

# 2012 TDG Monitoring

Carson Keeler  
Biologist  
Grant PUD



# Overview

- I. Introduction
- II. Fixed-Site Monitoring Stations (FSM Stations)
- III. Calibration and QA/QC Methods
- IV. Preliminary QA/QC Results
- V. TDG Compliance Value Calculation
- VI. Monitoring Results
- VII. Conclusions

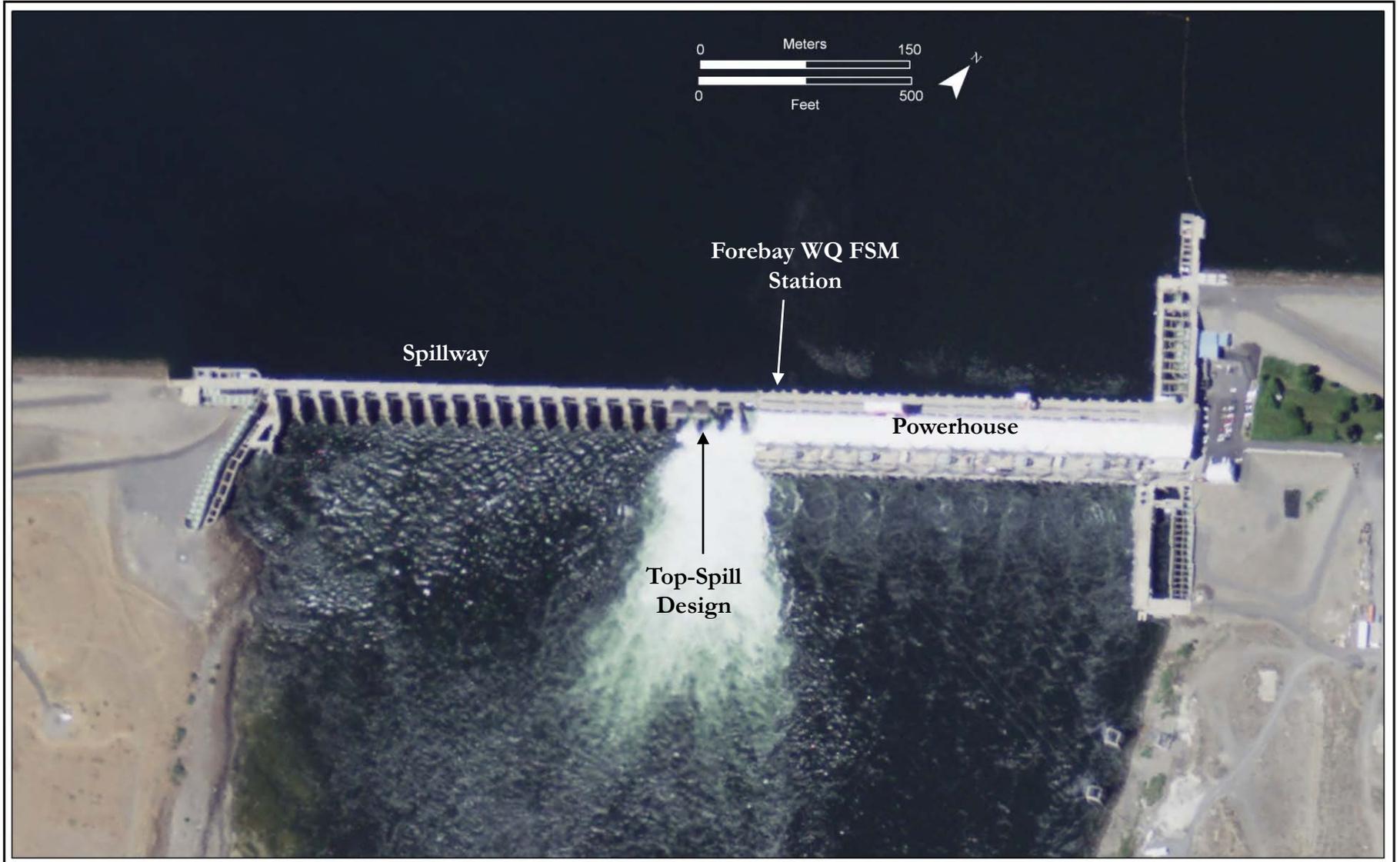
# I. Introduction

- **Monitoring Requirements**
  - April 2008 FERC License Order
  - 2008 NMFS BiOp
  - 2007 401 Water Quality Certification
    - WDOE-approved Quality Assurance Project Plan (QAPP)
  
- **Monitoring parameters, Intervals, and Technology**
  - Monitor Temperature and TDG, hourly/year-around
  - Monitor trend-data for DO, pH, and turbidity every two-three weeks
  - DataSonde 5x/5, 4a, or MiniSonde 5 multi-probes
  - Sutron Data Collection Platforms (DCP) at each site; data is transmitted through virtual COM-Ports and posted to web-site (~1 hr lag).

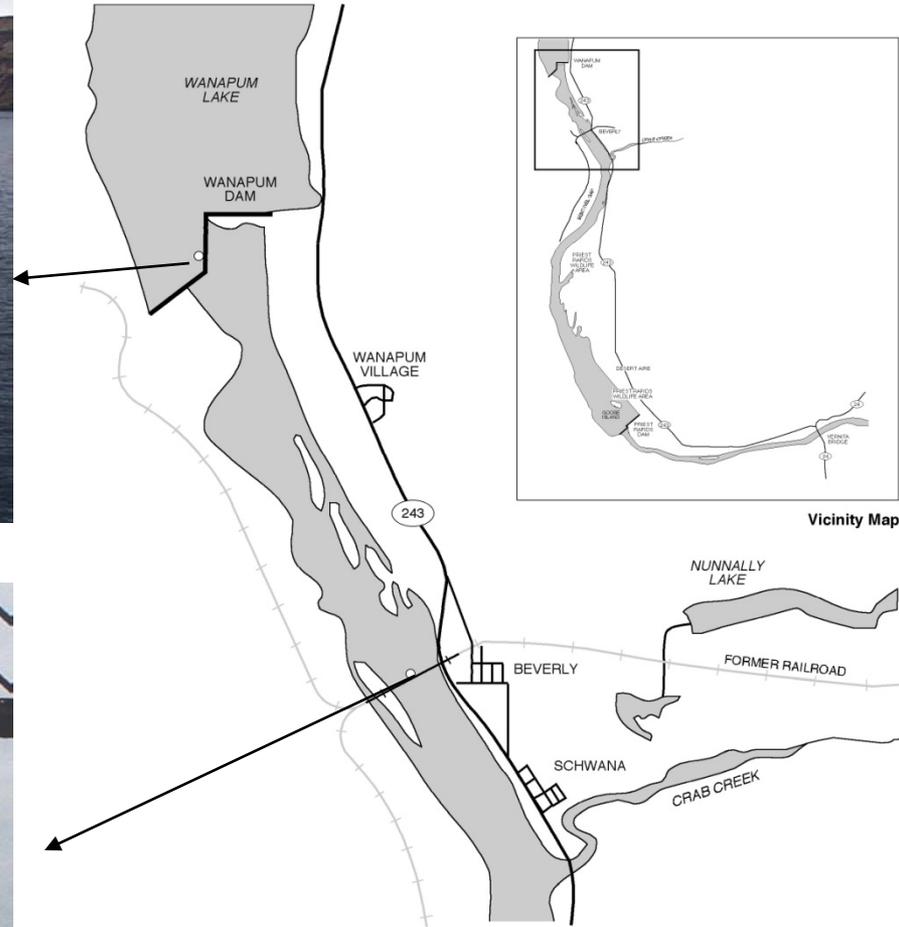
# Wanapum Dam



# Priest Rapids Dam



# II. Fixed-Site Monitoring Stations—Wanapum Dam



Parametrix 553-1542-037/04(036) GIS Services 803 (K)

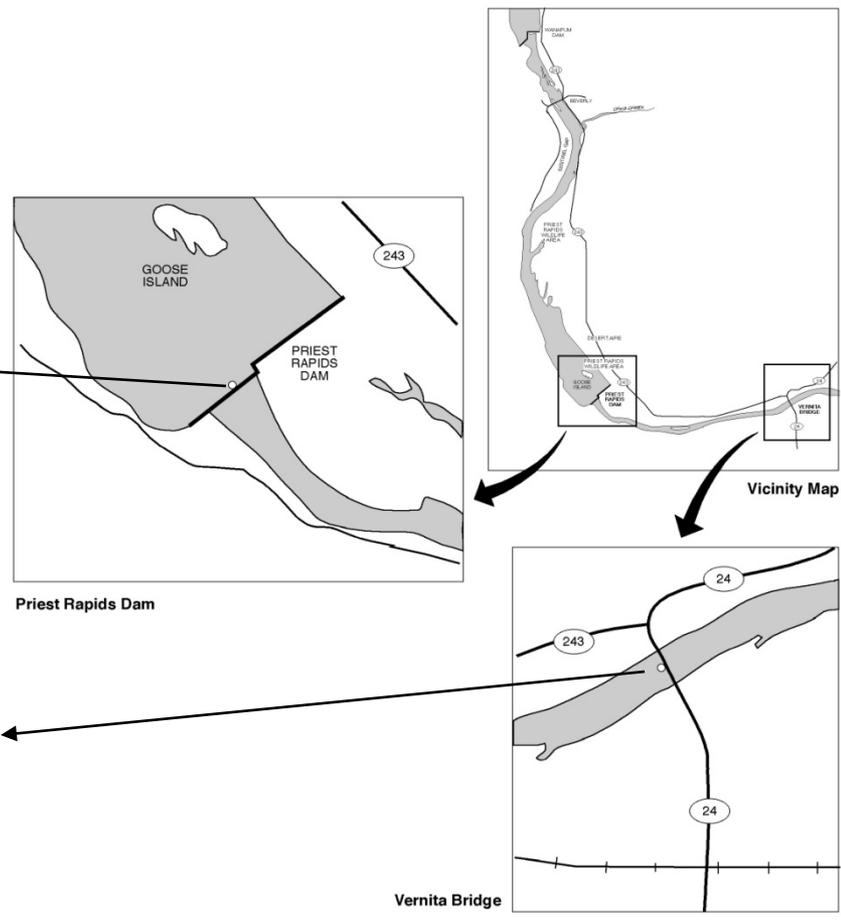


NOT TO SCALE

○ Fixed Station

**Figure 1**  
Location of Water Quality  
Fixed Site Monitoring Stations  
for Wanapum and Beverly

# II. Fixed-Site Monitoring Stations—Priest Rapids Dam



Parametrix 653-1542-037/04(036) GIS Services 803 (K)



○ Fixed Station

NOT TO SCALE

**Figure 2**  
Location of Water Quality Fixed Site  
Monitoring Stations for Priest and Vernita

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Water Quality Monitoring

Fixed Site Water Quality Monitoring

2011 Dissolved Gas Supersaturation Measurements

- [Fixed Site Monitoring - Hourly Data](#)
- [Fixed Site Monitoring - Monthly Summary \(.xls\)](#)
- [72 Hour Water Quality Information](#)

2011 Dissolved Gas Biological Smolt Monitoring

[Priest Rapids Smolt Monitoring](#)

2010 Dissolved Gas Supersaturation Measurements

- [Fixed Site Monitoring - Hourly Data](#)
- [Fixed Site Monitoring - Monthly Summary \(.xls\)](#)
- [72 Hour Water Quality Information](#)

2010 Dissolved Gas Biological Smolt Monitoring

[Priest Rapids Smolt Monitoring](#)

2009 Dissolved Gas Supersaturation Measurements

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- [Fixed Site Monitoring - Monthly Summary \(.xls\)](#)

2009 Dissolved Gas Biological Smolt Monitoring

[Priest Rapids Smolt Monitoring](#)

2008 Dissolved Gas Supersaturation Measurements

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2008 Dissolved Gas Biological Smolt Monitoring

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2007 Dissolved Gas Supersaturation Measurements

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2007 Dissolved Gas Biological Smolt Monitoring

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http://www.gcpud.org/naturalResources/fishWaterWildlife/waterqualityMonitoring.html


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### Water Quality Information

#### Priest Rapids Tailrace

Starting Date: 11/14/2011 11:00 End Date: 11/11/2011 11:00

DateTime	Discharge	Spill	Spill%	Sat%	Temp	TDG	BARO
11/14/2011 11:00	57	1	2	97.9	11.58	729.0	744.6
11/14/2011 10:00	57	0	2	97.9	11.55	729.0	744.3
11/14/2011 09:00	59	0	1	97.8	11.54	728.0	744.0
11/14/2011 08:00	57	0	1	97.9	11.59	728.0	743.5
11/14/2011 07:00	56	0	1	98.0	11.61	729.0	743.3
11/14/2011 06:00	46	0	1	98.2	11.63	730.0	743.2
11/14/2011 05:00	69	0	0	98.5	11.63	732.0	743.0
11/14/2011 04:00	150	0	0	98.6	11.61	733.0	743.1
11/14/2011 03:00	147	0	0	98.8	11.60	734.0	743.2
11/14/2011 02:00	120	0	0	98.8	11.60	735.0	743.6
11/14/2011 01:00	118	0	0	98.8	11.59	735.0	743.8
11/14/2011 00:00	85	0	1	98.8	11.55	735.0	743.7
11/13/2011 23:00	105	0	1	98.8	11.56	735.0	743.6
11/13/2011 22:00	102	0	1	98.9	11.55	736.0	743.6
11/13/2011 21:00	105	0	1	99.0	11.57	737.0	743.7
11/13/2011 20:00	113	0	1	99.1	11.53	737.0	743.5
11/13/2011 19:00	117	0	1	99.3	11.50	739.0	743.4
11/13/2011 18:00	102	0	1	99.3	11.56	738.0	743.3
11/13/2011 17:00	81	1	1	99.3	11.63	738.0	743.2
11/13/2011 16:00	56	1	2	99.3	11.70	738.0	743.3
11/13/2011 15:00	55	0	2	99.2	11.75	738.0	743.5
11/13/2011 14:00	56	0	1	99.0	11.78	737.0	743.4

#### Priest Rapids Forebay

#### Priest Rapids Tailrace

#### Wanapum Forebay

#### Wanapum Tailrace

#### Water Quality Parameter Definitions

- **Discharge:**  
Project Discharge in kcfs
- **Spill:**  
Project Spill in kcfs
- **Spill %:**  
Percent Spill
- **Saturation %:**  
Total Dissolved Gas Percentage
- **Temperature:**  
Water Temperature
- **TDG:**  
Total Dissolved Gas Probe Pressure
- **BARO:**  
Barometer Pressure

http://www.gcpud.org/data/water/WQMInfo.php?SITE\_PID=2&SITE\_TITLE=Priest Rapids Tailrace

# III. Calibration Methods

- Bi-weekly schedule during spill-season; every three weeks during non-fish spill season
- Calibration and maintenance follows established guidelines by USGS, Hydrolab Corporation, and WDOE-approved QAPP.
- Calibration data recorded on Hydrolab PDA using Hydrolab pocket-PC software
- Calibrations conducted in lab; newly calibrated probes deployed next day

# III. Probe QA/QC Methods

- QA/QC re-deployment methods follow established guidelines by USGS, WDOE-approved QAPP
- Calibration data recorded on Hydrolab PDA using Hydrolab pocket-PC software
- QA/QC data recorded on three different probes upon deployment of newly calibrated probe
  - Existing probe
  - QA/QC probe (also allows for grab-samples of DO, pH, and Turbidity)
  - Newly calibrated probe

# III. Data QA/QC Methods



## Grant PUD employs three QA/QC methods:

1. Outlying or erroneous data highlighted as it is collected by pre-programmed software
2. Data is graphically displayed by Grant PUD staff to determine additional outlying or erroneous data
3. Maintenance and calibration of probes

# IV. QA/QC- Results



2012 spill season (April 1 – August 31) – QAPP goal of less than 5% data loss

- Probe breakdowns
  - TDG membrane issues at WANT

## Overview of total dissolved gas dataset, 2012 fish-spill season.

Location	Available data collection hours	Number of omitted/lost hourly readings	Percent data loss (%)
WANF	3,672	0	0
WANT	3,672	68	1.9
PRDF	3,672	0	0
PRDT	3,672	0	0
Total	14,688	68	0.5

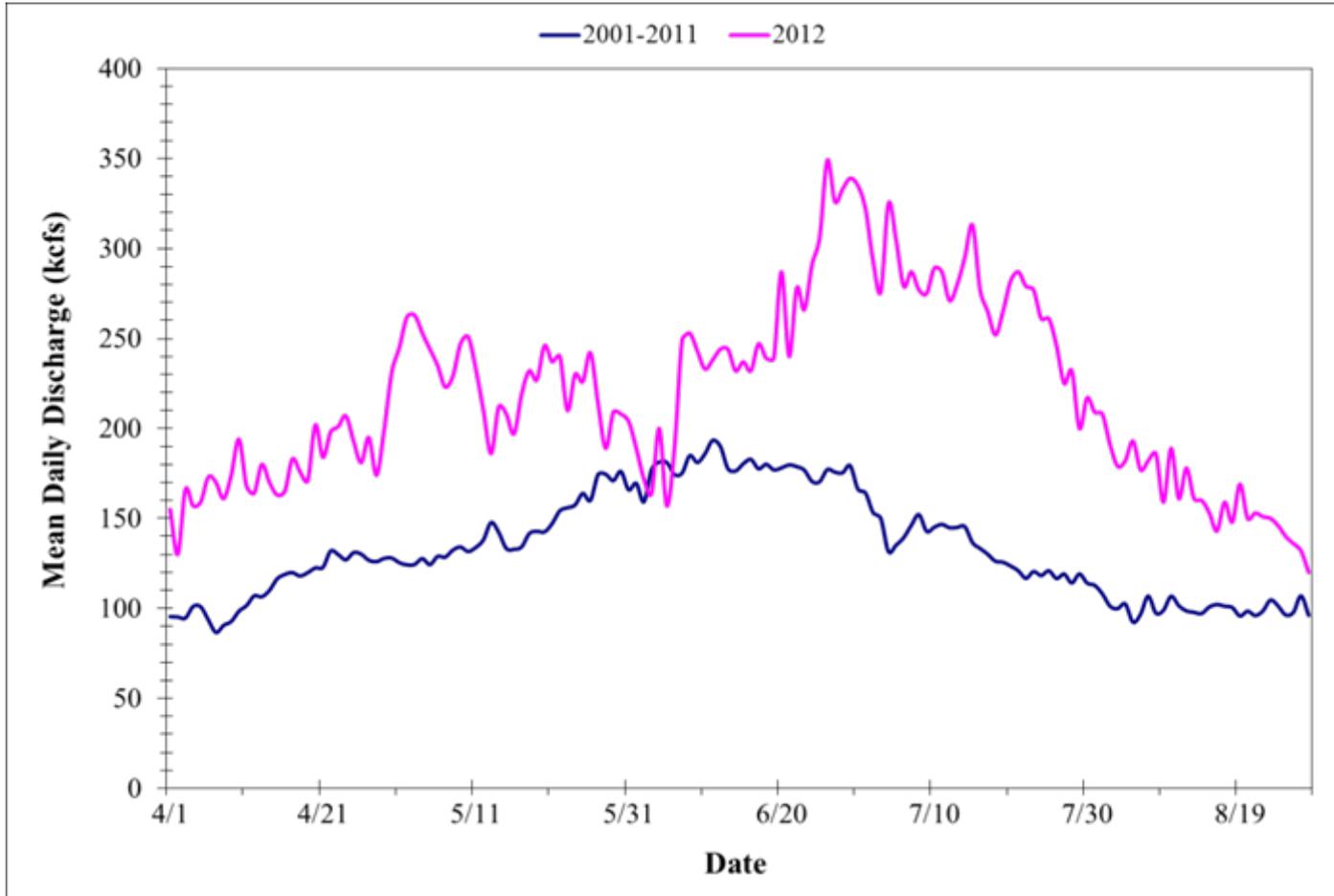
*Note:* WANF = Wanapum forebay, WANT = Wanapum tailrace, PRDF = Priest Rapids forebay, PRDT = Priest Rapids tailrace.

# V. TDG Compliance Value Calculation Method

- Using “rolling” average method creates “double-counting” issue
- Can cause same grouping of hourly TDG values to create TDG exceedance on two separate days
- Fourteen instances of rolling average method creating double-exceedances in 2012
  - Between 4/18 & 8/06
  - 3 @ WAN tailrace site
  - 4 @ PRD forebay site
  - 2 @ PRD tailrace site
  - 5 @ Pasco (next downstream site)
    - McNary forebay

Date	Hour	Hourly TDG Value	Average of 12 previous hours	Highest 12-hr consecutive average for each day
4/24/2012	1500	121.6	117.9	
4/24/2012	1600	121.8	118.4	
4/24/2012	1700	121.3	118.8	
4/24/2012	1800	121.4	119.2	
4/24/2012	1900	121.0	119.6	
4/24/2012	2000	120.8	120.0	
4/24/2012	2100	121.5	120.4	
4/24/2012	2200	121.3	120.7	
4/24/2012	2300	122.2	121.0	
4/24/2012	2359	122.8	121.2	121.2
4/25/2012	0100	120.8	121.4	121.4
4/25/2012	0200	119.9	121.4	
4/25/2012	0300	119.6	121.2	
4/25/2012	0400	119.5	121.0	
4/25/2012	0500	119.4	120.8	
4/25/2012	0600	119.2	120.7	
4/25/2012	0700	119.1	120.5	
4/25/2012	0800	118.8	120.3	
4/25/2012	0900	118.3	120.1	
4/25/2012	1000	118.3	119.8	
4/25/2012	1100	118.4	119.5	
4/25/2012	1200	118.6	119.2	119.2
4/25/2012	1300	118.7	119.0	
4/25/2012	1400	118.8	118.9	
4/25/2012	1500	119.0	118.8	
4/25/2012	1600	119.1	118.8	
4/25/2012	1700	118.8	118.8	
4/25/2012	1800	118.7	118.7	
4/25/2012	1900	118.4	118.7	
4/25/2012	2000	118.3	118.6	
4/25/2012	2100	118.2	118.6	
4/25/2012	2200	118.3	118.6	
4/25/2012	2300	118.3	118.6	
4/25/2012	2359	120.0	118.7	

# VI. TDG Monitoring Results



Comparison of 2012 vs. previous 10-year average (2001-2011) of mean daily discharge values as measured at the U.S. Geological Survey streamflow gage #12472800 located below Priest Rapids Dam, mid-Columbia River, WA.

# VI. TDG Monitoring Results



## Fish-spill program: Wanapum Dam

Date	Spill Program	Quantity <sup>1</sup>	Purpose
<i>April 23, 2012</i>	<i>Spring Spill Initiated</i>		
April 23-June 14	WFB (Open 24 Hours/Day)	Up to 20 kcfs	RPA 1 and terms and conditions of the Biological Opinion and as guided/approved by the PRCC
<i>June 15, 2012</i>	<i>End of Spring Spill/ Summer Spill Initiated</i>		
June 15-Aug 22	WFB (Open 24 Hours/Day)	Up to 20 kcfs	Priest Rapids Project Salmon and Steelhead Settlement Agreement and as guided/approved by the PRCC
<i>August 22, 2012</i>	<i>End of Summer Spill</i>		
<sup>1</sup> Actual quantity spilled is dependent on forebay and tailwater elevations.			

## Fish-spill program: Priest Rapids Dam

Date	Spill Program	Quantity <sup>1</sup>	Purpose
<i>April 24, 2012</i>	<i>Spring Spill Initiated</i>		
April 27-June 14	Prototype top-spill: spill-gate 5 & 6 (full open); spill-gate 4 & 7 open 4 ft.	Up to 24 kcfs	RPA 1 and terms and conditions of the Biological Opinion and as guided/approved by the PRCC
<i>June 15, 2012</i>	<i>End of Spring Spill/ Summer Spill Initiated</i>		
June 15-Aug 23	Prototype top-spill: spill-gate 5 & 6 (full open); spill-gate 4 & 7 open 4 ft.	Up to 24 kcfs	Priest Rapids Project Salmon and Steelhead Settlement Agreement and as guided/approved by the PRCC
<i>August 23, 2012</i>	<i>End of Summer Spill</i>		
<sup>1</sup> Actual quantity spilled is dependent on forebay and tailwater elevations.			

# VI. TDG Monitoring Results



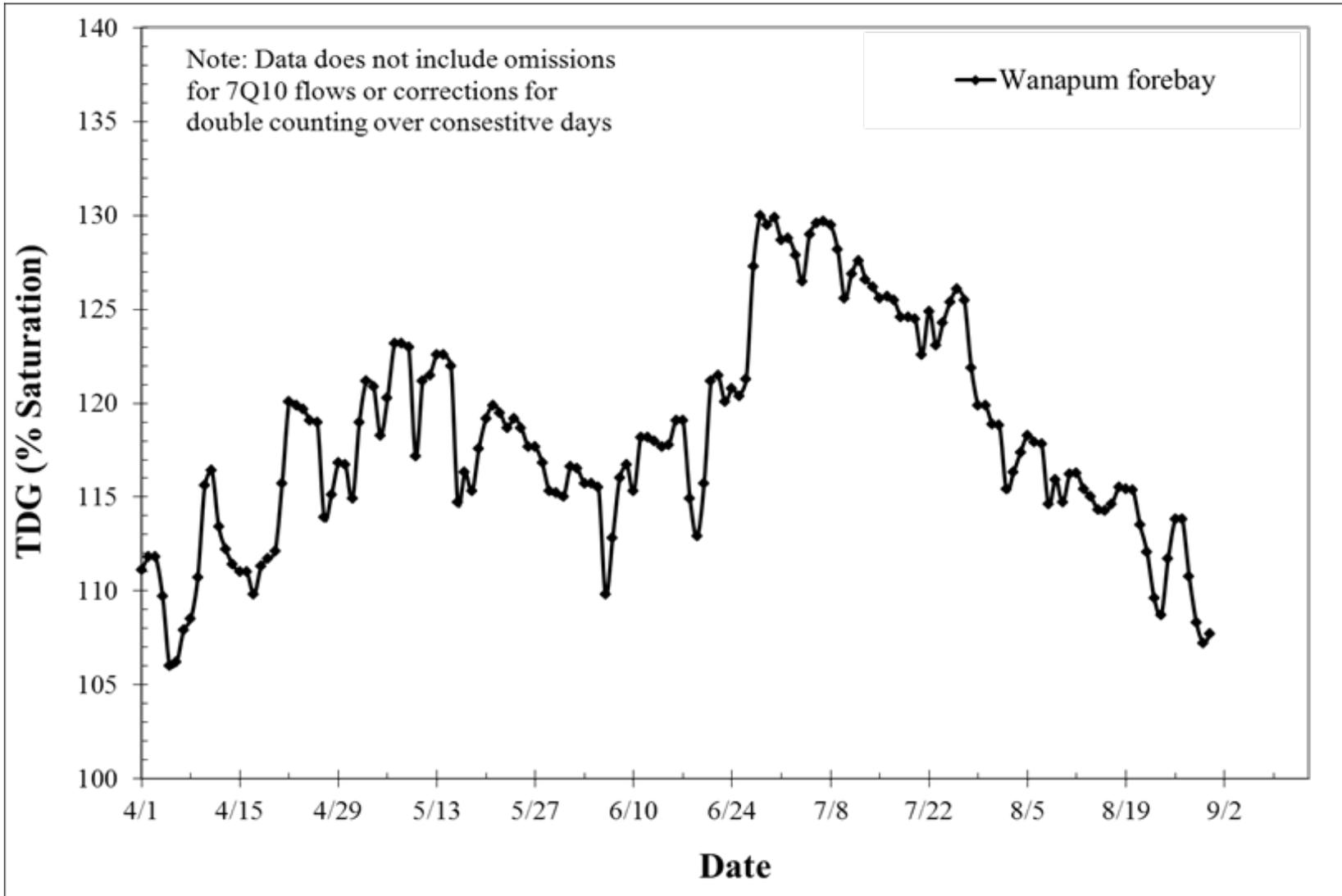
## Number of 2012 fish-spill season total dissolved gas exceedances, Priest Rapids Project, mid-Columbia River, WA.

Location <sup>1</sup>	Number of 115%/120% exceedances					Number of 125% hourly exceedances		
	Spring Spill	Summer Spill	Total	Total # of days <sup>2</sup>	% above standard	Total	Total # of hrs <sup>2</sup>	% above standard
WANT	31	7	38	103	37%	26	2478	1.0%
PRDF	48	15	63	108	58%	8	2478	0.3%
PRDT	13	6	19	88	22%	0	2111	0.0%
PASCO	22	5	27	88	31%	0	2111	0.0%
<b>Total</b>	<b>114</b>	<b>33</b>	<b>147</b>	<b>387</b>	<b>38%</b>	<b>34</b>	<b>9178</b>	<b>0.4%</b>

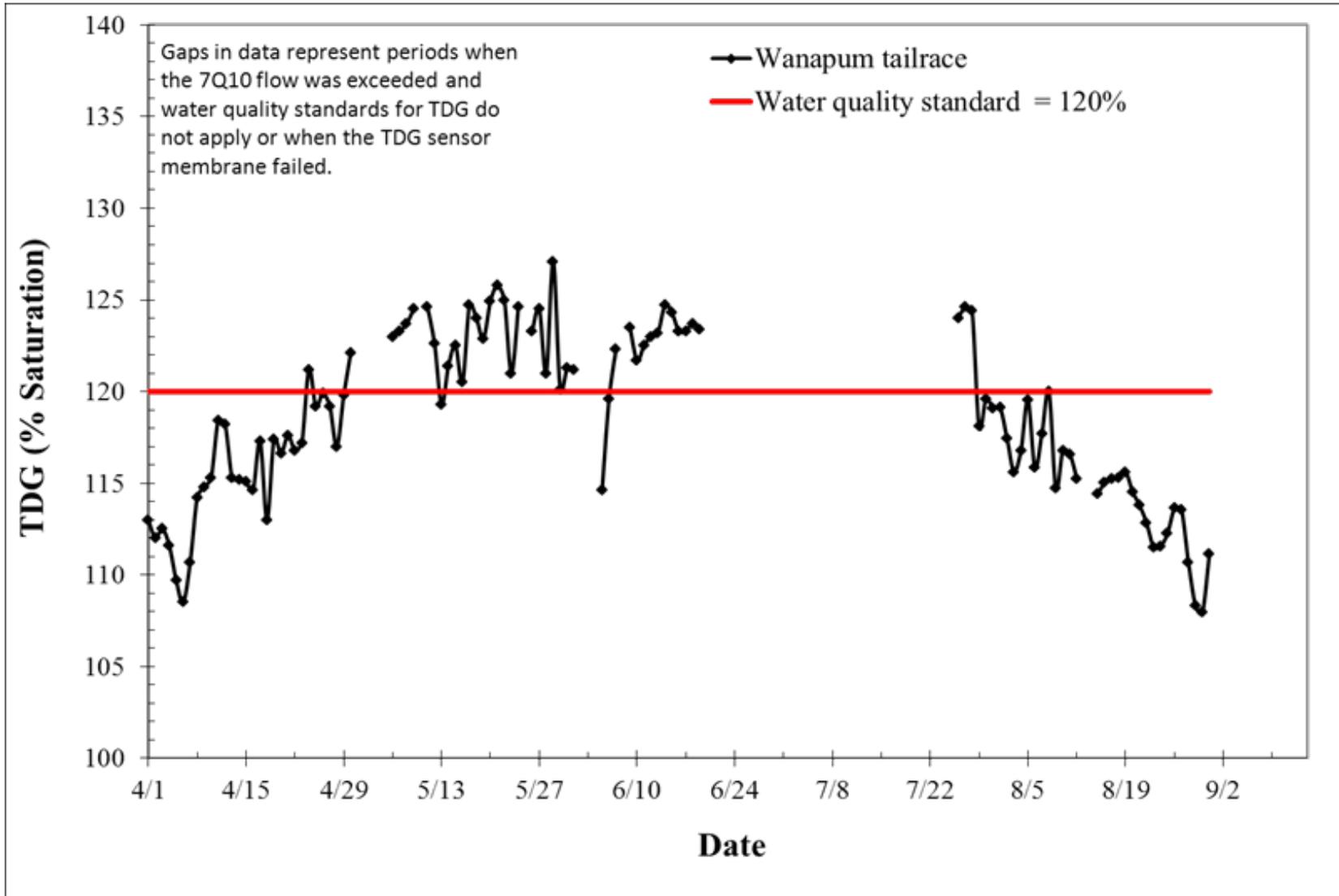
<sup>1</sup>WANT = Wanapum tailrace, PRDF = Priest Rapids forebay, PRDT = Priest Rapids tailrace, PASCO = Pasco Fixed Site Monitor located upstream of McNary Dam (next downstream forebay), operated by the US Army Corps of Engineers.

<sup>2</sup>Based on total number of available days/hrs minus days/hrs omitted due to the 7Q10 flood flow being exceeded or TDG membrane failures.

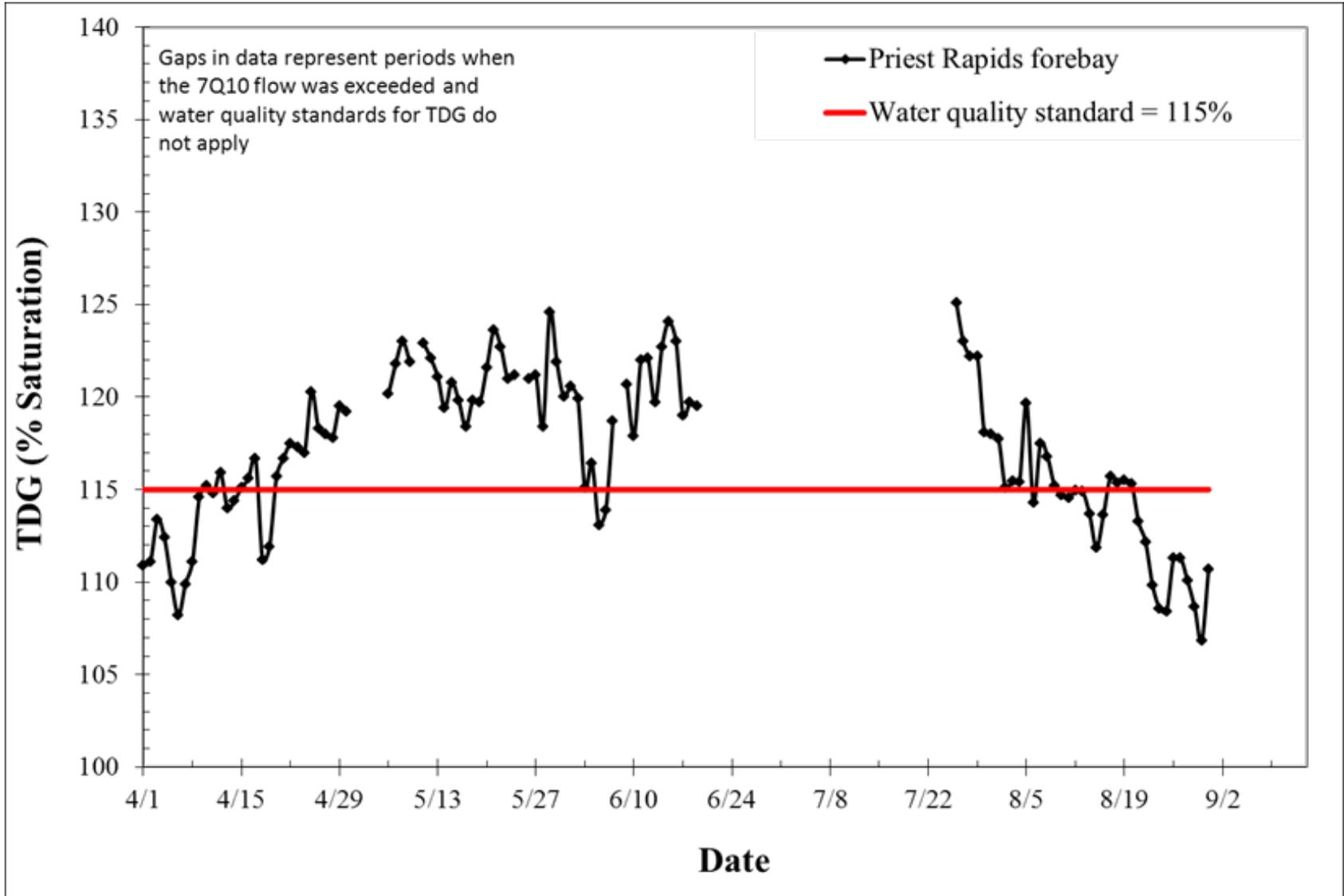
# VI. TDG Monitoring Results



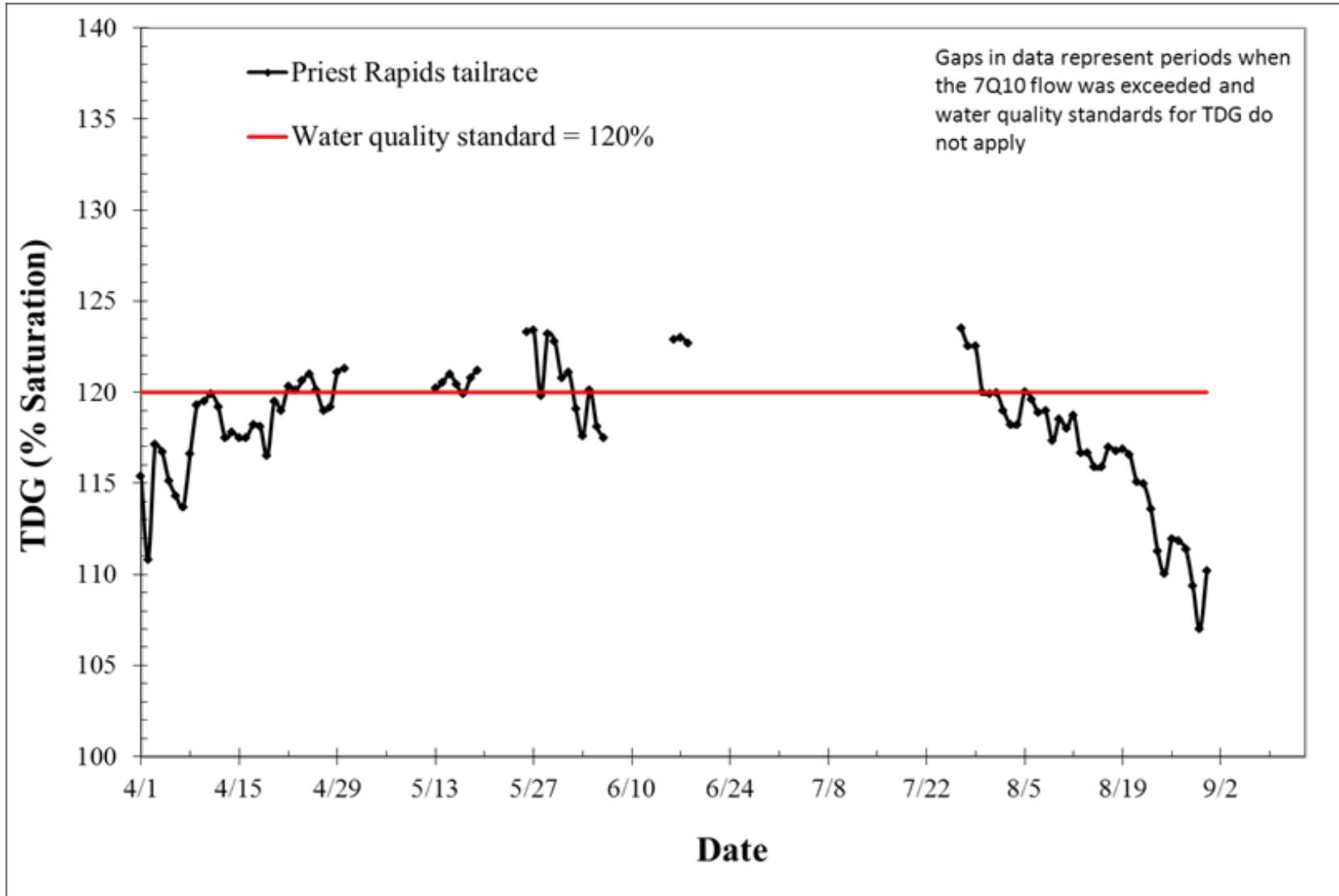
# VI. TDG Monitoring Results



# VI. TDG Monitoring Results



# VI. TDG Monitoring Results





# VII. Conclusions

- Grant PUD will continue hourly TDG & temperature monitoring; bi-weekly trend monitoring of DO, pH, and turbidity – year around
- Continue to follow 401 certification conditions set forth by WDOE
  - Quality Assurance Project Plan (QAPP)
  - Annual Gas Abatement Plan (GAP)
  - Annual reports (TDG & Water Quality)
- Continue to follow established USGS guidelines for calibration, maintenance, and QA/QC procedures, as outlined in Grant PUD's QAPP
- On-going and proposed improvements to both PR and Wanapum Dams expected to decrease TDG issues
  - Wanapum Fish Bypass (operation began in 2008)
  - Wanapum Advanced Turbines will increase powerhouse capacity; (tenth unit being installed; all 10 by 2013, TDG test in Fall of 2013 after installation of 10<sup>th</sup> turbine completed.)
  - PR top-spill fish bypass; started September 2011 (operational by fish-spill 2014, TDG testing after installation completed)
  - PR advanced turbines; studies on-going

# Questions?

