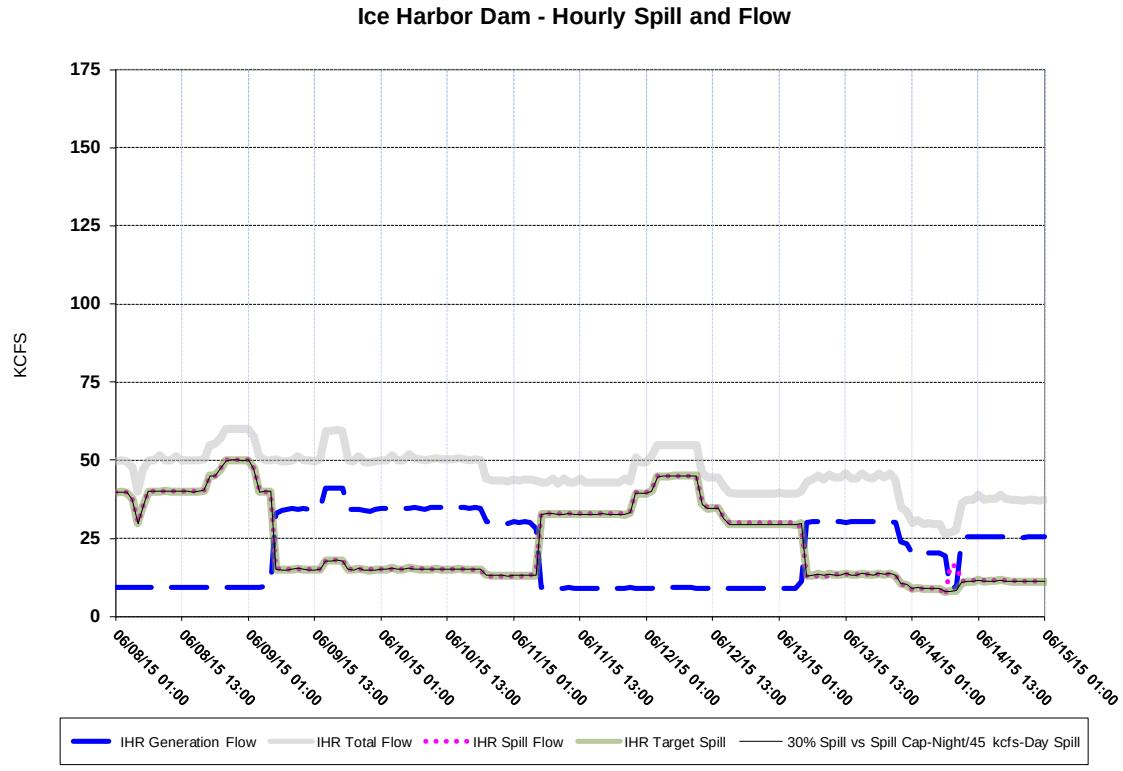
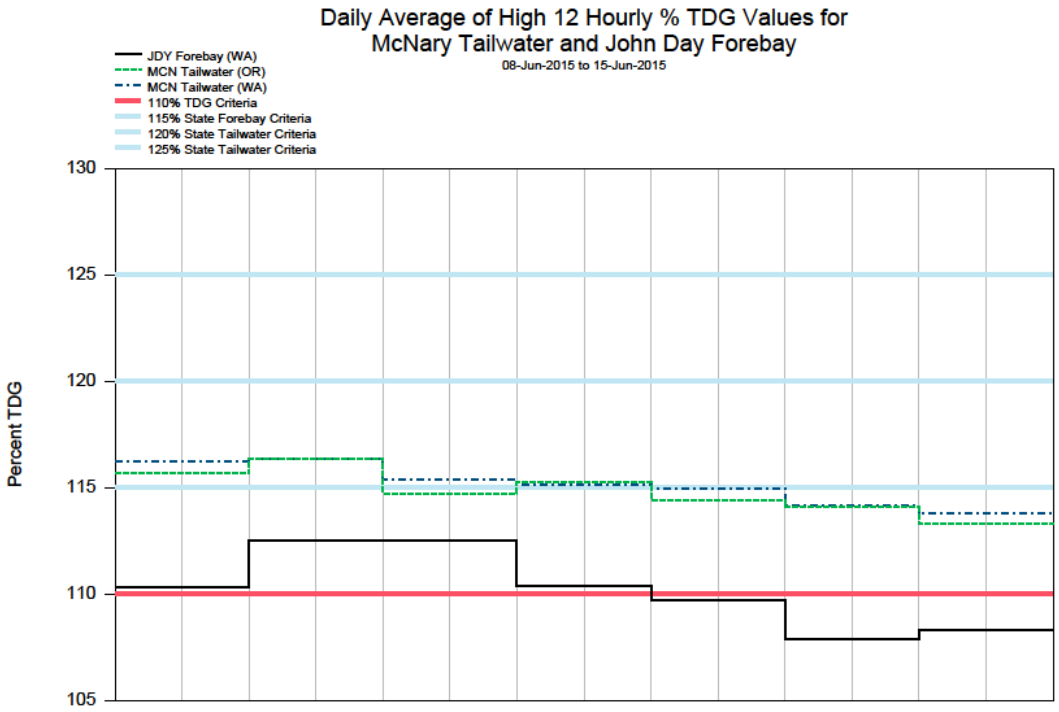

Ice Harbor Dam - Hourly Spill and Flow
KCFS
175
150
125
100
75
50
25
0
06/08/15 01:00
06/08/15 13:00
06/09/15 01:00
06/09/15 13:00
06/10/15 01:00
06/10/15 13:00
06/11/15 01:00
06/11/15 13:00
06/12/15 01:00
06/12/15 13:00
06/13/15 01:00
06/13/15 13:00
06/14/15 01:00
06/14/15 13:00
06/15/15 01:00
IHR Generation Flow
IHR Total Flow
IHR Spill Flow
IHR Target Spill
30% Spill vs Spill Cap-Night/45 kcfs-Day Spill

Figure 13


Daily Average of High 12 Hourly % TDG Values for
McNary Tailwater and John Day Forebay
08-Jun-2015 to 15-Jun-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
Percent TDG
130
125
120
115
110
105

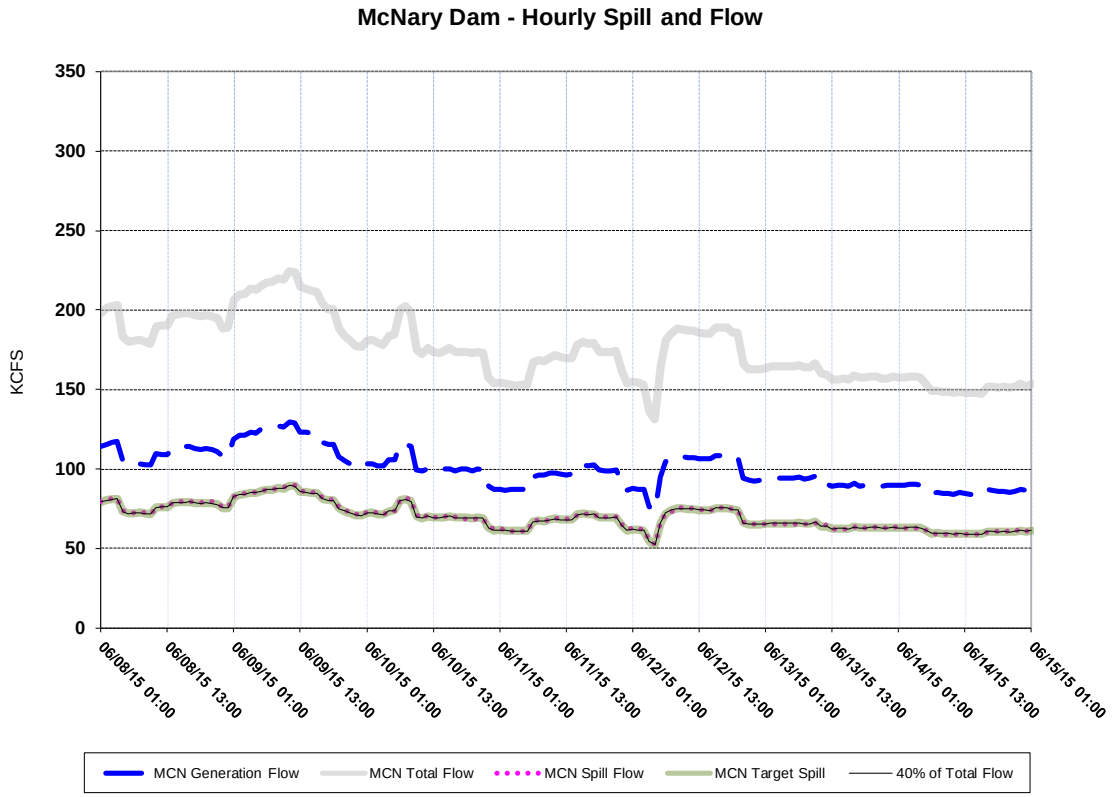
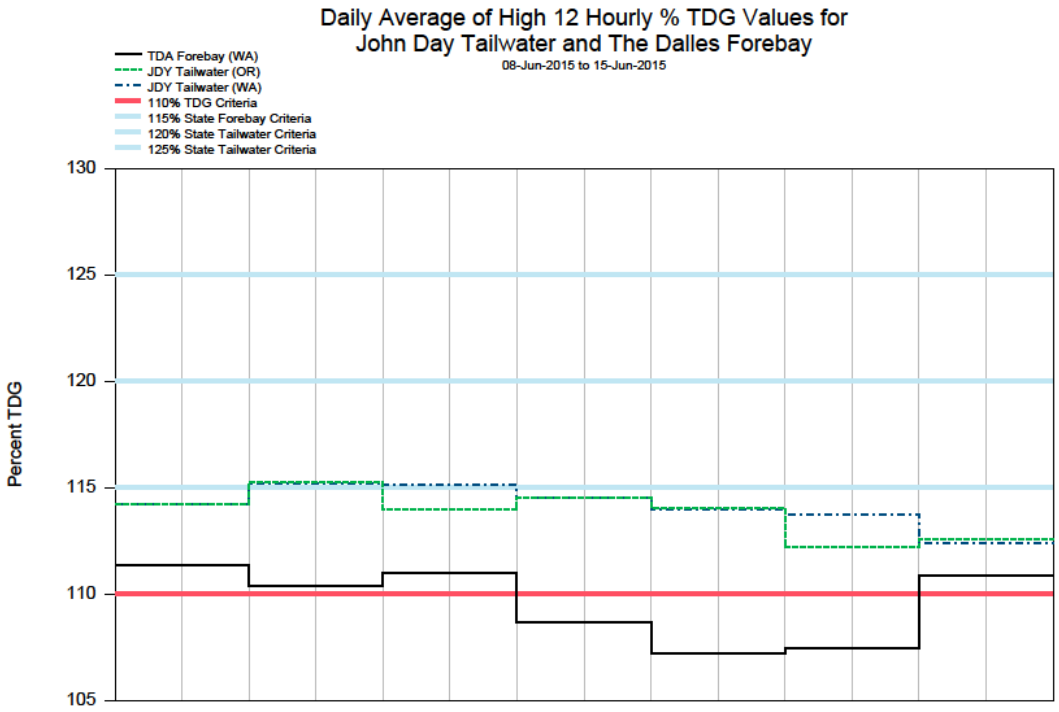

McNary Dam - Hourly Spill and Flow
KCFS
350
300
250
200
150
100
50
0
06/08/15 01:00
06/08/15 13:00
06/09/15 01:00
06/09/15 13:00
06/10/15 01:00
06/10/15 13:00
06/11/15 01:00
06/11/15 13:00
06/12/15 01:00
06/12/15 13:00
06/13/15 01:00
06/13/15 13:00
06/14/15 01:00
06/14/15 13:00
06/15/15 01:00
MCN Generation Flow
MCN Total Flow
MCN Spill Flow
MCN Target Spill
40% of Total Flow

Figure 14


Daily Average of High 12 Hourly % TDG Values for
John Day Tailwater and The Dalles Forebay
08-Jun-2015 to 15-Jun-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
Percent TDG
130
125
120
115
110
105

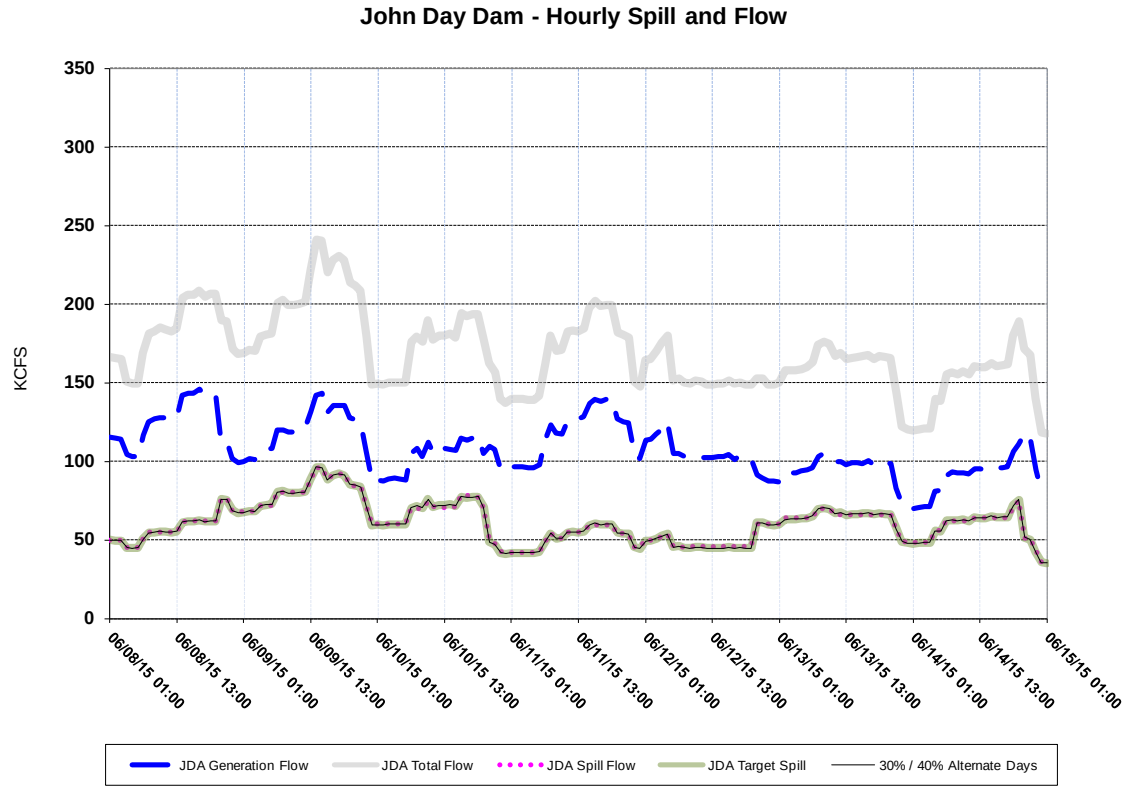
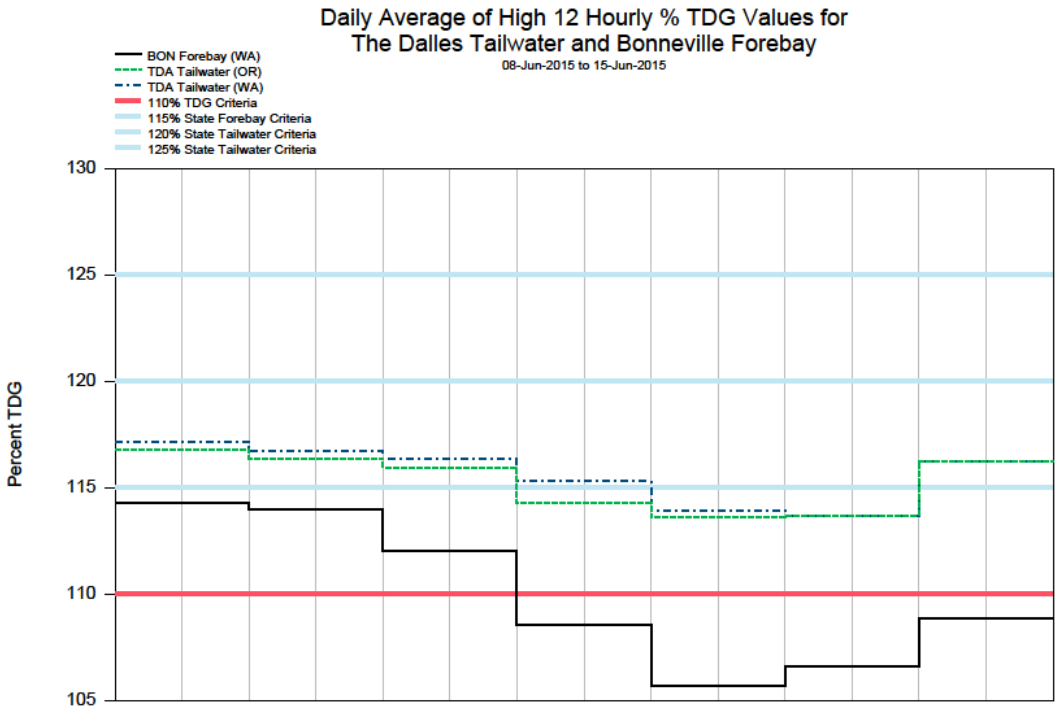

John Day Dam - Hourly Spill and Flow
KCFS
350
300
250
200
150
100
50
0
06/08/15 01:00
06/08/15 13:00
06/09/15 01:00
06/09/15 13:00
06/10/15 01:00
06/10/15 13:00
06/11/15 01:00
06/11/15 13:00
06/12/15 01:00
06/12/15 13:00
06/13/15 01:00
06/13/15 13:00
06/14/15 01:00
06/14/15 13:00
06/15/15 01:00
JDA Generation Flow
JDA Total Flow
JDA Spill Flow
JDA Target Spill
30% / 40% Alternate Days

Figure 15


Daily Average of High 12 Hourly % TDG Values for
The Dalles Tailwater and Bonneville Forebay
08-Jun-2015 to 15-Jun-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
Percent TDG
130
125
120
115
110
105

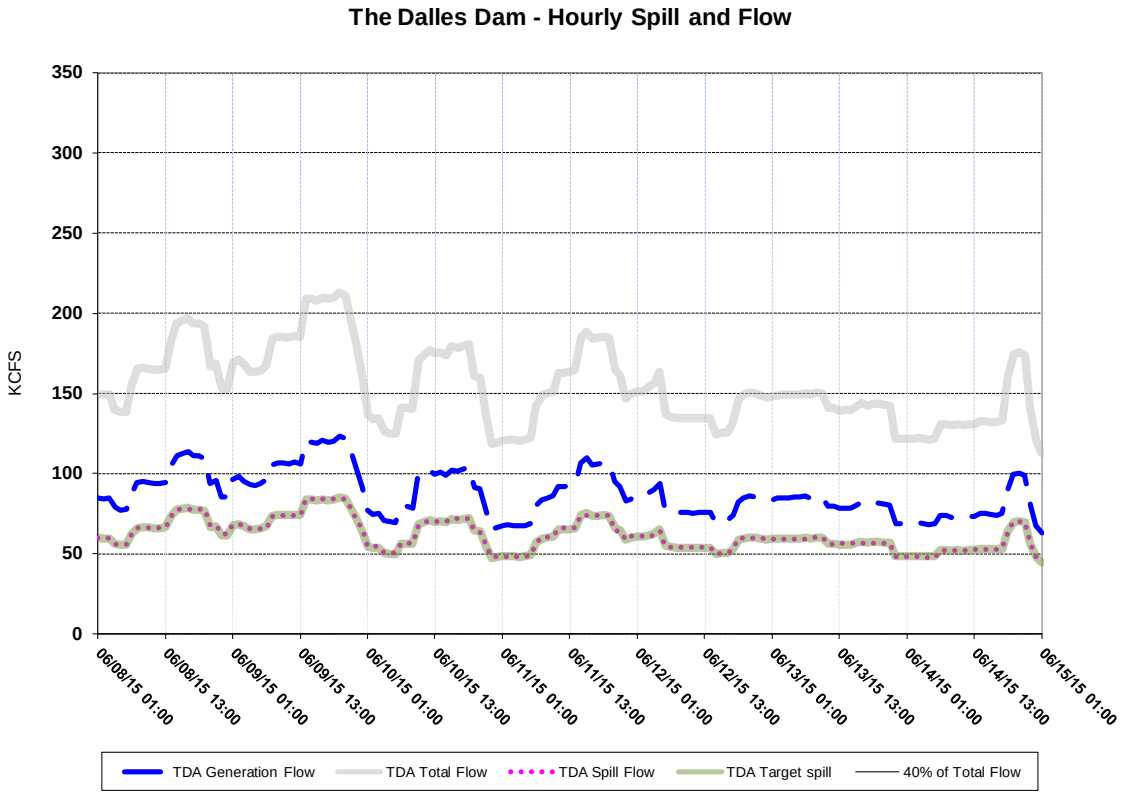
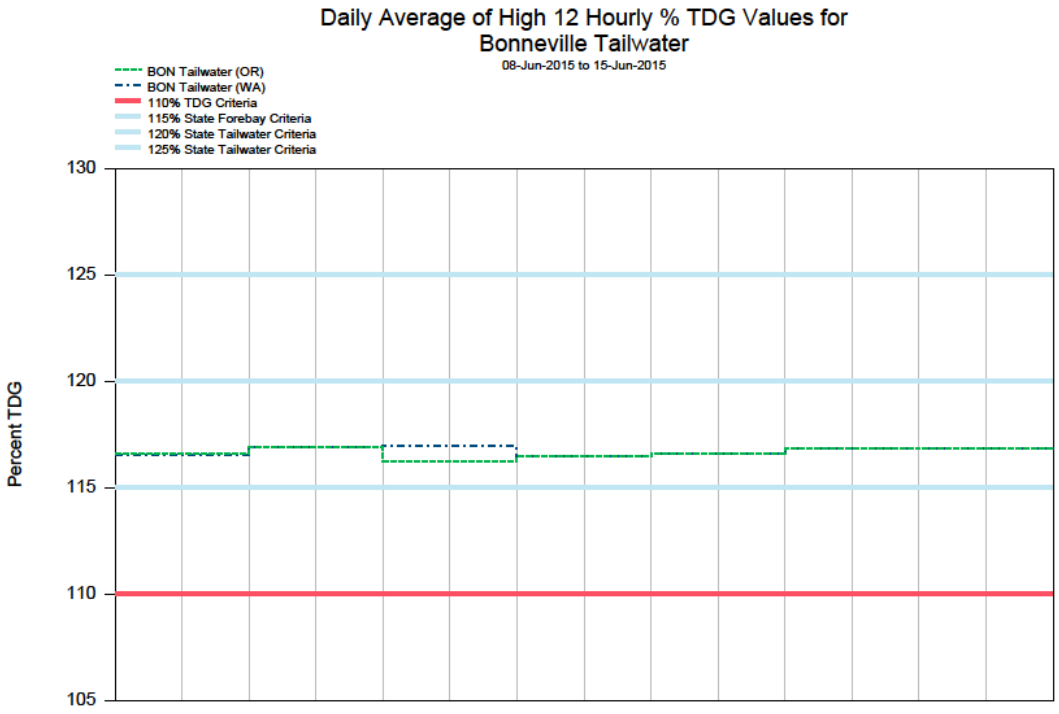

The Dalles Dam - Hourly Spill and Flow
KCFS
350
300
250
200
150
100
50
0
06/08/15 01:00
06/08/15 13:00
06/09/15 01:00
06/09/15 13:00
06/10/15 01:00
06/10/15 13:00
06/11/15 01:00
06/11/15 13:00
06/12/15 01:00
06/12/15 13:00
06/13/15 01:00
06/13/15 13:00
06/14/15 01:00
06/14/15 13:00
06/15/15 01:00
TDA Generation Flow
TDA Total Flow
TDA Spill Flow
TDA Target spill
40% of Total Flow

Figure 16


Daily Average of High 12 Hourly % TDG Values for
Bonneville Tailwater
08-Jun-2015 to 15-Jun-2015
BON Tailwater (OR)
BON Tailwater (WA)
110% TDG Criteria
115% State Forebay Criteria
120% State Tailwater Criteria
125% State Tailwater Criteria
Percent TDG
130
125
120
115
110
105

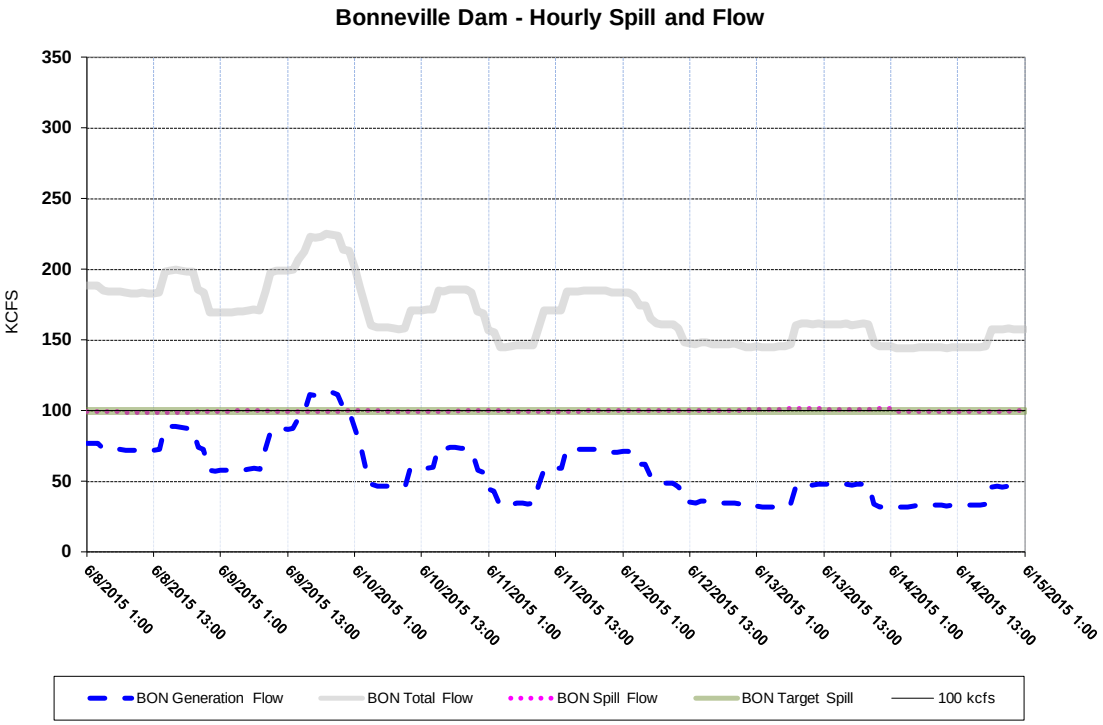
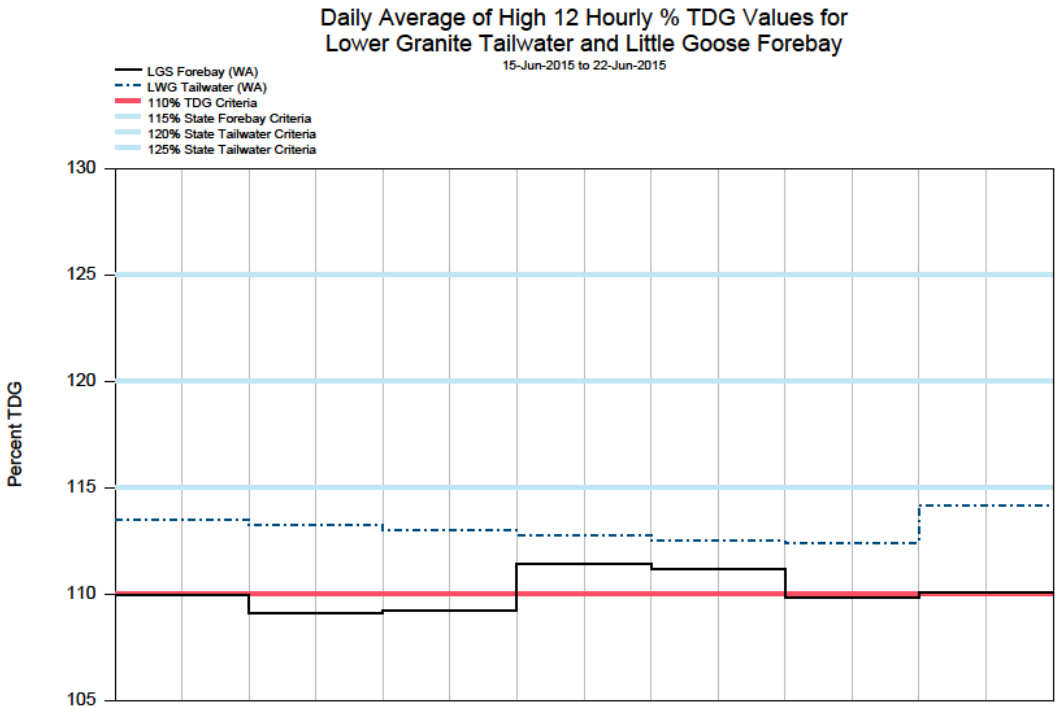

Bonneville Dam - Hourly Spill and Flow
KCFS
350
300
250
200
150
100
50
0
6/8/2015 1:00
6/8/2015 13:00
6/9/2015 1:00
6/9/2015 13:00
6/10/2015 1:00
6/10/2015 13:00
6/11/2015 1:00
6/11/2015 13:00
6/12/2015 1:00
6/12/2015 13:00
6/13/2015 1:00
6/13/2015 13:00
6/14/2015 1:00
6/14/2015 13:00
6/15/2015 1:00
BON Generation Flow
BON Total Flow
BON Spill Flow
BON Target Spill
100 kcfs

Figure 17


Daily Average of High 12 Hourly % TDG Values for
Lower Granite Tailwater and Little Goose Forebay
15-Jun-2015 to 22-Jun-2015
LGS Forebay (WA)
LWG Tailwater (WA)
110% TDG Criteria
115% State Forebay Criteria
120% State Tailwater Criteria
125% State Tailwater Criteria
Percent TDG
130
125
120
115
110
105

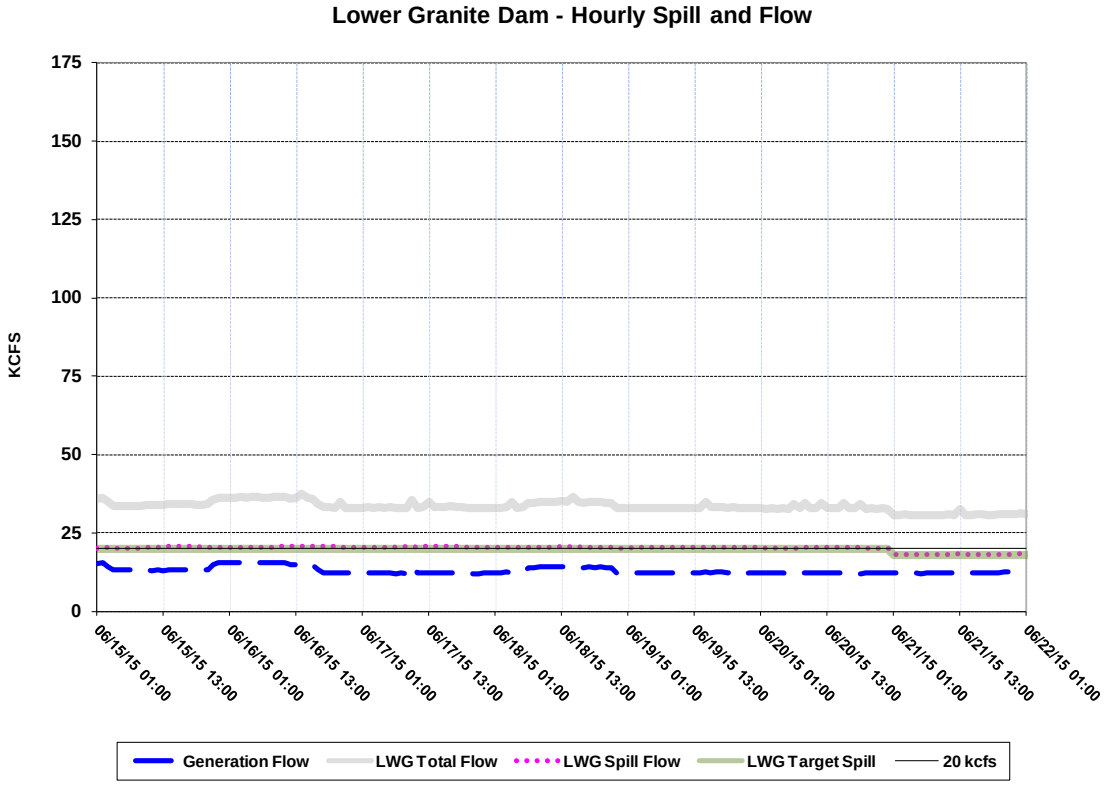
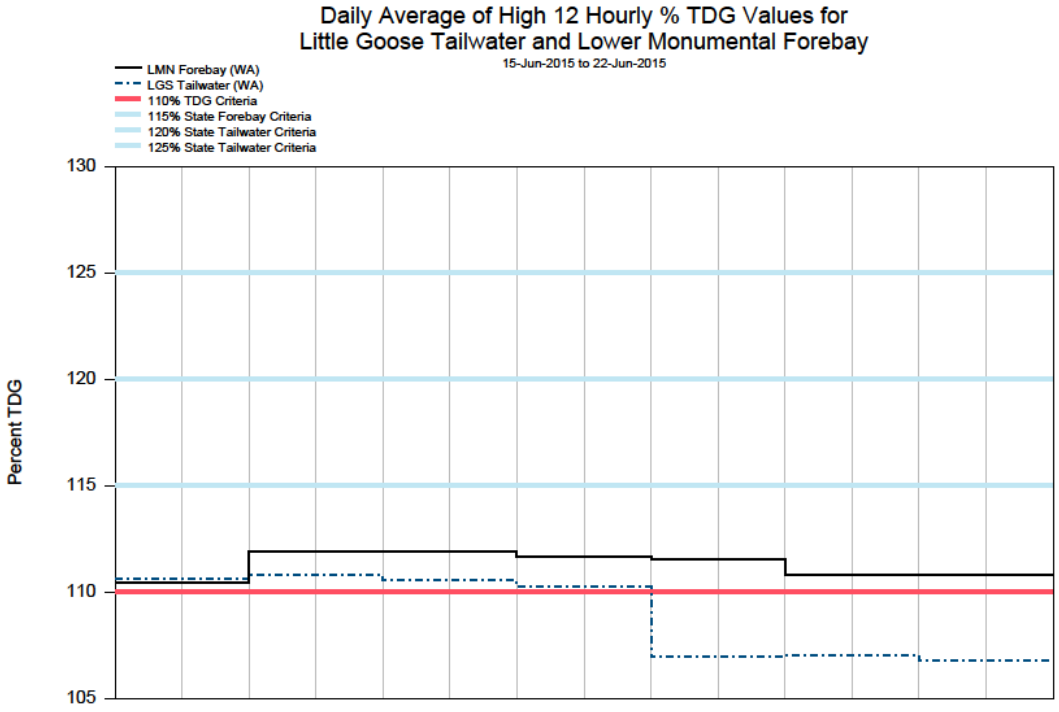

Lower Granite Dam - Hourly Spill and Flow
KCFS
175
150
125
100
75
50
25
0
06/15/15 01:00
06/15/15 13:00
06/16/15 01:00
06/16/15 13:00
06/17/15 01:00
06/17/15 13:00
06/18/15 01:00
06/18/15 13:00
06/19/15 01:00
06/19/15 13:00
06/20/15 01:00
06/20/15 13:00
06/21/15 01:00
06/21/15 13:00
06/22/15 01:00
Generation Flow
LWG Total Flow
LWG Spill Flow
LWG Target Spill
20 kcfs

Figure 18


Daily Average of High 12 Hourly % TDG Values for
Little Goose Tailwater and Lower Monumental Forebay
15-Jun-2015 to 22-Jun-2015
LMN Forebay (WA)
LGS Tailwater (WA)
110% TDG Criteria
115% State Forebay Criteria
120% State Tailwater Criteria
125% State Tailwater Criteria
Percent TDG
130
125
120
115
110
105

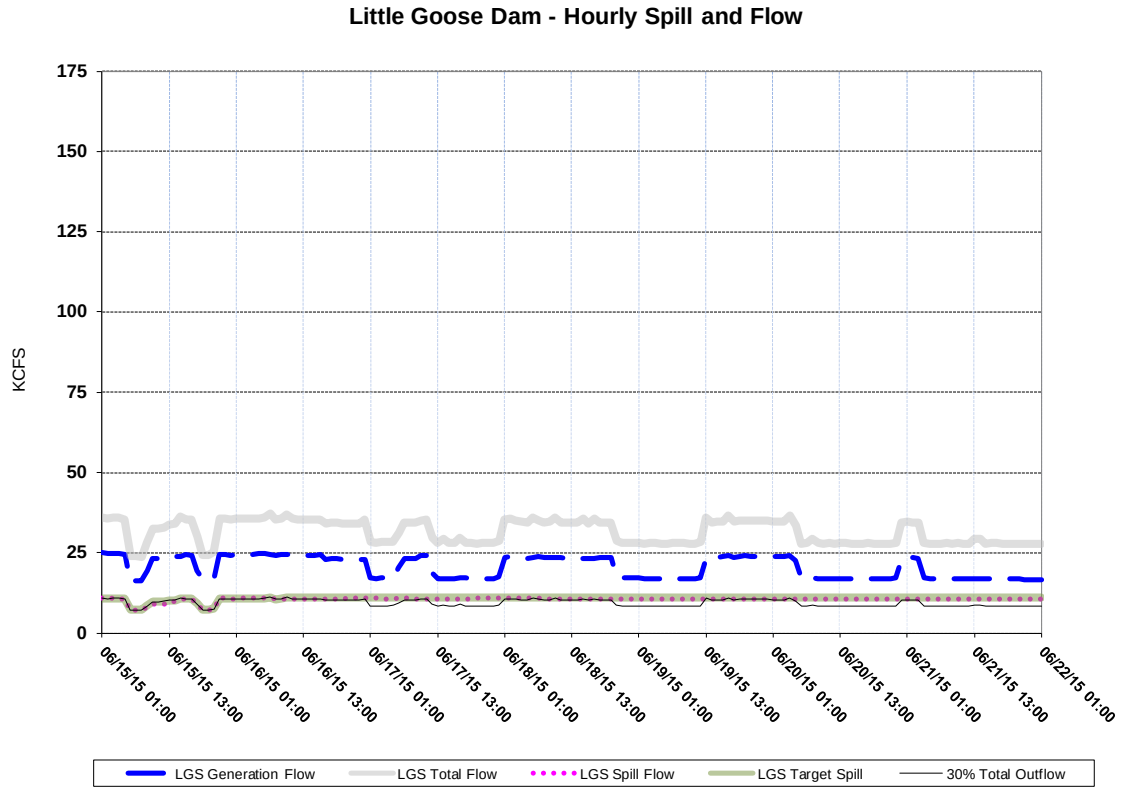
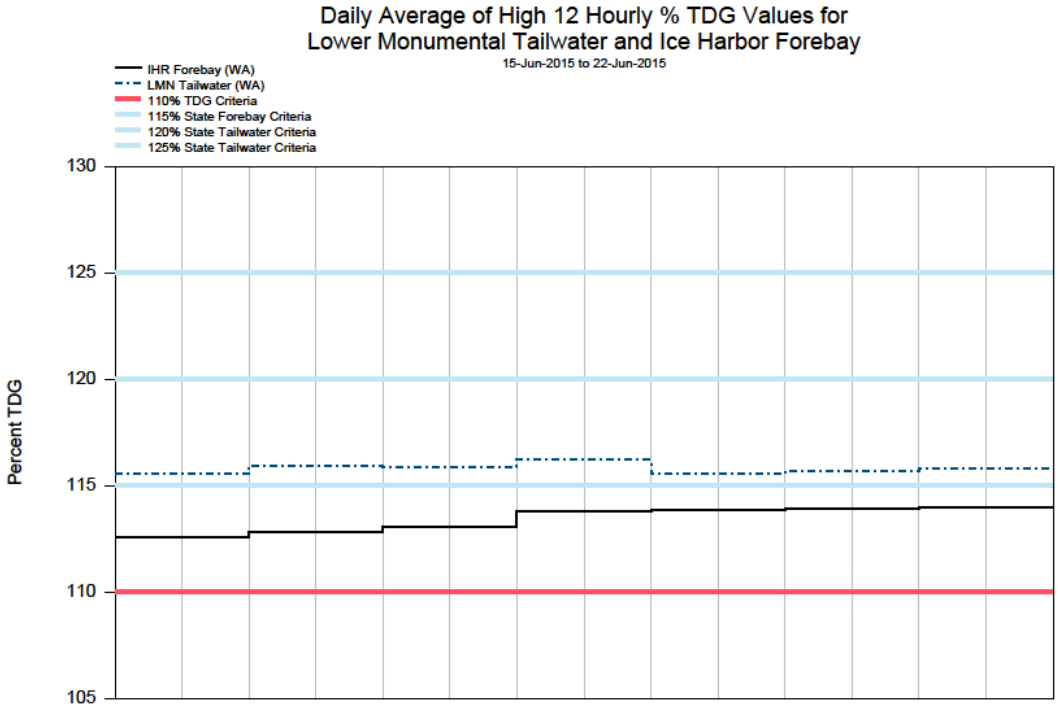

Little Goose Dam - Hourly Spill and Flow
KCFS
175
150
125
100
75
50
25
0
06/15/15 01:00
06/15/15 13:00
06/16/15 01:00
06/16/15 13:00
06/17/15 01:00
06/17/15 13:00
06/18/15 01:00
06/18/15 13:00
06/19/15 01:00
06/19/15 13:00
06/20/15 01:00
06/20/15 13:00
06/21/15 01:00
06/21/15 13:00
06/22/15 01:00
LGS Generation Flow
LGS Total Flow
LGS Spill Flow
LGS Target Spill
30% Total Outflow

Figure 19


Daily Average of High 12 Hourly % TDG Values for
Lower Monumental Tailwater and Ice Harbor Forebay
15-Jun-2015 to 22-Jun-2015
IHR Forebay (WA)
LMN Tailwater (WA)
110% TDG Criteria
115% State Forebay Criteria
120% State Tailwater Criteria
125% State Tailwater Criteria
Percent TDG
130
125
120
115
110
105

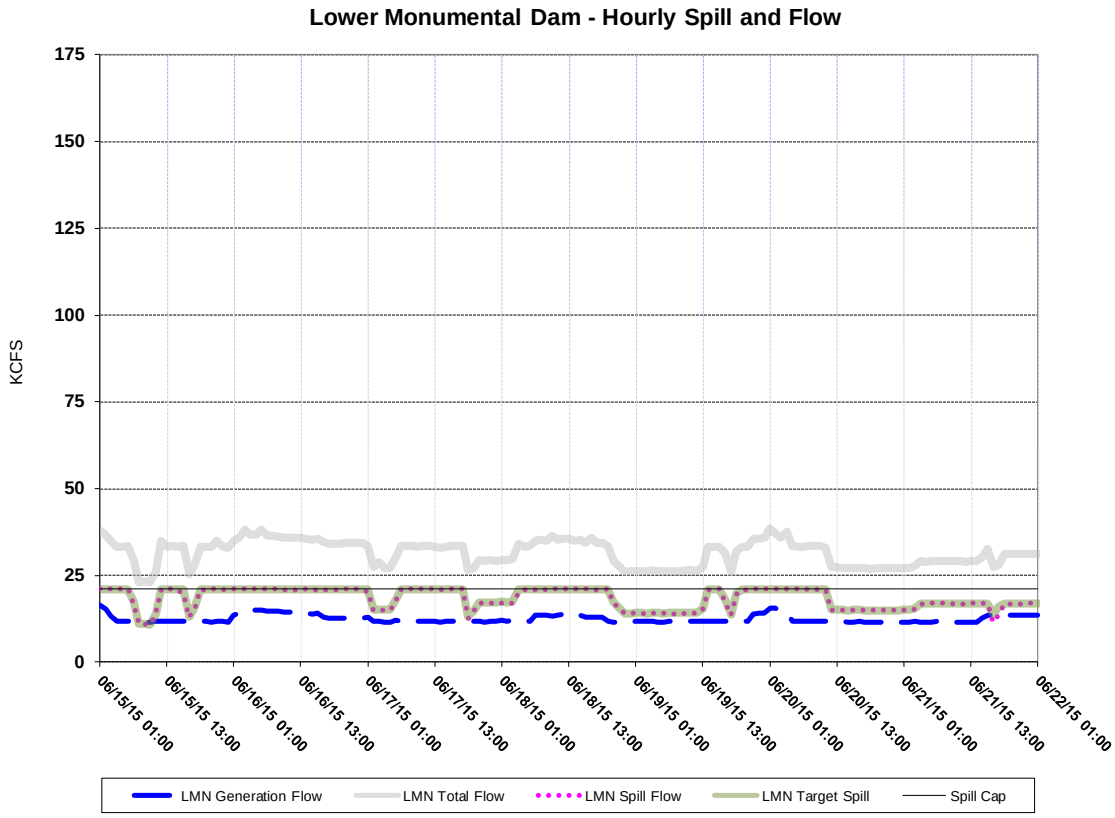
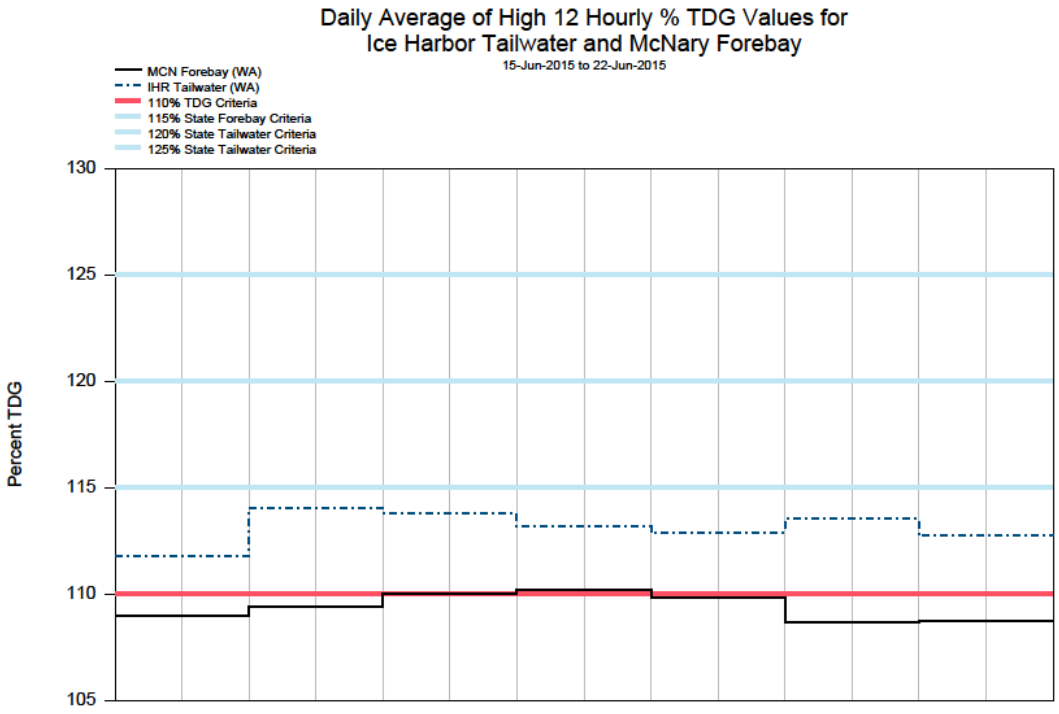

Lower Monumental Dam - Hourly Spill and Flow
KCFS
175
150
125
100
75
50
25
0
06/15/15 01:00
06/15/15 13:00
06/16/15 01:00
06/16/15 13:00
06/17/15 01:00
06/17/15 13:00
06/18/15 01:00
06/18/15 13:00
06/19/15 01:00
06/19/15 13:00
06/20/15 01:00
06/20/15 13:00
06/21/15 01:00
06/21/15 13:00
06/22/15 01:00
LMN Generation Flow
LMN Total Flow
LMN Spill Flow
LMN Target Spill
Spill Cap

Figure 20


Daily Average of High 12 Hourly % TDG Values for
Ice Harbor Tailwater and McNary Forebay
15-Jun-2015 to 22-Jun-2015
MCN Forebay (WA)
IHR Tailwater (WA)
110% TDG Criteria
115% State Forebay Criteria
120% State Tailwater Criteria
125% State Tailwater Criteria
Percent TDG
130
125
120
115
110
105

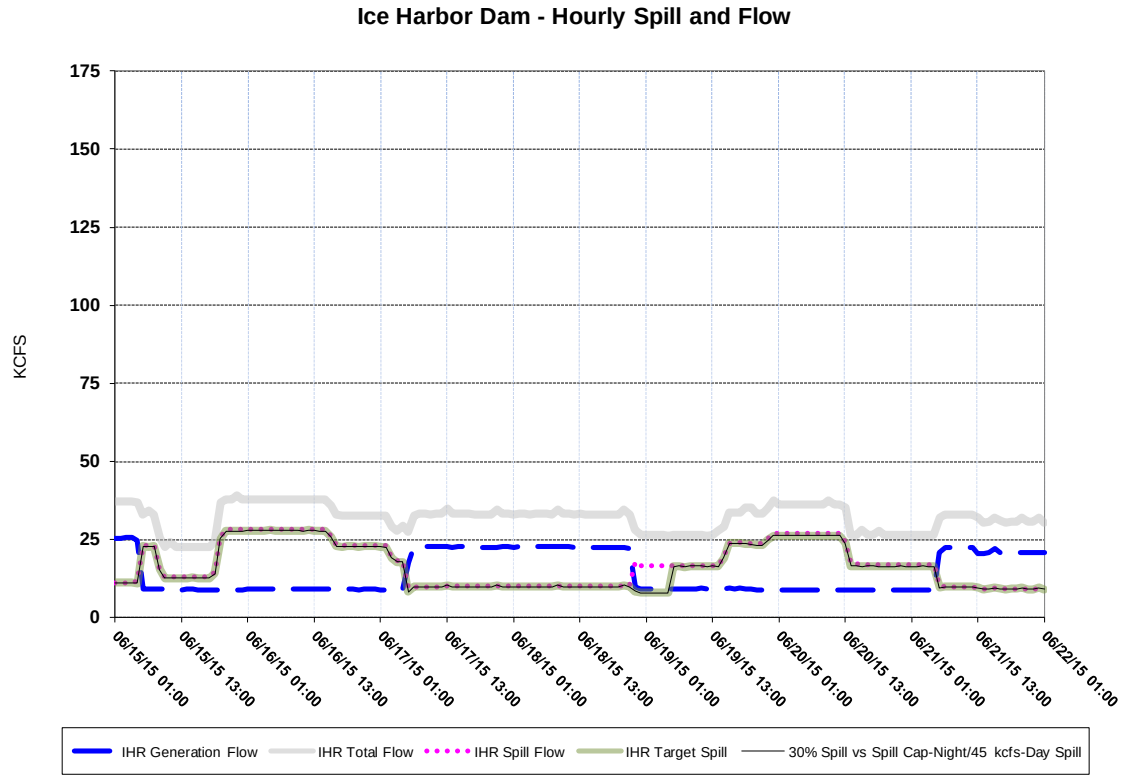
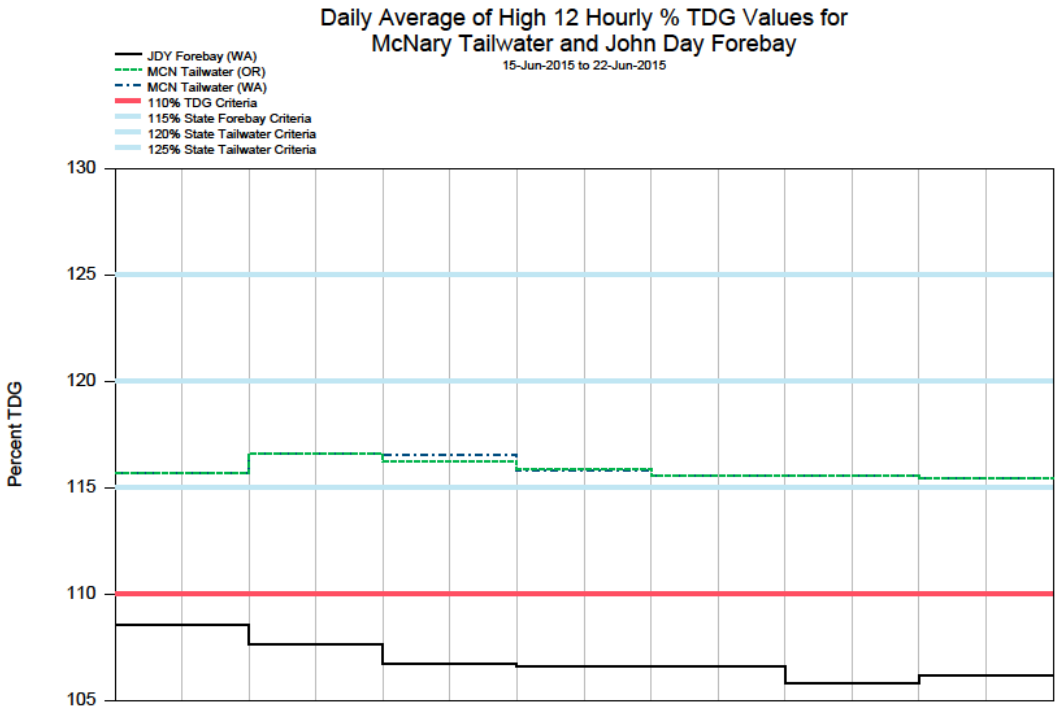

Ice Harbor Dam - Hourly Spill and Flow
KCFS
175
150
125
100
75
50
25
0
06/15/15 01:00
06/15/15 13:00
06/16/15 01:00
06/16/15 13:00
06/17/15 01:00
06/17/15 13:00
06/18/15 01:00
06/18/15 13:00
06/19/15 01:00
06/19/15 13:00
06/20/15 01:00
06/20/15 13:00
06/21/15 01:00
06/21/15 13:00
06/22/15 01:00
IHR Generation Flow
IHR Total Flow
IHR Spill Flow
IHR Target Spill
30% Spill vs Spill Cap-Night/45 kcfs-Day Spill

Figure 21


Daily Average of High 12 Hourly % TDG Values for
McNary Tailwater and John Day Forebay
15-Jun-2015 to 22-Jun-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
Percent TDG
130
125
120
115
110
105

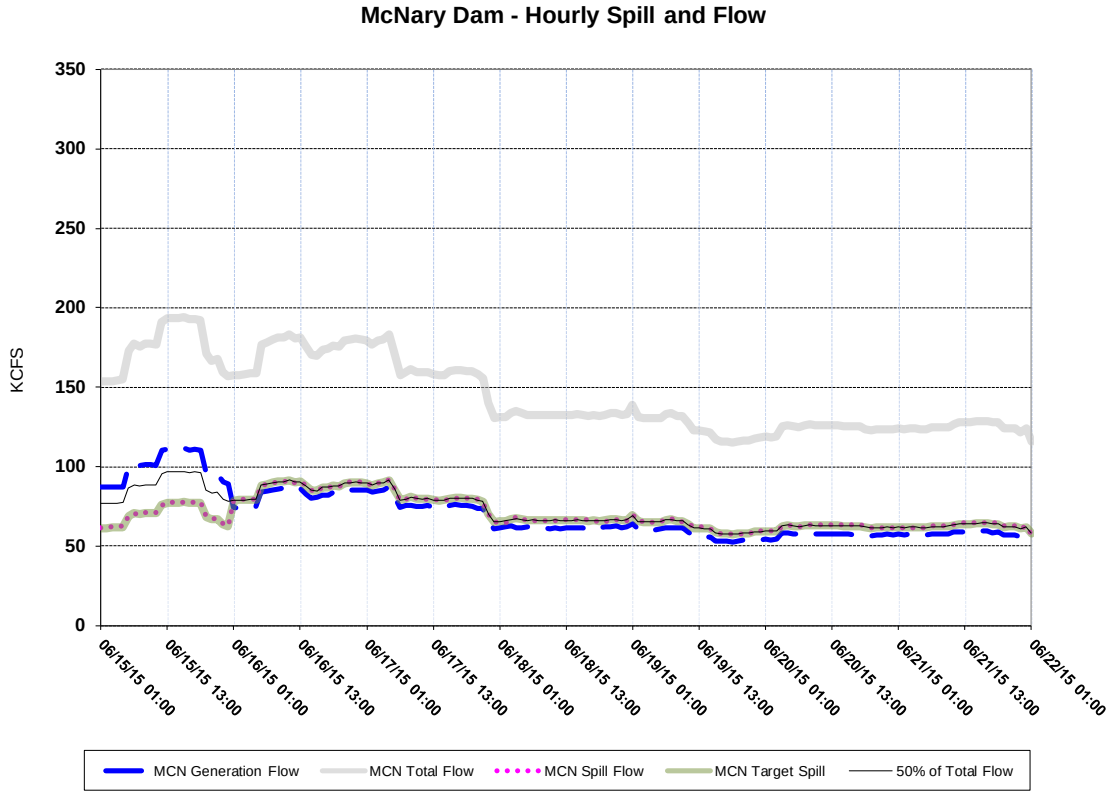
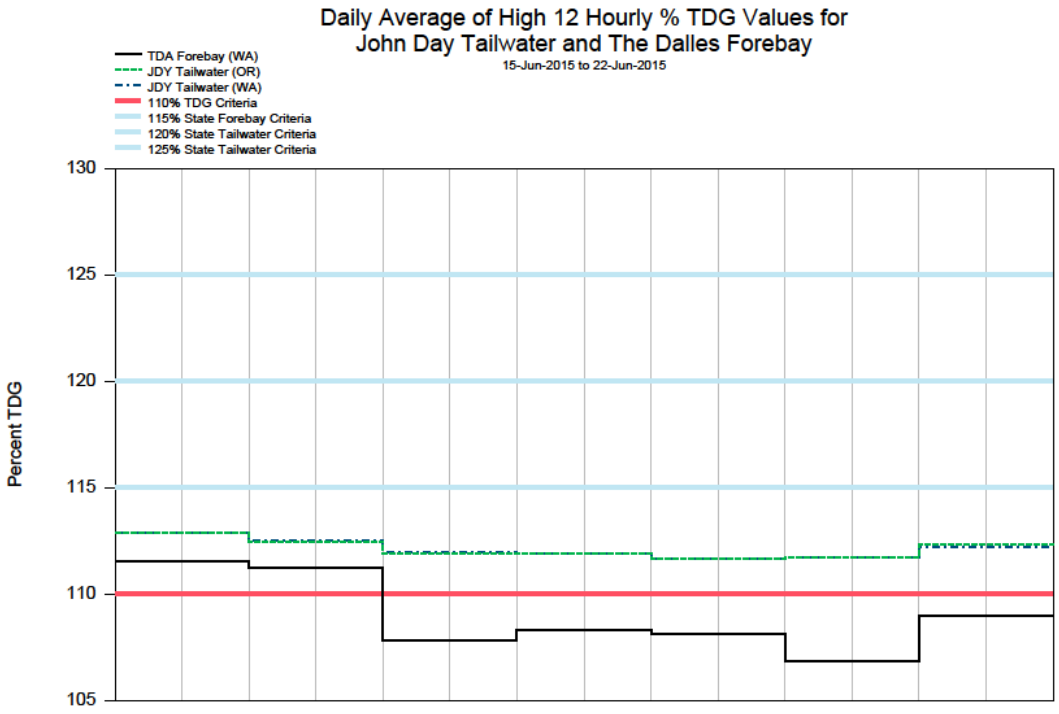

McNary Dam - Hourly Spill and Flow
KCFS
350
300
250
200
150
100
50
0
06/15/15 01:00
06/15/15 13:00
06/16/15 01:00
06/16/15 13:00
06/17/15 01:00
06/17/15 13:00
06/18/15 01:00
06/18/15 13:00
06/19/15 01:00
06/19/15 13:00
06/20/15 01:00
06/20/15 13:00
06/21/15 01:00
06/21/15 13:00
06/22/15 01:00
MCN Generation Flow
MCN Total Flow
MCN Spill Flow
MCN Target Spill
50% of Total Flow

Figure 22


Daily Average of High 12 Hourly % TDG Values for
John Day Tailwater and The Dalles Forebay
15-Jun-2015 to 22-Jun-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
Percent TDG
130
125
120
115
110
105

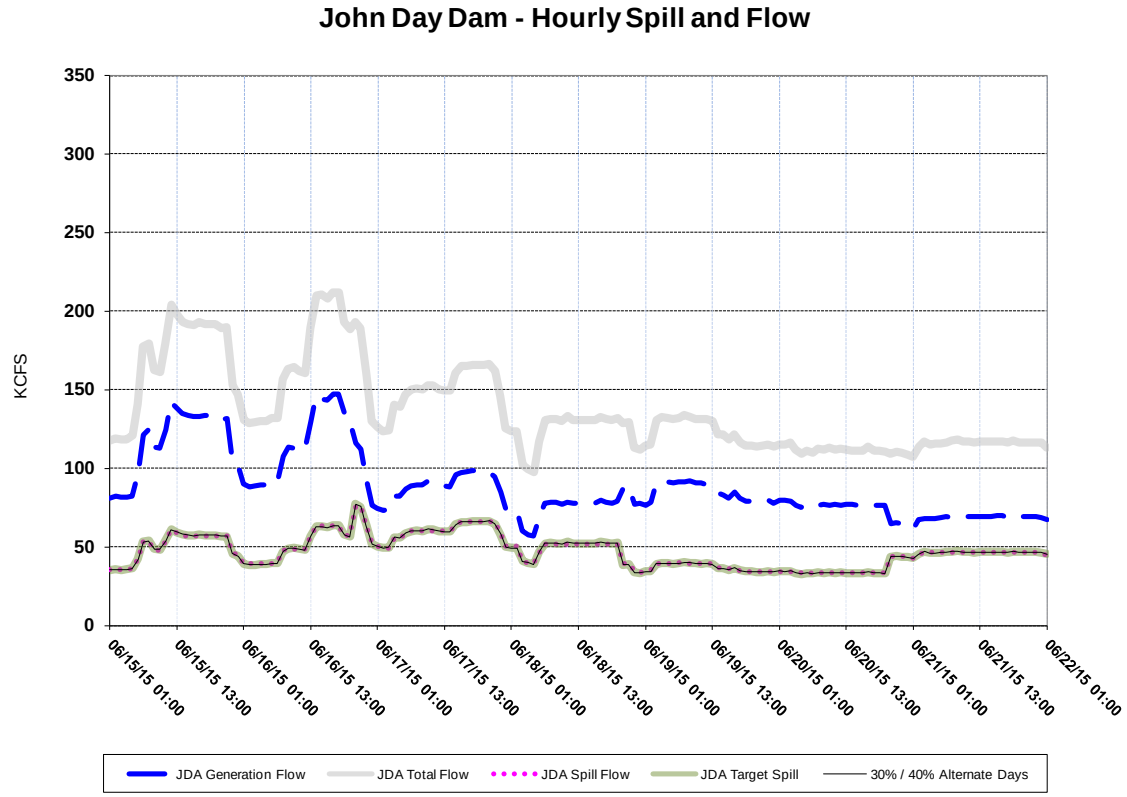
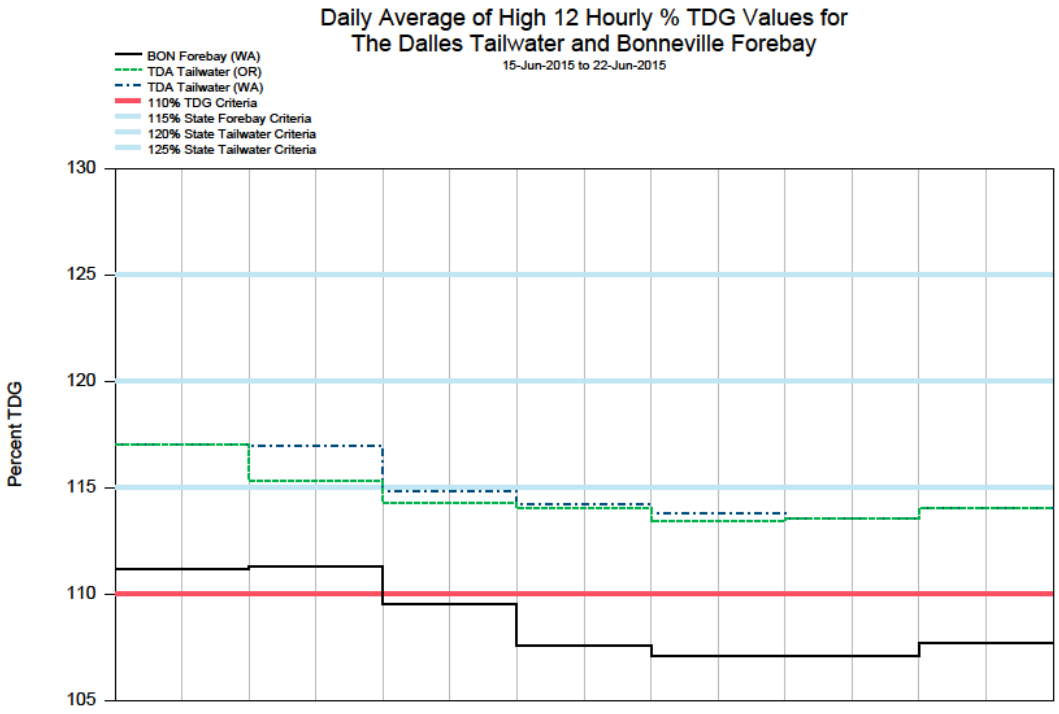

John Day Dam - Hourly Spill and Flow
KCFS
350
300
250
200
150
100
50
0
06/15/15 01:00
06/15/15 13:00
06/16/15 01:00
06/16/15 13:00
06/17/15 01:00
06/17/15 13:00
06/18/15 01:00
06/18/15 13:00
06/19/15 01:00
06/19/15 13:00
06/20/15 01:00
06/20/15 13:00
06/21/15 01:00
06/21/15 13:00
06/22/15 01:00
JDA Generation Flow
JDA Total Flow
JDA Spill Flow
JDA Target Spill
30% / 40% Alternate Days

Figure 23


Daily Average of High 12 Hourly % TDG Values for
The Dalles Tailwater and Bonneville Forebay
15-Jun-2015 to 22-Jun-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
Percent TDG
130
125
120
115
110
105

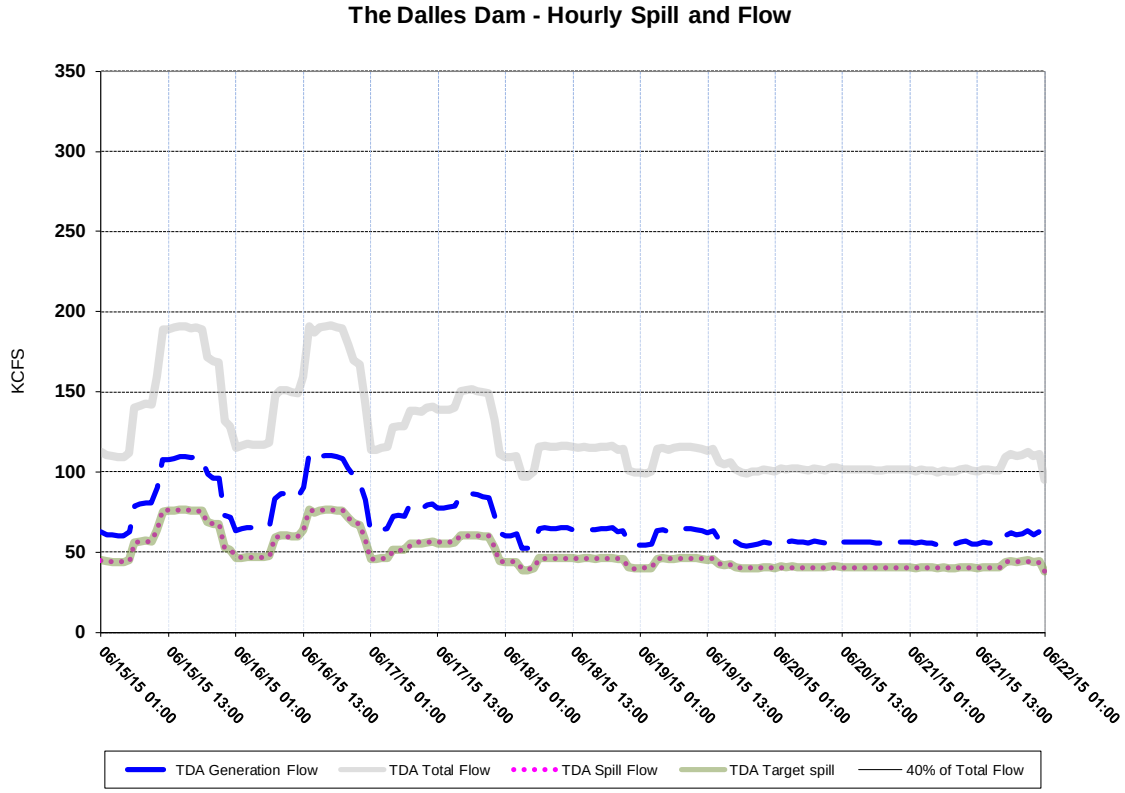
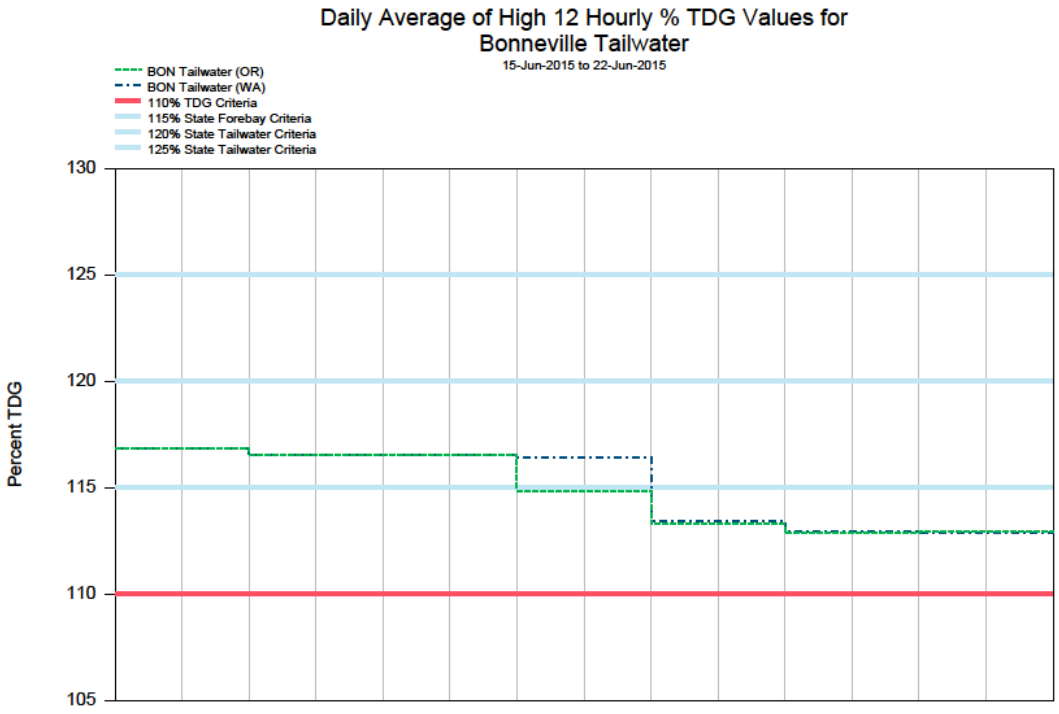

The Dalles Dam - Hourly Spill and Flow
KCFS
350
300
250
200
150
100
50
0
06/15/15 01:00
06/15/15 13:00
06/16/15 01:00
06/16/15 13:00
06/17/15 01:00
06/17/15 13:00
06/18/15 01:00
06/18/15 13:00
06/19/15 01:00
06/19/15 13:00
06/20/15 01:00
06/20/15 13:00
06/21/15 01:00
06/21/15 13:00
06/22/15 01:00
TDA Generation Flow
TDA Total Flow
TDA Spill Flow
TDA Target spill
40% of Total Flow

Figure 24


Daily Average of High 12 Hourly % TDG Values for
Bonneville Tailwater
15-Jun-2015 to 22-Jun-2015
BON Tailwater (OR)
BON Tailwater (WA)
110% TDG Criteria
115% State Forebay Criteria
120% State Tailwater Criteria
125% State Tailwater Criteria
Percent TDG
130
125
120
115
110
105

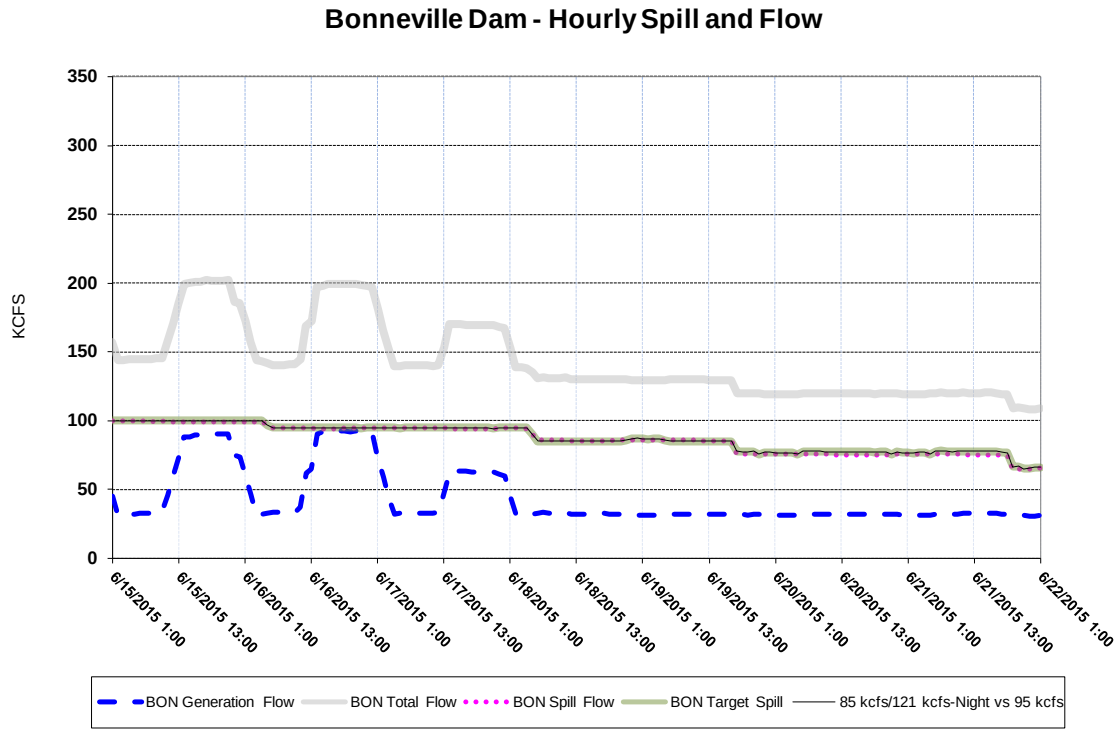
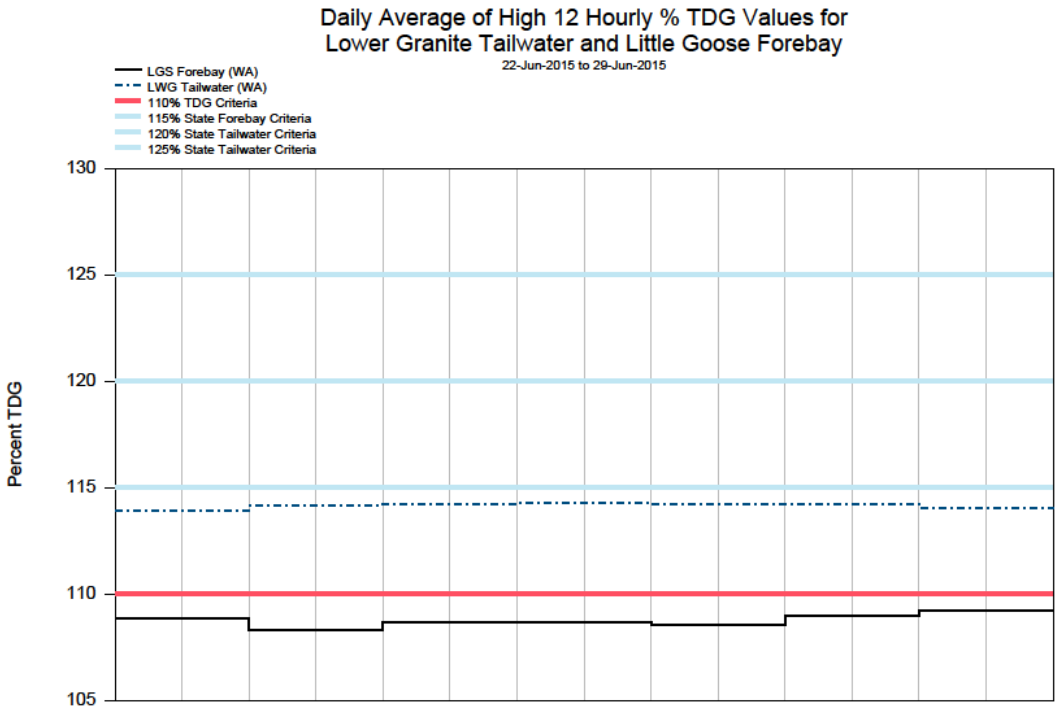

Bonneville Dam - Hourly Spill and Flow
KCFS
350
300
250
200
150
100
50
0
6/15/2015 1:00
6/15/2015 13:00
6/16/2015 1:00
6/16/2015 13:00
6/17/2015 1:00
6/17/2015 13:00
6/18/2015 1:00
6/18/2015 13:00
6/19/2015 1:00
6/19/2015 13:00
6/20/2015 1:00
6/20/2015 13:00
6/21/2015 1:00
6/21/2015 13:00
6/22/2015 1:00
BON Generation Flow
BON Total Flow
BON Spill Flow
BON Target Spill
85 kcfs/121 kcfs-Night vs 95 kcfs

Figure 25


Daily Average of High 12 Hourly % TDG Values for
Lower Granite Tailwater and Little Goose Forebay
22-Jun-2015 to 29-Jun-2015
LGS Forebay (WA)
LWG Tailwater (WA)
110% TDG Criteria
115% State Forebay Criteria
120% State Tailwater Criteria
125% State Tailwater Criteria
Percent TDG
130
125
120
115
110
105

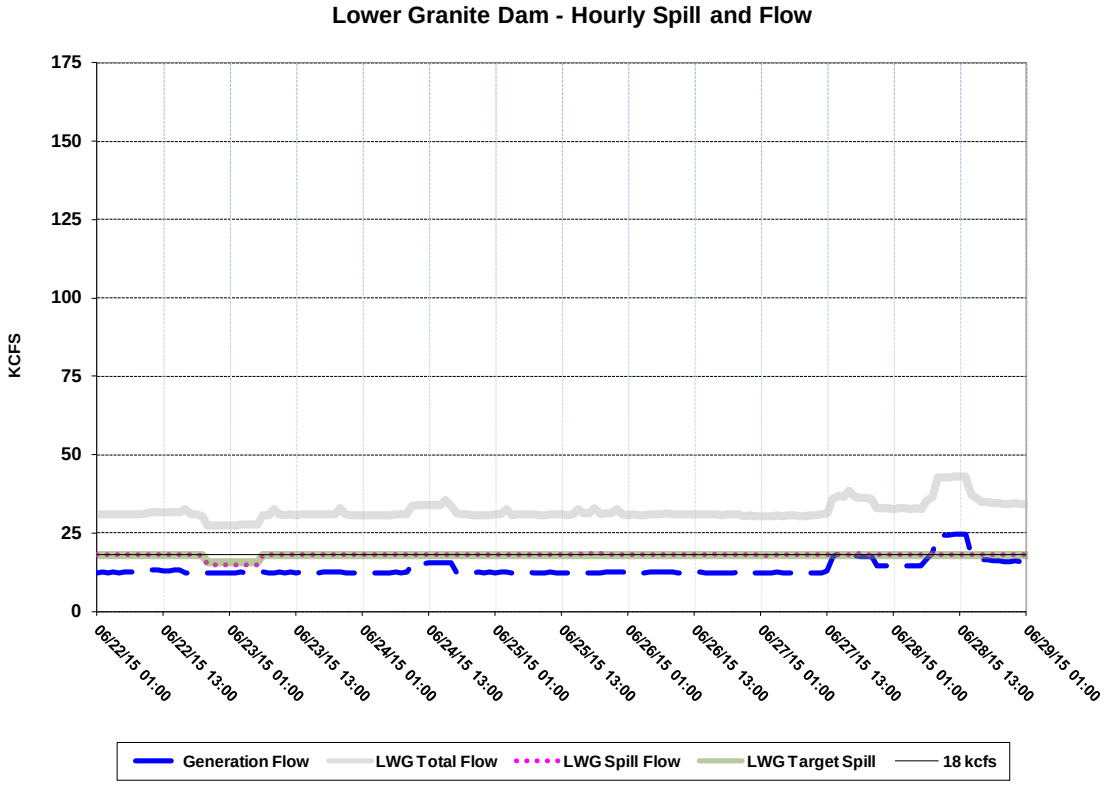
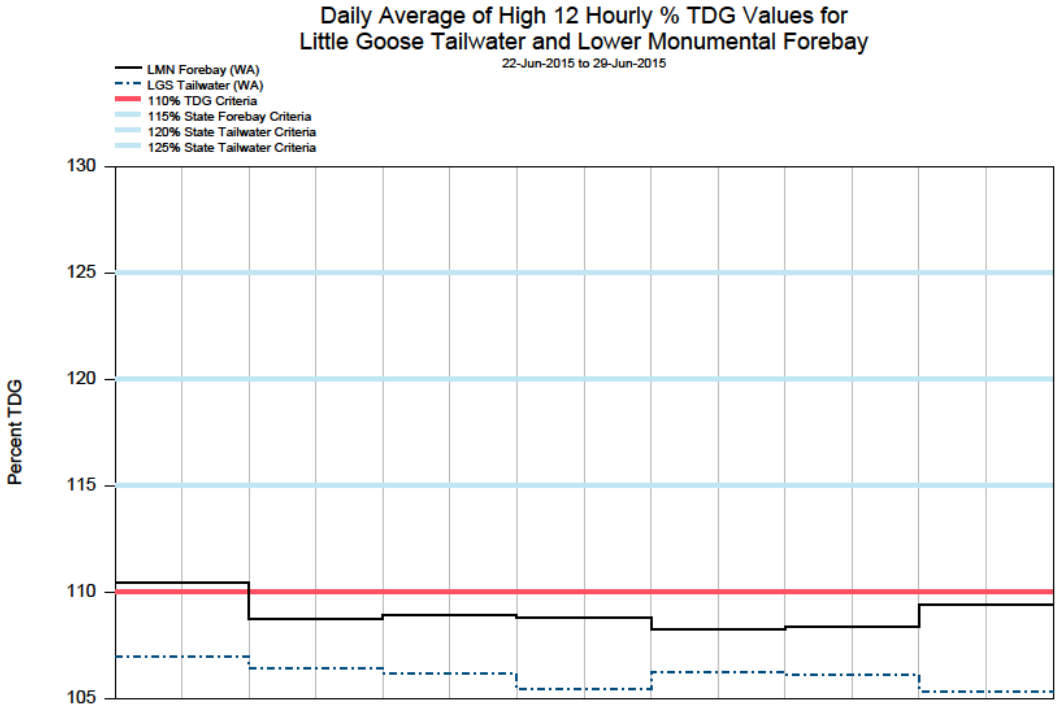

Lower Granite Dam - Hourly Spill and Flow
KCFS
175
150
125
100
75
50
25
0
06/22/15 01:00
06/22/15 13:00
06/23/15 01:00
06/23/15 13:00
06/24/15 01:00
06/24/15 13:00
06/25/15 01:00
06/25/15 13:00
06/26/15 01:00
06/26/15 13:00
06/27/15 01:00
06/27/15 13:00
06/28/15 01:00
06/28/15 13:00
06/29/15 01:00
Generation Flow
LWG Total Flow
LWG Spill Flow
LWG Target Spill
18 kcfs

Figure 26


Daily Average of High 12 Hourly % TDG Values for
Little Goose Tailwater and Lower Monumental Forebay
22-Jun-2015 to 29-Jun-2015
LMN Forebay (WA)
LGS Tailwater (WA)
110% TDG Criteria
115% State Forebay Criteria
120% State Tailwater Criteria
125% State Tailwater Criteria
Percent TDG
130
125
120
115
110
105

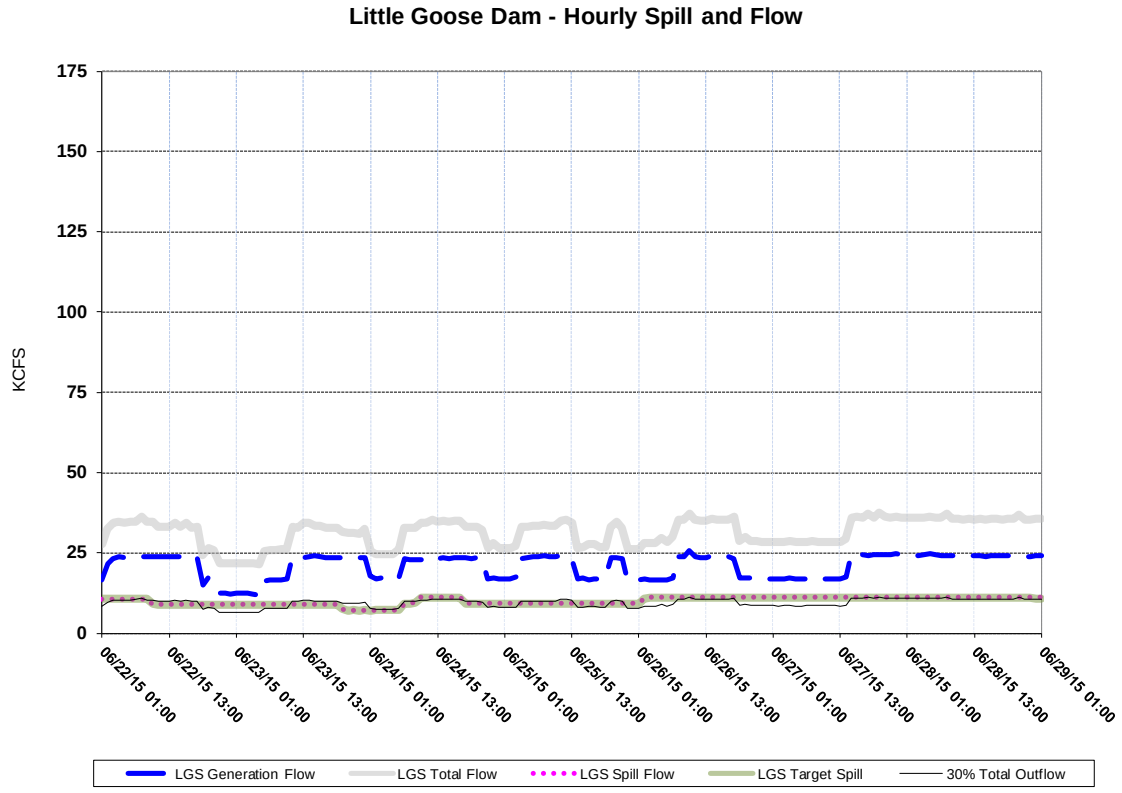
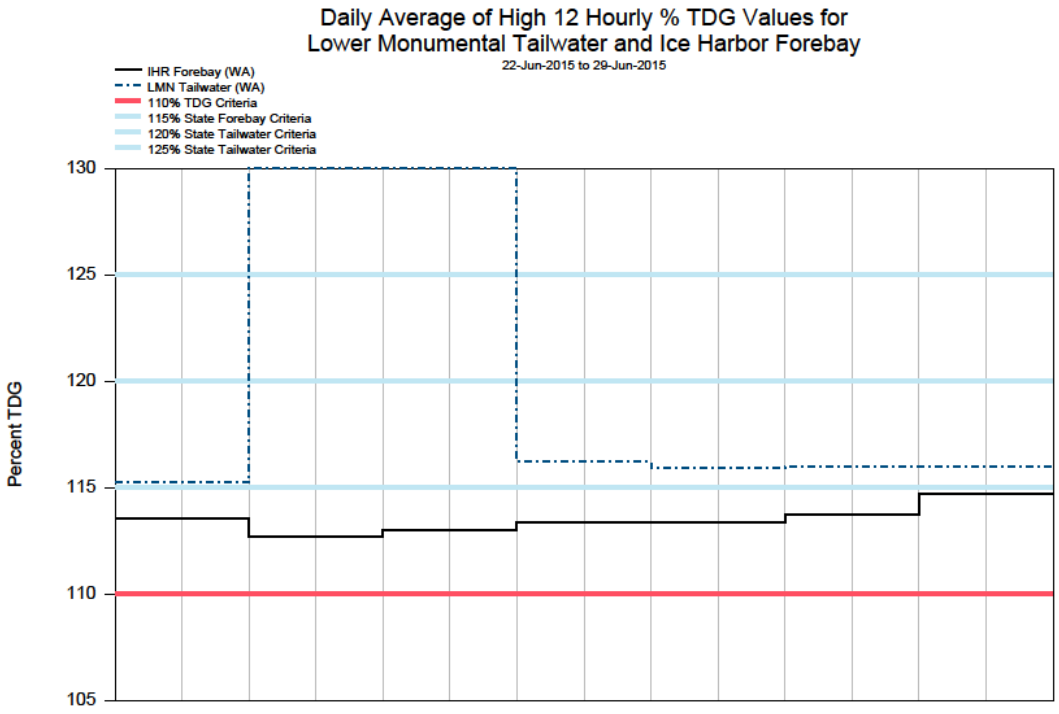

Little Goose Dam - Hourly Spill and Flow
KCFS
175
150
125
100
75
50
25
0
06/22/15 01:00
06/22/15 13:00
06/23/15 01:00
06/23/15 13:00
06/24/15 01:00
06/24/15 13:00
06/25/15 01:00
06/25/15 13:00
06/26/15 01:00
06/26/15 13:00
06/27/15 01:00
06/27/15 13:00
06/28/15 01:00
06/28/15 13:00
06/29/15 01:00
LGS Generation Flow
LGS Total Flow
LGS Spill Flow
LGS Target Spill
30% Total Outflow

Figure 27


Daily Average of High 12 Hourly % TDG Values for
Lower Monumental Tailwater and Ice Harbor Forebay
22-Jun-2015 to 29-Jun-2015
IHR Forebay (WA)
LMN Tailwater (WA)
110% TDG Criteria
115% State Forebay Criteria
120% State Tailwater Criteria
125% State Tailwater Criteria
Percent TDG
130
125
120
115
110
105

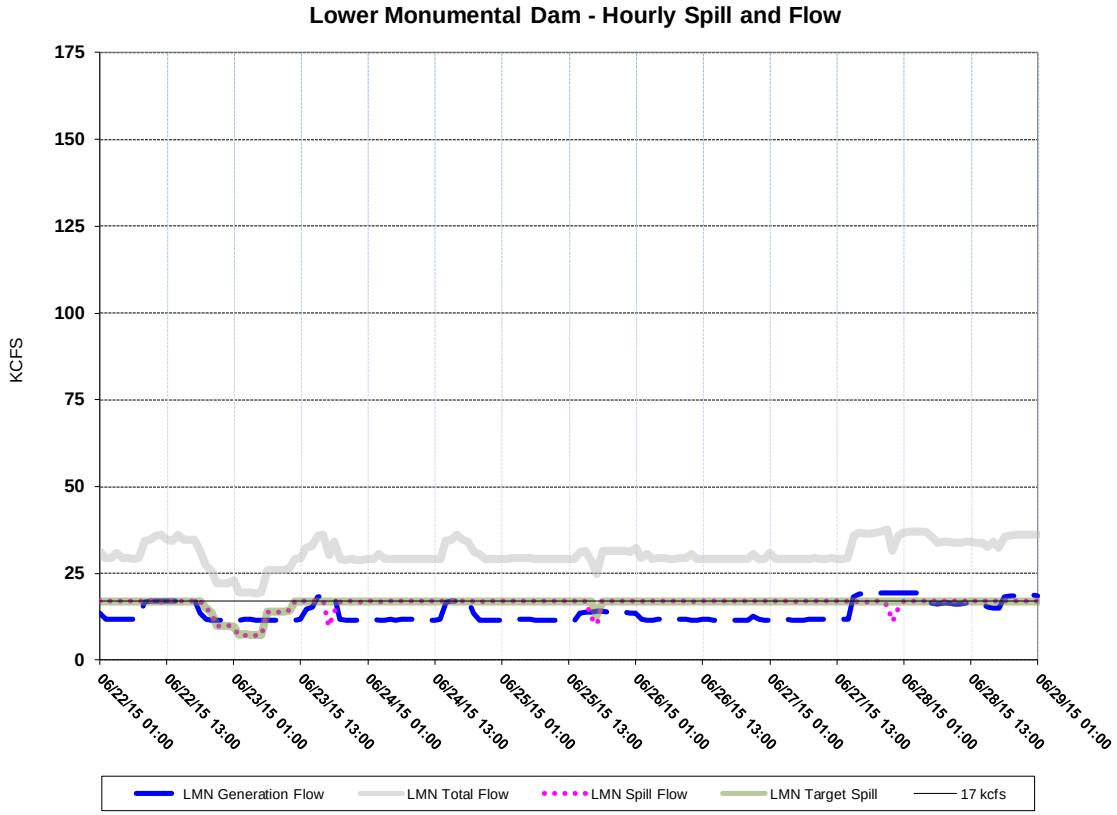
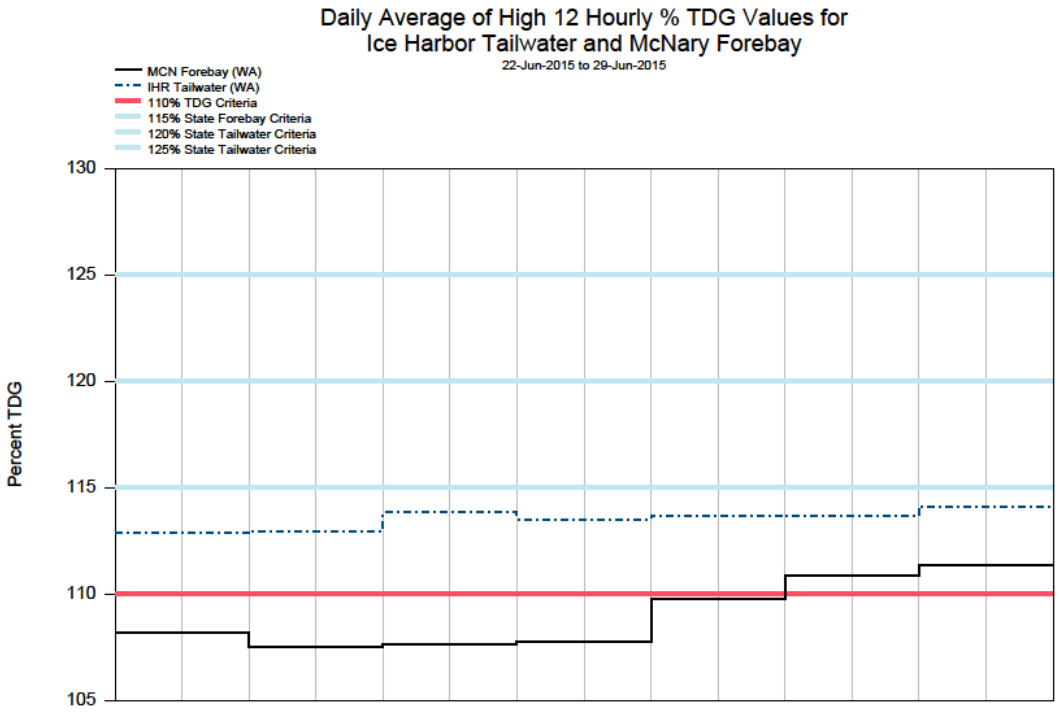

Lower Monumental Dam - Hourly Spill and Flow
KCFS
175
150
125
100
75
50
25
0
06/22/15 01:00
06/22/15 13:00
06/23/15 01:00
06/23/15 13:00
06/24/15 01:00
06/24/15 13:00
06/25/15 01:00
06/25/15 13:00
06/26/15 01:00
06/26/15 13:00
06/27/15 01:00
06/27/15 13:00
06/28/15 01:00
06/28/15 13:00
06/29/15 01:00
LMN Generation Flow
LMN Total Flow
LMN Spill Flow
LMN Target Spill
17 kcfs

Figure 28


Daily Average of High 12 Hourly % TDG Values for
Ice Harbor Tailwater and McNary Forebay
22-Jun-2015 to 29-Jun-2015
MCN Forebay (WA)
IHR Tailwater (WA)
110% TDG Criteria
115% State Forebay Criteria
120% State Tailwater Criteria
125% State Tailwater Criteria
Percent TDG
130
125
120
115
110
105

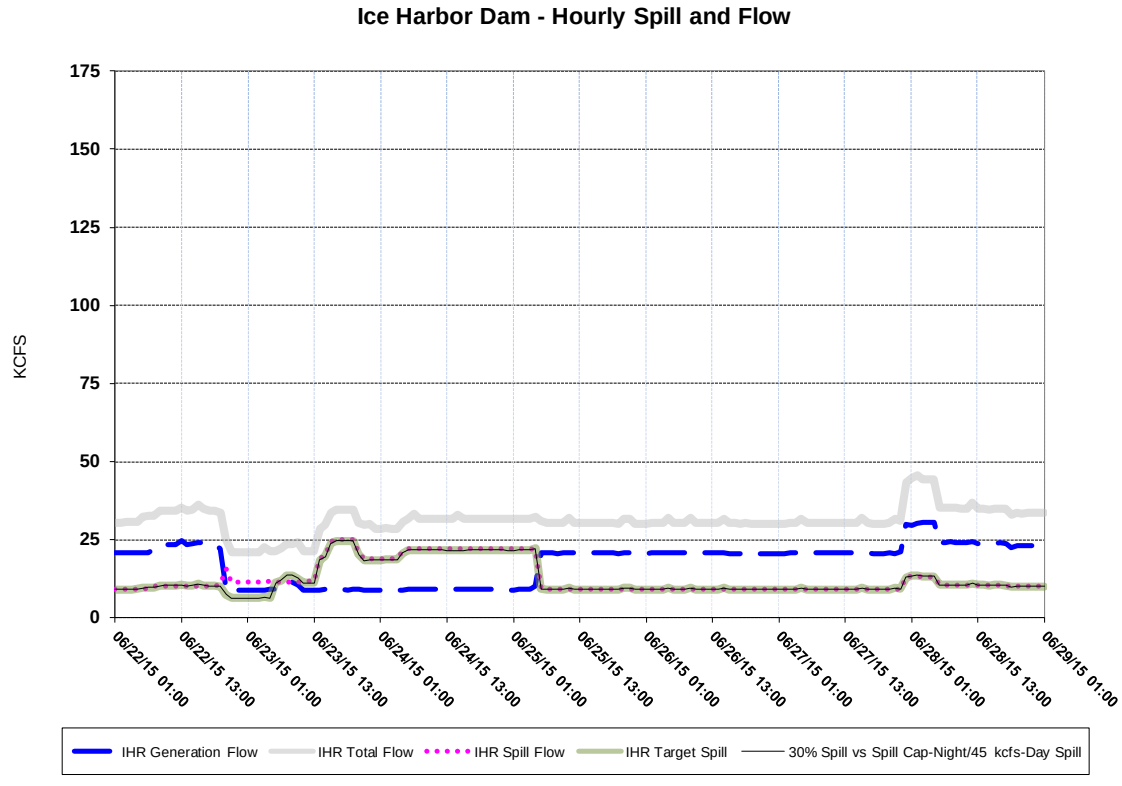
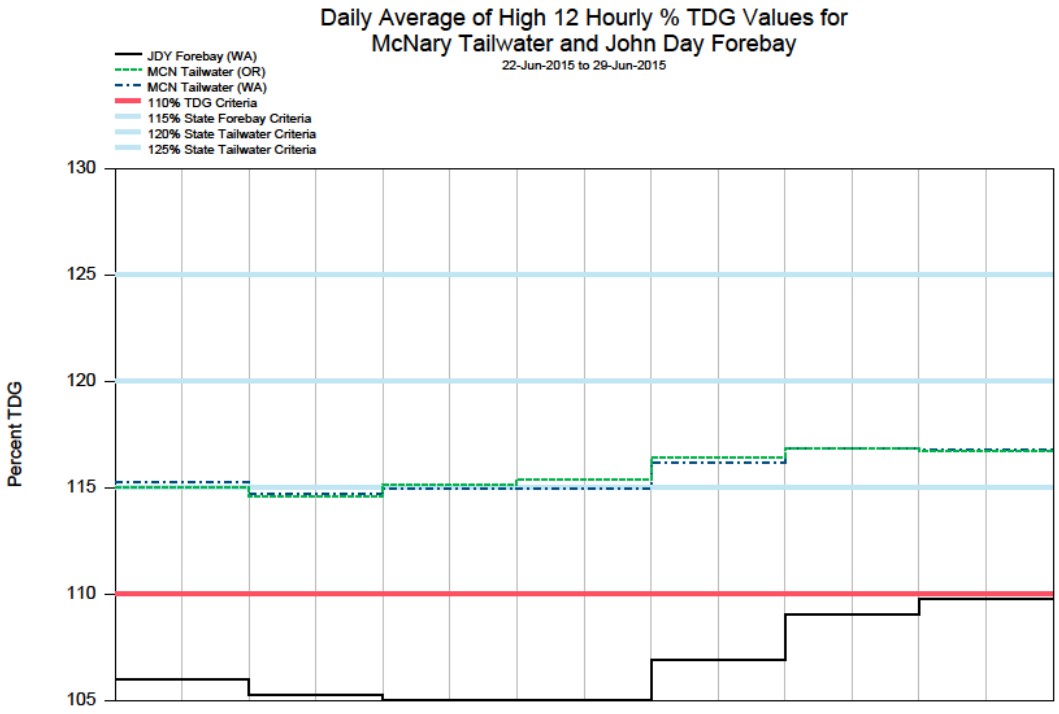

Ice Harbor Dam - Hourly Spill and Flow
KCFS
175
150
125
100
75
50
25
0
06/22/15 01:00
06/22/15 13:00
06/23/15 01:00
06/23/15 13:00
06/24/15 01:00
06/24/15 13:00
06/25/15 01:00
06/25/15 13:00
06/26/15 01:00
06/26/15 13:00
06/27/15 01:00
06/27/15 13:00
06/28/15 01:00
06/28/15 13:00
06/29/15 01:00
IHR Generation Flow
IHR Total Flow
IHR Spill Flow
IHR Target Spill
30% Spill vs Spill Cap-Night/45 kcfs-Day Spill

Figure 29


Daily Average of High 12 Hourly % TDG Values for
McNary Tailwater and John Day Forebay
22-Jun-2015 to 29-Jun-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
Percent TDG
130
125
120
115
110
105

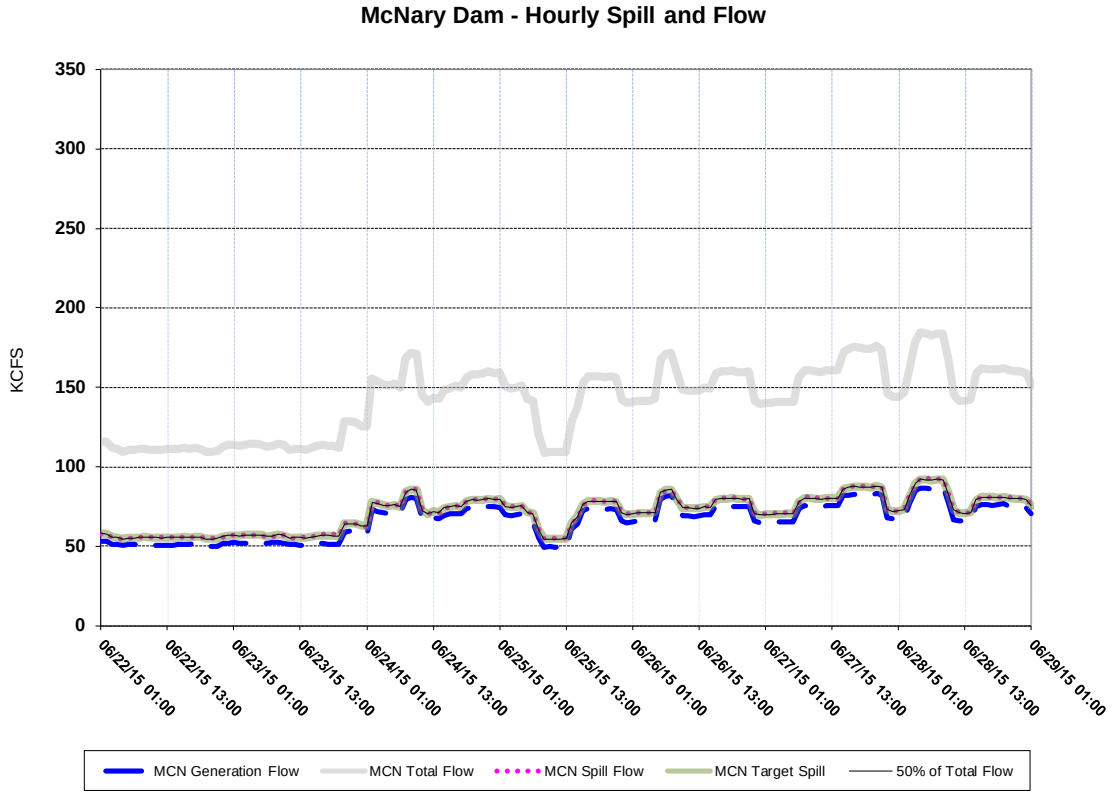
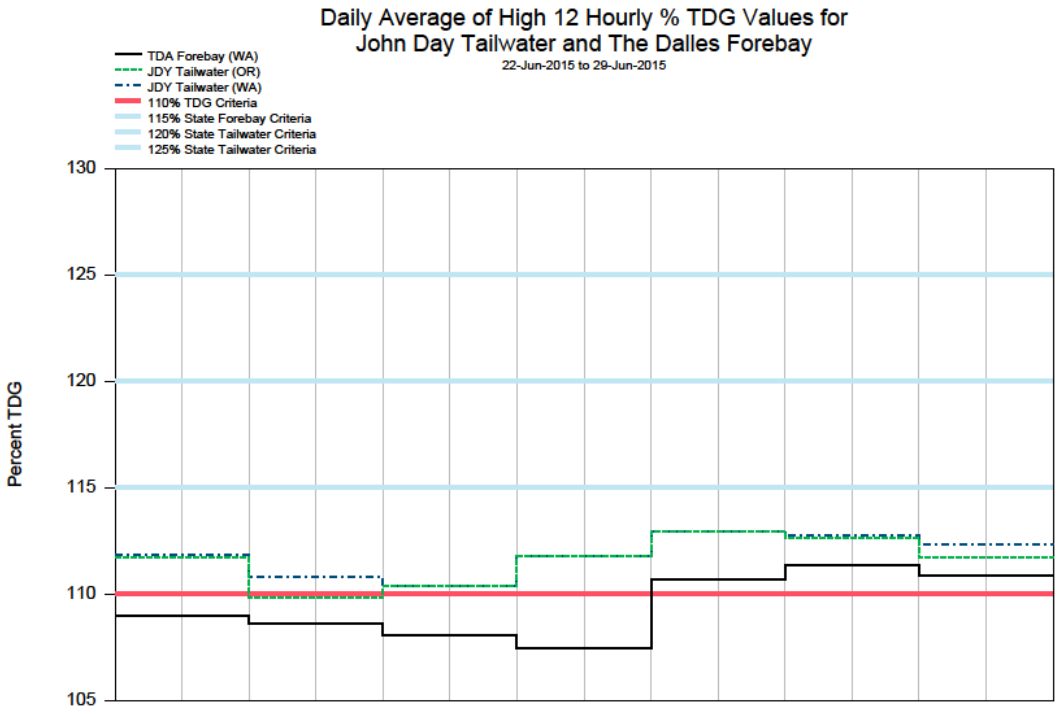

McNary Dam - Hourly Spill and Flow
KCFS
350
300
250
200
150
100
50
0
06/22/15 01:00
06/22/15 13:00
06/23/15 01:00
06/23/15 13:00
06/24/15 01:00
06/24/15 13:00
06/25/15 01:00
06/25/15 13:00
06/26/15 01:00
06/26/15 13:00
06/27/15 01:00
06/27/15 13:00
06/28/15 01:00
06/28/15 13:00
06/29/15 01:00
MCN Generation Flow
MCN Total Flow
MCN Spill Flow
MCN Target Spill
50% of Total Flow

Figure 30


Daily Average of High 12 Hourly % TDG Values for
John Day Tailwater and The Dalles Forebay
22-Jun-2015 to 29-Jun-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
Percent TDG
130
125
120
115
110
105

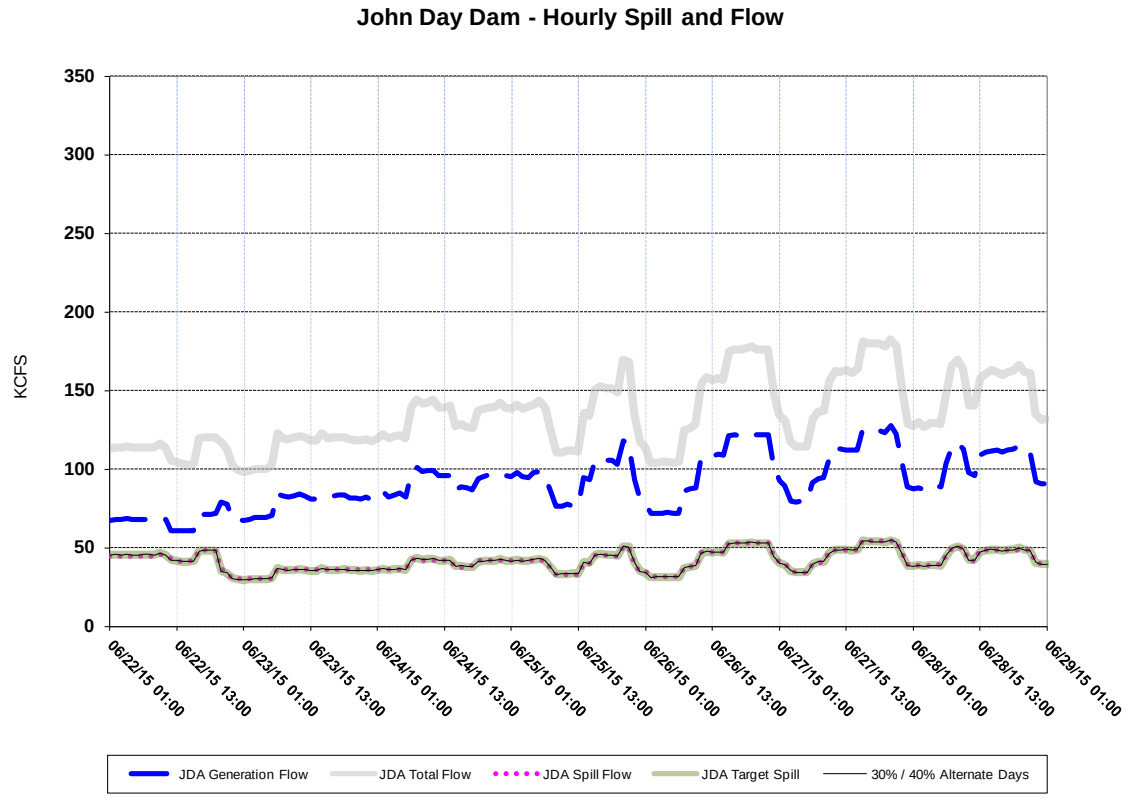
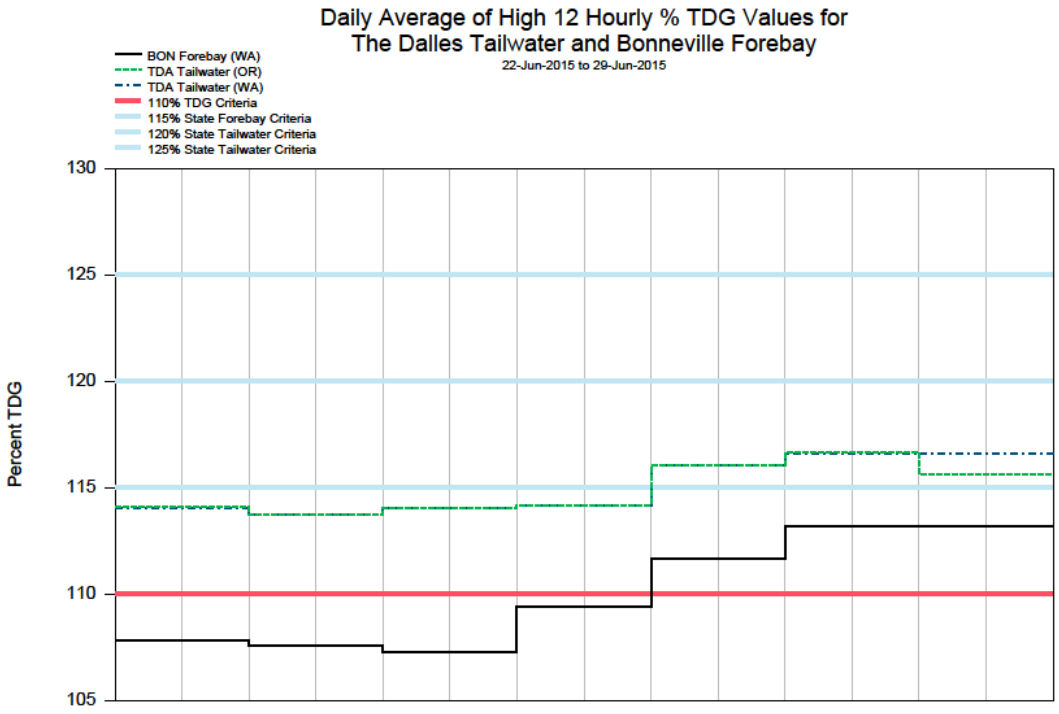

John Day Dam - Hourly Spill and Flow
KCFS
350
300
250
200
150
100
50
0
06/22/15 01:00
06/22/15 13:00
06/23/15 01:00
06/23/15 13:00
06/24/15 01:00
06/24/15 13:00
06/25/15 01:00
06/25/15 13:00
06/26/15 01:00
06/26/15 13:00
06/27/15 01:00
06/27/15 13:00
06/28/15 01:00
06/28/15 13:00
06/29/15 01:00
JDA Generation Flow
JDA Total Flow
JDA Spill Flow
JDA Target Spill
30% / 40% Alternate Days

Figure 31


Daily Average of High 12 Hourly % TDG Values for
The Dalles Tailwater and Bonneville Forebay
22-Jun-2015 to 29-Jun-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
Percent TDG
130
125
120
115
110
105

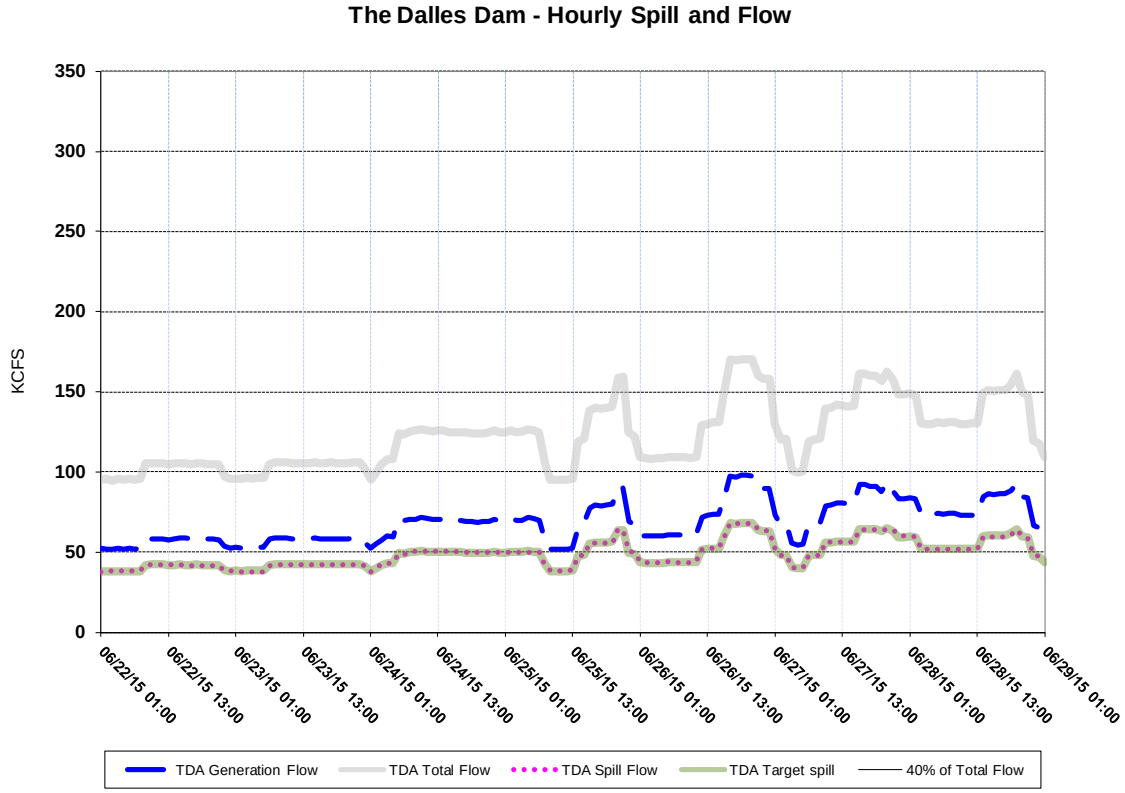
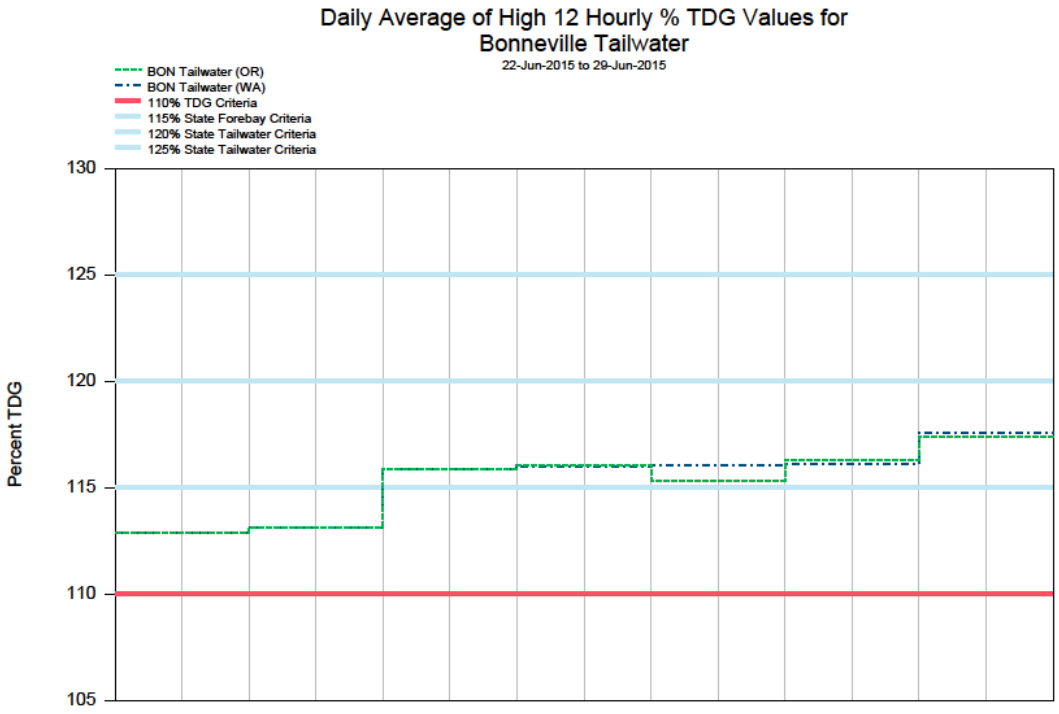

The Dalles Dam - Hourly Spill and Flow
KCFS
350
300
250
200
150
100
50
0
06/22/15 01:00
06/22/15 13:00
06/23/15 01:00
06/23/15 13:00
06/24/15 01:00
06/24/15 13:00
06/25/15 01:00
06/25/15 13:00
06/26/15 01:00
06/26/15 13:00
06/27/15 01:00
06/27/15 13:00
06/28/15 01:00
06/28/15 13:00
06/29/15 01:00
TDA Generation Flow
TDA Total Flow
TDA Spill Flow
TDA Target spill
40% of Total Flow

Figure 32


Daily Average of High 12 Hourly % TDG Values for
Bonneville Tailwater
22-Jun-2015 to 29-Jun-2015
BON Tailwater (OR)
BON Tailwater (WA)
110% TDG Criteria
115% State Forebay Criteria
120% State Tailwater Criteria
125% State Tailwater Criteria
Percent TDG
130
125
120
115
110
105

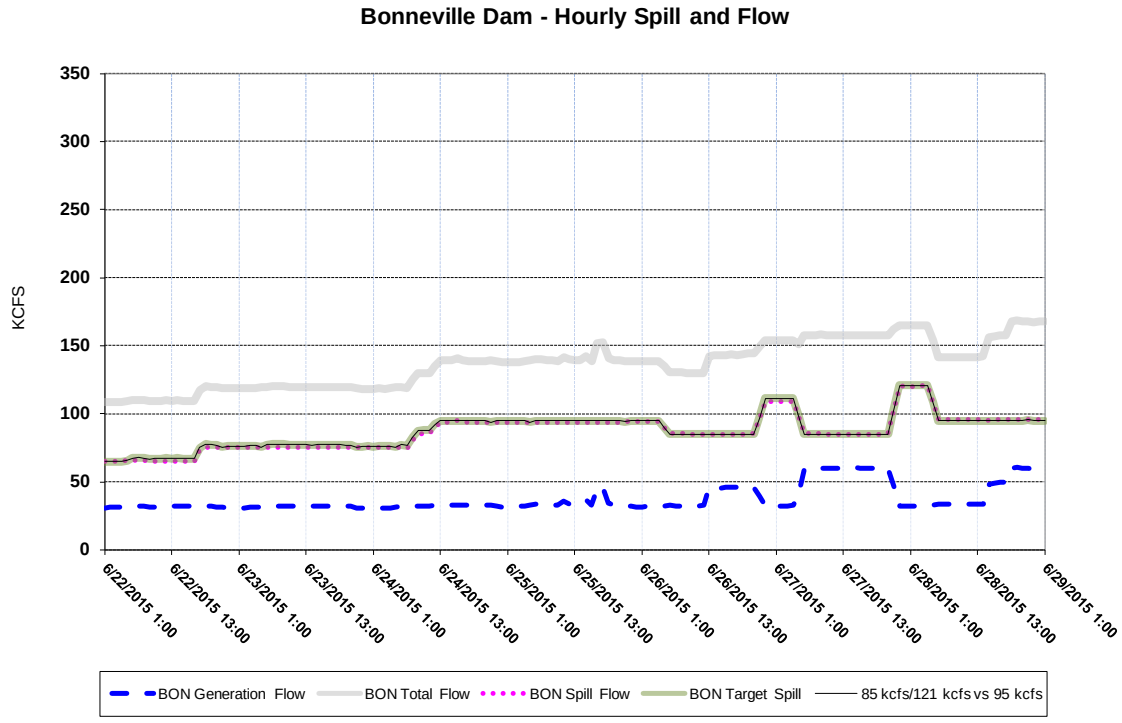

Bonneville Dam - Hourly Spill and Flow
KCFS
350
300
250
200
150
100
50
0
6/22/2015 1:00
6/22/2015 13:00
6/23/2015 1:00
6/23/2015 13:00
6/24/2015 1:00
6/24/2015 13:00
6/25/2015 1:00
6/25/2015 13:00
6/26/2015 1:00
6/26/2015 13:00
6/27/2015 1:00
6/27/2015 13:00
6/28/2015 1:00
6/28/2015 13:00
6/29/2015 1:00
BON Generation Flow
BON Total Flow
BON Spill Flow
BON Target Spill
85 kcfs/121 kcfs vs 95 kcfs

Table 2
Average Percent TDG Values For June 1 – June 28

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
6/1/2015	104.5	110.7	112.5	112.4	113.7	117.5	**117.5**	116	113.1	114.8	~~114.7~~	113	~~114.3~~	115	112.6	~~116.5~~	116.9	113.9	117.2	~~117.1~~
6/2/2015	103.8	110.3	111.3	111.8	112.8	114.3	**116.5**	115.7	111	114.7	~~114.5~~	111.9	114.2	~~114.2~~	109.8	115.3	~~115.3~~	110.7	~~117.4~~	117.5
6/3/2015	102.4	110.1	110.7	111.6	111.4	113.9	114.3	115.6	108.6	116.4	~~116.4~~	109.8	114.9	~~114.9~~	109.6	~~115.6~~	115.6	109.3	~~116.5~~	117.1
6/4/2015	101.7	109.9	110.3	110.8	110.8	113.7	112.6	115.6	107.5	116	~~116~~	108.2	114.3	~~114.3~~	109	115.7	~~115.7~~	110.1	116.6	~~116.6~~
6/5/2015	100.8	110.2	109.8	111.7	112.3	113.4	114	115.5	110.2	115.9	~~115.9~~	108.3	113.7	~~113.7~~	111.3	~~117.2~~	117.2	112.8	~~116.7~~	116.7
6/6/2015	101.3	110.8	112.2	112.5	112.8	114	**115.6**	113.3	112.4	115.9	~~115.9~~	109	~~113.4~~	113.6	112.6	117.7	~~117.7~~	114.4	116.7	~~116.7~~
6/7/2015	102.3	110.5	112.4	112	112.6	114.1	**117.4**	114.7	113.5	116.3	~~116.3~~	108.6	~~114~~	114	112.5	~~117.2~~	117.6	114.3	117.1	~~117.1~~
6/8/2015	103.9	110.9	111.7	112.1	113.7	115.7	**118.7**	114.2	113.5	~~115.6~~	116.1	110.4	114.2	~~114.2~~	111.3	~~116.8~~	117.1	114.3	116.8	~~116.8~~
6/9/2015	103.9	111	110.8	112.1	114.1	116.1	**118.7**	114.5	114.3	~~116.4~~	116.4	112.5	115.2	~~115.2~~	110.5	~~116.4~~	116.6	113.8	117.2	~~117.2~~
6/10/2015	104	111.6	110.7	112	114.1	115	**118.7**	113.9	114.4	~~114.7~~	115.1	112.5	~~114~~	115	111	~~115.9~~	116.3	111.8	~~116.4~~	117.2
6/11/2015	103.8	111.8	111	112.1	113.3	114.3	**117.8**	113.5	113.3	115.2	~~115.1~~	110.4	114.5	~~114.5~~	108.5	~~114.2~~	115.1	108.4	116.7	~~116.7~~
6/12/2015	103.6	112.3	111.1	111.7	112.2	114.1	**117**	113.5	111.7	~~114.4~~	114.7	109.7	114	~~114~~	107.2	~~113.6~~	113.8	105.7	116.9	~~116.9~~
6/13/2015	103.1	112.4	110.2	111.3	111.1	114.7	**115.8**	112.6	109.3	~~114.1~~	114.1	107.9	~~112.2~~	113.6	107.7	~~113.7~~	113.7	106.6	117.1	~~117.1~~
6/14/2015	103	112.9	109.8	110.9	110.3	115.4	114	111.8	108.5	~~113.3~~	113.7	108.4	112.5	~~112.4~~	110.9	116.2	~~116.2~~	109	117.1	~~117~~
6/15/2015	102	113.5	110	110.5	110.5	115.6	112.5	111.7	109.1	115.7	~~115.7~~	108.5	~~112.9~~	112.9	111.5	117	~~117~~	111.2	~~117~~	117
6/16/2015	101.2	113.1	109.1	110.8	111.9	115.9	112.9	114	109.5	116.6	~~116.6~~	107.6	112.5	~~112.5~~	111.1	~~115.2~~	116.8	111.3	~~116.8~~	116.8
6/17/2015	100.6	113	109.2	110.5	111.8	115.9	113	113.7	110.1	~~116.2~~	116.5	106.6	111.9	~~111.9~~	107.8	~~114.3~~	114.7	109.3	116.7	~~116.7~~
6/18/2015	101.6	112.8	111.4	110.1	111.6	116.2	113.8	113.2	110.2	115.8	~~115.8~~	106.6	~~111.9~~	111.9	108.3	~~114~~	114.1	107.6	~~114.8~~	116.7
6/19/2015	101.6	112.5	111.1	106.7	111.5	115.5	113.8	112.7	109.8	115.6	~~115.5~~	106.6	111.7	~~111.6~~	108	~~113.4~~	113.7	107.1	~~113.5~~	113.6
6/20/2015	101.9	112.4	109.9	107	110.8	115.7	114	113.5	108.7	115.5	~~115.5~~	105.9	111.8	~~111.7~~	106.8	113.6	~~113.5~~	107.2	~~113.1~~	113.1
6/21/2015	102.1	114.2	110.1	106.7	110.8	115.8	114	112.7	108.7	~~115.4~~	115.4	106.2	112.3	~~112.2~~	109	114	~~114~~	107.7	113.1	~~113.1~~
6/22/2015	101.5	113.9	108.7	106.9	110.4	115.2	113.5	112.9	108.2	~~115~~	115.1	105.8	~~111.7~~	111.7	109	114	~~114~~	107.8	113.2	~~113.1~~
6/23/2015	101.2	114.1	108.3	106.4	108.6	**138.6**	112.6	113	107.6	114.7	~~114.6~~	105.2	~~109.8~~	110.6	108.5	113.7	~~113.7~~	107.6	113.4	~~113.3~~
6/24/2015	101.5	114.2	108.6	106.2	108.9	**138.7**	113	113.8	107.6	115.1	~~115~~	104.9	110.4	~~110.3~~	108	114.1	~~114.1~~	107.3	116.1	~~116.1~~
6/25/2015	102.1	114.3	108.6	105.5	108.8	116.2	113.4	113.5	107.9	115.4	~~115.1~~	105.1	111.8	~~111.8~~	107.5	114.2	~~114.2~~	109.5	116.3	~~116.2~~
6/26/2015	103.7	114.2	108.5	106.2	108.3	115.9	113.4	113.7	109.8	116.4	~~116.2~~	107	~~112.9~~	112.9	110.7	116.2	~~116.2~~	111.8	~~115.7~~	116.2
6/27/2015	105	114.2	109.1	106	108.4	116	113.8	113.6	111	116.8	~~116.8~~	109.2	112.6	~~112.6~~	111.3	116.6	~~116.6~~	113.2	116.6	~~116.3~~
6/28/2015	106.3	114	109.2	105.3	109.4	116	114.7	114.1	111.3	116.7	~~116.7~~	109.7	~~111.7~~	112.1	110.7	~~115.6~~	116.5	113.1	~~117.5~~	117.8

Note: The Oregon TDG standard modification (OR) and the Washington TDG criteria adjustments (WA) have different methodologies for calculating TDG. When the standards vary or conflict, the Corps applies the more stringent standard. TDG values are presented in Table 1 by displaying the highest value %TDG (more stringent), and the lower value is displayed with a strikethrough.

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