

# ***Spring / Summer Update to the 2004 Water Management Plan***

## **1. Introduction**

The 2004 Spring / Summer update to the Water Management Plan (WMP) updates information on how the Action Agencies plan on operating the Federal Columbia River Power System (FCRPS) reservoirs during the spring and summer seasons.

The *Spring / Summer WMP Update* (S/S Update) is needed because water supply forecasts for the spring and summer time period are not available at the time the water management plan is written in the fall of 2003. Planned operations in the Spring / Summer update are based on the most current water supply forecast which is considered to be the best available forecast of the expected runoff water volume, and thus how the FCRPS will be operated in 2004. The “April Final” forecast is the most current forecast available when the final version of the Spring Summer update was written.

The *S/S Update* also reports 2004 research operations planned for the FCRPS projects. Research studies are routinely conducted to test the performance of current or new fish passage operations and the effects on a wide range of conditions, including spill survival, tailrace egress, transport benefits and the performance of new passage devices like the Bonneville corner collector and the Lower Granite Removable Spillway Weir (RSW). The Studies Review Work Group establishes the research study plan in the spring just prior to the commencement of the spring migration. The *S/S Update* summarizes the project operations that support these research activities.

The *S/S Update* does not repeat all of the information in the Water Management plan, but provides additional detail and specifies operations based on the current water supply forecast or changes that need to be made in operations because of the availability of current water supply forecasts and other new information.

## 2.0 Role of Water Supply Forecasts

There are four forecast points that are used to determine BiOp operation of the FCRPS reservoirs. The latest forecasts are given below.

Forecast Point	Forecast Period	Forecast Date	Value (April Final Forecast)
Lower Granite	April – July	February Final	20.8 MAF <sup>A</sup>
Lower Granite	April – July	February Final	20.8 MAF
The Dalles	April – August	February Final	88.2 MAF <sup>A</sup>
The Dalles	April – August	February Final	88.2 MAF
Hungry Horse	April – August	February Final	2.15 MAF <sup>AB</sup>
Libby	April - August	February	5.6 MAF <sup>C</sup>

All forecasts from Weather Service unless otherwise indicated

A – Value that is used to set operations

B – USBR Forecast      C – COE Forecast

Note: The April Final Forecast put out by the Weather Service assumes future precipitation to be normal.

## 3.0 Flow Objectives

### *Spring*

The spring flow objectives for Lower Granite and McNary are established by the April final water supply forecast. The Priest Rapids spring flow objective is fixed (not dependent on the water supply forecast). Based on the April final forecast the spring flow objectives are shown below.

Project	Spring Flow Objective
Lower Granite	100 KCFS
McNary	247 KCFS
Priest Rapids	135 KCFS

### *Summer*

Based on the latest water supply forecast (April Final) the summer flow objectives are shown below. The McNary summer flow objective is fixed (not dependent on the water supply forecast).

Project	Summer Flow Objective
Lower Granite	52 KCFS
McNary	200 KCFS

## ***Prospects For Meeting Flow Objectives***

An analysis of the likelihood of meeting the flow objectives was conducted by using the Corps' QADJ runs of the HYSSR model. This model uses the volume of the current water supply forecast and applies the 59-runoff shapes observed in the historical record to this forecast volume. The likelihood of meeting the flow objectives and refilling the reservoirs by the targeted dates is a function of both the runoff volume and the timeframe in which the snowmelt and stream flows occur. The likelihood of meeting the 2004 spring/summer flow objectives are listed below.

Summary  
of  
February  
2004  
QADJ  
Model  
Runs

19-Feb-04

### **Assumptions:**

- \* Streamflows were adjusted to the February Final Water Supply Forecast for the period of February thru August of 104 MAF at The Dalles and shaped 59 different ways based on observed historical runoff.
- \* Starting elevations were observed data from January 31, 2004.
- \* Grand Coulee helps meet Vernita Bar minimum flow objective of 70 kcfs in Feb-Mar drafting no lower than 1259.2 ft in Feb and 1261.0 ft in March. Operate to meet McNary flow objective of 247.3 kcfs drafting no lower than 1250.1 ft by Apr 15. Minimum draft elevations are based on a GCL/Dworshak shifted flood control and VECC/AER requirements.
- \* Hungry Horse operates to VARQ flood control or minimum flow from Jan - May and meets minimum flow of 3500 cfs at Columbia Falls, targets full in June, and drafts to 3540 ft by 31 Aug.
- \* Brownlee operates to flood control elevations.
- \* Dworshak targets elevation 1533.2 ft in Mar, 1542.2 ft by 15 Apr, and 1523.4 ft by 30 Apr, based on a GCL/DWR shifted flood control operation and maximum releases 15 kcfs in April and 13 kcfs May-Jun. DWR targets full in June with a minimum flow of 1.5 kcfs, releases a maximum of 13 kcfs in July - August to meet LWG flow objectives, and targets 1520 ft by 31 Aug.
- \* Libby operates on minimum flow or VARQ flood control Jan - Apr. Targets 13,900 cfs in May and 10,700 cfs in June for Sturgeon, based on an Apr-Aug forecast of 5.644 MAF and a Tier 3 required pulse of 0.88 MAF. Targets full in July with a minimum flow of 7,000 cfs for bull trout. Drafts to 2439 ft by 31 Aug.

**Results:**

Priest Rapids Meets Flow Objectives of 70 kcfs in Jan - Apr 15 and 135 kcfs in Apr 16 - Jun.

Month	Occurrences out of 59 Years	Average Flow for 59 Years (kcfs)
Feb	24	67
Mar	52	103
Apr 15	47	107
Apr 30	27	130
May	56	163
Jun	57	138

**Grand Coulee meets the Apr 15 flood control target elevation of 1249.0 ft in all 59 years. GCL operates to meet Bonneville objective of 125 kcfs in Feb-Mar.**

Lower Granite Meets Flow Objectives of 100 kcfs in Apr - May, 84 kcfs in June and 52 kcfs in Jul - Aug:

Month	Occurrences out of 59 Years	Average Flow for 59 Years (kcfs)
Apr 30	18	90
May	44	110
Jun	40	95
Jul	31	49
Aug 15	0	40
Aug 31	0	32

Bonneville Meets Flow Objectives of 125 kcfs in Feb - Apr:

Month	Occurrences out of 59 Years	Average Flow for 59 Years (kcfs)
Feb	59	136
Mar	57	176
Apr 15	57	203
Apr 30	59	245

McNary Meets Flow Objectives of 247.3 kcfs in Apr 15 - Jun and 200 kcfs in Jul - Aug:

Month	Occurrences out of 59 Years	Average Flow for 59 Years (kcfs)
Apr 30	16	221
May	55	273
Jun	46	278
Jul	25	192
Aug 15	2	161
Aug 31	0	145

Projects Refill by 30 June:

Month	Occurrences out of 59 Years	Average Elevation on 30 Jun for 59 Years
Libby	29	2456
Hungry Horse	44	3558
Grand Coulee	48	1288
Dworshak	39	1595

## Period Average Flows (kcfs)

	FEB 1-29	MAR 1-31	APR 1-15	APR 16-30	MAY 1-31	JUN 1-30	JUL 1-31	AUG 1-15	AUG 16-31
LIB	4.0	4.0	4.0	4.0	14.2	16.4	24.0	17.2	14.7
HGH	2.0	1.8	1.1	4.2	2.0	8.7	6.7	5.0	4.5
GCL	62.4	96.7	98.7	117.0	136.3	144.8	122.2	107.6	105.2
PRD	67.4	102.7	107.2	129.8	163.3	180.2	138.5	116.5	110.5
DWR	2.0	4.2	6.8	15.0	14.3	5.1	10.7	12.3	10.9
BRN	19.4	18.4	24.1	24.3	18.0	14.6	12.8	16.8	12.7
LWG	38.7	47.0	70.0	89.8	110.2	94.7	48.8	40.5	31.8
MCN	115.7	157.6	186.1	220.8	272.8	277.8	192.3	161.5	145.1
TDA	128.0	168.3	196.4	237.2	282.5	288.6	198.3	166.4	149.1
BON	136.5	175.8	202.8	245.3	285.1	291.0	201.4	169.0	151.3

## 4.0 Storage Project Operations

### *Libby Dam*

#### **Sturgeon Pulse**

The current water supply forecast (February) of 5.64 MAF for Libby (April – August) puts Libby operations in the 3rd tier of operation for sturgeon called for in the USFWS 2000 Biological Opinion. 5.64 MAF interpolated between Tier 3 and 4 calls for a Sturgeon flow volume of .88 MAF.

#### **Libby Outlook**

### *Hungry Horse Dam*

#### **Bull Trout Flows & Ramping Rates**

Based on the Bureau of Reclamation February forecast for April – August of 2146 kaf, the minimum outflow from Hungry Horse will be 900 cfs and the minimum flow for Columbia Falls will be 3,500 cfs.

#### **Hungry Horse Outlook**

### *Grand Coulee Dam*

#### **Grand Coulee Summer Draft Limit**

Based on the February final forecast of April – August runoff volume at the Dalles, the summer draft limit for Grand Coulee is expected to be 1278 feet.

## ***Dworshak Dam***

### **Summer Draft for Temperature Control**

A key operation at Dworshak Dam is to draft cold water from the Dworshak reservoir in July and August to cool water temperatures in the Lower Snake River for the benefit of migrating salmon and steelhead. In-season modeling will be done to provide information to aid in the making the decisions of when and how to draft Dworshak for water temperature control.

### **Dworshak Outlook**

## **5.0 Upper Snake River Flow Augmentation**

The Bureau of Reclamation currently estimates that between 250 and 300 kaf will be available for flow augmentation in 2003.

## **6.0 Flood Control Operations**

The flood control elevations based on the February final forecast are shown in the following table.

Note that April 10th flood control elevations are interpolated. As there is no official method of determining April 10th flood control elevations

Project	Date						
	31-Jan	28-Feb	15-Mar	31-Mar	10-Apr	15-Apr	30-Apr
ARDB	1430.5	1422.9		1414.1		1414.1	1414.1
LIB	2422.5	2431.6	2435.4	2435.4	2435.4	2435.4	2435.4
DCDB	1839.8	1807.7		1807.7		1807.7	1807.7
HGH	3543.8	3536.3		3529.1	3526.8	3525.6	3522
GCL	1290	1290		1272.8	1261.3	1255.5	1239.3
GCL-shifted	1290	1286		1265.8	1251.0	1243.6	
BRN	2077	2051.4		2049		2050.2	2049.8
BRN-shifted	2077	2077		2077		2077	
DWR	1539.5	1529.8		1521.6	1514.3	1510.6	1523.4
DWR-shifted	1539.5	1529.8		1533.2	1539.2	1542.2	0

## ***Dworshak/Grand Coulee flood control shift***

At the current time we are planning on shifting flood control from Dworshak to Grand Coulee.

## **7.0 Minimum Operating Pool**

The minimum operating pool (MOP) operation for the Lower Snake projects is scheduled to start April 3rd. The table below shows BiOp MOP operations. TMT may address, on an in-season management basis, navigation or other concerns that may result in adjustments in BiOp MOP operations.

Project	Lower Range		Upper Range	
	Operation	Elevation	Operation	Elevation
Ice Harbor	MOP	437	MOP + 1	438
Lower Monumental	MOP	537	MOP + 1	538
Little Goose	MOP	633	MOP + 1	634
Lower Granite	MOP	733	MOP + 1	734

At John Day the forebay will be operated within a 1.5-foot range between 262.5 and 264.0 feet from April 10th to September 30th.

## **8.0 Hanford Reach**

Note: This is last year's agreement.

### **GRANT COUNTY PUD ADAPTIVE MANAGEMENT PLAN to protect SALMON & STEELHEAD in the HANFORD REACH, PRIEST RAPIDS PROJECT AREA, AND UPPER TRIBUTARIES of the COLUMBIA RIVER July 29, 2002**

Subject to the limitations and conditions set out below, Grant PUD, shall provide the following flow regimes through the rearing period for fall Chinook salmon spawning and rearing in the Hanford Reach.

#### 1. Spawning Period

(a) Flows maintained during the spawning period and escapement levels are factors influencing the placement of redds. The flow manipulation is directed to minimize formation of redds above the 70 kcfs elevation. Minimizing formation of redds above the 70 kcfs elevation in turn is a key factor influencing the success of the flow regime during the emergence period.

(b) During the spawning period, Grant PUD will operate the Priest Rapids Project to the extent feasible through use of the mid-Columbia hourly coordination and reverse load factoring to produce a Priest Rapids outflow during daylight hours equal to 68% of the daily average Wanapum inflow. This obligation shall be in effect only if the daily average Wanapum inflow is between 80 kcfs and 125 kcfs. The goal during the spawning period is to limit spawning to the area below the 70 kcfs elevation on Vernita Bar. In the event physical changes are made at Priest Rapids which affect Grant PUD's ability to provide reverse load factoring, Grant PUD agrees to meet with the Fishery Agencies and Tribes to determine what adjustments to Grant PUD's obligation shall be made.

## 2. Pre-Hatch Period

During the pre-hatch Period the Priest Rapids outflow may be reduced to 36 kcfs for up to 8 hours on weekdays and 12 hours on weekends (with no two consecutive minimum periods). All participants recognize that utilization of the 36 kcfs minimum may have to be limited to achieve the Priest Rapids outflow goal during the spawning period.

## 3. Post-Hatch Period

(a) After hatching has occurred at redds located in the 36 to 50 kcfs zone, the protection level flow shall be maintained over Vernita Bar so that the intergravel water level is no less than 15 cm below the 50 kcfs elevation.

(b) After hatching has occurred at redds located in the zone above the 50 kcfs elevation, the protection level flow shall be maintained over Vernita Bar through the post hatch period so that the intergravel water level is no less than 15 cm below the critical elevation.

## 4. Emergence Period

(a) During the emergence period, after emergence has occurred in the 36 to 50 kcfs zone, the protection level flow shall not be less than necessary to maintain water over Vernita Bar at the 50 kcfs elevation.

(b) During the emergence period, after emergence has occurred above the 50 kcfs elevation, the protection level flow shall be maintained at or above the critical elevation.



## 5. Rearing Period

(a) Flow fluctuations during the rearing period may impact juvenile fall chinook. Elimination of all flow fluctuations is not physically possible without severely impacting the ability of mid-Columbia operators to produce a reliable supply of electricity. The goal during the rearing period is to provide a high level of protection for juvenile fall chinook rearing in the Hanford Reach by limiting flow fluctuations while retaining a reasonable level of load-following capability at each of the 7 dams on the mid-Columbia River.

(b) During the rearing period, Grant PUD will operate the Priest Rapids Project to the extent feasible through use of the mid-Columbia Hourly Coordination Agreement to produce a Priest Rapids outflow that limits flow fluctuations according to the following criteria:

(1) When previous day average weekday Priest Rapids outflow is between 36 and 80 kcfs limit Priest Rapids outflow weekday delta to no more than 20 kcfs. When the average of BPA's Friday Priest Rapids outflow estimates for Saturday and Sunday is between 36 and 80 kcfs limit the Priest Rapids outflow weekend delta to no more than 20 kcfs.

(2) When previous day average weekday Priest Rapids outflow is between 80 and 110 kcfs limit Priest Rapids outflow weekday delta to no more than 30 kcfs. When the average of BPA's Friday Priest Rapids outflow estimates for Saturday and Sunday is between 80 and 110 kcfs limit the Priest Rapids outflow weekend delta to no more than 30 kcfs.

(3) When previous day average weekday Priest Rapids outflow is between 110 and 140 kcfs limit Priest Rapids outflow weekday delta to no more than 40 kcfs. When the average of BPA's Friday Priest Rapids outflow estimates for Saturday and Sunday is between 110 and 140 kcfs limit the Priest Rapids outflow weekend delta to no more than 40 kcfs.

(4) When previous day weekday average Priest Rapids outflow is between 140 and 170 kcfs limit Priest Rapids outflow weekday delta to no more than 60 kcfs. When the average of BPA's Friday Priest Rapids outflow estimates for Saturday and Sunday is between 140 and 170 kcfs limit the Priest Rapids outflow weekend delta to no more than 60 kcfs.

(5) When previous day average Priest Rapids outflow is greater than 170 kcfs Priest Rapids outflow for the following day will be at least 150 kcfs.

## 6. Monitoring Team

For purposes of determining the protection level flow during the post hatch and emergence periods, a critical elevation shall be determined each year as follows:

(a) The monitoring team will survey redds on Vernita Bar in a specified area for the purpose of determining the initiation of spawning, the location of redds and the extent of spawning. The surveys will be conducted on weekends beginning on the weekend closest to October 15 of each year.

(b) The monitoring team will make a final redd survey the weekend prior to Thanksgiving to determine the critical elevation, which will be set as follows: (Elevations must be in 5 kcfs increments beginning at the 40 kcfs elevation.)

(1) If 31 or more redds are located above the 65 kcfs elevation, the critical elevation will be the 70 kcfs elevation.

(2) If there are 15 to 30 redds above the 65 kcfs elevation, the critical elevation will be the 65 kcfs elevation.

(3) If there are fewer than 15 redds above the 65 kcfs elevation, then the critical elevation will be the first 5 kcfs elevation above the elevation containing the 16<sup>th</sup> highest redd within the survey area on Vernita Bar (see Table 1 below for examples of the application of these counts).

Table 1. Examples illustrating theoretical final Vernita Bar redd counts and the resulting critical elevations, elevations are provided in kcfs ranges.

	36-50 kcfs	50-55 kcfs	55-60 kcfs	60-65 kcfs	65-70 kcfs	70+ kcfs	Resulting Critical Elevation
Example 1	836	418	148	71	48	34	70
Example 2	283	94	65	28	16	4	65
Example 3	105	35	10	3	1	0	55

(c) Additional activities of the monitoring team will include calculation of temperature units, determination of the dates of initiation of spawning, hatching, emergence, the end of the emergence period and the end of the rearing period. The monitoring team may also make nonbinding recommendations including non-binding recommendations to protect redds above the critical elevation or to address special circumstances. By August 1 of the following year, Grant PUD will submit an annual report to the monitoring team and BPA. The annual report will include, but not be limited to: 1) Vernita Bar redd counts, 2) dates on which the hatching, emergence, end of emergence and end of rearing occurred, 3) a record of Columbia River flows through the Hanford Reach based on Priest Rapids discharges, and 4) a description of the actual flow regimes from the initiation of spawning through the rearing period based on available data. After review by the monitoring team, the final report will be sent to all participants.

## 7. Redds Above Critical Elevation

This Agreement is not intended either to preclude or require protection of redds above the critical elevation.

## **9.0 Spill for Juvenile Fish Passage**

Note: At this time the spill operations for the 2004 spill season have not been finalized yet. Information below is the best of our knowledge and subject to change.

### ***Spring Spill Operations – Snake River Dams***

At the current time it appears that the forecasted inflow will be greater than 85 kcfs this year we will be spilling the Lower Snake projects in the spring. The spring spill season on the Snake River is from April 3rd to June 20th. .

#### **Lower Granite Dam**

Spring spill at Lower Granite will consist of spill using the RSW 24 hours a day. Spill using the RSW consists of spilling 6.7 – 7.7 kcfs through the RSW and some yet to be determined training spill. Last year the training spill was approximately 13 kcfs. A proposed test for this spring is testing the effect of having the BGS (Behavioral Guidance Structure) in place as compared to having the BGS not in place. (See section 11 for further details)

#### **Little Goose Dam**

Spring spill passage at Little Goose Dam will be as specified in the BiOp. Spill nights to gas cap (1800 – 0600)

#### **Lower Monumental Dam**

Spring spill at Lower Monumental Dam has been modified from that called for in the BiOp. Spill will be 24 hours a day with the spill percentage being 45% when total project outflow is less than 75 kcfs or greater than 100 kcfs. The spill percentage is 50% when the total project outflow is between 75 and 100 kcfs. Spill not to exceed the TDG gas cap. (See section 11 for further details)

#### **Ice Harbor Dam**

Spill operation will involve two distinct operations including one “bulk” spill pattern and one small gate-opening pattern. Specifics will be coordinated with the fishery agencies and others as needed. The last I heard was the “bulk” spill pattern will consist of spilling 100 kcfs 24 hours a day and spilling the small gate pattern will consist of spilling 45 kcfs 24 hours a day. (See section 11 for further details)

## ***Summer Spill Operations – Snake River Dams***

Note: The Action Agencies are currently looking at the possibility of modifying the summer spill program. What is presented below is the BiOp summer spill program.

The summer spill planning period is June 21-August 31 for the Lower Snake projects.

### **Lower Granite Dam, Little Goose, Lower Monumental Dam**

As recommended in the BiOp, no spill and full transport will be conducted at the Snake River transport dams.

### **Ice Harbor Dam**

Spill operation will involve two distinct operations including one “bulk” spill pattern and one small gate-opening pattern. Specifics will be coordinated with the fishery agencies and others as needed. The last I heard was the “bulk” spill pattern will consist of spilling 100 kcfs 24 hours a days and spilling the small gate pattern will consist of spilling 45 kcfs 24 hours a day. (See section 11 for further details)

## ***Spring and Summer Spill Operations – Lower Columbia River Dams***

Note: The Action Agencies are currently looking at the possibility of modifying the summer spill program. What is presented below is the BiOp summer spill program.

The spring spill planning period for the Lower Columbia River dams is 4/10-6/30 (Spill started 4/14). The summer spill planning period is July 1 - August 31 for Lower Columbia River projects. Spring and summer spill operations on the Lower Columbia River Dams are nearly identical. The exception is McNary Dam at which no summer spill occurs.

### **McNary Dam**

Spring spill will be conducted as specified in the BiOp which calls for night spill (1800 – 0600) to the gas cap. Spring spill will be suspended when river conditions are no longer spring-like (flows <200 kcfs and water temperature >62-degrees F) and transport initiated. No summer spill occurs at McNary Dam.

### **John Day Dam**

Spill will be provided from April 10 through August 31 for spring and summer migrants as required in the NMFS Biological Opinion. Between May 15 and July 20, spill will occur from 1900 to 0600 hours (11 hours total). Before that time period, spill will be for 12 hours nightly, from 1800 to 0600 hours. From April 10 to July 20, spill discharges will be 60% of instantaneous project flow at project flows up to 300,000 cfs. Above 300,000 cfs project flow, spill discharges will be 180,000 cfs (up to the hydraulic limit of the powerhouse). From July 21 through August 31, spill will be 30% of instantaneous project flow 24-hours per day. Spill will be provided in a manner consistent with TDG management to avoid excessive gas supersaturation

### **The Dalles Dam**

Spill will be 40% of total project outflow out to exceed the TDG cap.

### **Bonneville Dam**

Spill will be as specified in the BiOp, spill to the TDG cap at night and spill 75 kcfs (fallback limit) during the day.

## **10. Water Quality**

### ***Spill Priority List***

River operations are conducted to meet State Clean Water Act total maximum daily load (TMDL) dissolved gas standards. Also, research operations at a particular dam can be impacted by involuntary spill. Thus spill at research projects is given lower priority in the hope that involuntary spill can be eliminated during research. In 2004 involuntary spill will occur in the following order:

1. Little Goose
2. Lower Monumental
3. McNary
4. The Dalles
5. Bonneville
6. Priest Rapids
7. Rocky Reach
8. Wells
9. Rock Island
10. Lower Granite
11. Ice Harbor
12. John Day
13. Wanapum
14. Chief Joseph
15. Grand Coulee

## **2003 GAS Cap levels**

The range of gas caps during 2003 at the projects were:

	Min	Max
BON	100	170
TDA	85	135
JDA	95	165
MCN	100	160
IHR	51	110
LMN	15	44
LGS	27	43
LWG	36	43

## **Other Spill Operations**

Based on a study conducted by a subgroup of the Regional Forum Water Quality Team, it was determined that joint operations of Chief Joseph and Grand Coulee Dam for power and total dissolved gas production could result in an overall reduction in TDG levels both upstream and downstream of Chief Joseph dam by taking advantage of the larger generation flow capacity of Grand Coulee and the lower average TDG loading below the Chief Joseph spillways (absent deflectors). As a result of this study, and coordination with the Bureau of Reclamation and the Colville Tribe, the joint operation of Grand Coulee and Chief Joseph will be conducted during the 2004 spill season. Operationally, this will be as follows,

- When Lake Roosevelt is below 1260' elevation, spill from the Grand Coulee outlet tubes be avoided by shifting all spill to Chief Joseph for spill discharges up to 70 kcfs. If river conditions require spill releases above 70 kcfs at Chief Joseph, the additional spill should be distributed between Chief Joseph and Grand Coulee in a 2.5 to 1 ratio.
- When Lake Roosevelt TDG is elevated and at or above 1260' elevation, spill over the drum gates at Grand Coulee may be beneficial to the system due to potential degassing. The continuation of monitoring practices and additional investigations of these operational measures on TDG exchange are recommended to further establish efficient and effective joint operations at Grand Coulee and Chief Joseph.

## **11. 2004 Fish Passage Research**

A summary of 2004 fish passage research studies that have the potential to change project operation are described below and in the 2004 Snake River and Lower Columbia River Spring-Summer Research Summary Tables (following pages).

## **Lower Granite Dam**

The Removable Spillway Weir (RSW) was installed in the summer of 2001. It underwent extensive biological testing in spring 2002 and 2003. During February and March 2004, the Behavioral Guidance Structure will be moved to the north two units and the depth decreased along part of its length. The 2004 biological test will likely take place between mid-April and early June. The expected forebay elevation during testing will be between 734 and 735 feet, providing approximately 6,700 to 7,700 cfs over the RSW. A specific study design has not been finalized at this time, but will likely involve 24 hour per day operation of the RSW, along with some level of "training spill". Monitoring will likely consist of radio-telemetry. Monitoring will focus on RSW efficiency and effectiveness, and fish behavior in the vicinity of the RSW and relocated BGS. The evaluation may involve periodic removal of the BGS, which would likely result in short-term (1 – 3 hours) outages at units 5 and 6. A summer test of the RSW and BGS may also take place in 2004. This would occur sometime between mid-June and late July and would most likely run for 3 or 4 weeks. Radio-telemetry would again be used to assess RSW performance. Project operations would most likely include the RSW (between 6,000 and 7,700 cfs) and some level of training spill, 24 hours per day.

## **Lower Monumental Dam**

**Lower Monumental Spillway Survival Study.** Survival studies will be conducted using radio-telemetry in 2004. Two spill patterns will be tested in a 2-day blocked design. The two patterns will be determined through discussions within the region and physical model testing at ERDC in Mississippi.

**Near-field Study of Total Dissolved Gas Exchange and Evaluation of Added Spillway Deflector Performance.** As part of the COE Fastrack Gas Abatement Program, total dissolved gas abatement alternatives are being developed to reduce the TDG exchange associated with spill operations and to provide greater flexibility in scheduling spillway operations. Additional spillway deflectors for bays 1 and 8 were constructed in late 2002 and early 2003, and now all spillway bays are so equipped. A field study is proposed to address the TDG exchange associated with the modified spillway and associated operations under a wide range of operating conditions. The proposed long-term monitoring program will be initiated in April 2004 prior to the spill season and continue through the end of spill, typically in June.

This three month sampling period will provide for the widest range of operating and environmental conditions. This study will primarily focus on determining the total dissolved gas exchange characteristics associated with spillway operation for discharges up to the design spill for a 7-day, 10-year frequency flood. The incorporation of specific operations could significantly enhance study findings. These special operations could include scheduled spill outage to maintain TDG instruments, alternative spill patterns including bulk spill, management of tailwater stage through storage in Lake Sacagawea, and constant spill with and without powerhouse flows. Circulation patterns below the dam will also be described through a variety of sampling devices. This information will

support the interpretation of study TDG data and related issues concerning fish passage through this river reach.

### **Ice Harbor Dam**

**Spillway Survival Study.** Radio telemetry, PIT, and balloon tag studies will estimate the survival rates of test fish passing over the spillway. Project operations (spill levels and possibly patterns) will change according to a randomized block schedule. Details of the schedule and operations are not available at this time, but will be developed through the SRWG and FFDRWG. Spill operation will involve two distinct operations including one “bulk” spill pattern and one small gate opening pattern. Specifics will be coordinated with the fishery agencies and others as needed.

### **McNary Dam**

**Operation of Turbine Units Outside of 1% best Operating Range.** An operation of turbine units at McNary Dam outside of the normal 1% best efficiency operating range, up to 115% of overload (approximately 80 MWs), is proposed for the spring of 2004. A plan for monitoring this operation is being prepared and coordinated with the region.

### **The Dalles Dam**

**Spillwall Post Construction Evaluation.** Survival and injury estimates for spillway passed fish will be generated using balloon tag techniques. Test fish will be passed through bays 2 and 4 and 8 (optional, depending on river flow) via release hoses. Control fish will be released downstream of the end sill via a hose. Two test discharges will be evaluated: one per bay discharge that is between 12 and 18 kcfs, and 21 kcfs.

The 21 kcfs treatment may require a forebay restriction at Bonneville, in order to achieve an appropriate tailwater elevation at The Dalles. This will be coordinated with RCC, BPA and regional salmon managers during the study. The balloon-tag study is expected to run from 13 April – 1 May. Each day testing will begin at 0700 hours and conclude around 1900 hours. The balloon-tag study will occur only in the springtime. The start date will be selected prior to the finalization of the FPP. To conduct these evaluations, tailrace BRZ access is required. The hydraulic environment encountered by test fish in the tailrace will be characterized using autonomous sensors released through spillway hoses. Total mortality rates will be estimated using radio telemetry. Radio tagged fish will be released in John Day Dam’s tailrace, The Dalles Ice and Trash Sluiceway, and The Dalles tailrace. This study element will start in late April and conclude around July 20.

**Sluice Operations Evaluation.** An alternative sluiceway operation will be evaluated in 2004. Fixed hydroacoustics, 3-D acoustic telemetry, and radio telemetry will be used to estimate sluice passage. The schedule (Table 1 and Table 2) will include 2 treatments: operation of gates 1-1, 1-2, 1-3 and operation of gates 1-1, 1-2, 1-3, 18-1, 18-2, and 18-3.



**Treatments will be switched at 0800 hours daily.** Testing will begin April 19 and end on July 17

**Table 1. TDA spring sluice operations(all 3 gates open for MU1 and MU18).**

Study Block	Study Day	Summer Date	Day of Week	Sluice Treatment	Study Block	Study Day	Summer Date	Day of Week	Sluice Treatment
1	1	19-Apr	Mon	MU 1	14	27	15-May	Sat	MU 1, MU 18
1	2	20-Apr	Tue	MU 1, MU 18	14	28	16-May	Sun	MU 1
2	3	21-Apr	Wed	MU 1, MU 18	15	29	17-May	Mon	MU 1
2	4	22-Apr	Thur	MU 1	15	30	18-May	Tue	MU 1, MU 18
3	5	23-Apr	Fri	MU 1, MU 18	16	31	19-May	Wed	MU 1, MU 18
3	6	24-Apr	Sat	MU 1	16	32	20-May	Thur	MU 1
4	7	25-Apr	Sun	MU 1, MU 18	17	33	21-May	Fri	MU 1
4	8	26-Apr	Mon	MU 1	17	34	22-May	Sat	MU 1, MU 18
5	9	27-Apr	Tue	MU 1	18	35	23-May	Sun	MU 1, MU 18
5	10	28-Apr	Wed	MU 1, MU 18	18	36	24-May	Mon	MU 1
6	11	29-Apr	Thur	MU 1, MU 18	19	37	25-May	Tue	MU 1, MU 18
6	12	30-Apr	Fri	MU 1	19	38	26-May	Wed	MU 1
7	13	1-May	Sat	MU 1	20	39	27-May	Thur	MU 1, MU 18
7	14	2-May	Sun	MU 1, MU 18	20	40	28-May	Fri	MU 1
8	15	3-May	Mon	MU 1	21	41	29-May	Sat	MU 1
8	16	4-May	Tue	MU 1, MU 18	21	42	30-May	Sun	MU 1, MU 18
9	17	5-May	Wed	MU 1	22	43	31-May	Mon	MU 1
9	18	6-May	Thur	MU 1, MU 18	22	44	1-Jun	Tue	MU 1, MU 18
10	19	7-May	Fri	MU 1	23	45	2-Jun	Wed	MU 1, MU 18
10	20	8-May	Sat	MU 1, MU 18	23	46	3-Jun	Thur	MU 1
11	21	9-May	Sun	MU 1, MU 18	24	47	4-Jun	Fri	MU 1
11	22	10-May	Mon	MU 1	24	48	5-Jun	Sat	MU 1, MU 18
12	23	11-May	Tue	MU 1, MU 18					
12	24	12-May	Wed	MU 1					
13	25	13-May	Thur	MU 1, MU 18					
13	26	14-May	Fri	MU 1					

**Table 2. TDA summer sluice operations**(all 3 gates open for MU1 and MU18).

Study Block	Study Day	Summer Date	Day of Week	Sluice Treatment	Study Block	Study Day	Summer Date	Day of Week	Sluice Treatment
1	1	6-Jun	Sun	MU 1	12	23	28-Jun	Mon	MU 1, MU 18
1	2	7-Jun	Mon	MU 1, MU 18	12	24	29-Jun	Tue	MU 1
2	3	8-Jun	Tue	MU 1, MU 18	13	25	30-Jun	Wed	MU 1, MU 18
2	4	9-Jun	Wed	MU 1	13	26	1-Jul	Thur	MU 1
3	5	10-Jun	Thur	MU 1, MU 18	14	27	2-Jul	Fri	MU 1, MU 18
3	6	11-Jun	Fri	MU 1	14	28	3-Jul	Sat	MU 1
4	7	12-Jun	Sat	MU 1, MU 18	15	29	4-Jul	Sun	MU 1
4	8	13-Jun	Sun	MU 1	15	30	5-Jul	Mon	MU 1, MU 18
5	9	14-Jun	Mon	MU 1	16	31	6-Jul	Tue	MU 1, MU 18
5	10	15-Jun	Tue	MU 1, MU 18	16	32	7-Jul	Wed	MU 1
6	11	16-Jun	Wed	MU 1, MU 18	17	33	8-Jul	Thur	MU 1
6	12	17-Jun	Thur	MU 1	17	34	9-Jul	Fri	MU 1, MU 18
7	13	18-Jun	Fri	MU 1	18	35	10-Jul	Sat	MU 1, MU 18
7	14	19-Jun	Sat	MU 1, MU 18	18	36	11-Jul	Sun	MU 1
8	15	20-Jun	Sun	MU 1	19	37	12-Jul	Mon	MU 1, MU 18
8	16	21-Jun	Mon	MU 1, MU 18	19	38	13-Jul	Tue	MU 1
9	17	22-Jun	Tue	MU 1	20	39	14-Jul	Wed	MU 1, MU 18
9	18	23-Jun	Wed	MU 1, MU 18	20	40	15-Jul	Thur	MU 1
10	19	24-Jun	Thur	MU 1	21	41	16-Jul	Fri	MU 1
10	20	25-Jun	Fri	MU 1, MU 18	21	42	17-Jul	Sat	MU 1, MU 18
11	21	26-Jun	Sat	MU 1, MU 18					
11	22	27-Jun	Sun	MU 1					

**Bonneville Dam**

**Bonneville Rehab Biological Testing (also testing under the Turbine Survival Program).** Main unit 1 will need to be commission tested once it returns to service in May 2004. The unit will undergo a series of pre-startup tests. A normal pre-start scenario is to mechanically roll the unit for 1 day. After the unit has been deemed structurally sound, the unit will be HIPOT tested for 2-3 days. After this test series is complete the unit will be subjected to a minimal run load rejection test. Once test are completed the unit will be then advanced to a 72 hour run test, followed by the 100 day commissioning test. Unit 1 is scheduled to return to normal operation by early June 2004. This commissioning test was coordinated with the FFDRWG group and endorsement was gained to complete the test on February 3, 2004.

**Survival Evaluation.** As part of the B2 corner collector evaluation, project and route specific survival, and passage distribution will be estimated for spring and summer migrants. We will evaluate survival of spring chinook salmon and steelhead through (1) the B1 ice and trash sluiceway, (specific gates to be evaluate are 2c, 4c, & 6c in the Spring, and 1c, 3c, & 6c in the Summer), (2) through an MGR turbine unit (MU-4), and from upstream releases through the B2 CC, B2 JBS, spillway, and both powerhouses. We will evaluate survival of fall chinook salmon through the B1 ice and trash sluiceway (specific sluice gates to be evaluated are 1c, 3c, & 6c in the Summer), and with upstream

releases through the B2 CC, B2 JBS, Spillway and both powerhouses. It is expected that unit 4 that is being used for turbine survival testing will need to be shut down for release pipe/hose installation, and potentially in-season fixes. Due to the potential for changes in operations that could affect presently planned survival research contingency plans are being formulated for discussions with regional fishery managers.

Research at MU-4 MGR likely will occur during the spring passage season only. Unit outages will be required for the installation and removal of monitoring equipment in the sluiceway and MU-4 both Spring and Summer. Further, there will likely be the need for unit outages in order to fix broken or non-functional equipment within the evaluation timeframe (April through July). Specific project operations required will be maintaining unit 4 as a priority unit for the spring passage season/evaluation. Powerhouse priority during the MGR testing should keep unit 4 as first on last off with a minimum of unit 2 operating as the same time during testing to maintain good egress conditions of test fish through the test period (April- July 2004).

**Prototype Testing of Fish Guidance Efficiency (FGE) Improvements and Unit Gap Loss at Bonneville Second Powerhouse.** In 2004, prototype testing of a newly designed VBS will be conducted with two differing technologies (DIDSON & hydroacoustics). Testing will begin in late April and conclude in late July and will require the test units (15 & 17) to be shut down for short periods for removal and placement of the DIDSON camera frame. The required outage will be for approximately 1-2 hours for each unit per day for two weeks. Additional hydroacoustics transducers have will be installed in units 11, 12, 15, 17 to measure changes in FGE minus Turbine Intake Extensions (TIEs) and the B2CC operating.

Hydroacoustics will be used to estimate FGE (ERDC and PNNL). For the PNNL deployment, transducers will be installed both on the STS and on the trash racks prior to the test start date. Testing will be completed by Mid July. Installation on both the trash racks and STS will require a one-day outage. As always, several outages should be expected throughout the testing season to repair equipment.

It is expected that the test units will be available for normal operation during non-testing periods (unless significant fish injury is seen) to meet project/regional needs.

**Unit Priorities for spring and summer.** Unit priorities will be the same at B2 for the spring and summer in order of first on last off – 11, 17, 12, 13, 18, 14, 15, & 16. These operations are in support of the FGE and survival tests planned. Unit priorities will differ at B1 from spring and summer. Spring priorities at B1 are 4, 2, 3, 5, 6, 7, 10, 8, & 9. Sluice gates at B1 that will be operational in the spring will be 2c, 4c, & 6c. Summer priorities at B1 are 1, 3, 4, 5, 6, 7, 10, 8, & 9. Sluice gates that will be operational in the summer will be 1c, 3c, & 6c.

## 12 Appendix – Research Plans

To be filled out later as more details become available.