

2009 TDG Monitoring

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Grant County PUD



Overview

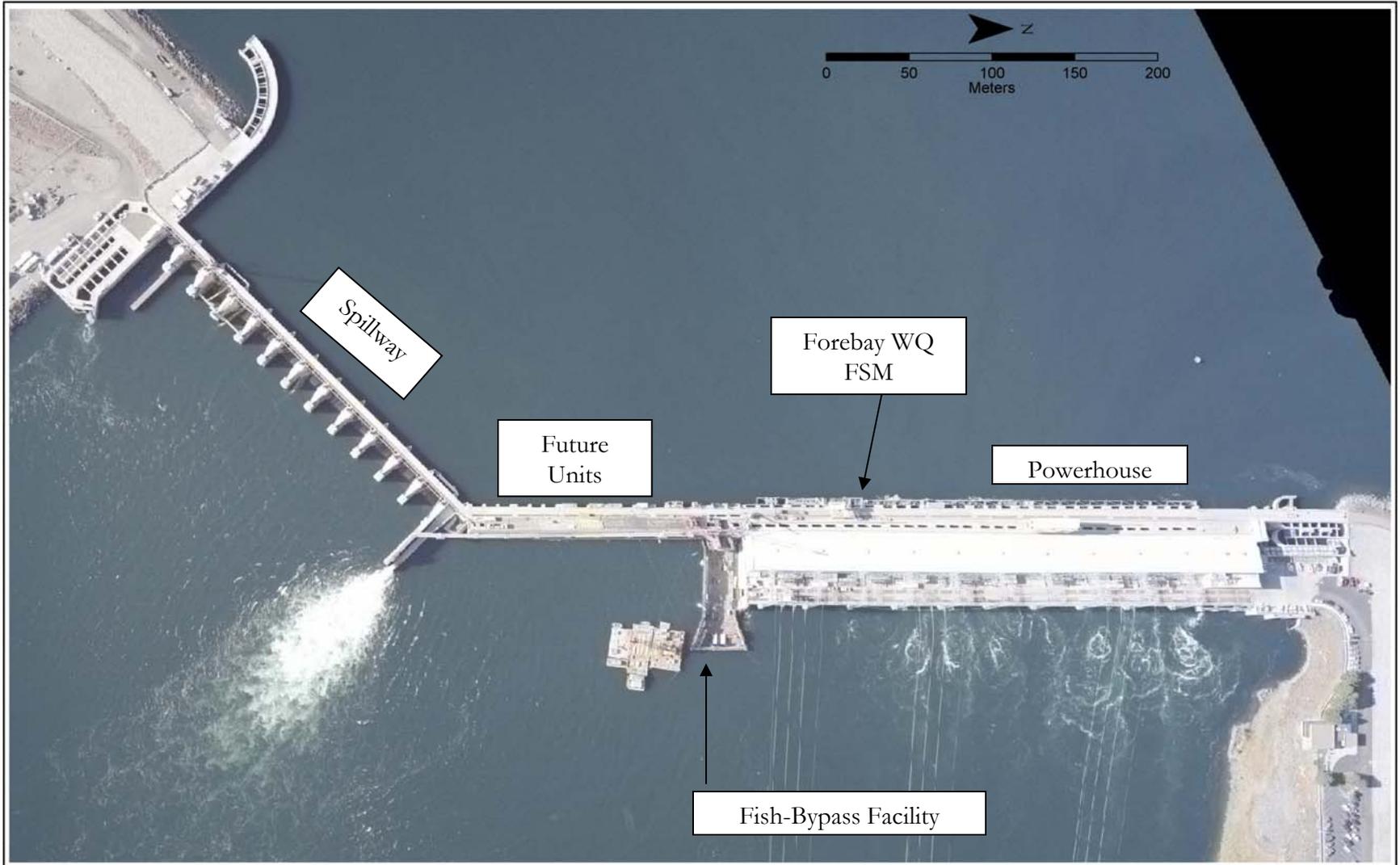
- I. Introduction
- II. Monitoring Sites
- III. Calibration and QA/QC Methods
- IV. Preliminary QA/QC Results
- V. TDG Compliance Value Calculation
- VI. Monitoring Results
- VII. Conclusions

I. Introduction

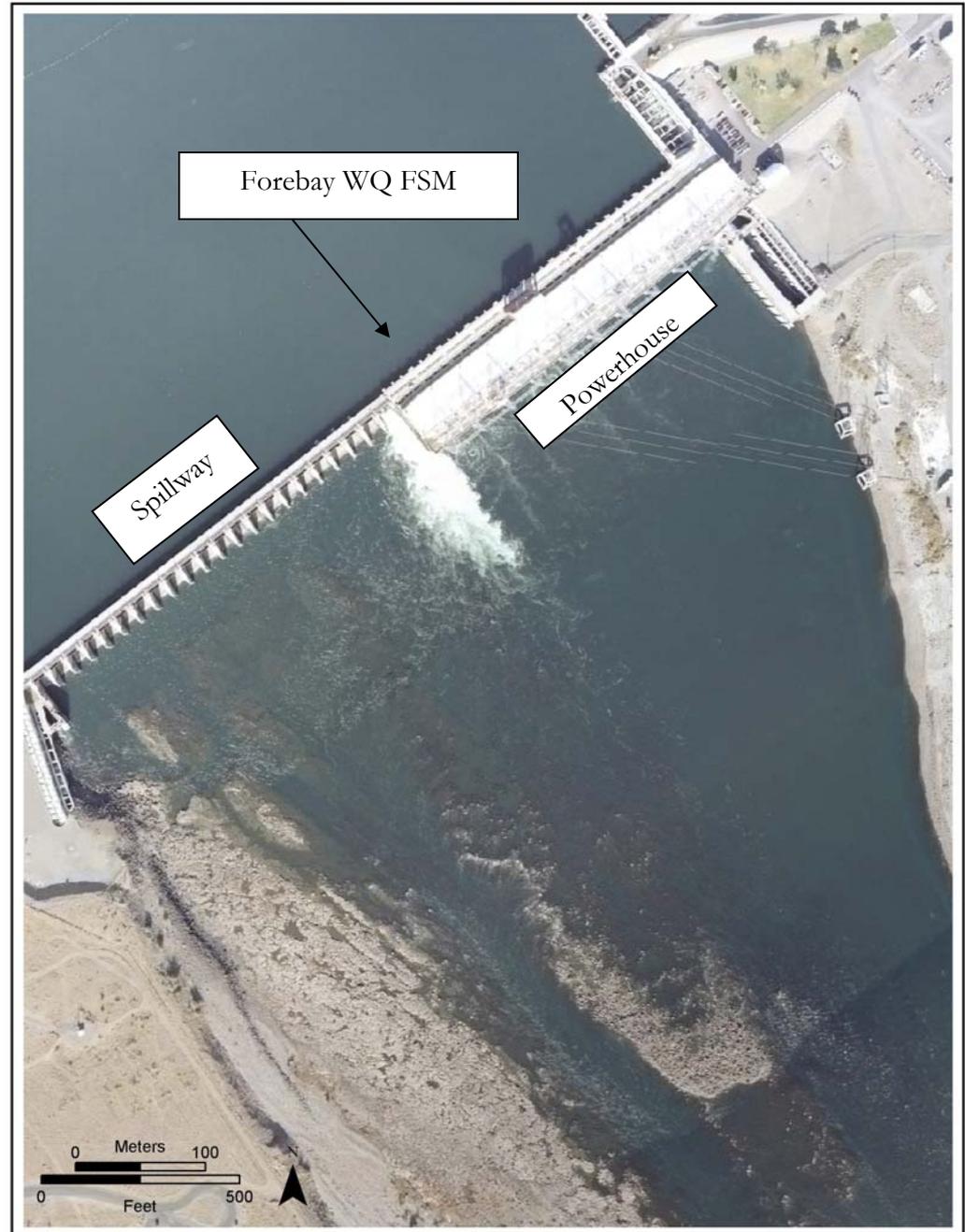
- **Monitoring Requirements**
 - April 2008 FERC License Order
 - 2008 BiOp
 - 2008 401 Water Quality Certification
 - WDOE approved QAPP for 2009

- **Monitoring parameters, Intervals, and Technology**
 - Monitor Temperature and TDG, hourly/year-around
 - Monitor trend-data for DO, pH, and Turbidity every two-three weeks
 - Hydrolab DataSonde 5x, 4a, or MiniSonde probes
 - Sutron Data Collection Platforms (DCP) at each site; data is transmitted to virtual COM-Ports and posted to web-site (~2 hr lag).

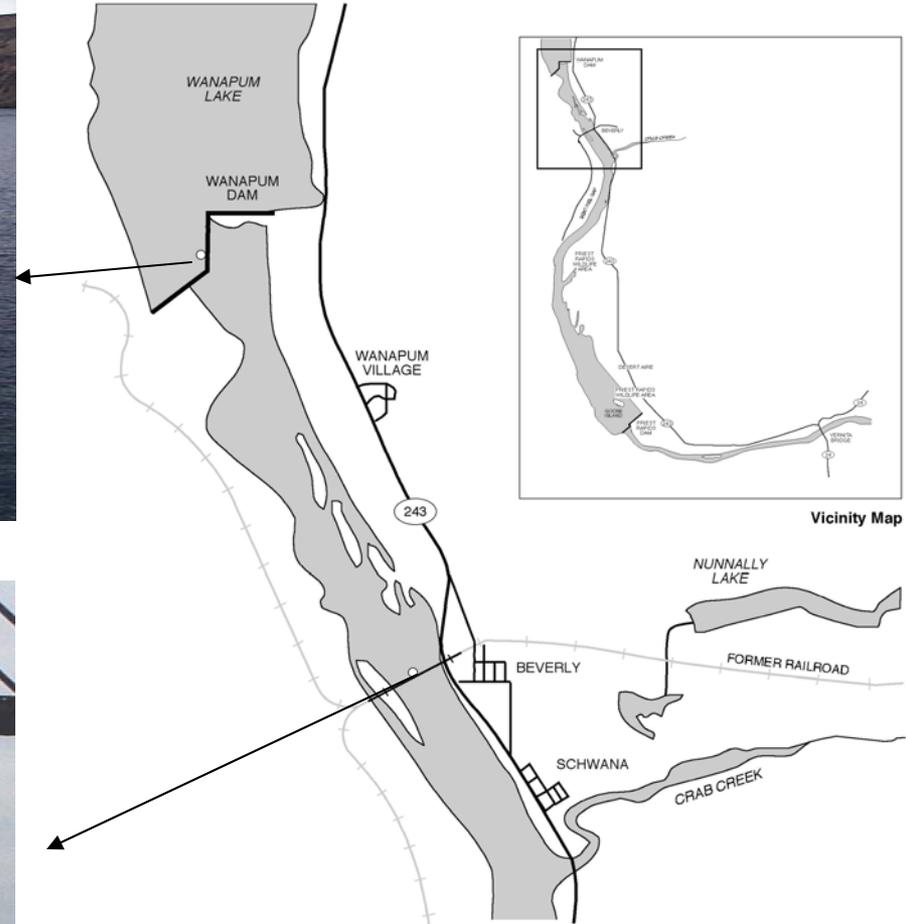
I. Wanapum Dam



I. Priest Rapids Dam



II. Monitoring Sites – Wanapum Dam



Parametrix 553-1542-037/04(036) GIS Services 8/03 (K)

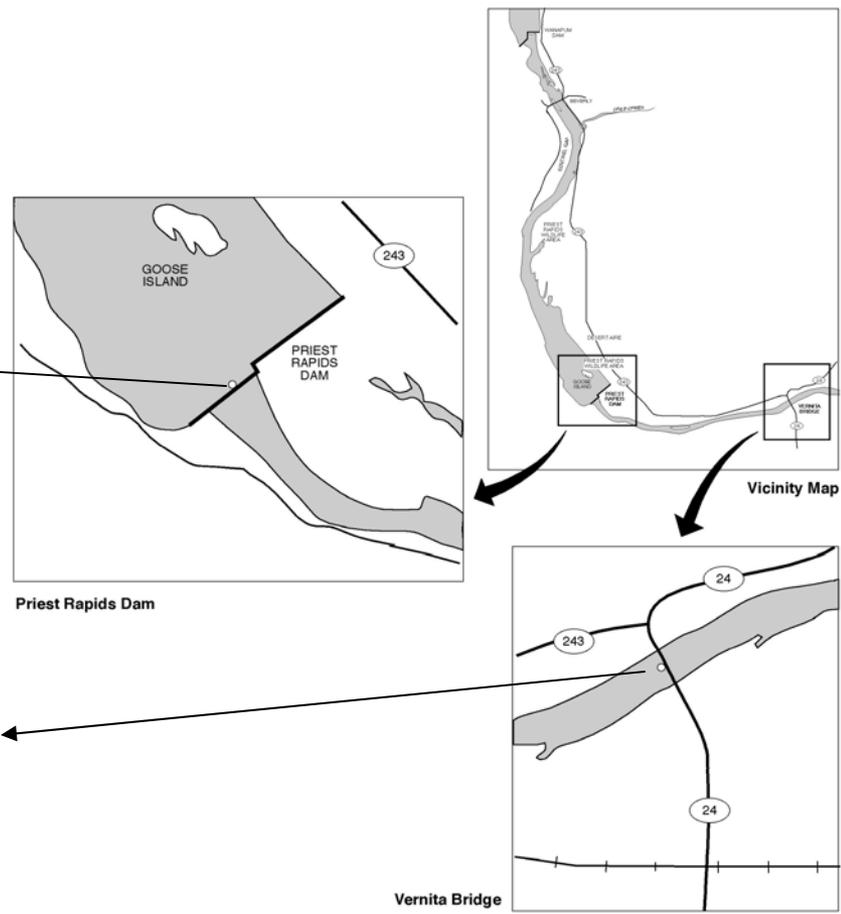


NOT TO SCALE

○ Fixed Station

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

II. Monitoring Sites – Priest Rapids Dam



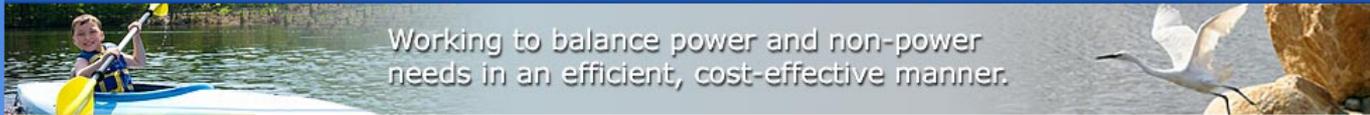
Parametrix 553-1542-037/04(035) GIS Services 6/03 (K)



○ Fixed Station

NOT TO SCALE

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



Working to balance power and non-power needs in an efficient, cost-effective manner.

Energy

- Hydropower
- Wind
- New Projects
- Transmission Services

Cultural and Historical

- Wanapum Relationship
- Heritage Center
- Reservoir Patrol

Land and Water

- Water Quality
- Land Use
- Plants

Fish and Wildlife

- Fish Counts
- Fish in the Project
- Fish Protection
- Wildlife Programs
- Resource Committees

Recreation Information

- Recreation
- Area Recreation Links
- Boat Launch Information
- Shoreline Maps
- Photo Tour
- Lands Weekend Patrol

Stewardship

- Stewardship
- Meeting our Obligations
- Priest Rapids Project
- Environmental Protection

Resource Documents

- Interlocal Agreements
- Integrated Resource Plan

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Fixed Site Water Quality Monitoring

2008 Dissolved Gas Supersaturation Measurements

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

2008 Dissolved Gas Biological Smolt Monitoring

[Priest Rapids Smolt Monitoring](#)

2007 Dissolved Gas Supersaturation Measurements

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

2007 Dissolved Gas Biological Smolt Monitoring

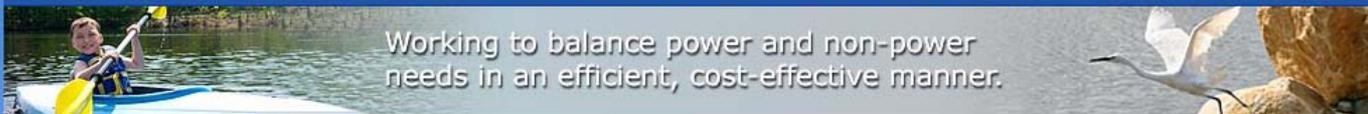
[Priest Rapids Smolt Monitoring.xls](#)

2006 Dissolved Gas Supersaturation Measurements

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

2005 Dissolved Gas Supersaturation Measurements

- [Fixed Site Monitoring - Hourly Data](#)
- [Fixed Site Monitoring - Monthly Summary](#)



Working to balance power and non-power needs in an efficient, cost-effective manner.

Home >> Resources >> Water Monitoring >> Water Quality Disclaimer >> Water Quality Information

Energy

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Wanapum Tailrace

Starting Date:11/20/2008

End Date:11/17/2008 09:00

08:00

DateTime	Discharge	Spill	Spill%	Sat%	Temp	TDG	BARO
11/20/2008 08:00	147	0	0	97.6	10.90	731.0	748.0
11/20/2008 07:00	157	0	0	97.5	10.90	731.0	748.7
11/20/2008 06:00	141	0	0	97.5	10.90	731.0	749.4
11/20/2008 05:00	155	0	0	97.5	10.90	732.0	749.9
11/20/2008 04:00	150	0	0	97.3	10.90	731.0	750.7
11/20/2008 03:00	154	0	0	97.2	10.90	731.0	751.4
11/20/2008 02:00	118	0	0	97.1	10.90	731.0	751.9
11/20/2008 01:00	61	0	0	97.0	10.90	731.0	752.8
11/20/2008 00:00	67	0	0	97.0	10.90	731.0	753.3
11/19/2008 23:00	80	0	0	96.9	10.90	731.0	753.7
11/19/2008 22:00	126	0	0	96.9	11.00	731.0	754.0
11/19/2008 21:00	156	0	0	96.8	11.00	731.0	754.4
11/19/2008 20:00	156	0	0	96.9	11.00	732.0	755.0
11/19/2008 19:00	157	0	0	96.8	11.10	731.0	755.3
11/19/2008 18:00	156	0	0	96.8	11.10	731.0	755.3
11/19/2008 17:00	142	0	0	96.7	11.10	731.0	755.5
11/19/2008 16:00	98	0	0	96.6	11.20	730.0	755.7
11/19/2008 15:00	72	0	0	96.3	11.20	728.0	755.9
11/19/2008 14:00	35	0	0	96.1	11.20	727.0	756.3
11/19/2008 13:00	47	0	0	96.0	11.20	727.0	756.8
11/19/2008 12:00	95	0	0	95.8	11.20	726.0	757.3
11/19/2008 11:00	117	0	0	95.9	11.30	726.0	757.5
11/19/2008 10:00	83	0	0	95.9	11.30	726.0	757.3
11/19/2008 09:00	75	0	0	96.0	11.30	726.0	756.8
11/19/2008 08:00	83	0	0	96.0	11.30	726.0	756.6
11/19/2008 07:00	71	0	0	96.2	11.30	727.0	756.2
11/19/2008 06:00	69	0	0	96.2	11.40	727.0	756.1
11/19/2008 05:00	80	0	0	96.2	11.40	727.0	755.7
11/19/2008 04:00	106	0	0	96.3	11.40	727.0	755.4
11/19/2008 03:00	118	0	0	96.3	11.40	727.0	755.3
11/19/2008 02:00	116	0	0	96.3	11.40	727.0	754.9
11/19/2008 01:00	85	0	0	96.5	11.40	728.0	754.7

Water Quality Data

[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

III. Calibration Methods

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

2009 spill season (April 1 – August 31) – QAPP goal of less than 5% data loss

- Probe breakdowns
 - Internal, TDG membrane, and connection problems

- Software/communication issues
 - Database failure
 - Cable failure at PRDF

Overview of total dissolved gas data set, 2009 fish-spill season.

Location	Available data collection hours	Number of omitted/lost hourly readings	Percent data loss (%)
WANF	3,696	45	1.2
WANT	3,696	105	2.8
PRDF	3,696	76	2.1
PRDT	3,696	45	1.2
Total	1,4784	271	1.8

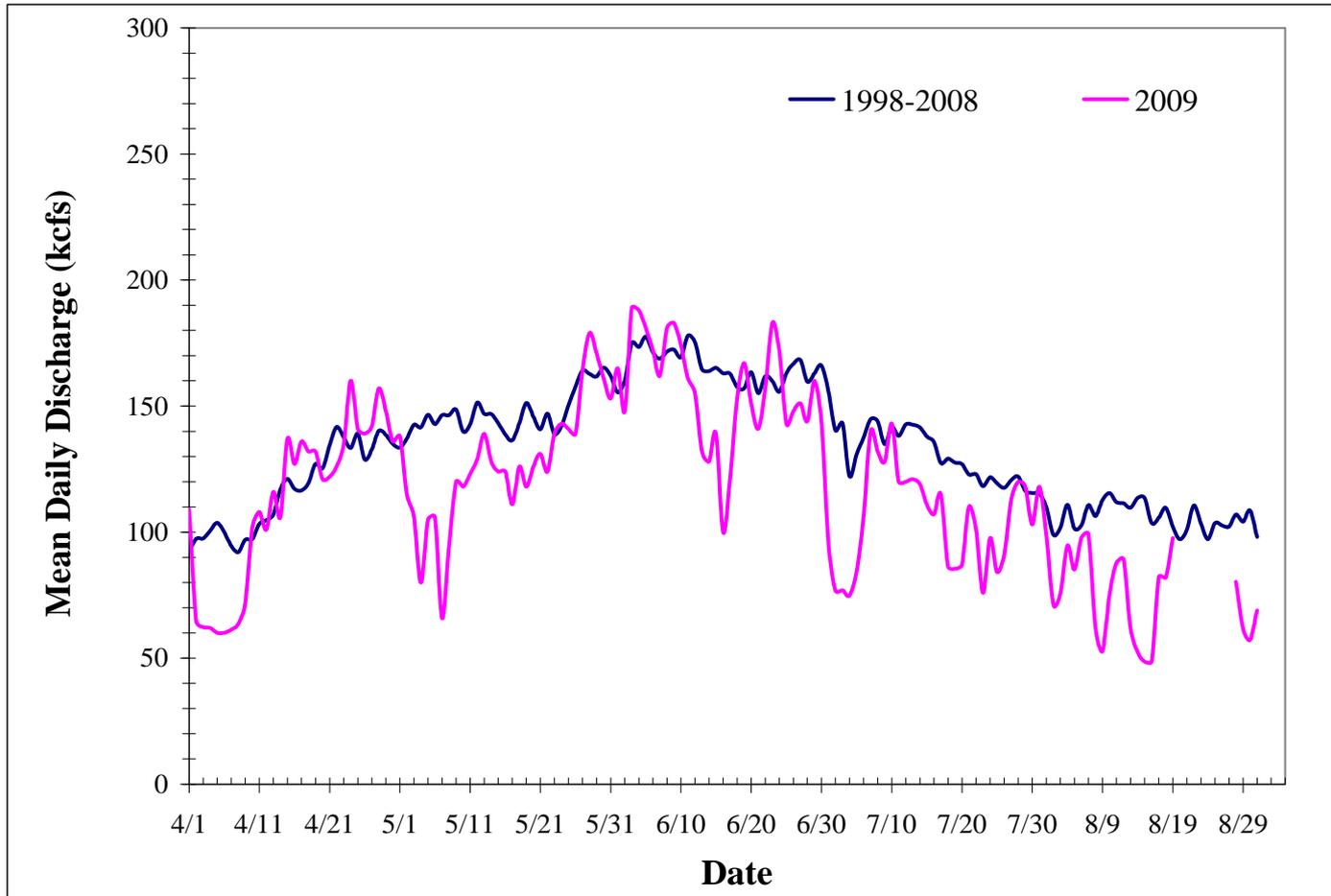
Note: WANF = Wanapum Dam forebay, WANT = Wanapum Dam tailrace, PRDF = Priest Rapids Dam forebay, PRDT = Priest Rapids Dam tailrace.

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
- Zero instances of rolling average method creating double-exceedances in 2009

Date	Hour	Hourly TDG Value	Average of 12 previous hours	Highest 12-hr consecutive average for each day
6/6/2008	1400	115.7	119.4	
6/6/2008	1500	115.5	118.5	
6/6/2008	1600	115.7	117.7	
6/6/2008	1700	118.4	117.2	
6/6/2008	1800	124.5	117.5	
6/6/2008	1900	125.5	117.9	
6/6/2008	2000	125.5	118.5	
6/6/2008	2100	125.4	119.3	
6/6/2008	2200	125.5	120.0	
6/6/2008	2300	125.4	120.8	
6/6/2008	2359	125.3	121.5	121.5
6/7/2008	0100	125.4	122.3	123.3
6/7/2008	0200	124.5	123.1	
6/7/2008	0300	118.6	123.3	
6/7/2008	0400	116.7	123.4	
6/7/2008	0500	115.4	123.1	
6/7/2008	0600	115.3	122.4	
6/7/2008	0700	115.5	121.5	
6/7/2008	0800	114.1	120.6	
6/7/2008	0900	113.9	119.6	
6/7/2008	1000	113.8	118.7	
6/7/2008	1100	113.4	117.7	
6/7/2008	1200	113.5	116.7	116.7
6/7/2008	1300	114.1	115.7	
6/7/2008	1400	114.6	114.9	
6/7/2008	1500	114.8	114.6	
6/7/2008	1600	115.1	114.5	
6/7/2008	1700	115.2	114.4	
6/7/2008	1800	115.4	114.5	
6/7/2008	1900	115.2	114.4	
6/7/2008	2000	115.4	114.5	
6/7/2008	2100	115.3	114.7	
6/7/2008	2200	115.3	114.8	
6/7/2008	2300	114.9	114.9	

VI. TDG Monitoring Results



Comparison of 2009 vs. previous 10-year average (1998-2008) 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 ¹	Purpose
<i>April 24, 2009</i>	<i>Spring Spill Initiated</i>		
April 24-June 14	WFB (Open 24 Hours/Day)	Up to 20 kcfs	RPA 1 and terms and conditions of the 2008 Biological Opinion and as approved by PRCC
<i>June 15, 2009</i>	<i>End of Spring Spill/ Summer Spill Initiated</i>		
June 15-Aug 19	WFB (Open 24 Hours/Day)	Up to 20 kcfs	2006 Salmon and Steelhead Settlement Agreement and as approved by PRCC
<i>August 19, 2008</i>	<i>End of Summer Spill</i>		
¹ Actual quantity spilled is dependent on forebay and tailwater elevations.			

Fish-spill program: Priest Rapids Dam

Date	Spill Program	Quantity ¹	Purpose
<i>April 27, 2009</i>	<i>Spring Spill Initiated</i>		
April 27-June 14	Prototype top-spill test: spill-gate 19-20; spill gate open 5 ft; + sluiceway	Up to 24 kcfs	RPA 1 and terms and conditions of the 2008 Biological Opinion and as approved by PRCC
<i>June 15, 2009</i>	<i>End of Spring Spill/ Summer Spill Initiated</i>		
June 15-Aug 20	Prototype top-spill test: spill-gate 19-20; spill gate open 5 ft; + sluiceway	Up to 24 kcfs	2006 Salmon and Steelhead Settlement Agreement and as approved by PRCC
<i>August 20, 2009</i>	<i>End of Summer Spill</i>		
¹ Actual quantity spilled is dependent on forebay and tailwater elevations.			

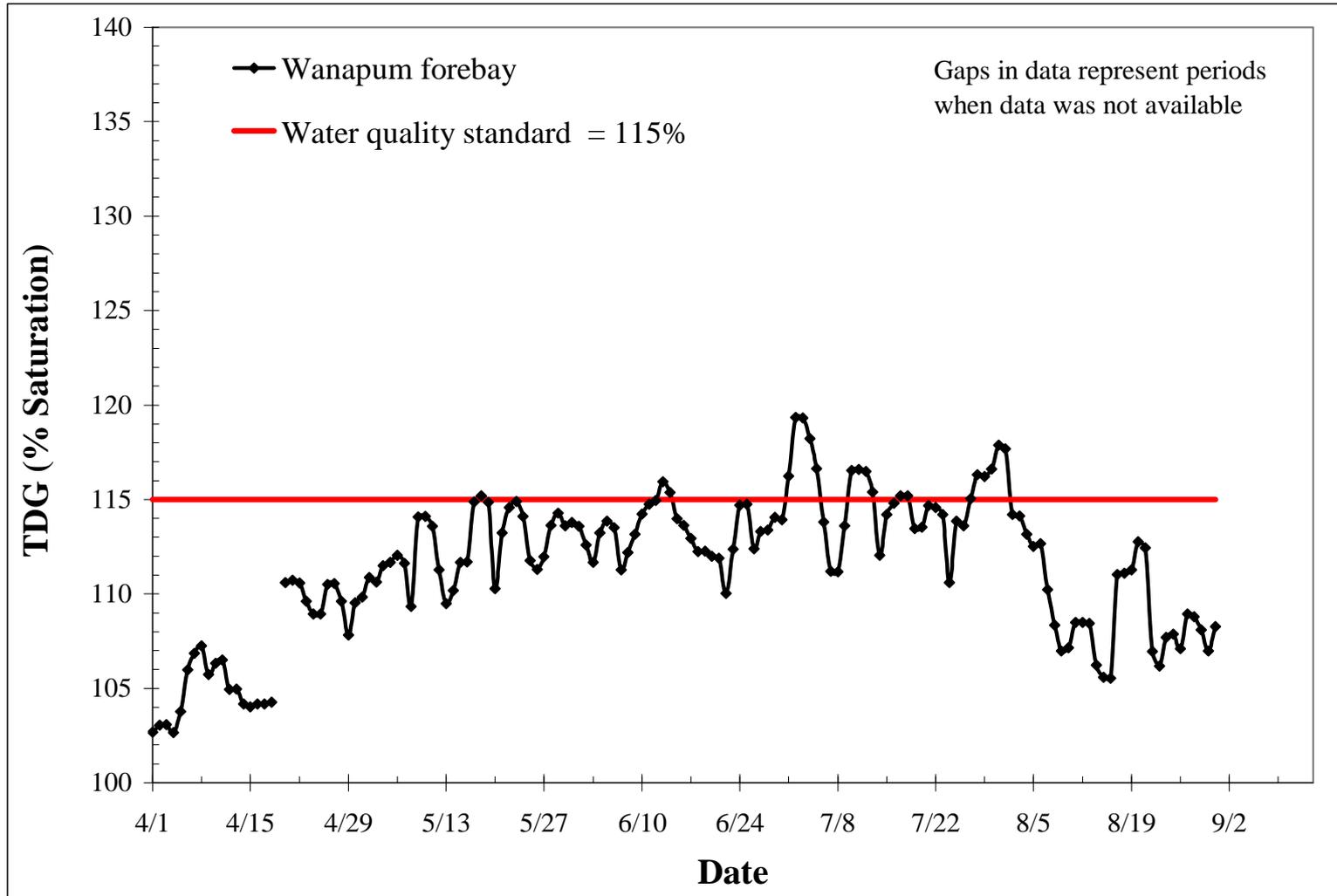
VI. TDG Monitoring Results

Number of 2009 fish-spill season total dissolved gas variances, Priest Rapids Project, mid-Columbia River, WA

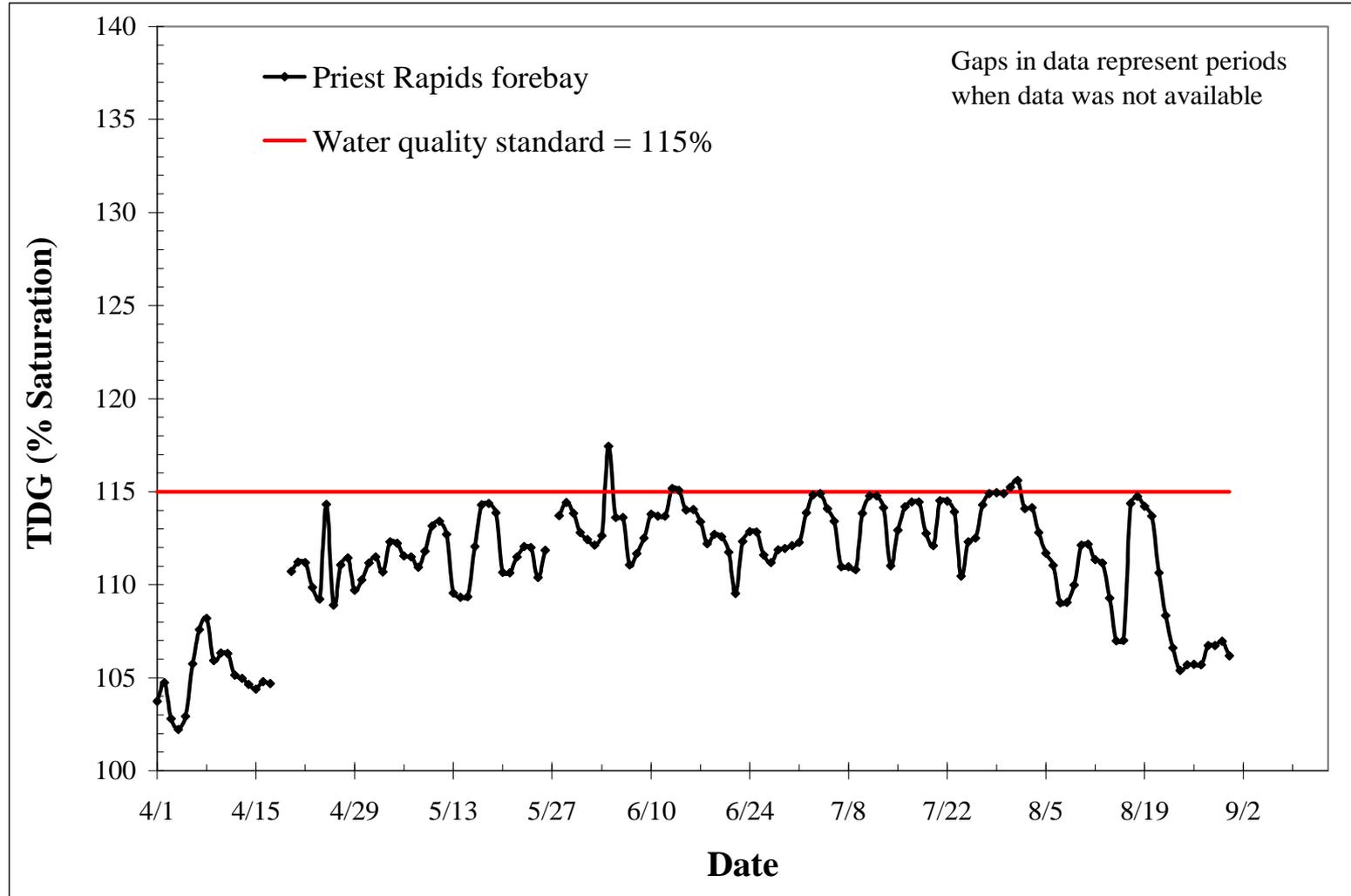
Location	Number of variances - Spring Spill	Number of variances - Summer Spill	Number of variances - Total	Total # of points	% above standard	Number of 1-hr Maximum >125%	Total # of hrs	% above 125% standard
WANF	1	13	14	152	9%	0	3601	0%
WANT	0	0	0	151	0%	0	3543	0%
PRDF	1	1	2	150	1%	0	3489	0%
PRDT	0	0	0	152	0%	0	3593	0%
PASCO	0	0	0	153	0%	0	3696	0%
Total	2	14	16	758	2%	0	17922	0%

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

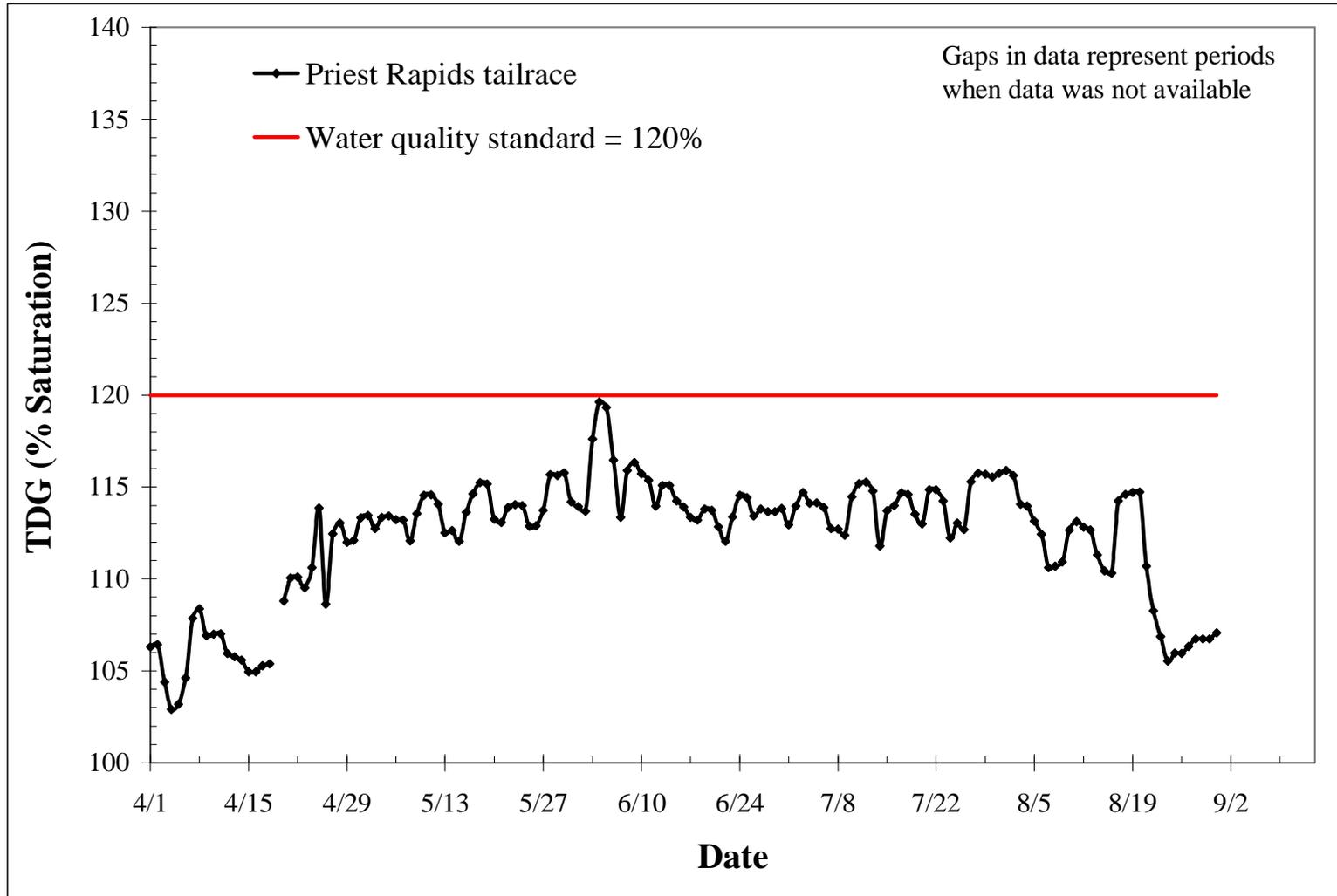
VI. TDG Monitoring Results



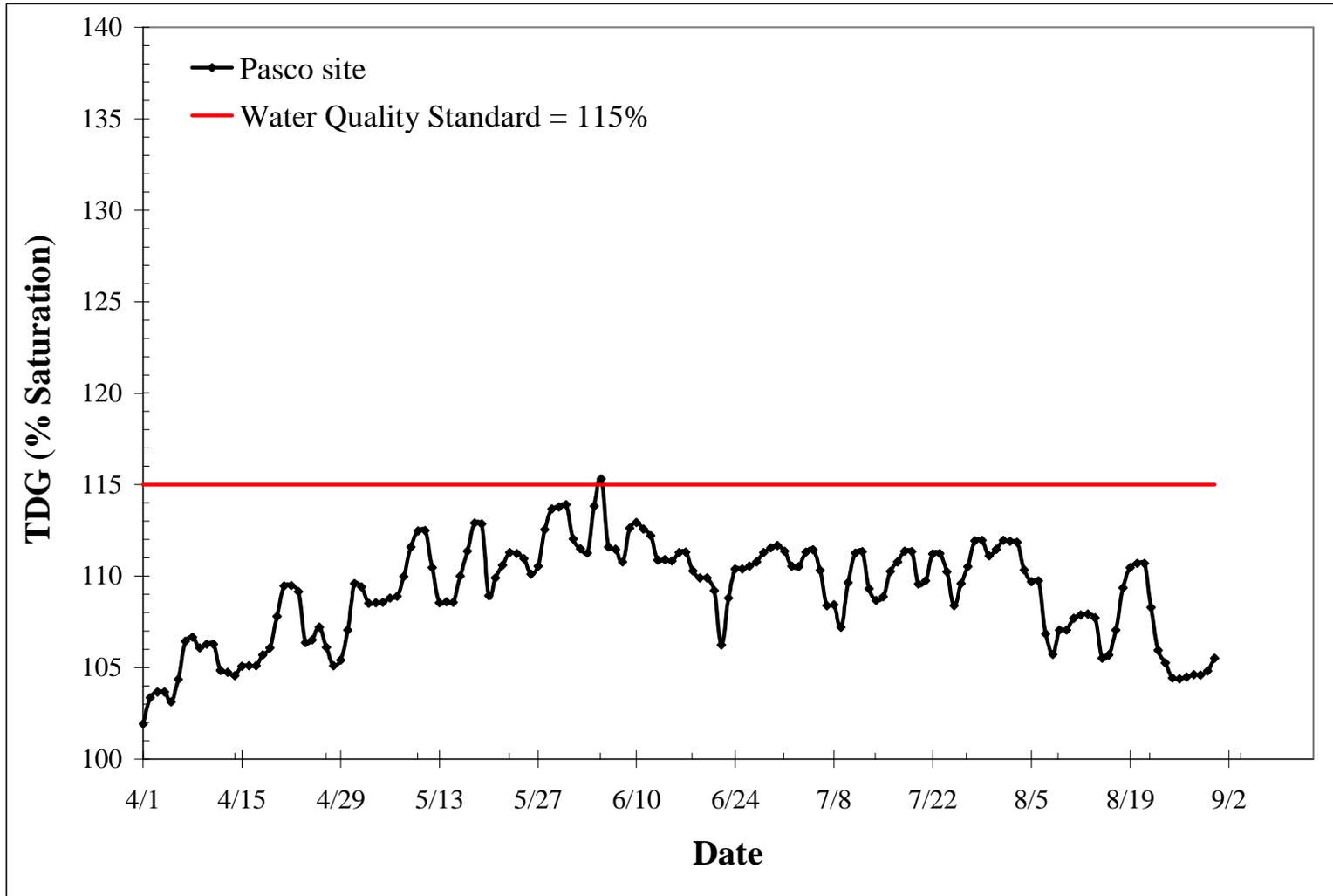
VI. TDG Monitoring Results



VI. TDG Monitoring Results



VI. TDG Monitoring Results



VII. Conclusions

- Grant PUD to continue hourly TDG & Temperature monitoring; bi-weekly trend monitoring of DO, pH, and Turbidity – year around
- Will follow 401 certification conditions set forth by WA. Dept. of Ecology
 - Quality Assurance Project Plan (QAPP)
 - Annual Gas Abatement Plan (GAP)
 - Annual reports
- Continue to follow established USGS guidelines for calibration, maintenance, and QA/QC procedures, as outlined in Grant PUD's QAPP
- On-going 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; (sixth unit being installed; all 10 by 2012)
 - PR top-spill fish bypass; studies on-going
 - PR advanced turbines; studies on-going

Questions?

