

# **Appendix B**

**2021 TDG TMDL**

**Implementation Summary**

## **Introduction**

This appendix summarizes the Corps' implementation of the gas abatement measures contained in the Total Maximum Daily Load (TMDL) for the Lower Columbia River Total Dissolved Gas (approved by EPA on November 18, 2002), and for the Total Maximum Daily Load for the Lower Snake River Total Dissolved Gas (approved by EPA on September 30, 2003). These Total Dissolved Gas (TDG) TMDLs include a Summary Implementation Strategy (SIS), developed in coordination with NOAA Fisheries, which identifies gas abatement actions that are compatible with meeting ESA responsibilities. The SIS describes the TMDL Implementation Plan which has two phases. Phase I (through 2010) involves improving water quality, while ensuring that salmonid passage is fully protected in accordance with ESA biological opinions; and Phase II (2011 through present) involves structural and operational changes to dams to achieve the TDG water quality standard. SIS Phase I tables include "Short-term Implementation Activities" that are directly related to achievement of the applicable TDG water quality standard; and "Additional Short-term Implementation Activities" that are indirectly related to achieving the applicable TDG water quality standard. SIS Phase II table: "Fish Passage Actions That Support TDG Water Quality Goals," is intended to identify long-term actions that will protect fish passage while moving the system toward attainment of the water quality standard for TDG.

The following tables provide information about the status of the SIS Implementation Plan actions undertaken by the Corps. The Corps has implemented numerous gas abatement modifications that have been incorporated into measures and operations designed to benefit ESA-listed fish. Table B-1 reports on "Short-term Implementation Activities," and Table B-2 reports on "Additional Short-term Implementation Activities." Table B-3 reports on "Fish Passage Actions That Support TDG Water Quality Goals."

**TABLE B-1**  
**PHASE I – SHORT-TERM TMDL IMPLEMENTATION ACTIVITIES**

| <b>2000 Biological Opinion<br/>Action Item Description</b>                            | <b>Status</b>   | <b>Estimated<br/>Completion Date</b> | <b>Actual<br/>Completion Date</b> |
|---|---|--------------------------------------|-----------------------------------|
| <b>Ice Harbor Deflectors</b>  | Deflectors installed in spillbays 2 - 9 (1997); and spillbays 1 and 10 (1998 - 1999).   | 1998                                 | 1999                              |
| <b>John Day Deflectors</b>  | Deflectors installed in spillbays 2 – 19; spillbay 20.  | 1998<br>2011                         | 1998<br>2010                      |
| <b>All Projects - Survival based spill caps at all dams (e.g. 40% at The Dalles).</b> | Juvenile dam passage survival studies are underway to determine if current project configurations and spill levels are meeting the juvenile dam passage survival performance standards specified in the 2014 Supplemental BiOp. | 2018                                 | 2019                              |
| <b>Bonneville Endbay Deflectors</b>   | Deflectors installed in spillbays 1 - 18.   | 2002                                 | 2002                              |
| <b>McNary Endbay Deflectors</b>   | Deflectors installed in spillbays 1, 2, 21, and 22.   | 2002                                 | 2002                              |
| <b>Lower Monumental Endbay Deflectors</b>   | Deflectors installed in spillbays 1 and 8. Repaired spillbay 2 deflector.   | 2003                                 | 2003                              |
| <b>Little Goose Endbay Deflectors</b>   | Deflectors installed in spillbays 1 and 8.  | 2009                                 | 2009                              |
| <b>Chief Joseph Deflectors</b>  | Deflectors installed in all 19 spillbays.   | 2008                                 | 2008                              |
| <b>The Dalles Deflectors</b>  | No deflector construction planned. Existing spillway stilling basin provides adequate degassing properties during spill operations for fish passage.  | N/A                                  | N/A                               |
| <b>Divider Walls at Appropriate Dams</b>  | (See below for itemized list of divider walls.)   |                                      |                                   |
| <b>The Dalles Spillwall I</b>   | Spillwall constructed between spillbays 6 and 7 to improve survival of fish passing through the spillway.   | 2004                                 | 2004                              |
| <b>The Dalles Spillwall II</b>  | Spillwall constructed between spillbays 8 and 9 to improve survival of fish passing through the spillway.   | 2010                                 | 2010                              |

Table B-1 corresponds to Table 15 of the 2002 TMDL for Lower Columbia River TDG and Table 18 of the 2003 TMDL for Lower Snake River TDG.

**TABLE B-2**  
**PHASE I – ADDITIONAL SHORT-TERM TMDL IMPLEMENTATION**  
**ACTIVITIES**

| <b>2000 Biological Opinion<br/>Action Item Description</b>                        | <b>Status</b>  | <b>Estimated<br/>Completion Date</b> | <b>Actual<br/>Completion Date</b>  |
|---|--|--------------------------------------|------------------------------------|
| <b>Bonneville Powerhouse 2<br/>Corner Collector (B2CC)</b>                        | Construction of corner collector at powerhouse 2.  | 2004                                 | 2004                               |
| <b>Bonneville Powerhouse 2<br/>Fish Guidance Efficiency<br/>(FGE) Improvement</b> | Installed turning vanes on Submerged Traveling Screens (STS). Installed ceiling gap closure device.  | 1997                                 | 1997                               |
| <b>Bonneville Powerhouse 2<br/>FGE Improvement</b>                                | Modified Vertical Barrier Screens (VBSS).  | 2008                                 | 2008                               |
| <b>Lower Granite Removable<br/>Spillway Weir (RSW)</b>                            | Installed spillway weir (SW).  | 2001                                 | 2001                               |
| <b>The Dalles Turbine Intake<br/>Blocks</b>                                       | Installed turbine intake blocks in 2001 and removed in 2004 after biological testing confirmed the blocks did not reduce turbine entrainment of juvenile fish.                               | 2001                                 | Completed in 2001; removed in 2004 |
| <b>Lower Monumental Bypass<br/>Outfall Relocation</b>                             | Relocation completed.  | 2012                                 | 2012                               |
| <b>The Dalles Sluiceway Outfall<br/>Relocation</b>                                | Not being investigated at this time; current sluiceway being used as is with high survival of juvenile fish passing through the existing outfall.  | N/A                                  | N/A                                |
| <b>Bonneville Powerhouse 1<br/>Surface Bypass or Extended<br/>Screens</b>         | Screens were removed from Bonneville Powerhouse 1 turbine intakes. Bonneville Powerhouse 1 sluiceway modifications completed in 2010 to provide surface bypass route for juvenile salmonids. | 2002                                 | 2010                               |

Table B-2 corresponds to Table 16 of the 2002 TMDL for Lower Columbia River TDG and Table 19 of the 2003 TMDL for Lower Snake River TDG.

**TABLE B-3**  
**PHASE II –**  
**Fish Passage Actions That Support TDG Water Quality Goals**

| <b>2000 Biological Opinion Action Item Description</b>                                       | <b>Status</b>   | <b>Estimated Completion Date</b> | <b>Actual Completion Date</b> |
|--|---|----------------------------------|-------------------------------|
| <b>John Day Spillway Weir (SW)</b>   | Construction of 2 SWs completed.  | 2008                             | 2008                          |
| <b>Removable Spillway Weirs (RSWs) at Lower Monumental, Little Goose and Ice Harbor dams</b> | See Details below   | See Details below                | See Details below             |
| <b>Lower Monumental SW</b>   | Construction completed.   | 2008                             | 2008                          |
| <b>Little Goose SW</b>   | Construction completed.   | 2009                             | 2009                          |
| <b>Ice Harbor SW</b>   | Construction completed.   | 2005                             | 2005                          |
| <b>McNary Bypass Improvements (New Outfall)</b>  | Construction completed.   | 2012                             | 2012                          |
| <b>McNary Bypass Improvements (temperature)</b>  | Warm Water Operations have been developed for the McNary Dam juvenile bypass system when system water temperature exceeds 68° F and are included in the annual Fish Passage Plan.   | Ongoing                          | Ongoing                       |
| <b>Lower Monumental Extended Screens</b>   | Installed spillway weir to improve fish passage.  | N/A                              | N/A                           |
| <b>John Day Extended Screens</b>   | Evaluated prototype but did not complete full installation. Two SWs were constructed as an alternative.   | 2003                             | 2003                          |
| <b>All Projects - Spill Effectiveness Studies</b>  | Juvenile dam passage survival studies are underway to determine if current project configurations and spill levels are meeting the juvenile dam passage survival performance standards specified in the 2014 Supplemental BiOp. | Ongoing                          | Ongoing                       |
| <b>Predator Removal and Abatement</b>  | Ongoing at projects includes avian hazing and installation of avian deterrent wires, pikeminnow removal, and sea lion hazing.   | Ongoing                          | Ongoing                       |
| <b>All Projects - Improved O&amp;M</b>   | Ongoing   | Ongoing                          | Ongoing                       |
| <b>Bonneville Powerhouse 1 Minimum Gap Runners</b>   | Installed MGRs in turbines 1-10.  | 2010                             | 2010                          |
| <b>Implement Turbine Survival Program Results</b>  | Ongoing   | Ongoing                          | Ongoing                       |

Table B-3 corresponds to Table 17 of the 2002 TMDL for Lower Columbia River TDG and Table 20 of the 2003 TMDL for Lower Snake River TDG.