

# **Appendix F**

## **% TDG Instance Tracking System**



## **INTRODUCTION:**

The US Army Corps of Engineers (Corps) tracks the number of instances that the percent TDG exceeds the state water quality standards (WQS) of the 2007 Oregon and Washington water quality standards and designates a cause for each instance during the spill season, April 3 through August 31. Both Oregon and Washington states changed their water quality standards which would affect TDG instance tracking information provided in this appendix. The changes to the state water quality standards were not implemented in 2009 because of the 2008 Biological Opinion litigation. Because of the litigation, the Corps operated consistent with the US District Court of Oregon order, which means the previous TDG monitoring system, with forebay gages and the method for calculating the 12 hour average used in 2007 continued through 2009. The 2007 Oregon and Washington specified method of calculating the “daily % TDG” is an average of the 12 highest hourly readings in a given day. This method of calculating the high 12 hour averages is called the Oregon/Washington method and is used for this appendix.

There are instances that occurred outside of the spill season, but they are not included in this report since they are not associated with spill for fish. The 2007 State water quality standards are 115% in the forebays and 120% in the tailwaters of the Columbia and Snake River dams, under the provisions of the state water quality exemptions granted by the states. The percent TDG instances are based on the daily high 12 hour average, except for those instances above 125% which are hourly. This information is provided to the Technical Management Team Regional Forum and can be found at <http://www.nwd-wc.usace.army.mil/tmt/documents/ops/spill/> and also in Appendix E at the end of each monthly court FOP Implementation Report.

Table F-1 provides a listing of the three causes (types) that are designated to each percent TDG instances when the daily high 12 hour average is exceeded. These definitions of instance types have been evolving since 2003. From 2002 to 2008, 14 instance types were used and in 2009 the definitions were condensed to three types, which included all the previous 14 instance types. Table F-2 designates a specific instance type for all the instances at the Corps Lower Columbia and Snake River projects. Tables F-3A and B provides the total number of each percent TDG instance type for each project. Table F-4 provides the maximum hourly % TDG value and number of instances, both hourly and daily high 12 hour average, for all the Corps Lower Columbia and Snake River projects plus Chief Joseph at the Middle Columbia River. Table F-5 provides a historical summary from 2001 to 2009 of the number of hours that exceeded the 125% TDG Oregon and Washington state standards during the spill season; Table F-6 breaks down the number of hours and range of %TDG instances over 125% per project for 2009.

Table F-7 gives a list of TDG gages that malfunctioned during the 2009 spill season. , The gage data collected when a gage was malfunctioning is included in Tables F-2 and F-3 to show when a TDG instance from a malfunctioning gage occurred and appeared as part of the real time operational review. Malfunctioning gage TDG instances are included as instance type 2a. This data is considered probably not representative of true conditions

and are the result of a malfunctioning TDG gage, so in a sense, they may not necessarily be an instance, but without actual data, we can not say that conclusively. Tables F-4, F-5 and F-6 do not include the malfunctioning gage data since they provide statistical information on hourly TDG levels and the Corps chooses to use only data that we have a high level of confidence in.

**TABLE F-1  
TYPES OF PERCENT TDG INSTANCE TRACKING**

<b>Type 1 Condition</b>	<b>TDG levels exceed the TDG standard due to exceeding powerhouse capacity at run-of-river projects resulting in spill above the BiOp fish spill levels. This condition type includes:</b>
	<ul style="list-style-type: none"> <li>• High runoff flows and flood control efforts.</li> <li>• BPA load requirements are lower than actual powerhouse capacity.</li> <li>• Involuntary spill at Mid Columbia or lower Snake river dams resulting in high TDG levels entering the lower Columbia River.</li> </ul>
<b>Type 1a Condition</b>	<b>Planned and unplanned outages of hydro power equipment including generation unit, intertie line, or powerhouse outages.</b>
<b>Type 2 Exceedance</b>	<b>TDG exceedances due to the operation or mechanical failure of non-generating equipment. This exceedance type includes:</b>
	<ul style="list-style-type: none"> <li>• Flow deflectors unable to function for TDG abatement with tailwater elevations above 19 - 26 feet at Bonneville Dam.</li> <li>• Spill gates stuck in open position or inadvertently left open.</li> <li>• Increased spill in a bulk spill operation to pass debris.</li> <li>• Communication errors, such as teletype were transmitted but change was not timely made or misinterpretation of intent of teletype by Project operator.</li> </ul>
<b>Type 2a Exceedance</b>	<b>Malfunctioning FMS gauge, resulting in fewer TDG or temperature measurements when setting TDG spill caps.</b>
<b>Type 3 Exceedance</b>	<b>TDG exceedances due to uncertainties when using best professional judgment, SYSTDG model and forecasts. This exceedance type includes:</b>
	<ul style="list-style-type: none"> <li>• Uncertainties when using best professional judgment to apply the spill guidance criteria, e.g., travel time, degassing, and spill patterns.</li> <li>• Uncertainties when using the SYSTDG model to predict the effects of various hydro system operations, temperature, degassing, and travel time.</li> <li>• Uncertainties when using forecasts for flows, temperature and wind.</li> <li>• Unanticipated sharp rise in water temperature (a 1.5 degree F. or greater change in a day).</li> <li>• Bulk spill pattern being used which generated more TDG than expected.</li> </ul>

**TABLE F-2  
PERCENT TDG INSTANCE TYPE TRACKING  
APRIL 2009**

Date	Low Gran FB	Low Gran TW	Little Goose FB	Little Goose TW	Low Monu. FB	Low Monu. TW	Ice Harb FB	Ice Harb TW	McNary FB	McNary TW	John Day FB	John Day TW	The Dalles FB	The Dalles TW	BON FB	BON TW	Camas FB
4/3/09	Spill Begins	Spill Begins	Spill Begins	Spill Begins	Spill Begins	Spill Begins	Spill Begins	Spill Begins									
4/4/09	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---
4/5/09	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---
4/6/09	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---
4/7/09	---	---	---	---	---	---	3	---	---	---	---	---	---	---	---	---	---
4/8/09	---	---	---	---	---	---	3	---	---	---	---	---	---	---	---	---	---
4/9/09	---	---	---	---	---	---	3	---	---	---	---	---	---	---	---	---	---
4/10/09	---	---	---	---	---	---	---	---	Spill Begins	Spill Begins	Spill Begins	Spill Begins	Spill Begins				
4/11/09	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---
4/12/09	---	---	---	---	---	3	---	---	---	---	---	---	---	---	---	---	---
4/13/09	---	---	---	---	---	3	---	---	---	---	---	---	---	---	---	---	---
4/14/09	---	---	---	---	---	3	---	---	---	---	---	---	---	---	---	---	---
4/15/09	---	---	2a	---	---	3	---	---	---	---	---	---	---	---	---	---	---
4/16/09	---	---	2a	---	---	---	---	---	---	---	---	---	---	---	---	---	---
4/17/09	---	---	2a	---	---	---	---	---	---	---	---	---	---	---	---	---	---
4/18/09	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---
4/19/09	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	3
4/20/09	---	---	---	---	---	---	3	---	---	---	---	---	---	---	3	---	3
4/21/09	---	---	---	---	---	---	3	---	---	---	---	---	---	---	3	---	3
4/22/09	---	---	---	---	3	---	3	3	---	---	---	---	---	---	---	---	---
4/23/09	---	---	---	---	---	---	---	3	---	---	---	---	---	---	---	---	---
4/24/09	---	---	---	---	1	---	---	3	---	---	---	---	---	---	---	1	---
4/25/09	---	---	---	---	1	---	1	---	---	---	---	---	---	---	---	1	---
4/26/09	---	---	---	---	---	---	3	2a	---	---	---	---	---	---	---	---	---
4/27/09	---	---	---	---	---	---	3	2a	---	---	---	---	---	---	---	2	---
4/28/09	---	---	---	---	---	---	3	---	---	---	---	---	---	---	---	---	---
4/29/09	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---
4/30/09	---	---	---	---	---	---	---	---	---	---	---	---	---	---	3	---	3

**TABLE F-2  
PERCENT TDG INSTANCE TYPE TRACKING  
MAY 2009**

Date	Low Gran FB	Low Gran TW	Little Goose FB	Little Goose TW	Low Monu. FB	Low Monu. TW	Ice Harb FB	Ice Harb TW	McNary FB	McNary TW	John Day FB	John Day TW	The Dalles FB	The Dalles TW	BON FB	BON TW	Camas FB
5/1/2009	---	---	---	---	---	---	---	---	---	---	---	---	---	---	3	---	---
5/2/2009	---	---	---	---	---	---	3	---	---	---	---	---	---	---	3	---	---
5/3/2009	---	---	---	---	---	---	---	---	---	---	---	---	---	---	3	---	3
5/4/2009	---	---	---	---	---	---	3	---	---	---	---	---	---	---	3	---	---
5/5/2009	---	---	---	---	---	---	3	---	---	---	---	---	---	---	---	---	---
5/6/2009	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---
5/7/2009	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---
5/8/2009	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	3
5/9/2009	---	---	---	---	---	---	---	---	---	---	---	---	---	---	3	---	3
5/10/2009	---	---	---	---	---	---	---	---	---	---	---	---	---	---	3	---	3
5/11/2009	---	---	---	---	---	---	3	---	---	---	---	---	---	---	3	---	3
5/12/2009	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---
5/13/2009	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---
5/14/2009	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---
5/15/2009	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	3
5/16/2009	---	---	---	---	---	---	---	---	---	---	---	---	---	---	3	---	3
5/17/2009	---	---	---	---	---	---	---	---	---	---	---	---	---	---	3	---	3
5/18/2009	---	---	---	---	3	3	3	---	---	---	---	---	---	---	3	---	3
5/19/2009	---	---	---	---	---	---	3	3	---	---	---	---	---	---	---	---	---
5/20/2009	---	1	---	---	---	---	---	1	---	---	---	---	---	---	---	1a	---
5/21/2009	---	1	---	---	---	1	---	1	---	---	---	---	---	---	---	1	1
5/22/2009	---	---	1	---	1	1	1	---	---	---	---	---	---	---	1	1	1
5/23/2009	---	---	1	---	1	1	1	1	1	---	---	---	---	---	1	1	1
5/24/2009	---	1	---	---	1	---	1	---	1	---	---	---	---	---	---	---	1
5/25/2009	---	1	1	---	1	1	1	1	---	---	---	---	---	---	---	1	---
5/26/2009	---	1	1	---	1	1	1	1	---	---	---	---	---	---	---	1	1
5/27/2009	---	1	1	---	1	---	1	1	---	---	---	---	---	---	3	1	1
5/28/2009	---	1	2a	---	1	1	1	1	---	---	---	---	1	---	1	1	1
5/29/2009	---	1	2a	---	1	---	1	1	---	---	1	---	1	---	1	1	1
5/30/2009	---	1	1	---	1	1	1	1	---	---	1	---	1	---	1	1	1
5/31/2009	---	1	1	---	1	1	1	1	1	---	1	---	1	---	1	1	1

**TABLE F-2**  
**PERCENT TDG INSTANCE TYPE TRACKING**  
**JUNE 2009**

Date	Low Gran FB	Low Gran TW	Little Goose FB	Little Goose TW	Low Monu. FB	Low Monu. TW	Ice Harb FB	Ice Harb TW	McNary FB	McNary TW	John Day FB	John Day TW	The Dalles FB	The Dalles TW	BON FB	BON TW	Camas FB
6/1/2009	---	1	1	---	1	1	1	1	1	1	1	---	1	---	1	1	1
6/2/2009	---	1	1	---	1	1	1	1	---	---	1	---	1	---	1	1	1
6/3/2009	---	---	1	---	1	1	1	1	---	---	1	---	1	---	1	1	1
6/4/2009	---	---	1	---	1	1	1	---	---	---	1	---	1	---	1	1	1
6/5/2009	---	---	1	---	1	1	1	1	---	---	1	1	---	---	---	1	1
6/6/2009	---	1	---	---	1	1	1	1	---	---	---	1	---	---	---	1	---
6/7/2009	---	1	---	---	1	1	1	1	---	---	---	1	---	---	---	1	---
6/8/2009	---	1	1	---	1	1	1	1	---	1	---	1	---	---	---	1	1
6/9/2009	---	---	1	---	1	---	1	---	---	---	---	1	---	---	3	1	1
6/10/2009	---	---	---	---	1	---	1	---	---	---	---	1	---	---	---	1	1
6/11/2009	---	---	---	---	1	---	1	---	---	---	---	1	---	---	---	---	1
6/12/2009	---	---	---	---	1	---	1	---	---	---	---	---	---	---	---	---	---
6/13/2009	---	---	---	---	---	---	1	---	---	---	---	---	---	---	---	---	---
6/14/2009	---	---	---	---	---	---	1	---	---	---	---	---	---	---	---	---	---
6/15/2009	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---
6/16/2009	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---
6/17/2009	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---
6/18/2009	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---
6/19/2009	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---
6/20/2009	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---
6/21/2009	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---
6/22/2009	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---
6/23/2009	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---
6/24/2009	---	---	---	---	---	---	---	2a	---	---	---	---	---	---	---	---	3
6/25/2009	---	---	---	---	---	---	---	2a	---	---	---	---	---	---	---	---	---
6/26/2009	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---
6/27/2009	---	---	---	---	---	---	---	---	---	---	---	---	3	---	---	---	---
6/28/2009	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---
6/29/2009	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	3
6/30/2009	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	3

**TABLE F-2  
PERCENT TDG INSTANCE TYPE TRACKING  
JULY 2009**

	Low Gran FB	Low Gran TW	Little Goose FB	Little Goose TW	Low Monu. FB	Low Monu. TW	Ice Harb FB	Ice Harb TW	McNary FB	McNary TW	John Day FB	John Day TW	The Dalles FB	The Dalles TW	BON FB	BON TW	Camas FB
7/1/2009	---	---	---	---	---	---	---	---	---	---	---	---	3	---	2a	---	3
7/2/2009	---	---	---	---	---	---	---	---	---	---	---	---	3	---	2a	---	3
7/3/2009	---	---	---	---	---	---	3	---	---	---	---	---	---	---	3	---	3
7/4/2009	---	---	---	---	---	---	3	---	---	---	---	---	---	---	3	---	3
7/5/2009	---	---	---	---	---	---	3	---	---	---	---	---	---	---	---	---	3
7/6/2009	---	---	---	---	---	---	3	---	---	---	---	---	---	---	---	---	---
7/7/2009	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---
7/8/2009	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---
7/9/2009	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---
7/10/2009	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	3
7/11/2009	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---
7/12/2009	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---
7/13/2009	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---
7/14/2009	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---
7/15/2009	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	3
7/16/2009	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	3
7/17/2009	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	3
7/18/2009	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	3
7/19/2009	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	3
7/20/2009	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	3
7/21/2009	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	3
7/22/2009	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	3
7/23/2009	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---
7/24/2009	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	3
7/25/2009	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	3
7/26/2009	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	3
7/27/2009	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	3
7/28/2009	---	---	---	---	---	---	---	---	---	---	---	---	---	---	3	---	3
7/29/2009	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	3
7/30/2009	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	3
7/31/2009	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	3

**TABLE F-2  
PERCENT TDG INSTANCE TYPE TRACKING  
AUGUST 2009**

	Low Gran. FB	Low Gran. TW	Little Goose FB	Little Goose TW	Low Monu. FB	Low Monu. TW	Ice Harb. FB	Ice Harb. TW	McNary FB	McNary TW	John Day FB	John Day TW	The Dalles FB	The Dalles TW	BON FB	BON TW	Camas FB
8/1/2008	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	3
8/2/2008	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---
8/3/2008	---	---	---	---	---	---	---	---	---	---	---	2a	---	---	---	---	---
8/4/2008	---	---	---	---	---	---	---	---	---	---	---	---	---	---	2a	---	3
8/5/2008	---	---	---	---	---	---	---	---	---	---	---	---	---	---	2a	---	---
8/6/2008	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---
8/7/2008	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---
8/8/2008	---	---	---	---	---	---	---	---	---	2a	---	---	---	---	---	---	---
8/9/2008	---	---	---	---	---	---	---	---	---	2a	---	---	---	---	---	---	3
8/10/2008	---	---	---	---	---	---	---	---	---	2a	---	---	---	---	---	---	3
8/11/2008	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	3
8/12/2008	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---
8/13/2008	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---
8/14/2008	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---
8/15/2008	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---
8/16/2008	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---
8/17/2008	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---
8/18/2008	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	3
8/19/2008	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	3
8/20/2008	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	3
8/21/2008	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---
8/22/2008	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---
8/23/2008	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---
8/24/2008	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---
8/25/2008	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---
8/26/2008	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---
8/27/2008	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	3
8/28/2008	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---
8/29/2008	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---
8/30/2008	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---
8/31/2008	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---
<b>Total</b>	<b>0</b>	<b>15</b>	<b>19</b>	<b>0</b>	<b>26</b>	<b>21</b>	<b>44</b>	<b>25</b>	<b>4</b>	<b>5</b>	<b>9</b>	<b>7</b>	<b>11</b>	<b>0</b>	<b>32</b>	<b>24</b>	<b>66</b>
<b>Grand Total</b>	<b>308</b>																

**TABLE F-3A  
LOWER SNAKE RIVER PERCENT TDG INSTANCE TYPE TOTALS**

<b>TDG Instance Types</b>	<b>Lower Granite Forbay</b>	<b>Lower Granite Tailwater</b>	<b>Little Goose Forbay</b>	<b>Little Goose Tailwater</b>	<b>Low Monumental forebay</b>	<b>Low Monumental Tailwater</b>	<b>Ice Harbor Forbay</b>	<b>Ice Harbor Tailwater</b>	<b>Totals</b>
1	0	15	14	0	24	16	25	17	111
1a	0	0	0	0	0	0	0	0	0
2	0	0	0	0	0	0	0	0	0
2a	0	0	5	0	0	0	0	4	9
3	0	0	0	0	2	5	19	4	30
<b>Grand Total</b>	<b>0</b>	<b>15</b>	<b>19</b>	<b>0</b>	<b>26</b>	<b>21</b>	<b>44</b>	<b>25</b>	<b>150</b>

**TABLE F-3B  
LOWER COLUMBIA RIVER PERCENT TDG INSTANCE TYPE TOTALS**

<b>TDG Instance Types</b>	<b>McNary Forbay</b>	<b>McNary Tailwater</b>	<b>John Day Forbay</b>	<b>John Day Tailwater</b>	<b>The Dalles Forbay</b>	<b>The Dalles Tailwater</b>	<b>BON Forbay</b>	<b>BON Tailwater</b>	<b>Camas/Washougal Forbay</b>	<b>Totals</b>
1	4	2	8	7	8	0	10	22	19	80
1a	0	0	0	0	0	0	0	1	0	1
2	0	0	0	0	0	0	0	1	0	1
2a	0	3	1	0	0	0	4	0	0	8
3	0	0	0	0	3	0	18	0	47	68
<b>Grand Total</b>	<b>4</b>	<b>5</b>	<b>9</b>	<b>7</b>	<b>11</b>	<b>0</b>	<b>32</b>	<b>24</b>	<b>66</b>	<b>158</b>

**TABLE F-4**  
**2009 SPILL SEASON - MAXIMUM %TDG and NUMBER of INSTANCES**  
**Starting April 3, L. Snake R and April 10, L. Columbia R:**

<b>Station</b>	<b>APR</b>	<b>MAY</b>	<b>JUN</b>	<b>JUL</b>	<b>AUG</b>
<b>Middle Columbia River</b>					
Chief Joseph Forebay (CHJ)					
Maximum hourly % TDG	107.9	110.2	115.8	117.0	111.4
Number of hours over 110%	0	3	569	646	59
Chief Joseph Tailwater (CHQW)					
Maximum hourly % TDG	117.4	116.9	121.4	116.3	111.7
Number of hours over 110%	23	13	529	542	51
<b>Lower Snake River</b>					
Lower Granite Forebay (LWG)					
Maximum hourly % TDG	105.4	108.2	108.1	104.4	105.6
Number of hours over 115%	0	0	0	0	0
Number of days high 12 hour avg over 115%	0	0	0	0	0
Lower Granite Tailwater (LGNW)					
Maximum hourly % TDG	118.5	127.4	127.0	111.7	115.8
Number of hours over 120%	0	205	92	0	0
Number of days high 12 hour avg over 120%	0	10	5	0	0
Little Goose Forebay (LGSA)					
Maximum hourly % TDG	112.1	119.8	122.0	114.0	110.6
Number of hours over 115%	0	168	155	0	0
Number of days high 12 hour avg over 115%	2	9	7	0	0
Little Goose Tailwater (LGSW)					
Maximum hourly % TDG	117.2	120.1	119.6	116.2	114.4
Number of hours over 120%	0	2	0	0	0
Number of days high 12 hour avg over 120%	0	0	0	0	0
Lower Monumental Forebay (LMNA)					
Maximum hourly % TDG	116.9	119.8	121.6	115.3	111.2
Number of hours over 115%	53	224	258	4	0
Number of days high 12 hour avg over 115%	3	11	12	0	0
Lower Monumental Tailwater (LMNW)					
Maximum hourly % TDG	121.0	122.1	123.1	118.4	116.9
Number of hours over 120%	52	109	101	0	0
Number of days high 12 hour avg over 120%	4	9	8	0	0
Ice Harbor Forebay (IHRA)					
Maximum hourly % TDG	118.0	118.7	119.5	117.2	113.6
Number of hours over 115%	191	329	307	53	0
Number of days high 12 hour avg over 115%	10	16	14	4	0
Ice Harbor Tailwater (IDSW)					
Maximum hourly % TDG	121.1	123.1	123.2	116.9	115.1
Number of hours over 120%	48	176	146	0	0
Number of days high 12 hour avg over 120%	4	11	9	0	0
<b>Lower Columbia River</b>					
McNary Washington Forebay (MCNA)					
Maximum hourly % TDG	112.9	116.5	116.1	115.1	113.4
Number of hours over 115%	0	46	7	1	0
Number of days high 12 hour avg over 115%	0	3	1	0	0
McNary Tailwater (MCPW)					
Maximum hourly % TDG	118.9	120.0	122.4	117.6	117.9
Number of hours over 120%	0	0	19	0	0
Number of days high 12 hour avg over 120%	0	0	2	0	4

**TABLE F-4 (continued)**  
**2009 SPILL SEASON - MAXIMUM %TDG and NUMBER of INSTANCES**  
**Starting April 3, L. Snake R and April 10, L. Columbia R:**

<b>Station</b>	<b>APR</b>	<b>MAY</b>	<b>JUN</b>	<b>JUL</b>	<b>AUG</b>
<b>Lower Columbia River</b>					
John Day Forebay (JDY)					
Maximum hourly % TDG	112.7	119	118.0	114.5	113.4
Number of hours over 115%	0.0	55.0	130.0	0.0	0.0
Number of days high 12 hour avg over 115%	0	3	5	0	0
John Day Tailwater (JHAW)					
Maximum hourly % TDG	118.1	119.3	121.1	120.0	116.6
Number of hours over 120%	0.0	0.0	137.0	0.0	0.0
Number of days high 12 hour avg over 120%	0	0	7	0	0
The Dalles Forebay (TDA)					
Maximum hourly % TDG	113.5	117.4	117.0	119.7	111.2
Number of hours over 115%	0.0	66.0	93.0	43.0	0.0
Number of days high 12 hour avg over 115%	0	4	5	2	0
The Dalles Tailwater (TDDO)					
Maximum hourly % TDG	117.5	119.9	118.8	118.1	116.4
Number of hours over 120%	0.0	0.0	0.0	0.0	0.0
Number of days high 12 hour avg over 120%	0	0	0	0	0
Bonneville Forebay (BON)					
Maximum hourly % TDG	115.9	119.6	117.9	118.0	112.0
Number of hours over 115%	38.0	306.0	128.0	64.0	0.0
Number of days high 12 hour avg over 115%	3	17	5	4	1
Cascade Island Washington (CCIW)					
Maximum hourly % TDG	124.4	125.6	124.3	123.0	118.8
Number of hours over 120%	33.0	230.0	266.0	1.0	0.0
Number of days high 12 hour avg over 120%	3	11	10	0	0
Camas/Washougal (CWMW)					
Maximum hourly % TDG	117.6	121.3	119.4	120.9	117.9
Number of hours over 115%	46.0	317.0	234.0	285.0	149.0
Number of days high 12 hour avg over 115%	4	19	12	22	9

**TABLE F-5**  
**2001 -2009 SPILL SEASON – NUMBER of HOURS OVER 125% TDG**

<b>Year</b>	<b>Number of Hours</b>
2009	52
2008	668
2007	0
2006	589
2005	0
2004	0
2003	417
2002	85
2001	0

**TABLE F-6**  
**2009 SPILL SEASON – NUMBER of HOURS and RANGE OVER 125% TDG**  
**Starting April 3, L. Snake R and April 10, L. Columbia R:**

Station	Gauge ID	Month	Range of %TDG	Number of Hours
Lower Granite Tailwater	LGNW	May	125.1 - 127.4	25
Lower Granite Tailwater	LGNW	June	125.8 - 127.0	26
Cascade Island Washington	CCIW	May	125.6	1
<b>TOTAL HOURS:</b>				<b>52</b>

**TABLE F-7**  
**MALFUNCTIONING TDG GAGES - 2009**

	Gauge ID	Dates	Number of Days*	Hours with Questionable Data	Reason for Failed Gauge	Effects on % TDG Reading
Little Goose Forebay	LGSA	4/15 - 4/17	3	1000 - 1100	Gauge Malfunctioned	Increased: 107.3 - 118.7
Ice Harbor Tailwater	IDSW	4/26 - 4/27	2	1300 - 1100	Gauge Malfunctioned	Increased: 117.8 - 123.0
Little Goose Forebay	LGSA	5/28-5/29	2	0500 - 1200	Unknown	Increased: 117.9 - 138.5
Ice Harbor Tailwater	IDSW	6/24 - 6/25	2	0100 - 0900	Unknown	Increased: 120.2 - 122.3
Bonneville Forebay	BON	7/1 - 7/2	2	1000 - 1200	Bad TDG Sensor	Missing
John Day Tailwater	JHAW	3-Aug	1	0100 - 1400	Punctured Membrane	Increased: 114.2 - 126.7
Bonneville Forebay	BON	8/4 - 8/5	2	0700 - 1000	Punctured Membrane	Increased: 112.0 - 151.6
McNary Tailwater	MCPW	8/8 - 8/10	3	0100 - 1200	Punctured Membrane	Increased: 116.3 - 147.8

Table F-7 provides additional information on instance type #2a in Tables F-2 and F-3, which includes the REV (deleted) data. Tables F-4, F-5, and F-6 do not include this questionable data.

\*Table includes days with more than 8 hours of questionable data, which makes it difficult to make spill cap changes.