

## FPOM's Annual FPP Change Form Review Meeting

Date / Time: Thursday, January 28, 2021 / 10am – 2pm

Change Forms and Drafts are online at: [pweb.crohms.org/tmt/documents/fpp/2021/changes/](http://pweb.crohms.org/tmt/documents/fpp/2021/changes/)

### \*\*\*\*\*Post-Meeting Results\*\*\*\*\*

#### CHAPTER 4 – JOHN DAY

1. 21JDA001 – Spillbay 2 Attraction Flow Dates (Wright, Grosvenor). **APPROVED**
2. 21JDA002 – Update Locked-Blade Units (Wright). **APPROVED**

#### CHAPTER 5 – McNARY

3. 21MCN001 – Adult Bull Trout Counts (Peery). **APPROVED w/ edits.**
4. 21MCN002 – Spill Pattern Change (Gersbach). **PENDING. Revised 4-FEB.**
5. 21MCN003 – Spill for Steelhead Overshoots (Wright). **APPROVED w/ edits.**

#### CHAPTER 6 – ICE HARBOR

6. 21IHR001 – Adult Bull Trout Counts (Peery). **APPROVED w/ edits.**
7. 21IHR002 – Spill for Steelhead Overshoots (Wright). **APPROVED w/ edits.**
8. 21IHR003 – RSW Updates (Wright) **APPROVED**

#### CHAPTER 7 – LOWER MONUMENTAL

9. 21LMN001 – Adult Bull Trout Counts (Peery). **APPROVED w/ edits.**
10. 21LMN002 – Update Locked-Blade Units (Wright) **APPROVED**
11. 21LMN003 – Spill for Steelhead Overshoots (Wright). **APPROVED w/ edits.**
12. 21LMN004 – RSW Updates (Wright) **APPROVED**

#### CHAPTER 8 – LITTLE GOOSE

13. 21LGS001 – Adult Bull Trout Counts (Peery). **APPROVED w/ edits.**
14. 21LGS002 – Spill for Steelhead Overshoots (Wright). **APPROVED w/ edits.**
15. 21LGS003 – Unit 1 Special Operation & Unit 6 Priority (FPOM). **PENDING**
16. 21LGS004 – ASW Crest During 30% Spill (Wright). **PENDING**

## **CHAPTER 9 – LOWER GRANITE**

- 17. 21LWG001 – Early JBS Dewater (Holdren). **APPROVED**
- 18. 21LWG002 – Adult Bull Trout Counts (Peery). **APPROVED w/ edits.**
- 19. 21LWG003 – Spill for Steelhead Overshoots (Wright). **APPROVED w/ edits.**
- 20. 21LWG004 – RSW August Operation (Wright). **PENDING**

## **APPENDIX A – Special Project Operations & Studies**

- 21. 2ppA001 – Doble Testing Schedule (Peery, Wright) **PENDING.**

## **APPENDIX L – Predator Management Plans**

- 22. 21AppL001 – Predation Plan Updates (Mackey, Cordie, Peery). **PENDING. Revised 4-FEB.**
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## **NEW or UPCOMING Change Forms (as of 5-FEB-2021):**

21BON001 – Temperature Monitor Locations Update (Derugin). *Posted on the FPP website and on the FPOM agenda for 11-Feb.*

21AppC001 – Turbine Range Updates (BPA). *Draft still in development.*

21AppI001 – Dworshak Turbine Maintenance & Testing Dates (Baus). *Draft still in development.*

## **Fish Passage Plan (FPP) Change Request Form**

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**Change Form # & Title:** 21MCN002 – McNary Dam modified spill tables  
**Date Submitted:** 18 December 2020  
**Project:** McNary Dam  
**Requester Name, Agency:** William Gersbach. CENWW-ODM  
**Final Action:**

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**FPP Section:** Spill Pattern Tables MCN-7 (with TSWs) and MCN-9 (No TSWs).

**Justification for Change:** Excessive wear and tear from operating beyond the designed capabilities has increased risk of failure for critical flood emergency response equipment. Limiting the number of times the electrical relays for spillway cranes are operated will help ensure that they will be fully functional when needed for emergency flood situations.

**Proposed Change:** Set the spill gates in bays 2 and 19, at the locations of spillway cranes 6 and 7, to a static opening of gate step 4.

See modified spill pattern tables on the pages below.

### **Comments:**

#### **28-Jan-2021 FPOM FPP Meeting:**

- Bettin asked if the TSW patterns could keep bay 2 closed until a higher spill rate, similar to what's proposed for the no TSW patterns.
- Lorz has concerns with locking bay 2 at four stops for all spill levels and would prefer to see the patterns defined in bands where bay 2 is open a set number of stops over a range of spill (i.e., the project would adjust bay 2 a couple times a season rather than just locking it at four stops). His concern is at higher spill levels there will be a hole in the pattern at bay 2.
- Peery said there are plans to get a new gear box for crane 7 sometime this year but no date yet. So these modified patterns would just be until the fix is made.
- Peery will work with the project and Laughery to see if the patterns can be revised as recommended.

**PENDING – will be revised and reviewed at FPOM on February 11.**

**4-FEB-2021 email from Chris Peery:** “Attached are revised spill tables for McNary Dam, produced by Ryan Laughery and reviewed by the project, for inclusion with 21MCN002.”

### **Record of Final Action:**

**Table MCN-7. [pg 1 of 5] McNary Dam Spill Patterns for Fish Passage with TSWs in Bays 19-20 and Bay 2 Locked at 4 or 6 Stops.**

MCN Spill Patterns with TSWs (# Gate Stops per Spillbay) and Bay 2 Locked at 4 or 6 Stops (in effect until crane repairs are completed)																						Total Stops (#)	Spill <sup>a</sup> (kcfs)
1 <sup>b</sup>	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22 <sup>b</sup>		
																		TSW	TSW	1		1	21.2
																	1	TSW	TSW	1		2	23.2
																	1	TSW	TSW	1	1	3	25.2
																	1	TSW	TSW	2	1	4	27.1
																	2	TSW	TSW	2	1	5	29.0
																1	2	TSW	TSW	2	1	6	31.0
																2	2	TSW	TSW	2	1	7	32.9
														1		2	2	TSW	TSW	2	1	8	34.9
														1		2	2	TSW	TSW	2	2	9	36.8
														2		2	2	TSW	TSW	2	2	10	38.7
														2	1	2	2	TSW	TSW	2	2	11	40.7
														2	2	2	2	TSW	TSW	2	2	12	42.6
													1	2	2	2	2	TSW	TSW	2	2	13	44.6
													2	2	2	2	2	TSW	TSW	2	2	14	46.5
										1		2		2	2	2	2	TSW	TSW	2	2	15	48.5
										2		2		2	2	2	2	TSW	TSW	2	2	16	50.4
								1		2		2		2	2	2	2	TSW	TSW	2	2	17	52.4
								2		2		2		2	2	2	2	TSW	TSW	2	2	18	54.3
								2	1	2		2		2	2	2	2	TSW	TSW	2	2	19	56.3
								2	2	2		2		2	2	2	2	TSW	TSW	2	2	20	58.2
								2	2	2		2	1	2	2	2	2	TSW	TSW	2	2	21	60.2
								2	2	2		2	2	2	2	2	2	TSW	TSW	2	2	22	62.1
								2	2	2	1	2	2	2	2	2	2	TSW	TSW	2	2	23	64.1
								2	2	2	2	2	2	2	2	2	2	TSW	TSW	2	2	24	66.0
						1		2	2	2	2	2	2	2	2	2	2	TSW	TSW	2	2	25	68.0
						2		2	2	2	2	2	2	2	2	2	2	TSW	TSW	2	2	26	69.9
				1		2		2	2	2	2	2	2	2	2	2	2	TSW	TSW	2	2	27	71.9
2.5		3.5		2		2		2		2		2	1	2	1	2	2	TSW	TSW	2	2	28	71.7
2.5		3.5		2	1	2		2		2		2	1	2	1	2	2	TSW	TSW	2	2	29	73.7
2.5		3.5		2	1	2		2	1	2		2	1	2	1	2	2	TSW	TSW	2	2	30	75.7
2.5		3.5		2	1	2		2	1	2	1	2	1	2	1	2	2	TSW	TSW	2	2	31	77.7
2.5	4	3.5		2		2		2		2		2	1	2	1	2	2	TSW	TSW	2	2	32	78.9
2.5	4	3.5		2	1	2		2		2		2	1	2	1	2	2	TSW	TSW	2	2	33	80.9
2.5	4	3.5		2	1	2		2	1	2		2	1	2	1	2	2	TSW	TSW	2	2	34	82.9
2.5	4	3.5		2	1	2		2	1	2	1	2	1	2	1	2	2	TSW	TSW	2	2	35	84.9
2.5	4	3.5		2	1	2	1	2	1	2	1	2	1	2	1	2	2	TSW	TSW	2	2	36	86.9
2.5	4	3.5	1	2	1	2	1	2	1	2	1	2	1	2	1	2	2	TSW	TSW	2	2	37	88.9

MCN Spill Patterns with TSWs (# Gate Stops per Spillbay) and Bay 2 Locked at 4 or 6 Stops (in effect until crane repairs are completed)																					Total Stops (#)	Spill <sup>a</sup> (kcfs)	
1 <sup>b</sup>	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22 <sup>b</sup>		
2.5	4	3.5	1	2	1	2	1	2	1	2	1	2	1	2	1	2	2	TSW	TSW	3	2	38	90.6
2.5	4	3.5	1	2	1	2	1	2	1	2	1	2	2	2	1	2	2	TSW	TSW	3	2	39	92.5
2.5	4	3.5	1	2	1	2	1	2	1	2	1	2	2	2	1	2	2	TSW	TSW	3	3	40	94.2
2.5	4	3.5	1	2	1	2	1	2	1	2	1	2	2	2	2	2	2	TSW	TSW	3	3	41	96.1
2.5	4	3.5	1	2	2	2	1	2	1	2	1	2	2	2	2	2	2	TSW	TSW	3	3	42	98.0
2.5	4	3.5	1	2	2	2	1	2	2	2	1	2	2	2	2	2	2	TSW	TSW	3	3	43	99.9
2.5	4	3.5	1	2	2	2	1	2	2	2	2	2	2	2	2	2	2	TSW	TSW	3	3	44	101.8
2.5	4	3.5	1	2	2	2	2	2	2	2	2	2	2	2	2	2	2	TSW	TSW	3	3	45	103.7
2.5	4	3.5	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	TSW	TSW	3	3	46	105.6
3	4	4	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	TSW	TSW	3	3	47	108.9
3	4	4	2	2	2	2	2	2	2	2	2	2	2	2	3	2	2	TSW	TSW	3	3	48	110.6
3	4	4	2	2	2	2	2	2	2	2	2	2	2	2	3	2	3	TSW	TSW	3	3	49	112.3
3	4	4	3	2	2	2	2	2	2	2	2	2	2	2	3	2	3	TSW	TSW	3	3	50	114.0
3	4	4	3	2	2	2	2	2	2	2	2	2	2	2	3	3	3	TSW	TSW	3	3	51	115.7
3	4	4	3	2	3	2	2	2	2	2	2	2	2	2	3	3	3	TSW	TSW	3	3	52	117.4
3	4	4	3	2	3	2	2	2	2	2	2	2	2	3	3	3	3	TSW	TSW	3	3	53	119.1
3	4	4	3	2	3	2	3	2	2	2	2	2	2	3	3	3	3	TSW	TSW	3	3	54	120.8
3	4	4	3	2	3	2	3	2	2	2	2	3	2	3	3	3	3	TSW	TSW	3	3	55	122.5
3	4	4	3	2	3	2	3	2	3	2	2	3	2	3	3	3	3	TSW	TSW	3	3	56	124.2
3	4	4	3	2	3	2	3	2	3	2	3	3	2	3	3	3	3	TSW	TSW	3	3	57	125.9
3	4	4	3	2	3	2	3	2	3	2	3	3	3	3	3	3	3	TSW	TSW	3	3	58	127.6
3	4	5	3	2	3	2	3	2	3	2	3	3	3	3	3	3	3	TSW	TSW	3	3	59	129.2
3	4	5	3	3	3	2	3	2	3	2	3	3	3	3	3	3	3	TSW	TSW	3	3	60	130.9
3	4	5	3	3	3	3	3	2	3	2	3	3	3	3	3	3	3	TSW	TSW	3	3	61	132.6
3	4	5	3	3	3	3	3	2	3	3	3	3	3	3	3	3	3	TSW	TSW	3	3	62	134.3
3	4	5	3	3	3	3	3	2	3	3	3	3	3	3	3	3	3	TSW	TSW	3	3	62	134.3
3	4	5	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	TSW	TSW	3	3	63	136.0
4	4	5	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	TSW	TSW	3	3	64	137.6
4	4	5	3	3	3	3	3	3	3	3	3	3	3	3	3	3	4	TSW	TSW	3	3	65	139.2
4	4	5	3	3	3	3	3	3	3	3	3	3	3	3	3	4	4	TSW	TSW	3	3	66	140.8
4	4	5	3	3	3	4	3	3	3	3	3	3	3	3	4	4	4	TSW	TSW	3	3	67	142.4
4	4	5	3	3	3	4	3	3	3	4	3	3	3	3	4	4	4	TSW	TSW	3	3	68	144.0
4	4	5	3	4	3	4	3	3	3	4	3	3	3	3	4	4	4	TSW	TSW	3	3	69	145.6
4	4	5	3	4	3	4	3	3	3	4	3	3	3	4	3	4	4	TSW	TSW	3	3	70	147.2
4	4	5	3	4	3	4	3	4	3	4	3	3	3	4	3	4	4	TSW	TSW	3	3	71	148.8
4	4	5	3	4	3	4	3	4	3	4	3	4	3	4	3	4	4	TSW	TSW	3	3	72	150.4
4	4	5	3	4	4	4	3	4	3	4	3	4	3	4	3	4	4	TSW	TSW	3	3	73	152.0
4	4	5	3	4	4	4	3	4	4	4	3	4	3	4	3	4	4	TSW	TSW	3	3	74	153.6

MCN Spill Patterns with TSWs (# Gate Stops per Spillbay) and Bay 2 Locked at 4 or 6 Stops (in effect until crane repairs are completed)																						Total Stops (#)	Spill <sup>a</sup> (kcsf)
1 <sup>b</sup>	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22 <sup>b</sup>		
4	4	5	3	4	4	4	3	4	4	4	4	4	3	4	3	4	4	TSW	TSW	3	3	75	155.2
4	4	5	3	4	4	4	4	4	4	4	4	4	3	4	3	4	4	TSW	TSW	3	3	76	156.8
4	4	5	3	4	4	4	4	4	4	4	4	4	3	4	4	4	4	TSW	TSW	3	3	77	158.4
4	4	5	4	4	4	4	4	4	4	4	4	4	3	4	4	4	4	TSW	TSW	3	3	78	160.0
4	4	5	4	4	4	4	4	4	4	4	4	4	3	4	4	4	4	TSW	TSW	4	3	79	161.6
4	4	5	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	TSW	TSW	4	3	80	163.2
5	4	5	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	TSW	TSW	4	3	81	164.8
5	4	5	4	4	4	4	4	4	4	4	4	4	4	4	4	4	5	TSW	TSW	4	3	82	166.4
5	4	5	4	4	4	4	4	4	4	4	4	4	4	4	4	5	5	TSW	TSW	4	3	83	168.0
5	4	5	4	4	4	5	4	4	4	4	4	4	4	4	4	5	5	TSW	TSW	4	3	84	169.6
5	4	5	4	4	4	5	4	4	4	5	4	4	4	4	4	5	5	TSW	TSW	4	3	85	171.2
5	4	5	4	5	4	5	4	4	4	5	4	4	4	4	4	5	5	TSW	TSW	4	3	86	172.8
5	4	5	4	5	4	5	4	4	4	5	4	4	4	5	4	5	5	TSW	TSW	4	3	87	174.4
5	4	5	4	5	4	5	4	5	4	5	4	4	4	5	4	5	5	TSW	TSW	4	3	88	176.0
5	4	5	4	5	4	5	4	5	4	5	4	5	4	5	4	5	5	TSW	TSW	4	3	89	177.6
5	4	5	4	5	4	5	4	5	4	5	4	5	4	5	4	5	5	TSW	TSW	5	3	90	179.2
5	4	5	4	5	5	5	4	5	4	5	4	5	4	5	4	5	5	TSW	TSW	5	3	91	180.8
5	4	5	4	5	5	5	4	5	5	5	4	5	4	5	4	5	5	TSW	TSW	5	3	92	182.4
5	4	5	4	5	5	5	4	5	5	5	5	5	4	5	4	5	5	TSW	TSW	5	3	93	184.0
5	4	5	4	5	5	5	5	5	5	5	5	5	4	5	4	5	5	TSW	TSW	5	3	94	185.6
5	4	5	4	5	5	5	5	5	5	5	5	5	4	5	5	5	5	TSW	TSW	5	3	95	187.2
5	4	5	5	5	5	5	5	5	5	5	5	5	4	5	5	5	5	TSW	TSW	5	3	96	188.8
5	4	5	5	5	5	5	5	5	5	5	5	5	4	5	5	5	5	TSW	TSW	5	4	97	190.4
5	4	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5	TSW	TSW	5	4	98	192.0
5	6	5	5	5	5	5	5	5	5	5	5	5	4	5	5	5	5	TSW	TSW	5	4	99	193.6
5	6	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5	TSW	TSW	5	4	100	195.2
5	6	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5	6	TSW	TSW	5	4	101	196.8
5	6	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5	6	TSW	TSW	5	5	102	198.4
5	6	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5	6	TSW	TSW	6	5	103	200.0
5	6	6	5	5	5	5	5	5	5	5	5	5	5	5	5	5	6	TSW	TSW	6	5	104	201.6
5	6	6	5	5	5	5	5	5	5	5	5	5	5	5	5	6	6	TSW	TSW	6	5	105	203.2
5	6	6	6	5	5	5	5	5	5	5	5	5	5	5	5	6	6	TSW	TSW	6	5	106	204.8
5	6	6	6	5	5	5	5	5	5	5	5	5	5	5	6	6	6	TSW	TSW	6	5	107	206.4
5	6	6	6	6	5	5	5	5	5	5	5	5	5	5	6	6	6	TSW	TSW	6	5	108	208.0
5	6	6	6	6	5	5	5	5	5	5	5	5	5	6	6	6	6	TSW	TSW	6	5	109	209.6
5	6	6	6	6	6	5	5	5	5	5	5	5	5	6	6	6	6	TSW	TSW	6	5	110	211.2
5	6	6	6	6	6	5	5	5	5	5	5	5	6	6	6	6	6	TSW	TSW	6	5	111	212.8
5	6	6	6	6	6	6	5	5	5	5	5	5	6	6	6	6	6	TSW	TSW	6	5	112	214.4

MCN Spill Patterns with TSWs (# Gate Stops per Spillbay) and Bay 2 Locked at 4 or 6 Stops (in effect until crane repairs are completed)																					Total Stops (#)	Spill <sup>a</sup> (kcfs)	
1 <sup>b</sup>	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22 <sup>b</sup>		
5	6	6	6	6	6	6	5	5	5	5	5	6	6	6	6	6	6	TSW	TSW	6	5	113	216.0
5	6	6	6	6	6	6	6	5	5	5	5	6	6	6	6	6	6	TSW	TSW	6	5	114	217.6
5	6	6	6	6	6	6	6	5	5	5	6	6	6	6	6	6	6	TSW	TSW	6	5	115	219.2
5	6	6	6	6	6	6	6	6	5	5	6	6	6	6	6	6	6	TSW	TSW	6	5	116	220.8
5	6	6	6	6	6	6	6	6	5	6	6	6	6	6	6	6	6	TSW	TSW	6	5	117	222.4
5	6	6	6	6	6	6	6	6	6	6	6	6	6	6	6	6	6	TSW	TSW	6	5	118	224.0
6	6	6	6	6	6	6	6	6	6	6	6	6	6	6	6	6	6	TSW	TSW	6	5	119	225.6
6	6	6	6	6	6	6	6	6	6	6	6	6	6	6	6	6	7	TSW	TSW	6	5	120	227.2
6	6	6	6	6	6	6	6	6	6	6	6	6	6	6	6	6	7	TSW	TSW	7	6	122	230.4
6	6	7	6	6	6	6	6	6	6	6	6	6	6	6	6	7	7	TSW	TSW	7	6	124	233.6
6	6	7	7	6	6	6	6	6	6	6	6	6	6	6	7	7	7	TSW	TSW	7	6	126	236.8
6	6	7	7	7	6	6	6	6	6	6	6	6	6	7	7	7	7	TSW	TSW	7	6	128	240.0
6	6	7	7	7	7	6	6	6	6	6	6	6	7	7	7	7	7	TSW	TSW	7	6	130	243.2
6	6	7	7	7	7	7	6	6	6	6	6	7	7	7	7	7	7	TSW	TSW	7	6	132	246.4
6	6	7	7	7	7	7	7	6	6	6	7	7	7	7	7	7	7	TSW	TSW	7	6	134	249.6
6	6	7	7	7	7	7	7	7	6	7	7	7	7	7	7	7	7	TSW	TSW	7	6	136	252.8
7	6	7	7	7	7	7	7	7	7	7	7	7	7	7	7	7	7	TSW	TSW	7	6	138	256.0
7	6	7	7	7	7	7	7	7	7	7	7	7	7	7	7	7	8	TSW	TSW	7	7	140	259.3
7	6	8	7	7	7	7	7	7	7	7	7	7	7	7	7	7	8	TSW	TSW	8	7	142	262.7
7	6	8	8	7	7	7	7	7	7	7	7	7	7	7	7	8	8	TSW	TSW	8	7	144	266.1
7	6	8	8	8	7	7	7	7	7	7	7	7	7	7	8	8	8	TSW	TSW	8	7	146	269.5
7	6	8	8	8	8	7	7	7	7	7	7	7	7	8	8	8	8	TSW	TSW	8	7	148	272.9
7	6	8	8	8	8	8	7	7	7	7	7	7	8	8	8	8	8	TSW	TSW	8	7	150	276.3
7	6	8	8	8	8	8	8	7	7	7	7	8	8	8	8	8	8	TSW	TSW	8	7	152	279.7
7	6	8	8	8	8	8	8	8	7	7	8	8	8	8	8	8	8	TSW	TSW	8	7	154	283.1
7	6	8	8	8	8	8	8	8	8	8	8	8	8	8	8	8	8	TSW	TSW	8	7	156	286.5
8	6	8	8	8	8	8	8	8	8	8	8	8	8	8	8	8	8	TSW	TSW	8	8	158	289.9
8	6	8	8	8	8	8	8	8	8	8	8	8	8	8	8	8	9	TSW	TSW	9	8	160	293.1
8	6	9	8	8	8	8	8	8	8	8	8	8	8	8	8	9	9	TSW	TSW	9	8	162	296.3
8	6	9	9	8	8	8	8	8	8	8	8	8	8	8	9	9	9	TSW	TSW	9	8	164	299.5
8	6	9	9	9	8	8	8	8	8	8	8	8	8	9	9	9	9	TSW	TSW	9	8	166	302.7
8	6	9	9	9	9	8	8	8	8	8	8	9	9	9	9	9	9	TSW	TSW	9	8	168	305.9
8	6	9	9	9	9	9	8	8	8	8	8	9	9	9	9	9	9	TSW	TSW	9	8	170	309.1
8	6	9	9	9	9	9	9	8	8	8	9	9	9	9	9	9	9	TSW	TSW	9	8	172	312.3
8	6	9	9	9	9	9	9	9	8	9	9	9	9	9	9	9	9	TSW	TSW	9	8	174	315.5
9	6	9	9	9	9	9	9	9	9	9	9	9	9	9	9	9	9	TSW	TSW	9	8	176	318.7
9	6	9	9	9	9	9	9	9	9	9	9	9	9	9	9	9	10	TSW	TSW	9	9	178	321.9
9	6	10	9	9	9	9	9	9	9	9	9	9	9	9	9	9	10	TSW	TSW	10	9	180	325.1

MCN Spill Patterns with TSWs (# Gate Stops per Spillbay) and Bay 2 Locked at 4 or 6 Stops (in effect until crane repairs are completed)																					Total Stops (#)	Spill <sup>a</sup> (kcfs)	
1 <sup>b</sup>	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22 <sup>b</sup>		
9	6	10	10	9	9	9	9	9	9	9	9	9	9	9	9	10	10	TSW	TSW	10	9	182	328.3
9	6	10	10	10	9	9	9	9	9	9	9	9	9	9	10	10	10	TSW	TSW	10	9	184	331.5
9	6	10	10	10	10	9	9	9	9	9	9	9	9	10	10	10	10	TSW	TSW	10	9	186	334.7
9	6	10	10	10	10	10	9	9	9	9	9	9	10	10	10	10	10	TSW	TSW	10	9	188	337.9
9	6	10	10	10	10	10	10	9	9	9	9	10	10	10	10	10	10	TSW	TSW	10	9	190	341.1
9	6	10	10	10	10	10	10	10	9	9	10	10	10	10	10	10	10	TSW	TSW	10	9	192	344.3
9	6	10	10	10	10	10	10	10	10	10	10	10	10	10	10	10	10	TSW	TSW	10	9	194	347.5
10	6	10	10	10	10	10	10	10	10	10	10	10	10	10	10	10	10	TSW	TSW	10	10	196	350.7
10	6	10	10	10	10	10	10	10	10	10	10	10	10	10	10	10	11	TSW	TSW	11	10	198	353.7
10	6	11	10	10	10	10	10	10	10	10	10	10	10	10	10	11	11	TSW	TSW	11	10	200	356.7
10	6	11	11	10	10	10	10	10	10	10	10	10	10	10	11	11	11	TSW	TSW	11	10	202	359.7
10	6	11	11	11	10	10	10	10	10	10	10	10	10	11	11	11	11	TSW	TSW	11	10	204	362.7
10	6	11	11	11	11	10	10	10	10	10	10	10	11	11	11	11	11	TSW	TSW	11	10	206	365.7
10	6	11	11	11	11	11	10	10	10	10	10	11	11	11	11	11	11	TSW	TSW	11	10	208	368.7
10	6	11	11	11	11	11	11	10	10	10	11	11	11	11	11	11	11	TSW	TSW	11	10	210	371.7
10	6	11	11	11	11	11	11	11	10	11	11	11	11	11	11	11	11	TSW	TSW	11	10	212	374.7
11	6	11	11	11	11	11	11	11	11	11	11	11	11	11	11	11	11	TSW	TSW	11	10	214	377.7
11	6	11	11	11	11	11	11	11	11	11	11	11	11	11	11	11	12	TSW	TSW	11	11	216	380.8
11	6	12	11	11	11	11	11	11	11	11	11	11	11	11	11	11	12	TSW	TSW	12	11	218	384
11	6	12	12	11	11	11	11	11	11	11	11	11	11	11	11	12	12	TSW	TSW	12	11	220	387.2
11	6	12	12	12	11	11	11	11	11	11	11	11	11	11	12	12	12	TSW	TSW	12	11	222	390.4
11	6	12	12	12	12	11	11	11	11	11	11	11	11	12	12	12	12	TSW	TSW	12	11	224	393.6
11	6	12	12	12	12	12	11	11	11	11	11	11	12	12	12	12	12	TSW	TSW	12	11	226	396.8
11	6	12	12	12	12	12	12	11	11	11	11	12	12	12	12	12	12	TSW	TSW	12	11	228	400
11	6	12	12	12	12	12	12	12	11	11	12	12	12	12	12	12	12	TSW	TSW	12	11	230	403.2
11	6	12	12	12	12	12	12	12	12	12	12	12	12	12	12	12	12	TSW	TSW	12	11	232	406.4
12	6	12	12	12	12	12	12	12	12	12	12	12	12	12	12	12	12	TSW	TSW	12	12	234	409.6
12	6	12	12	12	12	12	12	12	12	12	12	12	12	12	12	12	13	TSW	TSW	13	12	236	412.8
12	6	13	12	12	12	12	12	12	12	12	12	12	12	12	12	13	13	TSW	TSW	13	12	238	416



**Table MCN-9. [pg 1 of 5]. McNary Dam Spill Patterns with No TSWs and Bays 2 and 19 Locked at 4 or 6 Stops.**

MCN Spill Patterns with NO TSWs (# Gate Stops per Spillbay) and Bays 2, 19 Locked at 4 or 6 Stops (in effect until crane repairs are completed)																						Total Stops (#)	Spill <sup>a</sup> (kcfs)	
1 <sup>b</sup>	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22 <sup>b</sup>			
																		4				4	7.2	
																	1	4					5	9.2
																	2	4					6	11.1
																	2	4	1				7	13.1
																	2	4	2				8	15.0
														1			2	4	2				9	17.0
														2			2	4	2				10	18.9
													1	2			2	4	2				11	20.9
													2	2			2	4	2				12	22.8
												1	2	2			2	4	2				13	24.8
												2	2	2			2	4	2				14	26.7
									1			2	2	2			2	4	2				15	28.7
									2			2	2	2			2	4	2				16	30.6
							1		2			2	2	2			2	4	2				17	32.6
							2		2			2	2	2			2	4	2				18	34.5
					1		2		2			2	2	2			2	4	2				19	36.5
					2		2		2			2	2	2			2	4	2				20	38.4
		1			2		2		2			2	2	2			2	4	2				21	40.4
		2			2		2		2			2	2	2			2	4	2				22	42.3
		3			2		2		2			2	2	2			2	4	2				23	44.0
1		3			2		2		2			2	2	2			2	4	2				24	46.0
2		3			2		2		2			2	2	2			2	4	2				25	47.9
3		3			2		2		2			2	2	2			2	4	2				26	49.6
3		3			2		2		2			2	2	2		1	2	4	2				27	51.6
3		3			2		2		2			2	2	2		2	2	4	2				28	53.5
3		3			2		2		2			2	2	2		2	3	4	2				29	55.2
3		3			2		2		2			2	2	2		2	4	4	2				30	56.8
3		3	1		2		2		2			2	2	2		2	4	4	2				31	58.8
3		3	2		2		2		2			2	2	2		2	4	4	2				32	60.7
3		3	2	1	2		2		2			2	2	2		2	4	4	2				33	62.7
3		3	2	2	2		2		2			2	2	2		2	4	4	2				34	64.6
3		3	2	2	2	1	2		2			2	2	2		2	4	4	2				35	66.6
3		3	2	2	2	2	2		2			2	2	2		2	4	4	2				36	68.5
3		3	2	2	2	2	2	1	2			2	2	2		2	4	4	2				37	70.5
3		3	2	2	2	2	2	2	2			2	2	2		2	4	4	2				38	72.4
3		3	2	2	2	2	2	2	2			2	2	2		2	4	4	2				39	74.4
3		3	2	2	2	2	2	2	2			2	2	2		2	4	4	2				40	76.3

MCN Spill Patterns with NO TSWs (# Gate Stops per Spillbay) and Bays 2, 19 Locked at 4 or 6 Stops (in effect until crane repairs are completed)																					Total Stops (#)	Spill <sup>a</sup> (kcfs)	
1 <sup>b</sup>	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22 <sup>b</sup>		
3		3	2	2	2	2	2	2	2		2	2	2	2	1	2	4	4	2			41	78.3
3		3	2	2	2	2	2	2	2		2	2	2	2	2	2	4	4	2			42	80.2
3		3	2	2	2	2	2	2	2	1	2	2	2	2	2	2	4	4	2			43	82.2
3		3	2	2	2	2	2	2	2	2	2	2	2	2	2	2	4	4	2			44	84.1
3		4	2	2	2	2	2	2	2	2	2	2	2	2	2	2	4	4	2			45	85.7
3		5	2	2	2	2	2	2	2	2	2	2	2	2	2	2	4	4	2			46	87.3
3		5	3	2	2	2	2	2	2	2	2	2	2	2	2	2	4	4	2			47	89.0
3		5	3	2	3	2	2	2	2	2	2	2	2	2	2	2	4	4	2			48	90.7
3		5	3	2	3	2	3	2	2	2	2	2	2	2	2	2	4	4	2			49	92.4
3		5	3	2	3	2	3	2	3	2	2	2	2	2	2	2	4	4	2			50	94.1
3		5	3	2	3	2	3	2	3	2	3	2	2	2	2	2	4	4	2			51	95.8
3		5	3	2	3	2	3	2	3	2	3	2	2	3	2	2	4	4	2			52	97.5
3		5	3	2	3	2	3	2	3	2	3	2	2	3	2	3	4	4	2			53	99.2
3		5	3	2	3	2	3	2	3	2	3	2	2	3	2	3	4	4	2	1		54	101.2
3		5	3	2	3	2	3	2	3	2	3	2	2	3	2	3	4	4	2	2		55	103.1
3	4	5	3	2	3	2	3	2	3	2	3	2	2	3	2	2	4	4	2			56	104.7
3	4	5	3	2	3	2	3	2	3	2	3	2	2	3	2	3	4	4	2			57	106.4
3	4	5	3	2	3	2	3	2	3	2	3	2	2	3	2	3	4	4	2	1		58	108.4
3	4	5	3	2	3	2	3	2	3	2	3	2	2	3	2	3	4	4	2	2		59	110.3
3	4	5	3	3	3	2	3	2	3	2	3	2	2	3	2	3	4	4	2	2		60	112.0
3	4	5	3	3	3	3	3	2	3	2	3	2	2	3	2	3	4	4	2	2		61	113.7
3	4	5	3	3	3	3	3	2	3	2	3	2	2	3	2	3	4	4	2	2	1	62	115.7
3	4	5	3	3	3	3	3	2	3	2	3	2	2	3	2	3	4	4	2	2	2	63	117.6
3	4	5	3	3	3	3	3	2	3	2	3	2	2	3	2	3	4	4	2	3	2	64	119.3
4	4	5	3	3	3	3	3	2	3	2	3	2	2	3	2	3	4	4	2	3	2	65	120.9
4	4	5	3	3	3	3	3	3	3	3	2	2	2	3	2	3	4	4	2	3	2	66	122.6
4	4	5	3	3	3	3	3	3	3	3	3	2	2	3	2	3	4	4	2	3	2	67	124.3
4	4	5	3	3	3	3	3	3	3	3	3	3	2	3	2	3	4	4	2	3	2	68	126.0
4	4	5	3	3	3	3	3	3	3	3	3	3	3	3	2	3	4	4	2	3	2	69	127.7
4	4	5	3	3	3	3	3	3	3	3	3	3	3	3	3	3	4	4	2	3	2	70	129.4
4	4	5	3	3	3	3	3	3	3	3	3	3	3	3	3	3	4	4	3	3	2	71	131.1
4	4	5	3	3	3	3	3	3	3	3	3	3	3	3	3	3	4	4	3	3	3	72	132.8
4	4	5	3	3	3	3	3	3	3	3	3	3	3	3	3	3	4	4	4	3	3	73	134.4
4	4	5	3	4	3	3	3	3	3	3	3	3	3	3	3	3	4	4	4	3	3	74	136.0
4	4	5	3	4	3	4	3	3	3	3	3	3	3	3	3	3	4	4	4	3	3	75	137.6
4	4	5	3	4	3	4	3	4	3	3	3	3	3	3	3	3	4	4	4	3	3	76	139.2
4	4	5	3	4	3	4	3	4	3	4	3	3	3	3	3	3	4	4	4	3	3	77	140.8
4	4	5	3	4	3	4	3	4	3	4	3	4	3	3	3	3	4	4	4	3	3	78	142.4

MCN Spill Patterns with NO TSWs (# Gate Stops per Spillbay) and Bays 2, 19 Locked at 4 or 6 Stops (in effect until crane repairs are completed)																					Total Stops (#)	Spill <sup>a</sup> (kcfs)	
1 <sup>b</sup>	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22 <sup>b</sup>		
4	4	5	3	4	3	4	3	4	3	4	3	4	3	4	3	3	4	4	4	3	3	79	144.0
4	4	5	3	4	3	4	3	4	3	4	3	4	3	4	3	4	4	4	4	3	3	80	145.6
4	4	5	3	4	3	4	3	4	3	4	3	4	3	4	3	4	4	4	5	3	3	81	147.2
4	4	6	3	4	3	4	3	4	3	4	3	4	3	4	3	4	4	4	5	3	3	82	148.8
4	4	6	3	4	3	4	3	4	3	4	3	4	3	4	3	4	4	4	5	3	4	83	150.4
4	4	6	3	4	3	4	3	4	3	4	3	4	3	4	3	4	4	4	5	4	4	84	152.0
4	4	6	3	4	3	4	3	4	3	4	3	4	3	4	4	4	4	4	5	4	4	85	153.6
4	4	6	3	4	3	4	3	4	3	4	3	4	4	4	4	4	4	4	5	4	4	86	155.2
4	4	6	3	4	3	4	3	4	3	4	4	4	4	4	4	4	4	4	5	4	4	87	156.8
4	4	6	3	4	3	4	3	4	4	4	4	4	4	4	4	4	4	4	5	4	4	88	158.4
4	4	6	3	4	3	4	4	4	4	4	4	4	4	4	4	4	4	4	5	4	4	89	160.0
4	4	6	3	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	5	4	4	90	161.6
4	4	6	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	5	4	4	91	163.2
5	4	6	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	5	4	4	92	164.8
5	4	6	4	5	4	4	4	4	4	4	4	4	4	4	4	4	4	4	5	4	4	93	166.4
5	4	6	4	5	4	4	4	4	4	4	4	4	4	4	4	4	5	4	5	4	4	94	168.0
5	4	6	4	5	4	5	4	4	4	4	4	4	4	4	4	4	5	4	5	4	4	95	169.6
5	4	6	4	5	4	5	4	5	4	4	4	4	4	4	4	4	5	4	5	4	4	96	171.2
5	4	6	4	5	4	5	4	5	4	5	4	4	4	4	4	4	5	4	5	4	4	97	172.8
5	4	6	4	5	4	5	4	5	4	5	4	5	4	4	4	4	5	4	5	4	4	98	174.4
5	4	6	4	5	4	5	4	5	4	5	4	5	4	5	4	4	5	4	5	4	4	99	176.0
5	4	6	4	5	4	5	4	5	4	5	4	5	4	5	4	5	5	4	5	4	4	100	177.6
5	4	6	4	5	4	5	4	5	4	5	4	5	4	5	4	5	5	4	6	4	4	101	179.2
5	4	7	4	5	4	5	4	5	4	5	4	5	4	5	4	5	5	4	6	4	4	102	180.8
5	4	7	4	5	4	5	4	5	4	5	4	5	4	5	4	5	5	4	6	4	5	103	182.4
5	4	7	4	5	4	5	4	5	4	5	4	5	4	5	4	5	5	4	6	5	5	104	184.0
5	4	7	4	5	4	5	4	5	4	5	4	5	4	5	5	5	5	4	6	5	5	105	185.6
5	4	7	4	5	4	5	4	5	4	5	4	5	5	5	5	5	5	4	6	5	5	106	187.2
5	4	7	4	5	4	5	4	5	4	5	5	5	5	5	5	5	5	4	6	5	5	107	188.8
5	4	7	4	5	4	5	4	5	5	5	5	5	5	5	5	5	5	4	6	5	5	108	190.4
5	4	7	4	5	4	5	5	5	5	5	5	5	5	5	5	5	5	4	6	5	5	109	192.0
5	4	7	4	5	5	5	5	5	5	5	5	5	5	5	5	5	5	4	6	5	5	110	193.6
5	4	7	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5	4	6	5	5	111	195.2
6	4	7	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5	4	6	5	5	112	196.8
6	4	7	5	5	5	5	5	5	5	5	5	5	5	5	5	5	6	4	6	5	5	113	198.4
6	6	7	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5	4	6	5	5	114	200.0
6	6	7	5	5	5	5	5	5	5	5	5	5	5	5	5	5	6	4	6	5	5	115	201.6
6	6	7	5	6	5	5	5	5	5	5	5	5	5	5	5	5	6	4	6	5	5	116	203.2

MCN Spill Patterns with NO TSWs (# Gate Stops per Spillbay) and Bays 2, 19 Locked at 4 or 6 Stops (in effect until crane repairs are completed)																					Total Stops (#)	Spill <sup>a</sup> (kcfs)	
1 <sup>b</sup>	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22 <sup>b</sup>		
6	6	7	5	6	5	6	5	5	5	5	5	5	5	5	5	5	6	4	6	5	5	117	204.8
6	6	7	5	6	5	6	5	6	5	5	5	5	5	5	5	5	6	4	6	5	5	118	206.4
6	6	7	5	6	5	6	5	5	5	5	5	5	5	5	5	5	6	6	6	5	5	119	208.0
6	6	7	5	6	5	6	5	6	5	5	5	5	5	5	5	5	6	6	6	5	5	120	209.6
6	6	7	5	6	5	6	5	6	5	6	5	5	5	5	5	5	6	6	6	5	5	121	211.2
6	6	7	5	6	5	6	5	6	5	6	5	6	5	5	5	5	6	6	6	5	5	122	212.8
6	6	7	5	6	5	6	5	6	5	6	5	6	5	6	5	5	6	6	6	5	5	123	214.4
6	6	7	5	6	5	6	5	6	5	6	5	6	5	6	5	6	6	6	6	5	5	124	216.0
6	6	7	5	6	5	6	5	6	5	6	5	6	5	6	5	6	6	6	7	5	5	125	217.6
6	6	8	5	6	5	6	5	6	5	6	5	6	5	6	5	6	6	6	7	5	5	126	219.3
6	6	8	5	6	5	6	5	6	5	6	5	6	5	6	5	6	6	6	7	5	6	127	220.9
6	6	8	5	6	5	6	5	6	5	6	5	6	5	6	5	6	6	6	7	6	6	128	222.5
6	6	8	5	6	5	6	5	6	5	6	5	6	5	6	6	6	6	6	7	6	6	129	224.1
6	6	8	5	6	5	6	5	6	5	6	5	6	6	6	6	6	6	6	7	6	6	130	225.7
6	6	8	5	6	5	6	5	6	5	6	6	6	6	6	6	6	6	6	7	6	6	131	227.3
6	6	8	5	6	5	6	5	6	6	6	6	6	6	6	6	6	6	6	7	6	6	132	228.9
6	6	8	5	6	5	6	6	6	6	6	6	6	6	6	6	6	6	6	7	6	6	133	230.5
6	6	8	5	6	6	6	6	6	6	6	6	6	6	6	6	6	6	6	7	6	6	134	232.1
6	6	8	6	6	6	6	6	6	6	6	6	6	6	6	6	6	6	6	7	6	6	135	233.7
7	6	8	6	6	6	6	6	6	6	6	6	6	6	6	6	6	6	6	7	6	6	136	235.3
7	6	8	6	7	6	6	6	6	6	6	6	6	6	6	6	6	6	6	7	6	6	137	236.9
7	6	8	6	7	6	6	6	6	6	6	6	6	6	6	6	6	7	6	7	6	6	138	238.5
7	6	8	6	7	6	7	6	6	6	6	6	6	6	6	6	6	7	6	7	6	6	139	240.1
7	6	8	6	7	6	7	6	7	6	6	6	6	6	6	6	6	7	6	7	6	6	140	241.7
7	6	8	6	7	6	7	6	7	6	7	6	6	6	6	6	6	7	6	7	6	6	141	243.3
7	6	8	6	7	6	7	6	7	6	7	6	7	6	6	6	6	7	6	7	6	6	142	244.9
7	6	8	6	7	6	7	6	7	6	7	6	7	6	7	6	6	7	6	7	6	6	143	246.5
7	6	8	6	7	6	7	6	7	6	7	6	7	6	7	6	7	7	6	7	6	6	144	248.1
7	6	8	6	7	6	7	6	7	6	7	6	7	6	7	6	7	7	6	8	6	6	145	249.8
7	6	9	6	7	6	7	6	7	6	7	6	7	6	7	6	7	7	6	8	6	6	146	251.4
7	6	9	6	7	6	7	6	7	6	7	6	7	6	7	6	7	7	6	8	6	7	147	253.0
7	6	9	6	7	6	7	6	7	6	7	6	7	6	7	6	7	7	6	8	7	7	148	254.6
7	6	9	6	7	6	7	6	7	6	7	6	7	6	7	7	7	7	6	8	7	7	149	256.2
7	6	9	6	7	6	7	6	7	6	7	6	7	7	7	7	7	7	6	8	7	7	150	257.8
7	6	9	6	7	6	7	6	7	6	7	7	7	7	7	7	7	7	6	8	7	7	151	259.4
7	6	9	6	7	6	7	6	7	7	7	7	7	7	7	7	7	7	6	8	7	7	152	261.0
7	6	9	6	7	6	7	7	7	7	7	7	7	7	7	7	7	7	6	8	7	7	153	262.6
7	6	9	6	7	7	7	7	7	7	7	7	7	7	7	7	7	7	6	8	7	7	154	264.2

MCN Spill Patterns with NO TSWs (# Gate Stops per Spillbay) and Bays 2, 19 Locked at 4 or 6 Stops (in effect until crane repairs are completed)																						Total Stops (#)	Spill <sup>a</sup> (kcfs)
1 <sup>b</sup>	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22 <sup>b</sup>		
7	6	9	7	7	7	7	7	7	7	7	7	7	7	7	7	7	7	6	8	7	7	155	265.8
8	6	9	7	7	7	7	7	7	7	7	7	7	7	7	7	7	7	6	8	7	7	156	267.5
8	6	9	7	8	7	7	7	7	7	7	7	7	7	7	7	7	7	6	8	7	7	157	269.2
8	6	9	7	8	7	7	7	7	7	7	7	7	7	7	7	7	8	6	8	7	7	158	270.9
8	6	9	7	8	7	8	7	7	7	7	7	7	7	7	7	7	8	6	8	7	7	159	272.6
8	6	9	7	8	7	8	7	8	7	7	7	7	7	7	7	7	8	6	8	7	7	160	274.3
8	6	9	7	8	7	8	7	8	7	8	7	7	7	7	7	7	8	6	8	7	7	161	276.0
8	6	9	7	8	7	8	7	8	7	8	7	8	7	7	7	7	8	6	8	7	7	162	277.7
8	6	9	7	8	7	8	7	8	7	8	7	8	7	8	7	7	8	6	8	7	7	163	279.4
8	6	9	7	8	7	8	7	8	7	8	7	8	7	8	7	8	8	6	8	7	7	164	281.1
8	6	9	7	8	7	8	7	8	7	8	7	8	7	8	7	8	8	6	9	7	7	165	282.7
8	6	10	7	8	7	8	7	8	7	8	7	8	7	8	7	8	8	6	9	7	7	166	284.3
8	6	10	7	8	7	8	7	8	7	8	7	8	7	8	7	8	8	6	9	7	8	167	286.0
8	6	10	7	8	7	8	7	8	7	8	7	8	7	8	7	8	8	6	9	8	8	168	287.7
8	6	10	7	8	7	8	7	8	7	8	7	8	7	8	8	8	8	6	9	8	8	169	289.4
8	6	10	7	8	7	8	7	8	7	8	7	8	8	8	8	8	8	6	9	8	8	170	291.1
8	6	10	7	8	7	8	7	8	7	8	8	8	8	8	8	8	8	6	9	8	8	171	292.8
8	6	10	7	8	7	8	7	8	8	8	8	8	8	8	8	8	8	6	9	8	8	172	294.5
8	6	10	7	8	7	8	8	8	8	8	8	8	8	8	8	8	8	6	9	8	8	173	296.2
8	6	10	7	8	8	8	8	8	8	8	8	8	8	8	8	8	8	6	9	8	8	174	297.9
8	6	10	8	8	8	8	8	8	8	8	8	8	8	8	8	8	8	6	9	8	8	175	299.6
9	6	10	8	8	8	8	8	8	8	8	8	8	8	8	8	8	8	6	9	8	8	176	301.2
9	6	10	8	9	8	8	8	8	8	8	8	8	8	8	8	8	8	6	9	8	8	177	302.8
9	6	10	8	9	8	8	8	8	8	8	8	8	8	8	8	8	9	6	9	8	8	178	304.4

### **Fish Passage Plan (FPP) Change Request Form**

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**Change Form # & Title:** 21LGS003 – Unit 1 Special Operation & Unit 6 Priority  
**Date Submitted:** 4 January 2021  
**Project:** Little Goose  
**Requester Name, Agency:** FPOM (in-season adaptive management coordinated in 2020)  
**Final Action:**

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#### **FPP SECTION:**

Little Goose Table LGS-5 “Unit Priority Order” and section 4.2.3 “Unit 1 Special Operation”

#### **JUSTIFICATION FOR CHANGE:**

The current FPP defines a special operation to restrict Unit 1 to the upper 1% to push out the tailrace eddy that forms during ASW spill. Through in-season FPOM coordination in 2020, the operation was modified to *not apply* during hours of spring gas cap spill. The intent was to allow Unit 1 to operate to the lower 1% during min gen in order to have more flow remaining for spill.

As part of the modification, the spring unit priority order was modified to move Unit 6 from second priority to sixth priority to maximize flow through the southernmost units and reduce the tailrace eddy.

The modified 2020 operation was as follows:

- a. During spring gas cap spill, Unit 1 may be operated to the lower 1% when river flow is too low to achieve the spill cap (i.e., min gen, spill the rest).
- b. During spring 30% spill, maximize flow through available units in the order of priority (south to north) before moving to the next unit (i.e., Unit 1 upper 1%, then Unit 2 up to upper 1%, etc.). If project outflow drops below 38 kcfs, Unit 1 may be operated within the full 1% range as necessary to avoid turbine dead-bands that occur when targeting a percent spill at lower flows.
- c. Move Unit 6 from second priority to sixth priority (1, 2, 3, 4, 5, 6).

#### **PROPOSED CHANGE:**

If FPOM recommends incorporating this modified operation into the 2021 FPP, the language would be edited as shown below in track changes. Otherwise, modifications will need to be coordinated in-season.

#### 4.1. Turbine Unit Priority Order.

4.1.1. From March 1–November 30, turbine units will be operated in the order of priority defined in **Table LGS-5** to enhance adult and juvenile fish passage. If a turbine unit is out of service for maintenance or repair, the next unit in the priority order shall be operated. Unit priority order may be coordinated differently for fish research, construction, or project maintenance activities.

4.1.2. If more than one unit is operating, discharge will be maximized through the southernmost unit (i.e., operated in the upper 1% range) starting with Unit 1 to the extent possible. See **section 4.2.3** for more information.

**Table LGS-5. Little Goose Dam Turbine Unit Priority Order.**

<u>Dates / Season</u>	<u>Unit Priority Order</u>
March 1 – <del>April 2 / June 21</del> – November 30 Fish Passage Season <del>(except for Spring Spill as defined below)</del>	1 <sup>a</sup> , 2, 3, 4, 5, 6 <i>During ASW spill and outflow &gt;38 kcfs, <del>maximize</del> discharge through highest priority units</i>
<del>April 3 – June 20</del> <del>Spring Spill (Unit 6 second priority)</del>	<del>1<sup>a</sup>, 6, 2, 3, 4, 5</del>
December 1 – end of February Winter Maintenance Period	Any Order

a. **Unit 1 special operation (section 4.2.3. – *does not apply during spring gas cap spill*):** When the ASW is open and total outflow is > 38 kcfs, Unit 1 will be operated in the upper 1% range (~16.0–17.5 kcfs) to smooth out the eddy that forms during ASW spill. Assume other units operate approximately uniformly within their full 1% ranges. When other units are discharging < 16.0 kcfs, assume Unit 1 is at the lower end of the upper 1% (~16.0 kcfs). When average unit discharge is > 16.0 kcfs, assume all units are operating uniformly.

#### 4.2. Turbine Unit Operating Range.

**4.2.3. Unit 1 Special Operation.** *[The operation described in this section does **not** apply during spring spill to the gas cap. When spilling to the gas cap in the spring, April 3–June 20, Unit 1 may be operated down to the lower 1% range in order to pass more flow as spill when flows are too low to achieve the spill cap target.]* During fish passage season (except during spring spill to the gas cap), when the ASW is open in Bay 1 and total project outflow is greater than 38 kcfs, Unit 1 will be operated in the upper quarter of the 1% range to smooth out the eddy that forms during ASW spill. Historically, the GDACS program tended to balance flow out of all units in operation. However, this special operation will at times result in unbalanced discharge where more flow is passing through Unit 1 than other operating units. Physical modeling indicated that a higher flow out of Unit 1 is critical to disrupting the eddy that forms along the south shore downstream of the powerhouse when the ASW is operating in order to optimize tailrace conditions for both adult passage and juvenile egress. When the ASW is removed from service during summer spill, the tailrace eddy is mostly non-existent, and all turbine units may be operated within the full 1% range. When total project outflow is less than 38 kcfs, Unit 1 may be operated within the full 1% range as necessary to maintain MOP and spill operations pursuant to the FOP.

**COMMENTS:**

28-January-2021 FPOM FPP Meeting:

- Conder and Lorz were in support.
- VanDyke wasn't ready to endorse.
- Bettin asked about the unit priority table where it says to maximize discharge in the order of priority March 1-November 30. He wondered if the project was ok with this since there may be times outside of spill season when they need more flexibility. Wright noted that the project was able to successfully implement last year but will follow up. **[ACTION: added "*During ASW spill and outflow > 38 kcfs...*" to the note in the unit priority table to clarify when to maximize discharge through the highest priority unit. Otherwise it would be interpreted to apply during the entire timeframe of March 1-November 30.]**

PENDING – will be reviewed at FPOM on February 11.

**RECORD OF FINAL ACTION:**



### **Fish Passage Plan (FPP) Change Request Form**

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**Change Form # & Title:** 21LGS004 – ASW Crest During Spring 30%  
**Date Submitted:** 4 January 2021  
**Project:** Little Goose  
**Requester Name, Agency:** FPOM (in-season adaptive management coordinated in 2020)  
**Final Action:**

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#### **FPP SECTION:**

Little Goose section 2.3.2.7 ASW Operating Criteria.

#### **JUSTIFICATION FOR CHANGE:**

The current FPP criteria calls for operating the ASW at Low crest during high flows > 85 kcfs (i.e., spring freshet) to pass more water and smooth out tailrace hydraulics.

In 2020, the operation during high spring flows was modified to switch the ASW to High crest during hours of 30% spill, then switch back to Low crest during hours of gas cap spill. The intent was to improve tailrace hydraulics for adult fish passage. This in-season modification was implemented at the recommendation of regional salmon managers at the TMT meeting on June 3, 2020.

#### **PROPOSED CHANGE:**

If FPOM recommends incorporating this modified operation into the 2021 FPP, the language would be edited as shown below in track changes. Otherwise, modifications will need to be coordinated in-season.

**2.3.2.7. Adjustable Spillway Weir (ASW).** Little Goose has one adjustable spillway weir (ASW) that provides a surface passage route via spillbay 1. The ASW is operated from the control room and can be adjusted between Low crest and High crest to pass more or less water, respectively, according to the flow criteria below:

**i. High Crest:** The ASW High crest is at elevation 622 feet msl and spills approximately 7 kcfs when the forebay elevation is in the MOP range. *Unless flow conditions defined below are met, spill for fish passage will occur with the ASW at High crest* according to patterns for “Spring Spill” in **Table LGS-7** or “ASW-Hi 30% Spill” in **Table LGS-8**.

**ii. Low Crest:** The ASW Low crest is at elevation 618 feet msl and spills approximately 11 kcfs when the forebay elevation is in the MOP range. Low crest spill patterns are defined for “Spring Spill” in **Table LGS-7** and ~~“ASW-Lo 30%” in **Table LGS-9**~~. Change the ASW to Low crest to pass more water during high flows (i.e., spring freshet) when the previous day’s average total project outflow is above 85 kcfs and the NWRFC inflow forecast<sup>1</sup> stays above 85 kcfs for at least the next 3 days. Keep the ASW at Low Crest except when spilling 30% (i.e., during hours of 30% spill, switch the ASW to High crest). When the previous day’s average outflow drops below 85 kcfs and is forecasted to stay below 85 kcfs for at least the next 3 days, change the ASW back to high crest during all hours.

**iii. No ASW (Bay 1 Closed):** On or after August 1, when day average project outflow drops below 35 kcfs and is forecasted to stay below 35 kcfs for at least 3 days, close the ASW and spill according to patterns for “No ASW” in Error! Reference source not found.. ~~The ASW will be closed after RCC issues the teletype and coordinated through CENWW-OD-T.~~ *To avoid impacts to subyearling migration, the ASW will not be closed before August 1, even if low flow criteria are achieved, unless an adult passage delay is observed or if necessary due to unit operational constraints at low flow. Closing the ASW prior to August 1 will be coordinated through FPOM by CENWW-OD-T.* Re-open the ASW in high crest if day average project outflow increases above 35 kcfs and is forecasted to stay above 35 kcfs for 3 or more days. Continue to open and close the ASW according to these criteria for the remainder of the summer spill season.

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<sup>1</sup> NWRFC inflow forecast for Little Goose Dam: [www.nwrfc.noaa.gov/river/station/flowplot/flowplot.cgi?id=LGSW1](http://www.nwrfc.noaa.gov/river/station/flowplot/flowplot.cgi?id=LGSW1)

**COMMENTS:**

1/28/21 FPOM FPP Meeting: Conder has concerns with making this change permanent in the FPP. There is a risk to adjusting the ASW twice a day when it wasn't really designed to do that. It may be a better approach to have a biological trigger (adult fish counts) or respond in-season if there is an issue. He wants more time to think on this.

**PENDING further review – will be discussed at FPOM on Feb. 11.**

**RECORD OF FINAL ACTION:**

## **Fish Passage Plan (FPP) Change Request Form**

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**Change Form # & Title:** 21LWG004 – RSW Operation in August  
**Date Submitted:** 4 January 2021  
**Project:** Lower Granite  
**Requester Name, Agency:** FPOM (in-season adaptive management coordinated in 2020)  
**Final Action:**

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### **FPP SECTION:**

Lower Granite section 2.3.2.7. RSW Operating Criteria.

### **JUSTIFICATION FOR CHANGE:**

The current FPP establishes criteria to close the Lower Granite RSW during summer spill when flows drop below 30 kcfs.

In 2020, the operation was modified to keep the RSW open through August 31 in order to maintain PIT-tag detections. This in-season modification was implemented at the recommendation of regional salmon managers via [SOR 2020-5](#), as coordinated at the TMT meeting on August 7, 2020.

This change form also adds spill for steelhead to the RSW operation and clarifies that the estimated RSW spill rate is based on the forebay in MOP.

### **PROPOSED CHANGE:**

If FPOM recommends incorporating this modified operation into the 2021 FPP, the language would be edited as shown below in track changes. Otherwise, modifications will need to be coordinated in-season.

### 2.3.2.7. Removable Spillway Weir (RSW).

i. Lower Granite Dam has one removable spillway weir (RSW) that provides a surface passage route via spillbay 1. The RSW is opened and closed from the control room and spills approximately 6.8 kcfs when the forebay elevation is in the MOP range.

ii. The RSW will be raised and operational ~~on the first day of~~ throughout spring and summer spill for juvenile fish passage (**Appendix E**) and during spill for adult steelhead (section 2.2). Raise the spill gate to where it does not touch flow passing down the RSW (at least nine stops) and distribute spill according to patterns in Table LWG-7. If river flow is too low to maintain RSW spill and minimum generation requirements, close the RSW and distribute spill according to “No RSW” patterns in Table LWG-8.

iii. During high flows, if the Northwest River Forecast Center (NWRFC) inflow forecast for Lower Granite is above 200 kcfs, coordinate with RCC and CENWW-OD-T to initiate aggressive forebay debris removal so that RSW operation will not be impeded. If inflow exceeds 260 kcfs, the upstream river gauge flow is increasing, and the NWRFC inflow forecast is above 300 kcfs, stow the RSW (complete rotation to the landing pad).

~~iv. During summer spill (June 21–August 31), when daily average total project outflow is less than 30 kcfs and inflow is forecasted to remain below 30 kcfs for at least three days on a declining hydrograph, close the RSW and spill according to patterns with no RSW in Table LWG-8. If daily average project outflow increases above 30 kcfs and inflow is forecasted to remain above 30 kcfs for at least three days, re-open the RSW. Continue to open and close the RSW according to these criteria throughout summer spill.~~

~~v.~~iv. When not spilling, the RSW may be operated for short durations during low flows at the request of the Project biologist through CENWW if it appears the juvenile fish transportation facility and barge holding capacities will be exceeded, as described in the *Juvenile Fish Transportation Plan* (**Appendix B**).

**COMMENTS:**

1/28/2021 FPOM FPP Meeting: Lorz is tentatively supportive but wants to think more on this. He'll bring it to FPAC for more discussion.

PENDING further review. To be discussed at FPOM on 2/11.

**RECORD OF FINAL ACTION:**

**Fish Passage Plan (FPP) Change Request Form**

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**Change Form # & Title:** 21AppA001 – Outage for Doble Testing/Transformer Maintenance  
**Date Submitted:** 30 December 2020  
**Project:** All Lower Snake River Projects (Appendix A)  
**Requester Name, Agency:** Chris Peery, USACE NWW, and Lisa Wright, Corps RCC  
**Final Action:**

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**FPP SECTION:** Appendix A (Special Ops & Studies).

**JUSTIFICATION FOR CHANGE:** Adds the 2021 outage schedule for Doble testing/transformer maintenance.

**PROPOSED CHANGE:** *See following pages.*

**COMMENTS:**

28-JAN-2020 FPOM FPP Meeting:

- Conder doesn't support the Lower Monumental T1 outage starting July 22. There are still quite a few sockeye passing at that time so taking out all units during the day would likely have adverse impacts.
- Bettin wondered if some of the work (e.g., replacing doghouse covers) could be put off until future outages for transmission.
- Peery will coordinate with LMN on delaying the T1 outage to 1-AUG or later. An updated change form will be sent out and added to the FPOM agenda for 11-FEB. PENDING.

**RECORD OF FINAL ACTION:**

## Appendix A – Special Operations & Studies

### 1. INTRODUCTION

#### 1.5. Doble Testing<sup>1</sup>

Transformers at the Lower Snake River projects are required to undergo Doble testing<sup>1</sup> every three years to ensure they are functioning correctly and identify any issues that need repair. The testing must be conducted during warm, dry conditions (July–August) and requires an outage of the transformer and associated units. Testing is performed during already scheduled outages to the extent possible and timed to avoid or minimize impacts to fish.

In years that Doble testing isn't required, the project may still require an outage during the same timeframe to perform necessary transformer maintenance and repairs that were identified in previous Doble tests and inspections.

The transformer outage schedule for the current year is defined in **Table A-1**. For more information, refer to the project-specific sections below.

**Table A-1. Doble Testing Schedule in 2021.<sup>a</sup>**

Project	Dates	Outage (Transformer & Units)	Notes <sup>b</sup>
IHR	July 19–23	Line 3 (Units 5, 6) all hours	Remaining available units (1, 2, 4) operated per FPP priority order.
LMN	July 22 – August 6	T1 (Units 1–4) all hours; T2 (Units 5, 6) daily 0530–1630	All units OOS daily 0530–1630 with Unit 5 at speed no load (5 kcfs) for station service. Units 5 & 6 RTS nightly 1630–0530 and operated per FPP priority order.
LGS	August 2–13	T1 (Units 1–4) all hours; T2 (Units 5, 6) 0500-1700 Aug 2-5 and Aug 9-13	All units OOS for up to 12 hours (0500-1700) Aug 2-5 and Aug 9-13, with Unit 6 at speed no load (5 kcfs) for station service. During all other hours, Unit 6 available.
LWG	Aug 9–13; Aug 15–17	T1 (Units 1-4) daily 0600-1900 Aug 9-13 and Aug 16-17; T2 (Units 5-6) all hours	All units OOS daily for up to 13 hours (0600-1900) Aug 9–13 and Aug 16–17, with Unit 5 at speed no load (5 kcfs) for station service. During all other hours, T1 (Units 1-4) available.

**Commented [LSW1]:** Peery to coordinate with LMN to delay T1 outage to 1-AUG or later.

a. The lower Columbia projects (BON, TDA, JDA, MCN) have no specific outage for Doble tests and testing is done concurrent with outages for maintenance.

b. OOS = Out of Service (unavailable to operate); RTS = Return to Service (available to operate).

<sup>1</sup> "Doble test" is a common term referring to a power factor test of transformers to measure performance of electrical insulation. Doble is the name of a manufacturer of the test equipment.



## 6. Ice Harbor – Special Operations

### 6.1.3. Doble Testing (see section 1.5 above for more information)

- a) Dates: Summer (annually). In 2021, the outage is scheduled for July 19–23.
- b) Description: Transformer Doble testing of Line 3 and associated equipment will require Main Units 5&6 down continuously in association with this work.
- c) Impacts to FPP Criteria: None. Since Ice Harbor has multiple transformer banks and transmission lines and redundant switching capability, remaining available units (1, 2, 4) will be available and operated pursuant to FPP priority order. River flows are typically lower this time of year, so it is unlikely that additional spill will be needed above the voluntary spill for juvenile fish that will already be occurring.

## 7. Lower Monumental – Special Operations

### 7.1.3. Doble Testing (see section 1.5 above for more information)

- a) Dates: Summer (annually). In 2021, the outage is scheduled for July 22–August 6.
- b) Description: During the 2021 outage, the project will upgrade the T1 iso-phase bus, which will consist of replacing doghouse covers, replacing gaskets with upgraded materials, cleaning, and inspections. The outage will require T1 and T2 (all units) out of service daily for up to 11 hours (0530-1630) and all project outflow will be spilled except 5 kcfs through Unit 5 for station service power. T2 (Units 5, 6) will return to service nightly by 1630 and be available until 0530 the next morning.
- c) Impacts to FPP Criteria: All units will be out of service daily for up to 11 hours (0530-1630) and all project outflow will be spilled except 5 kcfs through Unit 5 for station service.

**Commented [LSW2]:** Peery to coordinate with LMN to delay T1 outage to 1-AUG or later.

## 8. Little Goose – Special Operations

### 8.1.1. Doble Testing (see section 1.5 above for more information)

- a) Dates: Summer (annually). In 2021, the outage is scheduled for August 2–13.
- b) Description: During the outage in 2021, the project will continue to upgrade the T1 iso-phase bus which will consist of replacing the doghouse covers, replacing the gaskets with upgraded materials, cleaning, and inspections. The outage will require all units out of service for up to 12 hours (0500-1700) on the first and last day, August 2 and 13, to hang and remove clearances on T1, and during work days, August 3-5 and August 9-12. During these hours, all project outflow will be spilled except 5 kcfs through Unit 6 for station service power. T1 (Units 1-4) will remain out of service for the duration of the outage. T2 (Unit 6) will be returned to service nightly and all hours over the weekend Aug 6–8 (Fri-Sun).
- c) Impacts to FPP Criteria: All units will be out of service for up to 12 hours (0500-1700) each day August 2-5 and 9-13, and all project outflow will be spilled except 5 kcfs through Unit 6 for station service.

## 9. Lower Granite – Special Operations

### 9.1.4. Doble Testing (see section 1.5 above for more information)

a) Dates: Summer (annually). In 2021, the outage is scheduled for August 9–13 and 15–17.

b) Description: The outage in 2021 is required to perform Doble testing and routine maintenance on T2 (Units 5 & 6). During this time, T2 transformer instrumentation will be upgraded, the iso-phase bus will be rehabbed, and transformer oil will be added to the T2B phase. The upgraded instrumentation will monitor transformer conditions and provide indication to the control room to prevent transformer failures and unplanned outages of all main generating units connected to the transformer. The iso-phase bus rehab will install bushing inspection covers and replace inspection hatch gaskets through the bus housing. This work will reduce the risk of water intrusion that has caused transformer/unit outages lasting up to a week.

Some of the work needs to be done from the top of the transformer on T2, which will require the powerhouse line (all units) out of service from August 9 at 0600 through August 13 at 1900, and from August 16 at 0600 through August 17 at 1900. T2 (Units 5 and 6) will remain OOS continuously through the entire outage period. T1 (Units 1-4) will RTS nightly and over the whole weekend August 14-15. Unit 5 will be operated for station service power (5 kcfs) while the PH line is OOS during the day August 9-13 and August 16-17.

c) Impacts to FPP Criteria: All units will be out of service for up to 13 hours/day (0600-1900) daily from August 9 through August 13, and August 16-17. During these hours, all project outflow will be spilled except approximately 5 kcfs through Unit 5 for station service.

## **Fish Passage Plan (FPP) Change Request Form**

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**Change Form # & Title:** 21AppL001 – Predation Management Plans for 2021  
**Date Submitted:** 22 January 2021  
**Project:** All  
**Requester Name, Agency:** Tammy Mackey, NWP; Bob Cordie, TDA; Chris Peery, NWW  
**Final Action:**

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### **FPP SECTION:**

Appendix L – Predator Management Plans

### **JUSTIFICATION FOR CHANGE:**

Updates predator management plans in Appendix L for 2021.

Also updated to add a new section to include avian activities in the estuary.

### **PROPOSED CHANGE:**

See draft Appendix L below with updates in “track changes”.

### **COMMENTS:**

#### 28-JAN-2020 FPOM FPP Meeting:

- Lorz requested more specificity on 2021 plans for PIT-tag analysis and reporting.
- Studebaker confirmed with McDonald that predation work based on PIT recovery will be contracted for 2021.
- Thompson and Swank want to run it by their staff.

Section 2.1.3 revised to add estuary PIT-tag reporting and analysis in 2021.

PENDING further review and discussion at FPOM on Feb 11.

### **RECORD OF FINAL ACTION:**

## 1. OVERVIEW

1.1. This Appendix includes the avian monitoring and deterrence action plans implemented in the estuary and at Corps hydropower projects on the lower Columbia and lower Snake rivers, and pinniped monitoring and deterrence action plans at Bonneville Dam, in accordance with current and applicable Biological Opinions under the Endangered Species Act Section 7.<sup>1</sup> These plans were coordinated with regional Federal, State, and Tribal fish agencies in the Fish Passage Operations & Maintenance (FPOM) coordination team.

1.2. Hazing techniques are defined in the approved *Operating Plans*. The program objective is to reduce piscivorous bird predation on juvenile salmonids and lamprey, and pinniped predation on adult salmonids, sturgeon and lamprey, by hazing in a manner that impedes their ability to forage on fish and/or forces them to leave the area.

1.3. Hazing activities are implemented by the U.S. Department of Agriculture's Animal & Plant Health Inspection Service (USDA APHIS).

1.4. Avian wires shall be installed each year at Lower Snake River projects prior to April 3 and at Lower Columbia River projects prior to April 10.

1.5. Avian hazing shall occur primarily near dam locations where predation risk is high (e.g., tailrace areas where fish may be disoriented after passing the project and/or forebay areas where fish may be delayed from passing the project).

1.6. Birds shall be hazed near spillway and powerhouse discharge areas, juvenile bypass outfall(s) and where birds congregate or feed, ranging up to approximately 2,000 feet downstream of the dam and outfall site. Roosting and actively foraging birds shall also be hazed within the forebay boat restricted zones (BRZ).

1.7. During juvenile lamprey outmigration, hazers may be requested to focus hazing at specific areas of the project where juvenile lamprey are known to pass.

1.8. Avian activities in the estuary are summarized in Table 1 and described in section 2.

1.9. Hazing dates and methods for all Lower Columbia and Lower Snake River projects are summarized in Table 2 and described in sections 3-10.

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<sup>1</sup> Available at: <https://www.salmonrecovery.gov/BiologicalOpinions/FCRPSBiOp.aspx>

**Table 1. Estuary Avian Activities by all Regional Partners (as of January 2021) – see Section 2 below for more information.**

Objective	Activity	Location (e.g., ESI)
Monitor avian predators in the estuary and discourage any avian predators that are found nesting at an upland disposal site per term and condition 1k of the 2012 BiOp for the <b>operations and maintenance</b> of the federal navigation channel and RPM #3 of the 2020 CRS BiOp.	Reconnaissance flights to detect avian predators on upland disposal sites	Disposal sites, Estuary-wide
	Passive and active dissuasion	Rice Island
Maintain no less than 1 acre of Caspian tern habitat on ESI annually to support approximately 3,125 to 4,375 breeding pairs. and prevent terns from nesting on ESI outside the designated habitat	Pre-season site preparation	ESI
	Colony size monitoring (annual peak abundance estimates every three years)	ESI
	Passive and active dissuasion (outside designated habitat)	ESI
Monitor DCCO on ESI and in the Columbia River Estuary annually for colony size and response to management, as necessary in support of the DCCO FEIS	Weekly reconnaissance flights and aerial photography of DCCO colonies in the estuary	ESI, Astoria-Megler Bridge, Channel Markers, Longview Bridge, Troutdale Towers
	Colony size monitoring	ESI, Astoria-Megler Bridge, Channel Markers, Longview Bridge, Troutdale Towers
	On-island management and response monitoring	ESI
Monitor DCCO on ESI annually to estimate DCCO abundance and nesting density	Colony size monitoring	ESI
Estimate and assess the East Sand Island DCCO and CATE annual predation rates (impacts) on juvenile salmonids in support of the DCCO FEIS and RPM #3 of the 2020 CRS BiOp.	Physical recovery of CATE PIT tags	ESI
	Physical recovery of DCCO PIT tags	ESI
	Statistical modeling of DCCO and CATE annual predation rates	ESI

**Table 1.2. Hazing Dates and Methods at the Lower Columbia and Lower Snake River Projects (as of January 2020) – see Sections 3-10 below for project-specific descriptions.**

Dam	Passive Deterrents	Hazing Dates	Location	Hazing hours/day	Hazing Methods	Action Trigger
BON	Avian wires, sprinklers	April 1 – July 31 (Avian)	Shore	8	Pyrotechnics, sound, propane cannon (if necessary)	150 birds in a single zone
TDA	Avian wires	April 15 – July 31	Shore, Boat	14 (Apr/Jul), 16 (May/Jun)	Pyrotechnics	~250 gulls 50% of 5-yr average
JDA	Avian wires	April 10 – July 31	Boat	8	Pyrotechnics	N/A
MCN	Avian wires, needle strips	April 25 <sup>19</sup> – July 24 <sup>25</sup>	Shore, Boat	Shore: 8 (Apr 19-25, Jul 11-24 <sup>12-25</sup> and Sundays); 12 <sup>16</sup> (Apr 25 <sup>26</sup> -Jul 10 <sup>11</sup> , 6 days/wk) Boat: 10 <sup>6</sup> (May 2 <sup>Apr 26</sup> -Jul 10 <sup>11</sup> , 34 days/wk except Sundays)	Pyrotechnics, sound, lasers, lethal take (if necessary)	N/A
IHR	Avian wires, wire spikes, sprinklers	April 1 – June 30	Shore, Boat	Shore: 8 (Apr 1-3 <sup>4</sup> , Jun 6 <sup>7</sup> -30); 16 (Apr 4 <sup>5</sup> -Jun 5 <sup>6</sup> ) Boat: 3 days/wk (Apr 4 <sup>5</sup> -17 <sup>18</sup> , May 23 <sup>24</sup> -Jun 5 <sup>6</sup> ); 5 days/wk (Apr 18 <sup>19</sup> -May 22 <sup>23</sup> )	Pyrotechnics, sound, laser, lethal take (if necessary)	Daily count twice 3-yr average; unresponsive to hazing.
LMN	Avian wires, sprinklers	April 1 – June 2 (to July 1 if needed)	Shore	8 (Apr 1-May 2); 16 (May 3-Jun 2)	Pyrotechnics, sound, lethal take (if necessary)	86 gulls, 43 terns, 15 cormorants
LGS	Avian wires, needle strips, sprinklers, visual	March 29 <sup>30</sup> – June 19 <sup>20</sup>	Shore, Boat	Shore: 8 (Mar 29 <sup>30</sup> -Apr 10 <sup>11</sup> , May 23 <sup>24</sup> -Jun 19 <sup>20</sup> ); 16 (Apr 11 <sup>12</sup> -May 22 <sup>23</sup> ). Boat: 8 (Mar 29 <sup>30</sup> -Jun 19 <sup>20</sup> , 3 days/wk)	Pyrotechnics, sound, lethal take (if necessary)	100 gulls &/or terns, 50 cormorants
LWG	Avian wires, needle strips, sprinklers	April 1 – June 30	Shore	8 (Apr 1-19, Jun 2-30), 16 (Apr 20-Jun 1)	Pyrotechnics, sound, lethal take (if necessary)	57 gulls, 110 cormorants

## **2. ESTUARY**

**2.1. Estuary-Wide Efforts.** Monitor avian predators in the estuary to support the Caspian Tern (CATE) and Double Crested Cormorant (DCCO) monitoring plans and fulfill Term and Condition 1k of the 2012 BiOp<sup>2</sup> and RPM #3 of the 2020 CRS BiOp for operations and maintenance of federal navigation channels which direct avian predators to be monitored and dissuaded from dredge material disposal sites in the Columbia River estuary.

### **2.1.1. East Sand Island (ESI) Caspian Terns (CATE) Monitoring and Hazing Plan.**

- (a) Maintain no less than 1 acre of CATE habitat on ESI annually to support approximately 3,125 to 4,375 breeding pairs. Prevent CATE from nesting on ESI outside the designated colony.**
- (b) The Corps Fish Field Unit (FFU) will collect the colony counts of CATE on ESI March through August and provide estimates of the number of birds off-colony but on ESI.**

### **2.1.2. Double Crested Cormorants (DCCO) Monitoring Plan.**

- (a) Monitor DCCO on ESI and in the Columbia River estuary annually for colony size and response to management, as necessary in support of the DCCO FEIS.**

**2.1.3. PIT-tag recovery, reporting, and analysis will occur in 2021.**

## **2.2. Rice, Miller Sands, and Pillar Rocks Islands.**

**2.2.1.a.** Monitor avian predators in the estuary and discourage any avian predators that are found nesting at an upland disposal site per the 2012 BiOp for the operations and maintenance of the federal navigation channel and the 2020 CRS BiOp.

**2.2.1.b.** Under the directing documents of the 2012 and 2020 BiOps, avian predators (i.e., CATE and DCCO) must be monitored for presence and breeding attempts on dredge material placement sites. If observed, a combination of non-lethal dissuasion and lethal egg take must be used to discourage and stop birds from using these sites.

**1.1.1.a.2.2.1.C.** FFU will conduct reconnaissance surveys to Rice, Miller Sands, and Pillar Rocks Islands on a weekly basis between March and August to detect CATE and DCCO interest in the sites. On Rice Island, a passive green laser will be beta tested for efficacy in 2021 and ropes, stakes, and flagging will be used to dissuade birds from using western-most area of historical CATE interest.

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<sup>2</sup> NMFS. July 11, 2012. ESA Section 7 Formal Consultation and Magnuson-Stevens Fishery Conservation and Management Act Essential Fish Habitat Consultation for the Columbia River Navigation Channel Operations and Maintenance, Mouth of the Columbia River to Bonneville Dam, Oregon and Washington. (NMFS No: 2011/02095).

## **2.3. BONNEVILLE DAM**

**2.1.3.1. Avian Monitoring.** Bird numbers are accessed daily during fishway inspections by a Project Biologist. Due to low bird populations at the dam during winter months, bird numbers are recorded 7 days a week from April 1 through October 31. Avian monitoring occurs as often as possible outside of these dates and during the non-fish passage season. Piscivorous birds of interest are gulls & cormorants, though other birds such as mergansers, grebes, osprey and eagles may occasionally be noted. Demarcated zones are Powerhouse (PH) 1 forebay, PH1 tailrace, Spillway forebay, Spillway tailrace, B2CC outfall, PH2 forebay, PH2 tailrace, and Juvenilesmolt Monitoring Facility (JSMF) outfall.

**2.2.3.2. Avian Action Plan.** Measures for avian deterrence at BON are listed below. While gulls and cormorants are present to a significant degree during peak summer months, relative avian abundance is low and no further actions are being considered at this time.

**2.2.1.3.2.1.** Avian wires are installed each year prior to April 10 in the tailrace of PH1, PH2, spillway and B2CC outfall.

**2.2.2.3.2.2.** Avian hazers are present at the dam April 1 through July 31, 8 hours per day, 7 days a week, between 0800 and 2000 hours. Hours of hazing vary so birds do not acclimate to long periods of no hazing.

**2.2.3.3.2.3.** A hydro-cannon operates continuously on the top JBS outfall flume.

**2.2.4.3.2.4.** A propane cannon was tested for use during fish transport releases at the JBS and may be considered for use if avian predation risk is found to exist during truck releases of juveniles.

**2.3.3.3. Avian Incident Response.** The trigger for additional action is 150 piscivorous birds in a single zone during a single observation. When the trigger is met, hazing efforts will be increased in those areas and increase the number of long-range pyrotechnic devices. A propane cannon may be useful in some zones (e.g., JBS outfall, B2CC, PH2 tailrace) but application must be limited to avoid impacting project visitors and nearby public areas and towns. Lethal removal would likely work but is not approved and would require additional funding. The trigger is only reached a few times a year, usually between mid-September and early October. Hazing concludes on July 31. If the trigger is consistently being met in September and October, adjustment of hazing dates could be pursued.

**2.4.3.4. Reporting.** Avian predation will be documented in the Project Weekly Report, including daily predation by species and zone. If warranted, a summary could also be included in the Annual Report.

### **2.5.3.5. Pinnipeds.**

**2.5.1.3.5.1.** California Sea Lions and Stellar Sea Lions shall be hazed at Bonneville Dam daily from March 31 through May 31 for 8 hours/day between the hours of 0600 and 2000. Hours should vary so that pinnipeds do not acclimate to long periods with no hazing, unless otherwise coordinated with the POC.



2.5.2.3.5.2. Pinniped hazing techniques are defined in the approved *Operating Plan* and in accordance with the *Marine Mammal Protection Act of 1972, Section 109 h.1.c.*

2.5.3.3.5.3. Pinnipeds hazing shall occur in the tailrace of the dam and spillway, Tanner Creek, and areas where pinnipeds haul out (unless otherwise coordinated for trapping efforts), ranging to approximately 1,500 feet downstream of the dam and outfall site.

2.5.4.3.5.4. Special activities will be coordinated each year as necessary with Federal, State and Tribal boat hazing, trap/take efforts and/or special evaluations or tests.

2.5.5.3.5.5. Sea Lion Exclusion Devices (SLEDs) will be installed at all adult fishway entrances and floating orifice gates (FOGs). All SLEDs may be left in year-round.

## **3.4. THE DALLES DAM**

**3.1.4.1. Monitoring.** Monitoring will be done by Project Fisheries staff daily April 1–September 30, 7 days per week. ~~A~~The standardized form will be used to record numbers of piscivorous birds gulls, terns and cormorants foraging and non-foraging. Data will be provided in the weekly and annual fishway status reports. Observation zZones include forebay, powerhouse tailrace, sluiceway outfall tailrace and spillway tailrace outside of the spillwall, spillway tailrace inside the spillwall, spillway tailrace upstream of bridge, and spillway tailrace downstream of bridge.

**3.2.4.2. Action Plan.** Avian hazing will be contracted to USDA (or other appropriate contractor) as in prior years. Corps NWP employees are not allowed to haze gulls as was successfully done in the past.

~~3.2.1.4.2.1.~~ Contracted hazing will occur April 15–July 31, 7 days per week, 14-16 hours/day ~~between the hours of 0600–2000~~ to cover most daylight hours.

~~3.2.2.4.2.2.~~ Hazing will consist of launching pyrotechnics when gulls are present as gull numbers increase within any of the zones.

~~3.2.3.4.2.3.~~ Almost all hazing occurs in SW4 immediately downstream of the bridge. Hazing will not occur from the Navigation Lock peninsula when barge traffic is present.

~~3.2.4.4.2.4.~~ Avian lines are not in place downstream of the bridge where predation is most prevalent. However, 13 avian lines are upstream of the bridge which tends to keep gull numbers low in that area and 61 avian lines are across the entire powerhouse tailrace as well as half of the channel over the ice/trash sluiceway outfall. Any gulls within the avian line grid are immediately hazed.

~~3.2.5.4.2.5.~~ From August through mid-April, there will be no avian abatement measures other than avian lines. Avian lines will be repaired and/or reinstalled as soon as possible following damage or removal. New avian lines will be installed and maintained in locations determined to have significant avian predation. Avian abatement measures shall be in place by April 1 unless delayed by inclement weather, in which case work will be completed as soon as weather permits.

**3.3.4.3. Incident Response.** The trigger for additional action will be 50% of the 5-year average should be around 250 gulls, based on recent numbers. This number is reached once to twice per year. Unfortunately, NWP has few options available if gull numbers reach a trigger. Lethal removal is being pursued as an option but at this trigger would likely work, but unlike NWW, is not approved by NWP at this time. Lethal removal would require no additional funding since the boat crew is already on site hazing. If for some reason hazing is not available, propane cannon, distress calls, and other recent bird replant technology will be tried in attempts to abate gulls. Handheld lasers are being tested by COE employees and will be used if shown beneficial. Use of handheld lasers seems to show promise in deterring loafing gulls and will be applied as needed. Investigation of cost savings for Corps NWP employee hazing program should also be investigated.

**3.4.4.4. Discussion.** Fish Field Unit (FFU) studies have shown that gulls are not highly efficient predators, when looking at the entire juvenile salmonid run as a whole. Predation rates were calculated at an average 0.75 fish/gull/hour in the zone (SW4) in 2010 and 0.58 fish/gull/hour in 2011. This zone requires almost all of the hazing. The zones upstream of the bridge have a much higher predation success rate per gull, but gull numbers are effectively held lower due to avian lines. If funding is limited, a cost benefit analysis should be made for the hazing program relative to other fish passage improvements and maintenance. More recent data from PIT-tag recovery indicates a very high number of ESA-listed species consumed by gulls on the Miller Island colony. These gulls feed primarily below The Dalles and John Day dams. This area is not COE property and this population should be managed by associated wildlife management agencies. This has increased the need for improving avian abatement at the dam.

## **4.5. JOHN DAY DAM**

**4.1.5.1. Monitoring.** Avian monitoring is done throughout the year at JDA. During the adult and juvenile fish passage seasons inspections are made twice daily. These numbers for the week are included in the weekly status report to the region, along with a brief assessment of the effectiveness of the avian deterrent program. During the winter months bird numbers are collected once daily due to only one inspection needed during the maintenance season. An annual summary will be provided in the fish facility annual report.

**4.1.1.5.1.1.** Birds most commonly observed at JDA are gulls, cormorants, grebes, and American white pelicans. Their presence and distribution differ from each other throughout the season. Their foraging and non-foraging numbers along with Caspian terns will be monitored.

**4.1.2.5.1.2.** There are 3 powerhouse tailrace zones and 3 spillway tailrace zones along with a forebay zone for both the powerhouse and spillway. Birds are counted in each of these zones during the fisheries inspections at 0800 and 1600.

**4.2.5.2. Action Plan.** Measures for avian deterrence at JDA are listed below. With the current configuration of the avian abatement array and boat hazing, JDA project fisheries feels this is sufficient for deterring gulls, the primary predator at JDA, from feeding in the tailrace.

**4.2.1.5.2.1.** Avian Array: 125 lines stretched across the tailrace expanding 2,200' below the dam.

**4.2.2.5.2.2.** Boat Hazing: 8-hour shifts, 7 days per week during fish passage season April 10–July 31. In the event weather and/or other conditions preclude safe boat operation, hazing shall occur from dam structures and/or adjacent shorelines.

## **5.6. MCNARY DAM**

**5.1.6.1. Introduction.** McNary Lock & Dam has one of the largest piscivorous bird populations on the Columbia River due to the number of juvenile fish descending on McNary from both the Snake and upper Columbia rivers and due to the project's close proximity to several significant bird nesting colonies.

**5.1.1.6.1.1.** McNary has a large mix of piscivorous bird species, including California and ring-billed gulls, western grebes, Caspian terns, white pelicans, double-crested cormorants, mergansers and other piscivorous waterfowl. The most numerous and troublesome are the two gull species and they typically are found in the spillway tailrace, which is the most difficult area to reach with shore-based pyrotechnic devices, propane cannons and electronic bird alarm calls.

**5.1.2.6.1.2.** Much of what the McNary project does to control predatory birds is determined months in advance, when the project helps establish the predatory bird control contract with APHIS, so there is very little additional that the project can do during times of unusually high avian predation, other than to shift hazers around to different spots around the project. Early in the season, we will have already deployed the appropriate number of propane cannons and bird alarms, so more would not be appropriate. In addition to adding boat hazing, the project will continue with the two-shift hazing effort during the busiest months of the year.

**5.1.3.6.1.3.** Propane cannons, electronic bird alarms and other noise-makers are problematic, because they disturb nearby homeowners, fishers, park users and tugboat crews, so they must be used with discretion. They are of limited effectiveness and propane cannons in particular must be restricted to near-dam areas and away from recreational and navigational traffic.

**5.2.6.2. Monitoring.** McNary biologists and biological technicians monitor the dam populations of gulls, grebes, Caspian terns, white pelicans and double-crested cormorants at least once per day, seven days a week, from April 1 through September 30, the juvenile fish bypass season at McNary. The project may monitor populations more frequently, as needed, during bird population surges or outside this time window. We will include observations of hazing activity, hazing hours, boat hazing, monitoring times, foraging/non-foraging activity, etc.

**5.3.6.3. Action Plan.** Bird hazing occurs April ~~2519~~ through July ~~2425~~. Double shifts (1~~26~~ hours per day) are used during the period of the greatest bird activity, April ~~2526~~ through July ~~1011, 6 days per week~~. Boat hazing is also used from ~~April 26~~ May 2 through July ~~1011~~, for ~~106~~ hours per day, 3 days per week (except Sundays). Hazing crews may at their discretion deploy limited lethal take of gulls and cormorants, particularly if hazing by itself loses its effectiveness. Project personnel may deploy a limited number of propane cannons and electronic bird alarms from time-to-time, typically early in the season. Overhead avian deterrent wires are located along the powerhouse tailrace. ~~A hydrocannon is situated at the juvenile fish bypass outfall. The sprinkler system on the juvenile fish bypass outfall and associated plumbing and electrical supply were lost during higher flows in 2019. Deterrent lasers and bird calls are currently being used to reduce avian predators at the outfall pipe.~~

**5.4.6.4. Incident Response.** When surges of predatory birds become apparent, the project will conduct the following actions based on the number of birds present:

- a. When predacious bird numbers at any particular location exceed 50-100 foraging birds, focus hazers on those locations;
- b. When predacious bird numbers at any particular location (most usually the spillway outfall) exceed 100 - 200 foraging birds, increase hazing efforts in those areas and increase the number of long-range pyrotechnic devices. Focus boat hazing in those areas. If hazers have not already initiated lethal take, deploy limited lethal take;
- c. When predacious bird numbers at any particular location exceed 200-300 foraging birds, increase hazing efforts. Continue to focus boat hazing in those areas. Place more emphasis on lethal take. Lethal take is a critical part of these predatory bird control efforts. Without it, hazing will likely have only a limited effect on local bird congregations.

**5.5.6.5. Reporting.** As noted in the “Monitoring” section above, McNary biologists and technicians monitor birds from April 1 through September 30, the juvenile fish bypass season at McNary. Records of this monitoring are maintained on an Excel spreadsheet. Regular updates will be provided in a table in the fish facility weekly report, along with a brief statement on the effectiveness of the bird deterrent program for that week. A summary of seasonal bird abundance and the overall effectiveness of the bird deterrent program will be provided in the fish facility annual report. Reporting is by zone, with the project divided into the following zones: Forebay (FB1); Juvenile Bypass Outfall (JFOF); Powerhouse Tailrace (PHT1); and Spillway Tailrace (SWT1). Reporting is by bird species, when clear identification is possible. There is no differentiation between gull species due to the difficulty in determining gull species from a distance. Data are also provided by contract hazing personnel working on the project. During the hazing season, Wildlife Service personnel also turn in daily and monthly reports.

## **6.7. ICE HARBOR DAM**

**6.1.7.1. Monitoring.** Bird monitoring dates are April 1 to July 31. Gull, cormorant, Caspian tern, grebe and pelican numbers are counted once per day, 6 or 7 days a week from April 1 to June 30, and 4 days (Monday through Thursday) a week from July 1 to July 31.

**6.2.7.2. Hazing.** Ice Harbor Dam utilizes the U.S. Department of Agriculture's Animal & Plant Health Inspection Service (APHIS) for hazing of piscivorous birds to reduce predation on ESA-listed fish passing the dam. Bird hazing occurs from April 1 through June 30, 7 days per week, and is focused on gulls, terns and cormorants observed to be feeding on passing fish. Land-based hazing is conducted by a Wildlife Specialist 8 hours per day April 1–~~34~~ and June ~~67~~–30, and 16 hours per day April ~~45~~–June ~~56~~. Boat-based hazing is conducted 3 days per week April ~~45~~–~~1718~~ and May ~~2324~~–June ~~56~~, and 5 days per week April ~~1819~~–May ~~2223~~.

**6.3.7.3. Action Plan.** Birds are actively hazed in the immediate forebay of the dam to the Boat Restrictive Zone (BRZ). In the tailrace, birds are actively hazed from the immediate tailrace of the dam downstream to Eagle Island. Data that are noted are the time, avian zone, the species of the bird, number of birds, if they are foraging or not foraging and control action taken.

**6.3.1.7.3.1.** Birds are hazed daily using propane cannons, bird distress calls, pyrotechnics and lasers. In addition, there are bird wires across the turbine discharge area and the spillway area below the Dam. A water cannon is located on the juvenile fish bypass pipe terminus. Wire spikes are installed on light poles, forebay buoys, and other bird perching areas.

**6.4.7.4. Incident Response.** When a bird (gull or cormorant) becomes unresponsive to hazing and is leading other birds to feed on juvenile fish (instigator bird) who are also unresponsive to hazing, lethal take of the instigator bird or a bird in the group of unresponsive birds will occur at the discretion of the hazing contractor. This action will occur most sparingly after all other efforts have failed to move the birds. In the event that the daily count of gulls, cormorants, and terns increases to twice the most recent 3-year average daily count for the same week, Corps personnel will assist in hazing.

**6.5.7.5. Reporting.** Bird observations will be reported weekly on the Project's ESA Weekly Report and will include a brief statement on the effectiveness of the bird deterrent program for that week. A summary of the season will be included in the Annual Fish Report.

## 7.8. LOWER MONUMENTAL DAM

**7.1.8.1. Monitoring.** Bird monitoring as part of standard fish ladder inspections will occur from March 1 to September 30. Fish ladder inspections will be conducted 4 days per week, once per day at random times from April 1 to June 30 (crew size permitting, 3 inspections per week minimum if crew size is compromised). Additionally, Wildlife Services (APHIS) will collect ~~this~~ these data on the three days per week not covered by COE. This will cover 97% of the typical juvenile salmonid outmigration. Fish ladder inspections will continue (July 1 to December 31) to collect ~~this~~ these data at the required rate of 3 inspections per week.

~~7.1.1. The annual high daily bird numbers by species including resting, flyby and foraging birds for the past ten years are as follows. For years 2004 through 2008 only gull numbers were required so the records are so limited. Also of note, is the fact that binoculars were not used on these inspections until 2012. Numbers prior to 2012 should be considered as reduced by some factor relating to the visual acuity of the inspector conducting the inspection.~~

Species	Year									
	2004	2005	2006	2007	2008	2009	2010	2011	2012	2013
Gull	74	155	86	360	445	37	59	101	104	247
Terns	N/A	N/A	N/A	N/A	N/A	2	1	6	37	1
Cormorants	N/A	N/A	N/A	N/A	N/A	29	3	9	44	22

~~7.1.2.8.1.1. Additionally,~~ **b** Bird hazing effectiveness inspections will take place once daily from April 1 through June 30. These will consist of flying gull and tern counts and floating cormorant counts in the tailrace and at the juvenile fish bypass outfall. These inspections will be conducted from the river end of the raceway structure and will occur between 1100 and 1300 hours.

~~7.1.3.8.1.2.~~ Data collected during fish ladder inspection will be recorded in a standardized Excel spreadsheet and will be limited to gulls, cormorants, terns, grebes and pelicans. There will be five zones monitored including: Forebay (FB1), Spillway (SWT1), Powerhouse outflow under bird wires (PH1), Powerhouse outflow downstream of bird wires (PH2) and the juvenile bypass outfall (JFOF). There will be two bird activities monitored: Foraging (flying, diving or feeding) and Non-foraging (resting in/on water, on debris, structures or land, or while scavenging).

~~7.1.4.8.1.3.~~ Data collected during bird hazing effectiveness inspections will be recorded in a standardized ~~e~~Excel spreadsheet and will be limited to: gulls, cormorants and terns.

**7.2.8.2. Action Plan.** Lower Monumental Dam will have an active hazing program consisting of one 8-hour shift per day from April 1 through May 2 and two 8-hour shifts (non-concurrent) from May 3 through June 2. Gulls, cormorants and terns will be the major focus of this hazing effort.

~~7.2.1.8.2.1.~~ Hazing shifts and zones to be emphasized will be adjusted to maximize deterrent effect on feeding bird populations.



7.2.2.8.2.2. Lethal take may occur as part of the hazing program and would exclusively be performed and regulated by licensed agencies and/or companies.

7.2.3.8.2.3. Bird wires will be maintained across the turbine discharge area (see zone photo). The addition of bird wires across the spillway is not practical or safe as the fish transport barge and tug would run through them.

7.2.4.8.2.4. Bird aversion water cannons will be in operation from April 1 through October 1 at the bypass outfall.

7.2.5.8.2.5. Boat hazing is not needed at Lower Monumental as the river is sufficiently narrow to allow effective hazing from the dam structure and shore.

**7.3.8.3. Incident Response.** In response to operational trigger numbers observed during bird hazing effectiveness inspections, the following action toolbox items will be utilized. The timing of the introduction of these additional hazing methods will be dependent on available trained staff:

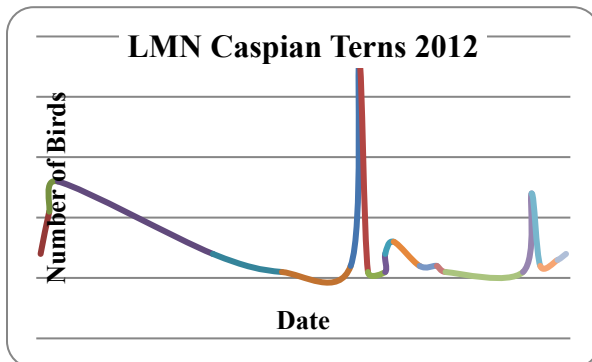
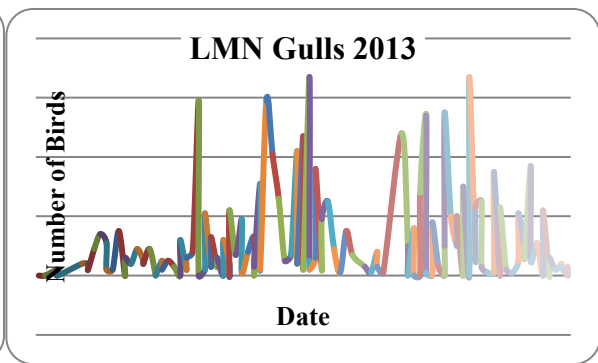
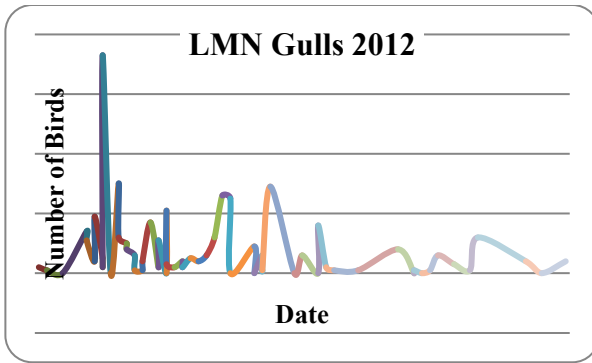
- a. Propane cannon placement.
- b. COE employee (added) hazing with screamers and poppers fired from shore.

**7.3.1.8.3.1. Operational Trigger Numbers.** When the following operational trigger criteria are met then (depending on the conditions) one of the toolbox items will be put into service. Available staff will likely be a factor in which item is selected. Re-evaluation of the item causing the action will occur daily in regard to stepping up, terminating or randomizing use of the operations from the Action Toolbox. Items will be added to the toolbox as they are tested and proved effective.

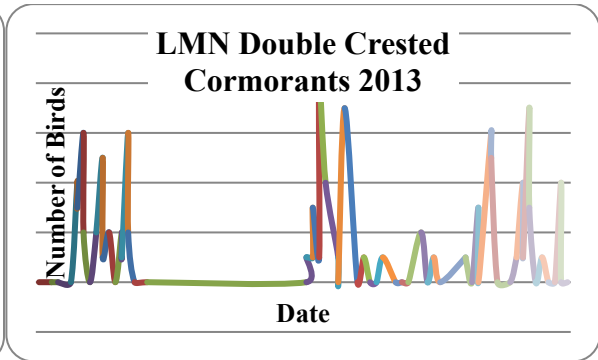
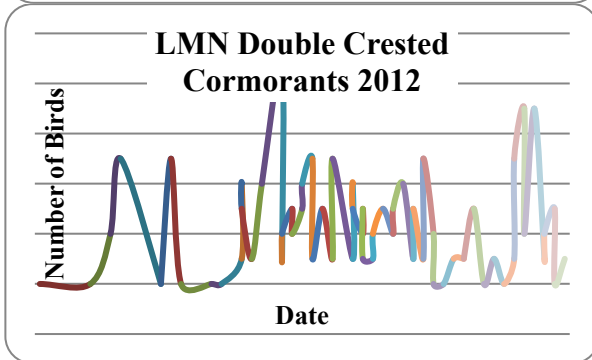
7.3.2.8.3.2. The following action point numbers based on foraging birds are proposed as a starting point for this process. As more years of data are collected with the benefit of binoculars then these action points will be adjusted accordingly.

- a. Action point Gulls = 86.
- b. Action point Terns = 43.
- c. Action point Cormorants = 15.

7.3.3.8.3.3. The graphs below show the average daily foraging bird numbers by species for the 2012 and 2013 operating year. Foraging bird numbers can be highly variable during the juvenile fish outmigration. The high foraging gull numbers, tern numbers and cormorant numbers for these two years were 72, 37 and 9, respectively.



Only 1 Caspian Tern recorded feeding during 2013 inspections (on April 14).



#### **7.4.8.4. Reporting.**

**7.4.1-8.4.1. Annual Reporting** of fish ladder inspection bird monitoring results will be included in the “Adult and Juvenile Fish Facility Monitoring Report” focusing on bird activities from April 1 through June 30.

**7.4.2-8.4.2. Weekly Reporting** of bird hazing effectiveness inspections and occurrence of trigger points and resulting action will be added to the standard Fish Facility Weekly Report in its own section and summary table labeled, “Table 2. LMO Tailrace Counts of Foraging Piscivorous Birds”, from April 1 through June 30.

## **8.9. LITTLE GOOSE DAM**

**8.1-9.1. Monitoring.** Little Goose will monitor and collect daily data on gulls, cormorants and terns from April 1 – October 31. Bird monitoring will occur 2 to 3 times per day in two zones; the forebay and tailrace. There will be two bird activities monitored; foraging and non-foraging.

**8.2-9.2. Action Plan.** Little Goose will perform bird hazing, which includes at least 8 hours per day, 7 days per week of contracted services from March ~~2930~~ to June ~~1920~~. During the peak period for bird abundance, April ~~1112~~-May ~~2223~~, up to 16 hours of hazing will occur. Boat hazing will occur March ~~2930~~-June ~~1920~~ for 8 hours per day, three days per week. Gulls, cormorants and terns will be hazed as needed during the juvenile fish passage season. Hazing will be performed using scare products. These include consumer fireworks, scare cannons, bird bangers and bird screamers.

**8.2-1-9.2.1.** Passive deterrents will be used. These include; needle strips, an overhead bird wire array, visual scare devices and a hydrocannon located at the juvenile fish bypass outfall. The wire array is composed of 12 wires across the turbine discharge area.

**8.2-2-9.2.2.** Limited lethal take may occur at the discretion of qualified APHIS Wildlife Services personnel.

**8.3-9.3. Incident Response.** If gulls and/or tern numbers reach an average of 100 per day or cormorants reach an average of 50 per day during the April 1 to August 31 period the project will commence into action one or more of the following toolbox control measures, in any combination, to best achieve reduced bird predation to an acceptable level.

- a. Deploy additional remotely activated propane canon(s);
- b. Increase hazing with pyrotechnics and other bird scare devices;
- c. Initiate limited lethal take by Wildlife Services personnel if not already started.

**8.4-9.4. Reporting.** Bird management data will be recorded into computer spreadsheets, assimilated and reported weekly and annually. A brief statement assessing the effectiveness of the avian deterrent program for that week will be included in the weekly report, with an overall summary provided in the annual report.

## **9.10. LOWER GRANITE DAM**

**9.1.10.1. Monitoring.** Monitoring work at Lower Granite Dam will be done by COE biologists April 1 through October 31 and by control agents of the USDA conducting bird hazing work at the dam April 1 through June 30. The agencies will conduct independent counts. Hazers will usually be counting birds once daily in all zones, in conjunction with their normal hazing activities. Binoculars will be utilized to make the counts and the normal count area will be from the base of the dam downstream to a buoy approximately 1/2 mile below the dam. The tailrace area of the dam has been divided into zones and the technicians will count the birds in each zone and record foraging or non-foraging behavior. Bird count data will be limited to gulls (California and ring-billed), cormorants and Caspian terns. American white pelicans will be recorded on an incidental basis in attempt to monitor their increasing abundance.

**9.2.10.2. Action Plan.** Base actions will be include the array of methods in long-time use by the USDA APHIS and will also include limited lethal control when the other methods prove ineffective. Passive avian deterrent structures include the overhead array of 34 wires spanning the tailrace downstream to the end of the navigation lock wall and across the river to the pole located just upstream of the visitor center overlook. Nonlethal control measures will include 15 mm pyrotechnics and Dominator rocket pyrotechnics. Agents will haze birds on both side of the river and will work as far as two miles below the dam. Limited lethal control of gulls and cormorants will be at the discretion of the agents working on site. Lethal take will be conducted with a shotgun in accordance with the USFWS-issued permit. Powerhouse operators and persons conducting tours will be notified before any lethal take activities take place. No lethal take will be allowed when schools or other tour groups are on site. Hazing activities will take place 8 hours per day from April 1 through April 19 and from June 2 through June 30. Hazing will take place 16 hours per day from April 20 through June 1 when the maximum numbers of juvenile salmonids are normally passing the dam.

**9.3.10.3. Incident Response.** A trigger for additional control measures is listed below. The trigger level is presently set at an order of magnitude above the average gull counts for the previous five-year period. It might be wise to consider lowering this number somewhat but it appears gulls are being effectively controlled at Lower Granite at the present time using the available techniques. The addition of limited lethal take in 2014 should help keep the numbers at reasonable numbers. In the event the numbers do significantly increase over time, possible control measures would include: remote-activated propane canons, biotech hazing with pyrotechnics (in addition to APHIS), playing remotely activated gull distress sounds and emergency call-out of off-duty JFF personnel to assist with hazing activities.

### **9.3.1.10.3.1. Avian Predation Trigger Level and Proposed Toolbox Control Measures.**

Gull numbers were obtained from daily counts off the Lower Granite JFF separator platform. At the present time, terns are not very abundant at Lower Granite and the project does not have count data. Cormorants are certainly present but much more difficult to count (and haze) than gulls. At this time, I recommend that a trigger level be calculated and utilized for gulls (both species combined) only. Below are the average gull numbers for each of five years running from April 1 through June 30 each year (APHIS hazing was being conducted):

Year	Gulls/Day (April 1 – June 30)
2013	9.36
2012	6.03
2011	6.43
2010	14.09
2009	11.5
2009-2013 Average	9.48 (st dev 3.05)

**9.3.2.10.3.2.** If gull numbers reach an average of 95 per day during the April 1 to June 30 time period (10x the 5-year average), the following project toolbox measures would be utilized in combination with APHIS hazing activities. In order to achieve the best control it is likely a combination of measures would need to be utilized:

- a. Remotely-activated propane cannon(s);
- b. Biological Technician hazing with pyrotechnics;
- c. Emergency call of off-duty separator technicians for hazing;
- d. Play audible gull distress sounds (*Bird Chase “Super Sonic” Player, Bird-B-Gone Catalog PN #1B50-PCOM*);
- e. Others to consider in combination with above: visual deterrent devices (e.g., raptor effigies, scare-eye balloons, etc.).

**9.4.10.4. Reporting.** Reporting of bird numbers will consist of a table of average daily bird counts that will be included in each weekly ESA report April 1 through October 31, along with a brief statement assessing the effectiveness of the avian deterrent program for that week. In addition, a section on bird predation control work will be included in the annual "Adult and Juvenile Fish Monitoring Report".