

# **Appendix D**

**2011**

**Fish Operations Plan Spill  
(Plus Chief Joseph Dam Spill)**

## **Introduction**

Each year from April through the end of August, the US Army Corps of Engineers (Corps) spills water at its lower four Snake and lower four Columbia River dams to facilitate downstream passage of juvenile salmonids. In 2011, spring and summer Fish Operations Plans (FOPs) shown in Appendix C, were implemented at lower Snake and Columbia River projects. This appendix provides an overview of how much FOP target spill is called for, how much spill occurred, the total river flow and total generation for each day from April 1 through August 31. In addition, data for Chief Joseph Dam, is included in this Appendix in order to account for spill operations in 2011. This information is provided in both tabular and graphical summaries (Figures D-1 through D-9; Tables D-1 through D-9). Tables D-10 through D-13 provide a comparison of 2011 to the previous 12 years and project to project comparison.

## **Overview of Spill Calculations**

Calculations of hourly FOP spill levels for juvenile fish passage are based on methods developed and used over the past several years. These methods monitor how closely each project and BPA are implementing juvenile fish spill based on the operating instructions (teletypes) provided to the projects and BPA by the Corps. Microsoft Excel spreadsheets have been developed to display actual project spill level and the level of spill specified for juvenile fish passage in the FOP. Both of these metrics are then displayed graphically, so that spill operations can be monitored visually to identify deviations in actual spill from FOP specified spill.

The mathematical functions developed to calculate FOP spill take into consideration FOP maximum spill levels, 115 percent forebay/120 percent tailrace TDG spill caps in effect, minimum generation requirements, fish research and testing during the spill season, and in some cases,  $\pm 1$  percent efficiency turbine unit operating requirements. Each project has its own set of mathematical functions depending on the FOP prescribed spill operation and season. Each year, several of these functions are modified to account for spill operations in effect for the current year. These changes are usually driven by fish research to evaluate fish passage and survival or modifications in target spill levels. Typically, functions for a given project are not modified for short duration spill operational changes at projects such as a three-day spill test or other short-term regulation adjustments.

One item considered when determining if the projects and BPA are complying with spill operation instructions is to review individual spill gate settings or spill patterns at each project. Spill gates are opened a set number of “stops” to provide a specific discharge through each spill bay. The minimum increment for opening a spill gate is either 1/2 stop or a full stop, which is generally equivalent to spill discharges of 0.8 - 1.9 kcfs per increment, but can vary depending on project. The project’s ability to operate continuously at a stop setting also varies due to the changing hydraulic conditions and the speed at which the spill gate control system can react to these changes. This limitation often results in spill levels that are slightly above or below the desired spill level for a period of time.

## **Project-Specific Spill Operations for Fish Passage**

In the following paragraphs, “spill” refers to the target spill level provided for juvenile fish passage as described in the 2011 Spring and Summer FOPs (Appendix C). The target spill is the desired spill amount, but can vary in some cases due to factors such as fluctuating TDG spill caps, minimum generation requirements, altered spill patterns, fish research and testing, and prescribed court-ordered spill levels. The target spill will often be lower than actual spill during involuntary spill events; otherwise target spill and actual spill are identical (Figures D-1 through D-8; Tables D-1 through D-8).

Because total river flows were unusually high in 2011, continuous spill began on March 30 at six of the eight projects with Ice Harbor beginning on March 28 and McNary beginning on January 18. For the purposes of this report, tracking of spill volumes and rates starts on April 1. The differences between spill for high flows in early April and the FOP fish passage spill are shown in the following graphs and tables.

### **Bonneville**

Spill for fish passage began at Bonneville Dam on April 10 at 0001 hours and continued until 0001 hours on September 1 (Figure D-1; Table D-1). The Spring FOP spill operation was 100 kcfs 24 hours per day from April 10 to June 15. The Summer FOP spill operation from June 16 through July 20 was an alternating spill test of 85 kcfs during daytime hours and 121 kcfs at night versus a constant 95 kcfs for 24 hours per day. Although the Summer FOP operations teletype was sent on June 15, it could not be implemented until July 20 because flows were too high. From July 21 to August 31, Summer FOP spill operation was 75 kcfs during daytime hours and to the 120 percent TDG spill cap at night. The B2 corner collector operated from March 14 at 1400 hours through September 1 at 0600 hours.

### **The Dalles**

Spill for fish passage began at The Dalles Dam on April 10 at 0001 hours and continued until 2400 hours on August 31 (Figure D-2; Table D-2). The FOP spill operation at The Dalles Dam for both spring and summer was 40 percent of total river discharge for 24 hours per day.

### **John Day**

Spill for fish passage began at John Day Dam on April 10 at 0001 hours and continued until 2400 hours on August 31 (Figure D-3; Table D-3). The FOP spill operation was an alternating spill test of 30 percent vs. 40 percent of total river discharge 24 hours per day from April 27 through July 20. John Day Dam spill operation was 30 percent of total river discharge, 24 hours per day from April 10 through April 27 and July 21 through August 31.

### **McNary**

Spill for fish passage began at McNary Dam on April 10 at 0001 hours and continued until 2400 hours on August 31 (Figure D-4; Table D-4). The Spring FOP (April 10 through June 19) spill operation was 40 percent of total river discharge 24 hours per day.

The Summer FOP (June 20 through August 31) spill operation was 50 percent of total river discharge 24 hours per day.

### **Ice Harbor**

Spill for fish passage began at Ice Harbor dam on April 3 at 0001 hours and continued until 0001 hours on September 1 (Figure D-5; Table D-5). From April 3 through April 27 and from July 13 through August 13, the FOP spill operation was 45 kcfs during the day and to the spill cap night. From April 28 through July 13, the FOP spill operation was an alternating spill test of 30 percent of total river discharge 24 hours per day versus 45 kcfs during the day and to the spill cap at night.

### **Lower Monumental**

Spill for fish passage at Lower Monumental Dam began on April 3 at 0001 hours and continued until 0001 hours on September 1 (Figure D-6; Table D-6). The Spring FOP (April 3 through June 20) spill operation was to the 115/120 percent TDG spill cap 24 hours per day with the RSW operating. The Summer FOP (June 21 through August 31) spill operation was 17 kcfs 24 hours per day (subject to 120 percent /115 percent TDG spill cap limits) with the RSW operating.

### **Little Goose**

Spill for fish passage at Little Goose Dam began on April 3 at 0001 hours and continued until 0001 hours on September 1 (Figure D-7; Table D-7). The FOP spill operation for both the spring (April 3 through June 20) and summer (June 21 through August 31) was 30 percent of the total river discharge for 24 hours per day.

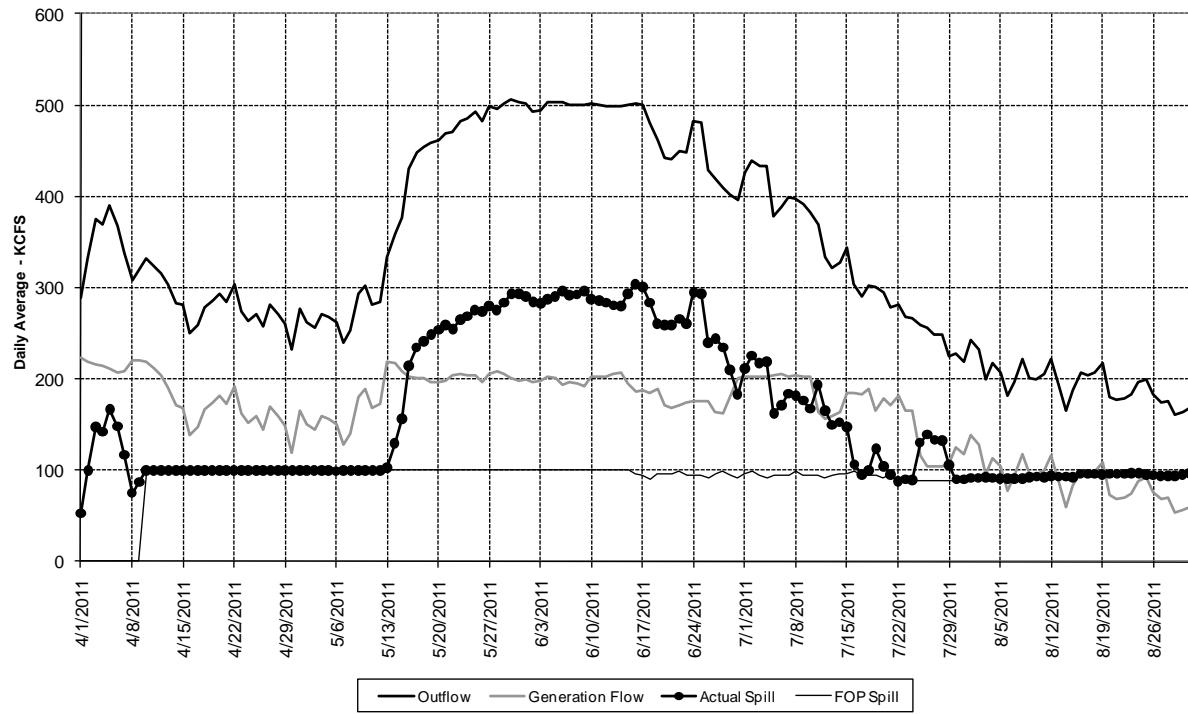
### **Lower Granite**

Spill for fish passage at Lower Granite Dam began on April 3 at 0001 hours and continued until 0001 hours on September 1 (Figure D-8; Table D-8). The Spring FOP (April 3 through June 20) spill operation was 20 kcfs for 24 hours per day (including approximately 6 kcfs from the RSW and 14 kcfs from training spill). The Summer FOP (June 21 through August 31) spill operation was 18 kcfs for 24 hours per day.

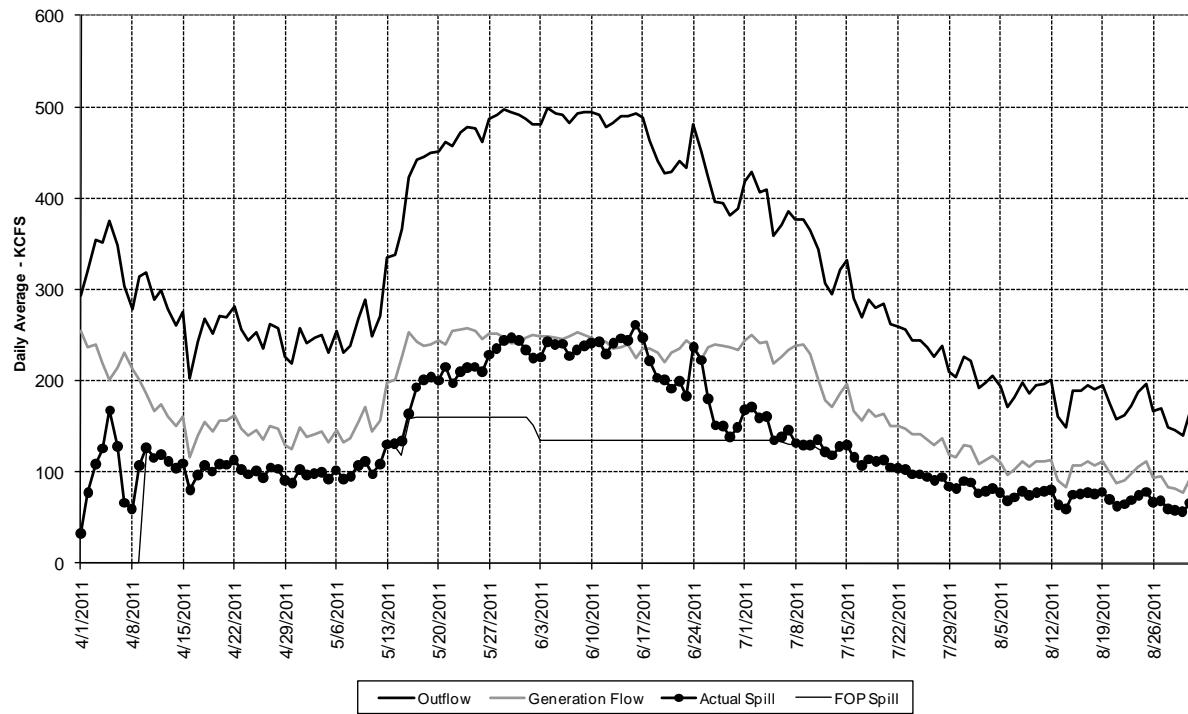
### **Chief Joseph**

As discussed in Section 1.1.7 of the Annual TDG and Temperature report narrative, there was a change in the Chief Joseph spill management process in 2011. In order to account for spill operations, Chief Joseph is included in this appendix. Spill was managed to attempt to achieve 120 percent TDG in the tailwater or 115 percent TDG in the Wells forebay to the extent possible. The total flow, generation and involuntary spill at Chief Joseph are shown on Figure D-9; Table D-9.

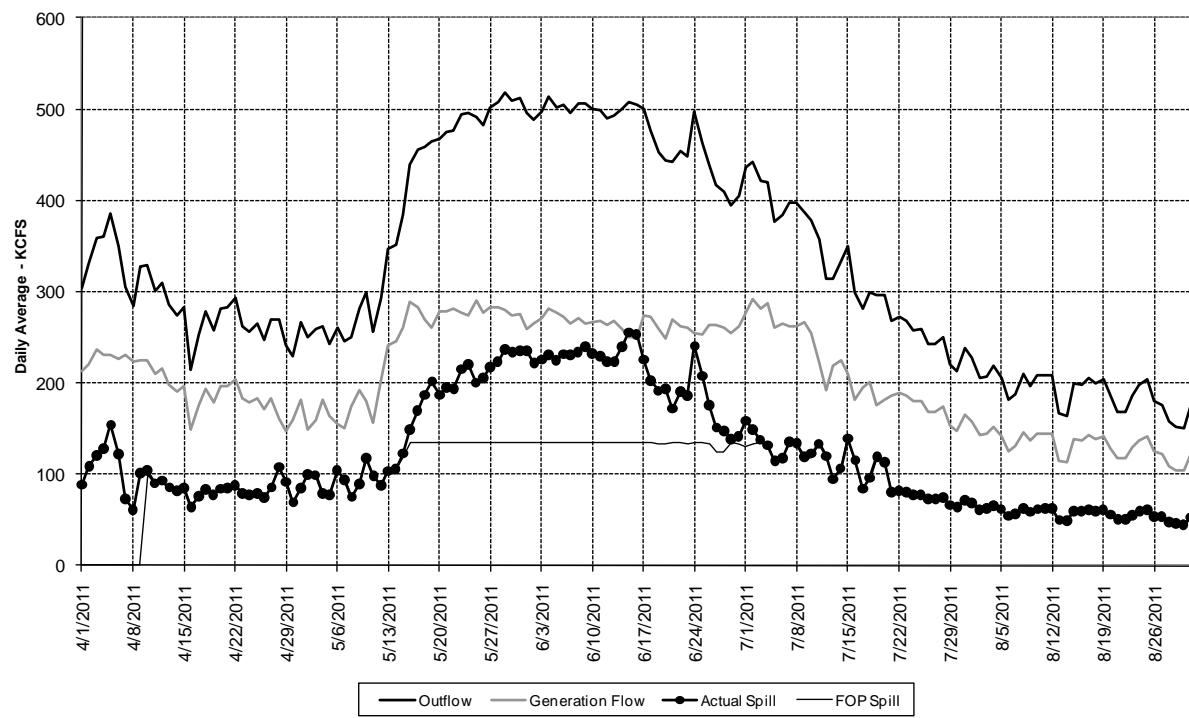
**Figure D-1**  
FOP Spill at Bonneville



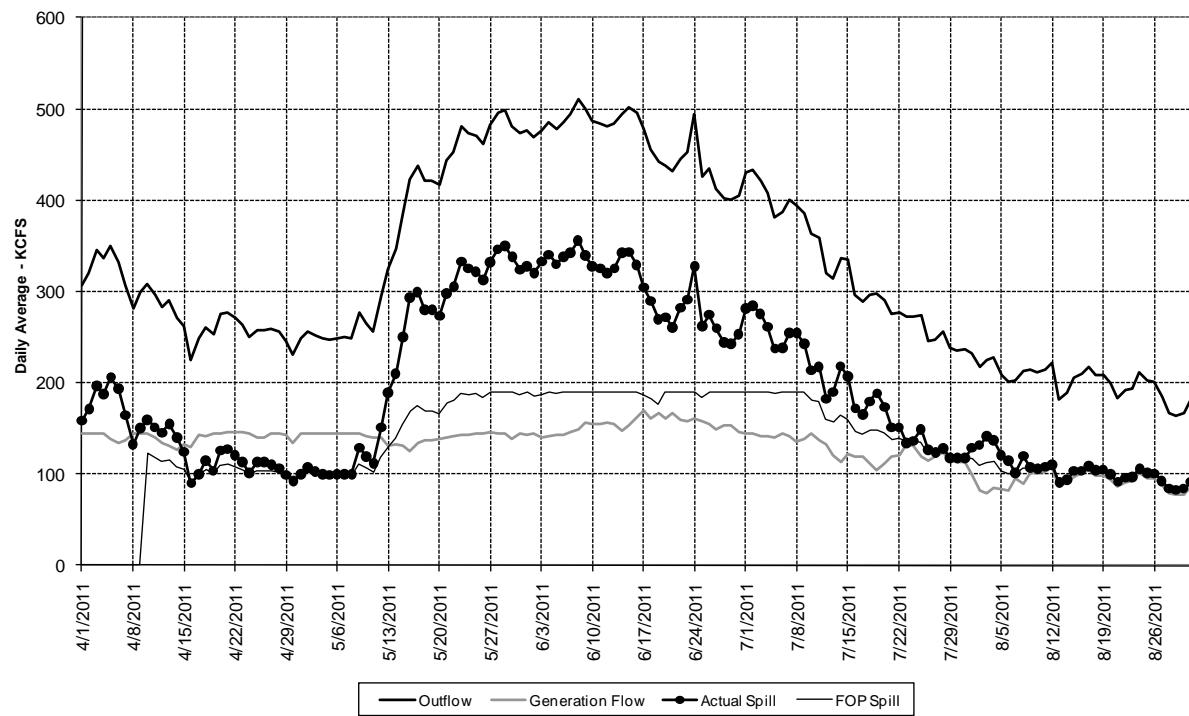
**Figure D-2**  
FOP Spill at The Dalles



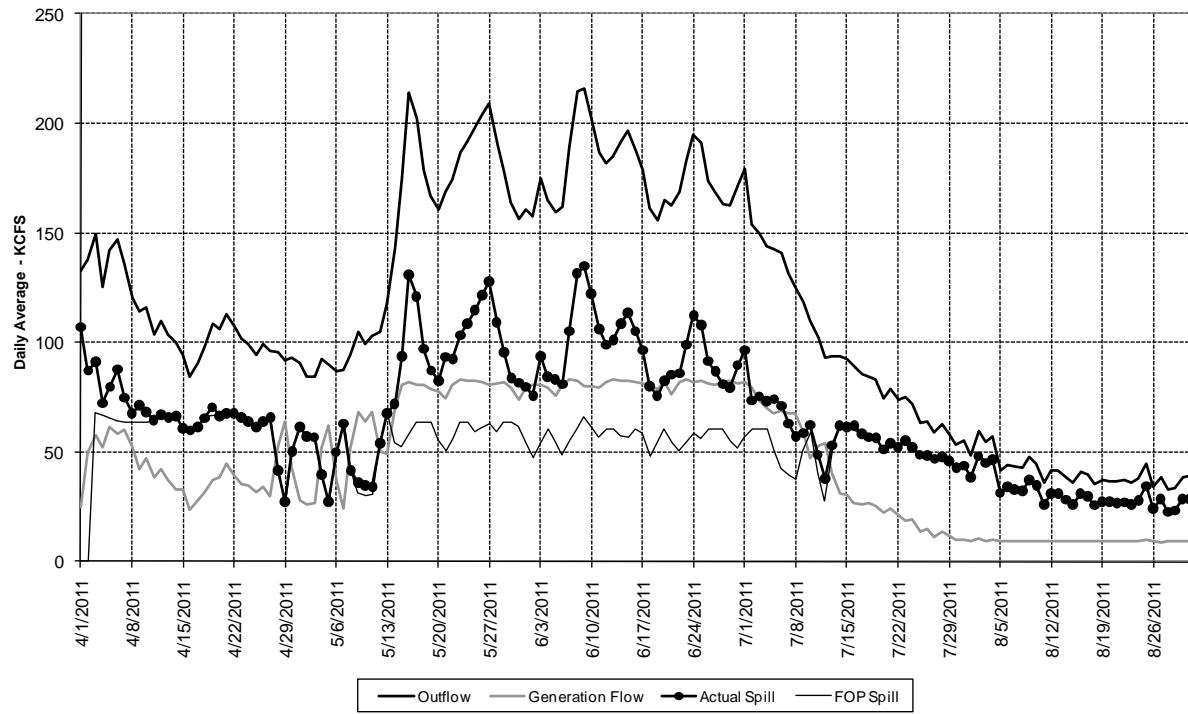
**Figure D-3**  
FOP Spill at John Day



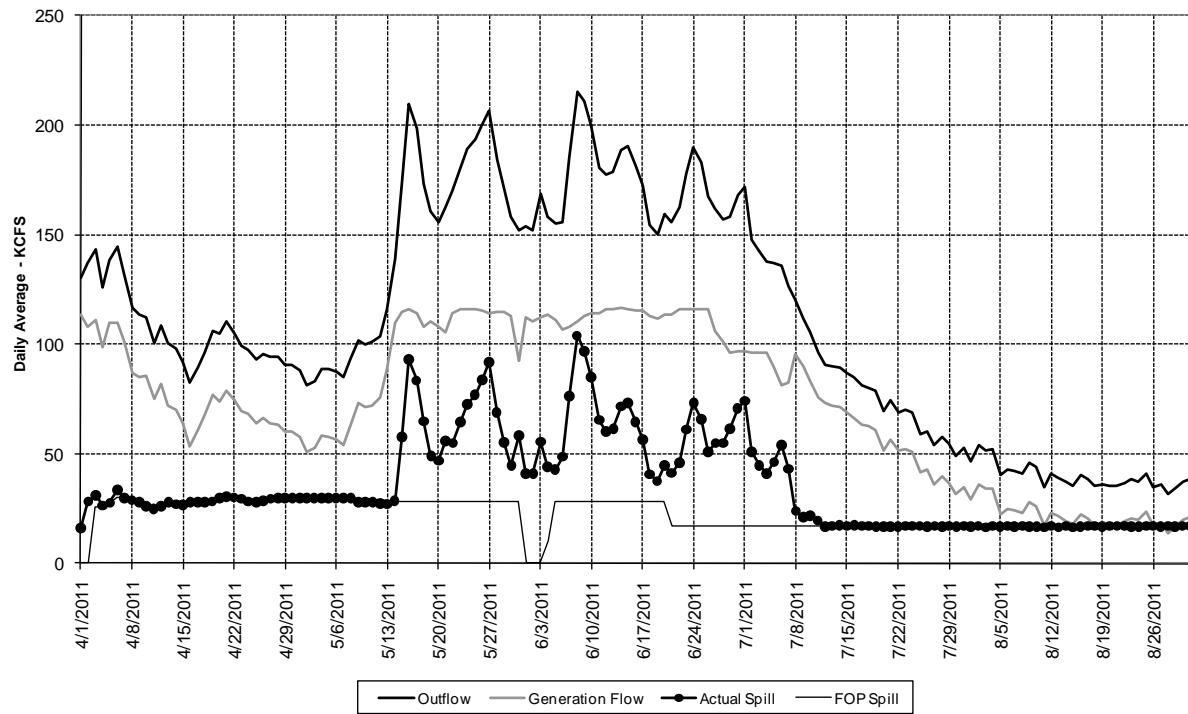
**Figure D-4**  
FOP Spill at McNary



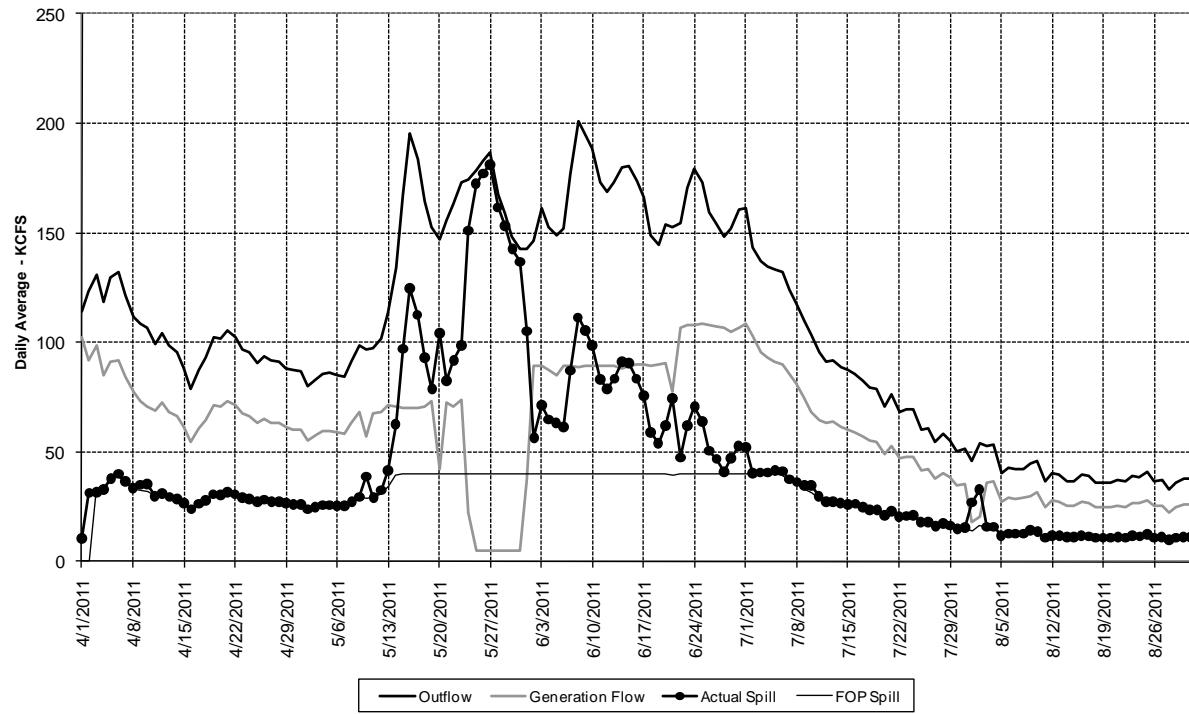
**Figure D-5**  
FOP Spill at Ice Harbor



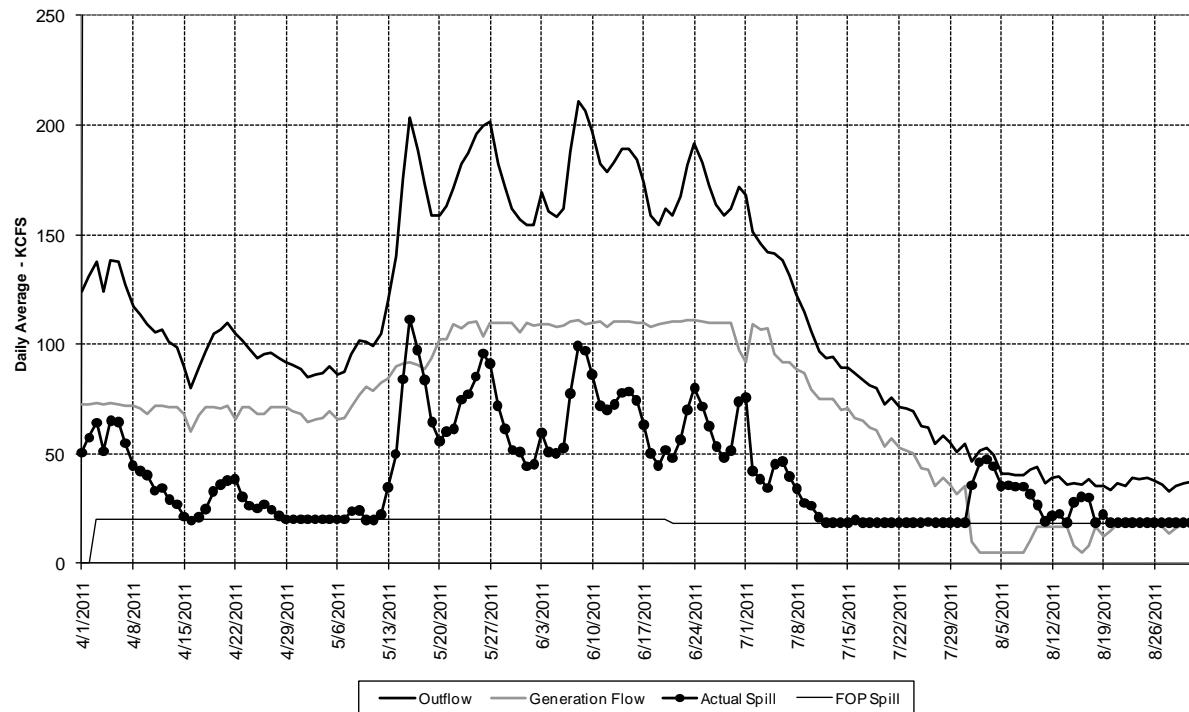
**Figure D-6**  
FOP Spill at Lower Monumental



**Figure D-7**  
FOP Spill at Little Goose



**Figure D-8**  
FOP Spill at Lower Granite



**Figure D-9**  
**FOP Spill at Chief Joseph**

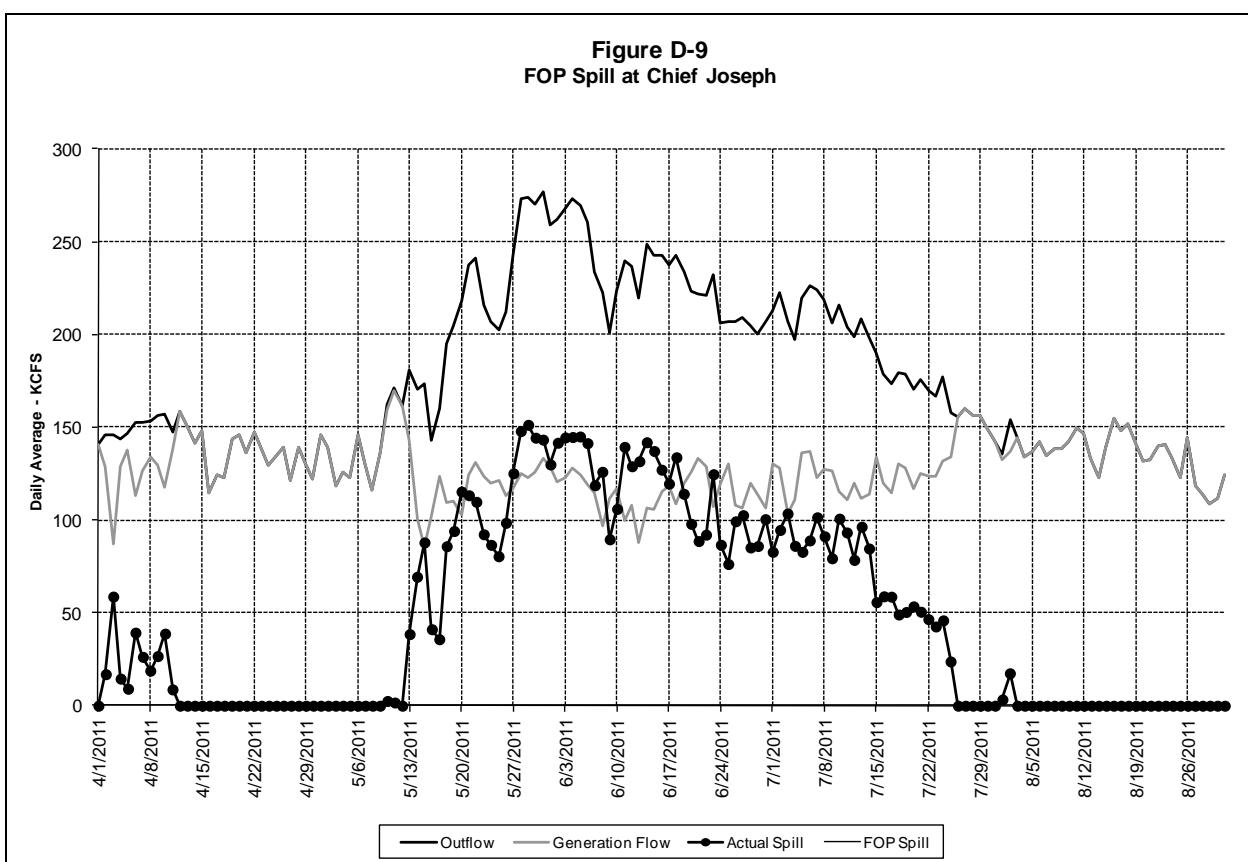


Table D-1

FOP Spill at Bonneville														
Date	Outflow KCFS	Generation Flow KCFS	Actual Spill KCFS	FOP Spill KCFS	Date	Outflow KCFS	Generation Flow KCFS	Actual Spill KCFS	FOP Spill KCFS	Date	Outflow KCFS	Generation Flow KCFS	Actual Spill KCFS	FOP Spill KCFS
04/01/11	288.76	223.67	52.69	0.00	05/22/11	470.75	203.72	254.63	100.00	7/12/2011	333.19	155.83	164.96	91.38
04/02/11	331.37	219.21	99.76	0.00	05/23/11	482.95	205.31	265.24	100.00	7/13/2011	321.43	159.39	149.64	94.63
04/03/11	375.07	215.71	146.96	0.00	05/24/11	484.69	203.62	268.67	100.00	7/14/2011	328.27	163.20	152.67	95.38
04/04/11	369.13	214.64	142.08	0.00	05/25/11	492.29	204.67	275.22	100.00	7/15/2011	344.21	184.77	147.04	95.38
04/05/11	390.53	211.35	166.77	0.00	05/26/11	482.75	195.95	274.40	100.00	7/16/2011	303.95	184.95	106.60	99.67
04/06/11	367.38	206.98	148.00	0.00	05/27/11	498.08	205.54	280.14	100.00	7/17/2011	290.98	182.95	95.63	95.00
04/07/11	337.84	208.77	116.68	0.00	05/28/11	496.23	208.82	275.01	100.00	7/18/2011	301.63	189.34	99.89	95.00
04/08/11	307.84	220.28	75.16	0.00	05/29/11	501.51	205.65	283.46	100.00	7/19/2011	301.09	165.32	123.37	95.00
04/09/11	319.92	220.20	87.32	0.00	05/30/11	506.53	200.88	293.25	100.00	7/20/2011	294.93	178.33	104.20	91.38
04/10/11	331.35	219.30	99.65	100.00	05/31/11	503.96	198.61	292.95	100.00	7/21/2011	278.37	170.95	95.02	95.38
04/11/11	323.44	211.45	99.58	100.00	06/01/11	501.53	199.29	289.85	100.00	7/22/2011	281.74	181.46	87.87	87.25
04/12/11	315.69	203.77	99.53	100.00	06/02/11	492.81	196.07	284.34	100.00	7/23/2011	268.11	165.87	89.84	88.75
04/13/11	303.26	191.24	99.62	100.00	06/03/11	493.79	198.72	282.67	100.00	7/24/2011	266.78	164.75	89.63	88.75
04/14/11	283.22	171.33	99.48	100.00	06/04/11	502.58	202.60	287.57	100.00	7/25/2011	258.49	115.89	130.20	88.75
04/15/11	280.81	168.58	99.83	100.00	06/05/11	502.68	200.30	289.98	100.00	7/26/2011	255.85	104.02	139.43	88.75
04/16/11	250.65	138.66	99.59	100.00	06/06/11	502.71	194.26	296.05	100.00	7/27/2011	249.26	103.83	133.03	88.75
04/17/11	259.17	147.13	99.64	100.00	06/07/11	499.85	196.00	291.45	100.00	7/28/2011	249.34	104.25	132.70	88.75
04/18/11	279.10	167.06	99.64	100.00	06/08/11	500.41	195.24	292.77	100.00	7/29/2011	225.54	107.57	105.57	88.75
04/19/11	286.17	174.30	99.47	100.00	06/09/11	500.47	191.72	296.34	100.00	7/30/2011	227.09	124.78	89.91	88.75
04/20/11	293.99	182.01	99.58	100.00	06/10/11	501.97	201.96	287.62	100.00	7/31/2011	219.37	116.95	90.03	88.75
04/21/11	284.23	172.01	99.82	100.00	06/11/11	500.22	201.82	286.00	100.00	8/1/2011	242.08	138.23	91.45	91.04
04/22/11	303.67	191.52	99.75	100.00	06/12/11	498.82	202.65	283.79	100.00	8/2/2011	232.13	128.06	91.67	91.04
04/23/11	274.24	162.16	99.68	100.00	06/13/11	498.44	205.63	280.41	100.00	8/3/2011	199.65	95.29	91.96	91.04
04/24/11	263.74	151.72	99.62	100.00	06/14/11	499.18	207.20	279.58	100.00	8/4/2011	216.92	113.32	91.45	91.04
04/25/11	271.04	159.01	99.63	100.00	06/15/11	500.76	194.78	293.57	100.00	8/5/2011	207.50	103.81	91.29	91.04
04/26/11	256.87	144.79	99.68	100.00	06/16/11	501.25	185.57	303.29	95.83	8/6/2011	181.46	78.02	91.05	90.41
04/27/11	281.99	169.92	99.67	100.00	06/17/11	500.26	187.31	300.55	95.00	8/7/2011	197.13	93.52	91.21	91.04
04/28/11	271.06	158.90	99.77	100.00	06/18/11	480.86	184.59	283.87	90.50	8/8/2011	221.86	118.23	91.23	91.04
04/29/11	260.72	148.85	99.47	100.00	06/19/11	461.50	189.03	260.07	96.75	8/9/2011	201.40	97.08	91.92	91.46
04/30/11	231.63	119.68	99.55	100.00	06/20/11	441.51	170.48	258.62	96.75	8/10/2011	200.14	94.71	93.03	92.50
05/01/11	277.50	165.53	99.58	100.00	06/21/11	440.58	168.88	259.30	96.75	8/11/2011	205.04	100.12	92.52	92.50
05/02/11	261.96	149.97	99.59	100.00	06/22/11	449.15	171.13	265.62	99.67	8/12/2011	221.60	115.90	93.30	92.50
05/03/11	255.90	143.88	99.63	100.00	06/23/11	447.55	174.37	260.78	95.00	8/13/2011	195.91	90.53	92.98	92.50
05/04/11	270.96	159.02	99.52	100.00	06/24/11	483.05	175.83	294.82	95.00	8/14/2011	165.85	60.19	93.26	92.50
05/05/11	267.45	155.70	99.35	100.00	06/25/11	480.63	175.37	292.86	95.00	8/15/2011	188.19	83.10	92.69	92.50
05/06/11	261.30	149.74	99.16	100.00	06/26/11	428.55	175.97	240.18	92.00	8/16/2011	206.44	98.25	95.79	97.50
05/07/11	239.92	127.87	99.65	100.00	06/27/11	420.29	164.20	243.69	96.75	8/17/2011	204.55	96.80	95.88	97.50
05/08/11	252.54	140.52	99.62	100.00	06/28/11	409.57	162.66	234.52	98.58	8/18/2011	206.32	97.65	96.27	97.50
05/09/11	292.71	180.84	99.47	100.00	06/29/11	401.93	179.83	209.70	95.00	8/19/2011	217.28	109.30	95.58	97.50
05/10/11	301.58	189.66	99.51	100.00	06/30/11	396.40	200.68	183.33	92.00	8/20/2011	180.72	72.35	95.97	97.50
05/11/11	280.73	168.59	99.74	100.00	07/01/11	426.18	202.62	211.16	95.38	8/21/2011	176.56	68.02	96.14	97.24
05/12/11	284.63	172.63	99.60	100.00	07/02/11	439.95	202.00	225.55	99.67	8/22/2011	178.60	70.32	95.88	97.46
05/13/11	333.60	218.29	102.92	100.00	07/03/11	432.72	202.67	217.65	95.00	8/23/2011	183.36	74.61	96.35	97.50
05/14/11	358.83	217.23	129.20	100.00	07/04/11	433.20	202.16	218.64	91.38	8/24/2011	196.27	87.51	96.36	97.50
05/15/11	376.95	208.60	155.95	100.00	07/05/11	377.65	203.35	161.90	94.63	8/25/2011	199.78	92.10	95.28	96.67
05/16/11	430.25	203.13	214.72	100.00	07/06/11	388.60	205.47	170.73	94.63	8/26/2011	182.87	76.13	94.35	95.63
05/17/11	447.54	200.41	234.73	100.00	07/07/11	399.49	203.00	184.10	94.63	8/27/2011	174.80	68.15	94.26	95.63
05/18/11	454.30	200.56	241.34	100.00	07/08/11	398.05	203.74	181.91	99.67	8/28/2011	176.13	69.64	94.08	95.57
05/19/11	458.56	197.21	248.95	100.00	07/09/11	391.92	203.12	176.41	95.00	8/29/2011	160.13	53.47	94.26	95.53
05/20/11	462.09	195.81	253.88	100.00	07/10/11	382.40	202.67	167.33	95.00	8/30/2011	163.65	56.43	94.82	95.26
05/21/11	468.85	197.88	258.57	100.00	07/11/11	369.68	163.57	193.71	95.00	8/31/2011	168.90	60.17	96.34	95.63

Table D-2

## FOP Spill at The Dalles

Date	Outflow KCFS	Generation Flow KCFS	Actual Spill KCFS	FOP Spill KCFS	Date	Outflow KCFS	Generation Flow KCFS	Actual Spill KCFS	FOP Spill KCFS	Date	Outflow KCFS	Generation Flow KCFS	Actual Spill KCFS	FOP Spill KCFS
04/01/11	293.15	254.17	32.88	0.00	05/22/11	457.13	253.91	197.13	160.00	7/12/2011	306.28	178.58	121.60	120.80
04/02/11	319.49	236.35	77.06	0.00	05/23/11	471.72	256.10	209.51	160.00	7/13/2011	294.97	170.58	118.28	117.99
04/03/11	354.15	239.23	108.83	0.00	05/24/11	477.84	257.50	214.23	160.00	7/14/2011	320.97	186.60	128.29	126.92
04/04/11	351.33	219.54	125.67	0.00	05/25/11	476.64	255.25	215.29	160.00	7/15/2011	331.74	195.81	129.83	129.88
04/05/11	374.75	201.00	167.65	0.00	05/26/11	462.09	246.14	209.86	160.00	7/16/2011	289.69	167.00	116.57	115.42
04/06/11	348.11	214.25	127.77	0.00	05/27/11	486.46	251.85	228.52	160.00	7/17/2011	269.50	156.04	107.35	107.80
04/07/11	303.55	231.38	66.05	0.00	05/28/11	491.88	250.89	234.89	160.00	7/18/2011	289.15	168.98	114.07	114.02
04/08/11	278.62	212.93	59.59	0.00	05/29/11	497.34	247.42	243.83	160.00	7/19/2011	279.23	161.52	111.60	111.69
04/09/11	314.15	200.67	107.38	0.00	05/30/11	494.46	240.90	247.44	160.00	7/20/2011	283.67	164.50	113.06	113.47
04/10/11	319.30	186.61	126.59	126.92	05/31/11	491.73	241.87	243.77	160.00	7/21/2011	262.26	151.09	105.06	104.90
04/11/11	289.06	167.33	115.60	115.62	06/01/11	486.49	247.03	233.36	160.00	7/22/2011	259.69	149.67	103.93	103.88
04/12/11	299.55	174.05	119.40	119.82	06/02/11	480.88	249.47	225.31	150.63	7/23/2011	255.34	147.02	102.24	102.14
04/13/11	278.69	161.20	111.38	111.40	06/03/11	481.13	249.34	225.69	135.00	7/24/2011	244.33	140.82	97.41	97.73
04/14/11	261.03	150.48	104.45	104.41	06/04/11	498.41	249.21	243.10	135.00	7/25/2011	244.51	140.76	97.66	97.80
04/15/11	275.69	160.05	109.54	109.51	06/05/11	493.33	247.23	240.03	135.00	7/26/2011	236.17	135.70	94.35	94.47
04/16/11	202.89	115.96	80.85	81.16	06/06/11	491.76	245.32	240.36	135.00	7/27/2011	226.47	129.70	90.67	90.59
04/17/11	242.91	139.55	97.26	97.16	06/07/11	482.40	249.20	227.10	135.00	7/28/2011	238.11	137.46	94.55	95.24
04/18/11	267.86	154.63	107.12	107.14	06/08/11	492.29	252.92	233.25	135.00	7/29/2011	209.22	119.23	83.89	83.69
04/19/11	251.20	144.59	100.50	100.48	06/09/11	494.48	250.27	238.12	135.00	7/30/2011	203.91	116.31	81.49	81.56
04/20/11	270.84	156.27	108.47	108.34	06/10/11	494.78	247.59	241.08	135.00	7/31/2011	225.66	129.72	89.85	90.27
04/21/11	270.20	156.02	108.09	108.04	06/11/11	491.09	242.06	242.93	135.00	8/1/2011	221.99	127.31	88.58	88.80
04/22/11	282.11	162.88	113.15	112.78	06/12/11	478.23	242.39	229.74	135.00	8/2/2011	191.54	108.91	76.53	76.62
04/23/11	255.64	147.25	102.29	102.26	06/13/11	482.08	234.65	241.32	135.00	8/3/2011	198.33	113.14	79.09	79.33
04/24/11	243.84	140.30	97.46	97.54	06/14/11	489.95	237.40	246.46	135.00	8/4/2011	205.45	117.23	82.13	82.18
04/25/11	253.75	146.35	101.30	101.00	06/15/11	489.84	239.56	244.18	135.00	8/5/2011	194.11	110.47	77.54	77.65
04/26/11	234.95	134.88	93.95	93.98	06/16/11	492.75	225.20	261.45	135.00	8/6/2011	171.04	96.59	68.33	68.42
04/27/11	261.82	150.99	104.73	104.73	06/17/11	488.38	234.77	247.49	135.00	8/7/2011	181.43	103.03	72.30	72.57
04/28/11	257.20	147.77	103.31	102.88	06/18/11	462.98	235.01	221.85	135.00	8/8/2011	197.49	112.37	79.02	79.00
04/29/11	226.31	129.70	90.52	90.53	06/19/11	440.38	231.24	203.04	135.00	8/9/2011	185.96	105.45	74.42	74.39
04/30/11	219.35	125.41	87.83	87.74	06/20/11	426.90	219.92	200.89	135.00	8/10/2011	194.35	111.23	77.03	77.74
05/01/11	257.10	148.26	102.74	102.84	06/21/11	428.48	231.03	191.35	135.00	8/11/2011	196.43	111.73	78.61	78.57
05/02/11	241.93	139.11	96.72	96.76	06/22/11	440.70	235.20	199.40	135.00	8/12/2011	200.32	113.88	80.34	80.13
05/03/11	246.79	141.95	98.74	98.72	06/23/11	432.90	243.88	182.91	135.00	8/13/2011	160.98	90.42	64.45	64.39
05/04/11	250.24	144.26	99.88	100.10	06/24/11	480.63	238.28	236.24	135.00	8/14/2011	149.27	83.54	59.64	59.71
05/05/11	230.08	131.91	92.10	92.03	06/25/11	451.82	223.00	222.73	135.00	8/15/2011	188.71	107.20	75.40	75.49
05/06/11	254.66	146.56	102.02	101.87	06/26/11	423.08	236.88	180.10	135.00	8/16/2011	189.23	107.20	75.93	75.69
05/07/11	231.22	132.77	92.34	92.38	06/27/11	396.45	239.32	151.05	135.00	8/17/2011	194.86	110.97	77.87	77.95
05/08/11	238.59	136.97	95.55	95.44	06/28/11	394.52	237.78	150.65	135.00	8/18/2011	189.84	107.86	75.77	75.94
05/09/11	267.91	154.54	107.28	107.16	06/29/11	381.41	237.18	138.14	135.00	8/19/2011	195.41	111.20	78.11	78.17
05/10/11	289.35	171.26	112.00	112.30	06/30/11	388.90	234.29	148.50	135.00	8/20/2011	175.54	99.31	70.12	70.22
05/11/11	248.45	144.59	97.76	98.20	07/01/11	418.33	243.58	168.66	135.00	8/21/2011	157.37	88.46	62.80	62.95
05/12/11	270.34	155.98	108.28	108.14	07/02/11	428.18	250.76	171.33	135.00	8/22/2011	161.75	90.99	64.65	64.70
05/13/11	335.20	198.60	130.50	130.53	07/03/11	405.74	240.83	158.83	135.00	8/23/2011	173.33	98.13	69.10	69.33
05/14/11	338.03	201.20	130.73	129.35	07/04/11	409.38	242.19	161.08	135.00	8/24/2011	186.88	106.38	74.39	74.75
05/15/11	366.69	226.45	134.13	118.59	07/05/11	359.30	218.71	134.50	134.88	8/25/2011	195.82	112.25	78.23	78.33
05/16/11	423.45	253.48	163.88	158.13	07/06/11	370.30	225.78	138.42	132.71	8/26/2011	167.11	94.19	66.83	66.85
05/17/11	442.26	243.26	192.90	160.00	07/07/11	385.98	234.34	145.54	130.00	8/27/2011	169.41	95.18	68.13	67.77
05/18/11	444.96	237.64	201.23	160.00	07/08/11	376.35	238.28	131.97	130.00	8/28/2011	148.44	82.92	59.40	59.38
05/19/11	449.96	239.93	203.93	160.00	07/09/11	376.27	240.43	129.74	130.00	8/29/2011	146.42	81.82	58.50	58.57
05/20/11	451.19	244.64	200.45	160.00	07/10/11	365.44	229.92	129.41	129.94	8/30/2011	140.38	78.08	56.21	56.15
05/21/11	461.15	239.69	215.36	160.00	07/11/11	343.23	201.30	135.83	126.44	8/31/2011	165.04	92.83	66.11	66.02

Table D-3

FOP Spill at John Day														
Date	Outflow KCFS	Generation Flow KCFS	Actual Spill KCFS	FOP Spill KCFS	Date	Outflow KCFS	Generation Flow KCFS	Actual Spill KCFS	FOP Spill KCFS	Date	Outflow KCFS	Generation Flow KCFS	Actual Spill KCFS	FOP Spill KCFS
04/01/11	303.14	213.43	88.53	0.00	05/22/11	476.66	281.36	193.80	135.00	7/12/2011	313.85	192.27	120.08	120.00
04/02/11	330.92	221.06	108.80	0.00	05/23/11	493.56	277.27	214.90	134.92	7/13/2011	314.85	219.10	94.55	94.46
04/03/11	359.25	236.95	121.09	0.00	05/24/11	495.33	273.98	219.98	135.00	7/14/2011	332.83	225.20	106.36	104.55
04/04/11	359.93	231.09	127.71	0.00	05/25/11	490.82	289.75	200.16	135.00	7/15/2011	350.08	209.76	139.13	139.49
04/05/11	385.62	230.19	154.30	0.00	05/26/11	482.98	276.28	205.65	135.00	7/16/2011	299.05	182.18	115.58	113.96
04/06/11	350.17	226.33	122.57	0.00	05/27/11	501.72	283.25	217.35	135.00	7/17/2011	281.04	195.71	84.05	84.31
04/07/11	305.00	230.96	72.68	0.00	05/28/11	507.65	283.07	223.30	135.00	7/18/2011	298.68	201.27	96.15	95.15
04/08/11	285.01	223.22	60.58	0.00	05/29/11	518.29	280.46	236.55	135.00	7/19/2011	295.77	175.70	118.87	118.31
04/09/11	327.08	224.34	101.47	0.00	05/30/11	509.09	274.19	233.62	135.00	7/20/2011	296.12	181.87	113.05	113.43
04/10/11	329.75	224.72	103.76	98.93	05/31/11	511.97	275.63	234.97	135.00	7/21/2011	267.91	186.06	80.57	80.37
04/11/11	300.44	209.30	89.87	90.13	06/01/11	495.70	258.64	235.72	135.00	7/22/2011	272.18	189.05	81.63	81.65
04/12/11	310.36	216.13	93.01	93.11	06/02/11	488.49	265.48	221.82	135.00	7/23/2011	267.70	186.14	80.29	80.31
04/13/11	285.32	198.58	85.55	85.60	06/03/11	498.00	270.99	225.58	135.00	7/24/2011	257.76	179.67	76.97	77.33
04/14/11	273.20	189.97	81.95	81.96	06/04/11	513.75	282.08	230.42	135.00	7/25/2011	258.49	180.10	77.26	77.55
04/15/11	283.00	196.72	84.79	84.90	06/05/11	502.47	276.68	224.51	135.00	7/26/2011	243.30	168.92	73.04	72.99
04/16/11	215.06	149.38	64.41	64.52	06/06/11	505.41	272.39	231.60	135.00	7/27/2011	243.29	168.94	72.78	72.99
04/17/11	253.40	176.10	76.08	76.02	06/07/11	496.45	264.66	230.38	135.00	7/28/2011	250.46	174.08	74.88	75.14
04/18/11	278.79	193.75	83.71	83.64	06/08/11	505.57	270.70	233.53	135.00	7/29/2011	220.35	152.89	66.20	66.11
04/19/11	257.70	178.97	77.38	77.31	06/09/11	506.13	265.18	239.51	135.00	7/30/2011	213.50	147.95	63.94	64.05
04/20/11	281.52	196.24	84.23	84.46	06/10/11	500.27	266.34	232.42	135.00	7/31/2011	238.05	165.52	71.19	71.42
04/21/11	282.86	196.70	84.97	84.86	06/11/11	498.57	267.57	229.50	135.00	8/1/2011	227.85	158.26	68.36	68.36
04/22/11	293.47	204.11	88.24	88.04	06/12/11	489.16	264.02	223.80	135.00	8/2/2011	205.07	142.21	61.35	61.52
04/23/11	262.53	182.56	78.79	78.76	06/13/11	492.28	267.75	223.34	135.00	8/3/2011	207.17	143.73	62.08	62.15
04/24/11	256.21	178.02	76.93	76.86	06/14/11	500.58	259.22	239.96	135.00	8/4/2011	219.55	152.35	65.86	65.86
04/25/11	264.60	183.86	79.37	79.38	06/15/11	506.98	250.20	255.43	135.00	8/5/2011	205.10	142.16	61.66	61.53
04/26/11	247.01	171.20	74.41	74.10	06/16/11	505.37	250.20	253.59	135.00	8/6/2011	181.49	125.61	54.29	54.45
04/27/11	270.09	183.31	85.50	85.47	06/17/11	500.08	273.35	225.53	135.00	8/7/2011	188.25	130.55	56.28	56.48
04/28/11	269.77	160.58	107.91	107.87	06/18/11	477.02	272.69	202.90	135.00	8/8/2011	210.00	146.10	62.47	63.00
04/29/11	240.53	147.52	91.57	91.71	06/19/11	452.01	259.27	191.54	133.22	8/9/2011	197.16	136.75	59.05	59.15
04/30/11	229.30	159.07	69.04	68.79	06/20/11	443.22	248.08	193.65	132.68	8/10/2011	208.33	145.00	61.98	62.50
05/01/11	266.88	181.02	84.44	84.41	06/21/11	441.93	268.89	171.84	135.00	8/11/2011	208.63	144.58	62.63	62.59
05/02/11	250.80	149.48	100.19	99.92	06/22/11	454.84	262.53	190.97	135.00	8/12/2011	208.11	144.65	62.27	62.43
05/03/11	259.44	158.90	99.20	99.15	06/23/11	448.06	260.89	185.83	133.01	8/13/2011	166.09	114.88	49.79	49.83
05/04/11	261.36	181.42	78.65	78.41	06/24/11	497.00	255.32	240.50	135.00	8/14/2011	164.33	113.80	49.19	49.30
05/05/11	242.41	163.78	77.27	77.23	06/25/11	462.99	253.65	207.90	135.00	8/15/2011	199.78	138.59	60.00	59.94
05/06/11	260.44	155.20	103.90	104.02	06/26/11	439.67	263.17	175.28	133.80	8/16/2011	198.32	137.63	59.42	59.50
05/07/11	245.14	150.28	93.66	93.84	06/27/11	416.48	263.80	151.33	124.94	8/17/2011	204.76	142.24	61.17	61.43
05/08/11	250.12	173.67	75.09	75.04	06/28/11	408.87	260.24	147.44	124.88	8/18/2011	199.21	138.37	59.73	59.76
05/09/11	281.79	191.75	88.92	89.26	06/29/11	394.57	254.94	138.07	135.00	8/19/2011	203.26	141.19	60.94	60.98
05/10/11	298.96	180.12	117.56	117.50	06/30/11	404.98	262.43	141.26	133.39	8/20/2011	185.75	128.37	55.81	55.72
05/11/11	256.33	156.96	98.10	98.06	07/01/11	436.27	276.25	158.75	130.74	8/21/2011	168.94	117.17	50.59	50.68
05/12/11	293.07	203.48	88.22	87.92	07/02/11	442.41	291.61	149.29	133.26	8/22/2011	168.51	117.01	50.29	50.55
05/13/11	346.97	241.88	103.68	104.09	07/03/11	420.80	281.89	137.57	135.00	8/23/2011	185.40	128.90	55.38	55.62
05/14/11	351.83	245.17	105.31	105.55	07/04/11	419.91	287.06	131.59	131.24	8/24/2011	198.33	137.68	59.38	59.50
05/15/11	383.63	259.85	122.60	116.80	07/05/11	376.02	260.50	114.24	112.81	8/25/2011	203.61	141.44	60.92	61.08
05/16/11	438.60	288.72	148.67	135.00	07/06/11	384.18	265.38	117.54	117.50	8/26/2011	179.92	125.02	53.79	53.98
05/17/11	454.88	283.38	170.22	134.74	07/07/11	398.02	261.42	135.32	135.00	8/27/2011	176.15	121.75	53.11	52.85
05/18/11	457.90	269.63	187.06	134.98	07/08/11	397.25	261.64	134.19	131.66	8/28/2011	157.71	109.05	47.24	47.31
05/19/11	463.92	261.20	201.52	134.55	07/09/11	387.83	267.07	119.34	116.35	8/29/2011	151.77	104.86	45.73	45.53
05/20/11	467.29	278.89	186.88	135.00	07/10/11	378.58	254.44	122.80	118.06	8/30/2011	150.18	103.92	44.98	45.06
05/21/11	474.26	278.35	194.71	135.00	07/11/11	357.03	222.49	133.48	133.67	8/31/2011	175.84	122.10	52.72	52.75

Table D-4  
FOP Spill at McNary

Date	Outflow KCFS	Generation Flow KCFS	Actual Spill KCFS	FOP Spill KCFS	Date	Outflow KCFS	Generation Flow KCFS	Actual Spill KCFS	FOP Spill KCFS	Date	Outflow KCFS	Generation Flow KCFS	Actual Spill KCFS	FOP Spill KCFS
04/01/11	307.35	144.30	158.33	0.00	05/22/11	452.21	142.14	305.38	180.89	7/12/2011	319.68	132.40	182.58	159.84
04/02/11	319.69	144.08	170.90	0.00	05/23/11	480.17	142.52	332.98	188.90	7/13/2011	314.57	120.19	189.69	157.29
04/03/11	345.31	144.10	196.50	0.00	05/24/11	473.10	142.93	325.46	187.57	7/14/2011	336.33	113.53	218.10	163.92
04/04/11	336.52	144.07	187.75	0.00	05/25/11	470.10	143.96	321.44	187.79	7/15/2011	334.35	122.30	207.34	160.00
04/05/11	349.81	139.12	205.98	0.00	05/26/11	461.68	144.44	312.54	184.55	7/16/2011	295.95	119.45	171.80	147.23
04/06/11	332.42	134.42	193.28	0.00	05/27/11	481.89	145.46	331.72	189.20	7/17/2011	288.43	118.60	165.12	144.22
04/07/11	306.51	137.29	164.52	0.00	05/28/11	495.54	144.46	346.37	189.95	7/18/2011	295.87	111.59	179.58	147.57
04/08/11	282.13	144.52	132.91	0.00	05/29/11	499.42	144.84	349.90	190.00	7/19/2011	297.98	104.87	188.43	148.51
04/09/11	298.66	143.70	150.28	0.00	05/30/11	480.59	138.29	337.59	189.09	7/20/2011	290.25	112.08	173.47	145.12
04/10/11	308.40	144.06	159.64	123.36	05/31/11	473.50	144.82	323.96	186.56	7/21/2011	274.74	118.81	151.24	137.37
04/11/11	296.11	140.30	151.31	118.44	06/01/11	476.06	143.38	327.99	189.72	7/22/2011	277.27	121.32	151.27	138.64
04/12/11	283.45	133.58	145.18	113.38	06/02/11	468.36	143.86	319.81	184.81	7/23/2011	271.97	132.88	134.38	135.99
04/13/11	290.20	130.74	154.79	116.08	06/03/11	476.72	139.41	332.63	186.46	7/24/2011	272.44	131.32	136.44	136.22
04/14/11	270.43	125.98	139.76	108.17	06/04/11	486.10	140.98	340.40	189.32	7/25/2011	273.28	119.69	148.89	135.44
04/15/11	262.08	133.18	124.20	104.83	06/05/11	477.56	142.98	329.88	188.84	7/26/2011	245.50	114.53	126.27	122.65
04/16/11	224.26	129.52	90.04	89.70	06/06/11	485.78	143.27	337.80	190.00	7/27/2011	247.88	119.32	123.85	123.94
04/17/11	248.39	143.60	100.08	99.36	06/07/11	493.57	145.97	342.89	190.00	7/28/2011	256.47	123.24	128.53	128.24
04/18/11	260.66	141.29	114.70	104.27	06/08/11	510.32	149.57	356.04	190.00	7/29/2011	237.53	115.00	117.83	118.76
04/19/11	252.67	144.29	103.69	101.07	06/09/11	500.93	156.45	339.78	190.00	7/30/2011	235.48	112.71	118.07	117.74
04/20/11	275.10	144.49	125.90	110.04	06/10/11	486.52	154.33	327.49	190.00	7/31/2011	236.42	113.62	118.11	118.21
04/21/11	277.66	145.57	127.41	111.06	06/11/11	484.27	154.23	325.34	190.00	8/1/2011	232.61	99.23	128.69	116.31
04/22/11	271.13	145.35	121.08	108.45	06/12/11	481.60	156.45	320.43	190.00	8/2/2011	217.87	81.45	131.72	108.94
04/23/11	263.37	145.28	113.37	105.35	06/13/11	484.33	154.48	325.17	189.88	8/3/2011	225.43	79.17	141.54	112.71
04/24/11	250.43	144.23	101.52	100.17	06/14/11	494.78	148.03	342.05	190.00	8/4/2011	227.16	85.33	137.13	113.58
04/25/11	257.36	139.86	112.80	102.94	06/15/11	501.50	153.50	343.30	190.00	8/5/2011	208.07	82.96	120.42	104.03
04/26/11	258.27	140.47	113.09	103.31	06/16/11	495.65	161.88	329.06	190.00	8/6/2011	201.40	82.07	114.63	100.70
04/27/11	258.42	143.96	109.75	103.37	06/17/11	478.49	169.57	304.23	187.20	8/7/2011	201.93	95.83	101.39	100.96
04/28/11	255.80	144.49	106.63	102.32	06/18/11	455.92	161.48	289.75	182.37	8/8/2011	213.09	88.62	119.78	106.55
04/29/11	246.03	142.45	98.90	98.41	06/19/11	442.01	167.43	269.87	176.81	8/9/2011	213.92	101.97	107.23	106.96
04/30/11	230.58	133.28	92.60	92.23	06/20/11	437.20	160.76	271.75	190.00	8/10/2011	211.16	100.66	105.79	105.58
05/01/11	247.97	143.98	99.27	99.19	06/21/11	431.40	166.63	260.05	190.00	8/11/2011	214.95	102.25	108.01	107.48
05/02/11	255.94	144.33	106.93	102.38	06/22/11	445.68	158.74	282.23	190.00	8/12/2011	222.19	107.37	110.12	111.09
05/03/11	251.30	144.23	102.37	100.52	06/23/11	453.17	157.63	290.84	190.00	8/13/2011	181.00	85.61	90.70	90.50
05/04/11	248.56	144.42	99.45	99.42	06/24/11	493.62	161.16	327.76	190.00	8/14/2011	188.41	90.21	93.47	94.21
05/05/11	247.48	143.82	98.97	98.99	06/25/11	425.34	158.10	262.53	183.77	8/15/2011	205.25	97.30	103.24	102.62
05/06/11	249.07	144.47	99.90	99.63	06/26/11	434.45	155.28	274.46	190.00	8/16/2011	209.45	101.20	103.55	104.72
05/07/11	249.66	144.85	100.10	99.86	06/27/11	413.02	148.62	259.71	190.00	8/17/2011	216.97	103.77	108.50	108.49
05/08/11	249.32	144.84	99.80	99.73	06/28/11	401.91	153.07	244.14	190.00	8/18/2011	207.88	98.56	104.62	103.94
05/09/11	277.53	143.83	128.99	111.01	06/29/11	401.03	153.55	242.78	190.00	8/19/2011	208.64	98.96	104.97	104.32
05/10/11	265.63	142.00	118.94	106.25	06/30/11	404.82	146.54	253.58	190.00	8/20/2011	199.04	94.43	99.92	99.52
05/11/11	256.68	139.86	112.14	102.67	07/01/11	430.38	144.63	281.04	190.00	8/21/2011	182.58	86.40	91.49	91.29
05/12/11	295.34	139.58	151.07	118.14	07/02/11	433.47	144.85	283.93	190.00	8/22/2011	191.55	90.84	96.01	95.78
05/13/11	325.25	131.70	188.86	130.10	07/03/11	422.08	142.00	275.38	190.00	8/23/2011	193.48	91.59	97.19	96.74
05/14/11	347.28	132.74	209.82	138.91	07/04/11	407.20	141.28	261.22	190.00	8/24/2011	211.06	100.71	105.65	105.53
05/15/11	385.78	130.75	250.32	154.31	07/05/11	381.54	139.49	237.35	189.03	8/25/2011	202.03	95.96	101.35	101.01
05/16/11	422.88	124.73	293.45	169.15	07/06/11	386.95	143.93	238.31	189.68	8/26/2011	200.70	95.47	100.54	100.35
05/17/11	437.83	133.68	299.43	175.13	07/07/11	400.05	141.15	254.18	190.00	8/27/2011	185.04	87.71	92.62	92.52
05/18/11	421.96	137.62	279.66	168.78	07/08/11	395.22	136.21	254.32	190.00	8/28/2011	167.33	78.67	83.97	83.66
05/19/11	421.50	137.18	279.62	168.60	07/09/11	386.03	138.34	242.98	190.00	8/29/2011	164.48	77.11	82.67	82.24
05/20/11	416.41	138.28	273.44	166.56	07/10/11	363.17	145.05	213.42	180.85	8/30/2011	166.53	77.92	83.90	83.26
05/21/11	443.02	140.26	298.07	177.21	07/11/11	358.80	136.32	217.78	179.40	8/31/2011	181.77	85.64	91.41	90.88

Table D-5

## FOP Spill at Ice Harbor

Date	Outflow KCFS	Generation Flow KCFS	Actual Spill KCFS	FOP Spill KCFS	Date	Outflow KCFS	Generation Flow KCFS	Actual Spill KCFS	FOP Spill KCFS	Date	Outflow KCFS	Generation Flow KCFS	Actual Spill KCFS	FOP Spill KCFS
04/01/11	132.80	25.07	106.98	0.00	05/22/11	174.31	80.92	92.49	56.13	7/12/2011	92.75	54.23	37.79	27.82
04/02/11	137.69	49.77	87.10	0.00	05/23/11	186.90	83.02	103.31	63.33	7/13/2011	93.93	40.22	52.96	51.27
04/03/11	149.34	57.44	91.15	67.92	05/24/11	191.91	82.75	108.61	63.47	7/14/2011	93.57	30.78	62.06	62.25
04/04/11	125.07	51.90	72.36	66.67	05/25/11	198.42	82.72	114.88	59.53	7/15/2011	92.22	30.14	61.32	61.49
04/05/11	141.87	61.36	79.64	65.63	05/26/11	204.16	81.96	121.52	61.25	7/16/2011	89.53	26.80	61.98	60.10
04/06/11	147.01	58.49	87.71	64.38	05/27/11	209.24	80.72	127.65	62.77	7/17/2011	85.33	26.13	58.47	58.75
04/07/11	136.05	60.22	74.77	63.33	05/28/11	190.88	81.09	109.12	59.17	7/18/2011	84.35	26.79	56.82	57.01
04/08/11	120.61	52.36	67.57	63.33	05/29/11	178.30	81.79	95.51	63.33	7/19/2011	82.99	25.60	56.50	56.74
04/09/11	113.90	41.89	71.13	63.33	05/30/11	163.84	79.44	83.59	63.33	7/20/2011	74.46	22.64	51.14	51.25
04/10/11	116.13	47.06	68.35	63.33	05/31/11	156.38	74.10	81.61	61.83	7/21/2011	78.71	24.05	53.78	53.82
04/11/11	103.45	38.35	64.35	64.35	06/01/11	160.38	79.63	79.81	53.43	7/22/2011	73.80	20.88	52.17	52.18
04/12/11	110.05	42.24	66.99	66.88	06/02/11	157.28	80.59	75.87	47.18	7/23/2011	75.08	18.90	55.19	55.46
04/13/11	103.63	37.10	65.73	65.93	06/03/11	175.23	80.91	93.57	53.65	7/24/2011	72.23	19.07	52.23	52.30
04/14/11	100.09	32.73	66.56	66.36	06/04/11	164.75	79.68	84.30	60.58	7/25/2011	63.07	13.64	48.67	48.77
04/15/11	94.10	32.68	60.77	61.11	06/05/11	159.34	75.44	83.02	54.96	7/26/2011	64.03	14.98	48.25	48.24
04/16/11	84.21	23.65	59.80	60.04	06/06/11	162.10	80.35	81.05	48.63	7/27/2011	59.04	11.47	46.78	46.91
04/17/11	90.41	28.18	61.43	61.80	06/07/11	189.28	83.07	105.22	55.28	7/28/2011	62.45	13.72	47.73	47.85
04/18/11	98.05	31.82	65.47	65.76	06/08/11	214.65	82.34	131.55	60.58	7/29/2011	58.22	11.69	45.80	45.88
04/19/11	108.27	37.09	70.49	66.67	06/09/11	215.67	79.87	134.86	66.14	7/30/2011	53.33	9.82	42.70	42.92
04/20/11	106.23	38.77	66.46	66.59	06/10/11	202.90	79.96	122.13	60.87	7/31/2011	55.01	10.21	43.79	43.81
04/21/11	112.99	44.87	67.43	67.46	06/11/11	186.70	79.70	106.25	56.89	8/1/2011	48.49	9.15	38.65	38.30
04/22/11	107.32	39.15	67.48	67.44	06/12/11	181.56	81.90	98.97	60.58	8/2/2011	59.50	10.65	48.15	47.94
04/23/11	101.65	35.34	65.62	65.93	06/13/11	184.67	82.84	101.09	60.72	8/3/2011	54.63	9.00	45.00	44.66
04/24/11	99.32	34.66	64.05	64.34	06/14/11	191.65	82.35	108.49	57.50	8/4/2011	57.15	9.70	46.70	46.50
04/25/11	94.03	31.73	61.47	61.58	06/15/11	196.62	82.31	113.57	56.91	8/5/2011	41.38	9.23	31.27	31.00
04/26/11	99.05	34.27	63.84	64.07	06/16/11	187.58	81.78	105.13	60.58	8/6/2011	44.22	9.28	34.22	33.99
04/27/11	96.02	29.55	65.65	65.71	06/17/11	178.87	81.53	96.43	58.57	8/7/2011	43.15	9.26	33.03	32.78
04/28/11	95.23	52.91	41.47	41.60	06/18/11	161.01	80.30	79.95	48.30	8/8/2011	42.53	9.29	32.31	32.10
04/29/11	91.92	63.60	27.44	27.58	06/19/11	155.48	78.76	75.85	54.25	8/9/2011	47.48	9.29	37.38	37.17
04/30/11	93.32	42.57	50.07	50.39	06/20/11	165.11	81.93	82.44	60.58	8/10/2011	44.68	9.27	34.72	34.49
05/01/11	90.53	28.20	61.52	61.99	06/21/11	162.80	76.60	85.38	54.47	8/11/2011	36.26	9.20	26.26	25.95
05/02/11	84.29	26.36	57.13	57.58	06/22/11	168.48	81.63	85.92	50.54	8/12/2011	41.26	9.20	31.12	30.82
05/03/11	84.11	26.57	56.74	56.99	06/23/11	182.95	83.14	99.00	54.88	8/13/2011	41.28	9.25	31.10	30.85
05/04/11	92.37	51.93	39.73	39.93	06/24/11	195.00	82.17	112.08	58.50	8/14/2011	38.33	9.26	28.17	27.93
05/05/11	89.79	61.73	27.11	26.94	06/25/11	191.07	82.24	107.95	56.37	8/15/2011	35.82	9.22	25.86	25.58
05/06/11	87.14	36.34	49.92	49.86	06/26/11	173.45	81.18	91.44	60.58	8/16/2011	40.85	9.23	30.93	30.67
05/07/11	87.74	24.01	62.92	63.53	06/27/11	168.44	80.93	86.90	60.58	8/17/2011	39.99	9.23	29.93	29.66
05/08/11	94.28	51.78	41.67	41.32	06/28/11	163.27	81.65	80.93	60.58	8/18/2011	35.66	9.20	25.69	25.39
05/09/11	104.69	68.01	35.98	31.41	06/29/11	162.62	82.27	79.60	55.11	8/19/2011	37.14	9.22	27.10	26.82
05/10/11	99.32	63.89	34.68	29.80	06/30/11	171.86	81.54	89.63	51.56	8/20/2011	36.86	9.20	27.10	26.80
05/11/11	102.90	68.08	34.07	30.87	07/01/11	179.57	82.14	96.55	56.90	8/21/2011	36.88	9.23	26.82	26.55
05/12/11	104.89	50.11	54.08	53.99	07/02/11	153.90	79.49	73.60	60.58	8/22/2011	36.99	9.24	27.07	26.81
05/13/11	117.68	49.25	67.61	67.45	07/03/11	149.34	73.21	75.38	60.58	8/23/2011	35.98	9.20	26.05	25.75
05/14/11	143.24	70.39	72.04	54.08	07/04/11	143.82	69.85	73.03	60.58	8/24/2011	38.05	9.19	28.12	27.80
05/15/11	175.19	80.76	93.63	52.56	07/05/11	142.53	67.53	74.22	50.46	8/25/2011	44.96	9.70	34.53	34.73
05/16/11	213.75	82.07	131.01	58.90	07/06/11	141.04	69.12	71.05	42.31	8/26/2011	33.86	9.09	24.04	23.63
05/17/11	202.09	80.53	120.82	63.33	07/07/11	131.63	67.81	63.01	39.49	8/27/2011	38.22	8.94	28.59	28.03
05/18/11	178.69	80.86	97.02	63.33	07/08/11	125.58	67.81	56.97	37.67	8/28/2011	32.74	9.31	22.54	22.35
05/19/11	166.90	78.88	87.22	63.33	07/09/11	118.33	59.04	58.55	50.46	8/29/2011	33.55	9.35	23.33	23.18
05/20/11	160.86	77.29	82.70	55.80	07/10/11	110.10	46.97	62.33	59.13	8/30/2011	38.76	9.45	28.65	28.60
05/21/11	168.60	74.49	93.42	50.58	07/11/11	102.34	53.04	48.68	40.41	8/31/2011	38.84	9.54	28.56	28.60

Table D-6

## FOP Spill at Lower Monumental

Date	Outflow KCFS	Generation Flow KCFS	Actual Spill KCFS	FOP Spill KCFS	Date	Outflow KCFS	Generation Flow KCFS	Actual Spill KCFS	FOP Spill KCFS	Date	Outflow KCFS	Generation Flow KCFS	Actual Spill KCFS	FOP Spill KCFS
04/01/11	130.18	113.24	16.13	0.00	05/22/11	169.91	114.24	54.88	28.00	7/12/2011	90.76	73.15	16.90	17.00
04/02/11	136.79	107.89	28.18	0.00	05/23/11	180.83	115.90	64.32	28.00	7/13/2011	89.80	71.97	16.99	17.00
04/03/11	143.33	111.33	31.19	26.00	05/24/11	189.17	115.90	72.60	28.00	7/14/2011	89.37	71.22	17.22	17.00
04/04/11	128.90	98.74	26.44	26.00	05/25/11	193.53	115.95	76.72	28.00	7/15/2011	86.77	68.89	17.02	17.00
04/05/11	138.49	110.06	27.63	27.83	05/26/11	200.18	115.58	83.80	28.00	7/16/2011	84.81	66.64	17.43	17.00
04/06/11	144.33	110.08	33.36	30.00	05/27/11	206.83	114.05	91.88	28.00	7/17/2011	81.28	63.46	17.02	17.00
04/07/11	131.46	100.91	29.76	30.00	05/28/11	184.43	114.54	68.92	28.00	7/18/2011	80.16	62.36	17.00	17.00
04/08/11	116.88	87.10	28.91	29.08	05/29/11	171.08	114.85	55.38	28.00	7/19/2011	78.53	60.74	16.95	17.00
04/09/11	113.42	84.70	27.87	28.00	05/30/11	158.36	112.96	44.63	28.00	7/20/2011	69.38	51.62	16.92	17.00
04/10/11	112.08	85.30	26.06	26.00	05/31/11	151.72	92.71	58.22	28.00	7/21/2011	74.46	56.75	16.92	17.00
04/11/11	100.47	74.75	24.97	25.00	06/01/11	154.07	112.39	40.76	0.00	7/22/2011	68.91	51.49	16.57	17.00
04/12/11	108.59	81.66	26.15	26.38	06/02/11	152.01	110.42	40.75	0.00	7/23/2011	69.83	52.05	17.02	17.00
04/13/11	100.52	71.73	27.92	28.00	06/03/11	168.66	112.33	55.50	0.00	7/24/2011	68.64	50.80	16.98	17.00
04/14/11	98.25	70.39	26.96	26.92	06/04/11	158.24	113.57	44.00	10.50	7/25/2011	59.00	41.27	17.00	17.00
04/15/11	91.67	64.11	26.87	26.92	06/05/11	154.99	111.25	42.96	28.00	7/26/2011	60.39	42.52	16.88	17.00
04/16/11	82.21	53.59	27.90	28.00	06/06/11	156.00	106.60	48.60	28.00	7/27/2011	54.22	36.11	17.01	17.00
04/17/11	89.30	60.71	27.94	28.00	06/07/11	185.19	108.06	76.21	28.00	7/28/2011	57.59	39.98	16.83	17.00
04/18/11	96.08	67.38	27.90	28.00	06/08/11	215.20	110.46	103.95	28.00	7/29/2011	54.64	36.88	16.98	17.00
04/19/11	106.08	77.13	28.22	28.46	06/09/11	211.18	113.20	96.95	28.00	7/30/2011	49.19	31.69	16.77	17.00
04/20/11	104.65	74.09	29.72	29.83	06/10/11	199.52	113.96	84.85	28.00	7/31/2011	52.57	34.66	17.00	17.00
04/21/11	110.18	78.88	30.56	30.54	06/11/11	180.46	114.38	65.37	28.00	8/1/2011	46.26	28.90	16.65	17.00
04/22/11	104.94	74.17	30.04	30.00	06/12/11	177.17	116.15	60.22	28.00	8/2/2011	53.78	36.07	17.01	17.00
04/23/11	99.48	69.35	29.47	29.50	06/13/11	178.35	116.25	61.30	28.00	8/3/2011	51.54	34.21	16.53	17.00
04/24/11	97.33	68.37	28.30	28.33	06/14/11	188.67	116.32	71.57	28.00	8/4/2011	52.16	34.27	17.09	17.00
04/25/11	92.83	64.09	28.08	28.00	06/15/11	190.21	116.27	73.15	28.00	8/5/2011	40.25	22.63	16.76	17.00
04/26/11	95.80	66.43	28.52	28.46	06/16/11	180.88	115.44	64.65	28.00	8/6/2011	42.70	24.95	17.03	17.00
04/27/11	94.30	64.13	29.38	29.46	06/17/11	172.59	115.43	56.32	28.00	8/7/2011	41.95	24.42	16.68	17.00
04/28/11	94.13	63.49	29.85	30.00	06/18/11	154.40	113.01	40.57	28.00	8/8/2011	40.77	22.95	17.02	17.00
04/29/11	90.87	60.28	29.94	30.00	06/19/11	150.19	111.65	37.56	28.00	8/9/2011	45.65	27.94	16.72	17.00
04/30/11	90.48	59.92	29.71	30.00	06/20/11	159.17	113.71	44.55	28.00	8/10/2011	43.95	26.28	16.94	17.00
05/01/11	88.32	57.97	29.63	30.00	06/21/11	155.95	113.63	41.15	17.00	8/11/2011	34.82	17.49	16.54	17.00
05/02/11	81.07	50.58	29.71	30.00	06/22/11	162.46	115.73	45.81	17.00	8/12/2011	40.96	22.93	17.11	17.00
05/03/11	83.42	52.81	29.85	30.00	06/23/11	178.24	116.29	61.14	17.00	8/13/2011	39.04	21.75	16.44	17.00
05/04/11	88.78	58.05	29.87	30.00	06/24/11	189.95	116.08	73.01	17.00	8/14/2011	37.09	19.20	17.03	17.00
05/05/11	88.49	57.71	29.86	30.00	06/25/11	182.73	116.07	65.95	17.00	8/15/2011	35.33	18.08	16.47	16.80
05/06/11	87.18	56.42	29.91	30.00	06/26/11	167.47	115.79	51.02	17.00	8/16/2011	40.27	22.46	16.90	17.00
05/07/11	84.80	54.19	29.75	30.00	06/27/11	161.68	105.86	54.84	17.00	8/17/2011	38.25	20.35	17.05	17.00
05/08/11	92.75	62.35	29.61	30.00	06/28/11	157.12	101.29	54.99	17.00	8/18/2011	35.18	17.16	17.03	17.00
05/09/11	101.90	73.28	27.82	29.54	06/29/11	158.14	95.97	61.31	17.00	8/19/2011	36.05	18.42	16.92	17.00
05/10/11	100.01	71.16	28.05	29.54	06/30/11	168.03	96.53	70.59	17.00	8/20/2011	35.57	17.81	17.11	17.00
05/11/11	101.05	72.25	27.93	29.54	07/01/11	171.69	96.67	74.23	17.00	8/21/2011	35.27	17.50	17.06	17.00
05/12/11	103.61	75.72	27.09	29.00	07/02/11	147.61	96.16	50.75	17.00	8/22/2011	36.65	18.93	16.99	17.00
05/13/11	116.28	88.51	26.99	29.00	07/03/11	141.94	96.42	44.79	17.00	8/23/2011	38.38	20.67	16.94	17.00
05/14/11	139.01	109.56	28.65	28.46	07/04/11	137.57	95.98	40.79	17.00	8/24/2011	37.41	19.73	16.88	17.00
05/15/11	173.53	114.77	57.90	28.00	07/05/11	136.81	89.80	46.16	17.00	8/25/2011	41.22	23.50	17.01	17.00
05/16/11	209.72	115.72	93.20	28.00	07/06/11	135.95	81.09	53.93	17.00	8/26/2011	34.97	17.18	17.00	17.00
05/17/11	198.66	114.27	83.48	28.00	07/07/11	126.36	82.44	43.12	17.00	8/27/2011	36.28	18.59	16.95	17.00
05/18/11	173.24	107.65	64.74	28.00	07/08/11	120.10	95.51	23.81	17.00	8/28/2011	31.42	13.61	17.01	17.00
05/19/11	160.55	110.50	48.91	28.00	07/09/11	111.59	89.77	21.03	17.00	8/29/2011	34.28	16.66	16.95	17.00
05/20/11	155.44	107.72	46.93	28.00	07/10/11	105.57	83.13	21.73	17.00	8/30/2011	37.42	19.65	17.00	17.00
05/21/11	162.23	105.55	55.83	28.00	07/11/11	95.99	75.73	19.56	17.00	8/31/2011	38.73	20.87	17.03	17.00

Table D-7

## FOP Spill at Little Goose

Date	Outflow KCFS	Generation Flow KCFS	Actual Spill KCFS	FOP Spill KCFS	Date	Outflow KCFS	Generation Flow KCFS	Actual Spill KCFS	FOP Spill KCFS	Date	Outflow KCFS	Generation Flow KCFS	Actual Spill KCFS	FOP Spill KCFS
04/01/11	113.94	102.56	10.59	0.00	05/22/11	162.99	70.82	91.65	40.00	7/12/2011	91.30	63.42	27.30	27.39
04/02/11	123.28	91.52	31.23	0.00	05/23/11	173.18	74.06	98.72	40.00	7/13/2011	91.78	63.80	27.41	27.53
04/03/11	130.65	98.63	31.45	32.00	05/24/11	174.07	22.60	151.07	40.00	7/14/2011	88.80	61.68	26.47	26.64
04/04/11	118.33	84.96	32.79	33.12	05/25/11	178.40	5.00	172.59	40.00	7/15/2011	87.20	60.43	26.06	26.16
04/05/11	129.73	91.49	37.81	37.33	05/26/11	182.73	5.00	177.15	40.00	7/16/2011	85.75	58.77	26.28	25.73
04/06/11	132.40	91.67	40.00	38.83	05/27/11	186.78	5.00	181.27	40.00	7/17/2011	82.75	57.37	24.86	24.83
04/07/11	121.79	84.58	36.52	36.54	05/28/11	167.29	5.00	161.65	40.00	7/18/2011	79.36	55.04	23.70	23.81
04/08/11	111.41	77.31	33.53	33.42	05/29/11	158.70	5.00	153.19	40.00	7/19/2011	79.01	54.73	23.57	23.70
04/09/11	108.53	72.96	35.00	32.56	05/30/11	148.23	5.00	142.71	40.00	7/20/2011	70.62	48.96	21.00	21.18
04/10/11	107.00	71.02	35.54	32.10	05/31/11	142.52	5.08	136.87	40.00	7/21/2011	76.55	52.78	23.05	22.96
04/11/11	99.44	69.09	29.89	29.83	06/01/11	142.90	37.05	105.16	39.98	7/22/2011	68.43	47.37	20.42	20.53
04/12/11	104.15	72.30	31.10	31.24	06/02/11	146.20	89.31	56.25	40.00	7/23/2011	69.25	47.91	20.78	20.77
04/13/11	98.33	68.29	29.40	29.50	06/03/11	161.58	89.55	71.52	40.00	7/24/2011	69.50	47.96	20.96	20.85
04/14/11	95.59	66.36	28.65	28.68	06/04/11	152.76	87.40	64.83	40.00	7/25/2011	60.06	41.57	17.83	18.02
04/15/11	88.30	61.30	26.48	26.49	06/05/11	148.98	85.25	63.17	40.00	7/26/2011	60.80	42.09	18.01	18.24
04/16/11	79.08	54.73	23.83	23.72	06/06/11	151.69	89.64	61.49	40.00	7/27/2011	54.63	37.60	16.27	16.39
04/17/11	87.55	60.71	26.28	26.26	06/07/11	177.10	89.29	87.13	40.00	7/28/2011	58.18	40.15	17.39	17.45
04/18/11	92.87	64.44	27.86	27.86	06/08/11	200.83	88.69	111.43	40.00	7/29/2011	55.14	38.18	16.35	16.54
04/19/11	102.59	71.38	30.71	30.78	06/09/11	195.00	89.06	105.30	40.00	7/30/2011	50.16	34.60	14.94	15.05
04/20/11	102.03	70.82	30.59	30.61	06/10/11	188.57	89.23	98.72	40.00	7/31/2011	51.67	35.58	15.52	15.50
04/21/11	105.58	73.27	31.74	31.68	06/11/11	173.14	89.55	83.05	40.00	8/1/2011	45.92	18.30	26.89	13.78
04/22/11	102.36	71.22	30.63	30.71	06/12/11	168.97	89.46	78.76	40.00	8/2/2011	53.87	20.45	32.83	16.16
04/23/11	97.08	67.65	28.97	29.12	06/13/11	172.94	89.07	83.33	40.00	8/3/2011	52.54	36.27	15.82	15.76
04/24/11	95.65	66.53	28.64	28.70	06/14/11	180.04	88.22	91.18	40.00	8/4/2011	53.29	36.72	15.85	15.99
04/25/11	90.76	63.02	27.28	27.23	06/15/11	180.58	89.49	90.52	40.00	8/5/2011	40.01	27.44	11.97	12.00
04/26/11	93.67	65.02	28.16	28.10	06/16/11	173.95	89.88	83.43	40.00	8/6/2011	42.73	29.41	12.80	12.82
04/27/11	91.72	63.56	27.46	27.52	06/17/11	166.21	89.75	75.76	40.00	8/7/2011	42.04	28.83	12.70	12.61
04/28/11	91.12	63.03	27.37	27.34	06/18/11	149.18	89.55	59.02	40.00	8/8/2011	42.32	29.17	12.70	12.70
04/29/11	88.29	61.25	26.51	26.49	06/19/11	144.65	90.12	53.85	40.00	8/9/2011	44.93	29.98	14.23	13.48
04/30/11	87.22	60.48	26.16	26.16	06/20/11	153.71	90.43	62.23	40.00	8/10/2011	46.10	31.80	13.84	13.83
05/01/11	86.60	60.10	25.96	25.98	06/21/11	152.30	77.45	74.28	39.44	8/11/2011	36.39	24.85	10.85	10.92
05/02/11	79.87	55.36	23.95	23.96	06/22/11	154.70	106.58	47.49	40.00	8/12/2011	40.30	27.71	11.94	12.09
05/03/11	83.41	57.79	25.00	25.02	06/23/11	170.53	107.96	61.93	40.00	8/13/2011	39.52	27.18	11.81	11.86
05/04/11	85.71	59.49	25.65	25.71	06/24/11	179.51	108.05	70.81	40.00	8/14/2011	36.71	25.19	10.97	11.01
05/05/11	86.29	59.65	25.78	25.89	06/25/11	173.25	108.83	63.85	40.00	8/15/2011	36.88	25.33	11.05	11.07
05/06/11	84.96	58.91	25.41	25.49	06/26/11	159.39	108.21	50.50	40.00	8/16/2011	39.52	27.06	11.80	11.86
05/07/11	84.25	58.34	25.28	25.27	06/27/11	154.45	107.04	46.84	40.00	8/17/2011	38.86	26.67	11.56	11.66
05/08/11	91.44	63.52	27.42	27.43	06/28/11	148.21	106.63	40.89	40.00	8/18/2011	36.18	24.82	10.90	10.85
05/09/11	98.68	68.48	29.56	29.60	06/29/11	152.21	104.56	47.08	40.00	8/19/2011	36.20	24.63	10.90	10.86
05/10/11	96.78	57.37	38.84	29.04	06/30/11	160.39	106.96	52.67	40.00	8/20/2011	36.06	24.68	10.90	10.82
05/11/11	97.66	67.80	29.22	29.30	07/01/11	161.05	108.30	52.06	40.00	8/21/2011	37.08	25.48	11.17	11.13
05/12/11	101.63	68.48	32.54	30.49	07/02/11	143.39	102.70	40.24	40.00	8/22/2011	36.34	24.90	10.82	10.90
05/13/11	113.80	71.41	41.66	34.14	07/03/11	136.85	95.67	40.71	40.00	8/23/2011	39.04	26.93	11.65	11.71
05/14/11	134.22	70.92	62.85	39.27	07/04/11	134.50	93.31	40.62	39.84	8/24/2011	38.70	26.50	11.50	11.61
05/15/11	167.75	70.23	97.01	40.00	07/05/11	133.47	90.95	41.76	39.89	8/25/2011	41.00	28.19	12.25	12.30
05/16/11	195.38	70.00	124.73	40.00	07/06/11	132.10	90.23	41.30	39.60	8/26/2011	36.69	25.17	10.93	11.01
05/17/11	183.40	70.24	112.59	40.00	07/07/11	123.92	85.82	37.52	37.17	8/27/2011	37.48	25.57	11.20	11.25
05/18/11	164.31	70.61	93.06	40.00	07/08/11	117.99	81.06	36.28	35.40	8/28/2011	32.67	22.36	9.81	9.80
05/19/11	152.61	72.89	78.97	40.00	07/09/11	109.87	74.50	34.89	32.96	8/29/2011	35.96	24.64	10.90	10.79
05/20/11	147.00	42.02	104.35	40.00	07/10/11	103.74	68.43	34.80	31.12	8/30/2011	38.01	26.05	11.36	11.40
05/21/11	155.86	72.85	82.49	40.00	07/11/11	95.27	64.76	29.92	28.58	8/31/2011	37.90	25.97	11.35	10.84

Table D-8

## FOP Spill at Lower Granite

Date	Outflow KCFS	Generation Flow KCFS	Actual Spill KCFS	FOP Spill KCFS	Date	Outflow KCFS	Generation Flow KCFS	Actual Spill KCFS	FOP Spill KCFS	Date	Outflow KCFS	Generation Flow KCFS	Actual Spill KCFS	FOP Spill KCFS
04/01/11	123.95	72.80	50.64	0.00	05/22/11	171.05	109.28	61.25	20.00	7/12/2011	93.80	74.90	18.53	18.00
04/02/11	130.64	72.84	57.44	0.00	05/23/11	182.64	107.39	74.80	20.00	7/13/2011	94.06	74.97	18.59	18.00
04/03/11	137.85	72.98	64.27	20.00	05/24/11	187.63	110.11	77.22	20.00	7/14/2011	89.55	70.35	18.60	18.00
04/04/11	124.35	72.70	51.19	20.00	05/25/11	196.12	110.43	85.25	20.00	7/15/2011	89.49	70.56	18.50	18.00
04/05/11	138.61	73.00	65.24	20.00	05/26/11	200.00	103.81	95.74	20.00	7/16/2011	86.80	66.53	19.83	18.00
04/06/11	137.41	72.38	64.52	20.00	05/27/11	201.68	110.00	91.16	20.00	7/17/2011	83.85	64.93	18.55	18.00
04/07/11	127.27	72.13	54.84	20.00	05/28/11	182.32	109.86	72.10	20.00	7/18/2011	81.17	62.20	18.53	18.00
04/08/11	116.98	72.01	44.54	20.00	05/29/11	171.68	109.65	61.58	20.00	7/19/2011	80.02	61.05	18.47	18.00
04/09/11	113.22	70.49	42.35	20.00	05/30/11	162.06	109.89	51.73	20.00	7/20/2011	72.35	53.26	18.58	18.00
04/10/11	108.93	68.32	40.30	20.00	05/31/11	157.24	105.76	51.04	20.00	7/21/2011	75.91	56.93	18.60	18.00
04/11/11	105.30	71.67	33.20	20.00	06/01/11	154.46	109.71	44.31	20.00	7/22/2011	71.56	52.67	18.46	18.00
04/12/11	106.74	71.78	34.51	20.00	06/02/11	154.32	108.56	45.39	20.00	7/23/2011	70.52	51.61	18.46	18.00
04/13/11	100.95	71.52	28.99	20.00	06/03/11	169.59	109.47	59.62	20.00	7/24/2011	69.38	50.32	18.42	18.00
04/14/11	98.75	71.37	26.94	20.00	06/04/11	160.45	109.00	51.00	20.00	7/25/2011	62.50	43.21	18.72	18.00
04/15/11	89.85	68.00	21.47	20.00	06/05/11	158.18	107.78	50.09	20.00	7/26/2011	62.10	42.63	18.88	18.00
04/16/11	80.09	60.16	19.62	19.62	06/06/11	161.79	108.69	52.73	20.00	7/27/2011	54.76	35.33	18.70	18.00
04/17/11	89.36	67.92	21.07	20.00	06/07/11	188.12	110.13	77.55	20.00	7/28/2011	58.10	39.06	18.61	18.00
04/18/11	96.57	71.32	24.95	20.00	06/08/11	211.16	111.19	99.45	20.00	7/29/2011	55.43	36.12	18.73	18.00
04/19/11	104.81	71.40	32.97	20.00	06/09/11	206.52	108.98	97.10	20.00	7/30/2011	50.80	31.60	18.68	18.00
04/20/11	106.78	70.63	35.85	20.00	06/10/11	196.97	110.03	86.42	20.00	7/31/2011	54.47	35.22	18.65	18.00
04/21/11	109.77	71.65	37.73	20.00	06/11/11	182.60	110.20	71.95	20.00	8/1/2011	46.33	9.90	35.77	18.00
04/22/11	104.86	66.00	38.44	20.00	06/12/11	178.78	108.19	70.21	20.00	8/2/2011	51.46	5.00	46.16	18.00
04/23/11	101.96	71.39	30.27	20.00	06/13/11	183.21	110.29	72.55	20.00	8/3/2011	52.78	5.00	47.41	18.00
04/24/11	98.24	71.46	26.43	20.00	06/14/11	188.92	110.63	77.93	20.00	8/4/2011	49.76	5.00	44.32	18.00
04/25/11	93.82	68.43	25.09	20.00	06/15/11	189.43	110.54	78.50	20.00	8/5/2011	40.96	5.00	35.45	18.00
04/26/11	95.78	68.29	27.04	20.00	06/16/11	184.48	109.59	74.52	20.00	8/6/2011	41.21	5.00	35.70	18.00
04/27/11	96.35	71.32	24.60	20.00	06/17/11	173.40	109.56	63.32	20.00	8/7/2011	40.34	5.00	34.97	18.00
04/28/11	93.63	71.47	21.72	20.00	06/18/11	158.69	107.96	50.30	20.00	8/8/2011	40.58	5.00	35.14	18.00
04/29/11	91.99	71.37	20.26	20.00	06/19/11	154.20	109.05	44.71	20.00	8/9/2011	43.01	10.81	31.84	18.00
04/30/11	90.26	69.79	20.17	20.00	06/20/11	161.82	109.67	51.73	20.00	8/10/2011	44.02	16.84	26.82	18.00
05/01/11	88.54	68.07	20.18	20.00	06/21/11	158.58	110.16	48.04	18.00	8/11/2011	36.60	16.80	19.29	18.00
05/02/11	84.78	64.31	20.08	20.00	06/22/11	167.44	110.42	56.52	18.00	8/12/2011	39.03	16.76	21.79	18.00
05/03/11	86.02	65.54	20.20	20.00	06/23/11	181.56	110.75	70.16	18.00	8/13/2011	39.96	16.80	22.63	18.00
05/04/11	87.06	66.40	20.15	20.00	06/24/11	191.55	110.98	80.19	18.00	8/14/2011	35.80	16.80	18.57	18.00
05/05/11	90.02	69.64	20.10	20.00	06/25/11	182.83	110.59	71.72	18.00	8/15/2011	36.33	7.94	28.02	18.00
05/06/11	86.02	65.53	20.13	20.00	06/26/11	172.59	109.77	62.52	18.00	8/16/2011	35.71	5.00	30.34	18.00
05/07/11	87.28	66.67	20.24	20.00	06/27/11	163.60	109.89	53.27	18.00	8/17/2011	38.65	8.02	30.05	18.00
05/08/11	95.34	71.24	23.80	20.00	06/28/11	159.11	110.08	48.58	18.00	8/18/2011	35.53	16.74	18.43	18.00
05/09/11	101.75	76.79	24.37	20.00	06/29/11	162.08	110.08	51.65	18.00	8/19/2011	35.49	12.60	22.52	18.00
05/10/11	101.14	80.57	20.05	20.00	06/30/11	171.78	97.41	73.94	18.00	8/20/2011	33.74	14.87	18.42	18.00
05/11/11	99.47	79.05	20.05	20.00	07/01/11	168.15	92.00	75.77	18.00	8/21/2011	36.75	17.94	18.44	18.00
05/12/11	104.80	82.28	22.21	20.00	07/02/11	151.40	108.94	42.16	18.00	8/22/2011	35.48	16.70	18.48	18.00
05/13/11	119.80	84.52	34.90	20.00	07/03/11	145.50	106.86	38.27	18.00	8/23/2011	39.36	20.31	18.54	18.00
05/14/11	140.18	89.97	49.91	20.00	07/04/11	141.95	107.05	34.40	18.00	8/24/2011	38.16	19.31	18.47	18.00
05/15/11	175.35	91.02	84.02	20.00	07/05/11	141.73	95.37	45.39	18.00	8/25/2011	39.23	20.37	18.47	18.00
05/16/11	203.37	91.73	111.35	20.00	07/06/11	138.57	91.53	46.60	18.00	8/26/2011	37.63	18.39	18.65	18.00
05/17/11	188.72	90.63	97.51	20.00	07/07/11	131.70	91.60	39.53	18.00	8/27/2011	36.12	16.93	18.62	18.00
05/18/11	173.00	88.71	83.72	20.00	07/08/11	122.79	88.40	34.02	18.00	8/28/2011	32.60	13.82	18.47	18.00
05/19/11	158.56	93.47	64.66	20.00	07/09/11	114.65	86.62	27.59	18.00	8/29/2011	35.07	16.06	18.49	18.00
05/20/11	158.65	102.44	55.71	20.00	07/10/11	106.27	79.55	26.28	18.00	8/30/2011	36.86	17.95	18.55	18.00
05/21/11	163.19	102.38	60.30	20.00	07/11/11	96.85	75.07	21.24	18.00	8/31/2011	37.42	18.37	18.54	18.00

Table D-9

FOP Spill at Chief Joseph														
Date	Outflow KCFS	Generation Flow KCFS	Actual Spill KCFS	FOP Spill KCFS	Date	Outflow KCFS	Generation Flow KCFS	Actual Spill KCFS	FOP Spill KCFS	Date	Outflow KCFS	Generation Flow KCFS	Actual Spill KCFS	FOP Spill KCFS
04/01/11	140.97	140.97	0.00	0.00	05/22/11	241.08	131.17	109.90	0.00	7/12/2011	198.74	120.16	78.58	0.00
04/02/11	145.65	128.65	17.00	0.00	05/23/11	215.62	123.22	92.40	0.00	7/13/2011	208.43	111.94	96.49	0.00
04/03/11	146.19	87.37	58.82	0.00	05/24/11	206.78	120.08	86.70	0.00	7/14/2011	198.36	113.63	84.73	0.00
04/04/11	143.67	129.09	14.58	0.00	05/25/11	202.13	121.58	80.54	0.00	7/15/2011	189.71	133.87	55.84	0.00
04/05/11	146.73	137.60	9.13	0.00	05/26/11	211.90	113.31	98.58	0.00	7/16/2011	178.95	119.96	58.97	0.00
04/06/11	152.78	113.38	39.40	0.00	05/27/11	241.79	116.55	125.24	0.00	7/17/2011	173.57	114.80	58.77	0.00
04/07/11	152.94	126.62	26.32	0.00	05/28/11	273.02	124.97	148.05	0.00	7/18/2011	179.45	130.29	49.16	0.00
04/08/11	153.20	134.33	18.88	0.00	05/29/11	274.16	122.75	151.40	0.00	7/19/2011	178.39	127.88	50.50	0.00
04/09/11	156.52	129.78	26.74	0.00	05/30/11	269.99	125.53	144.46	0.00	7/20/2011	170.61	117.07	53.54	0.00
04/10/11	156.78	117.93	38.85	0.00	05/31/11	276.82	133.40	143.42	0.00	7/21/2011	175.54	124.90	50.64	0.00
04/11/11	147.10	138.32	8.78	0.00	06/01/11	258.77	128.74	130.03	0.00	7/22/2011	169.87	123.20	46.65	0.00
04/12/11	158.57	158.57	0.00	0.00	06/02/11	262.06	120.31	141.75	0.00	7/23/2011	166.57	123.86	42.71	0.00
04/13/11	151.01	151.01	0.00	0.00	06/03/11	267.72	123.13	144.60	0.00	7/24/2011	177.42	131.40	46.02	0.00
04/14/11	141.52	141.52	0.00	0.00	06/04/11	273.04	128.21	144.83	0.00	7/25/2011	157.64	133.81	23.83	0.00
04/15/11	147.90	147.90	0.00	0.00	06/05/11	269.59	124.50	145.10	0.00	7/26/2011	155.85	155.85	0.00	0.00
04/16/11	114.98	114.98	0.00	0.00	06/06/11	260.81	119.29	141.52	0.00	7/27/2011	160.02	160.02	0.00	0.00
04/17/11	123.95	123.95	0.00	0.00	06/07/11	233.40	114.63	118.81	0.00	7/28/2011	155.99	155.99	0.00	0.00
04/18/11	122.67	122.67	0.00	0.00	06/08/11	222.86	96.78	126.08	0.00	7/29/2011	156.14	156.14	0.00	0.00
04/19/11	143.80	143.80	0.00	0.00	06/09/11	201.18	111.50	89.69	0.00	7/30/2011	149.95	149.95	0.00	0.00
04/20/11	146.01	146.01	0.00	0.00	06/10/11	223.03	116.95	106.08	0.00	7/31/2011	142.42	142.42	0.00	0.00
04/21/11	136.48	136.48	0.00	0.00	06/11/11	239.41	99.90	139.52	0.00	8/1/2011	135.75	132.38	3.37	0.00
04/22/11	147.70	147.70	0.00	0.00	06/12/11	236.84	107.76	129.07	0.00	8/2/2011	154.16	136.67	17.49	0.00
04/23/11	138.23	138.23	0.00	0.00	06/13/11	219.72	87.96	131.76	0.00	8/3/2011	144.71	144.71	0.00	0.00
04/24/11	129.72	129.72	0.00	0.00	06/14/11	248.50	106.49	142.02	0.00	8/4/2011	133.85	133.85	0.00	0.00
04/25/11	134.73	134.73	0.00	0.00	06/15/11	242.68	105.40	137.28	0.00	8/5/2011	136.74	136.74	0.00	0.00
04/26/11	138.87	138.87	0.00	0.00	06/16/11	242.39	115.17	127.22	0.00	8/6/2011	142.35	142.35	0.00	0.00
04/27/11	120.99	120.99	0.00	0.00	06/17/11	237.79	118.08	119.70	0.00	8/7/2011	135.05	135.05	0.00	0.00
04/28/11	139.06	139.06	0.00	0.00	06/18/11	242.41	108.46	133.90	0.00	8/8/2011	138.71	138.71	0.00	0.00
04/29/11	130.23	130.23	0.00	0.00	06/19/11	233.89	119.69	114.20	0.00	8/9/2011	138.40	138.40	0.00	0.00
04/30/11	121.78	121.78	0.00	0.00	06/20/11	223.55	125.54	98.01	0.00	8/10/2011	142.20	142.20	0.00	0.00
05/01/11	145.77	145.77	0.00	0.00	06/21/11	221.76	133.01	88.75	0.00	8/11/2011	149.46	149.46	0.00	0.00
05/02/11	139.35	139.35	0.00	0.00	06/22/11	220.94	128.75	92.19	0.00	8/12/2011	146.88	146.88	0.00	0.00
05/03/11	118.30	118.30	0.00	0.00	06/23/11	232.15	107.36	124.79	0.00	8/13/2011	133.48	133.48	0.00	0.00
05/04/11	125.46	125.46	0.00	0.00	06/24/11	206.06	119.32	86.74	0.00	8/14/2011	122.79	122.79	0.00	0.00
05/05/11	122.53	122.53	0.00	0.00	06/25/11	206.59	130.22	76.37	0.00	8/15/2011	139.11	139.11	0.00	0.00
05/06/11	145.69	145.69	0.00	0.00	06/26/11	207.30	107.89	99.41	0.00	8/16/2011	154.72	154.72	0.00	0.00
05/07/11	130.48	130.48	0.00	0.00	06/27/11	209.11	106.41	102.70	0.00	8/17/2011	148.32	148.32	0.00	0.00
05/08/11	116.41	116.41	0.00	0.00	06/28/11	204.87	119.58	85.29	0.00	8/18/2011	151.57	151.57	0.00	0.00
05/09/11	136.59	136.59	0.00	0.00	06/29/11	200.21	114.05	86.08	0.00	8/19/2011	140.41	140.41	0.00	0.00
05/10/11	162.02	159.47	2.55	0.00	06/30/11	206.99	106.44	100.55	0.00	8/20/2011	131.48	131.48	0.00	0.00
05/11/11	171.32	169.61	1.71	0.00	07/01/11	213.14	130.21	82.93	0.00	8/21/2011	132.47	132.47	0.00	0.00
05/12/11	161.79	161.79	0.00	0.00	07/02/11	222.40	127.70	94.74	0.00	8/22/2011	140.24	140.24	0.00	0.00
05/13/11	181.25	142.68	38.58	0.00	07/03/11	206.76	103.20	103.57	0.00	8/23/2011	140.64	140.64	0.00	0.00
05/14/11	170.29	100.80	69.50	0.00	07/04/11	197.38	111.21	86.16	0.00	8/24/2011	133.13	133.13	0.00	0.00
05/15/11	173.30	85.31	88.00	0.00	07/05/11	219.53	136.60	82.93	0.00	8/25/2011	123.04	123.04	0.00	0.00
05/16/11	142.94	102.10	41.21	0.00	07/06/11	225.97	136.88	89.08	0.00	8/26/2011	144.60	144.60	0.00	0.00
05/17/11	159.72	123.89	35.83	0.00	07/07/11	224.37	122.81	101.56	0.00	8/27/2011	118.55	118.55	0.00	0.00
05/18/11	195.25	109.28	85.97	0.00	07/08/11	218.81	127.50	91.30	0.00	8/28/2011	113.66	113.66	0.00	0.00
05/19/11	204.56	110.42	94.15	0.00	07/09/11	205.84	126.38	79.46	0.00	8/29/2011	108.79	108.79	0.00	0.00
05/20/11	218.08	102.67	115.42	0.00	07/10/11	215.93	115.09	100.84	0.00	8/30/2011	111.58	111.58	0.00	0.00
05/21/11	237.47	124.05	113.42	0.00	07/11/11	204.15	110.77	93.38	0.00	8/31/2011	123.97	123.97	0.00	0.00

**TABLE D-10**  
**Project-Specific FOP Spill Volumes in kaf**  
**April through August, 2000 - 2011**

Year	Lower Granite	Little Goose	Lower Monumental	Ice Harbor	McNary	John Day	The Dalles	Bonneville	Chief Joseph	Yearly Totals
2011	5,704	8,586	6,677	15,204	40,500	28,439	32,149	27,642	0	164,901
2010	7,222	5,782	7,047	10,846	25,945	18,641	20,749	27,819	---	124,051
2009	5,662	6,157	6,705	12,383	26,671	18,682	22,322	25,868	---	124,450
2008	5,703	6,624	6,326	11,920	29,115	21,671	25,645	25,967	---	132,971
2007	5,283	4,071	5,513	7,915	26,001	15,350	22,007	27,084	---	113,224
2006	5,612	5,684	6,003	11,493	26,359	15,007	24,671	24,042	---	118,871
2005	2,806	2,306	2,868	8,932	25,079	14,445	18,496	24,195	---	99,127
2004	715	631	948	11,188	10,488	13,943	19,440	25,216	---	82,569
2003	3,098	2,820	4,424	9,945	9,094	13,279	20,451	31,732	---	94,843
2002	3,100	3,770	0	13,408	10,497	17,863	24,122	30,803	---	103,562
2001	2,992	2,356	3,786	9,153	325	803	4,821	5,527	---	29,762
2000	3,605	3,039	4,856	14,022	9,297	18,500	21,647	25,417	---	100,383
Project Average	4,292	4,319	4,596	11,367	19,948	16,385	21,377	25,109		

\*2011 includes Chief Joseph dam.

**TABLE D-11**  
**Average Project Flow and FOP Spill in kcfs**  
**April through August, 2011**

Average Project Flow and FOP Spill in kcfs - April through August, 2011										
Average Flow	Lower Granite	Little Goose	Lower Monumental	Ice Harbor	McNary	John Day	The Dalles	Bonneville	Chief Joseph	Total
Outflow	111	106	110	114	328	332	319	335	177	1,932
Generation Flow	70	60	73	47	130	207	177	159	127	1,050
Actual Spill	41	45	36	66	193	124	136	163	49	853
Involuntary Spill	22	16	14	15	51	24	23	66	49	231
FOP Spill	19	29	22	51	142	100	113	97	0	573

\*2011 includes Chief Joseph dam.

**TABLE D-12**  
**Total Project Flow and FOP Spill Volumes in kaf**  
**April through August, 2011**

Volume Flow	Lower Granite	Little Goose	Lower Monumental	Ice Harbor	McNary	John Day	The Dalles	Bonneville	Chief Joseph	Total
Outflow	33,193	31,791	32,973	34,019	93,556	94,699	91,184	95,595	52,920	559,931
Generation Flow	20,880	18,014	21,982	14,136	37,051	59,037	50,494	45,547	38,172	305,313
Actual Spill	12,183	13,598	10,749	19,647	55,163	35,290	38,950	46,508	14,749	246,837
FOP Spill	5,704	8,586	6,677	15,204	40,500	28,439	32,149	27,642	0	164,901
Involuntary spill	6,478	5,012	4,073	4,443	14,663	6,851	6,801	18,867	14,749	81,936

\*2011 includes Chief Joseph dam.

**TABLE D-13**  
**Total Project Flow and BiOp Spill Volumes in kaf**  
**April through August, 2000 – 2011**

<b>Year</b>	<b>Total Project * Outflow</b>	<b>Generation * Outflow</b>	<b>Actual Spill *</b>	<b>FOP Spill *</b>
2011	559,931	305,313	246,837	164,901
2010	296,571	164,830	124,051	116,031
2009	335,784	196,691	131,444	124,450
2008	363,125	200,728	154,901	132,989
2007	283,680	162,927	113,174	113,224
2006	406,601	238,580	160,146	118,878
2005	274,635	167,402	99,333	99,127
2004	280,692	190,388	82,551	82,569
2003	311,458	206,927	98,001	94,843
2002	357,155	225,072	125,688	103,522
2001	182,996	164,738	11,460	29,762
2000	327,334	209,851	96,931	100,383
Average	331,663	202,787	120,376	106,723

\*2011 includes Chief Joseph dam.