

# ***Final 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 “May 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. 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 (May Final) are given below.

Forecast Point	Forecast Period	Forecast Date	Value
Lower Granite	April – July	April Final	15.6 MAF <sup>A</sup>
Lower Granite	April – July	May Final	13.1 MAF
The Dalles	April – August	April Final	73.4 MAF <sup>A</sup>
The Dalles	April – August	May Final	68.4 MAF
Hungry Horse	April – August	March Final	1939 KAF <sup>AB</sup>
Libby	April - August	May	4.9 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

## 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	85 KCFS
McNary	220 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	50 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.

See Appendix A for the latest QADJ run. (Based on the May Early water supply forecast)

## **4.0 Storage Project Operations**

See Appendix B for Volume Charts for Libby, Dworshak and Hungry Horse.

### ***Libby Dam***

#### **Sturgeon Pulse**

The current water supply forecast May of 4.9 MAF for Libby (April – August) puts Libby operations in the 2nd tier of operations for sturgeon called for in the USFWS 2000 Biological Opinion. The 2nd tier sturgeon operation calls for a sturgeon flow volume of .8 MAF and minimum bull trout flows of 7 kcfs in July.

An SOR with specific flow and date recommendations will be submitted to TMT prior to initiating a flow operation for sturgeon.

### ***Hungry Horse Dam***

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

Based on the Bureau of Reclamation March forecast for April – August of 1939 kaf, the minimum outflow from Hungry Horse will be 900 cfs and the minimum flow for Columbia Falls will be 3,500 cfs.

### ***Grand Coulee Dam***

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

Based on the May final forecast of April – August runoff volume at the Dalles, the summer draft limit for Grand Coulee is expected to be 1278 feet. The draft limit for this project changes from 1280 to 1278 when the July final April-to-August runoff volume forecast for The Dalles is less than 92 Maf. The current forecast (May final) calls for a runoff volume of 68.4 MAF during this period.

## ***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.

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

The Bureau of Reclamation currently estimates 300 kaf will be available for flow augmentation in 2004.

## **6.0 Flood Control Operations**

The flood control elevations based on the April 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		1424.1	1424.1
LIB	2422.5	2431.6	2441.1	2441.1	2442.6	2443.4	2443.3
DCDB	1839.8	1807.7		1815.9		1807.7	1807.7
HGH	3543.8	3536.3		3538.5	3545.8	3549.5	3549.6
GCL	1290.0	1290.0		1283.3	1283.3	1283.3	1283.1
GCL-shifted	1290.0	1286.0		1277.7	1279.0	1279.6	
BRN	2077.0	2051.4		2053.4		2076.6	2077.0
BRN-shifted	2077.0	2077.0		2077.0		2077.0	
DWR	1539.5	1529.8		1538.3	1544.8	1548.0	1548.0
DWR-shifted	1539.5	1529.8		1547.2	1559.7	1566.0	

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

No Dworshak/Grand Coulee flood control shift occurred this year. The elevation of Dworshak Reservoir at the end of March precluded the potential for conducting a shift between these projects this year.

## 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 planned operations in 2004. It was agreed at the March 17, 2004 TMT meeting that because of human health and safety issues associated with navigation concerns Ice Harbor, Little Goose, and Lower Granite would be operated at MOP+1 to MOP+2. 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+1	438	MOP + 2	439
Lower Monumental	MOP	537	MOP + 1	538
Little Goose	MOP+1	634	MOP + 2	635
Lower Granite	MOP +1	734	MOP + 2	735

At John Day the forebay will be operated within a 1.5-foot range of the minimum level that provides irrigation pumping from April 10th to September 30th. The initial range will be 262.5 and 264.0feet. The minimum level will be adjusted upward if needed to facilitate irrigation pumping.

## 8.0 Hanford Reach

The Vernita Bar protection level flow was set at a level of 70 kcfs based on the November redd count. This year's Vernita Bar protection operation is scheduled to end May 11. See Appendix C for the Hanford Reach Agreement.

## 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***

The forecasted inflow for Lower Granite Dam is significantly lower than the 85 kcfs trigger level, at which the 2000 NMFS BiOp call for maximizing juvenile fish transport. After discussions in the regional Technical Management Team and Implementation Team forums and no consensus being reached, the Corps of Engineers issued the following statement on this issue.

## **Corps of Engineers Decision 2004 Spring Spill at Lower Snake River Projects**

The NOAA 2000 Biological Opinion (BiOp) has provisions for spill when seasonal average Snake River flows are projected to be above 85,000 cfs (RPA 40). April final runoff volume forecast is for seasonal average Snake River flows to be about 77,000 cfs, well below the threshold for spill. As a result, the BiOp calls for maximizing fish collection and transportation in the Snake River. Recent transport research results have raised questions about the benefits of transporting yearling Chinook salmon in April (as opposed to leaving them to migrate inriver) and NOAA Fisheries has been proposing reconsideration of the transportation criteria for early season migrants (RPA 51). As a result, two System Operation Requests have been issued, requesting spill in the Lower Snake for Spring 2004. On April 14, 2004 the Technical Management Team (TMT) met to discuss these Spring Spill operations in the Lower Snake River. Because TMT could not reach agreement, it was elevated to the Implementation Team (IT) on April 15.

Based on the discussions at IT, the Corps has decided to provide spill at Lower Granite and Little Goose until 23 April to provide inriver passage for yearling Chinook prior to the steelhead juvenile migration. In addition, subject to further consideration by the Study Review Work Group regarding the design of the modified spill research at Lower Monumental, up to 18 days of spill will be initiated there for early inriver passage and for the study. Three days of spill will be available prior to 26 April and 15 days will be available beginning 26 April and provided per the research design. Although the study is not considered the premier study, other valuable research can be gathered and the sunk costs are not lost. The Lower Granite behavioral guidance structure testing planned for 2004 will be postponed until April 2005.

### **Lower Granite Dam**

Spill at Lower Granite started April 3. The default spill operation was spill using the RSW plus training spill of approximately 12 kcfs. There was several times that spilling to the 120% gas at night was used to offset times when daytime spill was not available because of equipment installation. Spill ended April 23.

### **Little Goose Dam**

Spill at Little Goose started April 7. Spring spill passage at Little Goose Dam was as specified in the BiOp. Spill nights to gas cap (1800 – 0600). Spill ended April 23.

### **Lower Monumental Dam**

The amount to be spilled is a percentage of the project outflow with the spill percentage being 50% when total project outflow is less than 75 kcfs or greater than 100 kcfs. The spill percentage is 45% when the total project outflow is between 75 and 100 kcfs. Because of the low water supply this year spill at Lower Monumental will be limited. In the “Corps of Engineers Decision 2004 Spring Spill at Lower Snake River Projects” it was agreed to spill for three days prior to the spill test and to spill for 15 (note the researchers asked for 14) days during the spill test. Spill at Lower Monumental started April 24. It was agreed to use the “3 days” of spill prior to the test to spill at night (1800 –

0600) for 6 days. The spill test will consist of 14 days of spill using the “Bulk” spill pattern 24 hours a day.

Note: A near field TDG test is scheduled during the spring (See section 11 for further details)

### **Ice Harbor Dam**

A test of the effect on juvenile fish of two different spill patterns will be tested this spring and summer. The dates of this test will be from April 15th to July 15th. 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 “bulk” spill pattern will consist of spilling up to the gas cap 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). Spill during the non-test period will be as specified in the BiOp (spill limited to 45 kcfs during the day and spill to the gas cap at night). Spill started at Ice Harbor April 13.

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

Note: The Action Agencies are currently looking at the possibility of modifying the summer spill program. See Appendix D. 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**

See spring spill section for 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. See Appendix D. 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. 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 exceptions are McNary Dam at which no summer spill occurs and at John Day where the spill percentage and spill period changes between the spring and summer spill periods.

**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 spill not to exceed the 120% 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. An evaluation of the recently constructed corner collector at the 2nd powerhouse is scheduled for the summer spill period.



## 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. Starting out in 2004 involuntary spill will occur in the following order:

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

On May 7 the order changed to:

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

This change was made to help maximize juvenile fish transport at the collector dam on the Lower Snake River.

### **2003 GAS Cap levels**

The range of gas caps during 2003 at the projects is shown below. The flow ranges listed below maintained the gas cap limits at the individual projects during the year.

	Min Kcfs	Max Kcfs
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**

Summaries of 2004 fish passage research studies that have the potential to change project operation are described below.

### **Lower Monumental Dam**

Below is the spill pattern used during the spill test.

spillgate								Total	Total
1	2	3	4	5	6	7	8	Stops	Spill
						1		1	1.1
						2		2	2.2
						3		3	3.3
						4		4	4.4
						5		5	5.5
						6		6	6.6
						7		7	7.7
						8		8	8.8
		4.5				4.5		9	10.5
		5				5		10	12.2
		5.5				5.5		11	13.9
		6				6		12	15.6
		6				7		13	17.3
		7				7		14	19
5		5				5		15	23.7
5.5		5				5.5		16	26.3
5.5		5.5				6		17	27.1
6		6				6		18	28.8
6.5		6				6.5		19	30.5
7		6				7		20	
7		7				7		21	31.4
5.5		5.5		5.5		5.5		22	35
6		5.5		5.5		6		23	36.7
6		6		6		6		24	38.4
6		6		6		7		25	40.1
7		6		6		7		26	41.8
7		7		6		7		27	43.5
7		7		7		7		28	45.2
2	5	4	4	4	4	4	2	29	44.8
2	5	4	4	4	4	5	2	30	46.4
2	5	5	4	4	4	5	2	31	48.1
2	5	5	4	4	5	5	2	32	49.8
2	5	5	5	4	5	5	2	33	51.5
2	5	5	5	5	5	5	2	34	53.2
2	6	5	5	5	5	5	2	35	54.9
2	6	5	5	5	5	6	2	36	56.6
2	6	6	5	5	5	6	2	37	58.3
2	6	6	5	5	6	6	2	38	60
2	6	6	6	5	6	6	2	39	61.7
2	6	6	6	6	6	6	2	40	63.4
2	7	6	6	6	6	6	2	41	65.1
2	7	6	6	6	6	7	2	42	66.8
2	7	7	6	6	6	7	2	43	68.5
2	7	7	6	6	7	7	2	44	70.2

Spillgate								Total Stops	Total Spill
1	2	3	4	5	6	7	8		
2	7	7	7	6	7	7	2	45	71.9
2	7	7	7	7	7	7	2	46	73.6
2	8	7	7	7	7	8	2	48	77
2	8	8	7	7	7	8	2	49	78.8
2	8	8	7	7	8	8	2	50	80.6
2	8	8	8	7	8	8	2	51	82.4
2	8	8	8	8	8	8	2	52	84.2
2	9	8	8	8	8	8	2	53	86
2	9	8	8	8	8	9	2	54	87.8
2	9	9	8	8	8	9	2	55	89.5
2	9	9	8	8	9	9	2	56	91.2
2	9	9	9	8	9	9	2	57	92.9
2	9	9	9	9	9	9	2	58	94.6
2	10	9	9	9	9	9	2	59	96.3
2	10	9	9	9	9	10	2	60	98
2	10	10	9	9	9	10	2	61	99.7
2	10	10	9	9	10	10	2	62	101.4
2	10	10	10	9	10	10	2	63	103.1
2	10	10	10	10	10	10	2	64	104.8
2	11	10	10	10	10	10	2	65	106.5
2	11	10	10	10	10	11	2	66	108.2
2	11	11	10	10	10	11	2	67	109.9
2	11	11	10	10	11	11	2	68	111.6
2	11	11	11	10	11	11	2	69	113.3
2	11	11	11	11	11	11	2	70	115
2	12	11	11	11	11	11	2	71	116.7
2	12	11	11	11	11	12	2	72	118.4
2	12	12	11	11	11	12	2	73	120.2
2	12	12	11	11	12	12	2	74	122
2	12	12	12	11	12	12	2	75	123.8
2	12	12	12	12	12	12	2	76	125.6
2	13	12	12	12	12	12	2	77	127.4
2	13	12	12	12	12	13	2	78	129.2
2	13	13	12	12	12	13	2	79	130.9
2	13	13	12	12	13	13	2	80	132.6
2	13	13	13	12	13	13	2	81	134.3
2	13	13	13	13	13	13	2	82	136
2	14	13	13	13	13	13	2	83	137.7
2	14	13	13	13	13	14	2	84	139.4
2	14	14	13	13	13	14	2	85	141.1
2	14	14	14	13	14	14	2	86	142.8
2	14	14	14	14	14	14	2	87	144.5
2	14	14	14	14	14	14	2	88	146.2
2	15	14	14	14	14	14	2	89	147.9
2	15	14	14	14	14	15	2	90	149.6
2	15	15	14	14	14	15	2	91	151.4

spillgate								Total Stops	Total Spill
1	2	3	4	5	6	7	8	92	153.2
2	15	15	14	14	15	15	2	93	155
2	15	15	15	14	15	15	2	94	156.8
2	15	15	15	15	15	15	2	95	158.6
2	16	15	15	15	15	15	2	96	160.4

**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. 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.

### IHR Bulk Spill Pattern - 2004

Spill Bay (stops)										Total Stops	Total Flow
1	2	3	4	5	6	7	8	9	10		
		5		5		5		5		<b>20</b>	33.60
		5.5		5		5		5.5		<b>21</b>	35.3
		5.5		5.5		5.5		5.5		<b>22</b>	37
		5.5		5.5		5.5		5.5		<b>22</b>	37.00
		5.5		5.5		5.5		5.5		<b>22</b>	37
		6		6		6		6		<b>24</b>	40.4
		6	6	6		6		1		<b>25</b>	42.1
		6	6	6		6		2		<b>26</b>	43.8
		6	6	6		6		3		<b>27</b>	45.5
		6.5	6.5	6.5		6.5		2		<b>28</b>	47
		6.5	6.5	6.5		6.5		3		<b>29</b>	48.7
		6	6	6		6		6		<b>30</b>	50.5
		6	6	6		7		6		<b>31</b>	52.1
		6	6	6		7		7		<b>32</b>	53.7
		7	6	7		7		6		<b>33</b>	55.3
		7	6	7		7		7		<b>34</b>	56.9
		7	7	7		7		7		<b>35</b>	58.5
		6	6	6	6	6		6		<b>36</b>	60.6
		6	6	6	6	7		7		<b>38</b>	63.8
		6	6	6	7	7		7		<b>39</b>	65.4
		6	6	7	7	7		7		<b>40</b>	67
		6	7	7	7	7		7		<b>41</b>	68.6
		7	7	7	7	7		7		<b>42</b>	70.2
	6	6	6	6	6	7		6		<b>43</b>	72.3
	6	6	6	6	7	7		6		<b>44</b>	73.9



Spill Bay (stops)										Total Stops	Total Flow
1	2	3	4	5	6	7	8	9	10		
	6	6	6	7	7	7		6		<b>45</b>	75.5
	6	6	7	7	7	7		6		<b>46</b>	77.1
	6	7	7	7	7	7		6		<b>47</b>	78.7
	6	6	6	6	6	6	6	6		<b>48</b>	80.8
	6	6	6	6	6	7	6	6		<b>49</b>	82.4
	6	6	6	6	7	7	6	6		<b>50</b>	84
	6	6	6	6	7	7	6	7		<b>51</b>	85.6
	6	6	6	7	7	7	6	7		<b>52</b>	87.2
	6	6	7	7	7	7	6	7		<b>53</b>	88.8
	6	7	7	7	7	7	6	7		<b>54</b>	90.4

Ice Harbor Spill Schedule - Spring and Summer, 2004

	Sunday	Monday	Tuesday	Wednesday	Thursday	Friday	Saturday
April	11	12	13	14	15 Bulk	16 Bulk	17 FPP
	18 FPP	19 Bulk	20 Bulk	21 FPP	22 FPP	23 Bulk	24 Bulk
	25 FPP	26 FPP	27 Bulk	28 Bulk	29 FPP	30 FPP	1 Bulk
May	2 Bulk	3 FPP	4 FPP	5 Bulk	6 Bulk	7 FPP	8 FPP
	9 Bulk	10 Bulk	11 FPP	12 FPP	13 Bulk	14 Bulk	15 FPP
	16 FPP	17 Bulk	18 Bulk	19 FPP	20 FPP	21 Bulk	22 Bulk
	23 FPP	24 FPP	25 Bulk	26 Bulk	27 FPP	28 FPP	29 Bulk
June	30 Bulk	31 FPP	1 FPP	2 Bulk	3 Bulk	4 FPP	5 FPP
	6 Bulk	7 Bulk	8 FPP	9 FPP	10 Bulk	11 Bulk	12 FPP
	13 FPP	14 Bulk	15 Bulk	16 FPP	17 FPP	18 Bulk	19 Bulk
	20 FPP	21 FPP	22 Bulk	23 Bulk	24 FPP	25 FPP	26 Bulk
	27 Bulk	28 FPP	29 FPP	30 Bulk	1 Bulk	2 FPP	3 FPP
July	4 Bulk	5 Bulk	6 FPP	7 FPP	8 Bulk	9 Bulk	10 FPP
	11 FPP	12 Bulk	13 Bulk	14 FPP	15 FPP	16	17

## 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), was proposed for the spring of 2004. A plan for monitoring this operation was being prepared and coordinated with the region. However, due to the low runoff volume there was no economic benefit to be derived from this operation and the proposal was dropped for 2004.

The McNary Modernization Program will be conducting both fish condition studies (gatewell) and Fish Guidance Efficiency (FGE) studies at McNary in 04. Purpose of these studies are two fold: 1) Evaluation of fish condition under higher gatewell flow conditions (also new Vertical Barrier Screens) and estimating FGE under higher turbine loading.

For these tests it will be required to operate up to 5 units in a two day blocked design with high and low loads. In other words, test units will be operated at 12.2 kcfs for two days, and then 16.4 kcfs for two days. Units 2, 3, 4 and 5 will be operating on the schedule below. Unit 9 will be operated the "opposite" of these units. We will need to ensure that units 5 and 9 are treatments on the same day for the fish condition testing.

Note: the test started out as described above. Due to high juvenile fish descaling the test was suspended April 29. The test was restarted May 8 with only running 2 units running at the maximum discharge. Also at that time unit 9 was dropped from the test. The test protocol is being discussed at this time.

<b>REQUESTED TURBINE OPERATIONS IN SUPPORT OF MCNARY MODERNIZATION STUDIES</b>
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DATE	UNIT 2, 3,4 and 5	UNIT 9
4/16/2004	max discharge (80.5mw)	max 1% (60mw)
4/17/2004	max discharge (80.5mw)	max 1% (60mw)
4/18/2004	max 1% (60mw)	max discharge (80.5mw)
4/19/2004	max 1% (60mw)	max discharge (80.5mw)
4/20/2004	max discharge (80.5mw)	max 1% (60mw)
4/21/2004	max discharge (80.5mw)	max 1% (60mw)
4/22/2004	max 1% (60mw)	max discharge (80.5mw)
4/23/2004	max 1% (60mw)	max discharge (80.5mw)
4/24/2004	max discharge (80.5mw)	max 1% (60mw)
4/25/2004	max discharge (80.5mw)	max 1% (60mw)
4/26/2004	max 1% (60mw)	max discharge (80.5mw)
4/27/2004	max 1% (60mw)	max discharge (80.5mw)
4/28/2004	max discharge (80.5mw)	max 1% (60mw)
4/29/2004	max discharge (80.5mw)	max 1% (60mw)
4/30/2004	max discharge (80.5mw)	max 1% (60mw)
5/1/2004	max discharge (80.5mw)	max 1% (60mw)
5/2/2004	max 1% (60mw)	max discharge (80.5mw)
5/3/2004	max 1% (60mw)	max discharge (80.5mw)
5/4/2004	max discharge (80.5mw)	max 1% (60mw)
5/5/2004	max discharge (80.5mw)	max 1% (60mw)
5/6/2004	max 1% (60mw)	max discharge (80.5mw)
5/7/2004	max 1% (60mw)	max discharge (80.5mw)
5/8/2004	max discharge (80.5mw)	max 1% (60mw)
5/9/2004	max discharge (80.5mw)	max 1% (60mw)
5/10/2004	max 1% (60mw)	max discharge (80.5mw)
5/11/2004	max 1% (60mw)	max discharge (80.5mw)
5/12/2004	max 1% (60mw)	max discharge (80.5mw)
5/13/2004	max 1% (60mw)	max discharge (80.5mw)
5/14/2004	max discharge (80.5mw)	max 1% (60mw)

<b>REQUESTED TURBINE OPERATIONS IN SUPPORT OF MCNARY MODERNIZATION STUDIES</b>		
<b>DATE</b>	<b>UNIT 2, 3,4 and 5</b>	<b>UNIT 9</b>
5/15/2004	max discharge (80.5mw)	max 1% (60mw)
5/16/2004	max 1% (60mw)	max discharge (80.5mw)
5/17/2004	max 1% (60mw)	max discharge (80.5mw)
5/18/2004	max discharge (80.5mw)	max 1% (60mw)
5/19/2004	max discharge (80.5mw)	max 1% (60mw)
5/20/2004	max 1% (60mw)	max discharge (80.5mw)
5/21/2004	max 1% (60mw)	max discharge (80.5mw)
5/22/2004	max discharge (80.5mw)	max 1% (60mw)
5/23/2004	max discharge (80.5mw)	max 1% (60mw)
5/24/2004	max 1% (60mw)	max discharge (80.5mw)
5/25/2004	max 1% (60mw)	max discharge (80.5mw)
5/26/2004	max discharge (80.5mw)	max 1% (60mw)
5/27/2004	max discharge (80.5mw)	max 1% (60mw)
5/28/2004	max discharge (80.5mw)	max 1% (60mw)
5/29/2004	max discharge (80.5mw)	max 1% (60mw)
5/30/2004	max 1% (60mw)	max discharge (80.5mw)
5/31/2004	max 1% (60mw)	max discharge (80.5mw)
6/1/2004	max 1% (60mw)	max discharge (80.5mw)
6/2/2004	max 1% (60mw)	max discharge (80.5mw)
6/3/2004	max discharge (80.5mw)	max 1% (60mw)
6/4/2004	max discharge (80.5mw)	max 1% (60mw)
6/5/2004	max discharge (80.5mw)	max 1% (60mw)
6/6/2004	max discharge (80.5mw)	max 1% (60mw)
6/7/2004	max 1% (60mw)	max discharge (80.5mw)
6/8/2004	max 1% (60mw)	max discharge (80.5mw)
6/9/2004	max discharge (80.5mw)	max 1% (60mw)
6/10/2004	max discharge (80.5mw)	max 1% (60mw)
6/11/2004	max 1% (60mw)	max discharge (80.5mw)
6/12/2004	max 1% (60mw)	max discharge (80.5mw)
6/13/2004	max discharge (80.5mw)	max 1% (60mw)
6/14/2004	max discharge (80.5mw)	max 1% (60mw)

<b>REQUESTED TURBINE OPERATIONS IN SUPPORT OF MCNARY MODERNIZATION STUDIES</b>		
<b>DATE</b>	<b>UNIT 2, 3,4 and 5</b>	<b>UNIT 9</b>
6/15/2004	max 1% (60mw)	max discharge (80.5mw)
6/16/2004	max 1% (60mw)	max discharge (80.5mw)
6/17/2004	max 1% (60mw)	max discharge (80.5mw)
6/18/2004	max 1% (60mw)	max discharge (80.5mw)
6/19/2004	max discharge (80.5mw)	max 1% (60mw)
6/20/2004	max discharge (80.5mw)	max 1% (60mw)
6/21/2004	max discharge (80.5mw)	max 1% (60mw)
6/22/2004	max discharge (80.5mw)	max 1% (60mw)
6/23/2004	max 1% (60mw)	max discharge (80.5mw)
6/24/2004	max 1% (60mw)	max discharge (80.5mw)
6/25/2004	max discharge (80.5mw)	max 1% (60mw)
6/26/2004	max discharge (80.5mw)	max 1% (60mw)
6/27/2004	max 1% (60mw)	max discharge (80.5mw)
6/28/2004	max 1% (60mw)	max discharge (80.5mw)
6/29/2004	max 1% (60mw)	max discharge (80.5mw)
6/30/2004	max 1% (60mw)	max discharge (80.5mw)
7/1/2004	max discharge (80.5mw)	max 1% (60mw)
7/2/2004	max discharge (80.5mw)	max 1% (60mw)
7/3/2004	max 1% (60mw)	max discharge (80.5mw)
7/4/2004	max 1% (60mw)	max discharge (80.5mw)
7/5/2004	max discharge (80.5mw)	max 1% (60mw)
7/6/2004	max discharge (80.5mw)	max 1% (60mw)
7/7/2004	max discharge (80.5mw)	max 1% (60mw)
7/8/2004	max discharge (80.5mw)	max 1% (60mw)
7/9/2004	max 1% (60mw)	max discharge (80.5mw)
7/10/2004	max 1% (60mw)	max discharge (80.5mw)
7/11/2004	max 1% (60mw)	max discharge (80.5mw)
7/12/2004	max 1% (60mw)	max discharge (80.5mw)
7/13/2004	max discharge (80.5mw)	max 1% (60mw)
7/14/2004	max discharge (80.5mw)	max 1% (60mw)
7/15/2004	max 1% (60mw)	max discharge (80.5mw)

## 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					

**Note: It has been requested that Main Unit 18 be run all the time during this test.**

**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. Research Activities that will Impact Project Operations

Project	2004 Snake River Research Summary Table		
	Research Objectives	Spring Spill Plan	Summer Spill Plan
Little Goose		N/A	N/A
Ice Harbor	Spillway survival	4/15 – 7/15: 24 hrs Bulk spill vs. FPP 2-day block design.	

Project	2004 Lower Columbia River Research Summary Table		
	Research Objectives	Spring Spill Plan	Summer Spill Plan
Bonneville	Route specific and spill survival	6/20 – 7/31 50kcfs/24 hrs  vs. <u>Day:</u> 75kcfs <u>Night:</u> Gas cap	
The Dalles	Post-construction evaluation of spillway wall	4/13 – 5/1: Daytime only balloon tag releases. 12-18kcfs vs. 21kcfs  Late April – 7/20: Radio tag mortality estimates	
	Sluice operations evaluation	4/19 – 6/30: 24 hrs 2-day block design 3 gates vs. 6 gates	7/1 – 7/17: 24 hrs 2-day block design 3 gates vs. 6 gates
John Day		N/A	N/A
McNary		N/A	N/A

## **Appendix A Qadj Runs.**

**Assumptions:**

- \* Streamflows were adjusted to the May Early Final Water Supply Forecast for the period of May thru August of 59.5 MAF at The Dalles and shaped 59 different ways based on observed historical runoff.
- \* Starting elevations were observed data from April 29, 2004.
- \* Grand Coulee operates to meet Priest Rapids flow objective of 135 kcfs from May 1-31, then tries to refill by June 30. Grand Coulee drafts no lower than 1243 ft by 31 May, and no more than 1 to 1.5 feet/day (for bank stabilization) when operating to meet Priest Rapids flow objectives.
- \* Hungry Horse targets elevation 3554 feet by 31 May with a minimum flow of 900 cfs, meets minimum flow of 3500 cfs at Columbia Falls, targets full in June, and drafts to 3540 ft by 31 Aug.
- \* Brownlee targets 2077 ft by 31 May, 2076 ft by 30 June, 2070 ft by 31 July, and 2057 ft by 31 August.
- \* Dworshak targets elevation 1590 feet by May 31 with a maximum release of 13 kcfs from May thru June. 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 targets 13.9 kcfs in May and 9.4 kcfs in June for Sturgeon, based on an Apr-Aug forecast of 5.1 MAF and a Tier 2 required pulse of 0.80 MAF. Minimum flow for bull trout in July and August is 7,000 cfs. Libby drafts to elevation 2449 ft by 31 July and 2439 ft by 31 Aug.

**Results:**

Priest Rapids Meets Flow Objectives of 135 kcfs from May 1 - Jun 30.

Month	Occurrences out of 59 Years	Average Flow for 59 Years (kcfs)	Priest Rapids Adjusted for Banks Lake Pumping (kcfs)
May	59	141	140.6
Jun	39	144	128.2

\*Note: the current QADJ model does not account for Banks Lake Pumping. ESP estimates 7.5 kcfs in May and 8.5 kcfs in June for Banks Lake, for a total of 16 kcfs. QADJ tries to meet 135 kcfs at PRD, so May flow at PRD will not change, but the GCL elevation will be decreased by the pumping volume, and will translate to a lesser flow in June to meet GCL refill. Adjusted June flow at PRD correlates to ESP flow in June with this logic.

Lower Granite Meets Flow Objectives of 85 kcfs in May, 73.3 kcfs in June, and 50 kcfs in Jul - Aug:

Month	Occurrences out of 59 Years	Average Flow for 59 Years (kcfs)
May	21	79
Jun	22	69
Jul	4	42
Aug 15	0	36
Aug 31	0	22

Project Elevations - May 31

	Average (feet)	Median (feet)
Libby	2424	2423
Hungry Horse	3552	3554
Grand Coulee	1276	1279
Dworshak	1590	1590

McNary Meets Flow Objectives of 220 kcfs from May 1 - Jun 30 and 200 kcfs from Jul 1 - Aug 31:

Month	Occurrences out of 59 Years	Average Flow for 59 Years (kcfs)	McNary Adjusted for Banks Lake Pumping (kcfs)
May	12	205	205
Jun	8	196	180
Jul	0	148	
Aug 15	0	136	
Aug 31	0	111	

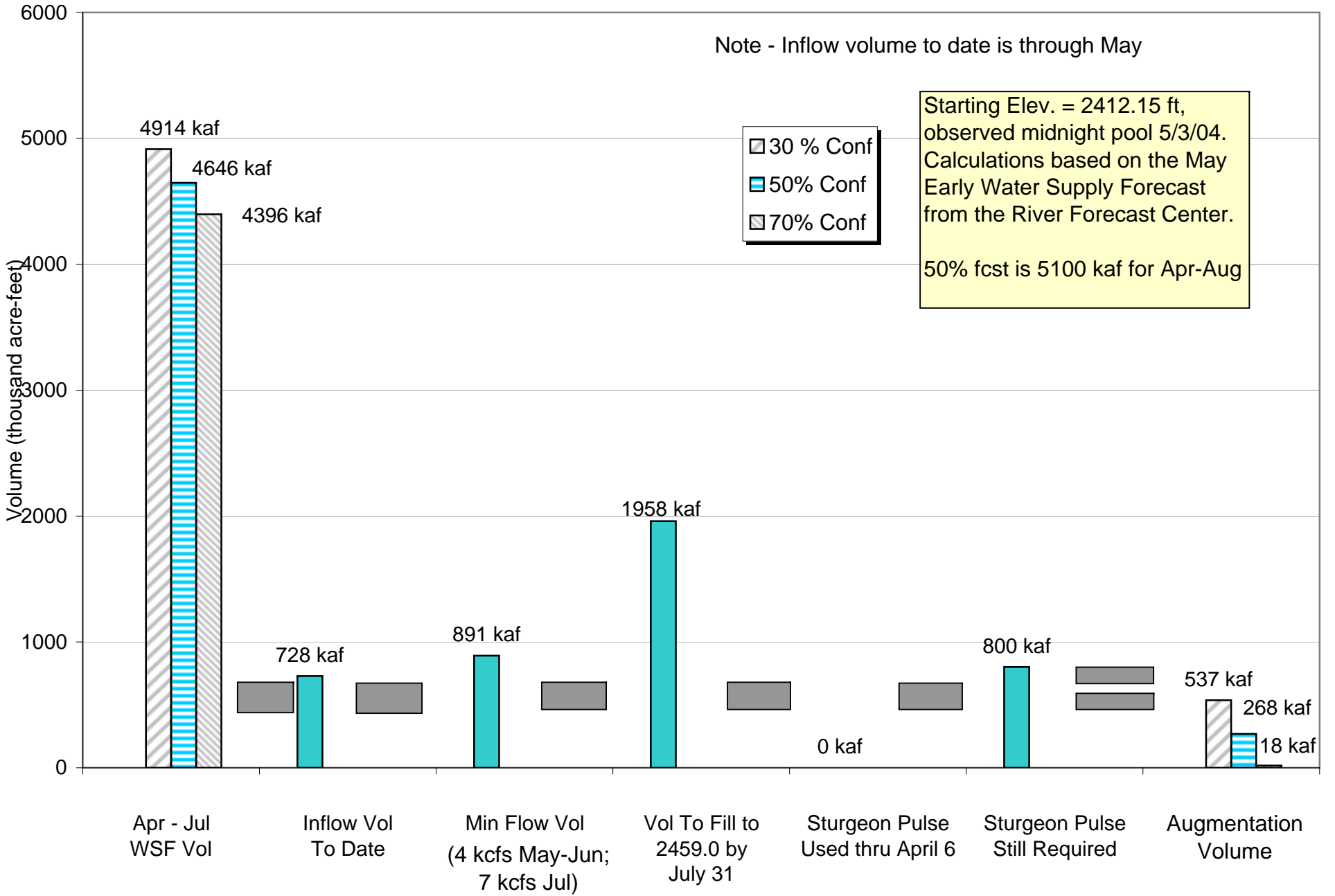
Projects Refill by 30 June:

	Occurrences out of 59 Years	Average Elevation on 30 Jun for 59 Years
Libby	13	2453
Hungry Horse	59	3560
Grand Coulee	59	1290
Dworshak	59	1600

	QADJ Period Average Flows (kcfs) (Not adjusted for Banks Lake Pumping)				
	MAY 1-31	JUN 1-30	JUL 1-31	AUG 1-15	AUG 16-31
LIB	14	10	19	16	13
HGH	2	4	6	5	4
GCL	120	118	104	98	88
PRD	141	144	116	104	93
DWR	5	5	14	14	6
BRN	15	10	9	13	8
LWG	79	69	42	36	22
MCN	205	196	148	136	111
TDA	218	205	153	140	114
BON	220	206	155	142	116

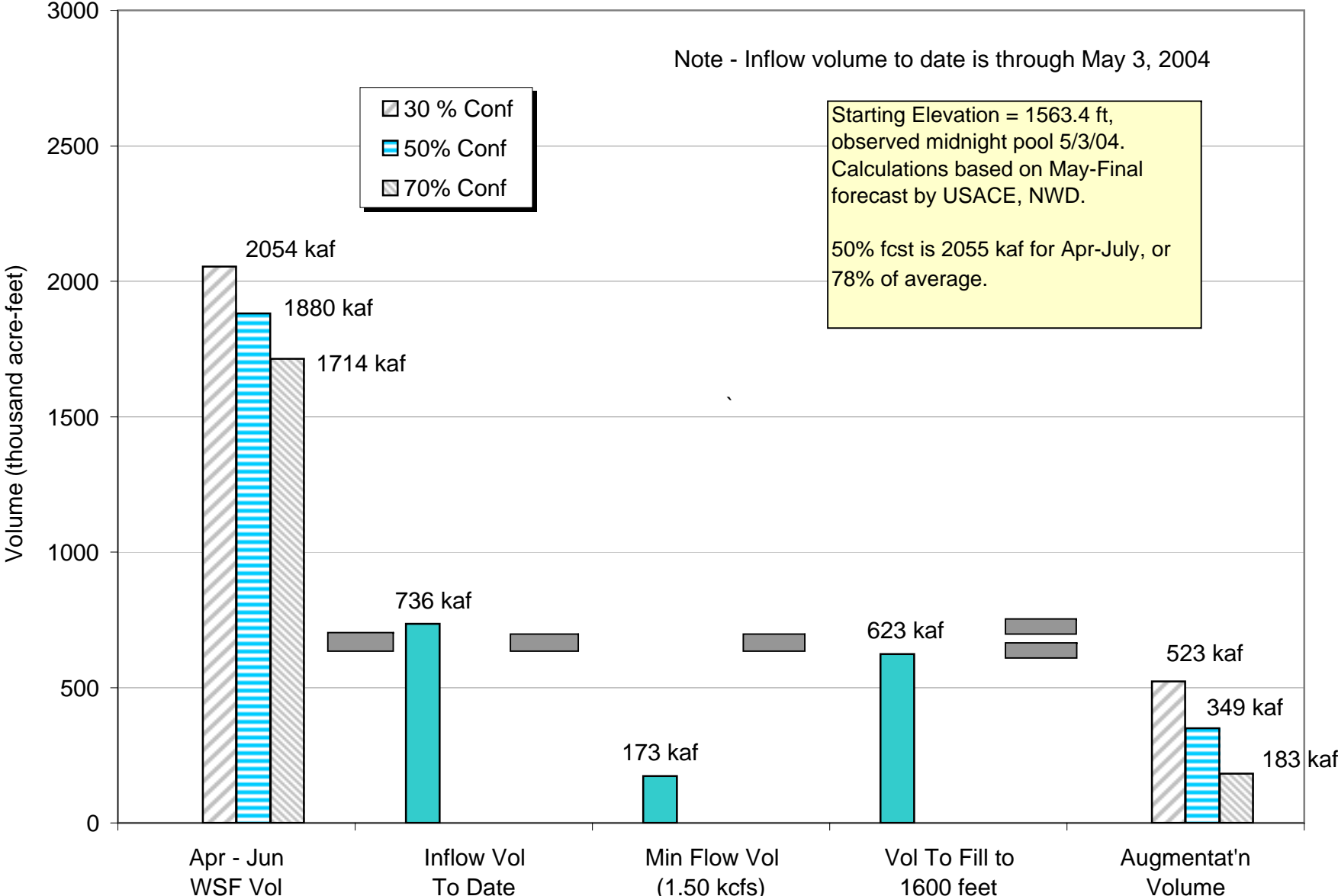
**Appendix B Volume Charts for Libby, Dworshak and  
Hungry Horse.**

Volumes at Libby  
1 April Through 31 July



Volumes at Dworshak  
1 April Through 30 June

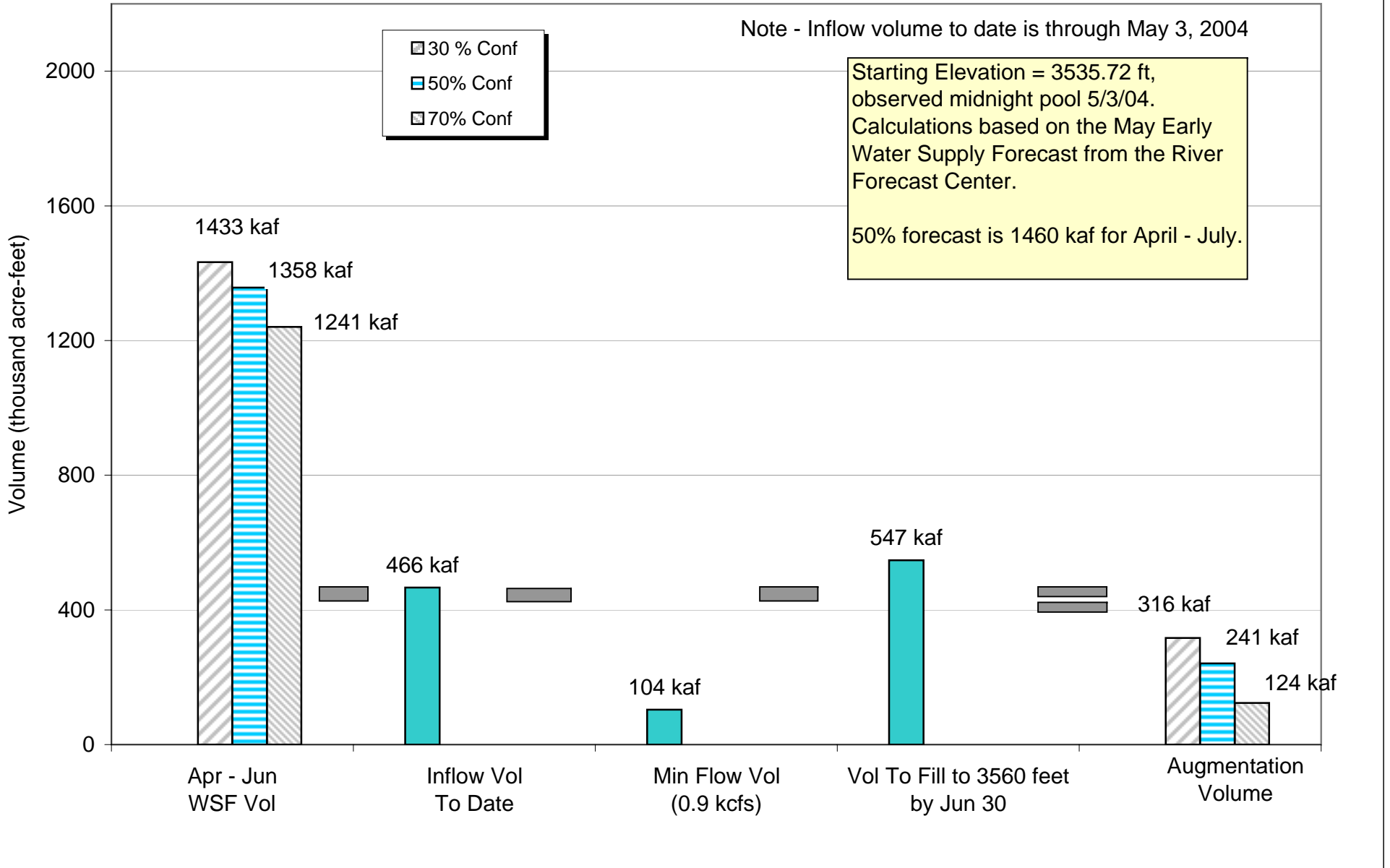
Note - Inflow volume to date is through May 3, 2004





Volumes at Hungry Horse  
1 April Through 30 June

Note - Inflow volume to date is through May 3, 2004



**Appendix C Hanford Reach Agreement.**

## **Hanford Reach Fall Chinook Protection Program**

This Agreement is made and entered into this 5th day of April, 2004, between and among Public Utility District No. 2 of Grant County, Washington ("Grant"), Public Utility District No. 1 of Chelan County, Washington ("Chelan"), Public Utility District No. 1 of Douglas County, Washington ("Douglas"), the United States Department of Energy acting by and through the Bonneville Power Administration ("BPA"), NOAA Fisheries ("NOAAF"), the Washington Department of Fish and Wildlife ("WDFW") and the Confederated Tribes of the Colville Indian Reservation ("CCT"). Each of the above entities may be referred to individually as a "Party" or collectively as the "Parties"; NOAAF, WDFW and CCT may be referred to individually as an "Agency Party" or collectively as the "Agency Parties"; Grant, Chelan, Douglas and BPA may be referred to individually as an "Utility Party" or collectively as the "Utility Parties".

### **A. DEFINITIONS**

"BPA's Friday Priest Rapids Outflow Estimates" – estimate of Priest Rapids Outflow for Saturday and Sunday provided by BPA on Friday afternoon based on expected operations at Chief Joseph Dam plus Side Inflows.

"Chief Joseph" – the Chief Joseph Dam located on the Columbia River System.

"Chief Joseph Uncoordinated Request" – the generation request which BPA determines is the desired output in megawatts of Chief Joseph at any time. Through the operation of Mid-Columbia Hourly Coordination, the Chief Joseph actual generation may be higher or lower than the Chief Joseph Uncoordinated Request. At any time, Chief Joseph Uncoordinated Request plus Chief Joseph bias must equal Chief Joseph actual generation.

"Corps of Engineers" – the United States Army Corps of Engineers.

"Critical Elevation" – the elevation on Vernita Bar at which the Protection Level Flow will be established as provided in subsection C.6.

"Critical Runoff Volume" – the volume of runoff for the January through July period at Grand Coulee for the year 1929 (42.6 million acre feet).

"Daylight Hours" – the time period from one hour before sunrise to sunset at Priest Rapids Dam.

"Emergence" – the point at which the water over eggs in Redds at Vernita Bar or other areas designated in Exhibit A have accumulated 1,000 (°C) Temperature Units after the Initiation of Spawning.

"Emergence Period" – the time period beginning with Emergence and continuing thereafter until 1,000 (°C) Temperature Units have been accumulated at Vernita Bar after the end of the Spawning Period.

"Hanford Reach" – an approximately 50-mile long section of the Columbia River extending from downstream of Priest Rapids Dam to just north of Richland, WA.

"Hatching" – the point at which the water over eggs in redds at Vernita Bar has accumulated 500 (°C) Temperature Units after the Initiation of Spawning.

"Holiday" – means any day designated as a national holiday in the Northwest Power Pool accounting procedures.

"Initiation of Spawning" – the Wednesday before the weekend on which the Monitoring Team first identifies five (5) or more Redds pursuant to subsection C.6. Separate dates for Initiation of Spawning will be set for the 36-50 kcfs zone and for the zone above 50 kcfs within areas identified in Exhibit A and in areas of the Hanford Reach below the 36kcfs level and/or outside the area specified in Exhibit A.

"kcfs" – thousand cubic feet per second.

"kcfs elevation" – the level along Vernita Bar reached by a specific rate of flow measured in kcfs.

"kcfs zone" – the area inundated by a specific rate of flow past Vernita Bar as measured in kcfs.

"kcfsh" – volume of water in thousand cubic feet per second hours.

"Mid-Columbia Hourly Coordination" – the operation of Grand Coulee, Chief Joseph, Wells, Rocky Reach, Rock Island, Wanapum, and Priest Rapids pursuant to the "Agreement For The Hourly Coordination Of Projects On The Mid-Columbia River", effective July 1, 1997 through June 30, 2017, as such may be amended, extended, or replaced.

"Monitoring Team" – a group of three individuals composed of one fishery biologist designated by each of the following: (1) Grant PUD; (2) Washington Department of Fish and Wildlife; and (3) a signatory fishery agency or tribe.

"Post-Hatch Period" – the time period between Hatching and Emergence.

"Pre-Hatch Period" – the time period between the Initiation of Spawning and Hatching.

"Previous Day's Average Weekday Wanapum Inflow" – the total volume of water discharged into the Wanapum development measured as a daily average discharge from Rock Island Dam. This measure is used from Monday to Friday to determine the allowable flow fluctuation during the Rearing Period and will be calculated based on data available to Grant that is reported on the Corps of Engineers website [<http://nwd-wc.usace.army.mil/report/projdata.htm>].

"Priest Rapids Project" – the Priest Rapids and Wanapum hydroelectric developments located on the Columbia River System.

“Priest Rapids” – the Priest Rapids Dam located on the Columbia River System.

"Priest Rapids Outflow" – the total volume of water discharged by Priest Rapids in any hour from all sources, measured in kcfs. For the purposes of the Spawning Period, Pre-Hatch Period, Post-Hatch Period and Emergence Periods, Priest Rapids Outflow shall be measured at the USGS station below Priest Rapids when possible. When USGS station data are not available and for the purposes of the Rearing Period, it will be calculated at Priest Rapids based on data available to Grant that are reported on the Corps of Engineers website [<http://www.nwd-wc.usace.army.mil/report/projdata.htm>].

"Priest Rapids Weekday Outflow Delta" – this is the difference between minimum Priest Rapids Outflow and maximum Priest Rapids Outflow over a 24 hr period beginning at 0001 hrs and extending to 2400 hrs. Priest Rapids Weekday Outflow Delta will be calculated at Priest Rapids based on data available to Grant that are reported on the Corps of Engineers website [<http://www.nwd-wc.usace.army.mil/report/projdata.htm>].

"Priest Rapids Weekend Outflow Delta" – this is the difference between minimum Priest Rapids Outflow and maximum Priest Rapids Outflow over a 48-hr period beginning at 0001 hrs on Saturday morning and extending to 2400 hrs on Sunday night. Priest Rapids Weekend Outflow Delta will be calculated at Priest Rapids based on data available to Grant that is reported on the Corps of Engineers website [<http://www.nwd-wc.usace.army.mil/report/projdata.htm>].

"Protection Level Flow" – the amount of water flowing over Vernita Bar which is needed to provide protection to Redds as specified in subsections C.2 through C.4 of this Agreement.

“Rearing Period” – the time period beginning with the start of the Emergence Period and continuing thereafter until 400 (°C) Temperature Units have been accumulated at Vernita Bar after the end of the Emergence Period.

“Redds” – defined area of riverbed material containing salmon eggs.

"Reverse Load Factoring" – the intentional reduction of power generation during Daylight Hours and the corresponding increase in power generation during hours of darkness for the purpose of influencing the location of Redds on Vernita Bar. Reverse Load Factoring does not include spilling at night to allow lower daytime flows.

"Rocky Reach" – the Rocky Reach Dam located on the Columbia River System.

"Side Inflows" – the algebraic sum of the flow rates of water entering or leaving the Columbia River from all sources between Chief Joseph and Priest Rapids as calculated by the method presently specified by Mid-Columbia Hourly Coordination.

"Spawning Period" – the time period beginning with the Initiation of Spawning and continuing until 2400 hours on the last Sunday prior to Thanksgiving.

"Temperature Unit" – one degree Celsius of water temperature above freezing (0°C) for 24 hours.

"Vernita Bar" – the gravel bar located in the Columbia River approximately four miles downstream from Priest Rapids.

"Wanapum" – the Wanapum Dam located on the Columbia River System.

"Wanapum Inflow" – the daily average flow rate for water flowing into the Wanapum reservoir calculated at Rock Island based on data available to Chelan.

"Wells" – the Wells Dam located on the Columbia River System.

## **B. SCOPE AND DURATION**

### 1. Purpose of Agreement and Relationship to Prior Agreement

This Agreement establishes the obligations of the Parties with respect to the protection of fall Chinook in the Hanford Reach of the Columbia River. The Parties agree that during the term of the Agreement these flow regimes address all issues in the Hanford Reach with respect to fall Chinook protection and the impact of operation of the seven dams operating under Mid-Columbia Hourly Coordination, including the obligations of Grant, Chelan, and Douglas under any new licenses issued by the Federal Energy Regulatory Commission (FERC).

It is the intent of the Parties that this Agreement replaces and supersedes the original **June 16, 1988 Vernita Bar Agreement**.

### 2. Term, Effectiveness, and Regulatory Approvals

(a) This Agreement shall become effective on the date of execution of this Agreement by all Parties and shall continue for a period equal to the remainder of the current license for Priest Rapids Project No. 2114, plus the term(s) of any annual license(s) and the next new Priest Rapids Project license which may be issued thereafter.

(b) By signing this Agreement, the Agency Parties represent that they have assembled and reviewed substantial evidence, and that based on that substantial evidence, they will recommend to FERC that this Agreement be approved in its entirety.

(c) Promptly after the execution of this Agreement, Grant shall file it with the FERC and request that FERC include appropriate conditions in the new license for the Priest Rapids Project reflecting the terms and conditions of this Agreement. All Parties agree to submit a statement of support of this Agreement to FERC within a reasonable time of Grant's filing. The Parties, however, shall, without limitation or qualification, commence implementation of this Agreement at the beginning of the 2004 Rearing period.

(d) In the event that FERC shall issue an order which makes any material modification to the terms of this Agreement, either by additions to or omissions from its terms, any Party may,

within 60 days following the issuance of a FERC order denying a request for rehearing, withdraw from this Agreement after giving the other Parties 30 days written notice of its intention to do so and of the reasons for its decision to withdraw.

(e) The Agency Parties represent and stipulate that this Agreement shall constitute the agency Parties terms, conditions and recommendations for any FERC licensing process of the Utility Parties; including any such necessary filings with the Washington Department of Ecology Section 401 certification process with respect to protection of fall Chinook in the Hanford Reach of the Columbia River.

(f) The Parties represent and stipulate that all submittals and recommendations to FERC, including those to Washington Department of Ecology, for inclusion in the new licenses for the Priest Rapids Project, the Rocky Reach Project and the Wells Project will in all respects be consistent with the terms and conditions of this Agreement.

(g) An Utility Party may, upon 30-days notice, withdraw from this Agreement and be relieved of all obligations under this Agreement in the event FERC, the Washington Department of Ecology, or other regulatory authority imposes on such Party any measure inconsistent with this Agreement or additional obligations with respect to the protection of fall Chinook and other aquatic resources in the Hanford Reach of the Columbia River.

(h) Nothing in this Agreement will limit or prohibit any action by any Party based on non-compliance with this Agreement.

### 3. Reopener Limitation/Withdrawal

(a) No Party may petition the FERC directly, or through the Washington Department of Ecology, to modify any provision of this Agreement or request any flows, minimum flows or other operation that is inconsistent with this Agreement, until ten years from the effective date of this Agreement, unless such modification is jointly requested by all Parties.

(b) Ten years following the effective date of this Agreement, a Party may:

(1) Request reopening of this Agreement and the imposition by the FERC of different, additional or modified fall Chinook protection measures for the Hanford Reach;

(2) Bring any cause of action, raise any defense (including exhaustion of administrative remedies at the FERC) or claim, or rely on any theory in any appropriate forum;

(3) Petition any other appropriate administrative agency or political body for relief, including the deletion of one or more measures otherwise in effect under this Agreement, or;

(4) Take other appropriate action relating to any issue or matter addressed by this Agreement that could have been addressed by this Agreement or the Parties with respect to protection of aquatic resources in the Hanford Reach.

(c) In any action under this subsection B.3(b) the petitioning Party shall have the burden of proof. The Parties will continue to implement this Agreement until the relief sought becomes effective by operation of law, unless otherwise agreed.

(d) With respect to any petition or suit filed pursuant to this subsection B.3(b) and any subsequent judicial review thereof, nothing in this Agreement shall bar, limit or restrict any Party from raising any relevant issue of fact or law, regardless of whether such issue is or could have been addressed by this Agreement.

(e) Notwithstanding any other provisions of this subsection B.3(b) any Party may participate in any legislative or administrative proceeding dealing with fish protection or compensation issues; provided that no Party may contend on its own behalf, or support any contention by other persons in any proceeding or forum, including the Northwest Power and Conservation Council, the Washington Department of Ecology Section 401 certification process, and/or Congress, that additional or different measures for protection of fall Chinook salmon in the Hanford Reach should be imposed on any Party until a period of ten years following the effective date of this Agreement has passed.

#### 4. Stipulation of Adequacy

For ten years from the effective date of this Agreement, the Parties stipulate as follows:

(a) Performance of the requirements of Grant, Chelan, Douglas and BPA under this Agreement shall constitute acceptable protection of fall Chinook in the Hanford Reach, taking into account both hydropower and fishery needs.

(b) Performance by any Utility Party of its obligations under this Agreement satisfies the obligations of such Party with respect to protection of fall Chinook salmon in the Hanford Reach arising under applicable laws and regulations, including but not limited to the Endangered Species Act, the Federal Power Act as amended by the Electric Consumers Protection Act of 1986, the Pacific Northwest Electric Power Planning and Conservation Act, the Fish and Wildlife Coordination Act and the Magnuson-Stevens Fisheries Conservation and Management Act. In any and all disputes, proceedings and hearings under the above applicable laws and regulations, the Parties will support the adequacy of protection for fall Chinook salmon in the Hanford Reach pursuant to this Agreement.

(c) Performance by any Party of its obligations under this Agreement shall constitute compliance with the applicable provisions of the Northwest Power and Conservation Council's Fish and Wildlife Program as currently written.



## **C. HANFORD REACH FALL CHINOOK PROTECTION**

Subject to the limitations and conditions set out in this Agreement, Grant, Chelan, Douglas and BPA shall provide the following flow regimes for the Spawning through Rearing Period for Hanford Reach fall Chinook salmon in the Hanford Reach of the Columbia River.

### 1. Spawning Period

(a) All Parties agree that flows maintained during the Spawning Period and escapement levels are factors influencing the placement of Redds. The flow manipulation under this subsection C.1 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 under subsection C.4 during the Emergence Period.

(b) During the Spawning Period(s) of 2005 and 2006, Grant will experiment with alternative operations for flow manipulation. The requirement of the alternative operations will be to ensure that Priest Rapids Outflows are not higher than 70 kcfs and not lower than 55 kcfs for a continuous period of at least 12 hours out of each day during the Spawning Period. Grant will provide continuous monitoring of Redd formation during these tests and report the results weekly. These experiments may continue as long as no more than 31 Redds are located above the 65 kcfs elevation on Vernita Bar. If Redd counts reveal that more than 31 Redds are located above the 65 kcfs elevation, Spawning Period operations will default to the procedures of C.1(c) below. If Redd counts show that alternative Spawning Period operations can limit the formation of Redds above 70 kcfs, then Grant shall be allowed to choose between use of C.1(b) or C.1(c) as guidelines for operational parameters during the Spawning Period of future years.

(c) If the experimental operations testing during C.1(b) above are unsuccessful in minimizing formation of Redds above the 70 kcfs elevation, Grant's operations will revert to the default operation specified in this paragraph. During the Spawning Period, Grant will operate Priest Rapids Project No. 2114 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 that can range from 55 to 70 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 the Priest Rapids Project which affect Grant's ability to provide Reverse Load Factoring, Grant agrees to meet with the Parties to this Agreement to determine what adjustments to Grant's obligation under this subsection C.1(c) shall be made, notwithstanding the provisions of subsections B.4 and B.5.

(d) The Parties agree that BPA has no obligation under this Agreement to limit fall flows to influence Redd location. This is, however, without prejudice to the rights of any Party to assert, except before the FERC prior to ten years from the effective date of this Agreement, that BPA may have an obligation apart from this Agreement to limit such flows and the rights of any Party to request cooperation of BPA, the Bureau of Reclamation and the Corps of Engineers to limit such flows. The Parties agree to work together to obtain the cooperation of BPA, the Bureau of Reclamation and the Corps of Engineers to achieve the desired flow regime.

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 Parties 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) All Parties recognize that flow fluctuations during the Rearing Period may impact juvenile Hanford Reach fall Chinook. The Parties also recognize that 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 Hanford Reach fall Chinook rearing in the Hanford Reach by limiting flow fluctuations while retaining operational flexibility at each of the seven dams on the Mid-Columbia River.

(b) During the Rearing Period, Grant will operate Priest Rapids Project No. 2114 to the extent feasible through use of the Mid-Columbia Hourly Coordination to produce a Priest Rapids Outflow that limits flow fluctuations according to the following criteria:

(1) When the Previous Day's Average Weekday Wanapum Inflow is between 36 and 80 kcfs limit Priest Rapids Weekday Outflow Delta to no more than 20 kcfs. When the average of BPA's Friday Chief Joseph Outflow Estimates plus side flow estimates for Saturday and Sunday is between 36 and 80 kcfs limit the Priest Rapids Weekend Outflow Delta to no more than 20 kcfs.

- (2) When Previous Day's Average Weekday Wanapum Inflow is between 80 and 110 kcfs limit Priest Rapids Weekday Outflow Delta to no more than 30 kcfs. When the average of BPA's Friday Chief Joseph Outflow Estimates plus side flow estimates for Saturday and Sunday is between 80 and 110 kcfs limit the Priest Rapids Weekend Outflow Delta to no more than 30 kcfs.
- (3) When Previous Day's Average Weekday Wanapum Inflow is between 110 and 140 kcfs limit Priest Rapids Weekday Outflow Delta to no more than 40 kcfs. When the average of BPA's Friday Chief Joseph Outflow Estimates plus side flow estimates for Saturday and Sunday is between 110 and 140 kcfs limit the Priest Rapids Weekend Outflow Delta to no more than 40 kcfs.
- (4) When Previous Day's Average Weekday Wanapum Inflow is between 140 and 170 kcfs limit Priest Rapids Weekday Outflow Delta to no more than 60 kcfs. When the average of BPA's Friday Chief Joseph Outflow Estimates plus side flow estimates for Saturday and Sunday is between 140 and 170 kcfs limit the Priest Rapids Weekend Outflow Delta to no more than 60 kcfs.
- (5) When Previous Day's Average Weekday Wanapum Inflow is greater than 170 kcfs Priest Rapids Outflow for the following weekday will be at least 150 kcfs. When the average of BPA's Friday Chief Joseph Outflow Estimates plus side flow estimates for Saturday and Sunday is greater than 170 kcfs, Priest Rapids Outflow for Saturday and Sunday will be at least 150 kcfs.
- (6) On four consecutive Saturdays and Sundays that occur after 800 TUs have accumulated after the end of the Spawning Period, Priest Rapids Outflow will be maintained to at least a minimum flow calculated as the average of the daily hourly minimum flow from Monday through Thursday of the current week.
- (c) All Parties agree that perfect compliance with the flow constraints of C.5(b) is not possible. Conditions related to inflow, reservoir elevation, accuracy of BPA estimates, emergencies and human error can contribute to exceeding the Priest Rapids Outflow Delta or Priest Rapids Outflow dropping below minimums specified. Grant will make every effort to meet the operating constraints.
- (d) On Monday, following lower flows from the weekend it is not considered a violation of the provisions in C.5(b) when Monday inflows require increasing the Priest Rapids discharge above the upper limit established at midnight on Sunday. If the upper limit is raised on Monday, the lower limit must be raised to allow the difference between the maximum and new minimum flow to remain within the applicable Priest Rapids Weekday Outflow Delta limit.
- (e) Problems can be expected from time to time. Grant will detail the circumstances associated with its inability to meet these constraints in the annual report described under C.6(c). In addition to annual reporting, the Parties agree to use the dispute resolution process described under E.9 whenever any Party claims excessive non-compliance.

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 the area specified on Exhibit A for the purpose of determining the Initiation of Spawning, the location of Redds and the extent of spawning. The Monitoring Team will also provide a concurrent aerial survey of the Hanford Reach on the same weekend(s). The aerial survey(s) will be utilized to determine if Initiation of Spawning in areas of the Hanford Reach below the 36 kcfs level and/or outside the area specified on Exhibit A occurs prior to Initiation of Spawning within the Exhibit A area above the 36 kcfs level. Once an initiation of Spawning date has been determined, based upon the presence of 5 or more redds in an individual survey, the aerial surveys maybe discontinued for that year. The surveys will be conducted on weekends beginning on the weekend prior 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. The Monitoring Team may also make a supplemental Redd survey the weekend after Thanksgiving to determine if additional Redds are present above the 50 kcfs elevation. A preliminary estimate of the Critical Elevation will be made following the final Redd survey and will be confirmed or adjusted based on the supplemental survey. The Critical Elevation 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 non-binding recommendations to any of the Parties to this Agreement, including non-binding recommendations to protect Redds above the Critical Elevation or to address special circumstances. By September 1 of the following year, Grant 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 Periods 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. During the rearing period, Grant will provide a weekly operations report to the Parties. After review by the Monitoring Team, the final report will be sent to all Parties. During the Rearing Periods of 2011, 2012 and 2013, the Parties will also meet to develop a follow-up monitoring program to estimate fry losses. This monitoring program will be designed according to protocols developed from 1999 to 2003 or alternatively with different methods developed by the Parties.

(d) If from time to time, disputes arise regarding activities of the Monitoring Team, the Parties agree to use the dispute resolution process described under E.9 below.

#### 7. Redds Above Critical Elevation

This Agreement is not intended either to preclude or require protection of Redds above the Critical Elevation. The Parties shall meet annually to determine if there are measures that, in the joint discretion of Grant, Chelan, Douglas and BPA, can be taken to protect any Redds located above the Critical Elevation.

### **D. RIVER OPERATIONS**

In order to achieve the required Protection Level Flows during the Post Hatch and Emergence Periods and to provide the desired flow regimes during the Rearing Period, Grant, Chelan, Douglas and BPA agree to the following:

#### 1. Weekday Request

On any day other than a Saturday, Sunday or Holiday, BPA shall provide a Chief Joseph Uncoordinated Request that will, on a daily average basis and when converted from megawatts to Chief Joseph discharge, be not less than the Protection Level Flow minus Side Inflows. For example, if the Critical Elevation is established at 65 kcfs, BPA shall be required to submit a Chief Joseph Uncoordinated Request during the periods described in subsections C.3(b) and C.4(b) which is not less than (but nothing in this Agreement shall require the request to be greater than) 65 kcfs minus Side Inflows on a daily average basis. For Saturdays, Sundays, and Holidays, the Chief Joseph Uncoordinated Request shall not be less than the amounts set out in subsections D.2 and D.3 below.

2. Saturday Request

Beginning 0000 hours on any Saturday, BPA may reduce the Chief Joseph Uncoordinated Request so long as the Saturday midnight accumulation of the difference between the resulting Chief Joseph discharge and the Protection Level Flow minus the Side Inflows does not exceed 925 kcfsh. The accumulated difference calculated above will be identified as the Chief Joseph Accumulated Deficiency (CJAD).

3. Sunday or Holiday Request

On any Sunday or Holiday, BPA may reduce the Chief Joseph Uncoordinated Request so long as the midnight CJAD does not exceed 854 kcfsh.

4. Post-Sunday or Holiday Deficiency

Following any Sunday or Holiday, BPA shall provide a Chief Joseph Uncoordinated Request so that CJAD does not exceed at midnight on any day the CJAD of the preceding midnight. On any weekend or holiday weekend when CJAD exceeds 0, BPA shall provide Chief Joseph Uncoordinated Requests such that CJAD will return to zero by 1200 hours on Wednesday of the following week.

5. Weekends During the Rearing Period

(a) BPA will provide flows necessary to meet the four weekend minimum flows as provided in C.5(b)(6). However, on any Saturday and Sunday of the prescribed four weekends BPA may reduce the Chief Joseph Uncoordinated Request so long as the resultant Sunday midnight accumulation of the difference between the resulting Chief Joseph discharge and the established weekend minimum flow minus the side inflows does not exceed the following criteria: 1) 925 kcfsh on Saturday at midnight, 2) 854 kcfsh on Sunday or any holiday at midnight.

(b) The accumulated difference calculated above will be identified as the Chief Joseph Accumulated Deficiency – II (CJAD-II). On all four designated weekends when CJAD-II exceeds 0, BPA shall provide Chief Joseph Uncoordinated Requests such that CJAD-II will return to zero by 1200 hours on Wednesday of the following week.

6. Grant, Chelan, Douglas and BPA Drafts and Refill

(a) Spawning through Emergence Period provisions are as follows:

(i) Grant, Chelan and Douglas shall utilize the actual discharges from the Chief Joseph Project and Side Inflows to meet the required Protection Level Flow. To the extent that actual discharges from the Chief Joseph Project, together with Side Inflows, are insufficient to meet the Protection Level Flow, Grant, Chelan and Douglas shall make up the deficiency by drafting their reservoirs in the following order and quantities to the extent required to comply with the flow regimes specified in this Agreement: 1) Grant will draft up to 3 feet from Priest Rapids, 2) Grant will draft up to 2 feet from Wanapum,

3) Chelan will draft up to 1 foot from Rocky Reach, (4) Douglas will draft up to 1 foot from Wells, and 5) Grant will draft up to 0.7 feet from Priest Rapids; provided, that in lieu of so drafting their reservoirs, Grant, Chelan and Douglas may, upon their agreement, draft their reservoirs in any alternative manner which provides the equivalent amount of total draft. Subsequent refill of the reservoirs shall be accomplished in the reverse order of draft (i.e., 0.7 feet at Priest Rapids, 1 foot at Wells, 1 foot at Rocky Reach, 2 feet at Wanapum and 3 feet at Priest Rapids) or in an alternative manner by agreement of Grant, Chelan and Douglas.

- (ii) After BPA has met its Chief Joseph Uncoordinated Request obligations, and after Grant, Chelan and Douglas have provided the drafts described above, additional water may still be required from time to time on a short-term basis to meet the flow regimes specified in this Agreement. Such additional water may be required to the extent that: 1) actual discharges from the Chief Joseph Project differ from Chief Joseph discharges which would have resulted from Chief Joseph Uncoordinated Requests, and/or 2) the CJAD exceeds, from time to time, 925 kcfsh. Whenever such additional water is required on a short-term basis, it will be provided by the draft of all seven dams associated with the operation of Mid-Columbia Hourly Coordination in proportion to 50% Federal and 50% Non-Federal contribution on a content basis.

(b) During the Rearing Period prescribed in C.5 Grant will operate Priest Rapids Project No. 2114 to limit flow fluctuations and maintain a minimum flow for the four designated weekends as described in C.5(b) through the following provisions:

- (i) After drafts of 1 foot from each of Wanapum and Priest Rapids (or combination thereof) have been provided, Chelan and Douglas will provide drafts of up to 1 foot from Rocky Reach and Wells Projects. All drafts will be measured from a pre-determined baseline.
- (ii) After conditions under (i) above have been provided, Grant will draft Wanapum and/or Priest Rapids beyond 1 foot each as necessary to meet the rearing requirements under C.5., limited to a total equivalent draft of 3.7 feet at Priest Rapids and 2 feet at Wanapum.
- (iii) Chelan, Douglas and Grant, upon their agreement may draft their reservoirs in any alternative manner, which provides an equivalent amount of total draft.
- (iv) After BPA has met its Chief Joseph Uncoordinated Request obligations, and after Grant, Chelan and Douglas have provided the drafts described above, additional water may still be required from time to time on a short-term basis to meet the flow regimes of C.5. Such additional water may be required to the extent that: 1) actual discharges from the Chief Joseph Project differ from Chief Joseph discharges which would have resulted from Chief Joseph Uncoordinated Requests, and/or 2) the CJAD-II exceeds, from time to time, 925 kcfsh. Whenever such additional water is required on a short-term basis, it will be provided by the draft of all seven dams associated with the operation of Mid-Columbia Hourly Coordination in proportion to 50% Federal and 50% Non-Federal contribution on a content basis.

7. BPA Request Requirements

BPA shall provide sufficient generation requests and hourly coordination operating parameters for Grand Coulee and Chief Joseph via Mid-Columbia Hourly Coordination such that the discharge from Chief Joseph, which would result absent modification by non-Federal generation requests via Mid-Columbia Hourly Coordination, would not be less than the flows required in subsections D.1 through D.5 above.

8. Relationship to Section C

Nothing in the foregoing subsections D.1 through D.7 shall limit or diminish the obligations of the Parties under Section C.

9. Draft at Mid-Columbia Projects

Notwithstanding any other provision of this Agreement, Grant, Chelan and Douglas shall not be required to draft their respective reservoirs in a manner which would be inconsistent with the requirements of any applicable FERC license or to a level less than one (1) foot above the applicable FERC license minimum reservoir elevation. At any time that a reservoir is within one (1) foot above the applicable FERC license minimum reservoir elevation, that project shall have no further obligation under this Agreement except to pass the inflow entering that project's reservoir.

Whenever the sum of the remaining pondage in Priest Rapids, Wanapum, Rocky Reach, and Wells is less than 1500 kcfsh, Grant, Chelan, Douglas and BPA shall confer to coordinate operations regarding the maintenance of the Protection Level Flow or operations necessary to meet Priest Rapids Weekday and Weekend Outflow Delta limits during the Rearing Period.

10. Excuse of Performance

In the event any performance by any Party is rendered impossible by an act of the Bureau of Reclamation or the Corps of Engineers which is beyond the control of such Party, such performance shall be excused until the cause of such impossibility is removed or eliminated.

11. Adverse Water Conditions

When the National Weather Service/Soil Conservation Service Joint official March 1, January-July volume of runoff forecast at Grand Coulee is less than the Critical Runoff Volume, the Parties will meet prior to any reductions and discuss an allocation of available flows between power interests, fishery interests at the Hanford Reach and other nonpower interests. After such discussions, BPA may reduce its flow requests below those required under Section D resulting in a proportional reduction in the Protection Level Flow and Critical Elevation, provided that such reductions are approximately proportional to the adverse impact on Columbia River firm hydropower generation from the reduced flow volume, and provided that failure to refill shall not be the determining factor in measuring such adverse impacts. In no event shall the effect of this



paragraph result in a reduction in the Protection Level Flow of greater than 15% or below 50 kcfs, whichever provides for a higher Protection Level Flow.

12. Instantaneous Minimum Flow for the Hanford Reach

The Parties further agree that a minimum instantaneous release of 36 kcfs from Priest Rapids Dam as measured at USGS gauge No. 12472800 will be maintained during all time periods except for those times when maintenance of the Protection Level Flow and Rearing Period operation constraints require a higher instantaneous minimum flow. The Parties agree that this minimum flow was historically intended to provide general protection for aquatic resources, water quality, recreation, and operation of water intakes of the Hanford Reservation and other beneficial uses of the Hanford Reach of the Columbia River.

**E. MISCELLANEOUS**

1. No Prejudice

All Parties stipulate that, except as expressly provided herein neither FERC approval nor any Party's execution of this Agreement shall constitute approval or admission of, or precedent regarding, any principle, fact or issue in any FERC or in any other administrative or judicial proceeding, including subsequent modification proceedings under Section B of this Agreement.

2. Waiver of Default

Any waiver at any time by any Party hereto of any right with respect to any other Party or with respect to any matter arising in connection with this Agreement shall not be considered a waiver with respect to any subsequent default or matter.

3. Entire Agreement—Modifications

All previous communications between the Parties hereto, either verbal or written, with reference to the subject matter of this Agreement are hereby abrogated, and this Agreement duly accepted and approved, constitutes the entire Agreement between the Parties hereto, and no modifications of this Agreement shall be binding upon any Party unless executed or approved in accordance with the procedures set forth in Section B.

4. Successors and Assigns

This Agreement shall be binding upon and inure to the benefit of the Parties hereto and their successor and assigns.

5. Force Majeure

No Party shall be liable for failure to perform or for delay in performance due to any cause beyond its control. This may include, but is not limited to, fire, flood, terrorism, strike or other labor disruption, act of God or riot. The Party whose performance is affected by a force majeure

will make all reasonable efforts to promptly resume performance once the force majeure is eliminated.

## 6. Execution

This Agreement may be executed in counterparts. A copy with all original executed signature pages affixed shall constitute the original Agreement. The date of execution shall be the date of the final Party's signature.

## 7. Authority

Each Party to this Agreement hereby represents and acknowledges that it has full legal authority to execute this Agreement and shall be fully bound by the terms hereof.

## 8. Captions

Captions and titles used to identify sections of this Agreement are for the convenience of the Parties and shall not have any substantive meaning.

## 9. Dispute Resolution

(a) Disputes covering issues associated with the implementation of this Hanford Reach Fall Chinook Protection Program shall be subject to the dispute resolution procedures.

(b) In the event that a dispute arises over an issue associated with the implementation of the Hanford Reach Fall Chinook Protection Program, the Party raising the issue shall provide written notice of the issue and the supporting rationale to each Party to the Agreement. Within five days of receipt of such notice, the Parties shall develop a subcommittee to review the disputed issue(s). The subcommittee shall be composed of one (1) representative of each Party. Within twenty (20) days of receipt of notice of a dispute, the subcommittee shall seek to resolve the dispute. Parties shall endeavor in good faith to reach a resolution of the dispute using the best available information.

(c) At the end of the twenty-(20) day period, the appropriate subcommittee shall provide a report to the Parties describing the outcome of their efforts under Section C.8(b), above. In the event that the subcommittee has identified a proposed resolution that is consistent with terms of the Hanford Reach Fall Chinook Protection Program, the report shall describe the proposed resolution, the basis for the proposed resolution, and such additional information as may be necessary to support the proposed resolution. In the event that the subcommittee was unable to resolve the dispute, the report shall describe the remaining issues in dispute, the efforts to resolve them, and any additional information pertinent to resolving the outstanding issues in a timely manner.

(d) Upon receipt of a report described above, the Parties, within thirty (30) days, will approve or disapprove the proposed resolution. In the event that it approves the proposal, the Parties will implement the resolution as accepted. In the event that the resolution requires the regulatory

approval of FERC or another regulatory entity, Grant PUD, with the support of the Parties, shall seek prompt approval of the resolution by FERC or the relevant regulatory authority, and the appropriate Party or Parties shall proceed with its implementation upon receipt of the required approval. In the event that the report identifies unresolved issues, the Parties shall undertake to resolve the matter according to procedures identified in the Alternative Dispute Resolution section below.

(e) Alternative Dispute Resolution: The Parties may use non-binding alternative dispute resolution (ADR) procedures involving a third-party mediator and in cooperation with FERC representatives to seek a resolution of an outstanding dispute that could not be resolved by the designated subcommittee. The Parties shall cooperate in good faith to promptly schedule, attend and participate in the ADR, and to devote the time, resources and attention to the ADR as may be necessary to attempt to resolve the dispute as promptly as possible.

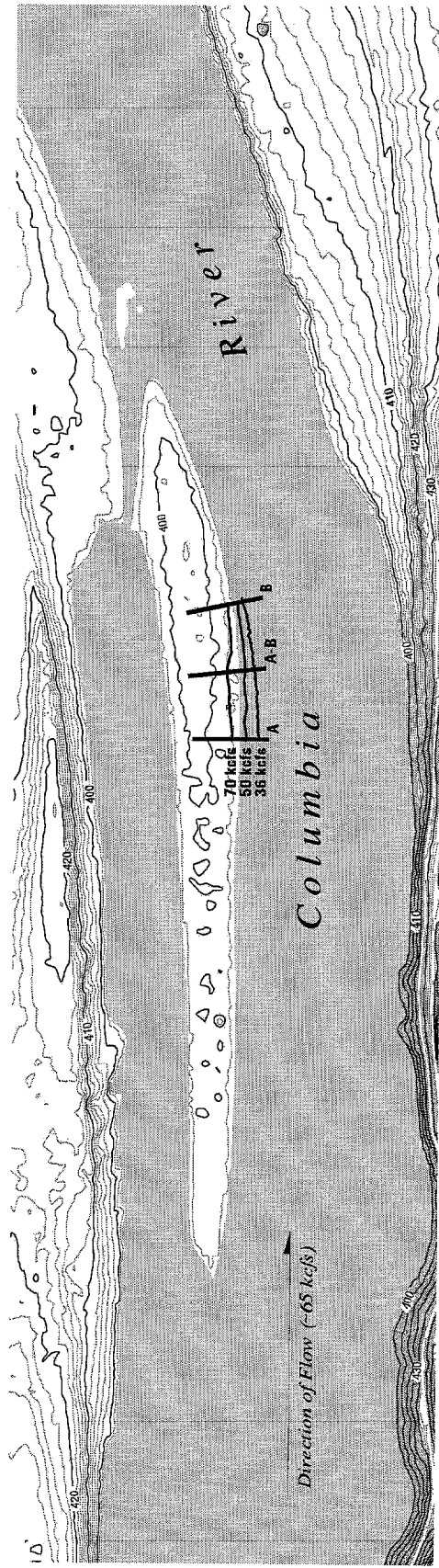
(f) Final Action: If, by the end of the thirty (30) day period (or the period otherwise agreed to), the Parties have not resolved the dispute, any Party may petition FERC for a remedy.

#### 10. Relationship to Mid-Columbia Hourly Coordination

This Agreement is not intended to prohibit Grant, Chelan, Douglas or BPA from exercising their rights to give notice of termination of the Agreement for Hourly Coordination of Projects on the Mid-Columbia River according to its terms. The termination of that agreement shall not relieve any Party from its obligations under this Agreement.

IN WITNESS WHEREOF, the Parties have executed this Agreement the day and year first written above.

Exhibit A. Map of Vernita Bar showing location of monitoring area.



Base map prepared by Paramatrix, February 04, 2004.  
File: grantpud\other\_maps\blats\nc\_10\_17\_03.gri

**NOTES:**

- 1) Water level presented is at approximately 396 feet elevation. Water level varies with river flow.
- 2) Elevation contours presented are based on the NAD83 vertical datum.



**Vernita Bar,  
Columbia River,  
River Mile 393**

Hanford Reach Fall Chinook Protection Program Agreement

Dated January 26, 2004

Public Utility District No. 2 of Grant County

By Timothy J. Culbertson

Name: Timothy J. Culbertson

Title: Interim Manager

Hanford Reach Fall Chinook Protection Program Agreement

Dated January 27, 2004

Public Utility District No. 1 of Chelan County

By Charles J. Hosken

Name: Charles J. Hosken

Title: General Manager

Hanford Reach Fall Chinook Protection Program Agreement

Dated January 19, 2004

Public Utility District No. 1 of Douglas County

By W C Dobbins

Name: William C. Dobbins

Title: CEO/Manager

Hanford Reach Fall Chinook Protection Program Agreement

Dated April 5, 2004

United States Department of Energy  
Bonneville Power Administration

By 

Name: Stephen J. Wright

Title: Administrator/CEO



Hanford Reach Fall Chinook Protection Program Agreement

Dated 3/22/, 2004

United States Department of Commerce  
National Oceanic and Atmospheric Administration Fisheries

By D. Robert Lohn

Name: D. Robert Lohn

Title: Regional Administrator, Northwest Region

Hanford Reach Fall Chinook Protection Program Agreement

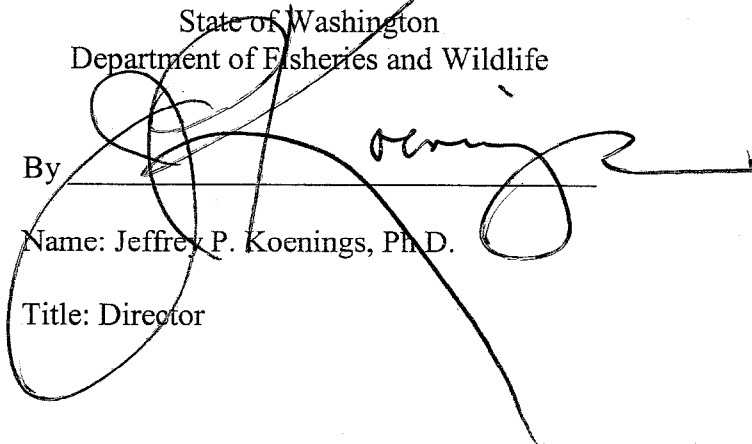
Dated 1-27, 2004

State of Washington  
Department of Fisheries and Wildlife

By \_\_\_\_\_

Name: Jeffrey P. Koenings, Ph.D.

Title: Director

A large, handwritten signature in black ink, appearing to read "Koenings", is written over a horizontal line. The signature is highly stylized and loops back under the line.

Hanford Reach Fall Chinook Protection Program Agreement

Dated 2-6, 2004

Confederated Tribes of the Colville Indian Reservation

By Joseph A. Pakootas

Name: Joseph A. Pakootas

## **Appendix D Summer Spill Proposal**

**Preliminary Proposal for**

**Federal Columbia River Power System  
Summer Juvenile Bypass Spill Operations**

**Bonneville Power Administration  
U.S. Army Corps of Engineers**



March 30, 2004

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# Preliminary Proposal for Federal Columbia River Power System Summer Juvenile Bypass Spill Operations

## I. Introduction

The goal of this proposal for summer spill operations is to achieve similar or better biological benefits for salmon at less cost than the current summer spill program. It is guided by the best available biological information we have about fall chinook. At the same time, regional decision-makers must consider the proposal in light of the need to balance the multiple objectives of the river system and the significant implications of alternatives to the region as a whole.

This is a joint proposal of the federal action agencies – Bonneville Power Administration (BPA) and the U.S. Army Corps of Engineers (Corps). It was developed in collaboration with NOAA Fisheries. BPA and the Corps propose to revise the 2004-2008 Implementation Plan to the NOAA Fisheries' 2000 Biological Opinion for FCRPS operations (2000 BiOp) to reflect this proposed summer spill operation and mitigation actions. The framework of the 2000 BiOp allows federal agencies to compare various alternatives to achieve the survival performance standards for listed species under the Endangered Species Act (ESA) – in this case, Snake River fall chinook. Through the implementation planning process, the actions described in the 2000 BiOp's Reasonable and Prudent Alternative (RPA) are further clarified and, in some cases, modified to meet the original intent of the agencies in adopting the RPA and its associated management framework.

The federal agencies' proposal has been guided by policy direction from several sources. First, The Northwest Power and Conservation Council (Council) adopted Mainstem Amendments in 2003 that included support for the 2000 BiOp's hydrosystem performance standards and its overall adaptive management framework. Recognizing the flexibility inherent in that framework to modify actions commensurate with their biological performance for adult and juvenile fish survival, the Mainstem Amendments asked the federal agencies "to examine the benefits of the current summer spill program... and to determine whether the biological benefits can be achieved in a more effective and less costly manner."<sup>1</sup> The Council has found that both ESA and Northwest Power Act responsibilities can "in many cases... be met in the same set of actions."<sup>2</sup> This is especially true with measures like summer spill where the action is needed for compliance with the 2000 BiOp yet it benefits primarily non-listed fish.

The four Northwest Governors sent their recommendations to the President dated June 5, 2003,<sup>3</sup> endorsing the Council's Mainstem Amendments, and urging the federal action agencies to fully implement them "as soon as is practicable." Then, in a joint executive statement on August 26, 2003, the regional executives of NOAA Fisheries, the Corps, and the BPA<sup>4</sup> said that "...under

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<sup>1</sup> Northwest Power and Conservation Council. "Mainstem Amendments to the Columbia Basin Fish and Wildlife Program," April 2003; p. 16.

<sup>2</sup> Northwest Power and Conservation Council. "Columbia River Basin Fish and Wildlife Program," 2000; p. 10.

<sup>3</sup> "Recommendations of the Governors of Idaho, Montana, Oregon and Washington for Protecting Columbia River Fish and Wildlife and Preserving the Benefits of the Columbia River Power System," signed by the four Northwest Governors June 5, 2003.

<sup>4</sup> See at <http://www.nwd-wc.usace.army.mil/tmt/agendas/2003/0827Exespil>

any survival estimates the costs [of the current summer spill program] appear exceedingly high relative to the biological benefit.” The agency heads said that they had “a responsibility to the region to devise an approach that is less costly while maintaining the ability to achieve the biological objectives for salmon and steelhead.” They committed to work with all interested parties in the region to achieve this objective. Subsequently, ten members of the Northwest delegation to the United States House of Representatives wrote BPA, NOAA Fisheries, and the Corps to encourage the agencies to test whether full mitigation of the biological impacts from reduced spill could be achieved at lower cost to ratepayers.<sup>5</sup>

In addition to this policy guidance, the federal agencies’ proposal has been informed by the best available scientific information, including analyses developed by the Spill Committee process, sponsored by the Council and the Columbia Basin Fish and Wildlife Authority (CBFWA). The federal agencies have analyzed the estimated effects of a range of summer spill operations on the FCRPS and programs to help mitigate for any effects of reduced summer spill on the fish that are migrating through the system during that time. In addition, the agencies have considered input from stakeholders throughout the region, including state and tribal fisheries managers and utility customers, who have submitted extensive comment on the technical and economic aspects of the alternatives.

The federal agencies propose here to provide the same or greater biological benefits to affected salmon stocks while supporting the FCRPS’ ability to remain an economic, efficient, and reliable energy source. We note that the fall chinook salmon affected by the summer spill changes also have economic importance for international, national, and tribal commercial harvest and regional sport fisheries, where they are harvested at approximately a 50 percent rate. This proposal presents a combined policy and biological issue, which must be considered in light of all the multiple objectives of the river system.

## **II. Summary of Summer Spill Proposal**

The federal agencies propose a three-year program (2004-2006) of spill reductions and mitigation actions. During this period, we will continue our ongoing monitoring of fish migration and offsets using the tools described in Section IV and updating information in the models and tests as it becomes available. At the conclusion of the three-year period, it is our understanding that the Council will conduct a public review process with the goal of providing recommendations to the federal agencies for the most biologically effective spill actions at the lowest possible cost.

Spill reductions would be implemented in mid-July at Ice Harbor Dam on the Snake River and in August on both the Snake and lower Columbia rivers. Spill at the lower river projects (Bonneville, The Dalles, and John Day) would end on July 31. To mitigate the impacts of these spill reductions on summer migrants, the federal agencies propose to implement a package of offset actions aimed at providing direct and indirect benefits to affected species. The specifics of the federal agencies’ proposal are described in Section IV.

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<sup>5</sup> Letter from Representatives Peter DeFazio, Darlene Hooley, Brian Baird, Rick Larson, Mike Simpson, George Nethercutt, Doc Hastings, Greg Walden, C.L. “Butch” Otter, and Dennis Rehberg to Steven J. Wright, D. Robert Lohn, and Brigadier General William T. Grisoli (March 13, 2004).



Table 1 shows the estimated impacts of this reduced spill operation, taking into account the comments we received in February. The range reflects the uncertainty inherent in the range of potential smolt-to-adult return rates (SARs), from 0.5 percent to 4 percent. Recent SARs for listed Snake River fish have been 0.32 percent, while recent rates for Hanford Reach fish have been 0.2 to 1.0 percent.

**TABLE 1: Estimated Biological Impacts of Spill Proposal**

<b>Stock</b>	<b>Smolts</b>	<b>Adults</b>
ESA-listed Snake River Fall Chinook	-500	-2 to -20
Non-listed Hanford Reach Fall Chinook	-177,000	-885 to -7,080
Other Non-listed Fall Chinook	-138,000	-690 to -5,520

To address these estimated adverse impacts from the summer spill modifications, we propose to implement a program of offsetting actions with same or better biological benefits for both listed and non-listed fall Chinook. The federal agencies propose to implement the following offset actions aimed at providing direct benefits to affected species:

- Enhanced Northern Pikeminnow management
- Hanford Reach stranding protection flows

The estimated benefits of these offsets are described in Table 2, below:

**TABLE 2: Estimated Offset Benefits (Increased Adult Returns)**

<b>Stock</b>	<b>Pikeminnow</b>	<b>Hanford Reach Anti-stranding</b>	<b>Total Adults</b>
ESA-listed Snake River Fall Chinook	+1 to +11	Not applicable	+1 to +11
Non-listed Hanford Reach Fall Chinook	+250 to +8,000	+3,916 to +80,662*	+4,166 to +88,662
Other Non-listed Fall Chinook		Not applicable	

\*The offset benefit attributed to Hanford Reach anti-stranding represents half of the overall total estimated biological benefit of the anti-stranding operation. The other half of the benefit from this operation, when combined with Grant County PUD's hatchery program, spill program, and its juvenile bypass systems at Priest Rapids and Wanapum Dams, is intended to mitigate for the existence and operation of Grant's projects.

Recognizing the mitigation actions set forth above offset approximately half the impact of the proposed spill reduction and therefore do not meet the criteria for providing similar or better biological benefits, the following actions are also under consideration. We request comments on which of these might be feasible and beneficial as summer spill offsets to fill the remaining gap. Such comments will inform an amended proposal that the federal agencies plan to release in advance of the April 16 regional executives meeting.

- Council Fish and Wildlife Program enhancement
- Additional flow augmentation from Dworshak Reservoir

- Tribal harvest enforcement funding
- Additional or improved artificial production
- Avian predation research
- Additional water acquisitions
- Habitat protection/enhancement
- Commercial harvest reductions (non-tribal), as available
- Additional Removable Spillway Weirs

### **III. The Process for Developing the Summer Spill Proposal**

Guided by the policy statements described above, BPA, Corps, NOAA Fisheries, and Council staff engaged in discussions to advance this initiative. The Council subsequently supported the CBFWA-sponsored Spill Committee process for broader regional discussion and development of a comprehensive summer spill evaluation. Participants included state, tribal, and federal agency representatives, as well as Council staff. This Spill Committee identified four summer spill options, and appointed a Science Team to develop study proposals for each and to assess their feasibility. The Spill Committee also appointed an Offsets Team to develop potential alternatives and to assess their effectiveness to mitigate for adverse impacts of reduced spill.

#### **A. Spill evaluation approaches**

The CBFWA Spill Committee Science Team considered two general approaches for determining the effect of the four summer spill options on fish survival: systemwide survival studies (either based on juvenile survival or returning adults) and project-specific survival studies.

The ideal approach would be to measure the system survival impacts of the existing operation or of any modification. A systemwide study is attractive because of its potential to assess the full range of direct and indirect effects of changes to spill operations. The overall complexity of such large-scale studies, however, is huge. The high observed seasonal and annual variability in survival requires tagging one to two million fish and likely alternating test conditions across years (as opposed to within years) to ensure that test fish are exposed to the subject treatment conditions. This requires decades or even centuries, to achieve a reasonable confidence level in the results. (Refer to Skalski<sup>6</sup>; also see comments of NOAA Fisheries regional director Bob Lohn<sup>7</sup>.)

For these reasons, the federal agencies continue to focus on project-specific evaluations to assess alternative operations (or configurations). Section IV describes the methods for the project-specific analyses in more detail.

The federal agencies used the SIMPAS model developed by NOAA Fisheries for the 2000 BiOp to estimate the relative biological impacts of a series of spill reduction

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<sup>6</sup> Skalski, John R., *Overview of Design Options for a Summer Spill Study*. 2003, p. 4.

<sup>7</sup> Bob Lohn presentation to Northwest Power Planning and Conservation Council, at [http://www.nwcouncil.org/news/2003\\_12/lohn.htm](http://www.nwcouncil.org/news/2003_12/lohn.htm)

scenarios. SIMPAS is widely used within the Regional Forum for management decisions on the hydro system.

The SIMPAS model has been criticized for not being able to predict survival with great certainty. Unfortunately, uncertainties and uncontrolled variables are characteristic of field biology studies as well. Past experience has shown that uncertainties, and the way they are treated, are at issue regardless of the model used. We chose the SIMPAS model precisely because it minimizes the number of uncontrolled variables used in analysis, and allows the broadest use of available field data, and because it is the method that has the broadest acceptance.

The federal agencies evaluated several spill reduction scenarios ranging from elimination of summer spill only at Ice Harbor Dam to full elimination of summer spill. These survival results were then used to show the relative effect on survival of juvenile and adult fish. This made the impacts analysis comparable to the estimated benefits of offset actions, because not all of the offsets can be expressed in terms of percent survival. Fish numbers also provide a somewhat better sense of the relative magnitude of impact.

#### **B. Assessment of offsets**

The CBFWA Spill Committee Offsets Team identified a broad list of potential offset actions, and developed principles or criteria for evaluating the efficacy of those actions. The committee used these criteria to screen its broad list, ultimately identifying and further developing several actions that were considered viable for offsetting the impacts of spill reductions. These actions were primarily aimed at reducing avian and fish predation and improving rearing habitat conditions for Hanford Reach fall chinook.

#### **C. Public comment period**

In mid-January, federal agencies released the results of the spill evaluation and the offset approaches for public review and comment. The analyses of biological impacts and offsets were presented at meetings of the Technical Management Team (TMT) and the Implementation Team (IT) in early February, with oral comments from meeting participants reflected in meeting notes.

By February 20, the comment closure date, the agencies received a total of 95 comments plus about 65 identical form letters. Of the 95 individual comments, 74 supported a reduction in summer spill. Most of these were from utilities and ratepayers wanting cost-effective salmon recovery efforts. The remaining letters expressed support for continuing the current summer spill program, cited policy issues or challenged technical aspects of the federal analysis. These included a detailed set of comments submitted jointly by state, tribal, and federal fisheries managers. Critics of the analyses primarily claimed that the agencies underestimated impacts of reducing summer spill and overestimated or miscalculated mitigation benefits.

The federal agencies considered these comments in developing many aspects of this proposal, particularly the offset package. A number of the offset actions were dropped from consideration as a result of the comments while other actions are receiving renewed consideration.

The federal agencies are seeking written comments on this proposal through April 7, 2004. We particularly seek comments on a reasonable package of mitigation actions that could achieve our objective of providing similar or better biological results for salmon. We will continue to consult with tribal and state executives and key staff during this time. The federal executives plan to consult with the 13 Columbia Basin Tribes on this proposal April 16. Later that same day the Regional Executive Committee, consisting of federal, state, and tribal executives, will meet to review the input received. The federal agencies will release an amended proposal ahead of these April 16 meetings, and will announce a final decision shortly after the meetings.

**IV. Details of the Proposal**

**A. Specific spill operations**

The following table compares the federal agencies’ proposed spill operation to the BiOp spill operation. Operations and evaluations would continue through the three-year period proposed.

**TABLE 3: Specific Spill Proposal**

	Ice Harbor		John Day		The Dalles		Bonneville	
	BiOp	Proposal	BiOp	Proposal	BiOp	Proposal	BiOp	Proposal
July	120% TDG, 24-hrs	planned test thru 7/15; no spill 7/16-31	60% of river flow, 12 hrs	30% of river flow, 24 hrs	40% of river flow, 24 hrs	BiOp	75 kcfs day, 120% TDG night	test BiOp vs 50 kcfs/ 24 hrs
August	120% TDG, 24 hrs	no spill	60% of river flow, 12 hrs	No spill	40% of river flow, 24 hrs	No spill	75 kcfs day, 120% TDG night	No spill

The federal agencies propose to end spill operations effective August 1 because they believe the majority of the summer migration generally occurs before then. Many fish have been collected and transported at the four collector projects, leaving fewer fish migrating in the lower river. Finally, the federal agencies have made significant investments in lower river projects to improve passage.

Following is a further description of the July operations and why we are proposing them. All study designs are being coordinated through the Regional Forum and the Corps' Anadromous Fish Evaluation Program (AFEP) process.

- At Bonneville Dam, we are proposing the reduced-spill evaluation in order to assess means to optimize potential benefits of the new corner collector.
- At The Dalles Dam, we are proposing BiOp levels due to relatively low turbine survival estimates and the need to maintain planned research on the new spillway training wall.
- At John Day Dam, we are proposing 30 percent spill for 24 hours/day based on research results indicating higher survival with those spill levels compared to BiOp spill, and preliminary research findings of relatively low turbine survival.
- At Ice Harbor Dam, we are proposing no spill after July 16. This is based on completion of planned research and past studies finding very little project survival improvement for Snake River fall chinook with spill. In addition, at this time of year, most fish have been collected and transported at the three upstream collector projects, leaving few fish migrating at this point in the lower Snake River to benefit from spill.

## **B. Proposed offsets**

The following actions are intended to provide offsetting benefits for ESA listed fall chinook, so that overall survival is the same or better. For non-listed fall chinook, these actions will also achieve similar survival levels as under the 2000 BiOp summer spill regime.

### **1. Northern Pikeminnow Management Program augmentation**

Juvenile salmonids are the major dietary component of the northern pikeminnow, with approximately 80 percent of that predation occurring in July and August. This coincides with the peak migration of subyearling fall chinook.

One of the primary actions available to improve in-river survival of fall chinook is the management of predatory fishes. The Northern Pikeminnow Management Program (NPMP) is a multi-year effort to reduce fish predation on juvenile salmon, primarily through public angler-driven systemwide removals of predator-sized (nine inches or greater) northern pikeminnow. Since program inception in 1990, over 2 million northern pikeminnow have been harvested through the sport reward program, with an estimated benefit of reducing predation mortality by 25 percent.<sup>8</sup>

The NPMP is a well-established operation with demonstrated success in adapting to changing conditions and responding to special circumstances. More aggressive

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<sup>8</sup> Friesen T. and David Ward. 1999. Management of Northern Pikeminnow and Implications for Juvenile Salmonid Survival in the Lower Columbia and Snake Rivers. North American Journal of Fisheries Management 19:406-420.

and focused removals could provide substantial survival benefit to reduce the impact of the conditions that in-river out-migrants face in 2004 and beyond.

Comments from the state, federal and tribal fishery agencies joint technical staff suggest that while there may be benefit from increased removal of northern pikeminnow, those effects would not be discernable. In response, we are proposing to more aggressively implement the NPMP to achieve exploitation rates that are in the higher end of the target range (the target range is 10 to 20 percent annual average exploitation), and which in the long-term may be more significant relative to measurements. We are also proposing that the mark-recapture effort, which is the basis for the NPMP evaluation, receive additional statistical review, as recommended by Hankin and Richards<sup>9</sup> (2000). We believe increased removal of northern pikeminnow has the effect of reduced consumption on smolts, a positive trend that has biological value and that can be estimated. Additionally, in response to comments concerning potential increases in predation resulting from spill operation modifications, we are proposing the addition of focused removals from Bonneville, The Dalles, and John Day forebays and tailrace boat restricted zones.

The scope of the 2004 augmentation would include these focused removals as well as a general increase in the reward structure in the Sport-Reward Fishery to provide systemwide enhancement and benefit to all affected stocks. Using the 2001 Power Emergency NPMP as a model for 2004 and beyond and the implementation of focused removal fisheries in the tailraces of select dams, we conservatively estimate an increase in systemwide catch of 15,000 northern pikeminnow. We believe it is reasonable to anticipate the potential for increased catch as high as 40,000 additional northern pikeminnow.

## **2. Hanford Reach anti-stranding operation**

Hanford Reach fall chinook, while not listed under ESA, are an important fish for tribal and commercial harvest. They are recognized throughout the region as a strong and healthy population.<sup>10</sup> The adults spawn in the Hanford Reach of the Columbia River and the juveniles enter the system above McNary Dam. Juvenile fish migrate through the mainstem Columbia River from June through September.

The Hanford Reach anti-stranding operation is intended to protect Hanford Reach fall chinook juveniles as they rear and pass out of the area in the spring by limiting flow fluctuations from Priest Rapids Dam. As flows fluctuate along the riparian zones downstream from Priest Rapids Dam, they sometimes strand the young fry in dewatered gravel or isolated pools. Since 1999, on a year-to-year

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<sup>9</sup> Hanken, D. and J. Richards. 2000. The Northern Pikeminnow Management Program: An Independent Review of Program Justification, Performance, and Cost-Effectiveness, 38pp.

<sup>10</sup> Evenson, Hatch, and Talbot. CRITFC: Hatchery Contribution to a Natural Population of Chinook in the Hanford Reach of the Columbia River, Washington. August 2002. Mentions quotes from three sources to that effect, including the Washington Department of Fish and Wildlife.

basis, BPA has voluntarily participated to varying degrees in operations to reduce such stranding.

Though Priest Rapids is owned and operated by Grant County Public Utility District (PUD), operations at federal projects upstream of Priest Rapids can affect Grant PUD's ability to maintain operations within the desired flow fluctuation limits. To assist Grant in providing more stable flows, we are proposing that BPA obligate itself through a long-term agreement to maintain certain outflows from the federal projects upstream. BPA would deliver Grant PUD amounts of energy to mitigate generation losses that Grant would incur from the limited flow fluctuation operation.

As noted in Table 2 above, we are proposing to claim 50 percent of the estimated benefit of this operation as an offset for summer spill reductions. The federal agencies believe it is appropriate to split the benefits of the operation with Grant PUD. This operation, when combined with Grant County PUD's hatchery program, spill program, and its juvenile bypass systems at Priest Rapids and Wanapum Dams, is intended to mitigate for the existence and operation of Grant's projects. However, Grant has indicated that it could not unilaterally provide this operation without BPA participation in the Protection Program.

This action is appropriate as an offset because it results in a 10-year BPA commitment to the operation (instead of the annual ad-hoc operation of the past several years); and, the operational regime has additional actions beyond those implemented annually in the recent past.

Initially, federal agencies estimated the total benefits of this operation to range from producing 8,000 to 66,000 additional Hanford Reach fall chinook adult returns. During the comment period, multiple parties suggested changes to improve the estimation method. Taking these comments into account, we have revised our estimate to approximately 3,916 to 80,662 additional adult returns.

### **3. Other mitigation actions that could enhance salmon survival**

The following specific actions are also under consideration as possible offsets. Some are extensions of existing programs currently being implemented, while others would be new activities. We note that there may be distinctions between those actions that likely have a biological benefit but the benefit is difficult to quantify, and those that are more easily quantified in terms of life stage survival. It would be particularly beneficial to receive input on the benefit of these actions and how they may be quantified.

- Council Fish and Wildlife Program funding increase – This would provide additional funding of \$5 million per year in each of FY 2005 and FY 2006 would enable BPA to implement additional mitigation actions that would not have otherwise been able to be funded in those years. Our objective is for this

funding to go toward actions that benefit stocks affected by summer spill reductions; however, the region may also prioritize projects targeted toward stocks that are in greater need. Federal agencies believe inclusion of this mitigation action in the final package of offsets is likely to advance our objectives of achieving similar or greater biological benefits.

- Additional flow augmentation from Dworshak – Additional water released from Dworshak could help moderate temperatures in the Snake River. There may be a benefit to increasing flow as well. It is recognized that this operation may result in cultural resources impacts for which mitigation would be required. Hydro regulation modeling indicates deeper drafts at Dworshak could also result in at least one additional year when spring refill would not be achieved and could substantially increase the volume of all refill misses.
- Tribal harvest enforcement funding – Funding for tribal law enforcement contracts could deter illegal take through increased compliance with regulations and laws and reduce illegal fishing through gear confiscation.
- Additional or improved artificial production – Hatchery supplementation could help offset survival impacts associated with spill reductions for affected stocks of hatchery origin.
- Avian predation research – Avian predation research may lead to management actions that reduce smolt mortality due to cormorants and caspian tern predation.
- Additional water acquisitions – Additional water acquisitions could provide a way to deliver additional flow and improved water quality in tributaries.
- Habitat protection – Habitat improvements could benefit both juvenile and adult salmon, providing a long-term benefit to affected species, as well as other stocks.
- Commercial harvest reductions (non-tribal), as available – Any regionally supported reduction in commercial harvest, as either a main offset or as a safety net in future years, would result in greater numbers of returning adults to other fisheries or to spawning grounds.
- Additional RSWs – This would involve prioritizing surface passage technologies at the lower Columbia River projects to offset the impacts of spill reductions and improve juvenile project survival.

## **C. Monitoring and evaluation**

### **1. Approach**

As described above, systemwide survival studies are not available to inform decisions in the short term. Project-specific studies provide a reasonable analysis of the relative differences in configuration or operational treatments, and the federal agencies rely extensively on them to support these decisions on the hydrosystem. While they are less accurate in predicting absolute survival, combined with modeling, project-specific studies allow us to apply the best available scientific information to evaluate relative differences among alternatives.



In 2004, project survival studies are planned at Bonneville, The Dalles, and Ice Harbor dams. They will rely on current methods and approaches, as described in this section. The studies will occur during the early part of the summer spill season. Project-specific studies are not feasible during the late summer when the proposed operation includes no spill. In August, water temperatures warm to the point that fish managers and researchers are concerned about the risk of increased mortality during fish handling and marking. The Corps has developed a pilot approach to address these issues that is being coordinated through their AFEP process.

### **General Evaluation Methods**

Smolt monitoring -- Routine annual sampling of guided fish at Bonneville, John Day, McNary, Lower Monumental, Little Goose, and Lower Granite dams. Information includes daily sampling to identify species, count, general condition, marks/tags, and signs of gas bubble disease. Subsamples of guided fish are anesthetized, observed, allowed to recover, and then returned to continue their migration (either in-river, or in some cases by transportation in barge or truck).

Hydroacoustic monitoring -- Research-related monitoring is conducted to determine relative magnitude and distribution of passage through various routes, including turbines, bypass, spillways, and other available routes (e.g., Bonneville second powerhouse corner collector, Lower Granite removable spillway weir). Hydroacoustic monitoring is totally passive, with no impact on migrating fish. However, hydroacoustic monitoring beyond early August is problematic because of the presence of out-migrating juvenile shad and the limited capability for discerning species composition of observed fishes.

Radio Telemetry -- Radio-telemetry (2- or 3-dimensional tracking of radio-tagged fish) is conducted at selected sites to determine fish behavior, passage distribution, and project passage survival (including route-specific survival). Once fish are tagged, radio tracking is a passive monitoring activity. However, fish tagging requires capture, anesthetization, tagging, recovery, and subsequent release. Radio telemetry is problematic when water temperatures warm and risks to fish from handling increase.

PIT tag detection -- Juvenile out-migrants are tagged throughout the Columbia River Basin for smolt monitoring or more specific research on in-river migration and factors affecting stock performance (e.g., extra mortality, multiple bypass), juvenile fish transportation (including delayed mortality), and site-specific evaluations of project passage alternatives. Juvenile PIT-tagged fish are passively interrogated at Bonneville, John Day, McNary, Lower Monumental, Little Goose, and Lower Granite dams, while returning adults are interrogated for PIT tags at Bonneville, McNary, Ice Harbor, Lower Granite, and Priest Rapids dams. Juvenile PIT tag interrogation is not able to resolve passage at specific routes through the projects.

## **2. Ongoing project-specific evaluations and monitoring activities**

In order to monitor summer spill modifications, information from the following evaluations will be used. Many of these are ongoing evaluations used routinely to assess program effectiveness and identify problem areas.

**Bonneville** - Radio telemetry and hydroacoustic monitoring will be used to assess the effectiveness of the newly installed second powerhouse corner collector under two different spill operations (BiOp spill vs. a lower level). The evaluations will assess project- and route-specific passage distribution and survival. Data on out-migrating fall chinook will be collected from late June through late July. Results will be available following the fish passage season, beginning in approximately November 2004. The studies will continue in 2005 and 2006, pending preliminary results of previous years' research.

**The Dalles** - Radio telemetry and hydroacoustic monitoring will be used to assess effectiveness of the newly-installed spillway training wall under BiOp spill. The evaluations will assess project- and route-specific passage distribution and survival. Data on out-migrating fall chinook will be collected from late June through late July. Results will be available following the fish passage season, beginning in approximately November 2004. The studies will continue in 2005 and 2006, pending preliminary results of previous years' research.

**Ice Harbor** – Radio telemetry monitoring will be conducted to assess two different spill patterns (small gate opening versus larger gate openings). This is a follow-up to the 2003 study that suggested a potential survival improvement with larger gate openings. Studies evaluating the new RSW will continue in 2005 and 2006.

**Estimate survival for the passage of juvenile salmonids through dams and reservoirs of the Lower Snake and Columbia rivers:** Hatchery subyearling fall chinook salmon will be PIT tagged and released above Lower Granite Dam to estimate their survival through the Snake River. River-run subyearling fall chinook salmon (mostly wild Hanford stock) will be PIT tagged and released at McNary Dam to estimate their survival through the lower Columbia River. We will explore the relationships among survival, travel time, environmental variables, and dam operations using the expanding data base generated by this study. As PIT-tagged adult fish return, we will continue to explore survival-to-adult for fish with different passage histories.

**Fall Chinook transportation effects (Lower Granite and McNary dams)** – Out-migrating juvenile fall chinook will be PIT tagged at Lower Granite and McNary dams. One group will be left to migrate in-river and another group will be transported to below Bonneville Dam by barge. Smolt-to-adult return rates will be assessed for the two groups to determine the effectiveness of

transportation and in-river migration. Studies of fall chinook transportation began in 2001 and will require several years. Preliminary results are reported annually in approximately November, with complete results available upon adult return of all year-classes in approximately 2010.

### **3. Monitoring the effectiveness of offsets**

Established monitoring activities associated with existing measures will provide feedback on the effectiveness of enhancements as offsets. Any new measures implemented under the Fish and Wildlife Program as offsets will include annual reporting of accomplishments as part of the usual reporting requirements for projects funded under the Program. Where existing monitoring programs exist, they will be used or modified.

**Northern Pikeminnow Management Program** – Routine NPMP monitoring will assess the effectiveness of this offset, including total annual effort (typically reported as number of angler-days), catch per unit effort, exploitation rate, and actual catch compared to projected catch (based on historic performance). Results will be reported annually.

**Hanford Reach Fall Chinook Protection Program** – Routine monitoring by Grant PUD, Washington Department of Fisheries, and others has historically provided information annually on stranding of fall chinook fry in the Hanford Reach. Five years of field monitoring while flow fluctuation limits have been in place has led to refinement of operating limits for Priest Rapids that have been incorporated in the proposed long-term Protection Program. That monitoring program provided adequate information; additional monitoring is not needed.

### **4. Final assessment in 2006**

At the end of the three-year period, results of the annual monitoring and evaluation efforts would be available. At that point, the Council has stated in its Mainstem Amendments that it plans to conduct a public review at the end of this evaluation “with the goal of providing recommendations to the federal agencies for the most biologically effective spill actions at the lowest possible cost.”<sup>11</sup> The federal agencies intend to assess the monitoring and evaluation information collected and collaborate with the Council on its public process. Our expectation is for this effort to lead to a regional recommendation for a long-term summer spill operation.

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<sup>11</sup> See footnote 1, page 1.

**V. Assessment of Biological and Economic Impacts of the Summer Spill Proposal**

**A. Summary of estimated biological impacts**

Overall system survival under the proposed operation is estimated to be less than 2 percent lower than under the BiOp spill operation. Table 4 summarizes the estimated system survival impact of the proposed operation by stock.

ESA-listed Snake River fall chinook are the least impacted, at about 0.4 percent. On average, approximately 62 percent of these juveniles migrate during July and 28 percent migrate in August. However, about 90 percent of juvenile Snake River fall chinook are transported, leaving a very small percentage in-river and subject to the impacts of the proposed spill operation. The federal agencies believe the proposed enhancement of the pikeminnow program can mitigate approximately half the survival impacts to the listed Snake River fall chinook resulting from the proposed operation.

System survival for non-listed Hanford Reach fall chinook is projected to decrease by approximately 1.7 percent under the proposed operation. Approximately 50 percent of the Hanford Reach juveniles are transported at McNary Dam, with about 80 percent migrating through the lower river by July 31. These fish are considered the basin’s healthiest salmonid population and make up a substantial portion of the overall fall chinook population. They are harvested in the ocean and in-river at approximately a 50 percent rate.

For those non-listed summer migrants that enter the FCRPS below McNary Dam and do not have the opportunity to be transported, impacts of the proposed operation range from less than 0.5 percent reduction in juvenile system survival to nearly 5 percent, with the highest impact occurring to the juvenile summer migrants originating from the Umatilla River.

**TABLE 4: Est. Survival Reduction of Proposed Operation vs. BiOp Spill**

Affected Stock	Estimated Impacts	
	Juvenile Numbers	% Reduction
<b>FALL CHINOOK</b>		
<b>Upriver Bright</b>		
Priest Rapids & Ringold Springs Hatcheries	72,000	1.7%
Hanford Reach Natural	177,000	1.7%
Yakima River & Marion Drain	5,000	1.7%
<b>Snake River Bright</b>		
Listed Wild Snake River	500	0.4%
Unlisted Lyons Ferry Hatchery	2,000	0.5%
Unlisted Nez Perce and Big Canyon Hatcheries	1,000	0.4%
<b>Mid-Columbia Bright</b>		
Deschutes River	10,000	2.4%
Klickitat River	13,000	1.0%

**TABLE 4: Est. Survival Reduction of Proposed Operation vs. BiOp Spill**

Affected Stock	Estimated Impacts	
	Juvenile Numbers	% Reduction
<b>FALL CHINOOK</b>		
Umatilla River	10,000	4.8%
Little White Salmon River	7,000	1.0%
<b>SUMMER CHINOOK</b>		
Upper-Columbia	18,000	1.7%
<b>TOTAL LISTED Juveniles</b>	500	0.4%
converted to adults with 0.5% SAR	3	0.4%
converted to adults with 1% SAR	5	0.4%
converted to adults with 2% SAR	10	0.4%
converted to adults with 4% SAR	20	0.4%
<b>TOTAL UNLISTED Juveniles</b>	315,000	1.6%
converted to adults with 0.5% SAR	1,575	1.6%
converted to adults with 1% SAR	3,150	1.6%
converted to adults with 2% SAR	6,300	1.6%
converted to adults with 4% SAR	12,600	1.6%

**B. Summary of Economic Impacts**

When water is passed over dam spillways and not through turbines, there is an opportunity cost to the power system. BPA estimates these foregone revenues by calculating the number of megawatt-hours the volume of spilled water could have produced, and applies a power market value (mid-Columbia power market price) to that foregone generation. In the summer months, BPA has estimated the power market value of BiOp spill to average \$77 million. (The cost estimates vary based on projected water conditions, from \$55 million to \$92 million, with 31 out of 50 water years falling between \$75 million and \$85 million.) Table 5 compares the power market value of BiOp spill to that of the proposed summer spill operation.

**TABLE 5: Power Market Value of Summer Spill (50 year average in \$ millions)**

	July	August	Total
BiOp Spill	\$ 35	\$ 42	\$ 77
Proposed Spill	\$ 30	\$ 0	\$ 30
Difference	\$ 5	\$ 42	\$ 47

Funding for the offset actions would be provided from the additional power revenues resulting from the proposed spill reduction. Table 6 describes the FCRPS revenue impacts associated with the proposed spill operation and the offset actions by year.

**TABLE 6: Revenue Impact of the Proposal** (in \$ millions)

	2004	2005	2006
<b>Value of Additional Generation</b> (50 water-year average)	<b>\$47</b>	<b>\$47</b>	<b>\$47</b>
Offsets			
Enhanced Pikeminnow Program	\$1 – 3	\$1– 3	\$1 – 3
Hanford Reach anti-stranding	\$0.1	\$0.1	\$0.1
Placeholder estimate for offsets under consideration	\$2 – 5	\$2 – 5	\$2 – 5
Council Fish & Wildlife Program Enhancement	\$0	\$5	\$5
<b>Offsets Total</b>	<b>(\$3.1 – 8.1)</b>	<b>(\$8.1 – 13.1)</b>	<b>(\$8.1 – 13.1)</b>
<b>FCRPS Net Revenue Impact</b>	<b>\$43.9– 38.9</b>	<b>\$38.9 – 33.9</b>	<b>\$38.9 – 33.9</b>

## VI. Conclusion

It is the federal agencies' policy to find the most cost-effective means to meet our obligations. Cost-effectiveness is also considered in evaluating mitigation. We believe a cost-effective, performance-based approach will ultimately lead to greater overall benefits to salmon. Working within the BiOp's performance-based framework, the federal agencies have attempted to respond to the technical input we have received and to design a proposal that provides similar or better biological benefits at less cost. This is consistent with our policy to provide for the multiple uses of the FCRPS benefiting the people and resources of the Pacific Northwest.

## VII. Libby and Hungry Horse Summer Operations Proposal

In its Mainstem Amendments, the Council recommends summer reservoir operations at Libby and Hungry Horse Dams that differ from the 2000 BiOp. Specifically, the Council recommends that on an experimental basis, these reservoirs be drafted at a steady rate from July 1 through September 30 until they reach 10 feet from full pool. This operation is recommended for all years except the lowest 20th percentile water supply years. In those low water years, the Council recommends that these reservoirs be drafted 20 feet from full pool.

The Action Agencies and NOAA Fisheries are considering the impacts and benefits of implementing this aspect of the Council's Mainstem Amendments. A federal proposal for implementation is not sufficiently developed for release simultaneously with the summer spill proposal. However, the federal agencies anticipate providing a recommended approach ahead of the summer operations season.